Dynamic Effects among Patients' Treatment Needs, Beliefs, and Utilization: A Prospective Study of Adolescents in Drug Treatment

Terry L. Schell, Maria Orlando, and Andrew R. Morral

Objective. To document the prospective, reciprocal relationships among substance use problems, utilization of drug treatment, and predisposing beliefs thought to increase treatment utilization.

Data Source. Persistent Effects of Treatment Study-Adolescent (PETS-A), conducted by the Center on Substance Abuse Treatment. This was a longitudinal study of youths originally participating in one of two CSAT studies; one sample included 476 youths receiving residential drug treatment, and the other included 519 youths receiving out-patient treatment.

Study Design. This study uses five waves of data collected over a 12-month period to examine the temporal relationships among four variables: treatment dose, substance use problems, drug resistance self-efficacy, and perceived need for treatment (PNT). Data from this longitudinal study were analyzed using cross-lagged panel models, and structural equation modeling techniques were used to estimate the prospective, reciprocal relationships among these four variables in each of the two samples, while controlling for several covariates.

Principal Findings. Both PNT and low drug resistance self-efficacy led to higher levels of subsequent treatment. However, low self-efficacy presaged increases in drug problems while PNT predicted decreases.

Conclusions. Understanding the role of psychological variables in the utilization of health services is complicated for psychological disorders because beliefs that affect treatment can also influence the disorder itself. Efforts to keep adolescents in drug treatment should focus on convincing youth that treatment can help them with their problems, rather than convincing them that they cannot resist drugs on their own. While both messages increase treatment utilization, the latter belief undermines the effects of treatment.

Key Words. Adolescent, GAIN, substance use, self-efficacy, drug treatment utilization, need for treatment, structural equation modeling

Adolescent substance abuse appears to contribute to a variety of harms both for society and for youths themselves. It is associated with reductions in wages and economic productivity (Bryant, Samaranayake, and Wilhite 1993; Burgess and Propper 1998), violence, crime and delinquency (Komro et al. 1999; Pepler et al. 2002), reduced physical hardiness and increased emergency room visits (Newcomb and Bentler 1987), early pregnancies and abortions (Mensch and Kandel 1992; Huizinga, Loeber, and Thornberry 1993; Grunbaum et al. 2002), and lower educational attainment (Friedman, Bransfield, and Kreisher 1994; Newcomb 1995). It is hardly surprising, therefore, that use of adolescent substance abuse treatment services has increased markedly in recent decades and that much of this surge is attributable to referrals made by the juvenile justice system. Indeed, nearly all of the 46 percent increase in public treatment admissions for 12–17 year olds in the U.S. between 1993 and 1998 was attributable to such referrals (Substance Abuse and Mental Health Services Administration 2001).

Several adolescent treatments have been shown to be efficacious (Winters 1999; Williams, Chang, and Addiction Centre Research Group 2000), and many others are associated with reductions in a range of adolescent problem behaviors (Hubbard et al. 1985; Gerstein and Johnson 1999; Hser et al. 2001). Nevertheless, large numbers of treated youths resume drug use and other problem behaviors after treatment (Brown et al. 2001; Hser et al. 2001), and multiple treatment admissions over a “treatment career” are commonplace (Hser et al. 1997; McLellan et al. 2000).

High relapse rates and treatment readmission do not necessarily signify treatment failures. As McLellan et al. (2000) note, if substance dependence were regarded as a chronic relapsing disorder like asthma or schizophrenia, relapse after treatment cessation would not be considered an indictment of the otherwise effective therapies used to treat it. In addition, there may be cumulative effects of treatment exposure. Specifically, we hypothesize that treatment exposure affects youths’ cognitions (i.e., their beliefs and attitudes) in ways that may facilitate subsequent treatment, increase treatment retention, and improve behavioral outcomes. For example, exposure to treatment may increase motivation for subsequent treatment, strengthen beliefs about the effectiveness of treatment, or increase drug-resistance self-efficacy beliefs.

Andersen’s (1968) behavioral model of service utilization is a useful framework in which to examine this possibility. This model conceptualizes

Address correspondence to Terry R. Schell, Ph.D., Drug Policy Research Center, RAND, 1776 Main St., Santa Monica, CA 90407–2138. Maria Orlando, Ph.D., and Andrew R. Moral, Ph.D., are with Drug Policy Research Center, RAND, Santa Monica, CA.

health service utilization as one set of health behaviors determined by individuals' predisposing, enabling and need characteristics. In the context of adolescent substance abuse treatment, predisposing characteristics would include youths' motivation and readiness for treatment, which have been shown to predict treatment retention and outcomes (Cady et al. 1996; Melnick et al. 2000; Orlando, Chan, and Morral 2003). Another important, but understudied, predisposing characteristic is adolescents' perceived drug resistance self-efficacy. Among adults in treatment, resistance self-efficacy is associated with abstinence from illicit drugs (Rounds-Bryant et al. 1997). While low resistance self-efficacy has been shown to be associated with increased drug use among adolescents in the general population (e.g., Ellickson and Hays 1991), some degree of resistance self-efficacy may also be necessary for youths to engage in drug treatment (see for example, Condiotte and Lichtenstein 1981; Ross et al. 1989). Enabling characteristics might include, for instance, the availability of affordable treatment or juvenile justice programs offering treatment as an alternative to other dispositions. Finally, need characteristics would include the severity of youths' preexisting substance use problems.

Gelberg, Andersen, and Leake (2000) extended the Andersen model to suggest that predisposing, enabling, need, and health behavior characteristics predict health outcomes. That is, those who utilize health care actually have improved health status, and less need. Thus, their model recognizes health status as both a predictor of utilization (a need characteristic) and a utilization outcome. This model could be similarly extended to allow for certain predisposing characteristics, such as cognitions about the health condition and its treatment, to play a dual role by both influencing and being influenced by utilization over time. For example, attitudes about the effectiveness of substance abuse treatment may influence an individual's likelihood of seeking treatment, but treatment itself may modify these same attitudes. Thus need and predisposing characteristics can be conceptualized as both predictors and outcomes of utilization over time.

Applying this service utilization model to characterize a behavioral health condition such as substance abuse raises the further possibility that predisposing characteristics, such as cognitions about substance use and substance use treatment, may also influence need characteristics. Thus beliefs may be affected by behaviors as those same beliefs influence behavior. Having a more serious drug problem (greater need) may lead to an increased perceived need for treatment (PNT); this belief may then cause the individual to respond more positively to the treatment and ultimately have less need over time. In this longitudinal conceptual framework, need and predisposing

factors may combine to influence both initial and subsequent treatment utilization while these same factors may be influenced by utilization. Understanding this reciprocal relationship may be a key to improving the quality of drug treatment, as well as increasing both initiation of treatment and retention in treatment.

This study uses five waves of data collected over a 12-month-period to examine the temporal relationships among treatment dosage, substance use severity, and two measures of substance-related cognitions: drug resistance self-efficacy, and PNT, among a sample of adolescents receiving residential or outpatient substance abuse treatment. The rich longitudinal data set and a cross-lagged analytic framework allow us to evaluate the evidence for reciprocal causal relationships among these factors.

METHOD

Participants and Participating Programs

We conducted separate but parallel analyses on two highly dissimilar samples of adolescents undergoing drug treatment. Both samples were studied as part of the Persistent Effects of Treatment Study-Adolescent (PETS-A), conducted by the Center on Substance Abuse Treatment (CSAT). PETS-A was a long-term follow-up study of youths originally participating in one of two CSAT studies. Adolescent Treatment Models (ATM) was a study examining the outcomes of all youths entering community-based treatment programs identified as offering potentially exemplary treatment services for adolescents (Stevens and Morral 2003). The long-term outcomes of youths from residential ATM programs in the western U.S. were subsequently followed under PETS-A. Sites included in the ATM study differed in terms of organizational structures, arrays of services offered, sources of referral, and clientele. Services at ATM sites were chiefly paid for with state or local funds (e.g., AFDC dollars, tobacco tax funds, or by probation departments). Admission criteria varied by program, but generally required youths to be between the ages of 13–19, and to have little or no history of violence or arson. Participation in the ATM study was available to all program enrollees during the recruitment period, conditional on youth assent and the consent of a legal guardian. Detailed discussions of the services, staffing, financing, and clientele at each ATM program are available (Stevens and Morral 2003).

The second PETS-A sample consisted of participants in an outpatient adolescent marijuana treatment experiment, entitled Cannabis Youth

Treatment (CYT). In CYT, youths at four eastern U.S. treatment centers were randomly assigned to one of six psychosocial treatment interventions that were provided at no cost to participants. Detailed discussion of the CYT experiment is available (Dennis, Babor, et al. 2000; Dennis, Titus et al. 2002), as are all the CYT intervention manuals describing the procedures used in each experimental condition (Godley et al. 2001; Hamilton et al. 2001; Sampl and Kadden 2001; Liddle 2002; Webb et al. 2002).

For the present analyses we divide the PETS-A data set into its residential (ATM) and outpatient (CYT) subsamples. The residential sample from PETS-A consists of all 476 youths who reported receiving any residential drug treatment services within the first 3 months of their participation in the ATM study. Youths in this sample entered one of two long-term residential programs (23 percent), one of two short-term residential programs (61 percent), or other residential programs (15 percent), between 1999 and 2001. The outpatient sample consists of all 519 youths who reported receiving any outpatient treatment within the first 3 months of their participation in CYT, which recruited participants during 1998 and 1999.

In addition to entering different treatment modalities (residential or outpatient), these samples are further differentiated by their geographic locations (western versus eastern U.S), differences between community-based treatments and clinical trials (concerning, for instance, random assignment, treatment fidelity monitoring, counselor training and supervision, subject recruitment procedures, and financing of services), the planned durations of treatment (3–12 months for residential, 3 months or less for outpatient), and by a range of client characteristics (see Table 1). While participants in the two treatment types did not differ with respect to age, the residential sample had a larger proportion of females ($\chi^2_{(1)} = 16.36, p < .0001$), and were more likely to be of Hispanic or mixed/other ethnicity, while the outpatient participants were more likely to be caucasian or African American ($\chi^2_{(3)} = 271.17, p < .0001$). Additionally, participants in the residential sample tended to have more serious drug problems as evidenced by their significantly higher rates of use of all drug types except marijuana during the year prior to baseline, and significantly higher scores on the Substance Problem Index; $t_{(993)} = 6.07, p < .0001$. Table 2 lists the rates of treatment exposure throughout the 12-month study period. Rates dropped over time for both groups.

Despite these many differences, both samples were collected by CSAT using a single survey instrument and comparable study designs. Data collection procedures were approved by local Institutional Review Boards for each site. All participants were volunteers who provided written informed assent,

Table 1: Participant Characteristics by Treatment Group

<i>Variable</i>	<i>Residential (N= 476) (%)</i>	<i>Outpatient (N= 519) (%)</i>
Gender		
Male	72	83
Female	28	17
Ethnicity		
White	41	64
African American	6	28
Hispanic	36	3
Other	17	6
Past year drug use at baseline		
Alcohol	99	93
Marijuana	98	100
Hallucinogens	69	34
Amphetamines	55	13
Crack cocaine	34	6
Other cocaine	52	8
Heroin	10	2
Other opiates	36	18
Barbiturates	32	10
Inhalants	26	9
Tranquilizers	20	15
PCP	17	8

and for whom written consent was provided by a parent or guardian. Data collection included a baseline assessment conducted within 7 days of treatment entry (for three residential programs) or prior to treatment admission (for the remaining programs).

Subsequently, participants were scheduled for follow-up interviews 3, 6, 9, and 12 months after their baseline interviews, except at one of the residential treatment sites (comprising 33 percent of the residential sample), where 9-month interviews were neither planned nor conducted. Because 9-month data are missing by design for these cases, we estimate model parameters using a missing data procedure that provides unbiased estimates (the EM Algorithm, see Schafer 1997), while ensuring efficient use of all available data. Data collection was conducted by local interviewers trained to criterion performance on the survey instrument used at every site, the Global Appraisal of Individual Needs-Initial (GAIN-I; Dennis, 1998) and its follow-up versions. The GAIN includes over 100 symptom, change score, and utilization indices that have good internal reliabilities and have been normed on adults and adolescents (Dennis et al. 1999, 2002; Dennis and Babor 2000). Sample retention rates for the 3, 6, 9 and 12-month follow-up assessments were superb, with 94 percent

Table 2: Means and Standard Deviations of Modeled Variables

<i>Variable</i>	<i>Residential (N = 476)</i>	<i>Outpatient (N = 519)</i>
SPI		
Baseline	5.38 (4.89)	3.76 (3.42)
3-month	2.53 (3.93)	2.46 (3.20)
6-month	2.31 (3.84)	2.18 (3.10)
9-month	2.83 (4.07)	1.96 (2.97)
12-month	2.62 (4.10)	1.83 (2.72)
TX dose*		
Baseline	0.31 (0.65)	0.23 (.70)
3-month	2.30 (0.93)	1.68 (.65)
6-month	1.14 (1.40)	0.36 (.86)
9-month	0.70 (1.15)	0.37 (.92)
12-month	0.51 (1.08)	0.30 (.86)
LSE		
Baseline	0.33 (0.29)	0.20 (0.22)
3-month	0.30 (0.27)	0.19 (0.23)
6-month	0.29 (0.27)	0.17 (0.21)
9-month	0.28 (0.27)	0.18 (0.22)
12-month	0.26 (0.26)	0.16 (0.21)
PNT		
Baseline	0.56 (0.31)	0.50 (0.28)
3-month	0.53 (0.31)	0.40 (0.29)
6-month	0.46 (0.31)	0.35 (0.28)
9-month	0.45 (0.31)	0.36 (0.30)
12-month	0.44 (0.31)	0.36 (0.29)

Note: *Residential and outpatient samples are measured on different scales.

SPI, substance-use problem index; LSE, low drug-resistance self-efficacy; PNT, perceived need for treatment.

or more of the baseline sample at each site successfully interviewed at each scheduled wave.

Measures

Substance Use-Related Problems. The GAINs Substance Problem Index (SPI) is a 16-item count of self-reported symptoms of substance abuse and dependence experienced in the 30 days prior to the interview. Seven items from this index correspond to DSM-IV criteria for dependence, and four for abuse (American Psychiatric Association 1994). Five additional items assess other common symptoms of substance misuse. The SPI has shown good internal consistency (Cronbach $\alpha = 0.9$) and test-retest reliability ($r = 0.7$) in prior research (Dennis, Dawud-Noursi et al. 2003; Dennis et al. 2002; Godley

et al. 2002). Table 2 lists the means and standard deviations of the SPI at each assessment for the two treatment samples.

Treatment Dose. As part of the GAIN, participants were asked four questions about any substance abuse treatments they received in the 90 days prior to the interview: “How many... (1) days were you in an inpatient treatment program (1–40 days)? (2) days were you in longer-term residential program (2–12 months)? (3) times did you go to an intensive outpatient program (9–12 hours per week)?, and (4) times did you go to a regular outpatient program (1–8 hours per week)?” Responses to these four items were summed to create a measure of treatment dose that includes treatment received as part of the planned treatment regiment as well as any additional or subsequent treatment received by the respondent. Although this summation combines receipt of inpatient and outpatient treatment within each sample to represent the total amount of treatment received, the type of treatment received by the “residential sample” was primarily residential treatment, and the treatment received by the “outpatient” sample was almost entirely outpatient treatment. The summed treatment dose variable was recoded for each of the two samples to provide better analytic distributions. For the residential sample, treatment dose was rescaled on a 0–4 scale corresponding to: No treatment, 1–29 days, 30–59 days, 60–89 days, and 90 days of treatment. For the outpatient sample, treatment (TX) dose was rescaled on a 0–3 scale corresponding to: No treatment, at least one day but not more than twice a month, between twice a month and weekly, more than weekly. Because of the different coding systems and types of treatment used in the residential and outpatient samples, it is not possible to directly compare the magnitude of TX dose across these different samples.

Low Drug-Resistance Self-Efficacy (LSE). This scale is derived primarily from the GAINs 5-item self-efficacy index, which measures self-efficacy specific to drug resistance. These items assess the respondents’ self-efficacy at the time of the interview and are answered Yes/No: “Do you think that you could avoid using drugs or alcohol . . . (1) at home, (2) at work or school, (3) with your friends, (4) when people around you were using them,” and (5) “You spend a lot of time thinking about drugs and alcohol.” Two additional GAIN items were found to correlate very highly with the self-efficacy items and contained substantially overlapping content: “It will be hard for you to resist drugs where you current live, work or go to school,” and “Your old friends may try

to get you to drink or use drugs again.” To create a scale measuring current LSE, the number of “no” responses to the five self-efficacy index items and the number of “yes” responses to the two additional items were summed and divided by seven. This scale showed adequate internal reliability (Cronbach $\alpha = 0.74$), and was highly stable across waves (see Table 2).

PNT. This scale is created using three items from the GAINs Treatment Motivation Index. The Treatment Motivation Index was not designed to assess a single construct but rather to assess a range of motivations. Preliminary analyses indicated that three items from this index were highly correlated and assessed the extent to which the participant believes that other people or treatments can help with their drug problem. Participants indicated whether they currently feel: (1) “You can get the help you need in an alcohol or drug treatment program.” (2) “You need to be in treatment for at least a month?” (3) “You need support from friends and relatives to deal with your alcohol or drug use.” The number of “yes” responses was summed and divided by three to create this scale. The relatively low internal reliability of this scale (Cronbach $\alpha = 0.56$) is common among scales with just three items. This measure was highly stable over time, as stable as the LSE and SPI measures.

Analytic Procedure

Our general approach for covariance structural modeling involved the implementation of cross-lagged path analysis (e.g., Kessler and Greenberg 1981; Mayer and Carrol 1987) to examine the temporal relations among the participants’ substance use problems (SPI), drug treatment exposure (TX dose), LSE, and PNT. In this modeling approach, each variable in the model is regressed on all of the variables that precede it in time (see Figure 1). For example, 6-month SPI scores are regressed on SPI, TX dose, PNT, and LSE measures from the 3-month wave; while 6-month PNT scores are regressed on PNT, and LSE measures from the 3-month wave, as well as SPI and TX dose measures reflecting experiences preceding the 6-month wave. The resulting models can be seen as a set of regression equations that are simultaneously estimated based on the full covariance matrix.

We estimated separate models for the participants enrolled in the residential and the outpatient treatment programs. This allows for separate causes and effects of treatment across these two subpopulations, and it reflects the fact that TX dose is measured on a different scale across the two samples. In the

Figure 1: Initial Cross-Lagged Model

Note: Model applied simultaneously to 0-, 3-, 6-, 9-, and 12-month data. Correlations between measures with overlapping time frames are not shown. Paths from baseline covariates are not shown.

final models for each of the two samples, a single coefficient was estimated for each conceptual relationship that was replicated across time intervals. For example, the path coefficient relating PNT with subsequent TX dose in the residential sample was estimated by simultaneously predicting 12-month TX dose from 9-month PNT, 9-month TX dose from 6-month PNT, and 6-month TX dose from 3-month PNT. Thus, the conceptual replications over time are modeled as a single, repeating process. The models also included age, gender, ethnicity, and study site as covariates for all regression equations. To increase analytic power, these covariates were pruned from the model when the removal resulted in a more parsimonious model, that is, when the effects were very small. The conceptual variables being modeled and the process of model development were identical for the two treatment samples. We have created a web-based technical appendix (please see <http://www.blackwellpublishing.com/products/journals/suppmat/HESR/HESR00399/HESR00399sm.htm>) that includes more details about the statistical analyses, including a summary of the model development process, the method used for parameter estimation, the selection of covariates, the criteria used for model pruning, the handling of missing data, and details of the final model specification. Overall model fit was evaluated using the procedure recommended by Hu and Bentler (1999). Specifically, a model was considered well-specified when the CFI value was greater than 0.95 and SRMR was less than 0.08.

RESULTS

The final models fit the data very well for both treatment groups, exceeding standard criteria for good model fit; $\chi^2(218) = 266.9$; CFI = 0.98; RSMR = 0.04; $\chi^2(233) = 309.1$; CFI = 0.97; RSMR = 0.03, for the residential and outpatient samples, respectively. This level of fit indicates that few significant associations among modeled variables are omitted in the current model. In addition, it demonstrates that modeling the multi-interval longitudinal data as a constant, repeating process is a parsimonious summary of the observed prospective relationships.

The results of theoretical interest are the standardized regression coefficients that characterize the interrelations among SPI, TX dose, LSE, and PNT over the 3- to 6-month, 6- to 9-month, and 9- to 12-month intervals. These standardized coefficients are shown in Table 3. Across both samples, the strongest predictors of all variables were the autoregressive paths, that is, the coefficients linking a particular variable across waves. This high level of stability is common in longitudinal modeling when the measurement intervals are as closely spaced as the current study (five measurements in 1 year). The magnitudes of these stability parameters were very similar across the two samples, with the exception of TX dose. There was considerably more wave-to-wave variability in TX dose for those in the outpatient sample.

In spite of the high degree of temporal stability in our measures, there were significant cross-lagged effects on each of our criterion variables. These cross-lagged effects indicate the ability of each variable to predict a subsequently measured criterion while controlling for all other predictors. The best cross-lagged predictor of substance abuse problems in both samples was participants' beliefs about their resistance self-efficacy. Participants reporting LSE showed an increase in subsequent drug problems relative to those with high self-efficacy. PNT and treatment dose also had effects on subsequent drug problems, however these effects were not significant in the outpatient sample. Controlling for all other factors, individuals in the inpatient sample who were high in PNT and those who received larger doses of treatment showed decreases in subsequent drug problems.

The cross-lagged predictors of TX dose differed substantially between the residential and outpatient samples. Having high levels of drug problems presaged a reduction in TX dosage for the residential treatment sample, but an increase in TX dose for those in the outpatient group. The participants' LSE and PNT were also independent cross-lagged predictors of TX dose. Having high PNT predicted subsequent increases in TX dose in both samples,

Table 3: Standardized Model Coefficients

Variable	Treatment Type	
	Residential (N = 476)	Outpatient (N = 519)
Predicting SPI at 6, 9, and 12 months		
Prior wave SPI	0.25***	0.34***
2 wave prior SPI	0.14***	0.19***
Prior wave TX	− 0.07**	− 0.03
Prior wave LSE	0.11***	0.14***
Prior wave PNT	− 0.06*	− 0.05 [†]
Predicting TX dose at 6, 9, and 12 months		
Prior wave TX	0.52***	0.38***
Prior wave SPI	− 0.09***	0.09**
Prior wave LSE	0.11***	0.04
Prior wave PNT	0.06*	0.11***
Predicting LSE at 6, 9, and 12 months		
Prior wave LSE	0.32***	0.31***
2 wave prior LSE	0.18***	0.17***
Previous 30 days SPI	0.29***	0.31***
Pervious 90 days TX	0.03	0.05*
Prior wave PNT	0.08**	0.04 [†]
Predicting PNT at 6, 9, and 12 months		
Prior wave PNT	0.37***	0.33***
2 wave prior PNT	0.17***	0.21***
Previous 30 days SPI	0.05	0.08***
Previous 90 days TX	0.21***	0.16***
Prior wave LSE	0.03	0.03

Note: Path coefficients are based on the simultaneous regression of 6-, 9-, and 12-month outcomes, and were constrained to be equal across these three replications. Variances were not constrained so these standardized coefficients are based on the average of the three standardized path coefficient. All coefficients are from models in which age, gender, ethnicity, and study site were included as covariates.

[†] $p < .1$;

* $p < .05$;

** $p < .01$;

*** $p < .001$.

SPI, substance-use problem index; LSE, low drug-resistance self-efficacy; PNT, perceived need for treatment.

while having LSE predicted increases in TX dose only within the residential sample.

These finding are consistent with a model in which participants' self-efficacy beliefs and their perceptions of the helpfulness of treatment influence their subsequent treatment utilization and their drug problems. However, there was also evidence that these beliefs and perceptions were influenced by

prior drug problems and drug treatment. LSE was primarily influenced by SPI, with participants high in drug problems developing lower self-efficacy beliefs. There are also weaker effects showing that PNT and TX dose influenced LSE. Those who believed that treatment was helpful subsequently developed lower self-efficacy, although this was only significant in the residential sample. Similarly, outpatient treatment dose predicted the development of lower self-efficacy. PNT was influenced primarily by prior TX dose, with higher levels of TX dose preceding increases in PNT for both samples. PNT was also influenced by prior SPI among the outpatient sample, with greater drug problems preceding beliefs that treatment would be helpful.

DISCUSSION

The current analyses demonstrate the prospective, reciprocal relationships that exist among drug problems, drug treatment receipt, perceptions of a need for treatment, and drug-resistance self-efficacy among two samples of adolescents undergoing drug treatment. These results reveal the important roles played by individuals' beliefs and cognitions in determining the course of treatment utilization, as well as the course of the substance use disorder itself. Viewed as a system, the models point out substantial differences in how PNT and drug-resistance self-efficacy operate. The belief that other people can help you with your drug problems appears to provide clear benefits through two independent mechanisms: encouraging continued treatment and directly reducing future drug problems. In addition, these beliefs appear to be modified positively in drug treatment, forming a beneficial feedback loop. In contrast, the belief that you have a hard time resisting drugs on your own has more complex effects. These beliefs encourage continued drug treatment for those in the residential sample, but this effect was not significant in the outpatient sample. More importantly, any small benefit achieved by increasing treatment is counteracted by the tendency of these beliefs to facilitate subsequent drug problems, an effect found in both the residential and outpatient samples. This effect is particularly problematic because these beliefs are themselves influenced by prior drug use problems. This suggests a vicious cycle in which drug problems lead to reduced resistance self-efficacy, and these beliefs then lead to subsequent increases in drug problems. In short, while it is good to admit that you need help, it is bad to admit that you cannot resist drugs on our own.

While these two types of beliefs play very different roles in determining subsequent drug use problems, they are moderately positively correlated in

our sample (r 's = 0.29, 0.25, for the residential and outpatient samples at baseline). Adolescents who believed that they needed help with their drug problem were also likely to claim that they had difficulties resisting drugs. This relationship continues to exist even after controlling for the severity of their drug use problems and their previous exposure to treatment (Partial r 's = 0.23, 0.12, for the residential and outpatient samples at baseline). These partial correlations between beneficial and detrimental beliefs may reflect a culturally transmitted belief system about drug treatment and addiction, that is, that treatment is only needed for people who cannot help themselves.

Interestingly, these beliefs exhibited similar effects in the separate analyses conducted on the outpatient and residential samples. These two samples differ in a wide range of factors, including: the type of treatment provided, the intensity of the treatment, the severity of drug problems, the types of substances used, the ethnic and racial composition, and the geographic location of the participants. In spite of these differences, the pattern of standardized coefficients indicates that PNT and LSE are playing qualitatively similar roles in these distinct samples. This conceptual replication across distinct samples provides evidence that the findings are robust.

These results have significant implications for how treatments should be crafted to achieve the dual aim of reducing drug use problems and facilitating treatment involvement. Treatment providers need to walk a fine line between convincing patients that treatment can help them with their drug problems and implying that they cannot resist drugs on their own. This is a subtle but important difference from a confrontational treatment message that attempts to convince clients that they are powerless to control their drug use. Evidence from the current study indicates that the treatment programs under study are only partially successful at achieving this goal. Treatment did increase the belief that others can help with the drug problem, but it did not improve drug-resistance self-efficacy. In fact, treatment dose actually predicted a slight lowering of self-efficacy within the outpatient sample (i.e., greater LSE), an effect that largely replicates findings by Grella et al. (1999) among adults. Given our evidence that low self-efficacy facilitates subsequent drug problems, modifying drug treatment so that it increases drug-resistance self-efficacy may be a promising avenue for treatment improvement.

Anderson's behavioral model and its subsequent elaboration (Gelberg et al. 2000) suggest that service utilization can be viewed as a function of service users' treatment needs, predisposing characteristics, and the factors that enable service utilization for the individual. Our findings demonstrate that the relationships among these variables are complex when dealing with treatment

for a behavioral health problem such as addiction. Specifically, we find three types of relationships that complicate conventional models of service use. First, higher levels of treatment need (as measured by substance use problems) do not always result in higher levels of treatment. Among the residential sample, those with the worst problems were actually the most likely to terminate treatment. This reversal of the model's prediction may represent a non-linear relationship between treatment need and treatment dose, with a positive association between these variables at most levels of treatment need, but a negative association among those who have the most severe substance use problems. This may also reflect the fact that the highly controlled environment of residential treatment is aversive for adolescents with severe drug use problems. This reversal may pose a significant public health challenge because those with the most severe addiction problems may find available treatments difficult to tolerate. Second, the treatments themselves can have substantial effects on "predisposing factors," such as acknowledgement of treatment need. This poses complications for research that looks at service utilization using cross-sectional methods. Any observed relationship between cognitive "predisposing" factors and service utilization may represent the causal influence of prior service use on these factors, rather than the influence of these factors on service use. When looking at behavioral disorders requiring ongoing treatment, the causal direction implied by the term "predisposing" factors may be inappropriate, since each factor can also be "postdisposing." Finally, we find that the factors that influence treatment utilization can also have direct influence on the disorder being treated. A particular belief may serve as a predisposing belief for treatment, thus appearing beneficial, but can simultaneously have a deleterious effect on the disorder itself. That is to say, what gets adolescent users into drug treatment, may not be what helps them to get healthy. Research attempting to understand the factors that facilitate drug abuse treatment should also model the effects of those factors on the disorder. Failure to account for both effects may lead to conclusions that dramatically misrepresent the true public health value of those predisposing factors.

The current research is strong in several areas: it uses prospective methods, integrates results over several waves of data, replicates the effects on two diverse samples, looks at several outcomes simultaneously, establishes statistical models that fit the data very well, and uses one of the largest and most complete datasets on adolescents in drug treatment. Nevertheless, it is not a true representative sample of all youths in drug treatment. In addition, the relatively narrow age range of the participants may limit generalizability of the findings. While adolescents and young adults constitute a large and growing

proportion of individuals in drug treatment, additional research will be needed to insure that these findings generalize to an older population or a more representative sample of adolescents.

A thorough understanding of how participant beliefs interact with treatment utilization and drug problems requires more comprehensive measurements of potential predisposing and enabling beliefs (e.g., beliefs about treatment efficacy, beliefs about treatment-related stigma, etc.). It would also be helpful to have a more refined instrument to assess PNT. This measure does not allow us to investigate the possibility that several dimensions are needed to fully capture the complexity of these beliefs. Unfortunately, the GAIN did not contain a wide array of treatment related cognitions. Nevertheless, we were able to establish that the PNT and LSE scales were each working in a consistent manner by testing each scale item's prospective effect on TX dose and SPI. Across both samples, the individual items related to these outcomes in the same directions as the overall scales. This gives us some confidence that the items used in these scales can be treated as unidimensional in the current analyses.

Finally, the research relied entirely of self-report measures of treatment utilization and substance use problems. Future research should consider methods for bolstering self-report data about treatment utilization and substance use problems with corroborating data sources.

In summary, this study demonstrates the important role played by adolescents' cognitions in their drug abuse treatment utilization and in the course of drug abuse. Low drug resistance self-efficacy was found to slightly increase treatment utilization but also undermined treatment outcomes by predicting increased drug use problems in the future. In contrast, believing that you could be helped by treatment both increased utilization and, independently, decreased drug problems. This longitudinal study also demonstrated the complexity of understanding treatment utilization for substance use disorders. The factors that were hypothesized to facilitate drug abuse treatment were predictive of utilization, however they were also highly influenced by prior drug treatment and had direct effects on the disorder being treated.

ACKNOWLEDGMENTS

This report was developed with support from the National Institute on Drug Abuse R01 DA017507-01 and the Center for Substance Abuse Treatment, Substance Abuse and Mental Health Services Administration (grant KD1-TI1433, and contract number 270-97-7011).

REFERENCES

- American Psychiatric Association 1994. *Diagnostic and Statistical Manual of Mental Disorders*. 4th ed. Washington, DC: American Psychiatric Association.
- Andersen, R. 1968. "Behavior Models of Families' Use of Health Services." Research Series No. 15. Center for Health Administration Studies, University of Chicago.
- Brown, S. A., E. J. D'Amico, D. M. McCarthy, and S. F. Tapert. 2001. "Four-Year Outcomes from Adolescent Alcohol and Drug Treatment." *Journal of Studies on Alcohol* 62 (3): 381-8.
- Bryant, R., V. A. Samaranayake, and A. Wilhite. 1993. "The Influence of Current and Past Alcohol Use on Earnings." *Journal of Applied Behavioural Science* 29: 9-31.
- Burgess, S. M., and C. Propper. 1998. "Early Health-Related Behaviours and Their Impact on Later Life Chances: Evidence from the US." *Health Economics* 7: 381-99.
- Cady, M. E., K. C. Winters, D. A. Jordan, K. Solberg and R. Stinchfield. 1996. "Motivation to Change as a Predictor of Treatment Outcome for Adolescent Substance Abusers." *Journal of Child & Adolescent Substance Abuse* 5: 73-91.
- Condiotte, M. M., and E. Lichtenstein. 1981. "Self-Efficacy and Relapse in Smoking Cessation Programs." *Journal of Consulting and Clinical Psychology* 49: 648-58.
- Dennis, M. L. 1998. *Global Appraisal of Individual Needs (GAIN) Manual: Administration, Scoring and Interpretation*. Bloomington, IL: Lighthouse Publications.
- Dennis, M. L., T. F. Babor, G. Diamond, J. Donaldson, S. H. Godley, F. Tims, J. Titus, C. Webb, J. Herrell, and The CYT Steering Committee. 2000. *The Cannabis Youth Treatment (CYT) Experiment: Preliminary Findings*. Rockville, MD: Center for Substance Abuse Treatment. Available at www.samhsa.gov/centers/csat/content/Recoverymonth.
- Dennis, M. L., S. Dawud-Noursi, R. D. Muck, and M. McDermeit (Ives). 2003. "The need for Developing and Evaluating Adolescent Treatment Models." In *Adolescent Drug Treatment in the United States: Exemplary Models from a National Evaluation Study*, S. J. Stevens, and A. R. Morral (eds.), pp. 3-34. Binghamton, NY: Haworth Press.
- Dennis, M. L., C. Scott, M. Godley, and R. Funk. 1999. *Comparisons of Adolescents and Adults by ASAM Profile Using GAIN Data from the Drug Outcome Monitoring Study (DOMS): Preliminary Data Tables*. Bloomington, IL: Chestnut Health Systems. Available at <http://www.chestnut.org/li/posters/asamprof.pdf> [accessed June, 10, 2003].
- Dennis, M. L., J. C. Titus, G. Diamond, J. Donaldson, S. H. Godley, F. M. Tims, C. Webb, Y. Kaminer, T. Babor, M. C. Roebuck, M. D. Godley, N. Hamilton, H. Liddle, C. K. Scott, and C. Y. T. Steering Committee 2002. "The Cannabis Youth Treatment (CYT) Experiment: Rationale, Study Design and Analysis Plans." *Addiction* 97: 16-34.
- Ellickson, P. L., and R. D. Hays. 1991. "Beliefs About Resistance Self-Efficacy and Drug Prevalence: Do They Really Affect Drug Use?" *The International Journal of the Addictions* 25: 1353-78.

- Friedman, A. S., S. Bransfield, and C. Kreisher. 1994. "Early Teenage Substance Use as a Predictor of Educational-Vocational Failure." *American Journal on Addictions* 3: 325-36.
- Gelberg, L., R. M. Andersen, and B. D. Leake. 2000. "The Behavioral Model for Vulnerable Populations: Application to Medical Care Use and Outcomes for Homeless People." *Health Services Research* 34: 1273-302.
- Gerstein, D. R., and R. A. Johnson. 1999. *Adolescents and Young Adults in the National Treatment Improvement Evaluation Study*. Fairfax, VA: National Evaluation Data Services.
- Godley, M. D., S. H. Godley, M. L. Dennis, R. Funk, and L. Passetti. 2002. "Preliminary Outcomes from the Assertive Continuing Care Experiment for Adolescents Discharged from Residential Treatment." *Journal of Substance Abuse Treatment* 23: 21-32.
- Godley, S. H., R. J. Meyers, J. E. Smith, T. Karvinen, J. C. Titus, M. D. Godley, G. Dent, L. Passetti, and P. Kelberg. 2001. *The Adolescent Community Reinforcement Approach for Adolescent Cannabis Users, Cannabis Youth Treatment (CYT) Series, DHHS Publication No. 01-3489*, Vol. 4. Rockville, MD: U.S. Department of Health and Human Services.
- Grella, C. E., Y.-I. Hser, V. Joshi, and M. D. Anglin. 1999. "Patient Histories, Retention, and Outcome Models for Younger and Older Adults in DATOS." *Drug and Alcohol Dependence* 57: 151-66.
- Grunbaum, J. A., L. Kann, S. A. Kinchen, B. Williams, J. G. Ross, R. Lowry, and L. Kolbe. 2002. *MMWR Surveillance Summaries* 51 (No. No. SS04). Atlanta: Center for Disease Control and Prevention.
- Hamilton, N. L., L. B. Brantley, F. M. Tims, N. Angelovich, and B. McDougall. 2001. *Family Support Network for Adolescent Cannabis Users, Cannabis Youth Treatment (CYT) Series, DHHS Pub. No. (SMA) 01-3488*, Vol. 3. Rockville, MD: U.S. Department of Health and Human Services.
- Hser, Y. I., M. D. Anglin, C. Grella, D. Longshore, and M. L. Prendergast. 1997. "Drug Treatment Careers. A Conceptual Framework and Existing Research Findings." *Journal of Substance Abuse Treatment* 14 (6): 543-58.
- Hser, Y. I., C. E. Grella, R. L. Hubbard, S. C. Hsieh, B. W. Fletcher, B. S. Brown, and M. D. Anglin. 2001. "An Evaluation of Drug Treatments for Adolescents in 4 US Cities." *Archives of General Psychiatry* 58: 689-95.
- Hu, L., and P. M. Bentler. 1999. "Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria versus New Alternatives." *Structural Equation Modeling* 6: 1-55.
- Hubbard, R. L., E. R. Cavanaugh, S. G. Craddock, and J. V. Rachal. 1985. "Characteristics, Behaviors, and Outcomes for Youth in the TOPS." In *Treatment Services for Adolescent Substance Abusers*, edited by G. M. Beschner. Rockville, MD: National Institute on Drug Abuse.
- Huizinga, D., R. Loeber, and T. P. Thornberry. 1993. "Longitudinal Study of Delinquency, Drug Use, Sexual Activity, and Pregnancy among Children and Youth in Three Cities." *Public Health Reports* 108: 90-96.

- Kessler, R. C., and D. F. Greenberg. 1981. *Linear Panel Analysis: Models of Quantitative Change*. San Diego, CA: Academic Press.
- Komro, K. A., C. L. Williams, J. L. Forster, C. L. Perry, K. Farbachsh, and M. H. Stigler. 1999. "The Relationship between Adolescent Alcohol Use and Delinquent and Violent Behaviors." *Journal of Child and Adolescent Substance Abuse* 9: 13–28.
- Liddle, H. A. 2002. *Multidimensional Family Therapy for Adolescent Cannabis Users, Cannabis Youth Treatment Series, DHHS Publication No. 02–3660*, Vol. 5. Rockville, MD: U.S. Department of Health and Human Services.
- Mayer, L., and S. Carrol. 1987. "Testing for Lagged, Cotemporal and Total Dependence in Cross-Lagged Panel Analysis." *Sociological Methods and Research* 16: 187–217.
- McLellan, A. T., D. C. Lewis, C. P. O'Brien, and H. D. Kleber. 2000. "Drug Dependence, a Chronic Medical Illness: Implications for Treatment, Insurance, and Outcomes Evaluation." *Journal of the American Medical Association* 284 (13): 1689–95.
- Melnick, G., G. De Leon, M. L. Hiller, and K. Knight. 2000. "Therapeutic Communities: Diversity in Treatment Elements." *Substance Use and Misuse* 35: 1819–47.
- Mensch, B., and D. B. Kandel. 1992. "Drug Use as a Risk Factor for Premarital Teen Pregnancy and Abortion in a National Sample of Young White Women." *Demography* 29: 409–29.
- Newcomb, M. D. 1995. "Identifying High Risk-Youth: Prevalence and Patterns of Adolescent Drug Abuse." In *Adolescent Drug Abuse: Clinical Assessment and Therapeutic Interventions*, edited by E. Rahdert and D. Czechowicz, pp. 7–38. Rockville, MD: U.S. Department of Health and Human Services.
- Newcomb, M. D., and P. M. Bentler. 1987. "The Impact of Late Adolescent Substance Use on Young Adult Health Status and Utilization of Health Services: A Structural-Equation Model over Four Years." *Social Science and Medicine* 24: 71–82.
- Orlando, M., K. S. Chan, and A. R. Morrall. 2003. "Retention of Court-Referred Youths in Residential Treatment Programs: Client Characteristics and Treatment Process Effects." *American Journal of Drug and Alcohol Abuse*. 29 (2): 337–58.
- Pepler, D. J., W. M. Craig, J. Connolly, and K. Henderson. 2002. "Bullying, Sexual Harassment, Dating Violence, and Substance Use among Adolescents." In *The Violence and Addiction Equation: Theoretical and Clinical Issues in Substance Abuse and Relationship Violence*, edited by C. Wekerle and A. M. Wall, pp. 153–68. New York: Brunner-Routledge.
- Ross, S. M., P. J. Miller, R. Y. Emmerson, and E. H. Todt. 1989. "Self-Efficacy, Standards, and Abstinence Violation: A Comparison between Newly Sober and Long-Term Sober Alcoholics." *Journal of Substance Abuse* 1: 221–9.
- Rounds-Bryant, J. L., P. M. Flynn, and L. W. Craighead. 1997. "Relationship between Self-Efficacy Perceptions and In-Treatment Drug Use among Regular Cocaine Users." *American Journal of Drug and Alcohol Abuse* 23: 383–95.
- Schafer, J. L. 1997. *Analysis of Incomplete Multivariate Data*. London: Chapman & Hall.
- Sampl, S., and R. Kadden. 2001. *Motivational Enhancement Therapy and Cognitive Behavioral Therapy for Adolescent Cannabis Users: 5 Sessions, Cannabis Youth Treatment (CYT) Series*, Vol. 1. Rockville, MD: U.S. Department of Health and Human Services.

- Stevens, S. J., and A. R. Morral (Eds.) 2003. *Adolescent Substance Abuse Treatment in the United States: Exemplary Models from a National Evaluation Study*. New York: Haworth Press.
- Substance Abuse and Mental Health Services Administration. 2001. *The DASIS Report—Coerced Treatment among Youths: 1993 to 1998*. Washington, DC: U.S. Department of Health and Human Services.
- Webb, C., M. Scudder, Y. Kaminer, and R. Kadden. 2002. *The Motivational Enhancement Therapy and Cognitive Behavioral Therapy Supplement: 7 Sessions of Cognitive Behavioral Therapy for Adolescent Cannabis Users, Cannabis Youth Treatment (CYT) Series, Pub. No. 02-3659*, Vol. 2. Rockville, MD: U.S. Department of Health and Human Services.
- Williams, R. J., S. Y. Chang, and Addiction Centre Research Group. 2000. “A Comprehensive and Comparative Review of Adolescent Substance Abuse Treatment Outcome.” *Clinical Psychology: Science and Practice* 7: 138–66.
- Winters, K. C. 1999. “Treating Adolescents with Substance Use Disorders: An Overview of Practice Issues and Treatment Outcome.” *Substance Abuse* 20: 203–25.