The social and economic costs and harms of alcohol consumption in the Northern Territory

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Acronyms

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
BITRE	Bureau of Infrastructure Transport and Regional Economics
DAGJ	NT Department of Attorney-General and Justice
DOH	NT Department of Health
DUMA	Drug Use Monitoring in Australia
FASD	Fetal Alcohol Spectrum Disorder
Menzies	Menzies School of Health Research
NDSHS	National Drug Strategy Household Survey
NDRI	National Drug Research Institute
NHMRC	National Health and Medical Research Council
NPV	Net Present Value
NT	Northern Territory
NTG	Northern Territory Government
OECD	Organisation for Economic Cooperation and Development
PAAF	Population Alcohol Attributable Fraction
SACES	South Australian Centre for Economic Studies
WHO	World Health Organisation

Executive Summary

The costs and harms of alcohol consumption in Australia are well documented, significant and have impacts across society including premature deaths, heavy use of the health system, high rates of crime (particularly violent crime and antisocial behaviour), child abuse and neglect, and road crashes (AIHW 2018a).

Historically, the per capita costs and harms of alcohol consumption in the Northern Territory (NT) have been the highest in the nation. The last time a comprehensive analysis of the nature of these costs was estimated was in 2009, based on consumption data from 2004/05 (SACES 2009; Skov et al 2010). At that time, the total social cost of alcohol in the NT in 2004/05 was estimated to be $642 million (SACES 2009). On a per capita basis, this was more than four times the comparable national level.

In an effort to provide a more robust study, an alternative quantitative methodology has been used which draws on new ways to estimate social costs. To ensure currency, the statistical analysis draws on data from 2015/16, unless specified otherwise.

While alcohol consumption in the NT appears to have decreased slightly over the past decade, this report shows that the costs and harms associated with alcohol consumption have not. Indeed, the scale of the harm has continued to increase.

At a population level it is now estimated that the total social cost of alcohol in 2015/16 was $1,386.8 million, with **tangible costs of $701.3 million**, and **intangible costs of $685.5 million** (excluding the lost quality of life due to addiction amongst dependent drinkers and the family members of dependent drinkers – the magnitudes of which are less certain but likely to be very substantial).

At an individual level the estimated total social cost of alcohol in 2015/16 was $3,832.19 in tangible costs per adult resident of the Northern Territory, with intangible costs imposing a further cost of $3,745.75 per adult. **This equates to a total estimated impact of $7,577.94 per adult** (excluding the costs of alcohol dependence to the dependent drinker and their family).

At a population level total costs of premature mortality equate to $785,537,761 including both tangible and intangible costs.

A summary of the tangible costs includes:

- **Total health costs equate to $100,177,195**
- **Total road crash costs equate to $57,626,900** (excluding mortality and hospital separations)
- **Total quantifiable costs of crime equate to $272,577,240**
- **Total child protection costs equate to $170,912,745**

The most significant intangible costs are:

- **Intangible costs of premature death of $652.5 million**
- **Intangible costs of permanent impairment from road crash injuries of $17.1 million**
- **Intangible costs of crime** (e.g. pain and suffering, reduced feeling of safety) **of $15.9 million**

In addition, the following estimations have been made regarding the impact of alcohol on the Northern Territory in 2015/16:

- There were an estimated 141.9 net premature deaths caused by alcohol.
- Crime caused by alcohol accounted for $75.9 million of police time while the total costs of alcohol attributable crime are just under $142 million.
- Alcohol is estimated to be responsible for between 4.5 per cent and 11 per cent of cases of child abuse and neglect, creating costs of $8 million to $20 million in increased child protection spending by the NT Government, and imposing lifetime costs of $62 million to $384 million on the victims of child abuse and neglect.
- Almost fifty per cent of road crash deaths, and twenty per cent of serious injury crashes are attributable to alcohol.

The 2004/05 estimate of $642 million, when adjusted for inflation over the intervening period using the Australian Bureau of Statistics(ABS) Consumer Price Index, is equivalent to $844.4 million in 2015/16[1]. The new estimate therefore represents an increase in real costs of 64.2 per cent.

However, the two figures are not directly comparable, partly because of changed understandings about the impact of alcohol and more sophisticated approaches to measurement, and partly because of a range of additional factors, including:

- Increases in the real costs of most NT Government (NTG) services impacted by alcohol, particularly police and prisons
- The inclusion of child protection costs in the current report (this was not included in the 2004/05 estimates)
- An increase in net deaths attributable to alcohol from 94.9 in 2004/05 to 141.9 in 2015/16
- Improved methodologies for valuing the intangible costs of death and disability.

[1] Australian Bureau of Statistics Consumer Price Index Calculator
www.abs.gov.au/websitedbs/d3310114.nsf/home/Consumer+Price+Index+Inflation+Calculator .

Chapter 1: Introduction

1.1 Background

The costs and harms of alcohol consumption in Australia have been well documented by the Australian Institute of Health and Welfare (AIHW 2018a). While the National Health and Medical Research Council (NHMRC) are currently reviewing the *Australian Guidelines for to Reduce Health Risks from Drinking Alcohol* (NHMRC 2018), the latest global evidence suggests there is no safe level of alcohol consumption (Griswold et al. 2018). The negative effects on the health and wellbeing of our society far outweigh its benefits (AIHW 2018a; Griswold et al. 2018; Daube & Stafford 2016; Commonwealth Department of Health 2018). Harmful levels of alcohol consumption – both binge drinking and sustained high and moderate levels of drinking – increase the propensity for risk taking associated with violence, crime, road trauma, unsafe sex, alcohol poisoning, drinking while pregnant and a wide raft of anti-social behaviours (AIHW 2018a; Griswold et al. 2018; Daube & Stafford 2016; Department of Health 2018). Alcohol's harm also extends beyond the drinker to those around drinker and arguably the totality of this harm is more than that which accrues to the drinker. This harm includes family and domestic violence, child neglect, road fatalities, injuries, diminished industry productivity and other third party harms (Laslett et al. 2010).

The AIHW (2018a) reports that the proportion of people drinking in excess of the recommended Australian risk guidelines has been declining since 2010. Generally speaking, this is good news. However, there is reason to be cautious (Yusuf & Leeder 2015) with population demographics changing and the decline being marginal given current average per capita drinking levels are more than double those in the 1930s (Livingston & Wilkinson 2013). For example, we know that around one in three Australians continue to binge drink, and that alcohol also remains the most common principal drug of concern for which Australian's seek treatment (AIHW 2018a). Also, we know that alcohol is an addictive drug. Dependence to alcohol requires a broad range of therapeutic and treatment options to minimise harms to the individual, their family, and the broader community (Ritter & Stoove 2016). The significant impact of alcohol consumption on population health in Australia is also well documented (AIHW 2016, 2018a). That is, excessive alcohol consumption exacerbates health issues associated with chronic conditions such as diabetes, cardiovascular disease, mental illness and cancer (AIHW 2016). Furthermore, excessive alcohol consumption is positively associated pathological gambling (Grant et al. 2002; Kidman 2002), spending more money while gambling (Leino et al. 2017), and other psychiatric disorders (Petry et al. 2005).

The Northern Territory (NT) has the highest reported rates of alcohol consumption per capita in Australia, with correspondingly high rates of alcohol fuelled violence and crime (Skov et al. 2010; SACES 2009; Riley 2017). A recent report released by the NT Department of Attorney-General and Justice (DAGJ) indicates that the estimated per capita alcohol consumption in the NT for persons aged 15 or over in 2017 was 11.6 litres per person (DAGJ 2018). While this has decreased 14 per cent over the past seven years (DAGJ 2018), this still represents the highest consumption of alcohol for any state or territory in Australia.

To further enhance the alcohol harm minimisation response currently being implemented in the NT, Menzies School of Health Research (Menzies) was recently commissioned by the NTG to examine the social and economic costs and harms of alcohol consumption in the Northern Territory. This study was approached in partnership with the South Australian Centre for Economic Studies (SACES) and aims to replicate, and expand on, a similar study undertaken by SACES a decade ago (SACES 2009). Using data gathered from 2015/16, this report provides a current evidence-based account of alcohol consumption in the NT. It uses well-established methodologies, to quantify and explain the harms and costs of alcohol consumption in the NT. This robust approach provides unique insights into the potential levers for change in policy and practice settings across the NT. This project was granted ethics approval through the DoH/Menzies Human Research Ethic Committee (18-3158), with reciprocal ethics approval obtained through the University of Adelaide Human Research Ethics Committee (18-33073).

1.2 Drinking and its Costs - Exploring the Connections

The relationship between alcohol use and the economic costs generated by drinking is a complex one, in which many factors mediate the relationship between drinking and its outcomes. The *logic* underpinning the relationship, however, is less complicated; it can be summarised as follows:

1. High levels of alcohol consumption in the NT contribute to high levels of a range of problems that governments are expected to address, either directly, or by paying non-government organisations to do so;
2. The unit costs of addressing these problems are higher in the NT than elsewhere in Australia.
3. Therefore, alcohol misuse in the NT gives rise to higher costs, particularly in relation to treatment and service costs, than it does in other jurisdictions.

This report uses quantitative approaches to explore the social and economic costs of alcohol to the Northern Territory and its people. The methodology is introduced and explained sequentially throughout the ensuing chapters. In each of the three broad areas of social cost outlined above, the costs are quantified to the extent possible.

The analysis presented in this report was led by Mr Steve Whetton from SACES and draws on the pioneering methodology adopted by Collins and Lapsley [27]. It has also been influenced by more sophisticated methodological adaptations for examining alcohol consumption. These new approaches are discussed in greater detail throughout the subsequent chapters.

Chapter 2: Quantifying the Impacts on Health

2.1 Attribution of harm

Alcohol is known to be a contributor (either wholly or partly) to a number of health conditions which can result in hospitalisation and/or premature death. There are also a smaller number of conditions for which there is some evidence that moderate consumption of alcohol may provide a protective effect, although the scale of these protective effects are increasingly being questioned (see for example, Stockwell et al. 2016, Naimi et al. 2017).

The net impact of alcohol on premature mortality and on morbidity, is an important component of the social cost calculation and this needs to be quantified.

The preferred approach to attributing some share of these harms (or some share of averted harm) to alcohol is through the use of what is known as attributable fractions (AF). These identify the proportion of the harm that is caused (or prevented) by exposure to the hazard. The AF can then be combined with deaths or hospital separations data to identify the notional fraction of each death caused or prevented by alcohol.

There are three broad sources for AFs from exposure to alcohol.

First, there are a small number of conditions which are by definition wholly caused by alcohol, such as alcohol poisoning, and alcoholic liver cirrhosis. These conditions are given an AF of 1.
Conditions wholly caused by consumption of alcohol are:

- Alcoholic liver cirrhosis;
- Alcoholic cardiomyopathy;
- Alcoholic beverage & other EtOH poisoning;
- Foetal alcohol syndrome disorder;
- Alcoholic psychosis;
- Alcohol dependence/abuse;
- Alcoholic polyneuropathy;
- Alcoholic gastritis; and
- Aspiration (not purely alcohol related by definition but English et al. 1995 report that in practice in Australia it is only used to code alcohol related cases).

The second source of AFs is sometimes referred to as the indirect method, calculates the AF specific to a population and time from the relative risk of exposure to the substance and the prevalence of exposure amongst the population of interest. Relative risk estimates are derived from analysis of case control or cohort studies and report the excess risk of developing the condition of interest (or dying from a particular cause) for those exposed to the risk factor after controlling for demographic factors. Combining this with the exposure to the risk factor of the population of interest gives a population specific estimate of the AF.

The method for calculating attributable fractions from relative risks was described by English et al. in 1995 and is still used today (English et al., 1995). The formula used to calculate the aetiological fraction (AF) for a condition with respect to a particular population where the risk varies by consumption is (World Health Organization, 2000):

$$AF = \frac{\sum_{i=1}^{n} P_i (RR_i - 1)}{\sum_{i=1}^{n} P_i (RR_i - 1) + 1}$$

Where -
i represents the consumption categories used;
P_i is the proportion of the population of interest who are in the particular consumption category i; and RR_i is the relative risk of a person in consumption category i acquiring the condition.
If the epidemiological data available is expressed in terms of odds ratios these need to be converted to a relative risk to allow the calculation of attributable fractions. This can be done using the following formula (Grant, 2014):

$$RR = \frac{OR}{1 - p_0 + (p_0 * OR)}$$

Where:
RR = relative risk for the risk factor in question;
OR = odds ratio for the risk factor in question;
p_0 = the baseline risk

The alternative approach to the indirect method, the direct method of calculating aetiological fractions is based on a study(ies) making a direct attribution on a case by case basis of the contribution of the substance use to the condition or injury, e.g., a study could analyse incident report data to identify the proportion of house fire injuries where the cause of ignition was a cigarette or discarded match. Direct attribution has important limitations such as variability in the criteria used to determine attribution, observer variation, and a failure to reflect the exposure patterns of the population to which it is being applied. It also reflects the consumption patterns at the time and place of the original study (although established methods exist to adjust AFs estimated by direct methods for differences in consumption behaviour – see below). Direct methods are generally only used when there are no estimates of the relative risk of the condition of interest.

2.2 Attributable fractions

2.2.1 Attributable fractions calculated from relative risks

Conditions partially caused or prevented by alcohol for which relative risk estimates exist are:

- Atrial fibrillation and flutter;
- Breast cancer;
- Cirrhosis and other chronic liver disease (excluding alcoholic liver cirrhosis);
- Colon and rectum cancer;
- Diabetes mellitus (protective effects at moderate levels of consumption, causative effect at higher levels of consumption);
- Epilepsy
- Hemorrhagic stroke
- Hypertensive heart disease
- Ischaemic heart disease (protective effects at moderate levels of consumption, causative effect at higher levels of consumption);

- Ischaemic stroke (protective effects at moderate levels of consumption, causative effect at higher levels of consumption);
- Larynx cancer
- Lip and oral cavity cancer
- Liver cancer due to alcohol use
- Lower respiratory infections
- Nasopharynx cancer
- Oesophageal cancer
- Other pharynx cancer
- Pancreatitis
- Self-harm
- Tuberculosis
- Unintentional injuries

The primary source of relative risk estimates for this analysis is the latest update of the global burden of disease study (Gakidou et al. 2017). The relative risks by age and consumption category are set out in Appendix A.

2.3 Alcohol consumption prevalence

The second requirement for an aetiological fraction calculation is the proportion of the population in each exposure category. Due to the potentially different levels of harm, prevalence estimates have been calculated separately for males and females and for Aboriginal and Torres Strait Islanders and the remainder of the Northern Territory population. As the global burden of disease study collated its relative risk estimates in terms of average daily consumption bands, Northern Territory prevalence needs to be expressed on a similar basis.

Overall alcohol consumption prevalence was extracted from a custom analysis of the 2016 National Drug Strategy Household Survey (NDSHS) unit record file (Hewitt 2017). The NDSHS does not directly collect data on average daily alcohol consumption, but this can be imputed by combining responses on the frequency of drinking and the average number of standard drinks consumed when drinking. This data was used to produce estimated consumption by gender and five-year age group for the Northern Territory population aged 12 and over.

Due to confidentiality restrictions (and the small sample size) it is not possible to undertake separate analysis of the alcohol consumption patterns of Northern Territory residents who are Aboriginal and Torres Strait Islanders and so an alternative prevalence measure is needed.

Our main measure of consumption by Aboriginal and Torres Strait Islanders in the NT will be the national consumption levels of Aboriginal and Torres Strait Islanders in the NDSHS, analysed on the same basis as the general NT population. To the extent that specific data exists it tends to suggest that, as is the case with the broader Northern Territory population, alcohol consumption rates amongst Aboriginal and Torres Strait Islanders in the Northern Territory are above the national average. This means our analysis is likely to somewhat understate alcohol attributable harms.

2.4 Directly derived attributable fractions

There are a small number of alcohol attributable conditions for which reliable relative risk based assessments of alcohol involvement do not exist, namely:

- Interpersonal violence;
- Transport injuries
- Oesophageal varices; and
- Gastro-intestinal haemorrhage.

The most significant of these is interpersonal violence, where relative risk estimates based on the consumption of the perpetrator cannot be readily applied to deaths or hospital separations data as those are coded on the age and gender of the victim of the crime. Nationally attributable fractions derived from the Australian Institute of Criminology's Drug Use Monitoring in Australia (DUMA) survey are typically used to identify the proportion of crime attributable to use of specific substances (Coghlan et al., 2015). Unfortunately the DUMA survey has not had a collection site in the Northern Territory since 2010. The NT Department of Attorney-General and Justice (DAGJ) undertake their own analysis of the influence of substance use on offending coding offences where charges were laid and offences where convictions were recorded based on substance involvement coded as alcohol, drugs, other (typically petrol sniffing), combinations of these substances, and no substance use. For the purposes of this deaths analysis we have used the proportion or homicides where alcohol was identified as being involved in the offence (e.g. excluding cases where alcohol was identified in conjunction with one or more other substances).

The proportion of transport injuries attributable to alcohol in the NT is taken from assessments made by NT police as to whether alcohol was the primary cause of the crash (Road Safety NT 2018), which conclude that on average over 2015 and 2016 47.9 per cent of crashes involving a fatality (and 19.9 per cent of crashes involving a serious injury) were attributable to alcohol.

In the case of oesophageal varices, following Ridolfo and Stevenson in using the attributable fractions derived for cirrhosis (2001, p.44).

Ridolfo and Stevenson identify an attributable fraction of 0.47 for alcohol's role in gastro-intestinal haemorrhage (*Ibid,* p. 44). This was modified to reflect Norther Territory specific drinking prevalence by age group, gender and Aboriginal and Torres Strait Islander identification using the approach set out below.

In general, estimates of harm attributable to substance use will not adjust the attributable fractions calculated by direct methods for local and current consumption patterns. However, WHO sets out an approach which can be used where either local consumption patterns differ notably from those in the reference population from which the directly derived attributable fraction was calculated, or where a study is attempting to assess the impact of a change in consumption patterns (WHO, 2000). In these cases the use of attributable fractions estimated by direct methods has the potential to under- or over-state the level of substance attributable harm. In the case of the Northern Territory with its above average risky consumption of alcohol, the use of directly derived attributable fractions is likely to underestimate the level of harm.

The formula used to adjust AFs estimated using direct methods is:

$$AF_x = \frac{((F * AF_{ref}) + AF_{ref})}{(\left((F * AF_{ref}) + AF_{ref}\right) + (1 - AF_{ref}))}$$

Where -
AF_x = the new attributable fraction for year x (the study year)
AF_{ref} = is the attributable fraction calculated using the direct method in some previous year, and
F = the change in exposure to the risk factor, expressed as:

$$F = \frac{(P_{ref} - P_x)}{(P_{ref} * -1)}$$

Where -
P_{ref} = the prevalence in the reference year of the original study, and
P_x = prevalence in the new target year x.

Chapter 3: Alcohol Attributable Premature Mortality

Data on the number of alcohol attributable deaths by age, gender and Aboriginal and Torres Strait Islander identification for conditions at least partially caused or prevented by alcohol were extracted by researchers at the NT Department of Health from the national mortality database (see Table 3.1). Extraction was based on the principal cause of death, coded using the ICD-10 classification structure.

Alcohol attributable deaths and deaths prevented by moderate alcohol consumption were calculated by applying the relevant attributable fraction to each death.

Total net alcohol attributable mortality in the Northern Territory is estimated to be 141.9 premature deaths, with an estimated 165.4 deaths caused by alcohol and 23.5 deaths prevented by moderate alcohol consumption.

Table 3.1 Alcohol attributable mortality, caused and prevented, by age group, gender and identification as Aboriginal or Torres Strait Islander

	0 - 11	12 - 17	18 - 24	25 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70+	All ages
Male - Not Aboriginal or Torres Strait Islander.										
Caused	0.0	0.0	6.8	5.7	5.2	7.4	12.9	15.7	10.2	63.9
Prevented	0.0	0.0	0.0	-0.1	0.0	-0.6	-0.9	-1.4	-3.6	-6.5
Total	**0.0**	**0.0**	**6.8**	**5.5**	**5.2**	**6.9**	**12.0**	**14.3**	**6.6**	**57.3**
Female - Not Aboriginal or Torres Strait Islander										
Caused	0.0	0.0	0.1	0.7	0.4	0.9	4.8	3.0	2.7	12.6
Prevented	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.2
Total	**0.0**	**0.0**	**0.1**	**0.7**	**0.4**	**0.9**	**4.8**	**3.0**	**2.5**	**12.4**
Male - Aboriginal or Torres Strait Islander										
Caused	1.0	0.0	3.3	3.6	11.7	14.9	16.6	5.2	7.2	63.5
Prevented	0.0	0.0	-0.2	-0.1	-1.2	-1.7	-1.9	-0.8	-1.1	-7.0
Total	**1.0**	**0.0**	**3.1**	**3.5**	**10.5**	**13.2**	**14.7**	**4.3**	**6.1**	**56.5**
Female - Not Aboriginal or Torres Strait Islander										
Caused	0.5	1.0	1.7	0.8	5.1	10.1	4.7	1.1	0.5	25.5
Prevented	0.0	0.0	0.0	-0.2	-1.0	-1.4	-2.3	-3.3	-1.6	-9.9
Total	**0.5**	**1.0**	**1.7**	**0.6**	**4.1**	**8.7**	**2.4**	**-2.2**	**-1.1**	**15.6**
All NT population										
Caused	1.4	1.0	12.0	10.7	22.3	33.4	39.1	24.9	20.5	165.4
Prevented	0.0	0.0	-0.2	-0.4	-2.1	-3.7	-5.1	-5.5	-6.4	-23.5
Total	**1.4**	**1.0**	**11.8**	**10.3**	**20.2**	**29.7**	**34.0**	**19.3**	**14.1**	**141.9**

Source: NT Department of Health, 2018, Gakidou et al. 2017, Hewitt, 2017, calculations by the authors

Males account for a majority of the deaths, 113.8 net deaths compared to 28.1 net deaths caused amongst women.

Alcohol attributable net mortality is most common in the age range 50 to 59 years, with those aged 40 to 49 years experiencing the second highest share of premature mortality.

Road crash deaths (vehicle) were the most common cause of alcohol attributable death in the Northern Territory in 2015/16, accounting for 30.6 deaths. The next most common causes of alcohol attributable death are alcoholic liver cirrhosis (22 deaths), self harm (16.0 deaths) and Nasopharynx cancer (10.8 deaths). Most deaths prevented by moderate alcohol use were ischaemic heart disease, with an estimated 17.2 deaths prevented in 2015/16, with 6.1 premature deaths from diabetes estimated to be prevented by alcohol use.

3.2 Tangible Costs of Premature Mortality

There are two broad forms of social cost (as opposed to private cost) that arise as a result of premature mortality: tangible costs (the present value of lost expected lifetime labour in paid employment not captured by the substance user, costs to employers of workplace disruption, the lifetime value of lost labour in the household, and a net cost saving from the present value of avoided lifetime medical expenditure by government), and the intangible cost of premature mortality. Productivity impacts are calculated per year for some period into the future and so require the number of deaths in the reference year to be converted into a years of life lost estimate, whereas intangible costs are calculated directly from the number of deaths that occur in the reference year.

No costs have been included for funerals and associated expenses as it has been assumed that the cost of these remain constant in real terms and so there is no net cost (or net saving) from them having occurred prematurely.

Estimates related to lifetime costs or savings are calculated as present values of future benefits or costs assessed over a 30 year horizon using a real discount rate of 7 per cent as recommended in Australian Government guidance (Department of Finance and Administration, 2006; Department of the Prime Minister and Cabinet, 2016).

3.2.1 Potential Years of Life Lost

Many of the tangible costs of premature mortality are age and gender specific. In order to support these calculations we have calculated the potential years of life lost (PYLL) for each of the mortality age group categories by gender and Aboriginal and Torres Strait Islander identification using the expected years of life remaining in the Australian Bureau of Statistic's life tables (Australian Bureau of Statistics, 2018a, 2013).

Within the age categories used in the prevalence data it was assumed for the purposes of the PYLL calculation that all deaths occurred in the mid-point year (i.e. 27 for deaths amongst those aged 25 to 29). Deaths amongst those aged 70+ years were assumed to occur at 77 years old.

3.2.2 Workplace costs

The workplace costs of a premature death are the present value of expected future economic output from the deceased individual (excluding the income that they would have received through wages which is a private cost), together with the cost to employers of filling a job vacancy.

The impact of a smaller labour force on Gross Domestic Product (GDP) due to alcohol attributable deaths in 2015/16 is calculated as a present value over a 30 year timeframe (to align with Commonwealth Department of Finance guidance) using a real discount rate of 7 per cent. Cost of filling job vacancies all occur in 2015/16, the year in which the premature death occurs.

The age and gender specific probability that an individual will be in employment in each of the following 30 years is taken from analysis of 2016 Census of Population and Housing (Australian Bureau of Statistics, 2017a). This was then applied to the potential years of life lost data by age group and gender to identify the expected number of years of *employment* lost in each financial year.

For the age and gender profile of the alcohol attributable deaths the greatest impact on the labour force occurred in in 2015/16 at 61.4 employee years. The impact on the labour force is estimated to be lower in each subsequent year, reaching 3.2 employee years by 2044/45.

Data is not available on the way in which the economic output attributable to labour varies across the workforce, or how the economic impact of those who die prematurely from smoking attributable causes differs from the average. As such it has been assumed that the economic output of those in work would have equalled the population mean. Gross State Product (GSP) per employee is calculated from current price estimates of GSP for the Northern Territory in June 2016 from the ABS state accounts and average employment in the Northern Territory over that year (Australian Bureau of Statistics, 2018b, c) and is $181,524 in 2015/16 (in 2015/16 values). GSP per employee is assumed to grow at its long-run average real growth rate of 1.5 per cent thereafter.

The value of lost GSP in 2015/16 due to net premature alcohol attributable mortality which occurs in 2015/16 is $13.8 million. The total present value cost to GSP of premature net alcohol attributable mortality which occurs in 2015/16 assessed over 30 years is **$160.7 million** in 2015/16 values.

Slightly over half of this lost GSP would have accrued to the deceased person as wages. Wages are generally considered a purely private benefit and are excluded as such from social cost studies. However a proportion of premature mortality by drinkers occurs amongst those who are dependent alcohol users or alcohol abusers. It is arguable that the assumptions underpinning the exclusion of wages from a social cost study do not apply to dependent users are they are not making rational choices on the quantity of alcohol they consume fully cognisant of the potential consequences (Whetton et al. 2016). Indeed this argument can be extended further to assert that given the information gaps in the understanding of the potential health consequences of alcohol and the prevalence of time inconsistent preferences that few if any heavy drinkers are doing so fully rationally, optimising over their lifetime welfare give the full range of potential health impacts arising from their consumption level.

A somewhat dated estimate from Degenhardt et al. (2000) suggests that around 4.1 per cent of the Australian population was a dependent drinker and a further 1.9 per cent met the criteria for alcohol abuse in DSM-IV. This suggests that around 35 per cent of those drinking at harmful levels may have a degree of alcohol dependence (the 2016 National Drug Strategy Household Survey reports that 17.1 per cent of the population drinks at a level that exceeds the current guidelines for risks of lifetime harm, AIHW 2017a).

In this analysis the central estimate will exclude the wages share of the GSP impact for non-dependent used from the tangible cost calculation, but include it for the estimated proportion of dependent alcohol users/alcohol abusers.

The lower bound estimate will exclude *all* GSP that would have been paid to the decedent as wages (e.g. essentially follow the rational addiction hypothesis that consumption levels by dependent users represent rational optimising choices, (Becker and Murphy 1988). The upper bound estimate includes all of the potential GSP impact, including the wages share of GSP on the assumption that one or more of the assumptions required for fully rational optimising consumption choices are missing for all of those drinking at risk of harm.

This gives a central estimate of the value of lost economic output of $104.3 million, with a lower bound of $73.8 million and an upper bound of $160.7 million.

In addition employers face one-off costs to recruit new employees to replace deceased workers, and to train those new workers. The estimated cost of this was $6,422 per prematurely deceased employee in 2006 values (Bureau of Infrastructure Transport and Regional Economics - BITRE, 2009). Converting to 2015/16 values using the change in the CPI (Australian Bureau of Statistics, 2018d) and applying the estimate of 61.4 fewer employees in 2015/16, gives a total cost of **$0.6 million**.

3.2.3 Reductions in labour in the household

Collins and Lapsley based their estimates of production losses in the household sector on the ABS publication Unpaid Work and the Australian Economy 1997 (Australian Bureau of Statistics, 1997; Collins and Lapsley, 2008). This remains the best available source of data on unpaid work in the household despite now being very dated. Under the definitions used in the report, a household activity is considered unpaid work if an economic agent other than the household itself could have supplied an equivalent service. Such services include domestic activities, childcare, purchasing of goods and services, and volunteer and community work. These are all services that would be lost by the community in the event of the death or severe illness of the person supplying them, and are therefore counted as a component of social cost (Collins and Lapsley, 2008).

The ABS report details two broad approaches that can be taken to valuing unpaid household labour, individual function replacement cost and the opportunity cost of time. Within these broad approaches unpaid household labour can be valued by the cost of hiring specialists to undertake each task, by the cost of hiring a housekeeper to undertake all unpaid labour in the household, or by a hybrid of the two; and opportunity cost can be measured based on pre-tax or post-tax income. We prefer individual function replacement costs, as using opportunity cost applies a zero value to work undertaken by individuals not in the labour force and therefore tends to systematically understate the value of work undertaken by women who have lower employment rates. This is also the approach taken by Collins and Lapsley in their study (Collins and Lapsley, 2008).

The total value of male unpaid labour in the household is estimated at $82 billion in 2007 values and female unpaid labour is valued at $154 billion. Converting these to per adult estimates using the population data in ABS (Australian Bureau of Statistics, 1997) and to 2015/16 values using the CPI (Australian Bureau of Statistics, 2018d) gives values of unpaid household work of $ 19,612.60 per adult male and $35,016.20 per adult female. It was assumed that the value of unpaid labour in the household for those aged less than 15 and those aged over 75 years old was zero, and the value of household labour of those aged 15 to 24 was discounted by 50 per cent. The estimated number of potential years of life lost in these age ranges was calculated from the PYLL data for each year of the 30 year analysis period.

Our central estimate is that there were 126.4 net years of life lost to alcohol in the relevant age ranges in 2015/16, with this value falling over the remainder of the analysis period. Assessing the present value of lost labour in the household over a 30 year timeframe gives an estimated cost to the Northern Territory of **$41.7 million**.

3.2.4 Avoided Health Care Costs

Whilst premature mortality attributable to substance use (in this case alcohol) inflicts many costs on society there is a small partially offsetting cost saving to society from the reduction in expected lifetime healthcare costs, which these individuals would have incurred in future years had they lived to their expected age at death rather than died prematurely due to alcohol attributable causes.

As with the costs of lost economic output, the 'years of life lost' (YLLs) for each premature death were calculated using age, gender and Aboriginal and Torres Strait Islander specific estimates for years of life remaining from the Australian Bureau of Statistics' life (2018a, 2013).

Annual expected healthcare costs averted in 2015/16 were calculated for each expected year of life remaining for those who died prematurely of an alcohol attributable cause by combining the estimated years of life lost by age at 2015/16 with data on average total health care expenditure per person (Australian Institute of Health and Welfare 2017b) and the distribution of healthcare expenditure by age group and gender (Australian Institute of Health and Welfare, 2010, p.14). These costs were projected out over a 30 year analysis period by 'ageing' the cohort by 1 year in each period and applying the age specific healthcare cost for the new age, together with the average real rate of per capita healthcare inflation over the five years to 2015/16 (Australian Institute of Health and Welfare 2017b). Where the expected years of life remaining for the age as at 2013/14 indicated that an average individual of that age would only be alive for a fraction of a year, that fraction was applied to the cost estimate. Where the expected years of life estimate suggested that an average individual of that age would not be alive then a cost of $0 was used.

The estimated total net present value of healthcare costs avoided due to net premature alcohol attributable mortality (over 30 years using a 7 per cent real discount rate for savings experienced after 2015/16) was a **saving of $13.5 million**.

3.3 Intangible Costs of Premature Mortality

Much of the cost to society arising from premature mortality relates to intangible costs, e.g. those costs which relate to factors that cannot be traded or transferred. Valuation of the intangible costs of premature mortality is usually done using a parameter known as the Value of a Statistical Life (VoSL).

It is important to note that the concept being assessed is ***not*** the value of one or more of the individual lives lost premature due to the health condition or hazard in question. Rather the concept is based on society's average willingness to pay to reduce the risk of premature death by 1 case. Estimates of this value are generally derived from individual's direct market behaviour, such as willingness to pay for products that produce a small reduction of risk, e.g. additional safety features on cars, or the increase in wage demanded to take a job that has a higher risk of premature mortality.

Current guidance for cost benefit analyses undertaken for the Australian Government recommend using an alternative estimate of the value of a statistical life, that developed by Abelson (2008). Abelson (2008) recommends using a value of a statistical life of $3 to $4 million in 2006/07 values. Abelson's (2008) recommended value was not derived from a meta-analysis of valuation studies. Rather, whilst it took note of a range of published meta-analyses of both wage premium studies, product market, and willingness to pay approaches to valuing a statistical life it was most strongly influenced by the values recommended by the UK government and the European Union member countries in their internal guidance on undertaking cost benefit analyses. Taking the mid-point of the range identified by Abelson, $3.5 million, and converting this to 2015/16 values using the growth in current price GDP per capita over the intervening period gives a 2015/16 estimate of $4.6 million.

Internationally, much higher values are often identified in research studies, for example Viscusi and Aldy (Viscusi and Aldy, 2003) undertook a meta-analysis of studies which used wage differentials and of those which looked at price premia paid for increased safety features in goods purchased and found the mean of the studies was US$6.7 million in 2000 prices. US government agencies typically use values of this magnitude, for example the US Department of Transport used a value of a statistical life of US$9.1 million in 2013 (US Department of Transportation, 2015) This was derived by averaging 15 hedonic wage studies[2] which were identified as being undertaken using good practice approaches. The US Environment Protection Authority also adopts a similar approach, albeit using a slightly different value derived from a slightly different set of studies. Converting the US Department of Transport VoSL estimate to Australian dollars using Purchasing Power Parity exchange rates (OECD, 2016), and then to 2015/16 values using the growth in per capita current prices GDP (Australian Bureau of Statistics, 2018b) from 2012/13 to 2015/16 gives a value of a statistical life of $13.6 million. This value is used as our upper bound estimates.

A final approach that can be taken is to measure intangible costs not in terms of the value of a statistical life but rather through the value of a statistical life ***year***. This has the effect of giving greater weight to premature deaths amongst the young and much lower weight to deaths amongst the old. This is an approach taken in drug approval processes in many jurisdictions such as Australia and the UK but is not generally taken in other approaches to distribution of resources such as assessing the costs and benefits of transport safety or environmental improvements.

Values of a statistical life year are derived from the value of a statistical life by treating the Value of a Statistical Life as the equivalent as the present value of an annuity over the expected years of life remaining, using the following formula:

$$\text{VoSLY} = VoSL \times \frac{(1-(1+g)/(1+r))}{(1-(\frac{1+g}{1+r})^{years})}$$

Where

VoSL = the value of a statistical life being used, in this case from Abelson, 2008 converted to 2014/15 values ;

g = the annual escalation factor used for the VoSL, in this case the expected per capita growth rate in GDP of 1.5 per cent per annum

r = the discount rate used, in this case 7 per cent real per annum; and

years = the number of years of healthy life remaining assumed to be implicit in the VoSL calculation, in this case following Abelson 2008 we have used 40 years.

This value of a statistical life year is applied to the estimated potential years of life lost calculated from the mortality data. Unlike the tangible cost estimates costs are included for each expected year of life remaining even where that occurs more than thirty years in the future. These annual costs are then converted to a present value estimate using a real discount rate of 7 per cent.

Using the Abelson (2008) value of a statistical life converted to 2015/16 values as the basis for a VoSLY gives an estimated value of a life year of $286,553 in 2015/16.

Where the deceased persons are younger on average, with potential years of life remaining greater than the reference value used, a VoSLY approach will generate higher values that a VoSL (unless artificially truncated based on a specified analysis period) and where the deceased persons are older on average a VoSLY approach will generate lower vales than a VoSL.

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2 Hedonic wage studies estimate the wage premium demand by workers for more dangerous occupations (using official statistics on rates of workplace fatality by occupation). They do this by starting with occupational wage premia, control for other observable elements of 'job quality' and required skill levels, and combine these job quality adjusted occupational wage premia with the difference in annual mortality rates between industries to calculate the implicit value placed on a premature death.

In order to ensure consistency with other estimates, we will use the Abelson values for our main estimates, which gives an expected intangible cost of net alcohol attributable premature mortality in 2015/16 of **$652.5 million**.

If, instead, the value of a statistical life estimate used by the US Department of Transport (US Department of Transportation, 2015) were to be used, then the estimated intangible cost of net alcohol attributable premature mortality in 2015/16 would be $1,933.3 million.

Finally, if intangible costs of premature mortality are valued based on potential years of life lost, then the intangible cost of net alcohol attributable premature mortality in 2015/16 would have an expected present value of $585.4 million.

3.4 Total Costs of Net Premature Mortality

Our central estimate of the cost of the estimated 141.9 net alcohol attributable premature deaths (165.4 deaths caused and -23.5 deaths prevented) in 2015/16 is **$785.5 million**, with net tangible costs of **$133.0 million** and intangible costs of **$652.5 million** if the Abelson (2008) value of a statistical life is used (see Table 3.2).

The upper bound estimates are calculated using the higher estimate of a value of a statistical life sourced from the US Department of Transport (US Department of Transportation, 2015) and the full impact on lost economic output. Using this value of a statistical life gives total expected net costs from premature mortality of $2,122.7 million, with net tangible costs of $189.5 million and intangible costs of $1,933.3 million. The lower bound estimate is calculated using potential years of life lost, rather than a set cost per case of premature mortality, with years of life lost valued using a VoSLY derived from Abelson's (Abelson, 2008) value of a statistical life, and excludes any impact to economic output which would be expected to flow to the drinker through wages. Using this approach gives total expected net costs from premature mortality of $687.9 million, with net tangible costs of $102.6 million and intangible costs of $585.4 million.

Table 3.2: Social cost of net alcohol attributable premature mortality, $ 2015/16

Costs	Central estimate Abelson VoSL [1] ($)	Lower bound estimate Abelson VoSLY [3] ($)	Upper bound estimate US DoT VoSL [2] ($)
Tangible costs			
NPV of lost economic output (non-employee)	104,281,863	73,794,170	160,684,094
Recruitment/training costs to employers	600,580	600,580	600,580
NPV of value of lost unpaid household work	41,660,664	41,660,664	41,660,664
NPV of healthcare costs avoided	-13,495,296	-13,495,296	-13,495,296
Total net tangible costs	***133,047,811***	***102,560,118***	***189,450,042***
Intangible costs	.		.
Value of statistical life	652,489,951	585,374,426	1,933,250,310
Total cost	**785,537,761**	**687,934,544**	**2,122,700,352**

Notes: VoSL = Value of a statistical life: [1] (Abelson, 2008): [2] (US Department of Transportation, 2015); [3] VoSLY = Value of a statistical life year, based on the Abelson value of a statistical life

Source: NT Department of Health, Gakidou et al. 2017, Hewitt, 2017, Abelson 2008, US Department of Transportation 2015, calculations by the authors

Chapter 4: Hospital Morbidity

4.1 Method

The health conditions caused (wholly or partially) or partially prevented by alcohol are set out in Chapter 2. Relative risks for all conditions other than interpersonal violence are the same between mortality and morbidity, with these relative risks converted to attributable fractions using age group, gender and Aboriginal and Torres Strait Islander specific prevalence estimates. The attributable fraction used for interpersonal violence in the hospital morbidity analysis is the proportion of all violent crimes other than homicide, attributed to alcohol in the NT DAGJ data, which is 47.0 per cent (compared to the AF used for homicide of 37.5).

Hospital separations for all conditions potentially caused or prevented by alcohol consumption were extracted from NT DOH data systems. Conditions are defined by ICD-10 codes as listed in Appendix A. Extracted data also included the age, gender and Aboriginal or Torres Strait Islander identification of the individual to who the separation relates, and the broad type of treatment delivered during the episode. In the case of 'accident' separations, coding was undertaken based on the secondary code which indicated the mechanism of injury (e.g. road crash, aspiration etc.). Data was extracted by staff of the NT DOH.

The separations data were coded to age groups to match to grouping of relative risk estimates in the global burden of disease study (Gakidou et al. 2017). For accidental injury separations such as unintentional injuries those aged less than 12 years old who would not themselves be the drinker were assigned an attributable fraction equal to the average of the aged 12+ population.

Applying the relevant attributable fractions by five year age group, gender, and Aboriginal and Torres Strait Islander identification to the hospital separations identifies the fraction of each hospital separation that is ***alcohol attributable***. Where a net protective effect from alcohol exists for a demographic group the calculated alcohol attributable hospital separations are negative.

Each hospital separation has an AR-DRG code recorded which identifies the type of treatment delivered. These AR-DRG codes can be used to identify the average cost of hospital separations by linking them to data from the Independent Hospital Pricing Authority (Independent Hospital Pricing Authority, 2015) on the 'costweight' for that treatment (that is the cost of that episode as a proportion of the average cost of a hospital separation), and then multiplying that costweight by the average cost of an acuity adjusted hospital separation.

In 2015/16 the average cost of an acuity adjusted hospital separation in the Northern Territory was $6,698 (Independent Hospital Pricing Authority, 2018). To illustrate the approach, separations with the AR-DRG 'A06A: Tracheostomy and/or Ventilation >=96hours, Major Complexity' have an average costweight of 29.9951, and an expected average cost of $200,907.2 per separation (e.g. $6,698 times 29.9951). These individual costs are then summed across all of the separations with that principal diagnosis to give the total cost attributable to alcohol (or the total cost saved).

4.2 Results

Total costs of net alcohol attributable hospital separations in the Northern Territory in 2015/16 were $13.7 million (Table 4.1). Conditions caused by alcohol consumption cost $15.4 million with prevented conditions saving $1.7 million is hospital separation costs.

Sixty five per cent of the costs ($8.9 million) relate to hospital separations by males. Those identified as Aboriginal and Torres Strait Islanders are overrepresented in the hospital separations data accounting for 60 per cent of alcohol attributable hospital separation costs (a notably higher degree of overrepresentation than is seen in the deaths data).

Table 4.1 Alcohol attributable mortality, caused and prevented, by age group, gender and identification as Aboriginal or Torres Strait Islander

	0 - 11	12 - 17	18 - 24	25 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70+	All ages
Male - Not Aboriginal or Torres Strait Islander.										
Caused	12.4	65.4	324.4	308.3	448.9	636.3	1,024.5	909.5	606.1	4,335.7
Prevented	0.0	0.0	0.0	0.0	-10.5	-36.4	-64.5	-63.2	-73.6	-248.3
Total	**12.4**	**65.4**	**324.4**	**308.3**	**438.4**	**599.9**	**960.0**	**846.3**	**532.4**	**4,087.4**
Female - Not Aboriginal or Torres Strait Islander										
Caused	14.6	8.3	122.0	94.7	191.4	498.4	475.4	149.2	119.3	1,673.4
Prevented	0.0	0.0	0.0	0.0	-15.4	-26.9	-46.4	-61.9	-105.5	-256.1
Total	**14.6**	**8.3**	**122.0**	**94.7**	**176.0**	**471.5**	**428.9**	**87.4**	**13.8**	**1,417.3**
Male - Aboriginal or Torres Strait Islander										
Caused	155.2	134.4	390.6	351.5	820.6	1,516.7	1,326.4	257.3	132.5	5,085.2
Prevented	0.0	-0.3	-1.4	-10.4	-49.3	-70.3	-50.5	-33.5	-11.7	-227.4
Total	**155.2**	**134.0**	**389.3**	**341.1**	**771.3**	**1,446.4**	**1,275.9**	**223.7**	**120.9**	**4,857.8**
Female - Not Aboriginal or Torres Strait Islander										
Caused	82.7	147.4	393.4	469.0	1,490.0	1,145.6	416.4	126.8	36.0	4,307.4
Prevented	0.0	-0.2	-5.1	-82.5	-235.9	-373.6	-137.4	-118.2	-8.2	-961.0
Total	**82.7**	**147.2**	**388.3**	**386.5**	**1,254.1**	**772.0**	**279.0**	**8.6**	**27.8**	**3,346.3**
All NT population										
Caused	264.9	355.5	1,230.4	1,223.5	2,951.0	3,797.0	3,242.7	1,442.8	893.9	15,401.7
Prevented	0.0	-0.5	-6.4	-92.9	-311.2	-507.2	-298.8	-276.7	-199.0	-1,692.7
Total	**264.9**	**355.0**	**1,224.0**	**1,130.6**	**2,639.8**	**3,289.8**	**2,943.9**	**1,166.1**	**695.0**	**13,708.9**

Source: NT Department of Health, Gakidou 2017, Hewitt, 2017, calculations by the authors

Interpersonal violence accounts for the largest share of costs at $3.5 million, followed by alcohol dependence/abuse at $2.8 million (see Table 4.2). Alcoholic liver cirrhosis at $1.5 million and transport injuries at $1.0 million are the only other conditions with costs of more than one million dollars.

Ischaemic heart disease and diabetes mellitus are reasonably even in terms of their contribution to avoided costs at $0.8 million and $0.7 million respectively.

Table 4.2 Alcohol attributable hospital separations in 2015-16, caused and prevented, by gender and Aboriginal and Torres Strait Islander identification, $ 2015-16

	Not identified as Aboriginal and Torres Strait Islander		Aboriginal and Torres Strait Islander		Total
	Male ($)	**Female ($)**	**Male ($)**	**Female ($)**	**Population ($)**
Tuberculosis	67,836.40	51,578.36	67,269.63	42,158.06	228,842.45
Lip and oral cavity cancer	508,268.19	127,063.32	215,527.15	11,615.68	862,474.34
Nasopharynx cancer	200,648.92		30,542.98	7,662.31	238,854.21
Other pharynx cancer	45,484.25		19,817.71		65,301.96

Oesophageal cancer	92,888.57	6,815.46	48,254.20		147,958.23
Colon and rectum cancer	174,303.42	37,977.81	24,214.18	6,242.63	242,738.03
Liver cancer due to alcohol use	20,673.08	2,920.09	11,400.90	6,242.59	41,236.65
Larynx cancer	58,988.19	5,722.76	23,489.25	977.60	89,177.81
Breast cancer	2,195.34	105,172.93	7,932.76	49,240.60	164,541.62
Diabetes mellitus	-13,786.46	-19,843.64	-35,808.04	-617,116.86	-686,555.01
Alcohol dependence/abuse	362,337.03	249,759.71	1,206,561.56	1,013,223.10	2,831,881.40
Alcoholic psychosis	59,103.16	21,461.73	30,948.78	14,385.29	125,898.95
Epilepsy	50,966.96	25,281.11	210,316.22	74,742.13	361,306.43
Hypertensive heart disease				2,356.85	2,356.85
Ischaemic heart disease	-234,497.95	-135,796.05	-191,545.58	-258,429.36	-820,268.93
Alcoholic cardiomyopathy	65,075.76		56,648.34	5,047.61	126,771.71
Atrial fibrillation and flutter	134,062.58	38,720.49	40,239.02	26,362.71	239,384.80
Haemorrhagic stroke	83,247.11	19,633.71	52,870.65	49,687.87	205,439.33
Ischaemic stroke	69,164.33	-100,433.30	17,242.49	-85,477.30	-99,503.77
Oesophageal varices	13,706.94	21,973.46	81,698.45	32,659.80	150,038.66
Lower respiratory infections	156,878.73	33,765.60	216,364.43	125,000.30	532,009.06
Gastro-intestinal haemorrhage	74,509.58	3,865.89	34,188.28	12,328.99	124,892.74
Alcoholic gastritis	70,724.19	12,408.71	272,640.73	32,187.91	387,961.54
Alcoholic liver cirrhosis	289,382.43	369,435.59	168,072.92	634,937.65	1,461,828.59
Cirrhosis and other chronic liver diseases due	68,185.62	10,694.90	48,934.06	20,460.81	148,275.39
Pancreatitis	270,863.91	63,015.97	328,688.64	123,348.77	785,917.29
FASD			56,500.31	13,679.99	70,180.30
Transport injuries	442,594.20	182,846.71	291,284.47	108,490.36	1,025,215.74
Occupational and machine injuries	149,949.58		83,993.98	52,470.36	286,413.91
Drowning		14,343.01			14,343.01
Aspiration	39,496.77	61,599.72	97,447.19	20,223.94	218,767.62
Alcoholic beverage & other EtOH poisoning	116,851.30	8,473.64	5,649.09	8,323.60	139,297.63
Self-harm	115,440.88	119,769.02	109,585.59	80,551.27	425,346.77

Interpersonal violence	491,325.46	79,089.85	1,186,720.10	1,718,280.19	3,475,415.60
Burns and scalds	40,555.90		40,145.25	14,480.76	95,181.92
Total	**4,087,424.35**	**1,417,316.54**	**4,857,835.72**	**3,346,346.23**	**13,708,922.84**

Source: NT Department of Health, Gakidou 2017, Hewitt, 2017, calculations by the authors

Chapter 5: Other Health Costs

Alcohol misuse places significant demands on hospitals in the NT. In 2017, Springer et al examined the characteristics of frequent users of inpatient hospital services in the NT by analysing all inpatient episodes in the five NT public hospitals between 2005 and 2013 (Springer et al., 2017). Frequent use was defined as having four or more inpatient episodes in any 365-day period during this time. Patients could therefore record multiple frequent use years. From a total of 105,371 patients (who accounted for 358,660 inpatient episodes), 13.6per cent were frequent users in at least one year, and they accounted for nearly half (46.6per cent) of all episodes. Aboriginal and Torres Strait Islander patients were more likely to be frequent users (21.7 per cent) than non-Aboriginal patients (10.0 per cent).

Patients with at least one inpatient episode in which the primary diagnosis was a condition that was wholly or partially attributable to alcohol or, in cases of injury or poisoning, in which an alcohol-related external cause was recorded, were marked with an alcohol-related risk flag. Similar procedures were used to apply mental health and pregnancy-related flags.

Having an alcohol-related risk flag was strongly associated with frequent use. Among Aboriginal patients who recorded one frequent use year, 36.8 per cent had an alcohol-related flag; the percentage climbed to 61.9 per cent among those who had two or more frequent use years in the nine-year period under review. While acknowledging that many conditions necessitate frequent attendance at hospitals, the study concluded that the 'single most avoidable factor associated with frequent us, particularly for Aboriginal people, was damage arising from alcohol misuse' (Springer, et al., 2017, p. 2).

In another recent study, Quilty et al (2016) analysed all adult presentations at the Katherine Hospital Emergency Department between 1 January 2012 and 31 December 2012, excluding presentations for chronic health conditions. They compared 'frequent attenders – defined as those who presented six or more times during the 12-month period – with those who presented once only. The study found that frequent attenders were significantly more likely than occasional attenders to be Aboriginal, homeless or in unstable living environments, and to have alcohol as a contributing factor to the presentations (Quilty et al., 2016).

In addition to the costs of hospital separations there are a number of other medical system and health related costs that can be partially attributable to alcohol. Previous studies such as Collins and Lapsley (2008) and South Australian Centre for Economic Studies (2009) tended to include a relatively broad range of costs, extrapolating from the attribution of hospital costs.

Better information on the drivers of non-hospital healthcare has led us to take a slightly more conservative approach in this report. We recognise that there are some data gaps that contribute to uncertainty about the appropriate substance attribution for these costs. As such, these should be viewed cautiously.

We have assumed that in general allied health spending such as physiotherapy and dentistry (except where included in the estimate of post injury costs for road crashes) will not be driven to any substantial degree by alcohol attributable diseases.

Substance use treatment costs are assessed in Section 12.1.

This leaves the following areas of other healthcare costs for inclusion in this analysis:

- Ambulance costs,

- Primary healthcare costs, including GP visits;
- Nursing home costs; and
- Absenteeism from work.

Unfortunately there is no direct equivalent to the coding by condition in the hospital separations data that would allow them to be straightforwardly attributed to alcohol, and therefore attribution of these costs will necessarily be more uncertain.

5.1 Ambulance costs

The proportion of ambulance costs attributable to alcohol is likely to be broadly similar to that of hospital separations. As such the proportion of hospital separation costs attributable to alcohol should provide a reasonable proxy for the proportion of ambulance costs that can be attributed to alcohol.

In 2015/16, total expenditure on hospital separations in the Northern Territory was $564.3 million. Alcohol attributable hospital separations are estimated to have had a total cost of $13.7 million, giving a cost share of 2.4 per cent.

Total ambulance expenditures (including user cost of capital) in the Northern Territory in 2015/16 were $28.1 million (SCRGSP 2017, Table 11A.16). Applying the cost share from the hospital separations data this suggests that the alcohol attributable cost of ambulances was **$682,038.55**.

5.2 Primary healthcare

There are a number of reasons for seeing a GP or other primary care physician which are largely unrelated to those for which patients are admitted to hospital. Reviewing data from the BEACH survey (Britt et al. 2016) there appears to be at least 19.4 per cent of GP visits that should be excluded from the calculation as wholly or largely unrelated to the conditions that result in hospital separations (prescriptions, general check-ups and administrative visits).

The AIHW estimates that total spending on primary healthcare in the Northern Territory is $875 million.

Adjusting this down to reflect the excluded reasons for encounter from the BEACH data gives in scope costs of $705.3 million.

Applying the cost share from the hospital separations data this suggests that the alcohol attributable cost of primary healthcare was **$17,132,758.88**.

5.3 Aged care costs

Data from the AIHW suggests that 53 per cent of nursing home residents suffer from some form of dementia (AIHW 2011). We have assumed that those with dementia would be in nursing home care regardless of other conditions and so have excluded them from the calculation of alcohol attribution.

Aged care spending in the Northern Territory is estimated to be $98.4 million in 2015/16 (SCRGS 2017, Table 14A.3).

Discounting this to expenditure on patients who do not have dementia gives potentially in scope costs of $46.6 million

Applying the cost share from the hospital separations data this suggests that the alcohol attributable cost of aged care is $1,132,900.67.

5.4 Workforce Costs

There are a number of ways in which the risky consumption of alcohol imposes costs on society through reduced economic output in the workplace, although most of these sources of cost are included in other Chapters of this report. Workplace costs include:

- Lost economic output due to premature mortality – included as part of the costs of premature alcohol attributable mortality;
- Lost economic output due to permanent impairment as a result of alcohol attributable injuries– costs related to road crash injuries included as part of the costs of road crash injuries, other accident costs cannot be quantified with the available data;
- Lost economic output due to time away from work as a result of alcohol attributable injury – included as part of the costs of premature alcohol attributable mortality;
- Lost economic output due to employees imprisoned for alcohol attributable crime – included as part of the costs of crime;
- Costs to business of recruiting replacement staff – included in premature mortality, alcohol attributable crime and road crash costs; and
- Lost economic output due to days absent due to alcohol linked illness and injury.

The national drug strategy household survey 2016 includes a question on the number of days lost from work or study due to your own or another person's alcohol use.

In total for the Northern Territory, once weighted up to the whole population of the Northern Territory aged 12+, the NDSHS data suggests that 21,294 working days were lost in the three months leading up to the survey (Hewitt 2017, analysis by the authors). Assuming that the rate of days lost to alcohol attributable causes is constant through the year, and that the average number of available working days was 229, this is equivalent to losing just under 372 employee years to absenteeism caused by alcohol use over the course of 2015/16.

Data is not available on the way in which the economic output attributable to labour varies across the workforce, or how the economic impact of those who die prematurely from smoking attributable causes differs from the average. As such it has been assumed that the economic output of those in work would have equalled the population mean. Gross state product per employee is calculated from current price estimates of GSP for the Northern Territory in June 2016 from the ABS state accounts and average employment in the Northern Territory over that year (Australian Bureau of Statistics, 2018b, c) and is $181,524in 2015/16 (in 2015/16 values). GSP per employee is assumed to grow at its long-run average real growth rate of 1.5per cent thereafter.

Applying this cost to the estimated number of employee years lost to alcohol attributable absenteeism gives a total cost of $67,520,574.35.

Chapter 6: Road Crash Costs

The approach taken in this chapter broadly follows that developed in Whetton et al. (2016) which was developed to assess the social costs of methamphetamine attributable road crash costs in Australia, with some minor modifications to address differences in the available data.

Driving under the influence of any of a number of intoxicating substances can increase the rates at which transport crashes occur. The increase in risk arises from impairment to the cognitive and psychomotor skills necessary to drive safely including reductions in attentiveness, poor judgement and/or increased impulsiveness, reduce lane control, increased reaction times, loss of consciousness and other impairments to fine and gross motor skills (Drummer et al., 2003a; Verstraete and Legrand, 2014). Evidence from crash studies suggests that alcohol and cannabis are the substances that cause the greatest number of road crash fatalities and hospitalisations, due to their greater population consumption prevalence and also to the nature of their effect on cognitive and psychomotor skills (Ch'ng et al., 2007; Drummer et al., 2003b; Verstraete and Legrand, 2014).

The tangible and intangible costs of premature mortality due to alcohol attributable transport accidents are included in the broader estimates of premature mortality costs (see Chapter 3). For the other forms of harm it is first necessary to quantify their overall frequency, then identify the proportion that can be attributed to alcohol, and finally to identify a unit cost for that form of harm.

6.1 Road crash frequency

Although data on fatalities and serious injury crashes are readily available, the lack of a requirement to report lower severity crashes means that the latter are typically undercounted, or not included at all, in published road crash statistics. Therefore estimates have been used in this report, as outlined below.

Data on the number of fatal road crashes and serious injury road crashes were taken from the Northern Territory Road Injury Statistical Summary (Road Safety NT, 2018). As this publication reports data on a calendar year basis estimates for the 2015/16 financial year were produced by averaging the data for 2015 and 2016.

Estimates for the frequency of lower severity crashes were derived by calculating the national ratio between non-hospitalised injury crashes and hospital injury crashes and that between non-injury crashes and hospitalised injury crashes in the national data (BITRE, 2009) and applying this to the number of serious injury crashes in the Northern Territory. The Bureau of Infrastructure, Transport and Regional Economics (BITRE) estimates that for every serious injury crash there were 7.4 'not hospitalised injury' and 17.2 non-injury crashes.

Averaging over 2015 and 2016 there were 47 road crash fatalities (arising from 41 accidents) and 515.5 serious injury accidents (from 384.5 crashes). Applying the national ratios to Northern Territory data suggest that there would be 3,804.9 'not hospitalised injuries (from 2,838 crashes), and 6,615.4 non-injury crashes. See Table 6.1 below.

Table 6.1: Average number of road crashes by severity of injury, 2015 and 2016

	Number of crashes	No. of persons injured by severity
Actual data		
Fatalities	41	47
Serious injury	384.5	515.5

Estimated from national ratios of accident severity		
Not hospitalised injury	2,838.0	3,804.9
Property damage only crashes	6,615.4	
Total	**9,878.9**	**4,367.4**

Source: Road Safety NT, 2018, BITRE, 2009

6.2 Alcohol attribution

Attribution of transport crash harms to alcohol require (ideally place specific) observation that identify the extent to which those intoxicated by alcohol are at fault in road crashes. Nationally this is estimated to have been 30 per cent of road crash fatalities and 9 per cent of serious injury crashes (Vissers, Houwing, and Wegman, 2017). Rates are expected to be higher in the Northern Territory given that the rate of risky alcohol consumption are significantly higher than the national average (AIHW 2017). Rates of driving whilst intoxicated also appear to be significantly higher in the Northern Territory, for example Devlin and Fitzharris (2013) report that over the period 2000 to 2006 51 per cent of drivers of fatal single vehicle crashes had a blood alcohol content above 0.05, whereas in the Northern Territory it was 71 per cent of drivers.

The two most promising approaches to identifying the degree to which road crash costs can be attributed to alcohol are: (1) using the assessments made by NT police as to whether alcohol was the primary cause of the crash (Road Safety NT 2018); and (2) factoring up the national estimates of alcohol attribution for road crashes (Vissers, Houwing, and Wegman, 2017) to reflect the higher prevalence of drunk driving in the Northern Territory (Devlin and Fitzharris, 2013).

The approach taken to the latter method is that set out in WHO (2000) for adjusting directly derived attributable fractions for differences in risk exposure (see Section 2.4 for details).

Attributable fractions derived using the two approaches are set out in Table 6.2. As it involves direct assessment of Northern Territory crash records the NT police attribution will be used as our central estimate, and the factoring up of national attributable fractions will act as a lower bound.

Table 6.2: Estimated alcohol attributable fractions for road crashes in the Northern Territory

	NT police attribution	Adjusted national estimates
Fatalities	0.479	0.393
Serious injury crashes	0.199	0.130

Source: Road Safety NT, 2018, Vissers, Houwing, and Wegman, 2017, Devlin and Fitzharris, 2013, calculations by the authors

Applying these attributable fractions to the estimated road crash frequency for the Northern Territory (and assuming that accidents with a severity lower than 'serious injury' have an alcohol attribution that matches that of serious injury crashes), we estimate that a total of 1,964 road crashes in the Northern Territory are attributable to alcohol, as were 868 road crash injuries.

Table 6.3: Estimated average number of alcohol attributable road crashes by severity of injury, 2015 and 2016

	Number of crashes	No. of persons injured by severity
Fatalities	19.6	22.5
Serious injury	76.5	102.5

Not hospitalised injury	564.3	756.5
Property damage only crashes	1,315.4	
Total	**1,964.3**	**868.4**

Source: Road Safety NT, 2018, BITRE, 2009, calculations by the authors

6.3 Costs of Road Crash Accidents

There are a range of harms and costs that can arise from transport accidents including:

- Premature mortality;
- Hospital separations;
- Permanent disability;
- Non-hospital medical costs;
- Damage to property;
- Costs of insurance administration; and
- Intangible costs on non-fatal accidents.

The tangible and intangible costs of premature mortality, and of hospital separations, due to alcohol attributable transport accidents are included in the broader estimates of premature mortality costs (see Chapters 3 and 4 respectively) and so are not assessed in this Chapter.

6.4 Tangible costs of disability caused by road crashes

There are two broad approaches that could be taken to the other costs of road crashes severe enough to result in a hospital separation, calculating the costs of each specific form of harm individually (e.g. outpatient medical care, lost lifetime output in the workplace, lifetime value of lost household labour, modifications to dwellings and vehicles to adjust for impairment, long-term care costs over the lifetime), or to use compensation payments for these injuries where such long-term costs should be "capitalised" into a single lump sum payment in the study year.

Due to uncertainties around the extent to which lump sum compensation payments fully capture long term care costs, we have adopted the former approach in this study.

The BITRE (2009) estimate that serious injury road crashes will lead to some degree of permanent impairment in around 15 per cent of cases, with the degree of permanent impairment varying significantly from 'profound limitations' to 'mild limitations'.

Applying these frequencies to the estimated 102.5 alcohol attributable serious injury accidents in the NT in 2015/16 suggest just over 15 persons would be expected to have an on-going disability due to alcohol attributable road crashes (see Table 6.4).

Average unit costs of disability by severity are taken from BITRE (2009) and these, updated to 2015/16 values using the CPI (ABS, 2018d) are also shown in Table 6.4.

Table 6.4: Estimated frequency and on-going costs of permanent impairment due to alcohol attributable road crashes in the Northern Territory

Severity of impairment	Proportion of serious injury accidents	Estimated no. alcohol attributable in NT	Equipment purchase & dwelling modification	Annual care (annual) $	Equipment maintenance (annual) $	On-going medical (annual) $

(one-off) $						
Profound limitations	0.022	2.3	49,966.1	271,591.2	1,169.4	7,136.8
Severe limitations	0.019	1.9	49,966.1	72,185.7	1,169.4	7,136.8
Moderate limitations	0.058	5.9	18,129.5	22,795.5	424.3	4,282.1
Mild limitations	0.049	5.1	9,064.7	0.0	212.2	2,569.2

Source: BITRE, 2009, Road Safety NT, 2018, ABS 2018d, calculations by the authors

In addition to these costs relating to dealing specifically with the impairment arising from road crashes, disabilities also impact on the probability of employment. The extent of the impact on employment will vary depending on the severity of the impairment, and the extent to which the injured individual's form of employment (or skill set and aptitudes) are amenable to modification to adjust for the impairment. Estimates presented by BITRE suggest that the reduction in employment probability ranges from 85 per cent for those with profound limitations to a 30 per cent reduction in the probability of employment for those with mild limitations.

The estimated years of potential workforce participation were allocated between gender and age group using national data from BITRE (2009). These age specific disability rates for then "aged forward" over the 30 year analysis period using life tables to estimate if someone of that age and gender would still be expected to be alive in that year. These were then multiplied by age and gender specific employment probabilities for the Northern Territory from the ABS's 2016 Census (ABS 2017a) to give the estimated lost years of employment. Gross state product per employee is calculated from current price estimates of GSP for the Northern Territory in June 2016 from the ABS state accounts and average employment in the Northern Territory over that year (ABS, 2018b, c) and is $181,524in 2015/16 (in 2015/16 values). GSP per employee is assumed to grow at its long-run average real growth rate of 1.5 per cent thereafter. Multiplied by the lost employee years for each year if the analysis period and converted to present values using a real discount rate of 7 per cent this gives a total cost of lost economic output of $12.2 million.

Permanent impairment also reduces the potential for individuals to contribute to unpaid household labour. It was assumed that the impact of impairment on the ability to contribute (unadjusted for labour force status) was used as the basis for the calculation.

The estimated value of household labour per adult estimates was calculated using the approach set out in Section 3.2.3 using the population data in ABS (1997) and to 2015/16 values using the CPI (ABS, 2017d) gives values of unpaid household work of $ 19,612.60 per adult male and $35,016.20 per adult female. It was assumed that the value of unpaid labour in the household for those aged less than 15 and those aged over 75 years old was zero, and the value of household labour of those aged 15 to 24 was discounted by 50 per cent.

Applying these estimates to the age structure of the injured population over the 30 year analysis period and converting to present values using a 7 per cent real discount rate gives an estimated cost of lost labour in the household of just under $2.7 million.

As many of these costs are long term, the total costs have been calculated as net present values over the expected remaining life of those injured (to a maximum of 30 years), discounting future costs at 7 per cent. It has been assumed that costs increase on average at the rate of inflation over the analysis period (e.g. constant in real terms. These net present values are shown in Table 7.5, with the total tangible cost of permanent alcohol attributable impairment occurring in 2015/16 estimated to be just under $30 million (see Table 6.5).

Table 6.5: Tangible costs of permanent impairment due to alcohol attributable road crashes in the Northern Territory

Cost type	Value ($)
Equipment costs	452,886
On-going support worker costs	13,696,406
On-going medical costs	905,731
Lost economic output from reduced employment	12,237,730
Lost value of household labour	2,696,032
Total	**29,988,785**

Source: BITRE, 2009, Road Safety NT, 2018, ABS 2018d, calculations by the authors

6.5 Workplace costs of road crashes

BITRE (2009) estimated that road crash injuries created workplace disruption costs (including temporary replacement costs for temporarily impaired workers, and the costs of recruitment and training to replace those unable to return to their previous employment) to employers of $77.7 million in 2006. Converting to a 'per fatality and serious injury crash' cost based on their estimate of crash frequency, and to 2015/16 values using the CPI (ABS, 2018d) gives an average cost of workforce disruption per crash resulting in a serious injury of $3,148.09.

We estimate that there were 102.5 serious injuries resulting from alcohol attributable road crashes in the Northern Territory in 2015/16, giving a total cost of $322,679.43

6.6 Intangible costs of alcohol attributable road crashes

In addition to the tangible cost of road crashes, they also impose intangible costs due to pain and suffering. In theory at least some intangible costs are likely to arise from almost any road crash, however we were only able to identify reliable parameter estimates for the disability adjusted life years (DALYs) lost from permanent impairment.

A DALY represents the equivalent of a full year of life lost prematurely. In the context of injury or illness these are typically expressed as a cost weight representing the estimated average loss of quality of life as a fraction of a health year of life. Cost weights range from 0 (full health) to 1 (equivalent to death).

These lost DALYs then need to be converted to a monetary value for inclusion in a social cost study. Valuing DALYs is not without controversy (Baker et al., 2010; Dolan, 2010; Donaldson et al., 2011; Miller and Hendrie, 2011). The most straightforward approach (used, for example, in Moore 2007 and Nicosia et al., 2009) is to assume the value of a DALY equals that of a statistical life year. The value of a statistical life year is typically calculated by making an assumption of the average years of life remaining for the individual's whose behaviours gave rise to the value of a statistical life estimate (typically assumed to be 40 years) and then annualise using the same approach used to calculate the annual payment for an annuity of a given total value, e.g.:

$$VoSLY_{t=1} = VoSL \times \frac{(1-(1+g)/(1+r))}{(1-(\frac{1+g}{1+r})^{years})}$$

Where

VoSL = estimated value of a statistical life
g = annual escalation factor for VoSLY, typically the long-run real growth rate in per capita GDP
r = the discount rate being used, in Australian studies this usually a real annual rate of 7 per cent
years = assumed average years of life remaining at the time of the study for the sample used to derive the VoSL estimate

The limitation of this simple approach is that research has shown that the value of a life year can be contextual, e.g. it can depend heavily on factors such as age, current health state, expected years of life remaining, ability to pay, and individual views on optimal distribution of resources through the life cycle (Baker et al., 2010; Dolan, 2010; Donaldson et al., 2011). The prospective expressed willingness to accept less years of life in exchange for avoiding various health conditions or impairments also often appears too high given the degree of adaption observed in individuals with those forms of impairment (Dolan, 2010).

For this reason some researchers maintain that it is only possible to obtain reliable estimates of DALYs in case and context specific studies that can capture the full context when estimating values. However such studies are typically very time intensive and require substantial resources to implement and it is impractical to undertake new quantification for each situation in which loss of quality of life needs to be valued. There is also the concern that in adopting study specific values for a DALY any observed differences in valuation between different contexts or forms of impairment may be driven by the sampling error in the study rather than reflecting any underlying difference in the valuation. For these reasons a VoSLY estimate derived from the value used for a statistical life (see Section 4.3) has been used in this study to value lost DALYs.

DALYs lost per year from the permanent impairment arising from a road crash range from 0.63 for profound impairment to 0.09 for mild impairment. Estimates of the number of cases of permanent impairment arising from alcohol attributable road crashes is calculated using the approach set out in Section 6.4. These were allocated between gender and age group using national data from BITRE (2009). These age specific disability rates for then "aged forward" over the 30 year analysis period using life tables to estimate if someone of that age and gender would still be expected to be alive in that year.

The VoSLY was increased at a real rate of 1.5 per cent per annum reflecting the long run average rate of increase in per capita national income, with future values discounted back to present values using a real discount rate of 7 per cent per annum.

The estimated present value of the intangible costs of road crash injury related impairment is $17,071,766.35.

6.7 Costs of road crash property damage

BITRE (2009) estimates that the average cost of property damage to vehicles as a result of road crashes ranges from $3,779 for cars to $15,171 for trucks. Converting to 2015/16 values using the CPI and calculating a weighted average based on the relative frequency of different vehicle types being involved in a road crash gives an average property damage cost per crash of $4,269.90.

Applying this average per vehicle cost to our estimate of 1,964.3 road crashes gives an estimated cost of alcohol attributable property damage of $8,387,296.70.

6.8 Costs of legal fees and insurance administration from road crashes

The costs of insurance administration for claims related to road accidents were estimated by BITRE to be $257.5 million in 2006, with legal actions costing a further $231.3 million (BITRE, 2009). Combining these two cost items, converting them to 2015/16 values using the change in the CPI from June 2006 to June 2016 (ABS, 2018d), and dividing them by the estimated number of road crashes in 2006 (BITRE 2009) gives a per accident cost of $945.06.

Multiplying this by the estimated number of alcohol attributable road crashes in the Northern Territory in 2015/16 gives a total cost of $1,856,373.29

6.9 Summary of costs

Excluding the costs of premature mortality and hospital separations due to road crashes to avoid double counting as they are included in the calculations set out in Chapters 4 and 5 respectively, alcohol attributable road crashes cost the Northern Territory $57.6 million in 2015/16.

The most significant single cost item is the loss of quality of life, followed by on-going support worker costs for those with long-term disabilities, and lost economic output from lower rates of workforce participation by those injured in road crashes.

Table 6.6: Summary of road crash costs in the Northern Territory attributable to alcohol in 2015/16

Cost item	Cost ($)
Premature mortality	included in Chapter 2
Hospital separations	included in Chapter 3
Tangible costs of permanent disability	
Equipment costs	452,886.16
On-going support worker costs	13,696,405.79
On-going medical costs	905,731.24
Lost economic output from reduced employment	12,237,729.77
Lost value of household labour	2,696,031.62
Costs of workforce disruption	322,679.43
Costs of property damage	8,387,296.70
Costs of insurance administration and legal costs	1,856,373.29
Lost quality of life due to road crashes (intangible cost)	17,071,766.35
Total road crash costs (excl mortality and hospital separations)	**57,626,900.35**

Chapter 7: Alcohol Attributable Crime

Excessive alcohol consumption is linked to increased rates of crime (Dingwall, 2013)..

The costs of alcohol attributable crime can be substantial, for example at the national level Collins and Lapsley (2008) estimated the cost of alcohol attributable crime in 2004/05 at $1,424 million (in 2004/05 dollars), excluding any healthcare costs or costs related to premature mortality. Following Collins and Lapsley's methodology, SACES (2009) estimated the cost of alcohol attributable crime to the Northern Territory in 2004/05 at $91.4 million.

We will largely follow a slightly revised methodology that was used in Whetton et al. (2016) to assess the costs of methamphetamine attributable crime. This requires several pieces of information:

- The proportion of crime, by most serious offence, attributable to alcohol;
- The share of police time spent on crime related matters;
- Criminal court costs;
- The costs of detention by most serious offence; and
- The costs of crime by type of offence.

7.1 Scale of alcohol attributable crime in the Northern Territory

Assault rates are far higher in the NT than elsewhere in Australia. In 2016-17, as Figure 7.1 shows, the number of recorded offenders with a principle offence of assault in the NT was 1365.7 per 100,000 population, almost four times the national rate of 343.6 offenders per 100,000, and far higher than any other jurisdiction (ABS, 2018e). Among Aboriginal and Torres Strait Islander residents of the NT, the offender rate for 'Acts intended to cause injury' in 2016-17 was 4081.7 per 100,000 population, more than 16 times the non-Indigenous rate of 248.7 per 100,000. (ABS, 2018f).

Figure 7.1: Assault offenders per 100,000 population, 2016-17

	NSW	Vic.	Qld.	SA	WA	Tas.	NT	ACT
Assaults	370.7	312.1	252.4	436.2	363.4	403.0	1,365.7	202.1

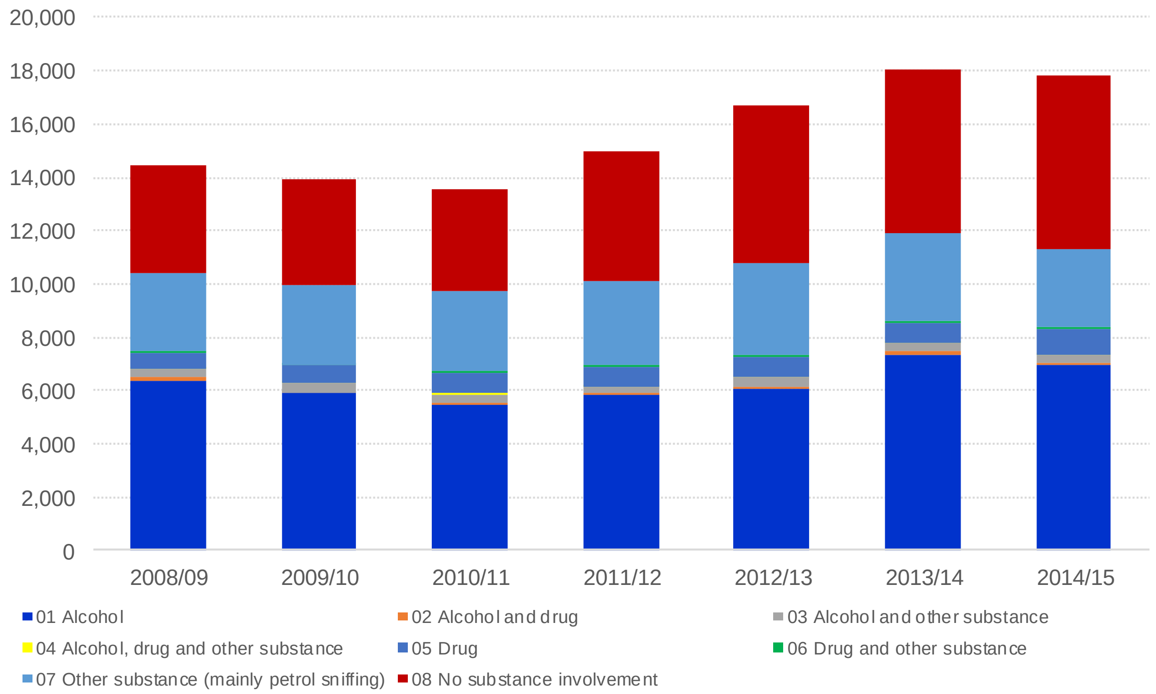
Source: Australian Bureau of Statistics, 4519.0 - Recorded Crime - Offenders, 2016-17

Historically the proportion of crime attributable to substance use in Australia is calculated by deriving equivalents to attributable fractions from the Drug Use Monitoring in Australia survey, which surveys those in police detention in selected watch houses. Substance use attribution is calculated by combining data from survey responses around self-reported attribution of offending behaviour to a specific substance, how recent the last use of that substance was, and whether they attribute offending to any other substance. This approach was used in Collins and Lapsley's national calculations for alcohol, smoking and drugs in 2004/05 (2009), in SACES's calculations for the costs of alcohol in the NT in 2004/05 (2009), and in a recent national analysis of the costs of methamphetamine use Australia (Whetton et al. 2016).

Due to funding cuts the DUMA survey is no longer undertaking in the Northern Territory and an alternative source of substance use attribution is needed. Fortunately data is collected by the NT Department of Attorney General and Justice which identifies attribution of court episodes to substance use. Offenders can be coded to alcohol, drugs, other substances (mainly petrol sniffing), combination of these substances, or to no substance, with the data also coded to the most serious offence.

Figure 7.2 and Table 7.1 show the contribution of the various substances to crime in the Northern Territory over the eight most recent years for which data is available. In each of the years alcohol alone is the largest single substance attributed to the offence, with no substance involvement the second largest and 'Other substances (petrol sniffing)' the third most common attribution. All other substances account for a very small share to total offenders.

Figure 7.2: Substance attribution of offending over time, charged persons, Northern Territory, 2008/09 to 2014/15.



Source: NT Department of the Attorney-General and Justice

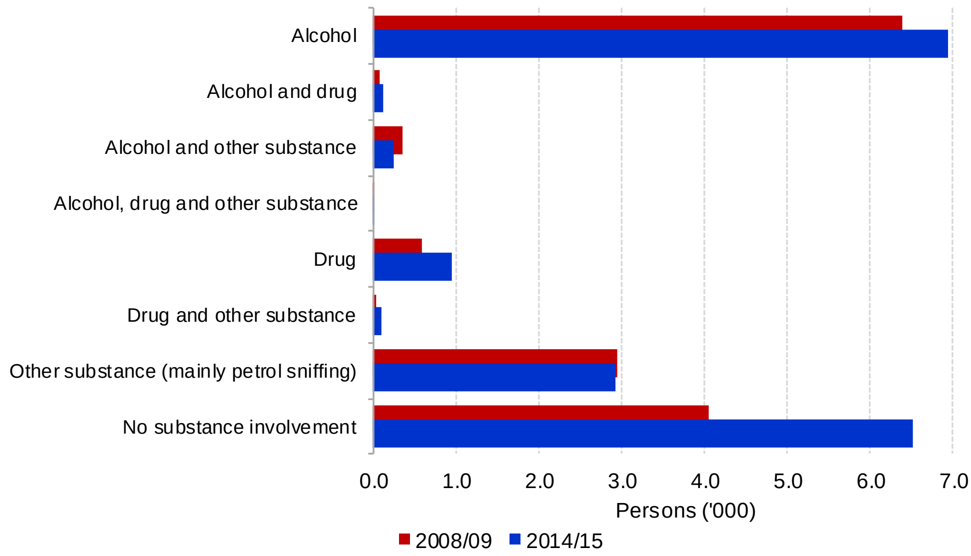
Table 7.1: Type of substance(s) involved in offending over time, charged persons, Northern Territory

Substance involved	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
01 Alcohol	6,395	5,873	5,443	5,807	6,063	7,340	6,940
02 Alcohol and drug	78	65	91	81	105	129	125
03 Alcohol and other substance	345	325	335	255	366	331	255
04 Alcohol, drug and other substance	11	11	7	5	12	8	12
05 Drug	580	658	783	711	710	742	942
06 Drug and other substance	38	53	61	69	70	80	102
07 Other substance (mainly petrol sniffing)	2,942	2,995	3,021	3,169	3,427	3,244	2,919
08 No substance involvement	4,057	3,961	3,782	4,905	5,963	6,209	6,524
Total	14,446	13,941	13,523	15,002	16,716	18,083	17,819

Source: NT Department of the Attorney-General and Justice

The proportion of offences with no substance attribution has increased steadily since the start of the 2010s, with the share of charged persons whose offence was attributed to alcohol and 'Other substances (petrol sniffing)' falling slightly (although the absolute number of offences attributed to each of these substances has increased over the period as the total number of offences has increased). This is also the case for the substance attribution of those convicted of an offence, shown in Figure 7.3 which compares the number of convicted persons whose offending is attributed to one or more substances (or no substance) between 2008/09 and 2014/15.

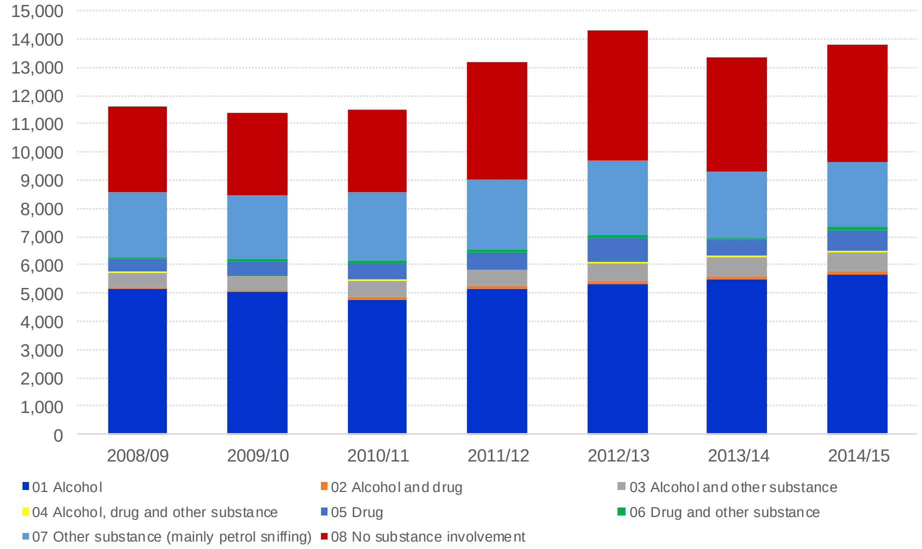
Figure 7.3: Type of substance involved for charged persons



Source: NT Department of the Attorney-General and Justice

A similar pattern can be seen amongst convicted persons, although unlike for charged persons the decline in alcohol attribution over the first two years then levels out, and whilst there is still an increase in the proportion with no substance involvement it is not as significant as that seen in the 'charged person' data (see Figure 7.4 and Table 7.2).

Figure 7.4: Substance attribution of offending over time, charged persons, Northern Territory, 2008/09 to 2014/15.



Source: Data provided by the Department of the Attorney-General and Justice

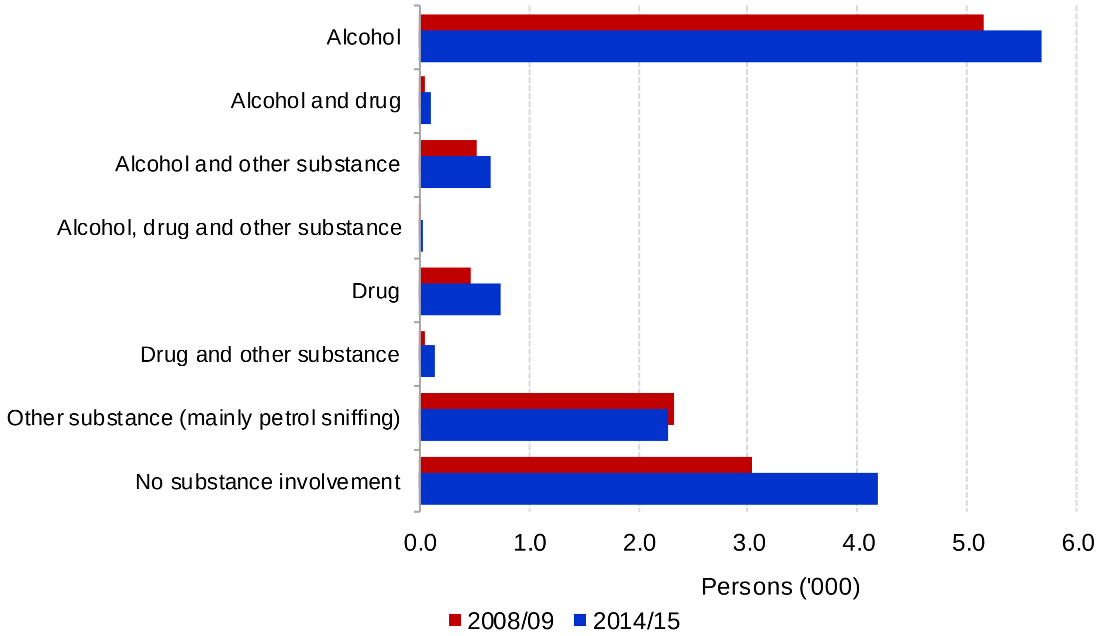
Table 7.2: Type of substance(s) involved in offending over time, convicted persons, Northern Territory

	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
01 Alcohol	5,161	5,011	4,761	5,173	5,313	5,489	5,678
02 Alcohol and drug	48	68	82	78	98	100	109
03 Alcohol and other substance	525	494	614	572	666	685	657
04 Alcohol, drug and other substance	13	19	14	22	31	35	29
05 Drug	459	540	590	617	823	564	734
06 Drug and other substance	53	58	77	91	125	98	135
07 Other substance (mainly petrol sniffing)	2,331	2,249	2,434	2,448	2,631	2,352	2,279
08 No substance involvement	3,031	2,925	2,953	4,214	4,641	4,031	4,180
Total	**11,621**	**11,364**	**11,525**	**13,215**	**14,328**	**13,354**	**13,801**

Source: Data provided by the Department of the Attorney-General and Justice

This lower growth rate for the share of offending without substance involvement can be seen more clearly in Figure 7.5 which compares convicted persons by substance involvement between 2008/09 and 2014/15.

Figure 7.5: Type of substance involved for convicted persons



Source: Data provided by the Department of the Attorney-General and Justice

For the purposes of calculating the costs of alcohol attributable crime it is not the total number of offences that are of interest, but rather then proportion of each most serious offence category that is attributable to alcohol. These proportions, which are similar to the alcohol attributable fractions reported in the deaths and hospitalisations chapters, are shown in Tables 7.3 (charged persons) and 8.4 (convicted persons). Amongst charged persons in 2014/15 the most serious offence category with the greatest alcohol involvement is 'Homicide and related offences' with 56 per cent of charged persons attributed to alcohol. 'Public order offences' (53 per cent) and 'Acts intended to cause injury' (48.5 per cent) have the next highest levels of alcohol involvement. Illicit drug offences have no alcohol attribution, and only 1.4 per cent of those charged with 'Deception and related offences' have their offending attributable to alcohol.

The pattern of alcohol attribution is slightly different for those convicted, with 'Public order offences' having the highest alcohol attribution at 56 per cent. 'Offences against justice procedures' (54 per cent) and 'Dangerous or negligent acts endangering a person' (49 per cent) are the most serious offence categories that have the next highest levels of alcohol attribution.

Having identified the proportion of crime (by most serious offence) that can be attributed to alcohol it is then necessary to identify the relevant cost items to apply these fractions to in order to identify the costs to the Northern Territory. There are:

- police costs;
- court costs;
- corrections costs; and
- costs to victims of crime.

Following the broader approach in the analysis costs directly incurred by the drinker themselves are excluded from the calculation as a private rather than a social cost. Medical costs, and costs arising as a result of premature mortality, are not included in this Chapter as they have been included in the cost calculations in Chapters 4 and 3 respectively. This analysis of alcohol attributable crime costs closely follows the approach set out in Whetton et al. (2016) which was developed to assess the social costs of methamphetamine attributable crime in Australia.

Table 7.3: Proportion of offending attributable to substance used by substance and most serious offence, charged persons, 2014/15

	Alcohol (per cent)	Alcohol & drug (per cent)	Alcohol & other substance (per cent)	Alcohol, drug & oth substance (per cent)	Drug (per cent)	Drug & oth substance (per cent)	Other (petrol sniffing) (per cent)	No substance involvement (per cent)	Total (no. of persons)
Homicide and Related Offences	55.6	0.0	0.0	0.0	5.6	0.0	22.2	16.7	18
Acts Intended to Cause Injury	48.5	0.7	1.0	0.0	1.0	0.2	16.7	32.0	3,033
Sexual Assault and Related Offences	20.5	0.7	0.0	0.0	1.3	1.3	20.5	55.6	151
Dangerous or Negligent Acts Endangering Persons	36.3	1.2	0.4	0.8	5.6	1.6	18.1	35.9	248
Abduction and Related Offences	21.4	0.0	0.0	0.0	2.4	0.0	28.6	47.6	42
Robbery, Extortion and Related Offences	23.1	0.0	0.0	0.0	7.7	3.8	17.3	48.1	52
Unlawful Entry with Intent/Burglary, Break and Enter	24.6	0.3	1.1	0.0	2.6	0.9	26.0	44.5	699
Theft and Related Offences	19.4	0.1	1.2	0.0	3.5	0.7	28.4	46.7	739
Deception and Related Offences	1.4	0.0	0.0	0.0	2.8	1.4	18.1	76.4	72
Illicit Drug Offences	0.0	4.4	0.0	0.1	88.7	6.0	0.3	0.5	794
Weapons and Explosives Offences	25.5	1.0	0.3	0.0	3.6	0.7	29.1	39.7	302
Property Damage and Environmental Pollution	28.3	0.3	1.0	0.0	1.5	0.5	26.7	41.7	607
Public Order Offences	53.1	2.5	1.9	0.1	1.3	0.5	14.9	25.8	800
Road Traffic and Motor Vehicle Regulatory Offences	41.9	0.5	1.4	0.1	1.1	0.2	12.7	42.1	4,807
Offences Against Justice Procedures, Govt Sec.& Ops.	43.6	0.3	2.2	0.1	0.8	0.2	16.9	36.0	5,296
Miscellaneous Offences	3.2	0.0	0.0	0.0	11.6	0.0	17.9	67.4	95
Others	1.6	0.0	1.6	0.0	4.7	0.0	26.6	65.6	64

Source: Data provided by the Department of the Attorney-General and Justice

Table 7.4: Proportion of offending attributable to substance used by substance and most serious offence, convicted persons, 2014/15

	Alcohol (per cent)	Alcohol & drug (per cent)	Alcohol & other substance (per cent)	Alcohol, drug & oth substance (per cent)	Drug (per cent)	Drug & oth substance (per cent)	Other (petrol sniffing) (per cent)	No substance involvement (per cent)	Total (no. of persons)
01 Homicide and Related Offences	37.5	0.0	0.0	0.0	4.2	0.0	25.0	33.3	37.5
02 Acts Intended to Cause Injury	48.4	0.4	6.2	0.2	1.1	0.5	19.1	24.1	48.4
03 Sexual Assault and Related Offences	20.3	1.5	0.0	0.0	1.5	0.8	22.6	53.4	20.3
04 Dangerous or Negligent Acts Endangering Persons	49.0	2.0	4.6	0.2	3.3	1.6	15.7	23.7	49.0
05 Abduction and Related Offences	28.3	0.0	5.0	0.0	3.3	1.7	23.3	38.3	28.3
06 Robbery, Extortion and Related Offences	30.2	0.0	2.3	0.0	2.3	0.0	23.3	41.9	30.2
07 Unlawful Entry with Intent/Burglary, Break and Enter	24.9	0.5	8.0	0.2	1.3	2.4	31.3	31.5	24.9
08 Theft and Related Offences	22.1	0.2	5.4	0.5	0.7	1.3	31.7	38.1	22.1

09 Deception and Related Offences	3.1	0.0	1.0	0.0	3.1	0.0	29.9	62.9	3.1
10 Illicit Drug Offences	0.0	4.7	0.0	0.9	83.6	9.4	0.7	0.6	0.0
11 Weapons and Explosives Offences	22.0	2.4	3.5	1.1	7.3	1.6	23.6	38.5	22.0
12 Property Damage and Environmental Pollution	34.7	0.0	4.8	0.3	0.8	0.5	23.0	36.0	34.7
13 Public Order Offences	56.0	1.2	4.9	0.0	0.4	0.4	15.5	21.6	56.0
14 Road Traffic and Motor Vehicle Regulatory Offences	42.0	0.4	3.3	0.0	0.6	0.0	12.9	40.8	42.0
15 Offences Against Justice Procedures, Govt Sec.& Ops.	54.0	0.5	6.5	0.2	1.1	0.3	13.4	23.9	54.0
16 Miscellaneous Offences	1.3	0.0	0.0	0.0	6.3	2.5	17.5	72.5	1.3
99 Others	0.0	0.0	0.0	0.0	7.4	0.0	25.9	66.7	0.0

Source: Data provided by the Department of the Attorney-General and Justice

7.2 Police Costs

Real expenditure on police service costs in the Northern Territory was $283.8 million in 2015/16 (SCRGSP 2017), or $306.8 million if the user cost of capital is included[3]. However only those costs related to crime or maintenance of public order are potentially attributable to alcohol and so these costs need to be scaled down appropriately as they include a number of forms of activity which are not related to activity to avert crime or identify those responsible for crimes.

Smith et al. (2014) estimate that approximately 80 per cent of police costs are spent on activities related to crime, based on 2011 data from the NSW police service. It is difficult to ascertain this accurately for the NT,. But an alternative estimate can be derived from WA Police 2014 Annual Report (WA Police, 2014) in which expenditure was allocated between activity types (with administrative overhead costs allocated between activity types based on their share of operational expenditure). For the purposes of this calculation, “Intelligence and protective services”, “Response to, and investigation of, offences” and “Services to the Judicial Process” are assumed to be crime related activities, with “Crime Prevention and Public Disorder”, “Community Support (non-offence)”; “Emergency Management” and “Traffic Law Enforcement and Management” were classed as non-crime activities. Excluding time allocated to these activity types gives an estimate of 64 per cent of police time being crime related.

Our central estimate combines the more conservative allocation of police costs to crime derived from the WA data with the cost of police services including the user cost of capital, giving a total cost of $195.7 million in 2015/16. As a lower bound estimate of the cost we have combined the WA activity costing with the police service cost ***excluding*** user cost of capital ($181.0 million), and our upper bound estimate is based on the Smith et al. (2014) estimate of the proportion of police time allocated to crime with the police service cost including user costs of capital ($245.5 million).

As different offence types have different alcohol attributable fractions the cost of police time allocated to crime needs to be split between principal offence types. Simply allocating costs based on the number of offenders processed by police will produce an inaccurate estimate as the amount of police time spent on frequent, but relatively straightforward, cases such as driving offences is much lower per person charged that in offences that typically involve more intensive investigations such as murder or major fraud. One approach to weighting the raw numbers would be to use data on the total police custody hours by offence category, however, this also has the potential to be influenced by variations in the time taken to arrange bail or to be transferred to remand which can be influenced by the socioeconomic status of the person in police custody. Instead, we use court data on the average length of a trial (ABS, 2017b) as a reasonable proxy for the average complexity of cases by offence category and use this to calculate a complexity weight for offence types. Police costs are allocate between principal offence categories based on this ***weighted*** frequency of individuals charged.

Allocating police costs between offence categories on this basis, and then applying the alcohol attributable fractions for charged persons derived from the data set out in Table 7.5 gives a central estimate of total alcohol attributable police cost of **$75.9 million,** with a lower bound of **$70.2** million and an upper bound of **$95.2 million**.

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[3] Any costs incurred by the Australian Federal Police have been excluded as there is no reliable way to estimate the alcohol attribution on the AFP’s activities.

Table 7.5: Allocation of police costs to alcohol attributable crime

Principal offence category	Number of charged persons	Weighted share of police time on crime (%)	Alcohol attributable fraction	Alcohol attributable police costs ($'000)
01 Homicide and Related Offences	18	0.5	0.556	528.9
02 Acts Intended to Cause Injury	3,033	18.5	0.485	17,543.5
03 Sexual Assault and Related Offences	151	1.3	0.205	508.0
04 Dangerous or Negligent Acts Endangering Persons	248	1.2	0.363	871.5
05 Abduction and Related Offences	42	0.3	0.214	114.0
06 Robbery, Extortion and Related Offences	52	0.8	0.231	344.1
07 Unlawful Entry with Intent/Burglary, Break and Enter	699	5.6	0.246	2,690.5
08 Theft and Related Offences	739	4.8	0.194	1,810.8
09 Deception and Related Offences	72	0.5	0.014	12.3
10 Illicit Drug Offences	794	4.4	0.000	0.0
11 Weapons and Explosives Offences	302	2.0	0.255	975.1
12 Property Damage and Environmental Pollution	607	3.1	0.283	1,729.6
13 Public Order Offences	800	5.9	0.531	6,173.2
14 Road Traffic and Motor Vehicle Regulatory Offences	4,807	11.0	0.419	9,001.2
15 Offences Against Justice Procedures, etc.	5,296	39.3	0.436	33,524.3
16 Miscellaneous Offences	95	0.6	0.032	38.0
99 Others	64	0.4	0.016	12.6
Total (central estimate)	**17,819**	**100.0**		**75,877.7**
Lower Bound Total				**70,190.1**
Upper Bound Total				**95,169.0**

Source: NT Department of the Attorney-General and Justice, SCRGSP 2017, ABS 2017b, WA Police 2014, Smith et al. 2014, calculations by the authors

7.3 Court Costs

Total recurrent expenditure on criminal courts in the Northern Territory was $13.2 million for higher courts and $15.4 million for Magistrates courts in 2015/16 (SCRGSP, 2017).

Offender based attributable fractions calculated by the NT DAGJ for 2014/15 were used to assess the court costs attributable to alcohol (see Table 7.3). As with police costs, these court costs need to be allocated between offence categories (based on the alleged perpetrator's most serious offence (MSO)) so that the relevant attributable fraction can be applied to them.

The dataset on persons charged did not identify the level of the court and so Australian data on the number of cases finalised and the mean duration of the case from the ABS publication 'Criminal Courts 2015-16, Cat No. 4513.0' (2017b) was used to estimate the number of 'defendant days' for each offence category by level of court (higher or magistrates). These totals were used to allocate Northern Territory offences between higher courts and magistrates courts, and within each level of court to allocate costs between offence categories.

Applying the relevant attributable fractions gives an estimate of total criminal court costs attributable to alcohol of $3.8 million for higher courts, and $5.2 million for magistrates courts, giving total alcohol attributable court system costs of **$9.0 million** (see Table 7.6)**.**

Table 7.6: Court system costs attributable to alcohol

	Estimated NT cases at level	Estimated NT Total defendant weeks	Alcohol attributable defendant weeks	Alcohol attributable court expenditure ($'000)
Higher courts				
01 Homicide & related offences	15.5	858.1	429.1	254.7
02 Acts intended to cause injury	143.7	6,509.4	3,253.6	1,931.7
03 Sexual assault & related offences	88.5	4,301.3	769.1	456.6
04 Dangerous or negligent acts endangering persons	3.5	148.3	160.9	95.5
05 Abduction, harassment & other offences against the person	2.9	137.0	55.4	32.9
06 Robbery, extortion & related offences	44.8	1,572.9	393.2	233.5
07 Unlawful entry with intent/burglary, break & enter	92.5	3,348.4	747.3	443.7
08 Theft & related offences	6.4	306.2	51.0	30.3
09 Fraud, deception & related offences	2.3	126.0	5.3	3.1
10 Illicit drug offences	65.3	2,710.4	0.0	0.0
11 Prohibited & regulated weapons & explosives offences	6.1	260.6	69.9	41.5
12 Property damage & environmental pollution	9.9	416.9	93.4	55.5
13 Public order offences	2.2	94.3	33.6	19.9
14 Traffic & vehicle regulatory offences	0.5	14.2	4.9	2.9
15 Offences against justice procedures etc.	31.9	1,381.4	355.5	211.1
16 Miscellaneous offences	0.9	44.1	0.5	0.3
TOTAL higher courts	**0.0**	**22,229.4**	**6,422.7**	**3,813.1**
Magistrates court				
01 Homicide & related offences	2.5	52.8	26.4	1.8
02 Acts intended to cause injury	2,889.3	58,364.0	29,172.4	2,009.7
03 Sexual assault & related offences	62.5	1,787.4	319.6	22.0
04 Dangerous or negligent acts endangering persons	244.5	3,862.9	4,190.0	288.7
05 Abduction, harassment & other offences against the person	39.1	719.6	291.3	20.1
06 Robbery, extortion & related offences	7.2	189.0	47.3	3.3
07 Unlawful entry with intent/burglary, break & enter	606.5	15,708.4	3,505.7	241.5
08 Theft & related offences	732.6	11,209.3	1,865.7	128.5
09 Fraud, deception & related offences	69.7	1,443.8	60.2	4.1
10 Illicit drug offences	728.7	7,651.2	0.0	0.0
11 Prohibited & regulated weapons & explosives offences	295.9	5,237.6	1,404.8	96.8
12 Property damage & environmental pollution	597.1	7,881.7	1,765.9	121.7
13 Public order offences	797.8	7,339.7	2,614.8	180.1

14 Traffic & vehicle regulatory offences	4,806.5	44,700.2	15,613.0	1,075.6
15 Offences against justice procedures, etc.	5,264.1	56,325.8	14,496.2	998.7
16 Miscellaneous offences	94.1	1,063.9	11.2	0.8
TOTAL Magistrates court	**0.0**	**223,537.3**	**75,384.3**	**5,193.3**
TOTAL all levels				**9,006.4**

Source: NT Department of the Attorney-General and Justice, SCRGSP 2017, ABS 2017b, calculations by the authors

The costs of legal representation is not included in these court system cost estimates. To the extent that these costs are borne by the drinker themselves they are generally regarded as a private cost and so excluded from social cost calculations. However, costs borne by the NT Government and Australian Government in prosecuting offenders, and in funding legal aid (through the Northern Territory Legal Aid Commission and through Aboriginal Legal Aid Services) are social costs and should be included.

In 2015/16 the Northern Territory Director of Public Prosecutions had a total operating budget of $11.5 million (Director of Public Prosecutions, 2016). It was assumed that the proportion of these expenditures attributable to alcohol was the same as the proportion of court system costs; 37.1 per cent of the total costs. This gives an estimated alcohol attributable expenditure by the DPP of **$4,262,294.**

Unfortunately data limitations prevent spending by legal aid organisations from being reliably split between functions and so it is not possible to reliably attribute a specific share of legal aid costs to alcohol.

7.4 Correction System Costs

Conceptually there are two ways that the correction costs arising from alcohol attributable crime could be calculated. The first is to calculate the net present value of all future corrections costs related to those convicted of alcohol attributable crime in 2015/16. The second approach is to calculate the corrections system related costs attributable to alcohol incurred due to imprisonment in 2015/16, regardless of when the offence itself occurred.

As rates of alcohol attributable crime and related imprisonment can vary year to year, we have taken the former approach.

7.4.1 Estimating the unit costs of imprisonment

The on-going net recurrent costs (including depreciation of capital items) of corrections facilities in the Northern Territory cost society a total of $191.8 million in 2015/16 (SCRGSP2017). Divided by the average daily number of prisoners, the per prisoner cost is $115,252.

There are other less direct costs and offsetting benefits associated with imprisonment, with researchers at the AIC identifying the following additional forms of cost and offsetting savings (Morgan and Althorpe, 2014):

Costs

- Lost productivity of prisoners (paid work);
- Lost productivity of prisoners (unpaid work);
- Workplace disruption and costs of recruiting replacement employees;

- Lost potential lifetime economic output as ex-prisoners have a lower employment participation rate post release;
- Increased risk of homelessness post release;
- Prison assaults (on both staff and prisoners);
- Additional government payments as a result of household income falling due to imprisonment of a member of the household who was in work;
- Health impacts of imprisonment such as transmission of blood borne viruses;
- Cost of out of home care for children whose custodial parent is imprisoned and who cannot be placed with another member of the immediate family; and,
- Childcare and parenting support costs.

Offsetting savings

- Reduced government payments;
- Incapacitation effect of imprisonment (e.g. it is more difficult for imprisoned offenders to commit additional crime (excluding prison assaults));
- Value of work completed in prison;
- Reduction in illicit drug use by prisoners (although it should be noted that although rates of drug use are likely to fall during imprisonment, the harms per user arising from use may actually increase, for example through increased sharing of needles);
- Reduction in alcohol use (and therefore associated harms) by prisoners; and,
- Reduction in access to welfare services by prisoners.

Unfortunately many of these costs cannot be accurately quantified from the available data, with the estimate of the net costs of imprisonment restricted to the following (with the method used to quantify the text set out in the discussion that follows):

- Net recurrent costs of corrections facilities: **$115,252** per detainee year;
- Lost productivity of prisoners in paid work: **$30,982**/male prisoner and **$13,883**/female prisoner per detainee year;
- Workplace disruption and costs of recruiting replacement employees **$2,925**/male prisoner and **$1,311**/female prisoner per detainee year;
- Lost productivity of prisoners in unpaid household work: **$19,613**/male prisoner and **$35,016/**female prisoner per detainee year;
- Prison assaults (on both staff and prisoners): **$52** per detainee year; and,
- Reduced government payments (offsetting saving): **-$2,848**/male prisoner and **-$3,363**/female prisoner per detainee year.

7.4.1.1 Lost productivity of prisoners in paid work

A proportion of offenders were in paid work at the time that they were arrested. For these individuals there is a social cost from the loss of the economic output that would have been produced had they remained in the labour force. Gross domestic product per employee is calculated from current price estimates of GDP for June 2014 from the ABS national accounts and employment numbers (ABS, 2018b, c) and was $138,083 in 2013/14. For the purposes of this calculation benefits of paid work captured by the individual have been excluded as they are a private not a social cost.

The average labour share of GDP over the past 20 years has been 54 per cent, and so only 46 per cent of the lost economic output per employee has been included as a cost in this analysis.

Data from the 2013/14 Victorian crime statistics (Victoria Police, 2014) indicates that 37 per cent of male adult alleged offenders and 17 per cent of female adult alleged offenders were in employment when they were arrested. We have assumed that these employment rates are representative of those arrested for methamphetamine attributable offences. These parameters give an estimated annual loss to economic output of **$30,982** per male prisoner and **$13,883** per female prisoner.

7.4.1.2 Workplace disruption and costs of recruiting replacement employees

Employers face one-off costs to recruit new employees to replace imprisoned workers, and to train those new workers. We have assumed these costs match the costs estimated by the Bureau of Infrastructure, Transport and Regional Economics for replacing deceased employees, namely $6,422 in 2006 values (BITRE, 2009). Converting to 2013/14 values using the change in the CPI (ABS, 2018d) gives a cost per imprisoned employee of $7,685. Applying the employment shares for alleged offenders (Victoria Police, 2014) gives an estimated average cost to employers of replacing imprisoned workers of **$2,925** per male prisoner and **$1,311** per female prisoner.

7.4.1.3 Lost productivity of prisoners in unpaid household work

The estimated value of labour in the household lost due to imprisonment is calculated on the same basis as that lost due to premature mortality (see Section 3.2.3) and are valued on an individual function replacement basis using data from the ABS publication Unpaid Work and the Australian Economy 1997 following the approach first used in Collins and Lapsley (2008), updating the costs using the change in the CPI (ABS, 1997, 2018d). Values used for per capita household labour are **$19,613** per adult male and **$35,016** per adult female.

7.4.1.4 Prison assaults

Data from the Review of Government Services Provision (SCRGSP, 2017) estimates that in 2015/16, 0.06 per cent of prisoners in the Norther Territory were the victim of a serious assault and 3.3 per cent were the victim of an assault, with 0.06 per cent having committed an assault on a prison guard (and no serious assaults having been committed against prison guards; all of these rates are well below the national average). The estimated cost per assault was taken from Smith et al.'s estimates of the costs of crime in Australia (see Table 8.11) with serious assaults assumed to be equivalent to assaults requiring hospitalisation and other assaults costed at the average cost of the other assault categories reported in Smith et al. weighted based on their relative frequency amongst assaults (Smith et al., 2014). For assaults on prisoners, the productivity costs were not included. Medical costs outside of hospital have been excluded for prisoners as it has been assumed that they are included in the overall recurrent costs of prisons. The estimated cost per assault on prisoners was $26,882 serious assaults and $1,055 for other assaults, and the costs per assault on a prison guard was $1,751 for assaults. Applying the relative frequencies to these unit costs, the estimated annual cost per prisoner year from assault in prison is **$52.**

7.4.1.5 Reduced government payments (offsetting saving)

Prisoners are not eligible for government income support payments whilst in detention, so to the extent that detainees were unemployed and on income support benefits at the time of their offence there will be a cost saving for the Australian Government. We have not been able to identify data on the proportion of offenders who were in receipt of income support benefits at the time of their imprisonment, however the 2013/14 Victorian crime statistics (Victoria Police, 2014) reports that 21 per cent of male alleged offenders and 25 per cent of female alleged offenders were unemployed at the time of their arrest (with the remainder being employed or not in the labour force). The annual value of Newstart allowance for singles in 2015/16 was $13,499 (Centrelink, 2017). Assuming that these proportions are representative of prisoners detained for an alcohol attributable offence at the time of their arrest, and that all unemployed alleged offenders were in receipt of Newstart allowance at the time of their offence this gives average offsetting savings of **-$2,848**/male prisoner and **-$3,363**/female prisoner. These estimates are likely to overstate the potential cost savings, as not all of those who are unemployed are eligible for Newstart allowance (in which case there would be no offsetting benefit) and of those eligible some would have a partner who was also in receipt of income support benefits (in which case the cost saving would be the difference between two persons in receipt of the couples Newstart allowance and one person in receipt of the single Newstart allowance). On the other hand at least some unemployed prisoners would have been in receipt of a more generous benefit such as the Disability Support Pension, and for those individuals the offsetting saving will be underestimated.

Combining the six sources of cost and offsetting benefit from imprisonment that were able to be quantified gives a total estimated net annual cost of imprisonment of $165,976 for male prisoners and $162,152 for female prisoners. It is not known whether the net costs would be higher or lower if all of the unquantifiable costs were able to be quantified.

7.4.1.6 Estimating the total costs of alcohol attributable imprisonment in the Northern Territory

The estimated total cost of alcohol attributable imprisonment in 2015/16 is calculated by applying the estimated unit cost of imprisonment to the proportion of persons convicted in the NT whose offending was attributable to alcohol, and whose conviction resulted in imprisonment.
Alcohol attributable convictions are taken from the NT DAGJ data shown at Table 7.4.

The proportion of these offenders expected to have received a custodial sentence is assumed to be the same as the for the NT as a whole, with the data on the proportion of prisoners coded by most serious offence who receive a custodial sentence table from the ABS publication “Prisoners in Australia”. Combined with the number of alcohol attributable convictions this gives the expected number of persons by most serious offence sentenced to a period of custody for an alcohol attributable offence.

Average length of sentences were taken from the estimated length of time to serve for those serving a custodial sentence in the NT by most serious offence from the ABS publication “Prisoners in Australia” (ABS 2017c). This expected inflow to custody in 2015/16 is shown in Table 7.7.

Table 7.7: Alcohol attributable admissions to custody 2015/16

Most serious offence	Alcohol attributable convictions (no. of persons)	Sentenced to custody (per cent)	Expected persons with custodial sentence	Mean expected time to serve
01 Homicide & related offences	9	79.4	7.1	13.5
02 Acts intended to cause injury	1,516	22.5	341.7	1.3
03 Sexual assault & related offences	27	48.2	13.0	5.5
04 Dangerous or negligent acts endangering persons	269	12.1	32.6	1.4
05 Abduction, harassment & other offences against the person	17	16.5	2.8	3.1

06 Robbery, extortion & related offences	13	59.0	7.7	2.9
07 Unlawful entry with intent/burglary, break & enter	156	35.3	55.1	1.3
08 Theft & related offences	123	9.5	11.7	1.3
09 Fraud, deception & related offences	3	15.0	0.5	1.5
10 Illicit drug offences	0	8.8	0.0	2.7
11 Prohibited & regulated weapons & explosives offences	81	14.6	11.8	0.0
12 Property damage & environmental pollution	136	6.2	8.5	1.0
13 Public order offences	285	2.1	6.0	0.6
14 Traffic & vehicle regulatory offences	1,679	1.0	17.1	0.4
15 Offences against justice procedures, etc.	1,363	8.2	111.8	1.0
16 Miscellaneous offences	1	1.4	0.0	0.0

Source: NT Department of the Attorney-General and Justice, ABS 2017c, calculations by the authors

These average lengths of time served were applied to each case where a custodial sentence was expected, and the per prisoner year cost was applied for each year (or, in fractional form, for each partial year) of the expected sentence. Lost value of potential economic output was expected to grow at 1.5 per cent in real terms (its long run rate), with all other costs and offsetting savings expected to remain constant in real terms. Net present values were calculated by discounting at a real rate of 7 per cent per annum. The net present value of each of the quantifiable cost items is shown in Table 7.8.

Table 7.8: Alcohol attributable cost of imprisonment in the Northern Territory 2015/16

Cost item	Net present value ($)
Cost of imprisonment	98,585,505.42
Value of lost economic output	25,783,470.18
Additional recruitment costs	2,414,353.61
Value of lost labour in household	17,616,794.13
Cost of prison assault	44,555.11
Offsetting saving in reduced benefit payments	-2,464,277.31
Total net costs	**141,980,401.14**

Source: NT Department of the Attorney-General and Justice, ABS 2017c, 2018b,c, SCRGSP 2017, Victoria Police 2014, Centrelink 2017, Smith et al. 2014, calculations by the authors

The cost of imprisonment accounts for the majority of the costs of alcohol attributable custody episodes, with a net present value of costs over the entire period of imprisonment of $98.6 million for those imprisoned in 2015/16. The value of lost economic output and the value of lost labour in the household are the other substantial quantifiable cost items, accounting for 30 per cent of the total net costs together. In total, the net expected costs of alcohol attributable imprisonment for those convicted in 2015/16 is estimated to be $142.0 million

7.5 Community-Based Correction Costs

The cost of community corrections relating to alcohol attributable offending was estimated from ABS data on the number of community service orders by most serious offence issued by the criminal courts in 2015-16 (ABS, 2017b) and data on the total cost of the community corrections system (SCRGSP, 2017).

For each most serious offence category, the share of community correction orders issued for that offence category was calculated, and the relevant alcohol attributable fraction was applied to it, giving the proportion of total community correction orders issued for alcohol attributable offences of that type. The weighted share of alcohol attributable community correction orders is estimated to be 33.4 per cent

Multiplying this share by the total cost of community corrections activity in the Northern Territory in 2015/16 gives an estimated total cost of alcohol attributable community correction orders of **$7,026,162.38**.

7.6 Costs to Victims of Crime

As well as the costs arising from the investigation of crime, the administration of justice and the detention of offenders, there are also substantial costs incurred by the victims of crime. Administrative data from police and courts authorities are generally poor guides as to the extent of crime victimisation, as many victims do not report the offence to the police. Nationally reporting rates in 2015/16 for selected crimes varied widely, ranging from 30 per cent for sexual assault to 93 per cent for motor vehicle theft (Australian Bureau of Statistics, 2017d).

The most comprehensive assessment of the prevalence of crime victimisation in Australia is provided by the ABS's survey "Crime Victimisation, Australia" (Australian Bureau of Statistics, 2017b). The number of persons reporting that they had been a victim of crime, by offence type, is set out in Table 7.9. It should be noted that the totals cannot be summed to provide an overall number of persons who have been a victim of crime in the reference year as not all crimes are in scope, and some individuals would have been the victim of more than one type of crime. It is also important to note that not all crimes are included in the survey of crime victimisation and for those types of crime costs to victims cannot be calculated.

This table reports the number of victims of crime, not the number of offences. As some victims of crime will have had more than one occasion in the year in which they were the victim of a particular crime type, these data understate the cost of crime to victims.

Table 7.9: Number of victims of selected crimes in Northern Territory by whether the crime was reported, 2015/16

	Told police about the most recent incident	Did not tell police about the most recent incident	Total	Estimated alcohol attributable cases
Physical assault	4,900	2,200[a]	7,200	3,483.9
Face-to-face threatened assault	2,800	3,500	6,600	3,193.6
Non face-to-face threatened assault	[b]	[b]	[b]	
Robbery	[b]	[b]	[b]	102.0[c]
Sexual assault	[b]	[b]	[b]	23.2[c]

Notes: [a] estimate has a standard error of between 25 per cent and 50 per cent and so should be treated with caution

[b] estimate has a standard error of more than 50 per cent and is considered too unreliable for general use by the ABS

[c] estimate calculated from NT Department of Attorney General and Justice data on charged persons whose alleged offence was attributable to alcohol, adjusted for underreporting

Source: ABS, 2017d, NT Department of the Attorney-General and Justice, calculations by the authors

Unfortunately, at the NT level, the standard errors for reported sexual assault and for reported robbery are above 50 per cent which is regarded by the ABS as too high for general use. As an alternative in those cases we have used the NT DAGJ data on persons charged with an offence as a proxy for victims who reported the crime to police, and adjusted using the national rates of underreporting to get a total estimate of victims of crime.

Data on victims of property crime are collected by the ABS on a household basis. Again not all categories of property crime are included in the data, but Table 7.10 outlines the estimated number of households reporting that they were victims key forms of property crime at least once in the year before the survey.

Table 7.10: Number of households reporting property crime in Northern Territory by whether the crime was reported, 2015/16

	Told police about the most recent incident	Did not tell police about the most recent incident	Total	Estimated alcohol attributable cases
Break and enter	4,000	1,500	5,300	1,304.1
Attempted break and enter	1,200	1,700	2,700	664.4
Motor vehicle theft	1,000 [a]	[b]	900 [a]	174.2
Theft from a motor vehicle	1,100	1,100	2,100	406.4
Malicious property damage	3,000	2,100	5,200	1,473.5
Other theft	600 [a]	900 [a]	1,600	309.6

Notes: a estimate has a standard error of between 25 per cent and 50 per cent and so should be treated with caution

b estimate has a standard error of more than 50 per cent and is considered too unreliable for general use by the ABS

Source: ABS, 2017d

These data provide the population estimate from which we estimate the number of victims of alcohol attributable crime in the NT, and the cost to victims of that crime. The number of victims of alcohol attributable crime was calculated by applying relevant alcohol attributable fractions derived from the NT DAGJ data as set out in Table 7.3.

The most comprehensive set of estimates of the costs of crime have been compiled by researchers at the Australian Institute of Criminology (Smith et al., 2014). Drawing together information from a range of Australian and international sources on the costs of various types of personal and household crime, they distinguish between medical costs, lost output, property loss, property damage, and intangible cost (e.g. pain and suffering). Although not all forms of crime are in scope, the analysis covers the majority of the crime types included in the ABS victims of crime survey. Costs of the various forms of personal crime are subdivided by the severity of medical impact on the victim.

In almost all cases the parameter values chosen by Smith et al. are consistent with the ranges adopted in comparable international exercises, however the intangible cost estimate adopted for sexual assault is at the lower end of comparable studies (Smith et al., 2014). Smith et al. did not derive a specific estimate for the intangible cost of sexual assault but rather based it on the intangible cost used for assault where the victim was injured, with treatment other than hospitalisation for sexual assault where the victim sustained physical injuries, and assault where the victim was injured and no treatment was required for sexual assault where the victim did not sustain physical injuries (Smith et al., 2014). In contrast, Dolan et al. (2005) derive estimates of intangible costs from estimates of the quality of life impact of sexual assault, expressed in terms of disability adjusted life years (DALY) using a value of 0.56 lost DALYs for rape and 0.16 lost DALYs for other sexual assault compared to a lost DALY of 0.19 for assault resulting in serious injury (roughly equivalent to the assault – hospitalised category used by Smith (2014)).

As it is more closely aligned to the approach taken to intangible costs in other areas of this report we have used the Dolan et al. (2005) estimates of the intangible costs of sexual assault in place of those derived by Smith et al (2014).

Unit costs for each cost category were converted to 2015/16 values using the change in current price Gross State Product (GSP) per capita (ABS, 2018b) from June 2011 to June 2016 for intangible costs and lost output, and the CPI for medical costs, property loss and property damage (ABS, 2018d). Table 7.11 sets out the unit costs to victims of personal crime while Table 9.12 reports the unit costs for household crime.

Table 7.11: Unit costs to victims of personal crime from Smith et al. converted to 2015/16 values

	Medical costs ($)	Lost output ($)	Intangible costs ($)
Assault			
Hospitalised	12,699	34,970	14,183
Injured, treatment other than hospital	755	2,923	3,031
injured no treatment		725	725
no injury		43	433
Sexual assault			
Injury	1,040	6,929	41,658
No injury	0	57	10,974
Robbery			
Hospitalised	12,699	34,970	13,988
Injured, treatment other than hospital	755	2,923	3,069
injured no treatment		731	725
no injury		43	433

Sources: (Australian Bureau of Statistics, 2018b, d; Smith et al., 2014, Dolan et al. 2005), calculations by the authors

Table 7.12: Unit costs to victims of property crime from Smith et al. converted to 2015/16 values

	Property loss & property damage ($)	Lost output ($)	Intangible costs($)
Burglary [a]			
Completed	1,911	87	1,135
Attempted	234	57	756
Motor vehicle theft	4,345	174	2,472
Theft from a vehicle [b]	1,135	63	822
Malicious property damage	621	47	1,346
Other theft	559	10	250

Note: [a] The unit cost used for burglary is that for burglaries of private residences, as we do not have an estimate for the number of victims of burglaries of commercial properties.
[b] These costs are the average for thefts from private and from commercial vehicles.

Sources: NT Department of the Attorney-General and Justice; ABS, 2018b, d; Smith et al., 2014, calculations by the authors

Applying the unit costs outlined in Tables 7.11 and 7.12 to the estimated number of victims of alcohol attributable crime in the Northern Territory gives a total estimated cost to victims of personal crime of **$24.6 million** (Table 7.13), and a cost of property crime of **$9.8 million**.

The costs of premature deaths due to alcohol attributable homicide are not included in these victim of crime cost estimates as they are included in the calculation of alcohol attributable premature deaths (Chapter 3). If they were included then the victim of crime costs attributable to alcohol would be $54.7 million higher than these estimates.

Table 7.13: Estimated total costs to victims of alcohol attributable personal crimes in the Northern Territory by offence type and severity, 2015/16

Offence	No. of alcohol attributable victims	Medical costs ($)	Lost output ($)	Intangible costs ($)	Total Costs ($)
Assault					
Hospitalised	142	1,804,842.3	4,970,037.0	2,015,711.6	8,790,590.9
Injured, treatment other than hospital	1,229	928,080.7	3,591,503.2	3,724,521.8	8,244,105.7
injured no treatment	2,113	0.0	1,532,884.2	1,532,884.2	3,065,768.5
no injury	3,194	0.0	138,304.6	1,383,046.3	1,521,350.9
Total	6,678	2,732,923.1	10,232,729.1	8,656,163.9	21,621,816.0
Sexual assault	.	.	.	.	.
Injury	45	47,139.1	314,060.6	1,888,140.4	2,249,340.1
No injury	57	0.0	3,250.6	621,650.6	624,901.2
Total	102	47,139.1	317,311.2	2,509,791.0	2,874,241.3
Robbery	.	.	.	.	.
Hospitalised	1	10,316.6	28,409.0	11,363.6	50,089.1
Injured, not hospitalised	3	2,393.3	9,261.5	9,724.6	21,379.3
injured no treatment	4	0.0	3,027.8	3,005.4	6,033.2
no injury	15	0.0	653.4	6,533.7	7,187.1
Total	23	12,709.8	41,351.6	30,627.2	84,688.6
All Personal Crime	.	.	.	.	.
Total	6,803	2,792,772.0	10,591,391.8	11,196,582.2	24,580,746.0

Sources: NT Department of the Attorney-General and Justice; ABS, 2018b, d; Smith et al., 2014, Dolan et al. 2005), calculations by the authors

Table 7.14: Central estimate of total costs to victims of household crimes in Australia by offence type and severity, 2013/14

Offence	Number of MA attributable cases	Costs of property loss & property damage ($)	Cost of lost output ($)	Intangible costs ($)	Total Costs ($)
Burglary					
Completed	1,304	2,492,812.0	112,956.5	1,479,729.7	4,085,498.2
Attempted	664	155,649.2	38,122.8	502,070.2	695,842.2
Total burglaries	1,969	2,648,461.3	151,079.3	1,981,799.9	4,781,340.5
Motor vehicle theft	174	756,716.8	30,356.7	430,461.2	1,217,534.6
Theft from a vehicle	406	461,325.9	25,517.2	333,923.2	820,766.3
Malicious property damage	1,473	914,305.0	68,597.1	1,983,890.9	2,966,793.0
Other theft	70	38,970.2	678.8	17,422.1	57,071.1
Total	4,092.2	4,819,779.1	276,229.0	4,747,497.4	9,843,505.5

Sources: NT Department of the Attorney-General and Justice; Australian Bureau of Statistics, 2018b, d; Smith et al., 2014, calculations by the authors

7.7 Total costs of alcohol attributable crime

The total quantifiable cost of alcohol attributable crime in the Northern Territory in 2015/16 (not including the cost of homicide to the victim) is estimated to be $272.6 million. The most significant cost item is the net quantifiable cost of imprisonment which accounts for just over half of the total, with police costs accounting for just over a quarter of the costs.

If the costs of premature mortality resulting from alcohol attributable homicide were included in the cost of crime estimates rather than the deaths estimates then victim of crime costs would become the second most significant form of cost.

Table 7.15: Summary of alcohol attributable costs of crime, Northern Territory, 2015/16

Cost area	Cost ($)
Police costs	75,877,717.61
Random breath testing (alcohol)	n.q.
Court system costs	9,006,412.83
Director of Public Prosecutions	4,262,294.14
Legal aid costs	n.q.
Net quantifiable social costs of imprisonment	141,980,401.14
Community correction costs	7,026,162.38
Australian Federal Police costs	n.q.
Victim of crime costs - personal crime	24,580,745.98
Victim of crime costs - property crime	9,843,505.48
Total quantifiable costs	**272,577,239.56**

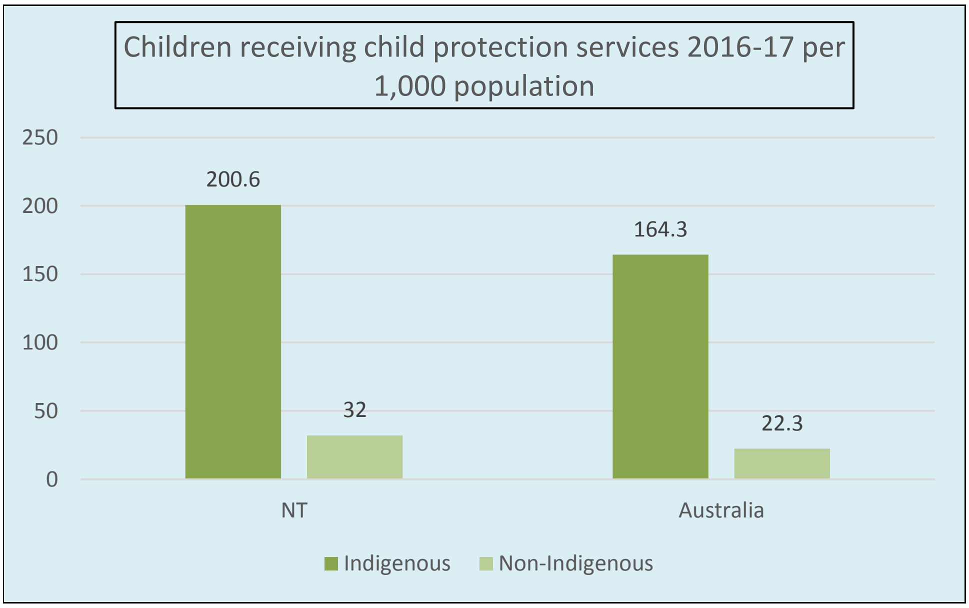
Chapter 8: Child protection costs

Child abuse and neglect are substantial public health issues in Australia, with national estimates of total costs lifetime costs in the order of $9.1 billion (Kezelman et al. 2016) to $13.7 billion (Taylor et al. 2007). The causal factors responsible for child abuse are varied, and most cases of child abuse substantiation have multiple factors of concern identified, however substance use is commonly identified as one of the causes of concern, with alcohol being the most commonly identified form of substance misuse.

8.1 Child abuse prevalence

In 2016-17 the number of children in the NT receiving child protection services - defined as being subject of one or more of (1) an investigation of a notification (2) a care and protection order and (3) out-of-home care was 6,525, a rate of 104.1 per 1,000 children aged 0-17. This was more than three times the national rate of 30.8 per 1,000 children (Australian Institute of Health and Welfare, 2018). Rates of children receiving child protection services are significantly higher than the national average for both non-Indigenous and Indigenous residents of the NT. Rates of child protection services for non-Indigenous children are 43.5 per cent higher than the national average and rates for Indigenous children are 22.1 per cent above the national average (see Figure 8.1). The significantly higher rate of child protection services than the national average is therefore driven by a combination of higher rates amongst both non-Indigenous and Indigenous families in the NT, as well as a higher share of the population who are Indigenous.

Figure 8.1: Rates of children receiving child protection services per 1,000 population aged 0-17, 2016-17, NT & Australia



Source: (Australian Institute of Health and Welfare, 2018)

Given that some cases of child abuse are unreported, its prevalence is likely to be even higher than these levels. McCarthy et al. (2016), drawing on national estimates of lifetime prevalence of child abuse and maltreatment in Australia (21.9 per cent of females and 12.9 per cent of males, Norman et al., 2012, Moore et al., 2015, both cited in McCarthy et al. 2016) and data from international studies on the relationship between lifetime and annual prevalence of child abuse (Finkelhor, Turner, Shattuck and Hamby, 2013, cited in McCarthy et al. 2016), estimated that the annual prevalence of child maltreatment and abuse in Australia was 4.6 per cent of those aged 0 to 17 years old.

Applying this national prevalence estimate to the population of the Northern Territory aged 0 to 17 would suggest that there were 2,882.8 cases of child maltreatment and neglect in the NT in 2015/16. However, whilst having 1.2 per cent of the national population aged 0 to 17 years, the Northern Territory recorded 2.9 per cent of substantiated cases of child abuse or neglect in Australia, and 5.9 per cent of total reports of child abuse and neglect (SCRGS 2017, data summarised in Table 8.1 below). If the prevalence is adjusted up in line with the excess rate of substantiations in the Northern Territory, then this would imply that there were 7,265.9 cases of child maltreatment and neglect in the Northern Territory in 2015/16.

Table 8.1: Reports and substantiations of child abuse and neglect by State/Territory, 2015/16 numbers

	NSW	*Vic*	*Qld*	*WA*	*SA*	*Tas*	*ACT*	*NT*
Investigations finalised by 31 August								
Substantiated	30,266	14,888	6,104	4,582	1,857	868	627	1,797
Not substantiated	52,258	12,400	12,228	6,028	2,103	339	1,537	3,473
Total finalised	*82,524*	*27,288*	*18,332*	*10,610*	*3,960*	*1,207*	*2,164*	*5,270*
Investigations in process	464	1138	2830	1249	682	216	448	363
Investigation closed - no outcome possible	1,264	–	1,419	796	217	86	231	2,229
Total investigations	84,252	28,426	22,581	12,655	4,859	1,509	2,843	7,862
Dealt with by other means	55,747	78,636	..	5,376	16,565	10,005	12,016	12,603
Total reported cases	**139,999**	**107,062**	**22,581**	**18,031**	**21,424**	**11,514**	**14,859**	**20,465**

Source: SCRGS 2017, Table 16A.6

8.2 Alcohol attribution

The child protection system in the NT has been the subject of several inquiries in recent years, including a comprehensive inquiry commissioned in 2009 and a Royal Commission into the detention and protection of children in 2017 (Bamblett et al., 2010; Royal Commission and Board of Inquiry into the Protection and Dentention of Children in the Northern Territory, 2017). These and other investigations have depicted a system struggling with inadequate resources to meet a rising tide of demand, to which alcohol and other substance misuse makes a constant contribution. As the 2010 report stated:

> Alcohol misuse has effects far broader than child wellbeing and its effects are widely documented. Its association with violence is well known, it consumes money that might otherwise be spent on food or other resources for children and families, it decreases ability to care for children when inebriated, and drinkers, while disinhibited, may consume food which might otherwise be intended for children. Drinking while pregnant is associated with the Fetal alcohol spectrum disorder and child cognitive impairment. Alcohol misuse has a strong correlation with violence. There are clear implications for child protection (Bamblett, et al., 2010, p. 114).

The report of the 2017 Royal Commission and Board of Inquiry into the Protection and Detention of Children in the NT made it clear that the situation had not improved. The report stated, that the child protection system in the NT was working with many families that were experiencing dysfunction and lacked resources to care for their children:

> During community visits, the Commission heard about families who are struggling to provide their children with a nurturing, safe environment in which they can grow up and thrive, due to their own problems with alcohol and substance misuse, poor mental health, gambling addiction, domestic violence and food security. These problems often co-occur (Royal Commission and Board of Inquiry into the Protection and Dentention of Children in the Northern Territory, 2017, Vol. 3A, p.199).

However, although alcohol is a frequently identified factor in child protection cases, other factors also play a role. It is therefore necessary to try and attribute some share of child abuse and neglect, and government actions in terms of child protection, to alcohol.

One potential source of an attributable fraction is a study which undertook a detailed review of 467 cases representing children's first entry into care in South Australia in 2005. The case review identified all of the factors that were mentioned in the case file as having contributed to the decision to place the child in care. No weighting or precedence of the factors could be identified. The study findings suggests that about 70 per cent of decisions to take a child into care (n=328) involved parental substance use as one of the factors of concern. Amongst those cases in which substance use was noted, alcohol was a factor of concern in 77 per cent of the cases (Jeffreys et al., 2009).

Table 8.2: Factors influencing decision to take a child into care in South Australia for the first time by whether substance use was noted in the case file, 2006

Factor influencing decision to take into care	Substance use not noted		Substance noted		All cases	
	% with factor	# of times with factor	# of times with factor	% with factor	# of times with factor	% with factor
Alcohol use	-	-	253.5	77.3	253.5	11.1
Cannabis use	-	-	174.8	53.3	174.8	7.6
Amphetamine use	-	-	166.3	50.7	166.3	7.3
Heroin use	-	-	39.4	12.0	39.4	1.7
Prescription drug use	-	-	35.1	10.7	35.1	1.5
Intravenous substance use	-	-	13.1	4.0	13.1	0.6
Methadone use	-	-	8.9	2.7	8.9	0.4
Ecstasy use	-	-	4.3	1.3	4.3	0.2
Inhalant use	-	-	4.3	1.3	4.3	0.2
Parental mental health	54.2	75.3	214.2	65.3	289.5	12.7
Domestic violence	16.7	23.2	227.3	69.3	250.5	11.0
Homelessness	8.3	11.5	91.8	28.0	103.4	4.5
Financial difficulties	0.0	0.0	96.1	29.3	96.1	4.2
Parental incarceration	4.2	5.8	83.0	25.3	88.8	3.9
Housing instability	8.3	11.5	78.7	24.0	90.3	3.9
Transience	0.0	0.0	74.5	22.7	74.5	3.3
Criminal activity	0.0	0.0	65.6	20.0	65.6	2.9
Abandonment	4.2	5.8	56.7	17.3	62.6	2.7
Social isolation	20.8	28.9	39.4	12.0	68.3	3.0
Parent abused as a child	0.0	0.0	43.6	13.3	43.6	1.9
Family breakdown	12.5	17.4	43.6	13.3	61.0	2.7
Parental intellect. Disability	25.0	34.8	8.9	2.7	43.6	1.9
Child behaviours	16.7	23.2	13.1	4.0	36.3	1.6

Parent/child conflict	16.7	23.2	13.1	4.0	36.3	1.6
Parent hospitalisation	12.5	17.4	13.1	4.0	30.5	1.3
Other jurisdiction CP involvement	4.2	5.8	13.1	4.0	19.0	0.8
Parent ex-guardianship of the Minister	12.5	17.4	4.3	1.3	21.6	0.9
Young parents	8.3	11.5	8.9	2.7	20.4	0.9
Parental death	0.0	0.0	13.1	4.0	13.1	0.6
Adolescent at risk	4.2	5.8	4.3	1.3	10.1	0.4
New arrivals	4.2	5.8	4.3	1.3	10.1	0.4
Support to relative carers	4.2	5.8	4.3	1.3	10.1	0.4
Unaccompanied minor, refugee program	8.0	11.1	0.0	0.0	11.1	0.5
Child disability	4.2	5.8	4.3	1.3	10.1	0.4
Child mental health	0.0	0.0	4.3	1.3	4.3	0.2
Child intellectual disability	0.0	0.0	3.3	1.0	3.3	0.1
Previous CP history	4.2	5.8	0.0	0.0	5.8	0.3
recovery order	4.2	5.8	0.0	0.0	5.8	0.3
Total number of factors					**2,285.4**	**100.0**

Source: Jeffreys et al., 2009, calculations by the authors

If it is assumed that each of the factors contributed an equal weight to the decision to take to child into care, and that none of the factors were caused by another factor[4], then the share of total factors can be used to identify the role of alcohol in care decisions.

Weighted up to the whole sample, there were an estimated 253.5 cases in which alcohol use was one of the factors contributing to the removal of a child into care for the first time, out of a total of 2,285.4 factors identified in the case review, or 11.1 per cent of the unweighted factors (see Table 8.2 above).

The second source an estimated attributable fraction for alcohol misuse in child protection interventions was Laslett et al. (2010) who analysed Victorian child protection case records over the period 2001 to 2005. They identified an odds ratio for reports being substantiated where alcohol abuse is recorded as a factor of 1.23. Converting the odds ratio to a relative risk, using the approach set out in Grant (2014) and then combing that relative risk with the prevalence of 33.2 per cent in the Victorian child protection population gives an alcohol attributable fraction of 0.045.

The prevalence of risky alcohol consumption in the Northern Territory in 2014/15 is significantly higher than in either South Australia or Victoria in 2001 to 2005, and as such prevalence estimates derived from these other jurisdictions are likely to understate the proportion of child abuse cases in the Northern Territory that are attributable to alcohol, although it could be that the higher risk is reflected in the disproportionate number of total cases of child abuse and neglect.

Due to this uncertainty this analysis has not adjusted the attributable fractions to reflect the higher rates of risky alcohol consumption amongst Northern Territory residents aged 18-54.[5] The cost estimates should, however, be regarded as conservative.

Applying these relative risk estimates to the two estimates of cases of child abuse gives an estimated number of alcohol attributable child abuse cases of between 130 and 806 (Table 8.3).

4 These assumptions are unlikely to be correct, but we do not know in which direction any difference from them is likely to skew the estimates.

5 Undertaking this calculation would suggest an attributable fraction of 0.109 to 0.269 compared to our main estimates of 0.045 to 0.113.

Table 8.3: Estimated cases of alcohol attributable child abuse and neglect in the Northern Territory, 2015/16.

	Estimated total cases	Alcohol attributable, RR=0.045	Alcohol attributable, RR=0.111
Low estimate	2,882.8	130.4	319.8
High estimate	7,265.9	328.7	806.1

Source: McCarthy et al. 2016; SCRGS 2017, Jeffreys et al., 2009; Laslett et al. 2010, calculations by the authors

8.4 Costs of child abuse and maltreatment

There are two main sources of costs from child abuse and neglect. The first is the cost to the Northern Territory of operating its child protection systems. The second consists of the costs arising from the impacts on the victims of the abuse, including the intangible costs.

8.4.1 Child protection system costs

Data from the review of government services provision identifies the total cost of the Northern Territory's child protection system, including Child protection, out-of-home care, intensive family support services and family support services, as $184,592,637.

Applying the attributable fractions calculated in Table 9.3 suggests that the alcohol attributable costs of the child protection system are between $8,352,007 and $20,479,017.

8.4.2 Costs arising from the abuse victim

McCarthy et al. (2016) identify a large number of costs that arise as a result of the impacts child abuse has on victims of child abuse. These costs have been converted from 2014/15 to 2015/16 costs using the change in the CPI (ABS 2018d). Some of these costs are captured in other sections of this report, and so it will be a proportion of their estimated per person costs that is included in the estimated total cost of child abuse reported in this section.

McCarthy et al. (2016) estimate that the total tangible per victim costs of the impacts of child abuse and neglect on its victims are $178,242 with intangible costs of $332,121. Removing any costs that should (at least in theory) be picked up in other sections of this report leaves total per person costs of $476,037 (Table 8.4).

Table 8.4: Estimated cost per person arising from impacts on victims of child abuse and neglect in the Northern Territory, 2015/16.

Type of cost	Best cost estimate ($)
Tangible costs	.
Health system - short term[a]	36.37
Health system - long term	63,122.36
Special education	3,757.05
Criminal justice system costs - short term[a]	4,149.03
Criminal justice system costs - long term	13,150.20
Housing and homelessness costs	882.94
Child protection system[a]	15,653.55
Productivity losses	48,403.27

Deadweight losses	29,087.63
Total tangible	***178,242.40***
Intangible costs	0.00
Lost quality of life and lifespan	317,634.29
Premature mortality as direct result of abuse or neglect[a]	14,486.73
Total intangible	***332,121.03***
Total costs per person	**510,363.43**
Total costs per person excluding those reported in other sections	**476,037.75**

Note a Costs included elsewhere in this report and so excluded from the total applied to the prevalence estimate.

Source: McCarthy et al. 2016; ABS 2018d, calculations by the authors

These costs broadly align with other attempts to quantify the costs of child abuse (Kezelman et al. 2015, Taylor et al., 2008) increasing our confidence in their accuracy.

Multiplying these per person costs by the estimated number of alcohol attributable cases of child abuse and neglect gives an estimated range of the costs arising from the impacts on victims of $62 million to $384 million. Our central estimate is $156.5 million (Table 8.5).

Table 8.5: Total alcohol attributable costs of the impacts on victims of child abuse

	Alcohol attributable, RR=0.045 ($)	Alcohol attributable, RR=0.111 ($)
Low estimate of total child abuse cases	62,090,975.04	152,246,287.42
High estimate of total child abuse cases	156,497,233.35	383,729,241.72

Source: McCarthy et al. 2016; SCRGS 2017, Jeffreys et al., 2009; Laslett et al. 2010, ABS 2018d, calculations by the authors

8.4.3 Total costs

Combining the upper and lower bounds of the alcohol attributable costs of the child protection system (using the average of the upper and lower bound as a central estimate) with the costs of the impacts to victims gives an estimated total cost of $170.9 million in 2015/16, with lower and upper bounds of $70.4 million to $404 million (Table 8.6)

Table 8.6: Total costs of alcohol attributable child abuse and neglect, Northern Territory, 2015/16

	Central estimate ($)	lower bound ($)	upper bound ($)
Child protection system costs	14,415,511.97	8,352,007.33	20,479,016.61
Costs of impact on victims not included elsewhere	156,497,233.35	62,090,975.04	383,729,241.72
Total	**170,912,745.31**	**70,442,982.37**	**404,208,258.32**

8.5 FASD and child protection

In this study we do not attempt to calculate the costs of Fetal Alcohol Spectrum Disorder (FASD), largely because prevalence and other required data are not available. The contribution of FASD to the high cost burden of child protection in the NT, however, has been the subject of some investigation in recent years.

Until recently, the acronym 'FASD' covered a range of adverse consequences of prenatal exposure to alcohol, and included diagnoses of Fetal Alcohol Syndrome (FAS), Partial Fetal Alcohol Syndrome (pFAS), Alcohol Related Neurodevelopmental Disorders (ARND), Alcohol Related Birth Defects

(ARBD), Static Encephalopathy/Alcohol Exposed (SE/AE) and Neurobehavioral Disorder/Alcohol Exposed (ND/AE) (Legislative Assembly of the Northern Territory Select Committee on Action to Prevent Foetal Alcohol Spectrum Disorder, 2015, p21). However, a review of the Australian FASD Diagnostic Instrument in 2015 saw FASD introduced as a diagnostic term, rather than a broader collective term (Bower & Elliott 2016). A FASD diagnosis was subsequently divided into one of two sub-categories (i) FASD with three sentinel facial features; and (ii) FASD with less than three sentinel facial features (Bower and Elliott 2016). FASD with three sentinel facial features replaced the diagnosis of FAS, but without a requirement for growth impairment (Bower and Elliott 2016). FASD with less than three sentinel facial features encompasses the previous categories of pFAS and ND/AE (Bower and Elliott 2016).

The 2009 inquiry into child protection in the NT drew attention to the inter-generational impact of alcohol and other drug misuse, stating that parental substance abuse was 'associated with children having a greater likelihood of abuse and neglect and poorer trajectories within the child protection system. Child abuse and neglect is more likely to be renotified and children more likely to enter care when a parent has a substance use problem' (Bamblett, et al. 2010, p. 180).

A study conducted in 2014 by the NT Department of Children and Families and FASD Consultant Prue Walker found that parental alcohol or other drug use was the main reason for the substantiation of child neglect following investigations (Northern Territory Department of Children and Families, 2014). The study was based on a sample of files of 230 children who were involved in the child protection system between 2011 and 2012, either as the subject of completed child protection investigations between 1 January and 31 December 2011 (180 children), or who were in residential, foster or kinship care as at 7 July 2012 (50 children). Indigenous children made up 81 per cent of the sample (Northern Territory Department of Children and Families, 2014, Attachment A).

In the absence of accepted definitions of safe levels of maternal alcohol consumption during pregnancy, and incomplete recording of parents' alcohol consumption on files, the study adopted a criterion of 'concerning' alcohol use by parents or carers, which was defined to include cases where:

- parental alcohol use was reported as a reason for the report to child protection;
- parental criminal histories included alcohol-related offences;
- alcohol use appeared to impact on parenting capacity (children being left unattended, lack of supervision);
- children were placed at risk due to issues including alcohol use by parents (exposed to alcohol-related violence, being dropped);
- parents had been referred to alcohol treatment;
- an alcohol-related harm substantiation was recorded;
- extended family members had identified parenting as affected by alcohol use;
- parents had been asked to modify their alcohol use or to establish safety plans around their drinking;
- long term alcohol use had impacted on care of other children;
- children had been placed with others by their parents due to alcohol use;
- previous reports of alcohol-related harm to children (Northern Territory Department of Children and Families, 2014, Attachment A).

The study found that 57 per cent of children who were subject to investigations, and 86 per cent of children on protection orders, had been exposed to concerning alcohol use by one or both parents. Children who had been exposed to concerning maternal alcohol use had three times as many previous reports to child protection as other children. In the total sample, 21 per cent were found to have definitely or probably been exposed to alcohol in utero or after birth. Among fetally exposed children, 23 per cent had behavioural problems compared with 13 per cent of non-exposed children, while 10 per cent had a speech delay and 15 per cent a developmental delay.

The prevalence of FASD is notoriously difficult to quantify in part because, apart from FAS, it is difficult to diagnose, and in part because of inadequate screening in many clinical settings. International estimates suggest that FASD occurs in around 10 per 1000 live births, FAS in 0.5 – 2.0 per 1000 live births (Legislative Assembly of the Northern Territory Select Committee on Action to Prevent Foetal Alcohol Spectrum Disorder, 2015). The only prevalence study conducted to date in the NT was by Harris and Bucens, who examined medical records and associated documents relating to children born at Royal Darwin Hospital between 1990 and 2000. They estimated the prevalence of FAS in the Top End of the NT at between 0.68 and 1.7 per 1000 live births. Among Indigenous children, the rate was estimated at between 1.87 and 4.7 per 1000 live births, a rate comparable to other indigenous populations (Harris & Bucens, 2003).

An inquiry conducted in 2015 by an NT parliamentary committee on action to prevent FASD in 2015 noted that FASD generated significant economic costs in the health, law enforcement and education sectors.

> The poor health outcomes associated with FASD result in high costs to the community and to individuals, families, and carers affected by FASD. Costs to individuals with FASD include loss of productivity (income), reduced quality of life and reduced longevity. Some of these costs are also incurred by families and carers of individuals with FASD. Community or social costs include direct costs to the government, such as the provision of health care and accommodation, and indirect governmental costs, such as the provision of special education and employment services, community services, income support, and justice services (Legislative Assembly of the Northern Territory Select Committee on Action to Prevent Foetal Alcohol Spectrum Disorder, 2015, Para 4.3).

As the Committee also noted, individuals with FASD are more likely to come into contact with law enforcement agencies as a result of parental neglect, substance use disorders, difficulties at school and in workplaces, homelessness and mental health problems. In 2011, in collaboration Angyinginyi Health Service in Tennant Creek, staff at Barkly Youth Services screened 220 participants in several youth programs in Tennant Creek. Over 70 per cent were found to exhibit one or more indicators of FASD. Almost all of those who did so had had some level of involvement with police and the courts and showed recidivism over the subsequent three years. Most of them also engaged in volatile substance abuse. In a submission to the Select Committee on Action to Prevent FASD, Barkly Youth Services reported that those who recorded positive indicators for FASD were far more likely than others to experience incarceration, and to require out of home care and other services (Barkly Youth Services, 2014). This is consistent with a recent prevalence study among youth detainees in Western Australia, which indicated that 36 per cent had a FASD diagnosis, and 89 per cent had at least one domain of severe neurodevelopmental impairment (Bower et al 2018).

In December 2018, the NT Government released a whole-of-government strategy for dealing with FASD (Northern Territory Department of Health, 2018).

Chapter 9: Costs of Alcohol Dependence

Alcohol dependence imposes significant costs on the dependent drinker, their family and society as a whole. As far as we are aware there are no recent population prevalence estimates for alcohol dependence in the Northern Territory.

A somewhat dated estimate from Degenhardt et al. (2000) estimated that around 4.1 per cent of the Australian population was a dependent drinker and a further 1.9 per cent met the criteria for alcohol abuse in DSM-IV.

A slightly more recent estimate from Slade et al. (2009) estimated that 1.4 per cent of Australians aged 16 years and over had alcohol dependence, with a further 2.9 per cent classifiable as 'harmful use'.

Rates of risky drinking in the Northern Territory are much higher than the Australian average and so these Australian averages would need to be scaled up to reflect local drinking patterns. Adjusting these estimated prevalences using the approach set out at the end of Section 2.4 gives an estimated prevalence of dependent users in the Northern Territory of between 2.2 per cent and 4.6 per cent.

Table 9.1: Estimated prevalence and numbers of dependent alcohol users in the Northern Territory, prevalence based on population 16 years and older

Source of national estimate	Metric	Dependent use	Problem use
Degenhardt et al. 2000	Estimated prevalence in NT	0.064	0.030
.	Estimated number of persons in NT	12,101.1	5,681.1
Slade et al. 2009	prevalence	0.022	0.046
.	number	4,198.5	8,619.9

Source: Degenhardt et al., 2000; Slade et al. 2009

There are three broad areas of costs of alcohol dependence that can be quantified, the costs of alcohol treatment services; the costs of dependency to the dependent user themselves; and the costs of dependency to the family members of the dependent drinker.

9.1 Alcohol treatment costs

Data from the national minimum dataset for substance use services shows that in the Northern Territory 48 per cent of drug treatment episodes have alcohol recorded as the principal drug of concern (AIHW 2017c).

Total spending on drug and alcohol treatment services in 2015/16 appropriated through the Northern Territory Government was $40.9 million (NT Treasury 2017). Assuming that costs are distributed between substances of concern on the same basis as treatment episodes then the total cost of alcohol attributable treatment services is $**19,649,001**

9.2 Intangible cost to the drinker

Substance use disorders, particularly dependence, have typically been identified as sources of significant quality of life loss for the dependent user.

Inclusion of intangible costs to dependent substance users is somewhat controversial in social cost studies as, by definition, costs to the consumer are excluded as private costs (they are, however, included in cost benefit analyses but this also includes the private benefits of increased utility from consuming the substance in question).

However, the treatment of costs incurred by ***dependent*** users as a result of their dependency as a purely internal cost relies on the assumption that the decision to consume the substance in that quantity is perfectly rational and that in deciding how much to consume the dependent user has fully taken into account all of the potential negative consequences including the exact risk that they may form a dependence on the substance (Becker and Murphy, 1998). This set of assumptions is not borne out in empirical work with substance users (c.f. Gruber and Köszegi, 2001; Kenkel, 1991; Khwaja et al., 2007; Smith et al., 2008; US Department of Health and Human Services, 1994; Angeletos et al., 2001; Laibson, 2001; Akerlof, 1991; and Suranovic et al., 1999). As such it is reasonable to contend that the behaviour once dependency has developed, to the extent that it differs from pre-dependency behaviour, is not a rational utility maximising choice by the consumer, and as such these consequences should be included as social costs.

In the current WHO estimates of disability weights for conditions for use in burden of disease calculations (Mathers and Stevens 2013) the disability weight for alcohol use is estimated to be:

- Alcohol use disorder: 0.111
- Mild alcohol dependence: 0.259
- Moderate alcohol dependence: 0.388
- Severe alcohol dependence: 0.549

Assuming that mild dependence is twice as prevalent as the other forms of dependence, and applying the estimated numbers of dependent drinkers from Table 9.2 gives an estimated number of years of healthy life lost to disability due to alcohol dependence in the Northern Territory of between 1,527 and 4,402. Valuing this intangible cost using the value of a statistical life year estimates derived from Abelson (2008) gives and estimated intangible cost of dependent alcohol use to the drinker themselves of between $437.6 million and $1,261.3 million, with intangible costs to those with alcohol problem use disorders of between $180.7 million and $274.2 million.

Table 9.2: Estimated intangible costs of dependent alcohol users in the Northern Territory, prevalence based on population 16 years and older, DALYs and $

Source of national estimate	Metric	Dependent use	Problem use
Degenhardt et al. 2000	Number of YLD	4,401.8	630.6
.	Value of lost DALYs ($)	1,261,341,421.7	180,699,746.1
Slade et al. 2009	Number of YLD	1,527.2	956.8
.	Value of lost DALYs ($)	437,625,864.0	274,177,261.0

Source: Degenhardt et al., 2000; Slade et al. 2009; Mathers and Stevens 2013; Abelson 2008, ABS 2018b, calculations by the authors

9.3 Intangible costs to the family of dependent users

The approach to quantifying the intangible costs of dependence to the family members of dependent alcohol users is closely based on the methodology developed as part of a project assessing the social costs of methamphetamine use in Australia (Whetton et al., 2016), with some minor adjustments for differences in data availability.

There is extensive evidence that substance dependency imposes costs not only on the dependent user themselves but also on their family and friends, particularly those who are resident with the dependent user. Harms include (Casswell et al., 2011; Homer et al., 2008; Laslett et al., 2010; Miller and Hendrie, 2008; Orford, 2015; Orford et al., 2013):

- Domestic violence;
- Emotional abuse/coercive control;
- Financial stress;
- Decreased mental and physical wellbeing;
- Need to provide care to the dependent user;
- Decreased quality of family relationships;
- Alienation from social networks and the wider community; and
- Feelings of guilt or inadequacy at being unable to prevent the substance dependency.

Specific risks and harms to the children of dependent substance users include (Arria et al., 2012; Orford, 2015):

- Increased rates of neglect and abuse;
- An increased risk of developing a substance use disorder as an adult;
- Increased rates of depression and suicidal ideation;
- Increased rates of illicit drug use amongst adolescents;
- Increased rates of early conduct and behavioural problems;
- Increased stress from living with tension and worry and uncertainty and often with denial and secrecy;
- Increased rates of school failure;
- Feelings of embarrassment at being seen with the dependent parent in public;
- Decreased levels of monitoring and supervision;
- Poorer quality parent–child interactions, and lower perception of parental warmth; and
- Inconsistent discipline.

No specific data is available on the household structure of dependent alcohol users, however Degenhardt et al.'s analysis suggests that the demographic profile of dependant drinkers is very similar to that of drinkers who consume alcohol at risky levels (2000). Therefore for the purposes of this analysis we will use the demographic profile of risky drinkers as a proxy for that of dependent drinkers.

Analysis of the NDSHS 2016 unit record file (Hewitt 2017) reports that 60 per cent of risky (lifetime) drinkers in the Northern Territory, and that 9 per cent have 1 dependent child, 17 per cent have 2 dependent children and 8 per cent have 3 dependent children. If we assume that those with 3+ children have three children, then the average number of dependent children per dependent drinker is 0.67.

Applying these proportions to the estimated number of dependent drinkers in the Northern Territory suggests that there are between 3,409 and 7,261 persons in the Northern Territory whose spouse or partner is a dependent drinkers, and between 3,806 and 8,108 children in the Northern Territory with at least one of the responsible adults in their household having an alcohol dependence problem.

The next uncertainty is what value to use for the average quality of life impact on these resident family members. Although there have been many studies identifying the range of adverse impacts (see the dot points above) these findings have not been presenting in a way that is amenable to direct costing of the impacts. Instead, we follow Mortimer and Segal (2006) in assuming the quality of life impact on resident family members matches that of dependent drinkers. In this case this implies an average disability weight of 0.364, giving estimated DALYs lost of between 1,240 and 2,641 for spouses/defactos and between 1,385 and 2,949 lost DALYs amongst the children of dependent drinkers.

Valuing these lost DALYs using the VoSLY derived from Abelson (2008) gives total intangible costs of between $355.3 million and $758.8 million for spouses/defacto partners and between $396.7 million and $845.1 million for dependent children.

Table 9.3: Years of life lost to disability and intangible costs of alcohol dependence for resident family members, numbers and $

Affected group	Metric	Lower bound	Upper bound
Spouses/defacto partners	Number	3,408.6	7,260.7
	YLD	1,239.9	2,641.1
	Cost ($)	355,294,771.1	756,804,853.0
Dependent children	Number	3,806.3	8,107.7
	YLD	1,384.5	2,949.2
	Cost ($)	396,745,827.8	845,098,752.6

Source: Degenhardt et al., 2000; Slade et al. 2009; Mathers and Stevens 2013; Hewitt 2017; Abelson 2008, ABS 2018b, calculations by the authors

Chapter 10: Summary & Conclusions

10.1 Total Social and Economic Costs and Their Incidence

The total quantifiable costs of alcohol to the Northern Territory and its population are very substantial, with the most likely total tangible costs of $701.3 million and total intangible costs (excluding the intangible cost of addiction to dependent drinkers and the intangible costs incurred by the family members of dependent drinkers) of $685.5 million, giving a total cost of $1,386.8 million (see Table 10.1). Allowing for the known uncertainties in the calculation, tangible costs are expected to be in the range of $580.6 million to $1,026.3 million and intangible costs (excluding the intangible costs arising from dependence) are expected to be in the range of $602.4 million to $3,576,806,428.

Alcohol attributable crime is the most significant source of tangible costs, with estimated total costs of $272.6 million in 2015/16, followed by child protection with estimated tangible costs of $170.9 million.

The intangible costs of premature death is the largest component of the intangible costs at $652.5 million.

Table 10.1 Total quantifiable costs of alcohol in the Northern Territory in 2015/16 values by source of cost

	Most likely estimate ($)	Lower bound ($)	Upper bound ($)
COSTS OF PREMATURE MORTALITY	.	.	.
Tangible costs	.		.
NPV of lost economic output (non-employee)	104,281,863	73,794,170	160,684,094
Recruitment/training costs to employers	600,580	600,580	600,580
NPV of value of lost unpaid household work	41,660,664	41,660,664	41,660,664
NPV of healthcare costs avoided	-13,495,296	-13,495,296	-13,495,296
total tangible	133,047,811	102,560,118	189,450,042
Intangible costs	.		.
Value of statistical life	652,489,951	585,374,426	1,933,250,310
Total cost of premature mortality	**785,537,761**	**687,934,544**	**2,122,700,352**
HEALTH COSTS	.	.	.
Hospital separations caused	15,401,657	15,401,657	15,401,657
Hospital separations caused	-1,692,735	-1,692,735	-1,692,735
Net hospital separations costs	13,708,923	13,708,923	13,708,923
Alcohol attributable ambulance costs	682,039	682,039	682,039
Alcohol attributable primary healthcare costs	17,132,759	17,132,759	17,132,759
Alcohol attributable aged care costs	1,132,901	1,132,901	1,132,901
Alcohol attributable absenteeism	67,520,574	67,520,574	67,520,574
Total health costs	**100,177,195**	**100,177,195**	**100,177,195**
ROAD CRASH COSTS	.	.	.
Tangible costs of permanent disability	.	.	.
Equipment costs	452,886	452,886	452,886
On-going support worker costs	13,696,406	13,696,406	13,696,406
On-going medical costs	905,731	905,731	905,731
Lost economic output from reduced employment	12,237,730	12,237,730	12,237,730
Lost value of household labour	2,696,032	2,696,032	2,696,032
Costs of workforce disruption	322,679	322,679	322,679
Costs of property damage	8,387,297	8,387,297	8,387,297
Costs of insurance administration and legal costs	1,856,373	1,856,373	1,856,373
Lost quality of life due to road crashes (intangible cost)	17,071,766	17,071,766	17,071,766
Total road crash costs (excl mortality and hospital separations)	**57,626,900**	**57,626,900**	**57,626,900**
COSTS OF CRIME	.	.	.
Police costs	75,877,718	70,190,087	95,168,964
Random breath testing (alcohol)	n.q.	n.q.	n.q.
Australian Federal Police costs	n.q.	n.q.	n.q.
Court system costs	9,006,413	9,006,413	9,006,413
Director of Public Prosecutions	4,262,294	4,262,294	4,262,294

Legal aid costs	n.q.	n.q.	n.q.
Net quantifiable social costs of imprisonment	141,980,401	141,980,401	141,980,401
Community correction costs	7,026,162	7,026,162	7,026,162
Victim of crime costs - personal crime	24,580,746	24,580,746	24,580,746
Victim of crime costs - property crime	9,843,505	9,843,505	9,843,505
Total quantifiable costs of crime	**272,577,240**	**266,889,609**	**291,868,486**
CHILD PROTECTION			
Child protection system cost	14,415,512	8,352,007	20,479,017
Lifetime costs to victims of child abuse	156,497,233	62,090,975	383,729,242
Total child protection costs	**170,912,745**	**70,442,982**	**404,208,258**
TOTAL EXCLUDING COSTS OF DEPENDENT DRINKERS	.	.	.
Tangible costs	701,326,045	580,625,039	1,026,259,116
Intangible costs	685,505,796	602,446,192	1,950,322,076
Total Costs	1,386,831,842	1,183,071,231	2,976,581,192

In addition to the total costs, it is also interesting to understand which groups in society are facing the costs, this is known as the incidence of the costs. The costs can initially fall on one or more of four broad community groups:

- consumers of the substance (although as a social cost study many of these own costs have been excluded),
- other individuals,
- businesses, and
- government.

For instance, in relation to alcohol consumption the incidence of the costs may fall as follows:

- Drinkers - the physical and psychological pain of premature death and alcohol-related illnesses or injury etc.;
- Other individuals – impact of crime, impact of child abuse etc.;
- Business - production losses resulting from smoking-related mortality and absenteeism and damage to or theft of property;
- Government - funding of criminal justice system costs and healthcare.

Public finance literature makes the distinction between the legal (or impact) incidence and the economic (or effective) incidence of a cost. Legal incidence refers to a legal requirement to pay the cost. Economic incidence refers to who ultimately bears the cost after all the economic responses to its initial imposition have been worked through. For example, business may be able to pass on the costs of productivity losses to consumers in the form of higher prices or to workers in the form of lower wages. The same issue arise in regards to the incidence of social costs.

The International Guidelines for Estimating the Cost of Substance Abuse (Single et al, 2001) note the inherent difficulty of estimating the economic incidence of a social cost, which involves following the various paths of possible cost shifting between community groups, and conclude that incidence analysis should be confined to examining the initial burden of consumption costs among the community groups. In line with this view, Collins and Lapsley restricted their analysis to estimation of the impact incidence on households, business and government (Collins and Lapsley 2008, p. 12). We follow that approach in this report.

Table 10.2 illustrates the distribution of the estimated social costs of alcohol use between different groups of stakeholders in the community. In this analysis households are treated as one group, abstracting away from the question as to whether the cost burden is imposed on drinkers themselves or on others. In assigning this incidence a number of assumptions have needed to be made about the proportion of cost items falling on various stakeholders, and so even ignoring the likely difference between initial incidence and final incidence, the calculation is only and approximation.

The bulk of the impacts of alcohol falls on households due to the preponderance of intangible costs in the total, all of which fall on households.

Looking at tangible costs, the greatest share fall on the Northern Territory which bore a tangible cost from alcohol of $228.0 million in 2015/16, largely through increased expenses. Businesses also faced a substantial burden from alcohol, $211 million, although the majority of this burden arises through reduced potential income due reductions in the workforce.

Table 10.2 Initial incidence of costs of alcohol in the Northern Territory, $2015/16

	NT Government ($)	Australian Government ($)	Business ($)	Households ($)
COSTS OF PREMATURE MORTALITY	.	.	.	.
NPV of lost economic output (non-employee)	1,805,320	14,149,805	88,326,738	.
Recruitment/training costs to employers	.	.	600,580	
NPV of value of lost unpaid household work	.	.	.	41,660,664
NPV of healthcare costs avoided	-6,747,648	-6,747,648	.	.
Value of statistical life	.		.	652,489,951
HEALTH COSTS	.	.	.	.
Hospital separations caused	7,700,829	7,700,829	.	.
Hospital separations caused	-846,367	-846,367	.	.
Net hospital separations costs	6,854,461	6,854,461	.	.
Alcohol attributable ambulance costs	682,039		.	.
Alcohol attributable primary healthcare costs	.	11,992,931	.	5,139,828
Alcohol attributable aged care costs	.	849,676	.	283,225
Alcohol attributable absenteeism	.	.	67,520,574	.
ROAD CRASH COSTS	.	.	.	.
Tangible costs of permanent disability	.	.	.	.
Equipment costs	226,443	226,443	.	.
On-going support worker costs	6,848,203	6,848,203	.	.
On-going medical costs	452,866	452,866	.	.
Lost economic output from reduced employment	211,859	1,660,514	10,365,357	.
Lost value of household labour	.	.	.	2,696,032
Costs of workforce disruption	.	.	322,679	
Costs of property damage	.	.	1,677,459	6,709,837
Costs of insurance administration and legal costs	.	.	371,275	1,485,099
Lost quality of life due to road crashes (intangible cost)	.	.	.	17,071,766
COSTS OF CRIME	.	.	.	.
Police costs	75,877,718			
Court system costs	9,006,413	.	.	.
Director of Public Prosecutions	4,262,294	.	.	.
Net quantifiable social costs of imprisonment	99,045,233	1,034,232	24,252,953	17,647,983
Community correction costs	7,026,162	.	.	.
Victim of crime costs - personal crime	3,687,112	3,687,112	.	17,206,522
Victim of crime costs - property crime	1,476,526	1,476,526	1,968,701	4,921,753
CHILD PROTECTION	.	.	.	.
Child protection system cost	.	14,415,512	.	.
Lifetime costs to victims of child abuse	17,323,341	12,157,423	15,818,745	111,197,724

TOTAL				
Tangible costs	228,038,342	69,058,055	211,225,062	193,004,586
Intangible costs	0	0	0	685,505,796
Total Costs	228,038,342	69,058,055	211,225,062	878,510,383

In addition to these costs, it is estimated that there are very substantial costs arising from alcohol dependence. However because of uncertainty about the number of dependent alcohol users in the NT and on the extent to which some of the intangible costs of dependence are picked up in other cost items included in this analysis, they have been excluded from the cost summary reported above. If they were included then the estimated total intangible costs of alcohol would increase substantially (see Table 10.3).

Table 10.3 Total quantifiable costs of alcohol in the Northern Territory in 2015/16 values if intangible costs of dependence are included

	Most likely estimate ($)	Lower bound ($)	Upper bound ($)
TOTAL EXCLUDING COSTS OF DEPENDENT DRINKERS	.	.	.
Tangible costs	701,326,045	580,625,039	1,026,259,116
Intangible costs	685,505,796	602,446,192	1,950,322,076
Total Costs	1,386,831,842	1,183,071,231	2,976,581,192
INTANGIBLE COSTS OF ALCOHOL DEPENDENCE/ABUSE			
Intangible cost to drinker - dependent drinker	849,483,643	437,625,864	1,261,341,422
Intangible cost to drinker - alcohol use disorder	227,438,504	180,699,746	274,177,261
Intangible cost to spouse/defacto of dependent drinker	556,049,812	355,294,771	756,804,853
Intangible cost to dependent child of dependent drinker	620,922,290	396,745,828	845,098,753
TOTAL INCLUDING COSTS OF DEPENDENCE TO DRINKER	.	.	.
Tangible costs	692,689,379	556,044,293	1,001,678,370
Intangible costs	2,948,036,712	1,997,393,147	5,112,325,110
Total Costs	**3,640,726,091**	**2,553,437,440**	**6,114,003,480**

An earlier study of the cost of alcohol-related harms in the NT, based on 2004/05 consumption levels, estimated the total cost at $642 million (SACES 2009). The 2004/05 estimate, when adjusted for inflation over the intervening period using the Australian Bureau of Statistics Consumer Price Index, is equivalent to $844.4 million in 2015/16[6]. The new estimate therefore represents an increase in real costs of 64.2 per cent. However, the two figures are not directly comparable, partly because of changed understandings about the impact of alcohol and more sophisticated approaches to measurement, and partly because of a range of additional factors, including:

- Increases in the costs of most NT Government (NTG) services impacted by alcohol, particularly police and prisons
- The inclusion of child protection costs in the current report (this was not included in 2009)
- An increase in net deaths attributable to alcohol from 94.9 in 2004/05 to 141.9 in 2015/16
- Improved methodologies for valuing the intangible costs of death and disability.

10.3 Study Limitations

This study has aimed to estimate the social and economic costs and harms of alcohol consumption in the NT. While the report is methodologically robust, there are certain areas of interest and impact in relation to alcohol consumption where it is difficult to accurately apportion costs.

For example, the lack of good quality prevalence data associated with FASD (partially indicative of contestation in relation to diagnostic tools) has meant that this has not been included in the quantitative analysis. Similarly, the lack of good quality data about the impact of alcohol consumption on homelessness in the NT has made it difficult to ascertain the likely social and

[6] Australian Bureau of Statistics Consumer Price Index Calculator www.abs.gov.au/websitedbs/d3310114.nsf/home/Consumer+Price+Index+Inflation+Calculator .

economic costs associated with people affected by alcohol seeking supported accommodation options, public housing or alternative shelter and hostel-style accommodation. In addition, Emergency Department (ED) alcohol-related presentation data, has not been included. This means that significant costs associated with ED presentations and addressing FASD, and homelessness and long-grassing, have not adequately been incorporated into the figures presented in this report. Yet, these are all emerging areas of public policy interest in the NT, where the need for further investment and action has already been noted (Quilty et al 2016; Department of Health 2018). This includes investing in better quality data and research that helps to guide such actions, a concept which was reaffirmed in the recent Riley Review [17].

Another study limitation is that no Aboriginal researchers were directly involved in the planning and analysis of this report. Ideally, this would have occurred given that approximately 30 per cent of the NT population identify as Aboriginal or Torres Strait Islander. This would have potentially enabled a more culturally nuanced investigation of the social and economic harms of alcohol consumption experienced by the Aboriginal population of the NT. That said, the findings presented in this report are consistent with other NT and national studies relating to the impact of alcohol consumption on Aboriginal and Torres Strait Islander communities (Symons et al 2012; Gray et al 2014).

In addition, the research team were located in three different states (NT, QLD & SA), making it difficult to analyse the findings collectively. The report has, however, been finalised with input from all authors.

10.4 Conclusion

This report has presented an overview of the social and economic costs and harms of alcohol consumption in the NT. It has achieved this through the analysis and presentation of a broad array of quantitative data. It is estimated that the total social cost of alcohol in the NT is estimated to be $1,386.8 million, with tangible costs of $701.3 million, and intangible costs of $685.5 million (excluding the lost quality of life due to addiction amongst dependent drinkers and the family members of dependent drinkers – the magnitudes of which are less certain but likely to be very substantial).

At an individual level the estimated total social cost of alcohol in 2015/16 was $3,832.19 in tangible costs per adult resident of the Northern Territory, with intangible costs imposing a further cost of $3,745.75 per adult. This equates to a total estimated impact of $7,577.94 per adult (excluding the costs of alcohol dependence to the dependent drinker and their family).

While alcohol consumption in the NT may have declined slightly over the past few years, the social costs and harms of alcohol have not. We have presented data throughout this report which explains why this is the case. We have also explained the complex relationships between drinking and alcohol-related harms. In doing so, we have shown that the harmful use of alcohol is a multi-faceted issue. It therefore requires a multi-faceted response, including the integration of related service system responses, particularly those relating to health, justice, child protection and police sectors.

It is clear that further work needs to be done to reduce the costs and harms of alcohol in the NT. The Northern Territory Government's (NTG) response to the recent independent review of alcohol policies and legislation in the NT released in October 2017 (NTG 2018a), and the parallel release of an *Alcohol Harm Minimisation Action Plan 2018-2019* (NTG 2018b), is a good start. This has included the establishment of a new Liquor Commission Act 2018 (NTG 2018c); and provisions to be the first jurisdiction in Australia to implement a Minimum Unit Price (MUP) on alcohol. In addition, the NTG had already (re)introduced the Banned Drinker Register (BDR) in September 2017. These recent investments in alcohol policy and legislation development are considered to be innovative, but require ongoing monitoring and evaluation in relation to assessing their overall effectiveness (Smith et al. 2019).

That is, the alcohol harm minimisation approach currently being adopted by the NTG provides a useful foundation from which to build additional and sustained evidence-based responses. These need to span policy, program and service delivery contexts if significant improvements are to be achieved. For this to be successful, such investment will need to reflect strong cross-sectoral collaboration; focus on preventive efforts; be targeted towards the people at greatest risk; involve significant service system redesign; and embrace innovative approaches that tackle alcohol issues at the grass roots. This report indicates that a longer-term outlook is required to adequately support the health and safety of the NT community from the harms of alcohol.

Appendix A

Appendix A Relative risk estimates for alcohol consumption (relative to abstention) by sex, age group and consumption level

Condition	Consumption level	Sex	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years	60-64 years	65-69 years	70-74 years	75-79 years	80-84 years	85+ years
Tuberculosis	72 g/day	Both	3.507	3.507	3.507	3.507	3.507	3.507	3.507	3.507	3.507	3.507	3.507	3.507	3.507	3.507	3.507
Tuberculosis	60 g/day	Both	2.994	2.994	2.994	2.994	2.994	2.994	2.994	2.994	2.994	2.994	2.994	2.994	2.994	2.994	2.994
Tuberculosis	48 g/day	Both	2.535	2.535	2.535	2.535	2.535	2.535	2.535	2.535	2.535	2.535	2.535	2.535	2.535	2.535	2.535
Tuberculosis	36 g/day	Both	2.058	2.058	2.058	2.058	2.058	2.058	2.058	2.058	2.058	2.058	2.058	2.058	2.058	2.058	2.058
Tuberculosis	24 g/day	Both	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531
Tuberculosis	12 g/day	Both	1.101	1.101	1.101	1.101	1.101	1.101	1.101	1.101	1.101	1.101	1.101	1.101	1.101	1.101	1.101
Lower respiratory infections	72 g/day	Both	1.357	1.357	1.357	1.357	1.357	1.357	1.357	1.357	1.357	1.357	1.357	1.357	1.357	1.357	1.357
Lower respiratory infections	60 g/day	Both	1.226	1.226	1.226	1.226	1.226	1.226	1.226	1.226	1.226	1.226	1.226	1.226	1.226	1.226	1.226
Lower respiratory infections	48 g/day	Both	1.127	1.127	1.127	1.127	1.127	1.127	1.127	1.127	1.127	1.127	1.127	1.127	1.127	1.127	1.127
Lower respiratory infections	36 g/day	Both	1.064	1.064	1.064	1.064	1.064	1.064	1.064	1.064	1.064	1.064	1.064	1.064	1.064	1.064	1.064
Lower respiratory infections	24 g/day	Both	1.026	1.026	1.026	1.026	1.026	1.026	1.026	1.026	1.026	1.026	1.026	1.026	1.026	1.026	1.026
Lower respiratory infections	12 g/day	Both	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013
Oesophageal cancer	72 g/day	Both	2.669	2.669	2.669	2.669	2.669	2.669	2.669	2.669	2.669	2.669	2.669	2.669	2.669	2.669	2.669
Oesophageal cancer	60 g/day	Both	2.452	2.452	2.452	2.452	2.452	2.452	2.452	2.452	2.452	2.452	2.452	2.452	2.452	2.452	2.452
Oesophageal cancer	48 g/day	Both	2.202	2.202	2.202	2.202	2.202	2.202	2.202	2.202	2.202	2.202	2.202	2.202	2.202	2.202	2.202
Oesophageal cancer	36 g/day	Both	1.815	1.815	1.815	1.815	1.815	1.815	1.815	1.815	1.815	1.815	1.815	1.815	1.815	1.815	1.815

Condition	Consumption level	Sex	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years	60-64 years	65-69 years	70-74 years	75-79 years	80-84 years	85+ years
Oesophageal cancer	24 g/day	Both	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.466
Oesophageal cancer	12 g/day	Both	1.212	1.212	1.212	1.212	1.212	1.212	1.212	1.212	1.212	1.212	1.212	1.212	1.212	1.212	1.212
Liver cancer	72 g/day	Both	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.424
Liver cancer	60 g/day	Both	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372
Liver cancer	48 g/day	Both	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31
Liver cancer	36 g/day	Both	1.225	1.225	1.225	1.225	1.225	1.225	1.225	1.225	1.225	1.225	1.225	1.225	1.225	1.225	1.225
Liver cancer	24 g/day	Both	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Liver cancer	12 g/day	Both	1.067	1.067	1.067	1.067	1.067	1.067	1.067	1.067	1.067	1.067	1.067	1.067	1.067	1.067	1.067
Larynx cancer	72 g/day	Both	2.461	2.461	2.461	2.461	2.461	2.461	2.461	2.461	2.461	2.461	2.461	2.461	2.461	2.461	2.461
Larynx cancer	60 g/day	Both	2.144	2.144	2.144	2.144	2.144	2.144	2.144	2.144	2.144	2.144	2.144	2.144	2.144	2.144	2.144
Larynx cancer	48 g/day	Both	1.813	1.813	1.813	1.813	1.813	1.813	1.813	1.813	1.813	1.813	1.813	1.813	1.813	1.813	1.813
Larynx cancer	36 g/day	Both	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531	1.531
Larynx cancer	24 g/day	Both	1.304	1.304	1.304	1.304	1.304	1.304	1.304	1.304	1.304	1.304	1.304	1.304	1.304	1.304	1.304
Larynx cancer	12 g/day	Both	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12
Breast cancer	72 g/day	Both	1.476	1.476	1.476	1.476	1.476	1.476	1.476	1.476	1.476	1.476	1.476	1.476	1.476	1.476	1.476
Breast cancer	60 g/day	Both	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.452
Breast cancer	48 g/day	Both	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.443
Breast cancer	36 g/day	Both	1.433	1.433	1.433	1.433	1.433	1.433	1.433	1.433	1.433	1.433	1.433	1.433	1.433	1.433	1.433
Breast cancer	24 g/day	Both	1.329	1.329	1.329	1.329	1.329	1.329	1.329	1.329	1.329	1.329	1.329	1.329	1.329	1.329	1.329
Breast cancer	12 g/day	Both	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
Colon and rectum cancer	72 g/day	Both	1.616	1.616	1.616	1.616	1.616	1.616	1.616	1.616	1.616	1.616	1.616	1.616	1.616	1.616	1.616
Colon and rectum cancer	60 g/day	Both	1.468	1.468	1.468	1.468	1.468	1.468	1.468	1.468	1.468	1.468	1.468	1.468	1.468	1.468	1.468
Colon and rectum	48 g/day	Both	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.323

Condition	Consumption level	Sex	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years	60-64 years	65-69 years	70-74 years	75-79 years	80-84 years	85+ years
cancer																	
Colon and rectum cancer	36 g/day	Both	1.237	1.237	1.237	1.237	1.237	1.237	1.237	1.237	1.237	1.237	1.237	1.237	1.237	1.237	1.237
Colon and rectum cancer	24 g/day	Both	1.156	1.156	1.156	1.156	1.156	1.156	1.156	1.156	1.156	1.156	1.156	1.156	1.156	1.156	1.156
Colon and rectum cancer	12 g/day	Both	1.078	1.078	1.078	1.078	1.078	1.078	1.078	1.078	1.078	1.078	1.078	1.078	1.078	1.078	1.078
Lip and oral cavity cancer	72 g/day	Both	4.858	4.858	4.858	4.858	4.858	4.858	4.858	4.858	4.858	4.858	4.858	4.858	4.858	4.858	4.858
Lip and oral cavity cancer	60 g/day	Both	3.766	3.766	3.766	3.766	3.766	3.766	3.766	3.766	3.766	3.766	3.766	3.766	3.766	3.766	3.766
Lip and oral cavity cancer	48 g/day	Both	2.991	2.991	2.991	2.991	2.991	2.991	2.991	2.991	2.991	2.991	2.991	2.991	2.991	2.991	2.991
Lip and oral cavity cancer	36 g/day	Both	2.311	2.311	2.311	2.311	2.311	2.311	2.311	2.311	2.311	2.311	2.311	2.311	2.311	2.311	2.311
Lip and oral cavity cancer	24 g/day	Both	1.738	1.738	1.738	1.738	1.738	1.738	1.738	1.738	1.738	1.738	1.738	1.738	1.738	1.738	1.738
Lip and oral cavity cancer	12 g/day	Both	1.293	1.293	1.293	1.293	1.293	1.293	1.293	1.293	1.293	1.293	1.293	1.293	1.293	1.293	1.293
Nasopharynx cancer	72 g/day	Both	4.545	4.545	4.545	4.545	4.545	4.545	4.545	4.545	4.545	4.545	4.545	4.545	4.545	4.545	4.545
Nasopharynx cancer	60 g/day	Both	3.803	3.803	3.803	3.803	3.803	3.803	3.803	3.803	3.803	3.803	3.803	3.803	3.803	3.803	3.803
Nasopharynx cancer	48 g/day	Both	3.062	3.062	3.062	3.062	3.062	3.062	3.062	3.062	3.062	3.062	3.062	3.062	3.062	3.062	3.062
Nasopharynx cancer	36 g/day	Both	2.385	2.385	2.385	2.385	2.385	2.385	2.385	2.385	2.385	2.385	2.385	2.385	2.385	2.385	2.385
Nasopharynx cancer	24 g/day	Both	1.839	1.839	1.839	1.839	1.839	1.839	1.839	1.839	1.839	1.839	1.839	1.839	1.839	1.839	1.839
Nasopharynx cancer	12 g/day	Both	1.371	1.371	1.371	1.371	1.371	1.371	1.371	1.371	1.371	1.371	1.371	1.371	1.371	1.371	1.371
Other pharynx cancer	72 g/day	Both	4.764	4.764	4.764	4.764	4.764	4.764	4.764	4.764	4.764	4.764	4.764	4.764	4.764	4.764	4.764
Other pharynx cancer	60 g/day	Both	3.972	3.972	3.972	3.972	3.972	3.972	3.972	3.972	3.972	3.972	3.972	3.972	3.972	3.972	3.972

Condition	Consumption level	Sex	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years	60-64 years	65-69 years	70-74 years	75-79 years	80-84 years	85+ years
Other pharynx cancer	48 g/day	Both	3.199	3.199	3.199	3.199	3.199	3.199	3.199	3.199	3.199	3.199	3.199	3.199	3.199	3.199	3.199
Other pharynx cancer	36 g/day	Both	2.519	2.519	2.519	2.519	2.519	2.519	2.519	2.519	2.519	2.519	2.519	2.519	2.519	2.519	2.519
Other pharynx cancer	24 g/day	Both	1.943	1.943	1.943	1.943	1.943	1.943	1.943	1.943	1.943	1.943	1.943	1.943	1.943	1.943	1.943
Other pharynx cancer	12 g/day	Both	1.472	1.472	1.472	1.472	1.472	1.472	1.472	1.472	1.472	1.472	1.472	1.472	1.472	1.472	1.472
Ischaemic heart disease	72 g/day	Male	1.091	1.091	1.091	1.091	1.091	1.091	1.091	1.091	1.091	1.091	1.091	1.091	1.091	1.091	1.091
Ischaemic heart disease	60 g/day	Male	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993
Ischaemic heart disease	48 g/day	Male	0.906	0.906	0.906	0.906	0.906	0.906	0.906	0.906	0.906	0.906	0.906	0.906	0.906	0.906	0.906
Ischaemic heart disease	36 g/day	Male	0.871	0.871	0.871	0.871	0.871	0.871	0.871	0.871	0.871	0.871	0.871	0.871	0.871	0.871	0.871
Ischaemic heart disease	24 g/day	Male	0.857	0.857	0.857	0.857	0.857	0.857	0.857	0.857	0.857	0.857	0.857	0.857	0.857	0.857	0.857
Ischaemic heart disease	12 g/day	Male	0.865	0.865	0.865	0.865	0.865	0.865	0.865	0.865	0.865	0.865	0.865	0.865	0.865	0.865	0.865
Ischaemic heart disease	72 g/day	Female	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107
Ischaemic heart disease	60 g/day	Female	1.012	1.012	1.012	1.012	1.012	1.012	1.012	1.012	1.012	1.012	1.012	1.012	1.012	1.012	1.012
Ischaemic heart disease	48 g/day	Female	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932
Ischaemic heart disease	36 g/day	Female	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882
Ischaemic heart disease	24 g/day	Female	0.846	0.846	0.846	0.846	0.846	0.846	0.846	0.846	0.846	0.846	0.846	0.846	0.846	0.846	0.846
Ischaemic heart disease	12 g/day	Female	0.823	0.823	0.823	0.823	0.823	0.823	0.823	0.823	0.823	0.823	0.823	0.823	0.823	0.823	0.823

Condition	Consumption level	Sex	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years	60-64 years	65-69 years	70-74 years	75-79 years	80-84 years	85+ years
Ischaemic stroke	72 g/day	Male	1.451	1.451	1.451	1.451	1.451	1.451	1.451	1.451	1.451	1.451	1.451	1.451	1.451	1.451	1.451
Ischaemic stroke	60 g/day	Male	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312
Ischaemic stroke	48 g/day	Male	1.159	1.159	1.159	1.159	1.159	1.159	1.159	1.159	1.159	1.159	1.159	1.159	1.159	1.159	1.159
Ischaemic stroke	36 g/day	Male	1.057	1.057	1.057	1.057	1.057	1.057	1.057	1.057	1.057	1.057	1.057	1.057	1.057	1.057	1.057
Ischaemic stroke	24 g/day	Male	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Ischaemic stroke	12 g/day	Male	0.938	0.938	0.938	0.938	0.938	0.938	0.938	0.938	0.938	0.938	0.938	0.938	0.938	0.938	0.938
Ischaemic stroke	72 g/day	Female	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43
Ischaemic stroke	60 g/day	Female	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Ischaemic stroke	48 g/day	Female	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
Ischaemic stroke	36 g/day	Female	0.985	0.985	0.985	0.985	0.985	0.985	0.985	0.985	0.985	0.985	0.985	0.985	0.985	0.985	0.985
Ischaemic stroke	24 g/day	Female	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Ischaemic stroke	12 g/day	Female	0.824	0.824	0.824	0.824	0.824	0.824	0.824	0.824	0.824	0.824	0.824	0.824	0.824	0.824	0.824
Haemorrhagic stroke	72 g/day	Male	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971
Haemorrhagic stroke	60 g/day	Male	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705
Haemorrhagic stroke	48 g/day	Male	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458	1.458
Haemorrhagic stroke	36 g/day	Male	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31
Haemorrhagic stroke	24 g/day	Male	1.162	1.162	1.162	1.162	1.162	1.162	1.162	1.162	1.162	1.162	1.162	1.162	1.162	1.162	1.162
Haemorrhagic stroke	12 g/day	Male	1.068	1.068	1.068	1.068	1.068	1.068	1.068	1.068	1.068	1.068	1.068	1.068	1.068	1.068	1.068
Haemorrhagic stroke	72 g/day	Female	2.276	2.276	2.276	2.276	2.276	2.276	2.276	2.276	2.276	2.276	2.276	2.276	2.276	2.276	2.276
Haemorrhagic stroke	60 g/day	Female	1.964	1.964	1.964	1.964	1.964	1.964	1.964	1.964	1.964	1.964	1.964	1.964	1.964	1.964	1.964
Haemorrhagic stroke	48 g/day	Female	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614
Haemorrhagic stroke	36 g/day	Female	1.337	1.337	1.337	1.337	1.337	1.337	1.337	1.337	1.337	1.337	1.337	1.337	1.337	1.337	1.337
Haemorrhagic stroke	24 g/day	Female	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
Haemorrhagic stroke	12 g/day	Female	1.031	1.031	1.031	1.031	1.031	1.031	1.031	1.031	1.031	1.031	1.031	1.031	1.031	1.031	1.031
Hypertensive heart	72 g/day	Both	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86

Condition	Consumption level	Sex	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years	60-64 years	65-69 years	70-74 years	75-79 years	80-84 years	85+ years
disease																	
Hypertensive heart disease	60 g/day	Both	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705
Hypertensive heart disease	48 g/day	Both	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614	1.614
Hypertensive heart disease	36 g/day	Both	1.479	1.479	1.479	1.479	1.479	1.479	1.479	1.479	1.479	1.479	1.479	1.479	1.479	1.479	1.479
Hypertensive heart disease	24 g/day	Both	1.315	1.315	1.315	1.315	1.315	1.315	1.315	1.315	1.315	1.315	1.315	1.315	1.315	1.315	1.315
Hypertensive heart disease	12 g/day	Both	1.046	1.046	1.046	1.046	1.046	1.046	1.046	1.046	1.046	1.046	1.046	1.046	1.046	1.046	1.046
Atrial fibrillation and flutter	72 g/day	Both	1.535	1.535	1.535	1.535	1.535	1.535	1.535	1.535	1.535	1.535	1.535	1.535	1.535	1.535	1.535
Atrial fibrillation and flutter	60 g/day	Both	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.411
Atrial fibrillation and flutter	48 g/day	Both	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312	1.312
Atrial fibrillation and flutter	36 g/day	Both	1.214	1.214	1.214	1.214	1.214	1.214	1.214	1.214	1.214	1.214	1.214	1.214	1.214	1.214	1.214
Atrial fibrillation and flutter	24 g/day	Both	1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131
Atrial fibrillation and flutter	12 g/day	Both	1.066	1.066	1.066	1.066	1.066	1.066	1.066	1.066	1.066	1.066	1.066	1.066	1.066	1.066	1.066
Cirrhosis and other chronic liver diseases	72 g/day	Both	9.427	9.427	9.427	9.427	9.427	9.427	9.427	9.427	9.427	9.427	9.427	9.427	9.427	9.427	9.427
Cirrhosis and other chronic liver diseases	60 g/day	Both	6.274	6.274	6.274	6.274	6.274	6.274	6.274	6.274	6.274	6.274	6.274	6.274	6.274	6.274	6.274
Cirrhosis and other chronic liver diseases	48 g/day	Both	4.673	4.673	4.673	4.673	4.673	4.673	4.673	4.673	4.673	4.673	4.673	4.673	4.673	4.673	4.673

Condition	Consumption level	Sex	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years	60-64 years	65-69 years	70-74 years	75-79 years	80-84 years	85+ years
Cirrhosis and other chronic liver diseases	36 g/day	Both	3.274	3.274	3.274	3.274	3.274	3.274	3.274	3.274	3.274	3.274	3.274	3.274	3.274	3.274	3.274
Cirrhosis and other chronic liver diseases	24 g/day	Both	2.055	2.055	2.055	2.055	2.055	2.055	2.055	2.055	2.055	2.055	2.055	2.055	2.055	2.055	2.055
Cirrhosis and other chronic liver diseases	12 g/day	Both	1.243	1.243	1.243	1.243	1.243	1.243	1.243	1.243	1.243	1.243	1.243	1.243	1.243	1.243	1.243
Pancreatitis	72 g/day	Both	3.298	3.298	3.298	3.298	3.298	3.298	3.298	3.298	3.298	3.298	3.298	3.298	3.298	3.298	3.298
Pancreatitis	60 g/day	Both	2.217	2.217	2.217	2.217	2.217	2.217	2.217	2.217	2.217	2.217	2.217	2.217	2.217	2.217	2.217
Pancreatitis	48 g/day	Both	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717
Pancreatitis	36 g/day	Both	1.471	1.471	1.471	1.471	1.471	1.471	1.471	1.471	1.471	1.471	1.471	1.471	1.471	1.471	1.471
Pancreatitis	24 g/day	Both	1.228	1.228	1.228	1.228	1.228	1.228	1.228	1.228	1.228	1.228	1.228	1.228	1.228	1.228	1.228
Pancreatitis	12 g/day	Both	1.073	1.073	1.073	1.073	1.073	1.073	1.073	1.073	1.073	1.073	1.073	1.073	1.073	1.073	1.073
Epilepsy	72 g/day	Both	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48
Epilepsy	60 g/day	Both	2.186	2.186	2.186	2.186	2.186	2.186	2.186	2.186	2.186	2.186	2.186	2.186	2.186	2.186	2.186
Epilepsy	48 g/day	Both	1.872	1.872	1.872	1.872	1.872	1.872	1.872	1.872	1.872	1.872	1.872	1.872	1.872	1.872	1.872
Epilepsy	36 g/day	Both	1.585	1.585	1.585	1.585	1.585	1.585	1.585	1.585	1.585	1.585	1.585	1.585	1.585	1.585	1.585
Epilepsy	24 g/day	Both	1.353	1.353	1.353	1.353	1.353	1.353	1.353	1.353	1.353	1.353	1.353	1.353	1.353	1.353	1.353
Epilepsy	12 g/day	Both	1.177	1.177	1.177	1.177	1.177	1.177	1.177	1.177	1.177	1.177	1.177	1.177	1.177	1.177	1.177
Diabetes mellitus	72 g/day	Male	1.198	1.198	1.198	1.198	1.198	1.198	1.198	1.198	1.198	1.198	1.198	1.198	1.198	1.198	1.198
Diabetes mellitus	60 g/day	Male	1.165	1.165	1.165	1.165	1.165	1.165	1.165	1.165	1.165	1.165	1.165	1.165	1.165	1.165	1.165
Diabetes mellitus	48 g/day	Male	1.084	1.084	1.084	1.084	1.084	1.084	1.084	1.084	1.084	1.084	1.084	1.084	1.084	1.084	1.084
Diabetes mellitus	36 g/day	Male	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Diabetes mellitus	24 g/day	Male	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932	0.932
Diabetes mellitus	12 g/day	Male	0.921	0.921	0.921	0.921	0.921	0.921	0.921	0.921	0.921	0.921	0.921	0.921	0.921	0.921	0.921
Diabetes mellitus	72 g/day	Female	1.172	1.172	1.172	1.172	1.172	1.172	1.172	1.172	1.172	1.172	1.172	1.172	1.172	1.172	1.172

Condition	Consumption level	Sex	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years	60-64 years	65-69 years	70-74 years	75-79 years	80-84 years	85+ years
Diabetes mellitus	60 g/day	Female	1.074	1.074	1.074	1.074	1.074	1.074	1.074	1.074	1.074	1.074	1.074	1.074	1.074	1.074	1.074
Diabetes mellitus	48 g/day	Female	0.945	0.945	0.945	0.945	0.945	0.945	0.945	0.945	0.945	0.945	0.945	0.945	0.945	0.945	0.945
Diabetes mellitus	36 g/day	Female	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836
Diabetes mellitus	24 g/day	Female	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Diabetes mellitus	12 g/day	Female	0.733	0.733	0.733	0.733	0.733	0.733	0.733	0.733	0.733	0.733	0.733	0.733	0.733	0.733	0.733
Unintentional injuries	72 g/day	Both	1.266	1.266	1.266	1.266	1.266	1.266	1.266	1.266	1.266	1.266	1.266	1.266	1.266	1.266	1.266
Unintentional injuries	60 g/day	Both	1.221	1.221	1.221	1.221	1.221	1.221	1.221	1.221	1.221	1.221	1.221	1.221	1.221	1.221	1.221
Unintentional injuries	48 g/day	Both	1.182	1.182	1.182	1.182	1.182	1.182	1.182	1.182	1.182	1.182	1.182	1.182	1.182	1.182	1.182
Unintentional injuries	36 g/day	Both	1.168	1.168	1.168	1.168	1.168	1.168	1.168	1.168	1.168	1.168	1.168	1.168	1.168	1.168	1.168
Unintentional injuries	24 g/day	Both	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154	1.154
Unintentional injuries	12 g/day	Both	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Self-harm	72 g/day	Both	1.927	1.927	1.927	1.927	1.927	1.927	1.927	1.927	1.927	1.927	1.927	1.927	1.927	1.927	1.927
Self-harm	60 g/day	Both	1.734	1.734	1.734	1.734	1.734	1.734	1.734	1.734	1.734	1.734	1.734	1.734	1.734	1.734	1.734
Self-harm	48 g/day	Both	1.545	1.545	1.545	1.545	1.545	1.545	1.545	1.545	1.545	1.545	1.545	1.545	1.545	1.545	1.545
Self-harm	36 g/day	Both	1.376	1.376	1.376	1.376	1.376	1.376	1.376	1.376	1.376	1.376	1.376	1.376	1.376	1.376	1.376
Self-harm	24 g/day	Both	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23
Self-harm	12 g/day	Both	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107	1.107

Source: Gakidou et al. 2017

References

Abelson, P. (2008). *Establishing a monetary value for lives saved: Issues and controversies, Working Papers in Cost-Benefit Analysis*. Office of Best Practice Regulation, Department of Finance and Deregulation.

ABS. (1997). *Unpaid Work and the Australian Economy, 5240*. Canberra, ABS.

ABS. (2013). *Life Tables for Aboriginal and Torres Strait Islander Australians, 2010–2012, cat. no. 3302.055.003*

ABS. (2017a). 'Tablebuilder Database, 2016 Census of Population and Housing', Data by place of usual residence. Canberra, ABS.

ABS. (2017b). *Criminal Courts, Australia, 2015–16, cat. no. 4513.0.*

ABS. (2017c). *Prisoners in Australia, cat. no. 4517.0*

ABS. (2018a). *Life Tables, States, Territories and Australia, 2015-2017, cat. no. 3302.055.001*

ABS. (2018b). *Australian National Accounts: National Income, Expenditure and Product, September 2018, cat. no. 5206.0*

ABS. (2018c). *Labour Force, Australia, Dec 2018, cat. no. 6202.0*

ABS. (2018d). *Consumer Price Index, Australia, December 2018, cat. no. 6401.0*

ABS. (2018e). *4510.0 - Recorded Crime - Victims, Australia, 2017*. Canberra. www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4510.02017?OpenDocument (retrieved 20 December 2018).

ABS. (2018f). *4519.0 - Recorded Crime - Offenders, 2016-17*. Canberra. www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4519.02016-17?OpenDocument (retrieved 20 December 2018).

AIHW. (2010). *Health system expenditure on disease and injury in Australia, 2004-05, Health and Welfare Expenditure Series No. 36. HSE 87*. Canberra, AIHW.

AIHW. (2011). *Dementia among aged care residents: first information from the Aged Care Funding Instrument. Aged care statistics series no. 32. Cat. no. AGE 63*. Canberra: AIHW.

AIHW. (2016). *Evidence for chronic disease risk factors*. Cat. No. WEB 166. Canberra: Australian Government.

AIHW (2017a). *National Drug Strategy Household Survey 2016: detailed findings. Drug Statistics series no. 31. Cat. no. PHE 214.* Canberra, AIHW.

AIHW. (2017b). *Health expenditure Australia 2015–16. Health and welfare expenditure series no. 58. Cat. no. HWE 68*. Canberra: AIHW.

AIHW (2017c). *Alcohol and other drug treatment services in Australia 2015–16. Drug treatment series no. 29. Cat. no. HSE 187*. Canberra, AIHW.

AIHW. (2018a). *Alcohol, tobacco and other drugs in Australia*. Cat. No. PHE 221. Canberra: Australian Government.

AIHW. (2018b). *Child protection Australia 2016–17. Child welfare series no. 68. Cat. no. CWS 63*. Canberra. https://www.aihw.gov.au/getmedia/66c7c364-592a-458c-9ab0-f90022e25368/aihw-cws-63.pdf.aspx?inline=true (retrieved 27 November 2018).

Akerlof, G. (1991). Procrastination and obedience. *American Economic Review*. 81 (2), 1-19.

Angeletos, G.-M., Laibson, D., Repetto, A., Tobacman, J. & Weinberg, S. (2001). The hyperbolic consumption model: Calibration, simulation, and empirical evaluation. *Journal of Economic Perspectives*. 15 (3), 47-68.

Arria, A., Mericle, A., Meyers, K. & Winters, K. (2012). Parental substance use impairment, parenting and substance use disorder risk. *Journal of Substance Abuse Treatment*. 43 (1), e114-122.

Bamblett, B., Bath, H., & Roseby, R. (2010). *Growing them Strong, Together: Promoting the safety and wellbeing of the Northern Territory's children, Report of the Board of Inquiry into the Child Protection System in the Northern Territory*. Darwin, Northern Territory Government.

Banks, K. (2016). Tributes flow for Dale Walkinshaw remembered as hard working apprentice, *NT News*, 27 September. Retrieved from https://www.ntnews.com.au/news/northern-territory/tributes-flow-for-dale-walkinshaw-remembered-as-hard-working-apprentice/news-story/75a9e3a1626f72c98976a812dcb4615a

Baker, R., Bateman, I., Donaldson, C., Jones-Lee, M., Lancsar, E., Loomes, G., Mason, H., Odejar, M., Pinto Prades, J., Robinson, A., Ryan, M., Shackley, P., Smith, R., Sugden, R. & Wildman, J. (2010). Weighting and Valuing Quality-Adjusted Life-Years Using Stated Preference Methods: Preliminary Results from the Social Value of a QALY Project. *Health Technology Assessment*. 14 (27), 1-161.

Barkly Youth Services. (2014). *Submission to the Select Committee on Action to Prevent Foetal Alcohol Spectrum Disorder*. Tennant Creek, NT. https://parliament.nt.gov.au/__data/assets/pdf_file/0019/363232/Submission_Number_26A_Barkly_Youth_Services.pdf (retrieved 23 January 2018).

Becker, G. & Murphy, K. (1988). A theory of rational addiction. *Journal of Political Economy.* 96 (4), 675-700.

BITRE. (2009). *Road crash costs in Australia 2006, Report 118.* Canberra: BITRE.

Bower, C. & Elliott, E. (2016) (on behalf of the Steering Group). Report to the Australian Government Department of Health: *Australian Guide to the diagnosis of Fetal Alcohol Spectrum Disorder (FASD).*

Bower, C., Watkins, R., Mutch, R. et al. (2018). Fetal alcohol spectrum disorder and youth justice: a prevlance study among young people sentenced to detention in Western Australia. *BMJ Open*. 8, e019605.

Britt H, Miller GC, Henderson J, Bayram C, Harrison C, Valenti L, Pan Y, Charles J, Pollack AJ, Wong C, Gordon J. (2016). *General practice activity in Australia 2015–16. General practice series no. 40.* Sydney, Sydney University Press.

Casswell, S., You, R. & Huckle, T. (2011). Alcohol's harm to others: Reduced wellbeing and health status for those with heavy drinkers in their lives. *Addiction*. 106 (6), 1087-1094.

Centrelink. (2016). 'A Guide to Australian Government payments'.

Ch'ng, C., Fitzgerald, M., Gerostamoulos, J., Cameron, P., Bui, D., Drummer, O., Potter, J. & Odell, M. (2007). Drug use in motor vehicle drivers presenting to an Australian, adult major trauma centre. *Emergency Medicine Australasia*. 19 (4), 359-365.

Coghlan, S., Gannoni, A., Goldsmid, S., Patterson, E., Willis, M. (2015). *Drug use monitoring in Australia: 2013–14 report on drug use among police detainees, Monitoring Reports, 27*. Canberra, AIC.

Collins, D.J., Lapsley, H.M. (2008). *The Costs of Tobacco, Alcohol and Illicit Drug Abuse to Australian Society in 2004/05, National Drug Strategy Monograph Series No. 64*. Canberra, Commonwealth of Australia.

Commonwealth Department of Health. (2018) *Consultation Draft National Alcohol Strategy 2017-2026*. Canberra: Commonwealth of Australia, 2018 [updated 2018 Nov 11]. Available at: http://www.health.gov.au/internet/main/publishing.nsf/Content/55E4796388E9EDE5CA25808F00035035/$File/Consultation%20Draft%20National%20Alcohol%20Strategy%202018-2026.pdf

Commonwealth Grants Commission. (2018). *Report on GST Revenue Sharing Relativities, 2018 Update*. Canberra. https://www.cgc.gov.au/inquiries/2018-update (retrieved 8 January 2018).

Commonwealth Grants Commission. (2015). *Report on GST Revenue Sharing Relativities 2015 Review – Volume 1*. Canberra. www.cgc.gov.au (retrieved 16 December 2018).

DAGJ (2018). *Northern Territory Wholesale Alcohol Supply 2010 to 2017*. Darwin, Northern Territory Government.

Daube, M. & Stafford, J. (2016). Alcohol and tax – time for real reform. *Medical Journal of Australia*. 204 (6), 218-219.

Degenhardt, L., Hall, W., Teesson, M., & Lynskey, M. (2000). *Alcohol use disorders in Australia: Findings from the National Survey of Mental Health and Well-Being (NDARC Technical Report No. 97).*

Department of Finance and Administration (2006). *Handbook of Cost–Benefit Analysis, Financial Management Reference Material No. 6*. Canberra, Commonwealth of Australia.

Department of Health (2018). *Addressing Fetal Alcohol Spectrum Disorder (FASD) in the Northern Territory 2018-2024*. Darwin, Northern Territory Government.

Department of the Prime Minister and Cabinet (2016). *Cost-Benefit Analysis: Guidance Note*. Canberra, Office of Best Practice Regulation, Australian Government.

Devlin, A., & Fitzharris, M. (2013). 'An analysis of single-vehicle fatality crashes in Australia at various Blood Alcohol Concentrations', Proceedings of the 2013 Australasian Road Safety Research, Policing & Education Conference 28th – 30th August, Brisbane, Queensland.

Dingwall, G. (2013). *Alcohol and crime* (ebook). London: Willan.

Director of Public Prosecutions, Northern Territory. (2016). 'Twenty-Sixth Annual Report'.

Dolan, P. (2010). 'Thinking about it: Thoughts about health and valuing QALYs'. *Health Economics.* 20 (12), 1407–1416.

Dolan, P., Loomes, G., Peasgood, T. & Tsuchiya, A. (2005). Estimating the intangible victim costs of violent crime. *British Journal of Criminology.* 45 (6), 958-976.

Donaldson, C., Baker, R., Mason, H., Jones-Lee, M., Lancsar, E., Wildman, J., Bateman, I., Loomes, G., Robinson, A., Sugden, R., Pinto Prades, J., Ryan, M., Shackley, P. & Smith, R. (2011). The social value of a QALY: Raising the bar or barring the raise? *BMC Health Services Research.* 11 (8), 1-8.

Drummer, O., Gerostamoulos, J., Batziris, H., Chu, M., Caplehorn, J., Robertson, M. & Swann, P. (2003a). The incidence of drugs in drivers killed in Australian road traffic crashes. *Forensic Science International*. 134 (2-3), 154-162.

Drummer, O., Gerostamoulos, J., Batziris, H., Chu, M., Caplehorn, J., Robertson, M. & Swann, P. (2003b). The involvement of drugs in drivers of motor vehicles killed in Australian road traffic crashes. *Accident Analysis and Prevention*. 36 (2), 239-248.

English, D., Holman, C., Milne, E., Winter, M., Hulse, G., Codde, J., Bower, C., Corti, B., de Klerk, N., Knuiman, M., Kurinczuk, J., Lewin, G. & Ryan, G. (1995). *The Quantification of Drug Caused Morbidity and Mortality in Australia*, 1995 edition. Canberra, Commonwealth Department of Human Services and Health.

Gakidou, E., Afshin, A., Abajobir, A., Abate, K., Abbafati, C., Abbas, K. et al. (2017). Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet*. 390 (10100): 1345–1422.

Grant, J., Kushner, M., & Kim, S. (2002). Pathological gambling and alcohol use disorder. *Alcohol Research & Health,* 26 (2), 143-150.

Grant, R. (2014). Converting an odds ratio to a range of plausible relative risks for better communication of research findings. *British Medical Journal*. 348 (f7540), e1-7.

Gray, D., Stearne, A., Bonson, M., Wilkes, E, Butt, J. & Wilson, M. (2014). *Review of the Aboriginal and Torres Strait Islander alcohol, tobacco and other drugs treatment service sector: Harnessing god intentions*. Perth, National Drug Research Institute.

Griswold, M., Fullman, N., Hawley, C., Arian, N., Zimsen, S., Tymeson, H. et al. (2018). Alcohol use and burden for 195 countries and territories, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet*. 392 (10152), 1015-1035.

Gruber, J. & Köszegi, B. (2001). Is addiction 'rational'? Theory and evidence. *Quarterly Journal of Economics*. 116 (4), 1261-1303.

Harris, K. & Bucens, I. (2003). Prevalence of fetal alcohol syndrome in the Top End of the Northern Territory. *Journal of Paediatriac & Child Health.* 39 (7), 528-533.

Henley, G. & Harrison, J. (2018). *Trends in injury deaths, Australia, 1999–00 to 2014–15. Injury research and statistics series no. 112. Cat. no. INJCAT 192*. Canberra. www.aihw.gov.au/reports/injury/trends-injury-deaths-1999-00-to-2014-15/contents/table-of-contents (retrieved 19 November 2018).

Hewitt, M. (2017). *National Drug Strategy Household Survey 2016*, doi:10.4225/87/JUDY2Y, ADA Dataverse, V3.

Homer, J.F., Drummond, M., French, M. (2008). Economic evaluation of adolescent addiction programs: Methodologic challenges and recommendations. *Journal of Adolescent Health*. 43 (6), 529-539.

Independent Hospital Pricing Authority. (2015). *National Efficient Price Determination, 2015-16.*

Independent Hospital Pricing Authority. (2018). *National Hospital Cost Data Collection, Public Hospitals Cost Report, Round 20 (Financial year 2015-16).*

Jeffreys, H., Hirte, C., Rogers, N. & Wilson, R. (2009). *Parental Substance Misuse and Children's Entry into Alternative Care in South Australia*. Adelaide, Department of Families and Communities , Government of South Australia.

Kenkel, D. (1991). Health behavior, health knowledge and schooling. *Journal of Political Economy*. 99 (2), 287-305.

Kezelman, C., Hossack, N., Stavropoulos, P. & Burley, P. (2015). *The Cost of Unresolved Childhood Trauma and Abuse in Adults in Australia*. Sydney, Adults Surviving Child Abuse and Pegasus Economics.

Khwaja, A., Sloan, F. & Chung, S. (2007). The relationship between individual expectations and behaviors: mortality expectations and smoking decisions. *Journal of Risk and Uncertainty*. 35 (2), 179-201.

Kidman, R. (2002). The perfect match? Co-occurring problem drinking and gambling. *Weekly Addiction Gambling Education Report.* 7 (20), 1-4.

Laibson, D. (2001). A cue-theory of consumption. *Quarterly Journal of Economics*. 116 (1), 81-119.

Laslett, A., Catalano, P., Chikritzhs, T., Dale, C., Doran, C., Ferris, J. et al. (2010). *The range and magnitude of harms to others.* Fitzroy, Victoria, AER Centre for Alcohol Policy Research, Turning Point Alcohol and Drug Centre, Eastern Health.

Laslett, A., Dietze, P. & Room, R. (2013). Carer Drinking and More Serious Child Protection Case Outcomes', *British Journal of Social Work*. 43 (7), 1384–1402.

Legislative Assembly of the Northern Territory Select Committee on Action to Prevent Foetal Alcohol Spectrum Disorder. (2015). *The Preventable Disability*. Darwin. https://parliament.nt.gov.au/__data/assets/pdf_file/0005/363254/Final_FASD_Report.pdf (retrieved 20 December 2018).

Leino, T., Molde, H., Griffiths, M. D., Mentzoni, R. A., Sagoe, D., & Pallesen, S. (2017). Gambling behavior in alcohol-serving and non-alcohol-serving-venues: a study of electronic gaming machine players using account records. *Addiction Research & Theory.* 25 (3), 201-207.

Livingston, M. & Wilkinson, C. (2013). Per-capita alcohol consumption and all-cause male mortality data, 1911-2006. *Alcohol and Alcoholism*. 48 (2), 196-201.

Mathers, C. & Stevens, G. (2013). *WHO Methods and Data Sources for Global Burden of Disease Estimates 2000-2011, Global Health Estimates Technical Paper WHO/HIS/HSI/GHE/2013.4*. Geneva, WHO.

McCarthy, M., Taylor, P., Norman, R., Pezzullo, L., Tucci, J. and Goddard, C. (2016). The lifetime economic and social costs of child maltreatment in Australia. *Children and Youth Services Review*, 71, 217–226.

McDermott, K., Brearley, M., Hudson, S., Ward, L., & Read, D. (2017). Characteristics of trauma mortality in the Northern Territory, Australia. *Injury Epidemiology.* 4(15), e1-10.

Miller, T. & Hendrie, D. (2008). *Substance Abuse Prevention Dollars and Cents: A Cost-Benefit Analysis, US Department of Health and Human Services Pub. No. (SMA) 07-4298*. Rockville, MD, Center for Substance Abuse Prevention, Substance Abuse and Mental Health Services Administration.

Miller, T. & Hendrie, D. (2011). Economic evaluation of interventions (641-666). In: G., L., Baker, S.P. (Eds.), *Injury Research: Theories, Methods, and Approaches*. Springer, New York.

Moore, T. (2007a). *Working estimates of the social costs per gram and per user for cannabis, cocaine, opiates and amphetamines, Drug Policy Modelling Project Monograph Series*. Sydney, NDARC.

Morgan, A. & Althorpe, L. (2014). *Short-term Cost-benefit Model for Imprisonment and Community Corrections in Victoria: Female Prisoners and Offenders, Consultancy report for Corrections Victoria*. Canberra, AIC.

Mortimer, D. & Segal, L. (2006). Economic evaluation of interventions for problem drinking and alcohol dependence: Do within-family external effects make a difference? *Alcohol and Alcoholism*. 41 (1), 92-98.

Naimi, T., S., Stockwell, T., R., Zhao, J., Xuan, Z., Dangardt, F., Saitz, R., Liang, W. and Chikritzhs, T., N. (2017). Selection biases in observational studies affect associations between 'moderate' alcohol consumption and mortality. *Addiction.* 112 (2), 207–214.

NHMRC (2018). *Australian Guidelines for to Reduce Health Risks from Drinking Alcohol,* 2009*.* [updated 2018 Nov 12]. Available at: https://nhmrc.gov.au/about-us/news-centre/revision-australian-guidelines-reduce-health-risks-drinking-alcohol-2009

Nicosia, N., Pacula, R.L., Kilmer, B., Lundberg, R. & Chiesa, J. (2009). *The economic cost of methamphetamine use in the United States, 2005, Monograph 829*. Santa Monica, CA, RAND Corporation.

Northern Territory Coroners Court. (2009). Inquest into the death of Danny Gumana [2009] NTMC 044. Darwin.

Northern Territory Coroners Court. (2017a). Inquest into the death of Baby S [2017] NTLC 014. Darwin.

Northern Territory Coroners Court. (2017b). Inquest into the death of Dale Scott Walkinshaw NTLC 026. Darwin.

Northern Territory Coroners Court. (2018). Inquest into the death of Addison Japaljarri Anthony. Darwin.

Northern Territory Department of Children and Families. (2014). *Submission to Select Committee on Action to Prevent Foetal Alcohol Spectrum Disorder (Submission no. 14)*. Darwin, Northern Territory Government.

Northern Territory Department of Health. (2018). *Addressing Fetal Alcohol Spectrum Disorder (FASD) in the Northern Territory 2018-2024*. Darwin, Northern Territory Government. https://digitallibrary.health.nt.gov.au/prodjspui/handle/10137/7232 (retrieved 24 January 2019).

Northern Territory Department of Treasury. (2017). *2016/17 Budget, Budget Paper No. 3, Agency Budget Statements 2016/17*.

Northern Territory Government. (2018a). *Northern Territory Government response to the alcohol policies and legislation review Final Report*. Darwin, Northern Territory Government.

Northern Territory Government. (2018b). *Alcohol Harm Minimisation Action Plan 2018-2019*. Darwin, Northern Territory Government.

Northern Territory Government. (2018c). *Northern Territory of Australia Liquor Commission Act 2018*. Darwin, 28 February 2018.

OECD. (2016). *Purchasing power parities (PPP) (indicator*). https://data.oecd.org/conversion/purchasing-power-parities-ppp.htm. accessed on 30 June 2016.

Orford, J. (2015). *Addiction in the Family: Adult and child family members affected by their relatives' excessive substance use or gambling, Addictions and Lifestyles in Contemporary Europe – Reframing Addictions Policy,* Policy Brief No. 6.

Orford, J., Velleman, R., Natera, G., Templeton, L. & Copello, A. (2013). Addiction in the family is a major but neglected contributor to the global burden of adult ill-health. *Social Science and Medicine*. 78, 70-77.

Petry, N., Stinson, F., & Grant, B. (2005). Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry.* 66 (5), 564-574.

Quilty, S., Shannon, G., Yao, A., Sargent, W., & McVeigh, M. F. (2016). Factors contributing to frequent attendance to the emergency department of a remote Northern Territory hospital. *Medical Journal of Australia.* 204 (3), 111.e111-111.e117.

Ridolfo, B., Stevenson, C. (2001). *The Quantification of Drug-Caused Mortality and Morbidity in Australia, 1998, No. PHE 29*. Canberra, Australian Institute of Health and Welfare.

Riley, T. (2017). *Alcohol Policies and Legislation Review: Final Report*. Darwin, Northern Territory Government.

Ritter, A. & Stoove, M. (2016). Alcohol and other drug treatment policy in Australia. *Medical Journal of Australia*. 204 (2), 138.

Road Safety NT. (2018). *Northern Territory 2018 Road Injury Statistical Summary*, available at: https://roadsafety.nt.gov.au/research-and-statistics/lives-lost-nt-roads

Roberts, J. (2018). *First progress report on the evaluation of the Katherine Individual Support Program*. Darwin, Menzies School of Health Research.

Royal Commissionn and Board of Inquiry into the Protection and Dentention of Children in the Northern Territory. (2017). *Report of the Royal Commissionn and Board of Inquiry into the Protection and Dentention of Children in the Northern Territory (Four volumes)*. Darwin. https://childdetentionnt.royalcommission.gov.au/Pages/Report.aspx (retrieved 21 December 2018).

Russell, D., Zhao, Y., Guthridge, S., Ramjam, M., Jones, M. P., Humphreys, J. & Wakerman, J. (2017). Patterns of resident health workforce turnover and retention in remote communities of the Northern Territory of Australia, 2013–2015. *Human Resources for Health.* 15 (52), e1-12.

SACES. (2009). *Harms from and costs of alcohol consumption in the Northern Territory: Final Report*. Adelaide, Adelaide and Flinders Universities.

Single, E., Collins, D., Easton, B., Harwood, H., Lapsley, H., Kopp, P. and Wilson, E. (2001). 'International Guidelines for Estimating the Costs of Substance Abuse—2001 Edition'.

Skov, S., Chikritzhs, T., Li, S., Pircher, S. & Whetton, S. (2010). How much is too much? Alcohol consumption and related harms in the NT. *Medical Journal of Australia*. 193 (5), 269-272.

Slade, T., Johnston, A., Teesson, M., Whiteford, H., Burgess, P., Pirkis, J. & Saw, S. (2009). *The Mental Health of Australians 2: Report on the 2007 National Survey of Mental Health and Wellbeing*. Canberra, Department of Health and Ageing.

Smith, J. (2018). *12 Month Evaluation of the Banned Drinker Register in the Northern Territory: Part 1 – A descriptive analysis of administrative data*. Darwin, Menzies School of Health Research.

Smith, J., Livingston, M., Miller, P., Stevens, M., Griffiths, K., Judd, J. & Thorn, M. (2019). Emerging alcohol policy innovation in the Northern Territory, Australia. *Health Promotion Journal of Australia*. 30 (1), 1-4.

Smith, R., Jorma, P., Sweeney, J. & Fuller, G. (2014). *Counting the costs of crime in Australia: A 2011 estimate, Research and Public Policy Series 129.* Canberra, Australian Institute of Criminology.

Smith, V., Taylor, D., Sloan, F., Johnson, F. & Desvousges, W. (2008). Do smokers respond to health shocks? *Review of Economics and Statistics.* 83 (4), 675-687.

Springer, A. M., Condon, J. R., Li, S. Q. & Guthridge, S. (2017). Frequent use of hospital inpatient services during a nine year period: a retrospective cohort study. *BMC Health Services Research.* 17 (348), e1-9.

Steering Committee for the Review of Government Service Provision (SCRGSP). (2017). *Report on Government Services*. Canberra, Productivity Commission.

Stockwell, T., R., Zhao, J., Panwar, S., Roemer, A., Naimi, T., S. and Chikritzhs, T., N. (2016). Do "moderate" drinkers have reduced mortality risk? A systematic review and meta-analysis of alcohol consumption and all-cause mortality. *Journal of Studies on Alcohol and Drugs. 77* (2), 185-198.

Suranovic, S., Goldfarb, R., Leonar, T. (1999). An economic theory of cigarette addiction. *Journal of Health Economics*. 18 (1), 1-29.

Symons, M., Gray, D., Chiritzhs, T., Skov, S., Saggers, S., Boffa, J. & Low, J. (2012). *A longitudinal study of influences of alcohol consumption and related harm in Central Australia: with a particular emphasis on the role of floor price*. Perth, National Drug Research Institute.

Taylor, P., Moore, P., Pezzullo, L., Tucci, J., Goddard, C. and De Bortoli, L. (2008). *The Cost of Child Abuse in Australia*. Melbourne, Australian Childhood Foundation and Child Abuse Prevention Research Australia.

US Department of Health and Human Services. (1994). *Preventing Tobacco Use Among Young People: A Report of the Surgeon General*. Atlanta, US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

US Department of Transportation (2015). *Revised Departmental Guidance 2014: Treatment of the Value of Preventing Fatalities and Injuries in Preparing Economic Analyses Guidance on Treatment of the Economic Value of a Statistical Life (VSL)*. Washington, DC, Office of the Secretary of Transportation.

Verstraete, A., Legrand, S. (2014). *Drug use, Impaired Driving and Traffic Accidents*. Luxembourg, Publications Office of the European Union, European Monitoring Centre for Drugs and Drug Addiction.

Victoria Police. (2014). *Crime Statistics 2013/2014*. Melbourne, Victoria Police.

Viscusi, W., Aldy, J. (2003). The value of a statistical life: A critical review of market estimates throughout the World. *Journal of Risk and Uncertainty*. 27 (1), 5-76.

Vissers, L., Houwing, S. and Wegman, F. (2017), *Alcohol-Related Road Casualties in Official Crash Statistics*, International Traffic Safety Data and Analysis Group Research Report, OECD/ITF.

WA Police (2014). *Annual Report 2014*. Perth, WA, Western Australian Police Service.

Whetton, S., Shanahan, M., Cartwright, K., Duraisingam, V., Ferrante, A., Gray, D., Kaye, S., Kostadinov, V., McKetin, R., Pidd, K., Roche, A., Tait, R.J. & Allsop, S. (2016). *The Social Costs of Methamphetamine in Australia 2013/14*, In R. Tait & S. Allsop, S. (eds.), Perth, National Drug Research Institute, Curtin University.

WHO (2000). *International Guide for Monitoring Alcohol Consumption and Related Harm*. Geneva, WHO, Department of Mental Health and Substance Dependence.

Yusuf, F. & Leeder, S. (2015). Making sense of alcohol consumption data in Australia. *Medical Journal of Australia*. 203 (3), 128-130.