

**Trends in per capita alcohol consumption in  
Australia, 1990/91-1998/99**



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**Trends in per capita alcohol consumption in Australia, 1990/91-1998/99**

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## **Executive summary**

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This monograph provides the first national state and territory estimates of adult per capita pure alcohol consumption in Australia. Data on retail and wholesale alcohol sales was obtained from state and territory liquor licensing authorities, which collected these to determine licensing fees during the 1990s. However, the analysis is restricted to the period 1990/91 through 1995/96 for most of the country because of the August 1997 High Court Hammond versus the State of New South Wales decision where it was found that states did not have the right to tax alcohol, petrol or tobacco through the use of licensing fees. Only Western Australia and the Northern Territory continued to collect data for public health purposes following this ruling, and the analysis has been extended for these two jurisdictions to 1998/99. It should be noted that the Australian Capital Territory and Queensland have re-established the collection of alcohol consumption data for financial recording and public health purposes respectively.

Two innovations in the methodology for calculating per capita consumption were developed for this monograph. The first was the application of conversion factors for alcoholic beverages specific to each of the states and territories. This was done using information on the alcohol contents of beverages sold within individual jurisdictions, particularly by taking into account the alcohol content of low alcohol beers and pre-mixed spirit beverages, which became popular in the 1990s. This was especially important in relation to spirits, which include a combination of "straight" spirits

(average about 38.5% pure alcohol content) and pre-mixed beverages (average about 5% alcohol), such as “UDL” cans. For example, in Western Australia the combined spirits pure alcohol content was estimated at 24.6% in 1991/92 and 21.1% in 1995/96, compared to New South Wales where the alcohol content was 32.4% in 1991/92 and 27.5% in 1995/96. In the past, many researchers used the crude average alcohol content for straight spirits of 38.5% to calculate per capita consumption. Similarly, low alcohol beer shows variation between jurisdictions as well. For example, in 1995/96 the alcohol content for low beer was highest in Western Australia at 3.5% and lowest in Tasmania at 2.8%. The use of locally specific alcohol contents and a consideration of changes in alcohol content over time are recommended by the World Health Organization (2000).

The second innovation was in adjusting for the effect of tourism and for population mobility when determining the population denominator to be used in the per capita consumption calculation. This monograph makes use of the idea of a “service population” to better estimate the number of likely consumers of alcohol. The service population includes tourists and visitors and makes allowances for residents who were away from their homes in order to calculate an average “overnight” population. Such a methodology improves estimates of per capita consumption given that visitors are also likely to contribute to the consumption of alcohol in any given area. Based on these calculations, at the state level service population tends to be within one or two percent of the Australian Bureau of Statistics (ABS) estimated resident population (ERP), however significant differences are apparent for some regions and do influence the calculation of adult per capita consumption (APCC). For example, in Queensland and Northern Territory the service population is 13.77% and 4.25%, respectively, greater than ERP in 1996. The differences are especially greater for non-metropolitan areas. Conversely, Victoria, Tasmania and South Australia tend to have a service population around 1% smaller than the ERP. The use of service population estimates, as with the use of regionally specific beverage conversion factors allow a more realistic estimate of APCC to be determined based on the regional characteristics of both the beverages being consumed and the local population characteristics.

Per capita consumption is an important indicator of the level of alcohol-related harm in a community as there are strong relationships between it and alcohol-caused

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morbidity and mortality. International and local research, including that previously conducted by the National Drug Research Institute (NDRI), shows a strong relationship between per capita consumption and harms such as traffic accidents, accidental falls and other accidents, illnesses, assaults and other crimes.

The results of the present analysis show that in 1990/91 the per capita consumption of alcohol for Australia was 9.81 litres per adult and it steadily dropped to 9.03 litres by 1995/96, the end of the period for which comprehensive data is available. This overall decline in consumption appears to have been due to falls in both regular beer and wine consumption that were only partially offset by increased consumption of low alcohol beer and pre-mixed spirit beverages. The ABS provides data on alcohol consumption that continues to be used by World Drink Trends (2000) to calculate per capita consumption at the national level, and these estimates show a similar trend to those provided here.

Individual states and territories however show a wide range in APCC, as can be seen in the following table.

**Adult per capita pure alcohol consumption (litres) by state and territory for 1995/96 and in available jurisdictions for 1997/98**

Year	NSW	Vic	Qld	SA	WA	Tas	NT	ACT
1995/96	9.5	7.5	9.7	8.5	10.0	8.7	13.6	10.2
1998/99	-	-	-	-	10.6	-	14.0	-

Over time, the Northern Territory consistently recorded the highest levels of consumption while Victoria recorded the lowest. While there was a general decline in APCC in the 1990s for Australia, the Northern Territory, Western Australia and to some degree Queensland all show increasing trends. Non-metropolitan consumption was consistently higher than that in the metropolitan areas, except for the Northern Territory where metropolitan APCC was notably higher than that for the non-metropolitan area in the later 1990s.

While it has been possible to compare state and territory trends to 1995/96, most jurisdictions ceased collecting data on alcohol consumption due to the Federal High Court ruling in 1997. This is unfortunate as these data provide the only source on regional consumption patterns. For the Northern Territory and Western Australia, who continued to collect alcohol wholesale sales data after 1995/96 there was an

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upward trend recorded in adult per capita alcohol consumption. It was not possible to determine whether this had also been the case in the other jurisdictions.

## **1. Introduction**

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This monograph provides national and state and territory estimates of adult per capita pure alcohol consumption of Australia. This marks the first time that estimates of adult per capita alcohol consumption (APCC) are available for all states and territories using a standardised methodology. The method applied adjusts for tourism and for differences in the typical alcohol contents of the various beverages sold throughout Australia. The consideration of the effect on the underlying population size and of the use of regionally specific alcohol contents for beverages makes a considerable difference to the calculation of APCC. The use of locally specific alcohol contents and a consideration of changes in alcohol content over time are recommended by the World Health Organization (2000). Similarly, taking into account visitors to regions when calculating APCC will improve estimates given that visitors will contribute to the consumption in the area.

This monograph has been able to provide more specific conversion factors for beer and spirits, particularly by taking into account the component of low alcohol beer and lower alcohol pre-mixed spirits using information on the alcohol contents of the beverages actually sold within the individual jurisdictions. The monograph makes use of the idea of a “service population” to better estimate the number of likely consumers of alcohol in a given region. The concept of a service population includes estimates of tourists and visitors and makes allowances for residents who spend time away from their homes.

Adult per capita consumption is an important indicator of the level of alcohol-related harm in a community and there are strong relationships between APCC and alcohol-caused morbidity and mortality. A recent special issue of the international journal *Addiction* contained an analysis of the relationship between per capita consumption and harms such as traffic accidents, accidental falls, other accidents and illnesses (Skög, 2001). Research by the National Drug Research Institute has also shown the value of APCC for tracking harm associated with alcohol-related deaths, illness and road injury (Chikritzhs *et al.* 2000ab). Other harms such as crime and assault have also been associated with APCC (Midford *et al.*, 1998; Stevenson *et al.*, 1999).

The data presented provide the only source of information in Australia on the regional differences in APCC. However, the analysis is restricted to the period 1990/91 through 1995/96 for most of the country because of the High Court Hammond versus the State of New South Wales decision where it was found that states did not have the right to tax alcohol, petrol or tobacco through the use of licensing fees. Only Western Australia and the Northern Territory continued to collect data for public health purposes following this ruling, and the analysis is extended for these two jurisdictions to 1998/99. Queensland has recently reinstated the collection of these data from producers and wholesalers specifically for public health purposes. In addition, the Australian Capital Territory re-established collection of data on the total value of wholesale alcohol sales for record keeping purposes during 2001.

## **2. Methods and main findings**

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### **2.1 Overview**

The method for calculating state and territory per capita consumption involved two essentially separate tasks. The first was to determine alcohol consumption for states and territories using jurisdiction specific data. The second task was to determine the appropriate population to use in calculating consumption per person.

As each jurisdiction had its own way of recording beverage consumption it was necessary to develop a method for each to estimate the amount of alcohol consumed. The approach was to first calculate conversion factors that reduced the total volume of an alcoholic beverage to its pure alcohol content. Conversion factors were derived from information on beverages sold in each jurisdiction and gathered from various statutory and commercial sources as described below. However, because of some shortcomings in the data on state and territory specific beverage consumption, it was necessary at times to use more readily available national data. Section 2.3 provides a description of each of the main beverage types, that is, beer, wine and spirits and the range of alcohol content for each. These conversion factors are discussed in detail for the nation in Section 2.4 and then for each state and territory in Section 2.5. They were then applied to the beverage volume data recorded by each state and territories' liquor licensing body. Conversion factors were calculated separately for beer, wine and spirits and where possible these categories were divided into "high" and "low" alcohol beverages. For example, low alcohol content beer was distinguished from

regular beer and pre-mixed spirit drinks were distinguished from straight spirits. In the case of South Australia and the Australian Capital Territory and for early years in New South Wales and Tasmania the consumption data supplied was as dollar sales so it was necessary to estimate volumes from dollar values.

As one aim of the monograph is to consider the differences in per capita consumption between metropolitan and non-metropolitan areas, calculation of total pure alcohol consumed also included identifying the quantities consumed in metropolitan and non-metropolitan areas. The division of state and territory volume data into metropolitan and non-metropolitan was done using the capital city as representative of the metropolitan region. The remainder of each jurisdiction was considered non-metropolitan. While not completely satisfactory, this definition was required due to limitations of the volume of alcohol data in terms of its geographic specificity and the need to match this data to the standard geographic boundaries used by the Australian Bureau of Statistics to report population statistics. Details of the manner of determining metropolitan and non-metropolitan volumes are presented in Section 2.2.3.

The second task was to determine an appropriate population for calculating per capita consumption. The population used here is a “service population”, that is, the population serviced by a particular region. This population includes the residents, tourists and visitors to the area and makes allowances for residents who are away from their homes. The use of a service population is a significant improvement to per capita consumption estimates, as it is unrealistic to use the resident population alone when it is possible that visitors and tourists may account for a significant proportion of alcohol consumption. To calculate service population the approach was to count residents, visitors in paid accommodation and visitors in other accommodation using resident, tourist and other surveys published by the ABS. As the interest is in calculating the population of alcohol drinkers, the population was limited to only those persons who were aged 15 years and older and excluded persons in prisons and hospitals. Section 2.7 presents the methodology for calculating service population in this way.

## **2.2 Data sources**

### **2.2.1 Alcohol data**

Historical alcohol sales data were acquired directly from the liquor licensing agency of each individual state and territory. After 1995/96 the data was no longer collected by most jurisdictions due to the *Hammond and Associates PL v State of New South Wales* [1997] High Court decision that invalidated state taxation on alcohol sales. However, Western Australia and the Northern Territory continued to collect the data for public health purposes and recently the Australian Capital Territory and Queensland have resumed data collection. The available data for each state and territory is summarised in Table 1.

**Table 1:**  
**Description of alcohol consumption data supplied by state and territory liquor licensing agencies**

State/Territory	Data supplied
New South Wales	Sales data in terms of the dollar value for 1990/91 and 1991/92 and volumes through 1995/96. The data was provided as "low/medium" and "high" alcohol beers (from 1992/93 through 1995/96 only), , all wine (including cider) and all spirits.
Victoria	Volumes consumed for 1990/91 through 1995/96. The data was provided as "low/medium" and "high" alcohol beer (1991/92 to 1995/96 only), "low" alcohol wine, "high" alcohol wine, all wine (including cider) and all spirits.
Queensland	Volumes consumed for 1991/92 through 1995/96. The data was provided as "light" and "high" alcohol beer, all wine (including cider) and all spirits. Due to inconsistencies in recording light beer, light and high alcohol beer were summed together to provide a total and more reliable beer estimate. Beverage categories were reinstated to a higher standard in 2000/2001.
South Australia	Sales data in terms of the total dollar value for 1990/91 through 1995/96. No individual beverage categories were collected. The data was supplemented with industry market share data.
Western Australia	Volumes consumed for 1990/91 through 1998/99. The data was provided as "low/medium" and "high" alcohol beer, "low" wine (includes cider) and "high" alcohol wine and all spirits.
Northern Territory	Volumes consumed for 1990/91 through 1998/99. The data were provided as "low" and "high" alcohol beer, "low" and "high" alcohol wine (for 1990/91 to 1994/95 only), cask wine, fortified wine and cider (for 1995/96 through to 1997/98 only), straight and pre-mixed spirits (1994/94 to 1997/98 only)

**Table 1: (Cont.)**

<b>State/Territory</b>	<b>Data supplied</b>
Tasmania	Volumes consumed from 1992/93 through 1995/96. Only dollar sales were available for 1991/92. The data were provided as "low/medium" and "high" alcohol beer (1993/94 to 1995/96 only), "low" and "high" alcohol wine (1993/94 to 1995/96 only), all wine and all spirits.
ACT	Sales data in terms of total tax revenue per annum from 1990/91 through 1996/97. This tax was leveraged at between 10% and 13% per annum of totals sales depending upon the alcohol content of beverages. Reinstated for 1999/2000.

### **2.2.2 Population data**

Census and other statistical data collected and published by the Australian Bureau of Statistics was necessary for the calculation of the population to be used as the denominator in per capita consumption estimates. The present report calculated a service population figure that identifies the total number of persons in a region including tourists and visitors rather than only residents. This section describes the data collected to calculate service population. Data was obtained from the census, estimated resident population and tourist surveys.

Census data comes from the five yearly censuses conducted by the Australian Bureau of Statistics. The published results of the census includes information on where persons were counted whether at home or in other residences, hotels, other non-private dwellings and so on that is essential for calculating service population. Data was collected from both the 1991 and 1996 census on the total number of residents, the number of residents who were at home on census night, the count of persons in hotels, motels and so on and in hospitals and prisons.

## *Methods and main findings*

**Table 2:**  
**Sources of estimated resident population figures**

State	Publication Number By Year								
	1991	1992	1993	1994	1995	1996	1997	1998	1999
ERP total persons, 1991 – 1999									
NSW	3209.1	3209.1	3209.1	3209.1P	3209.1P	3235.1	3235.1	3235.1	3235.1
VIC	Direct <sup>1</sup>	3203.2P	3207.2P	3207.2	3207.2P	3235.2	3235.2	3235.2	3235.2
QLD	3224.3	3224.3	3224.3	3224.3	3224.3	3235.3	3235.3	3235.3	3235.3
NT	3201.7	3207.7	3207.7	3207.7	3207.7	3235.7	3235.7	3235.7	3235.7
SA	3204.4	3204.4	3204.4	3204.4	3204.4	3235.4	3235.4	3235.4	3235.4
TAS	3204.6	Direct <sup>2</sup>	3204.6	3204.6	3204.6	3235.6	3235.6	3235.6	3235.6
WA	3203.5	3203.5	3203.5	3203.5	3203.5	3235.5	3235.5	3235.5	3235.5
ACT	3207.8	3207.8	3207.8	3207.8	3207.8	3235.8	3235.8	3235.8	3235.8
ERP persons 15 years and older 1991 – 1999									
NSW	3209.1	3209.1	3209.1	3209.1P	3209.1P	3235.1	3235.1	3235.1	3235.1
VIC	Direct <sup>1</sup>	3203.2P	3207.2P	3207.2	3207.2P	3235.2	3235.2	3235.2	3235.2
QLD	3224.3	3224.3	3224.3	3224.3	3224.3	3235.3	3235.3	3235.3	3235.3
NT	3201.7	3207.7	3207.7	3207.7	3207.7	3235.7	3235.7	3235.7	3235.7
SA	3204.4	3204.4	3204.4	3204.4	3204.4	3235.4	3235.4	3235.4	3235.4
TAS	3204.6	Direct <sup>2</sup>	3204.6	3204.6	3204.6	3235.6	3235.6	3235.6	3235.6
WA	3203.5	3203.5	3203.5	3203.5	3203.5	3235.5	3235.5	3235.5	3235.5
ACT	3207.8	3207.8	3207.8	3207.8	3207.8	3235.8	3235.8	3235.8	3235.8

<sup>1</sup> Data obtained directly from ABS Information Service Victoria.

<sup>2</sup> Data obtained directly from ABS Information Service Tasmania.

P Data taken from a preliminary ERP publication and used in the absence of final figures.

To provide for population figures for the years between censuses, the ABS calculates annual Estimated Resident Population (ERP). ERP is defined as the number of persons who have lived in a particular area for six months or more in the particular year. For census years, ERP is based on adjusting census counts by place of usual residence, to which are added the number of Australian residents estimated to have been temporarily overseas at the time of the census. For intercensal years, ERP is based upon a variety of data sources that add or subtract population as counted in census according to births, deaths and migration. ERP was collected from hardcopy annual publications released by the ABS (Table 2).

The importance of identifying tourists required that information on tourist guest nights be collected from the ABS quarterly "Tourist Accommodation" series (for example, ABS Cat No.8635). The statistics are limited to certain types of accommodation, such as in 1991 to 1997 hotels, motels, and guesthouses with more than 5 rooms or units. In 1998 to 1999 the statistics were limited to hotels, motels, guesthouses and serviced apartments with more than 15 rooms or units. To adjust for this difference the averages of 1996 and 1997 and 1998 and 1999 were compared. A percentage change was used according to the number of guest nights between these two periods to adjust the 1991 to 1997 data to the 1998 and 1999 definition.

### **2.2.3      Definition of metropolitan and non-metropolitan areas**

Each State and Territory has been divided into a metropolitan and non-metropolitan component. This division was conducted for the population and the alcohol consumption components of the per capita calculation. In order to calculate population numbers based upon Australian Bureau of Statistics figures, the metropolitan region has been defined as that area comprising the capital city Statistical Division (SD) for the state or territory. This Statistical Division is defined by the ABS and generally corresponds to the aggregate of the local government authorities that make up each city's metropolitan area. The non-metropolitan region is comprised of the balance of the state or territory. For the alcohol consumption data the task was then to match the reported regional data to the metropolitan and non-metropolitan areas based upon this population-based definition. Table 3 summarises the method used to calculate metropolitan and non-metropolitan alcohol consumption data for each of the states and territories.

In some cases the use of this definition may exclude areas on the periphery of the city that might otherwise be considered metropolitan, for example, the Gold Coast in Queensland and Newcastle in New South Wales. Further, major population centres away from the capital that may have metropolitan character are also included in the non-metropolitan component, for example, Townsville and Cairns in Queensland. Therefore this method for determining metropolitan and non-metropolitan breakdowns is a compromise that best takes into account the limitations of the reporting areas for the population and alcohol consumption data. However, the benefit is that it allows for the comparison of metropolitan and non-metropolitan data

### *Methods and main findings*

between states and territories based upon a definition that is at least consistent between jurisdictions.

Exceptions to this arrangement are the Australian Capital Territory, South Australia and Tasmania. For the Australian Capital Territory and South Australia, alcohol consumption data was only available for the complete jurisdiction, so it was not possible to split the data into metropolitan and non-metropolitan components. In Tasmania, the Greater Hobart SD includes shires that are split between it and other Statistical Divisions, so the metropolitan area has been adjusted to allow for the inclusion of the complete shire. This is necessary because the alcohol consumption data for Tasmania is supplied for the complete shires.

**Table 3:**  
**Methods for determining alcohol data for metropolitan and non-metropolitan regions of each state and territory**

State/Territory	Metropolitan/non-metropolitan
New South Wales	Alcohol data supplied by licensing districts. Though boundaries unspecified it appears that the metropolitan region was made up of six specific districts.
Victoria	Alcohol data supplied by Local Government Areas. Aggregating Melbourne LGAs allows division of metropolitan and non-metropolitan totals.
Queensland	Alcohol data supplied by postcode. It was possible to aggregate postcodes to the metropolitan area, though it is not the exact boundary as in ABS metropolitan Brisbane.
South Australia	Alcohol data available only for total of state so no metropolitan/non-metropolitan split possible.
Western Australia	Alcohol data available by individual license so data could be divided between metropolitan and non-metropolitan according to street address.
Northern Territory	Alcohol data supplied by regions. Though boundaries unspecified it appears that the Darwin and Palmerston regions constitute the metropolitan region.
Tasmania	Alcohol data supplied by Local Government Area. Aggregating Hobart LGAs allows division of metropolitan and non-metropolitan totals.
ACT	Alcohol data available only for total of territory so no metropolitan/non-metropolitan split possible.

## 2.3 Beverage definitions

This section describes the conversion factors used to calculate pure alcohol content from the beverage data obtained from the liquor licensing agencies as described in Section 2.2.1. Table 4 describes the definition of beverage types according to alcohol content. Appendix 2 provides descriptions of beverage types according to liquor regulations from states and territories. Each liquor licensing agency generally supplies data in categories reflecting the alcohol content within beer and wine. Spirits data is generally supplied as one figure for both straight and pre-mixed, which causes considerable problems in calculating conversion factors, as discussed below.

**Table 4:**  
Alcohol content for general categories of beverage

Alcohol Content	Beer	Wine	Spirits
High	>3.5%	>6%	
Medium/High	-	>3%	
Medium	3.3-3.5%	<=6%	
Low/medium	2.5-3.5%	-	
Low	2.5-2.9%	<=3%	
Neat (mean)			38.5%
Pre-mixed (mean)			5.9%

Looking at Table 4, the alcohol content for the medium and low beer are as defined by Lion Nathan (Lion Nathan, 2000) otherwise these are standard categories used across all the states and territories. The mean alcohol content for wine is 11.46% (Table 12), which includes bottled, cask and fortified wines (that may range up to 17.5%). The medium wine category includes a negligible amount of wine with 3% or less alcohol (hence the 3% lower limit) but largely consists of cider, which is generally 6% for full strength, so the mean alcohol content is assumed to be 4.8% (Stockwell *et al.*, 1997; Jonas *et al.*, 1999). The low wine category is made up of a very small number of ciders and wines with 3% alcohol or less. Finally, the medium/high wine category is only applicable to the Northern Territory.

For spirits the standard conversion factors are shown for straight and pre-mixed (Stockwell *et al.*, 1997; Jonas *et al.*, 1999). Given that many liquor licensing agencies provide only volumes for total spirits the conversion factors will be calculated on the

basis of the combination of the straight and pre-mixed which vary by jurisdiction and year.

## **2.4 Pure alcohol conversion factors for beverage types**

This section describes the calculation of pure alcohol conversion factors for beer, wine and spirits for each of the states and territories. These are necessary in order to calculate the total amount of pure alcohol consumed by beverage type given the volumes of beverages provided by the licensing authorities. For beer, this involves the calculation of conversion factors for low/medium and high alcohol content beverages. High and medium alcohol wine and spirits are then addressed. Other categories of beverages and beverage strengths that are specific to each state and territory are then discussed in the Section 2.5.

### **2.4.1 Low/medium alcohol content beer**

In the past, the analysis of alcohol consumption in Australia has utilised different pure alcohol conversion factors for low/medium strength beer. For instance, Stockwell *et al.* (1997) employed a conversion factor of 3.5% for Western Australia, while Jonas *et al.* (1999) assumed a mean alcohol content of 3.0% in Victoria. In order to address both this discrepancy and the different proportion of low and medium alcohol beers by region, industry survey data was obtained from AC Nielsen. This survey data estimated proportions of all beer purchased that was equal to or less than 3.5% alcohol content for New South Wales, Victoria, South Australia, Western Australia and Queensland for 1993 through 1995 and 1997. This information was supplemented with similar data obtained from the Australian Associated Brewers (AAB) for 1989 and 1999 for all states and territories, except the Australian Capital Territory (Table 12).

For the purposes of this report, for all jurisdictions except the Northern Territory (see Section 3.6) low/medium alcohol content beer was defined as beer which contained less than or equal to 3.5% alcohol by volume. In general, the vast majority of beer in this category ranged in alcohol content from 2.5% to 3.5% (Table 4). Table 5 shows the estimated proportion of all low/medium strength beer that had a low

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alcohol content for each jurisdiction in the years in which data is available from AC Nielsen (1993, 1994, 1995 and 1997) and AAB (1989 and 1999).

**Table 5:**  
**Estimated percentage of low/medium beer with low alcohol content, by state/territory, available years**

Year	NSW	Vic	Qld	SA	WA	Tas	NT
1989	90.1	50.6	40.1	93.1	33.8	97.5	33.0
1993	-	82.0	43.7	-	10.5	-	-
1994	98.8	77.7	31.8	-	6.4	-	-
1995	91.2	76.2	24.2	-	5.3	-	-
1997	78.6	81.8	14.6	77.3	4.8	-	-
1999	82.6	81.1	15.1	74.1	5.7	94.4	34.1

*Source: AAB for 1989 and 1999, AC Nielsen for 1993-1995 and 1997.*

While it was possible to identify the proportion of all low/medium strength beer that had a low alcohol content, it was not possible to determine the distribution of the various alcohol contents for individual beverages within the low and medium category. Table 6 shows the specific alcohol content for beers in the medium and low categories and a count of the number of beers based on a consumer guide (Borushek, 2000).

The vast majority of beers with medium alcohol content tend toward 3.5%. Similarly, among low alcohol beers, the majority had an alcohol content of 2.8% or 2.7%. For the purposes of calculating alcohol conversion factors, mean alcohol contents for low and medium beers were assumed to be 2.73% and 3.45% respectively. However, there was no means of determining whether the distribution of alcohol contents for the beers identified in Borushek (2000) are applicable across different regions of Australia.

**Table 6:**  
**Number of brewed beverages available for purchase by typical alcohol content**

Number of beers	Medium strength beer				Low strength beer				Mean
	8	3	2	Mean	1	9	7	1	
Alcohol content (%)	3.5	3.4	3.3	3.45	2.9	2.8	2.7	2.6	2.5

*Source: Borushek (2000).*

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Using Table 5 weighted pure alcohol conversion factors for calendar years were calculated by multiplying the estimated annual proportions of low and medium beers by their approximate alcohol concentrations, using the means from Table 6. For example, for Victoria in 1993:

*e.g. Alcohol conversion factor for “medium strength beer”, Victoria, 1993:*

$$\begin{aligned} &= (\%Low * Mean Low Alcohol Content) + ((100 - \%Low) * Mean Medium Alcohol Content) \\ &= (82.0 * 0.0273) + ((100 - 82.0) * 0.0345) \\ &= 2.85\% \text{ or } 0.29 \end{aligned}$$

However, since market share data were only available for selected calendar years, conversion factors for individual financial years from 1990/91 through 1996/97 were calculated using midpoints and simple linear extrapolation between known points. Financial year conversion factors are required because the volume data from the liquor licensing agencies and the population data used to determine per capita consumption is supplied by financial year. Table 7 summarises the resulting conversion factors. As no data was available for the Australian Capital Territory from AC Nielsen or the AAB, conversion factors could not be calculated and a separate calculation method was required (discussed in Section 2.5.8).

**Table 7:**  
Preliminary low/medium alcohol content beer weighted mean pure alcohol conversion factors based on low alcohol content of 2.73% and medium alcohol content of 3.45%,  
1990/91-1996/97

Year	NSW	Vic	Qld	SA	WA	Tas	NT
90/91	0.028	0.030	0.032	0.028	0.033	0.028	0.032
91/92	0.028	0.029	0.031	0.028	0.033	0.028	0.032
92/93	0.028	0.029	0.031	0.028	0.034	0.028	0.032
93/94	0.027	0.029	0.032	0.029	0.034	0.028	0.032
94/95	0.028	0.029	0.033	0.029	0.034	0.028	0.032
95/96	0.028	0.029	0.033	0.029	0.034	0.028	0.032
96/97	0.028	0.029	0.033	0.029	0.034	0.028	0.032

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The variation between states and territories is due to the differing share of medium and low alcohol content beer of the low/medium total, which reflects local preferences for beer brands of different alcohol contents.

In order to validate this methodology the mean national percentage of pure alcohol for low/medium strength beer was calculated and compared to the national mean derived by the ABS for 1993/94 and 1994/95. The ABS categorises beer into "low", greater than 1.15% and less than 3.8%, and "other" beers, greater than or equal to 3.8%. Thus the "low" beer category used by the ABS closely approximates the present low/medium category. The ABS data was derived directly from excise tax information and does not require the use of conversion factors, however it is only available at a national level. Using this data it was possible to divide total beer volume by total pure alcohol volume to estimate mean alcohol concentrations. As shown in Table 8, between 1992/93 and 1997/98 the ABS data show an alcohol content in the range of 2.96% and 3.09% for "low" beer. If the regional calculations presented in Table 7 are reliable, the national total should match these percentages from the ABS data.

**Table 8:**  
**National "Low" beer volumes from Australian Bureau of Statistics data**

Year	Volume 'Low' beer '000 (ltrs)	Volume pure alcohol '000 (ltrs)	% pure alcohol
1992/93	423,102	12,523	2.96
1993/94	393,166	11,927	3.03
1994/95	384,062	11,859	3.09
1995/96	407,232	12,597	3.09
1996/97	443,103	13,687	3.09
1997/98	461,912	14,261	3.09

*Source: ABS Cat. 4315.0 & 4306.0*

Using the data presented in Table 7 and annual ABS estimated residential populations (ERP), population weighted mean alcohol content was determined for 1992/93 through 1994/95. The results are presented in Table 9 for two scenarios. The first option is based on using the mean alcohol content of low and medium strength beer. The second option uses the upper limits of the alcohol content of low and high alcohol beers.

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It is apparent that these results are somewhat lower than the ABS estimates. In order to approximate the national ABS totals for low/medium beer as closely as possible (given that they are likely to be the most accurate measure of the national volume) the conversion factors in Table 7 were re-worked using the largest percentage alcohol content possible within the definitions of low and medium beer, that is, for low beer 2.8% and medium beer 3.5%. Subsequently, the adjusted population weighted means were larger and closer to pure alcohol proportions estimated from ABS data. The conversion factors for each state and territory by year could then be recalculated as shown in Table 10. Again, an estimate is required for the Australian Capital Territory given the lack of data for this territory.

**Table 9:**  
**National percentage of pure alcohol estimated from ERP weighted state/territory specific volume estimates, 1992/93-1996/97**

Year	Option 1	Option 2
<b>Assumed content</b>	<b>Low = 2.73%</b> <b>Med = 3.45%</b>	<b>Low = 2.80%</b> <b>Med = 3.50%</b>
1992/93	2.93	2.99
1993/94	2.93	3.00
1994/95	2.97	3.03
1995/96	2.98	3.05
1996/97	3.00	3.07

**Table 10:**  
**Final low/medium alcohol content beer weighted mean pure alcohol conversion factors based on low alcohol content of 2.8% and medium alcohol content of 3.5%, 1990/91-1996/97**

Year	NSW	Vic	Qld	SA	WA	Tas	NT
90/91	0.029	0.031	0.032	0.029	0.033	0.028	0.033
91/92	0.028	0.030	0.032	0.029	0.034	0.028	0.033
92/93	0.028	0.030	0.032	0.029	0.034	0.028	0.033
93/94	0.028	0.029	0.032	0.029	0.034	0.028	0.033
94/95	0.028	0.030	0.033	0.029	0.035	0.028	0.033
95/96	0.029	0.030	0.034	0.029	0.035	0.028	0.033
96/97	0.029	0.029	0.034	0.030	0.035	0.028	0.033

## 2.4.2 High alcohol content beer

Previous researchers have assumed a mean pure alcohol content for high strength beers of 4.8% (Stockwell *et al.*, 1997; Jonas *et al.*, 1999). This concurs closely with national excise data compiled by the ABS, which results in a high alcohol content beer percentage of between 4.76 and 4.79% (Table 11).

As described earlier, the “Other” beer category used by the ABS closely approximates the high beer category employed here. In the absence of jurisdiction specific data and market share information, year specific national conversion factors were applied for high beer using the ABS data. For 1990/91 and 1991/92 where national data was unavailable a mean pure alcohol content of 4.77% was assumed.

**Table 11:**  
National “Other” beer volumes from ABS surveys

Year	Volume ‘Other’ beer ‘000 (ltrs)	Volume pure alcohol ‘000 (ltrs)	% pure alcohol
1992/93	1,327,269	63,191	4.76
1993/94	1,347,296	64,476	4.79
1994/95	1,355,321	64,743	4.78
1995/96	1,326,718	63,118	4.76
1996/97	1,317,154	62,848	4.77
1997/98	1,298,534	61,975	4.77
Mean	1,328,715	63,391	4.77

Source: ABS Cat. 4315.0 & 4306.0.

## 2.4.3 High alcohol content wine

Previous researchers have assumed a mean pure alcohol content for high strength wine of 11.9% (Stockwell *et al.*, 1997; Jonas *et al.*, 1999). This is close to the estimates by the ABS where alcohol content ranged from 11.36% to 11.50% (Table 12). In the absence of jurisdiction specific data and information on wine products in the market place, annual specific national level conversion factors based on the ABS data have been used. For years where precise national data was unavailable, a mean pure alcohol content of 11.46% was assumed.

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**Table 12:**  
National wine volumes from ABS surveys

Year	Volume Wine '000 (ltrs)	Volume pure alcohol '000 (ltrs)	% pure alcohol
1992/93	321870	36874	11.46
1993/94	330424	37751	11.43
1994/95	329929	37805	11.46
1995/96	332191	38122	11.48
1996/97	349868	39753	11.36
1997/98	364436	41901	11.50
Mean	338119	38701	11.46

*Source: ABS Cat. 4315.0 & 4306.0.*

### **2.4.4 Medium alcohol content wine**

Beverages classified as “medium wine” generally include products such as ciders and wine coolers. Most jurisdictions that distinguish between high and medium alcohol content wine use a 6% alcohol content cut-off level for low wine. Subsequently, in the absence of market share information previous studies have also tended to assume a conversion factor of 6% for low wine beverages (Stockwell *et al.*, 1997; Jonas *et al.*, 1999).

However, recent information on the distribution of alcohol content in typical medium strength alcohol wine beverages suggests that the appropriate conversion factor may in fact be considerably lower. Table 13 identifies the number of cider and wine cooler brands available at specific alcohol concentrations. The mean alcohol concentration was 4.79% (5.36% for cider only and 3.44% for wine coolers). Thus, for medium alcohol content wine, a conversion factor of 4.80% was applied across all jurisdictions and all years.

**Table 13:**  
Number of medium strength alcohol wine beverages available for purchase by typical alcohol content

Number of beverages	Wine Coolers				Ciders				Mean
	3	2	Mean	1	1	3	6	1	
Alcohol content (%)	3.4	3.5	3.44	8.4	5.7	6.0	4.7	4.0	5.36

*Source: Borushek (2000).*

## 2.4.5 Spirits

Traditionally, few jurisdictions have distinguished between the purchase of straight spirits and pre-mixed spirits. In fact only the Northern Territory had a system of data collection that specifically separated the two types of beverages. Until the mid 1990's this was not of great concern since few pre-mixed spirit beverages were available and they were not aggressively marketed. However, in more recent years there has been evidence of a swift increase in the market share of pre-mixed spirit beverages such as UDL. Information regarding this change in drinking pattern has been obtained from several different sources including survey data from the Western Australian Health Department, market share data from the Liquor Merchants Association and Liquor Licensing data from the Northern Territory (Table 15).

For straight spirits, the conventionally assumed alcohol content is 38.5% (Stockwell *et al.*, 1997; Jonas *et al.*, 1999) although some sources have identified an average of 40% alcohol content (Borushek, 2000). In keeping with convention and in the absence of any other national or region specific data, this report assumed a conversion of 0.385 for straight spirits.

However, there is as yet no standard conversion factor to take into account the rising consumption of pre-mixed spirit beverages.

The Western Australian Health Department has used a 6% conversion factor for pre-mixed beverages based on their own survey (personal communication, 2000). As with low beer and wine, it was possible to identify major brands of pre-mixed spirits available in Australia and to summarise their alcohol contents (see Table 14). According to alcohol contents among available brands the mean pure alcohol content for pre-mixed spirit drinks was 5.9% - which concurred closely with the conversion factor employed by the Western Australian Health Department.

**Table 14:**  
Number of pre-mixed spirit based beverages available for purchase by typical alcohol content

	Pre-mixed beverages					
Number of beverages	7	6	9	1	2	1
Alcohol content (%)	5.0	5.5	6.0	7.0	8.0	8.4

*Source: Borushek (2000).*

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The Liquor Merchants association of Australia provided market share data on the volumes of straight and pre-mixed spirits purchased in 1993/94 and 1994/95 for each jurisdiction (with the Australian Capital Territory included in the New South Wales total). As shown in Table 15 from 1993/94 to 1994/95 the volume of all spirits sold as pre-mixed beverages increased by at least 10%, with the exception of Tasmania where there was little change.

Given the patchy nature of the available data for spirits it was necessary to calculate conversion factors for individual states and territories as explained in Section 3.

**Table 15:**  
Proportion of all spirits sold that were pre-mixed by state/territory, 1993/94-1994/95<sup>a</sup>

Year	Region	Total straight (38.5% alc) in 9 ltr casks	Total pre- mix(5.9% alc) in 9 ltr casks	Total	Pre-mix (%)	Change (%)
1993/94	NSW	1,962,098	654,504	2,616,602	25.0	
1994/95	NSW	1,956,562	800,764	2,757,326	29.0	+16.10
1993/94	Vic	1,190,777	788,410	1,979,187	39.8	
1994/95	Vic	1,222,225	983,957	2,206,182	44.6	+11.96
1995/96	Vic <sup>a</sup>	1,117,187	1,183,003	2,300,190	48.6	+8.97
1993/94	Qld	1,311,056	564,047	1,875,103	30.1	
1994/95	Qld	1,334,719	737,549	2,072,268	35.6	+18.32
1993/94	SA	388,872	102,135	491,007	20.8	
1994/95	SA	401,511	140,232	541,743	25.9	+24.44
1993/94	WA	514,607	445,713	960,320	46.4	
1994/95	WA	523,800	559,623	1,083,423	51.7	+11.29
1993/94	Tas	87,401	38,278	125,679	30.5	
1994/95	Tas	84,304	37,373	121,677	30.7	+0.85
1993/94	NT	65,082	40,745	105,827	38.5	
1994/95	NT	68,971	52,752	121,723	43.3	+ 12.56

Source: Liquor Merchants Association of Australia Ltd (LMAA)

<sup>a</sup> Additional 1995/96 data from the LMAA supplied by Turning Point Drug and Alcohol Centre.

## 2.5 State and territory specific conversion factors

Although the major issues regarding conversion factors and the various beverage types have been documented above, there were also problems specific to each jurisdiction. Most of the problems arose as a result of a lack of data quality and often required the application of time series statistical analyses to make estimates. This section presents conversion factors for each of the states and territories and discusses their calculation where necessary.

### 2.5.1 Victoria

#### 2.5.1.1 Conversion factors

Annual volumes of alcohol purchases by beverage type were sourced from the Victorian Liquor Licensing agency. The data distinguished between low and high beer and wine but only provided total spirit consumption. Table 16 summarises the conversion factors applied for the years of data available. Most of the conversion factors were sourced from the results in Section 2.4 with the exception of spirits, which is discussed below.

**Table 16:**  
Summary of pure alcohol conversion factors by beverage type for Victoria, 1990/91-1995/96

Year	High Beer	Low Beer	High Wine	Medium Wine	Spirits
Source	Sec 2.2	Table 10 Sec 2.4.1	Sec 2.3	Sec 2.4	See text.
1990/91	0.048	0.031	0.115	0.048	0.291
1991/92	0.048	0.030	0.115	0.048	0.280
1992/93	0.048	0.030	0.115	0.048	0.269
1993/94	0.048	0.029	0.114	0.048	0.255
1994/95	0.048	0.030	0.115	0.048	0.240
1995/96	0.048	0.030	0.115	0.048	0.224

### **2.5.1.2      Spirits**

For Victoria, specific calculations were required to estimate conversion factors for spirits. Data obtained from the Liquor Merchants Association of Australia allowed the calculation of proportions of mixed versus straight spirits consumption for 1993/94, 1994/95 and 1995/96 (Table 15 in Section 2.5). This data was then used to determine trends in the proportions of pre-mixed versus straight consumption for each year between 1990/91 and 1995/96. The percentage change in the volume of all spirits sold as pre-mixed from 1995/96 to 1994/95 (that is estimating back as a proportion of 1995/96) was about 10%. From 1994/95 to 1993/94 the percentage change was about 11%. In order to estimate the proportion of pre-mixed spirits in the earlier years of 1990/91 to 1992/93 a constant percentage change of 10.5% was assumed. The estimated annual proportions of pre-mixed spirits were then used to determine weighted total spirits conversion factors. The resulting estimated conversion factor of 22.4% for 1995/96 is close to the 21% estimate by Jonas *et al.* (1999).

## **2.5.2      New South Wales**

### **2.5.2.1    Volume and value data**

The first problem specific to the New South Wales data was that for 1990/91 and 1991/92 only the total value of purchases in dollars was available for three general beverage types: all beer, all wine and all spirits. This required that some extrapolations be made from the existing data in order to convert dollar value to approximate volumes.

Since 1990/91 and 1991/92 data was only available by totals for beer, wine and spirits, in order to determine volume to value ratios it was first necessary to combine low/medium beer with high beer and low wine with high wine for 1992/93 through 1995/96. As pre-mixed and straight spirits were already combined no such calculation was necessary for spirits. Table 17 shows the volume to value ratio for total beer, total wine and spirits between 1992/93 and 1995/96 for New South Wales.

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**Table 17:**  
**Volume to value ratios for all beer, spirits and wine, 1992/93-1995/96**

Year	Total Beer	Total Spirits	Total Wine
1992/93	0.53	0.05	0.31
1993/94	0.51	0.05	0.25
1994/95	0.50	0.05	0.22
1995/96	0.46	0.05	0.26
Mean	0.50	0.05	0.25

As can be seen in Table 17, there was a notable variation in the volume to value ratio for wine and a decrease of about 5% per year for beer. There was little change for spirits over the period. Assuming a linear trend it was possible to perform a simple extrapolation to estimate volume to value ratios for 1990/91 and 1991/92 for beer and wine, while spirits was assumed stable at 0.05 (SPSS used). Results of the linear back-casting process have been shown in Table 18. (Note that since SPSS forecasting procedure does not extrapolate backwards, order of years was reversed prior to analysis.)

**Table 18:**  
**Estimated volume to value ratio by beverage type, 1990/91-1991/92**

Year	Total Beer	Total Spirits	Total Wine
1990/91	0.58	0.05	0.32
1991/92	0.56	0.05	0.31

Thus, multiplying out the available total dollar values by the volume to value ratio, volume estimates were made for 1990/91 and 1991/92 and combined with the other annual volume data (Table 19 below).

**Table 19:**  
**Annual volume of alcohol purchase estimates for New South Wales, 1990/91-1995/96**

Year	High Beer (ltrs)	Low Beer (ltrs)	Total Beer (ltrs)	Total Wine (ltrs)	Spirits (ltrs)
1990/91	-	-	662,212,680	148,375,360	22,983,750
1991/92	-	-	638,206,800	148,206,660	22,852,900
1992/93	515,843,000	77,703,000	593,546,000	122,187,000	21,932,000
1993/94	525,897,000	68,435,000	594,332,000	117,464,000	22,396,000
1994/95	507,503,000	64,527,000	572,030,000	120,085,000	23,647,000
1995/96	504,699,000	76,932,000	581,631,000	119,584,000	24,533,000

## *Methods and main findings*

<sup>1</sup> estimated volumes (see text).

### **2.5.2.2 Beer**

To calculate conversion factors for beer for New South Wales required two separate methods. For those years when volume data was split between high and low alcohol content, conversion factors were applied as described in Section 2.1 and 2.2. For 1990/91 and 1991/92, with the newly calculated total beer volume it was necessary to estimate the relative proportions of low/medium versus high alcohol content beer. This calculation was based on the ratios evident in the subsequent years (Table 20).

**Table 20:**  
**Percentage of all beer sold which was high alcohol content for  
New South Wales, metro and non-metro, 1992/93-1995/96**

Year	Total NSW (%)
1992/93	86.9
1993/94	88.5
1994/95	88.7
1995/96	86.8
Mean	87.7

No specific trend was evident among the four years of data and since all years were approximately similar a mean value of 87.7% was assumed to be representative of the proportion of all beer that had a high alcohol content for 1990/91 and 1991/92. By employing the year specific low/medium alcohol content beer conversion factors provided in Table 10 (Section 2.1) and a conversion factor of 0.048 for high alcohol content beer (Section 2.2), weighted conversion factors for total beer in 1990/91 and 1991/92 were calculated. The following example illustrates the method:

$$\begin{aligned} & \text{1990/91 weighted pure alcohol conversion factor for total beer in New South Wales} \\ & = (0.048 * 87.7) + (0.029 * (100 - 87.7)) \\ & = 4.57\% \text{ or } 0.046 \end{aligned}$$

$$\begin{aligned} & \text{1991/92 weighted pure alcohol conversion factor for total beer in New South Wales} \\ & = (0.048 * 86) + (0.028 * (100 - 86)) \end{aligned}$$

=4.52% or 0.045

### 2.5.2.3 Wine

As was the case for beer in 1990/91 and 1991/92 only total dollar value of wine purchases was available for New South Wales for all years. While these could be converted to approximate volumes using ratios from subsequent years, the remaining problem was that none of the years for which data was available distinguished between medium and high strength wine. Therefore, it was not possible to model approximate proportions of different alcohol strength wine products using New South Wales' data. The approach taken was to apply the ratio of high to medium alcohol content wine from an alternative state where medium versus high wine proportions were known. Demographic data indicated that the best match for New South Wales was Victoria (see Tables A1 through A4 in Appendix 1). In addition, it was found that Victorian volume to value ratios for all beverages (including total wine) between 1992/93 and 1994/95 were very similar to those for New South Wales.

As shown in Table 21, for all years of the Victorian data, the mean proportion of medium alcohol content wine sold of all wine was less than half a percent. By assuming that this was also the case in New South Wales, the difference between any weighted average and the pure alcohol conversion factor for high wine (about 11.5%) would be so small as to be negligible. In this instance it would be reasonable to simply apply the year specific conversion factors identified in Table 12 to all wine.

**Table 21:**  
Proportion of all wine purchases that were medium  
alcohol content in Victoria, 1990/91-1995/96

Year	Medium Wine (%)
1990/91	0.2
1991/92	0.3
1992/93	0.4
1993/94	0.7
1994/95	0.4
1995/96	0.4
Mean	0.4

#### **2.5.2.4 Spirits**

As discussed in Section 2.5, for most jurisdictions, including New South Wales, volume of purchase data obtained from liquor licensing sources did not distinguish between pre-mixed and straight spirits. The data obtained from the Liquor Merchants Association of Australia (Table 15), however, could be used to approximate levels of pre-mixed spirits purchased in New South Wales for 1990/91 to 1992/93 and 1995/96.

From 1993/94 to 1994/95 the proportion of pre-mixed spirits increased by about 16% in New South Wales (Table 15) but it was not possible to obtain an accurate indication of the trend through the 1990s from only two years of data. The alternative was to consider the trends in states with more data available. In Victoria between 1993/94 and 1994/95 the proportion of mixed spirits sold increased by about 9% and then from 1994/95 to 1995/96 by 12%. In Western Australia where pre-mixed sales have also been estimated by the WA Health Department for 1988/89 through 1995/96 the annual increases appeared to be both linear and relatively consistent at between 5.5% and 8% per year with a mean of 7% (Table 25). Given the relatively consistent percentage change in Western Australia and Victoria and in the absence of state specific information for New South Wales, it was assumed that the change in purchases of pre-mixed spirits in New South Wales had also been consistent between 1990/91 and 1995/96.

In order to calculate the proportion of all spirits that were pre-mixed in New South Wales for 1990/91 through 1992/93 it was necessary to work backwards. That is, the percentage change from 1994/95 back to 1993/94 was first calculated as in the following example.

*Percentage change in the proportion of all spirits purchased as pre-mixed beverages from 1994/95 back to 1993/94 in New South Wales*

$$\begin{aligned} &= (\% \text{ pre-mixed } 93/94 - \% \text{ pre-mixed } 94/95) / \% \text{ pre-mixed } 94/95 \\ &= (25-29)/29 \\ &= -0.14 \end{aligned}$$

In this example, the proportion of pre-mixed spirits sold in 1993/94 was 14% less than that sold in 1994/95. Since it was assumed that percentage change remained

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stable over time, it was possible to estimate the proportion of pre-mixed for 1992/93 and earlier years assuming that levels of pre-mixed were 14% less than that for the previous year.

*Percentage change in the proportion of all spirits purchased as pre-mixed beverages in New South Wales, 1990/91-1992/93.*

*For 1992/93*

$$\begin{aligned} &= (\% \text{ pre-mixed } 1992/93 * \% \text{ change}) + \% \text{ pre-mixed } 1992/93 \\ &= (25 * -0.14) + 25 \\ &= 21.55 \end{aligned}$$

*For 1991/92*

$$\begin{aligned} &= (\% \text{ pre-mixed } 1991/92 * \% \text{ change}) + \% \text{ pre-mixed } 1991/92 \\ &= (21.55 * -0.14) + 21.55 \\ &= 18.58 \end{aligned}$$

*For 1990/91*

$$\begin{aligned} &= (\% \text{ pre-mixed } 1990/91 * \% \text{ change}) + \% \text{ pre-mixed } 1990/91 \\ &= (18.58 * -0.14) + 18.08 \\ &= 16.02 \end{aligned}$$

In order or to estimate the proportion of pre-mixed spirits for 1995/96 from levels in 1994/95 it was necessary to reverse this procedure. Thus, since the percentage change from 1994/95 to 1995/96 was 16% it was possible to estimate the proportion of pre-mixed spirits for the year as in the following example.

*Percentage change in the proportion of all spirits purchased as pre-mixed beverages in New South Wales, 1995/96.*

$$\begin{aligned} &= (\% \text{ pre-mixed } 1994/95 * \% \text{ change}) + \% \text{ pre-mixed } 1994/95 \\ &= (29 * 0.16) + 29 \\ &= 33.64 \text{ or } 0.336 \end{aligned}$$

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Estimates calculated for financial years 1990/91 through 1995/96 in this way have been summarised in Table 22. These estimates were then used to determine year specific weighted conversion factors for total spirits as shown in the following example and summarised in Table 23.

*Weighted pure alcohol conversion factor for total spirits in New South Wales, 1990/91.*

$$\begin{aligned}
 &= (\text{alcohol content pre-mixed} * \text{proportion pre-mixed}) + (\text{alcohol content straight} * \\
 &\quad (100 - \text{proportion pre-mixed})) \\
 &= (0.059 * 16.02) + (0.385 * (100 - 16.02)) \\
 &= 33.28\% \text{ or } 0.333
 \end{aligned}$$

**Table 22:**  
Estimated proportion of all spirits sold which were pre-mixed and weighted pure alcohol conversion factor for combined spirits, New South Wales, 1990/91-1995/96

Year	Pre-Mixed Spirits (%)	Weighted Spirit Conversion Factor
1990/91	16.0	0.333
1991/92	18.6	0.324
1992/93	21.5	0.315
1993/94	25.0	0.304
1994/95	29.0	0.290
1995/96	33.6	0.275

**Table 23:**  
Summary of pure alcohol conversion factors by beverage type, for New South Wales, 1990/91-1995/96

Year	High Beer	Low Beer	Total Beer	Total Wine	Spirits
Source	For pre 92/93 see text. Sec. 2.2	For post 91/92	See text	See text and Sec. 2.3	See text.
1990/91	-	-	0.046	0.115	0.333
1991/92	-	-	0.045	0.115	0.324
1992/93	0.048	0.028	-	0.115	0.315
1993/94	0.048	0.028	-	0.114	0.304
1994/95	0.048	0.028	-	0.115	0.290
1995/96	0.048	0.029	-	0.115	0.275

### **2.5.3 Western Australia**

#### **2.5.3.1 Conversion factors**

The Liquor Licensing Department of Western Australia supplied data by annual volume of purchase and beverage type for 1990/91 through 1998/99. The data distinguished between low and high beer and wine but only provided total spirit consumption. Table 24 summarises the conversion factors applied for the years of data available. Conversion factors were sourced from the results in Section 2 with the exception of wine for 1998/99 and spirits. For low alcohol beer conversion factor estimates for 1997/98 and 1998/99 were simply assumed to be similar to the previous three years and set at 3.5%.

**Table 24:**  
**Pure alcohol conversion factors for Western Australia, 1990/91-1998/99**

Year	High Beer Sec 2.2	Low Beer Table 10 Sec 2.1	High Wine Sec 2.3 and 2.5.3.2	Low Wine Sec 2.4 and 2.5.3.2	Spirits Sec 2.5.3.3
1990/91	<b>0.048</b>	<b>0.033</b>	<b>0.115</b>	<b>0.048</b>	<b>0.257</b>
1991/92	<b>0.048</b>	<b>0.034</b>	<b>0.115</b>	<b>0.048</b>	<b>0.246</b>
1992/93	<b>0.048</b>	<b>0.034</b>	<b>0.115</b>	<b>0.048</b>	<b>0.238</b>
1993/94	<b>0.048</b>	<b>0.034</b>	<b>0.114</b>	<b>0.048</b>	<b>0.230</b>
1994/95	<b>0.048</b>	<b>0.035</b>	<b>0.115</b>	<b>0.048</b>	<b>0.218</b>
1995/96	<b>0.048</b>	<b>0.035</b>	<b>0.115</b>	<b>0.048</b>	<b>0.211</b>
1996/97	<b>0.048</b>	<b>0.035</b>	<b>0.114</b>	<b>0.048</b>	<b>0.192</b>
1997/98	<b>0.048</b>	<b>0.035</b>	<b>0.110</b>	<b>0.035</b>	<b>0.175</b>
1998/99	<b>0.048</b>	<b>0.035</b>	<b>0.111</b>	<b>0.035</b>	<b>0.174</b>

#### **2.5.3.2 Wine**

An adjustment was necessary to high wine for 1997/98 and 1998/99 as alcoholic sodas, ciders and other pre-mixed wine beverages with an alcohol content of greater than 3.5% were no longer collected as “low” alcohol wines. These beverages with alcohol content of around 6% were collected within “high” alcohol wines, which have a conversion factor of 11.5% (Table 24). Before 1997/98 the volume of low alcohol

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wine contributed 7.5% of all wines purchased in Western Australia, so using this proportion for 1997/98 and 1998/99 it is possible to recalculate conversion factors for high wines. The calculation is complicated because not all of the low alcohol wines were collected within the high wine category for 1997/98 and 1998/99. Those wines with an alcohol content of less than 3.5% remained in the low wine category. The calculation is presented below and the results are provided in Table 24.

*Weighted pure alcohol conversion factor for wine in Western Australia, 1990/91.*

$(\%high\ wine - (7.5\% - \%low\ wine) * high\ wine\ conversion\ factor = 11.5\%) + (\%low\ wine * low\ wine\ conversion\ factor = 3.5\%) + (7.5\% - \%low\ wine) * (conversion\ factor\ for\ high\ ciders\ etc = 6.1\%)$

### *2.5.3.3 Spirits*

Annual conversion factors for spirits were based on information supplied by the Health Department of WA (personal communication, 2000). This survey data estimated the level of pre-mixed purchases made in Western Australia for calendar years 1991 through 1995 and 1997. These data were then converted to financial years and time series analysis applied to predict likely levels of pre-mixed spirits for missing years. Table 25 outlines the estimated proportions of pre-mixed spirits for 1990/91 to 1997/98 in Western Australia and shows that the proportion of all spirits sold in Western Australia that were pre-mixed increased steadily between 1990/91 and 1997/98. The level of pre-mixed spirits consumption estimated by the WA Health Department for 1993/94 (47.5%) and 1994/95 (51.2%) was confirmed by independent data obtained from the Liquor Merchants Association of Australia (LMAA) that indicated 46.4% for 1993/94 and 51.7% for 1994/95 (Table 15).

From the data in Table 25 weighted conversion factors were estimated as shown in the following example. The conversion factors for pre-mixed is taken as 5.9% and for straight 38.5% (Stockwell *et al.*, 1997, Jonas *et al.*, 1999). For 1998/99 a linear extrapolation was used, as no data on the proportion of pre-mixed spirits was available.

**Table 25:**  
**Proportion of all spirits estimated as pre-mixed in Western Australia,  
 1990/91-1997/98**

Year	Pre-Mixed Spirits (%)	% Change
1990/91	39.2	
1991/92	42.5	+8.42
1992/93	45.0	+5.88
1993/94	47.4	+5.33
1994/95	51.2	+8.02
1995/96	53.6	+4.69
1996/97	59.2	+10.45
1997/98	64.3	+8.61

*Source: Health Department of Western Australia.*

#### *Spirits conversion factor for Western Australia 1990/91*

$$\begin{aligned}
 &= (\text{Proportion pre-mixed} * \text{alcohol content pre-mixed}) + (\text{Proportion straight} * \\
 &\quad \text{alcohol content straight}) \\
 &= (0.392 * 0.059) + (0.608 * 0.385) \\
 &= 0.257
 \end{aligned}$$

### **2.5.4 South Australia**

#### *2.5.4.1 Converting values to volumes*

Data provided by the Liquor Licensing Department of South Australia did not identify volume of purchase or beverage types but only provided a single estimate of total dollar value of annual purchases. However, market share data calculated by major alcohol suppliers provided by the Liquor Licensing Department identified total volume of high and low alcohol content beer purchased between 1990/91 and 1995/96. The market share data was limited in its usefulness for three main reasons:

- It was not possible to identify regional metropolitan and non-metropolitan purchases.
- Only the combined annual value of purchases was available for wine and spirits. However, the value of low wine purchases was available for 1993/94 through 1995/96.

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- The data supplied did not include imports and minor brands.

To calculate volumes of alcohol and conversion factors it was necessary to first convert the value data for combined spirits and wine to volumes. Between 1990/91 and 1995/96 only the value of purchase was available for low wine and for combined high wine (non-cider) and spirits. Value of purchase is not appropriate for measuring trends in consumption since the beverage price also reflects changes in product price and in CPI over time. It was therefore necessary to first determine the approximate proportion of combined wine/spirits that was wine and secondly, convert the value to volumes based on relationships between the two measures evident in another similar region.

Victoria was found to be most similar to South Australia based upon wine versus spirit consumption and in terms of its demographic profile. As shown in Tables A1 through A4 in Appendix 1, South Australia was very similar to Victoria in terms of major demographic characteristics (e.g. age and sex distribution and the proportion of young males) and also in terms of beer consumption (see Tables A5 and A6 in Appendix 1).

The volume to value ratio for wine and spirits in South Australia was identified by comparing demographic data between states and by comparing annual trends in the proportion of all beer sold which was low alcohol between 1990/91 and 1995/96. Table 26 shows the estimated total dollar value of annual purchases of wine and spirits for South Australia after applying annually specific wine to spirit ratios obtained for Victoria.

**Table 26:**  
Estimated value of high wine (non-cider) and spirit purchases in South Australia,  
1990/91-1995/96

Year	Wine (\$)	Spirits (\$)
1990/91	108,300,220	103,099,780
1991/92	106,805,000	98,195,000
1992/93	108,117,800	94,882,200
1993/94	111,324,600	95,675,400
1994/95	122,214,180	100,885,820
1995/96	133,616,700	116,883,300

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**Table 27 below identifies the annual volume to value ratio for wine and spirits in Victoria from 1990/91 to 1995/96 and the subsequent volumes derived for South Australia after multiplying out by the Victorian volume to value ratio.**

**Table 27:  
Volume to value ratio for wine and spirits in Victoria for 1990/91-1995/96  
applied to South Australian data**

Year	Victoria		SA	
	Wine vol/val	Spirits Vol/val	Wine (ltrs)	Spirits (ltrs)
1990/91	0.253	0.063	27,399,956	6,495,286
1991/92	0.265	0.060	28,303,325	5,891,700
1992/93	0.249	0.060	26,921,332	5,692,932
1993/94	0.222	0.058	24,714,061	5,549,173
1994/95	0.203	0.058	24,809,479	5,851,378
1995/96	0.187	0.060	24,986,323	7,012,998

As discussed above, the market share data obtained for South Australia only included three years of information regarding medium/low wine purchases in dollar value (1993/94 through 1995/96). However, the proportion of all alcohol purchased as medium/low wine (generally cider) was small and only contributed to between 1.63% and 1.17% of total value of South Australia alcohol purchases.

As shown in Table 28, during the three years for which medium/low wine data was available there was no apparent trend. Thus, since the sales of medium/low wine were minimal, the mean dollar value from 1993/94 to 1994/95 was assumed as the approximate value for the previous three years 1990/91 to 1992/93 (\$6,333,333).

In order to convert the dollar value estimates to volumes, volume to value ratios for Victoria were again assumed to be applicable to South Australia consumption. As identified in Table 28, Victoria (and Western Australia) show a decline in the volume to value ratio for medium/low wine so specific yearly ratios are more appropriate than using a mean. The annual volume to value ratios were then applied to the estimated value data to estimate the volume of purchases for medium/low wine (Table 28).

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**Table 28:**  
**Annual value of cider consumption in South Australia and medium wine volume to  
 value ratios in Victoria and Western Australia, 1990/91-1995/96**

Year	Vic vol/val	WA vol/val	Estimated value of SA cider purchases (\$)	Estimated volume of SA cider purchases (ltrs)
1990/91	0.671	0.418	6,333,333	4,249,666
1991/92	0.723	0.359	6,333,333	4,579,000
1992/93	0.521	0.386	6,333,333	3,299,666
1993/94	0.509	0.347	5,700,000	2,901,300
1994/95	0.319	0.344	5,400,000	1,722,600
1995/96	0.428	0.337	7,900,000	3,381,200
Mean	0.472	0.359		

### *2.5.4.2 Spirits*

The calculation of spirit volumes and conversion factors required a different approach than that for wine. Instead of using Victorian data for total spirit conversion factors, the percentage pre-mixed of total spirits available for South Australia from the LMAA for 1993/94 and 1994/95 was used. As can be seen in Table 15, from 1993/94 to 1994/95, as a percentage of total spirits, pre-mixed increased by 24.44% from 20.8% to 25.9%. In the absence of other information, a linear change of 24% was used to calculate the percentage of pre-mixed spirits from 1991/92 through 1995/96. The national percent alcohol for pre-mixed of 5.9% and straight of 38.5% could then be used to calculate alcohol content of these two categories. Table 29 shows the resulting percentage of pre-mixed of all spirits and the conversion factor for total spirits.

**Table 29:**  
**Percentage of pre-mixed of total spirits and resulting total spirits conversion factors  
 for South Australia, 1991/92-1995/96**

Year	%Pre-Mixed of Total	Resultant Conversion Factor For Total Spirits
1991/92	11.9%	34.6%
1992/93	15.6%	33.4%
1993/94	20.8%	31.7%
1994/95	25.9%	30.1%
1995/96	32.1%	28.0%

#### 2.5.4.3 *Summary*

Table 30 summarises the estimates of the conversion factors for South Australia, using total spirits conversion factors as in Victoria.

**Table 30:**  
**Summary of pure alcohol conversion factors by beverage type for South Australia,**  
**1990/91-1995/96**

Year	High Beer Sec. 2.2	Low Beer Sec. 2.1 Table 10	High Wine Sec. 2.3	Medium Wine Sec. 2.4	Spirits See text.
Source					
1990/91	<b>0.048</b>	<b>0.029</b>	<b>0.115</b>	<b>0.048</b>	<b>0.346</b>
1991/92	<b>0.048</b>	<b>0.029</b>	<b>0.115</b>	<b>0.048</b>	<b>0.346</b>
1992/93	<b>0.048</b>	<b>0.029</b>	<b>0.115</b>	<b>0.048</b>	<b>0.334</b>
1993/94	<b>0.048</b>	<b>0.029</b>	<b>0.114</b>	<b>0.048</b>	<b>0.317</b>
1994/95	<b>0.048</b>	<b>0.029</b>	<b>0.115</b>	<b>0.048</b>	<b>0.301</b>
1995/96	<b>0.048</b>	<b>0.029</b>	<b>0.115</b>	<b>0.048</b>	<b>0.280</b>

#### 2.5.5 **Queensland**

Queensland volume of alcohol purchase data was supplied by the Liquor Licensing Division of the Department of Tourism for 1991/92 through 1995/96. Data was supplied for total beer, total wine and total spirits so methodologies for deriving estimates of high and low alcohol proportions within each category were required. Conversion factors for beer, wine and spirits are discussed in turn.

##### 2.5.5.1 *Beer*

According to the Australian Associated Brewers, in 1989 the proportion of all beer purchased in Queensland with a low/medium alcohol content was 16.2% (Table 15). By 1993, AC Nielsen reported that the proportion of low/medium beer had increased to 41% by 1995 and then to a maximum of about 50% in 1997 (Table 31). Using simple linear extrapolation it was possible to estimate the proportion of all beer purchased which was low/medium alcohol strength for financial years 1990/91 to 1995/96.

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**Table 31:**  
**Percentage of all beer estimated as low/medium alcohol content,  
Queensland, 1990/91-1995/96**

Year	Low/medium Beer (%)
1990/91	24.0
1991/92	30.0
1992/93	36.0
1993/94	38.5
1994/95	40.0
1995/96	44.0

*Source: AC Nielsen*

The estimated proportions of low/medium alcohol content beer shown in Table 31 were then used to determine approximate pure alcohol conversion factors for total beer purchases using the alcohol contents derived in Section 2.4. Table 32 summarises the results and the following example shows an example of the calculation.

**1991/92 weighted pure alcohol conversion factor for total beer in Queensland.**

$$\begin{aligned}
&= ((\% \text{low of all beer} \% \text{low alcohol content}) + ((100-\% \text{low of all beer}) * \% \text{alcohol high beer})) / 100 \\
&= ((30 * 0.032) + ((100 - 30) * 0.048)) / 100 \\
&= 0.043
\end{aligned}$$

**Table 32:**  
**Annual pure alcohol conversion factors for total beer,  
Queensland, 1990/91-1995/96**

Year	Total Beer Pure Alcohol Conversion Factor
1991/92	<b>0.043</b>
1992/93	<b>0.042</b>
1993/94	<b>0.042</b>
1994/95	<b>0.042</b>
1995/96	<b>0.042</b>

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### 2.5.5.2 Wine

Queensland volume of purchase data combined high wine and low alcohol content wine purchases between 1991/92 and 1995/96 so individual conversion factors for high and medium wine were not applicable. A weighted pure alcohol conversion factor that incorporated both types of beverages was required. Since there was no information on the relative proportions of all wine sold in Queensland that was of high and low alcohol content it was necessary to derive approximate proportions from other regions where the alcohol content of beverages were distinguished.

**Table 33:**  
**Proportion of medium wine by volume in selected States**

Year	Total Wine Volume	Medium Wine Volume	Medium Wine %
<b>Western Australia</b>			
1991/92	29,308,333	1,596,769	5.45
1992/93	33,001,616	1,985,381	6.02
1993/94	32,535,814	2,320,096	7.13
1994/95	33,661,395	2,663,196	7.91
1995/96	33,691,048	2,407,067	7.14
Mean	32,439,641	2,194,502	6.76
<b>Victoria</b>			
1991/92	70,526,294	197,678	0.28
1992/93	66,498,234	289,044	0.43
1993/94	69,700,379	491,220	0.70
94/95	72,588,138	302,196	0.42
95/96	68,929,471	238,810	0.35
Mean	69,648,503	303,790	0.44
<b>Tasmania</b>			
93/94	5,416,250	372,429	6.88
94/95	5,578,248	612,309	10.98
95/96	5,853,215	939,422	16.05
Mean	5615904.3	641387	11.42

The jurisdiction most likely to be representative of wine consumption in Queensland was identified by comparing demographic data between states and by comparing annual trends in the consumption of total beer, wine and spirits. Only

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Western Australia, Victoria, Tasmania and the Northern Territory liquor licensing data provided individual annual totals for high and low wine, however the Northern Territory was not applicable since levels of consumption were likely to have been affected by the Living With Alcohol program (Chikritzhs *et al.*, 1999). Thus it was necessary to choose the most similar state from among Western Australia, Victoria and Tasmania.

Table 33 identifies the volumes and proportions of high and low alcohol content wines purchased in Western Australia and Victoria between 1991/92 and 1995/96 and between 1993/94 and 1995/96 in Tasmania. It is apparent that the proportion of all wine purchased with a low alcohol content varied considerably between the three states. Rather than assuming a mean across all states and applying that to Queensland an attempt was made to identify which of the three states was most similar in terms of total beer, total wine and total spirits consumption to Queensland. Overall beverage preferences in Queensland appeared more similar to both Western Australia and Victoria than Tasmania but the proportions were closer in magnitude to Western Australia (Table 34). Thus, in the absence of data specific to Queensland, annual specific mean proportions of medium alcohol content in Western Australia between 1991/92 and 1995/96 were assumed to be representative of medium alcohol content wine consumption in Queensland. This choice was consistent with the demography of the states, as the demographic information shows Western Australia and Queensland having similar profiles (Tables A1 through A4 in Appendix 1).

Trends in per capita alcohol consumption in Australia, 1990/91-1998/99

**Table 34:**  
**Proportion of all purchases consumed as total beer, total wine and total spirits, for  
 Western Australia, Victoria, Tasmania and Queensland, 1990/91-1995/96**

Year	Total Beer	Total Wine	Total Spirits
<b>Queensland</b>			
1991/92	86.89	10.40	2.71
1992/93	82.63	13.74	3.62
1993/94	80.25	15.72	4.03
1994/95	80.14	14.48	5.38
1995/96	81.53	13.79	4.69
Mean	82.17	13.70	4.13
<b>Western Australia</b>			
1991/92	83.79	13.19	3.02
1992/93	81.70	14.96	3.34
1993/94	81.52	14.66	3.82
1994/95	81.03	14.62	4.34
1995/96	80.48	14.77	4.75
Mean	81.69	14.44	3.87
<b>Victoria</b>			
1991/92	81.19	15.58	3.23
1992/93	81.21	15.53	3.26
1993/94	80.10	16.24	3.66
1994/95	80.07	16.11	3.82
1995/96	78.95	16.47	4.58
Mean	80.81	15.57	3.62
<b>Tasmania</b>			
1991/92	88.51	9.46	2.04
1992/93	88.67	9.27	2.05
1993/94	87.69	10.16	2.14
1994/95	87.48	10.07	2.45
1995/96	86.49	10.89	2.62
Mean	87.22	10.37	2.40

Weighted pure alcohol conversion factors for Queensland for all years were then calculated by combining year specific high wine conversion factors (see Section 2.3), a medium wine conversion factor of 0.0479 (see Section 2.4) and assuming medium

## *Methods and main findings*

wine proportions as in Western Australia (Table 33). The following is an example of the conversion formula for calculating the weighted pure alcohol conversion factor for 1992/93 for wine in Queensland. Conversion factors are summarised in Table 35.

*1992/93 weighted pure alcohol conversion factor for total wine in Queensland.*

$$\begin{aligned} &= ((\% \text{medium wine} * \% \text{alcohol content}) + ((100 - \% \text{medium wine}) * \% \text{alcohol high wine})) / 100 \\ &= ((6.02 * 0.048) + ((100 - 6.02) * 0.115)) / 100 \\ &= 0.111 \end{aligned}$$

### *2.5.5.3 Spirits*

As with beer and wine, Queensland data also combined straight and pre-mixed spirit purchases. Thus, in the absence of specific data on the proportions of straight and pre-mixed it was necessary to identify a similar region from which estimates could be derived. As discussed above, in terms of overall beverage preferences and demographic profile, Western Australia provided the best model. And again, given the proportion of all alcohol purchases that were spirits, Western Australia was the best model to use for spirits in Queensland.

As shown in Table 15 the Liquor Merchants Association of Australia estimated that of all spirits purchased in 1993/94 and 1994/95 the proportions that were pre-mixed were 30.1% and 35.6% respectively. This is an annual increase of about 18%. It was assumed that levels of pre-mixed spirits purchases in Queensland were increasing constantly and linearly as identified for Western Australia and Victoria. In order to calculate the proportion of all spirits that were pre-mixed in Queensland for 1992/93 to 1990/91 from what was known about 1993/94 and 1994/95, it was necessary to work backwards, as in the following example.

*Percentage change in the proportion of all spirits purchased as pre-mixed beverages from 1994/95 back to 1993/94 in Queensland.*

$$\begin{aligned} &= (\% \text{pre-mixed of spirits 94/95} - \% \text{pre-mixed of spirits 93/94}) + \% \text{pre-mixed of spirits 94/95} \\ &= (35.6 - 30.1) / 35.6 \\ &= -15.5\% \end{aligned}$$

## Trends in per capita alcohol consumption in Australia, 1990/91-1998/99

Since it was assumed that percentage change remained stable from year to year, it was possible to estimate the proportion of pre-mixed for 1992/93 and 1991/92 assuming that levels were 15.5% less than that for the previous year and so on, as shown in the following examples.

*For 1992/93*

$$\begin{aligned} &= (\% \text{pre-mixed of all spirits} * \text{percentage change}) + \% \text{pre-mixed of all spirits} \\ &= (30.1 * -0.155) + 30.1 \\ &= 25.5\% \end{aligned}$$

*For 1991/92*

$$\begin{aligned} &= (25.5 * -0.155) + 21.55 \\ &= 21.5\% \end{aligned}$$

In order or to estimate the proportion of pre-mixed spirits for 1995/96 from what was known about levels in 1993/94 and 1994/95 it was necessary to reverse the percentage change operator. Thus, since the percentage change from 1994/95 to 1995/96 was an 18.3% increase, it was possible to estimate the proportion of pre-mixed spirits for 1995/96 as shown in the following example.

*Estimated proportion of pre-mixed spirits in 1995/96 for Queensland.*

$$\begin{aligned} &= (35.6 * 0.183) + 35.6 \\ &= 42.1\% \end{aligned}$$

These estimated proportions were then used to determine year specific weighted conversion factors for total spirits as shown in the following example.

*1990/91 weighted pure alcohol conversion factor for total spirits in Queensland.*

$$\begin{aligned} &= (\text{conversion factor pre-mixed} * \% \text{pre-mixed}) + (\text{conversion factor straight} * (100 - \% \text{pre-mixed})) \\ &= (0.059 * 16.02) + (0.385 * (100 - 16.02)) \\ &= 33.28\% \text{ or } 0.333 \end{aligned}$$

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### **2.5.5.4 Summary**

The complete set of conversion factors for Queensland is summarised in Table 35.

**Table 35:**  
**Summary of pure alcohol conversion factors by beverage type for**  
**Queensland, 1991/92-1995/96**

Year	Total Beer	Total Wine	Total Spirits
1991/92	0.043	0.111	0.315
1992/93	0.042	0.111	0.302
1993/94	0.042	0.110	0.287
1994/95	0.042	0.109	0.269
1995/96	0.042	0.110	0.248

### **2.5.6 Northern Territory**

The Northern Territory Liquor Licensing Commission supplied wholesale volume data by quarter from 1990 to the end of 1998/99. Definitions used by the Northern Territory Liquor Commission to describe their recorded alcohol categories were not comparable to those used by other jurisdictions and hence Northern Territory specific conversion factors were required for most beverage types.

Prior to 1994/95 data was collected in five main beverage groups. These were:  
high beer (> 3% alcohol);  
low beer (<= 3% alcohol);  
medium/high wine (> 3% alcohol);  
low wine (<= 3% alcohol) and  
total spirits.

Thus, according to the Liquor Licensing Commission, low beer was defined as those brands with 3% alcohol or less by volume and therefore differed to other regions, rendering the usual conversion factors inappropriate. However, as of July 1994, the Liquor Licensing Commission began collecting more specific information regarding different beverage types. These are:

bottled wine (approximate mean alcohol content of 11.5%);  
cask wine (approximate mean alcohol content of 11.5%);  
fortified wine (approximate mean alcohol content of 17.5%);

## Trends in per capita alcohol consumption in Australia, 1990/91-1998/99

low wine (<= 3% alcohol);  
full cider (approximate mean alcohol content of 4.8%);  
low cider (<= 3% alcohol);  
straight spirits (approximate mean alcohol content of 38.5%);  
mixed Spirits (approximate mean alcohol content of 5.9%);  
full beer (> 3% alcohol) and  
low beer (<= 3% alcohol).

### 2.5.6.1 Wine

Prior to 1994/95, medium and high wine sales were mixed thereby making standard alcohol conversion factors inappropriate. More detailed information on wine purchases subsequent to 1994/95 assisted in identifying the proportion of all “medium/high” wine that is likely to have consisted of medium strength alcohol (cider) prior to 1994/95.

From 1994/95 onwards, the Northern Territory volume of wine based beverages was divided into five categories: bottled wine, cask wine, fortified wine, full cider and low cider (low wine was no longer recorded). The first three wine groups fall into the high wine category, while full cider was categorised as a medium strength wine. Low cider was equivalent to low wine (3% alcohol or less) and did not affect the following calculations. Therefore, the combined volumes of bottled, cask, fortified, and full cider were equivalent to the medium/high wine category, as it existed prior to 1994/95.

In order to approximately divide medium/high wine into medium and high categories, the proportion of all medium/high strength wine beverages that was medium strength (cider) was calculated (see Table 36). Bottled and cask wine were combined in Table 36 since they both have a mean alcohol content of about 11.5%. This conversion factor is based upon the vast majority of the category being made up of bottled and cask wine. In the past high wine has also included fortified wine, but this generally accounts for less than 4% of total high wine purchases in the Northern Territory and is therefore not expected to alter the overall figure.

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**Table 36:**  
**Percentage of all medium/high wine (>3%) by beverage type**

Year	Bottled/cask (11.5%)	Fortified (17.5%)	Total bottled/cask/ Fortified (11.9%)	Cider (6.1%)
1994/95	85.65	2.99	88.64	11.36
1995/96	80.90	3.73	84.63	15.36
1996/97	80.74	4.84	85.58	14.42
1997/98	82.64	3.88	86.52	13.48
Mean	82.48	3.86	86.34	13.66

Notably, the largest proportion of all medium/high wine purchased was of the bottled/cask variety that contained a mean pure alcohol content of about 11.5%. Although the Living With Alcohol (LWA) program was implemented in April 1992 there were no interventions specifically aimed at wine consumption until July 1995 when the “cask wine levy” was introduced (Chikritzhs *et al.*, 1999). As shown in Table 36, there was no apparent trend in the proportions of the different beverage types. Therefore, in order to calculate a weighted mean alcohol conversion factor for combined medium/high strength wine, an average medium strength wine (cider) component of 13.7% for all years prior to 1994/95 was assumed. Thus, weighted mean pure alcohol contents for the Northern Territory combined medium/high wine from 1990/91 to 1993/94 was calculated using year specific high wine conversion factors (Section 2.4.3) and a 0.048 conversion factor for medium strength wine (Section 2.4.4). The following example shows the calculations required in estimating the pure alcohol conversion factor for combined medium and high strength wine in the Northern Territory for 1990/91.

***1990/91 weighted pure alcohol conversion factor for total wine in the Northern Territory***

$$\begin{aligned}
 &= (\text{alcohol content medium wine} * \% \text{medium wine}) + (\text{alcohol content high wine} * \\
 &\quad (100 - \% \text{medium wine})) / 100 \\
 &= ((0.048 * 13.7) + (0.115 * (100 - 13.7))) / 100 \\
 &= 0.105
 \end{aligned}$$

#### 2.5.6.2 Beer

Unlike most other jurisdictions, the Northern Territory Liquor Licensing Commission recorded all beer with an alcohol content less than or equal to 3% as “low” beer. This was a direct result of the introduction of the Living With Alcohol Program, implemented in 1992 and funded by an additional tax levy on all beverages with greater than 3% alcohol. However, Chikritzhs *et al.* (1999) identified that due to changes that took place in the Northern Territory with the implementation of the LWA program in 1992, there was reason to believe that “low” alcohol content beer in fact included some beer with a greater than 3% alcohol content. For this reason Chikritzhs *et al.* (1999) combined all beer and estimated a weighted pure alcohol conversion factor to convert total volume of alcoholic beverages to litres of pure alcohol. The same rationale was applied here, using an alcohol content for all beer of 4.24% based on the weighted average of the top 18 selling NT beers, 14 of which had alcohol contents greater than 3% and the remaining 4 that had a content less than 3% (Chikritzhs *et al.* 1999, pp. 20) as sourced from Northern Territory Legislative Assembly (1991). Thus, for all years, 1990/91 to 1997/98 the pure alcohol conversion factor for total beer was assumed in the first instance to be 0.042.

However, for beer and spirits a post-adjustment was required following a consideration of the *Northern Territory Liquor Act (1992)* and advice on the manner in which beer and pre-mixed spirits data was collected. It appears that from late 1991/92 through 1993/94 beer also included spirit beverages that contained 6% or less of alcohol by volume. This subsequently affected the actual beer conversion factors applied. The adjustments required are discussed in Section 2.5.6.4.

#### 2.5.6.3 Spirits

As of July 1994 the Northern Territory Liquor Licensing Commission began collecting volume of spirit purchases in terms of straight and pre-mixed beverages. Prior to July 1994 only a combined (straight and pre-mixed) spirits volume was recorded. To begin, the proportions of straight versus pre-mixed identified from the 1994/95-1997/98 data were used to estimate probable levels of pre-mixed purchases prior to this time and therefore to determine an approximate pure alcohol conversion factor for 1990/91 through 1993/94 for all spirits. The estimated mean alcohol content

### *Methods and main findings*

for pre-mixed spirits was assumed to be 5.9% and 38.5% for straight spirits (see Section 2.4.5).

**Table 37:**  
**Proportion of all spirits that were pre-mixed, 1994/95-1997/98,  
Northern Territory**

Year	Pre-mixed (%)	% change
1994/95	36.61	
1995/96	41.63	+0.14
1996/97	45.25	+0.09
1997/98	47.77	+0.06

Between 1994/95 and 1997/98 there appeared to have been yearly increases in the proportion of all spirits that were pre-mixed in the Northern Territory (Table 37), although the degree of increase also appeared to have been declining. Curve estimation assuming a quadratic fit (that incorporated less error than a linear trend) based on 1994/95 to 1997/97 data was used to approximate pre-mixed proportions from 1990/91 to 1993/94. The estimated proportions of pre-mixed spirits were then used to derive weighted pure alcohol conversion factors for total spirits are summarised in Table 38. The example below shows the necessary calculations.

*1990/91 weighted pure alcohol conversion factor for total spirits in the Northern Territory.*

$$\begin{aligned}
&= ((\text{alcohol content pre-mixed} * \% \text{pre-mixed}) + (\text{alcohol content straight} * (100 - \% \text{pre-mixed}))) / 100 \\
&= ((0.059 * 4.29) + (0.385 * (100 - 4.29))) / 100 \\
&= 0.371
\end{aligned}$$

**Table 38:**  
**Estimated proportion of all spirits that were pre-mixed and estimated pure alcohol conversion factors for all spirits, Northern Territory, 1990/91-1993/94**

Year	Pre-mixed (%)	Straight/pre-mixed spirits % pure alcohol
1990/91	4.29	0.371
1991/92	14.25	0.339
1992/93	22.96	0.310
1993/94	30.42	0.286

Following advice on the manner in which pre-mixed spirit sales were collected in the early 1990s, a post adjustment was required on beer and spirits to correct for this arrangement. The methodology for this adjustment is discussed in the next section.

#### *2.5.6.4 Adjustment to spirits and beer*

As mentioned above, following a consideration of the *Northern Territory Liquor Act (1992)* and advice on the manner in which beer and pre-mixed spirits data was collected an adjustment was necessary following the calculations made to this point.

According to the *Liquor Act*, for the purposes of calculating liquor fees payable, beer also included spirit beverages that contained 6% or less of alcohol by volume. These represent the “pre-mixed” spirit beverages. This arrangement was valid from the fourth quarter of 1991/92 (the regulation was applied on 30 March 1992) through to the end of 1993/94, when the regulations were again changed. Since from that financial quarter there were no separate records kept for pre-mixed spirits it was assumed that those for beer incorporated the pre-mixed spirits until the separate records were introduced at the end of 1993/4. Indeed, local expert advice was that this was highly likely to have been the case (Peter d'Abbs, personal communication, 2001). Further, according to the *Act*, as at 1992, alcoholic beverages (beer, wine and spirits) that did not contain at least 3% alcohol by volume were not included in the fee-paying regime.

To adjust the existing calculations for this situation, the following assumptions were made. Firstly, that beer data from the fourth quarter of 1991/92 through 1993/4 included pre-mixed spirits with alcohol content of 3% to 6%. As beer data during this period was split between high beer with greater than 3% alcohol and low beer with less than 3% alcohol, it was assumed that the pre-mixed spirits would have been added to the high beer category. Secondly, it was assumed that, if they exist at all, pre-mixed spirits with alcohol content greater than 3% were not included in the spirits category (or any other category) and are, following the *Act*, ignored from analysis. It follows that in the calculations made so far:

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- Spirit data from the fourth quarter of 1991/92 through 1993/4 did not include pre-mixed beverages with alcohol content of 3% to 6%. The conversion factor for spirits was therefore changed to that of straight spirits (38.5%).
- Pre-mixed spirits from the fourth quarter of 1991/92 through 1993/4 had to be apportioned from beer volumes. A conversion factor of 5.9% was then applied to the volume of pre-mixed spirits identified.
- The volume of pre-mixed spirits identified from the fourth quarter of 1991/92 through 1993/4 beer data needed to be subtracted from the beer data to avoid double counting.

The method used to implement these adjustments is described below. It was necessary to treat the effect on calculations for the fourth quarter of 1991/92 differently than those for 1992/93 and 1993/94 due to the fact that the former involves only adjustments to one of the four quarters of the year's total. The simpler method for 1992/93 and 1993/94 is presented first and then the modifications required for the fourth quarter of 1991/92 are described.

1. It was assumed that for 1992/93 and 1993/94 the stated amount of spirits was straight spirits (as the pre-mixed was counted within beer) and a conversion factor of 38.5% was applied.
2. The volume of pre-mixed spirits for 1992/93 and 1993/94 was calculated based on the estimated percentage of pre-mixed of total spirits determined by trending data for later years (Table 38). The calculation is as follows:
  3.  $(\text{Total volume straight} / \% \text{straight of total spirits}) * \% \text{pre-mixed of total}$
  4. An alcohol conversion factor of 5.9% was applied for the pre-mixed spirits for 1992/93 and 1993/94.
5. The total volume of pre-mixed spirits was subtracted from total beer for 1992/93 and 1993/94. The conversion factors for beer remained unchanged.

For the fourth quarter of 1992 the approach was to consider what percentage the fourth quarter was of the total volume for the year. This percentage was used to adjust figures accordingly. The method was as follows.

1. It was calculated that for 1991/92, the fourth quarter made up 29% of total spirits and 28% of total beer for the year.
2. The total amount of spirits in the fourth quarter was calculated by multiplying the total for 1991/92 by 29%. The result was assumed to be straight spirits given that pre-mixed spirits were included in total beer. Using the percentage pre-mixed of total spirits (Table 38) the total volume of pre-mixed and straight spirits for the quarter was estimated.
3. The total of spirits for the fourth quarter was subtracted from total spirits for the year. A conversion factor of 38.5% for straight and 5.9% for pre-mixed was then applied to the fourth quarter data. The existing conversion factors were applied to the remainder of 1991/92 spirit volume data.
4. The estimated fourth quarter pre-mixed spirit volume was subtracted from total beer for the year. The conversion factor for beer remained unchanged.
5. The estimated pure alcohol volume for straight and pre-mixed for the fourth quarter were then added to the total for combined spirits to estimate pure alcohol spirit consumption for the year.

As a final note, in order to estimate the volumes of high and or low alcohol beer, the available information on the split between the beer categories as provided by the Northern Territory Liquor Licensing Commission was applied. This data included a split by volume of beer into high and low alcohol from 1991/92 through 1995/96. While the 1992/93 through 1995/96 figures were considered accurate enough to be used to determine the appropriate volumes and therefore could be used to determine litres of alcohol consumed, the 1991/92 figure was more problematic. In 1991/92 the total low alcohol beer consumed was estimated at 3,063,710 litres compared to 9,634,244 litres in 1992/93. Notwithstanding the changes to the tax regime in 1992, this volume appeared much too low and was suspected to be incorrect. The volume of low alcohol content beer was subsequently increased to six million litres.

#### *2.5.6.5 Summary*

Table 39 summarises conversion factors for all beverage types in the Northern Territory for 1990/91 through 1997/98.

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**Trends in per capita alcohol consumption in Australia, 1990/91-1998/99**

**Table 39:**  
**Summary of pure alcohol conversion factors by beverage type for**  
**Northern Territory, 1990/91-1997/98**

Year	Total Beer	Medium/ High Wine	Low Wine	Bottled / Cask Wine	Fortified Wine	Full Strength Cider	Total Spirits	Straight Spirits	Pre-Mixed Spirits
1990/91	0.0443	0.105	0.03	-	-	-	0.371	-	-
1991/92	0.0443	0.105	0.03	-	-	-	0.339	-	-
1992/93	0.0416	0.105	0.03	-	-	-	-	0.385	0.059
1993/94	0.0422	0.105	0.03	-	-	-	-	0.385	0.059
1994/95	0.0426	-	0.03	0.115	0.175	0.054	-	0.385	0.059
1995/96	0.0427	-	0.03	0.115	0.175	0.054	-	0.385	0.059
1996/97	0.0424	-	0.03	0.114	0.175	0.054	-	0.385	0.059
1997/98	0.0424	-	0.03	0.115	0.175	0.054	-	0.385	0.059

### **2.5.7 Tasmania**

The Liquor Licensing Commission of Tasmania provided data for 1990/91 through 1995/96. For 1993/94 through 1995/96 data was supplied for high beer, low/medium beer, high wine, medium wine and total spirits. For 1991/92 and 1992/93 volume data was restricted to total beer, total wine and total spirits categories. For 1990/91, only a single total value of all alcoholic beverage purchases made in Tasmania was available, so it was necessary to compare the ratio of total value of alcohol purchases to volume for subsequent years in order to estimate approximate volumes. The calculations for 1990/91 will be dealt with first and are followed by the more routine methodology for the subsequent years.

**Table 40:**  
**Value, volume and volume to value ratio for alcohol purchases in**  
**Tasmania, 1991/92-1995/96**

Year	Value	Volume	Vol/val
1991/92	\$127,573,502	52,567,608	0.41
1992/93	\$135,060,154	54,215,830	0.40
1993/94	\$140,897,281	53,290,041	0.38
1994/95	\$147,271,743	55,405,694	0.38
1995/96	\$155,179,794	53,732,455	0.35

### *Methods and main findings*

The Tasmanian Liquor Commission identified the total value of alcohol purchase in 1990/91 as \$138,868,557. Table 40 above identifies the total volume to value ratio between 1991/92 and 1995/96 for Tasmania.

As shown in Table 40, the ratio of volume to value of alcohol purchase in Tasmania from 1991/92 to 1995/96 steadily declined in a largely quadratic fashion. Therefore curve estimation utilising a quadratic trend was used to estimate the likely volume to value ratio in Tasmania in 1990/91. A conservative estimate of the volume to value ratio for 1990/91 was identified as 0.416 and was multiplied by the total value of alcohol purchase in 1990/91 (\$138,868,557) to produce an estimated total volume of alcohol purchase of 57,769,320 litres for that year.

Since only total volume was estimated, the application of beverage specific pure alcohol conversion factors was not appropriate for 1990/91. In order to estimate pure alcohol content from total estimated volume of purchase for 1990/91 it was necessary to examine the proportion of pure alcohol for subsequent years. As shown in Table 41, the proportion of total volume of pure alcohol purchased in Tasmania remained relatively stable between 1991/92 and 1995/96 and only ranged from 5.6% to 5.8%. Thus, for 1990/91 it was assumed that 5.7% (the mean) of the total volume of alcohol purchase was pure alcohol. This resulted in pure alcohol consumption for Tasmania in 1990/91 estimated at 3,301,651 litres.

**Table 41:**  
**Ratio of pure alcohol to total volume in Tasmania, 1991/92-1995/96**

Year	Total Volume	Pure Alcohol Volume	Pure/Total
1991/92	52,567,608	3,048,192	0.058
1992/93	54,215,830	3,144,308	0.058
1993/94	53,290,041	2,987,054	0.056
1994/95	55,405,694	3,137,615	0.057
1995/96	53,732,455	3,068,903	0.057
Mean	53,842,326	3,077,214	0.057

The years from 1991/92 through 1995/96 are now considered in terms of the beverage specific data that was supplied by the Liquor Licensing Commission.

#### 2.5.7.1 Beer

For 1991/92 to 1992/93 only total beer purchases were available. In order to estimate the approximate proportion of all beer that was medium/low strength, proportions evident for subsequent years were identified. As shown in Table 42, there was no consistent trend evident in the three years of data available on proportions of low/medium strength beer purchases in Tasmania. In the absence of any obvious trend over time, the mean value of 10.37% was assumed to be representative of the proportion of low/medium strength beer purchases for 1991/92 to 1992/93.

**Table 42:**  
**Total and Medium/low beer volumes in Tasmania, 1993/94-1995/96**

Year	Total Beer (ltrs)	Medium/Low Beer (ltrs)	% Medium/Low Beer
1993/94	46,732,400	4,810,502	10.29
1994/95	48,468,319	4,759,900	9.82
1995/96	46,474,121	5,116,706	11.01
Mean	47,224,947	4,895,703	10.37

Total beer pure alcohol conversion factors for 1991/92 to 1992/93 were estimated using year specific mean alcohol contents for high beer (see Section 2.2) and medium/low beer conversion factors specific to Tasmania (see Section 2.1). The following example shows the calculations required.

*1990/91 weighted pure alcohol conversion factor for Total beer in Tasmania*

$$\begin{aligned}
 &= ((\text{high beer alcohol content} * (100 - \% \text{ medium/low beer})) + (\text{medium/low beer alcohol content} * \% \text{ medium/low beer}))/100 \\
 &= ((0.0477 * (100 - 10.37)) + (0.028 * 10.37))/100 \\
 &= 0.046
 \end{aligned}$$

#### 2.5.7.2 Wine

Tasmanian volume of purchase data for wine was also only available as a total for 1991/92 and 1992/93. Thus, a similar methodology to that described above for beer was employed to estimate weighted pure alcohol conversion factors for total wine for those two years.

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As can be seen in Table 43 the proportion of wine purchased with a medium alcohol content increased from 1993/94 to 1995/96. Utilising a fitted quadratic curve, approximate levels of low wine alcohol purchases for 1991/92 and 1992/93 were estimated at 1.6% and 3.7% respectively. This was a more rapid change than that observed in other jurisdictions, notably Western Australia and Victoria. However, in Victoria in 1990/91 and 1991/92 the proportion of low alcohol wine was 2% and 3% respectively. It was therefore reasonable to assume that in 1991/92 and 1992/93 the level of low alcohol wine consumption would be similarly low in Tasmania.

**Table 43:**  
**Total and Medium wine volumes in Tasmania, 1993/94-1995/96**

Year	Total Wine Volume	Medium Wine Volume	% Medium Wine
1993/94	5,416,250	372,429	6.88
1994/95	5,578,248	612,309	10.98
1995/96	5,853,215	939,422	16.05
Mean	5,615,904	641,387	11.42

The estimated proportions of low wine for 1991/92 and 1992/93 were then used to determine weighted mean pure alcohol consumption factors for total wine using a pure alcohol factor of 0.115 for high wine (see Section 2.3) and 0.048 for low/medium wine (see Section 2.4). This is illustrated in the following example.

*1991/92 weighted pure alcohol conversion factor for total wine in Tasmania*

$$\begin{aligned} &= (\text{high wine alcohol content} * (100\% - \text{low wine})) + (\text{low wine alcohol content} * \text{low wine}) / 100 \\ &= ((0.115 * (100 - 1.6)) + (0.048 * 1.6)) / 100 \\ &= 0.114 \end{aligned}$$

#### *2.5.7.3 Spirits*

Tasmanian volume of alcohol purchase data did not distinguish between straight and pre-mixed spirits at any time. The Liquor Merchants Association of Australia has however estimated that in Tasmania in 1993/94 and 1994/95 the proportion of total spirits that were pre-mixed was 30.5% and 30.7%. Thus the proportions appeared to

be stable, at least during those two years, but it was not known whether the earlier and later years also remained stable.

More years of information on the proportions of mixed and straight spirits were available for Victoria, Western Australia and the Northern Territory, although the Northern Territory was likely to be atypical. In all three regions, consumption of pre-mixed spirits did not remain stable but increased steadily from the early 1990s onwards. In general, consumption of pre-mixed spirits was low in the early 1990s, as the product was not marketed aggressively. Data from the Liquor Merchants Association of Australia also indicated that for all regions, except Tasmania, the purchases of pre-mixed spirits increased by more than 10% between 1993/94 and 1994/95 (see Section 2.5). However, it may have been the case that with regard to spirit consumption, Tasmanian drinking patterns were unlike those of other states. As identified in Table 34 and Table 44, Tasmania is dissimilar to both Western Australia and Victoria in terms of beverage choices, having greater beer and lower wine and spirits purchases.

Given that Tasmanian consumption appears to be atypical in terms of both pre-mixed consumption levels for 1993/94 and 1994/95 as well as in terms of consumption of other beverages and total spirit consumption, it was determined that a pure alcohol conversion factor would be based on the assumption that 30.6% of total spirits consumption was pre-mixed. This figure is the average of the values for 1993/94 and 1994/95. The following example shows the calculations applied to calculate a weighted mean conversion factor for spirits.

*Weighted pure alcohol conversion factor for Total spirits in Tasmania.*

$$=((0.059*30.6)+(0.385*(100-30.6)))/100 \\ =0.285$$

Notably, in the event that between 1990/91 and 1992/93 the level of pre-mixed spirits followed the trend in other states such as Victoria and Western Australia and was in fact lower due to less aggressive marketing then the pure alcohol conversion factor would have been closer to 38.5%. Conversely, had there been an increasing trend toward consumption of pre-mixed spirits then the conversion factor for 1995/96 would have been lower. Thus in the absence of additional data, an alcohol conversion

### *Methods and main findings*

factor for total spirits in Tasmania of 30% appears to be a conservative and reasonable estimate.

**Table 44:**  
Estimated per capita consumption of total spirits (not pure alcohol) for Tasmania, Western Australia and Victoria, 1991/92-1995/96

Year	Tas	WA	Vic
1991/92	2.28	4.05	3.28
1992/93	2.36	4.40	3.12
1993/94	2.41	4.98	3.50
1994/95	2.87	5.77	3.81
1995/96	2.96	6.14	4.20

#### **2.5.7.4 Summary**

Table 45 summarises the conversion factors for beverages as calculated in this section. Alcohol volumes for 1990/91 were discussed earlier and are not presented as conversion factors in this table.

**Table 45:**  
Summary of pure alcohol conversion factors for Tasmania, 1990/91-1995/96

Year	Total Beer	High Beer	Medium/Low Beer	Total Wine	High Wine	Medium Wine	Total Spirits
1990/91	na	na	na	na	na	na	na
1991/92	0.046	-		0.114	-	-	0.285
1992/93	0.046	-		0.113	-	-	0.285
1993/94	-	0.048	0.028	-	0.115	0.048	0.285
1994/95	-	0.048	0.028	-	0.114	0.048	0.285
1995/96	-	0.048	0.028	-	0.115	0.048	0.285

#### **2.5.8 Australian Capital Territory**

For the Australian Capital Territory only total annual franchise fees were available, without any distinction by beverage type. In the absence of beverage specific data it was necessary to make various assumptions about the beverage preferences by utilising data obtained for a similar region. Table 46 shows the annual value of total

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liquor licensing fees collected throughout the Australian Capital Territory between 1990/91 and 1996/97.

**Table 46:**  
**Annual value of liquor licensing fee for ACT,**  
**1990/91-1996/97**

Year	Licensing Fee (\$)
1990/91	9,400,000
1991/92	10,000,000
1992/93	11,930,000
1993/94	12,900,000
1994/95	13,030,000
1995/96	14,250,000
1996/97	13,600,000

The approach here is to convert total dollar fees to volumes by beverage. Prior to this it was necessary to estimate the proportions of total beer, total wine and total spirits purchases that contributed to the annual fees in the Australian Capital Territory.

Since there was no specific information available for the Australian Capital Territory on beverage consumption patterns, proportions of main beverage types were identified from a similar surrogate region. Using demographic data, and considering nearby Queanbeyan and Sydney, Sydney was identified as most typical of The Australian Capital Territory (see Tables A1 through A4 in Appendix 1). Table 47 shows the proportions of total dollar value of purchases for high beer, low/medium beer, total wine and total spirits based upon available data for Sydney. The 1996/97 figures have been replicated from the 1995/96 results in order to complete the series for the available Australian Capital Territory data.

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**Table 47:**  
**Percentage of total value of alcohol purchases by beverage type,**  
**Sydney, 1990/91-1995/96**

Year	High Beer (%)	Low/Medium Beer (%)	Total Wine (%)	Total Spirits (%)
1990/91	41.67	5.01	29.49	23.82
1991/92	40.89	4.92	30.17	24.01
1992/93	42.28	4.54	29.57	23.60
1993/94	42.89	3.82	30.65	22.64
1994/95	41.18	3.33	32.58	22.91
1995/96	41.99	3.56	32.28	22.17
1996/97	41.99	3.56	32.28	22.17

Due to a change in the licensing fee structure in 1992/93 in the Australian Capital Territory, for the purposes of estimating beverage proportions, it was also necessary to divide the licensing fee data into two parts: those fees obtained prior to mid 1992/93 and those after mid 1992/93. Prior to the second half of 1992/93 licensing fees was 10% of the total value of alcohol purchases made by individual licensed premises. After this time, a differential tax was introduced where the fee was calculated at 7% for low beer and 13% for all other products. Thus, for the first half of 1992/93, a total of \$5,150,000 in licensing fees was collected, for the remainder of 1992/93 the sum was \$6,780,000.

As shown in the examples below, this required different methods to estimate beverage specific value of purchases before and after the tax changes.

**Total, 1990/91 to December 1992.**

$$B_x = AF_y * P_{NSW,x} * (1/0.1)$$

**Low beer, January 1993 to 1996/97.**

$$B_{lb} = AF_y / (0.7 + (0.13 / (PH_{NSW,x} / (1 - PH_{NSW,x}))))$$

**High beer, wine and spirits, January 1993 to 1996/97.**

$$B_{(non-lb)x} = (AF_y - (B_{lb} * 0.7)) * PH_{NSW,x} * (1/0.13)$$

Where,

$B_x$  = estimated value of purchase of beverage  $x$ , (i.e. high beer, low beer, spirits, wine).

$B_{lb}$  = estimated value of purchase of low beer

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$B_{(non-lb) x}$  = estimated value of purchase of beverage x, except low beer, (i.e. high beer, spirits, wine).

$AF_y$  = specific annual Fee for year y.

$P_{NSW, x}$  = proportion of total dollar value of all purchases in New South Wales for beverage of interest

$PH_{NSW, x}$ = proportion of total dollar value of all non-low beer purchases (high beer, wine and spirits) in New South Wales for beverage x.

Following the application of the above formulae, annual dollar value for beverages was estimated as shown in Table 48. The estimates for the two parts of 1992/93 have been summed here.

**Table 48:**  
**Estimated value by beverage types in the ACT, 1990/91-1996/97**

Year	High Beer (\$)	Low/ Medium Beer (\$)	Total Spirits (\$)	Total Wine (\$)	Total (\$)
1990/91	39,172,208	4,714,015	22,390,841	27,722,936	94,000,000
1991/92	40,894,606	4,921,290	24,011,830	30,172,273	100,000,000
1992/93	44,384,826	4,391,903	24,779,643	31,045,018	104,601,390
1993/94	43,443,431	3,359,234	22,933,501	31,045,020	100,781,185
1994/95	42,004,735	3,001,446	23,376,219	33,233,652	101,616,052
1995/96	46,914,613	3,483,004	24,763,752	36,061,556	111,222,925
1996/97	44,774,648	3,324,130	23,634,177	34,416,643	106,149,598

The value estimates in Table 48 were then converted to volumes assuming the same volume to value ratios evident for Sydney as shown in Table 49.

**Table 49:**  
**Volume to value ratio for beverage specific alcohol purchases in Sydney, 1990/91-1996/97**

Year	High Beer	Low/Medium Beer	Total Spirits	Total Wine
1990/91	2.00	1.59	20.00	2.78
1991/92	2.00	1.59	20.00	3.03
1992/93	2.00	1.59	20.00	3.23
1993/94	2.07	1.63	20.00	4.17
1994/95	2.21	1.62	20.00	4.55
1995/96	2.30	1.65	20.00	3.85

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1996/97	2.30	1.65	20.00	3.85
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The resulting volume estimates by beverage for the Australian Capital Territory, based on Sydney consumption patterns are shown in Table 50.

**Table 50:**  
Estimated beverage specific volumes (litres) for the ACT, 1990/91-1996/97

Year	High Beer	Low/Medium Beer	Total Spirits	Total Wine
1990/91	19,597,374	2,956,376	1,119,542	9,980,257
1991/92	20,459,069	3,086,367	1,200,592	9,956,850
1992/93	22,205,183	2,754,364	1,238,982	9,623,956
1993/94	20,979,085	2,062,318	1,146,675	7,450,805
1994/95	19,006,905	1,848,668	1,168,811	7,311,403
1995/96	20,390,906	2,109,951	1,238,188	9,376,005
1996/97	19,460,795	2,013,708	1,181,709	8,948,327

The conversion factors for the Australian Capital Territory are summarised in Table 51. Conversion factors have been based upon Sydney data for high beer, however for low beer, wine and spirits conversion factors for the whole of New South Wales have been applied.

**Table 51:**  
Summary of pure alcohol conversion factors by beverage type,  
for ACT, 1990/91-1996/97

Year	High Beer	Low Beer	Total Wine	Total Spirits
Source	Sec. 2.2	Sec 2.1	Sec. 3.2	Sec. 3.2
1990/91	0.048	0.029	0.115	0.333
1991/92	0.048	0.028	0.115	0.324
1992/93	0.048	0.028	0.115	0.315
1993/94	0.048	0.028	0.114	0.304
1994/95	0.048	0.028	0.115	0.290
1995/96	0.048	0.029	0.115	0.275
1996/97	0.048	0.029	0.115	0.275

## 2.6 Beverage volumes by state and territory

Tables 52 through 59 provide summary of the totalled or estimated litres of beverage consumed within each state or territory from 1990/91 through 1998/99 where available. Combined with information on the conversion factors specific to each year, beverage and jurisdiction as discussed above and information on the division of each jurisdiction into its metropolitan and non-metropolitan components, the total amount of pure alcohol consumed in each jurisdiction (by beverage, by metropolitan and non-metropolitan and year) can then be calculated.

**Table 52:**  
Quantities of beverage consumed for New South Wales in litres, available years

Year	Low Beer	High Beer	All Beer	Low Wine	High Wine	All Wine	All Spirits
1990/91	-	-	662,212,680	-	-	148,375,360	22,983,750
1991/92	-	-	638,206,800	-	-	148,206,660	22,852,900
1992/93	77,703,000	515,843,000	593,546,000	-	-	122,187,000	21,932,000
1993/94	68,435,000	525,897,000	594,332,000	-	-	117,464,000	22,396,000
1994/95	64,527,000	507,503,000	572,030,000	-	-	120,085,000	23,647,000
1995/96	76,932,000	504,699,000	581,631,000	-	-	119,584,000	24,533,000
1996/97	-	-	-	-	-	-	-
1997/98	-	-	-	-	-	-	-
1998/99	-	-	-	-	-	-	-

**Table 53:**  
Quantities of beverage consumed for Victoria in litres, available years

Year	Low Beer	High Beer	All Beer	Low Wine	High Wine	All Wine	All Spirits
1990/91	80,974,312	324,670,511	405,644,823	133,106	67,125,192	67,258,298	15,931,098
1991/92	86,530,252	280,986,232	367,516,484	197,678	70,328,616	70,526,294	14,629,471
1992/93	90,261,444	257,436,611	347,698,055	289,044	66,209,190	66,498,234	13,973,987
1993/94	75,477,403	268,302,972	343,780,375	491,220	69,209,159	69,700,379	15,694,354
1994/95	80,476,405	280,274,256	360,750,661	302,196	72,285,942	72,588,138	17,192,870
1995/96	71,889,835	258,551,623	330,441,458	238,810	68,690,661	68,929,471	19,164,418
1996/97	-	-	-	-	-	-	-
1997/98	-	-	-	-	-	-	-
1998/99	-	-	-	-	-	-	-

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**Table 54:**  
**Quantities of beverage consumed for Queensland in litres, available years**

Year	Low Beer	High Beer	All Beer	Low Wine	High Wine	All Wine	All Spirits
1990/91	-	-	-	-	-	-	-
1991/92	-	-	330,438,210	-	-	39,533,407	10,317,369
1992/93	-	-	344,036,631	-	-	57,225,695	15,078,216
1993/94	-	-	343,167,991	-	-	67,211,770	17,249,259
1994/95	-	-	349,244,833	-	-	63,107,379	23,436,893
1995/96	-	-	350,382,315	-	-	59,247,820	20,140,438
1996/97	-	-	-	-	-	-	-
1997/98	-	-	-	-	-	-	-
1998/99	-	-	-	-	-	-	-

**Table 55:**  
**Quantities of beverage consumed for South Australia in litres, available years**

Year	Low Beer	High Beer	All Beer	Low Wine	High Wine	All Wine	All Spirits
1990/91	27,875,000	103,520,000	131,395,000	4,249,666	27,399,956	31,649,622	6,495,286
1991/92	39,241,000	103,386,000	142,627,000	4,579,000	28,303,325	32,882,325	5,891,700
1992/93	34,673,000	98,145,000	132,818,000	3,299,666	26,921,332	30,220,998	5,692,932
1993/94	29,708,000	98,858,000	128,566,000	2,901,300	24,714,061	27,615,361	5,549,173
1994/95	22,737,000	94,003,000	116,740,000	1,722,600	24,809,479	26,532,079	5,851,378
1995/96	20,224,000	89,303,000	109,527,000	3,381,200	24,986,323	28,367,523	7,012,998
1996/97	-	-	-	-	-	-	-
1997/98	-	-	-	-	-	-	-
1998/99	-	-	-	-	-	-	-

**Table 56:**  
**Quantities of beverage consumed for Western Australia in litres, available years**

Year	Low Beer	High Beer	All Beer	Low Wine	High Wine	All Wine	All Spirits
1990/91	58,444,276	117,219,687	175,663,963	1,535,856	23,386,363	24,922,219	6,027,407
1991/92	67,486,806	118,734,991	186,221,797	1,596,769	27,711,564	29,308,333	6,718,758
1992/93	69,171,980	111,046,962	180,218,942	1,985,381	31,016,235	33,001,616	7,375,833
1993/94	69,109,844	111,788,012	180,897,856	2,320,096	30,215,718	32,535,814	8,484,164
1994/95	70,040,606	116,491,409	186,532,015	2,663,196	30,998,198	33,661,394	9,992,763
1995/96	68,673,643	114,859,005	183,532,648	2,407,067	31,283,981	33,691,048	10,831,457
1996/97	66,601,212	117,024,620	183,625,832	2,940,058	33,369,358	36,309,416	11,419,151
1997/98	63,856,986	120,448,961	184,305,947	857,726	37,749,347	38,607,073	14,348,731
1998/99	73,224,590	126,550,812	199,775,402	126,824	40,232,058	40,358,882	15,014,809

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**Table 57:**  
**Quantities of beverage consumed for the Australian Capital Territory in litres,  
available years**

Year	Low Beer	High Beer	All Beer	Low Wine	High Wine	All Wine	All Spirits
1990/91	2,956,376	19,597,374	22,553,750	-	-	9,980,257	1,119,542
1991/92	3,086,367	20,459,069	23,545,436	-	-	9,956,850	1,200,592
1992/93	2,754,364	22,205,183	24,959,547	-	-	9,623,956	1,238,982
1993/94	2,062,318	20,979,085	23,041,403	-	-	7,450,805	1,146,675
1994/95	1,848,668	19,006,905	20,855,572	-	-	7,311,403	1,168,811
1995/96	2,109,951	20,390,906	22,500,858	-	-	9,376,005	1,238,188
1996/97	2,013,708	19,460,795	21,474,503	-	-	8,948,327	1,181,709
1997/98	-	-	-	-	-	-	-
1998/99	-	-	-	-	-	-	-

**Table 58:**  
**Quantities of beverage consumed for Tasmania in litres, available years**

Year	Low Beer	High Beer	All Beer	Low Wine	High Wine	All Wine	All Spirits
1990/91	-	-	-	-	-	-	-
1991/92	-	-	46,525,910	-	-	4,971,904	1,069,794
1992/93	-	-	48,075,073	-	-	5,027,146	1,113,611
1993/94	4,810,502	41,921,898	46,732,400	372,429	5,043,821	5,416,250	1,141,391
1994/95	4,759,900	43,708,419	48,468,319	612,309	4,965,939	5,578,248	1,359,127
1995/96	5,116,706	41,357,415	46,474,121	939,422	4,913,793	5,853,215	1,405,119
1996/97	-	-	-	-	-	-	-
1997/98	-	-	-	-	-	-	-
1998/99	-	-	-	-	-	-	-

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**Table 59:**  
Quantities of beverage consumed for the Northern Territory in litres, available years

NT	Low Beer	High Beer	All Beer	Low Wine	High Wine	Cask and Bottle Wine	Fortified Wine	Cider (high)	All Wine	Premixed Spirits	Neat Spirits	All Spirits
1990/91	-	-	30,852,415	679	5,105,261	-	-	-	5,105,940	-	-	1,065,497
1991/92	-	-	30,637,095	1,226	5,061,078	-	-	-	5,062,304	152,826	792,107	944,933
1992/93	-	-	28,673,346	9,992	4,566,169	-	-	-	4,576,161	-	758,292	984,283
1993/94	-	-	29,044,510	14,285	4,696,343	-	-	-	4,710,628	-	828,891	1,191,278
1994/95	-	-	28,586,528	40,190	-	4,355,670	151,817	577,919	5,125,596	432,012	747,930	1,179,942
1995/96	-	-	29,543,058	43,260	-	3,513,693	162,116	667,216	4,386,284	526,217	737,820	1,264,037
1996/97	-	-	29,879,343	42,331	-	3,867,337	231,998	690,769	4,832,436	649,731	786,190	1,435,921
1997/98	-	-	30,222,592	44,232	-	4,494,751	211,054	732,883	5,482,920	836,349	914,268	1,750,617
1998/99	-	-	30,908,592	18,295	-	4,140,293	186,155	767,773	5,112,516	1,066,891	859,040	1,925,931

## 2.7 Service population\*

### 2.7.1 Methodology

While annual alcohol consumption figures were obtained through calculations described above, a fundamental problem remains in defining and determining the appropriate population for calculating APCC. Ideally the population is the sum of consumers of alcohol within each state and territory that includes both individuals who are residents and those who are visitors, including overseas tourists, interstate tourists, students, individuals on business trips and so on. Unfortunately, there are no comprehensive data sources available to allow such estimates to be easily made (Cook, 1996; Lee, 1999).

The Australian Bureau of Statistics provides annual estimates of resident population (ERP) for states and territories but this specifically excludes tourists and other visitors. For the purpose of ERP, an individual is considered a resident if he or she spends at least six months of the year in the area of interest (ABS, 1991; Bell and Ward, 1998a). Further, the ERP does not take into account the fact that residents may spend some time away from their home during the year. These days away may be holidays, whether overseas, interstate or even intrastate, business trips or even daily work related travel between home and office. So, while ERP may be an excellent measure of the total population residing in an area, it may in fact be a poor measure of the number of persons in that area on a daily basis.

The five-year census includes questions on a person's usual residence, thus allowing the calculation of both the number of residents and visitors in any particular area. However, as the census is restricted to one night of the year every five years it is not comparable to annual data and is unlikely to be representative of the usual number of persons in any particular area (Bell and Ward, 1998a). This is because, firstly, the census is taken by the ABS on a date that is thought to be most likely to have the maximum number of persons in their normal residence (Bell and Ward, 1998a). That date has for all census since 1961 been in winter, thus minimising the effect of holiday travel. Secondly, the climate of Australia is likely to divide the travel patterns of north and south in such a way that the two are not comparable, for example, it

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might be expected that during winter more people would be holidaying in the north of the country than in the south. During the summer months, the southern states are a more popular destination for holiday makers.

This problem of measuring the number of persons actually in an area versus the number of people that reside in the area has been recognised by demographers, planners and all manner of other social researchers for some time. As yet there have been few attempts in Australia to calculate such a population, usually termed a “service population” because more persons consume the services of an area than residents alone. Interest in the service population has grown by the need of planners and government to appropriately fund development based on the size of the residential and visitor population and by social researchers to determine relationships between population and behaviour (Cook, 1996; Bell and Ward, 1998a; Lee, 1999; Smith, 1989, 1994). The aggregate consumption of alcohol by regions is a good example of the latter endeavour. It is clearly inappropriate to measure the alcohol consumption in an area by the residents if many of the residents are absent or many tourists spend time in the area.

While the value of the service population concept has been recognised in Australia, there has been little success in calculating it (Cook, 1996; Lee, 1999). The ABS has put significant resource into considering service population (Cook, 1996; Lee, 1999) but has concluded that it is not feasible given the available data and the multitude of individual definitions put forward. Indeed, when the ABS was asked to provide a quotation on providing service population for the present study, they declined on this basis.

In order to calculate a service population for the present purposes the approach was to restrict the population of interest to an estimate of the yearly average number of persons in an area as measured by the average number of overnight consumers present in each region on a typical day. This is an appropriate measure when looking at large areas (as in the metropolitan and non-metropolitan areas of states and territories) and means that the calculations can be based upon the most readily available statistical data. This approach avoids the difficulties experienced by the ABS in attempting to define a more general service population that would satisfy a multitude of different applications (Cook, 1996; Lee, 1999) and in restricting the method to the use of the most readily available census and survey data.

The estimated service population (ESP) figures presented in this report were calculated using a component method. The three main components of the estimates (see Figure 1) being:

- (1) Residents at home;
- (2) Persons (visitors) in paid public accommodation and
- (3) Persons (visitors) in other accommodation.

Each of these three components is estimated as the average number of persons present per day based upon the available data. For the purpose of calculating APCC for alcohol, consumers are limited to those 15 years and older and exclude individuals in hospitals and prisons. The remainder of this discussion considers each of these components in turn and then presents the formula used for the calculations.

### *Residents*

Residents are those persons counted by the ERP less a proportion of residents likely to be away from their home on a typical night. This is calculated by multiplying the ERP for the year by a ratio that expresses the average number of residents at home on census night. This ratio is based upon census data. While ERP is available annually with census data only available every five years this ratio must be considered approximate only. It is acknowledged that the census is not the ideal source for determining such a ratio—the census is specifically designed to count the minimal number of visitors and is likely to be unrepresentative for the nation as a whole given the climatic differences between the north and south. It is assumed that such an approach results in less error than in assuming residents are never away from home. Residents that are away from their homes but staying at other accommodation within the same region will be subtracted from ERP here but are assumed to be counted in either of the two other accommodation groups below.

### *Persons in paid public accommodation*

Persons in paid public accommodation are estimated based upon the ABS quarterly “Tourist Accommodation” statistics<sup>1</sup>. These publications count persons staying in

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<sup>1</sup> This data was sourced from the ABS quarterly series “Tourist Accommodation” (Catalogue Numbers: 8635.1, 8635.2, 8635.3, 8635.4, 8635.5, 8365.6 and 8365.7).

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hotels, motels, guesthouses and serviced apartments. The average number of persons in paid accommodation is then calculated by dividing total guest nights by the number of days in the year.

To estimate only those persons who are 15 years and older it is necessary to adjust total guest nights as they include all persons. The method used here was to take the mean of the following two ratios:

- (1) residents 15 years and older and total residents according to ERP, and
- (2) the census count of residents 15 years and older away on census night and the total census count of all residents away on census night.

The reason for not relying solely on the census in this ratio is that as the census night is chosen as a time when more people are likely to be home, the number of people 15 years and older away from home is likely to be underestimated. This ratio can then be multiplied against total guest nights to determine the total number of guest nights by people 15 years and older. It is acknowledged that this ratio is not the best given that it is a measure more of the local population than visitors, however, the inclusion of the census data is expected to improve the result a little and introduces less error than excluding it.

As the ABS quarterly tourist data is likely to under-count persons in paid accommodation because, for example, in 1999 it only counts premises with more than 15 rooms, a weighting factor is used to adjust for this under-count. The weighting is calculated by comparing the number of persons in paid accommodation on census night against the average number of persons in paid accommodation according to the ABS tourist survey during the winter quarter (the census was conducted in winter) of the census year. The ratio may be affected by temporary events, such as conferences or sporting events so the 1991 and 1996 figures were averaged to minimise the effect of any unusual circumstances on the census nights. The weighting is then multiplied against the tourist numbers.

### *Persons in other accommodation*

The final group is referred to as persons in other accommodation. These are tourists and other visitors who tend to stay in private accommodation or in facilities not counted in the ABS quarterly tourist survey. These could be seasonal workers, students, fly-in fly-out (FIFO) workers, and tourists staying with friends in private

accommodation and so on. While there are numerous assumptions and problems in using census data to determine this group of visitors, census data appears to be the only source of data available. With census data, this group can be calculated by subtracting those persons in residential or paid public accommodation from the total census count. This remainder must, by definition, be in "other" accommodation. It must be stressed that while this calculation is simple and logical, the result is less representative than is desirable given the present definition of service population as being for an "average day" (overnight total). This is because of the factors with regard to census data already mentioned: census data is collected only on one night that may or may not be representative year round. It is possible that some groups such as students and seasonal or FIFO workers may not be counted correctly because of this limitation.

#### *Post calculation adjustments*

Since data from the two censuses (1991 and 1996) are used in the calculations, service population is affected by the acknowledged under-count of overseas visitors in the census. No official estimates of this under-count were available but based on a statement on "missing overseas visitors" by the ABS (ABS, 1997:3) and information from Department of Immigration and Multicultural Affairs (DIMA, 1997:8) an estimate of the under-count of overseas visitors was made. This estimate was then converted into a ratio that was applied towards the completion of the calculation of service population.

The final calculation required is to subtract persons in prisons or hospital from the service population, as they would not be consuming alcohol and need to be excluded from the total consumers for the purpose of the current service population.

## ***Methods and main findings***

### ***Formula***

The basic formula for calculating service population is:

$$\text{ESP}_{15+} = (((\text{ERP}_{15+} * \text{RA}_r) + (\text{TGN}_{15+} / \text{DAYS}) + \text{CTV}_{15+}) * (1 + \text{RU}_v)) - \text{CPR}_{15+} - \text{CHS}_{15+}$$

Where,

$\text{ESP}_{15+}$  = estimated service population 15 years and older in the region;

$\text{ERP}_{15+}$  = estimated resident population 15 years and older in the region;

$\text{RA}_r$  = ratio of average number of residents 15 years and older at home per day:

$$1 - (\text{CAW}_{15+} / \text{CTR}_{15+})$$

Where,

$\text{CAW}_{15+}$  = census count of residents 15 years and older away from home;

$\text{CTR}_{15+}$  = census count of residents 15 years and older;

$\text{TGN}_{15+}$  = estimated number of publicly accommodated tourists as guest nights in year adjusted for population 15 years and older:

$$\text{TGN} * ((\text{ERP}_{15+} / \text{ERP}_{\text{tot}}) + (\text{CAW}_{15+} / \text{CAW}_{\text{tot}})) / 2 * \text{RT}_v$$

Where,

$\text{TGN}$  = total guest nights

$\text{ERP}_{15+}$  = estimated resident population 15 years and older in the region;

$\text{ERP}_{\text{tot}}$  = total estimated resident population in region;

$\text{CAW}_{15+}$  = census count of residents 15 years and older away from home;

$\text{CAW}_{\text{tot}}$  = census count of total residents away from home;

$\text{RT}_v$  = ratio of expected under-count of tourist nights:

$$((\text{CHA}_{\text{tot}1991} / \text{TNW}_{q1991}) + (\text{CHA}_{\text{tot}1996} / \text{TNW}_{q1996})) / 2$$

Where,

$\text{CHA}_{\text{tot}}$  = census count of all persons in hotels, motels, serviced apartments and guest houses on census night

$\text{TNW}_q$  = average total guest nights per day for winter quarter;

$\text{DAYS}$  = number of days in the year (365 or 366)

$\text{CTV}_{15+}$  = number of privately accommodated visitors (persons 15 years and older) on census night:

$$\text{CTV}_{15+} = \text{CCT}_{15+} - (\text{CRC}_{15+} + \text{CHA}_{15+})$$

Where,

$\text{CCT}_{15+}$  = census count of all persons enumerated 15 years and older;

$\text{CRC}_{15+}$  = census count of residents 15 years and older at home;

$\text{CHA}_{15+}$  = census count of persons 15 years and older enumerated in hotels, motels, serviced apartments and guest houses on census night;

$\text{RU}_v$  = Ratio for under-count of overseas visitors in Australia (1991 approx. 0.40% and 1996 approx. 0.68%)

$\text{CPR}_{15+}$  = census count of persons 15 years and older enumerated in prisons;

$\text{CHS}_{15+}$  = census count of persons 15 years and older enumerated in hospitals.

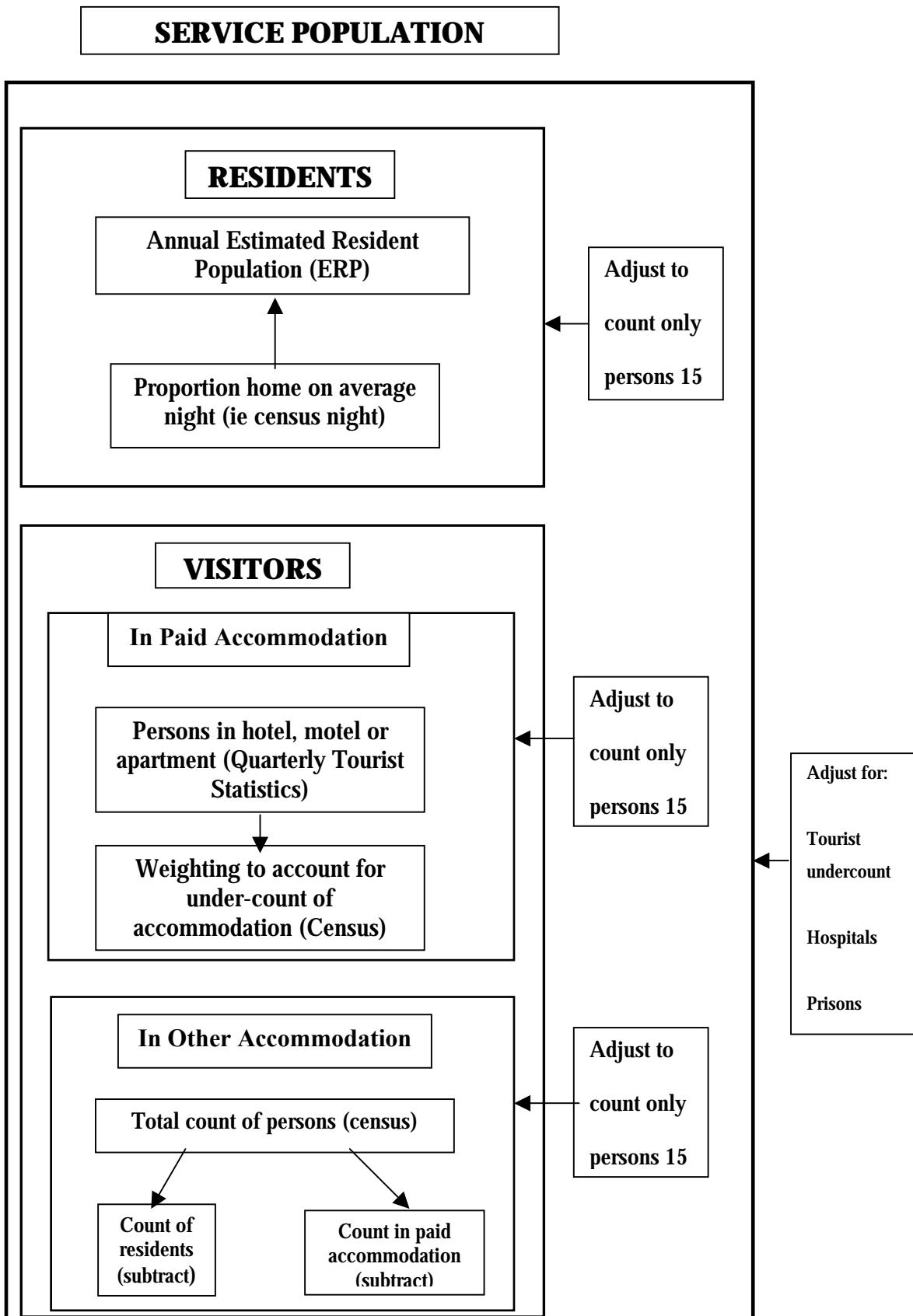


Figure 1: Components of service population as defined in this monograph

## **2.7.2 Results**

Table 60 compares the resulting estimated service population (ESP) against census counts (CC) and estimated resident population (ERP) for the two census years, 1991 and 1996. The totals for both metropolitan and non-metropolitan areas are presented. ESP tends to be within one or two percent of ERP for both 1991 and 1996. However, Queensland and Northern Territory ESP are much greater than ERP, particularly when considering non-metropolitan regions. Western Australia's non-metropolitan area is also larger than the ERP. Victoria, Tasmania and South Australia tend to have a service population around 1% smaller than the ERP. This is particularly so for 1996.

Compared to census counts, ESP tends to be significantly higher across the states and territories, ranging from 3% to 7% greater. Differences are greater in 1991, particularly for New South Wales, Victoria, Northern Territory, Western Australia and the Australian Capital Territory at 5% or more than the census counts. For 1996, the differences are more moderate and range from 2 to 5%. Western Australia, New South Wales and Victoria record the greatest differences between ESP and census counts. These differences can be accounted for by a variety of reasons, for example, the under count of overseas tourists, and the fact that the census measures only one night while the ESP is an average over a complete year. However, the greatest differences are likely due to the mobility of the population, particularly of people working in the north of the country, which is poorly measured by the census.

It should be noted that the original calculations for the service population were based upon estimates for all statistical divisions of each state and territory. While not presented here, the differences between ESP and ERP at the geographic level of the statistical division show a greater variation than those at the aggregate metropolitan and non-metropolitan level.

## **2.7.3 Improvements to service population estimates**

The reliability of the service population estimates depends on the quality of the input data. The greatest component of the service population is made up of the resident population. The resident population component was measured using annual ABS ERP figures, which are considered an extremely reliable data source. However, for some

states only preliminary ERP figures were available for some years (Table 2). A first improvement would then be the use of updated ERP inputs, which can only be obtained from the ABS.

Methodologically, improvements to the manner in which the ratios that were created in order to calculate the components of the visitor population, such as adjusting for visitors under 15 years of age, would be valuable. However, given the available data it is not clear at this time how such improvements can be made.

Finally, groups such as students, seasonal or FIFO workers may not be counted correctly due to the limitation of the census being only one night out of every five years. Some areas can also be affected by special events during census night, such as conferences or sporting events. In the present method, the average expected under-count of such persons has been calculated approximately using census and tourist survey data for 1991 and 1996. This under-count is also likely to include caravan park residents and overseas visitors. The present adjustment for the under-count of overseas visitors was made in a crude way due to lack of information. In the future, data on overseas visitors that is available from the Department of Immigration and Multicultural Affairs since 1997 can be applied. For caravan parks it might be possible to obtain survey data on the resident population. Similarly, more accurate yearly counts of prison and hospital populations would also improve the current method.

*Methods and main findings*

Table 60:

Service population (ESP) for states and territories compared to estimated resident population (ERP) and census counts (CC) for 1991 and 1996

State	Metro/Non-metro	ESP 1991	ESP 1996	ERP 1991	ERP 1996	Diff91	Diff96	CC 1991	CC 1996	Diff91	Diff96
NSW	Metropolitan	2,972,832	3,122,003	2,921,244	3,096,742	1.77%	0.82%	2,791,997	2,974,666	6.48%	4.95%
	Non-metropolitan	1,739,319	1,810,599	1,705,608	1,796,098	1.98%	0.81%	1,673,591	1,771,551	3.93%	2.20%
	Total	4,712,150	4,932,602	4,626,852	4,892,840	1.84%	0.81%	4,465,588	4,746,217	5.52%	3.93%
VIC	Metropolitan	2,521,674	2,612,793	2,515,169	2,629,490	0.26%	-0.63%	2,386,067	2,500,888	5.68%	4.47%
	Non-metropolitan	972,625	973,562	977,584	990,945	-0.51%	-1.75%	913,871	944,402	6.43%	3.09%
	Total	3,494,299	3,586,355	3,492,753	3,620,435	0.04%	-0.94%	3,299,938	3,445,290	5.89%	4.09%
QLD	Metropolitan	1,079,752	1,209,360	1,062,539	1,198,502	1.62%	0.91%	1,038,188	1,170,727	4.00%	3.30%
	Non-metropolitan	1,324,194	1,503,987	1,226,618	1,404,297	7.95%	7.10%	1,263,826	1,462,891	4.78%	2.81%
	Total	2,403,946	2,713,347	2,289,157	2,602,799	5.01%	4.25%	2,302,014	2,633,618	4.43%	3.03%
NT	Metropolitan	63,526	67,672	57,549	62,353	10.39%	8.53%	59,203	66,288	7.30%	2.09%
	Non-metropolitan	71,885	83,079	61,755	70,148	16.40%	18.43%	69,066	79,856	4.08%	4.04%
	Total	135,411	150,751	119,304	132,501	13.50%	13.77%	128,269	146,144	5.57%	3.15%
SA	Metropolitan	850,093	865,664	850,107	870,955	0.00%	-0.61%	817,266	840,181	4.02%	3.03%
	Non-metropolitan	297,790	301,649	296,976	303,773	0.27%	-0.70%	285,928	292,497	4.15%	3.13%
	Total	1,147,883	1,167,312	1,147,083	1,174,728	0.07%	-0.63%	1,103,194	1,132,678	4.05%	3.06%
TAS	Metropolitan	151,513	157,189	152,677	158,279	-0.76%	-0.69%	146,917	152,689	3.13%	2.95%
	Non-metropolitan	203,761	207,915	205,948	210,250	-1.06%	-1.11%	197,587	201,895	3.12%	2.98%
	Total	355,274	365,104	358,626	368,529	-0.93%	-0.93%	344,504	354,584	3.13%	2.97%
WA	Metropolitan	933,555	1,021,849	928,268	1,021,770	0.57%	0.01%	885,353	976,411	5.44%	4.65%
	Non-metropolitan	344,638	369,867	328,178	350,721	5.02%	5.46%	325,593	360,419	5.85%	2.62%
	Total	1,278,193	1,391,716	1,256,446	1,372,491	1.73%	1.40%	1,210,946	1,336,830	5.55%	4.11%
ACT	Metropolitan	222,973	240,219	220,532	240,189	1.11%	0.01%	211,759	231,264	5.30%	3.87%
	Non-metropolitan	326	268	295	256	10.51%	4.69%	480	260	-32.14%	3.08%
	Total	223,299	240,487	220,827	240,445	1.12%	0.02%	212,239	231,524	5.21%	3.87%



## **2.8 Per capita consumption**

Table 61 presents the per capita consumption for each state and territory for the years where data on alcohol consumption is available and where possible split into metropolitan and non-metropolitan components. National APCC is restricted to those years where data for all states and territory is available.

There was a general decline in APCC throughout the 1990s, although Queensland and Western Australia both show predominantly increasing trends. The Northern Territory consistently recorded the highest levels of APCC while the lowest levels of consumption were observed in Victoria. For the majority of jurisdictions it was apparent that the rapid decline in consumption in the early 1990s tapered off by 1995/96. However, jurisdictions with more years of available data (Western Australia and Northern Territory) show that APCC may have increased in recent years.

With the exception of Tasmania and the Northern Territory, non-metropolitan regions showed higher levels of consumption than metropolitan areas. For Tasmania this may be due to the comparatively small metropolitan area. Metropolitan and non-metropolitan comparisons were not available for South Australia and the Australian Capital Territory since authorities were only able to provide consumption data for the whole jurisdiction. The incomplete nature of the data makes regional and national comparison difficult and limits analysis to restricted time frames and geographic areas.

For the nation, the available years of 1991/92 through 1995/96 show a steady decline from 9.81 to 9.03 litres per person. As can be seen on Figure 2 (below), these calculations parallel those of World Drink Trends (2000), which for the years following 1995/96 record a continuation of the decline in per capita consumption. The World Drink Trends estimates were notably higher than the present calculations. However, it has been found that alcohol quantities used by World Drink Trends as measured by the ABS are not necessarily comparable to state level retail consumption due to stockpiling (particularly of spirits) and other effects that occurred at the time of importation. These sources are therefore not completely comparable to the present estimates, but do show a continuation of the existing trend.

Trends in per capita alcohol consumption in Australia, 1990/91-1998/99

**Table 61:**  
Per capita consumption for each state and territory by year and by metropolitan and non-metropolitan division (where available)

Jurisdiction		1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99
ACT	Metro	-	-	-	-	-	-	-	-	-
	Non-metro	-	-	-	-	-	-	-	-	-
	Total	11.41	11.37	11.22	9.61	9.00	10.22	9.66	-	-
NSW	Metro	11.48	11.03	9.25	9.04	9.02	8.77	-	-	-
	Non-metro	12.10	11.65	11.32	11.14	10.54	10.81	-	-	-
	Total	11.71	11.26	10.02	9.83	9.59	9.52	-	-	-
NT	Metro	15.97	16.88	13.22	13.70	15.14	14.86	15.14	16.14	17.33
	Non-metro	17.86	18.00	14.65	14.71	13.42	12.53	14.32	12.77	11.32
	Total	16.97	17.48	13.99	14.25	14.20	13.58	13.71	14.31	14.04
QLD	Metro	-	8.29	9.22	9.50	9.69	9.53	-	-	-
	Non-metro	-	9.33	10.63	10.90	11.04	9.78	-	-	-
	Total	-	8.87	10.00	10.28	10.44	9.67	-	-	-
TAS	Metro	-	8.50	8.71	8.70	9.45	9.11	-	-	-
	Non-metro	-	8.43	8.59	8.40	8.50	8.34	-	-	-
	Total	-	8.46	8.65	8.53	8.91	8.67	-	-	-
SA	Metro	-	-	-	-	-	-	-	-	-
	Non-metro	-	-	-	-	-	-	-	-	-
	Total	9.97	10.05	9.38	8.87	8.46	8.46	-	-	-
VIC	Metro	8.29	7.60	7.04	7.22	7.52	7.00	-	-	-
	Non-metro	9.82	9.43	8.94	8.94	9.29	8.72	-	-	-
	Total	8.72	8.10	7.56	7.69	8.01	7.46	-	-	-
WA	Metro	8.22	8.89	8.95	8.80	9.12	8.78	8.74	9.04	9.50
	Non-metro	12.16	12.77	12.66	12.78	13.10	13.38	13.15	13.19	13.70
	Total	9.28	9.94	9.95	9.88	10.20	10.00	9.91	10.14	10.62
AUST	Metro	-	-	-	-	-	-	-	-	-
	Non-metro	-	-	-	-	-	-	-	-	-

*Methods and main findings*

Total	-	9.81	9.37	9.32	9.34	9.03	-	-	-
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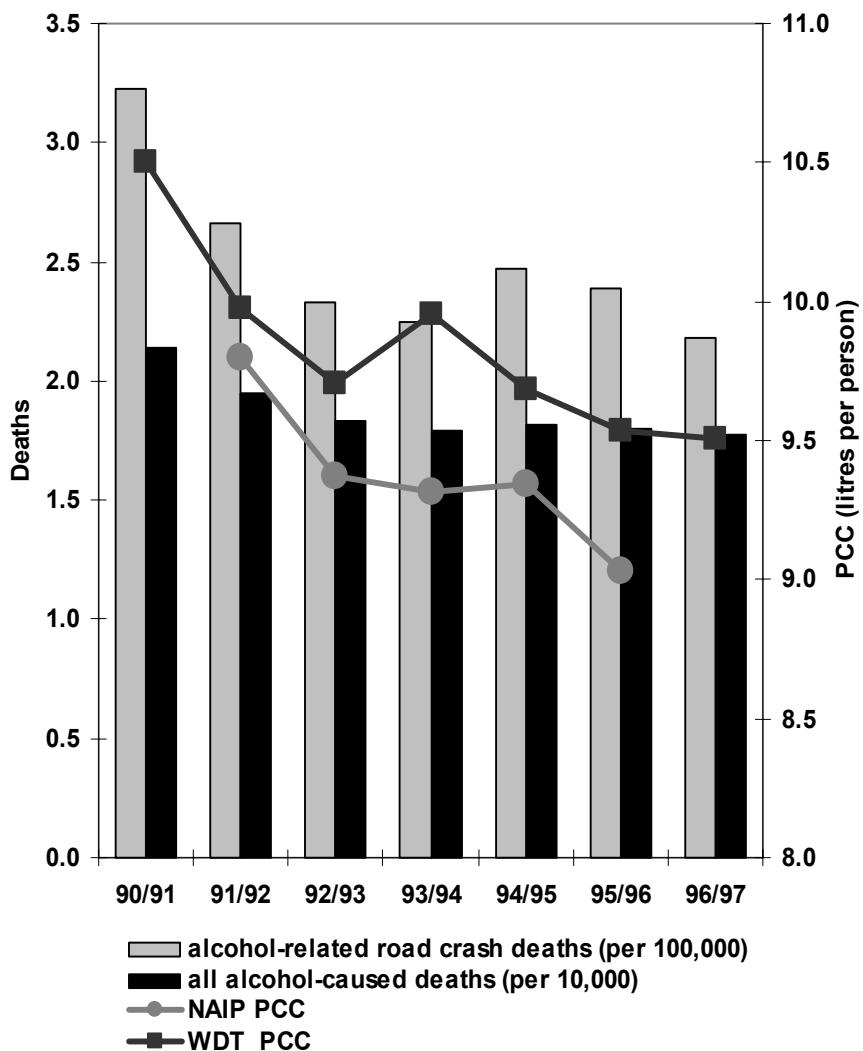
## **3. Discussion**

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### **3.1 The national trend in per capita consumption**

The national trend in APCC was determined by summing the total consumption and service population for all states and territories. Unfortunately, because of the limitations of individual states and territories, in terms of the years and the geographic level that data was collected, the national trend was restricted to 1991/92 through 1995/96. As can be seen in Table 61 this was because these years were the only ones when all states and territories collected data. Similarly, because the Australian Capital Territory and South Australia only provided data for the complete jurisdiction, with no way of dividing out the metropolitan and non-metropolitan components, only the national total could be calculated. The resulting trend of APCC for Australia for 1991/92 through 1995/96 is shown in Figure 2. Per capita consumption during this period fell dramatically from 9.81 to 9.37 litres per person between 1991/92 and 1992/93, remained stable until 1995/96 when another dramatic fall to 9.03 was recorded. This trend was parallel to, though significantly lower than the APCC estimated by World Drink Trends (2000), which is also displayed on Figure 2. As will be discussed in Section 3.5, these two measures are not strictly comparable due to the different data sources used but they do suggest a continuation in the decline of APCC in the years following 1995/96. Figure 2 also shows the trends in two harm measures; the relationship between these and APCC will be discussed in Section 3.3.

### Trends in per capita alcohol consumption in Australia, 1990/91-1998/99



**Figure 2:** Estimated visitor adjusted, national adult per capita alcohol consumption, compared to World Drink Trends (2000) APCC and alcohol-related road crash deaths and all alcohol-caused deaths

Table 62 shows national levels of APCC for different beverage types. The evident decline in consumption is due to significant falls in both regular beer and wine consumption that were only partially offset by increased consumption of low beer and spirits. While the total volume of spirit consumption increased, the pure alcohol consumed in this category declined due to the growing popularity of lower alcohol pre-mixed spirit beverages (e.g. UDL cans). It should also be noted that while pure alcohol consumption of low beer was about five times smaller than high beer, on average, a much larger volume of beverage must be consumed to reach similar levels of pure alcohol to high beer.

**Table 62:**  
**Estimated visitor adjusted national levels of per capita consumption of pure alcohol  
 (litres) by beverage type, 1991/92-1995/96**

Year	Low Beer	Regular Beer	Wine	Spirits	Total
1991/92	0.849	4.773	2.773	1.402	9.796
1992/93	0.905	4.403	2.645	1.420	9.373
1993/94	0.845	4.394	2.627	1.446	9.313
1994/95	0.860	4.312	2.619	1.551	9.343
1995/96	0.898	4.113	2.549	1.469	9.030

### **3.2 State and territory trends in per capita consumption**

Figures 3 through 10 illustrate the trends in APCC for each state and territory for the available years of data and where it was possible, between metropolitan and non-metropolitan components. For most states and territories, there was a general decline in APCC throughout the 1990s, although Queensland, the Northern Territory and Western Australia showed predominantly increasing trends. The Northern Territory consistently recorded the highest levels of APCC while the lowest levels of consumption were observed in Victoria. For the majority of jurisdictions it was apparent that the rapid decline in consumption in the early 1990s had tapered off by 1995/96.

With the exception of Tasmania and the Northern Territory, non-metropolitan regions indicated higher levels of consumption than metropolitan areas. For Tasmania this may have been due to the comparatively small metropolitan area. Metropolitan and non-metropolitan comparisons were not available for South Australia and the Australian Capital Territory since authorities were only able to provide consumption data for the whole jurisdiction.

There also appears to be a distinction between the north and the south of the country. It is notable that the Northern Territory, Western Australia and Queensland, which together contain the northern half of Australia, have higher consumption than the southern states. While the data is not available at the geographic level to confirm this completely (that would require a division of data between the more sparsely

## Trends in per capita alcohol consumption in Australia, 1990/91-1998/99

populated northern halves of Queensland and Western Australia), it is suggestive of different drinking patterns between the north and south of the country.

New South Wales declined from a APCC of 11.71 litres per person in 1990/91 to 9.52 litres per person in 1995/96. Figure 3 shows a steady decline in non-metropolitan APCC from 12.10 litres per person in 1990/91 to 10.81 litres per person in 1995/96. Metropolitan APCC declined sharply between 1990/91 and 1992/93 from 11.48 to 9.25 litres per person and continued to decline steadily to 8.77 litres per person by 1995/96.

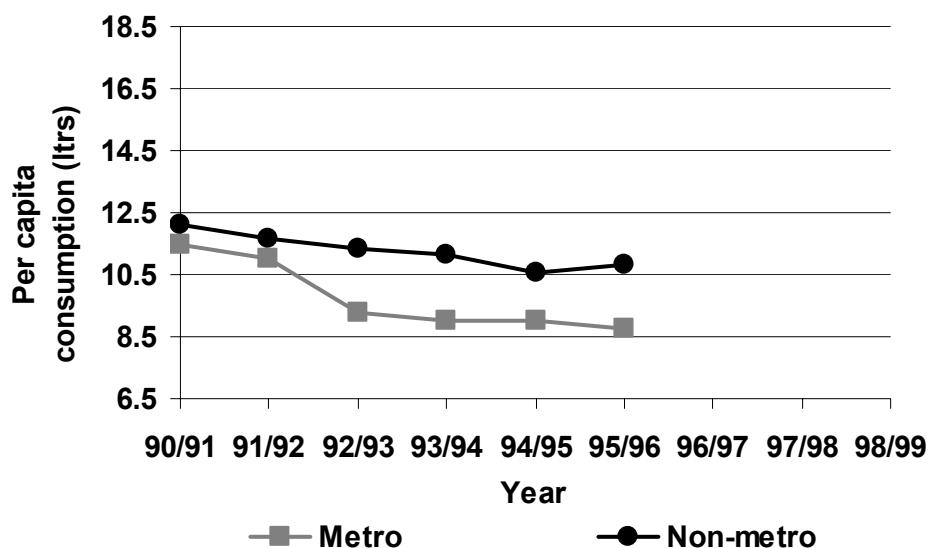
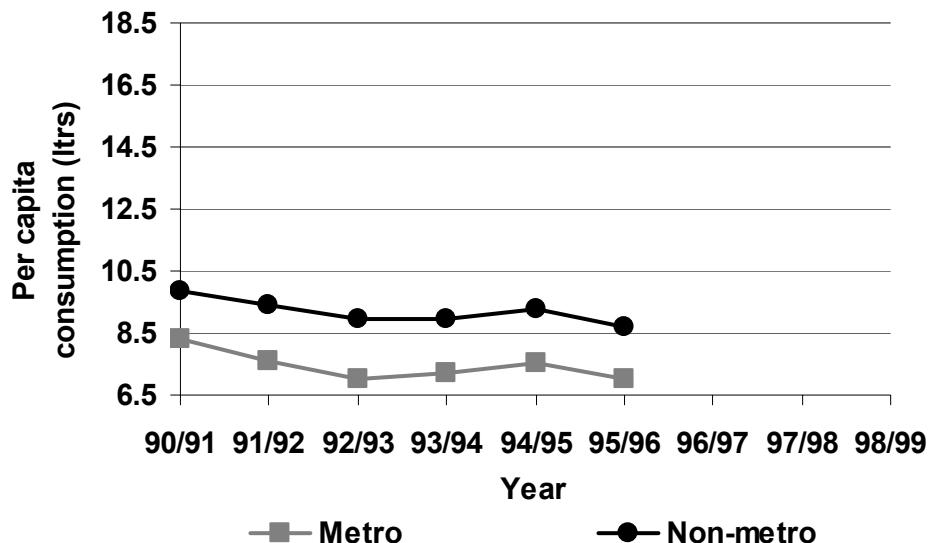


Figure 3: Trends in metropolitan and non-metropolitan adult per capita pure alcohol consumption in New South Wales, 1990/91-1995/96

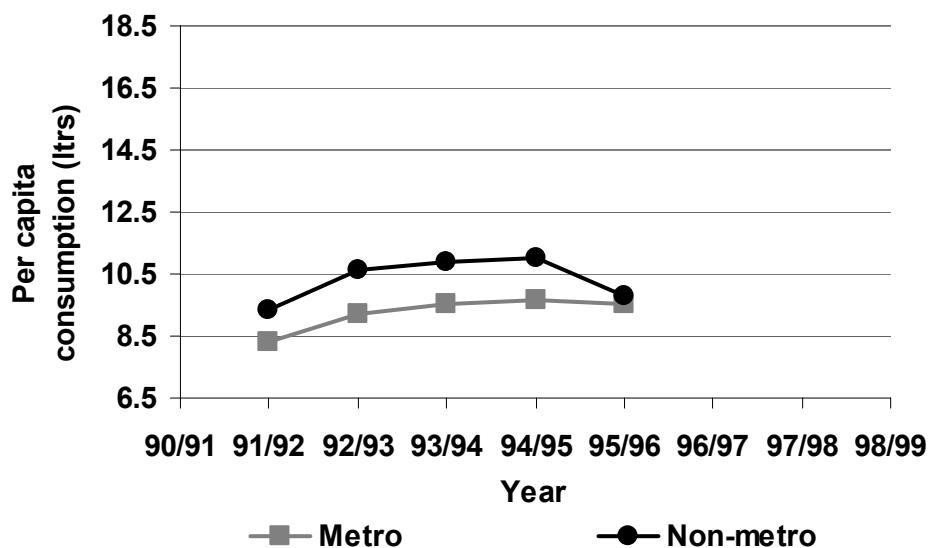
Per capita consumption for Victoria as a whole declined from 8.72 to 7.46 litres per person between 1990/91 and 1995/96. Figure 4 shows that there was a parallel, largely steady decline for both non-metropolitan and metropolitan Victoria. APCC declined from 9.82 to 8.72 litres per person in the non-metropolitan area between 1990/91 and 1995/96 and from 8.29 to 7.00 litres per person in the metropolitan area during the same period.

## *Discussion*



**Figure 4: Trends in metropolitan and non-metropolitan adult per capita pure alcohol consumption in Victoria, 1990/91-1995/6**

In Queensland, APCC rose from 8.87 to 9.67 litres per person between 1991/92 and 1995/96. There appears to have been a significant drop in APCC for non-metropolitan Queensland between 1994/95 and 1995/96, as can be seen in Figure 5. APCC had risen from 9.33 to 11.04 litres per person between 1991/92 and 1994/95 before this drop. For metropolitan Queensland there has been a slowing rise in APCC from 8.29 to 9.53 litres per person between 1991/92 and 1995/96.



**Figure 5: Trends in metropolitan and non-metropolitan adult per capita pure alcohol consumption in Queensland, 1991/92-1995/96**

## Trends in per capita alcohol consumption in Australia, 1990/91-1998/99

As has been discussed previously, alcohol consumption data was only available for the complete state of South Australia, so no metropolitan/non-metropolitan division was possible. In Figure 6, APCC shows a steady decline from 1990/91 through 1994/95 from 9.97 to 8.46 litres per person, though this appears to have levelled off by 1995/96, with APCC recorded again at 8.46 litres per person.

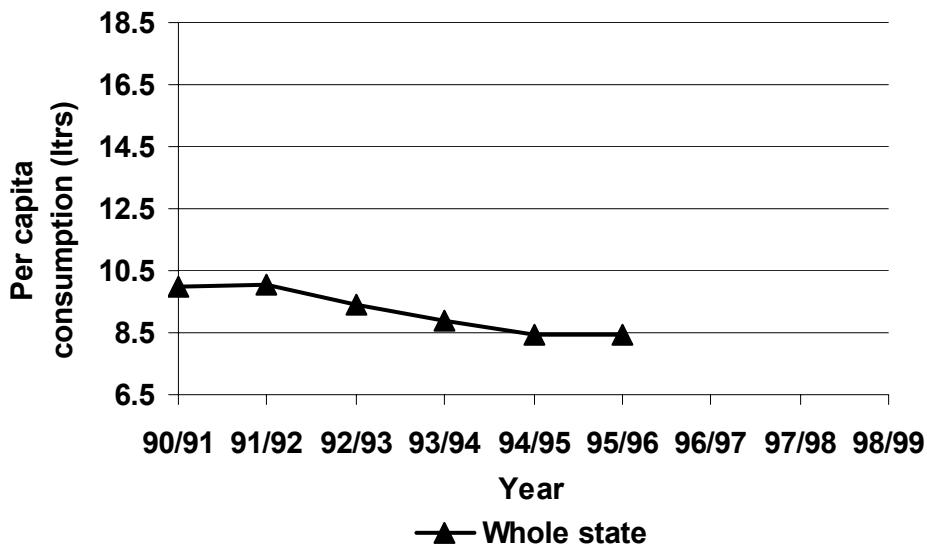
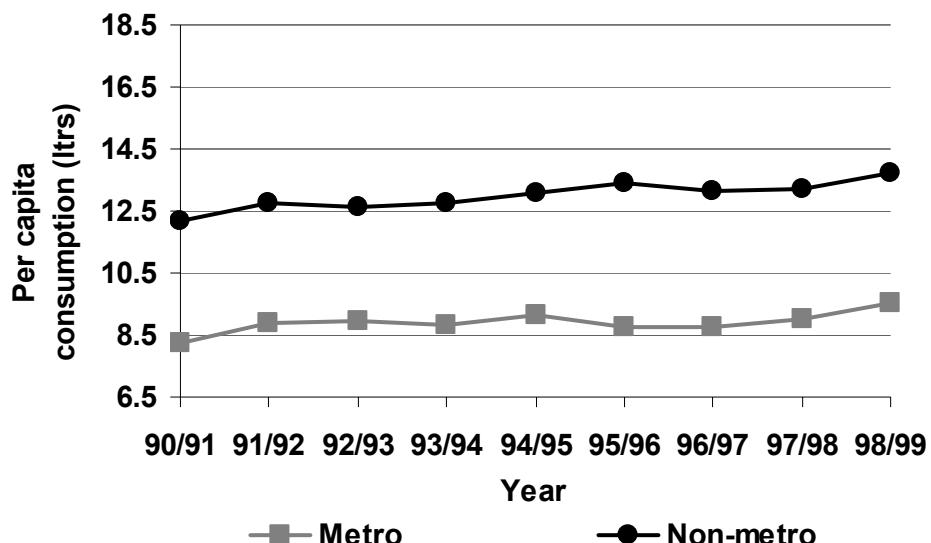


Figure 6: Trends in metropolitan and non-metropolitan adult per capita pure alcohol consumption in South Australia (whole state only), 1990/91-1995/96

Western Australia shows a steady increase in APCC from 9.28 to 10.62 litres per person between 1990/91 and 1998/99. As can be seen in Figure 7, while metropolitan and non-metropolitan Western Australia paralleled each other in terms of the steady rise in APCC, non-metropolitan APCC was significantly higher than that of the metropolitan area by up to around four litres per person. For non-metropolitan Western Australia, APCC rose from 12.16 to 13.70 litres per person between 1990/91 and 1998/99 and metropolitan consumption rose from 8.22 to 9.50 litres per person in the same period. As can also be seen in Figure 7, there was a significant rise in APCC between 1997/98 and 1998/99. Here, metropolitan consumption rose from 9.04 to 9.50 litres per person and non-metropolitan consumption rose from 13.19 to 13.70 litres per person.



**Figure 7: Trends in metropolitan and non-metropolitan adult per capita pure alcohol consumption in Western Australia, 1990/91-1998/99**

In Tasmania, APCC displayed a slight rise between 1991/92 and 1995/96 of 8.46 to 8.67 litres per person. Unlike other jurisdictions, metropolitan APCC was higher than non-metropolitan, as can be seen in Figure 8. Metropolitan APCC indicated a rise from 8.50 to 9.11 litres per person between 1991/92 and 1995/96, whereas non-metropolitan APCC declined slightly from 8.43 to 8.34 litres per person during the same period. It should be noted that the definition of metropolitan and non-metropolitan used here might have influenced the results. That is, metropolitan Tasmania is essentially the greater Hobart area, which is quite small in terms of population numbers and excludes the significant metropolitan component from Launceston and other relatively large towns in the state.

### Trends in per capita alcohol consumption in Australia, 1990/91-1998/99

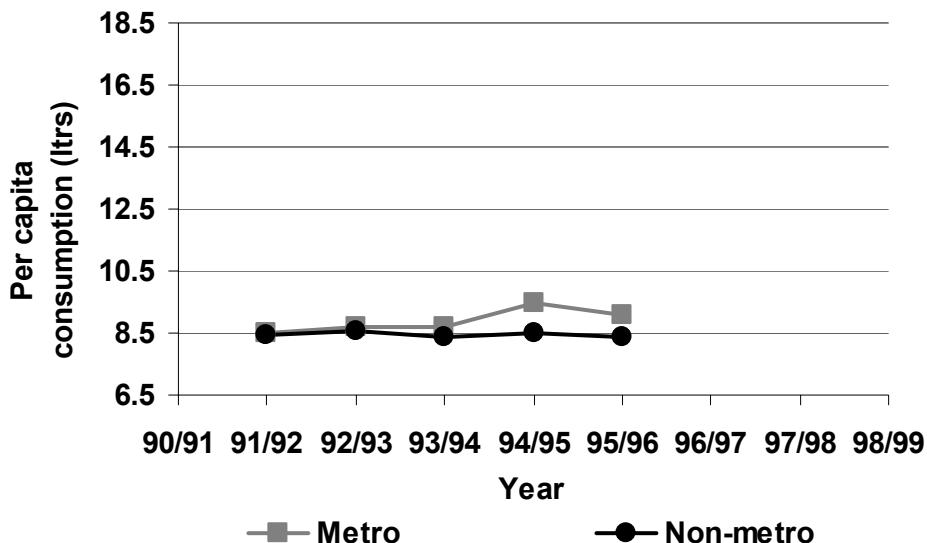
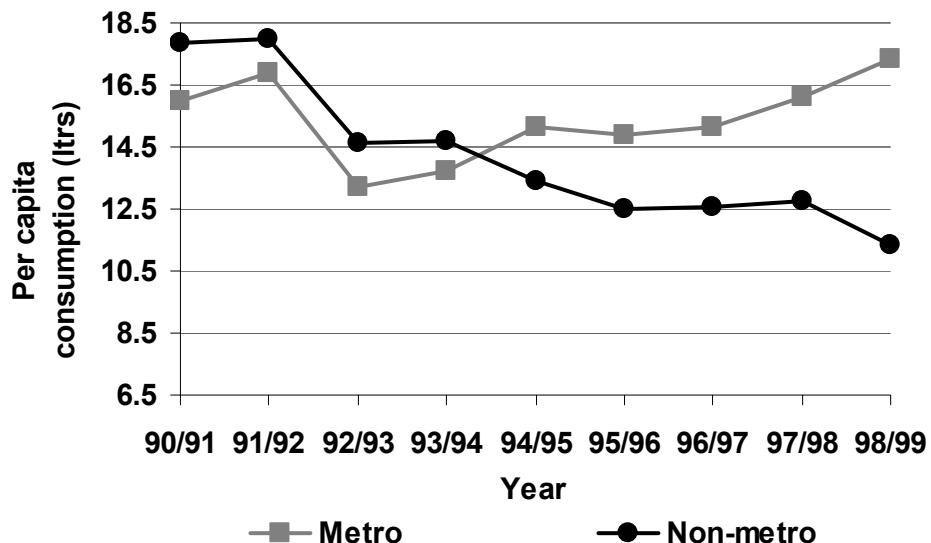


Figure 8: Trends in metropolitan and non-metropolitan adult per capita pure alcohol consumption in Tasmania, 1991/92-1995/96

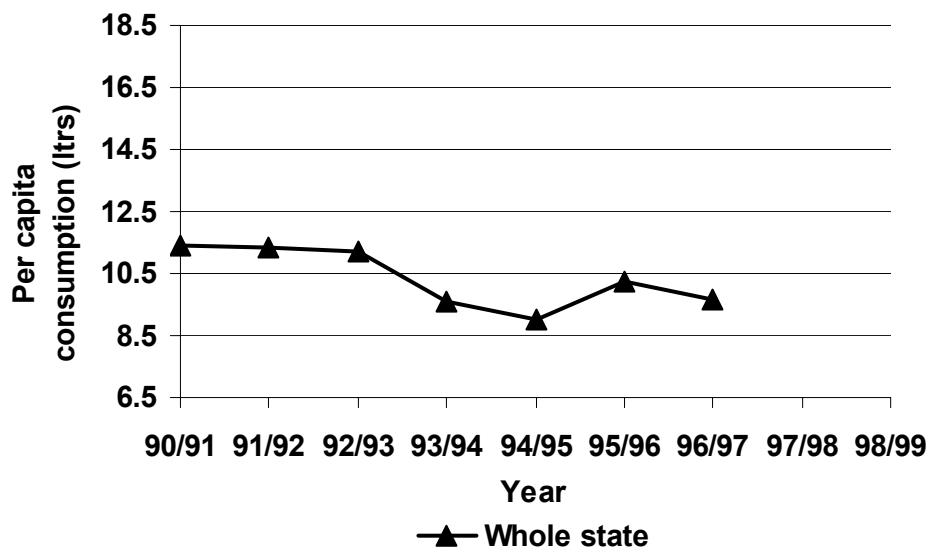
The Northern Territory recorded a drop in APCC between 1990/91 and 1998/99 from 16.97 to 14.04 litres per person. However, this drop bottomed in 1995/96 at 13.58 litres per person and had began rising again in 1996/97. As can be seen in Figure 9, metropolitan and non-metropolitan consumption paralleled each other until 1994/95 when metropolitan APCC began to increase and non-metropolitan APCC continued to decline. Metropolitan consumption fell to 14.20 litres per person in 1994/95 and then rose to 17.33 litres per person in 1998/99. Non-metropolitan APCC declined from 17.86 litres per person in 1990/91 to 12.77 litres per person in 1997/98 and then dramatically dropped again in 1998/99 to 11.32 litres per person.

## *Discussion*



**Figure 9: Trends in metropolitan and non-metropolitan adult per capita pure alcohol consumption in the Northern Territory, 1990/91-1997/98**

As has been discussed previously, alcohol consumption data was only available for the complete jurisdiction of the Australian Capital Territory, so no metropolitan/non-metropolitan division was possible. Figure 10 shows that APCC declined between 1990/91 and 1994/95 from 11.41 to 9.00 litres per person but then began rising again, reaching 9.66 litres per person by 1996/97.



**Figure 10: Trends in metropolitan and non-metropolitan adult per capita pure alcohol consumption in Australian Capital Territory (whole territory only), 1990/91-1996/97**

### **3.3 Per capita consumption as an indicator of harm**

Per capita consumption of alcohol is an important indicator of the level of alcohol-related harm in a community. There are strong relationships between APCC and alcohol-caused morbidity and mortality including that from alcohol-related car crashes (Chikritzhs *et al* 2000ab, Chikritzhs *et al* 1999). A recent comprehensive analysis of data for 14 European countries found strong and significant relationships between APCC and rates of death caused by injuries from all causes (Skög, 2001).

Figure 2 above shows APCC along with two measures of harm, alcohol-caused deaths and alcohol-related road fatalities. Alcohol related mortality is presented as the rate per 10,000 persons and alcohol related road fatalities as the rate per 100,000 persons. The harm measures show similar trends to the declining APCC measures. In Figure 2, road fatalities in particular closely follow the trend of the APCC for the available years between 1991/92 and 1995/96. The trend for alcohol-caused mortality is a lot more stable, though this in part due to the scale in which it is represented in Figure 2. Even so, the decline in mortality does follow the pattern of the decline in APCC as calculated here.

### **3.4 State and territory data issues**

As has been mentioned throughout this monograph, the failure of jurisdictions to collect data on alcohol consumption beyond 1995/96 makes an analysis of national trends difficult. Only two jurisdictions, Western Australia and Northern Territory, continued to collect data for health purposes following the 1997 Federal High Court *Hammond* ruling that held that state governments were not allowed to levy alcohol taxes. As can be seen in Table 61 the failure of jurisdictions to continue to collect data means that the current level of consumption for most jurisdictions is unknown. However, Queensland and the Australian Capital Territory have reinstated collection and figures are expected to become available in 2002.

The inability of these jurisdictions to provide data on consumption at any geographic area smaller than the state or territory total also limits the regional analysis possible. While the Australian Capital Territory is perhaps not as problematic because of its physically small size and the small number of persons residing outside of the

## *Discussion*

Canberra metropolitan area, this is a particular problem for South Australia. These data limitations mean that it is not possible to consider the metropolitan and non-metropolitan for these jurisdictions or for the nation as a whole.

The incomplete nature of the data for some states makes regional and national comparison difficult and limits analysis to restricted time frames and geographic areas. The unavailability of regional data for South Australia particularly (and the Australian Capital Territory but this is less of a concern) has meant that the picture of national metropolitan and non-metropolitan consumption is not complete. Similarly, after 1995/96 few states continued to collect data, so the estimates presented here are unable to be aggregated to create a national picture. These limitations in the data available for study are unfortunate as they provide the only source of regional consumption patterns, which have been shown to be an extremely useful indicator of community levels of alcohol-related harm (Section 3.3).

As is discussed in the following section, the Australian Bureau of Statistics collect data on alcohol consumption as part of their wider collection of consumption of foodstuffs (for example, ABS, 2000). However, this data is restricted to the national level and fails to differentiate between the manufacture or arrival of alcohol in Australia and the actual annual consumption. This is still a valuable data source but is another factor that limits the analysis of regional consumption.

The absence of these data in some jurisdictions means that it also becomes hard to interpret trends in road trauma, alcohol-related violence and other morbidity and mortality. It is not possible to estimate the extent to which changes observed in these are due to changes in overall alcohol consumption, or perhaps the impact of specific intervention measures.

### **3.5 State wholesale and national excise data**

As mentioned in the previous section, the Australian Bureau of Statistics provides annual national totals for the consumption of alcoholic beverages and includes details of beer, wine and spirits sales. This data is based on excise and customs data and is aggregated at the point of manufacture or import for the nation as a whole. While a useful data set, the restriction to the country as a whole is a limitation. It was also found that when the state and territory totals derived from jurisdiction based

consumption data were totalled, they did not completely equate with the ABS estimates. This was particularly the case for spirits, while wine, and especially, beer were closer to the ABS totals.

It was considered that the difference between these sources was due to the fact that the ABS measures importing and manufacture, whereas state and territory agencies measure consumption at the wholesale level. These measures are therefore not completely comparable, in the most due to stockpiling, particularly of spirits, and other effects that occur at the time of importation or manufacture (e.g. loss and wastage). Similarly, effects such as the potential double counting of spirits with mixers and with wines (such as fortified wines) and of the undercounting of alcoholic food essences may influence the differences between state and national totals. Arguably, wholesale sales data is likely to provide a better estimate of actual consumption levels since it is less removed from the consumer than customs or excise data.

### **3.6 The value of using a service population**

This monograph has made two significant improvements to the usual method of calculating per capita consumption. One is the use of conversion factors for calculating the percentage alcohol content of beverages that are specific to the jurisdictions from which consumption data is obtained. This improvement is further discussed in the following section. The other improvement has been the use of a service population that better estimates the number of likely consumers of alcohol in jurisdictions. These service population estimates include the tourists and visitors to the area and make allowances for residents who are away from their homes. This is an important issue in calculating per capita consumption, as it is unrealistic to use resident population when it is possible that visitors and tourists may account for a significant proportion of consumption. As the interest is in calculating the population of alcohol drinkers, the population was limited to only those persons who were aged 15 years and older and excluded persons in prisons and hospitals.

Such estimates are more appropriate than those generally used in the calculation of APCC. As an example, for Australia, World Drink Trends (2000) use the estimated resident population as supplied by the Australian Bureau of Statistics. While an

excellent measure of the total population of residents in the country, ERP as used by World Drink Trends (2000) does not allow for persons who are unlikely to be consuming alcohol such as children and the population of persons in hospitals and prisons. Further, ERP is not a particularly good measure of the population size in any particular region as it is only a measure of the residents (some who may be absent at times throughout the year) and completely excludes adjustments for persons visiting areas from other regions or from overseas. This has been recognised by the ABS in its investigation into providing service population (Cook, 1996; Lee, 1999) and can be illustrated by noting the difference between the present service population estimates and census based counts (Table 60). Here it can be seen that differences between service population and ERP in 1996 range from -1% up to 7%, and up to 14% for the Northern Territory.

### **3.7 The value of jurisdiction specific alcohol conversion factors**

The detailed discussion in Sections 2.3, 2.4 and 2.5 highlight the variation between jurisdictions and over time for the alcohol content of individual beverages. This analysis shows that in general, national level assumptions regarding the alcohol content of "beer" (5%), "wine" (11%) and "spirits" (38%) are some distance from the actual alcohol content of the beverages when they are considered in more detail. These differences are particularly important for spirits, where, for example in Western Australia the pure alcohol content was estimated at 24.6% in 1991/92 and 21.1% in 1995/96, compared to New South Wales where the alcohol content was 32.4% in 1991/92 and 27.5% in 1995/96. Low alcohol beer, while more consistent in alcohol content over time, shows variation between jurisdictions as well. For example, in 1995/96 the alcohol content for low beer was highest in Western Australia at 3.5% and lowest in Tasmania at 2.8%.

This monograph has been able to provide more specific conversion factors for beer and spirits, particularly by taking into account the component of low alcohol beer and lower alcohol pre-mixed spirits, based on the alcohol contents of the beverages actually sold within the individual jurisdictions.

#### **Trends in per capita alcohol consumption in Australia, 1990/91-1998/99**

The monograph has also been able to confirm that the use of a national estimate for wine alcohol content is appropriate given the available data and the apparent consistency of alcohol contents by Australian wines.

## **4. Conclusion**

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This monograph provides, for the first time, national and state estimates of adult per capita pure alcohol consumption adjusted for visitors and differences in the alcohol content of beverages sold in the individual states and territories of Australia. Overall, there was a general decline in consumption in the 1990s for Australia, although Queensland, the Northern Territory and Western Australia show increasing trends. This overall decline was due to falls in both regular beer and wine consumption that were only partially offset by increased consumption of low alcohol beer and, particularly, pre-mixed spirit beverages.

The Northern Territory consistently recorded the highest levels of consumption while Victoria recorded the lowest. Overall, non-metropolitan consumption was consistently higher than that in the metropolitan areas. Metropolitan APCC was significantly higher than non-metropolitan APCC for the Northern Territory and a little higher in Tasmania. However, while it has been possible to compare state trends to 1995/96, most jurisdictions ceased collecting data on alcohol consumption in 1997 due to a Federal High Court ruling. This is unfortunate as these data provide the only source regional consumption patterns, which have been shown to be an extremely useful indicator of community levels of alcohol-related harm. For those jurisdictions continuing to collect alcohol wholesale sales data after 1995/96 there was an upward trend recorded in adult per capita alcohol consumption. It is not possible to determine if this is the case in the other jurisdictions. Further, national data from other national

and international sources may not provide reliable indications on this point due to methodological shortcomings.

The methodology incorporated in this monograph includes two innovations for the calculation of adult per capita alcohol consumption that provide improved results and are recommended in future estimates. These were: (i) the use of year and jurisdiction-specific estimates of typical beverage alcohol content and (ii) population estimates that take account of movements of residents and tourists. These innovations allow a more realistic picture of APCC to be determined based on the regional characteristics of beverages and of population.

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## **Appendix 1**

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Trends in per capita alcohol consumption in Australia, 1990/91-1998/99

**Table A1:**  
**Base demographics for states and territories from 1996 Census (Source: ABS Cat No. 2016)**

Base demographics	South Australia	%	Victoria	%	Western Australia	%	New South Wales	%	Tasmania	%	Northern Territory	%	ACT	%	Queensland	%
Males	702,215	49.2%	2,150,301	49.2%	862,645	50.0%	2,983,447	49.4%	226,338	49.2%	101,370	52.0%	147,830	49.4%	1,673,220	50%
Females	725,721	50.8%	2,223,219	50.8%	863,450	50.0%	3,055,249	50.6%	233,321	50.8%	93,731	48.0%	151,413	50.6%	1,695,630	50%
Aged 0-14%	20.6%		21.2%	0.2%	22.4%		21.4%		22.7%		24.8%		22.6%		21.7%	
Aged 65+%	13.8%		12.0%	0.1%	10.5%		16.7%		12.3%		4.9%		7.0%		12.0%	
Indigenous	20,444	1.4%	21,474	0.5%	50,793	2.9%	101,485	1.7%	13,873	3.0%	46,227	23.7%	2,900	1.0%	95,518	3%
Australian born	1,077,533	75.5%	3,168,848	72.5%	1,178,331	68.3%	4,394,218	72.8%	394,774	85.9%	148,951	76.3%	222,477	74.3%	2,640,567	78%
Overseas (UK, Ire & NZ)	144,890	10.1%	269,644	6.2%	253,537	14.7%	394,092	6.5%	26,666	5.8%	12,521	6.4%	22,599	7.6%	291,287	9%
Overseas other	157,634	11.0%	770,442	17.6%	222,320	12.9%	994,868	16.5%	20,037	4.4%	16,914	8.7%	44,147	14.8%	265,514	8%
Total persons	1,427,936		4,373,520		1,726,095		6,038,696		459,659		195,101		299,243		3,368,850	
Lone person household	138,995	43.0%	356,364	37.9%	138,289	37.8%	476,246	37.8%	42,437	40.6%	9,599	29.5%	22,353	33.9%	248,336	37%
Family w/children	184,045	57.0%	583,950	62.1%	227,702	62.2%	784,739	62.2%	62,013	59.4%	22,970	70.5%	43,547	66.1%	426,025	63%

*Appendices*

**Table A2:**  
Labour force statistics for states and territories from 1996 Census (Source: ABS Cat No. 2016)

Labour Force	South Australia	%	Victoria	%	Western Australia	%	New South Wales	%	Tasmania	%	Northern Territory	%	ACT	%	Queensland	%
Full-time males	261,070	44.1%	847,677	45.0%	344,628	45.2%	1,151,954	45.0%	80,534	44.2%	35,947	43.3%	61,925	41.4%	638,797	45%
Full-time females	126,011	21.3%	437,376	23.2%	163,681	21.4%	608,742	23.8%	37,370	20.5%	20,885	25.2%	39,185	26.2%	323,214	23%
Part-time males	62,023	10.5%	180,260	9.6%	79,057	10.4%	247,707	9.7%	19,398	10.6%	9,827	11.8%	15,051	10.1%	141,481	10%
Part-time females	131,801	22.2%	376,162	20.0%	159,127	20.8%	493,504	19.3%	40,821	22.4%	14,113	17.0%	29,699	19.9%	286,312	20%
Total persons employed	592,507		1,884,880		763,207		2,558,875		182,211		82,976		149,415		1,420,668	
Private sector employees	78.0%		83.0%		81.0%		79.9%		75.0%		63.7%		52.1%		79.0%	
Managers, administrators, professionals	156,547	34.7%	513,544	36.1%	193,898	37.3%	692,162	37.9%	46,907	35.7%	21,000	34.4%	55,410	71.5%	339,571	55%
Labourers	59,855	13.3%	155,616	10.9%	69,400	13.4%	210,223	11.5%	17,313	13.2%	9,246	15.1%	6,303	8.1%	139,163	22%
Retail, property, business services, government administration & defence	234,709	52.0%	754,103	53.0%	256,448	49.3%	924,950	50.6%	67,101	51.1%	30,797	50.5%	71,235	91.9%	482,357	78%
Unemployment 15-24 %	18.4%		16.1%		13.7%		14.9%		19.6%		13.1%		14.6%		16.4%	
Unemployment 15+ %	10.4%		9.4%		8.1%		8.8%		11.0%		7.4%		7.3%		9.6%	

Trends in per capita alcohol consumption in Australia, 1990/91-1998/99

**Table A3:**  
**Dwelling stock statistics for states and territories from 1996 Census (Source: ABS Cat No. 2016)**

Dwelling Characteristics	South Australia		Victoria		Western Australia		New South Wales		Tasmania		Northern Territory		ACT	Queensland		
Fully owned	223,801	42.1%	695,910	45.9%	232,675	38.8%	924,081	44.8%	74,260	44.3%	10,202	20.1%	31,451	17.6%	465,402	25%
Being purchased	152,575	28.7%	431,197	28.4%	187,312	31.3%	489,538	23.7%	47,274	28.2%	13,027	25.6%	36,767	20.6%	298,312	16%
Rented	155,034	29.2%	389,128	25.7%	178,933	29.9%	651,068	31.5%	46,142	27.5%	27,563	54.3%	35,045	19.6%	382,399	20%
Total occupied dwellings	555,834		1,591,657		629,303		2,174,917		175,197		57,435		106,686		1,204,072	
Median housing loan repayment monthly	\$650		\$737		\$743		\$867		\$585		\$867		\$923		\$800	
Median rent weekly	\$90		\$120		\$110		\$140		\$90		\$100		\$150		\$125	
Median household income weekly	\$553		\$643		\$657		\$655		\$530		\$850		\$904		\$618	
Total non-private dwellings	1,464	0.3%	4,497	0.3%	2,053	0.3%	6,385	0.3%	684	0.4%	3,514	6.1%	184	0.2%	4,238	0.4%

**Table A4:**  
**Age and gender statistics for states and territories from 1998 estimated resident population. (Source: ABS Cat No. 3235)**

Age (ERP 1998)	South Australia		Victoria		Western Australia		New South Wales		Tasmania		Northern Territory		ACT	Queensland		
Males 15-29*	158,527	10.7%	518,580	11.3%	214,641	11.7%	689,701	11.0%	49,131	10.4%	35,944	19.2%	40,276	13.1%	395,618	11.6%
Females 15-29*	151,993	10.3%	509,311	11.1%	203,792	11.1%	674,844	10.8%	48,351	10.2%	32,854	17.6%	38,334	12.4%	382,135	11.2%
Total Males	731,919	49.5%	2,274,291	49.4%	921,613	50.3%	3,115,341	49.7%	232,636	49.3%	98,816	52.8%	153,537	49.8%	1,704,081	50.1%
Total Females	747,887	50.5%	2,330,857	50.6%	909,786	49.7%	3,159,028	50.3%	239,249	50.7%	88,316	47.2%	154,874	50.2%	1,697,151	49.9%
Total Persons	1,479,806		4,605,148		1,831,399		6,274,370		471,885		187,132		308,411		3,401,232	

\*15-34 years for NT

*Appendices*

**Table A5:**  
**Proportion of all beer by alcohol content estimated by AC Nielsen for available years**

Alcohol Content/ Year	NSW	Vic	Qld	SA	WA	Tas	NT
<b>Low</b>							
1989	9.1	8.4	6.5	12.1	8.8	7.7	8.9
1991							
1993		20.3	16.8		4.2		
1994	10.9	16.8	12.2	25.0	2.2		
1995	10.6		9.9	19.8	2.0		
1997	14.1		7.3	14.2	1.8		
1999	13.8	17.6	7.7	12.3	2.1	11.8	14.4
<b>Medium</b>							
1989	1.0	8.2	9.7	0.9	17.2	0.2	18.1
1991							
1993		4.5	21.6		36.4		
1994	0.1	4.8	26.1	3.0	31.9		
1995	1.0		31.1	1.1	36.0		
1997	3.8		42.5	4.2	35.6		
1999	2.9	4.1	43.3	4.3	34.9	0.7	27.8
<b>High</b>							
1989	89.9	83.4	83.8	87.0	74.0	92.1	73.0
1991	88.7						
1993	87.1	75.3	61.6	72.4	59.4		
1994	89.0	78.4	61.8	76.7	65.9		
1995	88.4		58.9	79.1	62.0		
1997	82.1		50.2	81.7	62.6		
1999	83.3	78.3	49.0	83.4	63.0	87.5	57.8

Trends in per capita alcohol consumption in Australia, 1990/91-1998/99

**Table A6:**  
**Comparisons in the proportion of beer consumed as low alcohol and the proportion of high wine and spirits consumed as high wine, 1990/91-1995/96**

Year	SA	WA	Vic	NSW	Qld
<b>Volume of low beer as a percentage of total beer volume</b>					
1990/91	21.21	33.27	19.96	-	-
1991/92	27.51	36.24	23.54	-	-
1992/93	26.11	38.38	25.96	10.80	-
1993/94	23.11	38.20	21.96	9.37	-
1994/95	19.48	37.55	22.31	9.07	-
1995/96	18.46	37.42	21.76	10.39	-
<b>Value of high wine as percentage of combined spirits and wine</b>					
1990/91	-	46.39	51.23	51.12	-
1991/92	-	47.72	52.10	50.22	37.95
1992/93	-	48.39	53.26	51.05	38.96
1993/94	-	47.22	53.78	52.54	41.24
1994/95	-	47.00	54.78	54.28	35.79
1995/96	-	46.45	53.34	54.21	40.09

## **Appendix 2**

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### **Beverage definitions by state and territory Liquor Licensing Acts and Regulations**

#### **Australian Capital Territory**

**The Liquor Act 1975 (Consolidated)** defines only “liquor”:

““liquor” means a beverage that contains more than 1.15% by volume of ethyl alcohol.”

*The Business Franchise (Liquor) Act 1993 (Consolidated)* refers to different types of liquor but provides no definitions. The definitions appear to be set by the Minister and recorded in the Gazette (Section 23).

#### **New South Wales**

***The Liquor Act 1982 (Consolidated)*** provides several definitions:

“beer means liquor which is beer, ale, lager, pilsener, porter, stout or any other fermented malt liquor or any fermented liquor made from hops or that for the purposes of sale is held out to be beer.”

“liquor includes:

(a) a beverage which, at 20 Celsius, contains more than 1.15 per cent ethanol by volume, and (b) anything that is not a beverage referred to in paragraph (a) but, for the purposes of sale, is held out to be beer or spirits, and (c) any other substance prescribed by the regulations as liquor.”

“low alcohol liquor means each of the following:

(a) undiluted and unadulterated liquor (other than wine of the grape) which, at 20 Celsius, contains 3.5 per cent or less ethanol by volume,  
(b) undiluted and unadulterated wine of the grape which, at 20 Celsius, contains 6.5 per cent or less ethanol by volume.”

“spirits includes any liquor prescribed as spirits.”

“wine includes any liquor prescribed as wine.”

The *Liquor Regulations 1983* provides a supplementary definition for wine as follows:

“For the purposes of the definition of wine ... cider, perry and mead are prescribed as wine.”

#### Northern Territory

The *Northern Territory Liquor Act* provides a general definition of liquor:

““liquor” means a beverage that contains more than 1.15% by volume of ethyl alcohol”.

In the *Liquor Regulations 1996 (Consolidated)* the relevant definitions are:

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““beer” means beer, ale, lager, stout or liquor of any other kind produced by brewing, and, for the purposes of calculating the fee under this Part, includes spirits containing 6% or less of ethyl alcohol by volume at 20° Celsius”.

““cask wine” means wine that is sold in a lightweight cardboard container which has a sealed lining within which the wine is held and a small tap with which to serve the wine”.

““spirits” means liquor of the kind produced by distillation, and includes a beverage mixed with spirits or to which spirits has been added”.

““wine” means wine, cider, mead, perry or other liquor produced from the fermentation of berries, fruit, honey or vegetables, and includes a beverage (other than spirits) mixed with wine or to which wine has been added”.

Under the Regulations, definitions of “beer”, “wine” and “spirits” “do not include beer, wine or spirits containing 3% or less of ethyl alcohol by volume at 20° Celsius”.

### **Queensland**

*The Queensland Liquor Act, 1992* provides the following definition of liquor:

**“4B. (1) "Liquor" is a spiritous or fermented fluid of an intoxicating nature intended for human consumption.**

**(2) "Liquor" also includes any other substance intended for human consumption in which the level of ethyl alcohol (ethanol) is more than 5mL/L (0.5%) at 20deg.C.**

**(3) However, "liquor" does not include a fluid, that would otherwise be liquor, if it is used merely as a preservative or medium in which fruit is offered for sale to the public in sealed containers and with the contents visible.”**

The *Act* refers to a definition of “wine” under the *Wine Industry Act 1974 (Consolidated)*. This is presently unavailable for inspection.

The *Liquor Regulations 1992 (Consolidated)* refer to the paying of fees in respect of beer, wine and spirits, however these categories do not appear to be further defined. The definitions may be in the endnotes to the Regulations, which are currently unavailable for inspection.

#### South Australia

The *South Australian Liquor Licensing Act 1997 (Consolidated)* provides the following definitions:

““liquor” means a beverage which at 20° Celsius contains more than 1.15 per cent alcohol by volume and includes any substance declared by regulation to be liquor for the purposes of this *Act*”.

““beer” means beer, ale, lager, stout or liquor of any other kind produced by brewing”.

““spirits” means liquor of any kind produced by distillation”.

““wine” includes mead, cider, perry and any other fermented liquor produced from fruit, vegetables, berries or honey but does not include a product produced by blending wine with other beverages.”

In the *Liquor Licensing (General) Regulations* as at 1985 low alcohol liquor is defined as:

“For the purposes of the *Act*, ‘low alcohol liquor’ means liquor in which the concentration of alcohol does not exceed –  
in the case of beer – 3.8 per cent by volume at 20° Celsius;  
in the case of wine – 6.8% per cent by volume at 20° Celsius.”

This definition was revised in the *Liquor Licensing (General) Regulations 1997 (Consolidated)* to:

**“For the purposes of the definition of "low alcohol liquor" ... [is] –**

**beer that at 20 degrees Celsius contains not more than 3.5% alcohol by volume; wine that at 20 degrees Celsius contains not more than 6.5% alcohol by volume.”**

**Tasmania**

The *Liquor and Accommodation Act 1990 (Consolidated)* provides the following definitions:

**““light beer” means beer with an alcoholic content of not less than 0·5% and not more than 3·5% by volume at a temperature of 20° C”.**

**““liquor” means a beverage (other than a medicine) that - is intended for human consumption; and has an alcoholic content greater than 0·5 per cent by volume when at a temperature of 20 degrees Celsius”.**

**““reduced alcohol wine” means wine with an alcoholic content of not less than 0·5% and not more than 6·5% by volume at a temperature of 20° C”.**

**Victoria**

The *Liquor Control Act 1987 (Consolidated)* provides the following definitions:

**““liquor” means a beverage, or other prescribed substance, intended for human consumption with an alcoholic content greater than 0·5 per centum by volume at a temperature of 20 degrees celsius”.**

**““prescribed liquor” means-**

**undiluted and unadulterated liquor with an alcoholic content of not more than 3·5 per centum by volume at a temperature of 20 degrees celsius; and undiluted and unadulterated wine of the grape with an alcoholic content of not more than 6·5 per centum by volume at a temperature of 20 degrees celsius”.**

## Western Australia

The *Liquor Licensing Act 1988 (Consolidated)* provides the following definitions:

““beer” means liquor of the type known as beer, ale, lager, porter, or stout or any other type of liquor produced by brewing”.

“liquor” means –

a beverage which at 20° Celsius contains more than 1.15% ethanol by volume; any other substance prescribed as being liquor for the purposes of this *Act*; and any thing that, for the purposes of sale, is held out to be such a beverage or substance”.

““low alcohol liquor” means liquor in which the concentration of ethanol does not exceed a prescribed level”.

““spirits” means potable spirit which at 20° Celsius contains more than 20.06% ethanol by volume”.

““wine” includes –

liquor of any type known as mead, cider, cyser, or perry;  
liquor obtained from the alcoholic fermentation of grapes or the must of grapes;  
liquor obtained from the alcoholic fermentation of other fruit, vegetables, berries or honey; or  
liquor prescribed as wine,  
but does not include liquor which at 20° Celsius contains more than 20.06% ethanol by volume.”

The *Liquor Licensing Regulations 1989 (Consolidated)* provides the following specifications:

“4. (1) For the purposes of the interpretation of the expression “low alcohol liquor” in section 3 (1) the concentration of ethanol shall not exceed –  
in beer, a level of 3.5% - ; and

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**(b) in wine, a level of 6.5% - ,  
by volume at 20° Celsius.**

**(2) In subregulation (1) (b), the reference to "wine" does not include a beverage that contains wine mixed with any other substance".**