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Sex, age, and progression of drug use in adolescents admitted for substance use disorder treatment in the northeastern United States: Comparison with a national survey

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Abstract

Background—National adolescent drug use surveys are distributed in United States schools. Survey results determine trends in drug use and inform research and prevention efforts, however, students who have dropped out of school or were truant the day of the survey are excluded. Examining drug trends in a high-risk population (adolescents admitted for drug treatment) may better characterize drug users and their use patterns.

Methods—The current study examined questionnaires completed by 939 adolescents admitted for substance abuse treatment between 1995 and 2010.

Results—Age of first use (ranging from 13.2 years for alcohol to 15.1 years for cocaine) was significantly younger for cigarettes, alcohol, and cannabis than for “harder” drugs like cocaine and heroin, and adolescents increased their use of almost every substance (except inhalants) with increasing age. This was not true of national data. Additionally, in the national data, less than 1.5% of participants reported using any of the harder drugs more than 5 times, but in the McLean data, even for harder drugs, >10% of adolescents used >50 times.

Discussion—In the high-risk sample examined here, progression to harder drugs is accelerated and increases with age regardless of sex. These data underscore the importance of prevention and immediate treatment when adolescent substance use is identified.

Keywords

adolescent; drug use; monitoring the future

INTRODUCTION

National surveys such as the Monitoring the Future Survey (MTF) are used in the United States to sample the general population of adolescents about drug use trends. While national surveys including both drug-using and non-drug-using populations are valuable, examining trends within a currently using population may address questions outside of the scope of

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studies like MTF. For instance, one weakness of the MTF survey is that any students who have dropped out of school or who miss school on the day of the assessment are not included. This is a potentially meaningful omission in the U.S. In 2008, 8% of student between the ages of 16 and 24 dropped out of high school (1), and in 2003, 11% of 8th graders and 16% of 10th graders reported recently skipping school (2). The very students who are skipping school are likely the students who are at an increased risk of drug and alcohol use. Indeed, students who rate academic achievement as important and who plan to attend college report less alcohol use (3). By surveying adolescents who are admitted for drug abuse treatment, even the students who often miss or have dropped out of school, we may gain valuable information that could be used to identify those who would benefit from early intervention.

One important benefit of surveying adolescents about drug use is that research and prevention efforts can be focused on drugs that are increasing in popularity and any meaningful pattern to drug use trends can be identified. For instance, a common theory on drug use progression is the “Gateway Drug Theory” which posits that use progresses from licit substances like tobacco and alcohol to “soft drugs” like cannabis, and finally to “hard drugs” like opioids, cocaine, and amphetamines (4). Although countries where cannabis use is less prevalent (ie. Japan and Nigeria) may be exceptions, in most countries tobacco and alcohol use is associated with an increased likelihood of future cannabis use, and cannabis use is associated with an increased likelihood of future use of other illicit drugs (5-7). If the “Gateway Drug Theory” is true, targeting prevention methods to substances used earlier in the chain (alcohol, tobacco, and cannabis) should prevent the progression to use of “hard drugs”.

However, prevention methods do not always work. If prevention efforts fail, and individuals do progress to drug use, demographic information such as the age and sex of the individual can be important for determining how to maximize the likelihood of a successful drug treatment program. Thus, demographic characteristics such as age and sex, as well as information about progression to different drugs, may offer clues about how to better tailor treatments for this group. Males and females exhibit differences in the substances they choose to use and in the speed of progression to more serious drugs of abuse. For instance, females may progress more quickly from cannabis use to harder drugs (8). Although more females use cocaine than opioids in rural the communities of Arkansas, Kentucky, and Ohio (9), regular opioid use is reported to be more common than cocaine use in females throughout the U.S. (10). Treatment outcomes also differ between the sexes. Cannabis smoking results in a more drastic lowering of quality of life scores for females than males (11); in former heroin users, women report more health problems and greater psychological distress than their male counterparts (12); and opioid-using females report more current and past health problems than opioid-using males (13). National surveys may be at a disadvantage in this assessment as more males (8.5% of 16-24 year olds in 2009) than females (7.5% of 16-24 year olds in 2009) do not finish high school (1).

The “Adolescent Chemical Dependency Questionnaire” was designed to aid in clinical diagnosis and in treatment plan development, and was collected on the first classroom day after admission to the McLean Child and Adolescent Drug Treatment Program between 1995 and 2010. In the current study, these questionnaires were examined for trends in drug use and compared to the published national MTF survey results. We hypothesized that drug use trends by a high-risk population (adolescents admitted for drug treatment) may better allow treatment professionals and researchers to characterize patterns of use and characteristics of drug users than a national survey.

METHODS

The “Adolescent Chemical Dependency Questionnaire” consisted of 112 questions. The McLean Hospital Institutional Review Board approved the review and statistical analysis of the items included in this questionnaire after de-identification of the data (removing names of family members, clinicians, therapists, treatment centers, and probation officers). Demographic data included participant age and sex. Questions examined in the current analyses are: “Do you currently smoke cigarettes?” “Have you ever used any of the drugs listed [in the following table]?” “If you answered yes, please check the drug(s) that you have used, indicate the total number of times you have used that particular drug, and at what age you first used.” Drugs were listed in the following manner: alcohol, marijuana (pot), LSD (acid), hashish, amphetamine (speed), valium/xanax/klonopin/ativan (referred to in this manuscript as benzodiazepines), heroin, codeine, Percocet, opium, mushrooms, morphine, cocaine/crack, PCP (angel dust), ecstasy (XTC), barbiturates (downers), crystal meth (ice), inhalants (huffing), and mescaline. Options for the total number of times a drug was used included: 1-5, 6-10, 11-20, 21-50, and 51 or more.

Between 1995 and 2010, 939 adolescents (average age=16.5±1.4) were surveyed. Of these, 451 self-identified as female (average age=16.4±01.29), and 419 as male (average age=16.6±1.58). The remaining 69 did not report their sex or reported it as “both” (1 individual). There was no significant difference in ages of males versus females (t-test $p=0.05$). Of the 939 total adolescents, 117 were aged 12-14, 410 were aged 15-16, and 337 were aged 17-20. The remaining 75 did not report either a date of birth or the date on which the survey was completed, making a calculation of age impossible. Before 1998, the number of participants included in the MTF surveys are not reported by year. From 1999-2010, MTF data are reported on 560,300 adolescents (average = 46,692 ± 2,007 per year), including 199,300 (average=16,608±779 per year) 8th graders, 187,300 (average=15,608±1,068 per year) 10th graders, and 173,300 (average=14,442±864 per year) 12th graders. Key demographic variables were between grades. These data are reported as average ± the standard deviation (15-28).

To compare the McLean data to the MTF data set, published percentages from trends in lifetime prevalence of use of various drugs for 8th, 10th, and 12th graders from the 1995-2010 surveys were averaged (14). Because the McLean question for cigarette use was on current use, the 30-day prevalence of use for cigarettes data from the MTF survey were included rather than lifetime prevalence. The MTF data set assessed crack and cocaine separately; therefore the included MTF data are for cocaine only. For each year (except 1996, as data were not available), data from the survey on lifetime “Frequency of use of various drugs” were averaged for the three age groups (14-28). Again, 30-day prevalence data were used for cigarettes. Options for “1-2 occasions” and “3-5 occasions” were summed and were included as 1-5 times. Other options were 6-9, 10-19, 20-39, and 40 or more. Similarly, for each year, available data from the survey on lifetime “Frequency of use of various drugs” separated for males and females were recorded, and data from the three age groups were averaged. For 1995, 1997, and 1998 data broken down by sex were only available for 12th graders (14-28). Again, 30-day prevalence data were used for cigarettes.

Univariate ANOVA compared age of first use of each drug. Bonferroni corrections were used for multiple comparisons, and data are presented as average percent ± standard error of the mean. Logistic regression compared rates of substance use between males and females and between age groups. The 12-14 year old group was used as the comparison group in the age group analyses. Because the McLean sample were adolescents who were admitted to a drug treatment program, it was expected that the overall percentage of teens using each substance would be higher than in the MTF data set. So, rather than a comparison of

absolute rates of substance use for each age group, a comparison of the relative rates of substance use between age groups (12th graders and 10th graders vs. 8th graders) was made by comparing odds ratios calculated from the MTF overall substance use rates to the 95% confidence intervals for odds ratios calculated from the McLean data set. An overall usage rate for each substance and each age group (8th graders, 10th graders, 12th graders) was calculated for MTF as the weighted average of reported percentages of adolescents who used each substance in 1995-2010 surveys with weights determined by the relative contributions of data from each year for the McLean sample. Weighted averages were used because if the relative usage rates by age varied in the MTF sample, using the unweighted rates could affect results. For example, if in 1995 use of a particular substance increased with age, but more adolescents were starting early in 2010, a difference in odds ratios comparing age groups between unweighted McLean and MTF data could have been explained by heavier McLean sampling in earlier or later years. An identical analysis was performed stratifying by sex. Analyses were conducted using SPSS statistical software version 18. In figure 1 (age of first use), data are included only for the participants who reported using each drug, and are presented as the average age $\pm$ the standard error of the mean. In figures 2 (age group) and 3 (sex), data are presented as the percentage of participants who reported use of each substance. In figure 4 (the number of times each substance was used), data are included only for participants who reported using each drug, and data are presented as the percent whose use fell into the appropriate bin.

RESULTS

Age of first use was significantly different between substances (Fig. 1; $F_{[1,19]}=41.18$; $p<0.0001$). Ages ranged from 13.2 years old for alcohol to 15.1 years old for cocaine/crack. With one exception, cigarettes, alcohol, and cannabis were first used at a significantly younger age than the “hard” drugs (all $p<0.05$). The one exception was that cigarettes were not used at a younger age than PCP ($p=0.061$). Inhalants were also used at a younger age than many of the substances, including mushrooms ($p=0.004$), ecstasy ($p<0.0001$), cocaine/crack ($p<0.0001$), opium ($p=0.03$), and benzodiazepines ($p=0.002$). Amphetamines were used at a younger age than cocaine/crack ($p=0.034$).

To be as comparable as possible to MTF data (8th grade, 10th grade, and 12th grade), McLean data were separated into age groups (12-14, 15-16, and 17-20). For each data set, the youngest group was used as the reference (See Methods). Of the standard substances, there was a significant increase in the percentage of adolescents in the oldest group who used alcohol (Fig. 2A; $X^2_{[1,453]}=6.98$; $p=0.008$) and cannabis (Fig. 2A; $X^2_{[1,453]}=8.71$; $p=0.003$). Of the hallucinogens, there was a significant increase in the percentage of adolescents in the oldest group who used LSD (Fig. 2B; $X^2_{[1,453]}=6.96$; $p=0.008$), mushrooms (Fig. 2B; $X^2_{[1,453]}=5.77$; $p=0.016$), and mescaline (Fig. 2B; $X^2_{[1,453]}=4.46$; $p=0.035$); an increase in the middle group who used PCP (Fig. 2B; $X^2_{[1,747]}=5.33$; $p=0.021$); and an increase in both the middle (Fig. 2B; $X^2_{[1,747]}=10.28$; $p=0.001$), and the oldest group (Fig. 2B; $X^2_{[1,453]}=19.63$; $p<0.0001$) who used ecstasy. Of the stimulants, there was a significant increase in the percentage of adolescents in the oldest group who used amphetamines (Fig. 2C; $X^2_{[1,453]}=5.82$; $p=0.016$), and crystal meth (Fig. 2C; $X^2_{[1,453]}=5.85$; $p=0.016$), and an increase in both the middle (Fig. 2C; $X^2_{[1,747]}=4.96$; $p=0.026$), and oldest group (Fig. 2C; $X^2_{[1,453]}=19.72$; $p<0.0001$) who used cocaine/crack. Of the opiates, there was a significant increase in the percentage of adolescents in the oldest group who used heroin (Fig. 2D; $X^2_{[1,453]}=5.19$; $p=0.023$), opium (Fig. 2D; $X^2_{[1,453]}=6.73$; $p=0.009$), codeine (Fig. 2D; $X^2_{[1,453]}=12.33$; $p<0.0001$), and morphine (Fig. 2D; $X^2_{[1,453]}=6.79$; $p<0.0001$). Finally, of the “miscellaneous” drugs, there was a significant increase in both the middle (Fig. 2E; $X^2_{[1,747]}=8.75$; $p=0.003$) and oldest group (Fig. 2E; $X^2_{[1,453]}=20.96$;

$p < 0.0001$) who used hashish, and in the middle (Fig. 2E; $X^2_{[1,747]} = 9.97$; $p = 0.002$) and the oldest group (Fig. 2E; $X^2_{[1,453]} = 24.57$; $p < 0.0001$) who used benzodiazepines.

Next, to determine whether the change in use by age group in our sample was different than the change in use by age group in the MTF sample, the odds ratios (OR) of the MTF sample were compared to the 95% confidence intervals (CI) from the regression analysis performed on the McLean data. If the OR of the MTF data falls within the 95% CI, there is no difference between the McLean data and the MTF data, but if the OR falls outside of the 95% CI, the McLean data are different. Of the standard substances, there was less of an increase in use between the 8th and 12th graders for alcohol (Fig. 2F; 95% CI=1.23-3.99; OR=0.99) and cannabis use (Fig 2F; 95% CI=1.35-4.50; OR=0.97) in the MTF data. Of the hallucinogens, there was less of an increase in use between both the 8th and 10th graders (Fig 2G; 95% CI=0.89-2.37; OR=0.81) and the 8th and 12th graders (Fig. 2G; 95% CI=1.19-3.20; OR=0.77) for LSD, and between both the 8th and 10th graders (Fig 2G; 95% CI=1.42-4.33; OR=0.83) and between the 8th and 12th graders (Fig 2G; 95% CI=2.02-6.19; OR=0.81) for ecstasy. Of the stimulants, there was less of an increase between the 8th and 12th graders for amphetamine (Fig 2H; 95% CI=1.12-2.99; OR=0.96), and less of an increase between both the 8th and 10th graders (Fig 2H; 95% CI=1.07-2.84; OR=0.89) and the 8th and 12th graders (Fig. 2H; 95% CI=1.86-4.97; OR=0.86) for cocaine. Finally, of the opioids, there was less of an increase between 8th and 12th graders for heroin (Fig. 2I; 95% CI=1.14-5.92; Odds ratio=1.04).

When data from males and females in the McLean data set were separated, a higher percentage of males had used mushrooms (Fig. 3B; $X^2_{[1,869]} = 17.53$; $p < 0.0001$), PCP (Fig. 3B; $X^2_{[1,869]} = 4.18$; $p = 0.041$), mescaline (Fig. 3B; $X^2_{[1,869]} = 5.30$; $p = 0.021$), amphetamine (Fig. 3C; $X^2_{[1,869]} = 4.77$; $p = 0.029$), opium (Fig. 3D; $X^2_{[1,869]} = 16.16$; $p < 0.0001$), codeine (Fig. 3D; $X^2_{[1,869]} = 12.07$; $p = 0.001$), morphine (Fig. 3D; $X^2_{[1,869]} = 5.07$; $p = 0.024$), hashish (Fig. 3E; $X^2_{[1,869]} = 40.19$; $p < 0.0001$), and barbiturates (Fig. 3E; $X^2_{[1,869]} = 5.44$; $p = 0.020$). Sex differences in the McLean data were compared to sex differences in the MTF data in a similar manner to the age group comparisons above. Although the difference was in the same direction (fewer females using), the magnitude of the difference was lower in the MTF data than the McLean data for LSD (Fig. 3G; 95% CI=0.56-1.01; OR=1.08), PCP (Fig. 3G; 95% CI=0.44-0.98; OR=1.22), and heroin (Fig. 3I; 95% CI=0.52-1.23; OR=1.50). Interestingly, while in our sample, more males used amphetamines than females, in the MTF sample this was reversed (Fig. 3H; 95% CI=0.53-0.97; OR=0.98).

Of the McLean adolescents, a large percentage of individuals who had used alcohol or cannabis had used it more than 50 times (Fig. 4A; 38% and 66% respectively). However, even for several of the harder drugs, more than 10% of adolescents had used more than 50 times. This included ecstasy (Fig. 4B; 13%), amphetamines (Fig. 4C; 24%), cocaine/crack (Fig. 4C; 16%), heroin (Fig. 4D; 16%), Percocet (Fig. 4D; 13%), hashish (Fig. 4E; 14%), benzodiazepines (Fig. 4E; 19%), and barbiturates (Fig. 4E; 13%). However, for the MTF data, many adolescents who had used alcohol reported using 5 or fewer times (Fig 4F; 22%) and only 14% of respondents who had reported using alcohol, and 9% of those who had used cannabis had used these substances more than 40 times (Fig 4F). Less than 1.5% of participants reported any use of harder drugs had used more than 5 times (Fig 4G-I).

DISCUSSION

The primary finding of this study was that the age of first use of adolescents who were admitted to McLean Hospital for drug treatment is between 13-15 for every drug. Although the adolescents in this study do seem to progress from cigarettes, alcohol, and/or cannabis then later transition to harder drugs in a manner similar to that posited by the "Gateway

Drug Theory” (4), this sample of adolescents progresses through drug classes very quickly, leaving little time for intervention. These data indicate that in some adolescents, early drug use could be an indication of a pending drug problem, and that any drug use, even that of substances considered to be less harmful, should be monitored. If drug use escalates, this escalation may take place over a very short period of time. Therefore, treatment should be sought as soon as possible. If alcohol, tobacco, or cannabis use is ignored in this population, intervention may come too late. Future work will be needed to identify what other factors are putting these individuals at risk for the very fast escalation to other drug use that we observed. It may be that these individuals have a psychiatric co-occurring disorder such as Attention-Deficit/Hyperactivity Disorder, or a mood or psychotic disorder. It is also possible that they are simply more prone to risk taking than other adolescents. Unfortunately, as personality traits and psychiatric diagnoses were not part of this questionnaire, this cannot be assessed in the current study.

The second finding is that in this likely “high-risk” population, the percentage of individuals using most drug classes increased with age. This was true in many of the drugs assessed in the national survey as well; however there are important differences in the McLean sample. The magnitude of change was greater in the McLean sample for many of the substances assessed, including those traditionally thought of as “gateway” drugs. Two important examples of this that are most distinct in the data are heroin and inhalant use. While the nationally distributed MTF survey finds that if students have not used heroin by 8th grade, they are not likely to initiate use thereafter (Fig 2I), in the McLean sample the percentage of individuals who had used heroin continued to increase into the 17-20 year old age group. Similarly, use of inhalants by the McLean adolescents showed the same trend, although this difference was not significant. Conversely, the MTF data showed decreasing use of inhalants in older age groups.

Third, we found sex differences in the choice of drugs used. For most of the substances examined, more males used than females (mushrooms, PCP, mescaline, amphetamines, opium, codeine, morphine, hashish, and barbiturates), however this was not true of all drugs. Males and females used cigarettes, alcohol, cannabis, ecstasy, cocaine/crack, crystal meth, sedatives, and inhalants at similar rates. In the MTF data set, males and females used almost all of the substances at similar rates, but amphetamine use was actually higher for females than for males. This is a potentially important finding as treatment outcomes differ between the sexes in drugs ranging from cannabis to opiates, with women often experiencing worse functional outcomes than men (11, 12).

Finally, although most adolescents were only using alcohol and cannabis many adolescents who reported using the harder drugs (ecstasy, amphetamine, cocaine/crack, crystal meth, heroin, codeine, percocet, hashish, sedatives, and barbiturates) used them 51 or more times. Similarly, most of the individuals in the MTF data set only used alcohol and cannabis, however an important difference between the MTF data set, and the McLean data set is that the adolescents in the MTF data set who had used the harder substances had only used them a handful of times. Clearly, in the national data, many of the participants who choose to use these harder drugs are simply sampling them and never progressing to more extreme use patterns. However, in the McLean sample, many of those choosing to use the harder drugs a few times, continue to use them relatively frequently. This represents an important addition to the existing literature. The treatment plan for an individual who has used substances like crack, crystal meth, or opioids only a handful of times may not be effective in an individual who has progressed to even weekly use of these substances.

There are a number of limitations to the use of McLean data set. First, all data were retrospectively collected via self-report. It may be difficult for 20 year-olds to remember

how old they were when they first drank alcohol. However, the MTF data are also subject to these limitations. Second, averaging the data across all of the years of the study is concerning, as this obscures any effect of cohort. In other words, adolescents examined in 1995 may differ in meaningful ways from adolescents in 2010. The first analysis conducted on the McLean data was the examination of substance use by year, as we originally hypothesized that use of some substances (eg. Percocet) would increase over this time period while use of other substances (eg. LSD) would decrease. However, we did not find any meaningful trends over these years, possibly due to the low number of completed surveys during some years. Third, these surveys were collected at a private hospital located in a suburb of Boston, and thus the majority of the population admitted live in Massachusetts and have insurance and/or a family able to pay for treatment. Therefore, these data may not be representative of other areas of the country or other socioeconomic groups. Finally, the age and frequency categories of the McLean sample do not exactly line up with the MTF data. As this survey was originally delivered as a clinical tool to best design a treatment program, rather than a method to collect data, it was not designed to be the same as the MTF survey.

However, there are several advantages of the McLean data that make them an interesting subject of investigation over and above the MTF data. The McLean data overcome a major limitation of the MTF data in that MTF data is only collected in school. Therefore, any adolescent who skips school that day or who has dropped out of school will not be assessed. Indeed, of the 939 adolescents included in this study, 358 reported school attendance as “poor”, and 52 of the 231 who reported that attendance was “not a problem” had quit, were expelled, or had stopped going. An additional 31 participants did not rate their school attendance, but 7 of these reported that they too had quit or stopped going. This indicates that nearly half (417) of the adolescents included in this study were not attending school at all, or were often absent. These adolescents would likely have been missed in national surveys.

In addition, the McLean sample has the advantage of shining a spotlight on the substances being used specifically in the most vulnerable of populations: those whose use has escalated to the point that they have been admitted for drug treatment. In order to prevent bad outcomes related to substance use disorders in our youth, we must study carefully the entire youth population: those who never use substances, those who use substances and do not require treatment, and those who use substances and require treatment. Data from our sample is useful from a clinical perspective because it illustrates the use patterns and trajectory of those who develop significant problems and require treatment; recognition of the drug use patterns and trajectories in this group may lead to earlier detection of substance use difficulties in the community. The similarities in use patterns between our sample and the MTF sample shows that clinicians must recognize that any adolescent drug use may progress to a point where treatment is required. Our sample complements the MTF sample and our findings make a case for following data from youth requiring treatment over time to assess trends in this population.

In our sample, progression of use to harder drugs is accelerated and increases with age regardless of sex. The swift progression from cigarettes, alcohol, and cannabis to use of “harder” drugs underscores the importance of prevention and immediate treatment when adolescent substance use is identified. The McLean data set can compare drug use in the Massachusetts area, but other hospitals around the country and abroad may benefit by surveying their admitted adolescents in a similar manner and comparing their results to national and international data sets.

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Figure 1.

Age of first use. Of those adolescents reporting use of each substance, age of first use is presented as average age $\pm$ SEM. * $p < 0.05$ from all other substances except PCP. † $p < 0.05$ from mushrooms, ecstasy, cocaine/crack, opium, and benzodiazepines

Figure 2.

Use by age group. Percent of McLean adolescents who used standard substances including cigarettes, alcohol, and cannabis (A); hallucinogens including LSD, mushrooms, PCP, ecstasy, and mescaline (B); stimulants including amphetamines, crack/cocaine, and crystal meth (C); opiates including heroin, opium, codeine, percocet, and morphine (D); or miscellaneous drugs including hashish, benzodiazepines (benzos), barbiturates, and inhalants stratified by age into 12-14 year olds, 15-16 year olds, and 17-20 year olds. Percent of adolescents surveyed by the Monitoring the Future study who used standard substances including cigarettes, alcohol, and cannabis (F), hallucinogens including LSD, PCP, and ecstasy (G), stimulants including amphetamines, cocaine, and crystal methamphetamine (H), the opiate heroin (I), or miscellaneous drugs including barbiturates and inhalants (J) stratified by age into 8th graders, 10th graders, and 12th graders. * $p < 0.05$

from the reference (12-14 year old) group; ** $p < 0.01$ from the reference group, *** $p < 0.0001$ from the reference group; ‡ $p < 0.05$ from the McLean data set.

Figure 3.

Use by sex. Percent of McLean adolescents who used standard substances including cigarettes, alcohol, and cannabis (A); hallucinogens including LSD, mushrooms, PCP, ecstasy, and mescaline (B); stimulants including amphetamines, crack/cocaine, and crystal meth (C); opiates including heroin, opium, codeine, percocet, and morphine (D); or miscellaneous drugs including hashish, benzodiazepines (benzos), barbiturates, and inhalants stratified by sex. Percent of adolescents surveyed by the Monitoring the Future study who used standard substances including cigarettes, alcohol, and cannabis (F), hallucinogens including LSD, PCP, and ecstasy (G), stimulants including amphetamines, cocaine, and crystal meth (H), the opioid heroin (I), or miscellaneous drugs including barbiturates and inhalants (J) stratified by sex. * $p < 0.05$; *** $p < 0.0001$; ‡ $p < 0.05$ from the McLean data set.

Figure 4. Number of times each substance was used. Of those McLean adolescents reporting use of each substance data were binned according to the number of times it was used for standard substances including cigarettes, alcohol, and cannabis (A); hallucinogens including LSD, mushrooms, PCP, ecstasy, and mescaline (B); stimulants including amphetamines, crack/cocaine, and crystal meth (C); opiates including heroin, opium, codeine, percocet, and morphine (D); or miscellaneous drugs including hashish, benzodiazepines (benzos), barbiturates, and inhalants stratified by sex. Data are stratified into bins including: 1-5 uses, 6-10 uses, 11-20 uses, 21-50 uses, and more than 50 uses. Of those Monitoring the Future adolescents reporting use of each substance data were binned according to the number of times it was used for cigarettes, alcohol, and cannabis (F), hallucinogens including LSD, PCP, and ecstasy (G), stimulants including amphetamines, cocaine, and crystal meth (H), the opioid heroin (I), or miscellaneous drugs including barbiturates and inhalants (J). Data are stratified into bins including: 1-5 uses, 6-9 uses, 10-19 uses, 20-39 uses, and more than 39 uses.