Prevalence and Correlates of Drug Use and Dependence in the United States

Results From the National Comorbidity Survey

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Objectives: To analyze nationally representative data on the lifetime and 12-month prevalences of use of and dependence on illegal drugs (marijuana/hashish, cocaine/crack, heroin, hallucinogens), nonmedical prescription psychotropic drugs (sedatives, tranquilizers, stimulants, analgesics), and inhalants; and to examine data on the sociodemographic correlates of use and dependence.

Methods: The data come from the National Comorbidity Survey, a structured diagnostic interview administered to persons aged 15 to 54 years that generates reliable diagnoses according to the definitions and criteria of *DSM-III-R*.

Results: Of the respondents, 51.0% used one of the above drugs at some time in their lives, and 15.4% did so in the past 12 months. These estimates are similar to those obtained in the 1991 National Household Survey of Drug Abuse, where lifetime prevalence was 45.2% and 12-month prevalence was 16.7% among respondents in the age range 15 to 54 years. Of National Comorbidity Survey respondents, 7.5% (14.7% of lifetime users) were dependent at some time in their lives and 1.8% were dependent in the past 12 months. The prevalence estimate for lifetime dependence was reduced to 5.3% when calculated the percentage of respondents in the age range of 28 to 54 years who reported an onset of dependence as of 10 years earlier (ie, when they were 18 to 44 years old) was computed. This is similar to the Epidemiologic Catchment Area Study estimate of 5.1% among respondents in the age range 18 to 44 years, a comparison that matches the two studies on year of assessment, age of risk, and cohort. Males were significantly more likely to report both lifetime and 12-month use and dependence. Use and dependence were found to be more common in cohorts born after World War II than those born before the end of the war. The demographic predictors of lifetime use differed from the predictors of lifetime dependence among users, and these, in turn, differed from the predictors of recent dependence among people with a lifetime history of dependence.

Conclusions: Drug use and dependence are highly prevalent in the general population. The fact that there are differences in the correlates of first use, dependence among users, and persistence of dependence means that future research aimed at pinpointing modifiable risk factors must be based on disaggregated analyses of separate stages of progression.

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SEVERAL ONGOING national data collection systems are currently in place to gauge drug use levels and trends.[1] These include the Drug Abuse Warning Network,[2] which tracks the prevalence of drug mentions in emergency department admissions and medical examiners' death records; the National Household Survey on Drug Abuse,[3] which tracks the prevalence of drug use in the total national household population aged 12 years and over; and the High School Senior Survey,[4] which tracks the prevalence of drug use among junior high, high school, college, and young adult populations and, beginning in 1993, school dropouts. While all of these systems include some information about problems caused by drug use, they have been criticized because none produces accurate estimates of the prevalence of drug abuse or drug dependence.[5,6] Without such information, it is difficult to assess the full magnitude of the nation's drug problem.

Although a number of surveys have reported estimates of drug abuse or dependence in particular communities and regions,[7,8] the landmark Epidemiologic Catchment Area (ECA) Study is the only large-scale general population survey to have produced national esti-

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MATERIALS AND METHODS

SAMPLE

The NCS is based on a stratified, multistage area probability sample of persons aged 15 to 54 years in the noninstitutionalized civilian population in the 48 coterminous states as well as a representative supplemental sample of students living in campus group housing. Fieldwork was carried out by the staff of the Survey Research Center at the University of Michigan, Ann Arbor, between September 14, 1990, and February 6, 1992. Interviewers were carefully trained and closely monitored throughout the data collection period. The response rate was 82.4%, with a total of 8098 participants. A more detailed discussion of the NCS sampling design is presented elsewhere.[11]

Because of previous evidence that survey nonrespondents have more psychiatric disorders than respondents,[12,13] a supplemental nonresponse survey was conducted in tandem with the main NCS survey. A financial incentive was offered to a random sample of initial nonrespondents to complete a short form of the diagnostic interview. The 353 completed short forms disclosed higher rates of both lifetime and current psychiatric disorders among initial nonrespondents than among initial respondents. These results were used to construct a nonresponse adjustment weight for the main survey data to compensate for this systematic nonresponse. A second weight was used to adjust for variation in probabilities of selection both within and between households. A third weight, finally, was used to poststratify the data to approximate the national population distribution of the cross-classification of age, sex, race/ethnicity, marital status, education, living arrangement, region, and urbanicity as defined by the 1989 US National Health Interview Survey.[14] Comparisons between the NCS and National Health Interview Survey results are presented in **Table 1**.

DIAGNOSTIC ASSESSMENT

The NCS questions on illicit drug use and nonmedical use of prescription drugs were based on those asked in the National Household Survey on Drug Abuse (NHSDA).[3] The question series began by defining nonmedical use as use (1) without a physician's prescription, (2) in greater amounts than prescribed, or (3) more frequently than prescribed. Respondents were then asked about their lifetime and recent nonmedical use of each of four categories of prescription drugs (sedatives, tranquilizers, stimulants, and analgesics). This was followed by questions concerning the use of four categories of illicit drugs (marijuana/hashish, cocaine/crack, hallucinogens, and heroin) and inhalants. The procedures of the NHSDA were followed in providing a detailed verbal definition and illustrative list of qualifying drugs in each category before inquiring about use.

The NCS deviated from the procedures of the NHSDA in three major respects. First, questions were interviewer-administered rather than self-administered. This change in procedures was dictated by the requirement that the interviewer know about the respondent's drug use to administer subsequent questions about dependence. Second, we did not use the colored pill card employed in the NHSDA in asking about use of prescription psychotropic drugs. Third, we included a screening question that does not exist in the NHSDA concerning dependence in the absence of nonmedical use of prescription drugs, namely, whether persons who used prescription drugs under the supervision of a physician ever believed that they could not stop or that they were dependent even though they were following the physician's directions concerning amount and frequency of use.

Lifetime use of a drug, for purposes of this article, was defined as having tried at least one of the above drugs at least one time, excluding medical use that did not lead to feelings of dependence. As in the ECA Study, further questions that assess dependence were asked only of lifetime users. Our NCS definition of use, however, was more inclusive than the ECA definition in two ways. First, the ECA did not include people who were using a prescription drug under the supervision of a physician even if the patient felt dependent. Second, the ECA assessed dependence only among those who had used a drug more than five times in their lives, while the NCS considered a respondent a user even if he or she had used only one time.

Dependence was defined according to the definitions and criteria of *DSM-III-R*.[15] The NCS questions used to generate this diagnosis are based on the Composite International Diagnostic Interview,[16] a state-of-the-art structured diagnostic instrument designed for use by trained

mates of the prevalence of these disorders.[9] Unfortunately, representativeness of these estimates can be called into question because the five community samples that made up the ECA were not nationally representative.[10] Furthermore, the ECA estimates are now more than a decade old.

This article presents updated estimates of the prevalence of drug use and dependence in the US household population on the basis of the National Comorbidity Survey (NCS). The NCS was designed to take the next step beyond the ECA by administering a structured psychiatric diagnostic interview to a nationally representative sample of the noninstitutionalized population and using these data to calculate the prevalence of and risk factors for psychiatric disorders in the United States.

RESULTS

THE PREVALENCE OF LIFETIME AND 12-MONTH USE

The NCS estimates of lifetime and 12-month prevalence of drug use are presented in **Table 2** separately by age and sex of respondents. Overall, somewhat more than half of respondents (51.0%) reported using an illegal drug or nonmedically using a prescription drug at least once in their lives, and 15.4% reported having done so in the past 12 months. Males were significantly more likely than females to have used a controlled substance both in their lifetimes (55.8% vs 46.4%, t=4.7, $P<.001$) and in the past 12 months

interviewers who are not clinicians.[17] World Health Organization field trials of the Composite International Diagnostic Interview have documented high interrater reliability,[18,19] test-retest reliability,[20,21] and validity of the diagnosis of psychoactive substance dependence.[22-28]

A lifetime diagnosis of dependence, generated by the Composite International Diagnostic Interview diagnostic computer program,[29] requires the respondent to have at least three of nine *DSM-III-R* criterion A symptoms at some time in his or her life (eg, developing tolerance; experiencing withdrawal; unsuccessfully attempting to control use; continuing use despite the recognition that it is related to social, psychological, or physical problems) and to fulfill the requirements of criterion B by endorsing two or more Composite International Diagnostic Interview questions concerning duration of symptoms over a period of at least 1 month or repeatedly over a longer period. Consistent with *DSM-III-R*, no requirement is imposed for the criterion A symptoms to cluster in time for a diagnosis of lifetime dependence. Our definition of 12-month prevalence, in comparison, required a clustering of three or more criterion A symptoms in the 12 months before the interview in the subsample of respondents who qualified for lifetime diagnosis.

ANALYSIS PROCEDURES

Data analyses included the estimation of lifetime and 12-month prevalences, the estimation of cohort-specific cumulative age-at-onset prevalence curves, and the estimation of demographic correlates of use and dependence. Prevalence analyses were stratified by sex on the basis of well-documented evidence of a sex difference in drug use and disorder rates.[3,9,30-35]

Because of the complex sample design and weighting, SEs of the estimates could not be based on conventional methods. In the case of the lifetime and 12-month prevalences, SEs were obtained by means of the Taylor series linearization method.[36] The PSRATIO program in the OSIRIS IV software package[37] was used to make these calculations. We calculated *t* tests for sex differences in proportions of use and dependence on the basis of these SEs.

Cumulative age-at-onset curves were generated by means of the survival analysis methods operationalized in the SURVIVAL program in the SPSS-X software package.[38] Prevalences were estimated within 10-year cohorts for 5-year age intervals (eg, cumulative lifetime prevalences by the ages of 4, 9, 14, 19, and 24 years among respondents in the age range 15 to 24 years at the time of the interview). Cumulative prevalences for ages that exceeded the current ages of some cohort members (eg, cumulative prevalence by age 24 years in the cohort currently between the ages of 15 and 24 years) were based on the at-risk subsample of the cohort at the beginning of the 5-year interval (eg, the subsample of the 15- to 24-year-old cohort currently between the ages of 19 and 24 years). Individuals in this subsample were assumed to have experienced half of the year in which they were censored. Among those with a first onset in the interval, this meant assuming that they had an onset in the middle of the year of their reported age at onset, while among those with no lifetime history, it meant assuming that they were in the middle of the year of risk corresponding to their age at interview. Discrete-time (person-year) survival files[39] were analyzed to generate *z* statistics to assess significant intercohort differences in the slopes of the cumulative onset curves. The survival models were conceptualized as nested logistic regression equations,[40] in which age, cohort, and age-by-cohort interactions were treated as predictors. Design-based estimates of the SEs were obtained by the method of balanced repeated replications in 44 balanced subsamples.[41,42] The balanced repeated replication estimates take into account the clustering and weighting of the data without the linearization constraint required in the Taylor series method, yielding somewhat less biased estimates of SEs and confidence intervals in nonlinear models, such as logistic regression.[43] The LOGISTIC module in SAS-UNIX (version 6.07) was used to make these calculations, while a SAS macro was used to compute the SEs on the basis of comparison of estimates across the replicates.

Odds ratios for the demographic correlates of use and dependence were derived by exponentiating the logistic regression coefficients, and design-based estimates of the confidence intervals were generated by the same balanced repeated replication methods described above. An odds ratio of 1.0, or indistinguishable from 1.0 as bounded by the 95% confidence interval, was considered insignificant. Significance tests were made without adjustments for multiple tests.

(18.4% vs 12.4%, t=4.9, $P<.001$). There was also a powerful inverse relationship between age and 12-month use, from a high of 23.8% among respondents in the age range 15 to 24 years to a low of 5.5% among respondents in the age range 45 to 54 years.

The association between age and lifetime use was complicated by the fact that there was both a positive association between age and years of risk and a negative association between cohort and age-specific risk. A disaggregation of this complex pattern is presented in **Figure 1**, where respondent reports on their age of first use are presented in curves for the age-specific cumulative probabilities of lifetime use separately for each of the four 10-year birth cohorts in the NCS. Cohort 1 (born in 1966 to 1975) includes the youngest NCS respondents, while cohort 4 (born in 1936 to 1945) includes the oldest. It is useful to recognize, in studying Figure 1, that respondents in cohort 4, the only NCS respondents born before the end of World War II, would normally have completed high school by the mid-1960s, before the widespread introduction of marijuana and subsequently other illicit drugs into youth culture.[30,44-46] Cohort 3 went through adolescence in the early years of the youth drug culture, cohort 2 at its height, and cohort 1 during the years of downturn in drug use that has taken place during the last decade.

These differences in cohort experience are reflected in the cohort-specific age trends in Figure 1. The age-at-onset curve in cohort 4 shows that cumulative prevalence of drug use did not begin to rise until middle adolescence (15- to 19-year age range), at the end of which

only about 7% of the cohort had any experience with drugs. Cumulative prevalence increased to approximately 13% by the end of late adolescence (20- to 24-year age range) and continued in roughly linear fashion through the present. The curves in the three more recent cohorts, in comparison, show uniform evidence of a dramatic rise in first use between early adolescence (10- to 14-year age range) and late adolescence, at which time 48% of cohort 3, 63% of cohort 2, and 57% of cohort 1 had used drugs at least once. The slopes of the onset curves become flatter after late adolescence. Consistent with the fact that respondents in cohort 2 were adolescents during the height of the youth drug culture, the onset curve is consistently higher in cohort 2 than in either cohort 1 or cohort 3 beginning in the age range 15 to 19 years.

Significance tests for intercohort differences in the slope of the onset curve between early adolescence and late adolescence (10- to 24-year age range) documented a significantly less steep slope among respondents in cohort 4 than in the three more recent cohorts (z=3.2, P=.001) as well as a significant difference between the two most recent cohorts, with the slope for cohort 2 significantly more steep than that for cohort 1 (z=2.4, P=.004). Contrasts between cohorts 1 and 3 and cohorts 2 and 3 in the survival models failed to show significant differences. An evaluation of differences in the cumulative probability of use as of the end of late adolescence (ages 20 to 24 years) showed that differences were significant between all pairs of cohorts (z tests between 2.1 and 22.4 for pairwise comparisons, with P between .009 and .001). This means that the lower cumulative probability of use in cohort 1 compared with cohort 2 at this age likely represents a genuine decrease rather than a sampling artifact. There are also significant differences in the survival models in the slopes of the onset curves in the years after late adolescence (cohort 2 vs cohort 4, z=2.1, P=.009; cohort 3 vs cohort 4, z=3.6, P<.001; cohort 2 vs cohort 3, z=1.3, P=.05), showing that first use after late adolescence was more common in cohort 4 than the more recent cohorts.

Sex-specific cohort differences in drug use are presented in **Table 3**. For both males and females the probability of use by age 24 years was lower in the youngest cohort (cohort 1) than cohort 2 (63% vs 68% for males; 51% vs 58% for females). The table also indicates that for both sexes in the three youngest cohorts, most first use occurred in the age range 15 to 19 years, with little initiation after the age of 20 years. For members of the oldest cohort, initiation was less dramatic in the 15- to 19-year age range and continued through the age of 34 years.

Table 1. Characteristics of National Comorbidity Survey (NCS) Respondents Compared With Total US Population

	US Population, % (N=65 244)*	NCS, % (N=8098)	
		Weighted	Unweighted
Sex			
M	49.1	49.5	47.5
F	50.9	50.5	52.5
Race			
White	75.0	75.3	75.1
Black	11.9	11.5	12.5
Hispanic	8.6	9.7	9.1
Other	4.5	3.5	3.3
Education, y			
0-11	22.5	22.3	18.2
12	36.8	37.4	33.1
13-15	21.2	21.7	26.3
≥16	19.5	18.6	22.4
Marital status			
Married	59.8	62.9	54.4
Separated, widowed, divorced	10.1	10.0	15.5
Never married	30.1	27.1	30.1
Region			
Northeast	20.0	20.2	19.2
Midwest	24.6	23.8	25.6
South	33.7	36.4	35.6
West	21.7	19.6	19.6
Age, y			
15-24	25.5	24.7	21.8
25-34	30.8	30.1	32.4
35-44	25.9	27.1	27.7
45-54	17.8	18.1	18.1
Urbanicity			
Metropolitan	71.2	67.8	68.9
Other urban	8.1	7.5	6.5
Nonurban	20.7	24.7	24.6

**The US population characteristics are based on results from the 1989 US National Health Interview Survey.*

THE PREVALENCE OF LIFETIME DEPENDENCE

The results in **Table 4** show that 7.5% of NCS respondents had a lifetime history of psychoactive substance dependence. Males were significantly more likely than females to have a lifetime history of dependence (9.2% vs 5.9%, t=3.8, P<.001). This is not merely because males were more likely to use drugs. They were also signifi-

Table 2. Lifetime and 12-Month (1990 to 1992) Drug Use, by Sex and Age

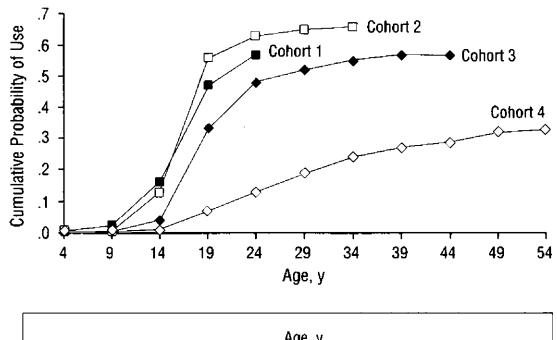
	%±SE					
	Males		Females		Total	
Age, y	Lifetime Use	12-mo Use	Lifetime Use	12-mo Use	Lifetime Use	12-mo Use
15-24	46.4±2.3	29.5±2.2	38.9±2.8	17.6±1.8	42.8±1.8	23.8±1.4
25-34	69.8±2.3	21.8±1.8	60.4±1.9	14.4±1.3	64.7±1.7	17.8±1.2
35-44	64.1±2.4	13.5±1.8	48.6±2.3	9.7±1.3	56.4±1.6	11.6±1.0
45-54	35.5±3.0	5.4±1.3	27.4±2.7	5.6±1.3	31.5±1.8	5.5±0.8
Total	55.8±1.3	18.4±1.0	46.4±1.5	12.4±0.7	51.0±1.0	15.4±0.6

cantly more likely than females to be dependent in the subsample of lifetime users (16.4% vs 12.6%, t=2.4, P=.004).

There was also an age-cohort effect in Table 4. In the sample as a whole, respondents in cohort 4 were significantly less likely to report a lifetime history of dependence than those in more recent cohorts (2.9% vs 7.3% to 9.5% in more recent cohorts, t tests between 3.2 and 5.5 for pairwise comparisons, all of them significant at $P<.001$). Among females, this lower prevalence resulted entirely from respondents in cohort 4 being much less likely than younger respondents to have ever used a drug, as shown by the fact that there was no significant association between age and lifetime dependence in the subsample of females who ever used a drug (cohort-specific prevalences between 11.7% and 14.1%, t tests between 0.1 and 0.5 for pairwise comparisons, with $.15<P<.23$). The situation was different for males, though, among whom prevalence of lifetime dependence was substantially lower for cohort 4 than more recent cohorts in the subsample of lifetime users (5.8% vs 16.7% to 19.7%, t=3.2 to 3.8 for pairwise comparisons, $P<.001$).

A disaggregated analysis of age and cohort effects is presented in **Figure 2**, where we show the cohort-specific cumulative probabilities of lifetime dependence among respondents who used drugs by specified ages. There was a consistent trend for higher prevalence of dependence among users in successively more recent cohorts. For example, whereas only 2.1%±1.2% (SE) of those respondents in cohort 4 who reported using drugs by the age of 24 years had a lifetime history of dependence by that age, the comparable percentages in more recent cohorts increased consistently to 10.0%±1.2% in cohort 3, 12.3%±1.4% in cohort 2, and 17.3%2.3% in cohort 1. Not only was this trend significant (z=6.3, $P<.001$) but, equally important for current policy purposes, the percentage was significantly larger in the most recent cohort (cohort 1) than the second most recent cohort (cohort 2; 17.3% vs 12.3%, z=1.9, P=.01), suggesting either a continuation of the trend among respondents currently in the age range 15 to 24 years or a systematic association between age and recall bias concerning age at first onset.

A disaggregation of these cohort differences by sex is presented in **Table 5**. Three intriguing patterns can be seen in this table. First, there was a consistent trend for the probability of lifetime dependence to be higher among female than male users at all ages in the oldest cohort. Second, there was an equally consistent trend for the probability of lifetime dependence to be higher among males than females in more recent cohorts. Third, there was a consistent sex difference in the age range at first onset of dependence. Among males, the vast majority of dependence occurred by the age of 24 years. Among females, in comparison, dependence had a later age at onset, with more than a doubling of the number of females who became dependent between the ages of 25 and 34 years compared with those with a history of dependence as of age 24 years. It is important to note that this sex difference in the age distribution of onset appears consistently across all cohorts.



		Age, y										
		4	9	14	19	24	29	34	39	44	49	54
Cohort 1	CP	0	.02	.16	.47	.57						
	SE	0	0	.01	.02	.02						
Cohort 2	CP	0	0	.13	.56	.63	.65	.66				
	SE	0	0	.01	.02	.02	.02	.02				
Cohort 3	CP	0	0	.04	.33	.48	.52	.55	.57	.57		
	SE	0	0	.01	.01	.02	.02	.02	.02	.02		
Cohort 4	CP	0	0	.01	.07	.13	.19	.24	.27	.29	.32	.33
	SE	0	0	0	.01	.01	.01	.02	.02	.02	.02	.02

Figure 1. *Cumulative probability (CP) of drug use, by cohort.*

THE PREVALENCE OF 12-MONTH DEPENDENCE

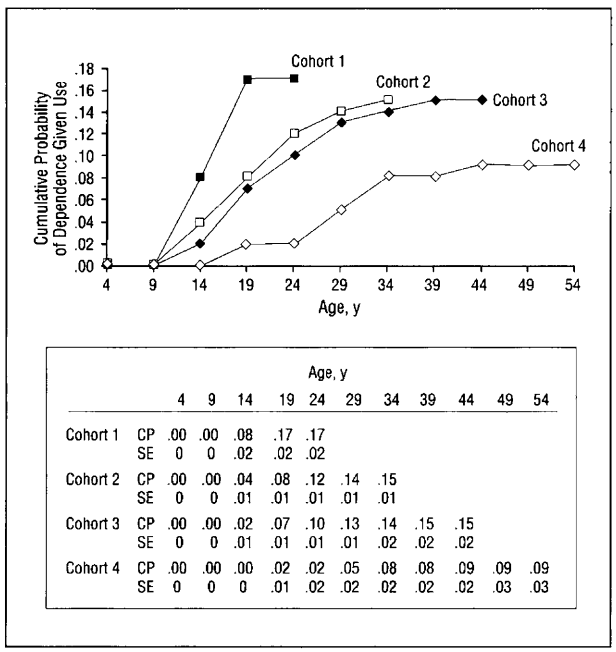
The results in **Table 6** show that 1.8% of NCS respondents were drug dependent during the 12 months before the interview. This represents 3.5% of lifetime users and 23.8% of persons with a lifetime history of dependence. It is worth repeating that our definition of 12-month dependence requires the respondent to meet full *DSM-III-R* A criteria within the past 12 months. If we relax this requirement and include persons with a lifetime history of dependence and at least one dependence

Table 3. Cumulative Probability of Drug Use, by Sex and Cohort

Sex	Cohort	Cumulative Probability±SE by Age Category, y								
		10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
M	1	.19±.02	.51±.02	.63±.02	...	...	...	...	...	...
	2	.16±.02	.62±.02	.68±.02	.70±.02	.71±.02	...	...	...	...
	3	.05±.01	.43±.02	.58±.02	.62±.03	.64±.02	.64±.02	.64±.02	...	...
	4	.01±.01	.09±.02	.15±.02	.22±.02	.27±.03	.31±.03	.34±.03	.36±.03	.36±.03
F	1	.13±.02	.43±.03	.51±.03	...	...	...	...	...	...
	2	.10±.01	.51±.02	.58±.02	.61±.02	.62±.02	...	...	...	
	3	.02±.01	.24±.02	.37±.02	.42±.02	.47±.02	.49±.02	.50±.02	...	...
	4	.01±.01	.05±.01	.10±.01	.16±.02	.20±.02	.23±.02	.25±.02	.28±.03	.29±.03

Table 4. Lifetime Drug Dependence in the Total Sample and Among Lifetime Users, by Sex and Age

	%±SE					
	Males		Females		Total	
Age, y	Total Sample	Lifetime Users	Total Sample	Lifetime Users	Total Sample	Lifetime Users
15-24	9.1±1.5	19.7±2.8	5.5±1.1	14.1±2.7	7.3±1.1	17.3±2.3
25-34	12.4±1.3	17.8±1.5	7.1±1.0	11.7±1.5	9.5±0.9	14.7±1.2
35-44	10.8±1.6	16.7±2.4	6.1±0.8	12.5±1.3	8.5±0.9	14.9±1.5
45-54	2.1±0.9	5.8±2.4	3.8±1.2	13.8±3.8	2.9±0.8	9.2±2.5
Total	9.2±0.7	16.4±1.2	5.9±0.5	12.6±1.0	7.5±0.4	14.7±0.7



		Age, y										
		4	9	14	19	24	29	34	39	44	49	54
Cohort 1	CP	.00	.00	.08	.17	.17						
	SE	0	0	.02	.02	.02						
Cohort 2	CP	.00	.00	.04	.08	.12	.14	.15				
	SE	0	0	.01	.01	.01	.01	.01				
Cohort 3	CP	.00	.00	.02	.07	.10	.13	.14	.15	.15		
	SE	0	0	.01	.01	.01	.01	.02	.02	.02		
Cohort 4	CP	.00	.00	.00	.02	.02	.05	.08	.08	.09	.09	.09
	SE	0	0	0	.01	.02	.02	.02	.02	.02	.03	.03

Figure 2. *Cumulative probability (CP) of drug dependence, given use, by cohort.*

symptom in the past 12 months, the prevalence increases to 2.8%±0.2%, equivalent to 5.4%±0.5% of lifetime users and 37.9%±3.2% of persons with a lifetime history of dependence.

As in earlier tables, the overall proportion of respondents with 12-month dependence shown in Table 6 is significantly greater among males than females (2.3% vs 1.3%, t=2.2, P=.007). This is because males are both more likely than females to use drugs at some time in their lives and more likely to become dependent once they use them. In comparison, there was no significant sex difference in 12-month dependence in the subsample of persons with a lifetime history of dependence (24.9% vs 22.2%, t=0.5, P=.15).

Table 6 shows that 12-month dependence was significantly more prevalent among respondents in the 15- to 24-year age range (3.3%) than among those who were 25 to 34 years old (1.6%, t=2.2, P=.007), 35 to 44 years old (1.3%, t=2.6, P=.002), or 45 to 54 years old (0.7%, t=3.2, P<.001). A less obvious result captured in the last two columns of the table is that this association largely results from young people being more likely to be recent users. That is, there was no meaningful association between age and 12-month dependence in the subsample of 12-month users (eg, 13.0% among 15- to 24-year-old males vs 11.9% among 45- to 54-year-old males, t=0.1, P=.23).

DEMOGRAPHIC CORRELATES OF USE AND DEPENDENCE

The prevalence estimates reported above document the existence of significant age and sex differences in both drug use and dependence. A broader set of demographic correlates is considered in this section of the article. While a number of different contrasts are of potential interest, we focus on three stages of progression: (1) the predictors of first use (lifetime use in the total sample); (2) the predictors of first onset of dependence among users (lifetime dependence in the subsample of lifetime users); and (3) the predictors of persistence of dependence (12-month dependence in the subsample of persons with a lifetime history of dependence). The analysis is based on a series of three sets of univariate logistic regression equations in which a single demographic variable is treated as a predictor and the dichotomous measures of use or dependence are treated as outcomes.

Results are reported in **Table 7**. Whites were significantly more likely than nonwhites to use drugs at some time in their lives. Among lifetime users, there was no significant association between race and dependence. Among respondents with a lifetime history of dependence, blacks were significantly more likely than whites to have 12-month dependence. Respondents in the "other" (largely Asian) racial category, finally, had the lowest odds ratios (ORs) in all the contrasts.

There was a generally positive association between education and lifetime use of drugs. This pattern reversed, though, in predicting progression to dependence, where the ORs for respondents with 0 to 11 (OR, 2.30) or 12 (OR, 1.69) years of education were significantly greater than 1.0. The ORs of recent dependence among respondents with a lifetime history of dependence were also elevated in the subsamples with 0 to 11 and 12 years of education, although these coefficients were not statistically significant.

There was no association between family income and lifetime use in the NCS. Among users, however, there was a negative relationship between income and lifetime dependence. This was particularly pronounced among respondents in the lowest income category.

Lifetime probability of drug use was significantly higher in the Northeast and West than the Midwest or South. Given use, respondents in regions other than the Midwest had a higher odds of lifetime dependence, but

Table 5. Cumulative Probability of Drug Dependence Given Use, by Cohort and Sex

Sex	Cohort	Cumulative Probability±SE by Age Category, y								
		10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
M	1	.06±.02	.19±.03	.20±.03	...	...	...	...	...	...
	2	.03±.01	.11±.01	.16±.02	.18±.02	.19±.02	...	...	...	...
	3	.00±.0	.09±.02	.12±.02	.15±.02	.16±.02	.17±.02	.17±.02	...	...
	4	.00±.0	.01±.01	.01±.01	.02±.01	.05±.03	.05±.02	.06±.03	.06±.03	.06±.02
F	1	.11±.04	.14±.03	.14±.03	...	...	...	...	...	...
	2	.05±.01	.06±.02	.09±.02	.11±.02	.12±.02	...	...	...	
	3	.03±.01	.03±.01	.06±.02	.10±.01	.12±.01	.13±.01	.13±.01	...	...
	4	.00±.0	.04±.02	.04±.02	.10±.05	.10±.04	.10±.04	.13±.04	.14±.04	.14±.04

Table 6. Twelve-Month (1990 to 1992) Drug Dependence in the Total Sample, Among Lifetime Users, Among Respondents With Lifetime Dependence, and Among 12-Month Users, by Sex and Age

Sex	Age, y	%±SE			
		Total Sample	Lifetime Users	Lifetime Dependent	12-mo Users
M	15-24	4.5±1.1	9.6±2.2	48.8±8.7	13.0±3.0
	25-34	2.2±0.5	3.2±0.7	17.8±4.1	9.9±2.2
	35-44	1.4±0.4	2.0±0.7	13.3±3.7	9.7±3.0
	45-54	0.6±0.5	1.8±1.4	30.6±21.1	11.9±8.8*
	Total	2.3±0.4	4.0±0.6	24.9±3.9	11.3±1.9
F	15-24	2.1±0.5	5.4±1.4	38.1±7.7	10.6±2.5
	25-34	1.2±0.3	1.9±0.6	16.6±4.5	8.1±2.1
	35-44	1.1±0.4	2.2±0.8	17.8±6.4	11.1±4.3
	45-54	0.8±0.7	2.9±2.5	21.3±15.8	0.4±0.4*
	Total	1.3±0.2	2.8±0.5	22.2±3.8	9.0±1.4
Total	15-24	3.3±0.7	7.8±1.5	45.0±6.1	12.2±2.3
	25-34	1.6±0.3	2.5±0.5	17.3±3.1	9.1±1.6
	35-44	1.3±0.3	2.1±0.5	14.9±3.3	10.3±2.6
	45-54	0.7±0.4	2.3±1.4	24.7±11.7	6.1±4.4
	Total	1.8±0.2	3.5±0.5	23.8±3.1	10.3±1.4

*Low precision.

residents of the West comprised the only group for whom this difference was significant. There were no significant regional differences in the persistence of dependence.

Urbanicity was examined at the county level by distinguishing major metropolitan counties (metropolitan), urbanized counties that are not in major metropolitan areas (urban), and rural counties. There was a significant positive association between urbanicity and lifetime drug use. Given use, however, urbanicity was not significantly related to either lifetime dependence or persistence of dependence. Readers who are interested in the effect of a particular demographic correlate when the others are controlled for may request multivariate analysis results from us.

COMMENT

PREVALENCE ESTIMATES

The NCS drug use prevalence estimates are generally similar to those obtained in the 1991 NHSDA.[1] The NHSDA lifetime prevalence estimate among respondents in the age range of 15 to 54 years is 45.2% compared with the NCS estimate of 51.0%, whereas the NHSDA 12-month prevalence estimate is 16.7% compared to the NCS estimate of 15.4%.

Methodologic studies carried out by NHSDA staff show that willingness to admit drug use is reduced in the NHSDA when questions are administered by interviewers, as they are in the NCS, rather than self-administered.[47] On the basis of this evidence, the 1991 NHSDA drug use questions were self-administered. It is somewhat surprising, in light of this methodologic research, that the NCS estimate (based on interviewer-administered questions rather than self-administered questionnaires) is higher than the NHSDA estimate for lifetime use and only slightly lower than the NHSDA estimate for 12-month use. We have no way of investigating the reasons for this with our data, but we suspect that it has something to do with the fact that the NCS was a health survey rather than a drug survey. Because of our focus on health, the NCS asked about drug use in the context of other health-relevant behaviors, such as exercise and diet, and it is possible that this difference in context led to a reduction in respondent hesitation to admit drug use.

It is difficult to make direct comparisons to assess the consistency of the NCS estimates of the prevalence

Table 7. Demographic Correlates of Lifetime Drug Use in the Total Sample, Lifetime Dependence Among Users, and 12-Month Dependence Among Those With Lifetime Dependence*

	Lifetime Use (Total Sample)		Lifetime Dependence (User Subsample)		12-mo Dependence (Lifetime Dependent Subsample)	
	OR	95% CI	OR	95% CI	OR	95% CI
Race						
White	1.00	...	1.00	...	1.00	...
Black	0.62†	0.51-0.74	0.69	0.46-1.03	3.05†	1.05-8.84
Hispanic	0.70†	0.50-0.98	1.05	0.65-1.69	2.38	0.77-7.33
Other	0.37†	0.25-0.56	0.97	0.39-2.42	0.22	0.04-1.05
Education, y						
0-11	0.53†	0.45-0.63	2.30†	1.60-3.29	2.25	0.74-6.85
12	0.81†	0.70-0.93	1.69†	1.21-2.37	2.11	0.80-5.62
13-15	1.07	0.91-1.26	1.30	0.88-1.91	1.27	0.46-3.52
≥16	1.00	...	1.00	...	1.00	...
Income, ×$1000						
0-19	1.00	0.80-1.26	2.24†	1.43-3.52	1.81	0.57-5.80
20-34	0.96	0.78-1.19	1.51	0.90-2.54	1.00	0.33-3.03
35-69	0.91	0.74-1.12	1.29	0.76-2.21	0.84	0.27-2.69
≥70	1.00	...	1.00	...	1.00	...
Region						
Northeast	1.47†	1.17-1.84	1.22	0.86-1.71	1.16	0.40-3.35
Midwest	1.00	...	1.00	...	1.00	...
South	0.93	0.78-1.12	1.24	0.89-1.73	1.57	0.68-3.62
West	1.76†	1.34-2.32	1.64†	1.23-2.19	1.39	0.59-3.25
Urbanicity						
Metropolitan	1.85†	1.46-2.35	1.40	0.98-2.00	1.17	0.47-2.90
Other urban	1.54†	1.13-2.11	1.38	0.92-2.08	1.28	0.56-2.91
Nonurban	1.00	...	1.00	...	1.00	...

OR indicates odds ratio; CI, confidence interval.
†An odds ratio with a confidence interval that does not include 1.0 is statistically significant.

of drug dependence with those of previous surveys because the latter have usually been based on either health maintenance organization or treatment samples[8,48] and have often used measures of dependence that are not comparable with the *DSM-III-R* criteria used in the NCS.[49] It is possible, however, to compare the NCS estimate of dependence with that of the ECA Study. Before the NCS, the ECA Study provided the most up-to-date estimate of the national prevalence of drug dependence. The NCS estimate of 7.5% lifetime dependence is somewhat higher than the 5.1% estimate obtained in the ECA Study for lifetime prevalence of *DSM-III* drug dependence among respondents in the age range of 18 to 44 years.[9] However, when we focus on NCS respondents who are currently in the age range of 28 to 54 years and compute the percentage who reported an onset of dependence as of 10 years earlier (ie, when they were 18 to 44 years old)—a comparison that matches NCS data with ECA Study data on year of assessment, age of risk, and cohort—the NCS prevalence estimate for lifetime dependence is reduced to 5.3%±0.6%, very similar to the ECA Study estimate of 5.1%.

SEX, AGE, AND COHORT EFFECTS

The NCS finding that males are more likely than females to use and to be dependent on drugs is consistent with previous research.[3,9,30-32] The finding that male drug users are more likely than female users to become dependent is inconsistent with the ECA Study finding that lifetime drug use disorders are equally prevalent among male and female extramedical drug users.[9] Additionally, our finding of no sex difference in 12-month dependence among respondents with a lifetime history of dependence is at odds with the ECA Study finding that men are significantly more likely than women to experience current problems associated with lifetime abuse or dependence.[9]

Our finding of an inverse relationship between age and use has been repeatedly found in previous research,[3,46] as has our finding that use and dependence are both much more common in cohorts born after World War II.[9,30,44-46,50] The decrease in the cumulative probability of use by age 24 years in cohort 1 compared with cohort 2 is consistent with recent trends from the data that show decreases in use over the last several years for 12th graders.[51]

The interaction found in the NCS between sex and cohort in predicting lifetime dependence was also found in weaker form in the ECA Study, where women in the 45- to 64-year age range were slightly more likely than men to qualify for lifetime dependence (0.4% vs 0.2%, t=.07, P=.24), while men had higher lifetime dependence than women in other age groups.[9] Males in the NCS had a higher lifetime prevalence of dependence than females among respondents in the cohorts born after the end of World War II but a lower prevalence than females in the cohort born in the decade before the end of

World War II, despite the fact that older males are more likely than older females to have a history of drug use. This result may be related to a finding in previous studies that females predominate among people who are dependent on psychotherapeutic medicines, while males predominate among people who are dependent on other drugs.[52-54] The former would be expected to be responsible for a larger proportion of drug dependence among persons in cohort 4, as they are the only NCS cohort to go through adolescence before the introduction of marijuana and other drugs into youth culture. Consistent with this possibility, disaggregated cohort-specific analyses of NCS dependence data by type of drug reported elsewhere shows that men are more likely than women to use psychotherapeutic drugs but female users are more likely than male users to become dependent.[55] More complex analyses are needed to determine whether this accounts for the sex-by-cohort interaction in dependence among users found here. Another plausible interpretation is that the interaction between sex and cohort comes about because of greater selection bias among males than females with a history of dependence, possibly because of a stronger association between dependence and early mortality among males than females.

We are unaware of any previous research documenting that the conditional probability of dependence among users has increased among respondents who are currently in the age range 15 to 24 years (cohort 1) compared with earlier cohorts (Figure 2), despite the fact that the probability of lifetime use is lower in cohort 1 than cohort 2 (Figure 1). A methodologic interpretation of this increased probability of dependence among users is possible, emphasizing some combination of differential recall bias, differential willingness to admit use, and differential sample selection bias in cohort 1 compared with earlier cohorts. A substantive interpretation is also possible, emphasizing the possibility that the people who are selected into use of drugs during a time when use is becoming less prevalent are likely to be more vulnerable (eg, more likely to have a history of psychopathology) and, as a result, more likely to become dependent.[56,57] It would be possible to evaluate this interpretation in more detailed analyses by studying cohort differences in retrospective reports concerning history of other disorders before the onset of drug use.

The findings regarding a significantly higher prevalence of 12-month dependence among the youngest respondents but no cohort difference in 12-month dependence among 12-month users is somewhat surprising in light of evidence that use is more likely to be experimental during the teenage years[51] and the likelihood that younger users are less likely to be using drugs associated with a high risk of dependence.[58] However, it has been argued that early age at onset contributes to an increased likelihood of dependence.[46] We also found a sex difference in the relationship between cohort and prevalence of lifetime dependence. The lower prevalence among females born before vs after the end of World War II results entirely from their lower probability of ever using a drug, whereas the lower prevalence of lifetime dependence among males born before vs after World War II results from a combination of lower probability of ever using a drug and lower probability of dependence among users. This might reflect a sex difference in drug of choice or in the changing centrality of drug use to other aspects of male and female life-styles across cohorts.

A sex difference in drug of choice could also help explain our finding that the curves for age at onset of dependence differ for males and females, with the lifetime prevalence of dependence among females doubling in the age range of 25 to 34 years, while virtually all dependence among males occurred by the age of 24 years. This difference is consistent with evidence that prescription drugs are responsible for a larger part of female than male dependence.[44] It also suggests the possibility that there may be a longer time between first use and onset of dependence among females than males.

OTHER DEMOGRAPHIC CORRELATES OF USE AND DEPENDENCE

Our results concerning other demographic correlates are broadly consistent with previous research in finding that drug use is positively associated with being white rather than nonwhite,[4,59] well educated rather than poorly educated,[30,60] urban rather than rural,[30,32] and a resident of the Northeast or West rather than the South or Midwest.[30,32]

We also documented that the predictive power of demographic variables often differs from one stage of disorder to the next. For example, whites are significantly more likely than blacks ever to use one of the drugs considered here, indistinguishable from blacks in their probability of lifetime dependence after first use, and significantly less likely than blacks to have persistent dependence. These results are consistent with Kandel's finding[61] that blacks are less likely than whites to experiment with most drugs but more likely than whites to persist in their use. Results such as these underscore the complexity of the issues surrounding substance use disorders and support the argument made nearly two decades ago by Robins[62] that an adequate understanding of risk factors for substance use disorders requires a decomposition of risk factors into stages.

LIMITATIONS

The NCS prevalence estimates probably underestimate the true prevalence of drug use and dependence in the total population because the sampling frame (the household population) excludes the homeless and residents of institutional settings and group housing and because reporting errors among respondents are likely to be in the direction of underreporting rather than overreporting these experiences.

Many results hinge on respondent recall of ages when use first occurred or they first became dependent. Recall bias in reporting these dates could lead to errors in the age-at-onset analyses. If these errors differ by current age, they could distort intercohort comparisons. This, in turn, could lead to the impression that there are substantive cohort differences when, in fact, these differ-

ences result from differential recall bias.[63] As a result, caution is needed in interpreting results concerning cohort differences.

Finally, the results concerning demographic correlates should be taken as descriptive rather than as evidence concerning risk factors because these results are all based on univariate prediction equations. It is likely that some of the significant associations would disappear in more complex multivariate analyses. Anthony,[64] for example, showed no significant association between being black and drug dependence when a control was introduced for neighborhood. Even when results hold up after the introduction of controls, the causal order of associations is not always clear. For example, the significant association between low educational attainment and lifetime dependence in the subsample of lifetime users could result from an effect of educational failure on subsequent onset of dependence, an effect of dependence on subsequent school dropout, an effect of other variables on both education and dependence, or some combination of these effects. Future analyses of the NCS data will rely on survival models in which age at onset of use and disorder are treated as outcome variables, and predictors that may be reciprocally related to the outcomes are treated as time-varying covariates to clarify this temporal uncertainty in the predictors of the progression from first use to dependence.

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