

Outcomes and Costs of Day Hospital Treatment and Nonmedical Day Treatment for Chemical Dependency*

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ABSTRACT. Objective: The purpose of this study was to estimate the outcomes and costs of day hospital and nonmedical community-based day treatment for chemical dependency. **Method:** A community sample of 271 adults (179 men) dependent on alcohol and/or drugs was recruited and randomized to either a hospital-based (medical) day treatment program or to a community-based (nonmedical) day treatment program. The day hospital (DH) program lasted for 3 weeks. One community-based program (CP2) lasted for 4 weeks, and the other (CP1) lasted for 6 weeks but with shorter treatment days and more criminal justice clients. Because of our concerns regarding treatment fidelity, we replaced CP1 with CP2 as the randomization site for the nonmedical, community-based arm of the trial halfway through the study. **Results:** Abstinence rates were similar between DH and CP2 subjects, with 53% and 60% of each group, respectively, reporting no drinking for the 30 days preceding both fol-

low-up interviews. DH subjects were less likely than those in either of the nonmedical programs to report medical problems at both follow-ups. Average episode costs per client were significantly ($p < .01$) lower at CP1 (\$526) than at DH (\$1,274) or CP2 (\$1,163). A pattern of weaker effects was observed at the less costly problematic community program (CP1), including less abstinence than was reported at CP2 (only 40% of CP1 subjects were alcohol free at both follow-ups) and worse psychiatric, family/friend and employment outcomes than were reported at DH or CP2. **Conclusions:** Our results not only demonstrate the clinical diversity that exists between nonmedical, community-based day treatment programs but also show that nonmedical programs can compete with DH treatment in cost as well as in most outcomes. (*J. Stud. Alcohol* 65: 371-382, 2004)

ALCOHOLISM AND DRUG ADDICTION are long-standing public health problems that cost society about \$9 billion annually in chemical dependency treatment alone and triple that amount if costs for treating medical consequences are considered (Harwood et al., 1998). As with the health care system at large, cost containment is a priority in addiction treatment. Payers increasingly scrutinize inpatient services, lengths of stay and costs associated with staff and setting (Annis, 1986; National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2000; Schmidt and Weisner, 1993; Weisner et al., 1999). The present study examined the outcomes and costs of alternative approaches to day hospital (DH) treatment, an intensive outpatient service that has developed in response to pressure to cut costs (McLellan et al., 1997). Outcomes included alcohol and drug abstinence, as well as medical and social consequences related to chemical dependence (McLellan et al., 1996).

To a greater extent than other outpatient approaches, DH treatment provides intensity sufficient to influence abstinence rates by requiring patients to spend most of the day in treatment (Finney and Monahan, 1996; Weisner et al.,

2000). DH treatment has a lower daily cost than inpatient settings but retains the benefits of medical model treatment (Institute of Medicine, 1990), such as the presence of on-site skilled medical and psychiatric staff (McLellan et al., 1997). Because the DH program shares only a portion of the high cost of maintaining medical facilities and staff, cost savings further accrue when DH patients attend those groups already in place for inpatients (Fink et al., 1985; Longabaugh et al., 1983).

Despite these potential advantages, it remains unclear whether DH treatment is actually less costly and/or more effective than nonmedical day treatment alternatives. Instead of comparing hospital-based and nonhospital-based day programs, most day treatment studies to date have compared the outcomes of day programs to those of inpatient programs (Alterman et al., 1994; Fink et al., 1985; Gudyish et al., 1999; Longabaugh et al., 1983; McKay et al., 1995; McLachlan and Stein, 1982; Potamianos et al., 1986) or to less intensive outpatient programs (Coviello et al., 2001; McKay et al., 1995; Weisner et al., 2000).

This article reports on a randomized health services trial that estimated the outcomes and costs of medical model DH treatment and two nonmedical community-based day treatment programs. We use the term "day hospital (DH)" to distinguish hospital-based, medically oriented day treatment programs (with full-time medical personnel on staff) from other day treatment approaches (McLellan et al., 1997). Initially, the trial included only one nonmedical comparison program, but halfway through the trial serious con-

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cerns about treatment fidelity at that site (described more fully in the Method section) led us to stop using it. Another nearby nonmedical day treatment program was substituted to represent the community-based arm for the second half of the study period. Although the change of study sites halfway through the trial is a deviation from the standards usually followed in conducting randomized trials, it accurately reflects the challenging conditions health services researchers must sometimes face when implementing randomized field studies. It also emphasizes the importance of monitoring treatment fidelity in health service trials in real world treatment agencies. The final study design has the advantage of enabling comparison either between medical and nonmedical programs or between two nonmedical programs.

The medical and nonmedical study arms both were 12-step based. The inpatient unit housing the DH program is representative of the Minnesota model of alcohol and drug rehabilitation that predominates in chemical dependency treatment in the United States (Institute of Medicine, 1990). Its multidisciplinary staff include medical personnel, licensed psychologists and nondegreed recovering counselors. The nonmedical comparison programs are extensions of the California social model (Borkman et al., 1998; Kaskutas et al., 1999) that exemplifies the sociocultural perspective in addressing the social problems of clients (e.g., problems involving family/friends, legal issues or employment issues) without providing medical care (Institute of Medicine, 1990).

Four sets of hypotheses were tested in relation to 6- and 12-month outcomes and associated treatment costs. First, taking into consideration the presence of medical and psychiatric staff at the DH program, we hypothesized better medical and psychiatric outcomes for those subjects randomized to DH treatment. Second, given the nonmedical programs' sociocultural roots, we hypothesized better social outcomes (including family, legal and employment) for subjects randomized to the nonmedical programs. Third, because no literature exists that contrasts abstinence between medical and nonmedical programs, we hypothesized no significant differences in rates of alcohol and drug abstinence in the subject groups. Fourth, given the type of personnel and other resources employed in DH programs, we hypothesized that the DH treatment program would have significantly higher episode costs than either of the nonmedical day treatment programs. In addition to these core hypotheses, we also examined specific differences between the two nonmedical programs.

Method

Sample

A community sample of 271 individuals (179 men) dependent on alcohol and/or drugs was recruited between May

of 1998 and December of 2000 from northern California Bay Area communities. To increase study generalizability, exclusion criteria were kept to a minimum. Eligibility depended upon age (18 years or older), not being homeless, not having been in treatment (beyond detoxification) in the last 30 days and having no (self-reported) psychoses. All screening and interviewing was conducted by research staff blinded to the randomized program assignment. Extensive outreach and advertising were used to reach socioeconomically diverse individuals in need of treatment. A third of the participants (34%, $n = 93$) responded to a notice on the local cable television's community service network. Others (41%, $n = 111$) were referred from local treatment programs. The remaining 67 subjects (25%) learned about the study from newspaper advertisements and posters placed throughout the community.

Free treatment and transportation were provided for study participants. Computerized urn randomization (Stout et al., 1994) balanced the study arm assignments on gender and ethnicity. The subjects represented a small minority of treatment clients at each of the study sites (ranging from 1 to 4 subjects on any given day, depending on the urn randomization and how long the study subjects remained in treatment). Subjects received \$85 for participating in the interviews (in-person baseline and two telephone follow-ups). The study involved no urine testing or collateral interviewing. Follow-up rates were 95% at 6 months ($n = 257$), 88% at 12 months ($n = 237$) and 87% for both follow-ups ($n = 235$). In accordance with procedures that had proved successful in previous process evaluations that compared medical and nonmedical programs (Kaskutas, 1998; Kaskutas and Borkman, 1996), client-level data in our study were supplemented by ethnographic observations designed to monitor treatment fidelity.

Study sites

Each study site offered group-oriented day treatment in a mixed-gender setting, and all schedules included daily check-in, educational groups about addiction, 12-step-oriented groups, relapse prevention and group therapy related to psychological issues. The hospital program also included several medically oriented groups led by nurses and physicians. One of the community programs offered an employment/job-readiness group. All held sober recreational events. The three study sites are described in detail below.

Day hospital (DH) program. The hospital site (135 subjects) offered detoxification, inpatient, DH and evening outpatient chemical dependency treatment. The combined inpatient/day program consisted of four 1-hour groups per day (plus lunch and several breaks) and ran from 9:30 AM to 4:15 PM, Monday through Friday, for 3 weeks (for a total planned treatment dose of 63 hours). Day patients were assessed by the intake coordinator (who also screened for

psychiatric problems), and patients' charts were under the review of the staff physician. This hospital-based program represented the medical model, DH arm of the study throughout the recruitment period (May 1998-December 2000).

This was the only study site that was hospital-based or had medical staff involved in the program. Average daily census amounted to 15 patients (approximately 11 inpatients and 4 DH patients). Inpatients and DH patients attended groups together. Treatment staff included 24-hour nursing coverage, a consulting neuropsychologist, a consulting psychiatrist, an intake coordinator, two counselors in recovery (one certified chemical dependency counselor and one M.A.), two others not in recovery (both M.A.s), a program director and a medical director (an M.D.).

Some groups at the hospital featured a round-robin format with all patients speaking in turn. Others involved one or two patients presenting written assignments they had completed (about past substance use, their family system, etc.). Counselors usually framed the topics, interpreted patients' contributions and solicited group feedback. The doctor- and nurse-led groups addressed the physiological and psychological sequella of chemical dependency. Staff sometimes presented lectures in a didactic classroom style. Educational films were shown, often several times a week, and were sometimes followed by counselor-led discussion.

Community Program 1 (CP1). The first community-based day treatment program (60 subjects) was part of a recovery center that also offered outpatient and family services. This 6-week day program was held on the recovery center property in a converted garage behind a main building where clients were served lunch and took breaks. The program met from 10:00 AM to 4:30 PM, Monday through Thursday, with four 60- to 90-minute daily groups that were substituted on Friday with a 12-step meeting in the community followed by a field trip (total planned treatment dose equaled 120 hours). This site represented the nonmedical comparison program for the first half of the study (May 1998-May 1999).

Consistent with its social model roots, CP1 employed a day staff consisting of two recovering counselors (one certified by the state of California) and two supplemental recovering staff members who occasionally led groups. They functioned, however, as educators or instructors rather than as social model staff focused on role modeling and client-guided recovery (Borkman, 1990). Average daily census amounted to 16 clients, most of whom (other than study subjects) had been referred to treatment as a condition of parole for substance abuse-related offenses.

CP1 was conducted didactically and relied heavily on lengthy written exercises (sometimes completed during group sessions), with clients often taking turns to read each question and answer aloud. Lectures and educational films were common. During their monthly observations, ethnog-

raphers noted a gradual decrease in the amount of discussion encouraged in these classroom-like sessions, a circumstance that suggested CP1 had been incorrectly characterized as a social model program (the hallmark of social model treatment fidelity is a nondidactic approach; Kaskutas et al., 1998). Moreover, groups routinely started late, clients had to wait while copies of handouts were made, staff often did not know the clients' names, and the focus on rote exercises discouraged client engagement and made treatment sessions tedious. This lapse in program fidelity signaled obvious quality problems that could not ethically be ignored (because we were randomizing people to attend that program). A second community program replaced CP1 in June of 1999.

Community Program 2 (CP2). This alternative 4-week community-based program (76 subjects) served as the randomization site for the nonmedical study arm during the last half of the recruitment period (June 1999-December 2000). CP2 offered residential and day treatment, with day and residential clients attending the same groups. The program was situated in a three-story house adjacent to its parent organization's long-term residential therapeutic community (De Leon, 2000). Average daily census at CP2 amounted to 30 clients—22 residential and 8 day treatment—about 20% of whom were criminal justice referrals. Clients attended four groups per day in addition to half-hour community check-in groups at the beginning and end of each day. The program ran from 9:00 AM to 5:00 PM, Monday through Friday. The length of stay was initially 4 weeks for study subjects but was shortened to 3 weeks during the last 6 months as a consequence of budgetary and staffing constraints (average planned treatment dose therefore ranged from 99 to 132 hours).

This day treatment program was staffed by two Ph.D. psychologists, two M.A.-level therapists, two addiction counselors certified by the state of California and three additional nondegree counselors. One psychologist, one therapist and all five counselors were in recovery.

The therapeutic process generally incorporated strong counselor leadership balanced with persistent solicitation of feedback from clients. Some groups were round-robin, some were open-ended discussions (structured around a particular subject, such as self-esteem), and others involved the presentation of written 12-step assignments or treatment plans by specific clients. In the latter case, feedback was routinely solicited from peers. Educational films were shown occasionally and almost always incorporated discussion.

Measures

Current (12-month) diagnoses for alcohol and/or drug dependence were determined at baseline using the Diagnostic Interview Schedule for Psychoactive Substance

Dependence, short form (Quick-DIS) (Bucholz et al., 1996). An abbreviated form of the Addiction Severity Index (ASI) was used to assess past 30-day problem severity at baseline, at 6-month and at 12-month interviews in five domains: medical, psychiatric, family/friend, legal and employment. The ASI is a valid and reliable instrument that yields a continuous composite score (range 0-1) for each problem area (McLellan et al., 1992). Composite ASI scores were dichotomized, enabling them to indicate either the absence (0 ASI score) or the presence of reported problems (ASI score greater than 0) in all domains except employment. To study whether exclusion of the subjective ASI questions (e.g., being bothered by a problem and perceived a need for treatment in a problem area) changed these results, the composite scores (and dichotomized versions) were recalculated without those items and the results were replicated. Since no subject reported an absence of employment problems, we decided to analyze employment status (full- or part-time vs no employment).

Questions from ASI sections on alcohol and drug use were used to create dichotomous indicators of alcohol abstinence, drug abstinence and combined alcohol and drug abstinence for the 30 days prior to each follow-up interview.

Length of stay data were collected from program records. Treatment resources and associated costs were analyzed using the Drug Abuse Treatment Cost Analysis Program (DATCAP; www.DATCAP.com) (French, 2001a,c; French et al., 1997; Roebuck et al., 2003; Salomé and French, 2001), a valid and reliable instrument that has been utilized in numerous treatment evaluation studies (French et al., 2000, 2002a,b,c). In addition to reporting annual accounting and opportunity (economic) costs for a particular program, the instrument and analysis program also calculates the average weekly cost per client and the cost per average episode.

Analysis

Tests of proportion were used to study differences between programs in rates of 30-day abstinence at both 6 and 12 months (Figure 1). Being abstinent at both follow-ups was also analyzed via three logistic regression models (Table 2). These models generated the odds of abstinence for alcohol, drugs and both alcohol and drugs and compared results between DH and, individually, CP1 and CP2 while controlling for length of stay and (Model 1) baseline alcohol severity, (Model 2) baseline drug severity and (Model 3) baseline alcohol and drug severity. Separate models were run to determine the contrasting odds of CP2 and CP1 (reported in Table 2 in italic type).

A final set of logistic regression models examined the role of study site as a predictor of no problems reported (i.e., a score of 0 on ASI measures at both follow-ups) with regard to medical issues, psychiatric issues, family/friend

issues and legal issues. Note that these analyses represent a most stringent test of program effectiveness because subjects reporting even very minor problems at either follow-up were considered program failures in these equations. The last model predicted being employed full- or part-time (versus not employed) at both follow-ups. All of the logistic regression models controlled for length of stay and respective baseline ASI scores (Table 2).

The next set of analyses considered reductions in problem severity over time, thereby allowing the observation of program effects even when subjects reported problems in a given area. Repeated measures analysis of covariance (ANCOVA) was used to determine significant differences between programs over time in the severity of medical, psychiatric, family/friend, legal and employment problems (based on the continuous ASI composite scores at baseline, 6 months and 12 months) while controlling for length of stay. These specifications considered the program effect as well as the program-by-time interaction. Wilks' lambda multivariate statistics (Shapiro et al., 1968), reported here, provided the best representation of our ANCOVA results (Stevens, 1992). In the presence of violation of sphericity, results were replicated using Greenhouse-Geisser statistics (Maxwell and Delaney, 1990). We also report (see the figures) the within-program significance levels for change between time points for each domain.

Average weekly cost was calculated for each program using the DATCAP. This information was then combined with length of stay data for each client to calculate client-specific costs of treatment. Nonparametric tests (Wilcoxon-Mann-Whitney) were used to determine whether mean differences in client costs were statistically significant between programs.

Because this is an intent-to-treat study, all subjects were included in the analyses, regardless of length of stay. Version 10 of the SPSS was used to perform the outcome analysis (SPSS Inc., 1999). As the tests of our hypotheses required two pair-wise comparisons (DH to CP1 and DH to CP2), Bonferroni adjustment was applied in judging statistical significance. Thus, $p = .025$ ($p = .05/2$) is our significance threshold for hypothesis testing. All results were replicated without controlling for length of stay or baseline problem severity. Program effects were similar. We report here on the analyses in which length of stay and baseline severity were controlled for as this is a conservative test of program effect and more appropriate for a health services trial where planned length of stay varied across sites.

Results

Table 1 shows the sample characteristics overall and by site for subjects ($N = 271$) recruited and randomized to treatment. There were no statistically significant differences between sites in demographics, substance abuse diagnoses

or baseline problem severity. Subjects recruited in the first wave of recruitment (while CP1 was the nonmedical randomization site) were significantly different from those in the second wave (when randomizing to CP2) in only one of the 15 variables in Table 1 (ASI employment severity: 0.608 vs 0.554, respectively, $p = .02$). Subjects who did not complete either follow-up ($n = 36$) did not differ from those re-interviewed at both follow-ups.

The final analysis sample was heterogeneous in many respects. About a third of the sample participants were women, about half were nonwhite (2% Asian, 35% black, 9% Hispanic, 2% Native American) and a quarter were employed. Both low and high income groups were represented, with a third of the sample reporting an income less than \$10,000 in the past year and 20% reporting \$50,000 or more. Of the sample, 16% had not completed high school, and 39% were married or living in a marriage-like situa-

tion. One third were dependent on both alcohol and drugs, 28% were dependent only on alcohol, and 39% were dependent only on drugs. Compared with DH subjects, significantly more subjects randomized to CP1 were dependent on both alcohol and drugs (45% vs 29%, $p = .04$). Analyses studying total abstinence controlled for baseline alcohol and drug severity.

Length of stay

Although CP1 had a 6-week planned length of stay versus 3 weeks at the DH program and 3 to 4 weeks at CP2, there were no significant differences in mean (SD) length of stay for study clients: 11.1 (6.7) days at the DH program, 12.0 (13.0) days at CP1 and 13.6 (10.3) days at CP2. Similar proportions completed a common minimal stay of 3 weeks (42% at CP1 and 45% at CP2 and DH); only 25%

TABLE 1. Baseline characteristics of study subjects by program ($N = 271$)

Characteristics	DH	CP1	CP2	Overall	<i>p</i> value
<i>N</i>	135	60	76	271	
Gender (%)					.686
Women	31	37	36	34	
Men	69	63	64	66	
Ethnicity (%)					.653
White	50	57	52	53	
Nonwhite	50	43	48	47	
Age, mean years (SD)	42 (9)	41 (11)	41 (10)	41 (10)	.669
Employment (%)					.856
Full/part-time	24	23	28	25	
Looking	24	25	25	25	
Not working	16	23	16	17	
Other	36	28	32	33	
Income (%)					.728
<\$10,000	30	37	29	31	
\$10,000 to \$24,999	25	21	21	23	
\$25,000 to \$34,999	13	13	9	12	
\$35,000 to \$49,999	13	13	16	14	
≥\$50,000	18	16	25	20	
Education (%)					.906
Less than high school	14	17	17	16	
High school/GED	36	40	34	37	
Some college	50	43	49	48	
Marital status (%)					.720
Married/living as married	42	42	33	39	
Separated/divorced/widow	30	27	34	31	
Never married	28	32	33	30	
DSM-IV dependence type (%)					.241
Alcohol only	30	25	28	28	
Drugs only	41	30	42	39	
Alcohol and drugs	29*	45*	30	33	
ASI, mean (SD)					
Alcohol	.382 (.329)	.366 (.302)	.415 (.346)	.388 (.327)	.667
Drugs	.153 (.128)	.139 (.117)	.139 (.119)	.146 (.123)	.647
Medical	.258 (.363)	.254 (.343)	.267 (.365)	.260 (.358)	.976
Psychiatric	.292 (.223)	.318 (.237)	.307 (.207)	.302 (.221)	.734
Family/friend	.309 (.273)	.334 (.272)	.328 (.291)	.320 (.277)	.797
Legal	.105 (.170)	.126 (.187)	.125 (.181)	.115 (.176)	.629
Employment	.616 (.287)	.656 (.308)	.554 (.296)	.608 (.295)	.120

Notes: DH = day hospital program; CP = community program.

* $p = .04$.

of the subjects randomized to CP1 completed its prescribed 6-week stay.

Abstinence outcomes

As hypothesized, abstinence rates at the DH program did not differ significantly from those at the nonmedical programs, regardless of time point (i.e., at 6 months or at both 6- and 12-month follow-ups) or measure (i.e., alcohol, drugs or both; Figure 1). Differences in rates of alcohol abstinence between the nonmedical programs, however, suggested a trend ($p < .10$) favoring CP2 at 6 months, which approached statistical significance ($p = .03$) at that point; 53% of DH subjects, 40% of CP1 subjects and 60% of CP2 subjects reported no drinking for the 30 days prior to their 6-month or their 12-month interview.

These bivariate results were re-examined using logistic regression that compared odds of abstinence (at both follow-ups) between the medical and the nonmedical programs, while controlling for length of stay (in weeks) and baseline ASI alcohol and/or drug severity (Table 2). Like the bivariate results, no differences in odds were found between non-medical and medical treatment, but subjects at CP2 were more likely than those at CP1 to be abstinent from alcohol at both follow-ups (odds ratio [OR] = 2.39, $p = .025$).

Medical and psychiatric outcomes

Our hypotheses that DH subjects would have better medical and psychiatric outcomes at follow-up were partially supported. Looking at improvement in medical and psychiatric problem severity scores over time, we found no sig-

nificant differences between the medical and nonmedical programs (results not shown). However, considering instead whether respondents reported any medical problems at either follow-up (i.e., scoring greater than 0 on the ASI medical composite score), we found that DH subjects did significantly better than CP2 subjects (OR = 2.55, $p = .007$) and marginally better than CP1 subjects (OR = 2.12, $p = .03$; Table 2). DH subjects (and CP2 subjects) were also more than three times as likely as CP1 subjects to report no psychiatric problems at both follow-ups.

Social outcomes

We found no evidence to support our hypotheses that family/friend, legal and employment outcomes would favor the community-based programs over the DH program. The main differences in program effects were between CP1 and the two other programs, with CP1 subjects faring more poorly.

Problems with family/friends were more severe over time for CP1 subjects than for DH subjects ($p = .021$; Figure 2a). This program effect evidently interacted with time ($p = .002$), as hospital subjects improved significantly between 6 and 12 months (those at CP1, however, did not). Furthermore, subjects at DH and CP2 were more likely than were CP1 subjects not to report problems with family/friends at either follow-up (OR = 3.74, $p = .002$ and OR = 2.96, $p = .020$, respectively; Table 2).

The odds of being employed (versus not employed) at both follow-ups did not vary by program (Table 2), but over time subjects at CP1 showed less improvement in this area than subjects at either DH ($p = .020$) or CP2 ($p =$



FIGURE 1. Rates of 30-day abstinence at 6 months, and at both 6 and 12 months, by program ($n = 235$ interviewed at both follow-up points)

TABLE 2. Logistic regression models predicting abstinence; no problems on ASI medical, psychiatric, family/friend and legal domains; and being employed at both 6- and 12-month follow-up interviews ($N = 235$)

	OR	95% CI	<i>p</i> value
Abstinent from alcohol (52%)			
DH vs CP1	1.75	(0.91-3.37)	.097
DH vs CP2	0.73	(0.38-1.39)	.334
CP2 vs CP1	2.39	(1.11-5.15)	.025
Length of stay (wks)	1.15	(0.99-1.33)	.062
Baseline alcohol severity	0.81	(0.36-1.80)	.598
Abstinent from drugs (62%)			
DH vs CP1	1.35	(0.68-2.68)	.385
DH vs CP2	1.50	(0.77-2.91)	.231
CP2 vs CP1	0.90	(0.41-1.97)	.797
Length of stay (wks)	1.22	(1.04-1.42)	.013
Baseline drug severity	0.05	(0.01-0.46)	.008
Abstinent from alcohol and drugs (42%)			
DH vs CP1	1.69	(0.84-3.39)	.138
DH vs CP2	0.88	(0.47-1.67)	.700
CP2 vs CP1	1.92	(0.87-4.23)	.107
Length of stay (wks)	1.25	(1.07-1.46)	.005
Baseline alcohol severity	1.28	(0.55-3.01)	.568
Baseline drug severity	1.08	(0.11-10.57)	.945
No medical problems (48%)			
DH vs CP1	2.12	(1.07-4.17)	.030
DH vs CP2	2.55	(1.30-5.01)	.007
CP2 vs CP1	0.83	(0.38-1.83)	.644
Length of stay (wks)	0.99	(0.85-1.16)	.946
Baseline medical severity	0.17	(0.07-0.38)	.000
No psychiatric problems (36%)			
DH vs CP1	3.07	(1.36-6.91)	.007
DH vs CP2	0.94	(0.47-1.90)	.867
CP2 vs CP1	3.26	(1.29-8.18)	.012
Length of stay (wks)	1.02	(0.86-1.22)	.795
Baseline psychiatric severity	0.02	(.004-.083)	.000
No family/friend problems (34%)			
DH vs CP1	3.74	(1.65-8.46)	.002
DH vs CP2	1.26	(0.65-2.48)	.495
CP2 vs CP1	2.96	(1.18-7.39)	.020
Length of stay (wks)	1.06	(0.89-1.26)	.514
Baseline family/social severity	0.23	(0.08-0.67)	.007
No legal problems (65%)			
DH vs CP1	1.46	(0.70-3.04)	.316
DH vs CP2	1.12	(0.54-2.32)	.760
CP2 vs CP1	1.30	(0.56-3.03)	.543
Length of stay (wks)	0.995	(0.84-1.18)	.954
Baseline legal severity	0.004	(0.001-0.027)	.000
Employed (25%)			
DH vs CP1	1.08	(0.48-2.46)	.851
DH vs CP2	0.92	(0.45-2.02)	.890
CP2 vs CP1	0.97	(0.39-2.47)	.957
Length of stay (wks)	1.004	(0.84-1.21)	.965
Baseline employment severity	22.28	(6.53-76.10)	.000

Note: Statistically significant differences are shown in boldface type.

.002) (Figure 2b). The latter result was somewhat driven by the presence of higher ($p = .012$) baseline employment severity at CP1 than at CP2 (Table 1). A program-by-time effect was found between DH and CP2 ($p = .02$). DH subjects' employment severity improved over time ($p = .039$), whereas for those at CP2 it improved between baseline and 6 months ($p = .051$), but worsened between 6 and 12 months ($p = .027$).

Treatment cost

Considering all clients (i.e., both completers and noncompleters), we found the cost of an average episode (per subject) to be significantly lower at CP1 (\$526) than at DH (\$1,274; $p < .001$) or CP2 (\$1,163; $p = .002$). The \$111 cost difference between DH and CP2 was not statistically significant ($p = .76$). It is interesting to observe that these cost estimates are qualitatively consistent with the outcome findings reported earlier, in that CP1 had generally worse outcomes compared with day treatment and CP2, whereas day treatment and CP2 had similar outcomes. Average costs for subjects who completed the programs amounted to \$1,788 for the 3-week DH program (\$596/week), \$2,196 for the 4-week community program (CP2) (\$549/week) and \$1,392 for the 6-week community program (CP1) (\$232/week).

Discussion

Many studies of randomized controlled trials in the chemical dependency field focus on a particular treatment technique (such as motivational interviewing or cognitive behavioral therapy (Project MATCH Research Group, 1993) instead of studying those treatment systems currently in place in communities. The present health services study is unique in its randomization of a diverse community sample to two different types of day treatment programs, both representative of approaches widely encountered in the United States. Although treatment fidelity is difficult to control in community-based trials, building routine observations into the study design, as we did, allows researchers to monitor fidelity and ensure the generalizability of study results to real world settings. Our study's applicability to current practice renders community-based trials particularly relevant to practitioners and policymakers.

The hypotheses outlined at the beginning of this article were partially supported by our findings (see Table 3). One of the two community programs, CP1, in which concerns arose about program fidelity, was less expensive than the DH program. Abstinence rates at the DH program were similar to those at the community programs. Medical outcomes at the DH program were better than those at either community program, but psychiatric outcomes at the DH program were superior only to those at CP1. Neither community program yielded better social outcomes than the DH program. A pattern of weaker effects was also observed at CP1, the less costly community-based program, including less abstinence than at CP2 and worse psychiatric, family/friend and employment outcomes than either DH or CP2.

CP1 differed from CP2 in several ways: setting (renovated garage versus converted house), staffing (few counselors, none of whom had degrees, versus nine staff, four of whom had degrees), group format (primarily didactic

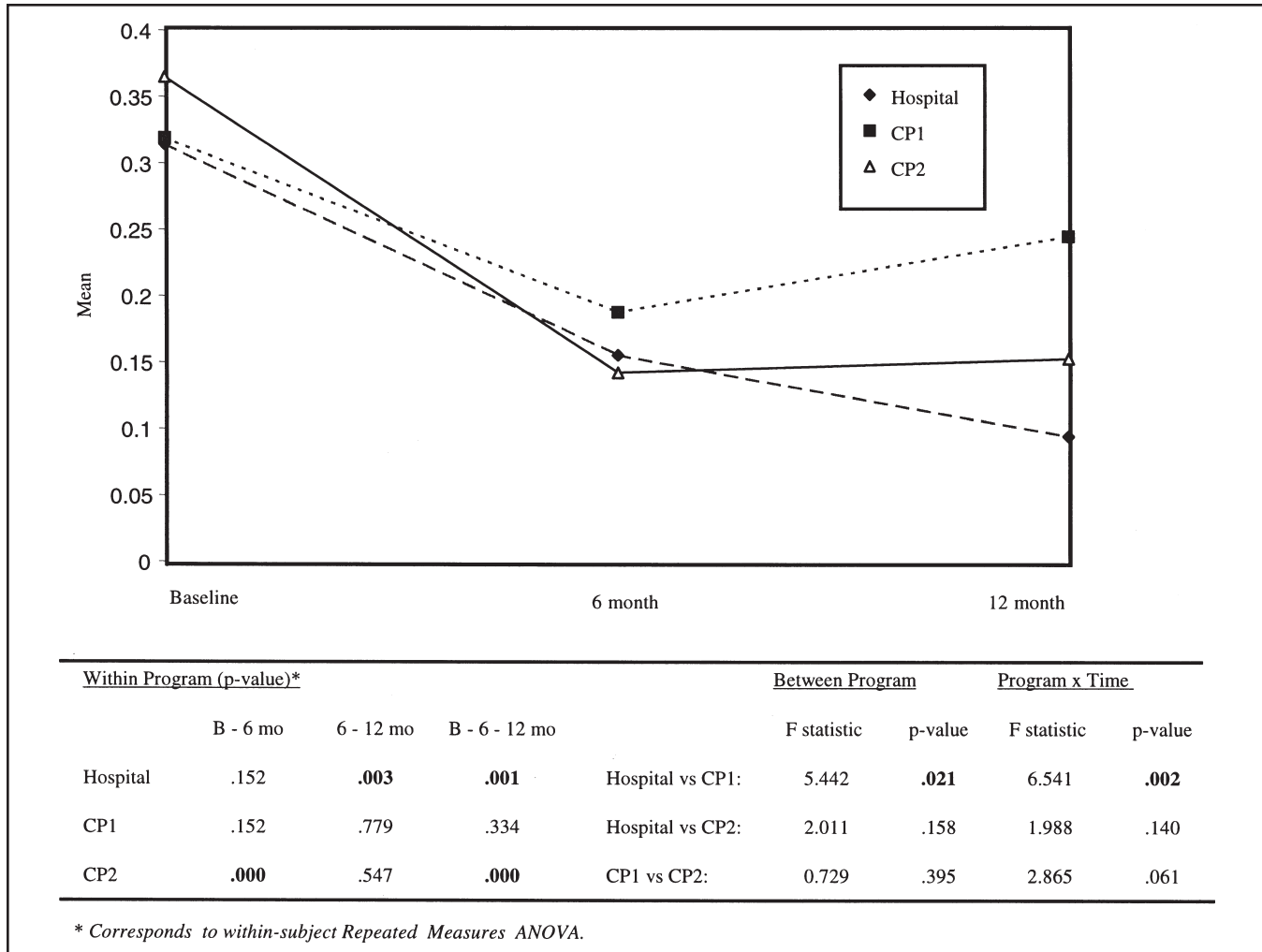


FIGURE 2a. Mean ASI family/social composite scores at baseline, and at 6 and 12 months, by program

education groups versus discussions) and clientele (predominantly criminal justice referrals versus 20% criminal justice referrals). It is difficult to isolate which, if any, of these differences might be the primary cause of divergent program outcomes. The accumulation and uncertain influence of criminal justice clients is especially troubling. Criminal justice referrals produce large numbers of clients who are potentially less motivated to enter treatment and may therefore have an adverse effect on overall program characteristics. Lower quality programs may be the inevitable result of emerging policies that seek alternatives to incarceration for alcohol- and drug-related crimes. In 1996, over a third of the clients in the U.S. chemical dependency treatment system had been referred by the criminal justice system (Lamb et al., 1998). Many of the criminal justice clients treated at CP1 were typical of the type of offender who is now being referred to treatment under California's Proposition 36 (implemented in 2001) as an alternative to incarceration (Public Law, 2000). Treatment programs are likely to respond to this policy shift by reserving more treatment

slots for criminal offenders and entering into contractual agreements with the criminal justice system. In addition to California, Arizona (1996), Hawaii (2002) and the District of Columbia (2002) have passed legislation to divert non-violent drug offenders from prison to chemical dependency treatment (Piper et al., 2003). We are concerned that treatment conditions necessary to address the particular needs of criminal justice-referred clients cannot be met by many community-based programs. In the case of CP1, treatment conditions may have worked against the dynamic of client participation expected at group treatment programs and may even have eroded staff morale, which in turn affected service delivery. Criminal justice clients may require an alternative treatment environment.

Program fidelity and outcomes research

One of the most important findings of this study is that treatment fidelity and quality vary tremendously across programs. This variance is seldom measured in research or in

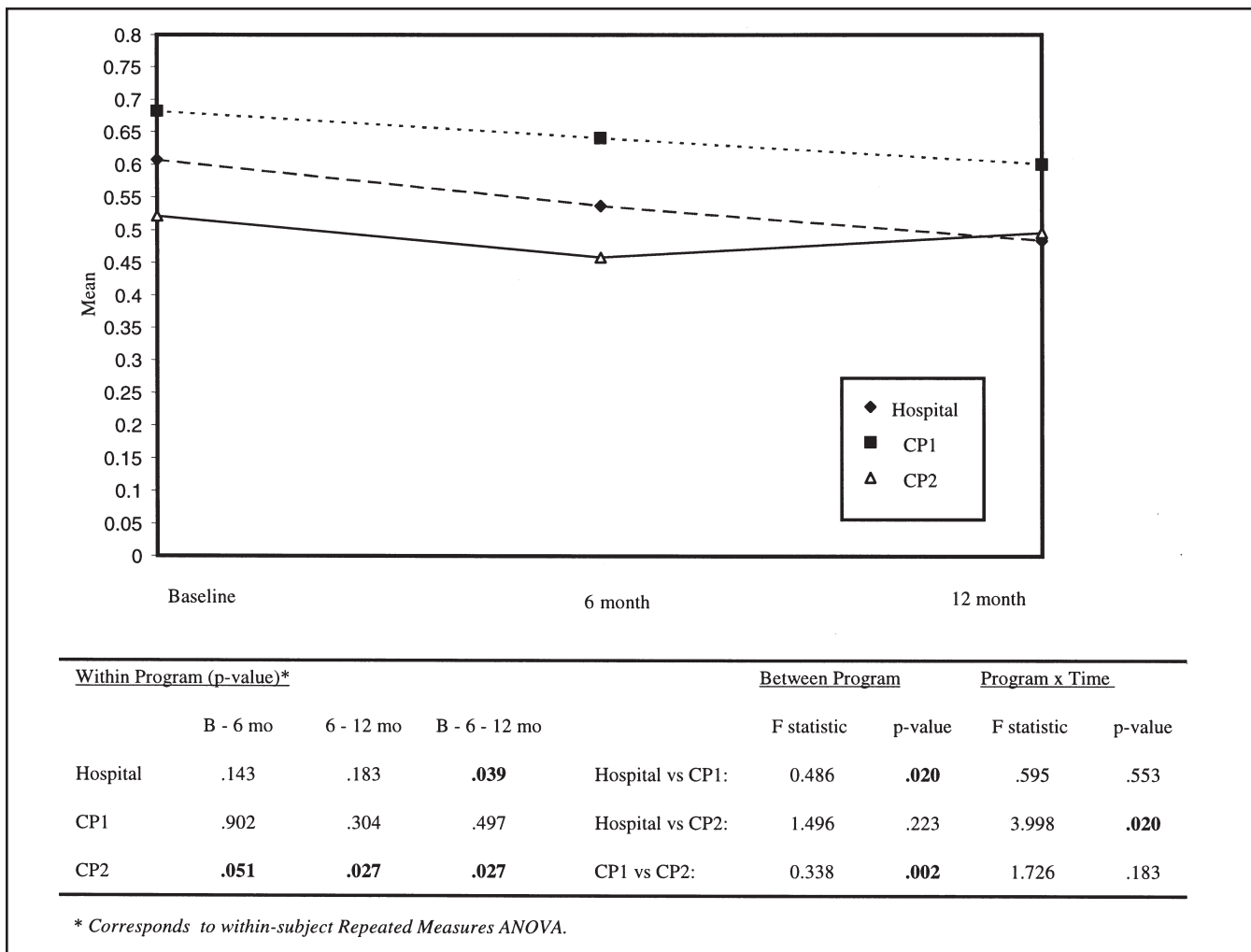


FIGURE 2b. Mean ASI employment composite scores at baseline, and at 6 and 12 months, by program

practice, and it has important implications for clinical and services research. The decision to replace CP1 was made in consultation with the funding agency and leading alcohol and drug researchers who conduct clinical trials. The consensus was that it was not in the spirit of the study's design to continue studying CP1. Had we not carefully observed treatment delivery and fidelity, however, the study's likely conclusion would have been that DH is more effective than community-based treatment. Had CP2 been the sole community site for the entire study, the conclusion would have been that DH treatment is no more effective than community-based day treatment.

A critical question is posed by these findings: What are the implications of measuring treatment fidelity as part of treatment research? Our dilemma arose because we did so. We believe that treatment fidelity is an important issue that affects a great deal of clinical and health services research and that insufficient attention is paid to it in health services trials as well as in treatment in general. It is increasingly appropriate to ensure that providers are delivering services

as expected, especially in light of the new emphasis on evidence-based medicine (National Institutes of Health, 2003).

Having the benefit of studying both programs and knowing that community-based treatment can be as effective as DH treatment for most outcomes, can we conclude the field would be better off having an article reporting that hospital-based treatment clearly was better than community-based treatment? We think not, which is why we have chosen to report the data from both CP1 and CP2.

Other study limitations

Treatments provided in groups, a common format in community programs such as the ones investigated here, raise issues of the interdependence of data for patients in the same groups and, to a lesser extent, for patients treated in the same programs. The disaggregated analyses reported here are parallel to the common technique of examination of site effects in multisite clinical trials, and our findings of

TABLE 3. Summary of findings

Outcome domain	Hypothesized effects	Significant findings			
		Figure 1: Higher proportion abstinent	Table 3: Higher odds of no problem	Figures 2a, 2b: Lower ASI problem severity	DATCAP: Lower treatment costs
Alcohol	No differences	CP2 > CP1 ^b	CP2 > CP1 ^a		
Drug	No differences				
Medical	DH better		DH > CP1 ^b DH > CP2 ^a		
Psychiatric	DH better		DH > CP1 ^a CP2 > CP1 ^a		
Family/Friend	CP1, CP2 better		DH > CP1 ^a CP2 > CP1 ^a	DH < CP1 ^a	
Legal	CP1, CP2 better				
Employment	CP1, CP2 better			DH < CP1 ^a CP2 < CP1 ^c	
Cost	DH > CP1, CP2				CP1 < DH CP1 < CP2

^a*p* = .025; ^b*p* = .03; ^csomewhat driven by baseline differences.

relatively poor outcomes at CP1 (where a high proportion of clients were criminal justice mandated) indeed highlight the interdependence issue. Despite these challenges, we feel it is extremely important to study group settings because they are the dominant service delivery format. The National Institutes of Health agree, having issued a request for applications in December 2004 soliciting studies of group treatment (National Institute on Drug Abuse [NIDA] and NIAAA, 2003).

At face value, the issue comes to a philosophical debate about the value of imperfect real world studies versus tightly controlled studies. A large multisite experimental study would be needed to address the multiple dimensions inherent in group- and program-level interventions, which would bring still another set of challenges into consideration, such as different demographic characteristics of study subjects, different counties exerting dissimilar payer demands on their treatment providers and higher research budgets. No single health services study of group treatment will provide definitive conclusions. Knowledge, however, builds on the accumulation of such studies. As noted by the NIDA's recent Blue Ribbon Task Force on health services research, studies are needed that consider "program-level and group therapy outcomes, rather than the historical focus on just individual-level therapies" (NIDA, 2004, p. 33). The panel called for the development of new innovative analytic methods that can adjust for variation in components of usual care. Our study has begun this process in a small way by collecting data on what we observed during treatment. We caution that these methods must be reasonable to implement within a study design without unduly interrupting the treatment process itself.

Another limitation of this study is its reliance on subject self-reporting to assess alcohol and drug abstinence and other outcomes. However, other studies have found good

correspondence between self-reporting and biological or collateral measures (Babor et al., 2000), and similar studies in which self-report was validated have reported similar rates of abstinence (McLellan et al., 1993; Weisner et al., 2000). In our study, there is no apparent reason why clients randomized to a particular study site should have been differentially motivated to tell the truth about their substance use. Any bias should therefore be evenly distributed across the study programs. Other limitations are the inability in this study to definitely identify a central cause of the differences in results across study sites and the question of the representativeness of the costs and outcomes at the single DH program we studied. On the issue of representativeness, it may be noted that the average cost per week at our DH (\$596) is similar to the weekly cost at the DH cocaine rehabilitation program in Alterman's seminal study (Alterman et al., 1994) comparing outcomes and costs of inpatient versus DH programs (\$566 per week).

For several reasons, we did not conduct a cost-effectiveness analysis (CEA) of DH relative to nonmedical day treatment. First, a CEA is inherently an incremental analysis, used to compare usual care with an enhancement of usual care or with a control group (Drummond et al., 1997). In this study, however, the interventions were independent and distinct treatment alternatives, and we were not able to include a no-treatment control group. Second, a CEA requires the selection of one outcome as the primary measure (McCollister et al., 2003; Zarkin et al., 2001), such as quality-adjusted life-years (QALYs) gained through a medical intervention (Gold et al., 1996). QALYs are rarely measured in addiction studies (Barnett et al., 2001) because chemical dependency treatment results in such a wide variety of medical and social outcomes, a point well illustrated in this study. Even measures of abstinence are problematic with CEA because a threshold value has not yet been es-

tablished for such addiction outcomes as the cost per sober day (whereas with QALY gained, the established threshold is \$50,000). Without this information, it is not possible to definitely prove one addiction treatment program to be more cost effective than another (French, 2001b; Kenkel, 1997).

In summary, DH treatment was similar in cost and outcome to one of two community-based day treatment programs. This result suggests that a rigorous and credible community-based program can effectively compete with a more traditional medical model program. This conclusion, however, is challenged by the fact that the other community-based program was less costly than the DH hospital program and generally less effective. One implication of this finding is that, although poorly run community-based treatment can save resources and lower treatment costs, its inferior outcomes may lead to greater social costs in the future. Because the present study is the first research project to randomly assign substance abusers to DH and community-based treatment approaches, it will be beneficial to determine whether these findings are replicated by studies that employ relatively large numbers of programs of each type and that reflect different settings and clients.

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References

- ALTERMAN, A.I., O'BRIEN, C.P., McLELLAN, A.T., AUGUST, D.S., SNIDER, E.C., DROBA, M., CORNISH, J.W., HALL, C.P., RAPHAELSON, A.H. AND SCHRADE, F.X. Effectiveness and costs of inpatient versus day hospital cocaine rehabilitation. *J. Nerv. Ment. Dis.* **182**: 157-163, 1994.
- ANNIS, H.M. Is inpatient rehabilitation of the alcoholic cost effective? *Con position. Adv. Alcohol Subst. Abuse* **5**: 175-190, 1986.
- BABOR, T.F., STEINBERG, K., ANTON, R. AND DEL BOCA, F. Talk is cheap: Measuring drinking outcomes in clinical trials. *J. Stud. Alcohol* **61**: 55-63, 2000.
- BARNETT, P.G., ZARIC, G.S. AND BRANDEAU, M.L. The cost-effectiveness of buprenorphine maintenance therapy for opiate addiction in the United States. *Addiction* **96**: 1267-1278, 2001.
- BORKMAN, T. A comparison of social model and clinical model services. In: SHAW, S. AND BORKMAN, T. (Eds.) *Social Model Alcohol Recovery: An Environmental Approach*, Burbank, CA: Bridge Focus, 1990, pp. 45-52.
- BORKMAN, T.J., KASKUTAS, L.A., ROOM, J. AND BARROWS, D. An historical and developmental analysis of social model programs. *J. Subst. Abuse Treat.* **15**: 7-17, 1998.
- BUCHOLZ, K.K., MARION, S.L., SHAYKA, J.J. AND MARCUS, S.C. A short computer interview for obtaining psychiatric diagnoses. *Psychiat. Serv.* **47**: 293-297, 1996.
- COVIELLO, D.M., ALTERMAN, A.I., RUTHERFORD, M.J., CACCIOLA, J.S., MCKAY, J.R. AND ZANIS, D.A. The effectiveness of two intensities of psychosocial treatment for cocaine dependence. *Drug Alcohol Depend.* **61**: 145-154, 2001.
- DE LEON, G. *The Therapeutic Community: Theory, Model, and Method*, New York: Springer, 2000.
- DRUMMOND, M.F., O'BRIEN, B.J., STODDART, G.L. AND TORRANCE, G.W. (Eds.) *Methods for the Economic Evaluation of Health Care Programmes*, 2nd Edition, New York: Oxford Univ. Press, 1997.
- FINK, E.B., LONGGABAUGH, R., MCCRADY, B.M., STOUT, R.L., BEATTIE, M., RUGGIERI-AUTHELET, A. AND McNEIL, D. Effectiveness of alcoholism treatment in partial versus inpatient settings: Twenty-four month outcomes. *Addict. Behav.* **10**: 235-248, 1985.
- FINNEY, J.W. AND MONAHAN, S.C. The cost-effectiveness of treatment for alcoholism: A second approximation. *J. Stud. Alcohol* **57**: 220-243, 1996.
- FRENCH, M.T. *Drug Abuse Treatment Cost Analysis Program (DATCAP): Program Version, 7th Edition*, Coral Gables, FL: Department of Sociology, University of Miami (available at: www.datcap.com), 2001a.
- FRENCH, M.T. The role of health economics in substance abuse research: Recent advances and future opportunities. In: GALANTER, M. (Ed.) *Recent Developments in Alcoholism, Vol. 15: Services Research in the Era of Managed Care*, New York: Kluwer Academic/Plenum, 2001b, pp. 201-208.
- FRENCH, M.T. *Drug Abuse Treatment Cost Analysis Program (DATCAP): Program Version, User's Manual, 7th Edition*, Coral Gables, FL: Department of Sociology, University of Miami (available at: www.datcap.com), 2001c.
- FRENCH, M.T., DUNLAP, L.J., ZARKIN, G.A., MCGEARY, K.A. AND McLELLAN, A.T. A structured instrument for estimating the economic cost of drug abuse treatment: the Drug Abuse Treatment Cost Analysis Program (DATCAP). *J. Subst. Abuse Treat.* **14**: 445-455, 1997.
- FRENCH, M.T., MCCOLLISTER, K.E., SACKS, S., MCKENDRICK, K. AND DE LEON, G. Benefit-cost analysis of a modified therapeutic community for mentally ill chemical abusers. *Eval. Prog. Plan.* **25**: 137-148, 2002a.
- FRENCH, M.T., SALOMÉ, H.J. AND CARNEY, M. Using the DATCAP and ASI to estimate the costs and benefits of residential addiction treatment in the state of Washington. *Social Sci. Med.* **55**: 2267-2282, 2002b.
- FRENCH, M.T., SALOMÉ, H.J., KRUPSKI, A., MCKAY, J.R., DONOVAN, D.M., McLELLAN, A.T. AND DURELL, J. Benefit-cost analysis of residential and outpatient addiction treatment in the state of Washington. *Eval. Rev.* **24**: 609-634, 2000.
- FRENCH, M.T., SALOMÉ, H.J., SINDELAR, J.L. AND McLELLAN, A.T. Benefit-cost analysis of addiction treatment: Methodological guidelines and application using the DATCAP and ASI. *Hlth Serv. Res.* **37**: 433-455, 2002c.
- GOLD, M.R., SIEGEL, J.E., RUSSELL, L.B. AND WEINSTEIN, M.C. (Eds.) *Cost-Effectiveness in Health and Medicine*, New York: Oxford Univ. Press, 1996.
- GUYDISH, J., SORENSEN, J.L., CHAN, M., WERDEGAR, D., BOSTROM, A. AND ACAMPORA, A. A randomized trial comparing day and residential drug abuse treatment: 18-month outcomes. *J. Cons. Clin. Psychol.* **67**: 428-434, 1999.
- HARWOOD, H.J., FOUNTAIN, D. AND LIVERMORE, G. *The Economic Costs of Alcohol and Drug Abuse in the United States, 1992*, NIH Publication No. 98-4327, Washington: Government Printing Office, 1998.
- INSTITUTE OF MEDICINE. *Broadening the Base of Treatment for Alcohol Problems*, Washington, DC: National Academy Press, 1990.
- KASKUTAS, L.A. Methodology and characteristics of programs and clients in the social model process evaluation. *J. Subst. Abuse Treat.* **15**: 19-25, 1998.
- KASKUTAS, L.A. AND BORKMAN, T. *A Process Evaluation of Social Model and Clinical Model Substance Abuse Recovery Programs*, Rockville, MD: Center for Substance Abuse Treatment, 1996.
- KASKUTAS, L.A., KELLER, J.W. AND WITBRODT, J. Measuring social model in California: How much has changed? *Contemp. Drug Probl.* **26**: 607-631, 1999.
- KASKUTAS, L.A., MARSH, D. AND KOHN, A. Didactic and experiential education in substance abuse programs. *J. Subst. Abuse Treat.* **15**: 43-53, 1998.
- KENKEL, D. On valuing morbidity, cost-effectiveness analysis, and being rude. *J. Hlth Econ.* **16**: 749-757, 1997.

- LAMB, S., GREENLICK, M.R. AND McCARTY, D. Bridging the Gap between Practice and Research: Forging Partnerships with Community-Based Drug and Alcohol Treatment, Washington, DC: National Academy Press, 1998.
- LONGABAUGH, R., McCRADY, B., FINK, E., STOUT, R., McAULEY, T., DOYLE, C. AND McNEILL, D. Cost effectiveness of alcoholism treatment in partial vs inpatient settings: Six-month outcomes. *J. Stud. Alcohol* **44**: 1049-1071, 1983.
- McCOLLISTER, K.E., FRENCH, M.T., INCIARDI, J.A., BUTZIN, C.A., MARTIN, S.S. AND HOOPER, R.M. Post-release substance abuse treatment for criminal offenders: A cost-effectiveness analysis. *J. Quant. Criminol.* **19**: 389-407, 2003.
- McKAY, J.R., ALTERMAN, A.I., McLELLAN, A.T., SNIDER, E.C. AND O'BRIEN, C.P. The effect of random versus nonrandom assignment in a comparison of inpatient and day hospital rehabilitation for male alcoholics. *J. Cons. Clin. Psychol.* **63**: 70-78, 1995.
- McLACHLAN, J.F.C. AND STEIN, R.L. Evaluation of a day clinic for alcoholics. *J. Stud. Alcohol* **43**: 261-272, 1982.
- McLELLAN, A.T., ALTERMAN, A.I., CACCIOLA, J., METZGER, D. AND O'BRIEN, C.P. A new measure of substance abuse treatment: Initial studies of the treatment services review. *J. Nerv. Ment. Dis.* **180**: 101-110, 1992.
- McLELLAN, A.T., GRISSOM, G.R., BRILL, P., DURELL, J., METZGER, D.S. AND O'BRIEN, C.P. Private substance abuse treatments: Are some programs more effective than others? *J. Subst. Abuse Treat.* **10**: 243-254, 1993.
- McLELLAN, A.T., HAGAN, T.A., MEYERS, K., RANDALL, M. AND DURELL, J. "Intensive" outpatient substance abuse treatment: Comparisons with "traditional" outpatient treatment. *J. Addict. Dis.* **16**: 57-84, 1997.
- McLELLAN, A.T., WOODY, G.E., METZGER, D., McKAY, J., DURELL, J., ALTERMAN, A.I. AND O'BRIEN, C.P. Evaluating the effectiveness of addiction treatments: Reasonable expectations, appropriate comparisons. *Milbank Q.* **74**: 51-85, 1996.
- MAXWELL, S.E. AND DELANEY, H.D. Designing Experiments and Analyzing Data: A Model Comparison Perspective, Pacific Grove, CA: Brooks/Cole, 1990.
- NATIONAL INSTITUTE ON ALCOHOL ABUSE AND ALCOHOLISM. Tenth Special Report to the U.S. Congress on Alcohol and Health: Highlights from Current Research, NIH Publication No. 00-1583, Bethesda, MD: Department of Health and Human Services, 2000.
- NATIONAL INSTITUTE ON DRUG ABUSE. Blue Ribbon Task Force on NIDA Health Services Research: Final Report, Bethesda, MD: National Institute on Drug Abuse, 2004.
- NATIONAL INSTITUTE ON DRUG ABUSE AND NATIONAL INSTITUTE ON ALCOHOL ABUSE AND ALCOHOLISM. Group Therapy for Individuals in Drug Abuse or Alcohol Treatment, RFA-DA-04-008, Bethesda, MD: National Institutes of Health, 2003.
- NATIONAL INSTITUTES OF HEALTH. NIH Roadmap Initiatives (accessed at: <http://nihroadmap.nih.gov/initiatives.asp>, 1/30/04), Bethesda, MD: National Institutes of Health, 2003.
- PIPER, B., BRIGGS, M., HUFFMAN, K. AND LUBOT-CONK, R. State of the States. Drug Policy Reforms: 1996-2002, New York, Drug Policy Alliance (available at: www.drugpolicy.org), 2003.
- POTAMIANOS, G., NORTH, W.R., MEADE, T.W., TOWNSEND, J. AND PETERS, T.J. Randomised trial of community-based centre versus conventional hospital management in treatment of alcoholism. *Lancet* **2**: 797-799, 1986.
- PROJECT MATCH RESEARCH GROUP. Project MATCH: Rationale and methods for a multisite clinical trial matching patients to alcoholism treatment. *Alcsm Clin. Exp. Res.* **17**: 1130-1145, 1993.
- PUBLIC LAW. Substance Abuse and Crime Prevention Act of 2000 (SACPA, Proposition 36). Chapter 2.5, Division 4, Title 9, California Code of Regulations (CCR); Divisions 10.8 and 10.9, Health and Safety Code, Sacramento, CA: State of California, 2000.
- ROEBUCK, M.C., FRENCH, M.T. AND McLELLAN, A.T. DATStats: Results from 85 studies using the Drug Abuse Treatment Cost Analysis Programs (DATCAPs). *J. Subst. Abuse Treat.* **25**: 51-57, 2003.
- SALOMÉ, H.J. AND FRENCH, M.T. Using cost and financial instruments for economic evaluation of substance abuse treatment services. In: GALANTER, M. (Ed.) Recent Developments in Alcoholism, Vol. 15: Services Research in the Era of Managed Care, New York: Kluwer Academic/Plenum, 2001, pp. 253-269.
- SCHMIDT, L. AND WEISNER, C. Developments in alcoholism treatment. In: GALANTER, M. (Ed.) Recent Developments in Alcoholism, Vol. 11: Ten Years of Progress, New York: Plenum, 1993, pp. 369-396.
- SHAPIRO, S.S., WILK, M.B. AND CHEN, H.J. A comparative study of various tests for normality. *J. Amer. Stat. Assoc.* **63**: 1343-1372, 1968.
- SPSS, INC. SPSS for Windows, Release 10.0.5, Standard Version, Chicago, IL: SPSS, 1999.
- STEVENS, J. Applied Multivariate Statistics for the Social Sciences, 2nd Edition, Mahwah, NJ: Lawrence Erlbaum, 1992.
- STOUT, R.L., WIRTZ, P.W., CARBONARI, J.P. AND DEL BOCA, F.K. Ensuring balanced distribution of prognostic factors in treatment outcome research. *J. Stud. Alcohol, Supplement No. 12*, pp. 70-75, 1994.
- WEISNER, C., McCARTY, D. AND SCHMIDT, L. New directions in alcohol and drug treatment under managed care. *Amer. J. Manag. Care* **5**: SP57-SP69, 1999.
- WEISNER, C., MERTENS, J., PARTHASARATHY, S., MOORE, C., HUNKELER, E.M., HU, T. AND SELBY, J.V. The outcome and cost of alcohol and drug treatment in an HMO: Day hospital versus traditional outpatient regimens. *Hlth Serv. Res.* **35**: 791-812, 2000.
- ZARKIN, G.A., LINDROOTH, R.C., DEMIRALP, B. AND WECHSBERG, W. The cost and cost-effectiveness of an enhanced intervention for people with substance abuse problems at risk for HIV. *Hlth Serv. Res.* **36**: 335-355, 2001.