Lifetime Substance Misuse and 5-Year Incidence Rates of Emergent Health Problems among Middle-Aged Adults

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Abstract

Understanding the impact of prior substance misuse on emergent health problems is important to the implementation of effective preventive care. This study examined 5-year incidence rates using a sample of middle-aged adult adoptees ($N = 309$, $M_{age} = 44.32$, $SD_{age} = 7.28$). Subjects reported on health problems at two waves of study. DSM-IV diagnoses of substance misuse were obtained using a semi-structured diagnostic interview. Finally, health services utilization and perceived health status were collected. Lifetime diagnoses of marijuana and other non-marijuana substance misuse significantly predicted new occurrences of cardiovascular and metabolic disease. Alcohol misuse predicted earlier onset of cardiovascular disease among men. Marijuana and other non-marijuana drugs predicted earlier onset of CVD for men and women. Finally, marijuana and other non-marijuana drugs predicted earlier onset of metabolic disease among men. Substance misuse did not predict health services utilization despite higher rates of disease. These findings emphasize the need to assess lifetime substance misuse when evaluating health risks associated with use.

Introduction

Substance misuse has been linked with a variety of health problems including respiratory problems[1-4], cardiovascular disease[5-9], thyroid functioning [10], cancer[4] and metabolic syndrome[11] [12]. The majority of the observed substance-induced health problems are acute events related to active metabolism of the substance of interest. Few studies have prospectively examined substance-related health problems following sustained abstinence. Previous analysis of the Iowa Adoption Studies data[13] showed few associations between substance misuse and health problems among individuals reporting an average abstinence period of 13 years for marijuana and other non-marijuana drugs. In fact, the only significant findings involved alcohol misuse among men with higher rates and earlier onset of CVD among problem drinkers. Neither use or diagnoses of misuse for marijuana and other non-marijuana drugs predicted health problems in this sample. The average of the sample was 41 years ($SD = 7.60$) with 76% of the subjects below the age of 46 years.

In addition to objective measures of health status, studies have compared perceived health status and healthcare utilization among substance users. The findings have been mixed. In a study comparing heavy marijuana users to a comparison sample of nonusers, Bourque14 failed

to show significant differences in perceived health problems. More recently, Eisen et al[15] used a twin control design to compare health problems in a sample of adult twins. Rates of self-reported health problems were compared between twins discordant (i.e., one twin used and the co-twin did not use) for marijuana use. The co-twin design controls for familial influences (e.g., genetic or environmental) on health status. Subjects had been abstinent for an average period of 20 years and did not report other non-marijuana drug use. The average age of the participants was 46 years (*SD*=3.2). Outcome measures included perceived impact of health problems on daily functioning and health service utilization. No differences were found for health services utilization or perceived health quality. This study did not report on prevalence rates for diseases or marijuana diagnosis. A report by Falck et al[16] showed significant associations between crack cocaine diagnosis, but not amount of use, and perceived poorer health status. Finally, De Alba et al [17] report lower perceived health among patients admitted to a detoxification unit.

In this paper, we examined the associations between substance misuse and 5-year incidence rates of emergent health problems. We predicted substance misuse would be associated with higher rates of disease. To test our hypotheses, we identified a group of individuals that did not report health problems at the previous interview but did so at a 5-year follow-up interview. We then tested associations between incidence rates (i.e., new cases) and lifetime substance misuse of alcohol, tobacco, marijuana, and other non-marijuana drugs. This study has several advantages over prior research on the health consequences of substance misuse. First, repeated assessment allows for more precise evaluation of substance-induced health problems because the within-subject design controls for individual factors (e.g., lifestyle choices) that may influence disease independent of substance use. Second, the subjects were in middle adulthood at the time of initial assessment and had not reached the age of risk for most of the diseases examined making it possible to evaluate new occurrences of disease within a defined period of time. This study is well equipped to examine whether substance misuse accelerates the natural disease process by controlling for baseline health status. Finally, we examined both perceived health outcomes and service utilization to evaluate possible under treatment of a high risk group of individuals.

Methods

Sample Description

The adoptees for the prior study wave (i.e., Wave 1) were originally interviewed as part of a follow-up study of previous participants (Total *n* = 772) from five separate studies that took place between 1975 and 1994 (for a description of methods see18). Adoptees were originally selected by the absence or presence of biological parent diagnoses (e.g., substance misuse, antisocial personality, and criminality). Approximately half were recruited due to the presence of a diagnosis in at least one birth parent, while the remaining participants were selected due to the absence of any known psychopathology in either parent. The average age at adoption was 2.42 months (SD = 6.39) with 71% of the adoptees placed with the adoptive parents before one month of age and 82% before 3 months of age. Adoptive parents were predominantly upper (20%) and middle class (76%). Average adoptee household income was $40,000 to $49,999 per year. Subjects were predominantly White, non-Hispanic (*N* = 304, 94%) with the remainder of the participants African American, non-Hispanic (*N* = 7, 2%), African American, Hispanic (*N* = 2, ~1%), Caucasian, Hispanic (*N* = 8, 3%), or mixed race (*N* = 2, ~1%). For the continuation (Wave 2), we recruited from a subset of participants with available school achievement data on file to examine the cognitive impact of substance use (*N* = 463).

We successfully updated substance use histories, psychiatric problems, and health problems, as well as administered a through cognitive assessment for 330 adoptees. Average age at follow-up was 44.32 years (*SD* = 7.28) with an average of 5 years (*SD* = 1.34) between

assessments. Mean education was 14.19 years (SD = 1.84). Of those subjects who failed to participate, we were unable to locate 38 (8%), 5 were deceased (1%), 5 (1%) were in prison, and 84 (18%) declined participation. Comparing participants and non-participants, we found no differences on biological parent antisocial or alcohol background ($\chi^2(1) = 0.01$, $p = .91$ and $\chi^2(1) = 2.39$, $p = .12$, respectively). Recruitment status was also not associated with participant diagnoses for alcohol ($\chi^2(1) = 0.05$, $p = .82$), marijuana ($\chi^2(1) = 1.54$, $p = .51$), or non-marijuana drugs ($\chi^2(1) = 0.80$, $p = .37$), antisocial personality disorder ($\chi^2(1) = 0.24$, $p = .62$), or Major Depressive Disorder ($\chi^2(1) = 1.25$, $p = .26$). Tobacco abuse/dependence was slightly lower among participants (64% versus 74%, $\chi^2(1) = 4.06$, $p = .04$).

Measures

Demographic information, medical history, and Axis I substance abuse/dependence diagnoses were collected using the Semi-Structured Assessment for the Genetics of Alcoholism SSAGA-II,[19] (see Table 1). Medical diagnoses were classified into the presence of any disorder within the following categories: 1) cardiovascular disease (e.g., high blood pressure, stroke, or heart disease) and 2) metabolic disorders (e.g., liver disease, thyroid disease, diabetes, or cancer). In order to examine substance-induced health problems, participants reporting onset of health problems prior to substance misuse were omitted from the analyses ($n = 21$). Lifetime substance abuse/dependence was determined using DSM-IV criteria. Finally, subjects reported on current health status, number of visits to the ER, and number of hospitalizations.

Analyses

Baseline and new occurrences of health diagnoses were identified at each wave of study (1999-2003 and 2004-2008, respectively). To examine baseline differences, we contrasted subjects with health problems at baseline with subjects that did not report a health problem at baseline. To compare rates of new occurrences of health problems, we compared subjects with health problems at follow-up with subjects that did not report any health problems at *both* assessments (i.e., subjects reporting health problems at baseline were excluded). Logistic regression was used to estimate adjusted odds ratios and their 95% confidence interval. Demographics (e.g., sex, current age, education and income) were included as covariates. Finally, Cox Regression survival analysis was used to examine substance diagnoses and age of onset for health problems.

Results

Descriptives

We examined sex differences in length of exposure to all substance (see Table 1). Men reported significantly longer use of marijuana and other non-marijuana drugs than women ($t (196) = 2.85$, $p = .005$ and $t (115) = 2.51$, $p = .013$, respectively). No sex differences were found for length of abstinence from marijuana ($t (200) = -1.71$, $p = .090$), but women reported long abstinence periods for other non-marijuana drugs than men ($t (126) = -2.24$, $p = .027$) (see Table 1). Twenty-nine subjects reported using marijuana in the past year. No one reported current use (within the past year) of other non-marijuana drugs. Men reported using tobacco significantly longer than women ($t (262) = 2.17$, $p = .031$), but no difference was found for length of abstinence ($t (262) = -0.82$, $p = .412$). Finally, men and women did not differ for length of alcohol use ($t (231) = 1.73$, $p = .085$) or abstinence ($t (298) = 0.378$, $p = .706$). Cross-tabulations between health problems and substance diagnoses are presented in Table 2.

Multivariate Analyses

Subjects that did not report health problems at baseline or follow-up were designated as the comparison group in the logistic regressions (see Table 3). The models controlled for

demographics (e.g., sex, current age, and education). We also examined sex by substance diagnosis interactions for CVD and metabolic disease.

Cardiovascular Disease

Baseline Health Problems—The interaction between sex and alcohol abuse or dependence was significant for baseline CVD (*Wald* = 7.58, *df* = 1, *A.O.R.* = 0.12, *p* = .006) (see Table 3). A lifetime diagnosis of alcohol problems was associated with a *lower* risk of baseline CVD among women (*Wald* = 4.15, *df* = 1, *p* = .034) but unassociated with CVD among men (*Wald* = 2.45, *df* = 1, *p* = .099). Tobacco, marijuana and non-marijuana drug diagnoses did not predict baseline CVD (*p* > .05).

New Occurrences of Health Problems—Diagnoses for alcohol and tobacco abuse/ dependence did not predict new cases of CVD (*p* > .05). A higher incidence of CVD was found among subjects diagnosed with marijuana dependence (*Wald* = 5.84, *df* = 1, *p* = .016) (see Table 3). A lifetime diagnosis of other non-marijuana drug abuse/dependence also predicted significantly higher rates of new cases of CVD (*Wald* = 4.89, *df* = 1, *p* = .027). Because of the high overlap between marijuana and other non-marijuana drug abuse/dependence, we compared rates of new occurrences of CVD between individuals reporting none, one or two diagnoses (Note. The logistic regression failed to converge when the diagnoses were entered simultaneously). The chi-square was significant (χ^2 (*df* = 2, *N* = 261) = 9.97, *p* < .01). The incidence of CVD was as follows: no diagnosis (6%), single diagnosis (21%), and dual diagnosis (40%).

Metabolic Disease

Baseline Health Problems—Alcohol and tobacco abuse/dependence did not significantly predict baseline metabolic disease (*p* > .05). A significant interaction between sex and marijuana dependence was found for baseline metabolic disease (*Wald* = 5.99, *df* = 1, *p* = . 014) with higher rates of disease among men with a diagnosis (*Wald* = 10.48, *df* = 1, *p* = .001) but not women (*Wald* = 1.05, *df* = 1, *p* = .948) (see Table 3). The interaction between sex and diagnosis was also significant for other non-marijuana drug diagnoses (*Wald* = 6.69, *df* = 1, *p* = .010) with a significant main effect for men (*Wald* = 10.28, *df* = 1, *p* = .001) but not women (*Wald* = 0.53, *df* = 1, *p* = .467). Again, we compared baseline rates of metabolic disease among individuals with no diagnosis, a single diagnosis, and dual diagnoses. The comparison was significant (χ^2 (*df* = 2, *N* = 117) = 29.72, *p* < .001). The highest rate of baseline metabolic disease (50%) was found among men meeting criteria for a dual diagnosis (marijuana plus other non-MJ drugs). None of the men with a single diagnosis reported metabolic disease and only 4% of men not meeting diagnostic criteria for abuse or dependence reported baseline metabolic disease.

New Occurrences of Health Problems—The only significant predictor of new occurrences of metabolic disease was other non-marijuana drug abuse/dependence (see Table 3). Higher rates of new cases of metabolic disease was found among men and women having a diagnosis (*Wald* = 7.81, *df* = 1, *p* = .005) (see Table 3).

Cox Regression Analyses

Cardiovascular Disease—The interaction between sex and an alcohol diagnosis was significant for CVD (*Wald* = 7.34, *df* = 1, *p* = .007); therefore, the survival analysis was analyzed separately for men and women (see Table 4). Men, but not women, reported earlier onset of CVD disease when diagnosed with alcohol problems (see Figure 1(a)). Tobacco diagnosis was not significantly associated with age of onset for CVD (*Wald* = 0.04, *df* = 1, *p* = 1.11).

The interactions between sex and substance diagnosis was not significant for marijuana (*Wald* = 1.79, *df* = 1, *p* = .181) or other non-marijuana drugs (*Wald* = 1.42, *df* = 1, *p* = .234) (see Table 4). However, men and women with marijuana or other non-marijuana drug diagnoses reported earlier onset of CVD than individuals with no diagnosis (see Figures 1(b) and 1(c), respectively). In order to examine whether the onset of CVD occurred during active use, we computed the difference between age at last use and age of onset for CVD. On average, men and women reported last using marijuana or other non-marijuana drugs 7 years before the onset of CVD (*SD* = 11.50, *Median* = -6.00) with 74% ceasing use before illness onset.

Metabolic Disease—Alcohol and tobacco misuse did not predict age of onset for metabolic disease (*Wald* = 0.27, *df* = 1, *p* = .601 and *Wald* = 0.004, *df* = 1, *p* = .947, respectively) (see Table 4). Significant differences between men and women were found for the association between marijuana (Interaction: *Wald* = 5.52, *df* = 1, *p* = .019) and other marijuana drug diagnoses and metabolic disease (Interaction: *Wald* = 6.87, *df* = 1, *p* = .009). Metabolic disease was diagnosed earlier among men reporting lifetime misuse of marijuana (*Wald* = 12.53, *df* = 1, *p* < .001) or non-marijuana drugs (*Wald* = 18.26, *df* = 1, *p* < .001) (see Figures 2(a) and 2(b)). Neither association was significant for women (Marijuana: *Wald* = .02, *df* = 1, *p* = .880 and Non-marijuana drugs: *Wald* = 0.34, *df* = 1, *p* = .654). As with CVD, 74% of men reported quitting active use of illicit drugs prior to the onset of metabolic disease (*M* = -6.65, *SD* = 13.47, *Median* = -7.50).

Perceived Health Problems and Service Utilization

Our final set of analyses examined the impact of substance diagnoses on health services utilization and perceived health (see Table 5). Subjects reported on the number of lifetime emergency room (ER) visits and perceived current health. Men and subjects diagnosed with alcohol misuse reported a significantly higher number of ER visits. A trend was found for marijuana and other non-marijuana drugs with more ER visits among subjects reporting misuse (see Table 5). Subjects with marijuana or other non-marijuana drug diagnoses reported significantly poorer health with nearly a quarter of subjects with a substance misuse diagnosis viewing their current health status as poor compared to 8% of subjects without a diagnosis.

Discussion

The present paper examined 5-year incidence rates of CVD and metabolic disease among individuals reporting lifetime substance abuse or dependence. Associations between lifetime diagnoses of substance misuse and health problems were tested for both baseline and new cases of disease. Data collection was completed in two phases. Baseline rates of disease were estimated from the first assessment and new cases of disease were those health events that occurred in the 5-year interval between the first and second phases of data collection.

We found few significant associations between lifetime alcohol and tobacco diagnoses and baseline health problems. Among women, a lifetime diagnosis of alcohol abuse or dependence was *protective* with fewer cases of CVD among women with a diagnosis. Among men, CVD had an earlier onset in the presence of alcohol abuse/dependence even though having a lifetime alcohol diagnosis did not predict the occurrence of CVD. Although initially counterintuitive, the protective effect observed among women and absence of effect observed among men could be a function of reduced consumption with age. Unfortunately, we did not have a comprehensive assessment of current drinking at follow-up. The only questions asked were the number of days drank and number of drinks consumed on an average day during the week of heaviest drinking in the preceding six months. The modal number of days drank was one and the modal number of drinks was two for men and women. Therefore, current levels of

consumption were low despite prior diagnoses of alcohol abuse/dependence. Finally, tobacco dependence was not associated with health problems for men or women.

Significant associations were found between illicit drugs (e.g., marijuana or other no-marijuana drugs) and health problems. Men diagnosed with lifetime abuse or dependence on illicit drugs were more likely to be diagnosed with a metabolic disease at baseline. This increased occurrence was primarily due to men with dual drug diagnoses (i.e., marijuana plus other non-marijuana drug abuse/dependence). Significantly higher 5-year incidence rates of CVD and metabolic disease were found among men and women reporting lifetime marijuana or other non-marijuana drug misuse. Again, subjects having a dual diagnosis were more likely to report new cases of disease. CVD was also diagnosed earlier for men and women reporting illicit drug abuse/dependence and metabolic disease occurred earlier among men with a diagnosis of illicit drug abuse/dependence.

Our findings have multiple implications for predicting the future health of individuals with diagnosable substance abuse/dependence. The first implication deals with recommendations of moderate alcohol consumption in the prevention of CVD by the American Medical Association (AMA). The association between alcohol consumption and health problems is typically characterized as quadratic with low and high consumption characterized as *not* protective against disease and moderate drinking characterized as reducing risk for disease[20], [21]; although contradictory evidence has also been reported suggesting a protective effect of heavy drinking among older individuals[22]. Furthermore, certain patterns of drinking (e.g., binge drinking versus regular consumption) have been shown to have differential effects on health with greater protective effects observed among steady drinkers[20], [23]. Our data is limited in directly testing the AMA recommendation due to the fact that we relied on diagnoses determined at baseline and current alcohol consumption could not be adequately quantified at follow-up. The reliance on a single lifetime assessment of alcohol diagnosis could underestimate the harmful effects of alcohol consumption in this sample[23]. Therefore, our findings can not speak directly to the recommendation of the AMA that moderate alcohol intake reduces certain health risks. We can suggest, however, that a lifetime diagnosis of alcohol abuse or dependence is not deterministic of future health problems[24] when current consumption is low.

The second implication is the predictive utility of lifetime diagnoses of tobacco dependence independent of current smoking exposure in predicting health status. We failed to find significant associations between lifetime tobacco dependence and CVD or metabolic disease. The lack of significant findings should not be interpreted as minimizing the effects of tobacco dependence on health, but rather that exposure independent of a dependence diagnosis may carry greater health risks. As with alcohol, the SSAGA-II focuses on collecting information about use during periods of heaviest use. Thus, current exposure could not be determined from these data. An additional caveat is the use of smokeless tobacco which has also been shown to influence cardiovascular health[25-27]. As the data are currently analyzed, individuals reporting use of smokeless tobacco are included in the non-dependent comparison group thereby possibly minimizing group differences. Conversely, individuals diagnosed with lifetime tobacco dependence but who are currently non-smokers are grouped in the positive group which may further reduce differences due to the recovery from smoking-related health problems upon cessation[28-30].

The final implication of our data is the role of a dual (polydrug) diagnosis in predicting health problems. Men and women were equally susceptible to the effects of illicit drug use on CVD both in terms of the emergence of problems and the onset of problems at an earlier age. These findings suggest that women might be more susceptible to the cardiovascular effects of illicit drugs at lower levels of exposure due to the significant differences in exposure length and

prevalence of substance diagnoses between men and women. This same interpretation does not hold true for metabolic disease in which men were more affected by polydrug use than women. Although formal statistical testing could not be conducted liver disease was the metabolic condition most common among men endorsing illicit drug abuse/dependence. Cocaine (the drug most commonly reported by our subjects) targets the liver[31] and alcohol intensifies this effect32. It is possible that men are more likely to engage in polydrug use, including combining other drug use with alcohol, which results in greater insult to physical health. Finally, unlike the possible transient effects of alcohol and tobacco, polydrug abuse/ dependence appears to carry health risks even after substantial periods of abstinence.

Health Services Utilization

Subjects with alcohol problems reported more frequent visits to the emergency room. In contrast, diagnoses for marijuana or other non-marijuana drugs were not associated with health service utilization despite poorer subjective ratings of current health and higher rates of objective health diagnoses. The disparity between presence of health problems and cost utilization of healthcare is not new in the substance abuse literature[33-35]. These data suggest that probing about past substance use history may be necessary to ensure individuals with prior misuse actively pursue preventive care especially among individuals reporting polydrug abuse/ dependence.

Limitations

The current study was limited by sample size which precluded examination of specific health problems rather than classes of diseases (e.g., CVD, metabolic). CVD consisted primarily of high blood pressure (92%); a major (although nonspecific) precursor to heart disease and other systemic disease (e.g., kidney failure). Metabolic disease was less clear cut consisting predominantly of thyroid disease (46%) followed by liver disease (31%), and diabetes (29%). Similarly, the sample size did not allow for separation of marijuana from other-non-marijuana effects on health problems with roughly half of either reporting use of the other substance nor were we able to examine specific classes of drugs. Men reported using an average of six different non-marijuana drugs compared to women who reported using an average of four different classes of drugs. It is not possible to determine whether these drugs were taken concurrently, simultaneously, or at different times throughout the period of use. Each pattern of use may have different consequences on health that we were not able to examine with these data. Similar confounds were present between alcohol and tobacco. Furthermore, there were only seven women meeting diagnostic criteria for illicit drug use limiting informative analyses for women. The information collected about health service utilization was rudimentary at best. Non-emergent care was not probed so information about current preventive efforts was not available.

Summary

Analyses presented above support our proposition that individuals reporting previous substance misuse develop significantly higher rates of emergent health problems within a shorter period of time. These health risks remain even after long periods of abstinence suggesting physicians, including those in emergent care settings, should inquire about prior substance use[33]. Our data also suggest that longitudinal studies with long-term follow-ups may be the most effective and sensitive approach to characterizing substance-induced health problems; especially for the detection of precursors to more serious and irreversible health problems. Future studies should utilize well-defined samples comprehensive in their assessments of all substance use, current and past, to examine physiological markers associated with acute substance misuse[7, 9, 36, 37] and determine whether the observed changes persist among individuals no longer actively using the substance.

Acknowledgments

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(a)

(b)

(c)
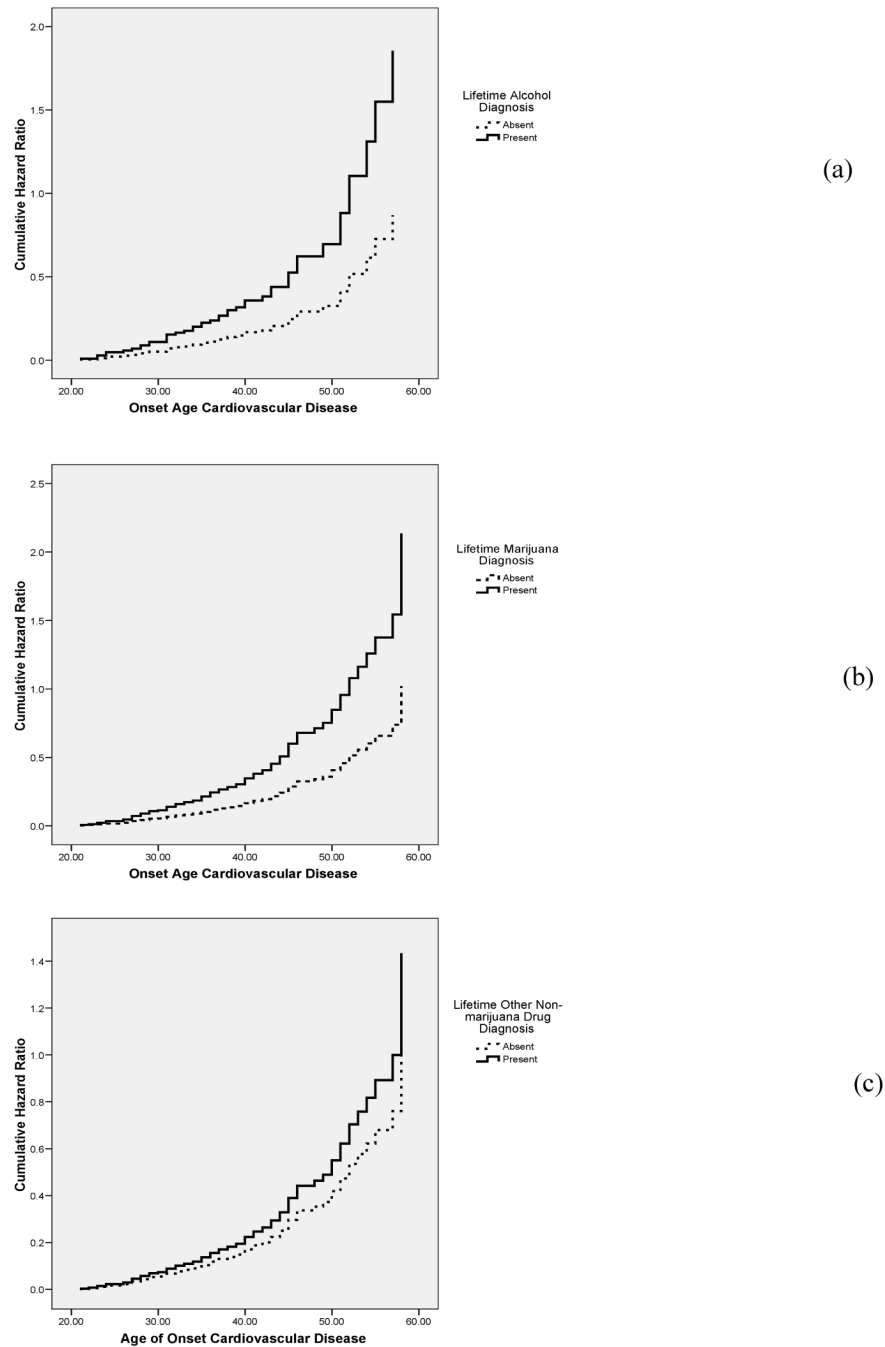
Figure 1.
Age of onset for cardiovascular disease (CVD) by substance diagnosis. (1a) Onset age of CVD by alcohol diagnosis for men. (1b) Onset age of CVD by marijuana diagnosis for men and women combined. (1c) Onset age of CVD by other non-marijuana drug diagnosis for men and women combined.
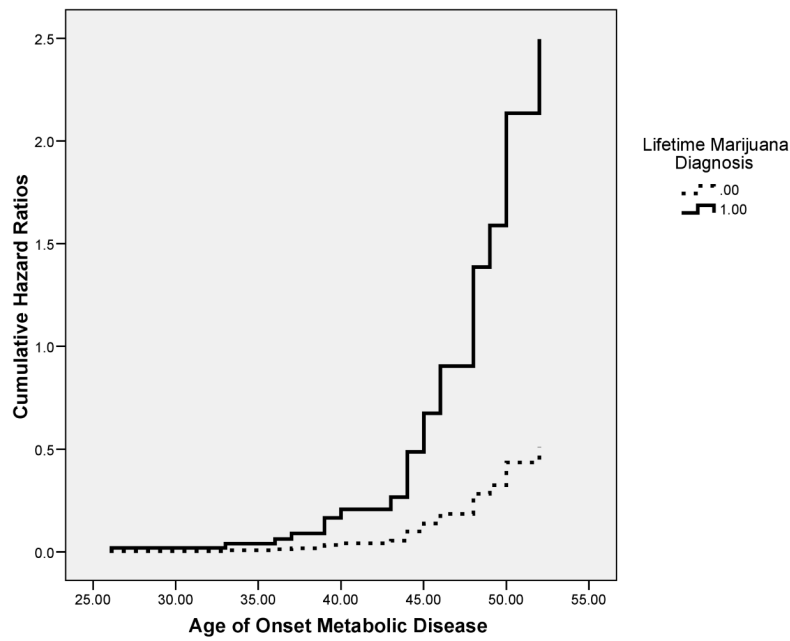
(a)
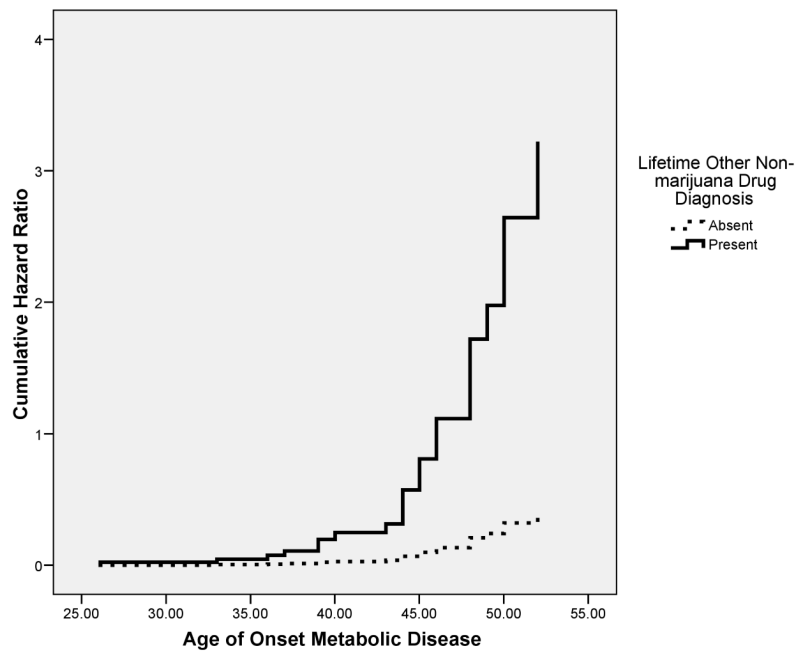
(b)

Figure 2.
Age of onset for metabolic disease by substance diagnosis. (2a) Onset age of metabolic disease by marijuana diagnosis for men. (2b) Onset age of metabolic disease by other non-marijuana drug diagnosis for men.

Table 1

Descriptives for Study Variables

Study Variables	Total Sample (n=309)	Men (n=130)	Women (n=179)	p*
Demographics				
Current Age (M, SD)	44.32 (7.28)	44.55 (7.30)	44.15 (7.29)	.638
Education (M, SD)	14.20 (1.76)	14.02 (1.87)	14.35 (1.76)	.113
Number of ER visits (M, SD)	4.09 (7.23)	5.30 (8.34)	3.21 (6.18)	.001
Poor Perceived Health (n, %)	27 (9)	13 (10)	14 (8)	.503
Cardiovascular Disease (n, %)	83 (27)	45 (35)	38 (21)	.009
High Blood Pressure (n)	76	42	34	.007
Stroke (n)	7	3	4	.414
Heart Disease (n)	12	9	3	.018
Metabolic Disease (n, %)	72 (23)	23 (18)	49 (27)	.047
Liver Disease (n)	12	6	6	.570
Thyroid Disease (n)	33	8	25	.028
Diabetes (n)	21	7	14	.401
Cancer (n)	22	7	15	.312
Substance Diagnoses				
Alcohol (n, %)	146 (47)	74 (57)	72 (40)	.004
Tobacco (n, %)	74 (24)	28 (22)	46 (26)	.398
Marijuana (n, %)	44 (14)	25 (19)	19 (11)	.031
Other Non-Marijuana Drugs (n, %)	38 (12)	26 (20)	12 (7)	.005
Length of Substance Use (years)				
Alcohol (n, %)[a]	233, 24.69 (7.41)	100, 25.65 (8.24)	133, 23.96 (6.65)	.085
Tobacco (n, %)	264, 17.63 (13.52)	106, 19.82 (14.25)	158, 16.16 (12.84)	.031
Marijuana (n, M(SD))	198, 10.95 (10.36)	89, 13.24 (10.90)	109, 9.09 (9.55)	.005
Other Non-MJ Drugs (years) (n, M(SD))	117, 10.03 (8.80)	59, 12.05 (8.50)	58, 8.05 (8.71)	.013
Abstinence from Substance Use (years)				
Alcohol (n, %)	300, 1.78 (5.55)	125, 1.92 (5.93)	175, 1.67 (5.27)	.706
Tobacco (n, %)	264, 12.65 (13.15)	106, 11.84 (13.42)	158, 13.20 (12.97)	.412
Marijuana (n, M(SD))	202, 15.78 (10.38)	93, 14.44 (10.64)	109, 16.93 (10.06)	.090

Study Variables	Total Sample (n=309)		Men (n=130)		Women (n=179)		*p*
Other Non-MJ Drugs (years) (n, M(SD)) [a]	128	16.83 (8.39)	65	15.22 (8.60)	63	18.49 (7.91)	.027

*
p-value corresponds to sex differences.

[a] Onset age of alcohol use was age first drank regularly (at least once a month). Twenty-eight subjects reported never drinking regularly. Differences in numbers reflect missing age of onset data.

MJ = marijuana.

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Table 2

Column Percentages for Health Diagnoses by Substance Abuse/Dependence Diagnoses

Diagnoses	Row Totals	Cardiovascular Disease			Metabolic Disease		
		None	Baseline	New	None	Baseline	New
Alcohol							
Present	146 (47%)	105 (46%)	20 (42%)	21 (40%)	113 (48%)	19 (48%)	14 (44%)
Absent	163 (53%)	121 (54%)	28 (58%)	14 (60%)	124 (52%)	21 (52%)	18 (56%)
Tobacco							
Present	74 (24%)	54 (24%)	9 (19%)	11 (31%)	54 (23%)	12 (30%)	8 (25%)
Absent	235 (76%)	172 (76%)	39 (81%)	24 (69%)	183 (77%)	28 (70%)	24 (75%)
Marijuana							
Present	44 (14%)	25 (11%)	9 (19%)	10 (29%)	28 (12%)	10 (25%)	6 (19%)
Absent	265 (86%)	201 (89%)	39 (81%)	25 (71%)	209 (88%)	30 (75%)	26 (81%)
Other Non-MJ Drugs							
Present	38 (12%)	22 (10%)	8 (17%)	8 (23%)	23 (10%)	7 (18%)	8 (25%)
Absent	271 (88%)	204 (90%)	40 (83%)	27 (77%)	214 (90%)	33 (82%)	24 (75%)
Column Totals	309	226	48	35	237	40	32

[*] Baseline = health problems present at initial assessment. New Occurrences = health problems present at 5-year follow-up but not at baseline. MJ = marijuana. Similar superscripts denote significant differences.

Table 3

Adjusted Odds Ratios (A.O.R.) from Logistic Regressions Predicting Health Problems from Substance Misuse Diagnoses

	Cardiovascular Disease		Metabolic Disease	
	Baseline	New Occurrences	Baseline	New Occurrences
	A.O.R. (95% CI)	A.O.R. (95% CI)	A.O.R. (95% CI)	A.O.R. (95% CI)
Alcohol	-	2.13 (0.96, 4.76)	1.30 (0.64, 2.65)	1.02 (0.46, 2.26)
Men	2.40 (0.85, 6.79)	-	-	-
Women	0.30 (0.10, 0.96) [†]	-	-	-
Tobacco	0.64 (0.28, 1.46)	1.54 (0.66, 3.57)	1.43 (0.66, 3.09)	0.86 (0.34, 2.15)
Marijuana	1.81 (0.75, 4.37)	3.24 (1.25, 8.41) [†]	-	2.12 (0.75, 5.94)
Men	-	-	20.25 (3.28, 125.07) [§]	-
Women	-	-	1.05 (0.28, 3.97)	-
Other MJ Drugs	1.77 (0.70, 4.52)	3.03 (1.13, 8.10) [†]	-	4.14 (1.53, 11.21) [‡]
Men	-	-	24.53 (3.47, 173.46) [§]	-
Women	-	-	0.46 (0.06, 3.79)	-

[*] Covariates included sex, current age, and education. Baseline = health problems present at initial assessment. New Occurrences = health problems present at 5-year follow-up but not at baseline. MJ = marijuana. A.O.R. represents odds ratios adjusted for participants' current age, sex, and education.

[†] $p < .05$.

[‡] $p < .01$.

[§] $p < .001$.

Table 4

Cox Regression Survival Analysis Predicting Age of Onset for Cardiovascular and Metabolic Disease

Predictor	Cardiovascular Disease			Metabolic Disease		
	Hazard Ratio	95% CI	*p* value	Hazard Ratio	95% CI	*p* value
Alcohol				1.14	0.70, 1.85	.601
Men	2.13	1.09, 4.17	.027	-	-	-
Women	0.54	0.25,1.18	.122	-	-	-
Tobacco	0.85	0.51, 1.43	.544	0.98	0.58, 1.68	.947
Marijuana	1.78	1.03, 3.06	.037			
Men	-	-	-	4.89	2.03, 11.78	<.001
Women	-	-	-	0.92	0.33, 2.59	.880
Other Non-Marijuana Drugs	1.83	1.03, 3.24	.038			
Men	-	-	-	8.20	3.12, 21.51	<.001
Women	-	-	-	0.65	0.16, 2.72	.559

*
Covariates included sex (for main effects models), current age, and years of education.

Table 5

Health Service Utilization and Perceived Health by Demographics and Substance Diagnosis

	ER Visits[*]				Current Poor Health[†]		
	N	M	SD	p value	N	%	p value
Sex				.001			.503
Male	130	5.30	8.34		130	10%	
Female	179	3.21	6.18		179	8%	
Alcohol				.006			.530
Absent	170	3.18	5.15		15	9%	
Present	156	5.17	8.89		17	10%	
Tobacco				.242			.058
Absent	248	3.70	6.19		20	8%	
Present	78	5.50	9.81		12	15%	
Marijuana				.059			.020
Absent	279	3.69	5.69		23	8%	
Present	47	6.74	12.93		9	19%	
Non-Marijuana Drugs				.066			.001
Absent	284	3.83	6.72		22	8%	
Present	42	6.14	9.97		10	24%	

[*] Mann-Whitney U tests of association.

[†] Chi-square analysis.

[‡] *ER* = Emergency Room. *n* = sample size. *M* = mean. *SD* = standard deviation.