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Illicit Drug Use by Mothers and their Daughters in Australia: A Comparison of Two Generations

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Abstract

Background

While recent decades have witnessed an increase in the use of illicit drugs in Australia, the extent to which the types of drugs used has changed over a generation of young women has not been documented.

Methods

Data are from a prospective birth cohort study. Mothers were recruited in early pregnancy (1981-83) and then they and their child were followed up, with mothers interviewed 27 years (2008-2011), and daughters 30 years (2010-14), after the birth. At these most recent interviews both mothers and daughters were administered the Composite International Diagnostic Interview (CIDI III). Comparisons are for mothers and daughters separated by a 25 year period. For this study, we compare levels of lifetime use of a range of illicit drugs and drug use disorders reported by mothers and their daughters (N=998 mother/daughter pairs) with adjustment for family income, marital status, education and occupation.

Results

There has been a generational increase in the use of illicit substances and prevalence of substance use disorders experienced by Australian women. Mothers' use of illicit drugs was generally restricted to cannabis. By contrast the majority of daughters report lifetime use of an illicit drug with cannabis, club drugs and stimulants the most common. Compared to the mothers, daughters used club drugs 50 times, cocaine 19 times and inhalants 20 times more often. Daughters report experiencing 12 times the rate of cocaine use disorders, 9 times the rate of stimulant disorders and 7 times the rate of cannabis use disorders compared to their mothers.

Conclusions

Mothers of the current generation of 30 year old Australian women rarely used illicit drugs and few experienced a drug use disorder. The current generation of young women report commonly using one or more illicit drugs with a substantial minority experiencing a drug use disorder. It is unlikely that the use of illicit drugs by young women in Australia will be reversed in the foreseeable future. Government policies and treatment practices need to be calibrated to the reality of the much greater contact with illicit drugs being exhibited by younger women.

Key words

Generational changes, mothers, daughters, 25 years, DSM-IV, substance use disorders.

Generational Changes in Illicit Drug Use by Women: Mothers and Daughters Compared

1. Introduction

Drug use, both licit and illicit, occurs in a broader social and cultural context. International comparisons confirm the substantial differences in population rates of use of a range of illicit drugs (Vega, Aguilar-Gaxiola, Andrade et al, 2002; van Nuijs, Castiglioni, Tarcomnicu et al, 2011). There are also substantial differences in the use of illicit drugs within national populations, including within Australia (Lai, O'Brien, Bruno et al, 2016). Drug use is enabled by consumer demand and supported by a network of producers and sellers. While a minority may use illicit drugs, many are exposed to drug use either indirectly because family members and peers use, or through offers of drug supply which may not be taken up (Parker & Measham, 1994; Smirnov et al, 2014). It is in the context of these patterns of use of illicit drugs that we compare two generations, of women on the basis of their use of illicit drugs. While there are studies comparing drug generations (or eras) in the United States (Golub, Johnson & Dunlap, 2005) the evolution of illicit drugs is likely to differ from country to country, with few comparisons of generational changes in patterns of illicit drug use outside of the United States. We have not identified any previous studies which have directly compared generational changes in the use of illicit drugs using validated diagnostic criteria for the assessment of substance use disorders. The current study takes advantage of data from a long running longitudinal study which includes two generations of women (mothers and their daughters) with data gathered using the Composite International Diagnostic Interview (CIDI). The most comprehensive data documenting generational changes in the use of illicit drugs comes from the United States. This data suggests not only a substantial increase in drug use beginning in the mid-1960s (Basov, Miron & Jacobson, 2001), but periodic changes in the drugs which are used. For example, the heroin injection generation (born around 1945-1954), the crack generation (born around 1955-1969) and the marijuana generation-with marijuana widely used after the 1970s (Golub et al, 2005). There remain three important limitations of

the available data. First, the comparisons primarily involve repeated, cross sectional population surveys or are service based. For example, Golub et al (2005) compare samples from the Arrestee Drug Abuse Monitoring program. In the above context it is not possible to directly compare generations and particularly generations from the same family. Comparing members of the same family over two generations provides a specific measure of generational change. Secondly, there is less data available on young women using drugs. Drug use by women is likely to be affected by their childbearing and childrearing behaviours. Knowing more about the generational changes in illicit drug use by young women is a gap in knowledge that this study addresses. Third, it is not known whether these generational shifts in drug use reflect changes in the characteristics of the female population (eg higher levels of female employment, better incomes for women, a more educated female population) or changes in the broader population which facilitate the use of illicit drugs.

In Australia the use of illicit drugs began to escalate greatly in the late 1980s and into the 1990s (Degenhardt, Lynskey, and Hall, 2000). Consequently the gap between generations is likely to be between those reaching adolescence and young adulthood in the 1970s and their counterparts born from about the mid-1980s onwards (Degenhardt, Lynskey & Hall, 2000). This study uses data from a linked mother-daughter birth cohort to compare the use of illicit drugs by mothers and their adult daughters separated by a period of 25 years. This study examines the generational change in the lifetime use of illicit drugs and lifetime prevalence of illicit drug use disorders in a population sample of mothers and their 30 year old daughters.

1.1 Generational Changes

Few previous studies have explicitly examined generational changes in behaviours despite widespread community debate concerning the nature of these changes. Mannheim was the first to identify a generation as a distinct and important social category (his essay on generations appeared in 1923), noting that similarly aged individuals experience similar historical and

social contexts and these contexts (shared experiences) could be expected to influence subsequent values and behaviours (Mannheim, 1952). Mannheim's use of the term generation is effectively synonymous with the term cohort. While Mannheim identified some historical events (war, economic recessions) as salient factors having a "collective influence" leading to a shared view of the world, contemporary changes may have a similar effect. Advances in transportation and communication have transformed the way we live no less than does war or do major economic recessions. The worldwide trade in illicit drugs is one of the important changes being experienced by more recent generations (see Arnold, 2005).

Recent research has also pointed to other societal changes which have implications for a willingness to use illicit drugs. These include evidence of increased levels of antisocial behaviour by adolescents (Twenge, 2011), an increased focus on individual fulfilment and achievement (Twenge et al, 2010), a greater emphasis on extrinsic values (Twenge, 2011) as well as an increased demand for immediate gratification (Twenge & Park, 2017). These changes, when combined with longer periods of the life course with limited attachment to key social institutions (marriage, work, child rearing – see Arnett, Zukauskienė & Sugimura, 2014) and improved availability of illicit drugs arguably lead to illicit drug use as a normative social activity, an accepted dimension of adolescent and young adult socialization.

1.2 Patterns of change in the Use of Illicit Drugs

Evidence suggesting there have been generational changes in the use of illicit drugs are from two primary sources, none of which link generational changes within a single family unit. The first of these involve cross sectional surveys repeated over an extended period of time, drawn from a similar population, but recruiting successive generations of respondents. The US based Monitoring the Future Study – MTF (Johnston et al, 2017), provides the longest available time series of changes in levels of drug use, with yearly surveys of school students beginning in 1975. Rates of lifetime use of an illicit drug (by grade 12) peaked in 1981 (66%), declined to

41% in 1992 and have since remained relatively stable at about 50% of grade 12 students (Johnston et al, 2017). The findings suggest generational changes which may have commenced in the United States around the period of the Vietnam War, 1965 – 1975. Similarly the National Youth Risk Behaviour Survey (Johnson et al, 2015) and the National Survey on Drug Use and Health (Lipari & van Horn, 2017) suggest changes in illicit drug use over time that vary by drug and the age group of the respondent. Golub and Brownstein (2013) use periodically collected data of arrestees from selected USA locations to document changes in the use of various drugs over an extended period of time. While these are comparisons of cross sectional data they suggest generational changes in most commonly used drugs in the USA.

A second source involves comparing age groups within a cohort study. For example the Minnesota Twin-Family Study – MTFS (Holdcraft & Iacono, 2004) and a Swiss study (Michaud et al, 2006) suggests an increase in DSM-diagnosed drug use disorders in more recent age cohorts with evidence of an increase in the use of a number of illicit drugs over time in Switzerland (1993-2002). By contrast, the findings of the German Epidemiological Survey of Substance Abuse (1990 – 2009) found no consistent pattern of change in cannabis use over time (Pionet et al, 2012).

We have not found any previous studies which explicitly compare lifetime use and lifetime diagnoses of drug use disorders using a two generations within a single family sample design.

1.3 Comparing Mothers and Daughters

To test the hypothesis that more recent generations of women more commonly use illicit drugs, we use data from a prospective birth cohort study to compare levels of illicit drug use by mothers and their daughters, separated by a 25 year period. This study design provides control for a variety of factors that are characteristics of the home environment. Mothers and daughters will share many beliefs, values and behaviours (Degner & Dalege, 2013). Daughters are reared in a similar geographic context to the one in which the mother resides and it could be expected

that low rates of illicit drug use by mothers will have an influence over the daughter's pattern of drug use, certainly social learning theory would suggest this to be the case.

We suggest that the specific comparison of mothers and their daughters provides a test of the extent to which the external environment (general societal attitudes and beliefs about drugs, availability of drugs, proximity to drugs and the availability of resources such as recreational time, influence of peers and financial resources) contribute to changes in levels of illicit drug use.

This study reports lifetime use and lifetime illicit drug use disorders diagnosed using DSM-IV criteria following administration of the Composite International Diagnostic Interview (CIDI) to this sample of mothers and their 30-year old daughters.

2. Methods

Data are from the Mater-University of Queensland Study of Pregnancy (MUSP) and its outcomes. Pregnant women were recruited at approximately 18 weeks gestation, and then followed up at the birth of their child, and then 6 months, 5, 14, 21 and 27 years after the birth. Children were interviewed at 14, 21 and 30 years after the birth. Ethics clearance was provided by The University of Queensland's and Mater Hospital's ethics committees. Informed consent was sought from mothers up to the 14 year follow up, and then separately for mother and child for all subsequent interviews. Initial recruitment was conducted while the prospective mother was waiting for her first obstetrical assessment. Of the 8556 consecutive women invited to participate in the study, over the period 1981-3, 8458 agreed to participate in the study. Excluding repeated pregnancies over the three years of recruitment, there were 6753 mothers who gave birth to 6703 live singleton babies (not adopted out) at the study hospital, of whom 3228 (48.2%) were female.

For mothers who had a second child in the three years of data collection and provided a second CIDI interview, their second interview and second child were excluded. There were 3482

mothers (51.9% of those recruited) who completed the Composite International Diagnostic Interview (CIDI) at the 27-year follow-up. In addition, 2540 children completed the CIDI at the 30-year follow-up, of whom 2370 were the initial pregnancy for which the mother attended the obstetrical service. There were 1359 female children (42.1% of those female children recruited) who met the inclusion criteria at the 30 year follow up. This provides 998 mother-daughter pairs for the main analysis.

2.1 Measures

The CIDI was developed in 1990 as a standardised diagnostic interview using definitions of disorder consistent with the criteria in the ICD-10 and DSM-III-R (see Wittchen et al, 1994). There have been a number of studies of the validity and reliability of the CIDI which conclude that it meets the criteria for a moderately valid/reliable measure of a number of conditions (Andrews & Peters, 1998; Haro et al, 2006; Üstün et al, 1997). For this study we use the 9 initial questions in the substance use module. These are lifetime use questions of the form “Have you used a sedative or tranquiliser non-medically?” and “Have you ever used either marijuana or hashish?”. In addition we compare mothers and their daughters on 7 CIDI lifetime diagnostic outcomes (sedative use disorder, stimulant use disorder, painkiller use disorder, cannabis use disorder, hallucinogen use disorder, and opioid use disorder).

We also compare mothers and their daughters on a number of sociodemographic variables (income, marital status, education and occupation). These questions were all administered in a similar form to mothers (mothers’ sociodemographic data are taken from the 5 year follow-up when the mean age of mothers was similar to the age of the daughter at the 30 year follow-up) and their daughters. Mothers completed the CIDI at the 27 year follow up. Daughters completed the CIDI at the 30 year follow up. We compare these two generations only on their lifetime use of nine illicit drugs, and seven lifetime diagnoses.

2.2 Data Analysis

We present paired (mother-daughter) unadjusted and adjusted comparisons (adjusted for maternal and daughter sociodemographic characteristics). These characteristics are associated with the illicit use of drugs. The study design is intended to provide some controls for the home environment of the mother and daughter and for family related factors such as single parenthood and poverty which may affect mother daughter differences. The study findings are intended to provide a test of the broad social and environmental factors which impact on the use of illicit drugs. Reducing the sample to mother and daughter pairs further reduces the sample to approximately 1000 mothers and daughters. In appendices A (Lifetime drug use) and B (Lifetime drug use disorder) we include the data for the total available samples of mothers and daughters. The results for the larger sample are very similar to those obtained from the paired data, with the advantage of the paired data providing control for mother daughter changes in some life circumstances (eg employment status). For this paper we use the substance use modules of the CIDI and compare the lifetime use and use disorder reported by mothers and their daughters. Data analyses were done using Stata 15 (Statacorp, 2017).

First we use the chi squared test to test for differences in the sociodemographic characteristics of the mothers and their daughters. We then select only mother and daughter pairs for whom CIDI data were available and examine self-reported levels of lifetime drug use with odds ratios calculated using McNemars test for marginal homogeneity. We then examine the adjusted odds ratios again using McNemars test. We repeat this analysis for seven diagnoses derived from the CIDI III (DSM-IV criteria) illicit drug use disorders unadjusted and then adjusted for a range of sociodemographic confounders. Numbers vary slightly from table to table due to listwise deletion and adjustment for multiple variables.

3. Results

At the 5 year follow-up (1986-88), mothers were a mean age of 31.3 years. At their most recent follow-ups (27yr follow-up, 2008-11), mothers were a mean age of 53.2 years and daughters

were a mean age of 30.3 years (2010-14). Comparing mothers' and daughters' sociodemographic characteristics (when they were both about 30 years of age) we note that daughters are more likely to be single/living together and to have a higher level of education. Relatively few mothers were in the workforce at 30 years of age compared to their daughters when a similar age. The majority of daughters were in the workforce at the 30 year follow-up (See Appendix C).

For table 1 there were 998 mother-daughter pairs available for comparison. Use of medications and drugs (lifetime) varies greatly over the 25 years when comparing mothers and daughters. Of the non-medically prescribed medications, stimulant use by daughters was much more prevalent than use by their mothers. Using the same (linked) sample of mothers and daughters, some 22 (2.2%) mothers report ever using a stimulant (non-medically) while 220 (22.0%) of their daughters report ever using stimulants, an (adjusted) almost 13 times difference in the odds of non-medical stimulant medication use. There has also been a large increase in the lifetime prevalence of club drug use when comparing the two generations. Few mothers (N=8; 0.8%) report ever using club drugs (includes ecstasy, MDMA, ketamine), however many of their daughters (N=282; 28.2%) report having ever used club drugs (adjusted odds ratio (OR) and 95% (CI) is 49.8 (24.4, 101.6). Only 11 (1.1%) mothers report ever having used cocaine by contrast to 169 (16.9%) of their daughters who report having ever used cocaine. The increased prevalence of hallucinogen use by daughters is not as great, in part, because the mothers' baseline use of these drugs was already at a moderate level (mothers N=49 (4.9%); daughters N=135 (13.5%)). Adjustment for maternal and daughter family income, marital status and education has no material impact on the findings.

(Table 1 about here)

Lifetime illicit drug use diagnoses are in Table 2. The largest generational change in drug use disorder diagnoses involve the proportion of daughters who have met the diagnostic criteria for

cocaine use disorder. Comparing mothers and their daughters, the latter had approximately twelve times the odds (lifetime) of meeting the criteria for a cocaine use disorder. There has also been a substantial change in the diagnosis of stimulant use disorders, with daughters having nine times the odds of meeting the criteria for diagnosis compared to their mothers. The change in cannabis use disorders reported by mothers and their daughters is also substantial. Adjustment for maternal and daughter differences in family income, marital status and education do not alter these findings.

(Table 2 about here)

Some 33.9% of mothers report ever having used an illicit drug compared to 64.8% of their daughters who report this behaviour (Table 3). Only 2.9% of mothers were found to have symptoms which met the criteria for a substance use disorder, compared to 14.6% of their daughters. Adjusted for sociodemographic differences between mothers and daughters, daughters were almost four times more likely than their mothers to have ever used an illicit drug, and about six times more likely to report ever having been diagnosed with an illicit drug use disorder.

(Table 3 about here)

4. Discussion

The generational increase in the lifetime prevalence of use of a range of illicit drugs is accompanied by a generational increase in drug use disorders experienced by daughters. Two of every three of the more recent current generation of 30 year old women in our sample report they have ever used an illicit drug and one in every six has experienced a drug use disorder. The majority of the more recent generation report they have used at least one illicit drug. Arguably more recent generations of women encounter and use illicit drugs in Australia at a rate that is historically unprecedented.

Levels of use of illicit drugs are greatly affected by a range of environmental factors such as the drug market (supply and demand). The supply of drugs is partly a function of transportation and communication. The social context of use (available discretionary time and financial resources) also matters as do perceptions of benefits, harms and the social acceptability of the substance.

There is good evidence that the supply of illicit drugs in Australia is high. Repeated surveys of Australian drug users report that heroin, methamphetamine, cocaine, cannabis and methadone are all easy or very easy to obtain (Stafford & Burns, 2013; Karlsson & Burns, 2018). Surveys of non-users of illicit drugs show that it is common for non-users to be offered supply (Smirnov et al, 2014). Despite vigorous efforts by a range of criminal justice agencies to apprehend both producers and sellers of illicit drugs in Australia, supplies continue to provide for market demand (Karlsson & Burns, 2018).

Funds to enable the purchase of drugs also appear to be more available to the more recent generation of women. Daughters were more likely to be in employment than were their mothers, providing financial resources needed to purchase the drugs. There has also been a substantial increase in venues of a type at which public consumption of illicit drugs is accepted, that is music festivals and clubs (Riley & Hayward, 2004; Gibson & Connell, 2016). Institutional forms have emerged to enable a drug using culture. While some of these changes are features of economically developed societies (Arnett et al, 2014), there are other societal changes that raise the possibility there may also be a retreat from the widespread use of illicit drugs. The latter includes the increase in the use of digital media which encompasses both a large investment in available free time as well as a decrease in face-to-face interaction with social networks (Arnett, 2018). While the use of electronic media increases potential access to a wide range of illicit drugs (Van Buskirk et al, 2016), Arnett argues that young people are increasingly living in a virtual world which may divert them from engaging in some high risk

behaviours (Arnett, 2018). There is an interesting possibility that time spent in the virtual world acts to divert the individual involved from using illicit substances.

Another factor affecting the propensity of young people to use illicit drugs is their perception of the risk to their health and wellbeing associated with the use of drugs. Many, in economically developed societies, are now concerned about lifestyle issues. There is a long term trend for young people to adopt more healthy lifestyles with a decline in unwanted pregnancies, drink-driving, cigarette use, and the consumption of unhealthy foods (Arnett, 2018). Research from the Monitoring the Future (MTF) study suggests that when there is an increase in the perception that the use of some drugs entails a risk to their health, the numbers using these drugs declines (Bachman et al, 2016). With high levels of illicit drug use, there is likely to be more information about the harms associated some users experience but whether this leads to an overall reduction in drug use, or diverts the user to other drugs, is unclear.

4.1 Limitations

Comparing mothers and daughters use of illicit drugs is a study design with advantages and limitations. The limitations include reduced numbers available for comparison, for example data are available for N=3482 mothers and for N=1359 of their daughters, but for only approximately N=1000 mother-daughter pairs. It is possible that restricting the sample to mother-daughter pairs affects the findings but we note in appendices A and B, where we present the mother-daughter unpaired data, that the results remain similar.

Elsewhere, we have examined the characteristics of those lost to follow-up (Saiepour et al, 2016; Ware et al, 2006) and the consequences of loss to follow-up for findings (Saiepour et al, 2019). Those lost to follow-up are the most economically and socially disadvantaged, with poorer mental health and high rates of substance use (Najman et al, 2015). However mothers and daughters are likely to be similarly affected and our analyses of similar patterns of loss to follow-up in MUSP suggest that the estimates of association in the group remaining in the

study and the group lost to follow-up remain unaffected (Saiepour et al, 2019). We have also examined maternal self-reported pre-pregnancy cannabis use in mothers who were retained and those subsequently lost to follow-up. Only minor differences in pre-pregnancy cannabis use by those remaining in the study and those lost to follow-up are observed. In any event our findings reflect the associations within our retained sample and invite replication from other studies.

The nine types of medication or drugs listed in the CIDI involve single item questions. These items have been tested and widely used, however, there are no specific data available to confirm their reliability or validity. Arguably, as both mothers and daughters were administered the same items, the results for mothers and daughters are subject to similar levels of imprecision.

It must also be noted that although all questions are about lifetime use or symptoms of substance use disorder, mothers were, on average 53.2 years of age when they completed the CIDI, while their daughters were 30.3 years of age at the completion of the CIDI. Illicit drug use generally begins in late adolescence or early 20s (AIHW, 2017). Mothers are being asked to recall a period in their lives less immediate than the period their daughters are recalling. It could be the case that mothers fail to recall their early drug use more often than do their daughters. If this were the case then the findings would underestimate rates of drug use by mothers and overestimate the extent of generational change in the use of illicit drugs. If we hypothesise that the longer period of maternal recall leads to a 25% reduction in recall of past drug use, the magnitude of change over 25 years would be reduced but the broad findings would remain consistent with the finding that there has been a large generational increase in the use of illicit drugs. In any event it would be expected that the diagnostic categories are less liable to forgetting than are individual drugs. The responses may also be influenced by discordant social desirability where the mothers or their daughters or both might be biased towards denying use of illicit drugs. We note that 30.8% of mothers report lifetime use of cannabis suggesting a willingness to report the use of the main available illicit drug in the mid-

1980s. Given that illicit drug use was a salient event in the mid-1980s, and that reporting this some 25 years later entails few negative consequences, it is difficult to argue for underreporting as a substantial explanation of the findings.

Conclusions

Illicit drug use by young Australian women is common. Is this high level of drug use and use disorder likely to continue and how should this likely pattern of continuing use influence criminal justice, community and health system responses? There is little evidence that the intensity of efforts to enforce drug laws or sanctions imposed by the criminal justice system have an impact on price or levels of use of illicit drugs (Bright & Ritter, 2010). Increased levels of law enforcement are relatively ineffective because suppliers and users adapt their activities by reducing purity, diverting to other drugs and finding alternative strategies for maintaining their profits (Bright & Ritter, 2010; Werb et al, 2011).

From a community perspective generational changes raise problems for policy and practice. Many of those responsible for formulating policies related to the use of illicit drugs are members of a generation which rarely used illicit drugs, and have experience (direct or indirect) only with cannabis. By contrast the substantial proportion of the contemporary generation of young adult women have experience with the use of a range of illicit drugs, including cannabis, club drugs (amphetamines, ecstasy) and stimulants. Policies need to adapt to these circumstances. Existing policy settings which condemn the use of illicit drugs have been ineffective. These policies are widely ignored and/or dismissed by the majority of young women. Arguably there is a need to engage the current generation of young women in formulating policies that are more likely to reduce the harms associated with the use of illicit drugs.

A public health response to these observed changes in women's use of illicit drugs might be based on a better understanding of how these changes have impacted on the health and well-

being of women in the medium to longer term. If the pattern of drug use we have observed in younger women involves short term changes in drug use with few long term impacts this will raise fewer concerns. Questions related to the duration, intensity and long terms impacts of drug use by young women warrant more detailed scrutiny.

References

- Andrew, G., & Peters, L. (1998). The psychometric properties of the Composite International Diagnostic Interview. *Social Psychiatry and Psychiatric Epidemiology*, 33, 80-88.
- Arnett, J. J. (2018). Getting better all the time: Trends in risk behaviours among American adolescents since 1990. *Arch Sci Psychol*, 6, 87-95.
- Arnett JJ, Zukaushkiene R, Sugimura K. (2014). The new life stage of emerging adulthood at ages 18-29 years: Implications for mental health. *Lancet Psychiatry*, 1, 569-76.
- Arnold, G. (2005) *The International Drugs Trade* Routledge, New York
- Australian Institute of Health and Welfare (2017) *National Drug Strategy Household Survey 2016: Detailed Findings* Canberra: AIHW. Drug Statistics Series No. 31.
- Bachman, J.G., Johnston, L.D., O'Malley, P.M. (2016). Explaining the recent decline in cocaine use among young adults: Further evidence that perceived risks and disapproval lead to reduced drug use. *J Health Soc Behav*, 31, 173-84.
- Basov, S., Miron, J., & Jacobson, M. (2001). Prohibition and the market for illegal drugs. *World Economics*, 2(4), 113-158.
- Bright, D.A., & Ritter, A. (2010). Retail price as an outcome measure for the effectiveness of drug law enforcement. *Int J Drug Policy*, 21, 359-63.
- Degenhardt, L., Lynskey, M., and Hall, W. (2000) Cohort trends in the age of initiation of drug use in Australia *ANZJPH* 24(4): 421-426
- Degner, J. and Dalege, J. (2013) The Apple Does Not Fall Far From the Tree, or Does it? A Meta-analysis of Parent-Child Similarity in Intergroup Attitudes *Psychological Bulletin* 139(6): 1270-1304
- Gibson, C., & Connell, J. (2016). *Music Festival and Regional Development in Australia*. Routledge: New York.

- Golub, A., & Brownstein, H.H. (2013). Drug generations in the 2000s: An analysis of arrestee data. *Journal of Drug Issues*, 43(3), DOI: 10.1177/0022042613475599.
- Golub, A., Johnson, B.D., & Dunlap, E. (2005). Subcultural evolution and illicit drug use. *Addiction Research and Theory*, 13(3), 217-229.
- Haro, J.M., Arbabzadeh-Bouchez, S, Brugha, T.S., et al. (2006). Concordance of the Composite International Diagnostic Interview Version 3.0 (CIDI 3.0) with standardised clinical assessments in the WHO world mental health surveys. *International Journal of Methods in Psychiatric Research*, 15(4), 167-180.
- Holdcraft, L.C., Iacono, W.G. (2004). Cross-generational effects on gender differences in psychoactive drug abuse and dependence. *Drug Alcohol Depend*, 74, 147-58.
- Johnson, R.M., Fairman, B., Gilreath, T., Xuan, Z., Rothman, E.F., Parnham, T., & Furr-Holden, C.D.M. (2015). Past 15-year trends in adolescent marijuana use: Differences by race/ethnicity and sex. *Drug and Alcohol Dependence*, 155, 8-15.
- Johnston, L.D., O'Malley, P.M., Miech, R.A., Bachman, J.G., Schulenberg, J.E. (2017) *Monitoring the future national survey results on drug use, 1975 – 2016: Overview, key findings on adolescent drug use*. Ann Arbor: Institute for Social Research, University of Michigan.
- Karlsson, A., & Burns, L. (2018). Australian Drug Trends 2017: *Findings from the Illicit Drug Reporting System (IDRS)*. Sydney: National Drug and Alcohol Research Centre, UNSW. Australian Drug Trend Series No. 181.
- Lai, Y. F., O'Brien, J., Bruno, R., Hall, W. et al (2016) Spatial variations in the consumption of illicit stimulant drugs across Australia *Science of the total environment* 568: 810-818
- Lipari, R.N., & Van Horn, S.L. (2017). Trends in substance use disorders among adults aged 18 or older. The CBHSQ Report: June 29, 2017. Center for Behavioural Health Statistics and Quality, Substance Abuse and Mental Health Services Administration, Rockville MD.

- Makkai, T., & McAllister, I. (1997). *Marijuana in Australia: Patterns and Attitudes*. Canberra: Commonwealth Department of Health and Family Services; Monograph Series No. 31.
- Mannheim, K. (1952). The Problem of Generations. In: Kecskemeti P, Ed. *Essays on the sociology of knowledge, Collected Works*, Volume 5. New York: Routledge.
- Michaud, P.A., Berchtold, A., Jeannin, A., Chossis, I., & Suris, J.C. (2006). Secular trends in legal and illegal substance use among 16-20 year old adolescents in Switzerland. *Swiss Med Wkly*, 136, 318-26.
- Najman, J.M., Bor, W., O'Callaghan, M., Williams, G.M., Aird, R., & Shuttlewood, G. (2005). Cohort profile: The Mater-University of Queensland Study of Pregnancy (MUSP). *Int J Epidemiol*, 34(5), 992-7.
- Najman, J.M., Alati, R., Bor, W., Clavarino, A., Mamun, A., McGrath, J.J., McIntyre, H.D., O'Callaghan, M., Scott, J., Shuttlewood, G., Williams, G.M., & Wray, N. (2015). Cohort profile update: The Mater-University of Queensland Study of Pregnancy (MUSP). *Int J Epidemiol*, 44(1), 78-78f.
- Parker, H., and Measham, F. (1994) Pick 'n' Mix: changing patterns of illicit drug use amongst 1990s adolescents *Drugs: Education, Prevention and Policy* 1(1): 5-13
- Piontek, D., Kraus, L., Pabst, A., Legleye, S. (2012). An age period cohort analysis of cannabis use prevalence and frequency in Germany, 1990-2009. *J Epidemiol Community Health*, 66, 908-13.
- Riley, S.C.E., & Hayward, E. (2004) Patterns, trends and meanings of drug use by dance-drug users in Edinburgh, Scotland. *Drugs: Education, Prevention and Policy*, 11(3), 242-262.

- Saiepour, N., Ware, R., Najman, J.M., et al. (2016). Do participants with different patterns of loss to follow-up have different characteristics? A multi-wave longitudinal study. *Journal of Epidemiology*, 26, 45-49.
- Saiepour, N., Najman, J.M., Ware, R., et al. (2019). Does attrition affect estimates of association: A longitudinal study. *Journal of Psychiatric Research*, 110, 127-142.
- Smirnov, A., Kemp, R., Wells, H., Legosz, M., Najman, J.M. (2014). Using population screening for recruitment of young adults engaged in illicit drug use: methodological issues and sampling outcomes. *Soc Sci Res.* 45, 89-97.
- Stafford, J., & Burns, L. (2013). *Australian drug trends, 2012. Findings from the illicit drug reporting system (IDRS)*. Australian Drug Trend Series No. 91. Sydney, National Drug and Alcohol Research Centre, University of New South Wales.
- StataCorp. (2017) *Stata Statistical Software: Release 15*. College Station, TX: StataCorp LLC.
- Twenge, J.M. (2011). Generational differences in mental health: Are children and adolescents suffering more, or less? *Am J Orthopsychiatry*, 81(4), 469-72. DOI: 10.1111/j.1939-0025.2011.01115.x.
- Twenge, J.M., Gentile, B., DeWall, C.N., Ma, D., Lacefield, K., Schurtz, D.R. (2010). Birth cohort increases in psychopathology among young Americans, 1938 – 2007: A cross-temporal meta-analysis of the MMPI. *Clin Psychol Rev*, 30, 145-54. DOI: 10.1016/j.cpr.2009.10.005.
- Twenge, J.M., Park, H. (2017). The decline in adult activities among US adolescents, 1976-2016. *Child Development*. Advance online publication. Available from <https://onlinelibrary.wiley.com/doi/full/10.1111/cdev.12930>.

- Üstün, B., Compton, W., Mager, D., et al. (1997). WHO study on the reliability and validity of the alcohol and drug use disorder instruments: Overview of methods and results. *Drug and Alcohol Dependence*, 47, 161-169.
- Van Buskirk, J., Naicker, S., Bruno, R., Burns, L., Breen, C., Roxburgh, A. (2016). *Drugs and the Internet*, Issue 6, Citation: Sydney: National Drug and Alcohol Research Centre.
- Van Nuijs, A.L.N., Castiglioni, S., Tarcomnicu, I., Postigo, C et al (2011) Illicit drug consumption estimations derived from wastewater analysis: A critical review *Science of the Total Environment* 409: 3564-3577
- Vega, W., Aguilar-Gaxiola, S., Andrade, L. et al (2002) Prevalence and age of onset for drug use in seven international sites: results from the international consortium of psychiatric epidemiology *Drug and Alcohol Dependence*, 68, 285-297
- Wallace, J.M., Bachman, J.G., O'Malley, P.M., Schulenberg, J.E., Cooper, S.M., & Johnston, L.D. (2002). Gender and ethnic differences in smoking, drinking and illicit drug use among American 8th, 10th and 12th grade students, 1976-2000. *Addiction*, 98, 225-2345.
- Ware, R.S, Williams, G., Aird, R.L. (2006). Participants who left a multi-wave cohort study had similar baseline characteristics to participant who returned. *Annals of Epidemiology*, 16, 820-823.
- Werb, D., Rowell, G., Guyatt, G., Kerr, T., Montaner, J., Wood, E. (2011). Effect of drug law enforcement on drug market violence: A systematic review. *Int J Drug Policy*, 27, 87-94.
- Wittchen, J.U., Zhao, S., Kessler, R.C., Eaton, W.W. (1994). DSM-III-R generalized anxiety disorder in the National Comorbidity Survey. *Arch Gen Psychiatry*, 57, 355-64.

Table 1. Ever “Nonmedical” Use of Medications or Illicit Drugs (N = 998)

Type of medication or drug	Mother 27 yr f/u N (%)	Daughter 30 yr f/u N (%)	Unadjusted Odds Ratio D/M**	Adjusted Odds Ratio D/M***
1. Sedative/Tranquilizer	29 (2.9)	72 (7.2)	2.6 (1.6,4.2)	2.6 (1.7,4.1)
2. Stimulant	22 (2.2)	220 (22.0)	14.2 (8.4,25.8)	12.8 (8.2,20.0)
3. Pain Killer	30 (3.0)	54 (5.4)	1.8 (1.1,2.9)	1.85 (1.2,3.0)
4. Cannabis	307 (30.7)	606 (60.6)	4.2 (3.4,5.3)	3.6 (3.0,4.3)
5. Cocaine	11 (1.1)	169 (16.9)	23.6 (11.2,59.5)	19.0 (10.3,35.1)
6. Club Drugs	8 (0.8)	282 (28.2)	46.7 (21.8,128.2)	49.8 (24.4,101.6)
7. Hallucinogens	49 (4.9)	135 (13.5)	3.3 (2.3,4.9)	3.1 (2.2,4.3)
8. Heroin/ Opioid	5 (0.5)	28 (2.8)	5.6 (2.1,18.6)	5.9 (2.2,15.5)
9. Inhalants/Solvents	2 (0.2)	38 (3.8)	19.0 (4.9,162.6)	19.8 (4.7,82.5)

Questions 1-3 are about medicines used nonmedically. Nonmedical is defined as without the recommendation of a health professional. Form of question is “Have you ever used a sedative or tranquilizer non-medically?”. Questions 4-9 are of the form “Have you ever used either marijuana or hashish?”

** McNemar’s Test, Marginal Odds Ratios

*** McNemar’s Marginal Odds Ratios, adjusted for mother and daughters: family income, marital status, highest education and daughters education

Bolded numbers denote significant differences

Table 2. Comparing Mothers' and Daughters' – Lifetime Diagnoses (CIDI DSM-IV)
(N = 998)

DSM-IV Diagnosis	Mother 27 yr f/u N (%)	Daughter 30 yr f/u N (%)	Unadjusted Odds Ratio D/M*	Adjusted Odds Ratio D/M**
1. Sedative use disorder	8 (0.8)	7 (0.7)	0.9 (0.3,2.8)	0.9 (0.3,2.4)
2. Stimulant use disorder	8 (0.8)	66 (6.6)	9.3 (4.3,24.0)	8.9 (4.3,18.7)
3. Pain Killer use disorder	6 (0.6)	8 (0.8)	1.3 (0.4,4.7)	1.3 (0.5,3.9)
4. Cannabis use disorder	17 (1.7)	106 (10.6)	6.6 (3.9,11.9)	7.0 (4.1,11.9)
5. Cocaine use disorder	1 (0.1)	12 (1.2)	12.0 (1.8,13.0)	12.3 (1.6,15.3)
6. Hallucinogens use disorder	5 (0.5)	9 (0.9)	1.8(0.5,6.8)	1.8(0.6,5.5)
7. Opioid use disorder	2 (0.2)	10 (1.0)	5.0 (1.1,26.9)	5.1 (1.1,23.7)

* McNemar's Test, Marginal Odds Ratios

** McNemar's Marginal Odds Ratios, adjusted for mothers and daughters: family income, marital status, highest education and daughter occupation.

Bolded numbers denote significant differences

Table 3. Generational Changes in the Use and Abuse of Illicit Drugs, comparing Mothers and Daughters.

	N	% Meeting Diagnostic Criteria	Unadjusted ⁺	Adjusted ^{***}
Mother, lifetime use of illicit drugs*	1006	33.9%	1 (ref)	1 (ref)
Daughter, lifetime use of illicit drugs*	1006	64.8%	4.5 (3.5,5.7)	3.7 (3.1,4.4)
Mother, lifetime CIDI (DSM-IV) diagnosis of illicit drug use**	1006	2.9%	1 (ref)	1 (ref)
Daughter, lifetime CIDI (DSM-IV) diagnoses of illicit drug use **	1006	14.6%	5.5 (3.6,8.8)	5.9 (3.9,9.0)

* Includes Sedative/tranquilizer, stimulants, pain killers, marijuana, cocaine, club drugs, hallucinogens, opioids, inhalants.

** Diagnoses include the following drugs: sedatives, stimulants, pain killers, marijuana, cocaine, hallucinogens, opioids.

*** McNemar's Odds Ratio of Marginal Homogeneity adjusted for maternal family income, marital status and education; daughter family income, marital status, education and occupation.

+ For mother-daughter pairs N=1006, odds ratio uses McNemar's test of Marginal Homogeneity.

Bolded numbers denote significant differences

Highlights

- Major changes in illicit drug use by mothers and their daughters in Australia.
- Mothers rarely ever used illicit drugs (exception is cannabis).
- Daughters report using a much wider variety of illicit drugs than their mothers.
- Most daughters report the use of illicit drugs and 14.6% report a drug use disorder.

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Illicit Drug Use by Mothers and their Daughters in Australia: A Comparison of Two Generations

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Yours sincerely

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