Published in final edited form as:
Subst Use Misuse. 2001 October ; 36(12): 1699–1729.

IS THE U.S. EXPERIENCING AN INCIPIENT EPIDEMIC OF HALLUCINOGEN USE?

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Abstract

NHSDA and MTF survey data indicate "epidemic"-like growth in hallucinogen use from 1992-1996 and associated increases in cocaine, crack, heroin and amphetamine use. These trends might have resulted from a proliferation of raves and dance clubs in the U.S. as occurred in Europe and elsewhere, although in contrast to evidence regarding European experiences the American epidemic involves primarily teens as opposed to persons in their twenties and involves primarily use of LSD as opposed to MDMA. This analysis highlights the need for further research into the context, significance, and consequences of these recently popular American drug use practices.

Keywords

Hallucinogens; Club drugs; "Raves"; Drug use epidemics

INTRODUCTION

An individual's life experiences are strongly mediated by prevailing historical events, such as economic depression or war, as well as endogenous social changes which can lead to shifts in fashion, musical preferences and drug use (1,2). In this regard, illicit drug use is typically embedded within a social context (3-5). As different social venues emerge, the various drugs-of-choice occasionally change. Thus, the substances to which an individual is exposed strongly depends on the prevailing culture (and/or drug subcultures) and how the individual is situated within it. Zinberg (6) describes how a substance's effect is further mediated by an individual's mindset and upon the expectations of the social context in which it is used. Consequently, substance use often varies with birth year as well as geographic location, race/ethnicity, and socio-economic status among other factors. Drug use can also often vary with gender as expectations for males and females within a social context can differ (7).

For some, recent substance use appears to be situated within various *club drugs venues* (described below). A Community Drug Alert Bulletin from the National Institute on Drug Abuse (8) maintains that club drug use represents a growing threat to public health in the U.S.:

> A number of our Nation's best monitoring mechanisms are detecting alarming increases in the popularity of some very dangerous substances known collectively as "club drugs." This term refers to drugs being used by young adults at all-night dance

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parties such as “raves” or “trances,” dance clubs, and bars. MDMA (Ecstasy), GHB, Rohypnol, Ketamine, Methamphetamine and LSD are some of the club or party drugs gaining popularity.

This paper presents a secondary analysis of data from two surveys of the U.S. population: The National Household Survey on Drug Abuse (NHSDA) and the Monitoring the Future (MTF) programs. The inquiry was also informed by limited qualitative information about the nature of club drugs venues and by a conceptualization for the dynamics of a drug use epidemic. This understanding led to new ways to look at the available data than have been employed previously.

Referring to a drug use trend as an “epidemic” implicitly invokes a metaphor between a social contagion and a disease epidemic. Such usage in the mass media can create images of an uncontrollable development causing massive devastation. That is not the sense in which we use this term. Social scientists refer to the process by which an idea or behavior spreads within a population via communication among individuals as an epidemic or in many disciplines [but not as much in drug use(r) research] as a *diffusion of innovation* (9). This usage highlights the mathematical similarity among communication processes and is not meant to presuppose the extent to which individuals have been pressured (or not) to use the drug, how wide-spread usage has (or will) spread, and the impact use will have. These factors differ widely across “epidemics”.

In this paper, we summarize much of what is known about the nature of club drug venues from scientific publications. Subsequently, we examine the extent to which data from the NHSDA and MTF surveys are consistent with a possible “epidemic” and what these data say about the course of any such epidemic. Throughout the paper, we refer to a “hallucinogen epidemic” instead of a “club drugs epidemic” because the NHSDA and MTF surveys ask about use of hallucinogens but not where the use took place. Consequently, we do not know the extent to which the self-reported use of the specific drugs NIDA is concerned about has occurred at club drug venues such as “raves”. Conceivably, their use could be as popular or even more popular in other social contexts. Ethnographic studies have clearly identified the use of club drugs at “raves” and other social contexts. However, this type of research has yet to establish how much hallucinogen use is occurring outside of such activities.

The central linkage between increased hallucinogen use and increased participation in “club drug venues” has not yet been established. This distinction represents more than a rhetorical exercise. Knowledge about the context(s) in which use of hallucinogens or other presumed club drugs has been growing has important implications for developing an appropriately-targeted public policy response. The discussion of findings returns to this issue and raises other important questions for subsequent quantitative and qualitative research.

Club Drugs Venues

A scientific understanding of club drug venues and their associated substance use has been emerging in the United States (10,11), Great Britain (12,13), Holland (14), Europe (15), and Australia (16). The primary gathering characterizing the use of club drugs is the *rave*, a large-scale party set-up at a temporary location (like an abandoned warehouse) where participants engage in trance-like dancing to electronic music, experience light shows and other special effects, and take drugs. It is through attendance at these events or through the vicarious experiencing, re-experiencing and pondering of such events that participants reaffirm their involvement with the clubs drugs venue.

Typically, promoters of raves in the U.S. seek to attract wealthier patrons. Substantial cover charges ($25 to $50) help them to earn a return while simultaneously discourage less desirable

participants. Raves are often viewed as an escape from the stifling doldrums of conventional society offering a time-out through illegal leisure activity. Anarchist philosopher Hakim Bey (17) refers to such gatherings as a Temporary Autonomous Zone (TAZ), a phrase widely used among rave attendees (18). Bey (17) claims that

> A TAZ is a guerilla operation which liberates an area . . . and then dissolves . . . itself before the state can crush it. The TAZ is a festival . . . a group of humans synergize their efforts and energies to realize mutual desires. The element of spontaneity is crucial.

Promoters of raves characteristically do not rely on traditional media like newspapers, radio or television to market their events. Their decision may be partially motivated by expense and convenience, but most centrally it is probably part of the cachet; participation in such "straight" media could undermine an event's subcultural capital (19,20). Instead, the advertising is designed to appear semi-spontaneous and underground. Events are usually announced no more than a month in advance and might use word-of-mouth, handbills, recorded phone messages, the Internet and/or the worldwide web to target the desired clientele.

Police intervention can represent a serious threat to a rave. One avoidance technique involves notifying potential participants of the date and time of the event over the Internet and providing a phone number for further information. Only those recognized as properly referred when they call are told where the event is to be held. This modern-day technology-based procedure serves a similar function as the classic visual check and verbal interrogation through a slot in the door of a speakeasy.

A special genre of music (variously labeled as *jungle*, *trance*, *drum and bass*,or *goa*) has evolved to enhance the experience. Fans and musicians alike describe these forms of electronic music as simultaneously futuristic (computerized, innovative, disorienting) and primitive (percussive, over-whelming, and communal). This "future primitive" music effectively releases participants from their restrictions to the here and now and enhances psychedelic drug experiences that are often saturated with memories, associations, and hallucinations that seem like revelations. In this manner, the club drug scene draws symbolic ties between music and drugs that catalyze drug-like trance states.

Outdoor "spontaneous" raves appear to have been slowly replaced in the U.S. by indoor venues not subject to weather restriction which are cashing in on this entertainment trend. Similarly, in England and other European countries raves are now actually quite rare (21). Other venues have developed for consumption of the same type of dancing, music and drugs, including otherwise legitimate nightclubs and house parties. Nightclubs have the advantage of a fixed facility; this avoids the necessity of separately advertising each night's event and setting up the equipment anew for each occasion. Clubs provide a much more regularized locale. They are also potentially subject to much more official regulation seeking to countermand illegal drug use/sales, to restrain underage drinking, and to control excessive occupancy. Private house parties can often avert these restrictions. It is not clear at this time what proportion of hallucinogen use in the U.S. takes place at raves, nightclubs, or house parties, nor the extent to which individuals have started to use hallucinogens at other venues and at other times. These alternative venues could have in the past or may in the future facilitate the spread in use of hallucinogens and other drugs to subpopulations well beyond the original target populations of rave promoters. Recent reports from Boston and New York City suggest that MDMA has become available on the streets where young people congregate (11; p. 76). It has yet to be documented how widely the hallucinogen use "epidemic" may spread and the extent to which it may lead to substance use dependence, deteriorating health, crime, financial distress, violence, family conflict or other problems.

A British research team followed a sample of persons attending several Manchester (England) clubs, before entry, during, and after attending the venue (13). They found most patrons were conventionally employed or in post-high school education, were routine users of several licit and illicit substances, and rarely had been arrested or in trouble with the law. These *clubbers* typically began drinking "heavily", smoking a spliff (a large, hand-rolled cigarette containing marijuana and tobacco), and taking amphetamines prior to arrival at the venue at about 10 p.m. At the venue, they continued drinking alcohol and smoking tobacco, and preferred to be under the influence of MDMA while dancing to the music. The preferred "chemical cocktail" favored by British clubbers in the late-1990s included 1-2 MDMA tablets taken in conjunction with a gram of amphetamine, followed by cannabis. Other substances (cocaine, ketamine, GHB, etc.) might be consumed intermittently as available. At night's end, some clubbers smoked marijuana. Handy, Pater and Barrowcliff (22) documented that at the end of the night some clubbers snorted heroin to come down from the intense visual, auditory, aerobic, and chemical stimulation. Interestingly, the role of LSD and psychedelics among English club-goers has always been small, and appears to be disappearing altogether from the British recreational drug scene (13).

This "pick and mix" polydrug use pattern in England and observations of polydrug use at dance and music clubs and raves in New York and Washington DC (11; p. 81) led us to wonder whether the increased use of hallucinogens in the United States might be related to the recent increases in cocaine, crack and heroin use among youths.

In the U.S. in the year 2000, hallucinogen use is still generally associated with more educated populations. America's inner-city populations who have historically tended to get in trouble with both drug misuse and the law appear to have been excluded from club drug venues and to have not adopted the use of hallucinogens (10,23). After having directly observed the devastation of the heroin injection and crack epidemics, most youths from these subpopulations have so far avoided the destructive lifestyles associated with use of illicit drugs with the exception of marijuana (3,24-26). In this regard, youths from more fortunate economic circumstances have been rarely involved in the real-life "drug education" readily available to youths in the inner city.

A Theoretical Conceptualization of a Hallucinogen Epidemic

Much observation and analysis suggests that the popularity of various illicit drugs rises and falls according to a pattern similar to a disease epidemic (4,5,27-31). Moreover, Rogers (9) describes how similar diffusion phenomena have been studied and exploited in order to promote new ideas in agriculture, education, public health, communication, marketing, and other fields. Based on this literature, Golub and Johnson (32-34) conceptualized four empirically-distinct phases to explain the dynamics of the Crack Epidemic that peaked during the 1980s in the United States: *incubation, expansion, plateau*, and *decline*. Golub and Johnson (3,24) subsequently used this conceptualization to study data concerning two other drug use "epidemics" in the United States: the *Heroin Injection Epidemic* that peaked in the 1960s and early 1970s; and the *Marijuana/Blunts Epidemic* that started in the 1990s. (This explicit four-phase conceptualization has not yet been applied to drug use prevalence data for countries other than the United States.)

This paper uses this four-phase conceptualization to examine whether the increase in hallucinogen use in the U.S. appears to constitute an "epidemic" and to ascertain its current status. The paper also examines the extent to which use of amphetamines, cocaine, crack, and heroin might be associated with this hallucinogen epidemic as suggested by the polydrug use observed at many club drug venues described in the previous section.

Historical evidence suggests that a drug use "epidemic" typically grows out of a specific social context: the *Heroin Injection* "*Epidemic*" grew out of the jazz era (35,36); the *Crack* "*Epidemic*" started among inner-city drug dealers (29,37); and the *Marijuana/Blunts Epidemic* was pioneered as part of the youthful, inner-city, predominately black, hip-hop movement (3,26,38,39). For each of these waves of drug use, there was an initial *incubation phase* during which the new drug use practice was developed and nurtured among a relatively small cohesive group of adult users. The qualitative research presented in the previous section suggests that the hallucinogen use "epidemic" may have grown out of the rave experience. If this were the case, the incubation phase would be characterized by low levels of hallucinogen use primarily limited to older, better educated, wealthier, cosmopolitan, and predominately white persons.

At some point, the hallucinogen use "epidemic" would have entered an *expansion phase*, a rapid, short-term increase in use. In general, it appears to be particularly difficult to identify the start of the expansion phase. The U.S. General Accounting Office (40) bemoaned the inability of the Nation's drug abuse surveillance to supply an early warning of new "epidemics". Such knowledge holds out the hope of avoiding any devastation before it really starts in earnest (28). So far, hindsight has proved to be the best for identifying an "epidemic's" incubation phase. Griffiths et al. (41) performed a content analysis of popular, scientific, and official government media regarding the recent waves of MDMA and heroin use in the U.K. They found that it took until 1988 for scientists and policy analysts to identify that a widespread epidemic of MDMA use in the U.K. had started back in 1984 and had been incubating among a population within the music and fashion industry since 1981. They found that it took until 1987 for scientists to identify a heroin use epidemic in the U.K. as having clearly started back in 1979. Similarly, Golub and Johnson (32) placed the timing of the incubation phase for the Crack Epidemic in the United States as having occurred in the early 1980s, more than ten years after the fact.

During the *expansion phase* of the hallucinogen epidemic, use would be expected to spread rapidly (even exponentially) primarily among older users of other drugs (perhaps cocaine and crack) as more of them became involved with a new social and drug use context and thus became walking advertisements and recruiters for the practice. During this phase, the hallucinogen use might spread beyond the rave and dance club scene to other social contexts.

After a while, all of the existing drug users would eventually either become hallucinogen users or at least had the opportunity to. This marks the transition into the *plateau phase*, when initiation to hallucinogen use would be primarily limited to youths first coming of age and becoming involved with the prevailing drug(s)-of-choice. The prevalence of hallucinogen use would eventually reach stability at its peak level as the new users effectively replaced older users who desisted from use for a variety of possible reasons like deteriorating health or possibly death; social pressure from family, friends or employment; government pressure aimed at reducing illicit substance use; financial concerns or just simply maturation.

Based on analogies to the Heroin Injection and Crack Epidemics, the end of a hallucinogen epidemic would most likely come into place slowly. The Heroin Injection Epidemic (42-44) and Crack Epidemic (3,29,38,45) entered a *decline phase* when youths first coming of age rejected initiation to or did not become regular users of these drugs. During a decline phase, the overall prevalence of hallucinogen use would be expected to decrease only slowly as existing users persisted in their habits, perhaps as long as decades for some. On the other hand, the prevalence among youths would be expected to decrease rapidly.

Amphetamine use has been broadly associated with hallucinogen use via the club drugs venue. Accordingly, an "epidemic" in amphetamine use would be expected to parallel the phases of

the hallucinogen epidemic. To the extent that cocaine and heroin became associated with the club drugs phenomenon, they could have effectively constituted secondary "epidemics" of drug use within a larger hallucinogen use "epidemic" among members of a limited subpopulation. Potentially, cocaine and heroin use could eventually spread beyond the club drug venues and start renewed "epidemics" in the use of these powerful drugs, which have found favor within the broader population in the past.

METHODOLOGY

This study employed publicly-available data collected from the NHSDA and MTF surveys to examine drug use trends over time and across demographic variables. Both the NHSDA and MTF surveys include questions about use of the most common illicit drugs (e.g., marijuana, cocaine) and about illicit use of any drugs in various categories. The study initially sought to examine the trends in "club drug" use as defined by NIDA (8). However, neither survey explicitly uses this term nor asks separately about use of each of the "club drugs." For the purpose of this analysis, hallucinogen use was chosen as the best available indicator of any use of a club drug, using NIDA taxonomy. This decision resulted in inaccuracy due to both the over-inclusiveness and under-inclusiveness of an operational definition of club drug use. Not all hallucinogen use represents club drug use. However, it seemed reasonable to presume that recent changes in hallucinogen use might have resulted from changes in club drug use. Conversely, some club drug users might not perceive of their MDMA use as hallucinogen use; indeed, European scientists and drug users do not define MDMA as a hallucinogen (21).

The designation of club drugs as best represented by hallucinogens appeared consistent with the NHSDA's own taxonomy. The NHSDA implicitly classifies most common illicit drugs into one or more drug categories by either:

- asking about lifetime use of the drug within the section of questions pertaining to each of six drug categories, or
- by including the drug in the list of valid, common responses to a question about lifetime use of any "other" drugs within a drug category.

In this manner, MDMA, GHB, and LSD are classified as hallucinogens by the NHSDA. Rohypnol and Ketamine are included within multiple classifications: hallucinogen, analgesic, tranquilizer and stimulant. Thus, use of either drug may or may not be reported as a hallucinogen, depending on the respondent's perception. The NHSDA asks about lifetime methamphetamine use in its section on stimulants, but also includes methamphetamine as a valid response to the "other" hallucinogen question. Since inception, the MTF survey has asked, "On how many occasions (if any) have you used LSD . . . during the last 12 months?" It has also asked a parallel question, "On how many occasions (if any) have you used psychedelics other than LSD (like mescaline, peyote, psilocybin, PCP) . . . during the last 12 months?" In this manner, any hallucinogen use has been measured as use of either LSD or "psychedelics other than LSD." The MTF program added explicit questions in subsequent years about use of PCP (1979), MDMA (1996), and rohypnol (1996). Responses to these questions were not incorporated into our operational definition of any hallucinogen use, in order to maintain consistency across survey years and across the six survey forms with different combinations of questions used by the MTF program.

The analysis focused on past-year hallucinogen use as an indicator of fairly current use. The choice of past-year use (instead of lifetime or past month use) was also consistent with the frequency of each survey, both are performed annually. The remainder of this section describes the central characteristics of each survey as well as the statistical procedures employed in this study including age-period-cohort analysis and logistic regression.

The National Household Survey on Drug Abuse (NHSDA)

The NHSDA was established in 1971 to measure the prevalence and correlates of illegal drug use and monitor trends over time (46,47). The survey was conducted in 1971 and 1972 and then every 2 or 3 years until 1990 when it became an annual survey. This analysis used the public-release data sets archived at the Inter-University Consortium for Political and Social Research (ICPSR) for surveys from 1979, 1982, 1985, 1988, and 1990 through 1997, a total sample of 209,559 respondents.

The NHSDA program uses a hierarchical procedure to obtain a representative sample of the general population resident in the United States over the course of the year. Oversampling is used to obtain accurate estimates of drug use within specific subpopulations, including Hispanics, blacks, and youths age 12 to 17. The survey excludes homeless persons who do not use shelters, active military personnel, and residents of institutional group quarters, such as jails and hospitals. Eligible persons are informed that participation is voluntary and that responses will be kept anonymous. Interviews take place in person, in the respondent's home. To help assure an honest response to sensitive questions, interviewees record their own responses to questions concerning illicit drug use on a separate sheet of paper.

There have been several major changes in NHSDA instrumentation that need to be noted because of their potential for causing a discontinuity in findings across interview years: Starting in 1991, the survey was expanded from households in the 48 contiguous states to include all of the U.S. civilian, noninstitutionalized population age 12 or older. For the first time persons living in Hawaii and Alaska and at military bases, college dormitories, rooming houses, and shelters were included. In 1994, the program was extensively redesigned to use more consistent wording, reduce vaguery, improve skip patterns, and improve logical editing of responses (48).

Monitoring the Future (MTF)

Each spring since 1975, the University of Michigan's Institute for Social Research has conducted a survey to estimate the prevalence of drug use among U.S. High School Seniors and to monitor trends over time (49,50). This analysis used the public release datasets archived at ICPSR for 1976 through 1998, a total sample of 382,823 respondents. Aggregate rates of use in 1975 and 1999 obtained from a press release (51) were added to graphs of time trends when possible.

The MTF program uses a multistage probability design to select a representative sample of 125-145 high schools from across the 48 contiguous states. Up to 350 seniors from each school are invited to participate in the survey. By design, the MTF survey excludes the 15 to 20 percent of youth that drop out of school before 12th grade. After providing informed consent, participants complete the questionnaires by themselves during a normal class period.

Sample Weights

Both the NHSDA and MTF public-release data sets provide sample weights to account for variation in each respondent's probability of selection. These weights were employed in all of the calculations presented in this paper in order to obtain unbiased estimates. The sampling plan also impacts the standard errors (S.E.s) in most cases increasing them beyond what they would have been had the sample been selected completely at random. These design effects were not accounted for in this study due to the complexity of the analysis including use of multiple years of data, subsetting, and multivariate analyses. Instead, S.E.s and tests of significance were based on conventional formulas for weighted data and are most likely lower bounds. Consequently, the interpretation of findings placed less credence in singular tests that were statistically significant at the α=0.05 level and emphasized those findings that were

significant at more rigorous levels and were part of consistent trends observed across multiple years, in both datasets, and across demographic subpopulations.

Age-Period-Cohort Analysis (NHSDA)

The NHSDA data archives serve as a major resource for tracking historical trends in substance use as they affect individuals at different ages. Because the program recruits a representative sample each year, information from successive interview years can track a birth cohort's aggregate experience as they age. For example, the prevalence of use by persons born in 1974 and interviewed in 1990 indicates their experience at age 16. To the extent that the NHSDA tends to sample the same population in successive years, any difference in prevalence in 1991 for the 1974 birth cohort would indicate the extent to which hallucinogen use increased (or decreased) around age 17. Prior research suggests that the NHSDA recruitment procedures have obtained a sufficiently similar sample over time to support this type of a *repeated cross-section analysis* (52). Johnson and Gerstein (53,54) have used this approach to examine differences in incidence of initiation to alcohol, cigarettes, marijuana and other drugs across birth cohorts.

Johnson and Gerstein (54) identified that hallucinogen use was virtually unheard of among persons born before 1941 and that use was much more common during the 1960s and 1970s corresponding with the hippy movement and a focus on psychedelic music, art and drug use. Of note, both the NHSDA and MTF surveys documented a marked decline in past-year hallucinogen use during the 1980s, and an upturn in the 1990s.

This study employed an age-period-cohort analysis to determine how successive birth cohorts were more or less impacted by the more recent hallucinogen epidemic and to elucidate its timing and dynamics. The analysis involved visual inspection of a two-way table indicating the prevalence of past-year hallucinogen use as a function of both the interview year and respondents' birth year. A major problem in performing age-period-cohort analysis is random year-to-year fluctuations that are not associated with any major trend. To minimize this problem, the analysis was restricted to those cells in which the prevalence rate was based on a minimum of 100 cases. In order to retain information about the smaller subsamples of older persons, respondents born from 1940 to 1959 were grouped into successive five-year birth cohorts and respondents born before 1939 were grouped into a single cohort.

Many of the prevalence rates were on the order of P=5%. At this level, the minimum subsample size of 100 guarantees a maximum S.E.=2.2%. This unfortunately would make it difficult to detect a change in hallucinogen use over time of only a few percentage points. To reduce the noise in the data even further a three-way smoothing procedure was employed. Whenever possible, each cell value representing persons born since 1960 was averaged with the value immediately to its right and its left (this constituted horizontal smoothing with members of a single birth cohort across ages as measured in successive interview years); above and below it (vertical smoothing across successive ages with respondents from a single interview year); and above and below it along the major diagonal (diagonal smoothing with respondents of the same age interviewed in successive years). Each cell was smoothed in each direction in which there was a minimum of 100 cases available to estimate the prevalence for both adjacent cells needed to perform the calculation.

Covariates of Hallucinogen Use (MTF)

The profound advantage of the MTF data set is its large sample of persons approximately the same age in successive years; the survey has recruited about 16,000 high school seniors each year. In contrast, the NHSDA has recruited about 1000 18-year-olds in each year since 1990 and only about 250 in each of the previous years sampled. This study employed the MTF data

in two ways: to examine variation in hallucinogen use across demographic characteristics; and to examine use of cocaine (in any form including crack), crack, heroin and amphetamines among past-year hallucinogen users.

The study examined variation in substance use with gender, race/ethnicity, region, urbanicity, and average parental education. Unfortunately, the MTF data do not include respondents' family income or other measures of socio-economic status other than parent's education. These data would have been particularly useful to confirm reports from qualitative studies that club drug use has mostly affected wealthier populations. The public-release data sets from the MTF identify each respondent as white, black, or other/missing. Historically, Hispanics comprise a relatively small portion of the sample. Because of concerns over disclosing an individual respondent's identity, the MTF program combines Hispanics into the other/missing category before releasing the micro-data to the public.

The study examined the variation in past-year hallucinogen use across the level of each of the demographic variables (bivariate analysis) and employed logistic regression to identify the extent to which hallucinogen use varied with each demographic variable controlling for the other variables included (multivariate analysis). The analysis was limited to high school seniors interviewed from 1995 to 1998, a period of pronounced hallucinogen use. (In a calculation not included in this paper, the analysis was performed separately for each interview year from 1991 through 1998. The demographic variation was similar for each.) The Wald statistics from the logistic regression analysis associated with each demographic variable was examined to determine whether the variation was statistically significant (55). In general, a larger Wald statistic indicates a variable that is associated with a greater amount of explained variation. The odds ratios were calculated for each level associated with each demographic variable. These estimated values indicated how much more (or less) frequently a person with the attribute had reported any hallucinogen use in the past year. A value close to 1.0 indicates an attribute for which the rate of past-year hallucinogen use was similar to that observed for a reference category. The base odds indicate the amount of past-year hallucinogen use among the reference population whose characteristics match the reference category for each demographic variable —white, males, from a small town in the Northeast whose parents graduated from high school.

The study decomposed time trends in past-year use of cocaine (in any form), crack, heroin and amphetamines according to whether each respondent had or had not used any hallucinogens in the past year. (The MTF survey does not distinguish amphetamine use from methamphetamine use except with regard to smoking of crystal methamphetamine, which is commonly known as "ice.") These trends were plotted as a series of bar charts showing the portion of past-year cocaine, crack, heroin and amphetamine use accounted for by past-year hallucinogen users. In a related analysis, the prevalence of past-year cocaine, crack, heroin and amphetamines use among past-year hallucinogen users was examined to determine if use of these substances had been growing within the subpopulation of hallucinogen users.

RESULTS

This section first examines the time trends in hallucinogen use among teens for evidence of a hallucinogen epidemic. Subsequently, the section explores variation in reported hallucinogen use across demographic factors in order to locate the possible epidemic more precisely. Lastly, the section explores the association of hallucinogen use with use of cocaine (in any form), crack, heroin, and amphetamines to identify the extent to which these other drugs could be associated with the hallucinogen epidemic.

Trends in Hallucinogen Use

Hallucinogen use had been relatively more popular during the 1960s and 1970s than in the 1980s. Figure 1 presents the variation in prevalence of past-year hallucinogen use reported by high school seniors (MTF) and by 17-18-year-olds (an age category analogous to high school seniors) from among the general household population (NHSDA). These national drug use surveys documented the tail end of the previous wave in popularity of hallucinogen use. Past-year use of any hallucinogen peaked in 1975 at 11% (MTF) and in 1982 at 12% (NHSDA). By the mid-1980s, both surveys recorded a drop in hallucinogen use to a stable 6%. From 1992 to 1995, both surveys recorded a rapid increase leading to a greater than 50% escalation in hallucinogen use. From 1995 to 1999, past year hallucinogen use among teens was relatively stable at about 9-10%, almost as high as the previous peak levels. This pattern over time is consistent with the expansion and plateau phases of the conceptual model for a hallucinogen epidemic.

From 1992 to 1998, the prevalence of LSD use was comparable to the level of any hallucinogen use and followed a similar pattern of an increase then plateau. This suggests that most of the teenage hallucinogen users primarily consumed LSD. Figure 1 indicates a somewhat lower level of use in the late 1990s for MDMA (about 5%) and much lower rates for use of PCP (about 2%) and rohypnol (under 2%) among MTF high school seniors.

Locating the Hallucinogen Epidemic by Time and Birth Cohort

Table 1 presents the prevalence of hallucinogen use by birth year for NHSDA surveys from 1979 through 1997. Overall, hallucinogen use has never been particular widespread. In 1979, only 3% of the general population reported any hallucinogen use in the past-year. This rate declined to 2% in the 1980s and to 1% in 1990-94.

This low overall rate is deceptive. Hallucinogen use has tended to start in late adolescence and then decline with age. In 1979, the rate of past-year hallucinogen use among 18-19-year-olds (1960-61 birth cohorts) was in the low teens (12-15%). Reading across Table 1 indicates that the rate of hallucinogen use among members of these birth cohorts declined to 4% by the time they reached their mid twenties (measured in 1985) and had almost completely ended by age 30 (0-1% measured in each year since 1990).

Simultaneous with the decline in hallucinogen use by members of the 1960-61 birth cohorts, the overall rate of hallucinogen use declined from 3% (in 1979) down to 1% by 1990 (see bottom row of Table 1). This broad-based decline was generally reflected in the rates of hallucinogen use at each age. The rate of hallucinogen use among 18-year-olds decreased from 12% in 1979 down to only 5% (1990-92)—see the darkly shaded diagonal in Table 1. This appears to have been the decline phase in the broader epidemic of hallucinogen use based in the 1960-70s psychedelic experience.

The increase in hallucinogen use in the 1990s had its greatest influence among persons in their late teens. The prevalence of hallucinogen use among 18-year-olds increased steadily from 5% in 1992 up to 9% in 1996. This rapid increase is consistent with the theoretical expectations of an expansion phase to a hallucinogen epidemic. From 1996 to 1997 (the last year of NHSDA data), the prevalence of hallucinogen use among 18-year-olds remained at 9%. The MTF data in Figure 1 indicates the prevalence of hallucinogen use among teens (in this case high school seniors) remained relatively stable (or even declined slightly) from 1996 through 1999, consistent with the theoretical expectations of a plateau phase to a hallucinogen epidemic.

Table 1 indicates that the expansion of the hallucinogen epidemic was based almost exclusively among youths. In the 1990s, the rate of hallucinogen use among 30-year-olds (lightly shaded diagonal in Table 1) remained at 1% and was even still quite low among 25-year-olds (2-3%,

medium-gray shaded diagonal in Table 1). This strongly suggests that the rise in popularity of hallucinogens in the 1990s was *not* caused by former hallucinogen users from the 1960s and 1970s returning to their habits. It also suggests that these youthful LSD users were not introduced to it by the older cohort of LSD users (who were often of their parent's age). The wide bold numbers in the lower right region of Table 1 indicate those groups most impacted by the rise in hallucinogen use in the 1990s and when. This area was identified by visually searching down each diagonal to find the year in which hallucinogen use increased for persons of a given age. In 1993, the increase centered among persons in their teens (13, 15, 17 and 18-year-olds). Rates of hallucinogen use among young adults age 19-24 started to increase from 1993 to 1996 representing two phenomena: the diffusion of use to slightly older persons; and the aging and continuation of use among those birth cohorts most affected by this hallucinogen epidemic.

By 1997, the hallucinogen epidemic had achieved its largest impact on persons born since 1977 (persons who reached age 18 since 1995). Among respondents born 1977-78, the prevalence of hallucinogen use reached a peak of 10% at age 19. Among respondents born 1979-84, the relatively high rates of hallucinogen use at ages 13-18 suggest that they were becoming involved with hallucinogen use at a similar and perhaps even slightly higher rate than previous birth cohorts.

The NHSDA data from recent years is as yet insufficient to indicate how far into adulthood persons born since 1977 will tend to persist with hallucinogen use. Past experience based on the limited data available from the decline phase of the psychedelic experience (upper rows in Table 1) suggests that hallucinogen use might begin to decline in the mid 20s.

Demographic Variation in Teenage Hallucinogen Use

Table 2 examines variation in past-year hallucinogen use among high school seniors 1995-98 across gender, race/ethnicity, region, urbanicity and parents' education. The bivariate analysis of annual prevalence levels indicated that hallucinogen use was relatively rare among black youths (1.5%) when compared to whites (11%); males (12%) were nearly twice as likely to have used hallucinogen as females (7%); rates were slightly higher in the Northeast (12%) than elsewhere (8-10%); rates were lower among youths from farms (5%) or other rural areas (7%) than in small towns (10%), cities (8-10%) and suburbs (10-13%); and rates were higher among youths whose parents were more educated (some college and beyond, 10%) than those whose parents had only a H.S. Diploma (9%) or had not completed high school (7%).

The multivariate analysis identified the importance of each independent variable included, controlling for the effect of all other variables. The Wald statistic indicates that race/ethnicity explains the most variation in hallucinogen use followed by gender, urbanicity, region, and parents' education. After controlling for race/ethnicity, the variation across regions was quite modest. Whereas in the bivariate analysis the prevalence of hallucinogen use was slightly higher in the West than in the North Central and South, this was not the case in the multivariate analysis. The higher rate observed in the West could be explained by a higher prevalence of whites. However, the higher rate observed in the Northeast was more than could be explained by regional variation in race/ethnicity alone. A similar phenomenon occurred with urbanicity. Youths from suburbs reported higher rates of hallucinogen use. However, the odds-ratios in the multivariate analysis associated with suburbs (1.11-1.41) were about the same as for cities (1.17-1.31) suggesting that the greater prevalence of whites in suburbs accounted for much of the variation in hallucinogen use between suburbs and cities. However, the rates in small towns, farms and other rural areas were still lower. The variation with parents' education also virtually disappeared (odds ratios varied from .90 to 1.08) after controlling for other demographic variables.

Thus, most of the apparent variation in hallucinogen use across region, urbanicity and parents' education was spurious. It could be attributed to another variable, in this case race/ethnicity, as identified in a multivariate analysis. This spurious association serves as a powerful reminder of a central limitation to this analysis: the MTF and NHSDA datasets provide only a few basic demographic variables. It seems implausible that being white leads to hallucinogen use or that being black insulates one from it. Rather, there are numerous differences in the lived experience of blacks and whites in the United States that could account for the disparity including: differences in income, socio-economic status, discrimination, cultural heritage, access to different drug markets, and simple peer-group homophily. In this regard, the wide disparity in hallucinogen use between blacks and whites serves as an indicator that race/ethnicity is still an important factor in determining affiliation with groups emphasizing specific drugs.

Cocaine, Crack, Heroin, Amphetamines and the Hallucinogen Epidemic

From 1992 to 1998, the rate of past-year use among high school seniors increased for various drugs other than hallucinogens: cocaine (from 3% to 6%), crack (1.5% to 2.5%), heroin (0.6% to 1.0%), and amphetamines (7% to 10%). Figure 2 indicates that the increase in past-year use of each of these drugs was predominately among individuals who had also used hallucinogens. Among high school seniors who had used cocaine in 1992, many had not used hallucinogens (1.3% of the sample, 41% of those who had used cocaine). By 1998, the prevalence of cocaine users who had not used hallucinogens had increased modestly to 1.8%. In contrast, the percentage that had used hallucinogens and cocaine more than doubled from 1.9% to 3.9%, an increase of two full percentage points. Thus, roughly four-fifths (2% out of 2.5%) of the increase in cocaine use from 1992 to 1998 among high school seniors was among individuals who were also hallucinogen users. Similarly, hallucinogen use was associated with about 80% of the increase in use of crack, perhaps all of the increase in use of heroin, and 70% of the increase in use of amphetamines.

Figure 3 examines the trends over time in use of other drugs among past-year hallucinogen users. Past-year use of amphetamines (40%) and cocaine (29%) were common among past-year hallucinogen users back in 1993. Past-year use of crack (13%) and heroin (5%) were less common among hallucinogen users. By 1998, use of each (amphetamines 46%, cocaine 43%, crack 18%, and heroin 9%) among past-year hallucinogen users had risen somewhat. However, the amount of the increase and its steady as opposed to pronounced growth suggest that an epidemic of these drugs was *not* commencing; rather, it appears that use of amphetamines, cocaine, crack and heroin had been associated with a similar proportion of hallucinogen users throughout the entire course of the hallucinogen epidemic.

These finding are consistent with the possibility that the increases observed during the 1990s in use of cocaine, crack, heroin and amphetamines among youths was primarily a result of the type of poly-drug use associated with club drug venues. However, the MTF survey, unfortunately, does not yet inquire about whether the respondent had attended a club or rave, whether such drugs were consumed at such a location, and where they had initiated the use of each drug.

DISCUSSION

This secondary analysis of the NHSDA and MTF survey data strongly suggests that there has been a hallucinogen use "epidemic" among a limited subpopulation and that by 1996 it was no longer incipient; it had plateaued. Self-reported hallucinogen use increased greatly among U.S. (predominately white) youths age 14-24 from 1992 to 1996. From 1996 to 1999, hallucinogen use was relatively stable.

There have also been more modest increases in cocaine, crack, heroin and amphetamine use among youths. Interestingly, most of the increase in use of cocaine, crack, heroin and amphetamines was among persons who also reported use of hallucinogens. Thus, the increase in all of these drugs may be associated with increased polydrug use (such as occurs at club drug venues) and not constitute separate "epidemics". Additionally, the annual prevalence of cocaine, crack, heroin and amphetamines use among youthful hallucinogen users has remained relatively constant in the 1990s suggesting that these drugs are part of the preferred substances of some polydrug users but that their relative popularity has not been increasing. Thus, concern that polydrug use may bring renewed emphasis on use of cocaine, crack and heroin appears unwarranted at this time.

MTF and NHSDA respondents are not asked where they take drugs. Consequently, it is not possible to determine whether the observed hallucinogen epidemic resulted from increasing popularity in club drug venues. Moreover, there are several features of the increased hallucinogen use in the U.S. that differ substantially from expectations based on qualitative descriptions of raves: the increase has been centered among teens as opposed to those in their twenties and thirties; and LSD as opposed to MDMA has been the most widely used hallucinogen. These differences suggests that if the recent upsurge in hallucinogen use resulted from expanding popularity of club drugs venues, then these social contexts in the U.S. may differ from those in Europe and elsewhere.

Because of these discrepancies, it is essential to hold in abeyance any judgment that the U.S. growth in hallucinogen use is centered around raves and clubs pending further information. In rushing to judgment, one might falsely conclude that addressing the existence of raves and their attendant substance use might have an impact on the increase in hallucinogen use, along with its personal and social consequences (the prevalence of which still need to be documented). It is not yet known whether youths coming of age have been starting their polydrug use at raves, nor whether this serves as the primary locus for their polydrug use. Quite possibly these individuals are starting experimentation with various drugs including hallucinogens in small groups and may be basing their use around house parties. A substantial proportion of them may have developed their own personal drug use patterns whose continuation is no longer dependent on attendance at any particular social venue such as raves and dance clubs.

Cultures, particularly drug subcultures, undergo continuous evolution. It is not simply the case that the prevalence in use of various substances shift over time. The venue, symbolic meanings, conduct norms, and behavioral patterns shift too. Consequently, the instruments used to monitor substance use as well as the analytic techniques used to interpret these trends need to be continually sensitive to paradigm shifts. This analysis brought new light to quantitative data regarding use of "club drugs" through qualitative insights into this new context. It has also crystallized essential questions to be addressed through further quantitative and qualitative research.

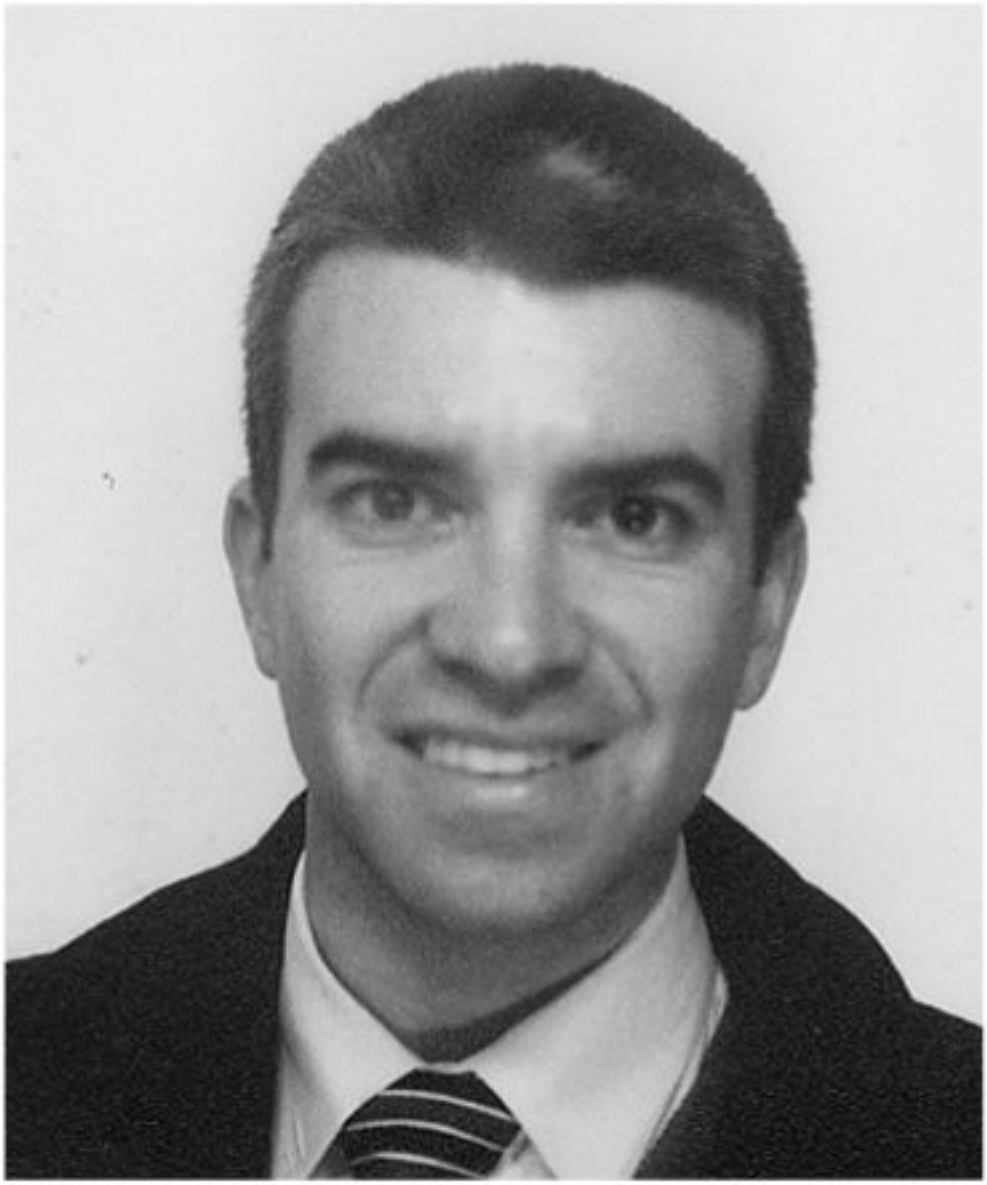
It is interesting to note that the possible club drugs use "epidemic" and the marijuana/blunts use "epidemics" (3,24) both started in the 1990s and were both centered among youths. However, there are important cultural differences. The quintessential blunt smoking ritual involves inner-city youths pooling their resources in order to share a couple of *blunts* (cigars in which the tobacco has been replaced with marijuana) and 40-ounce bottles of malt liquor while listening to rap music. The dictum "puff, puff, pass" captures the sense of a relaxed communal experience. National statistics strongly suggest that this marijuana/blunts subculture (at least a strong interest in marijuana) has diffused well beyond the inner city. In contrast, the quintessential club drugs use experience, the rave, offers intensive allnight dancing to a wealthier, predominately white population. These two subcultures appear to have emerged

simultaneously, although the extent of overlap is not yet clear. This hypothesis cannot be confirmed with existing data sets that do not (as yet) track the diffusion of various venues, symbolic meanings, and musical preferences, as well as the diversity of short- and longer-term consequences for those who become involved in them. That would appear to be a worthy venture for further qualitative research, quantitative research and integration of the two. The result should help lead to more informed, targeted, effective and cost-effective public policy.

ACKNOWLEDGMENTS

Preparation of this article was partially supported by a grant from the Robert Wood Johnson Foundation Substance Abuse Policy Research Program (033027). Additional support was provided by National Development and Research Institutes, Inc. Points of view and opinions expressed do not necessarily reflect the positions of the Robert Wood Johnson Foundation, nor National Development and Research Institutes.

Biography



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REFERENCES

1. Elder, GH. Children of the Great Depression: Social Change in Life Experience. 25th anniversary edition. Westview; Boulder, CO: 1999.
2. Newman, K. Ethnography, biography, and cultural history: generational paradigms in human development. In: Jessor, R.; Colby, A.; Shweder, RA., editors. Ethnography and Human Development: Context and Meaning in Social Inquiry. Chicago; Chicago: 1996. p. 371-393.
3. Golub AL, Johnson BD. From the Heroin Injection Generation to the Blunted Generation: Cohort Changes in Illegal Drug Use Among Arrestees in Manhattan. Substance Use Misuse 1999;34(13): 1733–1763. [PubMed: 10540971]
4. Johnson, BD.; Muffler, J. Sociocultural. In: Lowinson, J.; Ruiz, P.; Millman, R.; Langrod, J., editors. Substance Abuse: A Comprehensive Textbook. third edition. Wilkins and Wilkins; Baltimore: 1997. p. 107-117.

5. Musto, D. The American Disease: Origins of Narcotic Control. Oxford; New York: 1987.
6. Zinberg, NE. Drug, Set, and Setting: The Basis for Controlled Intoxicant Use. Yale; New Haven, CT: 1984.
7. Oetting ER, Donnermeyer JF. Primary Socialization Theory: The Etiology of Drug Use and Deviance. I. Substance Use Misuse 1998;33(4):995–1026. [PubMed: 9548633]
8. National Institute on Drug Abuse (NIDA). [accessed June 5, 2000]. www.nida.nih.gov/NIDAHome1.html
9. Rogers, EM. Diffusion of Innovations. fourth edition. Free Press; New York: 1995.
10. Hunt, D. Rise of Hallucinogen Use. N.I.J.; Washington, D.C.: 1997. Research in Brief
11. National Institute on Drug Abuse (NIDA). Epidemiologic Trends in Drug Abuse, Volume 1: Highlights and Executive Summary. N.I.H.; Bethesda, MD: 2000. NIH Publication No. 00-4739A
12. Parker, H.; Aldridge, J.; Measham, F. Illegal Leisure: The Normalization of Adolescent Recreational Drug Use. Routledge; London: 1998.
13. Measham, F.; Aldridge, J.; Parker, H. Dancing on Drugs: Risk, Health and Hedonism in the British Club Scene. Free Association Books; London: 2000.
14. Van de Wyngaart, G.; Braan, R.; De Bruin, D.; Fris, M.; Maalste, N.; Verbraeck, H. Ecstasy in het Uitgaanscircuit. Addiction Research Institute, Utrecht University; Utrecht, Netherlands: 1998. Ecstasy in the Club Scene-Holland
15. Griffiths, P.; Vingoe, L.; Jansen, K.; Sherval, J.; Lewis, R.; Hartnoll, R. New Trends in Synthetic Drugs in the European Union. EMCDDA; London: 1997.
16. Lenton S, Boys A, Narcross K. Raves, Drugs and Experience: Drug Use by a Sample of People who attend Raves in Western Australia. Addiction 1997;92(10):1327–37. [PubMed: 9489049]
17. Bey, H. The Temporary Autonomous Zone. 1995. www.unicorn.com//lib/zone.html#gtc
18. Stien, E. On Peace, Love, Dancing, and Drugs: A sociological analysis of rave culture. 1997. Available online at http://www/sspp.net/archive/papers/steins.html
19. Thornton, S. Moral panic, the media, and British rave culture. In: Ross; Rose, editors. Microphone Fiends: Youth Music and Youth Culture. Routledge; New York: 1994. p. 176-192.
20. Thornton, S. Club Cultures: Music, Media and Subcultural Capital. Wesleyan University Press; 1996.
21. Parker, H. Personal communication. Nov. 2000
22. Handy C, Pater R, Barrowcliff A. Drug Use in South Wales: Who uses Ecstasy Anyway. J. Substance Use Misuse 1998;3:82–88.
23. National Institute of Justice (NIJ). 1999 Annual Report on Drug Use Among Adult and Juvenile Arrestees. Department of Justice; Washington, D.C.: 2000. Report from the Arrestee Drug Abuse Monitoring [ADAM] Program. NCJ 181426
24. Golub, A.; Johnson, BD. The rise of marijuana as the drug of choice among youthful arrestees. 2001. National Institute of Justice *Research in Brief*, NCJ 187490
25. Johnson, BD.; Golub, A.; Dunlap, E. The Rise and Decline of Drugs, Drug Markets, and Violence in New York City. In: Blumstein, A., editor. The Decline in Violent Crime. Cambridge University Press; New York: 2000.
26. Sifaneck SJ, Kaplan CD. Keeping Off, Stepping on and Stepping Off: The Steppingstone Theory Reevaluated in the Context of the Dutch Cannabis Experience. Contemporary Drug Problems 1995;22:483–451.
27. Becker HS. History, Culture, and Subjective Experience: An Exploration for the Social Bases of Drug-induced Experiences. J. Health Social Behav 1967;8:163–176.
28. Chaiken, MR. Identifying and Responding to New Forms of Drug Abuse: Lessons Learned from “Crack” and “Ice.”. 1993. National Institute of Justice Issues and Practices report No. 1993-342-500:80017
29. Hamid A. The Developmental Cycle of a Drug Epidemic: The Cocaine Smoking Epidemic of 1981-1991. J. Psychoactive Drugs 1992;24:337–348. [PubMed: 1491283]
30. Johnston, LD. Towards a theory of drug epidemics. In: Donohew, DH.; Sypher, H.; Bukoski, W., editors. Persuasive Communication and Drug Abuse Prevention. Erlbaum; Hillsdale, NJ: 1991. p. 93-132.

31. Reinarman, C.; Levine, HG. Crack in context: America's latest demon drug. In: Reinarman, C.; Levine, HG., editors. Crack in America: Demon Drugs and Social Justice. California; Berkeley: 1997. p. 1-17.
32. Golub A, Johnson BD. A Recent Decline in Cocaine Use Among Youthful Arrestees in Manhattan (1987-1993). Am. J. Public Health 1994;84(8):1250–1254. [PubMed: 8059880]
33. Golub A, Johnson BD. Cohort Differences in Drug Use Pathways to Crack Among Current Crack Abusers in New York City. Criminal Justice Behavior 1994;21(4):403–422.
34. Golub, AL.; Johnson, BD. Cracks decline: Some surprises across U.S. cities. NIJ; Washington, D.C.: 1997. National Institute of Justice Research in Brief, NCJ 165707
35. Johnson, BD.; Golub, A. Generational Trends in Heroin Use and Injection Among Arrestees in New York City. In: Musto, D., editor. One Hundred Years of Heroin: History, Medicine and Policy. Greenwood; Westport, CT: 2000.
36. Malcolm, X.; Haley, A. The Autobiography of Malcolm X. Ballantine; New York: 1965.
37. Johnson BD, Golub A, Fagan J. Careers in Crack, Drug Use, Drug Distribution and Nondrug Criminality. Crime Delinquency 1995;41(3):275–295.
38. Furst RT, Johnson BD, Dunlap E, Curtis R. The Stigmatized Image of the Crackhead: A Sociocultural Exploration of a Barrier to Cocaine Smoking Among Cohort of Youth in New York City. Deviant Behav 1999;20:153–181.
39. Sifaneck, SJ.; Kaplan, CD. New rituals of cannabis preparation and self-regulation in two cultural settings and their implications for secondary prevention. National Development and Research Institutes, Inc.; New York: Working Manuscript
40. General Accounting Office (GAO). Emerging Drug Problems: Despite Changes in Detection and Response Capability, Concerns Remain. 1998. GAO/HEHS-98-130
41. Griffiths P, Vingoe L, Hunt N, Mounteney J, Hartnoll R. Drug Information Systems, Early Warning, and New Drug Trends: Can Drug Monitoring Systems Become More Sensitive to Emerging Trends in Drug Consumption. Substance Use Misuse 2000;35(68):811–844. [PubMed: 10847213]
42. Boyle J, Brunswick AF. What Happened in Harlem? Analysis of a Decline in Heroin Use Among a Generational Unit of Urban Black youth. J. Drug Issues 1980;10:109–130.
43. Clayton, RR.; Voss, HL. Young Men and Drugs in Manhattan: A Causal Analysis. National Institute on Drug Abuse; Rockville, MD: 1981. Research monograph no. 39
44. Hunt, LG.; Chambers, CD. The Heroin Epidemic: A Study Of Heroin Use In The U.S., 1965-1975. Spectrum; Holliswood, NY: 1976.
45. Williams, T. Crackhouse. Addison-Wesley; Reading, MA: 1991.
46. Substance Abuse and Mental Health Services Administration (SAMHSA). National Household Survey on Drug Abuse Series: H-8. National Household Survey on Drug Abuse Main Findings 1997. 1999. DHHS Publication No. (SMA) 99-3295
47. Substance Abuse and Mental Health Services Administration (SAMHSA). National Household Survey on Drug Abuse Series: H-10. Summary of Findings from the 1998 National Household Survey on Drug Abuse. 1999. DHHS Publication No. (SMA) 99-3328
48. Substance Abuse and Mental Health Services Administration (SAMHSA). The Development and Implementation of a New Data Collection Instrument for the 1994 National Household Survey on Drug Abuse. Apr. 1996 Office of Applied Studies. DHHS Publication No. (SMA) 96-3084
49. Bachman, JG.; Johnston, LD.; O'Malley, PM. The Monitoring the Future Project after Twenty-two years: Design and procedures. University of Michigan Institute for Social Research; Ann Arbor, MI: 1996. Monitoring the Future Occasional Paper Series #38
50. Johnston, LD.; O'Malley, PM.; Bachman, JG. National Survey Results on Drug Use from the Monitoring the Future Study, 1975-1998. 1. NIH; Bettesda, MD: 1999. National Institute on Drug Abuse. NIH Publication No. 99-4660
51. Johnston, LD.; O'Malley, PM.; Bachman, JG. Drug Trends in 1999 Are Mixed. University of Michigan News and Information Services; Ann Arbor, MI: 1999.
52. Golub A, Johnson BD, Labouvie E. On Correcting Biases in Self-reports of Age at First Substance Use with Repeated Cross-section Analysis. J. Quant. Criminology 2000;16(1):45–68.

53. Johnson RA, Gerstein DR. Initiation of Use of Alcohol, Cigarettes, Marijuana, Cocaine, and other Substances in US Birth Cohorts since 1919. Am. J. Public Health 1998;88(1):27–33. [PubMed: 9584029]

54. Johnson RA, Gerstein DR. Age, Period, Cohort Effects in Marijuana and Alcohol Incidence: United States Females and Males, 1961-1990. Substance Use Misuse 2000;35(68):925–948. [PubMed: 10847217]

55. Hosmer, DW.; Lemeshow, S. Applied Logistic Regression. Wiley; New York: 1989.

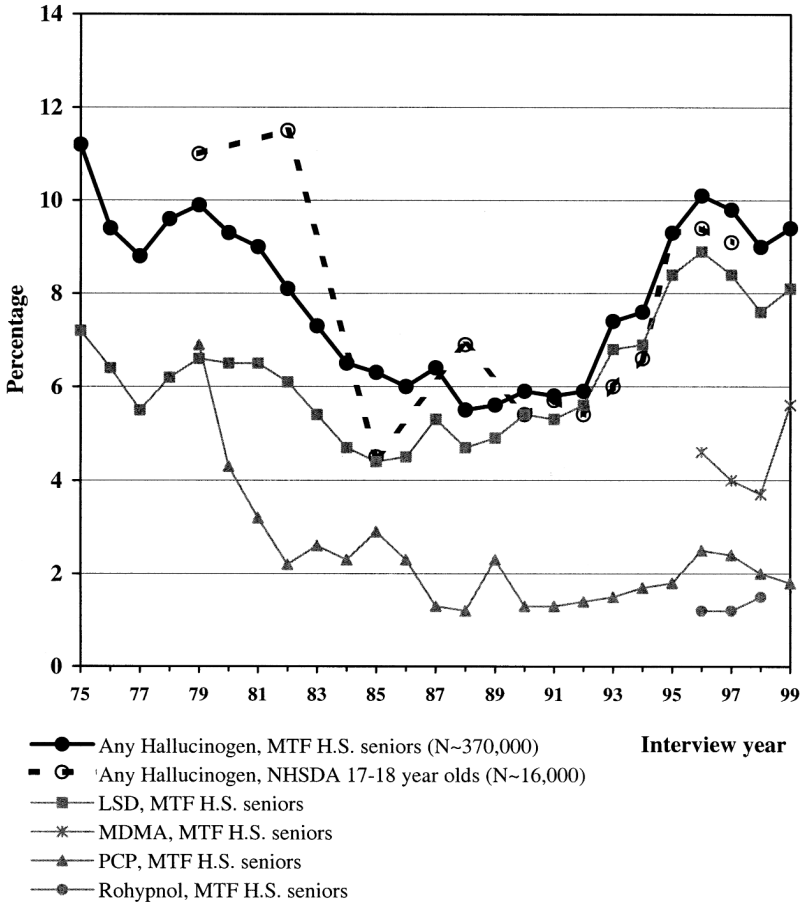

Figure 1.
Time trends in past year hallucinogen use in the late teens (MTF high school seniors and NHSDA 17-18 year-olds.

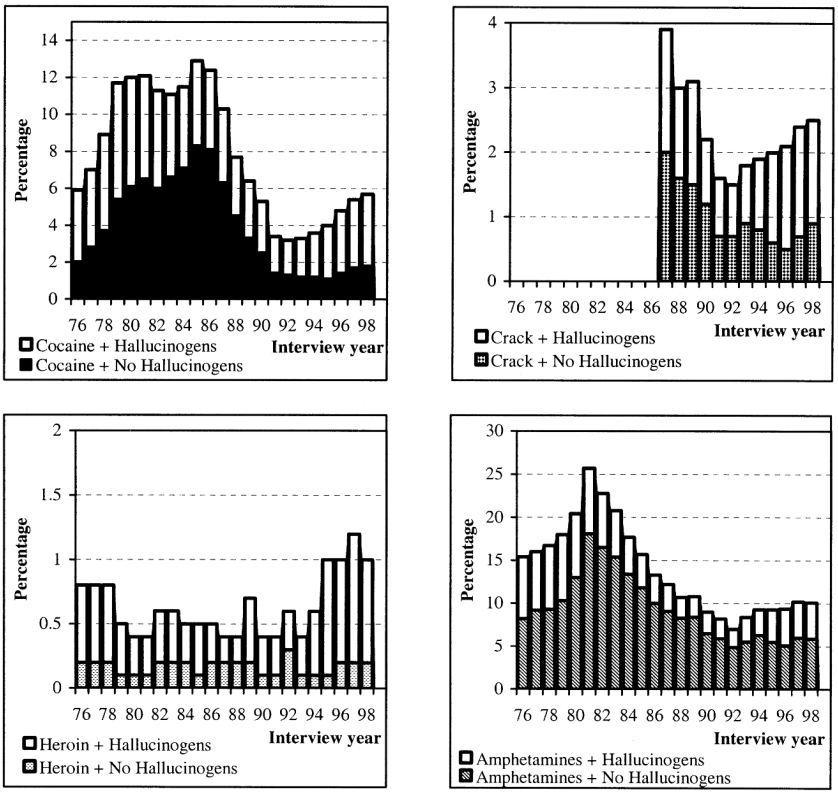

Figure 2.

Association over time between past-year cocaine, crack, heroin and amphetamine use with hallucinogen use among high school seniors, MTF 1976-1998 ($N \approx 370{,}000$).

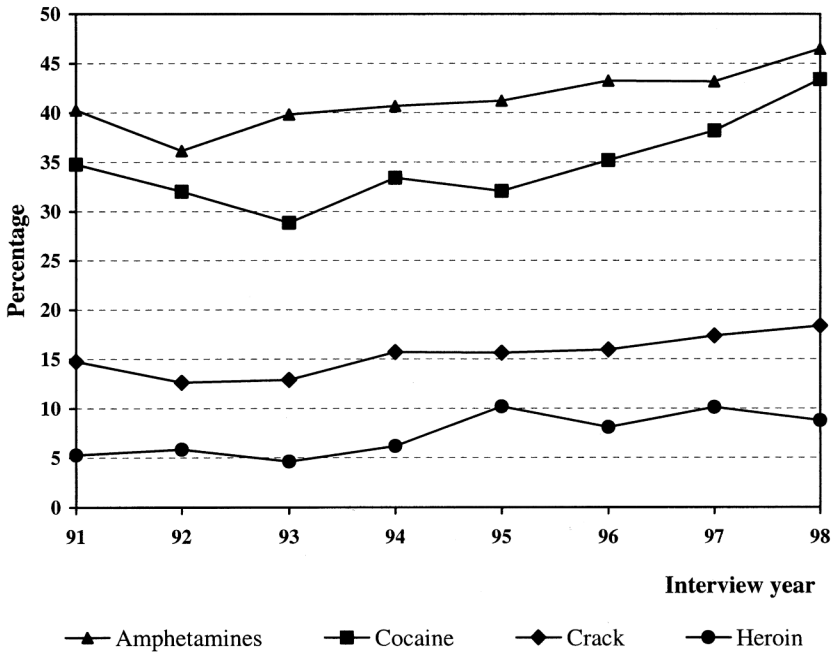

Figure 3.
Time trends in cocaine, crack, heroin and amphetamines use among past-year users of hallucinogen, MTF high school seniors 1991-98 ($N \approx 125{,}000$).

Table 1

Variation in Past-Year Hallucinogen Use by Age, Period and Birth Cohort, NHSDA 1979-97 (*N* ~ 200,000)

	Past year hallucinogen use by interview year												
Birth year	**79**	**82**	**85**	**88**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**Tot**
< 1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940-44	1	0	0	0	1	0	0	0	1	0	0	1	0
1945-49	2	2	0	0	0	0	1	0	0	0	0	0	0
1950-54	2	2	2	0	0	1	0	0	0	1	0	1	1
1955-59	10	4	4	2	1	1	0	0	1	1	1	1	1
1960	15	11	**4**	4	**0**	1	1	1	0	0	0	1	2
1961	**12**	9	4	2	1	**1**	1	1	1	1	1	1	2
1962	9	7	4	2	2	2	**1**	1	1	1	1	1	2
1963	8	7	4	**3**	2	2	2	**1**	1	1	1	2	2
1964	5	**9**	4	4	2	2	2	2	**1**	1	1	2	2
1965	4	9	4	4	**2**	2	2	2	1	**1**	1	1	2
1966	2	6	4	5	2	**3**	3	2	2	1	**1**	1	2
1967	0	2	**5**	5	3	4	**3**	3	2	2	1	**1**	3
1968		1	5	8	4	4	3	**3**	3	2	1	1	3
1969		0	4	8	5	5	4	3	**2**	2	2	2	3
1970		0	3	**8**	5	5	5	4	3	**3**	2	2	4
1971			1	6	5	6	6	5	4	3	**3**	2	5
1972			1	4	**5**	6	6	6	5	4	**4**	**2**	5
1973			0	3	5	**5**	6	6	6	**6**	**5**	**4**	5
1974				2	3	4	**5**	6	**7**	**7**	**6**	**6**	5
1975				1	2	3	4	**6**	**7**	**8**	**8**	**7**	5
1976				1	1	2	3	**5**	**7**	**9**	**9**	**8**	5
1977					0	1	1	3	**6**	**8**	**10**	**9**	4
1978						0	1	**2**	**4**	**7**	**9**	**10**	4
1979						0	0	1	**3**	**6**	**8**	**9**	4
1980							0	**1**	**2**	**4**	**6**	**8**	4
1981								0	**1**	**2**	**4**	**6**	3
1982									0	**1**	**3**	**4**	3
1983										0	**1**	**3**	2
1984											0	**2**	1
1985												0	0
Total	3	2	2	2	1	1	1	1	1	2	2	2	1

Cell entries based on at least 100 cases which at P = 5% guarantees a maximum S.E. of 2%.

The typical cell sample size of 600 has an S.E. of 1% (P=5%).

Values for birth cohorts since 1960 smoothed horizontally, vertically, and along major diagonal, when possible.

Age **18 25 30**.

Potential effect of the recent hallucinogen epidemic **1 2 3**.

Table 2

Bivariate and Logistic Regression Findings of Variation Across Selected Demographics in Past-Year Hallucinogen Use Among High School Seniors, MTF 1995-1998 ($N \sim$ 60,000)

	Percent past-year hallucinogen users[a]	Odds ratio (Wald)[b]
Gender		(400.1)**
Male	11.9	1.00[c]
Female	6.9	0.55
Race/Ethnicity		(510.1)**
White	11.0	1.00[c]
Black	1.5	0.11
Other/Missing	9.1	0.65
Region		(72.4)**
Northeast	11.9	1.00[c]
North central	8.5	0.70
South	8.8	0.81
West	9.8	0.81
Urbanicity		(248.1)**
Farm	5.0	0.47
Rural, not farm	7.1	0.72
Small town	9.5	1.00[c]
Med city (pop <50k)	10.5	1.31
Suburb med city	11.2	1.23
Lg city (100-500k)	8.8	1.18
Suburb lg city	13.1	1.41
Vlg city (>500k)	8.2	1.17
Suburb vlg city	10.5	1.11
Parents' Education		(15.7)**
No H.S. degree	7.4	0.90
H.S. degree	8.7	1.00[c]
Some college	9.8	1.08
College degree	9.8	0.98
Grad school	10.4	0.95
	9.5	0.19
	Overall	Base odds

[a] Bivariate analyses. Typical S.E.~0.2%.

[b] Multivariate logistic regression results. Differences in odds-ratios smaller than 0.10 were typically not statistically significant at the α=.01.

[c] Reference category.

** Statistically significant at the α=.01 level.