Cohort trends in the age of initiation of drug use in Australia

Louisa Degenhardt, Michael Lynskey & Wayne Hall

Technical Report No. 83

Cohort trends in the age of initiation of drug use in Australia

Louisa Degenhardt, Michael Lynskey, and Wayne Hall

Technical Report 83

National Drug and Alcohol Research Centre
University of New South Wales
Sydney NSW 2052
AUSTRALIA

ISBN No. 0 7334 0676

TABLE OF CONTENTS

List of Figures ..... **iii**
List of Tables ..... **iii**
Executive summary ..... **iv**
1. Introduction **1**
2. Method **3**
3. Results **4**
3.1. ALCOHOL 4
3.2. TOBACCO 5
3.3. CANNABIS 7
3.4. AMPHETAMINES 8
3.5. LSD 10
3.6. HEROIN 11
4. Discussion **13**
4.1. IMPLICATIONS 15
5. References **16**

LIST OF FIGURES

Figure 1: Prevalence of alcohol use by age and birth cohort 5
Figure 2: Prevalence of tobacco use by age and birth cohort 6
Figure 4: Prevalence of amphetamine use by age and birth cohort 9
Figure 5: Prevalence of LSD use by age and birth cohort 11
Figure 6: Prevalence of heroin use by age and birth cohort 12

LIST OF TABLES

Table 1: Prevalence (%) of alcohol use by birth cohort 4
Table 2: Prevalence (%) of tobacco use by birth cohort 6
Table 3: Prevalence of cannabis use by birth cohort 7
Table 4: Prevalence of amphetamine use by birth cohort 9
Table 5: Prevalence of LSD use by birth cohort 10
Table 6: Prevalence of heroin use by birth cohort 11

EXECUTIVE SUMMARY

This paper examines Australian population birth cohort trends in the prevalence of use, and the age of initiation of use, of six substances: alcohol, tobacco, cannabis, amphetamines, LSD, and heroin. Data were taken from the 1998 National Drug Strategy Household Survey, which was a representative sample of Australians aged 14 years and over. Nine five-year cohorts were examined in persons born between 1940 and 1984.

Results indicated that the lifetime prevalence of alcohol and tobacco use was similar among all birth cohorts, with the majority of persons reporting use of these substances. In contrast, the prevalence of illicit drug use – cannabis, amphetamines, LSD and heroin – increased significantly with successive birth cohorts. For example, while only 14% of those in the 1940-1944 birth cohort reported having used cannabis at some point in their lives, this figure was 63% among those born between 1975-1979.

Furthermore, more recent birth cohorts were significantly more likely to report using licit and illicit drugs at a younger age. Over half (56%) of those in the 1980-1984 birth cohort reported alcohol use by age 15 years, compared to 16% of those in the 1940-1944 birth cohort. Similarly, almost a third of those in the 1980-1984 birth cohort (31%) reported cannabis use by age 15 years, compared to under 4% of those born between 1940-1959.

Given the consistency of these findings with other research, and with what is known about changes in the availability of illicit drugs, it appears that more recent cohorts are more likely to use illicit drugs at some point in their lives. The consistency of the finding of reduced age of initiation among more recent birth cohorts for all drug types examined suggests that availability does not wholly explain the lower ages at which recent cohorts are using illicit drugs. These changes also reflect broader social changes and attitudes towards alcohol and other drug use.

1. INTRODUCTION

Most people in the general population will report using tobacco and alcohol at some point in their lives (Johnston, O'Malley, & Bachman, 1996; Makkai & McAllister, 1998). Similarly, substantial proportions of the population report using cannabis, with surveys of the Australian population carried out over about the past 15 years indicating that approximately one in three adults (around 30%) report that they have used cannabis at some point in their lives (Makkai & McAllister, 1998). LSD and amphetamine are two other illicit substances that are reportedly used by smaller but nonetheless significant minorities of the adult population (Makkai & McAllister, 1998).

One important issue from a public health perspective is the age at which alcohol and other drug use begins because earlier initiation has been linked with a number of adverse outcomes. There are two ways in which this has been examined. The first is by comparing adolescents who begin use at an early age with those who do not. The evidence suggests that those who begin drug use at an early age are more likely to use these drugs more frequently (Kandel, 1984), and to develop problematic drug use (Brook, Balka, & Whiteman, 1999; Fergusson & Horwood, 1997; Grant & Dawson, 1998; Grant & Dawson, 1997). Early onset of illicit drug use also increases the likelihood of using other illicit drugs (Brook et al., 1999; Kandel, Yamaguchi, & Chen, 1992), engaging in risky sexual behaviour (Brook et al., 1999; Newcomb & Bentler, 1988), becoming involved in criminal activity (Brook et al., 1999), and completing fewer years of education (Lynskey & Hall, 1999). These relationships have remained even after associated factors have been taken into account, such as family history of drinking problems and illicit drug use, social disadvantage, childhood sexual abuse, and early onset behavioural difficulties (Fergusson & Horwood, 1997; Grant & Dawson, 1998). These findings suggest that early drug use could be a marker for the later development of other problems, including problems with drug use and other facets of social adjustment.

The second way in which age of use has been examined is by analysing the effects of earlier use upon health and social outcomes *among drug users*. Again, the evidence suggests that those who begin substance use earlier are more likely than later users to develop problems. Smokers who begin smoking at a younger age (under 16 years) have been found to have a lower probability of quitting, than those who start later (Khuder, Dayal, & Mutgi, 1999). They also have a longer duration of smoking, heavier smoking, and greater nicotine dependence (Breslau, Fenn, & Peterson, 1993). Similarly, those who begin drinking alcohol at an earlier age are more likely to later report heavier alcohol consumption, on a more frequent basis, and more alcohol-related problems, than those who began drinking later (Fergusson, Lynskey, & Horwood, 1994; Hawkins et al., 1997; Pederson & Skrondal, 1998; Schuckit & Russell, 1983). These associations have persisted after controlling for a number of confounding factors, including socioeconomic background, parental alcohol use and misuse, and early childhood behaviour (Fergusson et al., 1994; Pederson & Skrondal, 1998). In short, it appears that earlier initiators of drug use are more likely to develop problematic use than those who initiate use later.

Given these findings, the age at which drug use begins in a population has public health implications. If a greater number of people begin substance use at an earlier age, then it is likely that more people will later experience problems related to their substance use.

From an historical point of view, it is also of interest to discover how drug use patterns have changed over time. Patterns of drug use initiation in the general population provide information about historical trends in drug availability and use. One aspect of special interest is whether there have been any changes in the mean age at which people born in different time periods begin using different substances.

For these two reasons, an examination of drug use initiation among people born in different birth cohorts can provide important information. Such an analysis involves examining patterns of drug use by young people living during different historical periods, and provides an indication of the ways in which patterns of drug use may have differed over these periods. Analysis of the age of initiation of use among these cohorts can also provide information about the different risks that may be faced by persons born in different time periods for problems associated with their drug use.

A birth cohort analysis of drug use has recently been carried out in the United States (Johnson & Gerstein, 1998). Estimates were made of the prevalence of drug use among different birth cohorts, and the percentage of persons using different drug types by the age of 15, 21 and 35 years. This study found that drug use was much more likely among individuals born after World War II, with later cohorts differing according to the drug type. The proportion of those using cannabis by age 21 was highest among those born between 1961-1965, with slightly lower proportions in later cohorts (1966-1970 and 1971-1975). When the proportion of each cohort using cannabis before the age of 15 years was examined, large minorities of the later cohorts (born between 1961-1975) reported such use. Alcohol use by age 15 years was more common with each successive birth cohort, with smaller proportions reporting regular use at this age. In contrast to these patterns, similar proportions of each cohort reported regular tobacco use before the age of 15 years.

No such birth cohort analyses of drug use have been conducted in Australia. There is evidence that the average age of initiation of heroin among more recent birth cohorts is declining in Australia (Lynskey & Hall, 1998) but similar analyses have not been conducted for other illicit drugs. The present paper aims to explore cohort trends in the prevalence of use, and mean age of initiation of the use of alcohol, tobacco, cannabis, amphetamines, hallucinogens (LSD), and heroin in the Australian population using data from the National Drug Strategy Household Survey conducted in 1998.

2. METHOD

The data used for these analyses came from the 1998 National Drug Strategy Household Survey (NDSHS), a general population survey conducted by the Australian Institute of Health and Welfare for the Commonwealth Department of Health and Aged Care. The survey had a response rate of 56%, and the sample comprised 10 030 persons aged 14 years and older (Australian Institute of Health and Welfare, 1999).

A subset of this sample will be used in the present analyses (n = 9127) with other participants excluded as they were out of the age range. The sample comprised persons born in the following nine birth cohorts: 1940-1944 (n = 382), 1945-1949 (n = 462), 1950-1954 (n = 566), 1955-1959 (n = 821), 1960-1964 (n = 1603), 1965-1969 (n = 1396), 1970-1974 (n = 1307), 1975-1979 (n = 1256), and 1980-1984 (n = 1334).

All persons were asked if they had ever used cannabis, amphetamines, hallucinogens (LSD), heroin, alcohol and tobacco. If they reported lifetime use, they were asked if they had used within the past 12 months. Age of first use was asked of those who reported lifetime use of any substance; and age of first regular (daily) tobacco use was asked of persons who reported having been regular tobacco smokers.

The prevalence of lifetime use and use by age 15 and 21 years was calculated for each birth cohort. Standard errors were approximated using recommendations for Australian total population figures (Australian Institute of Health and Welfare, 1999). Logistic regression was used to examine associations between birth cohort and the prevalence of lifetime use, use by the age of 15 years and use by the age of 21 years. The mean age at which each substance was used (and standard error of the mean) was also calculated for each birth cohort. The youngest cohort (1980-1984) was excluded from tests of the significance of the cohort effects, as the majority of this cohort has yet to reach the age of 18 years and hence has not passed through the period of greatest risk for the initiation of licit and illicit drug use (Chen & Kandel, 1995). The results for this youngest cohort will be reported in the text.

3. RESULTS

3.1. ALCOHOL

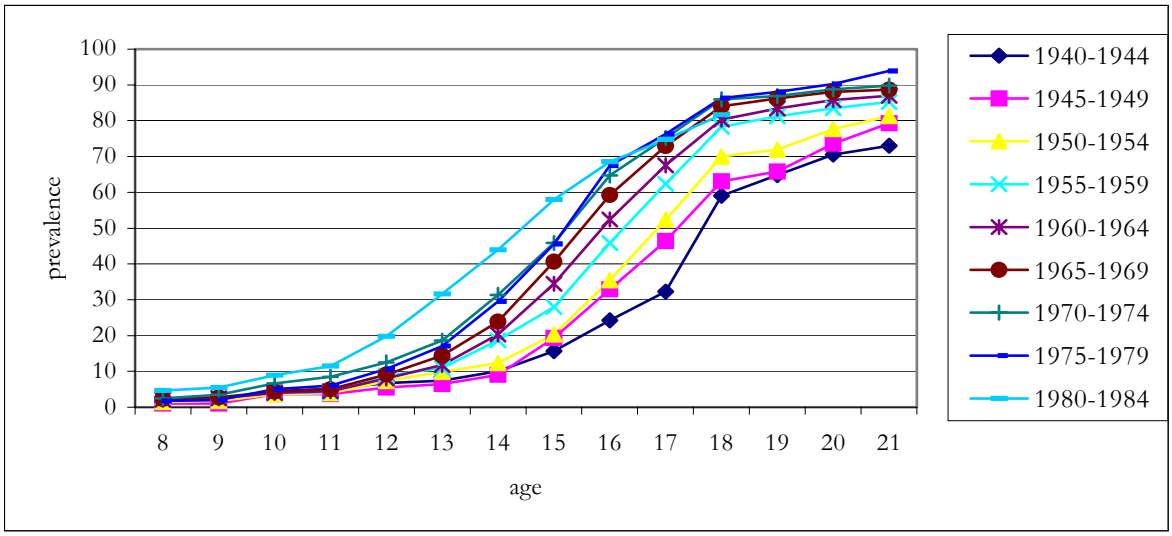
Almost all persons (96%) reported use of alcohol at some point in their lives, and there were no differences between birth cohorts in this (Table 1). However, there was a clear trend for successive birth cohorts to be more likely to report alcohol use by the age of 15 years (OR = 1.27 per birth cohort). The proportion of persons reporting such use increased from around one in 6 persons (16%) born between 1940-1944, to over half (56%) of those born in the youngest cohort, 1980-1984 (Table 1).

Table 1: Prevalence of alcohol use by birth cohort

Birth cohort	Prevalence of use (SE)	Prevalence of use by 15 years (SE)	Prevalence of use by 21 years (SE)	Mean age of first use (SE)
1940-1944	97.6 (6.1)	15.7 (2.6)	73.0 (5.7)	18 (0.33)
1945-1949	97.8 (5.5)	19.3 (2.4)	79.3 (4.6)	18 (0.35)
1950-1954	96.8 (5.4)	20.3 (2.4)	81.3 (4.6)	17 (0.23)
1955-1959	95.9 (5.3)	28.0 (2.6)	85.3 (4.5)	17 (0.15)
1960-1964	97.5 (5.3)	34.5 (2.8)	86.9 (4.2)	16 (0.11)
1965-1969	97.2 (5.4)	40.7 (3.2)	88.7 (4.5)	16 (0.09)
1970-1974	98.0 (5.5)	45.9 (3.4)	89.8 (4.6)	15 (0.10)
1975-1979	97.2 (5.4)	45.6 (3.4)	90.3 (4.6)	15 (0.08)
OR per cohort	1.00	1.27	1.17	β = -.52
95%CI	[0.93, 1.08]	[1.24, 1.30]	[1.13, 1.21]	[-.94, -.11]
Significance	ns	<.0001	<.0001	<.001

By age 21 years, much higher proportions of all cohorts were reporting use, with a similar trend as that observed at 15 years (OR = 1.17). Around three quarters (73%) of those born between 1940-1944, compared to 93% of those born between 1975-1979, reported alcohol use by this age. These trends can be observed graphically in Figure 1.

Figure 1: Prevalence of alcohol use by age and birth cohort



When examining the mean age of first use, a similar trend was observed: while 18 years was the mean age of first use among those born in 1940-1944, it was 15 years among those born in 1975-1979. Among those born 1980-1984, the mean age of first use was 13 years (SE = 0.12), although the latter estimate is affected by the fact that this cohort has not yet completed the period of risk of initiation ("right censoring").

3.2. TOBACCO

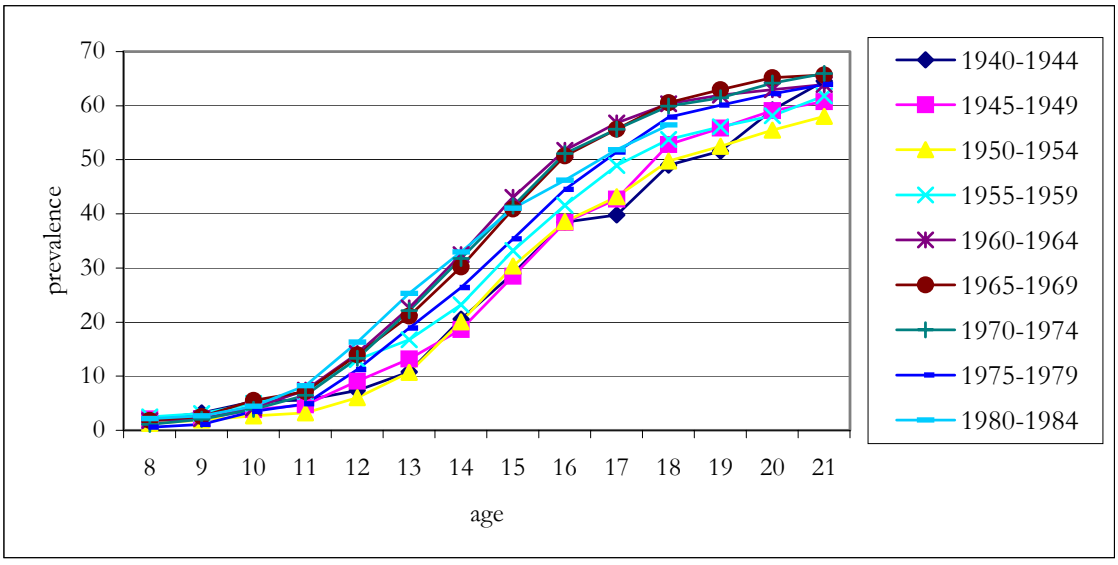
The rates of lifetime tobacco use were similar among all birth cohorts (OR = 0.98), with around three-quarters in each reporting lifetime use (Table 2). Greater proportions of persons reported tobacco use by the age of 15 years in successive birth cohorts (OR = 1.09). Those born after 1960 were more likely to report use by this age than those born in earlier cohorts (Table 2). The prevalence of *regular* (daily) tobacco use by age 15 years was also more common among persons born in later cohorts (OR = 1.07), particularly those born after 1960. These rates appeared to be stable across the later cohorts, with similar rates of any use and regular use of tobacco reported by age 15 years among those born in the cohorts between 1960-1984.

Table 2: Prevalence of tobacco use by birth cohort

Birth cohort	Prevalence of use (SE)	Prevalence of use by 15 years (SE)	Prevalence of daily use by 15 years (SE)	Prevalence of use by 21 years (SE)	Mean age first use (SE)
1940-1944	81.4 (5.6)	29.0 (3.3)	7.9 (1.7)	64.5 (4.9)	16 (0.34)
1945-1949	79.6 (4.7)	27.6 (2.9)	9.4 (1.7)	59.9 (4.2)	16 (0.27)
1950-1954	75.8 (4.4)	31.7 (2.9)	10.4 (1.8)	59.4 (3.9)	16 (0.25)
1955-1959	81.7 (4.5)	32.2 (2.8)	8.1 (1.5)	60.8 (3.8)	16 (0.17)
1960-1964	82.8 (4.2)	43.9 (3.2)	15.1 (1.9)	64.7 (3.8)	15 (0.11)
1965-1969	82.3 (4.4)	40.0 (3.2)	14.6 (1.9)	64.7 (4.0)	15 (0.12)
1970-1974	81.8 (4.5)	41.5 (3.2)	13.9 (1.8)	65.9 (4.1)	15 (0.11)
1975-1979	77.5 (4.4)	35.4 (3.0)	12.2 (1.8)	61.4 (3.9)	15 (0.09)
OR	0.98	1.09	1.07	1.04	β = -.55
95%CI	[0.95, 1.05]	[1.06, 1.11]	[1.03, 1.11]	[1.01, 1.06]	[-.96, -.13]
Significance	ns	<.0001	<.0005	<.005	<.005

These cohort differences had reduced by the age of 21 years, but there was still a significant cohort effect, again largely due to slightly higher rates among those born in the later cohorts; these trends can be seen in Figure 2. Around two thirds (64-66%) of the later cohorts reported use by 21 years, compared to around three in five of those in the earlier cohorts (58-65%). The mean age of first use showed a remarkably similar pattern: the mean age of first use was 16 years among those born between 1940-1959, compared to a mean of 15 years among the later cohorts (1960-1979). Notably, the differences between cohorts in the mean age at first use and prevalence of use by age are less pronounced for tobacco than for alcohol.

Figure 2: Prevalence of tobacco use by age and birth cohort



3.3. CANNABIS

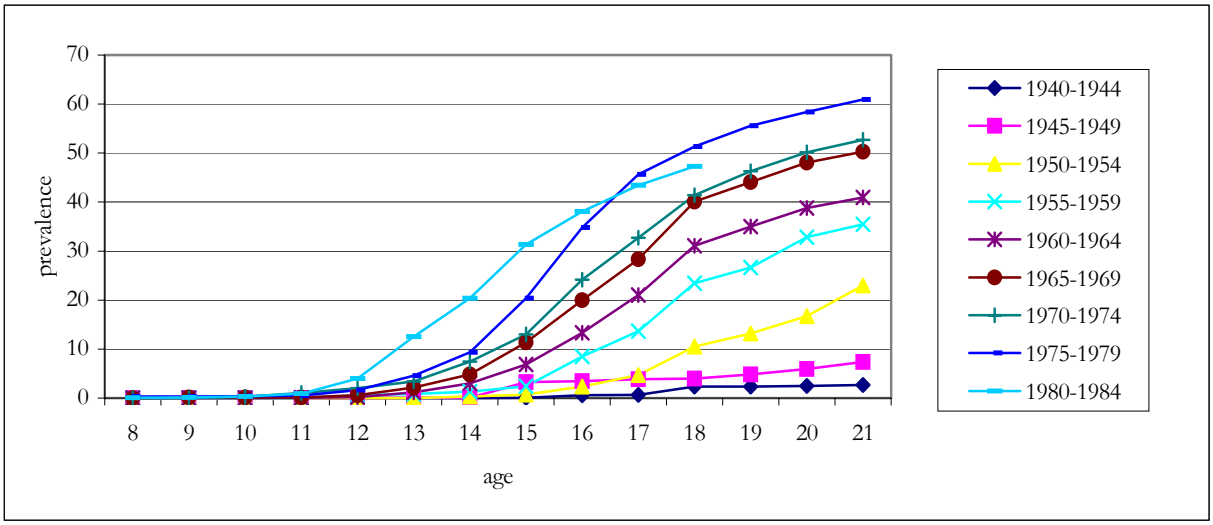
There was a strong cohort effect for lifetime rates of cannabis use: persons born in more recent cohorts were much more likely to report lifetime use (OR = 1.32; Table 3). While around 14% of persons born between 1940-1944 reported ever using cannabis, this proportion increased with successive cohorts to almost two thirds of those born between 1970-1979 (63%). The prevalence of use among the youngest cohort (1980-1984) was lower (42%), but this cohort has yet to complete the period of initiation of use.

Table 3: Prevalence of cannabis use by birth cohort

Birth cohort	Prevalence of use (SE)	Prevalence of use by 15 years (SE)	Prevalence of use by 21 years (SE)	Mean age of first use (SE)
1940-1944	13.9 (2.4)	0.1 (0.1)	2.7 (1.0)	30 (1.43)
1945-1949	24.3 (2.8)	3.3 (1.0)	7.4 (1.5)	26 (0.91)
1950-1954	37.3 (3.2)	0.7 (0.4)	23.0 (2.5)	22 (0.43)
1955-1959	50.5 (3.6)	2.4 (0.8)	35.5 (2.9)	20 (0.24)
1960-1964	56.7 (3.6)	6.8 (1.3)	41.0 (3.1)	19 (0.15)
1965-1969	61.5 (3.9)	11.4 (1.8)	50.3 (3.5)	18 (0.12)
1970-1974	62.8 (4.0)	13.0 (1.9)	52.7 (3.6)	18 (0.10)
1975-1979	62.8 (4.0)	20.4 (2.3)	58.5 (3.8)	16 (0.09)
OR	1.32	1.62	1.47	β = -.62
95%CI	[1.29, 1.35]	[1.54, 1.71]	[1.43, 1.51]	[-.92, -.33]
Significance	<.0001	<.0001	<.0001	<.001

The mean age of first use steadily decreased with each successive cohort, from 30 years among those born between 1940-1944, to 16 years among those born 1975-1979 (decreasing again to 14 years (SE = 0.09) among those born between 1980-1984). This strong trend was also present when the prevalence of use by age 15 and 21 years was examined. Very few born between 1940-1955 reported cannabis use by age 15 years (less than 4% of each cohort; Table 3, Figure 1). This proportion increased with each successive cohort (OR = 1.62; p<.0001). Of particular note was the increase in prevalence of use by age 15 years between those born 1970-1974 (13%) and those born between 1975-1979 (20.4%). This pattern was also seen for the youngest cohort, with almost one-third (31.3%; SE = 2.8) of those born between 1980-1984 reporting use by the age of 15 years. This means that over 400, 000 persons in this cohort had used cannabis by 15 years. These patterns are graphically illustrated in Figure 1: more recent cohorts had higher prevalence rates of use by age 21 years, with steeper lines indicating that greater numbers in these cohorts reported use at a younger age.

Figure 3: Prevalence of cannabis use by age and birth cohort



3.4. AMPHETAMINES

As with cannabis, there was a clear trend for lifetime amphetamine use to be more common among persons in the younger birth cohorts (OR = 1.31; p<.0001), with only around one in 50 persons from the 1940-1944 cohort reporting any use compared to one in 5 of those born between 1970-1979 (Table 4). The prevalence of lifetime amphetamine use was much lower for all cohorts than the prevalence of lifetime cannabis use.

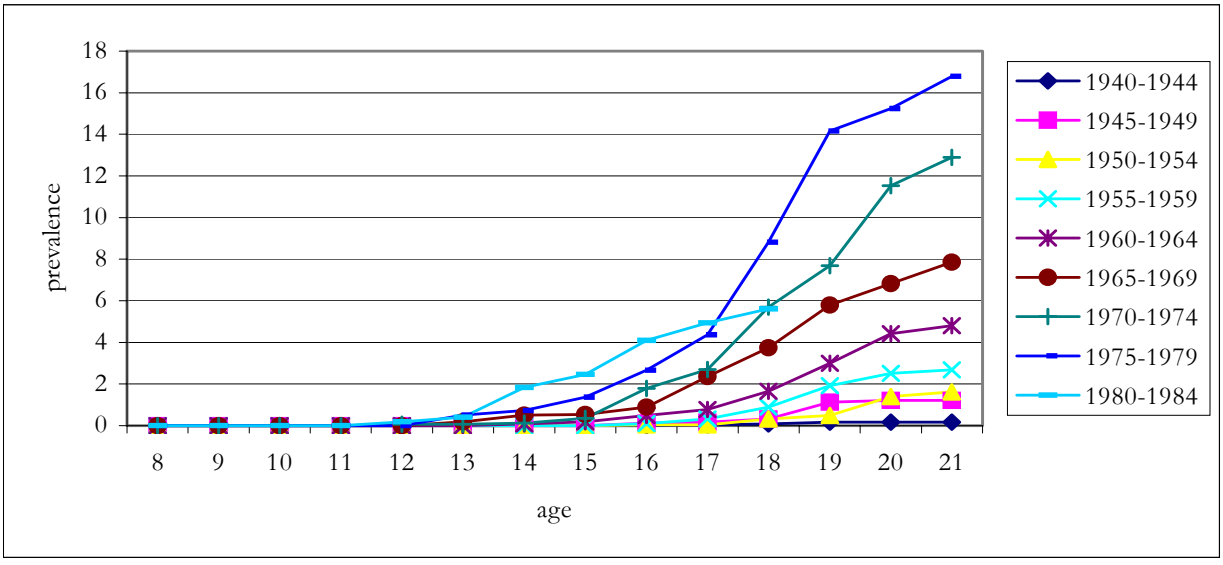
While there was variation in the trend for the mean age of first use, there was a significant reduction in the mean age with successive birth cohorts, with the two most recent birth cohorts reporting the lowest mean ages (M = 18 for those born 1975-1979; M = 16 years for those born 1980-1984). It must be kept in mind that these estimates are based on smaller numbers than for cannabis, alcohol and tobacco, and may contain significant amounts of error.

Table 4: Prevalence of amphetamine use by birth cohort

Birth cohort	Prevalence of use (SE)	Prevalence of use by 15 years (SE)	Prevalence of use by 21 years (SE)	Mean age first use (SE)
1940-1944	1.8 (0.9)	-	0.2 (0.2)	19 (1.08)
1945-1949	1.8 (0.8)	-	1.2 (0.6)	20 (0.85)
1950-1954	5.9 (1.3)	-	1.6 (0.7)	23 (1.20)
1955-1959	7.3 (1.4)	-	4.0 (1.0)	23 (0.75)
1960-1964	11.6 (1.7)	0.2 (0.1)	4.8 (1.1)	22 (0.39)
1965-1969	15.2 (2.0)	0.5 (0.3)	7.8 (1.4)	21 (0.31)
1970-1974	19.0 (2.2)	0.3 (0.2)	13.0 (1.9)	20 (0.20)
1975-1979	21.8 (2.4)	1.4 (0.6)	16.1 (2.1)	18 (0.15)
OR	1.31	1.88	1.47	β = -.59
95%CI	[1.26, 1.37]	[1.40, 2.54]	[1.39, 1.56]	[-1.0, -.18]
Significance	<.0001	<.0001	<.0001	<.001

Younger cohorts were significantly more likely to have used amphetamines by age 15 years (OR = 1.88), with a similar pattern by 21 years (OR = 1.47; Table 4). No-one in the oldest four cohorts reported use by 15 years, compared to 1.4% of those born 1975-1979 and 2.5% of the youngest cohort. Around one in six persons (16.1%) in the 1975-1979 cohort reported use by 21 years, compared to only 0.2% of those in the 1940-1944 cohort (Table 4). These findings are also displayed in Figure 4, with steeper lines indicating that among more recent cohorts, more persons were using amphetamines at a younger age.

Figure 4: Prevalence of amphetamine use by age and birth cohort



3.5. LSD

LSD use was more common among more recent cohorts (OR = 1.29; p<.0001). Almost one quarter (23%) of those born between 1975-1979 reported LSD use at some point in their lives, compared to 1.4% of those born between 1940-1944.

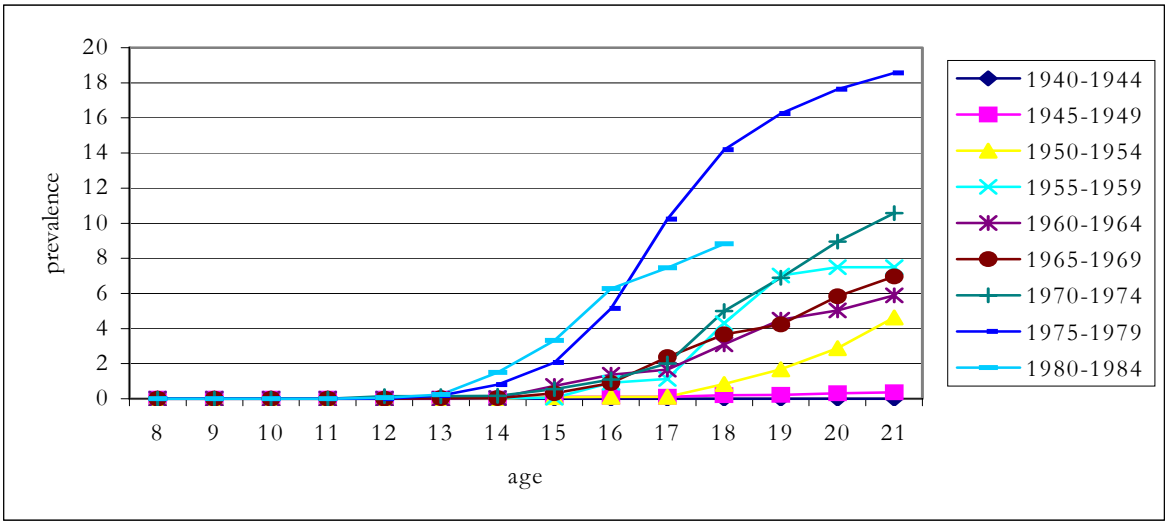
Table 5: Prevalence of LSD use by birth cohort

Birth cohort	Prevalence of use (SE)	Prevalence of use by 15 years (SE)	Prevalence of use by 21 years (SE)	Mean age first use (SE)
1940-1944	1.2 (0.7)	-	-	38 (6.17)
1945-1949	3.2 (1.0)	0.1 (0.1)	0.4 (0.3)	23 (1.03)
1950-1954	8.0 (1.5)	0.1 (0.1)	5.9 (1.3)	20 (0.47)
1955-1959	11.9 (1.8)	0.0 (0.1)	8.1 (1.5)	19 (0.31)
1960-1964	13.1 (1.7)	0.7 (0.1)	6.8 (1.3)	20 (0.34)
1965-1969	13.7 (1.9)	0.3 (0.2)	5.9 (1.2)	21 (0.34)
1970-1974	20.3 (2.3)	0.6 (0.4)	11.5 (1.8)	20 (0.20)
1975-1979	22.5 (2.4)	2.1 (0.8)	17.8 (2.2)	18 (0.13)
OR	1.29	1.58	1.41	β = -.44
95%CI	[1.24, 1.34]	[1.32, 1.90]	[1.34, 1.49]	[-.78, -.10]
Significance	<.0001	<.0001	<.0001	<.001

Consistent with the findings for other drugs, more recent birth cohorts were significantly more likely to have used LSD at an earlier age. Later cohorts were more likely to have used LSD by the age of 15 years (OR = 1.66), with 3.3% of those born 1980-1984 reporting use by 15. Younger cohorts were also more likely to report use by the age of 21 years (OR = 1.58). Again, similar to the findings for amphetamine and cannabis, Figure 5 shows that younger birth cohorts had steeper increases in the prevalence of use by age, indicating that more people were initiating use compared to older birth cohorts.

The trend was similar for the mean age of first use of LSD, with younger cohorts reporting a significantly lower mean age of first use, again with the most recent birth cohorts reporting the lowest ages (M = 15 years for those born 1980-1984). Again, these trends are based on small numbers, so the estimates may be subject to significant error.

Figure 5: Prevalence of LSD use by age and birth cohort



3.6. HEROIN

As with all the other illicit substances examined, there were strong differences between birth cohorts in the prevalence of lifetime heroin use, with younger cohorts more likely to report lifetime use (OR = 1.14; Table 6).

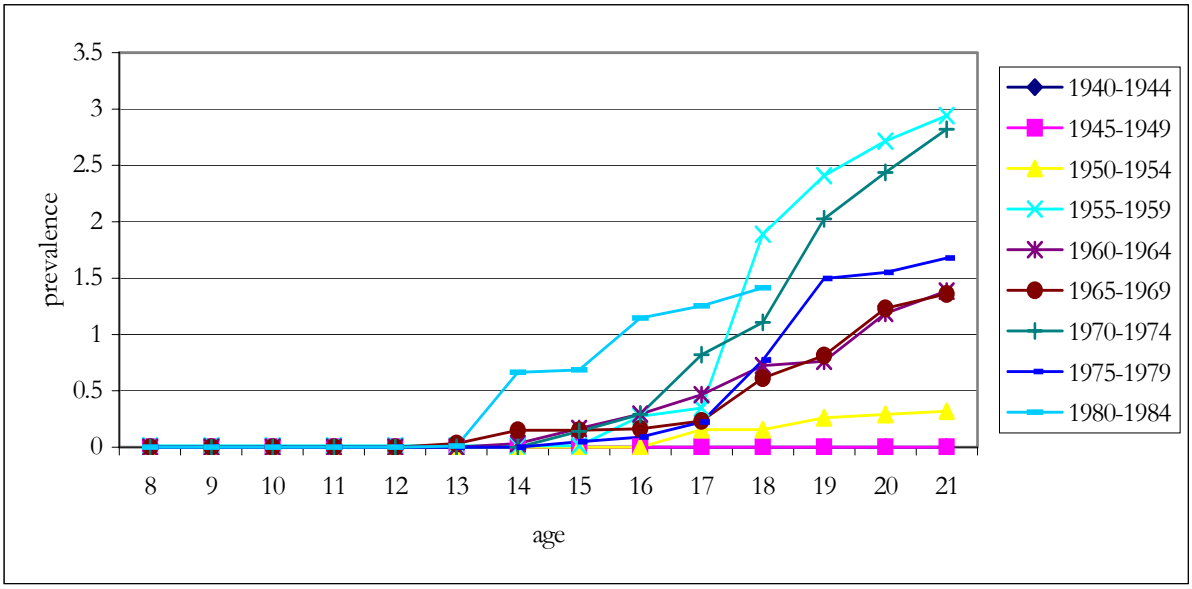
Table 6: Prevalence of heroin use by birth cohort

Birth cohort	Prevalence of use (SE)	Prevalence of use by 21 years (SE)	Mean age of first use (SE)
1940-1944	0.1 (0.1)	-	-
1945-1949	0.5 (0.4)	-	33 (9.2)
1950-1954	2.0 (0.8)	0.3 (0.2)	24 (2.0)
1955-1959	3.2 (0.9)	2.9 (0.9)	22 (1.0)
1960-1964	3.4 (0.9)	1.4 (0.6)	22 (0.8)
1965-1969	4.0 (1.0)	1.4 (0.6)	22 (0.7)
1970-1974	5.4 (1.2)	2.8 (0.9)	20 (0.4)
1975-1979	2.8 (0.9)	1.6 (0.6)	18 (0.3)
OR	1.14	1.22	β = -.46
95%CI	[1.06, 1.22]	[1.10, 1.35]	[-.89, -.05]
Significance	<.0005	<.0005	<.001

Only nine people in the entire sample reported heroin use by age of 15 years, so no analyses

were conducted, and these estimates have not been presented. Analyses of the other indicators of initiation showed that younger cohorts were more likely to have used heroin by 21 years (OR = 1.22) and to report a lower mean age of first use (β = -0.46). The prevalence of heroin use by age and birth cohort is presented in Figure 6. Notably, although all estimates here are based on small numbers, there is considerable consistency between these patterns and those observed for cannabis, LSD and amphetamines.

Figure 6: Prevalence of heroin use by age and birth cohort



4. DISCUSSION

Analysis of data on the reported use of alcohol and tobacco revealed no significant differences in lifetime rates of alcohol and tobacco use between birth cohorts. Most adults in the general population reported using alcohol and tobacco at some point in their lives, regardless of when they were born. However, younger cohorts were significantly more likely to have used alcohol and tobacco by age 15 and 21 years, and had a lower mean age of first use.

There were more marked cohort differences in the prevalence of lifetime use of cannabis, amphetamines, heroin and LSD. Persons in more recent birth cohorts were significantly more likely to report using these drugs at some point in their lives. The reported age of first use of these substances was also strongly related to birth cohort, with younger birth cohorts much more likely to report using these drugs by the age of 15 years, and to report a lower mean age of first use. These findings closely parallel those of a recent study in the US, where population cohort trends in the use of alcohol, tobacco, cannabis and LSD were also examined (Johnson & Gerstein, 1998). Among persons in the US population, more recent cohorts were more likely to report using these substances by age 15 and 21 years.

Before considering substantive interpretations of these trends, we need to consider artefactual explanations. One criticism of birth cohort trends in the average age of first use of drugs is that the data are "right censored" (Lynskey & Hall, 1998). That is, because younger birth cohorts have not yet reached older ages, their reported drug use necessarily occurs at a lower mean age. This possible explanation was excluded in these analyses by examining the prevalence of use by age 15 and 21 years. These estimates are not affected by right censoring. Furthermore, in the case of alcohol, 90% of persons in the youngest cohort (1980-1984) had already used alcohol by 1998, so the mean age of 13 years first use is unlikely to increase by much as this cohort grows older.

Another possibility is that the observed cohort differences in the age of initiation arise from the effects of differential mortality among individuals in the earlier born cohorts who initiated use at an early age. This is unlikely to explain the huge differences in rates across the birth cohorts, for two reasons. First, there are large differences in the prevalence of use by age 15 years between adjacent cohorts. Second, even if those who began use early had substantially increased mortality rates, this increased mortality would be unlikely to account for rates of use by 15 years that were 10% (tobacco) to 40% (alcohol) lower between the oldest and youngest cohorts.

A third threat to the validity of these findings is the possibility that the birth cohort trends in age of first use are due to response bias. Retrospective reporting of age of first drug use may be subject to error, given that respondents are being asked about events that, for older persons, occurred decades ago.

There have been two approaches to tests of this possibility; the first has been to use longitudinal studies of adolescents (Engels, Knibbe, & Drop, 1997; Henry, Moffitt, Caspi,

Langley, & Silva, 1994; Labouvie, Bates, & Pandina, 1997). These studies have found that upon repeat assessment, adolescents' estimates of the age of first use tended to increase. In one study, the authors concluded that the concept of age of initiation of drug use must be used with caution (Engels et al., 1997). However, the rank ordering of estimates remained, suggesting that rank differences between individuals will stay, even given changes in the absolute estimates (Henry et al., 1994; Labouvie et al., 1997).

The second approach is to use data from repeat general population surveys of drug use, and comparing birth cohorts' responses, as opposed to individuals' responses, over time. This has recently been carried out in an analysis of alcohol and cannabis use in birth cohorts using data from nine US National Household Surveys of drug use 1982-1995 (Johnson, Gerstein, & Rasinksi, 1998). The authors argued that prevalence estimates of use were biased downwards by response error as the time since adolescence increased. As time passed, cohorts were more likely to report later first use of alcohol (interpreted as forward telescoping by the authors) and less likely to report lifetime use of cannabis (interpreted as intentional concealment by the authors). Unfortunately, it was not possible to replicate the above analysis using Australian data. Although surveys have been conducted since 1985, different sampling methods have been used, the age of first use was not always asked, and because of aggregations of age in some surveys, there was no way in which to code birth cohorts consistently across the surveys.

It is nonetheless unlikely that response bias completely accounts for the strong trends observed here. First, similar cohort trends in age of initiation have been observed for heroin use using from data collected when older birth cohorts were 10 years younger (Lynskey & Hall, 1998). These trends have also been supported by strong cohort trends in opiate overdose mortality over the past 30 years (Hall, Degenhardt, & Lynskey, 1999). Since deaths are by definition new incidents, and are not based on self-report, there is no way that mortality data can have been affected by response bias.

Second, there is some evidence to suggest that lower rates of use were reported by the older cohorts during their adolescence, when the downward response bias could not have affected estimates of use. For example, surveys in which cannabis use was assessed in the early 1970s typically revealed lifetime prevalence estimates of between 5-10% among those aged 13-29 (Healy, 1978).

Third, the finding is consistent with changes in the roles of young people in more recent birth cohorts, where there has been an extension of the period of adolescence. In more recent times, young people are marrying later or not at all; having children later; and living in the family home for longer (Hess, 1995). Given the delay in assumption of traditional adult responsibilities, it is not surprising that a greater number of young people are engaging in activities such as substance use.

Fourth, the finding of an increased prevalence of illicit drug use among more recent birth cohorts is consistent with what is known about the changing availability of illicit drugs over the past few decades in Australia. Evidence suggests that heroin and other illicit drugs became more available only around the late 1960s and early 1970s (McCoy, 1980). This was after the period in which the 1940-1950 birth cohorts were in their early adolescence, and probably after the period in which they were at maximum risk of initiating drug use.

An increase in the availability of illicit drugs may largely explain changing patterns in the lifetime prevalence of use. It does not, however, explain all of the reduction in the age of initiation of drug use across birth cohorts. This is because the increase in the prevalence of use by 15 years and 21 years, and a reduction in the mean age of first use, were also observed for alcohol and tobacco. These were both legally available for the entire period of all cohorts' adolescence; and tobacco, at least, was probably more easy to obtain when the older cohorts were in their adolescence. Changes in the illicit drug market therefore do not wholly explain the trend towards earlier initiation of illicit drug use.

One possible explanation of the finding may be the more general societal changes that have occurred over the past half-century. Over the past half century, developed societies have seen a reduction in informal social controls of behaviour (Smith, 1995). This has been manifested by a move away from universal norms and values, and an increase in emphasis upon individualism and personal choice, the development of libertarian values, and tolerance in general (Halpern, 1995). There has also been a dramatic reshaping of the family, with more single parent families and higher divorce rates (Hess, 1995; Rutter, Giller, & Hagell, 1998). Among other things, these changes are likely to have brought about a reduction in the surveillance of adolescents' behaviour, with parents having less time to supervise their children, and others less likely to do so. Consistent with this possibility is the notable increase in conduct problems among young people over the past 40 to 50 years (Smith, 1995). Conduct problems are more likely when ineffective discipline techniques are used, or when there is inadequate supervision of children (Reid & Patterson, 1989). These social changes are likely to have meant greater freedom for adolescents to make their own decisions about behaviour relevant to their health. More young people are clearly choosing to experiment with substance use, both licit and illicit, at a younger age.

4.1. IMPLICATIONS

There are several implications of the present findings. Given their consistency with other evidence and coherence with what is known about societal change in general, it seems that the present findings have highlighted a robust trend. More recent birth cohorts of Australians are more likely to have tried cannabis, LSD, heroin and amphetamines at some point in their lives, and they are more likely to have done so at an earlier age than adolescents and young adults in preceding birth cohorts.

Initiation of drug use at a younger age may lead to a variety of adverse consequences. These include an increased likelihood of problematic substance use (Fergusson et al., 1994; Fergusson & Horwood, 1997; Grant & Dawson, 1998; Grant & Dawson, 1997; Khuder et al., 1999), and problems in other areas of life, including sexual activity (Brook et al., 1999), criminal activity (Brook et al., 1999), and reduced educational attainment (Lynskey & Hall, 1999). A greater number of Australians in younger birth cohorts may be at risk of experiencing these difficulties. Efforts need to be made to delay the onset of drug use in general, and to address the use of those who have begun use at an early age, to ensure that this does not become a more prevalent problem in the future.

5. REFERENCES

Australian Institute of Health and Welfare. (1999). *1998 National Strategy Household Survey: First results* . Canberra: Australian Institute of Health (Drug Statistics Series).

Breslau, N., Fenn, N., & Peterson, E. L. (1993). Early smoking initiation and nicotine dependence in a cohort of young adults. *Drug and Alcohol Dependence, 33*, 129-137.

Brook, J. S., Balka, E. B., & Whiteman, M. (1999). The risks for late adolescence of early adolescent marijuana use. *American Journal of Public Health, 89*(10), 1549-1554.

Chen, K., & Kandel, D. B. (1995). The natural history of drug use from adolescence to the mid-thirties in a general population sample [see comments]. *American Journal of Public Health, 85*(1), 41-7.

Engels, R., Knibbe, R., & Drop, M. (1997). Inconsistencies in adolescents' self-reports of initiation of alcohol and tobacco use. *Addictive Behaviors, 22*(5), 613-623.

Fergusson, D., Lynskey, M., & Horwood, J. (1994). Childhood exposure to alcohol and adoelscent drinking patterns. *Addiction, 89*, 1007-1016.

Fergusson, D. M., & Horwood, L. J. (1997). Early onset cannabis use and psychosocial adjustment in young adults. *Addiction, 92*(3), 279-296.

Grant, B., & Dawson, D. (1998). Age of onset of drug use and its association with DSM-IV drug abuse and dependence: Results from the National Longitudinal Alcohol Epidemiological Survey. *Journal of Substance Abuse, 10*, 163-173.

Grant, B. F., & Dawson, D. A. (1997). Age at onset of alcohol use and its association with DSM-IV alcohol abuse and dependence: results from the National Longitudinal Alcohol Epidemiologic Survey. *Journal of Substance Abuse, 9*, 103-10.

Hall, W., Degenhardt, L., & Lynskey, M. (1999). Opioid overdose mortality in Australia, 1964-1997: Birth cohort trends. *Medical Journal of Australia, 171*(5), 34-37.

Halpern, D. (1995). Values, morals and modernity: The values, constraints and norms of European youth. In M. Rutter & D. Smith (Eds.), *Psychosocial disorders in young people: Time trends and their causes* . Chichester: John Wiley & Sons.

Hawkins, J., Graham, J., Maguin, E., Abbott, R., Hill, K., & Catalano, R. (1997). Exploring the effects of age of alcohol use initiation and psychosocial risk factors on subsequent alcohol misuse. *Journal of Studies on Alcohol, 58*, 280-290.

Healy, P. (1978). *Patterns of Drug use in Australia: 1970-1977* . Sydney: Government Printer.

Henry, B., Moffitt, T., Caspi, A., Langley, J., & Silva, P. (1994). On the "remembrance of things past": A longitudinal evaluation of the retrospective method. *Psychological Assessment, 6*, 92-101.

Hess, L. (1995). Changing family patterns in Western Europe. In M. Rutter & D. Smith (Eds.), *Psychosocial disorders in young people: Time trends and their causes* . Chichester: John Wiley & Sons.

Johnson, R., Gerstein, D., & Rasinksi, K. (1998). Adjusting survey estimates for response bias. *Public Opinion Quarterly, 62*, 354-377.

Johnson, R. A., & Gerstein, D. (1998). Initiation of use of alcohol, cigarettes, marijuana, cocaine and other substances in US birth cohorts since 1919. *American Journal of Public Health, 88*(1), 27-33.

Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (1996). *National Survey Results on Drug Use from the Monitoring the Future Study, 1975-1995. College Students and Young Adults.* (Vol. 2). Rockville, MD: National Institute on Drug Abuse.

Kandel, D. B. (1984). Marijuana users in young adulthood. *Archives of General Psychiatry, 41*, 200-209.

Kandel, D. B., Yamaguchi, K., & Chen, K. (1992). Stages of progression in drug involvement from adolescence to adulthood: further evidence for the gateway theory. *Journal of Studies on Alcohol, 53*(5), 447-57.

Khuder, S., Dayal, H., & Mutgi, A. (1999). Age at smoking onset and its effect on smoking cessation. *Addictive Behaviors, 24*(5), 673-677.

Labouvie, E., Bates, M., & Pandina, R. (1997). Age of first use: Its reliability and predictive utility. *Journal of Studies on Alcohol, 58*, 638-643.

Lynskey, M., & Hall, W. (1999). *The educational consequences of early cannabis use among adolescents* . Sydney: National Drug and Alcohol Research Centre, University of NSW.

Lynskey, M. T., & Hall, W. (1998). Cohort trends in age of initiation to heroin use. *Drug and Alcohol Review, 17*, 289-297.

Makkai, T., & McAllister, I. (1998). *Patterns of drug use in Australia, 1985-1995*. Canberra: Australian Government Publishing Service.

McCoy, A. (1980). *Drug Traffic: Narcotics and Organised Crime in Austrlia*. Sydney: Harper & Row.

Newcomb, M. D., & Bentler, P. (1988). *Consequences of adolescent drug use*. California: Sage Publications.

Pederson, W., & Skrondal, A. (1998). Alcohol consumption debut: Predictors and consequences. *Journal of Studies on Alcohol, 59*, 32-42.

Reid, J. B., & Patterson, G. (1989). The development of antisocial behavior patterns in childhood and adolescence. *Adolescence, 3*, 107-119.

Rutter, M., Giller, H., & Hagell, A. (1998). *Antisocial behavior by young people*. Cambridge: Cambridge University Press.

Schuckit, M., & Russell, J. (1983). Clinical importance of age at first drink in a group of young men. *American Journal of Psychiatry, 140*, 1221-1223.

Smith, D. (1995). Youth crime and conduct disorders: Trends, patterns and causal explanations. In M. Rutter & D. Smith (Eds.), *Psychosocial disorders in young people: Time trends and their causes* . Chichester: John Wiley & Sons.