

# DRUG USE AND ABUSE

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In recent years, public concern about nonmedical drug use has stimulated a generous allocation of research funds, and this has resulted in a very large body of literature over a wide range of disciplines. The present brief review is necessarily highly selective, both in terms of the areas covered and the literature cited within specific fields. Some areas have been arbitrarily excluded because of the limits of space, others such as pharmacology and animal experimentation have been omitted because of the author's lack of familiarity with the literature. Alcohol and tobacco are not considered, although the aggregate individual and social costs resulting from their use is clearly much larger than that for other drugs. I have attempted to anticipate the topics of general reader interest—emphasizing such areas as current trends in the heroin epidemic, the individual and social impact of marijuana use, evaluations and new developments in treatment and the effectiveness of prevention efforts. Special attention has been given to the epidemiological and behavioral research which describe the dimensions, significance, and trends of current nonmedical drug use.

Probably the best general reviews of nonmedical drug use are contained in the recent reports of the U.S. and Canadian drug commissions. Both commissions issued separate reports on marijuana (23, 80), followed by documents on the overall subject of drug abuse and social policy (24, 79). Reviews of current marijuana research are provided by the annual *Marihuana and Health reports* to Congress (90). The *Federal Strategy for Drug Abuse and Drug Traffic Prevention* reports (1973 and 1974) describe the overall Federal activities and goals, and are a good source of current statistics related to drug use, treatment, and prevention (99, 100).

<sup>1</sup>Preparation of this chapter was supported by Research Scientist Award No KO5-DA-70182 from the National Institute of Mental Health

## THE RECENT EPIDEMIC

Before examining the current prevalence and patterns of drug use, it is of interest to note some of the unique characteristics of the recent drug epidemic among middle class youth. Its initiation in the early 1960s was largely unrelated to the then existing population of users among lower class minority groups. Only opiates, marijuana, and cocaine were proscribed at that time, and the limited nonmedical use of amphetamines and barbiturates was not viewed as a significant problem. Hallucinogen use was almost entirely limited to the ritual consumption of peyote by the Indians. The introduction of marijuana and hallucinogens to the middle class was closely related to the hippie movement and the popularization of LSD which preceded this phenomenon (70). LSD was probably crucial to the formation of the hippie or psychedelic movement, but the ideological and life-style features extended far beyond the associated drug use. Its spread was facilitated by the mass media, popular music, and the introduction of the underground press. In the opinion of the reviewer, the hippie movement of the 1960s was quite a significant social phenomenon. While it did not fully involve more than a small proportion of the total youth population, it influenced the philosophy, music, dress, attitudes, values, and drug-using behavior of a much larger group (69). Much of the widespread adoption of marijuana and other drug use can be viewed as marginal participation of the masses in the styles set by the hippie movement.

With the popularizing of the hippie movement, the original significance of LSD and other drugs was largely dissipated, and ideological factors are not regarded as a major motivation for use at present. Nevertheless, the explanation for many aspects of current drug usage can be traced to the manner of introduction into the culture. First, usage continues to be heavily concentrated among the young—that segment of the population most susceptible to fads and styles. Second, whereas illicit drug use had been largely limited to lower class minority groups in the past, the new phenomena were predominantly among middle class whites. For obvious reasons, the former groups were not responsive to a movement advocating dropping out of an overmaterialistic society. Third, normal curiosity and rebelliousness are more often factors in initiation than are personality defects or poor family backgrounds. Also, the ratio of female to male users is higher than for previous illicit drug usage, probably because of the higher acceptability of the behavior within the peer group. Fourth, the predominant pattern of infrequent usage of small quantities reflects the fact that most individuals are participating in a fad or style rather than being primarily attracted by the pharmacological properties of the drug. Finally, the rapid spread of drug use among secondary and college students throughout most countries of the world is clearly a copying of a style initiated in the United States. Some of these countries such as India have had lower class cannabis-using populations for centuries, but current student usage is an adoption of Western styles rather than a diffusion from indigenous sources. With the peak of the hippie movement now several years past, some of the above relationships are beginning to become less relevant; however, they still need to be considered in interpreting the present status of nonmedical drug use.

## PREVALENCE AND TRENDS

### *Opiates*

The available data permit only a rough estimate of the number of narcotics addicts currently in the United States. Since the population is not sufficiently accessible to household and student surveys (16), various other methods have been employed. Until recently the only estimates were based on case registers. The Bureau of Narcotics and Dangerous Drugs maintained a register based on state and federal arrest reports, and a New York City register included both arrest and health agency data (5). Attempts to estimate the proportion of the overall population contained in registers have been based on the percentage of narcotics deaths (5, 85) or new arrests (39) which are contained in the registers. Other estimates have been based on the incidence of reported serum hepatitis cases ( a disease often spread through unsterile self-injection procedures) and a compilation of estimates from state health agencies (20). The estimated addict population adopted by the Federal Strategy report in 1973 was 500 to 600 thousand (99). In 1974, DuPont (30) estimated a population of 630,000 in the following categories: treatment—130,000; incarcerated—100,000; currently abstinent—200,000; and active addicts—200,000. This points up another difficulty in terms of the definition of an addict—whether persons temporarily abstinent for various reasons are to be included in the estimated addict population. There is also apparently a large number of persons who have used heroin to some extent but have not become addicted. In the 1972 household survey conducted for the U.S. Marihuana Commission, 0.6% of those age 12-17 and 1.3% of those 18 and over reported one or more experiences with heroin (approximately 1.8 million) (79). As mentioned earlier, such surveys typically miss the majority of the street addict population.

Of more importance than the crude prevalence estimates are the data on incidence and trends that have recently become available. With the large number of heroin addicts currently in treatment, it is possible to determine in retrospect that a large heroin epidemic began in the mid-1960s and peaked around 1967-69. Data from New York show the incidence of first use peaked in 1967 and then declined sharply (43). These findings were replicated for persons entering treatment for each year from 1969 to 1973, so the results are apparently not an artifact of the interval between initiation of use and treatment entry. DuPont & Greene (31) found a similar peak in 1969 for incidence of first use in Washington, and Newmeyer (82) reports the same results for San Francisco. Evidence also points to a decline in the number of active addicts. Death rates attributed to narcotics have declined, as have the number of cases of hepatitis (31, 43). In Washington, D C., positive urine tests among arrestees in 1973 showed a significant decline over that for 1972 (31). Finally, the recent decrease in property-related crime has been related to the downturn in the prevalence of active heroin addiction (31, 43).

While it now seems reasonably well established that an epidemic in the initiation of heroin addiction occurred in the late 1960s, and that the indices of active addiction have also now declined, the reasons for these events are less clear. Some of the increase in heroin addiction was clearly a spillover from the middle class

Table 1 Percentage reporting nonmedical drug use in various surveys

Drug	Source	Population	Frequency of use	Year of survey									
				67	68	69	70	71	72	73	74		
Marijuana	Gallup (35)	National, > 18	ever used			4				11	12		
Marijuana	Gallup (34, 35a)	National, College	ever used	5		22	42	51					55
Marijuana	Marijuana Comm (79)	National, 12-17	ever used					14	14				
		National, > 18	ever used					15	16				
Marijuana	Blackford (11)	Ca H S seniors	> 1 time <sup>a</sup>		38	44	50	53	57	59	60		
			> 10 times <sup>a</sup>		22	28	29	37	40	42	43		
			> 50 times <sup>a</sup>				19	25	26	26	28		
Any hallucinogen	Gallup (34)	National, College	ever used	1		4	14	18					
Any hallucinogen	Marijuana Comm (79)	National, 12-17	ever used									5	
		National, > 18	ever used									5	
LSD	Blackford (11)	Ca H S seniors	> 1 time <sup>a</sup>		13	17	15	16	17	17	18		
			> 10 times <sup>a</sup>		5	7	5	5	5	5	4		
			> 50 times <sup>a</sup>				2	2	2	2	1		
Amphetamines	Gallup (34)	National, College	ever used				16	22					
Ethical stimulants	Marijuana Comm (79)	National, 12-17	ever used									4	
		National, > 18	ever used									5	
		Ca H S seniors	> 1 time <sup>a</sup>		18	23	20	25	25	21	23		
			> 10 times <sup>a</sup>		8	10	8	10	11	9	9		
			> 50 times <sup>a</sup>				3	5	5	4	4		
Barbiturates	Gallup (34)	National, College	ever used			10	15	15					
Ethical sedatives	Marijuana Comm (79)	National, 12-17	ever used									3	
		National, > 18	ever used									4	
		Ca H S seniors	> 1 time <sup>a</sup>				14	17	15	13	15		
			> 10 times <sup>a</sup>				5	6	5	5	4		
			> 50 times <sup>a</sup>				2	3	2	2	1		

<sup>a</sup> San Mateo County high school seniors, times used during past 12 months

marijuana-hallucinogen epidemic discussed in the previous section. Sheppard, Gay & Smith (91) report that 40% of those addicted to heroin since 1967 in the Haight-Ashbury drug subculture of San Francisco were heavy users of psychedelic drugs prior to using heroin. However, there was also a marked parallel increase in the incidence of addiction among the lower class minority groups, which have traditionally been involved in heroin use. In what manner this may have been related to the middle class epidemic is unknown. It peaked considerably sooner than the incidence of marijuana and hallucinogen use among the middle class (see Table 1), although it did parallel the vital phase of the hippie movement (1966-69) fairly closely

The large increase in the availability of addiction treatment facilities in the past few years is undoubtedly the source of some of the decline in the indices of current active addiction. The number in methadone maintenance treatment alone has increased from 4000 in 1969 (109) to approximately 80,000 in 1974 (30). Another factor is the success of law enforcement in limiting the availability of heroin. Substantial increases in the retail price of heroin have resulted, with an accompanying decline in the average amount consumed (13, 31). The decline in the indices of addiction prevalence may also be related to the natural decline of an epidemic. DuPont & Greene (31), as well as others, have noted the development of an anti-heroin attitude within the community

### *Marijuana*

Whereas there have been no satisfactory surveys of narcotics addiction in the United States, there is an abundance of surveys of marijuana and other drug use, mostly among student populations. The Marihuana Commission compiled a file of over 200 such surveys, involving more than 900,000 students (79). Table 1 presents survey results for the period 1967-73. The Gallup national poll of college students indicates the prevalence of any use of marijuana increased from 5% in 1967 to 51% in 1971, and the 1971 and 1972 Marihuana Commission surveys found approximately 15% of both youth (age 12-17) and adults had used the drug. The annual high school survey of San Mateo County, California, is of particular interest, since it has employed a standard instrument over the past 7 years and bases its statistics on use during the preceding year rather than in terms of ever having used. The data in Table 1 are based on responses from approximately 5000 high school seniors per year. San Mateo County is adjacent to San Francisco, and thus had an earlier and more pronounced exposure to the hippie movement than did most other areas. The drug usage rates are substantially higher than for most other parts of the country, and probably serve as good indicators of the maximum level of acceptance for the various drugs. It will be noted that marijuana, which is widely regarded as a relatively harmless drug, has continued to increase in popularity, whereas use of the other drugs has been essentially stable over the past few years.

### *Hallucinogens*

The opinion is often expressed that the use of LSD and other hallucinogens has declined sharply over the past few years. Certainly the aggressive propagandizing

of hallucinogen use has largely disappeared, along with the accompanying mass media publicity. Also, the incidence of hospitalizations for bad trips is markedly reduced. However, the available survey data does not show a corresponding decline in use. The rate of LSD use for San Mateo County high school seniors (Table 1) has been stable at about 17% for the past 6 years. Because LSD has often been sold under the name of mescaline in recent years, the actual usage of LSD may have increased <sup>2</sup>

### *Stimulants and Depressants*

Only a portion of nonmedical stimulant and sedative use is detectable through household and student surveys. The intravenous methamphetamine (speed) using population is generally not accessible, and the same is true for sedative and stimulant use by narcotic addicts, alcoholics, and other members of the street drug subculture. One Canadian study of a large sample of hospitalized alcoholics found 10% were barbiturate abusers and one-third of these either were or had been addicted (28). In addition, two studies of heroin addicts admitted to the Lexington hospital in the mid-1960s found the incidence of barbiturate-sedative addiction to be 23% and 35% (17, 42). In 1971 Eckerman et al (32) examined urine specimens collected from random samples of arrestees in six major U.S. cities. The percentage positive for barbiturates ranged from 1% in New York City to 14% for nondrug arrests in Los Angeles. In the three cities for which amphetamine screening was performed, the percentage of positive returns was approximately 3%.

While there are no reliable estimates of the prevalence of intravenous methamphetamine use, there is considerable evidence that usage is down from the peak level reached in the late 1960s. Illicit manufacture has apparently declined, and monthly monitoring of the illicit market by the Bureau of Narcotics and Dangerous Drugs reveals that in most cities the drug is no longer available in large lots (67). Apparently, the high-dose intravenous use observed in the late 1960s has proved to be self-limiting, and most of the concentrated enclaves of users have disappeared (95).

Recent reports by the U.S. and Canadian drug commissions warned of an increasing prevalence in nonmedical use of barbiturates and other sedatives (24, 79). In particular, the nonbarbiturate sedative methaqualone has become popular on the illicit market (37). This reported increase in sedative use is not reflected in the available survey data (Table 1), but may exist among users not accessible to this approach. Certain locales, such as Southern California, are known to have a heavy concentration of sedative abusers. The U.S. Drug Commission also called

<sup>2</sup> LSD, phencyclidine (PCP), and MDA (3, 4-methylene-dioxyamphetamine) are the only hallucinogens available on the illicit market with any regularity at the present time. Of those hallucinogens analyzed by the Federal Bureau of Narcotics and Dangerous Drugs in fiscal year 1971, 80% were LSD and another 10% were LSD and phencyclidine in combination (67). However, illicit hallucinogens are now so frequently alleged to be mescaline that some recent student surveys show the use of mescaline or other non-LSD hallucinogens to be reported more frequently than LSD (9).

attention to the overuse of barbiturates via prescription, calling it "America's hidden drug problem, comparable perhaps to the scope of hidden opiate dependence around the turn of the century" (79). In addition, the Federal government recently acted to sharply curtail the availability of prescription amphetamines, about 85% of which had been used for weight control (67). On the other hand, the authors of the only systematic national survey (1970-71) on the medical use of psychotropic drugs arrived at essentially the opposite conclusion—that usage was comparable to that for other Western industrialized nations, with only minimal excessive use (83).

Cocaine has recently reappeared on the illicit market after an absence of many years. Since this is a relatively new phenomenon, there is little data on incidence and prevalence (107). The 1972 U.S. Drug Commission survey did find 1.5% of youth and 3.2% of adults reporting some usage—more than double the corresponding percentages for any use of heroin (79).

While alcohol use is not included in this review, it should be noted that the rate of increase in illicit use of alcohol by minors during the past 2 or 3 years has probably exceeded that for marijuana or any of the other drugs discussed here (11, 24, 79).

## PATTERNS OF USE: FREQUENCY, AMOUNT, AND DURATION

### *Opiates*

The available survey data indicate that the number of persons who have had some experience with heroin is probably three to four times the current addict population (79). Some portion of these occasional users will eventually become addicted, but it does appear that addiction is not as inevitable as was previously believed. One of the probable reasons for the lower addiction potential among today's users is the typical pattern of multidrug use—heroin may simply be one of several drugs employed on an intermittent basis. Another likely factor is the small amounts of heroin currently consumed. DuPont & Greene (31) cite data for Washington, D.C. showing the average heroin content of the consumer package dropping from 7% in 1970 to 2% in 1973. In 1973, the average amount of heroin per package was only 5 mg. At this level, the typical addict would consume only about 20 mg of heroin per day in comparison to around 60 mg a few years earlier, or a maintenance dose of 135 mg for an English addict in 1969 (98). As a result of the low quality and high prices, most treatment programs report that current addicts evidence only minimal withdrawal signs when deprived of the drug.

One of the most significant recent studies in drug addiction concerns the subsequent drug-using behavior of U.S. military personnel addicted to opiates in Vietnam (86). Of a random sample of 451 army enlisted men who were returned to the United States in September 1971, 44% indicated they had used opiates in Vietnam and 20% felt they were addicted. Eight to 12 months after their return, 10% reported some use of narcotics, 2% indicated current use, and 0.7% addiction.

Urinalysis tests showed 0.7% positive for narcotics. Only 5% of the sample received treatment after return to the United States, and almost all of this was brief and occurred prior to discharge. This natural experiment demonstrates that a drug-using behavior which had been considered highly resistive to change may be strongly dependent on environmental conditions. In Vietnam, pure heroin was available for \$2.50 per 250 mg (43); the mode of administration (heroin smoking) was one not generally associated with addiction, and those affected were subjected to the stress, boredom, and low morale associated with restricted environmental conditions and combat in an unpopular war. Upon return to the United States, continued use of regular narcotics required the expenditure of large sums of money for low-quality heroin, which in turn required intravenous administration to produce significant effects; family and associates were disapproving of narcotics use; and the environmental conditions and opportunities for nondrug activities were greatly improved.

### *Marijuana*

In assessing the significance of current marijuana usage in the United States, it is instructive to compare the patterns of use with those for cultures with a long history of cannabis use. First, with respect to frequency of use, the ratio of daily to occasional cannabis use is very much higher in those cultures than that currently observed in the United States. The Indian Hemp Commission (47) concluded that the more potent preparations (ganja and charas) were seldom used except as a daily habit; and a recent study of the extensive use in Jamaica estimated 40 to 50 percent of the male population used on a daily basis (*Marihuana and Health*, 1972) (90). Other studies in North Africa have estimated that daily use represents one-third or less of the total population of users (87, 96). In any event, less-than-daily use in these cultures is generally ignored as having little significance. In contrast, the 1971 Marihuana Commission survey (1), which found 15% of the population had used marijuana, reported only 0.6% of youth and 0.5% of adults used marijuana one or more times per day. However, the more frequent patterns of use are apparently increasing. The 1972 Marihuana Commission survey found little change in overall prevalence of use, but the rate of daily or more frequent use more than doubled: 1.3% for youth and 1.4% for adults. Similarly, the 1971 results for one or more uses per week were 2.5% for youth and 1.9% for adults, compared to 4.0% and 4.1% respectively in 1972.

The same situation exists with regard to the amount of drug consumed. The typical occasional user in the United States smokes about one 0.5 gram marijuana cigarette per occasion (68). Daily users average around three cigarettes per day with a maximum of about 10. Since most marijuana consumed in the United States averages no more than 1% of the active ingredient—tetrahydrocannabinol (THC)<sup>3</sup>—the casual user is estimated to consume about 5 mg THC per occasion.

<sup>3</sup> Analyses of 40 large seizures (100–2000 pounds each) made by U.S. Customs at the Mexican border in 1971 showed only 25% exceeded 1% in THC content (range 0.07 to 2.87 percent) (14).



Daily users average around 15 mg per day, with very heavy users taking 50 mg. By comparison, moderate daily users in Egypt, Morocco, and India are estimated to consume around 40–60 mg THC per day, with heavy users averaging about 200 mg (69). A recent study in Jamaica estimated heavy usage at around 400 mg THC per day (81), and 100 mg experimental doses are routinely administered to heavy hashish-using subjects in Greece (75). One *ad libitum* experiment in Greece found chronic hashish users averaged 3 to 7 grams of hashish (est. 150–350 mg THC) per day for 30 days (76).

American users are quite capable of consuming larger amounts. A recent 21-day *ad libitum* study found subjects who were previously casual users averaged 60 mg THC per day during the experiment, while subjects who used marijuana daily prior to the experiment averaged 100 mg (81). Similarly, a sample of U.S. military users in Germany was reported to average 3 grams of hashish per day (est. 150 mg THC) (103). However, it may be concluded that under normal conditions, the average amount of marijuana consumed by the U.S. user represents only a small percent of that for other cultures with well-established cannabis-using populations.

The low frequency of marijuana use and small amounts consumed fit the thesis advanced at the beginning of this review—namely, that the recent middle class drug epidemic is more the adoption of a popular style rather than an attraction to the pharmacological properties of the drug. If this thesis is valid, it would be expected that a high proportion of current users would likely discontinue the practice after a few years. For instance, students primarily responding to peer influence might be expected to terminate usage after leaving school. Data on this issue are rather sparse at present. The 1972 Marihuana Commission survey found that, of those 18 and over who had ever used, one-half had now stopped (79). Longitudinal studies of individual users are now in progress, but to the reviewer's knowledge there are no significant published results as yet. Studies of cannabis use in other cultures show initiation is also most common in adolescence and may be discontinued in adulthood. However, usage frequently persists for long periods; and persons using for 20–40 years are not uncommon. At least under conditions of cultural acceptance, cannabis usage appears to have a longevity comparable to that for alcohol and the opiates.

### *Hallucinogens*

Unlike other psychoactive drugs, hallucinogens are rarely used on a daily basis. Tolerance to LSD occurs very rapidly, such that the effects are diminished on the second successive day of use and are largely absent after three daily administrations (19, 106). The same rapid tolerance exists for mescaline, psilocybin, and for some of the other hallucinogens. Thus, for practical purposes, these drugs cannot be used more than once or twice a week without losing much of their impact. Another reason for their relatively infrequent use is their lack of predictable effects. Habitual drug users generally seek to satisfy particular needs—escape, euphoria, anxiety relief, feelings of adequacy, etc. Since hallucinogens are quite inconsistent in terms of mood alteration, they do not meet this requirement.

Survey data support the expectation of infrequent use. Only about 25% of college students reporting having taken hallucinogens indicate usage within the past month (70). High school students tend toward more frequent use, with about 15% of those having used indicating one or more times per week (11, 16). The 1972 Marihuana Commission found similar results; of those having taken hallucinogens, 30% of youth and 15% of adults indicated use within the past month (1).

The amount of LSD taken per occasion is also relatively low. While the alleged potency of LSD dosage units on the illicit market is typically 200–250 mcg, quantitative evaluation of some 1000 samples in fiscal year 1971 found the median content to be 83 mcg (70). LSD dosages used for experimental and psychotherapeutic purposes are generally in the 50–200 mcg range.

The hallucinogens also tend to be self-limiting in terms of duration of use. Most users have been found to either discontinue usage or use very infrequently after a period of 2 or 3 years (8, 71, 88). The reason for this pattern is related to the drug effects. In addition to not being a reliable mood modifier, the hallucinogen experience tends to become less attractive with continued use. The major utility of these drugs is the uniqueness of the experience. As it is repeated many times, what was initially unique becomes more commonplace and there is a process of diminishing returns. The effect of hallucinogens is indeed “a trip” and trips tend to lose their appeal when repeated too often.

### *Stimulants and Depressants*

The pattern of nonmedical stimulant use will vary with the motivation of the user. Students studying for examinations, truck drivers, and other persons attempting to temporarily combat fatigue will take them on an as-needed basis. Occasional usage also seems to be the pattern for oral consumption of stimulants by young persons for euphoriant purposes. Similar usage occurs for barbiturates and other sedatives, often in combination with alcohol or marijuana. When used in this manner the typical dosages are around 20–30 mg for amphetamines and 300 mg for secobarbital or other short- or intermediate-acting barbiturates (67).

An unknown number of persons use oral amphetamines nonmedically on a daily basis and acquire a high level of tolerance. Typical daily dosages for this group range from 200 to 700 mg per day (40, 53).

In addition to the occasional use of sedatives by youths using many drugs, there is also substantial consumption among alcoholics, heroin addicts, methadone patients, and others. Usage may be intermittent or chronic. Tolerance to barbiturates does not develop to the same extent as for amphetamines, and the ratio of lethal to therapeutic dose is also much smaller. The typical daily dosage reported for chronic nonmedical users is around 800–1500 mg (28), although daily dosages averaging 2400 mg have been observed among barbiturate-using heroin addicts (25). Daily dosages above the 500–800 mg level generally produce physical addiction (48).

The pattern of intravenous methamphetamine use in the late 1960s was in “runs” lasting several days, with only a few days between runs. The drug was injected several times per day, and the typical daily dosages were of the order of

800–2400 mg (58). As mentioned earlier, this type of high-dose intravenous use appears to have sharply declined, although some observers indicate that there is now a more moderate pattern of intravenous use on a more episodic basis (24, 95).

Relatively little is known about the current patterns of cocaine use other than from anecdotal reports. It is quite expensive, is considered to be a high-status drug, and is used mostly by the middle class marijuana-psychedelic group (107). The usual mode of administration is sniffing rather than the intravenous route employed by heroin addicts during an earlier period. Partly because of the high cost, most current usage is thought to be intermittent and in small amounts.

## ETIOLOGY AND METHODS OF SPREAD

The limited scope of this review does not permit a review of the demographic, behavioral, and personality variables related to opiate addiction. Books by Chien and associates (18) and Ball & Chambers (7) provide good descriptions of the pre-1960 era. Robins (86) describes the military Vietnam opiate user as follows: "The man most likely to be detected positive in Vietnam was a young, single, black, low-ranking member of the Regular Army who had little education, came from a broken home, had an arrest history before Service, and had used drugs before Service."

The spread of heroin use has recently been investigated in terms of the contagious disease model (45, 46, 60), an approach first utilized by de Alarcon in England (26). The method shows considerable promise for identifying users in the early stages of an epidemic, especially when it occurs in a fairly well defined community. This, in turn, permits the early application of intervention approaches.

The characteristics of the current young middle class drug user have been described in dozens of studies—mostly for college populations. The early studies typically compared users and nonusers of marijuana. As the latter category receded to a minority status in some schools, populations were generally categorized in terms of frequent, occasional, and nonuse. Users are more likely than nonusers to come from urban professional families with above average education and income (12, 21, 38). Especially during the early phases of the epidemic, use was much higher for white as opposed to minority groups (12, 84). Males outnumber females, especially in the more frequent-use categories (68). Users are somewhat more likely to come from broken homes (12, 92), or to describe their parents' relationship as poor (6), and to have liberal parents (44). They are more likely to have fathers who use alcohol and tobacco and mothers who use tranquilizers (44, 92). However, Kandel (54) recently employed data obtained from triads—parents, adolescent and best school friend—to establish that, while parent's drug usage was positively related to adolescent use, peer group influence was much greater.

Haagen (41) has conducted one of the more interesting studies of the social and psychological correlates of marijuana use. He collected extensive biographical and test data at the time of college admission (1965), when virtually none of the sample had used marijuana, and again following the third year of college when

59% reported some use. At the time of admission, those who subsequently became occasional or frequent marijuana users scored slightly higher than the nonuser group on aptitude and achievement tests. On the other hand, the group that later used frequently had poorer study habits in high school, worked less hard, were more dissatisfied with school, and made lower grades than did the nonuser group. The frequent-using group were much more undecided as to their intended major at the time of admission, and continued to be uncertain about plans subsequent to college. They were more interested in social life, more accepting of nonconformist philosophy, and moved more in this direction during college. Another longitudinal study by Johnson (51a) followed 2200 males from the 10th grade in 1966 to one year past high school (1970). The findings are generally the same as those found by Haagen, but more limited in scope.

Smith (93, 94) has also conducted a prospective study of high school students, finding self and peer ratings of rebelliousness to be among the best predictors of those who subsequently became users of marijuana and other drugs. Jessor et al (50) have also reported some success in predicting, on the basis of various personality, belief, and attitude scores, which high school nonusers would subsequently initiate marijuana use. In addition, they found that those beginning use showed greater changes on these variables than did the continuing nonusers. None of these results occurred in the college sample.

As would be expected, users are more likely to consume alcohol and tobacco. In general, they exhibit a more unstable life style with respect to residence, work, school, and goals (44). They receive more traffic violations (44, 51), are more likely to have sought psychiatric counseling (51), are less religious, belong to fewer organizations, and participate less in athletics (41, 44). Users have sexual relations at an earlier age, more frequently, and with more partners (44, 51). They exhibit more liberal and leftist political views, see themselves as outside the larger society, have less respect for authority, and are more likely to be activists (12, 38, 44).

## EFFECTS OF MARIJUANA AND HALLUCINOGEN USE

Again, space does not permit more than a cursory examination of the literature in this area. At present the only clearly established physical complication resulting from heavy marijuana or hashish use is bronchitis (103). Two widely publicized preliminary studies have suggested possible serious physical damage from heavy marijuana use. One found evidence of cerebral atrophy among a sample of ten hospitalized patients with a history of marijuana and other drug use (15). The second reported a significantly lower level of cellular mediated immunity among marijuana users as compared to nonusers (77). Neither of these findings has been replicated. One recent study reported a depression of testosterone levels among a sample using marijuana four or more times per week (mean of 9 cigarettes per week) (56a). Soueif found a sample of 850 imprisoned for hashish use in Egypt tended to score lower than nonusers on various psychomotor and simple cognitive tests, however, adequate controls for age and education were not maintained (97).

Several authors have attributed various adverse behavioral and personality

problems to the frequent use of marijuana, especially that by adolescents (55-57). Others have criticized these conclusions on methodological grounds, showing that the same results can be predicted equally well by other associated forms of deviance such as premarital sex and high school truancy (4, 51). Regardless of the extent to which the relationship is causal or associational, there is clear evidence that heavy marijuana and hallucinogen users do consistently exhibit high rates of unemployment and general underachievement (8, 10, 88).

Two recent experimental studies have explored the effect of marijuana on productivity. In one study subjects were engaged in a microeconomy system in which they were paid on a piecework basis for making wooden stools or weaving woolen belts over a period of 3 to 4 months (23). The results showed dose-dependent decrements in productivity, and discontinuation of marijuana was followed by an increase in productivity. The second study collected detailed data on the work output of Jamaican laborers before and after smoking marijuana (89). The results showed marijuana intake caused decreased productivity per unit of time, an increase in calories consumed per unit of work, and less organization in work movements, greater repetition, and greater variability as measured in a videotape analysis.

With regard to hallucinogen effects, the long-term psychological effects of LSD have been reviewed recently by McWilliams & Tuttle (74). While the long-standing controversy over LSD and chromosomal alterations is not completely resolved, recent reviews suggest that it does not cause lasting chromosome breaks *in vivo* (29, 61). Four studies have employed at least a portion of the Halstead-Reitan test battery in an attempt to measure any LSD-related organicity. Three of these (3, 22, 72) found that the LSD group scored worse than the comparison group on some of the tests, but the results were not consistent across the three studies. The other study found no effect (108). None was able to control for possible predrug differences in the LSD and comparison groups. Furthermore, those test differences found were generally not correlated with the number of reported LSD ingestions.

## PREVENTION

Public concern over the recent drug epidemic has stimulated a large increase in prevention efforts in the past few years. Those directed at limiting the supply have been relatively successful with regard to heroin (13, 31). However, the overall impact of drug education efforts are regarded as highly uncertain.<sup>4</sup> This sentiment is reflected by a 1973 moratorium on the Federal production and support of new educational and mass media materials related to drug abuse (99). Also, in 1973 the National Marihuana Commission (79) concluded that no drug education program in the United States or elsewhere had been proved sufficiently successful to warrant its recommendation, and therefore suggested a moratorium on all drug

<sup>4</sup> Good reviews of drug education and other prevention efforts are contained in Wald & Abrams (105) and Abrams, Garfield & Swisher (2)

education programs in the schools and the repeal of legislative requirements for such courses in the school curriculum. These rather drastic recommendations resulted from the inability to demonstrate that drug education programs were effective in reducing drug-using behavior, and in some instances the programs may well have been counterproductive (101, 102). Mass media drug prevention efforts were similarly unevaluated (78)

Part of the drug education problem stemmed from the uniqueness of the middle class drug epidemic discussed at the beginning of this review. Previously, drug education stressed the health hazards of alcohol and tobacco and, while the warnings might be ignored, there was no active opposition to the material being presented. With the advent of the new drug epidemic, teachers were at a disadvantage with respect to the students because of the lack of first-hand experience with the drugs being discussed. They were also faced with the problem of how to deal with drug use closely associated with an antiestablishment movement. Whereas student use of alcohol and tobacco had long been associated with rebellion against authority, there was previously no associated prodrug philosophy which claimed beneficial effects from the drug use per se. Finally, the teacher was forced to advocate complete abstinence with regard to illicit drugs, a stance that was likely to be rejected outright by the casual marijuana user.

In the face of these difficulties, there has been a tendency to de-emphasize the drug issue by integrating the educational material with other relevant courses, and to utilize "affective training" techniques aimed at developing overall responsible behavior. Problem solutions, peer group pressure, and value clarification are explored by methods ranging from casual rap sessions to intensive encounter groups. Without questioning the potential value of these approaches, many do see a danger of overgeneralizing, i.e. dismissing cognitive drug education on the basis of experience obtained in the recent highly atypical drug epidemic. Drug use is not normally encountered as an integral part of an ideological movement replete with advocates, a supportive underground press, and an accompanying art and music form.

Most of the secondary prevention techniques which have been employed have not come under the criticism leveled at drug education efforts. These include school counseling, "hot lines," crisis centers, free clinics, and street drug analysis services. Such intervention approaches usually aim at preventing the young drug user from drifting into more destructive drug using or other behavior. They are typically more oriented toward encouraging moderation and good judgment than total abstinence, and serve a useful function in helping prevent further social isolation and alienation of a group that is not especially deviant in other respects.

## TREATMENT

Treatment emphasis has been largely limited to narcotics addiction, and methadone maintenance is currently the major modality. DuPont (30) estimated there were around 80,000 methadone maintenance patients in 1974, and that the number had been stable for the preceding year. With the exception of a few

localities, there are currently no waiting lists for methadone or other forms of treatment. The other well-defined volunteer modality is the therapeutic community, with a probable population of 10-15 thousand. Civil commitment accounts for an additional 18,000 (not including those also on methadone maintenance) in the Federal, California, and New York programs (73). An unknown additional number receive treatment at various detoxification and other centers—primarily on an outpatient basis. DuPont (30) estimated a total treatment population of 130,000 in 1974. Since treatment capacity is no longer a limiting factor, Federal efforts are being made to increase the treatment population through an informal system of diversion from the criminal justice system (TASC—Treatment Alternatives to Street Crime) (99).

It is probably fair to conclude that methadone maintenance has passed the honeymoon stage. The criticism of substituting one narcotic for another has continued, and as yet there is little evidence that a significant portion of methadone patients are eventually able to withdraw and remain abstinent. As this form of treatment has expanded and incorporated a less select population of addicts, the early one-year retention rates of 85%, found by Dole (36), have tended to drop closer to 40 to 50 percent (65). Some authors have also challenged the highly optimistic early reports of improved socialization in terms of employment and reduced crime (62). Nevertheless, methadone maintenance has been able to attract and retain a much higher number of narcotics addicts than any other form of volunteer treatment. There is little doubt that it has substantially reduced both the individual and social costs of addiction. Therapeutic communities (27) achieve excellent results for some addicts at relatively low cost, however, only a fraction of the addict population is attracted to this mode of treatment, and only about 10% of these remain (33, 63). Civil commitment, as it is now employed, is generally considered too coercive for the individual benefits achieved (59, 64); although for perhaps two-thirds of the addict population, some level of compulsion is probably necessary to limit the associated criminal costs of addiction (73).

Experimental heroin maintenance programs have been proposed in both the United States and Canada as a means of attracting larger numbers of addicts into treatment (24, 104). This approach has been relatively successful in England,<sup>5</sup> but the differences in the history, size, and nature of the problem makes it unlikely that it will be adopted in the United States in the near future.

A great deal of research has been directed toward developing a satisfactory opiate antagonist in the past few years. Cyclazocine has been in experimental use for several years, and oral doses effectively block opiate effects for 24 hours. However, it frequently produces undesirable side effects. Naloxone is an effective antagonist with little or no agonist activity, however, it is short acting, requires large doses, and is expensive. The most promising antagonist currently in the clinical testing phase is naltrexone. It is effective for 24 hours in moderate oral doses and has little agonist activity (66). While this represents a considerable

<sup>5</sup> In actuality, most maintenance patients in England now receive methadone rather than heroin, although it is typically injected rather than taken orally (52)

advance in the search for effective narcotic antagonists, it does not solve the problem of treatment motivation on the part of the patient. Many observers believe that a means of producing a narcotic blockade for several days or weeks is necessary before this approach will have wide applicability. Research is also continuing on the long-acting methadone congeners (49)

Treatment and preventive directions which are to be emphasized in current Federal plans include: expanded treatment for polydrug abuse, further attempts to provide job opportunities for the ex-drug addict, efforts to enlarge the treatment population through cooperation between therapeutic agencies and the criminal justice systems, school-based early intervention programs, and increased law enforcement efforts against illicit drug traffic (100)

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