

The Epidemiology of Substance Use and Dependence Among Women

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INTRODUCTION

Epidemiologic data on substance use and dependence among women provide a valuable foundation for understanding the implications of drug abuse for women's health. This chapter discusses four issues: (1) the extent of substance use and dependence among women in the general population in the United States; (2) the comorbidity of substance use disorders with other psychiatric disorders; (3) the sequence of steps underlying use of different drug classes and the patterns of drug-specific symptom progression; and (4) the potential of epidemiologic data to generate insights about important health and social consequences of drug use. In most instances, data are presented for men as well as women because comparative analyses highlight conditions that are either specific to women or common to both sexes.

Because of space limitations, some important issues cannot be addressed. Thus, except for age and sex, variations in patterns of use by sociodemographic characteristics and trends in drug use over time are not considered. The discussion is restricted to patterns of use in the general population and does not address patterns of use among women in treatment or in high-risk groups, such as homeless women, female sex workers, pregnant women, or women living in institutions, which are discussed in other chapters of this volume. In this discussion, the exclusion of these groups, which constitute a small proportion of the general population, does not significantly bias overall epidemiologic estimates (see Voss and Clayton 1987; Johnston et al. 1989), although the less frequently used drugs and the heaviest patterns of use may be underrepresented.

EPIDEMIOLOGIC DATA ON DRUG USE IN THE GENERAL POPULATION

The epidemiology of drug use consists of two different streams of research. The much more common stream measures consumption patterns in the population by inquiring whether individuals have ever used drugs and how frequently and how recently they have used them. The second stream, and one implemented more rarely, measures the extent of problematic drug use by inquiring about behaviors and symptoms that meet criteria for substance use disorders. The following 11 classes of drugs are generally covered in surveys: alcohol, cigarettes, illicit drugs (marijuana/hashish, cocaine, hallucinogens, heroin), inhalants, and nonmedical use of psychotropic drugs (tranquilizers, stimulants, sedatives, analgesics). Illicit drugs, inhalants, and the nonmedical use of psychotropic drugs are most often grouped together and referred to as "illicit drugs."

By focusing on unselected samples rather than the most extreme and deviant groups included in treatment programs or clinical practices, epidemiologic studies assess the distribution of the phenomenon in the population in a way that is free from selection and referral bias, provide normative data from which new understanding of drug behavior can be gained, generate hypotheses about the causes and consequences of drug use, and help assess the need for services.

Two major nationwide programs currently monitor patterns of drug use in the general population. The Monitoring the Future Study (MTF) is an annual national survey of high school seniors initiated in 1975, with samples of 8th- and 10th-graders added in 1991 (Johnston et al. 1993). The National Household Survey on Drug Abuse (NHSDA) is an ongoing national household survey of persons age 12 and older, initiated 20 years ago by the National Institute on Drug Abuse and now conducted by the Substance Abuse and Mental Health Services Administration (1993, 1994).

PREVALENCE OF DRUG USE AND DEPENDENCE

Prevalence of Drug Use

Data from the 1992 NHSDA (Substance Abuse and Mental Health Services Administration 1993), at this writing the most recent year for which sex-specific data are publicly available, illustrate three important

points regarding the epidemiology of drug use among women. First, the prevalence of use differs markedly for various substances (figure 1). The licit substances—alcohol and tobacco cigarettes—are used by a much larger proportion of the population than illicit drugs. Marijuana is the most prevalent illicit drug. The next most popular illicit drug is cocaine, having been used at some time by 9 percent of women.

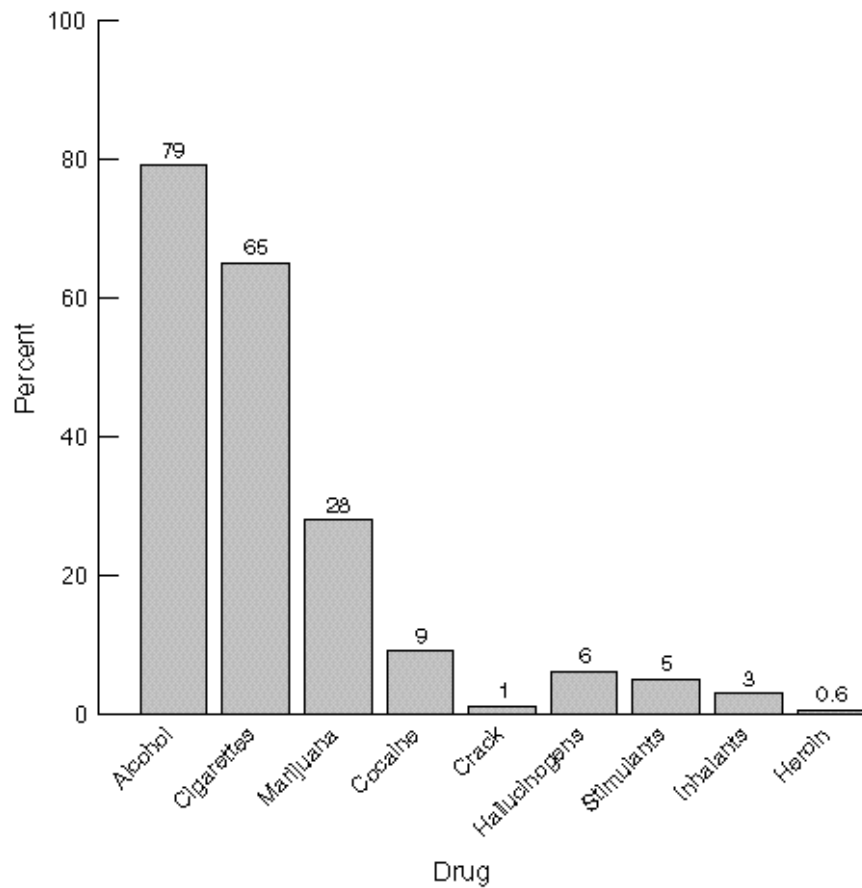


FIGURE 1. *Lifetime prevalence of the use of different drugs among females age 12 and older in the United States, 1992 National Household Survey on Drug Abuse*

SOURCE: Substance Abuse and Mental Health Services Administration 1993

Age Trends in Drug Use

Second, drug use, especially illegal use, is a phenomenon of youth, late adolescence, and early adulthood. Striking differences in the prevalence of illicit drug use can be observed over the life cycle. In 1992, 12 percent of females 12 to 17 years old reported having used an illicit drug during the last year compared with 23 percent among those 18 to 25, 14 percent among those 26 to 34, and 4 percent among those 35 and older. Active use of illicit drugs is concentrated at 12 to 34 years of age and peaks at ages 18 to 25; use declines sharply after age 34.

The use of licit substances also peaks in the same period as illicit drugs but does not exhibit the same sharp decline with age. Thus, the percentage of women who had smoked within the last year in each of the four age groups was 17, 40, 36, and 26 percent, respectively.

Sex Differences in Drug Use

Third, for most substances, a higher proportion of males than females are users. Overall, in the population age 12 years and older, the proportion of those who had ever used an illicit drug in 1992 was lower among women (32 percent) than among men (41 percent). However, a notable exception to this pattern appears among adolescents, for whom the sex difference in prevalence is small. Illustrative data for prevalence of past-year use are presented in table 1.

The sex differences generally increase with age, and within age groups they tend to increase with levels of drug involvement. For instance, in the general population 12 years and older in 1992, more than twice as many men (2.1 percent) as women (0.9 percent) reported lifetime needle use of an illicit drug (Substance Abuse and Mental Health Services Administration 1993, table 19). Similarly, among high school seniors, three times as many boys as girls reported daily use of marijuana or alcohol in 1992 (2.8 percent compared with 1.0 percent for marijuana; 5.2 percent compared with 1.6 percent for alcohol) (Johnston et al. 1993, table 9). There were, however, no sex differences in daily cigarette or cocaine use in the 1992 MTF data.

The rates of use calculated from these surveys are not necessarily representative of problematic drug-using behavior. For example, lifetime use rates include anyone who reports having experimented with a drug, even if only once, and although daily use is reported, it may or may not

TABLE 1. Percentages of people having used an illicit drug in the past year, by age and sex, 1992 National Household Survey on Drug Abuse

Age Group	Women		Men		z
	Percent	Standard Error	Percent	Standard Error	
12-17	12.5	(0.9)	11.0	(0.8)	1.25
Total number	(3,582)		(3,672)		
18-25	22.6	(1.2)	30.4	(1.4)	4.23
Total number	(4,269)		(3,253)		
26-34	14.4	(0.8)	22.3	(1.1)	5.81
Total number	(4,362)		(3,154)		
35+	3.7	(0.4)	6.7	(0.6)	4.17
Total number	(3,631)		(2,710)		
Total	9.0	(0.4)	13.4	(0.6)	6.11
Total number	(15,844)		(12,988)		

SOURCE: Substance Abuse and Mental Health Services Administration 1993, table 2-A

reflect a substance use disorder. Thus, these epidemiologic data provide information on the population at risk for problems associated with substance use but provide little information about the extent of this risk.

Prevalence of Lifetime Drug Dependence

The National Comorbidity Survey (NCS) provides the most current data about the epidemiology of psychiatric disorders, including substance use disorders, in the United States (Kessler et al. 1994). The NCS is based on a nationally representative sample of more than 8,000 individuals ages 15 to 54 who were interviewed in their homes between 1990 and 1992. The interview schedule was specially designed to measure psychiatric disorders according to the *Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised* criteria developed by the American Psychiatric Association (1987). A diagnosis of substance dependence requires that a respondent meet at least three of nine possible criteria. The nine criteria include restriction of activities because of use, tolerance (i.e., a markedly diminished effect with continued use of the same amount of the substance), withdrawal symptoms, pathological use, and social and psychological impairment. Some of these symptoms must have been experienced for at least 1 month or repeatedly over a longer period. NCS data on drug dependence refer to illicit drugs as well as psychotropic drugs used nonmedically.

Drug abuse is considered to be a less severe disorder than dependence, characterized by the recurrent use of a substance in physically hazardous situations or continued use despite knowledge of persistent problems caused by such use. Most of the NCS respondents who qualify for dependence also meet the criteria for abuse. To date, basic NCS prevalence results have been reported more extensively for drug dependence than for drug abuse (Warner et al. 1995).

Dependence is most prevalent with respect to tobacco, followed by alcohol, and then illicit drugs (Anthony et al. 1994). Among women 15 to 54 years old, 5.9 percent meet the criteria for a diagnosis of lifetime dependence on an illicit or psychotropic drug (table 2).

With the exception of tobacco, dependence rates are considerably higher for men than women; the alcohol dependence rate is more than twice as high for men as for women (20.1 v. 8.2 percent; $t=9.7$, $p<0.05$), and the illicit drug dependence rate is more than 50 percent higher (9.2 v. 5.9 percent; $t=3.8$, $p<0.05$).

Risk of Dependence Among Users

The preceding rates provide information about the extent of drug dependence in the household population as a whole. A more accurate estimate of the risk of drug dependence is obtained with restriction of the analysis to those persons who have ever used that particular class of drugs. Once a woman has used any illicit drug, her risk of developing

TABLE 2. *Prevalence of lifetime dependence on three classes of drugs among women and men 15 to 54 years old, 1990-92 National Comorbidity Survey*

Drug	Women		Men		z
	Percent	Standard Error	Percent	Standard Error	
Tobacco	22.6	(1.3)	25.6	(1.4)	1.6
Alcohol	8.2	(0.7)	20.1	(1.0)	9.7
Illicit drugs*	5.9	(0.5)	9.2	(0.7)	3.8
Total number	(4,241)		(3,847)		

*Refers to aggregate category comprising controlled substances and inhalant drugs

SOURCE: Anthony et al. 1994, table 5

dependence appears to be about 1 in 7.5 (Anthony et al. 1994). Among female smokers, the risk of dependence is close to 1 in 3, the highest of any of the substances (table 3).

For all classes of illicit drugs, including nonmedical use of psychotropics, men are significantly more likely than women to meet the lifetime criteria for dependence, once having used the drugs. However, substance-specific analyses reveal several intriguing patterns in the degree to which male and female users differ in rates of developing dependence. There are very slight differences between men and women substance users in the risk of developing lifetime dependence for tobacco and heroin and relatively little difference for cocaine. For alcohol and cannabis, by contrast, the rates of lifetime dependence among lifetime users are more than twice as high among men as among women, whereas among nonmedical users of psychotropics such as sedatives and tranquilizers, women are significantly more likely than men to develop dependence.

The reasons for drug-specific sex differences in dependence among users may stem from greater use of alcohol by males than females (Hilton 1991, pp. 73-86) and the possibility that among psychotherapeutic users, females use more heavily than males. Alternatively, the relative

TABLE 3. *Prevalence of lifetime dependence on three classes of drugs among women and men 15 to 54 years old, 1990-92 National Comorbidity Survey*

Drug*	Women		Men		z
	Percent	Standard Error	Percent	Standard Error	
Tobacco	30.9	(-)	32.7	(-)	(-)
Alcohol	9.2	(0.8)	21.4	(1.0)	9.5
Illicit drugs [†]	12.6	(1.0)	16.4	(1.2)	2.4
Cannabis	5.5	(0.7)	12.0	(1.1)	5.0
Cocaine	14.9	(2.0)	18.0	(1.9)	1.2
Heroin	25.2	(12.9)	22.3	(6.5)	0.2
Psychotropics [‡]	12.3	(2.2)	6.6	(1.0)	2.4

*Base frequencies for users not available

[†]Aggregate category comprising controlled substances and inhalant drugs

[‡]Anxiolytics, sedatives, and hypnotic drugs

SOURCE: Anthony et al. 1994, table 5

contribution of biological v. environmental factors may vary across drugs, and these factors may be more important determinants of dependence when rates among male and female users are not significantly different.

Age Trends in Dependence

Given possible age effects in the liability for drug disorder, dependence that occurs during the 12 months prior to interview may be a better indicator of age-specific patterns in risk for disorder than lifetime rates. Among those who ever used an illicit drug, including nonmedical use of psychotropics, the highest rates of 12-month dependence occur among the youngest respondents to the survey, those ages 15 to 24 (table 4). These rates decline sharply after age 24, and the differences in rates across the three older age groups are moderate, especially among women. With increasing age, women become more likely than men to report 12-month dependence; among those who have used an illicit drug as of their mid-forties, more women than men meet the criteria for dependence within the last 12 months.

For tobacco (table 5), as for illicit drugs, the highest rate of 12-month dependence occurs among the youngest users, and the rates decline progressively with age. However, in contrast to illicit drugs, the rates are higher for women than men at every age.

To further explore the striking National Comorbidity Survey finding that the highest rates of 12-month dependence occur among the youngest users, the authors conducted secondary analyses of NHSDA data, which permit an examination of drug use among respondents 12 years or older, in extension of the lower bound age of 15 in the NCS. The 1991

TABLE 4. *Twelve-month dependence among lifetime users of illicit drugs, by age and sex, 1990-92 National Comorbidity Survey*

Age Group	Women		Men		z
	Percent	Standard Error	Percent	Standard Error	
15-24	5.4	(1.4)	9.6	(2.2)	1.6
25-34	1.9	(0.6)	3.2	(0.7)	1.4
35-44	2.2	(0.8)	2.0	(0.7)	0.2
45+	2.9	(2.5)	1.8	(1.4)	0.4
All users	2.8	(0.5)	4.0	(0.6)	1.5

SOURCE: Warner et al. 1995, table 6

TABLE 5. *Twelve-month dependence among tobacco users, by age and sex, 1990-92 National Comorbidity Survey*

Age Group	Women		Men		z
	Percent	Standard Error	Percent	Standard Error	
15-24	41.5	(4.1)	35.3	(4.0)	1.1
25-34	31.7	(3.9)	26.7	(2.9)	1.0
35-44	26.4	(3.3)	20.6	(2.6)	1.4
45+	19.8	(3.4)	14.8	(2.2)	1.2
All users	28.9	(2.0)	23.2	(1.6)	2.2

SOURCE: Warner and Kessler, unpublished data

NHSDA public use tape, the most recent available at the time of this writing, included items on five 12-month dependence symptoms for four classes of drugs (alcohol, cigarettes, marijuana, and cocaine). The symptoms included attempts to cut down on use, use of larger amounts to achieve effects previously experienced at lower use levels, daily use for 2 or more weeks, feeling of need and dependence on the drug, and withdrawal.

The authors estimated the proportion of women and men ages 12 to 17 and 18 to 25 who had ever used any of the four substances and had experienced two symptoms of dependence on that substance within the year prior to interview (table 6). In adolescence, the rates for females are as high as or higher than for males, suggesting that once an adolescent female uses a drug, she is at high risk for subsequent dependence. In early adulthood, except for cigarettes and cocaine, the rates are twice as high among males as among females.

The NCS rates cited above refer to dependence and do not include persons who meet the criteria for abuse only. Whereas 6 percent of women ages 15 to 54 meet the criteria for lifetime drug dependence, 9 percent meet the lifetime criteria for either drug dependence or abuse, and 15 percent meet the criteria for lifetime alcohol dependence or abuse. If one considers both disorders together, almost one-fifth of women (18 percent) meet the criteria for a lifetime diagnosis of a substance abuse/dependence disorder, whether drug- or alcohol-related (Kessler et al. 1994, table 2). This proportion is half as large as that observed among men (35 percent).

Extensive comorbidity exists between an illicit drug disorder and an alcohol disorder, although it is more likely for those with a drug

TABLE 6. *Percentage of users who experienced two or more components of dependence in 1991, by age, category, and sex; 1991 National Household Survey on Drug Abuse*

	Users Ages 12-17, Percent (total)			
	Alcohol	Cigarettes	Marijuana	Cocaine
Women	10	27	14	10
Total number	(685)	(558)	(178)	(41)
Men	9	28	12	4
Total number	(815)	(668)	(243)	(36)
	Users Ages 18-25, Percent (total)			
	Alcohol	Cigarettes	Marijuana	Cocaine
Women	7	39	4	4
Total number	(2,069)	(1,641)	(1,119)	(377)
Men	14	36	9	4
Total number	(2,058)	(1,619)	(1,193)	(440)

SOURCE: Data tape, 1991 National Household Survey on Drug Abuse (Substance Abuse and Mental Health Services Administration 1991)

disorder also to have an alcohol disorder than the reverse. For example, 68 percent of women ages 15 to 54 who meet the lifetime criteria for drug dependence also meet the criteria for an alcohol disorder, compared with 82 percent of men who meet the lifetime criteria for drug dependence (Warner et al., unpublished data). Conversely, 47 percent of women who meet the criteria for lifetime alcohol dependence meet those for a drug disorder, compared with 41 percent of men (Kessler et al. 1997, table 2).

Comorbidity of Drug Dependence With Other Psychiatric Disorders

Substance use disorders constitute one of several major psychiatric disorder categories, and the rank ordering of the lifetime prevalence of all these disorders reveals substantial sex differences. Among men, substance use disorders, including dependence or abuse, are the most prevalent of the psychiatric disorders (35 percent), compared with 19 percent for anxiety disorders and 15 percent for affective disorders. Among women, however, substance use disorders rank third in

prevalence (18 percent), below anxiety disorders (31 percent) and affective disorders (24 percent) (Kessler et al. 1994).

In addition to the comorbidity between other drug and alcohol disorders documented above, high rates of comorbidity exist between substance disorders and other psychiatric disorders. The extent of comorbidity between any substance use disorder and other psychiatric disorders, both for lifetime and 12 months, is extraordinarily high (Kessler et al. 1996). Slightly more than one-half (51.4 percent) of the NCS respondents with any lifetime substance disorder also meet the lifetime criteria for at least one other psychiatric disorder, and 42.7 percent of those with a 12-month substance disorder experience another psychiatric disorder during the same period. These rates are similar for men and women.

However, analyses of the comorbidity between other psychiatric disorders and illicit drug dependence reveal differences in the prevalences of specific disorder pairings that reflect the sex-specific distribution of psychiatric disorders in the population (table 7).

Among both men and women, alcohol-related disorders are among the most highly comorbid with lifetime drug dependence (82.2 percent among men, 68.1 percent among women). Among women, anxiety disorders rank slightly higher (70.6 percent) than alcohol disorders, and affective disorders rank third (55.3 percent) in terms of comorbid prevalence; among men, the second most highly prevalent comorbid disorders are antisocial personality and conduct disorders (59.2 percent) (Warner et al., unpublished data). According to NCS respondents'

TABLE 7. *Comorbidity of drug dependence with other psychiatric disorders among drug-dependent women and men 15 to 54 years old, 1990-92 National Comorbidity Survey*

Disorder	Women		Men		z
	Percent	Standard Error	Percent	Standard Error	
Anxiety	70.6	(3.5)	43.8	(3.8)	5.2
Affective	55.3	(4.1)	32.7	(3.4)	4.2
Alcohol	68.1	(4.3)	82.2	(2.7)	2.8
Other*	34.4	(5.1)	59.2	(4.0)	3.8
Total number	(241)		(369)		

*Includes conduct and antisocial personality disorders

SOURCE: Warner and Kessler, unpublished data

reports of age at onset for each disorder, the overwhelming majority of drug dependence cases (79 percent for both men and women) are temporally secondary to at least one other psychiatric disorder (Warner et al., unpublished data).

STAGES OF SUBSTANCE INVOLVEMENT

Stages of Use Across Drugs

Research on stages of drug involvement provides another important focus for the epidemiology of substance use among women. There are well-delineated stages and sequences of involvement in the use of drugs during adolescence, which is the period of greatest risk for initiating the use of drugs. Longitudinal research on a cohort of male and female adolescents (New York State [NYS] Follow-Up Cohort) reveals a minimum of three developmental stages of drug use (Kandel 1975; Kandel et al. 1992; Kandel and Yamaguchi 1993). The overall sequence of use transitions through age 35 is displayed for women in figure 2a and for men in figure 2b. The use of alcohol and/or cigarettes, substances that are legal for adults in our society, marks the first stage. The next stage is marijuana use, and the third stage is the use of illicit drugs other than marijuana, such as cocaine. Young people are unlikely to experiment with marijuana without prior experimentation with one of the alcoholic beverages or with cigarettes; few young people try illicit drugs other than marijuana without prior use of marijuana.

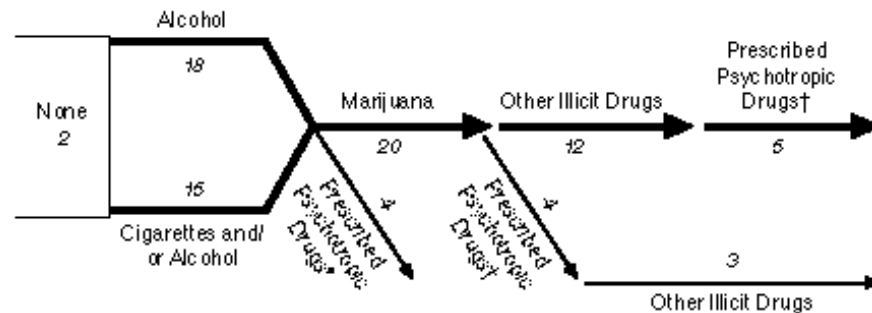


FIGURE 2a. *Sequential stages of drug involvement: Women 34 to 35 years old, New York State Follow-Up Cohort*

*Preceded by both alcohol and cigarettes

†Preceded by both alcohol and marijuana

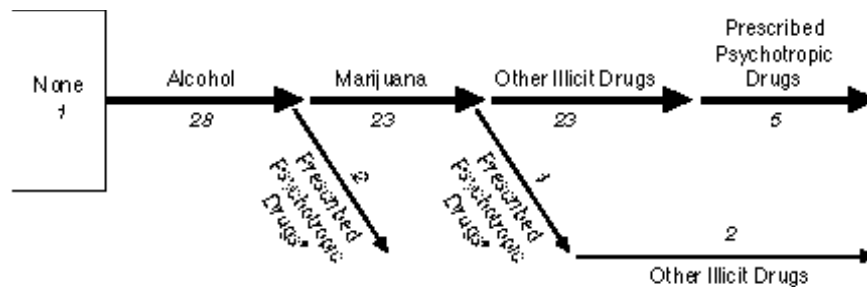


FIGURE 2b. *Sequential stages of drug involvement: Men 34 to 35 years old, New York State Follow-Up Cohort*

*Preceded by both alcohol and cigarettes

The sequence is somewhat different for women than for men in that the smoking of tobacco cigarettes plays a more important role for women in the initiation to illicit drugs. A subgroup of women do not progress to illicit drugs unless they have already used cigarettes; men progress to illicit drugs when they have used alcohol, whether or not they have smoked cigarettes.

Furthermore, many of the young people who have experimented with an illicit drug, especially females, are more likely than their peers who have not tried illicit drugs to use prescribed psychotropic drugs. This finding offers insights into why young people use drugs and highlights the fact that the choice of drugs is partially determined by social factors. The use of prescribed drugs may occur later in the sequence because adolescents are reluctant to see physicians and earlier use of illicit substances may represent unsuccessful attempts at self-medication. In fact, depression among adolescents predicts onset of the use of illicit drugs (Paton et al. 1977). Furthermore, the self-medication interpretation is consonant with the NCS findings that among most comorbid cases, drug dependence develops after the other disorder.

Early age of onset of licit drug use is one of the most important predictors of movement from one type of use to another. In a sample of high school seniors from New York State, boys and girls who by their senior year had experimented with crack had initiated the use of alcohol and cigarettes 2 or 3 years earlier than those who did not progress to using crack (Kandel, unpublished data). Among female seniors, crack users started smoking at an average age of 10.6 years compared with 13.5 for those who remained exclusively cigarette users.

Stages of Symptom Progression Within Drug Classes

Work on the trajectory of use across drug classes provides information about the ages at which intervention might be effective and clues to developmentally appropriate intervention components. In conjunction with these findings, NCS data allow researchers to evaluate both the specific symptoms that are experienced and the ages at which drug users in the general population accrue disorder symptoms and to discover whether a developmental sequence applies to the etiology of abuse or dependence. To date, analyses of patterns of symptom progression in the NCS have been conducted on alcohol users (Nelson et al. 1996). Results show that men experience significantly more symptoms of alcohol dependence than women but that the symptoms cluster in the same three clusters among men and women. Cluster A, the most prevalent, includes symptoms of abuse plus use of alcohol in larger amounts or for longer periods than intended. Cluster B includes symptoms of tolerance, increased time spent using alcohol, and unsuccessful attempts to cut down on use. Cluster C, the least prevalent, includes withdrawal and restriction of life activities because of drinking.

These symptom clusters fit a developmental model. The most prevalent symptoms have the earliest median onset ages (18 to 19 years) and the least prevalent have median onset ages of 20 to 21 years. In addition, the first stage of dependence is usually marked by Cluster A symptoms. If the respondent progresses along a dependence pathway, he or she next usually experiences Cluster B symptoms, then Cluster C symptoms. Nelson and colleagues (1996) have also found that these symptom clusters relate importantly to comorbidity; persons who have no psychiatric disorder except alcohol dependence are more likely to qualify for dependence on the basis of Cluster A symptoms alone, whereas those whose symptom profile included Cluster C at the time of dependence onset are more likely to have a primary psychiatric disorder.

CONSEQUENCES OF SUBSTANCE USE

Substance use disorders have substantial costs for the individuals who experience them and for their families and communities (Rice et al. 1990). These costs are not only financial but are also manifested in terms of role functioning and quality of life. This section reviews some of the effects of substance use on women's lives: the potential

transmission of substance use from mother to child as well as some of the social consequences of substance use for women.

Intergenerational Transmission of Smoking

Maternal drinking and/or smoking during pregnancy has effects on the fetus and on the subsequent behavioral development of children (e.g., Fergusson et al. 1993; Spohr et al. 1993; Filippini et al. 1994; Lewis and Woods 1994). Recent findings suggest that prenatal maternal smoking may also have long-term and unanticipated negative effects on smoking by female children (Kandel et al. 1994).

Independent analyses of mother-child pairs in the NYS Follow-Up Cohort and the National Longitudinal Survey of Youth (NLSY) show that prenatal maternal smoking is significantly associated with the child's smoking by age 13 (table 8). The strength of this association suggests that prenatal exposure to drugs may present an enduring risk factor for children. Furthermore, among children who have smoked, the association is stronger for smoking during the past year than for smoking at some time in their lives, suggesting an important relationship between maternal smoking behavior and the persistence of the child's smoking, over and above the risk for initiation. In both analyses stronger effects were observed for daughters than for sons; preadolescent girls whose mothers smoked at least a pack of cigarettes during their pregnancies were seven times as likely to smoke as girls whose mothers did not smoke during the prenatal period. These results hold for girls in analyses that control for current maternal smoking, but results for boys lose significance: Odds for current smoking among children of prenatal smokers v. nonsmokers are 4.0 for girls in the NYS Follow-Up Cohort and 4.1 in the NLSY; odds for boys are 1.0 and 1.6, respectively.

The mechanisms underlying the maternal influence might include an intrauterine effect whereby nicotine passing through the placenta affects fetal brain development such that substances released by maternal smoking modify the properties of the fetus' dopamine or related systems to predispose the child to the effects of nicotine at a later time in life. The increased liability for nicotine use because of intrauterine exposure may lead to greater likelihood of substance use disorder in general. Maternal exposure to drugs during pregnancy may have latent consequences that require more than a decade to become manifest.

TABLE 8. *Percentage of children who ever smoked or smoked during the past year in two cohorts, by maternal smoking during pregnancy and sex of child*

Cohort	Mother's Smoking During Pregnancy					
	Did Not Smoke		Smoked <1 Pack Per Day		Smoked ≥1 Pack Per Day	
	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error
New York State Follow-Up Cohort						
Boys						
Ever	24.2	(0.05)	20.4	(0.08)	36.3	(0.12)
Last year	14.8	(0.04)	14.9	(0.07)	28.1	(0.12)
Total number	(71)		(23)		(15)	
Girls						
Ever	13.2	(0.05)	46.8	(0.10)	29.4*	(0.11)
Last year	4.3	(0.03)	24.0	(0.09)	29.4*	(0.11)
Total number	(43)		(23)		(18)	
National Longitudinal Survey of Youth						
Boys						
Ever	17.7	(0.02)	28.2	(0.04)	26.9 [†]	(0.08)
Last 3 months	3.2	(0.01)	7.5	(0.02)	8.6	(0.05)
Total number	(251)		(115)		(33)	
Girls						
Ever	19.3	(0.02)	18.2	(0.04)	26.7	(0.08)
Last 3 months	5.2	(0.01)	13.6	(0.03)	17.5*	(0.07)
Total number	(249)		(118)		(30)	

* $p < 0.01$ (chi-squared test)

[†] $p < 0.05$

SOURCE: Kandel et al. 1994, table 1

Why the prenatal effect should be stronger for girls than for boys is not clear, but it merits further exploration. Animal studies have shown, for example, that female rats are more sensitive than males to the neurochemical and neurobehavioral effects of intrauterine exposure to cocaine, a stimulant like nicotine (Dow-Edwards 1989). The sex difference may reflect the distinctive sexual dimorphism of the brain, including hormonal and structural factors, which emerges during fetal development (Kelly 1991, pp. 959-973); the release of androgens may protect the male against the priming effect of nicotine.

Alternatively, a range of previous findings suggests that the female-specific effect may be related to depression: Smoking and depression are correlated in adolescence and adulthood (Breslau et al. 1993; Kandel and Davies 1982); adolescent depression predicts continued and heavy smoking in early adulthood (Kandel and Davies 1982); and depressive disorders are more prevalent among women than among men (Kavanagh and Hops 1994, pp. 45-79; Kessler et al. 1993; Weissman and Klerman 1985). Furthermore, maternal depression has been found to increase the risk of depression, alcoholism, and cocaine and opioid abuse among adult children, especially daughters (Kendler et al. 1993a; Kosten et al. 1991; Luthar et al. 1993; Merikangas et al. 1994). In the absence of genetically informed research designs, the relative contribution of genetic factors and other familial and environmental factors remains open to interpretation (Kendler et al. 1993a, 1993b; Merikangas and Gelentner 1990).

Consequences of Substance Use for Women

Substance use disorders have been linked with a host of other risk factors among women, including involvement in criminal acts to obtain drugs (e.g., larceny or prostitution) and participation in risky sexual behavior (Silverman 1982; Sanchez and Johnson 1987; Leigh 1990; Saxon and Calsyn 1992). Similarly, negative outcomes for women that stem from substance use and its concomitant behaviors range from poor physical and mental health to instability in family and marital relationships, unwanted or early pregnancy, truncated educational pursuits, diminished educational achievement, impoverished occupational role performance, jeopardized access to employment opportunities, and restricted social integration (e.g., Kandel et al. 1987; Mensch and Kandel 1988; Newcomb and Bentler 1988).

Recent analyses of the NCS data show that early-onset psychiatric disorders, including substance use disorders, account for one-fourth of all current high school dropouts in the United States (Kessler et al. 1995). Substance use disorders are responsible for a substantial proportion of these school terminations. Ancillary, long-term consequences are inevitable, as success in education is related to occupational level (Featherman 1980, pp. 675-738), financial security (Jencks et al. 1979), and lifestyle behaviors that affect physical health and emotional well-being (Bowman and Anderson 1963, pp. 247-279).

PUBLIC HEALTH IMPLICATIONS

The relevance of drug use as a serious public health problem among women is brought into sharp relief by the magnitude of the numbers of people potentially affected. On the basis of prevalence data from the 1993 NHSDA (Substance Abuse and Mental Health Services Administration 1994) and the rates of dependence obtained in the NCS, crude estimates of use and dependence for the U.S. female population ages 15 to 54 in 1994 were calculated. The 43.9 percent of women ages 15 to 54 in 1993 who reported having used an illicit drug represents 32.7 million women in 1994; 12.3 percent, or 9.2 million women, had used a drug within the past year, and 26.4 percent, or 19.7 million, had smoked within the past month.

The authors estimate that a total of 7 million women, 15 to 54 years old, have a lifetime drug disorder (4.4 million women meet the criteria for lifetime drug dependence and 2.6 million women meet the criteria for drug abuse). Slightly more than one-quarter million (0.26 million) women meet past-year criteria for a drug disorder. The numbers for alcohol dependence and abuse are higher: 10.9 million women 15 to 54 years old for lifetime dependence and abuse and 4 million for 12-month disorder. A total of 9.5 million women, some of whom are included in the estimates already cited, would meet the criteria for nicotine dependence during the past year. The magnitude of the problem is readily apparent.

Another public health implication of the epidemiologic findings regarding women's substance use is that women's most intense use of drugs occurs during their childbearing years. Figure 3 superimposes the rates of childbearing per 1,000 women on the rates of women's past-year illicit drug use and heavy smoking (i.e., at least a pack a day). The childbearing rates peak in the early twenties, and illicit drug use rates peak in the late teens and remain high in the twenties; rates of smoking rise from adolescence to the early twenties and continue at a steady state thereafter.

Epidemiologic data on the progression of use across drug types and the progression of dependence symptoms within drug types have the potential to discriminate the stages at which interventions might have the greatest impact as well as the types of interventions that might be most effective. Similarly, the descriptive epidemiologic data regarding constellations and temporal orderings of comorbid disorders can

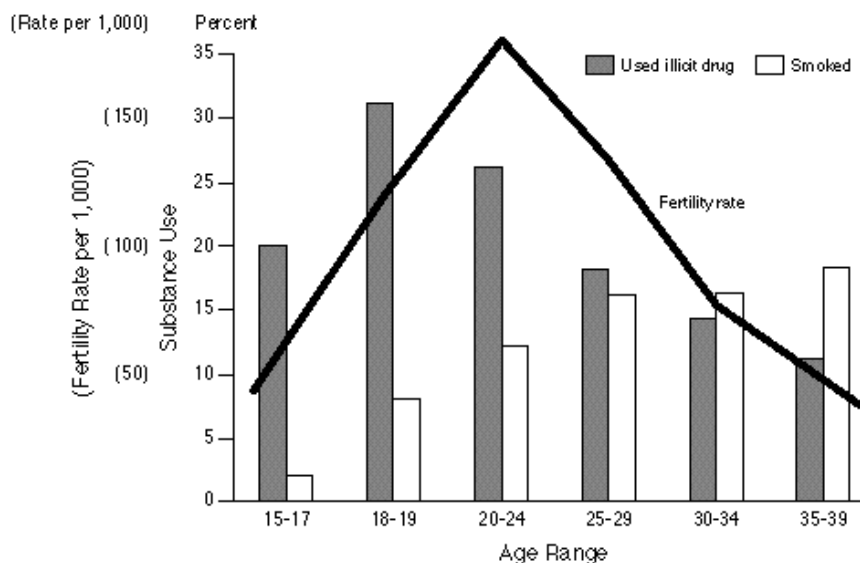


FIGURE 3. Age-specific fertility rates and prevalence of women using illicit drugs or smoking at least a pack of cigarettes a day within the past year, 1991 National Household Survey on Drug Abuse

SOURCE: Substance Abuse and Mental Health Services Administration 1991

elaborate components of both prevention and treatment frameworks. The need for such interventions is underscored by research that shows that persons with comorbidity have greater levels of impairment (Stoffelmayr et al. 1989; Carey et al. 1991; Bennett and McCrady 1993) and poorer treatment outcomes than those with a single drug or psychiatric disorder (Safer 1987).

Given the high rates of comorbidity between substance use disorders and other mental disorders, clinicians should routinely investigate the possibility of comorbidity among all women presenting for treatment, whether the milieu is substance use or psychiatric treatment (Kessler et al. 1997). Similarly, classifications adopted by Federal and State treatment reimbursement plans should carefully consider the relevance of these findings for comprehensive treatment coverage as opposed to coverage for singular disorders considered to have clinical primacy.

Kessler and Price (1993) argue for interventions that specifically seek to prevent the onset of temporally secondary disorders, such as substance use disorders, among people who already have a disorder. Given the

results above, a potentially important population for such targeted intervention might be women with anxiety disorders. The need for this focus is underscored by several specific findings regarding phobias: the high prevalence of substance abuse among patients who seek treatment for phobias (Stockwell and Bolderston 1987), the complications presented by substance use for the effectiveness of behavioral therapy (Marks 1985, pp. 25-35), the limited repertoire of pharmacologic agents available to treat substance-using persons with phobias (Kranzler and Liebowitz 1988), the increased severity of withdrawal symptoms among patients with phobias (Johnston et al. 1991), and the likelihood of a more severe course of substance use stemming from relapses to substance use during periods of fearfulness (Marlatt and Gordon 1980, pp. 410-452; George et al. 1990).

FUTURE DIRECTIONS

The epidemiology of women's drug use presents challenges separate from those raised by men's drug use. This review highlights several specific issues for future research: the greater liability for dependence of adolescent girls compared with adolescent boys; the greater impact of cigarettes for females than males in the sequential progression into drug use; the interrelationship between anxiety disorders, depressive disorders, and drug dependence; and the long-term consequences of prenatal smoking and other forms of substance use.

Understanding these issues and the complexity of substance use and addiction behaviors can come only from a multidisciplinary perspective in which biological, psychological, and sociological factors are taken into account. Such a comprehensive approach must be conducted in tandem with the collection of longitudinal epidemiologic data, which, as has been shown, not only generate insights that can be applied to practice settings but also advance the research agenda by provoking hypotheses regarding the connection between drug use patterns and their proximal and distal consequences.

A framework informed by theories and methods from a range of disciplines is the best hope for a more precise elaboration of the scope and duration of drug use sequelae, the ways in which they interact, and possible mediating factors. With a clearer understanding of the periods during which substance use and disorder have their most powerful effects, and how these effects influence subsequent life experience,

policy decisions can be informed not only by the cost of treatment and prevention programs but also by the potential losses that will occur in the absence of such programs. Empirical evidence is likely to prove that the immediate expense of early intervention and treatment is relatively insubstantial.

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