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PAPER

Prevalence and correlates of cannabis use and dependence in young New Zealanders

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Abstract

Aims. To determine change in patterns of cannabis use in New Zealand in an unselected birth cohort and investigate the relationship between level of cannabis use, violent behaviour and employment history.

Method. Prospective longitudinal design using members of the Dunedin Multidisciplinary Health and Development Study at ages 15, 18 and 21 years.

Results. Rates of cannabis use increased from 15% (n = 144) at age 15 years to more than half of the sample seen at age 21 years (n = 497; 52.4%). DSM-III-R defined cannabis dependence assessed at age 18 and 21 years increased from 6.6% (n = 61) to 9.6% (n = 91). Males were more likely to use and be dependent on cannabis than females. Early use substantially increased the risk for the development of cannabis dependence in young adulthood. Cross-sectional analysis at age 21 found levels of cannabis use and dependence to be higher among the unemployed and those with a history of violent behaviour.

Conclusions. Prevalence rates of cannabis use in young New Zealanders were found to be higher than previously reported. A history of unemployment or of violent behaviour was associated with more frequent cannabis use at age 21. Males were more likely than females to use cannabis frequently and to meet DSM-III-R criteria for dependence at age 21. It is suggested that drug education campaigns should specifically target young males.

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Recent reports have indicated relatively high rates of cannabis use in young New Zealanders. For example, 12-month prevalence estimates of cannabis use in 15 year old boys and girls range from 10% to 15%[1,2] and increase to one quarter of women and almost 40% of men aged 18-19 years.[3] The most commonly reported problems associated with frequent cannabis use are "difficulties with the law", memory problems and loss of motivation or energy.[4]

Unfortunately, it is not possible to discern trend information from the above findings due to their cross-sectional nature, nor is it clear if "difficulties with the law" stem from behaviour solely associated with cannabis use (ie, possession, cultivation or sale), or reflect higher rates of criminality per se in those who use cannabis. In particular, the relationship between violent behaviour and cannabis use deserves empirical scrutiny. Further, although cannabis use has not been shown to result in problems at work,[3] memory problems and loss of motivation which can result from frequent use may hinder successful job acquisition.

Prospective data are required to shed light on the changing patterns of use in young New Zealanders.[5] Similarly, more information is required about levels of DSM-III-R defined cannabis dependence during adolescence and young adulthood. This information is particularly important for policy makers and health planners as they attempt to target drug education campaigns and deliver health services effectively. Information regarding prevalence rates may also be of interest to policy makers concerned with drug law reform.

This study will therefore (1) provide information about changes in prevalence of cannabis use and dependence in a birth cohort of New Zealanders as they enter adulthood; (2) examine the relationship between cannabis use and violent behaviour; and (3) explore the relationship between cannabis use and employment status as study members enter the labour market.

Method

Participants. The sample comprised members of the Dunedin Multidisciplinary Health and Development Study, a longitudinal investigation of young people's health, development and behaviour from birth to adulthood. The study and sample members have been described in detail elsewhere.[6] Briefly, the Dunedin sample has been assessed with a diverse battery of psychological, medical and sociological measures with high rates of participation at age 3 (n =1037), 5 (n = 991), 7 (n = 954), 9 (n= 955), 11 (n = 925), 13 (n = 850), 15 (n = 976), 18 (n = 1008), and most recently 21 (n = 992). The present data are from assessments conducted at ages 15, 18 and 21.

Cannabis use. As part of the Mental Health Assessment at ages 15, 18 and 21, sample members were asked about their use of cannabis in the previous 12 months. Response categories at 15 were 'not used', 'once or twice' and 'three or more times' and at 18 and 21 were 'not used', 'less than six times' and 'six or more times'. Throughout this paper cannabis use less than six times will be denoted as 'intermittent use' and use six times or more will be denoted 'frequent use.'

Cannabis dependence. Dependence measures were obtained at 18 and 21 using a modified version of the Diagnostic Interview Schedule (DIS). The four modifications made to the DIS for the Dunedin study applied to all psychiatric diagnoses and were: (1) to limit questions to the assessment of DSM-III-R criteria only, (2) to limit the assessment of symptoms to those occurring with the past 12 months only, (3) to limit assessment to only the more commonly occurring diagnoses for this age group, and (4) to limit response options to "no," "yes, sometimes", and "yes, definitely".[7] Cannabis dependence, as defined by DSM-III-R criterion, was characterised by maladaptive behaviour induced by frequent (daily, or almost daily) use of cannabis. Sample members were asked questions relating to time spent using, obtaining or recovering from cannabis; impairment of their ability to control cannabis use; tolerance; continued use despite social, psychological or physical health problems caused or exacerbated by cannabis use; use of cannabis in hazardous situations; and whether cannabis use had led them to neglect any of their usual responsibilities or to give up any of their usual social, occupational or recreational activities. In order to be diagnosed as dependent, a sample member had to respond "yes, definitely" to questions in at least three of the above areas and to indicate that for at least one of these, their problem had endured for at least a month or had recurred over a longer period of time.

Employment status. Employment status was defined as either (a) Unemployed (b) Employed (c) Student or Training Scheme. At age 21, sample members also provided information about their monthly employment histories using the life history calendar (LHC), a visual method facilitating accurate recall of multiple life-events, their timing and duration.[8] Study members were asked if there were any periods of a month or more when they were unemployed but were seeking employment and if so, when (ie, which months). Employment data were obtained across a 6 year (72 month) period, from age 15 to 21.

Violent behaviour. Consent was obtained from sample members to acquire criminal conviction records for all courts in New Zealand and Australia from the New Zealand police database. Approval of this and all other aspects of the study was given by the Otago Ethics committee. We included sample members who had been convicted of one or more of the following violent crimes: inciting or threatening violence, using an attack dog on a person, presenting an offensive weapon, threatening a police officer, rape, manual assault, assault on a police officer, assault with a deadly weapon, aggravated robbery, and homicide. Forty-six sample members had been convicted of a violent offence by age 21.

Additionally, self reports of criminal offences committed during the past year were obtained in private standardised interviews at age 21 using the self report delinquency interview developed for US national surveys of illegal behaviour.[9] The interview assessed 41 different illegal offences and in the present sample yielded an internal reliability alpha of 0.88, a one month test-retest reliability coefficient of 0.85 and moderate correlations with informant reports and conviction records.

Self report items that related to violent behaviour were: "attacked someone you lived with, with a weapon or with the idea *of seriously hurting or killing them*", "attacked someone else with a weapon or with the idea of seriously hurting or killing them", "hit someone you lived with", "hit someone else", "used a weapon, force or strongarm methods to rob a person", or "were involved in a gang fight". Study members were included in the violence group if they had self-reported two or more violent acts in the past year or had been convicted of a violent crime.

Results

Prevalence. Rates of cannabis use at ages 15, 18 and 21 are presented in Table 1. The prevalence estimate for cannabis use in this sample at age 15 (ie, 15%) has been reported previously[2] and is included for comparative purposes. At age 18, 40% of females and 46.7% of males reported use which increased to 46.1% of females and 58.6% of males at age 21. Males and females were equally likely to use cannabis intermittently (less than 6 times) at both ages whereas significantly more males than females reported frequent use (6 or more times) at age 18 ($\chi^2 = 7.71$, $p < 0.05$) and 21 ($\chi^2 = 25.72$, $p < 0.001$). Cumulative lifetime rate of use at age 21 years was 61.9% among those seen at all three assessments (n = 875, or 91% of those given the DIS interview at age 21).

Table 1. Lifetime and 12-month prevalence of cannabis use in a longitudinal birth cohort at age 15, 18 and 21 years.

	% Males		% Females		% Total	
Age	Lifetime	12-month	Lifetime	12-month	Lifetime	12-month
15	13.8	13.8	16.3	16.3	15.0	15.0
18	48.3	46.7	44.3	40.0	46.3	43.4
21	65.5	58.6	58.3	46.1	61.9	52.4

Patterns of use from age 18 to 21 years. Of those reporting use at age 21 approximately one third were new users whereas just under two thirds reported use at both ages. About one quarter of 18 year old intermittent users had ceased use at age 21 whereas approximately 10% of the frequent users at age 18 had stopped using cannabis at age 21. These figures reveal relative stability of cannabis use at age 18 to 21 years, an increase in the numbers who used frequently as opposed to intermittently and further increase in rates of first time use.

Incidence, remission and stability of use from age 15 to 21 years. Levels of incidence, remission and stability were calculated from age 15. As would be expected given the increasing prevalence over this period, incidence (new cases) and the likelihood of increase in use was more common than either remission or decrease in use (see Table 2). This was particularly so for males. Females were more likely to desist or reduce cannabis use than males, and were more likely to remain nonusers or only light users. Frequent use at age 15 was strongly related to frequent use at age 21. All males using cannabis frequently at age 15 (n = 24) were using at age 21.

Dependence. The rates of cannabis dependence at age 18 and 21 are presented in Table 3. At age 18, 6.6% of the sample met criteria for dependence which increased to 9.6% at age 21. At age 18 approximately twice as many males than females met the criteria for dependence. While the level of dependence was essentially stable for females between 18 and 21, it almost doubled for males during this time. Of those diagnosed as cannabis dependent at age 18, approximately half were also diagnosed as dependent at age 21.

Table 2. Transition probabilities for incidence, remission and stability of cannabis use from 15 to 21 years for males, females and the total sample.

Ages	15 -18			18 - 21			15 - 21		
	Males	Females	All	Males	Females	All	Males	Females	All
Incidence:									
none to light	0.21	0.20	0.21	0.22	0.19	0.20	0.20	0.25	0.22
light to frequent	0.55	0.31	0.42	0.50	0.26	0.38	0.63	0.52	0.57
none to frequent	0.19	0.13	0.16	0.11	0.09	0.10	0.34	0.17	0.26
Remission									
frequent to light	0.09	0.14	0.12	0.09	0.15	0.11	0.04	0.18	0.11
light to none	0.14	0.31	0.24	0.21	0.32	0.27	0.13	0.36	0.26
frequent to none	—	0.19	0.09	0.07	0.17	0.11	—	0.09	0.04
Stability:									
none	0.60	0.67	0.63	0.67	0.73	0.70	0.46	0.58	0.52
light	0.31	0.37	0.34	0.29	0.42	0.35	0.25	0.12	0.18
frequent	0.91	0.67	0.79	0.85	0.68	0.78	0.96	0.73	0.84

Transition probabilities represent the percentage of those at a particular level of use at the first age who move to a different level of use at the second age, thus for example 21% of 15-year-old males who had never used cannabis reported light use at age 18.

Table 3. Percentage of males, females and the total sample meeting DSM-III-R criteria for cannabis dependence at 18 and 21 years.

Age	Males n (%)	Females n (%)	Total n (%)
18	41 (8.6)	20 (4.4)	61 (6.6)
21	69 (14.3)	22 (4.7)	91 (9.6)
18 & 21	23 (5.1)	7 (1.6)	30 (3.4)

Employment. The relationship between employment, cannabis use and dependence at age 21 is presented in Table 4. Use and dependence were both significantly associated with unemployment at this age. (Use: $\chi^2 = 12.50$, $p < 0.01$; dependence: $\chi^2 = 26.89$, $p < 0.01$). Compared to nonusers at age 15, those who reported using cannabis at this early age were twice as likely to be unemployed at age 21 (relative risk estimate = 2.11). Further, using the life history calendar, we found a significant difference in the number of months spent unemployed (from 15 to 21 years) between non-dependent (n = 852, 5.3 months) and cannabis dependent study members (n = 91, 10.7 months), $t = 4.92$, $p < 0.001$.

Table 4. Levels of cannabis use and dependence by employment status and history of violent offending for the total sample at age 21.

	Use (%)			Dependence (%)	
	No use	Intermittent (<6times)	Frequent (6+times)	Not dependent	Dependent
Unemployed	35.0	15.3	49.6	79.6	20.4
Employed	48.0	22.3	29.7	91.3	8.7
Student	53.6	23.4	23.0	95.1	4.9
Nonviolent	51.3	21.6	27.1	93.1	6.9
Violent	11.6	17.9	70.5	66.7	33.3

Violent behaviour. The relationship between violent behaviour, cannabis use and dependence at age 21 years is presented in Table 4. Use and dependence were both *significantly related to violent behaviour at this age (use:* $\chi^2 = 80.14$, $p < 0.001$; dependence: $\chi^2 = 69.11$, $p < 0.001$).

Discussion

While not directly comparable (due to different age categorisation), the rates of cannabis use reported in the present study appear significantly higher than those previously reported in New Zealand.[3,4] For example, Black

and Casswell (1990) found 12-month prevalence rates of 25.3% in females and 38.9% in males aged 18-19 years, rising to about 40% in males aged 20-24. Fewer females reported use in this age group than at 18-19 years (20.2%). Their overall 12-month prevalence rates for cannabis use were 32.9% at age 18-19 and 30.1% at age 20-24 years and their lifetime prevalence rate was 52%.

To what can we attribute these differences in prevalence estimates of cannabis use by young New Zealanders? Different sampling, assessment methodology, cohort and secular effects may explain the different findings.[11] For example, the Black and Casswell survey was conducted in 1990 by phone and had a response rate of 68% whereas the present study was based on interview data collected in 1990/1 and 1993/4 with response rates of above 95% on both occasions. The one third of nonresponders in the Black and Casswell telephone survey may well have been those more likely to report use of illegal substances,[3] resulting in an underestimate of the true rate of cannabis use. In contrast, our sample, with a long history of contact and assured confidentiality and low attrition, may more accurately reflect the actual rates of cannabis use in New Zealand. It should be noted, however, that although our sample contains all groups in the socioeconomic spectrum, it is under-representative of individuals of Maori and Pacific Island descent (about 3% in the sample compared with about 12% for New Zealand). Previous reports have suggested high rates of cannabis use in these groups,[2,3] thus it remains possible that the current findings are a conservative estimate of the true rate of cannabis use in this age group. Our lifetime and 12-month prevalence estimates are, however, similar to those reported in US longitudinal studies.[10,11] For example, Kandel and Logan (1984) reported 54% of 18 year-olds had used cannabis previously, with 26% of females and 39% of males reporting current use at age 18 years, increasing to approximately 33% of females and 52% of males at age 21 years.

A dependence rate, as defined by DSM-III-R, of almost 10% in the sample at age 21 is disconcertingly high and suggests that young males are particularly at risk for developing dependence in this age group. The observed association between frequent cannabis use, dependence and unemployment is noteworthy and requires further exploration. It is unclear from the present data if people use cannabis at greater rates when unemployed or whether high rates of cannabis use adversely effect an individual's ability to obtain employment. Our finding that those who were cannabis dependent spent twice as many months unemployed as non-dependent sample members suggests the hypothesis that heavy cannabis use may compromise a person's ability to obtain work. Interestingly, employed and student sample members report similar rates of usage indicating that cannabis use was not differentially associated with a student lifestyle or employment and presumably increased financial resources.

The finding of a strong relationship between levels of cannabis use and violent behaviour is cause for concern. While this finding does not establish a causal link between cannabis use and violent behaviour, it does indicate the two are meaningfully related. Speculatively, it remains possible that the elevated rate of violent behaviours associated with cannabis use are concomitants of procurement and/or supply of this drug. Alternately, prolonged or heavy use of cannabis may disinhibit aggressive or hostile responses, cause paranoid ideation, compromise an individual's ability to cope and/or diminish understanding of the negative consequences of violent behaviour.[12-16] Finally, it may be that a third unknown factor, for example difficult temperament (eg, impulsivity), adolescent conduct disorder or other substance use may account for this relationship. Clearly, more prospective research examining the nature of the relationship between violence and cannabis use is required before definitive conclusions can be made.

More generally, our findings emphasise the need to distinguish between occasional and frequent use so as not to underestimate the correlates of cannabis use. That is, had we restricted our analyses to individuals who had used cannabis only occasionally, a number of our findings would not have attained significance. The corollary of the above is that future research on drug use in New Zealand should employ recognised and reliable methods for assessing levels of drug use and dependence (eg, structured diagnostic interviews).

A striking finding from the present study is that more than half of the cohort (at age 21 years) reported using cannabis in the preceding year. This prevalence rate (52.4%) far exceeds those reported previously in New Zealand. Furthermore, almost 10% met DSM-III-R criteria for cannabis dependence. Intermittent use or experimentation was approximately equal between the sexes. More men than women reported using cannabis frequently and were cannabis dependent indicating that young men in particular should be targeted in drug education campaigns. Further, given the high rates of cannabis use by age 18, prevention programmes should be aimed at young adolescents before patterns of use become well-established. It seems reasonable to anticipate experimentation with cannabis by young people. When this occurs, it should be informed by knowledge about potential problems associated with frequent or excessive use. It is also imperative that future research focus on the relationship between cannabis use and unemployment and violent behaviour as these issues have a significant impact on both individual and societal well-being.

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1. Fergusson DM, Lynskey MT, Horwood LJ. Patterns of cannabis use among 13-14 year old New Zealanders. NZ Med J 1993; 106: 247-50.
2. McGee R, Feehan M. Cannabis use among New Zealand Adolescents. NZ Med J 1993; 106: 345.
3. Black S, Casswell S. Recreational drug use in New Zealand. Drug Alcohol Rev 1993; 12: 37-48.
4. Black S, Casswell S. Drugs in New Zealand: A survey 1990. Auckland: Alcohol and Public Health Research Unit; 1991.
5. National Drug & Alcohol Policy: a draft for public consultation: Mental Health Services - Ministry of Health. Wellington: Ministry of Health, 1995.
6. Silva P. The Dunedin multidisciplinary health and delopment study: A 15 year longitudinal study. Paediatr Perinatal Epidemiol 1990; 4: 76–107.
7. Feehan M, McGee R, Nada Raja S, Williams S. DSM-III-R disorders in New Zealand 18-year-olds. Aust NZ J Psychiatry 1994; 28: 87-99.
8. Caspi A, Moffitt TE, Thornton A, et al. The life-history calender: A research and clinical assessment method for collecting retrospective event-history data. Int J Methods Psychiatr Res, in press.
9. Elliot D, Huizinga D. Improving self-reported measures of delinquency. In: Klein MW, ed. Cross-national research in self-reported crime and deliquency. London: Kluwer Academic Publishers, 1989.
10. Kandel DB, Logan JA. Patterns of drug use from adolescence to young adulthood: Periods of risk for initiation, continued use, and discontinuation. Am J Public Health 1984; 74: 660-6.
11. O'Malley PM, Bachman JG, Johnston LD. Period, age, and cohort effects on substance use among American youth, 1976-82. Am J Public Health 1984; 74: 682-8.
12. McCormack RA, Smith M. Aggression and hostility in substance abuaers: the relationship to abuse patterns, coping style and relapse triggers. Addict Behav 1995; 20: 555-62.
13. Thomas H. Psychiatric symptoms in cannabis users. Br J Psychiatry 1993; 163: 141-9.
14. Thornicroft G. Cannabis and psychosis. Is there epidemiological evidence for an association? Br J Psychistry 1990; 157: 25-33.
15. Mezzich AC, Tarter RE, Kirisci L. Coping capacity in femalee sdolescent substance abusers. Addict Behav 1995; 20: 181-7.
16. Wolfordt S, Mihalic DE, Menard S. Continuities in marital violence. J Fam Violence 1994; 9: 195-225.
17. Jessor R. Problem-behaviour theory, psychosocial development and adolescent problem drinking. Br J Addict 1987; 82: 331-42.
18. Ohannessian CM, Stabenau JR, Hesselbrock VM. Childhood and adulthood temperament and problem behaviours and adult substance use. Addict Behav 1995; 20: 77-66.