

Article

Service costs for women with co-occurring disorders and trauma

Marisa Domino, (Ph.D.)^{a,*}, Joseph P. Morrissey, (Ph.D.)^{a,b},
Terri Nadlicki-Patterson, (M.A.)^b, and Sukyung Chung, (MPH)^a

^aDepartment of Health Policy and Administration, School of Public Health, University of North Carolina at Chapel Hill,
Chapel Hill, NC 27599, USA

^bCecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599, USA

Received 11 March 2004; received in revised form 8 July 2004; accepted 19 August 2004

Abstract

Several aspects of costs related to health care and other service use at 6-month follow-up are presented for women with co-occurring mental health and substance abuse disorders with histories of physical and/or sexual abuse receiving comprehensive, integrated, trauma-informed and consumer/survivor/recovering person-involved interventions ($n = 1023$) or usual care ($n = 983$) in a nine-site quasi-experimental study. Results show that, controlling for pre-baseline use, there are no significant differences in total costs between participants in the intervention condition and those in the usual care comparison condition, either from a governmental (avg. \$13,500) or Medicaid reimbursement perspectives (avg. just over \$10,000). When combined with clinical outcomes analyzed in other works in this issue by Coccozza et al. (2005) and Morrissey et al. (2005), which favored the intervention sites, these cost findings indicate that the treatment intervention services are cost-effective as compared with the usual care received by women at the comparison sites. © 2005 Elsevier Inc. All rights reserved.

Keywords: Cost analysis; Cost-effectiveness; Trauma; Mental health; Substance abuse

1. Introduction

Recent research highlights the increasing prevalence and concern about violence against women, especially those with co-occurring mental health and substance abuse disorders (Gil-Rivas et al., 1996; Golding, 1999; Jennings, 1997; Najavits, Weiss, & Shaw, 1997). Women with this constellation of problems are often faced with an equally complex set of needs, many of which have gone unmet. The services that women do receive tend to be more fragmented, more institutionally based, and much less comprehensive than what is necessary (Harris, 1994).

While it is well documented that women who have experienced trauma are higher users of services in the health-care setting (Bergman & Brismar, 1991; Koss, Koss, &

Woodruff, 1991; McCauley et al., 1995), much less is known about their service use patterns in other service arenas and their total service costs (Newmann, Greenley, Sweeney, & Van Dien, 1998; Yodanis, Godenzi, & Stanko, 2000). This article attempts to understand these service measures and how they may change through the introduction of comprehensive, integrated, trauma-informed and consumer/survivor/recovering person (CSR)-involved intervention services using data collected through the Women, Co-Occurring Disorders, and Violence Study (WCDVS) described in more detail elsewhere (McHugo et al., 2005). This SAMHSA-funded multi-site demonstration was designed to alter these service use patterns while enhancing access to integrated treatment and support for women with histories of interpersonal violence and co-occurring disorders.

Given the current era of fiscal restraint in health care spending, this article examines service costs to complement the previous work on clinical outcomes (Coccozza et al., 2005; Morrissey et al., 2005) in an effort to determine the cost-effectiveness of providing comprehensive integrated, trauma-informed, and CSR-involved services for this target

* Corresponding author. Department of Health Policy and Administration, School of Public Health, University of North Carolina at Chapel Hill, 1104G McGavran-Greenberg Hall, CB#7411, Chapel Hill, NC 27599-7411, USA. Tel.: +1 919 966 3891; fax +1 919 966 6961.

E-mail address: domino@unc.edu (M. Domino).

population. This research is very relevant to improving best practices in this area and is supported by the existing literature revealing how little is known about trauma-based services available to women in terms of their effectiveness and costs.

There is some support in the literature for the notion that costs of care are higher for abuse survivors than for those without abuse histories (Bergman and Brismar, 1991; Bryer, Nelson, Baker Miller, & Krol, 1987; Carmen, Rieker, and Mills, 1984; Kernic, Wolf, & Holt 2000; McCauley et al., 1995; Newmann et al., 1998; Wisner, Gilmer, Saltsman, & Zink, 1999). In one study of men and women with severe mental illness, Newmann and colleagues (1998) discovered that, controlling for gender, age, and Medicaid status, clients with sexual abuse histories had significantly higher service use costs compared to those without abuse histories. Interestingly, physical abuse histories were not associated with significantly higher costs of care. Wisner and colleagues (1999) compared charges from the perspective of a large private health insurance plan for women who were victims of intimate partner violence vs. a sample of randomly selected women from the same plan. They found a difference of \$1775 (1994 dollars) in average charges, although this difference was not explained by higher rates of emergency room use, because no higher rates of use were found. The authors did find higher costs only for general clinic ambulatory visits, mental health clinic visits, out-of-pocket referrals, and affiliate visits external to the plan.

Any cost analysis must first specify the perspective from which resource consumption or costs will be assessed. The reason is that costs may vary depending upon who pays. Often it is instructive to assess costs from multiple perspectives. Here, costs related to services use are examined from two perspectives: total government payments and a narrower Medicaid reimbursement perspective. The total government approach asks the question “how much would it cost to serve women enrolled in the study if we included all health, housing, and criminal justice services that could be provided or paid for by government agencies at all levels (federal, state, county, municipal)?”; this approach has been used elsewhere in the literature (e.g., Fenton, Hoch, Herrell, Mosher, & Dixon, 2002). The Medicaid perspective asks the question “how much would it cost to serve women enrolled in the study if all health services were provided or paid for by a Medicaid program?” This approach examines only costs that are reasonably expected to be covered by a typical Medicaid program; thus, some of the service costs reported in the all-government approach are not included in the Medicaid analysis (e.g., jail and shelter costs).

It is important to note what this study does not do: we do not examine expenditures from the perspective of the participating treatment providers, as have other authors in this area (e.g., French & McGeary, 1997). In an earlier report (Dalton, Domino, Nadlicki, Stewart, & Morrissey, 2003), we assessed the start-up costs of provider agencies in developing or enhancing the array of core services called for

by the WCDVS initiative. In examining five selected study sites, we found that start-up costs for agencies participating in the intervention condition ranged from \$0.6 million to \$1.2 million for the initial 2-year period depending upon whether sites were located in urban or rural locales, single or multiple participating agencies, and predominantly residential or outpatient-based service settings.

Further, we do *not* examine the operating costs of participating agencies in delivering services to enrolled women. While an analysis of operating costs would certainly address questions about additional resources that may be needed to provide enhanced services, it would not allow us to address the cost of services that are outside of the domain of the participating agencies (e.g., the jail). We explicitly chose the total government and Medicaid perspectives in order to examine policy-relevant questions that stem from the use of a broader range of services.

In this study we attempt to model the opportunity costs of services, defined as the value of whatever is given up in order to devote resources to each service, in as much as they are reflected in the average reimbursement rates we append to the service measures as unit costs. This is in contrast to an accounting perspective or the actual value of all the inputs to service provision (e.g., the rental value of office space, the exact salary and benefits to staff), used by some authors (e.g., Anderson, Bowland, Cartwright, & Bassin, 1998). In addition to the range of services examined, different perspectives would assign different unit costs to the services reported. For example, if Medicaid reimburses a provider agency \$50 for one unit of a hypothetical service, but the agency incurs \$60 of expenses in providing that service, the Medicaid perspective would use the \$50 unit cost, while the agency perspective would assign the service a \$60 unit cost; in reality, the agency costs could be higher or lower than the government costs, and this difference likely varies by the type of service and even by each study site. Determining the actual cost to each agency using the accounting perspective is itself a costly and difficult process and not feasible nor desirable for this analysis. We do not present results from a societal cost perspective, as is generally recommended (e.g., Gold et al., 1996) because measures of labor market participation, externalities stemming from reduced use of illicit substances and other important aspects of societal costs (French, Salomé, Sindelar, & McLellan, 2002) were not available for this analysis, which focuses on service costs.

Based on these considerations, this paper seeks to answer the following research questions:

1. Do women in the intervention condition have larger total service costs than women in the comparison condition when assessed from Medicaid and total government perspectives?
2. How do women in the two study conditions differ with regard to costs of services internal and external to the study interventions?

3. Is the intervention cost-effective as compared with usual care received by women in the comparison condition?

2. Methods

The data analyzed in this paper were collected from a nine-site, quasi-experimental study described elsewhere in this issue (Cocozza et al., 2005; McHugo et al., 2005; Morrissey et al., 2005) of women with mental health and substance abuse disorders who have experienced trauma. Study participants were women with histories of mental health and substance abuse services use who have experienced interpersonal abuse, which may or may not meet the DSM-IV definition of trauma. Women were enrolled in the intervention condition, which provided comprehensive, integrated, trauma-informed and CSR-involved services, or services which simultaneously addressed the trauma experienced by study participants as well as their other medical and mental health needs, and in the comparison condition (usual care). A variety of information on their mental health, substance abuse, and trauma status was obtained from in-person interviews at baseline and 6-month assessments. Detailed information on the use of services in the previous 3 months was also asked at the in-person interviews at baseline and 6 months, and by a phone interview at 3 months. The primary study outcomes are trauma-related symp-

tomatology, mental health status, and substance (alcohol and drugs) abuse status (see Cocozza et al., 2005, for further description).

At baseline, a total of 2,729 women were recruited across the nine sites. The inclusion criteria for the current study are participants with completed baseline and 6-month services interviews, taken within 12 weeks of the projected follow-up date, leaving a sample of 2,006 women. This analysis followed an intent-to-treat design, where study participants were assigned to either the intervention or comparison cohorts on the basis of baseline enrollment status, rather than treatment completion. Differences were found between study participants and those who dropped out before the 6-month assessment on demographic characteristics, trauma history, and substance use measures (McHugo et al., 2005). As noted below, differences were also observed between participants in the intervention and comparison conditions of the study. Differences in baseline service use patterns were controlled in the cost analyses.

2.1. Measures of costs

Service use described here was self-reported by study participants at each of the first three assessment interviews (baseline, 3, and 6 months). At each interview, study participants were asked to report service use in a variety of categories, ranging from outpatient individual and group

Table 1
Unit reimbursement and data sources for governmental and Medicaid payers by service type

Service type	Value or Range for All Government Perspective (in 2001 dollars)	Value or Range for Medicaid Perspective (in 2001 dollars)	Source
Hospital days	Varies by state and psych/general hospital \$568–695 psych \$1149–1648 general	Varies by state and psych/general hospital \$568–695 psych \$1149–1648 general	1999 Medicare Cost reports
Emergency room visits	Varies by census region \$425–461	Varies by census region \$255–348	2000 MEPS for private pay women (Medicare) and Medicaid women (Medicaid)
Detoxification costs	\$203	\$203	Welch and Quirke, 2002
Residential treatment costs	\$110	\$110	Welch and Quirke, 2002
Homeless or domestic violence shelter costs	\$62.97	\$0	NYC cost, (Coalition for the Homeless, 2001)
Jail costs	Booking fee of \$139, per diem cost of \$64	\$0	Washington state jail rates (Domino et al., 2004)
Outpatient individual counseling costs	Varies by city \$93–112	\$46	Medicare allowable costs for 45–50 min. visit, CPT 90806; CA Medicaid rates
Outpatient group counseling costs	Varies by city \$30–37	\$14	Medicare allowable costs, CPT 90853; CA Medicaid rates
Case management	\$91	\$42.6	NV Medicaid for SMI, WI Medicaid
Outpatient medical costs	Varies by city \$91–109	\$57.20	Medicare allowable costs for CPT 99215; CA Medicaid rates
Psychotropic medication costs	Varies by census region \$74–77	Varies by census region \$92–98	MEPS cost per medication for women with psychiatric or SA indication
Peer support	\$1.20	\$0	Humphreys & Moos, 1996

counseling to jail and homeless or domestic violence shelters. For both inpatient and outpatient services, the frequency of visits or days was reported for each of the services listed in Table 1. For outpatient services, respondents were asked to report the number of visits received in the last 3 months or since the last interview, and the average time per session. For inpatient services, the respondent was asked to report the number of days in each inpatient facility. Each survey elicited service use in the last 3 months or since the last survey, so the 178 (8.9%) individuals missing the intermediate 3-month survey were not excluded from the cost analyses. The services use instrument recorded total services use and was not limited to services received at the participating study site. This means that our analysis captured and assigned dollar values to services used in all sectors, whether they were affiliated with the study or not. This is an important difference from many costing activities used in the literature (e.g., Svikis et al. 1997; Weisner, Mertens, Parthasarathy, Moore, & Lu, 2001), which limit costs to just those viewed from the perspective of the participating medical or mental health setting or provider. If the intervention leads to an increase in out-of-system use, this use should be considered an outcome of the intervention and thus is included in our analyses.

Service measures were aggregated by type (e.g., hospital use, emergency room use) and assigned a unit cost for each type. The same measures of unit costs were used for all service areas regardless of the content area of the service reported (e.g., mental health, physical health, or trauma) with the exception of hospital care; separate unit costs were developed for psychiatric and general health hospital days due to their sizable variation from the source data, described below. Two measures of unit costs were used sepa-

rately for these analyses in order to examine the policy implications from different vantage points and in order to explore the robustness of the findings to the unit cost values: a total government payer perspective and a Medicaid payer perspective.

Unit costs were obtained from a variety of sources; no single source exists that contains unit cost estimates for the broad array of service types measured in this study. The values and sources for each service type are presented in Table 2. Unit costs for emergency room visits and psychotropic drugs were obtained from the authors' calculations on adult women from the 2000 Medical Expenditure Panel Survey (Agency for Healthcare Research and Quality, 2003). Medicare reimbursements rates were used for the hospital cost estimates and governmental perspective outpatient services. Medicaid reimbursement rates from various states were assigned for the outpatient-based services in the Medicaid perspectives. Estimates for the costs from detoxification services, residential treatment, jail services, and domestic violence center use were obtained from recent values in the published literature. All dollar amounts were inflated by the Medical component of the Consumer Price Index and are expressed in 2001 dollars.

Total costs were obtained by summing across all service types for the 6-month study period. In addition, two measures of service costs external to the study intervention were used as secondary, imperfect, measures of outcomes: external medical costs (hospital and ER costs) and external non-medical costs (jail and shelter costs). Both of these cost measures attempt to quantify effects that may have "spilled over" or affected other service settings outside of the scope of the intervention. Although we anticipated higher costs for services provided by the intervention (such as trauma groups) over those observed in the comparison

Table 2
Six-Month average cost among the participants

	Governmental perspective		Medicaid perspective	
	Intervention sites (n = 1,023)	Comparison sites (n = 983)	Intervention sites (n = 1,023)	Comparison sites (n = 983)
Hospital days	\$2,543	\$2,115	\$2,543	\$2,115
Emergency room visits	\$290	\$320	\$204	\$222
Detoxification costs	\$150	\$190	\$150	\$190
Residential treatment costs	\$4,879	\$4,540	\$4,879	\$4,540
Homeless or domestic violence shelter costs	\$277	\$308	–	–
Jail costs	\$105*	\$160	–	–
Outpatient individual counseling costs	\$2,041	\$2,303	\$930	\$1,051
Outpatient group counseling costs	\$1,031**	\$825	\$434*	\$353
Case management	\$1,315**	\$947	\$618**	\$445
Outpatient medical costs	\$1,158	\$1,089	\$350*	\$275
Psychotropic medication costs	\$216	\$230	\$264	\$283
Peer support	\$105	\$99	\$89	\$89
Total costs in study period	\$14,108	\$13,126	\$10,689	\$9,839
External costs in study period	\$3,214	\$2,903	\$2,747	\$2,338
External medical costs	\$2,833	\$2,435	\$2,747	\$2,338
External non-medical costs	\$381	\$468	–	–

Means at intervention sites are significantly different than means at comparison sites: * $p < 0.05$; ** $p < 0.01$.

condition, we tested whether these extra intervention services have decreased the use and thus costs of service sectors external to the intervention. Daley and colleagues (2000), for example, found a reduction in costs to the jail sector associated with the participation in residential substance abuse treatment programs by a cohort of pregnant women.

Table 2 reports the costs by service category and the total costs of services used in the first 6 months of the study. The per participant cost of all service use from the all-government perspective was similar between the intervention and comparison groups at approximately \$13,000 in the 6-month period, while the Medicaid costs were only slightly less at just over \$10,000. Significant differences in the simple averages were observed at 6 months only in three sectors: the intervention was associated with lower jail spending and higher spending on case management and outpatient group counseling. These simple averages, however, mask differences in the probability of receiving any service in each area, and the level of service use, as described in section 3, Results.

2.2. Analyses

Ordinary least squares (OLS) regressions were run separately on measures of total costs and external costs. Two-part models were initially considered to estimate all cost regressions; these models separate the estimation of having any costs from the estimation of the level of costs for service users. However, due to the very high numbers of service users (>99% of the sample¹), one-part OLS models were instead used on the full sample for the main cost models. Two-part models were used on the external cost measures on which 54% of the participants showed non-zero values. All regressions controlled for the level of the relevant variables at baseline and participant age.² Site-level fixed effects were used to control for mean differences in costs at each of the nine study sites and *SEs* were adjusted for potential clustering at the site level. Clinical effectiveness measures reported were analyzed elsewhere (Cocozza et al., 2005; Morrissey et al., 2005).

Guidelines for conducting cost-effectiveness analyses do not recommend the calculation of incremental cost-effectiveness ratios when insignificant results are found in independent analyses on either costs or clinical outcomes, because the intervention is said to dominate the comparison condition (Siegel, Laska, and Meisner 1996). However, several authors have pointed out the dearth of cost-effectiveness ratios available in the substance abuse literature (French, McCollister, et al. 2002; Sindelar, Jofre-

Bonet, French, & McLellan, 2004). Cost-effectiveness ratios allow the comparison across studies of the marginal cost of attaining a one-unit improvement in the clinical measure; for meaningful comparisons, the composition of the study population and the comparison condition must be similar. Cost-effectiveness ratios also facilitate comparison of the cost per unit of improvement from the intervention to an established threshold. For example, Weisner and colleagues (2001) reported that if the relevant decision makers were willing to pay \$5600 per additional person reporting abstinence, then the integration of primary care services into the substance abuse setting could be considered cost-effective with 95% certainty. As Sindelar and colleagues (2004) have pointed out, the outcomes from substance abuse treatment have multiple dimensions and do not collapse easily to a single scale. We adopt their approach of providing multiple measures of outcome resulting in multiple cost-effectiveness ratios. The incremental cost effectiveness ratios of the intervention were created from the ratio of the regression coefficient on the intervention indicator in a regression model on the overall service costs (governmental perspective) to the same variable from separate regression models on each of the four outcome measures. The same set of independent variables, including site fixed effects, age, and pre-baseline measures, were controlled for in all of the models. Nonparametric bootstrapped *SEs* from 500 replications are provided around the ratio estimates in order to form confidence intervals.

3. Results

3.1. Cost results

There were no significant differences in total costs at 6 months between participants in the intervention condition and those in the comparison condition (Table 3). Only the level of service use in the pre-baseline period served as a significant predictor of use during the study period. This was true for both definitions of costs (all government or

Table 3
Overall cost results from linear regression analysis

Dependent Variable \ independent variables	Total costs – all government perspective (2001 U.S. dollars)	Total costs – Medicaid perspective (2001 U.S. dollars)
Intervention site	–19.108 (769.818)	108.307 (877.756)
Pre-baseline use	0.238* (0.105)	0.170* (0.085)
Age	33.259 (42.960)	39.216 (40.614)
Site fixed effects	Not reported	Not reported
R ²	0.10	0.11

No. observations = 2,006.

Robust standard errors in parentheses.

* Significant at 5% level.

¹ The high rates of service use in both treatment conditions are due to recruitment of women who were high-end service users.

² Age was initially allowed to enter in quadratic form, but the age-squared term was never significant, so the more parsimonious linear model was used instead.

Table 4
Incremental cost-effectiveness ratios

Outcome domain (measure)	Incremental cost-effectiveness ratio	95% confidence interval	With 90% probability, costs per unit improvement are less than:	With 95% probability, costs per unit improvement are less than:
Drug Use (ASI)	–\$ 841.49	–46749.41, 54878.21	\$31,320.42	\$38,250.44
Alcohol Use (ASI)	–\$ 58.17	–5024.66, 5511.64	\$2,642.30	\$3,709.53
General Health (GSI)	–\$ 177.71	–17109.73, 18089.05	\$7,148.94	\$13,131.88
Trauma (PSS)	–\$ 50.48	–16313.50, 5576.65	\$2,384.52	\$4,785.83

Medicaid). We also found no difference in the costs of services external to the study intervention using the two-part methodology described earlier on either access to or level of use of these external services (results not reported). Since there was heterogeneity in the exact implementation of the intervention services, we also explored whether mean cost differences were observed at one or more study sites, through the use of interaction terms between each of the study sites and the intervention indicator (results not reported). We found no evidence of cost differences at any of the nine study sites.

3.2. Cost effectiveness results

Since the analyses exploring the effect of the treatment intervention on clinical outcomes (Cocozza et al., 2005; Morrissey et al., 2005) found significant improvements in two of the outcome measures for women in the intervention condition over those observed in the comparison condition at the 95% confidence level and a third outcome at the 94% confidence level, we can use this to motivate an application of these results to the cost-effectiveness of the intervention as a whole. Since the present analysis found no statistical difference in total costs of the intervention from either perspective explored here, we can conclude that the intervention is cost-effective as compared with the usual care received by women in the comparison condition.

For comparison with other studies or thresholds that have yet to be established in the substance abuse literature (Weisner et al., 2001), Table 4 provides estimates of the cost-effectiveness ratios from this study intervention. As expected from the independent cost analyses reported earlier, the confidence intervals are broad and always include zero, indicating that the study interventions may be associated with either positive costs or cost savings; thus we cannot rule out a hypothesis of no cost-offset from the intervention. The last two columns of the table give the 90th and 95th percentile values from the bootstrapped replications. These values may be compared across other thresholds used to determine the cost effectiveness of the intervention. For example, if a threshold of \$38,250.44 per unit improvement in the Addiction Severity Index drug score is considered cost-effective, then with 95% probability, the study intervention is less than or equal to that level. To our knowledge, no other cost-effectiveness analyses in the literature have been conducted on populations similar

enough to permit comparisons, but we are optimistic that these estimates may inform future comparisons.

3.3. Robustness analyses

We ran additional cost models controlling for high contrast Integrated Counseling intervention sites, as described in companion papers (Cocozza et al., 2005; Morrissey et al., 2005). This program contrast examines the content of service use at 3 months, but not the level of use, by examining the average number of content areas (trauma, mental health, or substance use) addressed in group or individual counseling for women who used these services at the 3-month assessment interview. Sites with large differences between the content of service use at the intervention vs. comparison conditions are considered high contrast on Integrated Counseling. We find significantly higher costs for high contrast Integrated Counseling intervention sites over other intervention sites (Table 5), but only from the Medicaid perspective. This is not surprising since these are the sites that have achieved a higher level of improvement in clinical outcomes (Table 2 in Cocozza et al., 2005, in this issue). Controlling for the differences in service use between the high contrast Integrated Counseling sites and the other intervention sites also reveals that the total costs at the low contrast sites were lower than those at the comparison sites. These low contrast

Table 5
Results from linear regression analysis on costs with additional interaction for high contrast Integrated Counseling intervention sites

Dependent Variable \ independent variables	Total Cost – Governmental perspective	Total Cost – Medicaid perspective
Intervention site	–837.34* (398.47)	–1,345.27* (551.62)
Pre-baseline use	0.24* (0.11)	0.166 (0.086)
Age	33 (43)	38.47 (40.83)
High Integrated Counseling*	1,661.10 (1,420.71)	2,951.41* (1,427.20)
Intervention site	Not reported	Not reported
Site fixed effects	Not reported	Not reported
R ²	0.10	0.11

No. observations = 2,006.

Robust standard errors in parentheses.

* Significant at 5% level.

sites did not achieve improvements in clinical outcomes for any of the four measures examined.

4. Discussion

The combined work in this issue shows that the intervention modestly improved the participants' clinical outcomes, especially trauma and drug use outcomes, without an increase in service costs, indicating that the intervention was more cost-effective than the services received by participants in the comparison condition. This is true from both an all-government perspective and from a Medicaid-only perspective. Service costs were still substantial, averaging over \$13,500 per woman for the 6-month study period; approximately \$11,000 of these costs were for health services of the types delivered by the study intervention.

This implies that reorganizing services to women in the manner implemented by this intervention provides a more efficient service delivery model, through the achievement of better clinical outcomes with the same level of resources. We could not find evidence that the service costs of the intervention increased over those incurred in the comparison setting, either from the perspective of total government costs or from the narrower perspective of a typical Medicaid program. Other authors have found similarly positive findings in other economic analyses of substance abuse interventions. In particular, French, McCollister, and colleagues (2002) quantified the benefits from two types of residential treatment program for pregnant substance abusers in dollar terms and found that these benefits exceed the cost of treatment. This clearly has implications for health services financing, as larger payers of health care services in this population, such as most state Medicaid programs, may want to restructure incentives by way of reimbursement mechanisms that reward the provision of intervention services with more generous funding.

We found substantial heterogeneity in costs by study site. At high-contrast integrated counseling sites the intervention condition subjects had higher average costs, but better outcomes (Morrissey et al., 2005) than did those in the comparison condition, while at low-contrast sites the intervention condition subjects had lower average costs than did the comparison condition at these sites. Further research should explore determinants of this variation in cost and outcome across sites, such as the intervention model used, staffing ratios, and other possibly explanatory characteristics.

The fact that both perspectives showed no difference between the intervention and comparison conditions in external costs indicates not only that spill-over effects into non-health settings such as the jail or shelters are not being observed during this short-term follow-up, but also that spill-overs to hospitals and emergency departments were not observed. Spill-over effects have been noted elsewhere in the substance abuse literature. For example, Daley and colleagues (2000) found net cost savings from a reduction in crime that out-

weighed treatment costs among pregnant women in residential substance abuse treatment programs. Persons in these interventions showed better cost-benefit profiles compared to those using outpatient only or detoxification treatment.

Several caveats to this work should be mentioned. Service use was measured on a self-report basis by women participating in the study. While service use was reported every 3 months, minimizing recall bias from a longer follow-up, we do not have an independent method of validating the levels of service use reported. Self-report health care services use have been found to have a high level of agreement with registered utilization in a variety of settings (e.g., Reijneveld and Stronks 2001).

Another limitation of our approach is that we were unable to value resources that were not directly linked to service provision. If, for example, intervention sites incurred significantly more start-up costs in training personnel to conduct intervention services, or following up with study participants in ways that were not reported in the service use measures, then we are at risk of undercounting the costs to the intervention sites. While an analysis of start-up costs was conducted in a limited sub-sample of study sites participating in this intervention (Dalton et al., 2003), we did not include these costs in our analyses for a number of reasons. For one, including start-up costs might duplicate the resource use measured in the unit costs, as services may have higher costs precisely because of high fixed or start-up costs (prescription drugs are an example of this). Second, the start-up study cost overstates the costs needed to start up the actual services provided, since the specific research setting in which the start-up phase was conducted included elements of the study intervention that were later dropped at most sites (e.g., integration and information sharing among a large group of agencies in each community). Finally, data on start-up costs were not available for all study sites analyzed here.

In order to assess the appropriateness of our reliance on Medicaid reimbursement costs for the trauma-specific groups that were at the heart of the intervention, key informant interviews were conducted with study site representatives that were determined to have the most knowledge about billing for services and the content of the intervention group counseling sessions at each site, as determined by the site Principal Investigator. Participants' backgrounds ranged from clinical (masters or doctoral level) to accounting/administrative personnel. The key question discussed was whether trauma-specific groups were more resource-intensive than were other types of group counseling sessions of the same duration that were reimbursed by Medicaid or other payers. All participants agreed that trauma groups were no more resource intensive than other types of groups, and thus a standardized unit cost for group counseling sessions was appropriate for trauma-specific groups. The process was only undertaken for this single service measure, as an analogous issue did not arise for other types of services.

More research should be done to explore the economic feasibility of the group of interventions examined here in other populations, including women who may not be already in treatment. As other authors have pointed out, as the tools of economic analysis are increasingly applied to substance abuse treatments, the sophistication of these tools should increase, facilitating cross-study comparisons. Other forms of economic analysis, such as cost-utility analysis or cost-benefit analysis, where multidimensional outcomes are collapsed to quality of life or dollar measures, respectively, may help facilitate this agenda, although they are costlier to conduct. Further research could also expand the scope of these findings by following study participants for a longer time period, and investigating the effects on labor market participation, parenting and child health outcomes, illegal substance use, and government subsidies.

Acknowledgments

This study was funded under Guidance for Applicants No. TI 00-003 entitled *Cooperative Agreement to Study Women with Alcohol, Drug Abuse and Mental Health Disorders who have Histories of Violence: Phase II* from the Department of Health and Human Services, Public Health Service, Substance Abuse and Mental Health Services Administration's three centers: Center for Substance Abuse Treatment, Center for Mental Health Services and Center for Substance Abuse Prevention (March 2000). The assistance of project staff at the following participating sites (listed in alphabetical order by state) is gratefully acknowledged: Los Angeles, California: PROTOTYPES Systems Change Center, Vivian Brown, Principal Investigator, Stockton, California: Allies: An Integrated System of Care, Jennie Heckman, Principal Investigator, Thornton, Colorado: Arapahoe House – New Directions for Families, Nancy VanDeMark, Principal Investigator, Washington, DC: District of Columbia Trauma Collaboration Study, Roger Fallot, Principal Investigator, Avon Park, Florida: Triad Women's Project, Margo Fleisher-Bond, Co- Principal Investigator, Colleen Clark, Co- Principal Investigator, Boston, Massachusetts: Boston Consortium of Services for Families in Recovery, Hortensia Amaro, Principal Investigator, Cambridge, Massachusetts: Women Embracing Life and Living (WELL) Project, Norma Finkelstein, Principal Investigator, Greenfield, Massachusetts: Franklin County Women's Research Project, Rene Andersen, Principal Investigator, New York, New York: Portal Project, Sharon Cadiz, Principal Investigator. The Coordinating Center is operated by Policy Research Associates (PRA), located in Delmar, New York, in coordination with the National Center on Family Homelessness of Newton, Massachusetts and the Cecil G. Sheps Center for Health Services Research at the University of North Carolina (UNC) in Chapel Hill, North Carolina.

The interpretations and conclusions contained in this publication do not necessarily represent the position of the

WCDVS Coordinating Center, participating study sites, participating Consumer/Survivor/Recovering persons, or the Substance Abuse and Mental Health Services Administration and its three centers (Center for Substance Abuse Treatment, Center for Mental Health Services, Center for Substance Abuse Prevention).

References

- Agency for Healthcare Research and Quality. (2003). Medical Expenditure Panel Survey: Data & Publications. Rockville, MD. Available: http://www.meps.ahrq.gov/data_public.htm. Retrieved October 21, 2003.
- Anderson, D. W., Bowland, B. J., Cartwright, W. S., & Bassin, G. (1998). Service-level costing of drug abuse treatment. *Journal of Substance Abuse Treatment*, 15, 201–211.
- Bergman, B., & Brismar, B. (1991). A 5-year follow-up of 117 battered women. *American Journal of Public Health*, 81, 1486–1489.
- Bryer, J. B., Nelson, B. A., Baker Miller, J., & Krol, P. A. (1987). Childhood sexual and physical abuse as factors in adult psychiatric illness. *American Journal of Psychiatry*, 144, 1474–1476.
- Carmen, E., Rieker, P., & Mills, T. (1984). Victims of violence and psychiatric illness. *American Journal of Psychiatry*, 141, 378–383.
- Coalition for the Homeless. (2001). Rental Assistance for Working Homeless New Yorkers. Briefing Paper. Available: www.coalitionforthehomeless.org, retrieved October 21, 2003.
- Cocozza, J. J., Jackson, E. W., Hennigan, K., Morrissey, J. P., Glover Reed, B., Fallot, R., & Banks, S. (2005). Outcomes for women with co-occurring disorders and trauma: Program-level effects. *Journal of Substance Abuse Treatment*, 28, 109–120.
- Daley, M., Arherious, M., McCarty, D., Callahan, J. J., Shepard, D. S., & Williams, C. N. (2000). The costs of crime and the benefits of substance abuse treatment for pregnant women. *Journal of Substance Abuse Treatment*, 19, 445–458.
- Dalton, K., Domino, M. E., Nadlicki, T., Stewart, S., & Morrissey, J. (2003). Developing capacity for integrated trauma-related behavioral health services for women: Case studies in start-up costs from five community sites. *Women & Health*, 38, 111–126.
- Domino, M. E., Norton, E. C., Morrissey, J. P., & Thakur, N. (2004). Cost shifting to jails after a change to managed mental health care. *Health Services Research*, 39, 1379–1401.
- Fenton, W. S., Hoch, J. S., Herrell, J. M., Mosher, L., & Dixon, L. (2002). Cost and cost-effectiveness of hospital vs residential crisis care for patients who have serious mental illness. *Archives of General Psychiatry*, 29, 357–364.
- French, M. T., & McGeary, K. A. (1997). Estimating the economic cost of substance abuse treatment. *Health Economics*, 6, 539–544.
- French, M. T., McCollister, K. E., Cacciola, J., Durell, J., & Stephens, R. L. (2002). Benefit-cost analysis of addiction treatment in Arkansas: Specialty and standard residential programs for pregnant and parenting women. *Substance Abuse*, 23, 31–51.
- French, M. T., Salomé, H. J., Sindelar, J. L., & McLellan, A. T. (2002). Benefit-Cost Analysis of Addiction Treatment: Methodological Guidelines and Empirical Application Using the CATCAP and ASI. *Health Services Research*, 37, 433–455.
- Gil-Rivas, V., Fiorentine, R., & Anglin, M. D. (1996). Sexual Abuse, Physical Abuse, and Post-traumatic Stress Disorder among Women Participating in Outpatient Drug Abuse Treatment. *Journal of Psychoactive Drugs*, 28, 95–102.
- Gold, M. R., Siegel, J. E., Russell, L. B., & Weinstein, W. C. (Eds.). (1996). *Cost-effectiveness in health and medicine*. Oxford University Press.
- Golding, J. M. (1999). Intimate partner violence as a risk factor for mental disorders: A meta-analysis. *Journal of Family Violence*, 14, 99–132.
- Harris, M. (1994). Modifications in service delivery and clinical treatment for women diagnosed with severe mental illness who are also the

- survivors of sexual abuse trauma. *Journal of Mental Health Administration*, 21, 397–406.
- Humphreys, K., & Moos, R. H. (1996). Reduced Substance-abuse-related health care costs among voluntary participants in alcoholics anonymous. *Psychiatric Services*, 47, 709–713.
- Jennings, A. (1997). On being invisible in the mental health system. In M. Harris, & C. Landis (Eds.), *Sexual abuse in the lives of women diagnosed with serious mental illness* (2nd ed.). Netherlands: Harwood Academic Publishers.
- Kernic, M. A., Wolf, M. E., & Holt, V. L. (2000). Rates and relative risk of hospital admission among women in violent intimate partner relationships. *American Journal of Public Health*, 90, 1416–1420.
- Koss, M. P., Koss, P. G., & Woodruff, W. J. (1991). Deleterious effects of criminal victimization on women's health and medical utilization. *Archives of Internal Medicine*, 151, 342–347.
- McCaughey, J., Kern, D. E., Kolodner, K., Dill, L., Schroeder, A. F., DeChant, H. K., Ryden, J., Bass, E. B., & Derogatis, L. R. (1995). The 'Battering Syndrome': prevalence and clinical characteristics of domestic violence in primary care internal medicine practices. *Annals of Internal Medicine*, 123, 737–746.
- McHugo, G., Kammerer, N., Jackson, E. W., Markoff, L. S., Gatz, M., Larson, M. J., Mazelis, R., & Hennigan, K. (2005). Women, co-occurring disorders and violence study: Evaluation design and study population. *Journal of Substance Abuse Treatment*, 28, 91–107.
- Morrissey, J. P., Ellis, A. R., Gatz, M., Amaro, H., Glover Reed, B., Savage, A., Finkelstein, N., Mazelis, R., Brown, V., Jackson, E. W., & Banks, S. (2005). Outcomes for women with co-occurring disorders and trauma: Person-level effects. *Journal of Substance Abuse Treatment*, 28, 121–133.
- Najavits, L. M., Weiss, R. D., & Shaw, S. R. (1997). The link between substance abuse disorder and post-traumatic stress disorder in women: A research review. *The American Journal on Addictions*, 6, 273–283.
- Newmann, J. P., Greenley, D., Sweeney, J. K., & Van Dien, G. (1998). Abuse histories, severe mental illness, and the cost of care. In B. L. Levin, A. K. Blanch, & A. Jennings (Eds.), *Women's mental health services: A public health perspective*. Thousand Oaks, CA: Sage Publications.
- Reijneveld, S. A., & Stronks, K. (2001). The validity of self-reported use of health care across socioeconomic strata: A comparison of survey and registration data. *International Journal of Epidemiology*, 30, 1407–1414.
- Siegel, C., Laska, E., & Meisner, M. (1996). Statistical methods for cost-effectiveness analyses. *Controlled Clinical Trials*, 17, 387–406.
- Sindelar, J. L., Jofre-Bonet, M., French, M. T., & McLellan, A. T. (2004). Cost-effectiveness analysis of addiction treatment: Paradoxes of multiple outcomes. *Drug and Alcohol Dependence*, 73, 41–50.
- Svikis, D. S., Golden, A. S., Huggins, G. R., Pickens, R. W., McCaul, M. E., Velez, M. L., Rosendale, C. T., Brooner, R. K., Gazaway, P. M., Stitzer, M. L., & Ball, C. E. (1997). Cost-effectiveness of treatment for drug-abusing pregnant women. *Drug and Alcohol Dependence*, 45, 105–113.
- Weisner, C., Mertens, J., Parthasarathy, S., Moore, C., & Lu, Y. (2001). Integrating primary medical care with addiction treatment: a randomized controlled trial. *JAMA*, 286, 1715–1723.
- Welch, K. W., & Quirke, M. (2002). *Wisconsin substance abuse treatment capacity analysis: 2000 executive summary*. Madison, WI: University of Wisconsin Center for Health Policy and Program Evaluation.
- Wisner, C. L., Gilmer, T. P., Saltzman, L. E., & Zink, T. M. (1999). Intimate partner violence against women: do victims cost health plans more? *The Journal of Family Practice*, 48, 439–443.
- Yodanis, C. L., Godenzi, A., & Stanko, E. A. (2000). The benefits of studying costs: A review and agenda for studies on the economic costs of violence against women. *Policy Studies*, 21, 263–276.