

# Reducing the Risk of AIDS Through Methadone Maintenance Treatment

JOHN C. BALL  
W. ROBERT LANGE

*National Institute on Drug Abuse  
Addiction Research Center*

C. PATRICK MYERS

*University of Maryland*

SAMUEL R. FRIEDMAN

*Narcotic and Drug Research, Inc.*

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*In a three-year field study of methadone maintenance programs in New York City, Philadelphia, and Baltimore, treatment was found to be effective in reducing IV drug use and needle sharing among most heroin addicts. Of 388 patients who remained in treatment for one year or more, 71 percent had ceased IV use. Conversely, 82 percent of patients who left treatment relapsed rapidly to IV drug use.*

*Marked differences in the effectiveness of various programs were observed: current IV use varied from less than 10 percent to over 57 percent of patients in particular treatment programs. This differential effectiveness was related both to length of patient's stay and to the quality of treatment provided.*

*HIV seropositivity among high-risk drug users is related to frequency of injections and needle-sharing contacts. Effective methadone treatment can stop these practices, but a widespread impact on the AIDS epidemic will require improvement of treatment in many programs.*

In the past few years, drug abuse treatment research has received a new mandate: to find treatment for patients that is not only generally rehabilitative but also specifically effective in reducing intravenous drug use and needle-sharing practices among heroin addicts and others who resort to injections (Clayton 1986; Drotman 1987; Stimmel 1987). This

concern about IV use was caused by the AIDS epidemic, although other medical and epidemiological problems associated with IV use have been recognized as well (Ball and Chambers 1970; Lowinson and Ruiz 1981) since this route of administration was first followed in the 1920s in the United States (O'Donnell and Jones 1968). Now, however, AIDS adds a new urgency to the search for effective treatment. Currently IV drug users constitute the second largest population group in the United States at risk for AIDS (Centers for Disease Control 1987; Des Jarlais, Friedman, and Hopkins 1985; Ginzburg, MacDonald, and Glass 1987; Hardy, Allen, Morgan, and Curran 1985). In New York City some 50 percent of heroin addicts are infected with the human immunodeficiency virus (HIV) (Des Jarlais and Friedman 1987a); in Baltimore the rate is 29 percent

Direct all correspondence to John C. Ball, National Institute on Drug Abuse, Addiction Research Center, P.O. Box 5180, Baltimore, MD 21224.

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(Lange, Snyder, Lozovsky, Kaistha, Kaczaniuk, and Jaffe 1987). In addition, intravenous drug users are the principal transmitters of HIV to the heterosexual population and to the newborn (Des Jarlais et al., 1985; Pyun, Ochs, Dufford, and Wedgwood 1987).

The search for an effective means of treating and rehabilitating opiate addicts has a long history in the United States. The difficulty of effecting a cure or long-term improvement among chronic addicts has been documented repeatedly. In their classic compendium, *The Opiate Problem*, Terry and Pellens (1928) described how this problem developed and changed during the nineteenth and early twentieth centuries. They traced the rise and fall of various treatment regimens which endeavored to mitigate or cure opiate addiction. Although some success was reported for diverse treatments at various times, the overall finding was that the successful treatment of chronic addiction is extremely difficult and problematic.

The search for effective treatment has continued since the 1920s. Public Health hospitals were established in the 1930s at Lexington, Kentucky and Fort Worth, Texas to treat opiate addicts from throughout the United States (Martin and Isbell 1978). After World War II, community-based treatment programs for heroin addicts were initiated, with the result that therapeutic communities and methadone maintenance therapy became available in many cities (Jaffe 1979). In recent years two lines of treatment research have been emphasized. One approach is to focus on the efficacy of matching particular groups of patients to specific modalities of treatment (McLellan, Luborsky, O'Brien, Woody, and Druley 1982). The other is to evaluate specific programs or clinics on the basis of their effectiveness in treating addict patients with respect to "performance based ratings" (Dole, Nyswander, Des Jarlais, and Joseph 1982). This latter approach measures program effectiveness on the basis of treatment dropouts, positive urines, criminal behavior and other pertinent variables. Both of these approaches are necessary in the evaluation of treatment—determination of patient characteristics and program performance.

In this paper, the principal research issue is to ascertain the effectiveness of methadone maintenance treatment in reducing IV drug use and concomitant needle sharing practices

among addict patients. Specifically, four research questions were addressed: 1) To what extent does long-term methadone maintenance treatment reduce IV use and needle sharing?; 2) Are some programs markedly more (or less) effective than others?; 3) To what extent and how rapidly does relapse occur when patients leave treatment?; and 4) Are patient characteristics or program characteristics more important in reducing IV use and needle sharing during treatment?

Although the three-city treatment evaluation project from which this paper was derived was not designed to test psychosocial theories of addictive behavior (Lettieri, Sayers, and Pearson 1980), research findings pertaining to the continuation or cessation of intravenous drug abuse have various theoretical ramifications. Thus if it is found that patients' pretreatment social and drug history characteristics are associated with successful change during treatment and, concomitantly, that there are only minor variations in success rates among the programs studied, this finding would support psychosocial theories that stress the primacy of early etiological factors and long-term socialization in the addict subculture. Conversely, if successful treatment is associated primarily with specific programs and if pretreatment patient characteristics are found to be of lesser importance, these findings would support resocialization theories that stress programmatic and group efforts at interrupting addictive or deviant behavior (DuPont, Goldstein, O'Donnell, and Brown 1979). It may be assumed that both sets of influences (pretreatment and in-treatment) are operative; the research problem is to ascertain the relative influence of each on outcome criteria.

In considering the theoretical implications of the research issues addressed, it is pertinent to note that treatment success as defined here (cessation of IV drug use) refers primarily to patients who remain in methadone maintenance treatment for two or more years. Thus analysis is restricted largely to those patients who remain in continuous treatment in the same program for some years. One also must address the collateral issues of why most patients drop out of treatment and why many addict patients do not seek treatment. Although these two issues remain largely unresolved and (especially in the case of untreated addicts) difficult to investigate, it is feasible and important to determine whether

existing treatment programs are effective in reducing or stopping intravenous drug use and needle-sharing practices among their patients.

### *Methadone Maintenance Treatment*

Effective methadone maintenance treatment involves long-term rehabilitation of addict patients. As Vincent Dole observed almost 20 years ago (Dole 1971), this rehabilitation has two principal aspects. First, it is necessary to interrupt the addict's self-destructive lifestyle, which involves daily drug-seeking behavior and intravenous injections; this process entails getting him off illicit street drugs and controlling his physical addiction. Second, it is necessary to provide long-term rehabilitative support and services. These two aspects of rehabilitation (withdrawal from illicit drugs and lifestyle changes) are interrelated; both must be addressed consistently during treatment.

Contemporary methadone maintenance treatment in the United States is a specialized type of rehabilitation for heroin addicts. The principal features of this treatment are as follows:

- A prescribed dose of methadone is dispensed daily at a clinic to each addict patient. Methadone is consumed orally under direct supervision in order to prevent diversion, arrest IV use, and ensure patient compliance in medication, and thereby to provide a substitute for heroin use.
- Patients are provided with long-term rehabilitative support and services. These include a close, consistent relationship with a designated drug abuse counselor, who is seen twice a month in individual sessions and more frequently and informally as needed; medical care and referral services; and some educational and vocational services (usually minimal).
- Treatment is monitored and controlled on a daily and weekly basis. Patients have a set schedule of attendance; they are monitored daily for drug abuse behavior and other problems (e.g., alcohol intoxication) by the dispensing nurses or counselors. Urine specimens are collected weekly at the clinic. As noted,

counseling and medical sessions are scheduled.

- Patient care is individualized; treatment regimen is changed as patients improve. Thus, take-home methadone medication is allowed on one day or more per week as patients improve (i.e., cease drug use, adhere to clinic rules, obtain employment). Conversely, clinic privileges can be withdrawn for adverse behavior: drug abuse (i.e., as detected by urinalysis), missed attendance, fighting or loitering, and so forth.
- A separate director or administrator coordinates and supervises the operation of each clinic. He or she may be a physician, a counselor, or an administrator.
- Methadone maintenance programs are relatively small clinics with 200 to 300 patients; usually they are located in separate quarters in old buildings on commercial avenues in center-city or slum neighborhoods.

### METHOD

The research findings pertaining to IV drug use were derived from an intensive three-year study of six methadone maintenance programs in three Eastern cities, two each in New York, Philadelphia, and Baltimore. We selected only large, stable programs with average or above-average staff-patient ratios in order to exclude transitory or grossly inadequate programs. The six programs were studied intensively on site over a three-year period by a four-person research team which included a sociologist, a clinical psychologist, a pharmacist, and a drug abuse counselor. Treatment services at each clinic were measured through structured interviews with the entire staff, systematic observation of clinic operations, and comprehensive record reviews (Ball, Corty, Petroski, Bond, Tommasello, and Graff 1986).

The 633 male methadone patients selected for study at these six programs were initially interviewed in winter 1985–86; and 506 of these patients were reinterviewed in winter 1986–87. Twelve professional interviewers completed face-to-face interviews with the addict patients in confidential conditions which facilitated cooperation by patients and resulted in a low refusal rate. The interviews

were voluntary, were held in private, and were conducted by extramural staff members; the completed schedules were removed from the clinic when the interviews were finished. Patients were paid \$10 or \$15 per interview depending upon the program.

The 633 patients included at least 100 from each clinic. Two types of patients were interviewed at each site: new admissions and persons currently in treatment. The new admissions were interviewed during an eight-week period in late 1985 from consecutive admissions at each clinic. The in-treatment patients were a representative sample of each clinic's patient population in treatment at least six months. Of the 633 patients, 113 were new admissions and 520 belonged to the in-treatment sample.

The principal instrument used in the patient interviews was the Addiction Severity Index (ASI) (McLellan, Luborsky, O'Brien, and Woody 1980). This instrument has been employed extensively in drug abuse treatment research, and its reliability and validity have been established (McLellan, Luborsky, Cacciola, Griffith, Evans, Barr, and O'Brien 1985). The ASI measures the following seven areas: medical status, employment or support status, alcohol use, drug use, legal status (i.e., crime), family and social relationships, and psychiatric status. In addition to administering the ASI, we asked questions on drug abuse history, treatment experiences, and criminal behavior.

The findings pertaining to current IV use and needle-sharing practices were obtained from the second interview with 506 patients. The second interviews were conducted at the clinics, or in the community if the patients had left treatment. We obtained 399 interviews with patients in treatment and 107 interviews with patients who had left treatment. Of the in-treatment sample, seven patients reported no history of intravenous drug use, three interviews were classified as invalid on the basis of standard ASI criteria (i.e., three or more invalid scales) and one patient did not provide answers about his history of intravenous drug use. With these 11 cases removed, the in-treatment sample consisted of 388 patients. The out-of-treatment sample is discussed separately below.

In the second face-to-face interview, questions were asked about the type and frequency of injections during the addict's last period of IV drug use; this period was defined as the

month preceding the last injection of illicit drugs. We obtained information on the number of days per month of both IV use and needle sharing. We measured days per month of IV use for two reasons: 1) this procedure was used in prior research (Nurco, Cisin, and Balter 1981) which indicated that recall was facilitated by the days-per-month schema, and 2) this procedure reduced the distortion introduced by extremely high values, such as persons who injected 200 or more times a month. Other researchers have used the number of injections per month as a measure, which also has advantages (Marmor, Des Jarlais, and Cohen 1987). The two procedures are supplementary in that each provides particular data sets.

Of the 506 male addicts interviewed in 1986-87, 399 were still in the same treatment programs as in 1985 and 107 had left methadone maintenance treatment. These two samples are first analyzed separately and then compared with respect to current IV use and needle-sharing practices.

The present paper focused on IV use rather than on needle-sharing behavior because needle-sharing frequency responses obtained from addicts tend to underestimate the extent of this practice. This occurs because addicts tend to define needle sharing in a restricted sense; for example, they include needle sharing only for profit or with strangers. Beyond this point it is worth noting that intravenous drug use is fundamentally a group activity. Heroin addicts commonly receive their first shot—their "wings"—from another addict and continue to participate in the social relationships, including sharing drugs, needles, and works, that accompany the life of heroin addiction (Novick, Klan, and Kreek 1986). Thus needle sharing can be viewed as a corollary of intravenous drug use (Des Jarlais, Friedman, and Strug 1986). It remains to be determined to what extent this close association between IV use and needle sharing can be altered in the AIDS era through specialized treatment, education, and other prevention efforts (Des Jarlais et al. 1987b; Friedman, Des Jarlais, Sotheran, Garber, Cohen, and Smith 1987).

Although considerable literature exists pertaining to the effectiveness of methadone maintenance treatment (Cooper, Altman, Brown, and Czechowicz 1983; Tims and Ludford 1984), these studies do not refer to the reduction of intravenous drug use as an

outcome variable. To rectify this situation we planned several treatment studies which will measure the prevalence of IV drug use, needle sharing, and HIV seropositivity among drug abuse patients.

RESEARCH FINDINGS

*Last Period of Intravenous Drug Use For Patients in Treatment*

When we asked the 388 patients the month and year of last intravenous drug use, 18.6 percent gave a date that preceded their current treatment, 17.8 percent gave a date that coincided with their admission, 21.9 percent gave a date that occurred after they had entered treatment, and the remaining 41.8 percent reported IV use in the past year. This last group included those who reported IV use in the past year but not in the past month (12.9%) as well as those who reported IV use in the past month (28.9%).

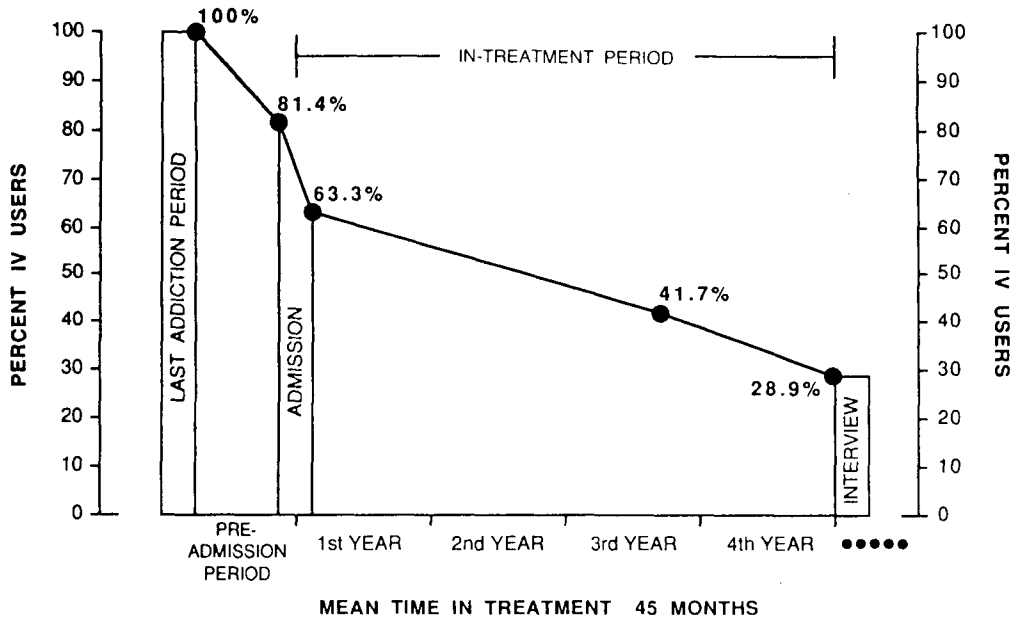
Figure 1 shows the overall findings with regard to the effectiveness of methadone maintenance treatment in reducing intravenous drug use. All of the addicts under study were prior IV drug users; hence this 100 percent prevalence represents the last addiction period that preceded their current treat-

ment. Prevalence of IV use at admission was 81 percent, as some addicts were incarcerated or in other treatment before their current admission. During their admission period, IV use prevalence dropped from 81 to 63 percent. This rapid decline continued during long-term treatment, but at a lesser rate. After four years of outpatient methadone maintenance the prevalence of IV use was reduced to 29 percent. In sum, then, IV drug use was reduced by 71 percent from prior addiction status.

Thus these patients showed considerable variation as to when and under what circumstances they stopped their intravenous drug use, or whether they had given it up at all. All of the intreatment sample had been in treatment for at least a year; most had been in treatment for two or more years. At the time of the second interview in 1986 the mean time in treatment was almost four years (Table 1).

Many of the 72 patients who had ceased IV drug use before their current treatment entered from jail or other treatment programs (Group A, Table 1). It is significant that these patients did not relapse to IV use *at all* during the 53 mean months of their current treatment because their prior frequency of IV use was high: 21 days per month. This group can be classified as treatment successes with respect

FIGURE 1. Effect of Methadone Maintenance Treatment on IV Use for 388 Male Methadone Patients in Six Programs



**TABLE 1. Frequency of Intravenous Drug Use and Needle Sharing during Patients' Last IV Use Period<sup>a</sup> for 388 Male Patients in Methadone Maintenance Treatment**

Treatment Status at Last IV Use	(1) Patients in Each Status		(2) For Each Group, Mean Months in Treatment	(3) IV Use, Mean Days Per Month	(4) Needle <sup>b</sup> Sharers in Last Period		(5) Frequency Needle Sharing Days per Month (per Positives)
	N	%			N	%	
A. Before current treatment	72	18.6	52.5	20.9	31	47.0	11.1
B. At admission (two-month period)	69	17.8	35.5	25.2	33	49.3	15.1
C. During treatment	85	21.9	66.2	10.1	20	34.5	8.2
D. Last year (11 months)	50	12.9	33.8	8.5	5	13.9	4.4
E. Current IV use—last month	112	28.9	35.0	11.2	29	29.9	7.5
Total	388	100.0	45.0	14.9	118	36.4	10.6

<sup>a</sup> Last IV use period is the month preceding each patient's last injection of illicit drugs.

<sup>b</sup> Needle sharing during most recent period of IV drug use. Needle-sharing frequency data were available for 324 subjects; Column 4 calculations are based on these patients.

to discontinuation of IV use and concomitant needle sharing.

Almost one-fifth of the patients (Group B, Table 1) gave up their IV use at the time of admission (i.e., a month before or after admission). This finding establishes that methadone maintenance treatment can stop IV use rapidly among some heroin addicts. This cessation of IV drug use persisted over the entire 36-month period in which these patients underwent treatment. As with the previously described group, the frequency of prior IV use was high: 25 days per month. Consequently this group of addict patients also can be classified as treatment successes.

Another one-fifth of the patients ceased IV drug use after admission to treatment (Group C, Table 1). Cessation of IV use for this group was gradual over the years. With regard to last frequency of IV use, these patients had markedly lower use rates (10 days per month) than the preadmission or admission groups; this lower frequency of IV use may reflect the partial effect of treatment. Because these patients ceased IV use while in treatment, they too can be considered as successes.

Patients who reported IV drug use during the past year but not in the past month (13%; Group D, Table 1) appear to be a transition group, some of whom are in the process of cessation. This interpretation is supported by the lower frequency of IV use (8.5 days). At the same time, most of these patients have yet to achieve long-term discontinuation. There-

fore this group can be considered only as transitory or partly successful.

Of the 388 patients in treatment, 112 reported IV use during the past month. The mean frequency of IV use per month was 11.2 days; some reported continuous use to the day of interview. This group of current IV users is classified as treatment failures.

#### *The Extent of Needle Sharing among the Five Patient Groups*

Of the 324 male patients for whom relevant data were available, 118 reported that they had shared needles during their last period of IV use. Although the percentage of patients who shared needles was higher before treatment (Table 1, Groups A and B) than after methadone maintenance treatment was begun (Groups C, D, and E), this difference was not statistically significant.

The effect of treatment on needle sharing is evident. Thus, the frequency of needle-sharing days was significantly lower for sharers whose last IV use occurred after admission (Groups C, D, and E) than for the admission or preadmission groups (A and B);  $t = 4.689$ ,  $df 177.1$  using separate group variances,  $p < .001$ .

To recapitulate, 36.4 percent ( $N = 118$ ) of 324 patients had shared needles during their last or current period of IV use. Of these needle sharers, 64 had stopped this practice before or during admission, 20 stopped

during treatment, five had stopped at least temporarily (for the past month) and the remaining 29 still continued to share needles. This last group—active needle sharers—constituted nine percent of the patients in treatment.

## RESULTS

### *Program Differences in Effectiveness*

From the overall findings pertaining to IV use, it might be concluded that methadone maintenance treatment is quite successful for some 60 percent of patients who ceased IV use for at least one year, but has only limited success or is a failure for the remainder. Such a conclusion assumes relative uniformity in effectiveness among programs; but this assumption was found to be incorrect.

We had anticipated that the six programs selected for study would contain some variation in program characteristics and treatment services provided to patients, even though the original selection procedure was designed to exclude inadequate programs. We had not anticipated, however, that we would find such marked and such persistent differences. After our first comprehensive on-site evaluation of each program, we found wide variations in the type, frequency, and quality of treatment provided to patients (Ball et al. 1986). Given these findings, we investigated whether these differences affected IV drug use among patients in treatment.

The six methadone maintenance programs varied greatly in effectiveness of reducing IV drug use among patients in treatment (see

Table 2). The most striking finding is the range in the percent of patients who were current IV drug users—from 9.8 percent to 57.1 percent. Four of the programs were reasonably effective; IV use stopped among 75 to 90 percent of their patients. In two programs, however, over 56 percent of the patients are still injecting drugs.

Marked differences also exist with respect to other indicators of program effectiveness. In one program 38 percent of the patients stopped IV use at admission, while in two others only four to eight percent did so. Significantly, there was a high positive association between success at admission and success in keeping patients from current IV use (Spearman rank correlation .9429,  $p < .05$ ). Again, it is revealing that four of the programs affect IV use at admission for a sizable portion of their patients (14 to 38%) while two affect less than eight percent.

These considerable differences in effectiveness were unexpected. Although we had anticipated that there would be minor variation in outcome due to program differences, we thought that the dominant influence upon treatment success would be patients' characteristics, such as length of addiction, employment history, prior criminality, and severity of psychiatric symptoms. This expectation was not substantiated by the research findings; instead we found program treatment variables to be of paramount importance in reducing IV usage. This topic is investigated more systematically in the discussion of multivariate analysis.

**TABLE 2. Differential Effects of Treatment Programs: Last IV Drug Use by 388 Male Patients in Six Methadone Maintenance Programs**

Treatment Program	Sample N	Last Period of IV Use					Not Current IV Users %
		Percent reporting last use in each period					
		(1) Before Treatment	(2) At Current Admission	(3) While in Treatment	(4) During Past Year <sup>a</sup>	(5) Current Month	
A	82	18.3	37.8	28.0	6.1	9.8	90.2
B	62	30.6	17.7	21.0	12.9	17.7	82.3
C	65	27.7	13.8	24.6	15.4	18.5	81.5
D	64	18.8	17.2	23.4	15.6	25.0	75.0
E	66	10.6	7.6	12.1	13.6	56.1	43.9
F	49	2.0	4.1	20.4	16.3	57.1	42.9
Percent	100.0	18.6	17.8	21.9	12.9	28.9	71.1

<sup>a</sup> Column 4 refers to IV use in past year, but does not include past month (Column 5).

*The Dropout Sample*

One-third of the patients had dropped out of treatment in the six programs during the year following their first interview. Of these patients, 107 (48%) were reinterviewed in the community. When we compared dropouts who were reinterviewed with those who were not reinterviewed, we found no significant differences in demographic or addiction characteristics.

Two of the 107 interviews with treatment dropouts were judged to be invalid on the basis of ASI criteria. The remaining dropout sample consisted of 105 male ex-patients who had left methadone maintenance treatment during the prior year.

The overall finding is that 71 of the 105 dropouts relapsed to IV use after leaving treatment (see Table 3); their mean time out of treatment was 7.2 months. The relationship of time out of treatment to relapse is linear and highly positive (Figure 2). We obtained an estimate of the annual relapse rate from those addicts who had been out of treatment for 10 to 12 months; this rate is 82 percent.

Of the 105 dropouts from treatment, 19 shared needles. The percentage of needle sharers tended to increase with time out of treatment; 48 percent of those out of treatment for 10 to 12 months reported this practice.

45 months), were less likely to have been employed (29 versus 53%) and were somewhat younger than those still in treatment (36 versus 38 years). The two groups did not differ significantly, however, with respect to age at onset of opiate use, length of heroin addiction, number of prior treatments, race, years of schooling, or years in prison (see Table 4).

The life history findings pertaining to the 493 addicts included in this comparison substantiate both the scope and the chronicity of behavior problems that accompany heroin addiction (Table 4). On the average these patients have been in prison for more than two years; they began their addiction as teenagers; they have sustained their heroin addiction for 11 years; their work history is marginal; they were in prior treatment for their drug use three times. The chronicity of their addiction continues as they approach 40 years of age. How to alter this lifestyle and cope with its consequences remains as a special challenge to those involved in studying the AIDS epidemic (Kaplan, Johnson, Bailey, and Simon 1987; Galea, Lewis, and Baker 1988).

**DISCRIMINANT FUNCTION ANALYSIS: PROGRAM VERSUS PATIENT CHARACTERISTICS**

**FURTHER ANALYSIS: COMPARISON OF SAMPLES**

In order to compare dropouts with patients who remained in treatment, we analyzed the two groups with respect to relevant pretreatment characteristics. We found that the dropouts had spent less time in their prior methadone maintenance treatment (24 versus

As both program variables and patient characteristics were found to be associated with cessation of IV use, we undertook analysis to determine the relative effects of these two factors in reducing or stopping IV use by addicts who enter methadone maintenance treatment.

We conducted discriminant function analysis of individual and program variables to

**TABLE 3. Intravenous Drug Use and Needle-Sharing Frequency of 105 Treatment Dropouts, by Months Since Leaving Treatment**

Months since Treatment <sup>a</sup>	N	Months in Last Treatment	IV Use Since Drop-Out		Needle Sharers		
			Yes - %	Per Month, <sup>b</sup> Mean Days	N	%	NS - Days Per Month <sup>c</sup>
1-3	11	45.2	45.5	16.8	2	40.0	14.0
4-6	33	24.4	57.6	15.6	3	15.8	4.3
7-9	33	19.0	72.7	10.4	3	12.5	9.7
10-12 +	28	21.1	82.1	17.0	11	47.8	12.4
Total	105	24.0	67.6	14.5	19	26.8	10.8

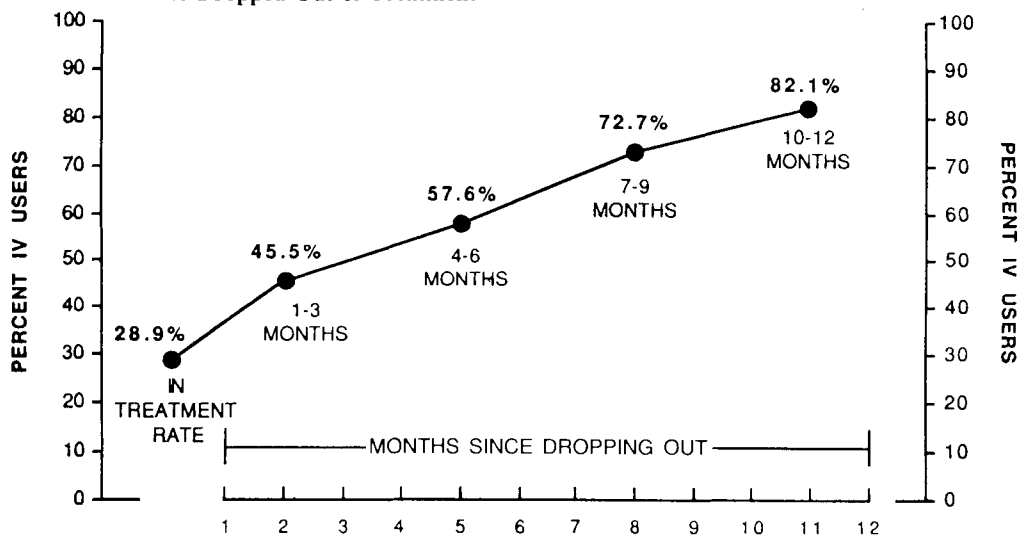
<sup>a</sup> Mean months since leaving treatment = 7.2 months for the 105 former patients.

<sup>b</sup> For those who relapsed to IV use.

<sup>c</sup> Number of needle-sharing days per month during last monthly period of IV use.



FIGURE 2. Relapse to IV Use After Methadone Maintenance Treatment for 105 Male Addicts Who Dropped Out of Treatment



ascertain which of these were associated most closely with the cessation of IV drug use. The dependent variable in the analysis is IV use, with the groups defined as indicated in Table 1. The independent (or predictor) variables are age at interview, years of heroin use, number of years of cocaine use, number of prior treatments, number of months incarcerated, number of months in current treatment program, race, program membership, and methadone dose level. Three discriminant functions were significant at the .05 level. Because the first two functions accounted for 83.95 percent of the variance, analysis was confined to these two.

The first function discriminates between current IV users (Groups D and E) and those that have ceased IV use (Groups A, B, and C). This function, then, is a determinant of current IV use. The second function differentiates between Groups A and B—between those patients who stopped IV use before treatment (e.g., in jail) and those who stopped at admission to treatment. The second function, then, identifies success during the admission period.

Three factors were found to be correlated highly with the first function: methadone dose level (-.70), membership in Program F (+.54), and membership in Program E

TABLE 4. Pretreatment Characteristics of 493 Male Methadone Maintenance Patients, for Intreatment and Dropout Samples

Patient's Characteristics	Total Patients (N = 493)	In-Treatment Sample (N = 388)	Dropout Sample (N = 105)	IT-OT Difference	
				P =	Test
1. Age at onset of opiate addiction, mean years	18.9	18.7	19.7	NS	t = -1.123(118.4 d.f.)
2. Years of heroin addiction, mean years	11.2	11.4	10.3	NS	t = 1.188(191.2 d.f.)
3. Prior treatments for drug abuse, mean number	3.5	3.2	4.3	NS	t = -1.47(108.8 d.f.)
4. Months in current (or past) treatment, mean	40.5	45.0	24.0	<.05	t = 10.43(311.7 d.f.)
5. Race, percent white	39.6	41.5	32.4	NS	$\chi^2 = 3.148(1 \text{ d.f.})$
6. Schooling, mean years	11.6	11.6	11.9	NS	t = 1.49(202.1 d.f.)
7. Pre-admission employment, percent full-time prior 3 years	40.5	53.3	29.4	<.05	$\chi^2 = 4.824(1 \text{ d.f.})$
8. Years in prison, mean	2.5	2.3	3.1	NS	t = -1.57(140.5 d.f.)
9. Age at second interview, mean years	37.7	38.3	35.6	<.05	t = 3.912 (199.4 d.f.)

(+.41). Thus as methadone dose level decreased, patients were more likely to be current IV users; patients in Programs F and E were more likely to be current IV users. The important finding is that program and treatment variables (i.e., particular programs and adequate methadone dosage) are related to success; patient characteristics are less significant. This function accounts for 63.9 percent of the variance in current IV use.

Further analysis revealed that a second function differentiates between Groups A & B—between those patients who stopped IV use before treatment (e.g., in prison) and those who stopped at admission to treatment. The second function, then, identifies success at admission to methadone maintenance treatment. The second function is correlated most closely with four factors: enrollment in Program A (+.71), more prior treatment (+.29), more years of heroin use (+.20), and more time in prison (+.17). This function explains 20 percent of the variance (see Table 2).

Although the discriminant function analysis confirms the prior finding of the effects of programs in reducing IV use among patients, investigation of additional program variables and treatment models is indicated; it is necessary to ascertain which program models and which specific types of treatment services account for treatment effectiveness.

## DISCUSSION

Several observations about the 71 percent reduction of IV drug use during methadone maintenance treatment are pertinent. It is disturbing that 29 percent of patients report IV use in the past month. Yet for many, IV use was continued at a reduced frequency from pretreatment levels, so that IV use was reduced but did not cease completely. The difficulty of stopping drug use completely among long-term heroin addicts has been a consistent problem since this drug was introduced in the early twentieth century. Indeed, it has been said that no treatment programs exist which will take most opiate addicts off opiates (Ball 1972). Still it is important to note that cessation of IV use occurs for most of the outpatients who remain in regular treatment, because this fact establishes that this goal of treatment can be achieved. At the same time, however, we do

not ignore or deny the reality that most heroin addicts do not remain voluntarily in methadone maintenance or in any other treatment modality for as long as two years.

It is a major finding that some methadone maintenance programs are markedly more effective than others in reducing IV drug use and needle sharing among their patients because these differences in treatment outcome are related to definite program variables. The more effective programs have high patient retention rates (especially long-term retention rates), high rates of scheduled attendance, a close, consistent, and enduring relationship between staff and patients, and year-to-year stability of treatment staff. Conversely, the less effective programs are characterized by poor patient attendance, inadequate methadone medication, and high rates of staff turnover. Effective and ineffective programs, however, did not differ with regard to patient characteristics. Indeed, a separate analysis of patients in the six programs revealed an overall similarity in pretreatment characteristics (Corty and Ball 1987).

In considering the marked differences among methadone maintenance programs, it is important to recognize that many treatment programs have inadequate funds, facilities, and staff. In addition, many programs are beset by lack of governmental support and by neighborhood opposition (Friedman and Des Jarlais 1988). The effectiveness of many programs could be increased considerably if these inadequacies and impediments were removed. Certainly it seems reasonable to conclude that many more programs in the United States could achieve the degree of treatment effectiveness in reducing IV drug use which was found among the better programs evaluated in this study.

In considering whether or not these findings from three Eastern cities are typical of the United States generally, several observations are relevant. Both the prevalence of heroin addiction and methadone maintenance treatment are concentrated highly in the Northeast; consequently this region provides the most suitable benchmark for addressing this problem. Second, the results of the present study show a wide range of effectiveness among programs. On the basis of available evidence, it seems likely that comparable variations exist in other regions.

In considering the more theoretical issue of

how methadone maintenance effects a reduction of IV drug use by patients (as well as concomitant rehabilitation), three major aspects of this treatment deserve comment. First, this modality of treatment is designed to affect heroin addiction directly. Thus a pharmacological intervention immediately provides a substitute for illicit opiates. In this regard, daily administration of oral methadone at a clinic is important because this procedure tends to interrupt and prevent the recurrence of intravenous heroin use.

Second, by providing consistent long-term counseling and other support services, the staff at methadone maintenance programs works to rehabilitate or resocialize addict patients. This interpersonal task transcends pharmacological control of the addiction status; it involves fundamental behavioral changes on the part of the patient. These psychosocial changes in lifestyle commonly require years of continuous intervention rather than weeks or months. Thus the long-term aspect of treatment is crucial if rehabilitation is to occur.

Third, the social control aspect of successful methadone maintenance treatment is important. Not only are pharmacologic and rehabilitative services provided consistently; they are provided under close supervision within a therapeutic environment. A firm yet supportive treatment policy is indicated. This approach commonly requires a consistent concern about and response to missed attendance, illicit drug use, and violation of basic clinic rules (e.g., no fighting or drug dealing). In addition, an effective therapeutic intervention includes consistent concern about each patient's progress with regard to his current work, family, health, and other problems.

Although both the short-term pharmacological and the long-term rehabilitative aspects of methadone maintenance are significant in successful treatment, the latter seem more important with respect to reducing IV use. Thus pharmacologic intervention is seen as a necessary but not a sufficient condition for successful methadone maintenance treatment. The sufficient aspect is long-term rehabilitation.

## CONCLUSION

In evaluating the treatment effectiveness of six large methadone maintenance programs in three Eastern cities, we found that this

modality of treatment is effective in reducing intravenous drug use by heroin addicts. Thus 71 percent of an in-treatment sample of 388 patients had stopped IV drug use; most had refrained completely from IV use for one year or more.

Marked variation in treatment effectiveness was found among the methadone maintenance programs with respect to the reduction of IV drug use and needle sharing. Thus current IV use varied among programs from less than 10 percent to over 57 percent of the patients in treatment. These findings show that it is possible to operate drug abuse treatment programs at high levels of effectiveness.

In view of the current scope of the AIDS epidemic and the lack of a cure, this disease can be controlled only by preventing further transmission of the human immunodeficiency virus. In this endeavor it seems prudent to support whatever means of prevention is efficacious; methadone maintenance treatment has been found to be an effective means of reducing IV use and needle sharing among heroin addicts who are at risk for AIDS.

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