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Epidemiological patterns of drug use in the United States: Evidence from the National Comorbidity Survey Replication, 2001–2003

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Abstract

Background—In 1994, epidemiological patterns of extra-medical drug use in the United States were estimated from the National Comorbidity Survey. This paper describes such patterns based upon more recent data from the National Comorbidity Survey Replication (NCS-R).

Methods—The NCS-R was a nationally representative face-to-face household survey of 9282 English-speaking respondents ages 18 and older, conducted in 2001–2003 using a fully structured diagnostic interview, the WHO Composite International Diagnostic Interview (CIDI) Version 3.0.

Results—The estimated cumulative incidence of alcohol use in the NCS-R was 92%; tobacco, 74%; extra-medical use of other psychoactive drugs, 45%; cannabis, 43%; and cocaine, 16%. Statistically robust associations existed between all types of drug use and age, sex, income, employment, education, marital status, geography, religious affiliation and religiosity. Very robust birth cohort differences were observed for cocaine, cannabis, and other extra-medical drug use, but not for alcohol or tobacco. Trends in the estimated cumulative incidence of drug use among young people across time suggested clear periods of fluctuating risk.

Conclusions—These epidemiological patterns of alcohol, tobacco, and other extra-medical drug use in the United States in the early 21st century provide an update of NCS estimates from roughly 10 years ago, and are consistent with contemporaneous epidemiological studies. New findings on religion and religiosity, and exploratory data on time trends, represent progress in both concepts and methodology for such research. These estimates lead to no firm causal inferences, but contribute to a descriptive epidemiological foundation for future research on drug use and dependence across recent decades, birth cohorts, and population subgroups.

Keywords

cannabis; cocaine; alcohol; tobacco; drug; epidemiology

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1. Introduction

In 1994, epidemiological patterns of extra-medical drug taking in the United States were described using data from the 1990–1992 National Comorbidity Survey (NCS). “Extra-medical” drug use refers to alcohol, tobacco and illegal drug use, as well as to the use of psychoactive prescription or over-the-drugs, when such use is to get “high” or is outside the bounds of the prescribed purpose (Anthony et al., 1994). In the NCS, it was estimated that the 92% of the population had used alcohol; 76% had engaged in tobacco smoking; 51%, any extra-medical use of psychoactive drugs; 46%, cannabis, and 16%, cocaine. A National Comorbidity Survey Replication (NCS-R) was completed between 2001–2003 (Kessler et al., 2004; Kessler and Merikangas, 2004). The current paper describes epidemiological patterns of extra-medical drug use based upon these more recent data.

Our focus in this paper is upon estimation of the cumulative occurrence of drug use. The statistical measure of “cumulative occurrence” is a cumulative incidence proportion, estimated from assessments of the lifetime history of individuals who survived to the date of their survey participation. This outcome is sometimes labelled as a “lifetime prevalence” proportion, in the sense that it also describes the lifetime history of a population’s exposure. When conceptualised as the cumulative occurrence of drug use among surviving members of a birth cohort, this proportion has a direct interpretation as an estimate of risk of “becoming” a drug user, and this proportion is not influenced by the duration of the experience under study – in contrast to all other known prevalence proportions. Estimates for the cumulative incidence proportion are therefore estimates of how many in the population have become drug users by the time they were interviewed.

1.1 Aims

The specific aims of this paper are to:

1. Present cumulative incidence proportions of alcohol, tobacco, cannabis, cocaine and any extra-medical drug use for the study population as a whole;
2. Present cumulative incidence proportions for major population subgroups, defined with reference to (a) year of birth, (b) sex, and (c) race-ethnicity, and the following characteristics (which may vary across time) as measured at the time of assessment: educational attainment, marital status, employment status, family income, religion and religiosity, and location of residence (region and a measure of the rural-urban gradient);
3. Explore trends in the occurrence of extra-medical drug use among young people in the United States, across time periods.

2. Method

2.1 Research design and sample

As described in extensive detail elsewhere (Kessler et al., 2004; Kessler and Merikangas, 2004), the NCS-R is a nationally representative household survey of English speakers ages 18 + in the coterminous United States. Respondents were confined to English-speakers because two parallel surveys were conducted in nationally representative samples of Hispanics (in Spanish or English, depending on the preference of the respondent) and Asian Americans (in a number of Asian languages or English, again depending on the preference of the respondent) (Alegria et al., 2004). These surveys used the same diagnostic instrument as the NCS-R and are covering the major groups of non-English speakers in the US population.

NCS-R respondents were drawn by probability sampling within a multi-stage clustered area probability sample of households; one randomly selected person from each household was sampled. Standardized assessments were completed via computer-assisted personal interviews (CAPI) between February 2001 and April 2003, with face to face personal interview as backup for equipment malfunction; assessors were professional interviewers from the Institute for Social Research (ISR) at the University of Michigan. The participation level was 71%.

The survey was administered in two parts. Part I was the core diagnostic assessment administered to all participants (n = 9282). Part II included questions about suspected correlates or determinants as well as additional topics including extra-medical psychoactive drug use. Selection into Part II was controlled by the computer assisted interview program, which divided respondents into three strata based on their Part I responses; part II was administered to: a) all Part I respondents who had qualified as cases for any of the core disorders assessed in Part I; b) a probability sample of 59% of the respondents who had met some but not all criteria, or had sought treatment for a mental health or drug use problem, or had experienced suicidal ideation, or had used tobacco, and c) 25% of the remaining respondents (part II sample n = 5692) (Kessler et al., 2004).

Each Part II respondent was assigned the inverse of his or her predicted probability of participation in Part II from the final within-stratum equation, with norming undertaken such that the values equalled the sum of part I weights in the full part I in the stratum. These normed values were then summed across the entire Part II sample of 5,692 cases and renormed to have a sum of weights of 5,692. These renormed values defined weight WT1.5; WT1.5 was then multiplied by the consolidated Part I weight to create the consolidated Part II weight. This procedure thus adjusted for the fact that part II was an enriched sample of cases and allowed for representative weighted estimates to be produced in the analyses presented here (Kessler et al., 2004).

Interviewers explained the study and obtained informed consent prior to beginning each interview. The NCS-R full protocol was approved by the Human Subjects Committees of both Harvard Medical School and the University of Michigan; the protocol for analysis of these data was additionally approved by the Human Subjects Committee of Michigan State University.

2.2 Measures

2.2.1 Extra-medical drug use—The NCS-R standardized survey module on tobacco smoking started with this question to identify every-smokers: “Have you ever smoked a cigarette, cigar, or pipe, even a single puff?” The module on drinking alcoholic beverages started with this question to identify ever-drinkers: “How old were you the very first time you ever drank an alcoholic beverage – including either beer, wine, a wine cooler, or hard liquor?”

The module on other extra-medical drug use made use of a booklet with show-card pages that listed drug names, and the context of extra-medical drug use was introduced by explaining the survey’s interest in drugs used for any reason other than a health professional would prescribe (hence, ‘extra-medical’). For example, the show-card on sedatives, hypnotics, and anti-anxiety compounds listed examples of more than 30 older and more recent trade names and several generic names that have been commonly prescribed and named in federal reports on extra-medical use (e.g., older products such as Seconal®, Quaaludes®, and Valium® as well as more recently introduced products such as Xanax®, Restoril®, and Halcion®). This show-card also listed colloquial names such as ‘sleeping pills’ and ‘downers’ or ‘nerve pills.’ A show-card on stimulants other than cocaine listed colloquial names such as ‘uppers,’ ‘dexies’ ‘speed,’ and ‘ice,’ as well as more than 20 examples selected from older and more recent compounds (e.g., Desoxyn®, Ritalin®, Preludin®, methamphetamine). A show-card on analgesic compounds listed ‘painkillers,’ as well as 20 examples (e.g., Tylenol® with codeine, Percodan®,

Demerol®, morphine, and codeine). A show-card on other drugs referred to “Other drugs, such as heroin, opium, glue, peyote, and LSD, with some colloquial names as well.

The first question in the ‘drugs’ module asked about cannabis: “Have you ever used either marijuana or hashish, even once?” The question about cocaine asked the participant to look at appropriate show-cards in the booklet, which listed different forms of cocaine. “Looking at Pages 24–25 in your booklet, have you ever used cocaine in any form, including powder, crack, free base, coca leaves, or paste?” Assessment of extra-medical use of prescription medicines included this instruction and question: “Look at Pages 24–25 in your booklet. Have you ever used tranquilizers, stimulants, pain killers, or other prescription drugs either without the recommendation of a health professional, or for any reason other than a health professional said you should use them?” Assessment of extra-medical use of other psychoactive drugs was via this question: “Looking at pages 24–25 in your booklet, have you ever used any other drug – such as (those listed in your booklet/heroin, opium, glue, LSD, peyote, or any other drug)?”

Three main summary categories were formed from the participant responses to the above-listed questions: (1) alcohol; (2) tobacco; and (3) any extra-medical drug use excluding alcohol and tobacco. We have also produced separate estimates for the most commonly used drugs other than alcohol and tobacco – cannabis and cocaine. With respect to each drug category, if extra-medical use in that category had occurred, even once, the participant was classified as having used it.

2.2.2 Covariates—The main covariates of interest in this paper include three time-fixed variables: sex, race-ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, Other), and birth cohort, which can also be labeled as age at time of assessment. The birth cohorts were: 1973–1984 (18–29 years at time of assessment); 1958–1972 (30–44 years); 1943–1957 (45–59 years); and 1904–1942 (60–98 years).

A number of time-varying covariates were studied: a) completed years of education (grouped as 0–11, 12, 13–15, 16+ years); b) marital status (married-cohabitating, previously married, never married); c) employment (homemaker, retired, other, working/student); d) family income (defined in relation to the federal poverty line¹: low income was less than or equal to 1.5 times the poverty line, low-average was 1.5–3 times the poverty line, high-average as 3–6 times the poverty line, and high was greater than 6 times the poverty line); e) region of residence, and f) a rural-urban gradient. The rural-urban gradient variable was coded according to 2000 Census definitions, which distinguished large (at least 2 million residents) vs. smaller Metropolitan Statistical Areas (MSAs) by central cities, suburbs, adjacent areas (areas outside the suburban belt, but within 50 miles of the central business district of a central city), and rural areas (more than 50 miles from the central business district of a central city). The coding system has been used in numerous population surveys and is comprised of a set of three interrelated codes aimed at classifying national area probability segments as urban or rural: a) “belt code” (defined by the Consolidated Metropolitan Statistical Areas (CMSA) population total that the segment is located in (or non-MSA status), whether it is a Census defined Central City or in a “suburb”/urban fringe location surrounding a Central City or a rural location); b) “population in 1000s”, and c) “size of place of interview”, which is coded based on the belt code and population size.

Religious denomination was assessed for all part II respondents, using an item from previous studies conducted at the University of Michigan, including the National Comorbidity Survey (Miller et al., 2000). For the present study, religious denomination was categorized according to previous research examining religious affiliation in the United States (Steensland et al., 2000), using the RELTRAD coding system: Black Protestant, Evangelical Protestant, Catholic,

¹<http://aspe.hhs.gov/poverty/03poverty.htm>

Jewish, Mainline Protestant, Other, and None. Religiosity was also assessed for all part II respondents, who reported how important religious beliefs were in their lives (low, a little, somewhat, very much).

2.3 Analysis methods

In the analysis, weights were used to adjust for variation in Part II probabilities described in Section 2.1, as well as within-household probability of selection, non-response, and differences between the sample and 2000 Census on socio-demographic variables. Further detail on weights has been provided in previous work (Kessler et al., 2004).

Cumulative incidence proportions of drug use were estimated, with standard errors derived using the Taylor series linearization (TSL) methods implemented in the SUDAAN software system to adjust for the effects of weighting and clustering on the precision of estimates. Regression coefficients were estimated and then exponentiated for interpretation as odds ratios (ORs), with TSL design-based 95% confidence intervals (95% CI). When p-values are reported or indicated (via *), they are from Wald tests with TSL design-based coefficient variance – covariance matrices ($\alpha = 0.05$; two-tailed). Tables with actual TSL-estimated p-values will be posted to this journal's online supplement database or will be made available upon request to the MSU research team (JCA).

Exploratory analyses of time trends were conducted, making use of retrospectively recalled age of onset data from each participant's interview. Calendar year-specific estimates were derived for young people as they passed through a drug-specific sample-based interval of risk for having initiated extra-medical drug use. The age band used for each drug category was derived from the interquartile range (IQR) of the age of initiation of drug use of participants. Discrete-time survival models were conducted for each drug category, with person-year as the unit of analysis and covariate terms for age, sex and race-ethnicity. Model-based estimates produced from these analyses are calendar year-by-year cumulative incidence proportions for the following age groups, derived from drug-specific IQR for first drug use: tobacco 13–19 years; alcohol 14–19 years; cannabis 16–21 years; cocaine 19–26 years; any extra-medical drug 16–21 years. Historical time trends were considered by including linear, quadratic and cubic time trends in successive models. The best fitting time trends were selected through examination of fit statistics of the model and examination of the fit of observed versus predicted year-by-year values.

3. Results

3.1 Sample characteristics

Table 1 presents the frequency distribution in the NCS-R sample for all covariates and response variables considered in this paper. Unweighted sample sizes are shown first, followed by (weighted) estimated proportions and TSL-derived standard errors for the proportions. Aside from the unweighted sample frequencies, all results reported are based on conventional analytic methods for complex survey sample data, after appropriate weighting as described in Sections 2.1 and 2.3.

3.2 Cumulative incidence of drug use across birth cohorts

The estimated cumulative incidence of drug use shows considerable variation across birth cohorts for use of drugs other than alcohol and tobacco; the estimates are exceptionally precise (i.e., with very small standard errors; Table 2). Table 2 presents the complementary results from discrete-time survival models to estimate birth cohort-associated variation in cumulative incidence of drug use. Clear variation exists across cohorts for some drug types, but not for others. Alcohol was used by the majority of participants: proportions using were similar among

younger birth cohorts (93–94%), which were slightly higher than estimates observed for the oldest cohort (86%). For tobacco, there was no such cohort-related variation (Table 2).

The variation across birth cohorts was most pronounced for the extra-medical use of drugs other than alcohol and tobacco. Estimated cumulative incidence proportions for any extra-medical drug (excluding alcohol and tobacco) were lowest for the oldest cohort, born 1904–1942 (7%). Larger proportions were observed in more recent cohorts such that the majority of the two youngest cohorts (55% and 61%) had become users of such drugs by the time of interview (Table 2). Similarly, the cumulative incidence proportions for cannabis use were largest for the two youngest cohorts; the proportion was also much larger for the 1943–1957 cohort (46%) than it was for those born between 1904–1942 (6%).

The pattern differed for cocaine. The cohort with the highest cumulative incidence of use was the 1958–1972 birth cohort (28%), whereas the 1973–1984 and 1943–1957 cohorts had similar and lower proportions (16 and 17% respectively). Cocaine use was extremely uncommon among members of the oldest cohort (1%).

3.3 Correlates of drug use

Table 3 presents estimated odds ratios (OR) from bivariate analysis of associations between selected covariates and cumulative incidence of drug use. Some variables were consistently related to drug use across drugs: males were more likely than females to have become users of all drug types; and younger adults were more likely than older adults to have become users of all drugs examined here (with the exception of tobacco, where there was no association with age at interview; Table 3).

On a bivariate level, participants identifying as non-Hispanic Blacks and those in the ‘Other’ category (primarily Asian-Americans) were less likely than non-Hispanic Whites to have become users of alcohol or tobacco, but few other differences were observed (Table 3). The picture changed when covariate terms were added to the models (Table 4), namely: a) non-Hispanic Whites were most likely to have engaged in extra-medical use of other drugs compared to other race-ethnicity subgroups; b) those in the ‘Other’ category had less experience with alcohol (adjusted OR = 0.4; $p < 0.05$), and c) persons of Hispanic origin, as well as non-Hispanic Blacks, were less likely than non-Hispanic Whites to have started smoking tobacco (OR = 0.6; $p < 0.05$; OR = 0.7; $p < 0.05$, respectively) (Table 4).

Estimated associations with educational attainment differed across drug types. Based upon estimates from the bivariate analyses, persons who did not attend college were more likely to have started tobacco smoking, whereas they were less likely to have consumed alcohol or cannabis; the OR for any extra-medical drug use was also inverse (Table 3). The picture changed with covariate adjustment, as shown in Table 4, where inverse associations existed between completion of college and cocaine use ($p < 0.05$).

Marital status was more strongly associated with drug use after covariate adjustment (Table 4), as compared to the bivariate OR estimate shown in Table 3. Those who had never been married as of the time of interview were *less* likely to have started engaging in drinking, tobacco smoking, or any extra-medical drug use, whereas those who had been separated or divorced generally were *more* likely to have become extra-medical drug users; the only exception was observed in relation to alcohol (Table 4).

With covariate adjustment, compared to those attending school or working for pay, persons who classified themselves as homemakers were less likely to have started drinking alcohol (OR = 0.5; $p < 0.05$; Table 4). Retirees were less likely to have started smoking cannabis (OR = 0.4; $p < 0.05$) or to have become extra-medical drug users (OR = 0.5; $p < 0.05$). Individuals

classifying themselves in ‘Other’ employment sub-categories (e.g., unemployed) were just as likely as the ‘Working/student’ subgroup to have started drinking alcohol, but were somewhat more likely to have started using the other drug types: this covariate-adjusted association was most robust with respect to cocaine (OR = 1.4; $p < 0.05$; Table 4) and any extra-medical drug use (OR = 1.5; $p < 0.05$; Table 4). The association between income level and cumulative incidence of extra-medical drug use was positive, and although with covariate adjustment, the inverse associations became less statistically robust, the same general pattern was present: those with the highest incomes were most likely to have engaged in extra-medical use of all drug types but for cocaine (where the number of users was smallest (Tables 3 and 4).

Geographical location of current residence was related to drug use of all kinds. In general, those living in the southern US region were less likely to have used all drugs examined here, and those living in the West region were most likely to have done so (Tables 3 and 4). Covariate-adjusted estimates also showed an excess incidence of extra-medical drug use in the northeast region relative to the southern region (e.g. Table 4: OR = 1.7 for cannabis, 1.4 for cocaine). Compared to those in the southern states, those living in the Midwest were more likely to have started drinking alcohol (OR = 2.3; $p < 0.05$; Table 4), and were more likely to have started smoking cannabis (OR = 1.3; $p < 0.05$; Table 4). With respect to the rural-urban gradient, those living in rural areas were just as likely to have started drinking alcohol or smoking tobacco, as those living closer to, or in, ‘central cities’ (Table 4). This was not the case for other drugs, where cumulative incidence was *lower* for residents of rural areas than it was for residents of other areas (Table 4). Cumulative incidence of cocaine use tended to follow the rural-urban gradient, with residents of cities and suburbs being some 4–5 times more likely to have started using cocaine, as compared to rural residents.

With respect to religious affiliation, Mainline Protestants (e.g. Anglicans, Baptists) were specified as the reference group. Covariate-adjusted excess risk of having used alcohol was found among Catholics (OR = 1.9; $p < 0.05$) and a reduced risk of starting to drink was found among those of ‘Other’ religions (e.g., Islam; OR = 0.2; $p < 0.05$; Table 4). Also shown in Table 4, the cumulative incidence of tobacco smoking was inversely associated with being affiliated with Black Protestantism (aOR = 0.5; $p < 0.05$) and with the ‘Other’ religion category (OR = 0.5; $p < 0.05$). The only statistically robust variation with respect to extra-medical drug use concerned those who had no current religious affiliation: this group was more likely than Mainline Protestants to have started to use cannabis, cocaine, and extra-medical drug use generally (OR = 1.4–2.0, $p < 0.05$; Table 4).

The self-reported importance of religion was inversely associated (on a bivariate level) with drug use: those for whom religion was less important were more likely to have used all drug types (Table 3). This relationship largely remained after covariate adjustment, but the pattern was more akin to a threshold function, with those who held religion as “very important” to them being less likely than others to have become drug users.

3.4 Initiation of drug use across birth cohorts and historical time

The birth cohort variations above were more marked when the age of initiation of use was examined: Figure 1 presents the cumulative incidence of drug use by age, and according to birth cohort. By the time they had turned 21 years, half of the youngest cohort (1973–1984) had used cannabis (52%), and 89% had used alcohol. In contrast, only an estimated 1% of the 1904–1942 cohort had started cannabis use by this age, and 68% had tried alcohol. The cumulative incidence of tobacco use was similar across all birth cohorts by this age.

More pronounced cohort-associated variations existed with respect to cumulative proportions estimated for starting drug use by age 15 years: in the 1973–1984 cohort, roughly one third had used alcohol (38%), and 14% had used cannabis; among the 1904–1942 cohort, under 1%

had used cannabis, and 23% had used alcohol. Experience with tobacco smoking by age 15 was just as common for members of the oldest birth cohorts as it was among younger birth cohorts. Clear cohort-associated variations existed in the age of initiation of alcohol use, but they were most marked for extra-medical use of drugs other than alcohol and tobacco (Figure 1).

Using NCS-R retrospective estimates for age at first drug use, we re-constructed the experience of young people from 1955 through 2001, as described in the Methods section. Figure 2 presents two curves for each drug category, with one curve showing model-based estimates, and the other curve based on these estimates after smoothing.

For extra-medical use of drugs other than alcohol and tobacco, the interquartile range for age of initiation of use was 16–21 years. In 1957, it was rare for individuals in that age range to have engaged in extra-medical use of these drugs, but the estimated cumulative incidence proportion grew substantially such that by 1979, an estimated 41% of 16–21 year olds in that year had become a user of one or more of the drugs in this category (Figure 2). This drug was typically cannabis (which followed an extremely similar trend). The estimated cumulative incidence proportion for 16–21 year olds showed a decline from the mid 1980s, followed by an increase from 1995.

For tobacco, the interquartile range for initiation of smoking was 13–19 years, and in 1955, an estimated 43% of young people in this age range had become tobacco smokers. That proportion remained relatively stable across years, but a gradual decline was seen from the mid 1980s, such that the estimated proportion for young people who were 13–19 years old in 1996 was only 37%. For alcohol, a curvilinear trend was evident: in 1955, an estimated 39% of 14–19 year olds had begun alcohol use, gradually increasing to around 60% in the mid-1980s; this estimated proportion decreased such that among 14–19 year olds in 1996, roughly 50% had begun alcohol use.

4. Discussion

This study has provided information about epidemiological patterns in the cumulative incidence of drug use in the United States, and estimated changes in such drug use among young people across the latter half of the last century. Comparing across the NCS and NCS-R surveys, conducted a decade apart, the similarities in cumulative incidence of drug use were noteworthy, despite sampling frame differences. The estimate for cumulative incidence of alcohol use was 92% in both surveys. For other drugs, the corresponding pairs of estimates were as follows: tobacco smoking (74% vs. 76%); any extra-medical use of psychoactive drugs, 45% vs. 51%; cannabis, 43% vs. 46%; and cocaine, 16% (both surveys).

The NCS-R disclosed statistically robust associations between extra-medical drug use and age, sex, income, employment, educational attainment, marital status, and geographical region. Similar patterns were seen in the NCS; the analyses of the association between religion and drug use were more detailed in the NCS-R than the NCS, and included a measure of religiosity (which was not studied in the NCS paper).

4.1 Cohort and time trends in drug use

Robust birth cohort-associated variations were not observed for cumulative incidence of tobacco smoking, but *were* observed in relation to initiation of alcohol consumption and extra-medical use of other drugs. These cohort-associated variations were made more visible in Figure 1's plots of cohort-specific cumulative incidence estimates. Particularly for cannabis, cocaine, and other drugs, and less so for alcohol and tobacco, members of the more recently

born cohorts have been much more likely to start such drug use in childhood and early-mid adolescence.

Exploratory analyses of time trends in the estimated cumulative incidence of use among young people passing through intervals of risk indicated robust increases in the likelihood of drug use initiation across the past half century. These trends were weaker for tobacco and alcohol, and were stronger for cannabis, cocaine and the other psychoactive drugs under study. Nonetheless, before detailed discussion of these findings, we should mention some limitations and potential biases that affect interpretation of this type of evidence from cross-sectional epidemiological studies.

4.1.1 Limitations—One limitation that might be thought to affect the estimates in this paper is the participation level of 71%. Survey participation levels have been declining over the recent decades, perhaps more in general population field surveys of psychiatric disorders that include assessment of drug use than in other types of surveys. To probe into this potential limitation, efforts were made to re-contact and interview individuals who initially declined to participate in both the NCS and NCS-R surveys, and such individuals were offered financial inducements to participate (Kessler et al., 2004; Kessler et al., 1995). If these people agreed, they were then interviewed using an abbreviated form of the interview. The estimated levels of extra-medical drug use among people who initially declined to be interviewed in the NCS and the NCS-R were higher than those of people who initially agreed to be interviewed (Kessler et al., 2004; Kessler et al., 1995). Accordingly, the potential under-estimation bias was adjusted for, via a method that involved making a non-response adjustment weight, which weighted up the cases of participants with profiles found to be under-represented in the sample. This potential source of underestimation bias is therefore minimised, if not corrected.

Cross-sectional research on the cumulative incidence of drug use – and the age of initiation of such use – has limitations (Wu et al., 2003). The first limitation involves drug-related excess mortality, and pertains to virtually all clinical research projects in the field of pharmacology. At cross-section, a sample of living humans has been subject to selective attrition processes, such as drug-related deaths. A cross-sectional sample of persons aged 18+ years in any given year consists of survivors to that point in time, with excess mortality due to drug use representing an additional source of selective attrition. Viewed from this perspective, virtually any assembly of participants in clinical research is subject to the limitations associated with selective attrition; cross-sectional epidemiological field surveys are not exceptional in this regard.

It is possible that at least some of the cohort differences in cumulative incidence of extra-medical drug use, and in the age of initiation, are due to higher mortality among individuals in the older cohorts who initiated drug use at an early age, since they were obviously not included in this study's sample (e.g., see Anthony et al., 1994). This possibility is unlikely, however, to explain the rather large category-specific differences in cumulative incidence of extra-medical drug use across the birth cohorts, for two reasons. In the case of cannabis use, convincing evidence of significantly elevated mortality risk remains to be provided; existing cohort studies have been inconsistent, with very small and possibly negligible increases in mortality risk, even among regular cannabis users (Hall et al., 2001). Furthermore, there are large differences in the cumulative incidence of use by age 15 years between adjacent cohorts (see, for example, the cocaine estimates for the three youngest birth cohorts). Even if those who began use early had substantially increased mortality rates, this increased mortality would be unlikely to account for cumulative incidence proportions of cannabis use by age 15 years that were around 14% lower in the oldest cohort compared to the youngest cohort. Finally, tobacco-associated mortality is apt to be especially large, and yet this was the drug with the smallest cohort-associated variations.

Another limitation is a possible bias is that the age of first use of drugs is “right censored” (Wu et al., 2003): because younger birth cohorts have not yet reached older ages, their reported drug use necessarily occurs at a younger age. This is most relevant for the youngest birth cohort, the youngest of whom were still in the period of highest risk for initiation of illegal drug use (Chen and Kandel, 1995; Wagner and Anthony, 2002). However, such a bias is not relevant for estimates of the cumulative incidence proportion for ages through which all cohorts have passed, since comparisons may be made across cohorts for a given age in the lifespan (e.g. age 15 years), where we still found cohort differences.

We also note that the birth cohort trends in age of first use reflect response biases. Retrospective reporting of age of first drug use may be subject to error, given that respondents are being asked about events that, for older persons, may have occurred decades ago. Longitudinal studies of adolescents have found that estimates of the age of first use do tend to increase upon repeat assessment (i.e. as people age) (Engels et al., 1997; Henry et al., 1994; Labouvie et al., 1997), but the rank ordering for the different drugs remains the same (Engels et al., 1997; Henry et al., 1994; Labouvie et al., 1997). This cannot account for all of the differences in age of onset observed here, however, since the cumulative incidence of cocaine use was lower for the most recent cohort (1973–1984) than it was for the next older one (1958–1972).

It is unlikely, however, that these biases completely account for the strong trends observed here. First, similar birth cohort trends in age of initiation of illegal drug use have been observed in other epidemiological studies in the United States (Johnson and Gerstein, 1998; Kerr et al., in press), and Australia (Degenhardt et al., 2000), some of which used data collected across time (rather than relying solely on retrospective reports; e.g. see (Kerr et al., in press)). Second, contrasting birth cohort trends in cumulative incidence of drug use were observed across different drug types, suggesting that the pattern of responses was not being affected by a uniform response or selection bias. Third, the trends are at least partially consistent with existing data concerning drug markets in the US. There is good evidence that drug availability and drug use co-vary in the general population (Degenhardt et al., 2005; Norstrom and Skog, 2003; Room et al., 2005). This phenomenon most likely involves complex feedback loops such that increasing numbers of drug users and demand move prices upward, drawing in new suppliers and supplies that make the drug more available, with persistence of relatively high levels of availability even after the peak incidence of use has occurred. In the United States, for example, the 1980s saw an increase in the availability of cocaine (and particularly, “crack” cocaine); concurrently, there were increases in the proportion of young adults using cocaine at that time, as measured in cross-sectional studies conducted during the period (United States Substance Abuse and Mental Health Services Administration, 2005). Although cocaine availability persisted in the late 1980s and early 1990s, the risk of starting cocaine use seems to have been declining over that period (Golub and Johnson, 1994, 1997; Johnston et al., 2003; Miech et al., 2005; United States Substance Abuse and Mental Health Services Administration, 2005). Estimates from the current study were consistent with these patterns. By far the highest cumulative incidence of cocaine use was observed in a cohort of adults (1958–1972) who were entering the peak years of risk of initiating cocaine use when cocaine availability was growing to peak levels. In contrast, the most recent cohort (1973–1984) has a lower cumulative incidence of cocaine use to date, despite a persisting widespread availability of cocaine in US communities, according to drug threat reports issued by the federal government.

Changes in the availability of drugs are not the sole explanation of changes in use. There have been many changes in the US in the past half century at a societal level, and at the level of communities, social networks, and family structures. Each of these may have some influence upon drug availability, the opportunity to use drugs, norms about drug use, and the decision to use drugs when the chance occurs. The possible rôle of such norms was given support by

the finding in the present study of an association between religious affiliation and extra-medical drug use, which remained statistically robust after covariate adjustment, and was independent of the importance that individuals placed upon their religious beliefs. Interestingly, this observed association differed across drug types, and the pattern was generally consistent with broad proscriptions of specific religious denominations. These findings extend recent work estimating the effects of religion upon abstinence from, and patterns of use of, alcohol (Michalak et al., in press), which has suggested that both religious denomination and religiosity were associated with alcohol use. The current study has suggested that religious denomination and religiosity may also be important for illegal and other extra-medical drug use. Previous research suggested that religious affiliation may have multiple paths of influence upon drug involvement – including the possibility that religious activities occupy leisure time and tend to surround an individual with non-using peers (Chen et al., 2004). In this regard, associations linking drug use with religious affiliation may not be a simple reflection of the individual's perceived importance of religion, or religious beliefs per se.

Does an increase in drug use across birth cohorts imply an increase in *problems*? A proportion of those who begin using any drug will experience problems related to their use, and some will develop dependence (Anthony et al., 1994; Chen et al., 2005). Drug use occurs within a social context; however, and dramatic increases in the occurrence of drug use may mean that the social context of use is also changing in important ways. For example, when drug use becomes more normalised, the strength of the association with drug dependence might *decrease*, to the extent that drug use becomes less reflective of other individual traits (Shedler and Block, 1990). These possible changes will be the subject of future analyses of the NCS-R dataset.

Another uncertainty is whether increased cumulative occurrence of use *during late childhood and early adolescence* causes greater risk of later problems. Very precocious or early initiation of drug use has been associated with a greater likelihood of later drug problems, and with progression to the use of other drug types (Anthony and Petronis, 1995; Breslau et al., 1993; Brook et al., 1999; Grant et al., 2005; Newcomb and Bentler, 1988; Storr et al., 2004; Wagner and Anthony, 2002), but the nature of this association remains a matter for debate. Again, future research will examine this issue further.

4.3 Conclusions

The epidemiological patterns of alcohol, tobacco, and other extra-medical drug use documented in the United States in the early 21st century provide an update of NCS estimates provided a decade ago. These estimates lead to no firm causal inferences or interpretations, but evidence of this type provides a foundation for more probing research on drug involvement across the decades and across birth cohorts, and lays out an evidence base that will be useful for future work examining the occurrence of the problems of drug dependence once drug use has started. The NCS-R data are available in public use dataset format (http://www.hcp.med.harvard.edu/ncs/ncs_data.php), so that others can undertake more probing research into the issues raised in this initial overview of epidemiological patterns of use.

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Figure 1.

Estimated age-specific cumulative incidence of drug use by birth cohort. Data from the National Comorbidity Survey Replication (NCS-R), United States, 2001–2003 (Part II sample $n = 5,692$ 18–98 year olds; estimates from weighted data).

Figure 2.

Estimated cumulative incidence proportions for young people in the US, plotted against calendar years of historical time. Data from the National Comorbidity Survey Replication (NCS-R), United States, 2001–2003 (Part II sample $n = 5,692$ 18–98 year olds; estimates from weighted data).

Table 1

Description and summary overview of the NCS-R sample in relation to drug use and covariates of interest. Data from the National Comorbidity Survey Replication (NCS-R), Part II sample with n = 5692, United States, 2001–2003.

		Unweighted n	Weighted %	SE (%)
Birth cohort (age band)	1973–1984 (18–29 years)	1371	23.5	1.1
	1958–1972 (30–44 years)	1826	28.9	0.9
	1943–1957 (45–59 years)	1521	26.5	1.1
	1904–1942 (60–98 years)	974	21.2	1.0
Sex	Female	3310	53.0	1.0
	Male	2382	47.0	1.0
Race-ethnicity	Hispanic	527	11.1	1.2
	Non-Hispanic Black	717	12.4	1.0
	Other	268	3.8	0.4
	Non-Hispanic White	4180	72.8	1.8
Education	< high school	849	16.8	0.9
	High school	1712	32.5	1.1
	Some college	1709	27.5	0.8
	College	1422	23.2	1.0
Marital status	Never married	1217	23.2	1.2
	Previously married	1239	20.8	0.7
	Married/Cohabiting	3236	55.9	1.2
Employment	Homemaker	340	5.6	0.5
	Retired	682	15.0	0.8
	Other	609	9.6	0.7
	Working/student	4061	69.8	1.0
Income	Low	1177	21.5	1.1
	Low-average	1267	22.1	0.9
	High-average	1885	32.5	1.1
	High	1363	23.9	1.3
Region	Northeast	1043	18.8	3.0
	Midwest	1566	23.5	1.8
	West	1233	22.1	1.9
	South	1850	35.6	1.9
Urban-rural	Central city $\geq$ 2 million	711	12.5	1.1
	Central city < 2 million	902	13.3	1.9

		Unweighted n	Weighted %	SE (%)
	Suburbs of central city ≥ 2 million	1018	17.7	2.0
	Suburbs of central city < 2 million	1254	17.6	2.4
	Adjacent area	1741	37.3	3.7
	Rural area	66	1.6	1.7
Religious Denomination	Black Protestant	437	8.0	0.8
	Evangelical Protestant	400	6.9	0.7
	Catholic	1339	24.6	1.4
	Jewish	88	1.5	0.2
	Others	175	2.9	0.3
	None	1211	19.1	1.0
	Mainline Protestant	2042	37.0	1.5
Religiosity	Low importance	1193	20.5	1.1
	Little	1446	25.1	0.8
	Somewhat	1248	22.8	0.8
	Very important	1805	31.7	1.1
Drug use	Alcohol	5329	92.0	0.9
	Tobacco	4370	73.6	1.2
	Any extra-medical drug use excluding alcohol & tobacco	2959	44.5	1.1
	Cannabis	2844	42.7	1.0
	Cocaine	1129	16.4	0.6

Note: SE from Taylor series linearization.

Table 2
Estimated cumulative incidence of drug use by birth cohort, and estimates from discrete time survival analysis models. Data from the National Comorbidity Survey Replication (NCS-R), United States, 2001–2003 (Part II n = 5,692 18–98 year olds).

Birth cohort	Alcohol			Tobacco			Any extra-medical drug use excluding alcohol & tobacco						Cannabis			Cocaine				
	%	SE	OR	95%CI	%	SE	OR	95%CI	%	SE	OR	95%CI	%	SE	OR	95%CI	%	SE	OR	95%CI
1904–1942	86.1	1.5	1.0 [/]	--	73.4	2.5	1.0 [/]	--	7.4	1.0	1.0 [/]	--	6.4	0.9	1.0 [/]	--	1.1	0.4	1.0 [/]	--
1943–1957	93.8	1.1	1.4 [*]	1.3–1.5	76.3	1.6	1.1	0.9–1.2	47.5	1.8	8.5 [*]	6.4–11.4	45.8	1.8	9.4 [*]	7.1–12.4	16.7	1.2	15.3 [*]	7.7–30.1
1958–1972	94.2	1.0	1.7 [*]	1.5–1.9	74.1	1.8	1.1	0.9–1.2	60.7	1.9	14.9 [*]	11.3–19.7	58.1	1.9	16.0 [*]	12.4–20.8	27.5	1.5	29.8 [*]	15.1–58.8
1973–1984	92.6	1.3	1.8 [*]	1.6–2.1	70.1	2.3	1.1	0.9–1.2	54.9	1.9	18.0 [*]	13.2–24.6	53.2	1.9	19.3 [*]	14.6–25.4	16.3	1.5	30.0 [*]	14.5–61.8
Total	92.0	0.9	(χ^2 = 106.4) [p<0.001]		73.6	1.2	(χ^2 = 1.6) [p=0.653]		44.5	1.1	(χ^2 = 451.5) [p<0.001]		42.7	1.0	(χ^2 = 595.7) [p<0.001]		16.4	0.6	(χ^2 = 149.2) [p<0.001]	

[/] Results are based on multivariable discrete-time survival models with person-year as the unit of analysis and covariate terms for time and sex: male/female.

^{*} Weighted data. Taylor series linearization for variance estimation, signifies p value < 0.05 level, 2-sided test. Actual p-values available upon request.

Table 3

Estimated strength of association between selected covariates and cumulative occurrence of drug use. Data from the National Comorbidity Survey Replication (NCS-R), United States, 2001–2003 (Part II sample n = 5,692 18–98 year olds).

	Alcohol		Tobacco		Any extra-medical drug use excluding alcohol & tobacco		Cannabis		Cocaine		
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	
Age	18–29	2.0*	1.4–3.0	0.8	0.6–1.1	15.3*	10.7–21.9	16.7*	11.9–23.5	17.0*	8.0–35.9
	30–44	2.6*	1.8–3.7	1.0	0.8–1.4	19.5*	14.4–26.3	20.4*	15.2–27.3	33.1*	15.8–69.5
	45–59	2.4*	1.7–3.4	1.2	0.9–1.5	11.4*	8.3–15.6	12.5*	9.1–17.0	17.4*	8.4–36.1
	60+	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--
	X ² ₃ [p]	46.7	[<0.001]	7.1	[0.070]	393.6	[<0.001]	437.0	[<0.001]	111.4	[<0.001]
Sex	Female	0.5*	0.3–0.6	0.5*	0.4–0.6	0.5*	0.5–0.6	0.5*	0.5–0.6	0.4*	0.4–0.5
	Male	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--
	X ² ₁ [p]	21.2	[<0.001]	52.9	[<0.001]	80.1	[<0.001]	74.2	[<0.001]	110.4	[<0.001]
Race-ethnicity	Hispanic	0.8	0.4–1.8	0.7	0.5–1.0	0.9	0.7–1.2	0.9	0.7–1.2	1.1	0.8–1.5
	Non-Hispanic Black	0.5*	0.3–0.7	0.5*	0.4–0.6	0.9	0.7–1.2	0.9	0.7–1.2	0.8	0.6–1.1
	Other	0.4*	0.2–0.8	0.6*	0.4–0.9	0.8	0.5–1.3	0.8	0.5–1.3	0.9	0.5–1.5
	Non-Hispanic White	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--
	X ² ₃ [p]	14.9	[0.002]	40.3	[<0.001]	1.6	[0.667]	2.1	[0.544]	2.9	[0.402]
Education	< high school	0.6*	0.4–0.9	1.6*	1.1–2.1	0.7*	0.5–0.9	0.7*	0.5–0.9	1.0	0.7–1.3
	High school	0.8	0.5–1.2	1.3*	1.0–1.6	0.8*	0.7–1.0	0.8*	0.7–1.0	1.1	0.8–1.4
	Some college	1.4	0.9–2.2	1.1	0.9–1.4	1.0	0.8–1.2	1.0	0.8–1.2	1.1	0.8–1.5
	College	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--
	X ² ₃ [p]	19.9	[<0.001]	10.4	[0.015]	14.2	[0.003]	14.5	[0.002]	2.6	[0.451]
Marital status	Never married	0.9	0.6–1.3	0.7*	0.5–0.9	1.4*	1.1–1.8	1.5*	1.2–1.8	1.2	1.0–1.5
	Previously married	0.8	0.5–1.3	1.0	0.9–1.2	0.8	0.7–1.0	0.8	0.7–1.0	0.9	0.7–1.2
	Married/Cohabiting	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--
	X ² ₂ [p]	0.9	[0.642]	7.1	[0.028]	23.0	[<0.001]	22.8	[<0.001]	5.8	[0.055]

	Alcohol			Tobacco			Any extra-medical drug use excluding alcohol & tobacco			Cannabis			Cocaine		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Employment	Homemaker	0.3 [*]	0.2–0.4	0.6 [*]	0.4–0.9		0.4 [*]	0.3–0.6		0.4 [*]	0.3–0.6		0.4 [*]	0.3–0.7	
	Retired	0.5 [*]	0.3–0.8	1.1	0.9–1.5		0.1 [*]	0.1–0.1		0.1 [*]	0.0–0.1		0.1 [*]	0.1–0.2	
	Other	0.6	0.4–1.1	1.2	0.8–1.7		1.2	0.9–1.6		1.1	0.8–1.5		1.3	0.9–1.7	
	Working/student	1.0	--	1.0	--		1.0	--		1.0	--		1.0	--	
	X ² ₃ [p]	47.1	[<0.001]	9.2	[0.027]		318.5	[<0.001]		279.8	[<0.001]		55.3	[<0.001]	
Income	Low	0.3 [*]	0.2–0.5	0.9	0.7–1.1		0.6 [*]	0.5–0.8		0.6 [*]	0.5–0.8		0.9	0.7–1.2	
	Low-average	0.6 [*]	0.3–1.0	0.9	0.7–1.2		0.7 [*]	0.6–0.9		0.7 [*]	0.6–0.9		0.8	0.6–1.1	
	High-average	0.6 [*]	0.4–0.9	1.0	0.8–1.3		0.8	0.7–1.0		0.8	0.7–1.1		1.1	0.9–1.4	
	High	1.0	--	1.0	--		1.0	--		1.0	--		1.0	--	
	X ² ₃ [p]	21.9	[<0.001]	3.6	[0.304]		22.4	[<0.001]		19.7	[<0.001]		6.4	[0.094]	
Region	Northeast	2.6 [*]	1.2–5.5	1.7 [*]	1.1–2.6		1.7 [*]	1.3–2.2		1.7 [*]	1.4–2.2		1.6 [*]	1.3–2.1	
	Midwest	3.1 [*]	1.4–6.8	1.8 [*]	1.4–2.5		1.4 [*]	1.1–1.8		1.4 [*]	1.2–1.8		1.0	0.8–1.3	
	West	2.5 [*]	1.3–4.8	1.3	1.0–1.8		2.1 [*]	1.7–2.6		2.1 [*]	1.7–2.5		2.3 [*]	1.7–3.0	
	South	1.0	--	1.0	--		1.0	--		1.0	--		1.0	--	
	X ² ₃ [p]	17.7	[0.001]	19.2	[<0.001]		55.6	[<0.001]		69.1	[<0.001]		53.0	[<0.001]	
Urban-rural	Central city >= 2 million	2.4 [*]	1.3–4.4	0.8	0.6–1.1		4.4 [*]	3.4–5.6		4.0 [*]	3.1–5.1		9.0 [*]	7.2–11.1	
	Central city < 2 million	3.3 [*]	2.3–4.8	1.1	0.9–1.5		4.3 [*]	3.6–5.1		4.1 [*]	3.4–4.9		6.6 [*]	5.3–8.1	
	Suburbs of central city >= 2 million	5.0 [*]	2.9–8.4	1.0	0.8–1.2		4.1 [*]	3.5–5.0		4.1 [*]	3.4–4.9		8.1 [*]	6.4–10.4	
	Suburbs of central city < 2 million	3.4 [*]	2.0–5.9	1.3 [*]	1.1–1.6		3.3 [*]	2.7–4.2		3.3 [*]	2.7–4.1		6.0 [*]	5.2–7.0	
	Adjacent area	3.8 [*]	2.4–6.2	1.3 [*]	1.0–1.7		2.9 [*]	2.5–3.5		2.9 [*]	2.4–3.4		5.1 [*]	4.3–6.1	
	Rural area	1.0	--	1.0	--		1.0	--		1.0	--		1.0	--	
	X ² ₅ [p]	121.1	[<0.001]	13.2	[0.022]		910.9	[<0.001]		943.4	[<0.001]		1717.1	[<0.001]	

	Alcohol		Tobacco		Any extra-medical drug use excluding alcohol & tobacco		Cannabis		Cocaine	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Religious denomination										
Black Protestant	0.5*	0.3–0.8	0.4*	0.3–0.6	0.9	0.7–1.2	1.0	0.7–1.2	1.0	0.7–1.5
Evangelical Protestant	0.6	0.4–1.1	0.8	0.5–1.1	1.5*	1.1–2.0	1.4*	1.0–1.9	2.0*	1.3–2.9
Catholic	2.1*	1.3–3.7	1.1	0.8–1.4	1.2	1.0–1.5	1.2	1.0–1.5	1.4*	1.0–1.9
Jewish	0.5	0.2–1.5	0.9	0.5–1.5	1.4	0.8–2.2	1.3	0.8–2.1	1.6	0.8–3.4
Others	0.4*	0.2–0.8	0.4*	0.3–1.7	1.7	1.0–3.0	1.7	0.9–3.2	2.1*	1.3–3.4
None	2.0*	1.2–3.4	1.2	0.9–1.7	2.9*	2.4–3.4	2.9*	2.5–3.4	3.4*	2.7–4.3
Mainline Protestant	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--
X ² ₅ [p]	54.2	[<0.001]	51.5	[<0.001]	196.9	[<0.001]	225.4	[<0.001]	168.0	[<0.001]
Religiosity										
Low important	4.4*	2.6–7.4	2.0*	1.5–2.6	3.4*	2.7–4.1	3.4*	2.8–4.2	2.6*	2.1–3.3
Little	2.8*	1.8–4.4	2.1*	1.7–2.6	2.1*	1.7–2.5	2.1*	1.7–2.5	1.5*	1.1–2.0
Somewhat	1.7*	1.0–2.8	1.3*	1.1–1.7	1.5*	1.1–1.9	1.5*	1.2–1.8	1.2	0.9–1.5
Very important	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--
X ² ₃ [p]	44.5	[<0.001]	48.7	[<0.001]	157.3	[<0.001]	169.6	[<0.001]	106.2	[<0.001]

These estimates are from bivariate logistic regression analyses.

* Weighted data, Taylor series linearization for variance estimation, signifies p value < 0.05 level, 2-sided test. Actual p-values available upon request.

Table 4

Covariate-adjusted estimates of strength of association between selected covariates and cumulative occurrence of drug use. Data from the National Comorbidity Survey Replication (NCS-R), United States, 2001–2003 (Part II sample n = 5,692 18–98 year olds).

	Alcohol			Tobacco			Any extra-medical drug use excluding alcohol & tobacco			Cannabis			Cocaine		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Race-ethnicity	Hispanic	0.6	0.3–1.3	0.7*	0.4–1.0		0.6*	0.4–0.8		0.6*	0.4–0.8		0.7*	0.5–0.9	
	Non-Hispanic Black	1.7	0.6–4.7	0.9	0.5–1.6		1.1	0.6–2.1		1.0	0.5–1.9		0.6*	0.4–0.9	
	Other	0.4*	0.2–0.8	0.7	0.4–1.1		0.4*	0.2–0.7		0.4*	0.2–0.7		0.4*	0.2–0.8	
	Non-Hispanic White	1.0	--	1.0	--		1.0	--		1.0	--		1.0	--	
	X ² ₃ [p]	14.4	[<0.01]	5.1	[0.166]		23.8	[<0.001]		20.7	[<0.001]		18.9	[<0.001]	
Education	< high school	0.9	0.5–1.8	1.8*	1.3–2.6		1.2	0.9–1.7		1.2	0.9–1.7		1.6*	1.1–2.1	
	High school	0.9	0.5–1.4	1.4*	1.1–1.7		1.1	0.9–1.3		1.1	0.8–1.3		1.4*	1.1–1.9	
	Some college	1.4	0.9–2.3	1.2	0.9–1.5		1.1	0.9–1.3		1.0	0.9–1.3		1.3	1.0–1.8	
	College	1.0	--	1.0	--		1.0	--		1.0	--		1.0	--	
	X ² ₃ [p]	6.1	[0.106]	14.9	[<0.01]		1.2	[0.754]		1.7	[0.636]		9.9	[<0.05]	
Marital status	Never married	0.7*	0.4–1.0	0.7*	0.5–0.9		0.7*	0.6–1.0		0.8	0.6–1.0		0.9	0.7–1.2	
	Previously married	1.3	0.7–2.3	1.2	1.0–1.5		1.6*	1.3–2.0		1.6*	1.3–2.1		1.3*	1.1–1.7	
	Married/Cohabiting	1.0	--	1.0	--		1.0	--		1.0	--		1.0	--	
	X ² ₂ [p]	9.0	[<0.05]	10.9	[<0.01]		31.2	[<0.001]		23.2	[<0.001]		11.9	[<0.01]	
Employment	Homemaker	0.5*	0.3–0.8	0.8	0.5–1.3		0.8	0.5–1.1		0.8	0.5–1.1		0.8	0.5–1.4	
	Retired	1.1	0.6–1.9	1.3	0.9–1.8		0.5*	0.3–0.7		0.4*	0.3–0.6		1.0	0.4–2.3	
	Other	1.0	0.6–1.7	1.3	0.8–1.9		1.5*	1.1–2.1		1.3	1.0–1.9		1.4*	1.0–1.9	
	Working/student	1.0	--	1.0	--		1.0	--		1.0	--		1.0	--	
	X ² ₃ [p]	16.7	[<0.001]	5.0	[0.170]		34.1	[<0.001]		24.3	[<0.001]		7.9	[<0.05]	
Income	Low	0.5*	0.3–1.0	1.0	0.8–1.3		0.6*	0.5–0.9		0.6*	0.5–0.9		1.0	0.7–1.4	
	Low-average	0.7	0.4–1.4	1.0	0.7–1.3		0.8	0.6–1.0		0.8	0.6–1.1		0.9	0.7–1.2	
	High-average	0.6*	0.4–0.9	1.0	0.8–1.2		0.8*	0.6–1.0		0.8*	0.6–1.0		1.1	0.8–1.4	

	Alcohol		Tobacco		Any extra-medical drug use excluding alcohol & tobacco		Cannabis		Cocaine	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
High	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--
X^2_3 [p]	8.0	[<0.05]	0.1	[0.990]	10.5	[<0.05]	9.7	[<0.05]	1.3	[0.721]
Region										
Northeast	2.0	0.9–4.3	1.5*	1.0–2.3	1.7*	1.3–2.1	1.8*	1.4–2.3	1.4*	1.1–1.7
Midwest	2.6*	1.2–5.8	1.7*	1.2–2.4	1.3*	1.0–1.7	1.4*	1.1–1.7	0.9	0.7–1.1
West	2.7*	1.3–5.4	1.5*	1.1–2.0	2.3*	1.8–2.9	2.3*	1.9–2.8	2.0*	1.5–2.5
South	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--
X^2_3 [p]	12.1	[<0.01]	11.5	[<0.01]	56.6	[<0.001]	74.5	[<0.001]	48.8	[<0.001]
Urban-rural										
Central city >= 2 million	1.0	0.5–1.9	0.6*	0.4–0.9	2.5*	1.9–3.4	2.2*	1.5–3.1	5.3*	3.8–7.3
Central city < 2 million	1.6*	1.0–2.4	0.9	0.6–1.2	3.1*	2.4–4.0	2.8*	2.2–3.6	4.6*	3.3–6.2
Suburbs of central city >= 2 million	1.7	0.9–3.5	0.6*	0.4–0.9	2.3*	1.7–3.1	2.2*	1.6–3.0	5.0*	3.6–6.8
Suburbs of central city < 2 million	1.7*	1.0–2.8	0.9	0.6–1.3	2.4*	1.9–3.0	2.3*	1.8–2.9	4.4*	3.5–5.6
Adjacent area	1.9*	1.3–2.7	0.9	0.6–1.3	2.0*	1.7–2.4	1.9*	1.6–2.3	3.5*	2.9–4.3
Rural area	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--
X^2_5 [p]	14.5	[<0.05]	13.1	[<0.05]	111.7	[<0.001]	106.1	[<0.001]	223.3	[<0.001]
Religious denomination										
Black Protestant	0.4	0.1–1.2	0.5*	0.3–0.9	0.7	0.4–1.3	0.9	0.5–1.6	1.4	0.8–2.4
Evangelical Protestant	0.6	0.3–1.1	0.8	0.6–1.3	1.1	0.7–1.5	1.0	0.7–1.4	1.5	0.9–2.3
Catholic	1.9*	1.3–2.9	1.1	0.8–1.4	0.9	0.7–1.2	0.9	0.7–1.2	1.1	0.7–1.6
Jewish	0.4	0.1–1.1	0.9	0.5–1.7	1.1	0.5–2.4	1.1	0.5–2.4	1.3	0.5–3.2
Others	0.3*	0.2–0.6	0.5*	0.3–0.8	1.0	0.6–1.8	1.0	0.5–2.0	1.4	0.9–2.2
None	1.0	0.6–1.7	1.1	0.8–1.5	1.4*	1.1–1.8	1.5*	1.2–1.8	2.0*	1.5–2.7
Mainline Protestant	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--
X^2_5 [p]	53.0	[<0.001]	30.0	[<0.001]	23.0	[<0.01]	24.7	[<0.001]	48.5	[<0.001]

		Alcohol		Tobacco		Any extra-medical drug use excluding alcohol & tobacco		Cannabis		Cocaine	
		OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Religiosity	Low important	2.9*	1.7–4.9	1.5*	1.1–2.1	2.1*	1.6–2.7	2.1*	1.6–2.7	1.4*	1.1–1.9
	Little	2.1*	1.3–3.4	1.9*	1.5–2.4	1.6*	1.3–2.1	1.6*	1.3–2.1	1.1	0.8–1.6
	Somewhat	1.6	1.0–2.6	1.3*	1.1–1.6	1.4*	1.1–1.8	1.4*	1.1–1.8	1.1	0.8–1.5
	Very important	1.0	--	1.0	--	1.0	--	1.0	--	1.0	--
	X ² ₃ [p]	22.1	[<0.001]	33.3	[<0.001]	31.9	[<0.001]	33.5	[<0.001]	10.0	[<0.05]

These estimates are from multiple logistic regressions with covariate terms for all listed variables, as well as age (in years) and sex. See Table 3 for age and sex OR estimates.

* Weighted data, Taylor series linearization for variance estimation, signifies p value < 0.05 level, 2-sided test. Actual p-values available upon request.