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## Studying the Natural History of Drug Use

Yih-Ing Hser, Douglas Longshore, Mary-Lynn Brecht and M. Douglas Anglin

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YIH-ING HSER, DOUGLAS LONGSHORE, MARY-LYNN BRECHT AND M. DOUGLAS ANGLIN • UCLA Integrated Substance Abuse Programs, Neuropsychiatric Institute, University of California, Los Angeles

## 1. INTRODUCTION

To understand the process of drug use initiation, progression, addiction, cessation, and recovery, the importance of “natural history” or “drug use career” approaches has been increasingly emphasized (Anglin et al., 1997, 2001; Hser and Anglin, 1991; Hser et al., 1997; Maddux and Desmond, 1986; Sobell et al., 1993; Valillant, 1988, 1992). Findings in the United States have shown that patterns of lifetime drug use and related problems are extremely heterogeneous. Many people experiment with use and then desist, while a subset become frequent users, and only some of these become problematic or dependent users (Chen et al., 1997; Warner et al., 1995). For example, the National Drug Use and Health Survey (DUHS) shows that rates of use of illicit drugs other than marijuana are low (marijuana 39 percent, cocaine 14 percent, methamphetamine 5 percent, and heroin 2 percent). The small subset of serious users, once having initiated use, tends to continue and to accrue attendant problems until ‘captured’ in the criminal justice, health, or drug treatment system.

The only recurrent multi-city study assessing changes in adverse health effects is the Drug Abuse Warning Network (DAWN), by which hospitals and county coroners in selected cities report rates of drug use events or mentions in cases brought before them. DAWN data probably represent a broader range of users, from short-time users who have unexpected or mixed drug reactions to serious users who obtain an unexpectedly pure dose of their primary drug. Regarding the criminal justice system, the only multi-site national study of drug use among arrestees—and the only study to obtain urine for verification of self-report—was the Arrestee Drug Abuse Monitoring (ADAM) program, funded until 2004 by the National Institute of Justice. In the main however, only small, infrequent, and geographically limited epidemiological studies are conducted on the drug use of high social cost populations such as offenders, the mentally ill, the homeless, and so on. But it is in these populations that the majority of natural history studies have been conducted.

Altogether, research on the natural history of problematic drug use in the general population is scanty, and most knowledge about different aspects or stages of drug use careers is based, as noted, on more severe drug users whose health, mental health, and legal problems bring them into contact with the criminal justice system or social services. These are the populations least likely to be represented in national epidemiological surveys. For such ‘system defined’ groups, a consistent finding is the association of more serious drug use with other problematic behavior (emergency department visits, deaths reported to coroners, and so on), leading to the identification of drug users for study who have a certain history length and persisting pattern of use. Such samples are important since they represent socially high cost groups, but may not be representative of the natural history of less involved users.

A better understanding of the developmental and dynamic interplay between drug use overall, severe drug use, other problem behaviors, drug treatment, the criminal justice system, and other service systems is needed generally and will have important implications for improving practice and policy within and across these systems. Additionally, the natural history of drug use and its interplay with service systems also needs to be examined in specific demographic populations. In this chapter, we first provide our conceptual framework for study of the natural history of drug use as it occurs in the United States. Drawing from our own work and others, we describe patterns and correlates of initiation, progression, addiction, and cessation. The chapter then focuses on the natural history of drug use among individuals encountered in drug treatment, criminal justice, and mental health systems, followed by life-history differences with respect to gender and race/ethnicity. The chapter concludes with critical findings and suggests future research to improve the scientific knowledge on the natural history of drug use.

## **2. CONCEPTUAL FRAMEWORK**

In addition to research on the drug use career (Anglin et al., 2001; Hser et al., 1997; Nurco et al., 1975; 1994), which has established that addiction takes a chronic and relapsing course, we have drawn upon the “life course” concept in social psychology, the “illness career” concept in medical sociology, and the “criminal career” concept in criminology. Studies of the life course focus on the timing and consequences of change in social roles, e.g., marital status and occupation. Studies of the illness career have identified stages of illness beginning with problem recognition, health care utilization, primary compliance with caregiver advice, outcomes (e.g., recovery from or chronicity of illness), and secondary compliance (continuing in a long-term treatment regime) (Baltes et al., 1999; Pescosolido, 1991). Finally, we have drawn on research regarding the criminal career, i.e., “the longitudinal sequence of crimes committed by an individual offender” (Blumstein et al., 1986: 12). Criminal career researchers are engaged in mapping trajectories of offending, comparing these trajectories across different background characteristics of offenders, and measuring the interplay between criminal justice intervention and change in offending trajectories (Laub and Sampson, 2001; Piquero et al., 2003).

## **3. DRUG USE PROGRESSION**

The natural history of drug use can be considered in terms of drug use initiation and progression, persistent use, consequences, dependence and addiction, and cessation and recovery. Over the lifetime of a dependent user, some of these

processes may repeat multiple times for the same or different substances. The key factors that influence drug use careers and associated consequences are of particular interest because they may have important implications for intervention development and policy decisions.

### 3.1. Drug Use Initiation and Progression

The work of Kandel and others has shown that among the general population, most drug use initiation occurs during the early teens, and almost no one initiates use of any illicit drug after age 29 (Chen and Kandel, 1995). While the causal significance of developmental stages remains unclear (Morrall et al., 2002), studies have shown that adolescents are very unlikely to experiment with marijuana if they have not experimented previously with an alcoholic beverage or with cigarettes; similarly, very few try illicit drugs other than marijuana without prior use of marijuana (Brook et al., 1982; Donovan and Jessor, 1983; Kandel, 1975). As noted, most of these studies are primarily based on samples that included few serious drug users.

Other studies (Golub and Johnson, 1994; Mackesy-Amiti et al., 1997), based on samples of serious drug users, have found somewhat different sequences in drug use progression than those typically found in the general population. Golub and Johnson (1994) examined a sample of 994 serious drug users (e.g., those smoking crack or injecting heroin on a daily or more frequent basis) recruited in New York City in 1988–89. They found that alcohol use was not a typical prerequisite for progression to marijuana, but marijuana use nearly always preceded use of more serious substances such as cocaine, crack, and heroin. Their data also showed that among those serious substance abusers born in 1963 or later, marijuana appears to be more likely to precede any use of alcohol than the converse. The study results suggest the importance of considering birth cohort as a proxy for sociocultural context, since drug use developmental sequences may depend on the prevalence, availability, and accessibility of the various substances of the era and area. Thus, patterns of drug use initiation and progression may depend on sample characteristics, including regional histories of drug availability, overall level of drug involvement, mode of administration, concurrent behavioral or other problems, or birth cohorts of the sample under study (Johnson and Gerstein, 1998; Mackesy-Amiti et al., 1997; Warner et al., 1995).

Regardless of initiation sequences, however, age at initial use of alcohol, cigarettes, and illicit drugs has been shown to be a powerful predictor of subsequent consequences and dependence. Epidemiological and clinical studies suggest that adolescents who begin drug use at early ages typically use drugs more frequently, escalate to higher levels of use more quickly, and are more likely to persist in using (Anthony and Petronis, 1995; Yu and Williford, 1992).

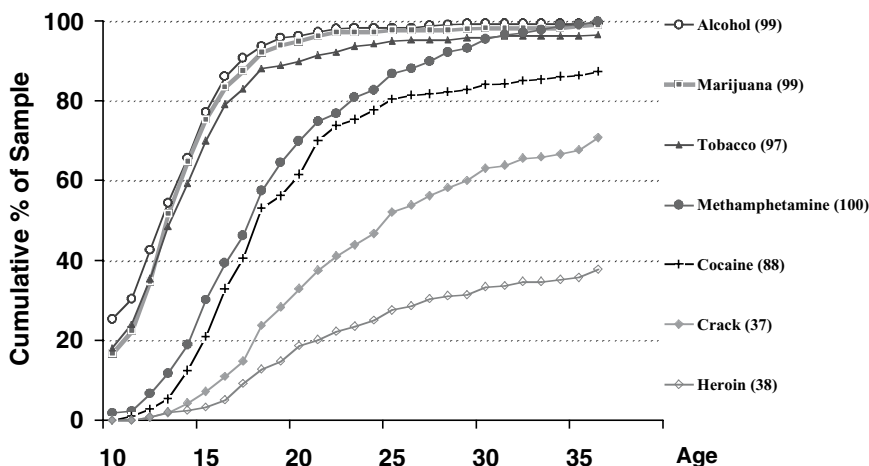
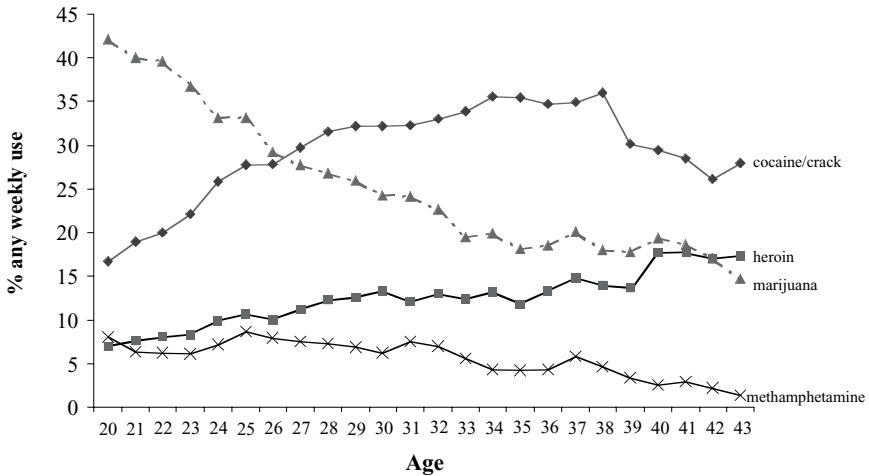


Figure 1. Age of initiation of seven drug types among a sample of methamphetamine users. [ ( ) indicates percent of sample ever reporting use]

### 3.2. Persistent Use

Because the proportions and numbers of serious drug users identified in general population studies are too low for rigorous scientific study, patterns of progression and persistence have been examined among populations in which higher proportions of individuals have progressed, or are likely to progress, to more serious levels of use. As one example to illustrate typical initiation patterns among those who ultimately become problematic users, Figure 1 shows the cumulative percent of a large Los Angeles sample of methamphetamine users arrayed by age of initiation for seven types of substances (Brecht et al., in submission). The so-called ‘gateway’ triad of alcohol, marijuana, and tobacco had been used by over 95 percent of the sample by age 20. Methamphetamine and cocaine use have similar patterns of initiation until about age 27, when methamphetamine use involved 100 percent of this sample and became the persisting drug of use. Crack and heroin use was reported by about 40 percent of the sample, and ages of initiation were more delayed and gradual than for other substances.

Long-term patterns of cocaine, methamphetamine, marijuana, and heroin use were studied by Hser and colleagues (1998) in a sample of approximately 1,800 drug users recruited from three high-risk settings (600 each from jails, hospital emergency rooms, and sexually transmitted diseases clinics) in Los Angeles County. A random subset of 566 drug users was followed over time to provide their natural history of drug use. Figure 2 shows patterns of at least weekly use of cocaine, methamphetamine, marijuana, and heroin by these individuals (Hser, 2002). There were distinct age-related trends for each drug. Marijuana and methamphetamine



**Figure 2.** Self-reported weekly use of illicit drugs over time.

use showed linear declines as the cohort aged, although declines covered different age periods and occurred at different rates over time. Cocaine use increased from age 20 until the mid 30s and declined after the late 30s. Heroin use, on the other hand, increased with age. Thus, these findings clearly suggest that long-term trajectories of use among those who escalate to weekly use or more may differ by drug. Importantly, use peaks at different ages for such users, compared to users in the general population.

### 3.3. Consequences of Use

In a 33-year follow-up of a sample of 581 male narcotic addicts admitted to the California Civil Addict Program (a compulsory drug treatment program for opiate-dependent criminal offenders) from 1962 through 1964 (Hser et al., 2001), it was found that at the latest follow-up (1996/97), when the average age of this sample was 57 years, 284 were confirmed to be dead (48.9 percent), a much higher rate than in the general population of the same age. Death was most often caused by drug/alcohol overdose (21.6 percent), violence or accidents (19.5 percent), and medical conditions (chronic liver disease, 15.2 percent; cancer, 11.7 percent; and cardiovascular disease, 11.7 percent). Among the 242 addicts interviewed, about 40 percent reported past-year heroin use, and many reported current tobacco use (66.9 percent), daily drinking (22.1 percent), and drug use (e.g., past-year use of marijuana was reported by 35.5 percent, cocaine use by 19.4 percent, crack use by 10.3 percent, and methamphetamine use by 11.6 percent). The group also

reported high rates of disability (43.8 percent), health problems (e.g., hepatitis, 41.7 percent), a variety of mental health problems, and criminal justice system involvement.

While mortality increased steadily and at a much higher rate than in the general population, opiate use patterns were remarkably stable; at average age 37, only 38 percent were opiate free at interview, a rate that increased to 41 percent by average age 48, and to 55.8 percent by average age 57. These slow rates of desistance suggest that cessation of opiate use is a very slow process and may not occur for those addicts who have not ceased use by their late 30s. Even among those abstinent for as long as 15 years, a quarter had relapsed in subsequent observations. Similarly, other research has shown that long-term cessation of heroin use is both slow and difficult process for many addicts and is preceded by repeated cycles of abstinence and relapse (Scott et al., 2003; Vaillant, 1992). In contrast, a long-term study of veterans who used heroin in Vietnam showed high remission rates once these veterans returned to home (Price et al., 2001), most often due to reduced stress, lack of drug availability, and return to civilian life with its social roles, benefits, and responsibilities. Another study of male alcohol abusers suggested that, unlike heroin use, relapse to alcohol use was typically rare after abstinence had been maintained for five years (Vaillant, 1996), suggesting that the inherent physiological differences between alcohol and heroin and the type of intervention and subsequent social support for recovery can produce very different outcomes.

In contrast to the heroin data reported above, Hser and colleagues have recently completed a 12-year follow-up study of 321 cocaine-dependent male veterans originally admitted in 1988–89 to their first treatment episode for cocaine dependence (2003a). Their cocaine use careers, from onset of use to treatment entry, averaged 11.5 years. Time-series analysis of severe cocaine use not only demonstrated dramatic reductions of cocaine use following treatment entry but also showed greater treatment effects by type of treatment utilized or longer treatment participation (Khalsa et al., 1993). The 12-year follow-up interviews, at average age 48, showed that although treatment entry at average age 36 produced a significant reduction in cocaine use, some 36 percent of those alive 12 years later reported cocaine/crack use in the prior year, and about 25 percent were positive for cocaine as evidenced by urinalysis (Hser et al., 2003a).

### **3.4. Cessation and Recovery**

Only a few studies have examined cessation of illicit drug use among the general population (e.g., Chen and Kandel, 1998; Price et al., 2001; Vaillant, 1996). For example, some idea of desistance can be obtained from the DUHS by comparing ever use rates to past year rates, with the assumption that those reporting no use in the past year have discontinued their use of a particular drug.

By this rough guide, nearly half of those ever using marijuana had desisted and over 75 percent of cocaine users had desisted. By contrast, most studies on cessation or recovery from serious drug use are based on subjects selected from drug treatment programs for treatment evaluation purposes. Few studies have examined untreated users, either alone or as comparison groups for treated users. In such samples, desistence rates are, as noted in the prior section, less dramatic and frequently require intervention to produce.

#### 3.4.1. Cessation and Recovery in Treated Populations

Nearly all studies of drug treatment confirm the overall effectiveness of residential, outpatient, methadone maintenance, and other treatment modalities (Gerstein and Harwood, 1990; Hubbard et al., 1997; Simpson et al., 1999, 2002). However, the beneficial effect of any single treatment episode is often short-lived, and relapse to drug use is common (Hser et al., 1997; Nurco et al., 1994, Valliant, 1988). On the other hand, studies that focus on a single treatment episode typically ignore the effects of subsequent treatment. Among limited studies that have considered subsequent treatment, results generally suggest favorable outcomes among those reporting additional treatment(s). For example, Weisner and colleagues (2003) found that among those patients not abstinent at 6 months post-admission, treatment readmission was a significant predictor of abstinence at a five-year follow-up. This and other studies have demonstrated the beneficial impact of readmission for those not initially successful in treatment. Furthermore, for some patients, multiple treatment episodes are typical and may be necessary to achieve incremental improvements and eventual cessation (Anglin et al., 2001; Hser et al., 1997).

#### 3.4.2. Cessation and Recovery in Untreated Populations

Recovery can occur without treatment, and although the concept of “spontaneous recovery” is typically applied to less serious users, even severe drug users are capable of quitting as well (e.g., Cunningham et al., 1993). Unfortunately, rates of spontaneous recovery are not well documented; they come primarily from studies of alcohol users and qualitative studies on users of illicit drugs, and the evidence is neither consistent nor conclusive. Reviewing the literature on “spontaneous recovery” from alcohol abuse, Smart (1975) reported overall recovery rates varied across studies from 4 percent to 58 percent and yearly recovery rates since problem identification varied from less than 1 percent to 33 percent. This wide variation in reported rates can, to a great extent, be explained on methodological grounds (e.g., criteria of problematic use and definitions of remission). Some of the more optimistic conclusions on spontaneous recovery may be attributable to the study sample having only mild drug problems (cf. Lindstrom, 1992). Nevertheless,



self-remitters studied by Sobell et al. (1992, 1993) and Klingemann (1991) were reported to have drinking or heroin use histories comparable in severity to various clinical samples. Thus, although the exact rates of self-remission from use of different drugs may vary and remain unclear, self-remission may occur even among people with consumption levels and duration of use similar to that of average clinical populations.

### 3.4.3. Factors Influencing Recovery

Successful termination of problematic drug use results from a complex interactive process, including environmental influences, attitudinal changes, and reorientation of behavior. The exact nature of this interaction, the relative importance of contributing factors, and the context in which they occur are complicated and unclear. However, researchers have reported broad categories that seem applicable. Maddux and Desmond (1980) listed five conditions (relocation, religion, employment, probation/parole, and alcohol substitution) that probably facilitated three-year abstinence in 54 former heroin addicts. Waldorf et al. (1991) suggested six patterns of recovery from heroin use. For example, “situational change” was found to be the main path to recovery for addicts whose heroin use was situational. Working-class addicts living in communities with a high incidence of drug use and criminality reported the most difficulty trying to recover. Middle-class addicts with a greater array of resources either “matured out” by the simple process of aging and related life events (e.g., relocation, marriage, employment) or used other paths out of drug dependence. Maruna (2001) has documented similar patterns of cessation in the criminal career. The natural history approach captures the heterogeneity of recovery processes and provides the larger context in which to design, implement, and assess those policies and practices most likely to result in beneficial change.

## 4. SPECIAL POPULATIONS

Although there are major commonalities in the natural history of many diverse types of substance users, it is important to describe patterns of the natural history for users of different demographic characteristics, and to assess how these factors affect the interplay between drug abuse, drug treatment, and other service systems. Below, we examine gender and racial/ethnic differences in the natural history of drug use and service system involvement.

### 4.1. Gender Differences

Long-term patterns and correlates of drug use may differ by gender (Anglin et al., 1987a, 1987b; Chen and Kandel, 1998; Kandel, 2000; Yamaguchi and

Kandel, 1996). Some studies have shown that women tend to start using alcohol and other drugs at a later age than do men, but they enter into drug treatment after a briefer period of regular drug use (Anglin et al., 1987b) and may be more responsive to treatment (Hser et al., 2003b). While criminal justice involvement is a route to treatment for many users, women are less likely than men to be involved in crime and less often enter treatment under legal pressure (Grella et al., 2003). Several studies (e.g., Brady et al., 1993; Griffin et al., 1989) have reported more psychiatric disorders, particularly affective disorders (Wallen, 1992), among drug-using women than among drug-using men. Additionally, women users have more severe family and social problems (Brady et al., 1993; Grella et al., 2003; Hser et al., 2003b). Studies have also found that women are more likely to have substance using spouses and partners (Grella et al., 2003; Hser et al., 2003b) and that women's drug use is often influenced by their spouses or partners (e.g., Amaro and Hardy-Fanta, 1995). Women generally have lower levels of employment than do men and have primary responsibility for child rearing. They often lack the resources for transportation and childcare, which imposes barriers to their participation in treatment (Kline, 1996; Marsh et al., 2000). Thus, despite a shorter period of regular use before entering treatment, they often demonstrate more severe drug use and psychosocial disorders upon admission to treatment (Grella et al., 2003).

#### **4.2. Racial/Ethnic Differences**

Some studies have found racial/ethnic differences in drug use progression (Mackesy-Amiti et al., 1997; Yamaguchi and Kandel, 1996). Mackesy-Amiti et al. (1997) reported significant race/ethnicity effects for the typical progression (alcohol to marijuana to other drugs) versus atypical comparisons. For example, African Americans were less likely to use other illicit drugs before marijuana compared to non-African Americans. Hispanic addicts may begin using heroin at a younger age than other ethnicities (Trimble et al., 1987), yet time between first opiate use and progression to daily use was similar for Hispanics and Whites in Anglin et al. (1988). Typically, African Americans and Hispanics are over-represented in drug treatment in relation to their proportion of the population (NIDA, 1995), but racial/ethnic differences in treatment need have to be taken into account in studying treatment utilization. Among drug-using arrestees in Los Angeles, African Americans and Hispanics were less likely than Whites to think they needed treatment even though all were using drugs (mostly cocaine) on a daily basis (Longshore et al., 1993). Among persons who do enter treatment, outcomes may be less favorable for African Americans and Hispanics than for Whites (Prendergast et al., 1998; Trimble et al., 1987), although the evidence is not sufficient to support a firm conclusion (Brown and Alterman, 1992).

## 5. CONCLUDING COMMENTS

Drug use can escalate through myriad pathways to more severe levels. Once established, drug dependence frequently has a chronic, relapsing course lasting many years with multiple episodes of treatment and relapse, and stable cessation for many may be observable only in the long term. Accordingly, long-term strategies for curtailing drug use are unlikely to be optimally effective if based on studies with only short-term observations. Furthermore, drug users often come in contact with service systems other than drug treatment, and each system must be able to address not only the problem that brings clients to that system but their drug use and other problems as well. It is critical to take a longitudinal perspective in assessing drug use trajectories and interactions with a variety of service systems and to develop cross-system capabilities to serve the client and society.

Additional conceptual and methodological developments are needed to provide critical knowledge about patterns of drug use and cessation. Our 33-year follow-up study has shown that the eventual cessation of heroin use is a slow process that may not occur at all for some older addicts. However, it is not clear whether similar conclusions can be drawn about cocaine or methamphetamine users. Also, the similarities and differences that may exist in predictors of and pathways to cessation among users of these different drug types or among various special populations of drug users need further explication. Moreover, although many studies have shown that treatment generally reduces drug use and that rates of relapse and return to treatment are high, it is not known how drug use characteristics (e.g., consequences, severity, and chronicity) and treatment characteristics (e.g., type, intensity, and frequency) interact to produce the desired outcomes. Finally, studying predictors and correlates of drug use cessation, relapse, and episodic recovery is important in understanding the process of sustained recovery from dependence. Findings from such studies have practical implications for designing more effective intervention strategies, not only for those who seek formal treatment but also for the many drug-dependent users who do not. The improved scientific understanding of long-term drug use patterns and clinical/services research will expand our ability to develop effective longer-term clinical and policy strategies.

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