Age and Cohort Patterns of Substance Use among Adolescents

Authors

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Abstract

Objective. This report examines cohort differences in the use of cigarettes, alcohol, and marijuana among youths aged 12 to 17 from 2002 to 2008.

Methods. Analyzed data were from 158,995 respondents aged 12 to 17 in the 2002 through 2008 National Surveys on Drug Use and Health (NSDUHs). Cohorts of adolescents were constructed, and lifetime prevalence estimates were examined at each age within each cohort. Logistic regression modeling was applied to assess the independent association of adolescent age and cohort with lifetime use of cigarettes, alcohol, and marijuana.

Results. The lifetime prevalence of use of cigarettes, alcohol, and marijuana among youths increased as age increased. In all of the cohorts in the study, the prevalence rate by the age of 17 was more than 40 percent for cigarettes, more than 60 percent for alcohol, and more than 30 percent for marijuana. Logistic regression model results showed that adolescents in later cohorts (e.g., those aged 17 in 2008) were significantly less likely to use these substances compared with youths in earlier cohorts (e.g., those aged 17 in 2002). These differences by cohort were independent of the relationship between adolescents' age and lifetime use.

Conclusions. Given the associations between onset of substance use in early adolescence and the subsequent development of dependence or abuse, substance use prevention efforts among adolescents can have long-term public health benefits. Lifetime prevalence data from this study underscore the importance of prevention efforts starting at or before the age of 12 for each of these substances. The lower likelihood of youths in later cohorts being users of these substances is consistent with secular trends showing decreases in prevalence among youths from 2002 to 2008. Nevertheless, the cohort data suggest further opportunity for improvement in preventing use of cigarettes, alcohol, or marijuana among youths.

Introduction

Adolescence is universally a time of vulnerability to many types of influences, with youths initiating various behaviors during that period. In the United States, lifetime users of cigarettes, alcohol, or marijuana typically initiate use of these substances by their late teens, and the rates of lifetime use generally increase with age in a regular developmental pattern. In 2008, 22.9 percent of adolescents aged 12 to 17 (5.7 million persons) had smoked a cigarette at least once in their lifetime, 38.3 percent (9.5 million persons) had ever used alcohol, and 16.5 percent (4.1 million persons) had ever used marijuana. The lifetime prevalence of cigarette use among adolescents in 2008 ranged from 5.0 percent among those aged 12 to 42.0 percent among those aged 17. Among youths aged 12, 9.9 percent had ever used alcohol, and 1.5 percent had ever used marijuana. Among those aged 17, the corresponding rates were 63.3 percent for alcohol and 34.4 percent for marijuana.[1]

Moreover, multiple studies in the United States have found associations between the early onset of alcohol use and the occurrence of alcohol-related problems,[2,3,4] including alcohol abuse or dependence.[2,3] Similarly, National Survey on Drug Use and Health (NSDUH) data have shown that adults in 2008 who were aged 14 or younger when they initiated marijuana use were more than 6 times as likely to be classified with illicit drug dependence or abuse compared with adults who initiated marijuana use when they were aged 18 or older.[1] Other studies have shown that early initiation of cigarette use is associated with a lower likelihood of smoking cessation or increases the risk for nicotine dependence.[5,6] There are competing explanations for the observed higher rates of substance use disorders

among earlier initiates of substance use, such as pre-existing vulnerabilities in early initiates and a longer period of potential use for those who start at a younger age. Nevertheless, it is clear that exposure to tobacco, alcohol, and illicit drugs during adolescence occurs at a time during which formative experiences and brain development are still occurring. Thus, efforts that successfully prevent initiation of cigarette, alcohol, or marijuana use during adolescence and young adulthood or delay initiation beyond adolescence are important to public health.

Furthermore, the historical period and social context in which persons go through adolescence can affect their adoption of behaviors that persist among that cohort as it ages. Being at a critical age for the initiation of substance use during a particular historical period can have long-term effects on individuals' substance use patterns. For example, cohort differences are evident in increases in the rate of past year drug use in the United States from 2002 through 2007 among adults aged 50 to 59; these increases have been driven by the aging of the baby boom cohort (persons born between 1946 and 1964), who had a higher rate of drug use in adolescence and young adulthood compared with previous cohorts.[7] Differences in rates of substance use across separate cohorts of adolescents and how these rates change as cohorts age can help to explain shifts over time in the overall rates of substance use in specific age groups, which are typically referred to as "secular trends." For example, the prevalence of lifetime marijuana use among adolescents was significantly lower in 2008 than in 2002 through 2004. In addition, lifetime use of cigarettes and alcohol among males aged 12 to 17 decreased from 2007 to 2008.[1]

This report examines developmental increases in rates of substance use with age among different cohorts of adolescents from 2002 to 2008. It also compares overall levels of use across different cohorts, which may underlie secular trends over time or reflect the effects of unique historical experiences. By better understanding the natural history of substance use behaviors among adolescents as they age, substance abuse prevention counselors and other professionals may be able to identify appropriate points of intervention by age to discourage substance use more effectively. Similarly, the historical and policy environment in which adolescents attain different stages of maturity could affect their likelihood of experimenting with different substances.

Although the NSDUH uses a cross-sectional design with separate samples of respondents (as opposed to a longitudinal design that collects follow-up data from the same respondents over time), NSDUH is well suited to examine changes in prevalence among cohorts of youths. First, NSDUH is designed to yield nationally representative data for the civilian, noninstitutionalized population aged 12 or older in the United States; this population includes almost 98 percent of the total U.S. population aged 12 or older. Second, NSDUH is an annual survey with samples of nearly 70,000 respondents per year, including more than 22,000 youths aged 12 to 17. The large annual sample sizes—especially for adolescents—improve the precision of estimates, particularly when survey data are pooled across multiple years. Pooling of data across multiple survey years also can permit construction of representative cohorts of adolescents by taking, for example, 12 year olds from the 2002 survey, 13 year olds from the 2003 survey, and so on, through 17 year olds from the 2007 survey. Third, NSDUH uses a core set of questions that remain in the survey every year and support basic trend measurement of prevalence estimates. Use of a common set of core questions improves confidence that changes in estimated substance use prevalence observed over time reflect actual changes in the population rather than changes in measurement.

Methods

Data Sources

This report analyzed data from 158,995 persons aged 12 to 17 in the 2002 to 2008 NSDUHs. NSDUH is a face-to-face survey conducted at each sampled person's home. A 5-minute screening procedure conducted with a handheld computer is used to compile a list of all household members along with their basic demographic data. Depending on the composition of the household, zero, one, or two persons in the household are selected for an interview. Each interview takes approximately 1 hour to complete. Audio computer-assisted self-interviewing is used, providing respondents with a private, confidential way to record answers, particularly to questions about sensitive topics such as underage use of alcohol and tobacco or use of other substances. The household screening response rates ranged from 89.0

percent in 2008 to 91.3 percent in 2005. Interview response rates for persons aged 12 to 17 ranged from 84.7 percent in 2008 to 90.0 percent in 2002. Further descriptions of the NSDUH design and data are available in the 2008 *National Findings* report.[2]

Analytic Approach

This report focuses on lifetime use of cigarettes, alcohol, and marijuana among youths aged 12 to 17. As noted previously, NSDUH uses a cross-sectional design with a different sample of respondents each year to estimate substance use. Therefore, cohorts of adolescents were constructed using data on age and survey year from the 2002 through 2008 surveys. Table 1 describes the cohorts of youths presented in this report. For example, persons aged 12 in 2006 would be aged 13 at some point in 2007 and would be aged 14 in 2008 (cohort 10 in Table 1). Thus, cohort 10 consists of adolescents aged 12 from the 2006 survey, those aged 13 from the 2007 survey, and those aged 14 from the 2008 survey.

Weighted prevalence estimates and standard errors were generated for lifetime use of cigarettes, alcohol, and marijuana for the cross-tabulation of cohorts and individual years of age. For adolescents aged 12, for example, weighted prevalence estimates were produced for cohorts 6 through 12.

In addition, separate logistic regression models were run for lifetime use of these substances among adolescents to examine age and cohort as predictors of lifetime use. Models were run to identify relationships between age and lifetime use independent of any effects of cohort and, conversely, to identify any relationships between cohort and lifetime use independent of the effects of age. Two sets of models were run for each substance. In the first model for each substance, persons in the combined cohorts 1 through 6 were compared with those in the combined cohorts 7 through 12. In the second model, individual cohorts were compared, with cohort 7 as the reference group. In both sets of models, age in years was included as a continuous variable.

Results of the models are expressed as odds ratios (ORs). The ORs for age reflect the change in the likelihood of being a lifetime user of a particular substance for each 1-year increase in age. ORs for a cohort indicate the likelihood of members of a given cohort (or combined cohorts) being lifetime users relative to the reference cohort(s).

Definitions

NSDUH includes questions about whether respondents have ever used cigarettes, alcohol, or marijuana. Cigarette use in NSDUH refers to smoking part or all of a cigarette. Alcohol use refers to having a drink of any type of alcoholic beverage, not counting times when persons had only a sip or two from a drink. Marijuana use refers to any use, even once, of marijuana or hashish.

Table 1. Correspondence between Cohorts, Ages of Respondents, and Survey Years: 2002 to 2008

Cohort Number	Ages and Survey Years
1	Aged 17 in 2002 survey
2	Aged 16 in 2002 survey or 17 in 2003 survey
3	Aged 15 in 2002 survey, 16 in 2003 survey, or 17 in 2004 survey
4	Aged 14 in 2002 survey, 15 in 2003 survey, 16 in 2004 survey, or 17 in 2005 survey
5	Aged 13 in 2002 survey, 14 in 2003 survey, 15 in 2004 survey, 16 in 2005 survey, or 17 in 2006 survey
6	Aged 12 in 2002 survey, 13 in 2003 survey, 14 in 2004 survey, 15 in 2005 survey, 16 in 2006 survey, or 17 in 2007 survey
7	Aged 12 in 2003 survey, 13 in 2004 survey, 14 in 2005 survey, 15 in 2006 survey, 16 in 2007 survey, or 17 in 2008 survey
8	Aged 12 in 2004 survey, 13 in 2005 survey, 14 in 2006 survey, 15 in 2007 survey, or 16 in 2008 survey
9	Aged 12 in 2005 survey, 13 in 2006 survey, 14 in 2007 survey, or 15 in 2008 survey
10	Aged 12 in 2006 survey, 13 in 2007 survey, or 14 in 2008 survey
11	Aged 12 in 2007 survey or 13 in 2008 survey
12	Aged 12 in 2008 survey

Table 2. Prevalence of Lifetime Cigarette Use among Youths Aged 12 to 17, Percentages by Age and Cohort*: 2002 to 2008

Cohort	Aged 12	Aged 13	Aged 14	Aged 15	Aged 16	Aged 17
Cohort 1	—	—	—	—	—	56.9
Cohort 2	—	—	—	—	48.4	54.2
Cohort 3	—	—	—	39.7	46.7	51.1
Cohort 4	—	—	28.5	37.2	43.5	48.3
Cohort 5	—	18.7	25.6	34.2	40.0	46.9
Cohort 6	9.2	15.3	25.1	31.0	38.1	42.9
Cohort 7	7.8	14.9	20.7	30.1	37.2	42.0
Cohort 8	7.0	14.0	20.0	26.8	34.4	—
Cohort 9	5.8	12.1	17.5	25.5	—	—
Cohort 10	5.6	10.7	16.9	—	—	—
Cohort 11	5.1	10.1	—	—	—	—
Cohort 12	5.0	—	—	—	—	—

* See Table 1 for descriptions of the individual cohorts.   —: data not used.

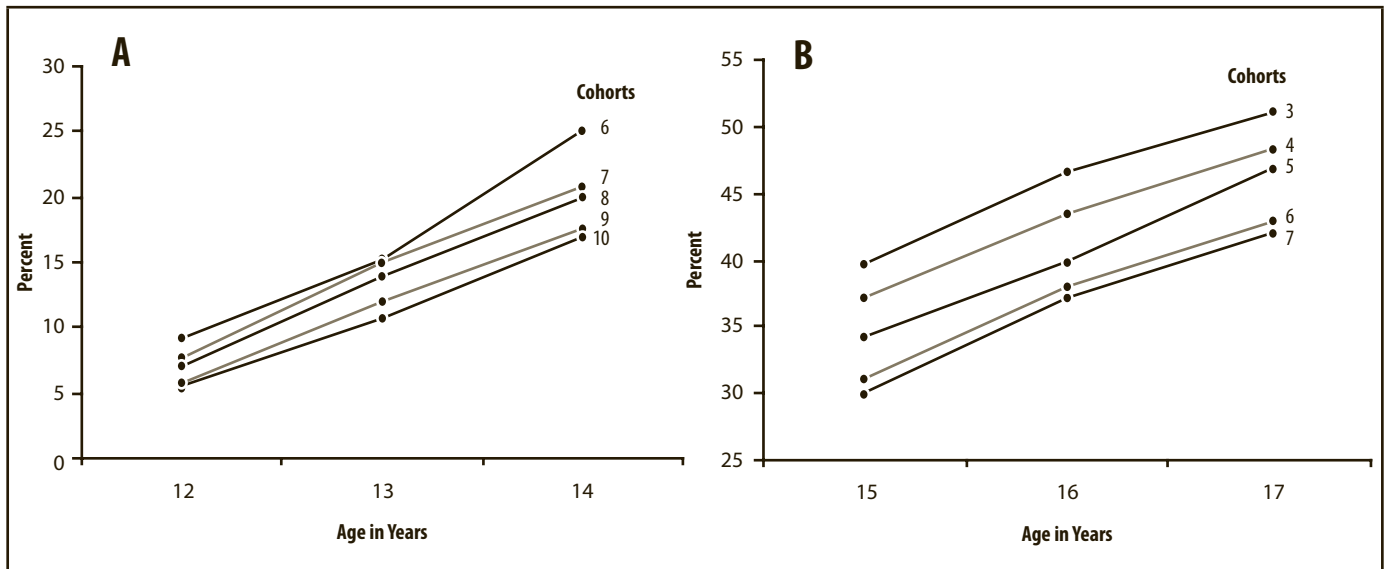Source: 2002 to 2008 SAMHSA National Surveys on Drug Use and Health (NSDUHs).

Results

Lifetime Prevalences of Cigarette, Alcohol, and Marijuana Use by Age

Table 2 shows percentages of lifetime cigarette users among adolescents aged 12 to 17 by individual years of age and cohort. Figure 1 also presents these data for cohorts 3 to 10, for which 3 or more years of data were available. The prevalence of lifetime cigarette use increased as age increased. For example, in cohorts 6 and 7, the two cohorts in which all ages are represented, fewer than 10 percent of youths aged 12 had tried a cigarette, but more than 40 percent of those aged 17 had done so. Similar patterns were found in other cohorts that included at least three age groups.

Table 3 shows the prevalence of lifetime alcohol use among youths by age and cohort, and Figure 2

Figure 1. Prevalence of Lifetime Cigarette Use among Youths Aged 12 to 17 in Cohorts 3 to 10,* by Age: 2002 to 2008

* See Table 1 for descriptions of the individual cohorts.

Source: 2002 to 2008 SAMHSA National Surveys on Drug Use and Health (NSDUHs).

Table 3. Prevalence of Lifetime Alcohol Use among Youths Aged 12 to 17, Percentages by Age and Cohort*: 2002 to 2008

| Cohort	Aged 12	Aged 13	Aged 14	Aged 15	Aged 16	Aged 17
Cohort 1	—	—	—	—	—	72.6
Cohort 2	—	—	—	—	63.1	70.8
Cohort 3	—	—	—	52.9	62.8	71.7
Cohort 4	—	—	37.8	52.8	60.6	67.2
Cohort 5	—	24.5	35.4	50.7	60.7	66.3
Cohort 6	11.6	23.2	36.5	50.2	59.7	67.2
Cohort 7	12.9	22.1	33.3	47.8	59.0	63.3
Cohort 8	11.1	21.5	34.9	46.8	56.8	—
Cohort 9	9.6	20.7	31.9	44.5	—	—
Cohort 10	9.5	18.6	32.3	—	—	—
Cohort 11	10.1	17.8	—	—	—	—
Cohort 12	9.9	—	—	—	—	—

* See Table 1 for descriptions of the individual cohorts.   —: data not used.

Source: 2002 to 2008 SAMHSA National Surveys on Drug Use and Health (NSDUHs).

presents these prevalences for cohorts 3 to 10. The prevalence of lifetime alcohol use among adolescents in cohorts 6 and 7 increased by about 9 to 15 percentage points per year of age from ages 12 to 16 and then increased less sharply between ages 16 and 17. Fewer than 13 percent of adolescents aged 12 in cohorts 6 and 7 had used alcohol at least once in their lifetime, but at age 17, about two thirds of youths in these cohorts had used alcohol at least once. Similar patterns were evident in other cohorts.

Table 4 presents lifetime marijuana use data among youths by age and cohort, and Figure 3 presents data for cohorts 3 to 10. Among adolescents aged 12 in cohorts 6 and 7, 2.1 and 1.4 percent had used marijuana. In these two cohorts, the prevalences increased to 34.9 and 34.4 percent of youths who were aged 17. This increasing pattern was evident in other cohorts as well.

Figure 2. Prevalence of Lifetime Alcohol Use among Youths Aged 12 to 17 in Cohorts 3 to 10,* Percentages by Age: 2002 to 2008
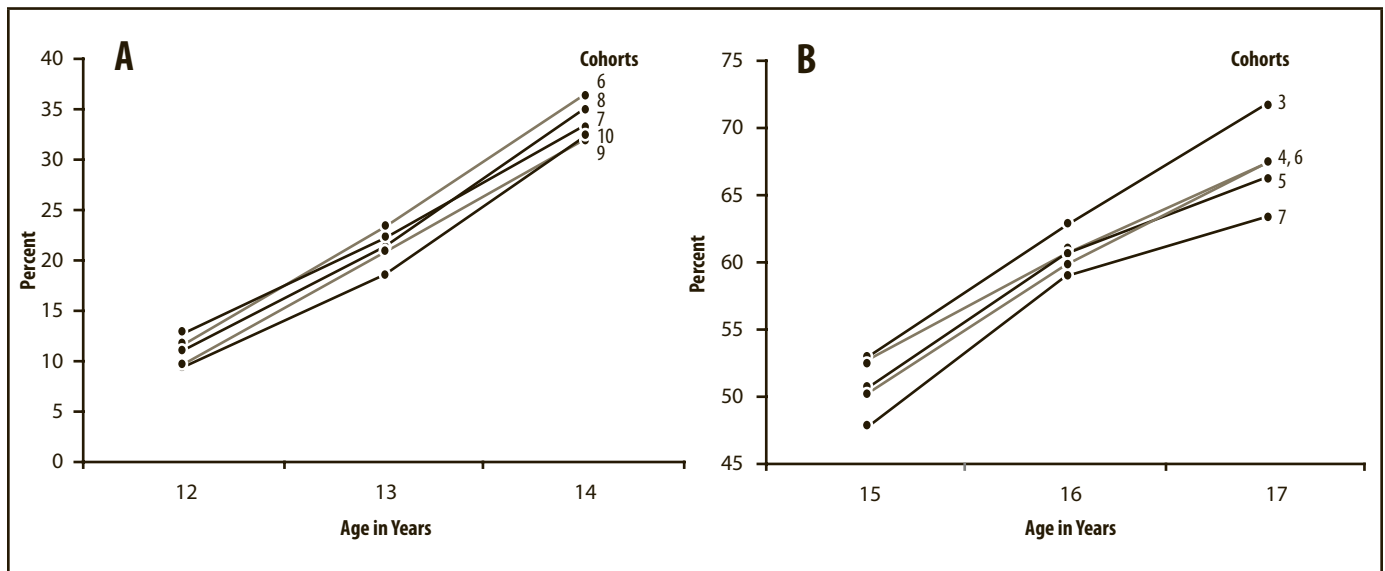
* See Table 1 for descriptions of the individual cohorts.

Source: 2002 to 2008 SAMHSA National Surveys on Drug Use and Health (NSDUHs).

Table 4. Prevalence of Lifetime Marijuana Use among Youths Aged 12 to 17, Percentages by Age and Cohort*: 2002 to 2008

Cohort	Aged 12	Aged 13	Aged 14	Aged 15	Aged 16	Aged 17
Cohort 1	—	—	—	—	—	43.1
Cohort 2	—	—	—	—	34.1	40.2
Cohort 3	—	—	—	24.9	34.2	39.4
Cohort 4	—	—	14.7	22.9	33.0	37.4
Cohort 5	—	6.5	14.0	22.4	29.1	35.6
Cohort 6	2.1	5.2	12.8	20.3	29.1	34.9
Cohort 7	1.4	5.5	10.2	20.6	27.5	34.4
Cohort 8	1.6	5.4	10.7	17.9	26.5	—
Cohort 9	1.3	4.6	9.9	19.2	—	—
Cohort 10	1.4	4.1	9.8	—	—	—
Cohort 11	1.3	4.6	—	—	—	—
Cohort 12	1.5	—	—	—	—	—

* See Table 1 for descriptions of the individual cohorts.   —: data not used.

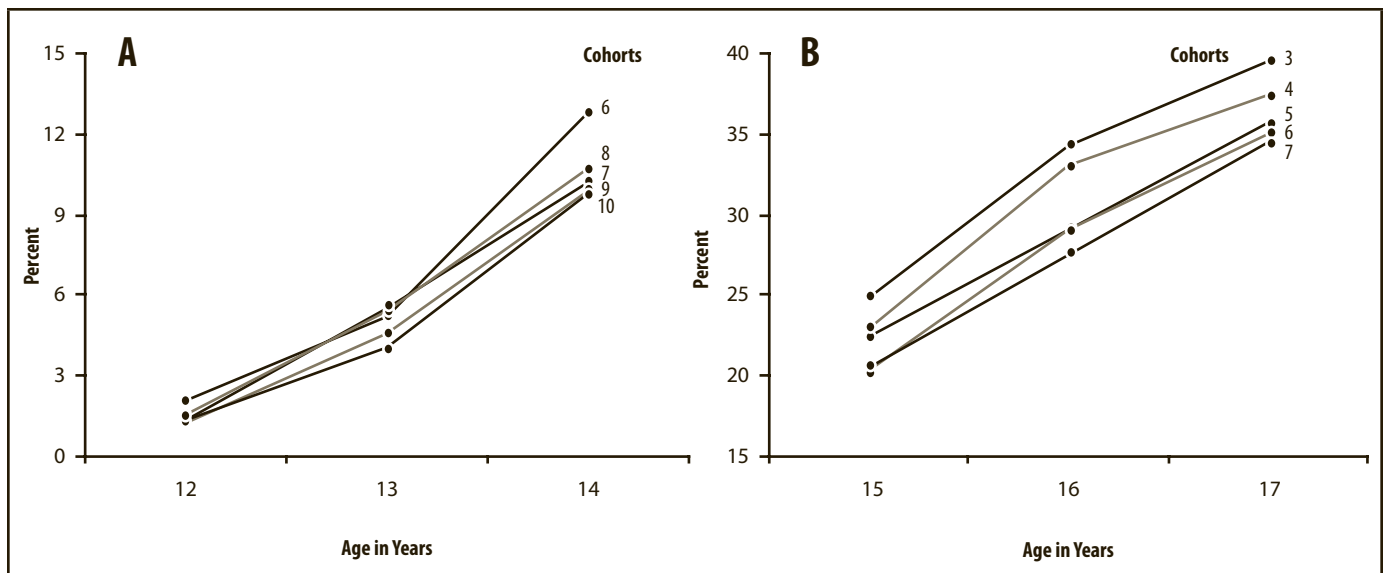Source: 2002 to 2008 SAMHSA National Surveys on Drug Use and Health (NSDUHs).

Cohort Differences in Cigarette, Alcohol, and Marijuana Use

The prevalence of lifetime use of each substance among adolescents at a given age was lower in later cohorts than in earlier cohorts (Tables 2 through 4). This is consistent with secular trends in use of these substances from 2002 to 2008.

For example, 39.7 percent of adolescents aged 15 in cohort 3 (from the 2002 NSDUH) were lifetime cigarette users, compared with 25.5 percent of those aged 15 in cohort 9 (2008) (Table 2). More than half of youths aged 17 in the first three cohorts were lifetime cigarette users. Less than half of youths aged 17 in cohorts 4 through 7 were lifetime cigarette users. For alcohol, 63.1 percent of adolescents aged 16 in cohort 2 (2002) were lifetime users compared with 56.8 percent of 16 year olds in cohort 8 (2008) (Table 3). For marijuana, 43.1 percent of adolescents in cohort 1 had used marijuana by age 17 (2002), compared with 34.4 percent of cohort 7 who were lifetime marijuana users at that age (2008) (Table 4).

Figure 3. Prevalence of Lifetime Marijuana Use among Youths Aged 12 to 17 in Cohorts 3 to 10,* Percentages by Age: 2002 to 2008

* See Table 1 for descriptions of the individual cohorts.

Source: 2002 to 2008 SAMHSA National Surveys on Drug Use and Health (NSDUHs).

Logistic Regression Model Results for Age and Cohort

Table 5 presents logistic regression model results for lifetime use of cigarettes, alcohol, and marijuana among youths with adolescent age as a continuous variable and two groupings of adolescent cohorts (1 to 6 and 7 to 12) as categorical variables. Consistent with the findings in Tables 2 through 4, older adolescents were more likely than younger adolescents to be lifetime users of each of these substances, even when differences based on being in an early or later cohort were taken into account. For example, youths were 1.77 times more likely to be lifetime marijuana users for each incremental increase in age. Stated another way, the model for lifetime marijuana use indicated that adolescents aged 13 were 1.77 times more likely than those aged 12 to be lifetime marijuana users; adolescents aged 14 were 1.77 times more likely to be lifetime users than those aged 13, and so on.

These models also indicate an overall relationship between use of these substances and whether adolescents were in an earlier or a later cohort. Youths in the earlier cohorts as a whole were more likely than those in the last six cohorts to be lifetime users of each of these substances. Compared with adolescents in the last six cohorts overall, those in the first six cohorts were 1.45 times more likely to be lifetime cigarette users, 1.20 times more likely to be lifetime alcohol users, and 1.27 times more likely to be lifetime marijuana users.

Table 5. Logistic Regression Models with Combined Cohorts for Lifetime Use of Cigarettes, Alcohol, and Marijuana among Youths Aged 12 to 17: 2002 to 2008

Characteristic	Cigarettes, Odds Ratio	Cigarettes, 95% CI*	Alcohol, Odds Ratio	Alcohol, 95% CI*	Marijuana, Odds Ratio	Marijuana, 95% CI*
Age	1.54	1.52-1.55	1.71	1.69-1.73	1.77	1.75-1.79
Cohort**						
Cohorts 1 to 6	1.45	1.40-1.50	1.20	1.16-1.24	1.27	1.22-1.32
Cohorts 7 to 12 (ref)	1.00	N/A	1.00	N/A	1.00	N/A

* 95% CI = 95 percent confidence interval for the odds ratio.   ** See Table 1 for descriptions of the individual cohorts.   N/A: not applicable (reference group).
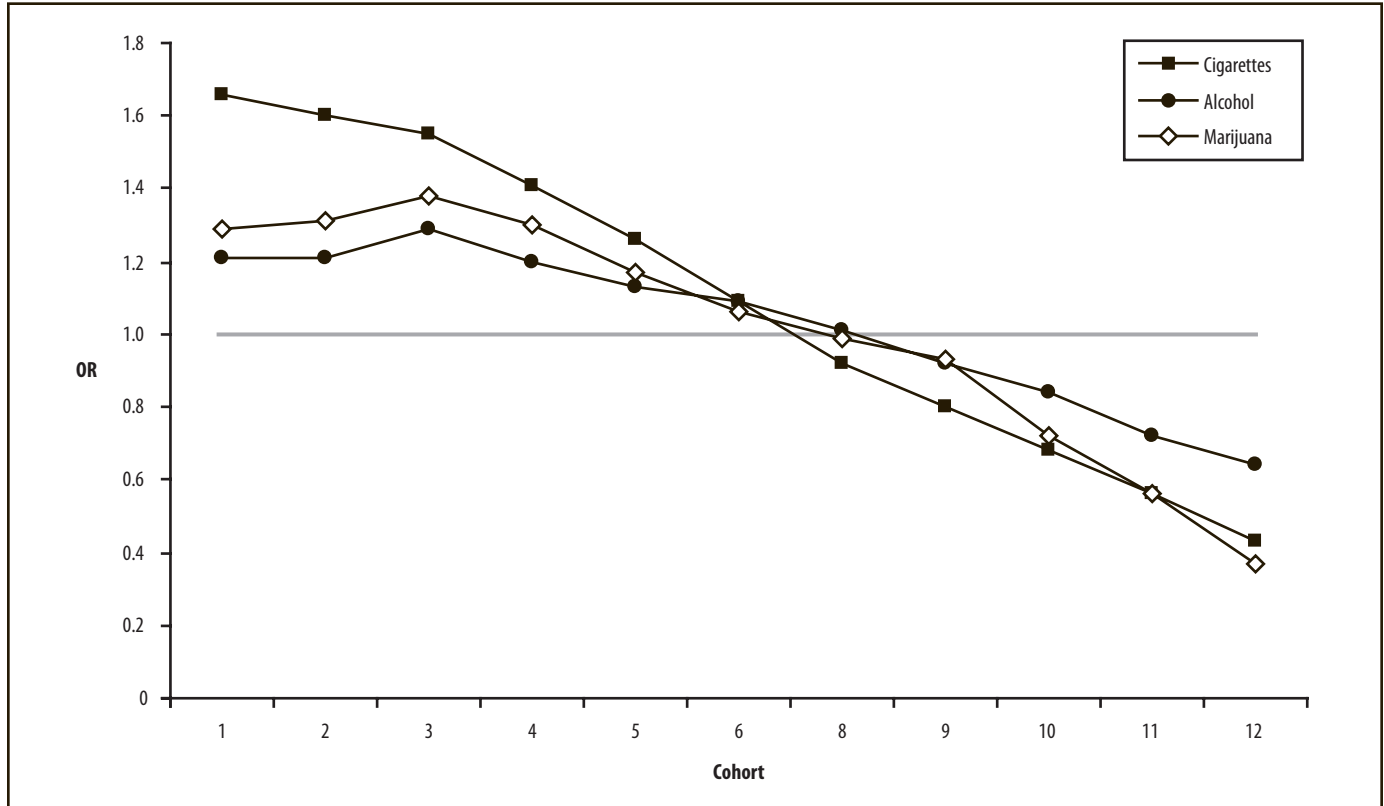Source: 2002 to 2008 SAMHSA National Surveys on Drug Use and Health (NSDUHs).

Table 6. Logistic Regression Models for Lifetime Use of Cigarettes, Alcohol, and Marijuana among Youths Aged 12 to 17: 2002 to 2008

Characteristic	Cigarettes, Odds Ratio	Cigarettes, 95% CI*	Alcohol, Odds Ratio	Alcohol, 95% CI*	Marijuana, Odds Ratio	Marijuana, 95% CI*
Age	1.46	1.44-1.47	1.66	1.64-1.68	1.71	1.68-1.74
Cohort**						
Cohort 1	1.66	1.50-1.84	1.21	1.08-1.35	1.29	1.17-1.43
Cohort 2	1.60	1.48-1.73	1.21	1.12-1.30	1.31	1.20-1.41
Cohort 3	1.55	1.45-1.65	1.29	1.21-1.38	1.38	1.29-1.48
Cohort 4	1.41	1.33-1.50	1.20	1.13-1.27	1.30	1.21-1.39
Cohort 5	1.26	1.19-1.33	1.13	1.07-1.20	1.17	1.09-1.25
Cohort 6	1.09	1.03-1.15	1.09	1.03-1.14	1.06	1.00-1.14
Cohort 7	1.00	N/A	1.00	N/A	1.00	N/A
Cohort 8	0.92	0.87-0.98	1.01	0.96-1.07	0.99	0.92-1.06
Cohort 9	0.80	0.74-0.85	0.92	0.87-0.98	0.93	0.85-1.02
Cohort 10	0.68	0.63-0.74	0.84	0.78-0.91	0.72	0.64-0.81
Cohort 11	0.56	0.49-0.63	0.72	0.65-0.79	0.56	0.46-0.68
Cohort 12	0.43	0.35-0.52	0.64	0.55-0.74	0.37	0.26-0.51

* 95% CI = 95 percent confidence interval for the odds ratio.   ** See Table 1 for descriptions of the individual cohorts.   N/A: not applicable (reference group).
Source: 2002 to 2008 SAMHSA National Surveys on Drug Use and Health (NSDUHs).

Figure 4. Odds Ratios (ORs)* for Lifetime Use of Cigarettes, Alcohol, and Marijuana Comparing Other Youth Cohorts** to Cohort 7: 2002 to 2008

* See Table 6 for presentation of the values of odds ratios.   ** See Table 1 for descriptions of the individual cohorts.

Source: 2002 to 2008 SAMHSA National Surveys on Drug Use and Health (NSDUHs).

Table 6 and Figure 4 present additional logistic regression model results that examine relationships between lifetime use of these substances by single years of age and among youths in individual cohorts. In these models, one of the two cohorts that included persons in all age groups (cohort 7) was chosen as the reference group. As in the previous models, the likelihood of adolescents being lifetime users of cigarettes, alcohol, or marijuana increased with each incremental increase in age when the potential confounding effects of differences in prevalence by cohort were taken into account.

Results of these models in Table 6 and Figure 4 also show significant relationships between individual youth cohorts and lifetime use of cigarettes, alcohol, and marijuana, independent of age. For cigarettes, adolescents in cohorts 1 through 6 (earlier cohorts) were more likely to be lifetime cigarette users (controlling for age) than those in cohort 7. For example, the adolescents in cohort 1 (aged 17 in the 2002 survey) were 1.66 times more likely to be lifetime cigarette users than those in cohort 7, when

the model took into account the greater likelihood that 17 year olds were lifetime cigarette users. In contrast, youths in cohorts 8 through 12 (later cohorts) were less likely to be lifetime cigarette users than those in cohort 7. Youths in cohort 12 (aged 12 in the 2008 survey) were less than half as likely as those in cohort 7 to be lifetime cigarette users.

Similar relationships between lifetime use and cohort were observed for alcohol and marijuana; however, the relationship between cohort and lifetime use was not as strong for these two substances as it was for cigarettes. Specifically, adolescents in cohorts 1 or 2 were 1.21 times more likely to be lifetime alcohol users than youths in cohort 7 were. Youths in these earliest two cohorts also were 1.29 to 1.31 times more likely to be lifetime marijuana users than those in cohort 7. Similarly, youths in cohorts 9 through 12 were less likely than those in cohort 7 to be lifetime alcohol users, and youths in cohorts 10 through 12 were less likely than those in cohort 7 to be lifetime marijuana users. Also, unlike the results for cigarettes, members of later cohorts of youths that were adjacent

to cohort 7 by one or two cohorts (i.e., cohort 8 for alcohol and cohorts 8 and 9 for marijuana) did not have a significantly different likelihood of being lifetime users of alcohol or marijuana compared with youths in cohort 7.

Discussion

Adolescents are an important target group for efforts to prevent the use of cigarettes, other tobacco products, alcohol, marijuana, and other drugs. The lower rates of lifetime use of cigarettes, alcohol, and marijuana in later cohorts of youths compared with earlier cohorts correspond to the secular trends noted elsewhere[1,2] and offer encouraging news for professionals working in substance abuse prevention. These findings are especially encouraging because of the positive public health implications of preventing the initiation of cigarette, alcohol, or marijuana use or at least delaying initiation to a point beyond adolescence.

Nevertheless, this analysis found that in all cohorts of youths, at least 40 percent of youths have tried a cigarette by age 17 and more than 60 percent have tried alcohol by age 17, despite use of these substances being illegal for adolescents. One third or more of adolescents have tried marijuana by age 17. Thus, further opportunities exist for preventing the use of cigarettes, alcohol, or marijuana among adolescents.

The finding that approximately 10 percent of youths aged 12 in all cohorts were already lifetime alcohol users underscores the importance of alcohol prevention efforts that start before the age of 12 and continue into adolescence. By the age of 15, approximately half of youths have used alcohol at least once. For cigarettes, the fairly steady increases in lifetime use that occur as age increases suggest that tobacco prevention efforts need to start before the age of 12 and to continue throughout the teens to prevent additional youths from initiating cigarette use as they progress through adolescence. Given that the lifetime prevalence of marijuana use was at 2 percent or less for youths aged 12 in all cohorts but started increasing at the ages of 13 and 14, marijuana prevention efforts for 12 and 13 year olds still would appear to reach youths at a time when 90 percent or more have *not* tried it.

These results also may help to elucidate changes over time in lifetime use of cigarettes, alcohol, and marijuana among adolescents. Within a cohort, lifetime rates of use of these substances can be expected to increase with age because once adolescents have used cigarettes, alcohol, or marijuana, they continue to be classified as lifetime users as they progress through adolescence. However, the prevalence of lifetime use among all youths aged 12 to 17 would decrease over time if cohorts of youths with a higher prevalence of lifetime use move into adulthood (i.e., aged 18 or older) and are replaced by cohorts that were less likely to have initiated substance use. The observed decreases in the lifetime prevalence of cigarettes, alcohol, and marijuana across later cohorts of youths from 2002 through 2008 are consistent with this hypothesis. Additional research on differences in adolescents' attitudes about substance use, perceived harmfulness of use, and social norms between cohorts would help explain changes in substance use patterns between cohorts.

Author Affiliations

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