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Correlates of Later-onset Cannabis Use in the National Epidemiological Survey on Alcohol and Related Conditions (NESARC)

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Abstract

Background—Much of the research surrounding correlates of cannabis initiation has focused on adolescent and young adult populations. However, there is growing evidence that cannabis onset occurs later in life as well and little is known of the risk and protective influences that are associated with late-onset cannabis initiation.

Methods—We used data on 34,653 individuals that participated in both the first wave and the 3-year follow-up (3YFU) of the National Epidemiological Survey on Alcohol and Related Conditions (NESARC). Univariate and multivariate logistic regression was used to examine the association between cannabis initiation at 3YFU and socio-demographic, religious/pro-social and psychiatric measures. Analyses were also conducted in age bands to further distinguish across the lifespan.

Results—Of the 27,467 lifetime abstainers at wave 1, 509 had initiated cannabis use at 3YFU. Consistent associations between divorce, religious attendance, volunteer/community service, alcohol abuse/dependence, nicotine dependence and cannabis initiation were noted in the full sample and across age-bands.

Conclusions—Religious and pro-social activities are negatively associated with late-onset cannabis onset while divorce and alcohol and nicotine-related problems are positively associated with later onset.

Keywords

Cannabis; NESARC; Late-onset

1. INTRODUCTION

Cannabis remains the most widely used illicit psychoactive substance in developed nations (Degenhardt et al., 2008). In the United States, 2.1 million individuals aged 12 and older initiated use of cannabis in the past month with these past month rates peaking (16.4%) in those aged 18–25 years (Substance Abuse and Mental Health Services Administration (SAMHSA),

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2005). Rates of lifetime and recent use of cannabis appear to have stabilized over the last decade, and while much is known about the predictors and sequelae of early-onset cannabis use (ages 17 and younger), sources contributing to onsets of cannabis use during adulthood remain largely unexplored.

A majority of cannabis-using older adults initiate their use in adolescence and early adulthood – the peak period of risk (Agrawal et al., 2006; Agrawal et al., 2007; Boden et al., 2006; Degenhardt et al., 2000; Vega et al., 2002; Wagner et al., 2002a; Wagner et al., 2002b; Wittchen et al., 2008) and over 50% continue to use cannabis into middle adulthood (Perkonig et al., 2008). Across birth cohorts, while there have been fluctuations in mean age at first cannabis use, most individuals report onsets adolescence and young adulthood (16–30 years) with declining age of initiation in more recent cohorts (Degenhardt et al., 2000), likely due to cohort effects. In those aged 15–54 years, first use of cannabis has been shown to peak at 18 years (Wagner et al., 2002a), with few onsets after age 25 years and nearly no onsets after age 35 years (Vega et al., 2002). Thus, later-onset cannabis use, even though unusual, is a fairly unique phenomenon and little is known of its etiology.

In the current study, we use data from 34,653 U.S. adults who were first interviewed in 2001–2002 as part of the National Epidemiological Survey on Alcohol and Related Conditions (NESARC) (Grant et al., 2003b) and followed up, 3 years later (Grant et al., 2008). We examine the socio-demographic and psychiatric correlates of new onsets of cannabis use during the 3 year follow-up and examine whether the constellation of risk and protective influences vary when comparing those initiating prior to age 35 years and later onsets.

2. MATERIALS AND METHODS

2.1 Sample

National Epidemiological Survey on Alcohol and Related Conditions (NESARC) is a nationally representative sample of 43,093 participants aged 18–99 years (at Wave 1). Comprehensive details regarding the survey design and sample characteristics are available elsewhere (Grant et al., 2003b). Wave 1 was collected during 2001–2002 by the U.S. Bureau of the Census on behalf of the National Institute on Alcohol Abuse and Alcoholism and the sample includes data from adult, non-institutionalized U.S. citizens and non-citizens (including Alaska and Hawaii). Approximately 57% of the sample was female and 19% was Hispanic (76% Caucasian), with an over-sampling for non-Hispanic Black households and for young adults aged 18–24 years. A 3-year follow-up (3YFU) interview has also been completed. A response rate of 86.7% (Ruan et al., 2008) for an effective sample size of 34,653, with exclusions due to death, deportation and mental or physical impairment was achieved. The cumulative response rate at Wave 2 was the product of this Wave 2 response rate and the response rate from Wave 1 (81.0%), or 70.2% and compare favorably with many cross-sectional studies.

Prior to each interview, written documents detailing the nature of the survey, its statistical uses, the voluntary aspect of participation, and the Federal laws that rigorously provide for the confidentiality of identifiable survey information were provided to each participant. Only consenting respondents were subsequently interviewed. The research protocol, including informed-consent procedures, received full ethical review and approval from the U.S. Census Bureau and the U.S. Office of Management and Budget.

The Alcohol Use Disorders And Associated Disabilities Schedule (AUDADIS-IV) was used to collect interview data from all individuals. The AUDADIS is a fully-structured diagnostic interview, for self-report data, that can be administered by lay interviewers and/or clinicians. The AUDADIS diagnoses lifetime, past 12 month and prior to past 12 month diagnoses based

on DSM-IV criteria and does not rely on skip-outs during assessments. The reliability and validity of assessments from the AUDADIS-IV are good and have been discussed in detail elsewhere (Grant et al., 2003a; Ruan et al., 2008).

2.2 Measures

Cannabis initiation was defined as use of cannabis (even once) at 3YFU in those who reported, during their Wave 1 interview, that they had never used cannabis during their lifetime. Of the 27,467 individuals who reported never using cannabis at Wave 1 (and were in the 3YFU sample with a non-missing response for cannabis initiation), 1.9% (N=509) reported cannabis use at some point during the 3YFU while the others remained never users. Of the 509 users at 3YFU, 85 reported use prior to the past year alone while 83% (N=424) reported using cannabis in the past year; 14% (N=71) reported daily use, 15% (N=78) reported weekly (but non-daily) use while others (N=275) used it less frequently. When stratified by age (21–34 years or 35 years and older), those who were 21–34 years during initiation were more likely to report daily use in the past year (19.5% vs 12.9%) while those aged 35 years and older were modestly more likely to be weekly (19.1% vs 17.9%), monthly (23% vs 21%) or less frequent users. For these analyses, all 509 individuals, irrespective of their level of cannabis use, were considered to be ‘new onsets’.

2.3 Correlates

Based on a review of the literature, a number of factors that have been previously shown to be correlated with initiation of cannabis use were examined in these analyses. The correlates could be broadly categorized into socio-demographic and psychiatric measures.

2.3.1 Socio-demographic measures were coded as follows

- a. Age, dichotomized as 34 years and younger
- b. Sex
- c. Self-reported Caucasian ethnicity
- d. Living at/below the poverty line (at wave 1 or 3YFU)
- e. Living (during 3YFU) in the Midwest/West/Southern Census regions (i.e. not in the Northwest)
- f. Urbanicity (at 3YFU) indexed by living in a Metropolitan Statistical Area
- g. High school completion by 3YFU
- h. Being a full/part-time student at 3YFU – measures representing educational attainment (being a student during 3YFU and having a GPA no less than B) and housing (being a student during 3YFU and not living with parents/relatives) were also included
- i. Being employed during the 3YFU
- j. Getting divorced or separated during the 3YFU
- k. Having biological or adoptive children during 3YFU
- l. Self-reported current good health

2.3.2. Religious and pro-social activities were assessed using 3 items—(a) current attendance at religious services at 3YFU; (b) another item indexing that religious beliefs were ‘very important’ (assessed on a scale of ‘very important’ to ‘not important’) to the participant

was also included; (c) being currently involved in regular volunteer activities or community service;

2.3.3 Psychiatric measures included lifetime (combined across wave 1 and 3YFU)—DSM-IV diagnoses of major depressive disorder, generalized anxiety disorder, social phobia, specific phobias, panic disorder, mania, posttraumatic stress disorder, conduct disorder, attention deficit hyperactivity disorder, alcohol abuse/dependence and nicotine dependence. While the AUDADIS is not structured to assess serious psychotic illnesses, a self-report item on being diagnosed with schizophrenia/psychotic illness by a health professional was included. A measure assessing family history of drug or alcohol problems (father or mother had problems with ‘drugs’ or ‘alcohol’) was also included.

2.4 Statistical analyses

Univariate and multivariate logistic regression models were conducted in STATA (Stata Corp, 2003). All analyses were appropriately weighted, clustered on primary sampling units (PSU), and adjusted for strata (Grant et al., 2003b). All analyses were conducted using the *svy* options in STATA which allows for specification of design effects (weights, PSU and stratum). The *idonepsu* option was used to account for strata with single PSUs (Sarver, 2001). A stepwise selection process was used to retain significant correlates in the multivariate model.

3. RESULTS

3.1 New onsets of cannabis use

Figure 1 shows the number of new onsets of cannabis use for individuals at various ages during the 3YFU – the x-axis in the Figure 1 represents age at 3YFU (not age at initiation, which was not reported, however, had to have occurred in the 3 years of follow-up) – therefore, onset could have occurred in the 2 years preceding the interview or during the year of the interview. A majority of the new onsets were noted in those aged 21–25 years at 3YFU with fewer onsets in those aged 26–34 years. While they were infrequent, individuals aged 35–45 years also reported initiated cannabis use during the 3YFU.

3.2 Univariate associations

As seen in Table 1, a number of socio-demographic measures were associated with onset of cannabis use. Those initiating cannabis use during the 3YFU were more likely to be younger, male and living at or below the poverty line. They were also more likely to be students and/or employed. Religious attendance and participation in volunteer/community service were associated with a lower likelihood of cannabis initiation while experiencing divorce during the 3YFU was associated with an increased likelihood of cannabis initiation. All DSM-IV diagnoses were associated with an increased univariate likelihood (O.R. ranging from 1.45–5.56) of cannabis initiation as was family history of drug/alcohol problems and self-reported medical diagnosis of schizophrenia/psychotic illness.

3.3 Multivariate Stepwise modeling

When modeled jointly (final column of Table 1), divorce, religious attendance, volunteer/community service as well as DSM-IV alcohol abuse/dependence, nicotine dependence, major depressive disorder, posttraumatic stress disorder and a medical diagnosis of schizophrenia/psychotic illness remained as significant correlates of cannabis initiation. Family history continued to be associated with onset of cannabis use.

3.4 Interactions with Age

Retaining the covariates significant in the multivariate stepwise model, the interactions between each covariate and age (younger than 35 years and 35 years and older) were examined. In univariate tests (including main effect and interaction, with the exception of divorce, all age interactions were significant. Therefore, we proceeded to examine these associations, separately, in those younger than 35 years and those 35 years and older. The results from these multivariate models are shown in Table 2. Across both age-groups, poverty, DSM-IV alcohol abuse/dependence and nicotine dependence were significantly and positively associated with the likelihood of cannabis initiation while female gender, Caucasian ethnicity, religious attendance and volunteer activities were significantly and negatively associated with onset of cannabis use. Of these correlates, only the effect of DSM-IV alcohol abuse/dependence appeared to be statistically higher (as denoted by non-overlapping confidence limits, OR of 4.34 vs. 2.44) in younger individuals.

A host of other covariates were associated with cannabis use in one age group but not the other. In those aged 21–34 years, being a student was positively associated while becoming a parent (and being in current good health) was negatively associated with cannabis onset. In contrast, in those aged 35 years and older, being employed or being recently divorced were positively associated with onset of cannabis use. Some differences in psychiatric correlates of cannabis onset were also noted across age groups – a lifetime history of DSM-IV major depressive disorder and a medical diagnosis (self-reported) of schizophrenia/psychotic illness were associated with cannabis onsets in those aged 21–34 years while a lifetime history of PTSD was positively correlated with cannabis initiation in those aged 35 years and older.

4. DISCUSSION

In the present study, we sought to examine the socio-demographic and psychiatric correlates associated with onset of cannabis use, particularly during early- and middle-adulthood and the extent to which these correlates may vary with age of onset. While alcohol abuse/dependence, nicotine dependence and psychopathology positively correlated with probability of cannabis initiation, religious attendance and beliefs, participation in volunteer and community service and becoming a parent were negatively associated with chances of using cannabis during the 3YFU.

4.1 Importance of later-onset cannabis use

Cannabis initiation in later adulthood is relatively rare and may not be associated with subsequent problems – older initiates may represent experimenters and occasional users with a reduced predisposition to problematic use (Grant et al., 2006; Wittchen et al., 2009). However, as shown in our sample characteristics, over 30% of our new initiates reported weekly to daily use in the year preceding the interview. Furthermore, upon examining the correlates of cannabis onset, we may also hypothesize that onset of cannabis use, particularly if it transitions into regular use, may be part of a constellation of increasing social and mental health problems. For instance, those who use cannabis are less likely to be able to quit smoking cigarettes, even after accounting for the increased likelihood of cannabis initiation in smokers (Amos et al., 2004; Patton et al., 2005; Timberlake et al., 2007). Therefore, while later onsets are rare, their impact may be fairly profound.

4.2 The importance of religious and pro-social activities

In youth, participation in pro-social activities, in school or with parents, has been known to be associated with reduced rates of substance use (Henry, 2008). Our analyses suggest that, during adulthood, current attendance at religious services (Chitwood et al., 2008), and participation

in volunteer/community service also correlates with reduced likelihood of cannabis initiation. This underscores the importance of involvement in pro-social activities across the lifespan.

4.3 Positive and negative life events

Despite the known importance of the relationship between substance use and psychopathology, our analyses suggest that development specific life events may play a more prominent role in initiation of cannabis use. Becoming a parent, particularly in those aged 34 years and younger, and getting divorced/separated in those aged 35 years and older were associated with cannabis initiation, albeit in opposing directions (i.e. becoming a parent is protective; divorce is associated with increased risk of onset). There is considerable evidence suggesting that divorce is a potent correlate of substance use but the direction of causation (Aitken et al., 2000; Collins et al., 2007; Kandel et al., 1985; Yamaguchi et al., 1997), if indeed a causal relationship does exist between marital instability and substance use, remains elusive. To some extent, the correlation between divorce and cannabis initiation may also reflect a host of other, potentially causal, factors (e.g. personality traits or deviant affiliations) that may jointly contribute to an increased likelihood of divorce and onset of cannabis use. Likewise, being a student or currently employed, with the former being more relevant in the younger age-group and the latter being more relevant to older individuals were both associated with cannabis initiation.

4.4 Alcohol and nicotine use disorders

Associations between a lifetime history of alcohol abuse/dependence, nicotine dependence and onset of cannabis use were the strongest and were significant in all analyses with some evidence for the association with alcohol abuse/dependence being stronger in younger individuals. A wealth of evidence from twin and family studies has suggested that this association may be largely due to common genetic and environmental factors (Han et al., 1999; Kendler et al., 2007). It is particularly intriguing that alcohol abuse/dependence and nicotine dependence were important correlates of cannabis onset even in older initiates – one might anticipate that older individuals with problem drinking and smoking might also have used cannabis in the past.

4.5 Comparison with predictors of adolescent-onset cannabis use

Onset of cannabis use is highest in adolescents and young adults. In Monitoring the Future (Johnston et al., 2008), 2008 estimates suggest cannabis use by 43% of 12th graders. Rates are higher in older adolescents and young adults, and as high as 54–77% in datasets from Germany (Perkonig et al., 2008; Wittchen et al., 2008), Australia (Degenhardt et al., 2000; Patton et al., 2007; Swift et al., 2001) and New Zealand (Boden et al., 2006) as well as in other developed nations (Hall et al., 2007).

Multiple studies have also examined correlates of cannabis initiation during adolescence and early adulthood (Agrawal et al., 2007; Brook et al., 1996; Ellickson et al., 2004; Guxens et al., 2007a; Guxens et al., 2007b; Hayatbakhsh et al., 2008; Korhonen et al., 2008), which are considered to be the peak periods of vulnerability. The current study is unique in that it includes a focus on later onsets of cannabis use, however, some of the correlates remain the same. Alcohol and nicotine dependence continue to act as important correlates through adulthood. One of the most potent mediators of risk for adolescent onset of cannabis use is peer influence (Brook et al., 1998; Guxens et al., 2007b; Korhonen et al., 2008; Musher-Eizenman et al., 2003; Windle et al., 2004)—multiple studies have demonstrated that affiliations with peers who use substances or who are perceived to have favorable attitudes towards drug use is a robust predictor of the participant's substance use as substance-using peers serve as primary routes of drug availability. While we did not have measures of peer substance use in NESARC, it is possible that the measure representing 'student' status is representative of contact with substance-using peers and as a consequence, access to cannabis.

4.6 Limitations

Some limitations of this study are noteworthy: First, it is possible that some new onsets at 3YFU reflect individuals who incorrectly reported being lifetime non-users at wave 1. However, this is a limitation of all self-reported assessments which is exacerbated in this case due to use of an interval instrument at 3YFU. Second, age at onset of cannabis use within the 3YFU period was not available (only whether it was used in the past year or not) and this precluded examining survival models of age at cannabis onset. Third, while NESARC includes assessments of myriad health conditions, some that may be related to medicinal use of cannabis (e.g. glaucoma, cancer), were not available.

4.7 Conclusion

While estimates of cannabis use in adolescent populations appear to have stabilized, lifetime use in adults aged 26 and older appears to have undergone a slight increase (Substance Abuse and Mental Health Services Administration (SAMHSA), 2005). Therefore, attempts to identify correlates of new onsets and of persistence of cannabis use through adulthood have become particularly relevant. In our study, we find that while religious and pro-social activities are associated with lower probability of initiation, alcohol and nicotine dependence as well as other forms of psychopathology and life events, such as divorce is positively associated with onset of cannabis use in adulthood. Further efforts following the course of late-onset cannabis use in these older individuals will be critical in determining whether the nature of cannabis involvement, in those with later-onsets, is similar or different to those initiating use during adolescence.

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FIGURE 1.

Number of new onsets of cannabis use (a total of 509) during the NESARC 3 Year Follow-Up (3YFU, conducted 2004–2005) by age at 3YFU. Note that the x-axis represents age at the interview – onset could have occurred in the same year as the interview or in the 2 years preceding the interview.

Table 1

Univariate and multivariate associations (using stepwise regression, $p < 0.05$) between socio-demographic and psychiatric correlates and onset of cannabis use (during 3YFU) in 27,467 never users (at wave 1) of the NESARC

	Univariate O.R. [95% C.I.]	Multivariate O.R. [95% C.I.]
<i>Socio-demographic</i>		
Age (21–35 years)	6.32 [5.29–7.54]	4.45 [3.61–5.49]
Female	0.46 [0.38–0.55]	0.59 [0.48–0.64]
Caucasian	0.89 [0.71–1.06]	0.67 [0.55–0.83]
Midwest/South/West	1.11 [0.88–1.41]	-
Urban dwelling	0.90 [0.71–1.13]	-
Poverty	1.48 [1.23–1.79]	1.42 [1.15–1.74]
Completed High School	1.23 [0.96–1.58]	-
Full/Part-time student	2.93 [2.40–3.59]	1.51 [1.20–1.90]
- Housing	- 0.66 [0.43–0.99]	
- Grades	- 0.69 [0.48–0.98]	
Employed	2.45 [1.99–3.02]	1.57 [1.25–1.96]
Divorced/Separated	1.98 [1.36–2.88]	-
Became parent	1.22 [0.92–1.62]	0.67 [0.50–0.91]
Good Health	1.12 [0.94–1.34]	-
<i>Religious/Pro-social activities</i>		
Current religious attendance	0.33 [0.27–0.40]	0.52 [0.43–0.64]
Importance of religion	0.42 [0.35–0.50]	-
Volunteer/community service	0.45 [0.34–0.60]	0.73 [0.54–0.98]
<i>DSM-IV Psychiatric Diagnoses</i>		
Alcohol abuse/dependence	5.56 [4.64–6.66]	3.34 [2.73–4.09]
Nicotine dependence	4.16 [3.23–4.45]	2.56 [2.10–3.11]
Conduct Disorder	2.86 [1.96–4.17]	-
Attention Deficit Hyperactivity Disorder	2.56 [1.85–3.53]	-
Schizophrenia/psychotic illness	3.63 [1.90–6.92]	2.03 [1.01–4.11]
Major Depressive Disorder	1.82 [1.51–2.21]	1.26 [1.02–1.57]
Manic episode	2.18 [1.58–3.02]	-
Generalized Anxiety Disorder	1.83 [1.39–2.41]	-
Panic Disorder	1.98 [1.51–2.60]	-
Social Anxiety Disorder	1.88 [1.41–2.52]	-
Specific Phobias	1.45 [1.16–1.81]	-
Posttraumatic Stress Disorder	2.07 [1.63–2.61]	1.61 [1.23–2.10]
Family history of drug/alcohol problems	1.73 [1.43–2.40]	1.24 [1.01–1.53]

Table 2

Multivariate associations (using stepwise regression, $p < 0.05$) between socio-demographic and psychiatric correlates and onset of cannabis use (during 3YFU, N=509) in 27,467 never users (at wave 1) of the NESARC, stratified by age.

	21–34 years N=5902	35 and older N=21,565
Number of new onsets	303	206
<i>Socio-demographic</i>		
Female	0.58 [0.45–0.75]	0.61 [0.45–0.83]
Caucasian	0.69 [0.52–0.91]	0.66 [0.48–0.91]
Poverty	1.42 [1.09–1.84]	1.53 [1.09–2.14]
Completed high school	ns	1.52 [1.01–2.31]
Full/Part-time student	1.53 [1.18–1.98]	ns
Became parent	0.69 [0.49–0.95]	ns
Employed	ns	1.63 [1.20–2.21]
Divorce	ns	2.17 [1.29–3.64]
Good Health	0.72 [0.54–0.96]	ns
<i>Religious/Pro-social Activities</i>		
Current religious attendance	0.49 [0.37–0.64]	0.54 [0.41–0.73]
Volunteer/community service	0.54 [0.34–0.88]	0.53 [0.29–0.95]
<i>DSM-IV Psychiatric Diagnoses</i>		
Alcohol abuse/dependence	4.34 [3.33–5.66]	2.44 [1.79–3.31]
Nicotine dependence	2.53 [1.95–3.29]	2.83 [2.10–3.79]
Schizophrenia/psychotic illness	2.54 [1.04–6.23]	ns
Major Depressive Disorder	1.45 [1.11–1.91]	ns
Posttraumatic Stress Disorder	ns	2.11 [1.48–3.02]
Family History	ns	ns

ns = not significant in a multivariate stepwise regression in this age-band.

Note: Variables that were significant in any ONE age band only are shown.