CRACK AND THE DEVELOPMENTAL PROGRESSION OF SUBSTANCE ABUSE

Andrew Golub and Bruce D. Johnson
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PATHWAYS TO CRACK

ABSTRACT

The popularity of specific drugs at a given time effects both the substance use of current drug users and abusers and the developmental pathway by which some youthful non-substance users become serious drug abusers. Since the mid 1980s, crack cocaine has been the primary drug of abuse in many American cities. This paper employs data obtained from interviews with 1003 serious drug abusers from New York City to identify the sequence of drugs used prior to onset to crack and examine variation in the developmental pathways over time. The crack abusers born from 1928 to 1957, lived through the time period from 1963 to 1973 when widespread heroin injection prevailed. Consequently, most of these persons injected heroin prior to using crack. However, subjects born more recently, and particularly those born between 1968 and 1972, tended not to have injected heroin. Most of these persons snorted cocaine prior to using crack. However, a substantial proportion onset to crack after experience with alcohol and/or marijuana only.

INTRODUCTION

The popularity of particular drugs and drug practices change over time. During the 1960s and 1970s, many persons initiated the practice of injecting heroin. Consequently, at that time heroin was a primary public concern and substance use programs focused on prevention and recovery from heroin addiction.[1 2 3] Since, the mid-1970s, much fewer persons have onset to heroin injection. Heroin injection remains a problem today, although a considerably different one in that many of the heroin injectors of today initiated their habits back in the 1960s and 1970s. In the 1980s and early 1990s, crack cocaine is the substance abuse problem defined as the greatest concern in many American cities.[4 5 6] Strikingly, prior to the 1980s few persons had heard of crack cocaine and even fewer had used it. This variation in the popularity of particular drugs and routes of consumption over time led to the idea of a *drug era*, a period of time wherein widespread use of a specific drug prevails.[7 8]

A new drug era generally starts out slowly when a few existing drug users pioneer the use of a new substance or technique of consumption. Most such experiments are forgotten and do not effect the subsequent substance use habits of many persons. However, sometimes an idea takes hold and spreads rapidly by word of mouth. Typically, the original pioneers recruit or "turn on" other existing drug users. Subsequently, the rate of recruitment increases as the original pioneers and earliest recruits introduce other users to the substance or technique which leads to further increases in the rate of recruitment.

The rapid rate of recruitment steadily declines after most existing drug users either onset to the new substance or at least have the opportunity. Afterwards, a relatively steady rate of onset prevails as new users, mainly persons first coming of age and starting serious substance use, become users. Eventually, a particular substance or technique may go out of favor which leads to a *decline phase* of the drug era. During such a phase, declining proportions of high-risk persons in younger

birth cohorts coming of age initiate to that substance or technique. However, existing users may continue its use for some time. Thus over a ten to twenty year period, a drug technique such as heroin injection may decline substantially but not completely, due to decreasing prevalence among more recent birth cohorts.

Based primarily upon ethnographic information, Johnson & Manwar identified several drug eras and their approximate times for the New York City drug scene (see Table I).[5 7 8] These drug eras and their dates are specific to New York City and may not necessarily apply to other areas. Of particular importance to this study, Johnson & Manwar identify the period from 1963 to 1973 as the *Heroin Injection Era* and the period from 1985 to the present as the *Crack Era.* Persons coming of age (18) in these eras in the inner-city of New York reported different patterns of drug use and abuse as documented in this paper.

[Table I about here]

The recent growth in the use of crack cocaine has resulted in changes in individual substance use and abuse. Many persons who had already established a pattern of serious drug use and abuse--e.g., snorting cocaine or injecting heroin--added crack to their existing drug habit during the mid to late 1980s; most of the earliest users of crack had established a pattern of serious drug abuse by 1982.[9 10] For these existing substance users, crack was an additional drug in their *pathways* through substance use, the sequence of substances and consumption techniques initiated by an individual over the course of their involvement with substance use and abuse. Once crack's popularity grew and was well established by 1986, many persons who had not yet established a pattern of serious drug abuse, due to their young age, initiated the use of crack cocaine. Had these persons been born twenty years earlier, they might have initiated the use of heroin injection, which they now avoid, and go directly to the "in" drug for their generation, crack.

The early part of an individual's pathway, or *developmental pathway*, describes the sequence of onset to various substances from a time of no substance use as a youth leading to adulthood and the possibility of serious substance abuse. Extensive research, much of it influenced by the seminal work of Denise Kandel and her associates, has established the idea that individuals tend to follow a common developmental pathway.[11 12 13 14 15 16 17 18 19 20 21] Typically, a person's first substance use experience occurs in early adolescence, around age 13, and involves the use of less serious substances such as alcohol or tobacco. Subsequently, some users of these less serious substances progress to the use of marijuana. Reaching age 18 marks a transition into adulthood in many ways. It is the end for many of education, for others the beginning of college, full-time employment, and for many youths in the inner-city, the beginning of long-term under-employment or unemployment. Age 18 also marks a legal transition after which an individual is legally accountable as an adult for their criminal offenses. Similarly, prior empirical results indicate that after age 18, and rarely before, some but not all of the marijuana users initiate the use of more serious substances such as cocaine and heroin.[22] Typically, persons who do not onset to use of more serious substances by mid to late 20s will not initiate their use subsequently.

These prior empirical studies suggest persons typically follow a developmental pathway through the following series of increasingly serious substances, with individuals differing as to how far each progresses: 1) non-substance use of any kind, 2) less serious substance use involving alcohol or tobacco, 3) marijuana, 4) more serious substance use possibly including cocaine and/or heroin. Individuals who do not initiate the use of less serious substances tend not to initiate the use of marijuana, and similarly those who do not initiate the use of marijuana tend not to progress to more serious substance use. These prior studies have typically found only modest variation in the progression of drugs leading to more serious substance use.[11-21] Of course, not all subjects followed precisely the same progression, some skip one or two substances in the progression or onset to a more serious substance prior to less serious substances. More importantly, prior research

has found systematic variations, although minor, in the developmental sequence associated with race--black substance users are less likely to use psychedelics than white users[23]--and gender--cigarettes play a stronger role in progression to serious substance use for females.[22]

DEVELOPMENTAL PATHWAYS AND DRUG ERAS

This study examines the extent to which the developmental pathway has changed during the Crack Era. Previous studies of the developmental pathway have generally restricted their attention to a single birth cohort and, thus, not examined variation over time. Additionally, very few studies of substance use in the 1960s and 1970s delineated the developmental pathway beyond marijuana leading specifically to substances such as heroin injection or crack. This paper uses data from a study of serious drug abusers containing a cross section of birth cohorts, including more recently born individuals, in order to examine variation in individual pathways that lead to crack cocaine abuse. A comparison between the developmental pathways taken by older substance abusers with more recently born substance abusers will document the extent to which crack has led to a change in the developmental pathway of individuals.

The primary hypothesis behind this analysis is that an individual's pathway though substance use depends on changing popularity of specific drugs over time. In particular, this paper examines whether more recent birth cohorts followed different pathways to crack than earlier birth cohorts. In a reciprocal sense, drug eras not only affect what drugs appear in individual pathways but the preferences of existing drug users may influence the development of new drug eras.[7,8,10] In further support of this idea, Williams[24,25] and Hamid[26] provide ethnographic details about how existing drug user preferences changed within a short number of years from cocaine powder, to freebase cocaine, and to crack.

We describe the drug use pathways for persons born in inner New York City in 1953 and 1967 to illustrate differences in drug use experience across cohorts. The cohort born in 1953 corresponds to the oldest subjects included in Kandel's study. These individuals reached age 13 in 1966, when many of this cohort first experimented with less serious substances such as alcohol and cigarettes. From age 13 to 18, which occurred from 1966 to 1971, some of the less serious substance users onset to marijuana. This cohort reached age 18 in 1971, after which time some marijuana users onset to more serious substances. 1971 falls within the Heroin Injection Era. Consequently, persons from this cohort who became involved with serious substances were likely to have onset to heroin injection. Around 1975, the Cocaine Powder Era started. At this time, individuals who had already onset to serious substance use were at increased risk of onset to cocaine powder. In 1985, at the age of 32, the 1953 birth cohort was also confronted with the opportunity to onset to crack cocaine. The hypothesized interaction between drug eras and individual pathways suggests that crack onset in 1985-1987 would be limited to those persons from among the 1953 birth cohort who had previously established a pattern of serious drug use by their mid-twenties involving the injection of heroin and/or snorting of cocaine powder.

In contrast, the cohort born in 1967 may have been children of heroin abusing parents, but would have been under age six when the heroin era came to a close. These persons, as adolescents, experienced the risk of onset to less serious drugs and progression to marijuana use from 1980 to 1985 and reached age 18 at the beginning of the crack era. The idea of drug eras suggests that those who onset to more serious substances were likely to smoke crack but not to inject heroin.

The remainder of this paper empirically examines several important questions regarding the hypothesized inter-relationship between drug eras and pathways through serious substance use particularly focusing upon crack. First, the paper examines whether members of earlier birth cohorts who reported use of crack in 1988-89 generally employed a wider variety of more serious substances--corresponding to previous drug eras--prior to onset to crack. Second, the paper examines where crack cocaine fits into the development pathway to crack among various birth

cohorts. In this regard, the paper examines whether alcohol/marijuana, cocaine snorting, and heroin injection are pre-requisites for onset to crack or whether onset to crack may occur earlier in the developmental sequence.

DATA

Most prior literature on developmental pathways through substance use have employed samples from general populations. The multi-wave, prospective, longitudinal analysis--wherein a group of youths randomly selected from a more general population are interviewed about current substance use at several different points in their lives--provides reliable self-reports of substance use histories and has become an important standard for developmental research on substance use.[20] [21 27] Such prospective studies, however, rarely identify sufficient numbers of serious drug abusers for pathway analysis since the use and especially abuse of heroin or cocaine is relatively rare within general populations. For example, Kandel employs a sample of 1325 subjects reinterviewed at about age 25 as the basis for many of her analyses. Of these 1325 subjects, only 40 (3%) report ever using heroin. Heroin injection should be a primary substance of serious drug use since these persons came of age during the Heroin Injection Era. Hence, probably fewer than 40 of her subjects were serious substance abusers.

This analysis focuses upon pathways to crack among serious drug abusers. The Careers in Crack Project directly recruited 1003 serious drug abusers and sellers (753 of whom report having used crack cocaine) from inner-city Manhattan and obtained retrospective reports of their substance use, illegal drug selling, and non-drug criminality. Obtaining a representative sample of serious drug abusers presents a challenge since these individuals generally maintain limited association with the more conventional, non-drug using community, and often change or do not maintain any permanent place of residence. To obtain as broad a sample from this population as possible, sizable numbers

of serious drug abusers were recruited from several different locales: 1) the streets of Harlem and Washington Heights, 2) drug treatment programs, 3) probation/parole, 4) individuals arrested and released, 5) jail, and 6) prison. The art of locating drug abusers and providing a suitable environment for obtaining reliable responses are documented elsewhere.[28 29] This analysis of the pathway to crack cocaine uses retrospectively reported dates for first use of alcohol, marijuana, cocaine powder (for snorting), intravenous drugs and crack for the 994 subjects who reported ever having used any of these substances; the analysis excludes the nine subjects who claimed to have never used any of these substances. Subjects were not asked about the use of tobacco, another gateway substance, so it can not be included in the analysis.

Compared to more general populations, our subjects (Table II) report a high rate of current use of alcohol and marijuana, and especially more serious substances including cocaine, crack, and intravenous drugs, they report a low rate of marriage, a low level of educational achievement, a high rate of unemployment, a high proportion of the sample have sold drugs, and a high proportion have self-reported one of the serious offenses identified by the FBI as index offenses. These subjects, however, are not unique in their low conformance to mainstream standards; a comparison with other samples drawn from criminal justice and drug treatment populations exhibit comparably poor or slightly better characteristics suggesting that the Careers in Crack sample may provide a fairly representative view of disaffiliated persons who perform poorly in society and get in trouble with both drugs and the law.[29]

[Table II about here]

This study analyzes pathways through substance use with retrospective data obtained from interviews with current drug abusers. Consequently, these data do not indicate the proportion of persons who became crack abusers, nor the proportion of existing drug users who onset to crack. These data exclude persons who desisted from serious drug abuse prior to the emergence of crack

cocaine and includes a disproportionately small number of drug abusers who did not onset to serious crack abuse. Furthermore, this clearly excludes those whose life-styles do not meet a certain profile. These subjects were specifically recruited from the streets and institutional settings to represent specific profiles of serious drug abuse. These respondents are not representative of many occasional recreational users from working, middle and upper socio-economic backgrounds, who tend to incur arrest less frequently, and who rarely associate with serious drug abusers on the streets of New York City. Hence, these subjects are clearly in the right tail of the drug use/abuse distribution in the general population, but are typical of those drug abusers who come to the attention of the criminal justice and drug treatment systems.

ANALYSIS

The analysis employs Markov Models to identify common pathways through onset to each of the following substances and techniques of consumption:

1. Less serious substances--alcohol and/or marijuana. This study focuses on eventual onset to crack. For the purpose of simplifying the exposition this analysis does not distinguish between onset to alcohol and marijuana but, rather, considers the two as a single category of less serious substances. A preliminary analysis found that individuals tend to onset to either alcohol or marijuana in their first year of substance use and that onset to marijuana first has become more prevalent among recent cohorts. Hence, for these persons who became serious substance abusers, the orderly progression from a first substance use experience involving alcohol followed by marijuana use and subsequent onset to more serious substances often did not hold. The details of this analysis are reported elsewhere.[30]

2. Snorting cocaine: In New York City prior to the late 1980s, snorting drugs primarily involved the use of cocaine. The popularity of heroin snorting (without eventual injection) has been uncommon among hard drug abusers. Out of the 994 subjects, 804 (81%) report having snorted cocaine and about half of these subjects (405) report having also snorted heroin. An additional 36 subjects (4% of the sample) report having snorted heroin but not cocaine. The few heroin snorters are classified together with persons who snorted cocaine for this study. The study uses the first year of snorting either cocaine or heroin, whichever occurs first, as the date of onset to cocaine snorting.

3. Intravenous drug use: A sizeable proportion of the serious drug abusers and sellers in the sample report having injected either cocaine or heroin intravenously: 368 out of 994 or 37%. Most of these users report having injected both cocaine and heroin together (330 out of 368 or 90% of intravenous drug users), a practice referred to as speedballing. For this analysis, all individuals who report injecting cocaine or heroin singly or combined are classified as having used drugs intravenously. The study uses the first year of injecting either cocaine or heroin, whichever occurred first, as the date of onset for intravenous drug use.

4. Crack cocaine.

Markov models are commonly used in Operations Research to study transitions between a number of possible states.[31,32] For this analysis, a *state* is defined as a combination of substance use practices to which an individual has onset, by a given time. An individual's state is referred to by the letters LSIC, where each letter represents one of the four substance use practices analyzed and a "/" indicates those substances to which an individual has not onset. For example, LS/C indicates an individual who used less serious substances and snorted cocaine but has not injected drugs nor used crack. A *transition* to a new state is said to have occurred when an individual onsets to a new drug. For example, the transition from L/IC to LSIC refers to someone who started snorting cocaine who had previously only used less serious drugs.

For this analysis, a person can be a user or non-user of each drug, and so there are 2^4 or 16 possible states. An individual can transition from any state to any other state that includes all the substances used in the previous state. Subjects were asked the year in which they first used each substance. Hence, transitions can and do include simultaneous onset to two or more substances when onset to all the substances occurred in the same year. Thus, there are $2^4 \times 2^4 \div 2 = 128$ possible transitions. The first factor of 2^4 accounts for all the possible initial states. The second factor of 2^4 accounts for all the possible final states. The last factor of two accounts for the fact that only forward transitions are possible in this model due to the irreversibility of onset to a substance. For example, L/IC to LSIC represents a possible transition, but the reverse LSIC to L/IC is not possible, since a person is designated as having onset to snorting cocaine even if the

individual subsequently stops. Hence, in these Markov models, an individual's state describes each person's previous substance use which can differ from a person's current substance use. In contrast, Elliot, Huizinga and Menard employed Markov models with states defined by current substance use in order to identify the annual rate of transition between various current drug use patterns.[21]

An individual's substance use history can be conveniently summarized by a series of transitions between substance use states. The number in parentheses associated with each state in the transition diagram (Figure 1) reports how many persons out of a sample of 994 passed through it. The diagram also displays the most common transitions between states as lines connecting the states with a count of the persons who made each transition; to avoid a large number of lines, Figure 1 excludes the less popular transitions, those with fewer than 50 cases.

[Figure 1 about here]

Figure 1 indicates that individuals typically start with less serious substances. Out of 994 subjects, 764 used only alcohol and/or marijuana in the first year of substance use. Of the remaining 230, 135 onset to less serious substances in addition to other substances in the first years of substance use. Hence, somewhere between 77% and 90% of the serious drug abusers included in this study (between 764 and 899 out of 994 persons) onset to alcohol and/or marijuana prior to any of the other substances. After less serious substance use, most progressed to cocaine snorting and many subsequently onset to injecting drugs. Most of the subjects, 753 out of 994, eventually onset to crack. The majority (52%) of those who ever onset to crack cocaine were daily (and multiple times daily) users of crack when interviewed (and were specifically screened for high levels of crack at recruitment). All 753 persons with any onset to crack are referred to below as *current crack abusers.*

Figure 1 reports three most common pathways to crack onset among current crack abusers: 1) a direct pathway from less-serious substance use to crack without intermediate use of cocaine powder or intravenous drugs, 2) a pathway involving cocaine snorting, and 3) a pathway involving both cocaine snorting and intravenous drug use. The hypothesis of an interaction between drug eras and individual pathways suggests that pathways vary across birth cohorts. Table III presents a contingency table analysis of the pathway to crack as a function of birth cohort. For this analysis, each of the 753 subjects who report having onset to crack are classified according to the pathways identified in Figure 1. In order to obtain exhaustive categories and thus maximize the number of subjects included in the analysis, all crack users who had injected drugs prior to crack onset are designated as having followed the injection path. Consequently, some persons designated as having followed the injection pathway in Table III, actually, had not previously snorted cocaine or even onset to less serious substances, although most subjects in the injection pathway had previously snorted cocaine (271 out of 286 or 95%). Similarly, all persons who snorted cocaine but had not injected drugs prior to having onset to crack are designated as having followed the snorting path. Most of these persons also used less serious drugs prior to onset to crack (376 out of 382 or 98%). All other crack users, who neither snorted cocaine or injected drugs prior to crack onset are designated as having followed the direct path. Most of these persons onset to less serious substance use prior to onset to crack (71 out of 85 or 84%). Among the 753 persons who onset to crack, there are 47 cases in which a person onset to an additional substance after onset to crack. For this analysis, persons are classified according to their state when they first onset to crack.

Each individual in Table III is cross-classified as belonging to one of five birth cohorts: 1928-1952, 1953-1957, 1958-1962, 1963-1967 and 1968-1972. The 1953-1957 birth cohort corresponds to the cohort studied by Kandel. The birth cohorts presented in Table III are described according to both their birth years and to the primary drug era(s) prevailing when members of that cohort reached age 18.

[Table III about here]

Each cell in Table III reports the percentage of each cohort (and raw count) that followed each pathway to crack. The product-moment correlation ϕ=.62 clearly indicates a strong association between birth cohort and pathway to crack. Among the current crack abusers from the 1928-1952 birth cohort, 81% onset to intravenous drugs prior to crack, an additional 17% snorted cocaine prior to crack (and had not injected drugs), and only 2% followed the direct pathway to crack. A large, but not quite as overwhelming, proportion of the current crack abusers in the 1953 to 1957 birth cohort, followed the injection pathway (58%), many followed the snorting pathway (40%), and a minimal proportion followed the direct pathway (2%).

In contrast, for current crack abusers from the 1958-1962 birth cohort, the predominant pathway shifted to the snorting pathway (67%). Slightly more than one quarter had used intravenous drugs (26%), and few followed the direct pathway (6%). Individuals born subsequent to 1958 are hypothesized to have reached age 18 subsequent to the Heroin Injection Era and were therefore less likely to initiate intravenous drug use. Most recently, for current crack abusers from the 1968 to 1972 cohort, the snorting pathway still predominated (52%), however, a substantial proportion followed the direct pathway (37%) and relatively few had used intravenous drugs (10%). Hence, among the three most recent cohorts (current crack abusers born from 1958 to 1972) snorting cocaine has been the primary pathway to crack onset. A substantial and increasing proportion of younger cohorts onset to crack directly after experience with less serious substances--without ever snorting or injecting drugs. A decreasing proportion of younger cohorts followed the pathway to crack through intravenous drug use which predominated among older cohorts born before 1958.

CONCLUSION

This paper hypothesized that the prevailing popularity of particular substances in different time periods affects both substance use by existing drug users and the developmental pathway by which some youths progressively transition from non-substance use to possible serious substance abuse. An empirical analysis of the pathways to crack use of serious drug abusers recruited from Northern Manhattan provides strong support to this hypothesis. This analysis identified three predominant pathways among those who reported onset to crack: 1) a direct pathway from alcohol and/or marijuana use to crack without intermediate use of cocaine powder or intravenous drugs, 2) a pathway involving cocaine snorting, and 3) a pathway involving intravenous drug use. Much of the variation in individual pathways to crack onset can be accounted for by variation in birth year and in particular by the drug eras a person lived through. Older birth cohorts, persons born in 1957 and earlier, reached young adulthood or lived through the Heroin Injection Era prevailing from 1963 to 1973. Hence, the majority of the persons who became crack users in 1988-89 followed the heroin injection pathway to crack. Very few of these persons onset to crack without first having experience with other hard drugs--cocaine powder and/or intravenous injection. Among current crack abusers, however, those born in 1958 and later tended to be too young to have experienced the Heroin Injection Era as young adults and most followed the cocaine snorting pathway to crack.

The empirical analysis also suggests that the developmental pathway has changed over time. Among current crack abusers from the most recent birth cohort (1968 to 1972), almost all of them had used alcohol and/or marijuana prior to onset to crack. Injecting heroin appears not to be a necessary part of the pathway to serious drug abuse. Furthermore, although a majority (52%) of this cohort snorted cocaine prior to onset to crack, snorting cocaine does not appear to be a prerequisite since a substantial proportion (37%) reported having followed the direct pathway from less serious substances to crack without snorting or injecting hard drugs.

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Table I: Recent Drug Eras in New York City (Johnson & Manwar 1991)

Drug Era	Approximate Time	Birth Cohort Reaching Age 18 During the Era
Marijuana	1965 to 1979	1947 to 1961
Heroin Injection	1963 to 1973	1945 to 1955
Cocaine Powder	1975 to 1984	1957 to 1966
Cocaine Freebase	1980 to 1984	1962 to 1966
Crack	1985 to ???	1967 to ???

Table II: Profile of the Careers in Crack Sample

Average Age in 1988	28 years
Female	31%
Alcohol: Ever Use Currently Use Median Frequency of Use	75% 57% a few days per week
Marijuana: Ever Use Currently Use Median Frequency of Use	91% 60% a few days per week
Cocaine: Ever Use Currently Use Median Frequency of Use	81% 54% a few days per week
Intravenous Drugs: Ever Use Currently Use Median Frequency of Use	29% 18% once a day
Crack: Ever Use Currently Use Median Frequency of Use	76% 62% 2–3 times per day
Single or Divorced	80%
Did not Graduate High School	48%
Unemployed	75%
Ever Sold Drugs	62%
Ever Committed an Index Offense	81%

Table III: Variation in Pathway to Crack Across Birth Cohorts Among Those With Crack Onset

Birth Cohort Birth years and drug era prevailing at age 18	Pathway to Crack: Direct Pathway	Cocaine Snorting Pathway	Injection Pathway	ROW TOTAL
1928 to 1952: Early Heroin Era	2% (3)	17% (25)	81% (121)	100% (149)
1953 to 1957: Late Heroin and Early Cocaine Powder Eras	2% (3)	40% (51)	58% (74)	100% (128)
1958 to 1962: Cocaine Powder Era	6% (12)	67% (124)	26% (49)	100% (185)
1963 to 1967: Cocaine Freebase Era	13% (21)	70% (117)	17% (29)	100% (167)
1968 to 1972: Crack Era	37% (46)	52% (65)	10% (13)	100% (124)
COLUMN TOTAL	11% (85)	51% (382)	38% (286)	100% (753)

The product-moment correlation between birth cohort and pathway to crack ϕ=.62 and is statistically significant at the α=.01 level.

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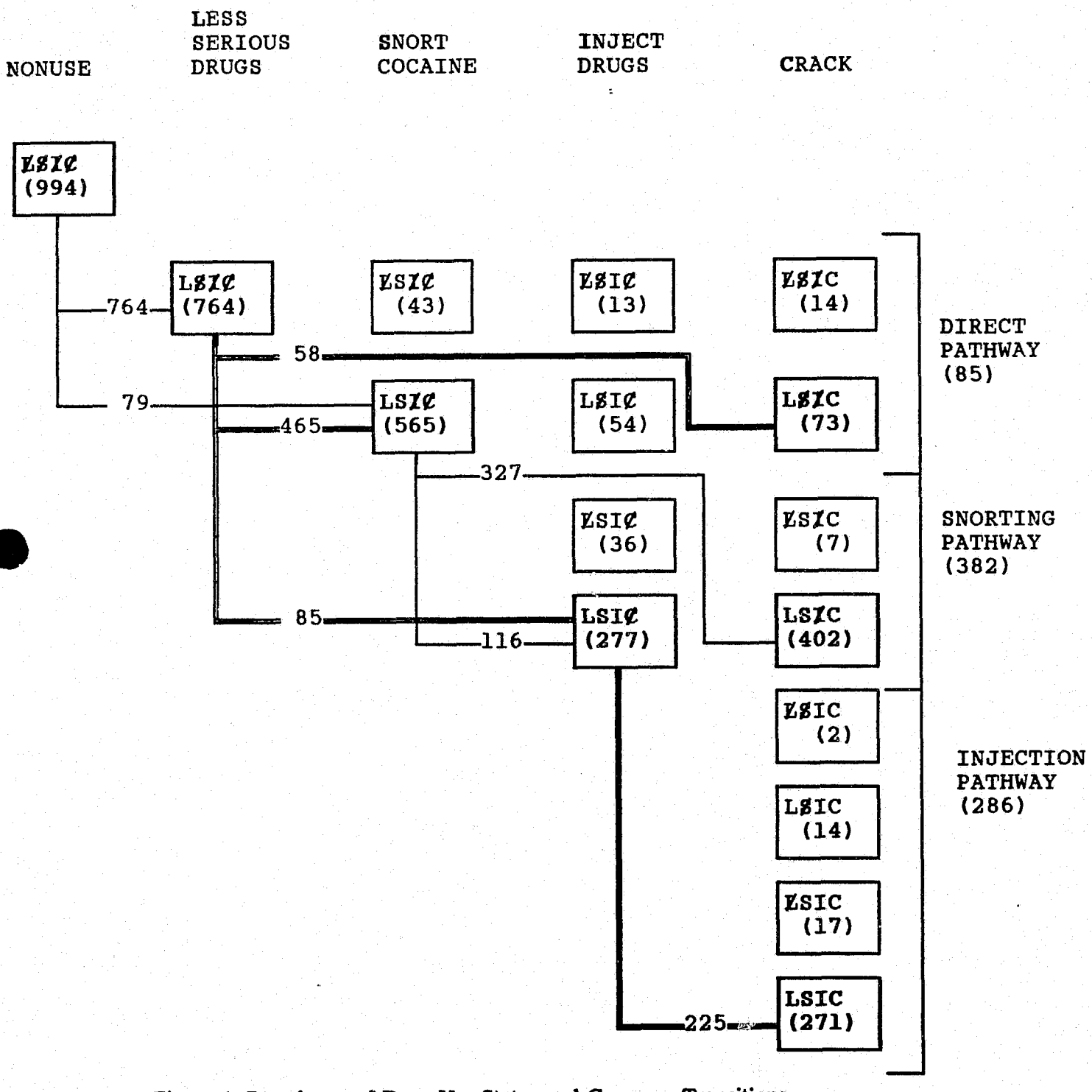

Figure 1: Prevalence of Drug Use States and Common Transitions