ORIGINAL ARTICLE

An Evaluation of Drug Treatments for Adolescents in 4 US Cities

Yih-Ing Hser, PhD; Christine E. Grella, PhD; Robert L. Hubbard, PhD; Shih-Chao Hsieh, MS; Bennett W. Fletcher, PhD; Barry S. Brown, PhD; M. Douglas Anglin, PhD

Background: Little is known about outcomes of community-based treatment programs for adolescents with drug problems.

Methods: We studied 1167 adolescents (age range, 11-18 years; 368 females, 799 males) from 4 US cities (Pittsburgh, Pa; Minneapolis, Minn; Chicago, Ill; and Portland, Ore) using a naturalistic, nonexperimental evaluation design. These adolescents were consecutive admissions during the period from 1993 to 1995 at 23 community-based treatment programs in the Drug Abuse Treatment Outcome Studies for Adolescents. Included were 418 admissions to 8 residential programs, 292 admissions to 9 outpatient drug-free programs, and 457 admissions to 6 short-term inpatient programs.

Results: Adolescents in treatment typically had multiple problems (eg, 58.4% of them were involved in the legal system, and 63.0% met diagnostic criteria for a mental disorder). Nevertheless, less than half (43.8%) of all patients reported weekly marijuana use in the year following treatment (dropping from 80.4% in the year before admission). Similarly, there were decreases in heavy drinking (dropping from 33.8% to 20.3%), use of other illicit drugs (dropping from 48.0% to 42.2%), and criminal involvement (dropping from 75.6% to 52.8%). Additionally, patients reported better psychological adjustment and school performance after treatment. Longer stays in treatment were positively associated with several favorable outcomes, although length of time in treatment was generally short.

Conclusions: Substance abuse treatment for adolescents is effective in achieving many important behavioral and psychological improvements. Strategies specific to adolescents to improve their treatment retention and completion are needed to maximize the therapeutic benefits of drug treatment.

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From the UCLA Drug Abuse Research Center, Neuropsychiatric Institute, University of California, Los Angeles (Drs Hser, Grella, and Anglin and Ms Hsieh); the National Development and Research Institutes Inc, Raleigh, NC (Dr Hubbard); the National Institute on Drug Abuse, Bethesda, Md (Dr Fletcher); and the University of North Carolina at Wilmington (Dr Brown).

IN RECENT YEARS, increased concern about alcohol and drug use among youths has resulted in an increase in the number of alcohol and drug treatment programs for adolescents.[1,2] Still, relatively little research has focused on the effectiveness of treatment for adolescent alcohol and drug abuse, and most literature on treatment outcome has been based on adult patients.[2,3] Most earlier large-scale evaluation studies have focused primarily on adults and have included only small samples of adolescents. The few treatment outcome studies on adolescents offer mixed results.[2] The large-scale evaluation studies have generally reported less favorable outcomes among adolescents than adult patients.[4-6] For example, adolescents interviewed 1 year after treatment in the Treatment Outcome Prospective Study (TOPS) showed favorable reductions in drug use and criminal activities. However, almost 25% to 30% of youths still reported daily use of marijuana and heavy use of alcohol following TOPS treatment.[5] The Services Research Outcomes Study[7] compared adolescents' behaviors during the 5-year period before treatment and the 5 years after treatment, and found that alcohol use increased by 13%, and rates of crack use were approximately doubled. Results from other small-scale evaluation studies[8-10] of adolescent treatment have similarly suggested that although there is a reduction of use after treatment, a large proportion of adolescents return to drug and alcohol use following treatment.[1,11]

Adolescents go through distinctive developmental stages; therefore, their substance abuse patterns[12-14] and the factors influencing their use may differ from those of adults. Thus, they may require different types of treatment strategies. The recent Drug Abuse Treatment Outcome Studies for Adolescents (DATOS-A) is the first large-scale effort designed specifically to

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PARTICIPANTS AND METHODS

DATOS-A is a multisite prospective treatment outcome study.[15] The study includes 1732 consecutive admissions to 23 programs in 4 major US cities (Pittsburgh, Pa; Minneapolis, Minn; Chicago, Ill; and Portland, Ore) from 1993 to 1995. Although the study originally included patients and programs in Miami, Fla, and New York, NY, they were excluded from the present study because of the administrative and logistical problem of implementing follow-up interviews. The cities selected for participation in DATOS-A were limited to those in which DATOS adult data collection was being conducted. In these locations, programs recruited for DATOS-A were providers specializing in adolescent treatment that were judged to be stable community-based organizations. No programs selected to participate refused. Treatment modalities included residential (RES) programs, outpatient drug-free (ODF) programs, and short-term inpatient (STI) programs. These adolescents were assessed at intake and targeted for 1-year posttreatment interviews. The present analysis included 1167 adolescents who completed the follow-up interviews (ie, a 67.3% interview completion rate).

PARTICIPANTS

The focus of the present study was on 1167 adolescent patients (from 23 programs) who completed both the intake assessment and the 1-year follow-up interviews. Included were 418 patients in 8 RES programs, 292 patients in 9 ODF programs, and 457 patients in 6 STI programs. The overall study sample was 31.5% female, 66.2% white, 18.3% black, 9.3% Hispanic, and 6.3% other ethnic groups. The mean ± SD age was 15.7 ± 1.3 years. More than 80% were currently in or had completed the ninth grade. One third (37.4%) were not attending school at the time of treatment admission. Surprisingly, even at these young ages, 45.8% reported employment for at least some period during the 12 months before admission to the DATOS-A treatment. Almost half (47.1%) of these adolescents reported marijuana use as their primary drug problem. An additional 20.6% cited alcohol use as their primary problem. **Table 1** presents characteristics of the sample by modality.

The generally high attrition rate in the follow-up study is not unusual for large-scale field studies of this type. Although the field research team attributed the attrition mainly to logistical and resource constraints, careful examination of its effect was deemed necessary to rule out any systematic bias. We compared the subjects without follow-up interviews with those who completed follow-up interviews and did not find any differences in age, use of drugs (eg, marijuana, alcohol, cocaine, or other illicit drugs), or enrollment in school. The 2 samples also did not differ in treatment retention in STI or ODF programs, but patients in RES programs who completed follow-up stayed in treatment significantly longer than those without follow-up (mean days in treatment, 124.4 vs 105.4, respectively). The follow-up sample had a higher proportion of female (31.5%) and white (66.2%) participants and lower proportions of black (18.3%) and Hispanic (9.3%) participants compared with those without follow-up (21.3% female, 60.3% white, 21.9% black, and 12.5% Hispanic).

TREATMENT PROGRAMS

Questionnaires completed by the program directors and counseling supervisors provided the description of treatment protocols, policies, and staff at participating DATOS-A facilities.

Residential treatment programs included traditional, modified, and short-term therapeutic community programs, as well as other types of RES programs. The programs provided residential living, education and counseling sessions, and interventions designed to resocialize patients. One half of the RES programs provided group sessions almost daily, and 87.5% provided individual counseling sessions at least once per week. One half of the RES programs placed great emphasis on family therapy. Planned or recommended duration of stay ranged from 3 to 12 months (median, 5 months).

Outpatient drug-free programs included regular and intensive day treatment. Services included counseling sessions, education, and skills training. About 78% of the programs provided group sessions 3 or more times per week, 55.6% of the programs had individual sessions once per week, and an additional 22.2% of programs had individual sessions 2 to 3 times per week. All but one ODF program reported great emphasis on family therapy. Planned duration of treatment ranged from 1 to 6 months (median, 1.6 months).

Short-term inpatient programs provided services (eg, counseling sessions and "12-step" sessions) within a medically controlled environment. A majority of the programs had daily group sessions and weekly individual sessions. All reported a strong emphasis on family therapy. Planned duration of stay ranged from 5 to 35 days (median, 18 days). Patients were typically referred for continued outpatient treatment at discharge.

All programs were primarily drug treatment programs, as opposed to alcohol-only treatment programs, and most had a mixture of funding from both public and private sources. The number of years these programs had been in operation ranged from 1 to 25 years, with the mean being 14 years.

PATIENT INTAKE ASSESSMENT AND FOLLOW-UP PROCEDURES

Informed consent to participate in the study was obtained from a parent or guardian of anyone younger than 18 years, as well as from the adolescent. Face-to-face interviews were conducted in private settings by trained professional interviewers who were independent of the treatment programs. The interviews were conducted at intake and at a 12-month posttreatment follow-up. Intake interviews were conducted at program sites in 2 separate sessions approximately 1 week apart. Interviewers recontacted patients for face-to-face follow-up interviews approximately 12 months after their last contact with the treatment program. Each interview session lasted approximately 90 minutes. Patients were paid $10 for each intake interview and $15 for the follow-up interview.

For validation of self-reported drug use, a quarter of the respondents were selected randomly for urinalysis. Specimens were obtained from 249 (85%) of the selected

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respondents; those who did not provide a specimen either refused to or were unable to provide an adequate specimen for testing.

MEASURES

Problem Severity Index

An index of problem severity at intake was defined using variables representing functional domains commonly related to treatment goals and outcomes. Eight indicators were scored to reflect "problems" in these domains. The patient problem severity index is the sum of the presence of these 8 problems (range, 0-8); the index was further classified into low (0-2), medium (3-5), and high (6-8) levels of severity. The indicators were multiple drug use (use of ≥3 drugs during the year before treatment), dependence on alcohol or any drug (by *DSM-III-R* criteria[16]), mental disorder (conduct disorder, attention-deficit/hyperactivity disorder, panic disorder, anxiety disorder, or major depressive disorder, using *DSM-III-R* criteria), criminal involvement, unstable living arrangement, family alcohol and other drug (AOD) problems, deviant reference group, and academic failure prior to DATOS-A treatment. Patients were considered criminally active if they were on probation or parole, awaiting trial or had a case pending at intake, or reported a period of weekly involvement in illegal activities during the past year. The unstable living arrangement scale ranged from 0 to 9 (with a greater value indicating greater instability) and was the summed presence of the following conditions: receiving supplemental security income (0=no; 1=yes), not having adequate food or shelter (0=no; 1=yes), living in an unstable residence (range, 1-3; 1=house or condominium; 2=mobile home, apartment, or other multiple family building; 3=hotel, boarding house, homeless shelter), number of places lived (range, 1-3), and not living with parents (0=no, 1=yes). The scale for family AOD problems had a range of 0 to 5, with 5 being the most problematic, and is the summed presence of AOD problems among the adolescent's mother, father, mother's relatives, father's relatives, and sisters or brothers. Scores on the deviant reference group ranged between 0 and 12 (with a greater value indicating greater severity) by counting the number of family members and friends who used drugs, drank alcohol heavily, had been arrested, or were jailed. An academic failure scale (range, 0-9, with a greater value indicating greater failure) considered repeating grades (range, 0-2; 0=no, 1=once, 2=more than once); being suspended (range 0-2; 0=no, 1=once, 2=more than once) or expelled (range, 0-2; 0=no, 1=once, 2=more than once); skipping school (0=no, 1=yes); and whether first expulsion, suspension (0=younger than 15 years, 1=15 years or older), or truancy occurred prior to age 15 years (0=younger than 15 years, 1=15 years or older). Most problem indicators were dichotomous variables, and a median split was used for those with continuous scales (ie, unstable living arrangement, family AOD problems, deviant reference group, and academic failure).

Treatment Retention

Treatment retention was defined as the number of days between DATOS-A program admission and discharge. Patients in each modality were classified as having short-term or long-term retention. For RES and ODF programs, the retention threshold for the long-term groups was set at 90 days, and for STI programs, the threshold was 21 days. Especially for RES and ODF, these retention thresholds have been demonstrated to be predictive of positive outcomes for adults in treatment.[17,18] Overall, 58.4% of the RES sample stayed in treatment for at least 90 days as did 27.1% of the ODF sample, and 63.7% of the patients in STI programs exceeded the 21-day criterion.

Outcome Measures

Outcome measures included drug-use patterns, psychological adjustment, criminal involvement, and school performance. For each type of drug, respondents were asked about their average use during a specific time frame (eg, 12 months before treatment admission or before the follow-up interview), and there were 8 response categories (ranging from "not used at all" and "less than once a month," to "daily or almost every day" and "4 or more times a day"). Measures of drug use included any use of marijuana; weekly (once per week or more frequently) use of marijuana; heavy drinking (≥5 drinks in a single sitting at least once per week); any use of hallucinogens, cocaine, or other stimulants; and use of any illicit drug excluding marijuana. Measures of psychological adjustment included any suicidal thoughts, hostility (a subscale of a 90-item Symptoms Checklist; Cronbach $\alpha=.88$),[19] and self-esteem (Cronbach $\alpha=.89$).[20] Measures of school performance included school attendance (currently in school) and grades (among those in school). Measures of criminal activities included engagement in illegal acts and arrest. All variables were repeated measures for the year prior to and the year following treatment, permitting pretreatment and posttreatment comparisons.

Urine specimens collected from the randomly selected subsample of 249 respondents during the follow-up interviews were tested for 8 categories of drugs (amphetamines, barbiturates, benzodiazepines, cannabinoids, cocaine metabolite, methaqualone, opiates, phencyclidine). Positive rates were 35.7% for marijuana, 2.8% for cocaine, and less than 1% for the remaining drugs. Comparing self-reports with urine results, underreporting of marijuana use was about 13% among those who denied use in the previous 30 days.

ANALYSES

We provided descriptive statistics to characterize patient pretreatment characteristics. A series of statistical tests (analysis of variance [ANOVA] for continuous dependent variables and χ^2 tests for categorical variables) was conducted to test the effect of modality. Repeated-measures ANOVAs were conducted to examine the pretreatment and posttreatment differences in key outcomes (controlling for modality). Logistic regression analyses were conducted to determine the effects of treatment length (short-term vs long-term) on posttreatment outcomes, controlling for pretreatment severity (low, medium, and high) and modality (RES, ODF, and STI programs). All significance tests were 2-tailed, and unless otherwise indicated, $P=.05$.

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Table 1. Background Characteristics at Admission to Treatment*

	RES (n = 418)	STI (n = 457)	ODF (n = 292)	Total (N = 1167)	ANOVA/χ^2 Results	*P*
Mean (SD) age, y	15.9 (1.16)	15.6 (1.31)	15.7 (1.3)	15.7 (1.3)	$F_{2,1164} = 6.38$	.002
Male	82.1	60.4	61.6	68.5	$\chi^2_2 = 53.29$	<.001
Ethnicity					$\chi^2_6 = 96.30$	<.001
White	51.4	78.8	67.8	66.2		
Black	28.2	10.1	16.8	18.3		
Hispanic	16.0	3.7	8.2	9.3		
Other	4.3	7.4	7.2	6.3		
Referral source						
Self	2.6	9.4	4.5	5.7	$\chi^2_8 = 176.72$	<.001
Family/friends	23.9	49.2	54.8	41.6		
School/employer	1.2	4.2	7.5	3.9		
Legal system	63.6	26.0	22.6	38.6		
Other	8.6	11.2	10.6	10.1		
Legal involvement	81.5	47.7	42.1	58.4	$\chi^2_2 = 132.05$	<.001
Problem severity					$\chi^2_2 = 18.04$	<.001
Multiple drug use (≥3 drugs)	29.9	27.1	16.1	25.4		
Alcohol or drug dependence	72.7	76.3	68.2	73.0	$\chi^2_2 = 5.92$	.05
Mental disorder	59.7	73.3	52.0	63.0	$\chi^2_2 = 31.81$	<.001
Criminally active	89.0	60.2	46.9	67.2	$\chi^2_2 = 131.79$	<.001
Unstable living arrangement, mean (SD)	3.6 (1.77)	3.2 (1.98)	2.8 (1.84)	3.3 (1.9)	$F_{2,1164} = 16.63$	<.001
Family AOD problems, mean (SD)	1.5 (1.33)	1.8 (1.24)	1.5 (1.21)	1.6 (1.28)	$F_{2,1164} = 10.62$	<.001
Deviant reference group, mean (SD)	8.7 (2.53)	7.9 (2.54)	7.3 (2.36)	8.0 (2.55)	$F_{2,1164} = 27.47$	<.001
Academic failure, mean (SD)	5.3 (1.53)	5.0 (1.4)	4.5 (1.49)	5.0 (1.51)	$F_{2,1164} = 26.93$	<.001

*Values are given as percentages unless otherwise indicated. Presence of dependence (alcohol or other drug [AOD]) or mental disorder was determined by *DSM-III-R* criteria. Legal involvement referred to any involvement with the legal system (eg, in jail or detention, probation, parole, case pending). Unstable living arrangement scale (range, 0-9, with 9 being most unstable) considered the presence of the following conditions: receiving Supplemental Security Income, without adequate food/shelter, in unstable residence, number of places lived, and not living with parents. Family AOD problems score (range, 0-5, with 5 being most problematic) was the summed presence of AOD problems among mother, father, mother's relatives, father's relatives, and sisters or brothers. Deviant reference group score (range, 0-12, with 12 being most deviant) counted the number of family members and friends who used drugs, drank alcohol heavily, had been arrested, or entered jail. Academic failure (range, 0-9, with 9 indicating a greater failure) considered repeating grades, being suspended or expelled, skipping school, and whether first expulsion, suspension, or truancy occurred prior to age 15 years. Readers are referred to the text for more details on each scale construction. RES indicates residential; STI, short-term inpatient; ODF, outpatient drug-free; and ANOVA, analysis of variance. χ^2 Or ANOVA analyses were conducted to test modality differences.

evaluate treatment outcomes among adolescents. Treatment programs included in DATOS-A were community programs specifically intended to treat adolescents with drug problems. This article reports results of an assessment of treatment outcomes among adolescent patients participating in DATOS-A. The study addressed 3 key research questions: (1) What were the patterns of drug use and other problem behaviors of these adolescents before they entered the DATOS-A treatment programs? (2) Were there changes in their drug use and other problem behaviors after treatment? (3) Was the length of stay in treatment related to their posttreatment outcomes?

RESULTS

PRETREATMENT CHARACTERISTICS

The average patient in DATOS-A was aged 15 to 16 years, male (68.5%), white (66.2%) or black (18.3%), referred by family or friends (41.6%) or the legal system (38.6%), and was in trouble with the law (ie, 58.4% were on parole, probation, or awaiting trial) (Table 1). The percentage of white participants was highest in STI programs (78.8%), compared with 67.8% in ODF and 51.4% in RES programs. Sources of referral also reflected significant differences by modality, with referral by family or friends to ODF programs being the highest (54.8%), compared with 49.2% to STI programs and 23.9% to RES programs. Referral by the legal system to RES programs was highest (63.6%), compared with 26.0% to STI and 22.6% to ODF programs.

Many of the patients were polydrug users (25.4% used ≥3 drugs), dependent on alcohol or other drugs according to *DSM-III-R* criteria (73.0% of participants; with 64.1%, 36.1%, and 10.0% dependent on marijuana, alcohol, and cocaine, respectively), diagnosed as having a mental disorder (63.0% of participants; 57.3% had a conduct disorder, 12.3% had attention-deficit/hyperactivity disorder, 15.0% had a depressive disorder, 1.9% had overanxious disorder, and 1.9% had panic disorder), and most patients were criminally active (67.2%). More than one quarter (27.9%) of participants had a history of prior drug treatment, with the highest rates being among patients in RES (38.7%) and STI (27.9%) programs, and the lowest among patients in ODF programs (12.7%).

POSTTREATMENT OUTCOMES

Overall, there were significant improvements in drug use, psychological adjustment, school performance, and criminal activity during the year after treatment, compared with the year before treatment (**Table 2**). Weekly or more

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Table 2. Changes From Year Before to Year After Treatment*

	RES (n = 418)		STI (n = 457)		ODF (n = 292)		Total (N = 1167)			
	Before	After	Before	After	Before	After	Before	After	ANOVA (1 *df*)	*P*
Drug use										
Any marijuana	92.6	60.5	94.5	73.9	84.9	69.1	91.4	67.9	217.40	<.001
Weekly marijuana	83.9	42.4	82.9	46.1	71.6	42.1	80.4	43.8	397.77	<.001
Heavy drinking	36.1	21.5	37.7	21.7	24.4	16.2	33.8	20.3	58.16	<.001
Any cocaine use	23.2	17.3	15.1	22.6	9.2	16.5	16.5	19.2	3.76	.05
Any hallucinogen use	31.2	18.9	34.4	34.4	25.4	26.1	31.0	26.8	5.24	.02
Any stimulant use	19.4	11.0	23.3	18.9	12.0	15.8	19.1	15.3	4.67	.03
Any hard drugs	48.8	32.9	53.7	48.4	38.2	46.0	48.0	42.2	5.17	.02
Psychological adjustment										
Any suicidal thoughts	18.4	10.1	37.4	19.3	25.1	13.7	27.5	14.6	72.81	<.001
Hostility, mean (SD)	8.8	4.6	10.1	6.4	7.9	4.9	9.1	5.4	307.38	<.001
	(6.6)	(4.9)	(6.3)	(5.6)	(5.9)	(4.9)	(6.3)	(5.2)		
Self-esteem, mean (SD)	30.4	34.0	28.4	33.7	29.7	34.9	29.4	34.1	486.11	<.001
	(5.2)	(6.4)	(5.4)	(6.0)	(5.4)	(5.0)	(5.4)	(5.9)		
School performance										
Attendance	48.8	56.6	68.7	82.6	72.6	85.5	62.6	74.0	44.50	<.001
Grades average or better	53.2	85.2	48.4	75.1	60.8	81.3	53.4	79.6	131.84	<.001
Criminal activities										
Any illegal act	79.1	49.9	78.3	56.4	66.4	51.4	75.6	52.8	133.50	<.001
Any arrest	74.0	35.3	41.9	34.4	29.4	31.4	50.3	33.9	65.07	<.001

*Values are given as percentages unless otherwise indicated. Drug use for each specific type was any use during the time period, except for weekly marijuana (once a week or more frequent use) and heavy drinking (≥5 drinks in a single sitting at least once a week). Hostility was measured using a subscale of the Symptoms Checklist (90 items). Self-esteem was measured by the Rosenberg Self-Esteem Scale. Attendance indicated being currently in school. RES indicates residential; ODF, outpatient drug-free; STI, short-term inpatient; and ANOVA, analysis of variance. Repeated-measures ANOVAs were conducted to test pretreatment and posttreatment differences, controlling for modality.

frequent marijuana use dropped from 80.4% in the year before admission to 43.8% in the year following treatment. Similarly, heavy drinking dropped from 33.8% to 20.3%, use of other illicit drugs dropped from 48.0% to 42.2%, and criminal activities dropped from 75.6% to 52.8%. Additionally, patients reported better psychological adjustment in terms of reduced suicidal thoughts and hostility, and increased self-esteem. During the year after treatment, more patients attended school and reported average or better than average grades compared with the year before treatment. There were exceptions to this general pattern of improvement, however. In the total sample, cocaine use increased to 19.2% at follow-up from 16.5% before intake ($Qw_1=3.76$; $P=.05$), mainly due to increases among patients in STI ($Qw_1=9.52$; $P=.002$) and ODF ($Qw_1=6.95$; $P=.008$) programs. Patients in ODF programs also showed no improvement in their use of hallucinogens and stimulants, and they significantly increased use of illicit drugs other than marijuana ($Qw_1=4.94$, $P=.03$). Additionally, although the level of illegal acts was reduced from pretreatment levels for adolescents treated in ODF programs ($Qw_1=18.04$, $P<.001$), there was a (nonsignificant) increase in arrest rates for these patients.

To investigate how treatment retention might affect treatment outcomes among adolescents, we conducted separate logistic regression analyses for selected posttreatment outcomes, controlling for problem severity and modality (**Table 3**). Even including STI programs, longer time in treatment was found to be significantly related to lower drug use (eg, any marijuana use, or any drug or alcohol use) and lower rates of arrest following treatment.

Table 3. Odds Ratios and 95% CI of Longer Treatment Retention Predicting Posttreatment Outcomes*

Posttreatment Outcome	Odds Ratio (95% CI)
Alcohol and drug use	
No marijuana use	1.53† (1.15-2.04)
No weekly marijuana use	1.12 (0.86-1.50)
No heavy drinking	1.30 (0.94-1.78)
No drug or alcohol use	1.52† (1.13-2.05)
Psychological adjustment	
No suicidal thoughts	1.02 (0.70-1.49)
School performance	
Grades average or better	1.34 (0.91-1.97)
Criminal activities	
No criminal activity at follow-up	1.20 (0.92-1.55)
No arrests at follow-up	1.45† (1.10-1.90)

*N = 1167. Longer treatment retention was 90 days or more for residential and outpatient drug free treatment, and was 21 days for short-term inpatient treatment. All tests included modality and pretreatment problem severity as control variables.
CI indicates confidence interval.
†$P<.01$.

This important finding does not establish thresholds for necessary minimum treatment durations, but it does replicate a finding that has been repeatedly demonstrated in adult evaluation research.[17,18]

COMMENT

This study of a sample of adolescents admitted to drug abuse treatment programs revealed many important behavioral and psychological improvements in the year fol-

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lowing discharge. Less than half (43.8%) returned to regular (at least weekly) marijuana use, and there were significant reductions in criminality, heavy drinking, and use of other illicit drugs. Additionally, these adolescent patients showed significant improvement in psychological adjustment and were doing better in school after treatment. These improvements were observed across the 3 modalities of treatment programs.

It should be emphasized that the improvements achieved following treatment are particularly impressive in light of the following considerations. First, these adolescents typically displayed multiple problems (eg, polydrug use, mental disorders, criminal involvement, unstable living arrangements, family drug-use problems, deviant reference groups, and academic failure). Therefore, treating these adolescents represents a considerable challenge. Second, reductions in alcohol and drug use and other problem behaviors observed in the present study were consistent and significant, with few exceptions. The marked reductions in marijuana and alcohol use (the major drugs of abuse for this population) and illegal activities are particularly encouraging in the context of these adolescents' developmental stages. Many surveys of the general population[21,22] have reported that there is an acceleration in alcohol and drug use during adolescence. Thus, the reversal of this trend among treated adolescents in the present study supports the effectiveness of treatment for this group.

The present study also reveals several findings that are consistent with those in the adult literature. Patients in programs of different modalities seemed to reflect different levels of problem severity (eg, patients in RES programs were the most troubled, with criminal justice activities and referrals, school difficulties, and peer deviance). Hence, the various modalities are differentially employed by referral sources and, therefore, are dealing with somewhat different patient populations. Thus, adolescents may require differing strategies to achieve resolution of those problems. The present study also confirmed the findings of prior studies on adults,[17-24] showing that patients who stayed in treatment longer were more likely to have more favorable outcomes, even when patient problem severity and modality were statistically controlled.

The findings of the present study also suggest ways to further improve treatment outcomes among adolescents. Despite important improvements in drug use and other measures, many adolescents were still engaging in negative behaviors (eg, 20.3% drank heavily, 19.2% used cocaine, 42.2% used illicit drugs other than marijuana, and 52.8% committed crimes) during the year after treatment. These results were largely associated with the generally short lengths of stay among adolescents in DATOS-A treatment programs (ie, almost three quarters of patients in ODF programs stayed less than 3 months). Thus, strategies specific to adolescents are needed to improve retention and completion of drug treatment by adolescent patients in order to maximize therapeutic benefits.[25] Additionally, as we have discussed earlier, many of these adolescents were troubled by multiple problems. While this is comparable to findings for adult drug users, the timely resolution of these problems may be even more critical to successful treatment for adolescents, considering their developmental process. Failure to address adolescents' drug use and related problems in the context of the additional need to complete stage-appropriate developmental tasks can delay or frustrate adolescents' capacity to assume behaviors critical to responsible adulthood. A large body of research has demonstrated that drug use and other antisocial behaviors initiated in adolescence are frequently maintained through young adulthood.[26-31] How to effectively assist adolescent patients to address the multiple problems in their lives, especially those involving their close family members or friends, represents a continuing challenge to the treatment field.

National multisite and multimodality naturalistic evaluations such as the DATOS-A effort have the advantage of representing patients and services in the real world, thereby strengthening the external validity of research findings and enhancing the generalizability of findings.[17,18] The limitations of such research are that neither treatment modalities nor types of programs that patients enter are controlled. The DATOS-A sample of programs was purposive, intending to represent stable programs of specific types operating in the communities, rather than designed to be representative of all adolescent treatment programs. Thus, the study results may not be generalizable to programs that are not similar to those that participated in DATOS-A. Other limitations include the following: a 33% loss of sample at 1 year of posttreatment follow-up; the fact that study results are mostly based on self-report; and the fact that treatment effects may be somewhat inflated, particularly for patients in RES programs because those patients lost to follow-up seemed to have shorter lengths of stay in treatment than those who completed follow-up interviews. Nevertheless, naturalistic studies such as DATOS-A that routinely monitor and evaluate typical treatment programs for adolescent patients who abuse drugs are needed. They provide the information necessary for developing strategies that improve treatment and treatment policies. The present DATOS-A study makes an important contribution to our understanding of adolescents' drug use and their outcomes in drug treatment. The results of the present study further underscore the importance of evaluations of adolescent treatment that consider adolescent-specific issues such as different patterns of alcohol and drug use; the roles of family, school, and peers; developmental processes; and the types of treatment adolescent patients are referred to.

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Corresponding author and reprints: Yih-Ing Hser, PhD, UCLA Drug Abuse Research Center, 1640 S Sepulveda Blvd, Suite 200, Los Angeles, CA 90025 (e-mail: yhser@ucla.edu).

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