# Initiation of Use of Alcohol, Cigarettes, Marijuana, Cocaine, and Other Substances in US Birth Cohorts since 1919

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## ABSTRACT

*Objectives.* This study examined recent trends in initiation of psychoactive drug use.

*Methods.* Data from the 1991 through 1993 National Household Surveys on Drug Abuse were used to compare the percentages of US cohorts born from 1919 through 1975 who began using drugs before the ages of 15, 21, and 35.

*Results.* Initiation of cigarette smoking by males peaked in the 1941–1945 cohort, then declined steadily. For females, early smoking initiation rose through the 1951–1955 cohort and then stabilized. Initiation of alcohol use was less common than smoking for pre-1930 cohorts but increased steadily, approaching cigarette use for cohorts born in the early 1970s. Only 2% of teenagers born in 1930–1940 tried marijuana; half the teenagers born in 1956–1965 did so. The percentage initiating marijuana use declined in the 1980s, more so among young adults than among teenagers. The use of cocaine and other illicit drugs echoed the rise of marijuana use but peaked later and showed less evidence of subsequent decline. Sex differences declined over time for every drug.

*Conclusions.* Cohorts born since World War II have had much higher rates of illicit drug use initiation, but trends have varied by drug type, possibly reflecting changes in relative prices. (*Am J Public Health.* 1998;88:27–33)


## *Introduction*

Data on how often and how early in life Americans start to consume drugs are important for tracking effects of prevention policies, explaining life-cycle patterns of drug use, and predicting drug problems. Age of initiation of alcohol, cigarette, and illicit drug use is a powerful predictor of drug consequences and dependence.[1,2] Epidemiological and clinical studies suggest that adolescents who begin drug use at early ages use drugs more frequently, escalate to higher levels more quickly, and are less likely to stop using.[2,3] Public health analysts view "alcohol, tobacco, and other drugs" as a spectrum of addictive substances with epidemiological commonalities.[3–6] We argue that this perspective gives too little attention to differences among drug types.

Patterns and trends in the incidence or initiation of drug use have until recently received little attention in research.[7] Descriptions of trends in drug use in the United States have focused instead on measures of prevalence, such as the percentage reporting drug use in the past year, and consequences, such as emergency room visits, arrests, and treatment admissions.[8–14] Most studies have analyzed only one drug at a time,[15] narrowly defined age groups,[3,16] or a single birth cohort.[4,5]

Unlike previous studies, the study reported in this paper compared drug use initiation across birth cohorts, allowing new inferences about the historical development of drug use patterns. The large database also permits inferences about rarely used as well as more commonly used drugs.

## *Methods*

### *National Household Survey on Drug Abuse*

This paper's results are based on 87 915 interviews conducted in the 1991, 1992, and 1993 National Household Surveys on Drug Abuse (NHSDAs) sponsored by the Substance Abuse and Mental Health Services Administration. Conducted since 1971, the NHSDA is a repeated cross-sectional personal interview survey based on probability sampling of individuals aged 12 years and older residing in US households and civilian, noninstitutional group quarters, a surveyed population that comprises about 98% of the total US population aged 12 and older. The 1991 through 1993 NHSDAs oversampled large metropolitan areas, Blacks, Hispanics, and individuals aged 12 through 17 years. Details are presented elsewhere.[8–10]

The NHSDA interview takes about an hour to complete and incorporates procedures designed to maximize honest reporting of drug use. In the 1991 through 1993 NHSDAs, self-administered, self-sealed answer sheets were used by respondents for all drug use questions except those about cigarettes (this section became self-administered in 1994). Interview completion rates averaged 82%.[8–10] A split-sample comparison of self-and interviewer-administered cigarette items in the 1994 NHSDA suggested that interviewer-administered items

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resulted in underreporting, especially by adolescent respondents.[11]

Data for estimating drug use incidence were obtained from respondents' retrospective reports of their age at first use of 11 drugs. For alcohol and cigarettes, NHSDA distinguishes between "first casual use" (any use) and "first regular use." For alcohol, "first casual use" is when "you first had a glass of beer or wine or a drink of liquor, such as whisky, gin, scotch, etc.", and "first regular use" is when "you first began to drink beer, wine, or liquor *once a month* or more often." For cigarettes, "first casual use" is when "you first tried a cigarette," and" first regular use" is when "you first started smoking daily." Item nonresponse rates were about 1% for alcohol, cigarettes, marijuana, and heroin; 3% for cocaine and hallucinogens; 6% for inhalants; 8% for stimulants and tranquilizers; and 13% for analgesics and sedatives. The data on stimulants, tranquilizers, analgesics, and sedatives pertain strictly to nonmedical uses.

### *Statistical Methods*

In this paper we use the estimated percentages using drugs before the ages of 15, 21, and 35 years to compare 20th-century US birth cohorts. The percentages are weighted to reflect the NHSDA sample design and interview completion rates and to produce unbiased estimates for the surveyed population in 1991 through 1993.[8–10] We use two-sample difference-in-proportions tests to determine the statistical significance of differences between cohorts (Tables 2 and 3) and between males and females (Table 3).[17] The normality assumption of these tests is justified by the large sizes of the subsamples being compared. All tests were two-sided with probability of type I error (rejecting the hypothesis of no difference when it is true) fixed at the $\alpha = .05$ level. The standard errors of percentages presented in Tables 2 and 3 imply that differences between cohorts or between sexes of 5 percentage points or more are usually significant according to this criterion.

For nine US cohorts born between 1919–1929 and 1971–1975, Table 1 presents estimated population sizes, in 1991–1993 and at birth, and sample sizes. The seven cohorts born after 1940 are standard 5-year birth cohorts. Because the sample born before 1941 was too small to support precise estimates for 5-year cohorts, we defined two earlier cohorts with sufficient numbers, one covering the post-World War I era (1919–1929) and the other the Depression era (1930–1940). To estimate the size of each cohort at birth, we divided the estimated size in 1991–1993 (based on the NHSDA) by the estimated fraction surviving from birth to 1992. To calculate the surviving fraction for the 1919–1929 cohort, we first approximated the fraction surviving until 1968, using cohort survivorship data from the National Center for Health Statistics (NCHS),[18] then extended the survival curve to 1992, using an NCHS 1979–1981 synthetic life table.[19] Calculations for the 1930–1940 and subsequent cohorts used only the 1979–1981 synthetic life table.

**TABLE 1—US Birth Cohorts, 1919–1929 through 1971–1975: Ages in 1992, Estimated Population Sizes, Percentages Surviving to 1992, and Sample Sizes in the Combined 1991 through 1993 National Household Surveys on Drug Abuse (NHSDAs)**

| Birth Year | Age in 1992 | Population Size, Millions, 1991–1993[a] | Fraction Surviving to 1992[b] | Population Size at Birth, Millions | Sample Size, 1991-1993 NHSDAs |
|---|---|---|---|---|---|
| 1919–1929 | 63–73 | 21.4 | .60 | 35.7 | 2 412 |
| 1930–1940 | 52–62 | 24.1 | .85 | 28.4 | 3 026 |
| 1941–1945 | 47–5 | 14.0 | .91 | 15.4 | 2 711 |
| 1946–1950 | 42–46 | 17.6 | .94 | 18.7 | 3 899 |
| 1951–1955 | 37–41 | 20.6 | .95 | 21.7 | 4 895 |
| 1956–1960 | 32–36 | 22.0 | .96 | 22.9 | 11 702 |
| 1961–1965 | 27–31 | 20.2 | .97 | 20.8 | 13 083 |
| 1966–1970 | 22–26 | 17.9 | .97 | 18.5 | 13 079 |
| 1971–1975 | 17–21 | 17.1 | .98 | 17.4 | 14 683 |

*Note.* Standard errors are less than 0.5.
[a]Based on the 1991–1993 NHSDAs.
[b]Based on data from the National Center for Health Statistics.[18,19]

We used least squares regression to project the percentage of the 1971–1975 cohort (last row of Table 1) using each drug before age 21. For each drug, we regressed the estimated percentages using before age 21 of annual cohorts born in 1971, 1972, 1973, 1974, and 1975 in 1991, 1992, and 1993 (15 data points) on age at interview and the square of age at interview, then used the predicted value at age 21 to compare the 1971–1975 cohort with earlier cohorts. The proportion of variance explained by these regressions was .85 or larger for each drug analyzed in this report.

### *Evaluation of Possible Biases*

The estimates presented in this paper may be subject to three kinds of bias:

- *Bias due to differential mortality.* Some members of birth cohorts analyzed in this paper died before the interviews were conducted in 1991 through 1993. The standard formula for assessing coverage bias is $p_A = P_A + X_A Y_A$, where $p_A$ is the estimated percentage of cohort A using a drug, $P_A$ is the true percentage, $X_A$ is the proportion who died before the interview date, and $Y_A$ is the difference between the percentages of surviving and nonsurviving members who used the drug.[20] The estimate $p_A$ is biased to the extent that individuals who died before the survey period made up an appreciable fraction of cohort members ($X_A$ is large) *and* the drug initiation patterns of deceased and surviving persons differed ($Y_A$ is large).

Table 1 suggests that mortality could affect estimates for the 1919–1929 cohort, because only about 60% survived until 1992. More than 85% of the 1930–1940 cohort survived, and the percentages surviving of cohorts born in 1941–1945 and later exceed 90%. The only drug for which survival rates of users are available is cigarettes. The Surgeon General's 1979 report on smoking estimated the age-adjusted mortality risk of *current* cigarette smokers to be about 70% higher than that of nonsmokers.[21] Even if 70% higher mortality applied to persons who *ever* used cigarettes, this difference is less than one-tenth as large as most estimated changes in drug use incidence between pre-1941 and post-1945 birth cohorts, which exceed 700% for every drug except alcohol and cigarettes (Table 2). If the differential mortality of cigarette smokers is typical of drug users, the second factor in the bias, $Y_A$, is relatively small. The first factor, $X_A$, is less than .10 for cohorts born 1941–45 and later.

Similarities between the drug initiation patterns of the interwar and 1941–1945 cohorts (Table 2) also suggest that differential mortality is unlikely to account for differences in drug use incidence between pre-1945 and post-1945 cohorts. The greatest difference in survival between adjacent cohorts involves the cohorts born in 1919–1929 (60% surviving to the interview

**TABLE 2—Percentages Using Alcohol, Cigarettes, and Other Drugs before Selected Ages, by Birth Cohort: 1991 through 1993 National Household Surveys on Drug Abuse (n = 87 915 Respondents)**

| Birth Cohort | Age | Years Age was Attained | % Using (SE) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Alcohol, Any Use | Alcohol, Regular Use | Cigarettes, Any Use | Cigarettes, Regular Use | Marijuana | Cocaine | Hallucinogens |
| 1919–1929 | 15 | 1934–1944 | 9 (1) | 2 (1) | 24 (2) | 5 (1) | 0 (*) | 0 (*) | 0 (*) |
| | 21 | 1940–1950 | 63 (2) | 27 (2) | 64 (2) | 38 (2) | 0 (*) | 0 (*) | 0 (*) |
| | 35 | 1944–1964 | 82 (2) | 45 (2) | 74 (2) | 52 (2) | 1 (*) | 0 (*) | 0 (*) |
| 1930–1940 | 15 | 1945–1955 | 10 (1) | 2 (1) | 30 (2) | 6 (1) | 1 (*) | 0 (*) | 0 (*) |
| | 21 | 1951–1961 | 66 (2) | 31 (2) | 71 (2) | 43 (2) | 2 (*) | 0 (*) | 0 (*) |
| | 35 | 1965–1975 | 84 (1) | 52 (2) | 78 (2) | 56 (2) | 6 (1) | 1 (*) | 0 (*) |
| 1941–1945 | 15 | 1956–1960 | 11 (1) | 2 (1) | 34 (2) | 6 (1) | 1 (*) | 0 (*) | 0 (*) |
| | 21 | 1962–1966 | 73 (2) | 33 (2) | 75 (1) | 47 (2) | 6 (1) | 1 (*) | 1 (*) |
| | 35 | 1976–1980 | 89 (1) | 58 (2) | 80 (1) | 58 (2) | 24 (2) | 4 (1) | 3 (*) |
| 1946–1950 | 15 | 1961–1965 | 11 (1) | 2 (*) | 35 (1) | 6 (1) | 1 (*) | 0 (*) | 0 (*) |
| | 21 | 1967–1971 | 76 (1) | 35 (1) | 74 (1) | 43 (1) | 21 (1) | 2 (*) | 4 (1) |
| | 35 | 1981–1985 | 90 (1) | 57 (1) | 80 (1) | 53 (1) | 38 (2) | 9 (1) | 9 (1) |
| 1951–1955 | 15 | 1966–1970 | 14 (1) | 2 (*) | 37 (1) | 6 (1) | 3 (*) | 0 (*) | 1 (*) |
| | 21 | 1972–1976 | 82 (1) | 42 (1) | 72 (1) | 39 (1) | 40 (1) | 6 (1) | 13 (1) |
| | 35 | 1986–1990 | 92 (1) | 61 (1) | 77 (1) | 48 (1) | 50 (1) | 19 (1) | 16 (1) |
| 1956–1960 | 15 | 1971–1975 | 20 (1) | 4 (*) | 39 (1) | 7 (1) | 12 (1) | 0 (*) | 2 (*) |
| | 21 | 1977–1981 | 85 (1) | 49 (1) | 74 (1) | 39 (1) | 53 (1) | 13 (1) | 13 (1) |
| 1961–1965 | 15 | 1976–1980 | 25 (1) | 5 (*) | 41 (1) | 8 (*) | 17 (1) | 1 (*) | 1 (*) |
| | 21 | 1982–1986 | 85 (1) | 53 (1) | 70 (1) | 36 (1) | 55 (1) | 17 (1) | 13 (1) |
| 1966–1970 | 15 | 1981–1985 | 28 (1) | 5 (*) | 39 (1) | 7 (*) | 15 (1) | 1 (*) | 2 (*) |
| | 21 | 1987–1991 | 86 (1) | 54 (1) | 70 (1) | 33 (1) | 51 (1) | 16 (1) | 12 (*) |
| 1971–1975 | 15 | 1986–1990 | 33 (1) | 6 (*) | 37 (1) | 7 (*) | 13 (1) | 1 (*) | 2 (*) |
| | 21[a] | 1992–1996 | 86 (1) | 55 (2) | 68 (2) | 33 (2) | 51 (3) | 13 (2) | 11 (1) |

*Note.* (*) = SE < .05.
[a]Projections to age 21 based on ordinary least squares regression (see text).

date) and 1930–1940 (85%), but the estimated drug use incidence patterns of these cohorts are very similar.

• *Bias due to memory errors.* The two principal kinds of retrospective reporting bias are recall decay, which is the decline in the ability to remember an event as it grows more distant in time, and forward telescoping, which is the misperception that past events occurred more recently than they did.[20] Recall decay would downwardly bias the estimated percentages using drugs of earlier cohorts relative to later cohorts, because earlier cohorts must recall events that are more distant in time. Forward telescoping would upwardly bias estimates of the years of first use but would not bias estimates of the percentages using drugs.

• *Bias due to social acceptability and fear of disclosure.* Interviewer-administered questionnaires result in greater underreporting of drug use than do self-administered forms.[22] Evaluations using the 1994 NHSDA[11] suggest that this bias primarily affects reports of cigarette smoking by adolescents, that is, estimates for the 1971–1975 birth cohort in Tables 2 and 3. The cigarette questions were the only drug use items that were not self-administered prior to 1994. Adolescent respondents may have underreported smoking because underage purchase of cigarettes is illegal and because about one quarter of adolescent interviews were conducted with someone else in the room at least part of the time.[23]

Despite the potential for bias, comparisons of estimated numbers of drug use initiates in specified years based on NHSDAs conducted at different times suggest that the cohort comparisons of this paper are valid.[7,23] If differential mortality, recall decay, or forward telescoping biased these comparisons, the estimated number of initiates in a given year would decline as the time separating that year from the survey year increased. Yet trends in drug use initiation, including cigarette smoking, based on NHSDAs conducted in different years are similar.

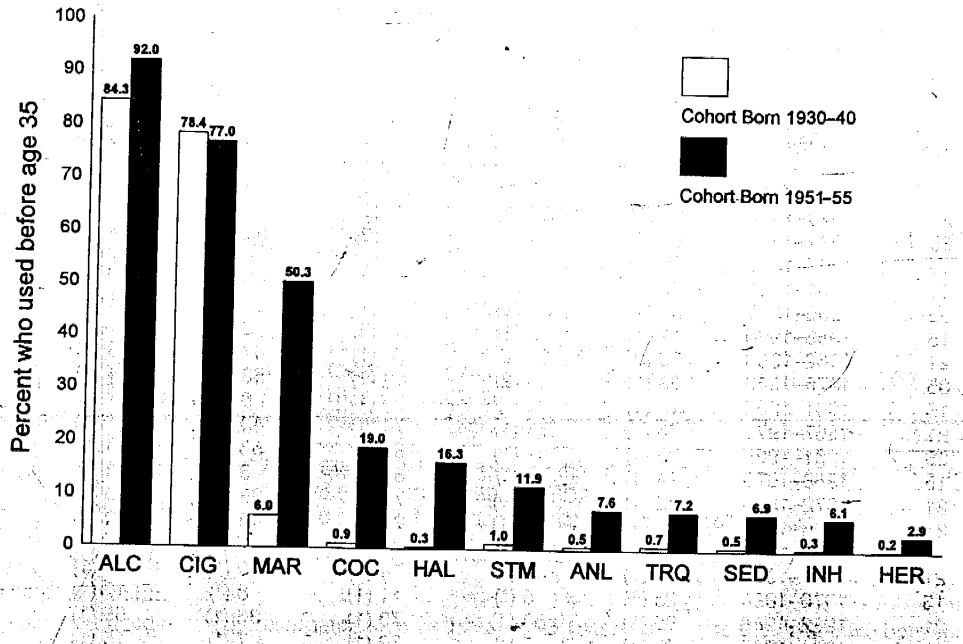
## Results

### *Drug Use Incidence by Birth Cohort*

Individuals born before and after World War II differed dramatically in the range and extent of their drug use (Figure 1). In the 1930-1940 cohort, only 3 drugs were used by more than 1% before age 35: alcohol (84%), cigarettes (78%), and marijuana (6%). In the 1951–1955 cohort, 10 drugs were used by more than 5% before age 35: alcohol (92%), cigarettes (77%), marijuana (50%), cocaine (19%), hallucinogens (16%), inhalants (6%), stimulants (12%), analgesics (8%), tranquilizers (7%), and sedatives (7%). The percentage using heroin also increased, from about 0.2% in the 1930–1940 cohort to 3% in the 1951–1955 cohort.

In comparing the 1930–1940 and 1951–1955 cohorts, the increase in the percentage using before age 35 was greater than 700% for every drug except cigarettes and alcohol. The largest increases were for marijuana (50% in the 1951–1955 cohort vs 6% in the 1930–1940 cohort) and cocaine (19% vs 0.9%). The increase in the percentage using alcohol, from 84% to 92%, was also substantial. Except for cigarette use, which remained stable at about 78%, the coming of age of cohorts born just after World War II coincided with substantial increases in the first use of every drug.

Table 2 compares the percentages using alcohol (any and regular use), cigarettes (any and regular use), marijuana, cocaine, and hallucinogens before ages 15, 21, and 35 in the nine cohorts defined in Table 1. Comparing the 1951–1955 cohort with the cohorts born in the late 1960s and early 1970s indicates that post–World War II trends have varied markedly by drug type. Use of only one major drug, alcohol, shows continuingly




*Note.* ALC = alcohol; CIG = cigarettes; MAR = marijuana; COC = cocaine; HAL = hallucinogens; STM = stimulants; ANL = analgesics; TRQ = tranquilizers; SED = sedatives; INH = inhalants; HER = heroin.

**FIGURE 1—Percentages using eleven drugs before age 35 in US birth cohorts of 1930–1940 (n = 3026) and 1951–1955 (n = 4895): 1991 through 1993 National Household Surveys on Drug Abuse.**

increasing incidence across post–World War II cohorts, from 82% using any alcohol before age 21 in the 1951–1955 cohort to 86% in the 1966–1970 and 1971–1975 cohorts. The percentage using any alcohol before age 15 more than doubled, from 14% in the 1951–1955 cohort to 33% in the 1971–1975 cohort. The percentage using alcohol regularly followed a similar pattern.

The percentage using cigarettes regularly before age 35 declined steadily after World War II, from 58% in the 1941–1945 cohort to 48% in the 1951–1955 cohort. Since 1945, the percentage using cigarettes regularly before age 21 has been smaller in each cohort than in the one preceding it. Yet the percentage using cigarettes regularly before age 15 remained between 4% and 7% for cohorts born between 1919–1929 and 1971–1975, and the percentage using any cigarettes before age 15 remained approximately constant at about 38% after World War II. Despite declines in regular cigarette use at later ages, a roughly constant level of early adolescent involvement with cigarettes persisted. These results are broadly consistent with analyses of smoking initiation[24] and smoking prevalence[25] by historical period.

The percentages using each of three drugs—marijuana, cocaine, and hallucinogens—before age 21 increased to peak levels in the cohorts born just after World War II, with roughly stable levels of use thereafter. The trajectories in time of these three drugs were distinctive. Hallucinogen use peaked earliest, 13% using before age 21 in the 1951–1955 cohort. Both marijuana and cocaine use attained peak levels (55% and 17%, respectively) in the 1961–1965 cohort, but the most rapid increase occurred in the late 1960s for marijuana use, as the 1946–1950 cohort entered adulthood, and in the 1970s for cocaine use, as the 1951–1955 cohort entered adulthood. The percentage using marijuana before age 21 increased by 250% (from 6% to 21%) in the 1946–1950 cohort, and the percentage using cocaine before age 21 increased by 200% (from 2% to 6%) in the 1951–1955 cohort.

Table 2 also shows that the declines in initiation of illicit drug use in the 1980s were modest relative to the increases of the 2 preceding decades. The percentage using marijuana before age 21 declined from 55% in the cohort born in 1961–1965 to 51% in the cohort born in 1966–1970. The corresponding declines for cocaine use and hallucinogen use (from 17% to 16% and from 13% to 12%, respectively) are not statistically significant. Projections to age 21 of the 1971–1975 cohort (see Statistical Methods) indicate a further decline, from 16% to 13%, in the percentage initiating hallucinogen use, but no significant changes in the percentages initiating marijuana and cocaine use. Data from Monitoring the Future, a continuing survey of 8th-, 10th-, and 12th-grade students, suggest that even these modest declines were transitory, because illicit drug use among adolescents, especially marijuana use, increased in the early 1990s.[16]

### *Drug Use Incidence by Birth Cohort and Sex*

For the same nine birth cohorts, Table 3 presents the estimated percentages of males and females who used alcohol (any and regular use), cigarettes (any and regular use), marijuana, cocaine, and hallucinogens before age 21. For example, 79% of males and 49% of females used any alcohol before age 21 in the 1919–1929 cohort, compared with 90% of males and 83% of females in the 1966–1970 cohort. Figure 2 presents the ratios of the female and male percentages shown in Table 3. (Ratios for marijuana use in cohorts born before 1930–1940 and for cocaine and hallucinogen use in cohorts born before 1946–1950

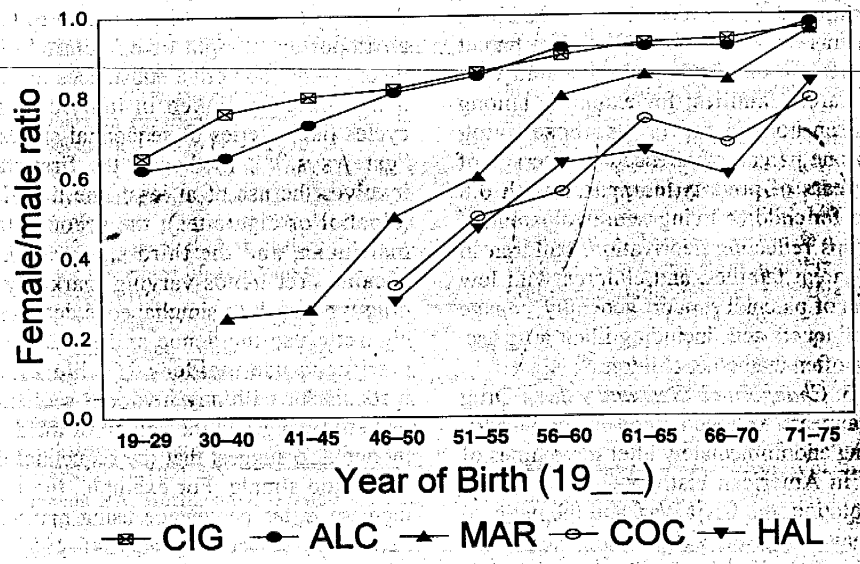
**TABLE 3—Percentages Using Alcohol, Cigarettes, and Other Drugs before Age 21, by Birth Cohort and Sex: 1991 through 1993 National Household Surveys on Drug Abuse (n = 87 915 Respondents)**

| | | % Using (SE) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Birth Cohort | Sex | Alcohol, Any Use | Alcohol, Regular Use | Cigarettes, Any Use | Cigarettes, Regular Use | Marijuana | Cocaine | Hallucinogens |
| 1919–1929 | Male | 79 (2) | 45 (3) | 79 (2) | 59 (3) | 1 (*) | 0 (*) | 0 (*) |
| | Female | 49 (3) | 11 (1) | 51 (2) | 19 (2) | 0 (*) | 0 (*) | 0 (*) |
| 1930–1940 | Male | 81 (2) | 50 (3) | 82 (2) | 56 (3) | 4 (1) | 0 (*) | 0 (*) |
| | Female | 53 (2) | 14 (2) | 62 (2) | 31 (2) | 1 (*) | 0 (*) | 0 (*) |
| 1941–1945 | Male | 85 (2) | 51 (3) | 84 (2) | 60 (2) | 11 (2) | 1 (*) | 1 (*) |
| | Female | 62 (2) | 18 (2) | 67 (2) | 35 (2) | 3 (1) | 0 (*) | 0 (*) |
| 1946–1950 | Male | 84 (2) | 51 (2) | 82 (2) | 52 (2) | 28 (2) | 3 (1) | 7 (1) |
| | Female | 68 (2) | 19 (1) | 67 (2) | 35 (2) | 14 (1) | 1 (*) | 2 (1) |
| 1951–1955 | Male | 88 (1) | 59 (2) | 77 (2) | 46 (2) | 50 (2) | 8 (1) | 17 (2) |
| | Female | 75 (1) | 26 (2) | 66 (1) | 33 (1) | 30 (2) | 4 (1) | 8 (1) |
| 1956–1960 | Male | 89 (1) | 62 (1) | 78 (1) | 42 (1) | 59 (1) | 16 (1) | 16 (1) |
| | Female | 82 (1) | 37 (1) | 70 (1) | 37 (1) | 47 (1) | 9 (1) | 10 (1) |
| 1961–1965 | Male | 89 (1) | 64 (1) | 73 (1) | 36 (1) | 59 (1) | 19 (1) | 15 (1) |
| | Female | 82 (1) | 42 (1) | 68 (1) | 37 (1) | 50 (1) | 14 (1) | 10 (1) |
| 1966–1970 | Male | 90 (1) | 63 (1) | 72 (1) | 33 (1) | 56 (1) | 19 (1) | 15 (1) |
| | Female | 83 (1) | 46 (1) | 68 (1) | 33 (1) | 47 (1) | 13 (1) | 9 (1) |
| 1971–1975[a] | Male | 87 (2) | 63 (3) | 69 (2) | 31 (1) | 52 (2) | 14 (1) | 12 (1) |
| | Female | 85 (1) | 49 (2) | 67 (2) | 34 (2) | 50 (2) | 11 (1) | 10 (1) |

*Note.* (*) = SE < 0.5.
[a]Projections to age 21 based on ordinary least squares regression (see text).

are too imprecise to be presented.) Thus, the ratio of female to male percentages using any alcohol before age 21 equals .62 (49/79) for the 1919–1929 cohort and .92 (83/90) for the 1966–1970 cohort.

Regardless of the specific drug, Figure 2 shows a convergence in the percentages of males and females who began drug use before age 21. Sex convergence in initiation of alcohol and cigarette use occurred primarily in cohorts born before or shortly after World War II, since female-to-male ratios in the 1946–1950 cohort (.81 for alcohol and .82 for cigarettes) are already close to 1.0. Sex convergence in initiation of illicit drug use is more recent. Between the 1946–1950 and 1971–1975 cohorts, the female-to-male ratio increased by 92% (from .50 to .96) for marijuana use, by 139% (from .33 to .79) for cocaine use, and by 186% (from .29 to .83) for hallucinogen use. In the 1971–1975 cohort, males were still about 25% more likely than females to use cocaine and to use hallucinogens before age 21.




*Note.* CIG = cigarettes; ALC = alcohol; MAR = marijuana; COC = cocaine; HAL = hallucinogens.

**FIGURE 2—Ratios of female to male percentages using cigarettes, alcohol, marijuana, cocaine, and hallucinogens before age 21, by birth cohort: 1991 through 1993 National Household Surveys on Drug Abuse (n = 87 915 respondents).**

## *Discussion*

The end of World War II was a major divide in the history of illicit drug use in the 20th-century United States. Only 2 drugs, alcohol and cigarettes, were used before age 35 by more than 6% of individuals born during 1930–1940, while 10 drugs—alcohol, cigarettes, and 8 illicit drugs—

exceeded this threshold in the 1951–1955 cohort. Only 2% of the 1930–1940 birth cohort used marijuana before age 21, but more than 50% of the 1956–1960 and 1961–1965 cohorts did so.

The research literature suggests three hypotheses to account for the increase in illicit drug use incidence in the cohorts born after World War II:

1. *Imbalance in cohort sizes.* According to the Easterlin hypothesis,[26] the consequences of cohort size extend beyond the direct effect of population numbers on the incidence of events. Increases in the size of birth cohorts after World War II (see Table 1) may have raised the supply of young workers above the demand for labor in the 1960s and 1970s, and the increased incidence of illicit drug use may thus have reflected discouragement in the face of smaller than expected economic opportunities. Moreover, the large number of young persons relative to older adults in the 1960s and 1970s may have increased the percentage of young persons' social interactions that were with other young persons rather than with older persons who would be less likely to use drugs or condone drug use.[27]

2. *Changes in familial living arrangements.* The percentage of American children aged 17 or younger who were living with two natural parents (not including stepparents) declined steadily from about 71% in 1960 to 51% in 1990.[28] One-parent families are disadvantaged compared with two-parent families; for example, among children born in the 1960s, those living with one parent experienced an average of 7.2 years of poverty, compared with 0.8 years for children living with two parents.[29] Perhaps reflecting deprivation, children in one-parent families, and children with low levels of parental support generally, engage in delinquent acts, including illicit drug use, more often than other children.[30]

3. *Changes in beliefs and values.* Drug use appears to have surged in the periods during and immediately after three times of trial in American history—the American Revolution, the Civil War, and the national upheaval over civil rights and the war in Vietnam during the 1960s.[31] Each crisis may have initiated a period of increased tolerance for drug use followed by a period of decreased tolerance as the public became newly aware of the social costs of drug use. Changes in mass media messages may also have shaped public beliefs and values about drug use during recent US history.[10,32]

The economic literature suggests a fourth hypothesis, which may account for the divergent pathways of use of major drug types in cohorts born since the 1950s:

4. *Changes in drug markets.* Historically, drug markets have been highly segmented, with a different cartel controlling the production and shipping of each drug.[31,33] Variations in supply costs and government impositions on supply might have affected the price and quantity traded of any drug independently of other drugs. Econometric studies of adolescent alcohol and cigarette consumption suggest that such changes in price can significantly affect initiation.[34–36] The erosive effect of price inflation on the value of alcohol per-gallon excise taxes (nominally stationary at the federal level, with one adjustment for each beverage type, since 1951[37]), in contrast to the much more rapid, inflation-pacing growth of cigarette taxes, offers a plausible reason for different trends in alcohol and cigarette use initiation. Although equivalent data are not available for marijuana, cocaine, and hallucinogens,[38,39] studies of prohibited drugs in other contexts suggest that demand does respond to price shifts in such markets.[40,41] The relevant price is the price as perceived by the consumer, including not only the monetary price but also fear of apprehension and punishment and cost in time and worry of acquiring the drug.[39]

The different trends in use of major drug types suggest the need to qualify an important insight of epidemiological theory—that addictive substances are epidemiologically linked in individual life cycles like a series of sequential stages or "gateways."[3–5] In theory, the first stage involves the use of at least one licit drug (alcohol or cigarettes), the second stage marijuana, and the third stage crack or cocaine. Yet trends varying markedly by drug type, such as simultaneous declines in cigarette use incidence and increases in marijuana use incidence (Table 2), are inconsistent with any invariant sequential pattern. Changes in the pattern of incidence by age also suggest that the sequential theory is too simple. For example, the rapid increase in the percentage using marijuana before age 15 between the 1946–1950 and 1961–1965 cohorts (Table 2) may have contributed to declines in the percentage of marijuana initiates who had previously used licit drugs: The 1991 through 1993 NHSDA data show that among individuals who initiated marijuana use before age 21, the percentage who had previously tried either alcohol or cigarettes declined steadily from about 80% in the 1946–1950 cohort to 59% in the 1961–1965 cohort before increasing to 66% in the 1966–1970 cohort.

With the sequential theory in mind, prevention efforts have depended heavily on pedagogical approaches that were originally developed to deter cigarette smoking, with the expectation that the same approaches would work for other drugs and that reducing initiation of cigarette use would reduce the flow of individuals through later gateways.[42] Given the diverging paths of use of major drug types in recent birth cohorts, it should not surprise us that prevention approaches based on sequential theory have had little apparent effect on the incidence of marijuana use.[43,44] There is no need to discard the central insight that prior use of alcohol or cigarettes predisposes many individuals to try illicit drugs. We simply propose that explanatory models and prevention approaches need to take into account both prior uses of licit drugs and market conditions for particular illicit drugs.

Additional hypotheses are needed to account for the 20th-century convergence in drug use incidence between American males and females. Sex convergence in drug use patterns since World War II coincided with sex convergence in school enrollment, educational attainment, labor force participation, employment status, occupation, and earnings.[45] As gender role expectations became more similar, perhaps the role *strains* predisposing individuals to use drugs also became more similar between males and females. As the two sexes increasingly attended the same schools and worked in the same settings, the opportunities to share drugs and communicate pro-drug messages between sexes probably increased as well. Females are still underrepresented in workplaces and in traditionally male occupations,[45] but such remaining sex differences may be counteracted by greater female susceptibility to family- and job-related stresses that can give rise to drug use.[46,47] □

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