

Determining Best Organizational Practices among Community-Based Treatment Providers: A Two-Stage Data Envelopment Analysis

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Porto & Flynn: Organizational Practices among Community-Based Treatment Providers (CPDD, Puerto Rico, June 2000)

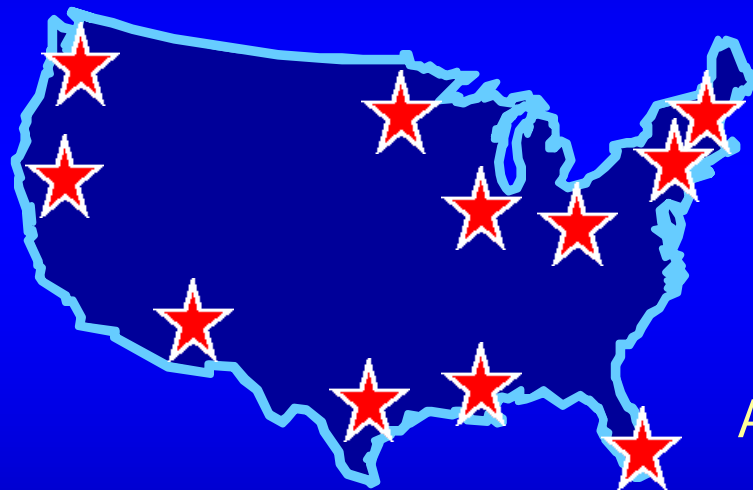
Abstract

Using data from 40 treatment programs participating in NIDA's Drug Abuse Treatment Outcome Studies (DATOS), program treatment efficiency and effectiveness frontiers were established to identify the "best organizationally performing" community-based treatment programs. Substance abuse treatment was modeled as a two-stage service delivery process and a two-stage data envelopment analysis (DEA) was conducted to estimate this model. The first stage examined the ratio of outputs (e.g. treatment services provided by programs) to inputs (e.g. programs resources), and the second stage examined the ratio of outcomes (e.g. reduced substance use, decreased unemployment, reduced illegal acts, etc.) to outputs while controlling for between program variances in patient-level problem severity. Outcomes were case-mix adjusted with a problem severity index that produced a percentage of client problems present in each program: alcohol use, lack of health insurance, depression/anxiety, hostility, anti-social personality, and criminality. Programs were classified into one of four performance groups: low efficiency/low effectiveness; high efficiency/low effectiveness; low efficiency/high effectiveness; and high efficiency/high effectiveness. Using these categories or DEA measurement scores, characteristics of performance groups may be identified through standard analytic techniques. This methodology provides the capability of conducting a comparative evaluation across a large number of programs that determines both organizational efficiency and effectiveness and has the potential to produce important policy-relevant information. States and other regulatory entities could use this methodology to improve treatment practices and outcomes in public behavioral health systems.

DATOS

Drug Abuse Treatment Outcome Studies Third National Evaluation of Treatment Effectiveness

Funded by the
National
Institute on
Drug Abuse



1991-93

11 Cities

96 Programs

~10,000 Patients

All treatment types

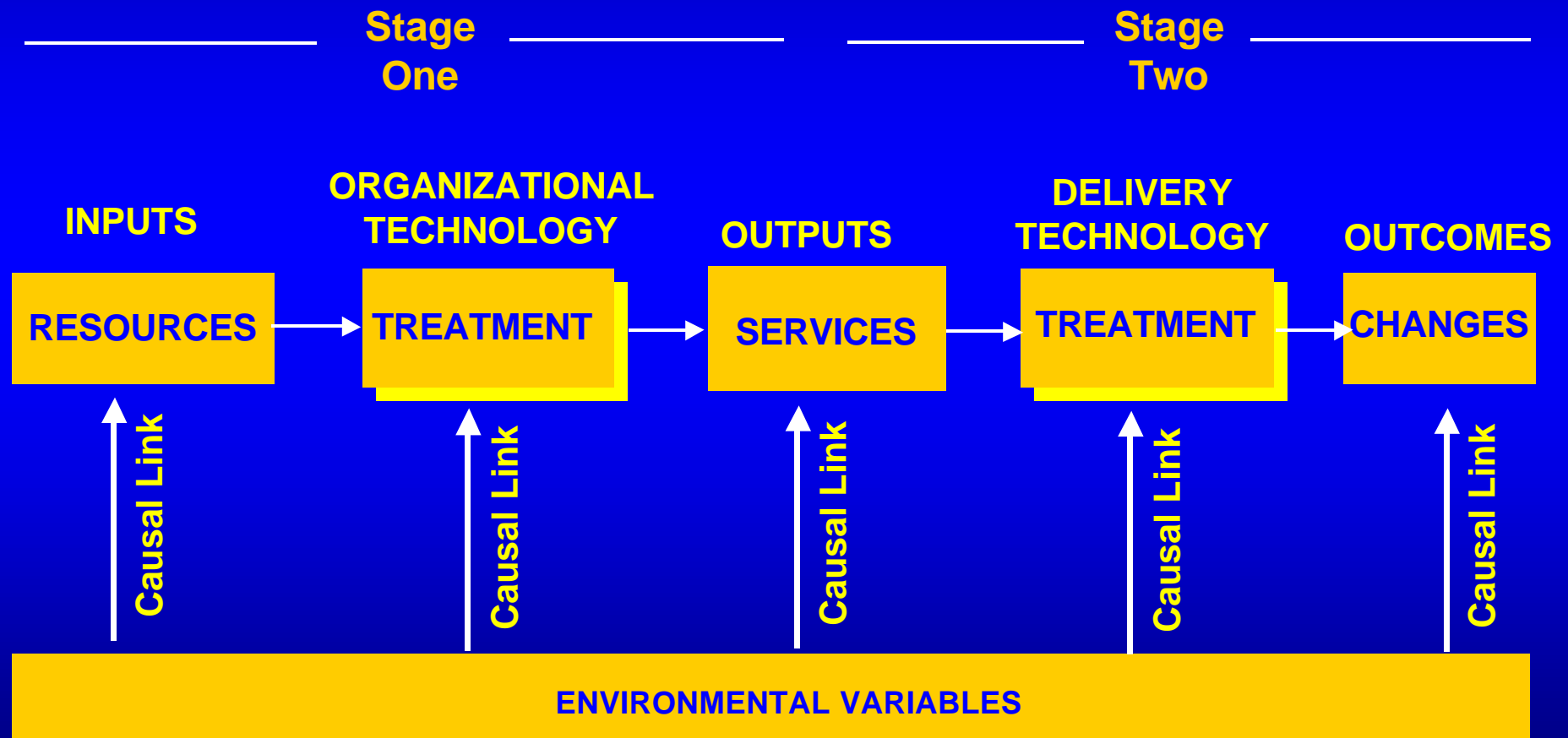
Special Issues: Psychology of Addictive Behaviors (Dec 97)

Drug and Alcohol Dependence (Dec 99)

Latest Article: Archives of General Psychiatry (1999)

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Substance Abuse Treatment as a Two-Stage Service Production Process



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Two-Stage Data Envelopment Analysis (DEA)

First Stage Linear Programming Model

min
, z

s.t. $u^j \leq zM$
 $zN \leq x^j$

where

=efficiency factor.

u^j =outputs for test vector

x^j =inputs for test vector

**N=matrix of inputs (substance
abuse treatment resources)**

**M=matrix of outputs (substance
abuse treatment services)**

Second Stage Linear Programming Model

min
, z

s.t. $u^j \leq zM$
 $zN \leq x^j$

where

=effectiveness factor.

u^j =outcomes for test vector

x^j =outputs for test vector

**N=matrix of outputs (substance
abuse treatment services).**

**M=matrix of outcomes (substance
abuse treatment results).**

Definitions

$$\text{Technical Efficiency} = \frac{\text{Services}}{\text{Resources}}$$

$$\text{Service Effectiveness} = \frac{\text{Outcomes}}{\text{Services}}$$

$$\text{Total Effectiveness} = \frac{\text{Outcomes}}{\text{Resources}}$$

Outcome Severity Index*

Prog	Clients	Number of Clients with						Total Probs	Average Probs	TCU Index
		Anti-Social Pers	Host Probs	Psych Probs	Alcohol Probs	Criminal Probs	Insurance Probs			
01	62	38	34	43	31	47	62	255	4.11	0.96
02	158	64	68	90	64	116	154	556	3.52	0.82
03	116	28	44	56	56	75	113	373	3.22	0.75
04	134	75	69	106	75	118	134	576	4.30	1.00
05	184	121	63	137	92	163	184	760	4.13	0.96
06	200	102	106	140	128	162	189	826	4.13	0.96
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35	68	18	24	50	37	41	53	223	3.28	0.76
36	153	64	64	121	68	85	145	548	3.58	0.83
37	39	7	7	20	13	0	20	65	1.67	0.39
38	40	6	12	22	18	18	25	102	2.54	0.59
39	86	33	19	38	14	57	81	244	2.83	0.66
40	64	6	17	47	0	41	41	151	2.36	0.55

* Based upon indices developed by Simpson et al. at Texas Christian University

TE and SE for LTR Programs in DATOS by Performance Group and Rank (n=13)

Program	Effectiveness		Frontier	Frontier	Performance Group	Total	Overall Rank	Modality Rank	TCU Index
	TE	SE	On=1 Off =0	On=1 Off =0		Effectiveness TE x SE			
7	0.74	0.46	0	0	D	0.34	22	11	0.82
13	0.34	0.52	0	0	D	0.17	31	13	0.77
AVG	0.57	0.64				0.26			0.80
1	1.00	0.79	1	0	C	0.79	11	8	0.96
4	1.00	0.47	1	0	C	0.47	20	10	1.00
8	1.00	0.34	1	0	C	0.34	22	11	0.91
11	1.00	0.87	1	0	C	0.87	9	7	0.82
AVG	1.00	0.62				0.62			0.92
5	0.63	0.94	0	1	B	0.59	15	9	0.96
AVG	0.63	0.94				0.59			0.96
2	1.00	1.00	1	1	A	1.00	1	1	0.82
3	1.00	1.00	1	1	A	1.00	1	1	0.75
6	1.00	1.00	1	1	A	1.00	1	1	0.96
9	1.00	1.00	1	1	A	1.00	1	1	0.92
10	1.00	1.00	1	1	A	1.00	1	1	0.83
12	1.00	1.00	1	1	A	1.00	1	1	0.93
AVG	1.00	1.00				1.00			0.87
T-AVG	0.90	0.80				0.72			0.88

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TE and SE for OMT Programs in DATOS by Performance Group and Rank (n=11)

Program	Effectiveness		Frontier	Frontier	Performance Group	Total	Overall Rank	Modality Rank	TCU Index
	TE	SE	On=1 Off =0	On=1 Off =0		Effectiveness TE x SE			
14	0.85	0.61	0	0	D	0.52	17	2	0.76
17	0.53	0.33	0	0	D	0.17	32	7	0.67
20	0.20	0.23	0	0	D	0.05	40	11	0.34
22	0.26	0.62	0	0	D	0.16	33	8	0.53
23	0.88	0.78	0	0	D	0.69	12	1	0.57
AVG	0.54	0.51				0.32			0.57
15	1.00	0.22	1	0	C	0.22	29	6	0.72
21	1.00	0.27	1	0	C	0.27	25	4	0.56
24	1.00	0.40	1	0	C	0.40	21	3	0.59
AVG	1.00	0.30				0.30			0.62
16	0.12	1.00	0	1	B	0.12	36	10	0.61
18	0.13	1.00	0	1	B	0.13	35	9	0.72
19	0.24	1.00	0	1	B	0.24	28	5	0.84
AVG	0.17	1.00				0.17			0.72
T-AVG	0.56	0.59				0.33			0.63

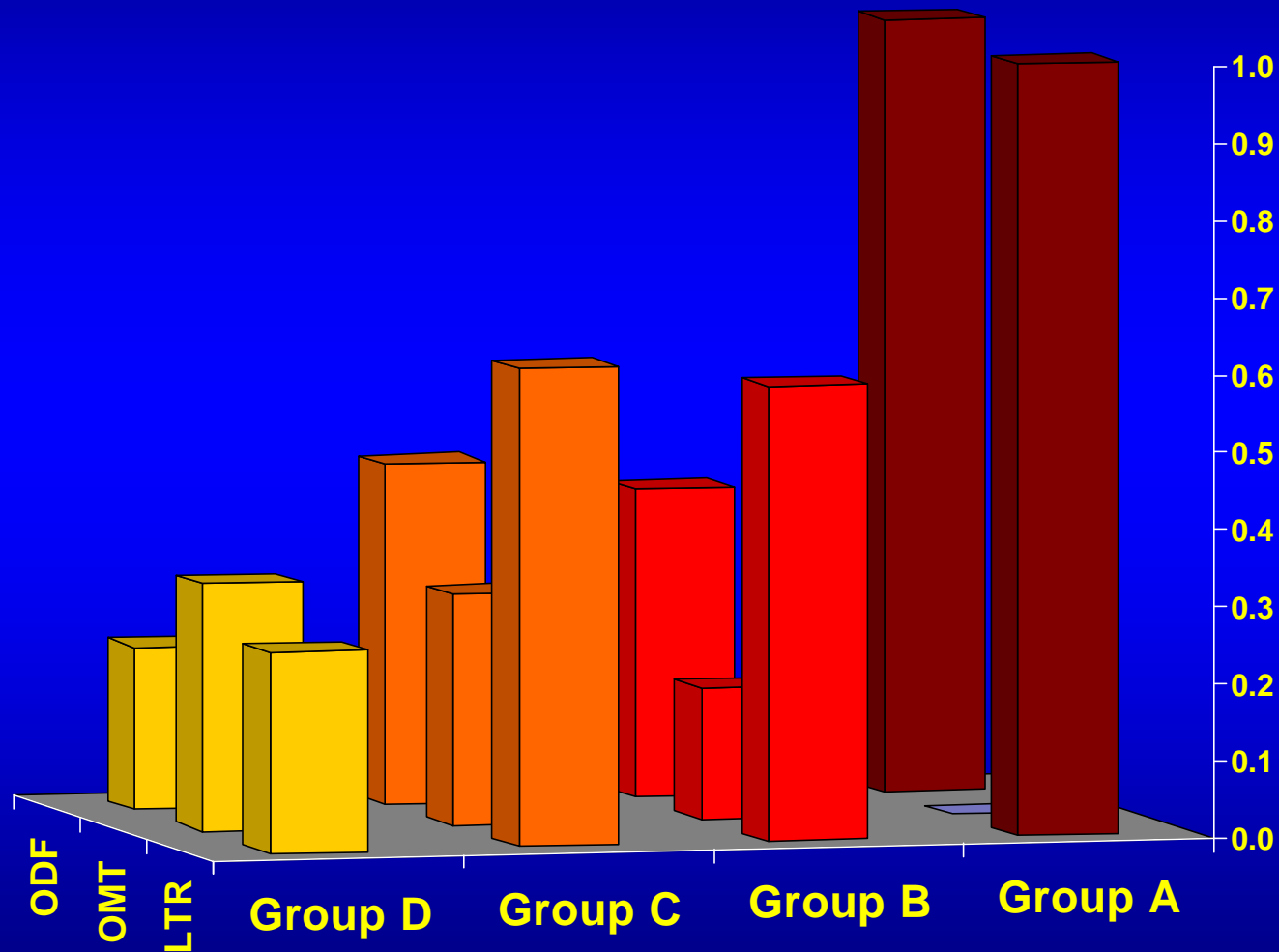
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TE and SE for ODF Programs in DATOS by Performance Group and Rank (n=16)

Program	Effectiveness		Frontier	Frontier	Performance Group	Total	Overall Rank	Modality Rank	TCU Index
	TE	SE	On=1 Off =0	On=1 Off =0		Effectiveness TE x SE			
28	0.81	0.33	0	0	D	0.27	26	10	0.77
34	0.30	0.39	0	0	D	0.12	37	14	0.65
35	0.29	0.88	0	0	D	0.26	27	11	0.76
39	0.67	0.29	0	0	D	0.19	30	12	0.66
AVG	0.52	0.47				0.21			0.71
25	1.00	0.31	1	0	C	0.31	24	9	0.67
27	1.00	0.10	1	0	C	0.10	39	16	0.55
29	1.00	0.49	1	0	C	0.49	19	8	0.94
30	1.00	0.84	1	0	C	0.84	10	3	0.89
31	1.00	0.54	1	0	C	0.54	16	6	0.64
37	1.00	0.11	1	0	C	0.11	38	15	0.39
38	0.95	0.70	1	0	C	0.67	13	4	0.59
40	1.00	0.50	1	0	C	0.50	18	7	0.55
AVG	0.99	0.45				0.44			0.65
32	0.64	1.00	0	1	B	0.64	14	5	0.78
36	0.15	1.00	0	1	B	0.15	34	13	0.83
AVG	0.40	1.00				0.40			0.80
26	1.00	1.00	1	1	A	1.00	1	1	0.76
33	1.00	1.00	1	1	A	1.00	1	1	0.79
AVG	1.00	1.00				1.00			0.77
T-AVG	0.80	0.59				0.47			0.70

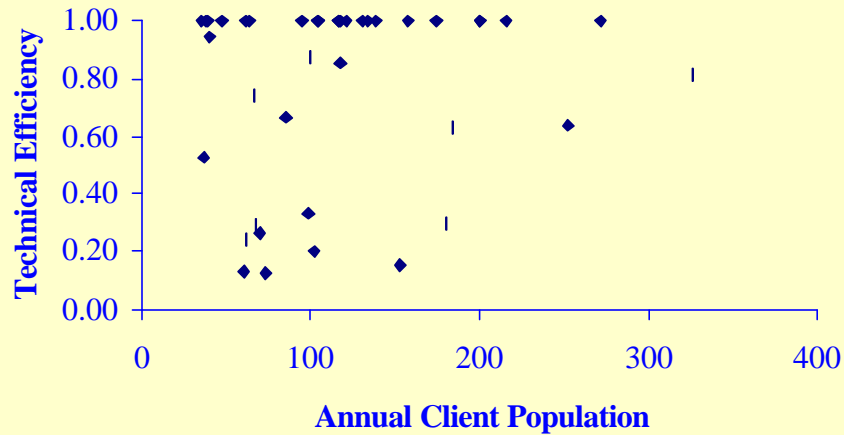
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Total Effectiveness by Modality by Performance Group

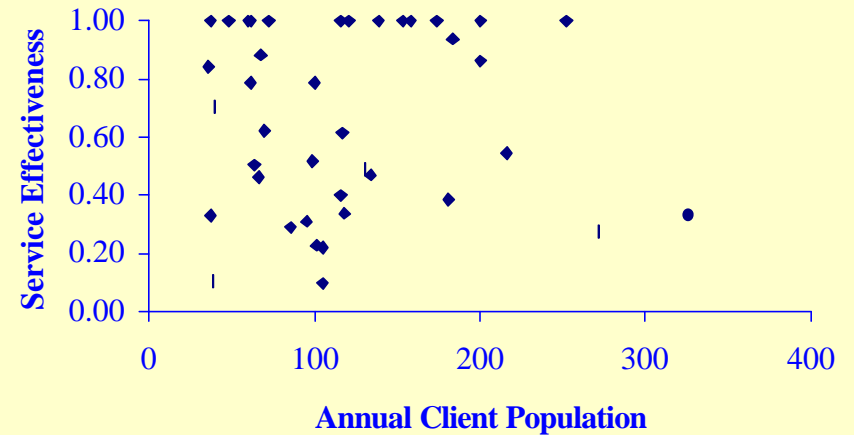


Frontier Charts

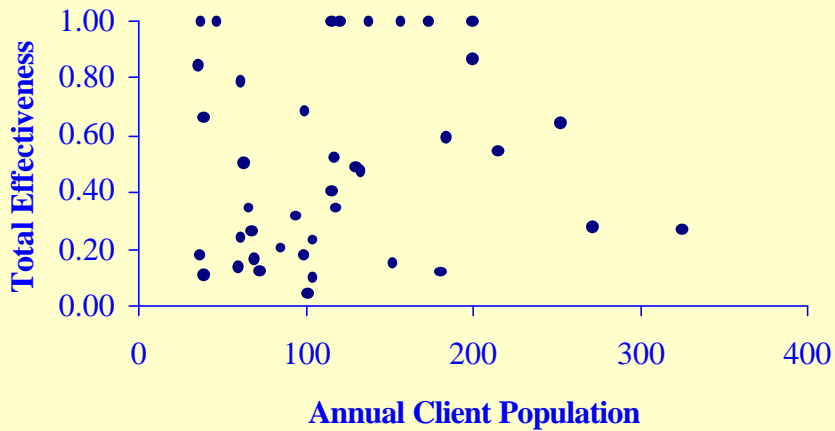
Technical Efficiency by Size



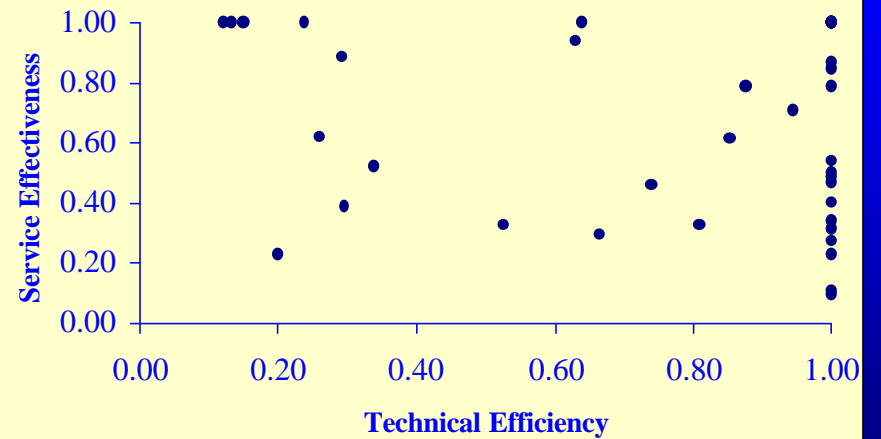
Service Effectiveness by Size



Total Effectiveness by Size



TE and SE



Conclusions

Conceptualization of Substance Abuse Treatment as a two-stage service production model is useful. The two-stage DEA analytic model is a powerful estimation technique that provides measures of efficiency (technical efficiency), effectiveness (service effectiveness), and total effectiveness that are more precisely defined. Moreover these definitions are grounded in an overall conceptual framework that aids in the assessment of performance. Of interest to policy-makers is the potential for developing performance profiles by using these measures as dependent variables in causal analyses. To date few studies have included the necessary data to conduct robust comparative evaluations based upon this methodology. In addition to client-level outcome data, future large scale, national studies (like TOPS and DATOS) should include program level data that capture detailed resource counts, service counts, and cost information.