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Managed Care and the Quality of Substance Abuse Treatment

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Abstract

Background: In the US, the spiraling costs of substance abuse and mental health treatment caused many state Medicaid agencies to adopt managed behavioral health care (MBHC) plans during the 1990s. Although research suggests that these plans have successfully reduced public sector spending, their impact on the quality of substance abuse treatment has not been established.
Aims of the Study: The Massachusetts Medicaid program started a risk-sharing contract with MHMA, a private, for-profit specialty managed behavioral health care (MBHC) carve-out vendor on July 1, 1992. This paper evaluates the carve-out's impact on spending per inpatient episode and three proxy measures of quality: (i) access to inpatient treatment (ii) 30-day re-admissions and (iii) continuity of care.
Methods: Medicaid claims for inpatient treatment were collapsed into episodes. Clients were tracked across the five-year period and an interrupted time series design was used to compare the three quality outcomes and spending in the year prior to (FY1992) and the four years during MHMA (FY1993-FY1996). Logistic and linear regression models were used to control for race, disability status, age, gender and primary diagnosis.
Results: Despite a 99% reduction in the use of hospital-based settings, access to 24-hour services overall increased by 38%, largely due to an expansion in the use of freestanding detoxification and acute residential services. Continuity improved by 73%. Nevertheless, rates of 7-day (58%) and 30-day (24%) readmission increased significantly, even after controlling for increases in disability status. Per episode spending decreased by 76% ($2,773), characterized by a dramatic spending reduction in FY1993 that was maintained but not augmented in subsequent years.
Discussion: The carve-out had mixed effects on the quality of substance abuse treatment. While one of the three measures (readmission rates) deteriorated, two improved (access and continuity).
Implications for Health Care Provision and Use: Rapid re-admissions were strongly associated with shorter lengths of stay, suggesting that strengthening discharge planning may preserve the benefits of MBHC while avoiding its risks.
Implications for Health Policies: Since reductions in Medicaid spending were impressive but finite, MBHC may not be the permanent solution to inflation in behavioral health care. MBHC firms should implement quality-monitoring programs to ensure that aggressive utilization management strategies do not compromise quality of care.
Implications for Further Research: The impact of managed behavioral health care should ideally be evaluated in randomized controlled studies. In addition, research is needed to establish that the quality measures employed in this evaluation - improved access, enhanced continuity and fewer rapid re-admissions - actually correspond to reductions in drug or alcohol use and other favorable outcomes obtained through client self-report or urinalysis.

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Introduction

The explosive growth of public sector managed behavioral health care (MBHC) in the United States during the 1990s raised legitimate concerns among policy makers, health care professionals and consumers about the potential for deterioration in the quality of substance abuse treatment services delivered to impoverished, disabled, pregnant, parenting, dual diagnosed and other needy clients who were dependent on these plans. The primary concern was that aggressive cost-containment measures would reduce access and utilization for substance abusers to the point where their ability to achieve stable recovery and accomplish other desirable lifestyle changes - such as employment, housing, family reunification, psychological well-being - would be seriously threatened. These concerns stimulated increased government funding for research into the impact of MBHC on the outcomes of treatment for "vulnerable" Medicaid clients.

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In this report, we address one critical issue - did the quality of substance abuse treatment services received by Massachusetts Medicaid enrollees improve or decline under the first four years of MHMA, the first public sector managed behavioral health care program in the US? To accomplish this, we examine three aspects of quality - access, continuity of care and rapid re-admissions - using Medicaid claims and enrollment files for clients who received drug and alcohol treatment in the period prior to (FY1992) and following (FY1993-FY1996) the introduction of MHMA in Massachusetts. Since cost containment was the major impetus for the expansion of public sector MBHC plans in the US, we also examine reductions in Medicaid spending on substance abuse treatment, although quality is the focus of the paper. These outcomes are supplemented by reports of changes in provider satisfaction before and after the introduction of managed care that were obtained from annual surveys of providers of substance abuse and mental health treatment. Using multiple measures of quality obtained through both qualitative and quantitative sources, the report fills a serious gap in the literature by providing more valid and reliable measures of quality than have been available to date.

Expansion of Managed Behavioral Health Care into the Public Sector

In the US private sector health care system, managed care has existed in some rudimentary form since the 1940s. However, the growing use of managed behavioral health care in public sector Medicaid programs has taken place almost entirely within the past decade.[1] Until that time, concerns about adverse treatment outcomes and the responsiveness of behavioral health care to financial incentives impeded the growth of MBHC among Medicaid and other public payers.[2,3]

In FY1993, the Massachusetts Division of Medical Assistance (DMA) became the first state Medicaid agency to offer a statewide managed behavioral health care plan to its beneficiaries,[3-8] contracting with MHMA, a private for-profit specialty vendor to provide services to approximately 375,000 Medicaid enrollees each year. Implementation was immediate, taking effect on July 1, 1992.

An independent evaluation of the first year of this plan's performance indicated that expenditures on behavioral health care (which included both mental health and substance abuse) were reduced by 48%, with no apparent sacrifice in access or quality.[4] These encouraging early results may have influenced the decisions of 48 other states to adopt some form of MBHC and at least 15 of these states adopted the carve-out model that was used in Massachusetts.[1]

Since the MHMA evaluation[4] was published in 1995, a growing body of literature has documented that MBHCs have been unusually successful in containing costs.[9-20] A positive relationship between MBHC and quality has been more difficult to establish, however. Conclusions about quality have been difficult to reach because few studies have direct measures of clinical outcomes before and after managed care - for example, through urinalysis or self-reported follow-up information on drug use, employment or other positive lifestyle changes. In contrast, much of the literature relies on proxy quality measures like re-hospitalizations, telephone waiting times or consumer satisfaction surveys, which have mixed evidence of validity.[21] Even given these limitations, however, the literature on quality has been inconclusive.

Improving Access

Because MBHC attempts to reduce spiraling health care costs through reducing the provision of clinically unnecessary services, preserving or improving access has generally been viewed as a critical component of quality. In the carve-out model, the provision of mental health and substance abuse services is managed separately from that of other medical care. Because they specialize in behavioral health care, carve-outs are hypothesized to have greater potential to enhance the quality of substance abuse treatment services than are HMOs or other integrated plans. Despite these advantages, there is the danger that carve-outs may also deny treatment to clients who are perceived as potentially high resource users - in other words, the most highly impaired clients - in an effort to contain costs. Whether or not a plan enhances or impedes access to treatment, especially for the neediest clients, is hence a very important determinant of quality.[21-23]

Surprisingly, in many states MBHC has often been found to *improve* rates of access, generally by offering their clients a wider range of inexpensive outpatient, day treatment and residential services in lieu of more costly hospital based services.[6,7,9,11-13,16,19,24-26] For example, the first MHMA evaluation[4] measured changes in access by the penetration rate, i.e., the number of unique clients who received any type of mental health or substance abuse treatment service divided by the total number of managed care enrollees. In the year following MHMA, the penetration rate rose from 212.7 per thousand enrollees to 222.6 per thousand enrollees indicating a 4.7% improvement in access. In a separate study of the same Massachusetts carve-out program, Dickey[6] reported that access to all types of inpatient/outpatient mental health treatment improved by 29% while costs decreased from $51 million to $13 million for psychiatrically disabled adult Medicaid beneficiaries in the year following MHMA.

Outside of Massachusetts, a recent government funded evaluation of the changes in access, utilization and costs associated with MBHC plans that were implemented by state Medicaid agencies in Iowa, Maryland and Nebraska concluded that access to behavioral health care services improved in all three of these states.[19] Similarly, managed behavioral health care initiatives in Colorado[9] and Oregon[11] were both successful in reaching the goals of cost containment and improved access.

There were only a few reported instances where the introduction of a MBHC plan was accompanied by declines in access to substance abuse treatment services for Medicaid enrollees.[27-29] For example, in addition to a series of other political, economic and administration difficulties, Tennessee's public sector MBHC was forced to close after access declined by 15%[27] and an early study in Pennsylvania found that Medicaid clients who enrolled in HMOs or PPOs were less

likely to access substance abuse treatment services than Medicaid enrollees served by a mixed managed/unmanaged plan.[28] Despite this, favorable reports from most states suggest that managed behavioral health care plans can improve access if designed and implemented properly.

Rapid Re-admissions to Acute Treatment Services/ Re-hospitalizations

Re-admissions to acute treatment services within a relatively short period of time are frequently used as proxy measures of relapse because many facilities require that clients be actively using alcohol or drugs as a pre-requisite for admission. This outcome is undesirable from the perspective of clients and their clinicians because it suggests that the client has returned to using drugs, perhaps due to inadequate or inappropriate treatment in the originating facility. The outcome is undesirable from the perspective of taxpayers, public agencies and managed care organizations because it shows that the client is relying on one of the least effective and most costly types of treatment. Although rapid re-admissions are widely used as a performance measure by managed care organizations, including MHMA in Massachusetts, they are controversial among treatment professionals and researchers alike. In fact, some clinicians would argue that clients who are re-hospitalized are experiencing better outcomes than those who are not re-hospitalized, but continue to use drugs and alcohol in the community.

On the other hand, it is undeniable that re-admissions to acute treatment services suggest that the client is experiencing some difficulty maintaining stable recovery[4,31,32] and some research has found strong evidence for the predictive validity of the recidivism measure. For example, a study of pregnant drug-dependent women in Massachusetts found that being re-admitted to detoxification during pregnancy significantly increased the likelihood of delivering a low birth weight infant.[33]

In the Callahan study,[4] a re-admission to any 24-hour service within 30 days of discharge from another overnight stay was used as a measure of "relative" quality. This measure declined from 19% to 18%, a non-significant amount. For her group of schizophrenics, Dickey *et al.*[7] examined at 30 day re-admissions to psychiatric hospitals as one of several quality measures, and found that they increased by a non-significant amount in the two years after MHMA. Merrick found no difference in re-hospitalization rates for patients with major depressive disorder after the implementation of an MBHC carve-out plan for Massachusetts state employees.[16] Retrospective examination of 1,594 patients records from a large treatment center in Hawaii found no difference in rates of re-admission to equal or higher levels of care within a two year interval for four groups of substance abuse clients: intensive managed care, traditional managed care and two unmanaged groups.[34] Hence, the literature provides little evidence that managed care has caused an increase in rapid re-admissions for either substance abusers or mental health patients.

Continuity of Care

Promoting continuity of care is another proxy measure that has been used to judge the impact of managed behavioral health organizations on quality. Defined as the percent of clients who successfully complete referrals to a lower level of treatment (residential, outpatient or methadone) within a short time period (7, 14 or 30 days) of discharge from a higher level of treatment (detoxification or inpatient hospitalization), achieving continuity is desirable because it suggests that clients are receiving additional treatment beyond detoxification. Many clinicians feel that the likelihood of recovery is enhanced if the client moves along a continuum of services of decreasing intensity that are necessary to resolve longstanding difficulties and achieve stable recovery.

Indeed, there is considerable evidence linking continuity of care with reductions in drug use and other favorable outcomes among various treatment subpopulations and demographic groups.[33,35-40] For example, a recent cost-effectiveness analysis reported that clients who received the full continuum of substance abuse treatment services (defined as detoxification followed by residential and outpatient) experienced better outcomes and lower overall costs than a comparable group of public-sector clients who received a partial continuum of services only, in terms of reduced medical and psychiatric care, reduced criminal activity and increased legitimate earnings.[41]

In the ideal situation, a behavioral health carve-out can improve continuity of care by contracting with a larger and more specialized network of established treatment providers and encouraging these providers to cooperate with one another. The few studies that have examined the impact of managed care on the continuity of treatment services, however, have reported equivocal results. In studying a group of clients with major depressive disorder, Merrick[16] found that the likelihood of obtaining follow-up outpatient or residential treatment within 15 (59% to 76%) or 30 (67% to 84%) days of discharge from an inpatient hospitalization increased significantly following the introduction of a managed care carve out plan for Massachusetts state employees. On the other hand, Dickey found that continuity - defined as an admission to outpatient treatment within 30 days of discharge from an inpatient hospitalization - decreased from 50% to 46% in the two years following MHMA for a group of schizophrenic patients.[7]

Direct Measures of Clinical Outcome

As we mentioned previously, few studies have obtained direct measures of clinical outcomes. In the area of addictions treatment, evidence of the positive or negative effects of managed care on client drug use, employment, legal problems and other lifestyle changes are limited. A notable exception is a recent study that used the Addiction Severity Index (ASI) to compare self-reported post-treatment changes in seven life areas (medical, employment, drug use, alcohol use, legal problems, family/social problems, psychological symptoms) for 145 men and 149 women under managed care (a private,

for-profit carve-out) and fee-for-service plans.[44] The sample were all participants in the Target Cities Demonstration Project, located in nine community outpatient programs in lower income areas of Philadelphia. Despite the perception that managed care restricts service delivery, there were no significant differences in the amount of treatment services received by members of the two funding groups. After controlling for severity at intake, there were also no significant difference in ASI change scores by funding group, except that patients treated under managed care plans showed more improvement in their drug use composite scores. The authors concluded that managed care did not have an unfavorable effect upon treatment utilization or client outcomes. Although the evaluation involved only outpatient facilities, which may be less subject to managed care oversight than inpatient/residential programs, the findings are particularly relevant because they concern a for-profit managed care carve-out, they involve a predominantly low-income minority population, and because they look specifically at treatment for chemical dependency.

Despite encouraging findings from the Target Cities study, there is some evidence to suggest that substance abuse services may be especially vulnerable to controls in utilization and attendant costs. For example, the first Massachusetts evaluation[4] found that per enrollee expenditures on substance abuse treatment services were reduced much more drastically (48%) than were expenditures on mental health treatment (19%). Huskamp[14] reported that when a carve-out was initiated for state employees, spending on inpatient episodes for major depression (67%) and substance abuse disorders (55%) declined much more precipitously than for other conditions. Several studies have reported reductions in the utilization of both inpatient and outpatient services for alcohol and drug treatment after the introduction of MBHC[2,18,30] and cautioned that these reductions did not appear to be compensated for by an increase in the use of intermediate residential services. Findings like these have caused the American Society for Addiction Medicine to warn that managed care has had a greater impact upon substance abuse treatment services than other areas of health care and that client outcomes should be closely monitored to ensure that a deterioration in health status or functioning does not result. The recent spread of the HIV virus among intravenous drug users makes this recommendation particularly timely.

To help preserve the quality of addictions treatment services with a managed care environment, this paper adds to the literature in several ways: by offering information on the relative risks and benefits of alternative treatment programs, by covering an extended post-intervention period (4 years) and by evaluating multiple measures of quality, our findings can help stakeholders to make more intelligent resource allocation decisions that will contribute to better treatment.[23]

Methods

Data Sources

All Medicaid claims for substance abuse treatment received by MHMA enrollees less than 65 years of age from FY1992 through FY1996 (July 1, 1991 through June 30, 1996) were obtained from what is now the Department of Transitional Assistance, Division of Medical Assistance (DMA). Unlike some other states, Massachusetts did not switch to an encounter-based reporting system when managed care was introduced. On the contrary, although MHMA was paid on a capitated basis with some sharing of profits and losses above a given target, DMA's contract with MHMA specified that a claim be submitted for all mental health and/or substance abuse treatment services delivered. This requirement ensured that there were comparable pre- and post- intervention data to permit monitoring and evaluation of MHMA's performance.

A claim for substance abuse treatment was defined as any invoice of type 1 (hospitalizations), 3 (clinic visits), 5 (physician's services) or 9 (miscellaneous services) meeting at least one of the following criteria: (i) a primary diagnosis of drug or alcohol abuse or dependence; (ii) a primary diagnosis of mental health disorder and a second, third, fourth or fifth diagnosis of drug or alcohol abuse or dependence; (iii) identified by DMA as a specialty substance abuse service based on invoice type, procedure code, provider type or provider specialty code. Claims for pharmaceuticals, transportation, Medicare crossover services and dental visits were not included. Using the unique identifier used by Medicaid (Recipient Historical Number or RHN), each client was matched with his enrollment record to obtain demographic information and to ensure that the client was eligible for Medicaid and participating in MHMA at the time of the claim.

Based on an algorithm used in the prior Brandeis MHMA evaluation,[4] all claims were categorized into 21 service types based on invoice type, primary diagnosis, procedure code, provider type and provider specialty and collapsed into four modalities: (i) acute inpatient treatment for alcohol or other drug (AOD) withdrawal (ASAM level 4); (ii) acute residential services (ASAM level 3); (iii) day treatment/ regular outpatient (ASAM levels 1 and 2); and (iv) methadone counseling. Claims for methadone dosing were excluded because preliminary analyses indicated that virtually all of these clients (99%) had also received counseling.

Outcome Measures

Access

The penetration rate for 24-hour services (those with beds) is defined as the total number of unique clients admitted to any 24-hour service in each fiscal year per 1000 managed care enrollees. The average number of managed care enrollees was determined by total person-days of eligibility during the year divided by 365 (or 366 during leap years).

Rapid Re-admissions and Continuity of Care

Claims for the five years were merged and a chronological file was created for each client, sorting by admission date and modality. Because multiple claims are frequently submitted within a single inpatient stay, individual claims were grouped

into episodes. For inpatient and residential treatment, an episode was defined as any sequential claims of the same modality with 0 or 1 days between the discharge date of the first claim and the admission date of the second claim. A lapse of 2 days or longer was considered a re-admission and not a continuation of the same episode. For outpatient and methadone claims, we determined that a new episode had been initiated whenever there was an interval of 45 or more days between successive visits. Within each episode, the total days or sessions attended and the Medicaid payments (amount paid rather than amount billed) were summed, resulting in a file with 55,304 distinct episodes with admission and discharge dates.

The number of days between episodes was then computed. For inpatient or residential treatment, an admission to a lower level of care (outpatient, methadone or a lower level of residential) within 14 days of discharge from a first inpatient or residential episode was assigned a "1" for continuity of care, a favorable outcome. If the client was admitted to the same or a higher level of care within 2 to 30 days, it was assigned a "1" for a rapid re-admission, an unfavorable outcome. Since the calculation looked forward up to six episodes to identify re-admissions within 30 days, it is possible for a client to have both continuity and rapid re-admission for the same episode, if he was discharged to a lower level of care and subsequently re-admitted to a higher level of care within 30 days of the first discharge.

If a client received outpatient or methadone services concurrently with a residential or inpatient treatment episode, continuity was achieved only if the outpatient or methadone visits extended beyond the discharge date for the residential or inpatient episode. Preliminary frequency distributions and summary statistics were conducted on all variables by year of service to assess the integrity and face validity of this episode-based data set. All episodes were then classified by year of admission, and as to whether the episode was initiated prior to or following the introduction of managed care on July 1, 1992 (POSTMC=1). Clients whose first admission occurred after May 31, 1996 were excluded because they would not have had a full month in which to monitor services with the available data.

All client characteristics available from the claims or enrollment files were selected as control variables, including age, race, gender, eligibility status (which was dichotomized into disabled versus non-disabled), or primary diagnosis according to ICD-9 code (cocaine, heroin, alcohol, other drug or mental health). A mental health diagnosis indicated co-morbidity since all clients were substance abusers. The six racial categories (White, Black, Hispanic, Asian, Native American and Eskimo) were collapsed into White, Black, Hispanic and Other. Each of five age groups, race and drug of choice were expressed as categorical variables to permit the calculation of odds ratios. Although income and education were not available, all clients should be below 185% of the federal poverty level as a pre-requisite for Medicaid eligibility.

To identify other variables that may have contributed to changes in the quality of treatment over this time period, we used chi-square, t-tests, analysis of variance and general linear models regression analysis (PROC GLM) with interaction terms to test for trends in client characteristics over time.

In our previous evaluations,[4,26] we discovered that MHMA contained costs by drastically reducing inpatient hospitalizations and increasing the use of intermediate residential services. To compare the impact of the newer treatment programs on quality and costs, separate regressions were estimated with six of the seven inpatient treatment options: free-standing (non-hospital based) detoxification programs, mental health hospitals, mental health hospitals for clients under 21 years of age, acute residential substance abuse treatment programs, acute residential substance abuse treatment programs for clients under 21 years of age, crisis intervention and mental health residential programs - as explanatory variables. The reference case (the omitted variable) was substance abuse hospitalization, which was the preferred form of treatment prior to managed care. We also looked at the duration of a treatment episode and calculated two summary variables: any hospital use (use of mental health hospitals, substance abuse hospitals or mental health hospitals for clients under 21 years of age) and episodes with duration of treatment less than 3 days. All regressions controlled for race, gender, age, eligibility status and diagnosis code. Interaction effects were not estimated between MHMA and any of the program variables since the duration of a treatment episode, the decision to admit a client to a hospital and type of treatment program were considered intermediate outcomes that reflected the MHMA approval and review policies, as well as the complexity of the admission. All quality regressions were estimated with the logistic regression procedure (PROC LOGISTIC) of the SAS Program, Version 8.[45]

Spending

Since costs are calculated from the perspective of the state Medicaid authority, spending per episode is defined as the total amount paid by Medicaid for each episode of care. This sum should not be confused with the amount that providers billed to Medicaid or the true cost of the resources consumed in providing treatment. All expenditures were adjusted to the midpoint of FY 1996 dollars using the Consumer Price Index-All Urban Consumers, Boston area, Medical component.[46] Cost regressions were estimated using the ordinary least squares regression procedure (PROC REG) of the SAS Program, Version 8.

Data Analytic Procedures

This paper examines the cost and quality of various policy options using multiple and/or logistic regression to adjust for changes in demographic characteristics (age, race, gender) and historical changes (drug of choice, eligibility status) that may have independently affected spending, continuity or rapid re-admissions over time. Coefficients from the cost regressions tell us how much each explanatory variable (including managed care) adds to (or diminishes) the average

Table 1. Client characteristics FY1992 to FY1996

		Carve-out begins				Percent change
Program characteristic	FY92	FY93	FY94	FY95	FY96	FY92-FY96
Average MBHC eligibles	365,031	368,111	379,805	384,027	373,111	+2%
Gender (in percent)						
%Male	49.9%	49.8%	47.7%	47.3%	48.0%	-4%
%Female	50.1%	50.3%	52.3%	52.7%	52.0%	+4%
Race						
%White	78.0	78.1	79.6	77.9	75.9	-3%
%Black	16.4	15.7	14.3	15.2	15.6	-5%
%Hispanic	4.5	5.2	5.2	5.7	5.3	+17%
%Other race	1.2	1.0	1.0	1.3	3.3	+l75%
Age category						
%Under 21	7.4	9.6	11.4	9.6	10.3	+3%
%21 to 30	32.0	24.5	22.8	21.2	17.7	-44%
%31 to 40	36.7	40.2	40.7	41.5	40.6	+11%
%41 to 50	15.6	17.4	17.8	20.0	23.6	+51%
%Over 50	8.3	8.2	7.4	7.8	7.8	+6%
Drug of choice (ICD9 code)						
%Heroin*	19.4	20.1	21.5	22.7	28.1	+45%
%Cocaine*	14.7	10.1	8.6	9.1	10.7	-27%
%Alcohol*	55.5	55.1	38.9	33.5	35.2	-37%
%Other drugs	10.4	8.9	15.3	17.9	7.9	-24%
%Dual diagnosed	17.7	11.2	16.7	17.6	18.6	+5%
%Disabled*	51.9	57.7	61.6	65.3	69.0	+33%

* Differences between the pre- and post-managed care periods are significant according to Fisher's Exact test for dichotomous variables and paired comparison t-tests for continuous variables, p<.01

Medicaid expenditure for an episode of 24-hour care after controlling for changes in eligibility status, race, gender, age and primary diagnosis. Odds ratios from the logistic regressions can be multiplied by the mean rate of re-admission or continuity to assess the magnitude of each explanatory variable's contribution (including managed care), after other changes are held constant. A particularly useful feature of this type of analysis is that if the quality and cost coefficients for the same program are taken together, it suggests how much additional spending is required to achieve a given increment in quality after controlling for other factors.

Results

Nearly nine-tenths (87%) or 48,294 of the 55,304 episodes occurred after the introduction of managed care (**Table 1**). Between FY1992 and FY1996, the percentage of disabled persons and the proportion of episodes with a diagnosis for a heroin problem increased significantly, while cocaine and alcohol disorders decreased significantly. These changes were consistent with a national reports of an increase in the proportion of Medicaid enrollees with disability status during the 1990s[47] and local reports from the Massachusetts Department of Public Health, Bureau of Substance Abuse Services (BSAS) of an increase in the purity and availability of heroin in the Boston area over this time period.[48]

Access

Although the proportion of overnight episodes occurring in hospitals declined by 99% following managed care (**Table 2**), access to all 24-hour services increased by 26% (**Figure 1**) between FY1992 and FY1996. The number of distinct users of all overnight services increased from 4,278 in FY1992 to 6,055 in FY1996, while the number of MHMA enrollees remained relatively stable. Declining numbers of hospital admissions were more than compensated for by increased admissions to non-hospital based inpatient services (free-standing detoxification, acute residential, level III detoxification, crisis intervention and mental health residential).

Rapid Re-admissions

On average, 20% of the inpatient/residential episodes were followed by an admission to the same or a higher level of care

Table 2. Types of programs attended for all episodes of substance abuse treatment with an overnight stay FY1992 to FY1996 (N=55,304)

		Carve-out begins				Percent change
Program characteristic	FY92	FY93	FY94	FY95	FY96	FY92-FY96
Types of Programs						
%AOD Hospital *	89.0	16.1	3.1	2.0	1.2	-99%
%Freestanding detoxication *	11.0	50.4	48.4	47.6	49.0	+765%
%MH residential<21 †	0.0	5.7	7.8	6.2	6.8	-
%Crisis stabilization †	0.0	0.03	7.9	10.7	11.5	-
%AOD residential †	0.0	15.2	17.0	18.3	18.5	-
%Level 3 detoxification †	0.0	12.1	14.6	13.9	11.8	-
%AOD residential<21 †	0.0	0.6	1.2	1.2	1.2	
Average days per episode ‡	7.45	5.33	5.20	5.40	5.48	-26%
% of episodes.with <3 days *	25.2	34.8	38.3	41.9	42.9	+70%
Average cost per episode *	$3,638	$956	$803	$813	$876	-76%
Total 24-hour episodes	7,010	9,610	11,692	13,325	13,667	55,304

† = new service in FY1993;
‡ = the amount paid by Medicaid adjusted to FY1996 dollars using the Medical Care Component of the Consumer Price Index, All Urban Consumers, Greater Boston Area (US Dept of Labor, 2002).
* Differences between the pre- and post-managed care periods are significant according to Fisher's Exact test.
MH = mental health; AOD = alcohol or drug.

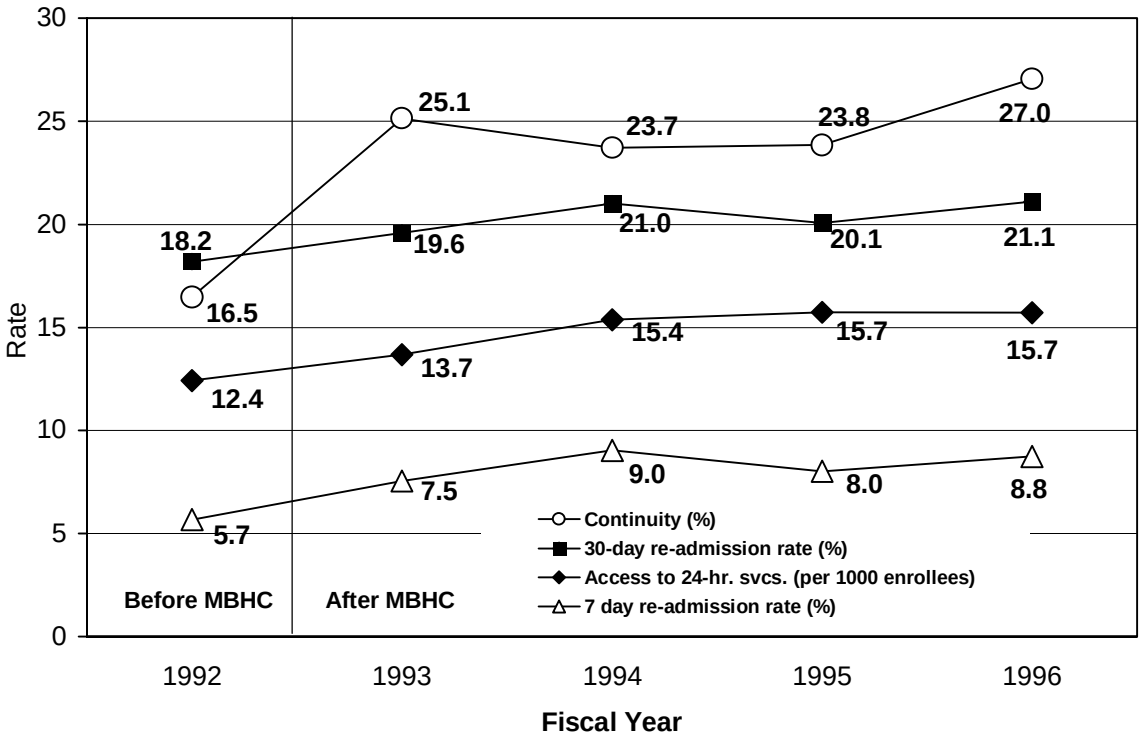

Figure 1. Quality measures before and after managed behavioral health care for Medicaid enrollees. *****

*Access is the number of unique clients who received inpatient substance abuse treatment services per thousand MHMA enrollees, These measures were standardized for eligibility status by weighting the rates for disabled and non-disabled enrollees by the respective proportions of enrollees in each eligibility status in 1994 (disabled 61.61%, non-disabled 38.39%).

within 30 days of discharge **(Figure 1**). The percentage of 24-hour discharges that were followed by a re-admission within 30 days increased from 18% in FY1992 to 21% in FY1996, a growth of 16%. The 7-day readmission rate rose even faster (by 69%) over these years. After adjusting for the effect of eligibility status, age, race and gender, logistic regression (**Table 3**) suggested that those who received treatment in the post-managed care period were 26% more likely to be re-admitted within 30 days (chi-square 44.33, p<.0001). Women, members of minority groups, cocaine abusers, clients under 21 years of age and those who stayed in treatment longer were significantly less likely to be re-admitted. Males, Caucasians, disabled individuals and those with dual diagnosis were more likely to be re-admitted.

In logistic regressions, treatment days per episode was by far the variable most strongly correlated with re-admissions to inpatient treatment (chi-square 912.56, p<.0001), considerably more significant than hospital use (chi-square 55.67, p<.0001). Clients with less than three days in treatment were more likely to recidivate (odds ratio = 1.77) and about half as likely to achieve continuity. However, as shown in **Table 2**, the percentage of clients who spent less than three days in treatment increased from 25% in FY1992 to 43% in FY1996.

Compared to substance abuse hospitals, episodes taking place in crisis intervention centers, freestanding detoxification and level 3 detoxification units were more likely to be followed by a re-admission to a higher level of care within 30 days, while episodes that occurred in substance abuse residential facilities for clients under 21, mental health residential programs for clients under 21, and substance abuse residential facilities were less likely to result in a 30-day re-admission.

Continuity

The proportion of discharges that were followed by an admission to a lower level of care increased from 16% in FY1992 to 27% in FY1996 (chi-square 308.80, p<.0001). This trend was characterized by an abrupt increase in FY1993,with smaller changes thereafter (**Figure 1**). After controlling for other trends, logistic regression indicated that clients in the post-managed care period were 73% more likely to complete referrals to continuing care (**Table 3**). The disabled, blacks, Hispanics, males, and those with a co-existing mental health diagnosis were less likely to receive continuing treatment services. Conversely, women, clients with a primary diagnosis of alcohol abuse, Caucasians and clients over 21were more likely to achieve continuity. Rates of continuity were particularly low for the dual diagnosed and clients under 21 years of age, perhaps owing to a paucity of services for this group.

Since managed care radically changed the setting in which treatment was delivered, it might be instructive to examine continuity by treatment setting (**Table 3**). Substance abuse detoxification facilities (adjusted OR =1.81) and level three detoxification facilities (adjusted OR =2.37) were much more successful in promoting continuity of care than the other types of 24-hour facilities examined in this report (substance abuse hospitals, acute residential, acute residential under 21, mental health residential, and mental health residential under 21). Mental health facilities had the lowest rates of continuity, suggesting that finding appropriate placements for patients with dual diagnosis may be difficult.

Spending on Treatment Episodes

The costs of a treatment episode plunged from an average of $3,638 in FY1992 to $876 in FY1996, a savings of $2,763 or 76% (**Table 2**). The average length of a treatment episode decreased by 26% from 7.45 days in FY1992 to 5.48 days in FY1996, characterized by an abrupt decline in FY1993 and no change thereafter. Reductions in spending and length of stay were maintained but not augmented in ensuing years (FY1994 to FY1996).

Ordinary least squares regressions show that managed care was most strongly associated with reductions in per episode expenditures (**Table 3**). Controlling for race, primary diagnosis, disability status, and gender, spending per episode declined by an average of $2,773 after MHMA took over (t=-19.05, p<.0001) below the intercept value of $4,671. Spending per episode did not differ by gender. Clients under 21, the dual diagnosed, clients over 50 and black clients were more expensive to treat. Hispanics, cocaine users, alcohol users, clients between 21 and 30, and the disabled were less expensive to treat.

Substance abuse hospitals were by far the most expensive locality in which to receive treatment and cost about $3,457 per episode. Coefficients from the cost regression show the savings that resulted when the carve-out replaced hospitals with the new, transitional services. For example, treatment in a freestanding detoxification cost $564 or $2,892 less than treatment in a substance abuse hospital. Each day of treatment added $246 to costs and decreased the likelihood of re-admission by about 9%. Receiving treatment in any type of hospital increased expenditures by $2,821 and decreased the likelihood of readmission by about 16%. Decreasing costs by $256 and reducing the likelihood of re-admission by 42%, continuity had an unequivocally favorable impact on outcomes. The costs associated with continuity were lower because clients who completed referrals to residential, methadone or outpatient treatment spent fewer days in the originating facility.

Discussion

This evaluation examined whether three measures of quality - access, rapid re-admissions and continuity - improved or deteriorated in the four years after the introduction of a public sector managed behavioral health care carve-out for Medicaid enrollees. Although the carve-out had a dramatic and immediate impact upon the treatment system, its overall effect on the quality of services received by Medicaid clients was mixed. Access to 24-hour treatment facilities improved and continuity of care increased by 73%, two highly favorable developments. Despite this, the likelihood of a re-admission

Table 3. Multiple and logistic regression: Impact of managed care on the adjusted odds of 30 day re-admissions, the adjusted odds of continuity of care and spending per episode for Medicaid enrollees (N=55,304).

Client or program charateristic	Re-admissions within 30 days (mean=20.3%)				Continuity of care (mean=23.8%)				Per episode costs (Intercept=$4,671)		
	Chi-square	Adjusted Odds ratio	95% Lower CL	95% Upper CL	Chi-square	Adjusted Odds ratio	95% Lower CL	95% Upper CL	Parameter Estimate	t	p
Managed care	44.33	1.26	1.18	1.35	246.85	1.73	1.61	1.85	-$2,773	19.02	<.0001
Gender											
Male (vs. female)	97.58	1.27	1.21	1.34	85.17	0.80	0.77	0.84	37	14.19	0.0085
Race (vs. Caucasian)											
Black	163.85	0.65	0.65	0.69	67.17	0.78	0.74	0.83	141	17.81	<.0001
Hispanic	10.04	0.84	0.75	0.93	19.27	0.81	0.73	0.89	-92	28.72	0.0013
Other race	7.33	0.66	0.49	0.89	2.62	0.79	0.73	1.05	29	75.48	0.7036
Primary diagnosis (vs. cocaine)											
Alcohol	24.00	1.20	1.12	1.30	85.75	1.39	1.30	1.45	77	3.76	0.0002
Heroin	26.00	1.23	1.14	1.33	27.10	1.22	1.13	1.31	188	8.46	<.0001
Mental health	73.96	1.41	1.30	1.52	461.95	0.36	0.33	0.39	689	30.28	0.3004
Other drug	3.87	1.10	1.00	1.20	68.10	1.41	l.30	1.53	26	1.04	<.0001
Disabled (vs. other eligibles)	311.15	1.66	1.57	1.76	39.23	0.85	0.81	0.90	-137	-8.71	<.0001
Age (vs. under 21)											
21 to 30	141.13	1.94	1.74	2.17	161.96	2.07	1.85	2.32	-1357	-49.82	<.0001
31 to 40	189.38	2.10	1.89	2.34	219.02	2.29	2.05	2.56	-1324	-50.38	<.0001
41 to 50	199.17	2.24	2.00	2.50	157.85	2.11	1.88	2.37	-1304	-45.10	<.0001
Over 50	178.11	2.32	2.05	2.63	36.62	1.51	1.32	1.73	-1173	-34.4 3	<.0001
Program (vs. AOD hospital)											
AOD detoxification	118.08	1.42	1.34	1.51	364.58	1.81	1.70	1.93	-2892	-164.51	<.0001
AOD level 3 detoxification	71.63	1.42	1.31	1.54	512.18	2.37	2.20	2.56	-2869	-123.70	<.0001
AOD acute residential	27.04	0.80	0.74	0.87	18.25	1.18	1.09	1.27	-2770	-128.97	<.0001
AOD residential <21	41.08	0.31	0.21	0.44	1.07	0.88	0.70	1.12	-1409	-22.52	<.0001
MH acute residential	229.29	1.98	1.82	2.17	272.39	0.32	0.28	0.37	-2869	-106.37	<.0001
MH residential <21	94.94	0.53	0.46	0.60	322.54	0.05	0.04	0.07	-166	-5.75	<.0001
Program elements											
Any hospital use	55.67	0.80	0.75	0.84	145.40	0.70	0.66	0.74	$2,660	147.03	<.0001
Length of stay	912.56	0.91	0.91	0.92	26.89	0.99	0.99	0.99	246	228.89	<.0001
LOS < 3 days	638.18	1.77	1.69	1.85	421.74	0.61	0.58	0.64	-1160	-69.42	<.0001
Continuity	389.61	0.58	0.55	0.61					-256	-14.17	<.0001
Re-admission within 30 days									-339	-20.59	< 0001

to the same or higher level of care within 30 days of discharge also increased by 26% even after controlling for other changes - such as a rise in heroin use and an increase in the disabled population - that could have adversely affected re-admission rates. To help reconcile these findings, the following paragraphs examine some of the advantages and disadvantages of the managed care carve-out program in Massachusetts.

It is certainly encouraging that overall access to 24-hour care did not decrease over the period of observation, particularly since other investigators have expressed concern that the expansion of new, intermediate levels of care did not compensate for the 99% decrease in the use of hospital-based services.[2] On the contrary, our study found that access to inpatient treatment improved by 26% over the course of the investigation, and our previous paper[26] reported that improvements in access (using the penetration rate) were even more pronounced for disabled individuals (58%) than for the non-disabled (22%). Although the penetration rate may be a crude measure of access, it is a widely used epidemiological tool that can be quite meaningful as a measure of *relative* access when comparing pre- and post-intervention service use. Most importantly, however, the findings suggest that MHMA did not achieve spending reductions by denying treatment to difficult clients, as many health care professionals had feared.

MHMA was granted more autonomy by DMA to improve quality while reducing escalating behavioral health care costs and hence was able to exert a great deal of influence over provider behavior. Perhaps for this reason, continuity of care improved quickly and dramatically (73%) in the first year of MHMA, suggesting that the carve-out used its leverage to encourage providers in their network to cooperate more fully with one another to ensure that referrals were completed.

It is undeniable that MHMA saved a great deal of money for the Commonwealth of Massachusetts at a time when Medicaid spending had been growing at over 20% per year. Rather than reducing the benefit, then Medicaid Director Bruce Bullen received a waiver from the Health Care Financing Administration to experiment with adapting private sector managed care techniques to behavioral health care programs funded through Medicaid.[4] By expanding the scope of services available, negotiating for lower rates with network providers and promoting treatment in less expensive facilities, MHMA preserved access and reduced the costs of inpatient substance abuse treatment episodes by 76%. In addition, examination of per episode cost reductions over time suggests that costs never returned to pre-managed care levels. However, there were no further spending reductions after FY 1993.

MHMA addressed the rising cost of mental health and substance abuse treatment in several ways. Through a competitive procurement, it contracted with 55 inpatient providers beginning in FY 1993 who could deliver cost-effective services, compared to 76 in the prior period. Secondly, it developed several levels of transitional residential care that had not been previously available to Medicaid recipients.Utilization decisions were based on strict clinical guidelines and client placement criteria were loosely based on those recommended by the American Society for Addiction Medicine (ASAM). Third, MHMA allowed virtually all existing outpatient treatment providers into its network, recognizing that the community mental health system had valuable experience serving this population. These strategies helped promote access to the least restrictive level of care, and enhanced continuity by allowing patients to remain with their existing clinicians.

Despite MHMA's initial problems in establishing credibility, a number of provider surveys[49-55,57] indicate that MHMA developed and maintained good clinical relationships with network providers, who commended MHMA for encouraging more cooperation between providers, for promoting better integration between mental health and AOD treatment, for their use of quality improvement initiatives like performance measurement and provider profiling, for encouraging effective discharge planning and for developing new services for women and minorities.[40-46] As a result, continuity improved 73% under MHMA, a substantial achievement. Continuity, in turn, was responsible for a 43% reduction in re-admission rates.

In the aftermath of these favorable changes, why did readmission rates increase? The first explanation would be that length of stay and the use of hospital-based services were reduced to the point where outcomes for substance abusers began to suffer. Coefficients from the regressions can be used to estimate the trade-offs between cost and quality that were involved in switching to less intensive levels of care, reducing the duration of a treatment episode and using fewer hospitals. In logistic regression, the duration of a treatment episode was the explanatory variable most closely associated with rapid re-admissions (χ^2=912.56, p<.0001, odds ratio=.91/day) with a chi-square almost twice as large as any other predictor (next closest in magnitude were continuity at χ^2=389.61, p<.0001, odds ratio=.58; and disability χ^2=311.15, p<.0001, odds ratio=1.57). When the carve-out cut the length of a treatment episode by two days, the Commonwealth of Massachusetts saved $492 per episode, but the likelihood of a readmission increased by 18%. The improvement in continuity of care was largely the result of creating new, transitional services to compensate for the decrease in length of stay. However, while some of the new services were successful, they did not appear to compensate for the reduction in length of stay. We could speculate that it might be disruptive for clients to be taken out of treatment and transferred to a new facility at a time when their recovery is so precarious.

The carve-out also dramatically altered the setting in which services were received, expanding their use of the 19 free-standing (non-hospital based) detoxification centers operated by the BSAS as a cost-containment measure and virtually eliminating the provision of addictions treatment in the more expensive hospital based facilities (these declined 99%, from 89% of all episodes in FY1992 to 1% of all episodes in FY1996). Compared to discharges from hospital-based treatment, however, the regression coefficients suggest that discharges from free-standing and level 3 detoxification facilities had 42% higher odds of re-admission within 30 days controlling for age, race, eligibility status and primary diagnosis. Although costs declined dramatically due to

expanding use of freestanding detoxification and level 3 detoxification, outcomes for clients treated in these facilities appear to be significantly worse than their counterparts in hospital-based units. In any event, the observations that those treated in hospital settings and those with longer duration of treatment fared better gives support to the speculation that re-admission rates increased because the coordination of other services could not keep pace with the reduction in length of stay. MHMA officials mentioned this problem particularly in regard to children's services, for whom coordination was required not only among multiple service providers, but also between DMA and other state agencies, such as the Department of Social Services. A shorter stay created two pressures: arrange the necessary coordination in a shorter time, and coordinate more services, as the client's condition might be more acute and demand more services after an earlier discharge.

A second explanation questions the validity of the use of rapid re-admissions as a measure of client outcome and the quality of care. Because rapid re-admissions are readily available from administrative data and easily measured, they are widely reported in the literature and commonly used as a performance measure. Despite this, the use of this particular measure has aroused considerable controversy among researchers, who argue that re-admission rates do not capture the true extent of substance use among treatment populations, omit clients who continue to use substances in the community and never return to treatment, and ignore the benefits of clients being more ready to acknowledge a recurrence of substance abuse and to seek treatment. In a study of clients in Veteran's Administration (VA) hospitals, Humphreys[56] found little correlation between detoxification re-admissions and self-reported follow-up information on medical status, employment and criminal justice involvement. This second explanation is supported by the results of three rounds of surveys of Massachusetts's substance abuse providers during the MHMA period.[49-55] In all cases, the providers gave favorable ratings to the clinical decisions of MHMA reviewers for adults for substance abuse and mental health services. The absence of primary outcome data from urinalysis or client self-reports is a serious limitation of this study.

On a positive note, some of the new residential services that MHMA created appear to be even more effective than the substance abuse hospitals they replaced. For example, re-admission rates for clients in substance abuse acute residential facilities were about 20% lower than those in substance abuse hospitals, clients in mental health residential facilities were about 47% less likely to be re-admitted and individuals in substance abuse residential under age 21 facilities were about 69% less likely to be re-admitted, the lowest rate of any setting examined. These findings underscore the importance of extending substance abuse treatment beyond the acute detoxification stages and MHMA ensured that these facilities were available for those who needed them.

The study has several limitations. First, using Medicaid claims to identify treatment utilization may underestimate the true extent of resource use in both the pre- and post-intervention periods. Since non-acute residential services are not covered under Medicaid, treatment in halfway houses, therapeutic communities or recovery homes would not be recorded in the claims data. Furthermore, any admissions to non-acute residential treatment that were made within 15 days of discharge from acute treatment services would falsely be recorded as a negative in the "continuity" calculations. Second, many individuals experience lapses in their eligibility for Medicaid benefits and any treatment utilized during these periods would not be reflected in the claims data. However, since these omissions would likely have affected both the pre- and post-managed care periods equally they should not bias the results. Second, although the data are several years old, they still have important lessons for other state agencies facing similar trade-offs between cost containment and quality of care. For example, inpatient treatment services should be of sufficient duration to prevent an increase in client re-hospitalization.

In conclusion, although MHMA had a record of solid accomplishments in Massachusetts - improving access, enhancing continuity of care and dramatically reducing costs - the carve-out's overall impact on the quality of treatment services received by Massachusetts Medicaid enrollees was equivocal. Findings suggest that clients who sought substance abuse treatment over this time period experienced greater difficulty maintaining stable recovery after MHMA, as reflected in a 26% greater likelihood of a re-admission to acute treatment services within 30 days. This change may be due to the challenges in coordinating services from other state agencies within the shorter 24-hour stay. Since the decision to adopt MBHC may involve some balancing of costs and quality, the performance of these programs should be closely monitored.

References

1. Robinson GK. *Managed Care Tracking Systems: State Profiles on Public Sector Managed Behavioral Health Care and Other Reforms*. Rockville, Md: US Dept of Health and Human Services, Substance Abuse and Mental Health Services Administration; 1998. Publication SMA 99-3289.
2. Frank RG, McGuire TG, Notman EH, Woodward RM. Developments in Medicaid managed behavioral health care. In: *Mental Health in the United States*. Rockville, MD: US Dept of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Mental Health Services; 1996.
3. Sabin JE, Daniels N. Public-sector managed behavioral health care: II. Contracting for medicaid services - the Massachusetts experience. *Psychiatr Serv* 1999; **50**(1): 39-41.
4. Callahan JJ, Shepard DS, Beinecke RH, Larson MJ, Cavanaugh, D. Mental health/substance abuse treatment in managed care: The Massachusetts Medicaid experience. *Health Aff* 1995; **143**(3):173-184.
5. Counihan CW, Nelson D, Pattullo R. A Medicaid mental health carve-out program: the Massachusetts experience. *Manag Care Q* 1996; **4**(3): 85-92.
6. Dickey B, Norton EC, Azeni H, Fisher W, Altaffer F. Managing the care of schizophrenia: lessons from a four year Massachusetts Medicaid study. *Arch Gen Psychiatry* 1996; **53**(10): 945-52.
7. Dickey B, Norton, EC, Normand S, Azeni H, Fisher W, Altaffer F. Massachusetts Medicaid managed care reform: treatment for the psychiatrically disabled. *Advances in Health Economics and Health Research* 1995; **15**: 99-116.

8. Frank RG, McGuire TG. 1997. Savings from a Medicaid carve-out for mental health and substance abuse in Massachusetts. *Psychiatr Serv* 1997; **48**(9): 1147-52.
9. Bloom JR, Hu TW, Wallace N. Mental health costs and outcomes under alternative capitation systems in Colorado: early results. *J Ment Health Policy Econ* 1998; **1**:3-13.
10. Cuffel B, Regier D. The relationship between treatment access and spending in a managed behavioral health organization. *Psychiatr Serv* 2001; **52**(7):949-52.
11. Deck DD, McFarland BH, Titus M, Laws E, Gabriel RM. Access to substance abuse treatment under the Oregon health plan. *JAMA* 2000; **284**(16):2093-99.
12. Grazier KL, Eselius LL. 1999. Mental health carve-outs: effects and implications. *Med Care Res Rev* 1999; **56**(Supplement 2):37-59.
13. Grazier KL, Eselius LL, Hu TW, Shore KK, G'Sell WA. Effects of a mental health carve-out on use, costs and payers: a four-year study. *J Behav Health Serv Res* 1999; **26**(4):381-89.
14. Huskamp H. How a managed behavioral health carve-out plan affected spending for episodes of treatment. *Psychiatr Serv* 1998; **49**:147-61.
15. Ma CA, McGuire TG. Costs and incentives in a behavioral health carve-out. *Health Aff* 1998; **17**(2):53-69.
16. Merrick, EL. Treatment of major depression before and after the implementation of a behavioral health carve-out plan. *Psychiatr Serv* 1998; **49**:1563-67.
17. Steenrod S, Brisson A, McCarty D, Hodgkin D. Effects of managed care on programs and practices for the treatment of alcohol and drug dependence. In: Galanter M, ed. *Recent Developments in Alcoholism,Volume 15: Services Research in the Era of Managed Care.* New York, NY: Kluwer Academic/Plenum Publishers; 2001
18. Stein B, Reardon E, Sturm R. Substance abuse service utilization under managed care: HMOs versus carve-out plans. *J Behav Health Serv Res* 1999 **26**(4):451-456.
19. Argeriou M, McCarty D, Dilonardo J, Denmead G, Ettner S, Normand SL, Tompkins E, Bouchery E, Harwood H, Pugh-YI R, Tepper F. *State Substance Abuse/Mental Health Managed Care Evaluation: Final Contract Report* Rockville, Md: US Dept of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Substance Abuse Treatment/Center for Mental Health Services 2001. CSAT/CMHS Contract #270-96-0002
20. Sturm R. Tracking changes in behavioral health: how have carve-outs changed care? *J Behav Health Serv Res* 1999; **26**(4): 360-371.
21. Hellinger FJ. The effect of managed care on quality: a review of recent evidence. Arch Intern Med 1998; **158**: 833-41.
22. Vogelsang I. Economic aspects of mental health carve-outs. *J Ment Health Policy Econ* 1999; **2**(1): 29-41.
23. Galanter M, Keller DS, Dermatis H, Egelko S. The impact of managed care on substance abuse treatment: a problem in need of solution (A report of the American Society of Addiction Medicine). In: Galanter M, ed. *Recent Developments in Alcoholism, Volume 15: Services Research in the Era of Managed Care.* New York, NY: Kluwer Academic/Plenum Publishers; 2001.
24. Rohrer JE, Rowland BM, Westermann J, Knott J, Zwick J. Managed care for substance abuse treatment: impact in Iowa. *Adm Policy Ment Health* 1999 Jul **26**(6):429-33.
25. Goldman W, McCulloch J, Sturm R. Costs and use of mental health services before and after managed care. *Health Aff* 1998; **17**(2):40-52.
26. Shepard DS, Daley M, Ritter GA, Hodgkin D. Effects of a state-wide carve-out on spending and access to substance abuse treatment in Massachusetts, 1992 to 1996. *Health Serv Res* 2002; 36(6) Part II: 32-44.
27. Chang CF, Kiser LJ, Bailey, JE, Martins M, Gibson WC, Schaberg KA, Mirvis DM, Applegate WB. Tennessee's failed managed care program for mental health and substance abuse services. *JAMA* 1998; **279**(11):864-69.
28. Asher M, Friedman N, Lysioneck C, Peters C. *Evaluation of the implementation of Pennsylvania's Act 152: The quantitative findings* Villanova (PA): Human Organization Science Institute, Villanova University; 1995.
29. Ellis RP. *Drug abuse treatment patterns before and after managed care* Third Annual Advisory Committee on Managed Care Meeting. Washington, DC: April 27, 1992.
30. Brisson AS. *Changes in a managed behavioral health care carve-out and the impact on substance abuse services* [dissertation]. Waltham MA: Brandeis Univ.; 1999.
31. Barnett PG, Swindle RW. Cost-effectiveness of inpatient substance abuse treatment. *Health Serv Res* 1997; **32**(5):615-629.
32. Thakur NM, Hoff RA, Druss B, Catalanotto J. Using recidivism rates as a quality indicator for substance abuse treatment programs. *Psychiatr Serv* 1998; **49**(10):1347-1350.
33. Daley M, Argeriou M, McCarty D, Shepard DS, Callahan JJ, Williams CN. The impact of substance abuse treatment on birth weight and health care expenditures. *J Psychoactive Drugs* 2001; **31**(1):57-66.
34. Renz EA, Chung R, Fillman TO, Mee-Lee D, Sayama M. The effect of managed care on the treatment outcome of substance use disorders. *Gen Hosp Psychiatry* 1995; **17**:287-292.
35. *Principles of Drug Addictions Treatment: A Research Based Guide* Rockville (MD): US Department of Health and Human Services, Public Health Service, National Institute on Drug Abuse; 1999. NIH Publ No.: 99-4180.
36. Miller NS, Ninonuevo F, Hoffmann NG, Astrachan BM. Prediction of treatment outcomes: lifetime depression versus the continuum of care. *Am J Addict* 1999; **3**:243-53.
37. McKay, JR. The role of continuing care in outpatient alcohol treatment programs. In: Galanter M, Ed. *Recent Developments in Alcoholism,15: Services Research in the Era of Managed Care.* New York, NY: Kluwer Academic/Plenum Publishers 2001
38. Rapp RC, Siegal HA, Li L, Saha P. Predicting post-primary treatment services and drug use outcome: A multivariate analysis. *Am J Drug Alcohol Abuse* 1998; **24**(4):603-615.
39. Mattick RP, Hall W. Are detoxification programmes effective? *Lancet* 1996; **347**: 97-100.
40. Gerstein DR, Harwood HJ, Suter N, Maloy K. *Evaluating Recovery Services: The California Drug and Alcohol Treatment Assessment (CALDATA).* Sacramento, CA: California Department of Alcohol and Drug Problems: 1994.
41. French MT, Salome J, Krupski A, McKay JR, Donovan DM, McLellan AT, Durell J. Benefit-cost analysis of residential and outpatient addiction in the State of Washington. *Eval Rev* 2000; **24**(6):609-634.
42. Manning WG, Chuan-Fen L, Stoner TJ, Gray DZ, et al. Outcomes for Medicaid beneficiaries with schizophrenia under a prepaid mental health carve-out. *J Behav Health Serv Res* 1999; **26**(4):442-450.
43. Ware JE, Bayliss MS, Rogers WH, Kosinski M, Tarlov AR. Differences in four year health outcomes for elderly and poor, chronically ill patients treated in HMO and fee-for-service systems: results from the medical outcomes study. *JAMA* 1996; **276**(13):1039-1047.
44. Alterman AI, Randall M, McLellan AT. Comparison of outcomes by gender and for fee-for-service versus managed care: a study of nine community programs. *J Subst Abuse Treat* 2000; **19**:127-134.
45. *SAS/STAT Software. Version 8*. Cary, NC: SAS Institute, Inc.
46. US Dept of Labor, Bureau of Labor Statistics. *Consumer Price Index: All Urban Consumers, Boston Area, Medical Services.* Washington DC: US Dept of Labor; 2002.
47. Hoffman ED, Klees BS, Curtis CA. Overview of the Medicare and Medicaid programs. *Health Care Financ Rev Stat* Suppl. 2000; 1-348.
48. Commonwealth of Massachusetts, Department of Public Health, Bureau of Substance Abuse Services. *Drug Use Trends: Greater Boston 1992-1997.* Boston (MA): Health and Addictions Research, Inc.: 1998.
49. Beinecke RH, Callahan JJ, Shepard DS, Cavanaugh DA, Larson MJ. The Massachusetts Mental Health/Substance Abuse managed care program: the providers' view. *Adm Policy Ment Health* 1996; **23**(5): 379-391.
50. Beinecke RH, Goodman M, Lockhart A. The impact of managed care on Massachusetts' mental health and substance abuse providers. *Adm Soc Work* 1997; **21**(2):41-53.
51. Beinecke RH, Shepard DS, Goodman M. Assessment of the Massachusetts managed mental health/substance abuse program: year three. *Adm Policy Ment Health* 1997; 24(5):205-220.
52. Beinecke RH, Perlman SB. The impact of the Massachusetts managed mental health/substance abuse program on outpatient mental health clinics. *Comm Ment Health J* 1997; **33**(5):377-385.
53. Beinecke RH, Lockhart A. A provider assessment of the Massachusetts Medicaid managed behavioral health care program: Year four. *Adm Ment Health* 1998; **25**(4):411-426.
54. Beinecke RH, Keane RJ, Symanzick M, Casey D. The Massachusetts behavioral health program year five: transition to a new managed care organization. *Adm Policy Ment Health* 1999; **26**(5):313-327.
55. Shepard DS, Beinecke RH, Reif S, Cavanaugh DA. Effect of a managed care carve-out on substance abuse treatment in Massachusetts: the providers' perspective. *Alcohol Treatment Quarterly* 2002; in press.
56. Humphreys K, Weingardt KR. Assessing re-admission to substance abuse treatment as an indicator of outcome and program performance. *Psychiatr Serv* 2000; **51**(12):1568-9.
57. Beinecke RH, Shepard DS, Sousa D, Leung M. Evaluation of the Massachusetts behavioral health program: Year 8. *Adm Policy Ment Health* 2002; forthcoming.