

- [see H. D. Young, *Statistical Analysis of Experimental Data* (McGraw-Hill, New York, 1962)].
20. J. H. Hitchborn and G. J. Hills, *Science* **157**, 705 (1967).
 21. M. Yanagida, D. J. DeRosier, A. Klug, *J. Mol. Biol.* **65**, 489 (1972).
 22. K. R. Leonard, A. K. Kleinschmidt, N. A. Keshishian, L. Shapiro, J. V. Maizel, *ibid.* **71**, 201 (1972).
 23. A. Klug, *Fed. Proc.* **31**, 30 (1972).
 24. J. Hanson and J. Lowy, *J. Mol. Biol.* **6**, 46 (1963).
 25. B. R. Gerber, L. M. Routledge, S. Takashima, *ibid.* **71**, 317 (1972).
 26. W. Bode, J. Engle, D. Winklmaier, *Eur. J. Biochem.* **26**, 313 (1972).
 27. B. R. Gerber and H. M. Robbins, *Biophys. Soc. Annu. Meet. Abstr.* **11**, 102a (1971).
 28. J. Lowy and J. Hanson, *J. Mol. Biol.* **11**, 293 (1965).
 29. E. J. O'Brien and P. M. Bennett, *ibid.* **70**, 133 (1972).
 30. B. R. Gerber and L. M. Routledge, unpublished data.
 31. W. F. Harris and L. E. Scriven, *J. Mechanochem. Cell Motility* **1**, 33 (1971). I found this and other basically important articles by Harris on "cylindrical crystals" only after completion of this article.
 32. S. Asakura, *Advan. Biophys.* **1**, 99 (1970).
 33. S. Grund, *Zentralbl. Veterinaermed. Reihe B* **18**, 133 (1971).
 34. M. C. Ledbetter and K. R. Porter, *Science* **144**, 872 (1964).
 35. K. R. Porter, in *Principles of Biomolecular Organization*, G. E. W. Wolstenholme and M. O'Connor, Eds. (Churchill, London, 1966), p. 308.
 36. L. G. Tilney, *J. Cell Biol.* **51**, 837 (1971).
 37. ——— and J. Bryan, unpublished data.
 38. I. R. Gibbons and A. V. Grimstone, *J. Biophys. Biochem. Cytol.* **7**, 697 (1960).
 39. C. Cohen, S. C. Harrison, R. E. Stephens, *J. Mol. Biol.* **59**, 375 (1971).
 40. A. V. Grimstone and A. Klug, *J. Cell Sci.* **1**, 351 (1966).
 41. M. B. Thomas, *Biol. Bull. Woods Hole* **138**, 219 (1970).
 42. J. Bryan and L. Wilson, *Proc. Nat. Acad. Sci. U.S.A.* **68**, 1762 (1971); I. Meza, B. Huang, J. Bryan, *Exp. Cell Res.* **74**, 535 (1972); J. Bryan, *J. Mol. Biol.* **66**, 157 (1972).
 43. G. B. Witman, K. Carlson, J. L. Rosenbaum, *J. Cell Biol.* **54**, 540 (1972).
 44. R. E. Stephens, in *Cilia and Flagella*, M. A. Sleight, Ed. (Academic Press, London, in press).
 45. This conclusion is tentative. If the dimers, rather than the monomers, are numbered consecutively along a 1-parastichy, it turns out that the arrangement is (3, 10, 13). It would be interesting to explore the symmetrical tubular arrangements of two or more classes of objects.
 46. J. A. Subirana, *J. Theoret. Biol.* **20**, 117 (1968).
 47. I am grateful to my colleagues, Bernard R. Gerber, Lewis M. Routledge, Lewis G. Tilney, Joseph Bryan, and Shinya Inoué for prodding me to consider this problem, and for providing references, data, and critical discussion. Arthur Veen has offered mathematical criticism and has carried out most of the computer solutions of equations and computer plotting of figures. This work has had the support of grant GB-23028 from the National Science Foundation.

The Dynamics of a Heroin Addiction Epidemic

Heroin abuse has declined in Washington, D.C.

Robert L. DuPont and Mark H. Greene

In the mid-1960's a wave of heroin addiction enveloped Washington, D.C., and directly affected the lives of an estimated 18,000 residents of that city. Almost every other major metropolitan area in the United States witnessed a similar phenomenon, with associated criminal activity and social disruption. In response to the obvious need to bring the heroin addiction problem under control, a variety of treatments and intervention strategies were developed throughout the country. The debate regarding the effectiveness of addiction treatment, the role of law enforcement, the value of methadone, and the motives of treatment planners has been characterized by more heat than light and continues unabated and unresolved.

The District of Columbia made a

major manpower and monetary commitment in an attempt to solve its heroin addiction problem. There were two components to its intervention strategy. The first was a comprehensive, multimodal treatment program for addicts, which began in the fall of 1969 and relied substantially, but not exclusively, on methadone (1). The second was a major law enforcement commitment to reduce the supply of heroin in the city, which also began in 1969 (2). Observations made during the 3 years since the implementation of these programs form the basis for this article.

In early 1973, the heroin epidemic appeared to be waning in the District of Columbia. In this article we document the decline of heroin addiction in the nation's capital, using measures of the incidence and prevalence of heroin addiction, as well as measures of the availability, cost, and quality of heroin in the streets. It is our intention to describe what has happened

in Washington, D.C., during a time in which intensive efforts have been directed at solving the problem of heroin addiction.

Methods

Few data on heroin use were gathered in the District of Columbia before 1969. Since then, data have been systematically collected and analyzed from a number of sources. Some data have been available since 1969. Other data only became available as our understanding of the addiction problem developed. The following sources were used during this analysis.

Patients in treatment. Starting in July 1970, information on the year and age of first heroin use has been tabulated for all patients entering the Narcotics Treatment Administration (NTA), the city's comprehensive addiction treatment program. Monthly totals of the number of patients entering treatment have been available since October 1971. This information is subdivided according to type of patient referral (voluntary or criminal justice) and to whether the patient is new to NTA or is being readmitted to treatment. Periodic surveys have been made to elicit information regarding the street availability and quality of heroin as judged by addicts entering treatment. Questionnaire information obtained from addicts has been shown to be remarkably reliable (3).

Urine drug testing. Urine testing for heroin has been carried out at three locations. Heroin use is indicated by the presence of morphine or quinine or both in the urine. Arrestees held in the

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lockup of the Superior Court of the District of Columbia, a prearrest holding facility, voluntarily surrender urine samples for drug testing by NTA's criminal justice division. This program was instituted in December 1971. All patients in treatment with NTA are required to submit urine samples twice a week. Summaries of the results of these urine tests on the entire treatment population became available in April 1972. Finally, surveys on the extent of heroin abuse among prisoners entering the D.C. Jail were carried out in August 1969, January 1971, August 1972, and February 1973. As part of these surveys, qualitative and quantitative analyses of urine were done by toxicology laboratories licensed by the Food and Drug Administration. These laboratories were periodically evaluated by NTA with quality control checks.

Opiate overdose deaths. In July 1971 the District of Columbia adopted a medical examiner system for medical-legal death investigation. A modern, sophisticated toxicology laboratory is part of this new system, and has played a critical role in the investigation of suspected drug-related fatalities. All acute deaths directly related to opiate abuse are classified as acute opiate overdose deaths. These deaths occur primarily in young, black, inner-city males with a history of narcotics addiction (80 percent), in whom there is toxicological evidence of morphine, quinine, or methadone (98 percent), and for whom there is no discernible

natural or traumatic cause of death at autopsy. Excluded from this group are deaths resulting from the various recognized medical complications of narcotism (sepsis, endocarditis, tetanus, hepatitis, massive pneumonia, and so forth), and deaths from natural and unnatural causes (homicide, suicide, accident, and so forth) among known addicts. The D.C. medical examiner's staff includes two full-time forensic pathologists and two full-time toxicologists. Death investigations are supported by the homicide unit of the D.C. Metropolitan Police Department, which has a highly trained and experienced staff.

These deaths are tabulated on a monthly basis and classified as heroin, methadone, or combination (both heroin and methadone) deaths, according to the results of toxicological examinations. Data on opiate overdose deaths are complete and highly reliable.

Age trends among addicts. As it is clear that opiate abuse begins among teen-agers (see Fig. 1), age trends among patients entering NTA treatment and among drug abusers identified in the Superior Court system have been followed. Monthly data on the NTA treatment population have been available since January 1972. Two studies of defendants before the Superior Court, in January 1971 and August 1972, provided data on the ages of that population.

Metropolitan Police reports. The D.C. Metropolitan Police Department has tabulated all drug charges on an

annual basis since 1969. From this data we have abstracted those charges in which an opiate drug was involved. Police agents also seize opiate drugs from arrested persons and make undercover "buys" of heroin as part of the effort to reduce heroin availability. The number of seizures has been tabulated on a monthly basis since January 1971 and undercover buys on a monthly basis since January 1972. Additional information available on the undercover buys [made at the street level only (4)] includes the amount paid by the undercover officer, and results of laboratory analyses (5) of the heroin content of the material purchased. This permits the calculation of the cost of heroin (per milligram of pure heroin), the average amount of heroin in a street-level package (a foil container), and the average purity of street-level heroin.

Police activity in the narcotics area grew steadily from 1969 through 1971 and stabilized at a high level in 1972. The validity of data collected by police officials have been the subject of controversy recently. We made every effort to obtain data that were as specific as possible (for example, we included *opiate* charges, not drug charges). Wherever feasible, we analyzed the raw data (buys, seizures, cost, and purity) ourselves.

Data were analyzed for significance using Student's *t*-test and the chi-square test. Trends were demonstrated by determining the linear regression line by the method of least squares.

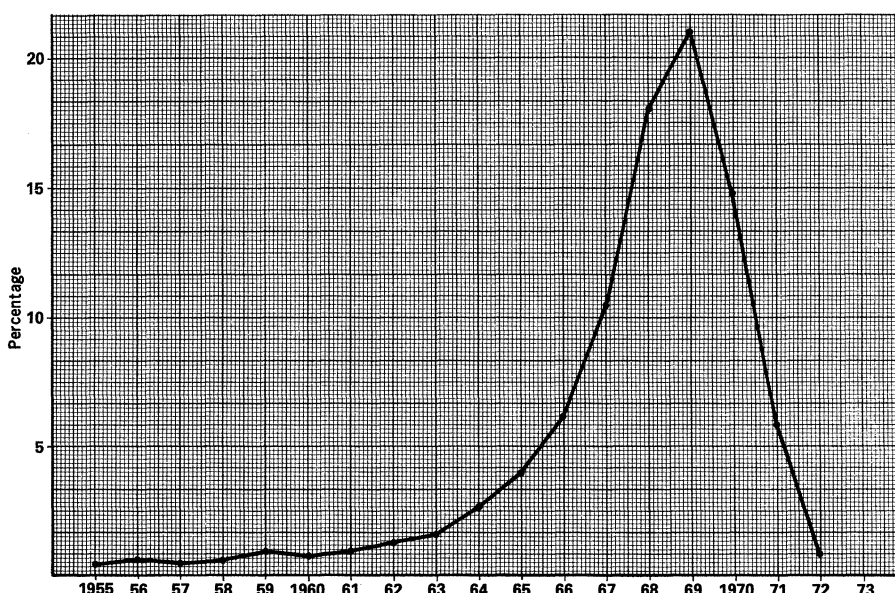
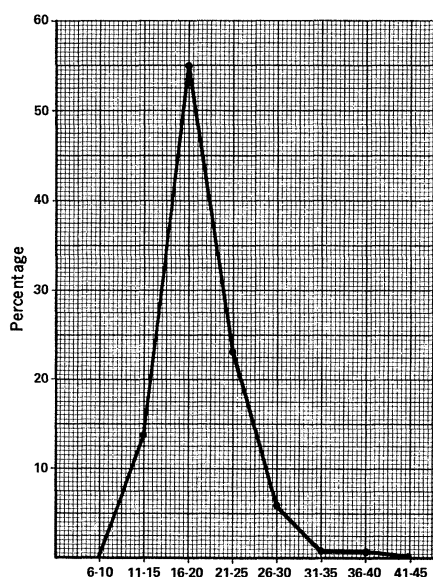


Fig. 1 (left). Age at first use of heroin as reported by 13,000 NTA patients. Each point represents the percentage of the total sample in each age group at the time heroin use was initiated. Fig. 2. Year of first heroin use as reported by 13,000 NTA patients. Each point represents the percentage of the total sample which began heroin use in a given year.

Results

The results are summarized in three major categories: data on heroin addiction incidence, data on heroin addiction prevalence, and data on heroin availability (considered as a separate category because they are related to both incidence and prevalence).

Measures of heroin addiction incidence. Data on all patients seen by NTA between its inception in 1970 and December 1972 (nearly 13,000) were used to generate Fig. 2, in which the number of patients who began heroin use in a given year is plotted over time. It shows that new heroin use rose sharply from 1965 through 1968, peaked in 1969, and fell dramatically in 1970, 1971, and 1972. Similar data have been used by Hughes *et al.* (6) to document the heroin epidemic that occurred in Chicago in the early 1950's. If heroin addiction were a process in

which most of the people affected died within 1 to 2 years, one would expect a similar drop in the curve. Addiction is *not* such a process. In fact, the average duration of heroin use before entry into NTA is 4 years. Changes in the source of patients over time (that is, shifts between voluntary and criminal justice referrals) could not explain this drop, as curves obtained for voluntary and criminal justice patients are identical. Another explanation for the drop might be that new users are relatively unlikely to seek treatment; only after they have been involved with heroin for some period of time do they become interested in treatment. To test the hypothesis that a lag between onset of heroin use and entry into treatment explains the drop in addiction incidence, similar curves were obtained for five patient subgroups as determined by the date of their entry into NTA: July to December 1970, January to December 1970, January to December 1971, January to December 1972, and July to December 1972.

June 1971, July to December 1971, January to June 1972, and July to December 1972. If the hypothesis were correct, one would expect the peak of these five curves to shift over time. In fact, the peak of the curves for the last four subgroups is at 1969 (Fig. 3). This suggests that the decline in incidence is real and not related to delay in seeking treatment.

The shape of the incidence curve suggests contact as the mode of transmission. This is consistent with previous data indicating that heroin addiction spreads by person-to-person contact (7).

Given that the onset of addiction occurs primarily among people in their teens and early 20's, one would expect to see the average age of heroin users rise if our hypothesis regarding a sharp decline in the rate of creation of new users is correct. Data were available on the ages of the NTA treatment population and of arrestees in the D.C. Superior Court lockup (see Tables 1 and 2). In the early history of NTA, nearly 31 percent of patients in treatment were under age 21. Half of those were under 18. By the end of 1972, only 16.6 percent of patients in treatment were under 21, and only 10 percent of them were under 18. Among arrestees in the Superior Court lockup, the average age of heroin users rose from 23.1 to 25.7 years over an 18-month period. The mean age of nonusers of drugs remained constant. The fact that the mean age rose $2\frac{1}{2}$ years over a $1\frac{1}{2}$ -year period suggests that not only were considerably fewer new users being created, but also that a substantial number of young users were becoming nonusers at the same time.

Measures of heroin addiction prevalence. Heroin overdose deaths were first tabulated in 1969. Before the institution of the medical examiner system, several improvements had been made in overdose investigations that made it difficult to follow trends. Since July 1971, however, procedures have been constant. The rate of death from heroin overdose peaked in the summer of 1971, when 29 deaths occurred in a 3-month period. Since then, heroin overdose deaths have decreased progressively. During 1972, there were only 20 heroin overdose deaths in the District of Columbia, all but two of which occurred during the first 6 months of the year (see Fig. 4). There has been only one heroin overdose death during the first 3 months of 1973. Heroin may have also contributed to the deaths of 18 additional persons in 1972 (classified as combination deaths).

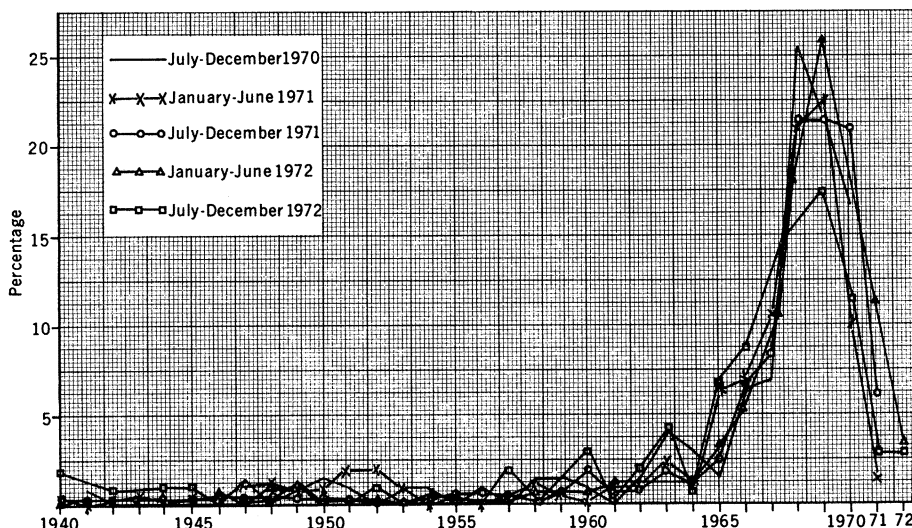


Fig. 3. Year of first heroin use as reported by five cohorts of NTA patients. A cohort consists of all patients admitted for treatment during a given 6-month period.

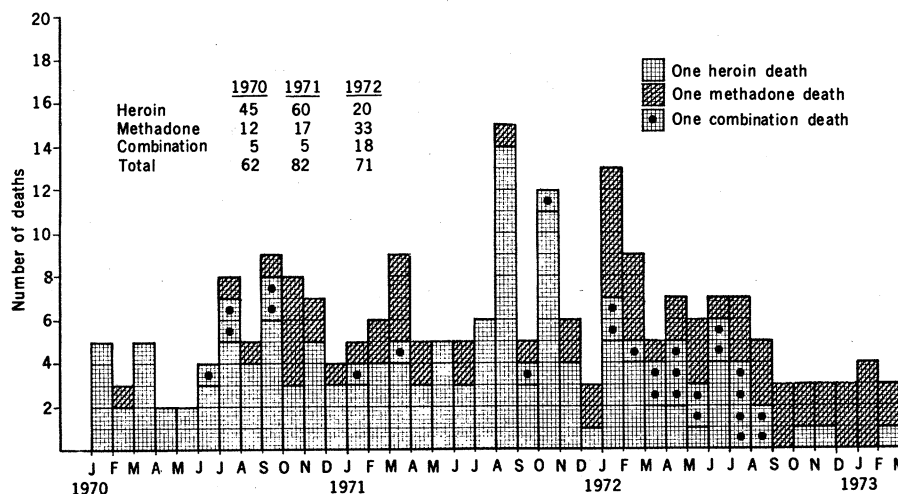


Fig. 4. Acute opiate overdose deaths in the District of Columbia, January 1970 through February 1973.

All of those deaths occurred during the first 8 months of 1972; none have occurred since August 1972.

The number of opiate charges made by the D.C. Metropolitan Police climbed rapidly to a peak of 3144 in 1971, as more police manpower was added and narcotics offenses were being given higher priority. The number of charges remained high through early 1972, but the total number of opiate charges made during 1972 dropped (see Fig. 5). The 1972 total clearly falls outside the 99 percent confidence band established around the trend line for the years 1969 to 1971. This indicates that 1972 is significantly different from the preceding years, but more data are needed to establish the existence of a new trend. If we use the number of opiate charges made during the first quarter of 1973 to project an estimated total for 1973, it appears that this decline is continuing. The 1973 estimate is 1300 charges. It is clear that a substantial portion of the rise in the number of opiate charges results from a reporting artifact that is secondary to increased police activity, but not secondary to increased criminal activity among addicts. Given that the incentive for the police is to report high numbers of opiate charges, the most reasonable explanation for the decline in this index is either a decline in the total number of addicts or a decline in the amount of heroin-related criminal activity or both.

From the day it opened its doors in February 1970, NTA has never had unused treatment capacity. In fact, the overcrowding of treatment centers has contributed to the program's dropout rate. On several occasions the admission of new patients to the program was suspended because resources were so severely taxed. Between October 1971 and February 1972, a time of open intake, approximately 25 new patients were taken into treatment daily. In March 1972, there was a sharp rise in the demand for treatment. Intake averaged 49 patients daily and peaked at 58 patients entering treatment in a single day (see Table 3). In April 1972, intake was restricted to 25 per day because treatment capacity had been exhausted. By the summer of 1972, there was a decline in the demand for treatment; intake restrictions were entirely removed on 5 September 1972. From September 1972 through March 1973, an average of only ten patients entered treatment each day.

In the past, word had spread quickly regarding changes in NTA intake pol-

Table 1. Age trends among NTA treatment population.

Date	Patients in treatment (%)	
	Under 21	Under 18
July 1970	30.9	15.9
January 1972	23.6	3.6
July 1972	20.5	2.2
January 1973	16.6	1.6

Table 2. Age trends among defendants before the D.C. Superior Court.

Category	Age (years)	
	January 1971	August 1972
Total cohort	25.4	28.0
Nonusers of drugs	29.2	28.9
Drug users	23.1	25.7

icy. It is unlikely that this unexpected and unprecedented drop in treatment was related to the 5 months of restricted intake during the spring and summer of 1972. It might be argued that NTA had simply become unpopular with addicts, and that there were still, in March 1973, many untreated users in the streets who were unwilling to enter treatment. If that were so, one would expect the drop in intake to be manifested only among voluntary patients, with criminal justice referrals remaining constant. In fact, the number of criminal justice referrals declined in a similar fashion. Finally, the number of new admissions decreased until there

were fewer new admissions than readmissions. This suggests that there were sharply reduced numbers of untreated addicts in the streets by early 1973.

In December 1971 urine testing indicated evidence of heroin use in 22 percent of the arrestees who were tested in the D.C. Superior Court lockup. This rate peaked at 31 percent in March 1972 and fell to an all-time low of 12.5 percent in March 1973. Analysis of this data (Fig. 6) reveals a clear downward trend.

Four separate surveys, in which similar techniques were used, were made of men coming in to the D.C. Jail. In August 1969, urine testing indicated evidence of recent heroin use in 30 percent of those tested. In January 1971 this figure rose to 47 percent. By August 1972 it had fallen to 24 percent, and in February 1973 it declined further to 13 percent.

Measures of heroin availability. The number of heroin seizures made by the police reached a peak of 457 in September 1971. This number progressively declined through 1972, so that in March 1973 only 56 seizures were made, despite no change in the number of agents assigned to narcotics work and continued efforts to find heroin. The number of purchases made by undercover agents peaked in June 1972 at 113 and then fell progressively to 31 in March 1973.

Since June 1969 there has been a progressive decline in the purity of heroin available on the streets of Washington. In 1969 the average heroin content of all street-level buys and seizures was more than 6 percent. Comparable data were obtained in other parts of the country. By the end of the first quarter of 1973, the average heroin content had reached an all-time low of 2.1 percent ($t = 3.87$, $P < .001$, for comparison between the first quarter of 1969 and the first quarter of 1973). These data are summarized in Fig. 7.

Analysis of heroin specimens obtained by the police also revealed a sharp drop in the number of milligrams of heroin in an average consumer-sized package from 16.4 mg in February 1972 to 5.2 mg in March 1973 ($t = 3.34$, $P < .001$).

The standard deviation of the mean number of milligrams in a consumer package was ± 18.75 mg in February 1972 and ± 7.46 mg in March 1973. This sharp decline in variability of heroin content may partially explain the reduction in the heroin overdose rate.

Coincident with the decrease in her-

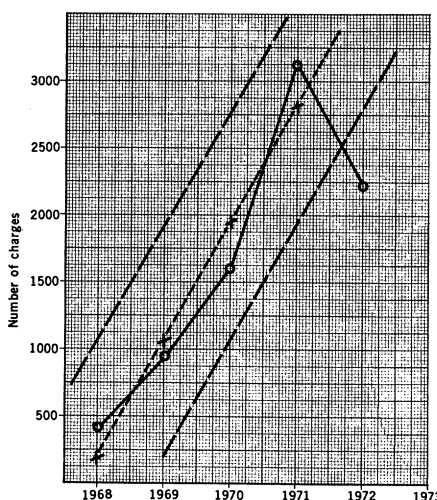


Fig. 5. Annual number of opiate offense charges reported by the D.C. Metropolitan Police Department. (Open circles) Actual data points; (crosses) best fit points; (dashed line) 99 percent confidence band. The actual data points are 408 (1968), 958 (1969), 1588 (1970), 3144 (1971), and 2108 (1972). The linear regression line was determined by the method of least squares.

oin availability, there has been an increase in the cost of heroin in the illegal market. In February 1972 the calculated cost of street-level heroin was \$1.53 per milligram. During the next 10 months there was a progressive rise in price to \$5.80 per milligram in March 1973 (see Fig. 8). This increase is statistically significant ($t = 4.12$, $P < .001$).

Before March 1972 approximately 20 percent of all urine samples tested from patients admitted to NTA showed evidence of heroin use. From March 1972 through November 1972 this figure fell to a surprising 7 percent. This drop in the "dirty urine" rate reflected, in part, improvements in the NTA counseling program, but it was hard to attribute such a sudden drop to any program

changes. Most of the drop from August through November probably reflected decreased heroin availability.

In October 1972 a sample of 74 heroin addicts entering treatment was surveyed regarding current heroin availability as compared to availability of heroin 3 months earlier. A change in availability was reported by 81 percent, of whom 68 percent stated that heroin was less available, 80 percent stated that the available heroin was weaker, and 100 percent stated that the price of heroin had increased. In a follow-up survey made in November 1972, the addicts interviewed reported a rise in the average daily cost of their heroin habit from \$39 to \$52 over the 3-month period prior to their entering treatment ($t = 2.37$, $P < .02$).

Related Findings

Serious crime rate declines. A major impetus to the creation of heroin addiction treatment programs was public concern regarding the rising crime rate. Much of the increase in serious crime in the early 1960's was attributed to addict-related criminal activity. A full discussion of the relation between addiction and crime is beyond the scope of this article. However, as so much importance has been attached to the expectation that a decline in heroin addiction will lead to a decline in the crime rate, we feel obliged to comment on this issue.

It is very difficult to prove a cause and effect relationship between observed changes in the prevalence of

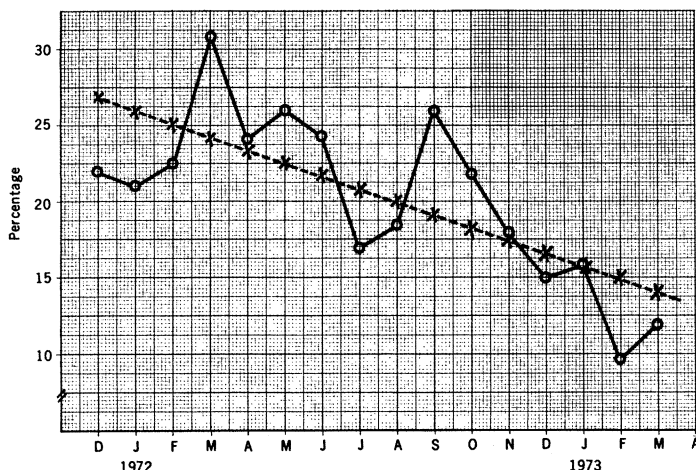


Fig. 6 (left). Percentage per month of urine samples positive for heroin (morphine or quinine or both) among arrestees held in the D.C. Superior Court lockup, December 1972 through March 1973. (Open circles) Actual data points; (crosses) best fit points. The linear regression line was determined by the method of least squares. Fig. 7 (right). Percentage per quarter of average heroin content in street-level heroin purchases. (Open circles) Actual data points; (crosses) best fit line. The linear regression line was determined by the method of least squares.

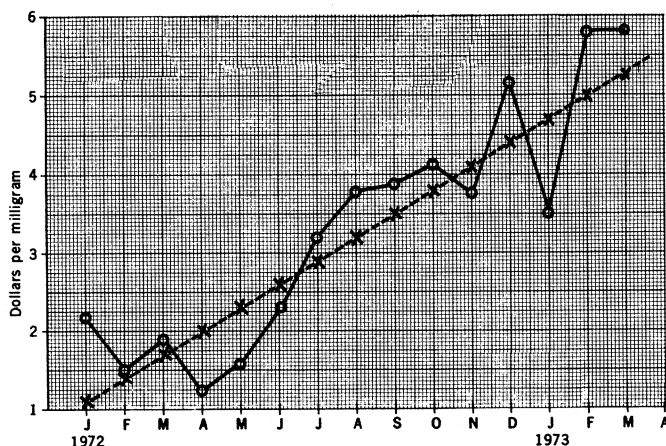
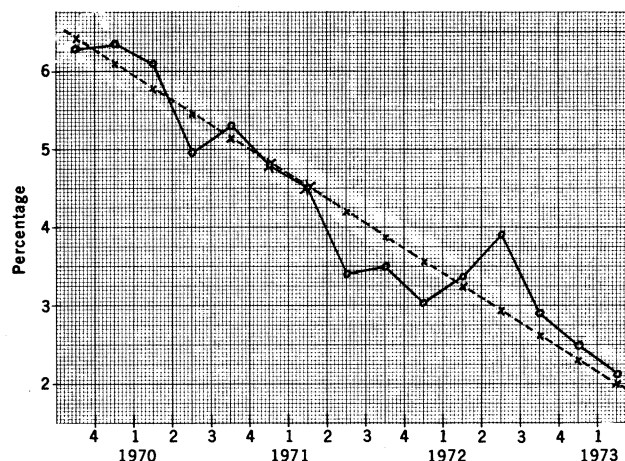
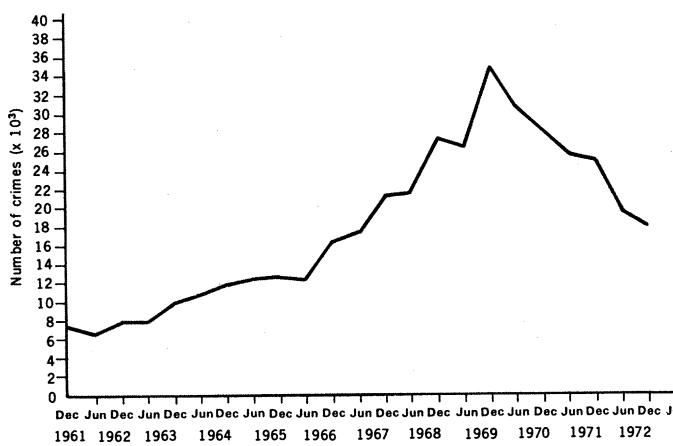


Fig. 8 (left). Calculated cost per milligram of pure heroin in street-level heroin purchases, January 1972 through March 1973. (Open circles) Actual data points; (crosses) best fit points. The linear regression line was determined by the method of least squares. Fig. 9 (right). Number of crime index offenses in Washington, D.C. (6-month totals) from December 1961 through December 1972. Crime index offenses include murder, rape, robbery, aggravated assault, burglary, larceny (\$50 and over), and auto theft.

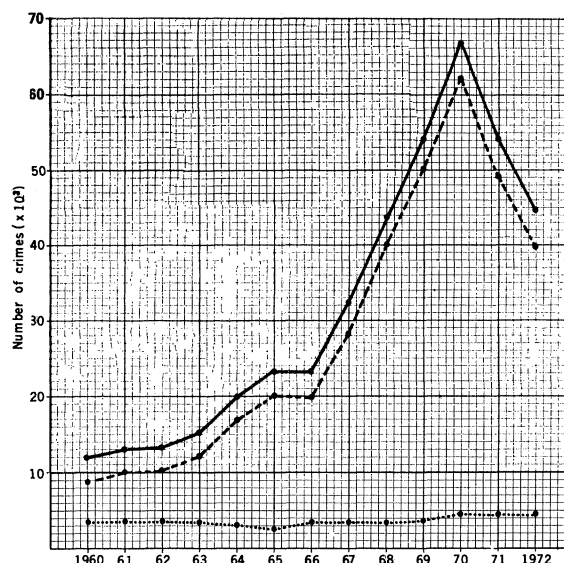


heroin addiction and observed changes in the crime rate. One is forced to rely on data that are indirect. The best available evidence reveals a sharp and progressive decline in the serious crime rate in the District of Columbia (Fig. 9).

Similar trends have been noted in New York City, which suggests that this is not a local phenomenon. There are three observations that suggest a relationship between the declining crime rate and the termination of the heroin addiction epidemic. First is the temporal association between the two trends. The decline in the serious crime rate began late in 1969, when addiction treatment first became available in Washington, D.C., and has continued during the period of diminishing heroin abuse, prevalence, and availability. Second, when the components of the serious crime index are examined separately, changes in the rates of property-related crime (those crimes traditionally associated with addicts) account for both the rise and decline of the crime rate in the last decade (Fig. 10). Finally, when one compares the monthly total of NTA's active patient population with the monthly property-related crime rate (using the Pearson correlation coefficient), there is a striking negative correlation ($r = -.79$, $P < .001$). That is, as rising numbers of addicts were brought into treatment, fewer and fewer crimes of the type associated with addiction were committed.

These data suggest a relationship between trends in addiction and crime, but certainly do not prove it. We refer the reader to the second report of the National Commission on Marihuana and Drug Abuse (8) for the most current summary of data on this topic. A report by Seidman and Couzens disputes the validity of D.C. crime statistics (9). This report generalizes conclusions based on observations in a single category of crime (larceny over \$50) to all property-related crime. It is based on data available through mid-1971, and focuses on a change in police administration as the critical event associated with the new crime data trends. Other critical events are temporally associated with the new crime trend (for example, the creation of NTA, high-intensity street lights, and so forth). The category of crime upon which their conclusions are based is precisely the category one would expect to change if addiction rates fell. To generalize from this one category to others is du-

Fig. 10. Number of crime index offenses in Washington, D.C., 1960 through 1972. (Solid line) Total offenses; (dashed line) property-related offenses (robbery, burglary, larceny over \$50); (dotted line) person-related offenses (murder, rape, aggravated assault). [Adapted from data provided by the D.C. Metropolitan Police Department]



bious, and data collected over an additional 1½ years further refute their conclusions. Finally, the authors themselves admit that the D.C. crime data do not conform to the statistical model upon which their entire analysis is based.

As heroin use and availability have declined, two new drug abuse problems have made their appearance in Washington. Methadone has appeared in the streets and is being used as either an alternative opiate in place of heroin or by addicts attempting to treat themselves outside an established treatment program. Although there is no evidence to support the development of "primary methadone addiction" (that is, regular methadone use in persons not previously addicted to heroin), there has been a marked increase in methadone overdose deaths. Efforts to curb

this problem have included removal of methadone from the shelves of D.C. pharmacies, the institution of noninjectable methadone preparations in NTA's program, and reduction of the amount of methadone that patients are allowed to take home. These efforts have been partially successful, but the problem still exists.

In the spring and summer of 1972, there was an epidemic of intravenous methamphetamine abuse among Washington's addicts. Studies have shown that this drug originated from a small group of physicians and was used by addicts to augment the "high" obtained from oral methadone or poor-quality heroin. A combined effort by the D.C. Medical Society, NTA, and the D.C. Metropolitan Police Department brought this problem under control by October 1972 (10).

Table 3. Number of monthly NTA admissions, October 1971 through February 1973.

Year	Month	Voluntary admissions		Criminal justice admissions		Total	Daily average
		New	Readmit	New	Readmit		
1971	October	212	141	120	75	548	26.1
	November	250	150	197	89	686	32.7
	December	189	136	118	89	532	25.3
1972	January	175	137	104	84	500	23.8
	February	194	165	93	80	532	25.3
	March	473	325	133	99	1030	49.0
	April	306	225	88	88	707	33.7
	May	227	183	106	92	608	30.0
	June	224	224	92	101	641	30.5
	July	157	174	102	102	535	25.5
	August	93	132	107	92	424	20.2
	September	56	89	52	69	266	12.7
	October	55	78	48	48	229	10.9
	November	39	80	50	50	219	10.4
	December	41	83	28	42	194	9.2
1973	January	53	88	42	42	225	11.2
	February	38	77	39	63	217	10.8

Conclusions

The heroin addiction epidemic in the District of Columbia began in 1966 and reached a peak in 1971. The creation of new addicts (incidence) peaked in 1969, but it was not until early in 1972 that there appeared to be a reduction in the number of heroin users (prevalence) in the city.

We must emphasize that these data describe very complicated events that have occurred in a relatively brief time span. In a sense, it is easier to *describe* what has happened than to *explain* what has happened. It does appear, however, that at least two factors were critical in curbing the heroin epidemic: the availability of treatment, which reduced the addicts' dependence on heroin; and vigorous local, national, and international law enforcement efforts, which reduced the supply of heroin. It is the combination of the two that is important. During times when heroin is plentiful, inexpensive, and of high quality, there is less incentive for the addict to seek treatment. When heroin is scarce and treatment is not available, the addict is forced to make more desperate efforts to support his habit, and society pays the price in terms of increasing social disruption. When heroin is scarce and treatment is available, addicts have both a disincentive to heroin abuse and an alternative to an increasingly desperate criminal life-style. It is imperative that both treatment and law enforcement efforts be maintained if heroin abuse is to be kept at the lowest feasible level. The potential danger inherent in a relaxation of these efforts

is illustrated by recalling the disastrous sequence of events that followed when efforts to control venereal disease were reduced because the epidemic seemed under control. Today, venereal disease is virtually pandemic in the United States, just a few years after its demise as a major public health problem was heralded. It would be a tragedy if the same thing happened with heroin addiction.

It is probable, although difficult to document, that the development of an antiheroin attitude in the community also contributed to terminating the epidemic. Heroin is now "out." No longer is the pusher seen as a glamorous individual, a fabulously successful businessman. He has become a parasite in the community. Youngsters in the susceptible age group have become more aware of the dangers of addiction and, therefore, less willing to experiment with heroin. It is one thing to grow up knowing there is an older fellow on the next block who is addicted to heroin, and quite another to have many of your friends "strung out," in jail, or even dead from an overdose. As the appalling consequences of heroin addiction have become apparent, previously susceptible teen-agers are no longer willing to take the risk of experimenting with heroin.

It is also apparent that data which accurately depict drug abuse trends are critically needed to facilitate rational policy-making in this area. Sensors must be established in the community to monitor drug use patterns and to document the consequences of the various patterns observed. Only in this way can new problems be detected in their

earliest stages and be dealt with before they reach crisis proportions. Recently described detection and intervention techniques offer real promise in this regard (11).

Finally, it should be emphasized that the trends indicating a reduction in both the incidence and prevalence of heroin abuse in Washington are unprecedented and of relatively short duration. The passage of time alone will tell whether the problem is truly solved.

References and Notes

1. R. L. DuPont, *N. Engl. J. Med.* **285**, 320 (1971).
2. ——— and R. N. Katon, *J. Amer. Med. Ass.* **216**, 1320 (1971).
3. R. Stephens, *Int. J. Addict.* **7**, 549 (1972).
4. A street-level buy is defined as a buy in which less than \$50 is paid for a package containing less than 500 milligrams of material (only a small part of which is actually heroin).
5. Analysis of heroin samples was carried out by the Washington Regional Laboratory of the Bureau of Narcotics and Dangerous Drugs.
6. P. H. Hughes, N. W. Barker, G. A. Crawford, J. H. Jaffe, *Amer. J. Public Health Nat. Health* **62**, 995 (1972).
7. R. De Alarcon, *Bull. Narcotics* (July–September 1969), p. 17; R. Levingood, P. Lowinger, K. Schoof, "Heroin addiction in the suburbs: An epidemiologic study" (paper presented at the 99th annual meeting of the American Public Health Association, Minneapolis, 1971).
8. National Commission on Marihuana and Drug Abuse, *Drug Use in America: Problem in Perspective* (Government Printing Office, Washington, D.C., 1973).
9. D. Seidman and M. Couzens, "Crime, crime statistics, and the great American anti-crime crusade: Police misreporting of crime and political pressures" (paper presented at the 1972 annual meeting of the American Political Science Association, Washington, D.C., 1972); *Law Soc. Rev.*, in press.
10. M. H. Greene and R. L. DuPont, in *Proceedings of the Fifth National Conference on Methadone Treatment* (National Association for the Prevention of Addiction to Narcotics, New York, 1973); *J. Amer. Med. Ass.*, in press.
11. P. H. Hughes, G. A. Crawford, N. W. Barder, *Arch. Gen. Psychiat.* **24**, 389 (1971); P. H. Hughes and G. A. Crawford, *ibid.* **27**, 149 (1972).