

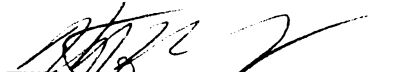
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I am submitting herewith a dissertation written by Dong Zhao-Siegel entitled "Analysis of Cost-Efficiency and Cost-Effectiveness in Tennessee's Public Mental Health Care Reform." I have examined the final copy of this dissertation for form and content and recommendation that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Economics.

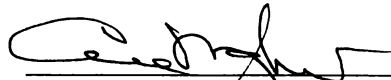


Milton Russell, Major Professor

We have read this dissertation
and recommend its acceptance:


Matthew N. Murray, Professor
Robert A. Bohm, Professor
Paul M. Jakus, Professor

Accepted for the Council:



Interim Vice Provost and
Dean of the Graduate School

Analysis of Cost-Efficiency and Cost-Effectiveness in Tennessee's Public Mental Health Care Reform

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Dong Zhao-Siegel
May 2001

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DEDICATION

This dissertation is dedicated to my mother

Mrs. Wang Xian

(王显)

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I am deeply indebted to my family, my husband Bruce and daughter Naomi, having them go through various anxieties with me while I was working on my dissertation. Bruce was also very contributive in critiquing my work.

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ABSTRACT

Tennessee's public mental health system was transformed from a fee-for-service program to a capitation-based managed care program in July 1996. Given the interest in alternative health care policies, the outcomes of such a reform experiment were evaluated from the perspectives of cost-efficiency and cost-effectiveness.

Monthly time series data on program expenditures, access, utilization, and quality of care were compiled for two distinct program periods: January 1994 to July 1996, the traditional fee-for-service period administrated by the Tennessee Department of Mental Health and Mental Retardation (TDMHMR); July 1996 to December 1998, the capitation-based managed care period administrated by the TennCare Partners Program (TPP). Utilization and quality of care functions were constructed for each period in which utilization (bed-days, services) and quality of care (recidivism rates) measures were assumed to be dependent on levels of program funding, positive demand for care (program users), and program payment characteristics (i.e., fee-for-service and capitation). The managed care impact was then tested with the hypotheses that the parameters of the TDMHMR (FFS) form of the functions were the same as those given by the TPP (capitation) form of the functions. With the rejection of the hypotheses, funding parameters were assessed to identify the direction and magnitude of cost-efficiency and cost-effectiveness. Multi-variable linear regressions, SAS[®] Auto-regression procedures, Chow tests, and maximum likelihood estimation were used in parameter estimations and outcome evaluation.

The research demonstrated that the managed care program achieved the goal of cost containment, at least in the short run. The comparable spending on inpatient and outpatient care for the TPP capitation program was nine percent below the projected spending in the TDMHMR fee-for-services program it replaced. The realization of cost containment was due primarily to volume and intensity reductions in inpatient and outpatient utilization. From the TDMHMR/FFS period to the TPP/capitation period,

inpatient bed-days were reduced by 21 percent, and average length of hospital stays was down from 19 days per month to 11 days per month. Outpatient services were down about seven percent, from five and one-half units of services per user per month to four units of services per user per month. The capitation program held average cost advantages in member cost (PMPM) and user cost (PUPM), even though the TPP program was not able to demonstrate comparative cost-efficiencies when measured in traditional output measures (i.e., per diem rate and unit cost of outpatient services) in the period observed. It is cautioned that the conclusion could be different if true costs of care from the provider level were known.

Despite the reduction in service utilization, all levels of access to care increased under the managed care program: 1,103 percent in program eligible members, 23 percent in program users, 39 percent in inpatient users, and 24 percent in outpatient users. More importantly, the managed care program demonstrated better quality of care outcomes measured by 30-, 60-, and 90-day recidivism rates. Despite the actual increase in inpatient admissions, the readmission rates per 1,000 covered lives or per 1,000 patients discharged moderated under the managed care program, regardless of the length of the measuring timeframe. Further, the regressions reviewed an inverse relationship between outpatient service utilization and outpatient program expenditures for the capitation program, as opposed to a positive relationship for the FFS system. In the short run, such an inverse relationship is considered typical within a managed care framework.

Besides managed care, the TPP's improvement in quality of care was largely attributed to reformatting of the service and treatment modalities of the public mental health care system. Management and intervention-oriented services and treatment programs such as case management, medication management, and crisis intervention received increasing emphasis over time, while lengthy treatment programs like day treatment, psycho rehabilitation, and therapy programs received less emphasis in managed care.

PREFACE

On July 1, 1996 Tennessee's public mental health system transitioned from a fee-for-service (FFS) reimbursement system to a capitation-based managed care system. Through carve-out contracting to two Behavioral Healthcare Organizations (BHOs), the reformed system, known as the TennCare Partners Program (TPP), offered mental health coverage to about one-fourth of Tennesseans, including 800,000 Medicaid eligible and 400,000 uninsured/uninsurable individuals. With the implementation of the mental health care reform program, the state was expecting to further strengthen cost containment efforts carried out under the TennCare initiative as well as improve mental health care access by offering it to more consumers in need. Given the interest and concern in alternative health care policies, this empirical research set forward to evaluate the TPP's performance from the perspectives of cost-efficiency (quantity of care with respect to program expenditures) and cost-effectiveness (quality of care with respect to program expenditures) compared to the performance of the traditional FFS system administrated by the Tennessee Department of Mental Health and Mental Retardation (TDMHMR).

Chapter one highlights contemporary issues along with the discussion of health care economics in a managed care context. Common cost drivers of public health care financing are discussed from the perspectives of demand and supply in the mental health care market. Discussed also are necessities to reconfiguring the healthcare landscape from a three-player to a four-player platform and to adopt managed care as an alternative to Tennessee's FFS mental health care system. Further, a series of literature on empirical studies dealing with cost containment and quality of mental health care is presented.

Chapter two discusses definitions of cost-efficiency and cost-effectiveness measurements. Along with the per diem rate and unit cost as efficiency measures, hospital recidivism rates are considered in measuring the effectiveness of a system of integrated mental health care. A brief discussion is made about the advantages of using recidivism as the indicator of quality. Among all measures, program expenditures,

adjusted for inflation in medical care services, are used as the base for cost-related analysis. Data collection, modeling, regression, and testing techniques will be discussed.

Chapter three presents cost-efficiency and cost-effectiveness analysis in the areas of program access, inpatient care, outpatient care, and quality of care. Actual TPP expenditures are compared to projected expenditures as if there were no changes made to the system in order to quantify the overall cost containment effort. Average and marginal unit costs are estimated based on service utilization trends in hospital bed-days, on outpatient service and treatment sessions, on influences of public program funding, on number of program users, and on program payment characteristics. Other commonly used price indicators, such as \$PMPM (per member per month) and \$PUPM (per user per month), also are evaluated. Further observations are made regarding strategic factors of managed care, such as service substitution, contracting, and service system reconfiguration.

Chapter four outlines findings obtained in the research. Policy relevance and implications associated with these findings also are discussed.

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ABBREVIATIONS AND ACRONYMS

ALLSVD	All Served
ALOS	Average of Length of Stay
AR	Autoregression/Autoregressive
BHO	Behavioral Health Organization
BLUE	Best Linear Unbiased Estimators
BPRS	Brief Psychiatric Rating Scale
CM	Case Management
CMHA	Community Mental Health Agency
CMHC	Community Mental Health Center
CMI	Chronically Mentally Ill
CPI	Consumer Price Indexes
CRG	Clinical Related Group
DPS	Direct Patient Service
DRG	Diagnosis-Related Grouping
FFS	Fee-for-service
FUNDPT	Program expenditures per 1,000 members
FY	Fiscal Year
GAS	Global Assessment Scale
GLM	Generalized Linear Model
HCFA	Health Care Financing Administration
HIPC	Health Insurance Purchasing Cooperative
HMO	Health Maintenance Organization
IP	Inpatient
IPDAYS	Inpatient Days
IPFUND	Inpatient Funding
IPSVD	Inpatient Served
LOS	Length of Stay
MCI	Mobile Crisis Intervention
MCO	Managed Care Organization
MCS	Medical Care Services
MH/SA	Mental Health and Substance Abuse
ML	Maximum Likelihood
OLS	Ordinary Least Squares
OP	Outpatient
OPFUND	Outpatient Funding
OPSVCS	Outpatient Services
OPSVD	Outpatient Served
PMPM	Per member per month
Premier	Premier Behavioral Health of Tennessee

PUPM	Per user per month
R^2	Coefficient of determination, <i>R</i> -square
RCID30D	30-day Recidivism Rate
RCID30DPT	30-day readmission rate per 1,000 members
RCID60D	60-day Recidivism Rate
RCID60DPT	60-day readmission rate per 1,000 members
RCID90D	90-day Recidivism Rate
RCID90DPT	90-day readmission rate per 1,000 members
RMHIs	Regional Mental Health Institutes
SANS	Scale for Assessment of Negative Symptoms
SAS®	Statistical Analysis System
SED	Serious Emotional Disorders
SMI	Serious Mentally Ill
SPMI	Severe Persistent Mentally Ill
SSE	Sum of Squared Errors
SVDPT	Served individuals per 1,000 members
TBH	Tennessee Behavioral Health, Inc.
TDMHMR	Tennessee Department of Mental Health and Mental Retardation
TPG	Target Population Group
TPP	TennCare Partners Program
WHO	World Health Organizations

Chapter 1: Introduction

This chapter highlights contemporary issues and discussions of health care economics in a managed care context. Common cost drivers of public health care financing are discussed from the perspectives of demand and supply in the mental health care market. Discussed also are the necessities to reconfigure the healthcare landscape and to adopt managed care as an alternative to Tennessee's fee-for-service (FFS) mental health care system. Further, the chapter introduces structural development, service domain, funding history, and payment characteristics for Tennessee's public mental health system. Lastly, a series of literature on empirical studies dealing with cost containment and quality of mental health care is presented.

1.1 Public Mental Health Care Reform--The Implication of Economics

Managed care reforms have pervaded the public mental health care and substance abuse treatment¹ arena rapidly through the 1990s. By the end of the decade, over 90 percent of the states had engaged in about 100 reform programs or activities, from aggressive and extensive risk-based carve-out contracting to small-scale capitation experiments geared to traditional safe-net providers. As of July 1999, Tennessee, along with eight other states², no longer offers mental health and substance abuse treatment and services under the traditional fee-for-service system. In fact, Tennessee is one of two states³ that offer mental health and substance abuse treatment and services under capitation-based carve-out contracts⁴ with Behavioral Health Organizations (BHOs), only to a much larger population (Steven, 1999 [1]; SAMHSA, 2000 [2]).

The necessity of aggressively engaging public mental health care in managed care reform is compelled by the nation's urgent need in curbing the fast growth in public health/mental health care expenditures, and by, if not as urgent, the need to further expand access to mental health care to more people who are in great need for care. Several key factors from both the demand and supply sides, and from

¹ Subsequently, the phrase mental health care will be used to denote mental health care and substance abuse treatment (MH/SA).

² According to the Lewin Group's report, as of July 1999 the following eight states are offering the full range of mental health and substance abuse services through HMOs or BHOs (except Washington) under capitation arrangements: Nebraska, Tennessee, Washington, Oregon, Rhode Island, Vermont, Virginia, and Wisconsin (SAMHSA, 2000 [2]).

³ Nebraska and Tennessee

⁴ Carve-out: A capitation system allowing for certain services normally considered covered to be carved out of the capitation payment. Expenditures of operating carve-out programs will be deducted from the original capitation program. In Tennessee, the TennCare Partners Program (mental health and substance abuse care) is a carve-out of the TennCare program (physical health care).

consumers to providers to government, are contributing to the financing crisis in the public mental health field.

On the demand side, our health care system still faces the reality of growing unmet health care demand, indicated by the increasing size of the uninsured and uninsurable population, and by the shortage of providing sufficient and effective services to the population in care. As Mechanic and Aiken summarized: “Public mental health services are seriously deficient. Care is typically under financed and fragmented and often inaccessible, and many seriously mentally ill persons suffer from considerable neglect (Mechanic and Aiken, 1989 [3], p. 1).” In Tennessee, the TennCare Partners Program (TPP) served about 106,000 consumers during FY1996-97⁵. According to national estimates, Tennessee has about 197,000 residents who suffers serious mental illness (SMI) solely among persons age 18 and older during a typical 12-month period (Kessler et al, 1998 [4], p. 104). Knowing that the majority of serious mentally ill are mainly cared for by the public sector, these statistics indicate that there is still a large number of people with great needs in mental health care in Tennessee who are not being properly cared for.

The pressures from the supply side are related mainly to funding adequacy, policy design on funding distribution, and payment methodology. In the past 10 years, Tennessee’s public mental health care spending has been growing at an average annual rate of nine percent, a rate that is above the national average for public health and mental health care expenses (Mckusick, et al. 1996 [5], p. 155), depicted in Figure 1. The potential for continuous growth at such a rate is challenged by the overall

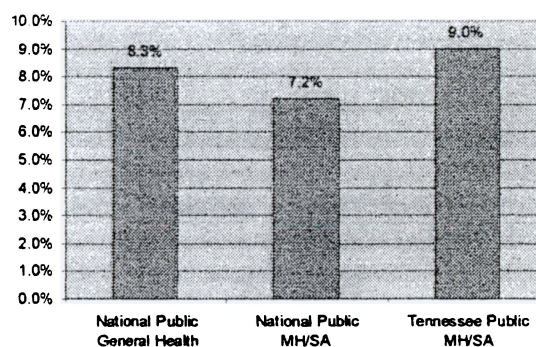


Figure 1: Annual Increases of Health Care Spending 1986-1996 (current dollars)

⁵ Source: TPP encounter data compiled by this researcher.

From this point forward, all statistics developed by this researcher will not be footnoted.

shortage in the federal budget and the state financial crisis that led to restructuring Tennessee's Medicaid program. The Tennessee Department of Mental Health and Mental Retardation (TDMHMR), funded mainly by Medicaid dollars, has to do its share in curbing public mental health care spending as well.

Several factors exist as the major forces in driving up expenditures on public mental health care.

1. Transferred or Adversely Selected Demand Historically, state governments played the significant role in caring for chronically mentally ill (CMI) who have been neglected by society and by private health care markets (Stein, 1989 [6]; Grob, 1990 [17]; Essock and Goldman, 1995 [15]). From market or insurer's perspectives, the unwillingness to treat mental illness is due largely to unforeseeable financial risks of a long-term commitment and uncertainties in the outcome of short-term treatments. Therefore, in general, private health insurance plans offer very limited mental health benefits (Newhouse, 1995 [7]; Sturm, 1997 [8]).

Economically, the parsimony in offering mental health benefits is largely related to the fear of adverse selection. Mental health care has a relatively sensitive price elasticity of demand⁶ (Frank and McGuire, 1998 [9]; Dorwart and Epstein, 1995 [10]; Feldstein, 1999 [11]). This characteristic would discourage insurers from offering generous mental health benefit packages since it would lead to a certain degree of adverse selection of consumers with costly needs in mental health services. Plans would experience competitive disadvantages where such selection was significant enough that the marginal cost of insuring these consumers would outweigh the marginal revenue of providing care. Therefore, private insurers, if they do not have mental health carve-out arrangements, usually offer limited annual mental health benefits⁷ (Dial, et al. 1996 [12]; Sturm, 1997 [8]). To many individuals who have serious and chronic mental illnesses, these benefits could be quickly exhausted. For example, the average cost of providing a basic level of services, including care management, day activity, medication maintenance services, and residential assistance to a patient with moderate mental illness, were estimated at about \$4,500 per year; and it would be about \$12,000 to \$20,000 a year for a patient who needs intensive mental health care, such as long-term

⁶ Frank and McGuire: The demand for mental health is more responsive to signals of price reduction than the demand for general health. When the amount of consumers' pay is reduced, the quantity demanded in mental health goes up by more than for general health care. This demand response is referred to as "moral hazard" in the health insurance literature.

⁷ The mean annual dollar limits for outpatient mental health coverage in 1993 is about \$1,548. The maximum number of covered outpatient visits per year in 1993 is 20 visits. The inpatient day limit is roughly 33 days on average (Dial, et al. 1996 [12], p. 55).

hospitalization (Mauch, 1989 [13], p. 56). In Tennessee, the average service and treatment cost of outpatient and inpatient care was estimated as about \$9,100 to \$14,000⁸ per consumer per year under the traditional fee-for-service (FFS) system. Therefore, for persons with chronic and severe mental health illnesses who could not be cared for with limited private insurance coverage, and for those who could not afford long-term, high-cost mental health treatments, they would be forced out of the private health care market (Strum, 1997 [8]). Consequently, this 'forced-out' demand is either 'dumped' out of the private market as uninsured or uninsurable, or is transferred or adversely selected into the public mental health care system. As Mark Schlesinger describes, when Healthcare Maintenance Organizations (HMOs) emphasize very short-term treatments, that is likely to lead to greater "dumping" of the seriously mentally ill into the public sector (Schlesinger, 1989 [14]).

2. Inadequate and Indirect Financial Incentives and Moral Hazard As for the fundamentals of the market economy, self-paying consumers under a fee-for-service system would make their decisions on how much mental health care to purchase based on service prices offered by a market. A hypothetical market equilibrium is illustrated in Figure 2 by the series D1, S1, p1, and q1. When there is private health insurance available to consumers, holding constant other system factors such as income, availability and choice of providers, health and healthcare know-how, quality of service, population and population risk characteristics, the price elasticity of demand is generally expected to be more inelastic than the one given by the consumers if they have to pay entirely by themselves⁹ (Mihalik and Scherer, 1998 [16]; Dorwart and Epstein, 1995 [10]; Frank and McGuire, 1998 [9]). This situation is illustrated in the same figure with the series D2, S2, p2, and q2. In an extreme, if the consumers receive public health care

The Congressional Research Service used limits of 30 inpatient days and 20 outpatient sessions in its simulations for the costs of parity (Strum, 1997 [8], p. 1535).

⁸ This is calculated based on average utilization and average unit cost of services during the TDMHMR period, assuming 1 to 2 hospital stays per year per patient :

\$9,136 (in current dollars) = [19 (bed-days) * \$262 (per diem rate)] * 1 (one hospital stay a year) + [5.5 (services) * \$63 (unit cost)] * 12 (months).

\$14,114 (in current dollars) = [19 (bed-days) * \$262 (per diem rate)] * 2 (two hospital stays a year) + [5.5 (services) * \$63 (unit cost)] * 12 (months).

⁹ Mihalik and Scherer (p. 3): "Utilization of behavioral health resources by individuals is also elastic—with utilization increasing when services are paid for from pooled resources. Similar relationships between use of services and payment responsibility are not noted for most medical care."

Dorwart and Epstein (p. 32): "... the demand for mental health visits is responsive to price elasticity: the higher the price to the consumer, the lower the utilization. Price responsiveness decreases as income of patients increases and is more sensitive for mental health than for general medical care."

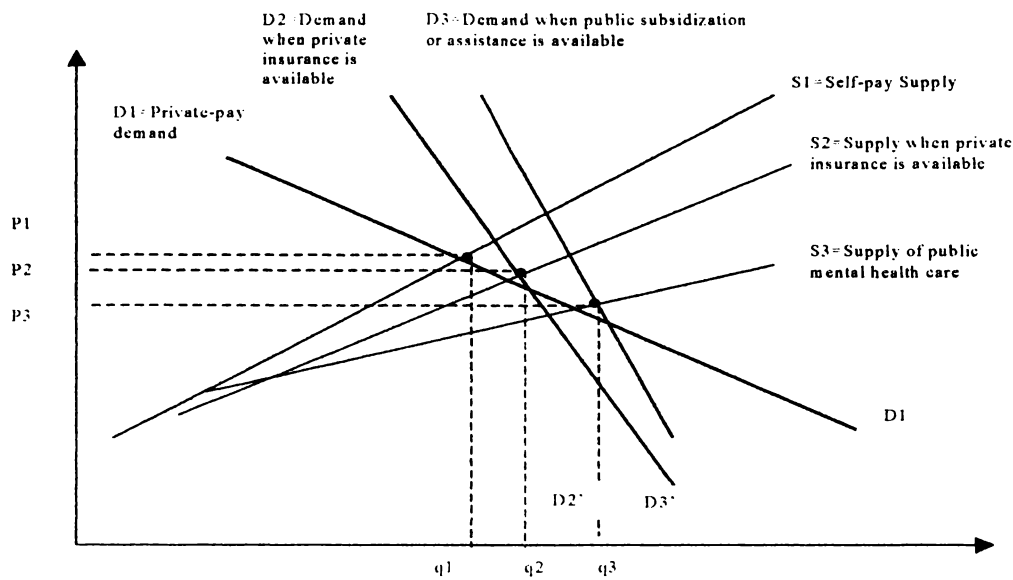


Figure 2: Financial Incentives and Demand/Supply Curves

assistance or insurance subsidization and do not bear any financial risks in using health care services, the price elasticity of demand is expected to become more inelastic than the ones given in the self-pay and private insurance scenarios. In general, it is recognized that under the public program, the greater the amount of public subsidization or assistance to the consumers, the less the elasticity of demand of the consumers. Again, *ceteris paribus*, this case is illustrated in Figure 2 with the series D3, S3, p3, and q3.

The above analysis depicts the empirical concern of over consumption or moral hazard effects (Frank and McGuire, 1998 [9]; Newhouse, 1995 [7], Sorkin, 1992 [18]) when consumer choices are assisted with pooled resources or other subsidization resources. With the availability of pooled resources and subsidization, consumers may bear indirect or inadequate financial risks in health care consumption and tend to consume more public mental health services than those who do not have

public assistance. Using Tennessee as an example, Medicaid SPMI/SED¹⁰ consumers incurred about 43 units of services per year, while the non-Medicaid SPMI/SED consumers, who carried financial risks, used about 28 units of services per year (TDMHMR, 1989 [22], p. I.2.15).

In a nutshell, the fundamental problem of potential over consumption of health care services in the last two scenarios is the separation of the unity of payors and beneficiaries at the time of seeking services so that the beneficiaries do not bear direct or sufficient financial incentive when using services. In public mental health care systems, once a consumer is accepted into or entitled to use a public mental health care system, he bears little or no personal financial obligations. The dilemma is obvious: low co-payments and public assistance may be necessary to help people in great service need, but those granted assistance also tend to produce, if not to encourage, careless usage of services from the demand side. A patient in the public mental health care system may do little weighing in making a decision whether he needs to use the emergency room or just take some medication to cope with an acute episode.

3. Open-ended Public Subsidization with a FFS Arrangement The factors discussed above have the effect of driving up public mental health care expenditures by shifting up the demand curve. In like manner, open-ended public mental health care subsidization directly contributes to spending escalation through affecting the supply curve for public mental health care.

Historically, providing mental health care to the severely mentally ill was the responsibility of state governments. For this reason, the primary purpose for federal subsidization of public mental health care was to fund and stimulate public mental health care supply. For many years, states aggressively pursued a policy of “outreaching” to needy consumers who have not been or not been adequately served before. Also, the public mental health care network and services have been expanded to include significant portions of

¹⁰ SPMI: Severely and Persistently Mentally Ill

SED: Seriously Emotionally Disturbed

SPMI and SED statuses are based on a patient’s CRG (Clinical Related Groups—used for adults) and TPG (Target Population Groups—used for children and youth) assessments. CRG1, CRG2, and CRG3 are considered as SPMI; TPG2 is considered as SED.

CRG1 – Persons age 18 or over with severe and persistent mental illness

CRG2 – Persons age 18 or over with severe mental illness

CRG3 – Persons age 18 or over who are formerly severely impaired

CRG4 – Persons age 18 or over with mild/moderate mental disorders

TPG1 –Children in state custody

TPG2 –Children with serious emotional disturbance

TPG3 –Children at risk of SED

community support related services, such as housing support, employment support, supported living, and social skill development¹¹ (TDMHMR, 1993 [24]). Consequently, these activities have induced significant policy pulled supply or demand of public mental health care. In fact, according to the World Health Organization (WHO) “More is better” (WHO, 1994 [23], p. 4) was a common view held in public health policy, which directly promoted supply and demand of health services for decades.

By design, federal funding was available to states by way of matching. The Matching Fee-For-Service Reimbursement clause states that for every dollar the states spend on treating mental health illness in the Medicaid population, the federal government will match up to 70 cents of service costs. Many states, therefore, have put a great deal of effort in consolidating local resources and increasing the quantity of supply so that more funding can be drawn down from the federal government.¹² To date, this reimbursement policy has created an open-ended subsidization pool and has backfired today with the uncontrollable growth of Medicaid funding in public health and public mental health care.

For the past twenty years, open-ended subsidization did stimulate the supply and demand for public mental health care. It put federal, state, and local governments in a prominent role in financing the nation’s mental health and substance abuse services and treatments. By 1996 more than half the funding for mental health and substance abuse treatments in the United States came from public sector payors, with Medicaid and other state and local government funding accounting for nearly 20 percent each. Medicare made up 13.4 percent of total mental health and substance abuse expenditures; other federal government programs made up 3.8 percent (U.S. Dept. of Health and Human Services, 1996 [26]).

A fee-for-service payment arrangement also contributes to over consumption. It has long been recognized in economic analysis that “any (FFS) reimbursement system that ties compensation for goods and services supplied by firms directly to the cost incurred by each individual supplier is likely to provide poor incentives for suppliers to produce efficiently (Joskow, 1983 [27], p. 168).” Also, as the World Health

TPG4 –Children who do not meet the criteria of TPG2 or TPG3

¹¹ The community service system that was once focused primarily on treatment now include case management, employment, housing, psychosocial rehabilitation, social support services, family education and support, and peer support services.

¹² For example, the method used in financing new (TDMHMR, FY1989-90) mental health services has successfully leveraged new state resources to ‘draw down’ new federal resources. A total of \$1.2 million in new state resources will serve as the match for \$3.3 million in federal dollars in the case management and supported employment programs.

Organization (WHO) explains: “When providers provide more services to the same population who are already in care rather than to new patients, they are likely to produce system waste when volume of the services is the only target. Inappropriate incentives may encourage private providers to overservice patients. Providers may order unnecessary procedures or they may resort to polypharmacy if their incomes are tied to the volume of services provided or to the drug sales (WHO, 1994 [25], p. 12).”

4. High Technology and High Cost Association Many facts seem to suggest that, at least in the short run, medical diagnostics, therapeutic procedures, and pharmaceutical technological advancements may have created new goods and services in healthcare that are too costly¹³ (Aaron and Schwartz, 1993 [28]). For example, the introduction of new medications has dramatically offset cost savings brought on by managed care efforts. New drugs introduced since 1992 added 40.8 percent to prescription costs and 25.4 percent to prescription usage in 1999 (Cliggott Communications, Inc., 2000 [29]). Economically, when these high-tech and high-cost medical or pharmaceutical advancements are made available in the market, trade-off choices often need to be made between using all possible resources to save a few with the new drugs and procedures, or to help the many with affordable care. Otherwise, the net effect of technological advancement is to shift the supply curve to the left, i.e., raising prices.

All factors discussed above, transferred or adversely selected demand, inadequate and indirect financial incentives and moral hazard, open-ended public subsidization with FFS arrangements, and high technology and high cost association, had significant influences on public mental health financing. Today, federal and state governments began to play a significant role and, ultimately, experience increasing pressure in financing the nation’s health and mental health care. Consequently, reform in public health and mental health care policies becomes inevitable.

Capitation-based managed care reforms are the most widely adopted policy instruments in the public health/behavioral health care industry. Two innovative activities are recognized as strategic to such reform. It is essential to “uncouple” payors and providers and “introduce” a class of new players in the

¹³ Aaron and Schwartz (p. 206): “The pace of medical technology advance shows no signs of abating and many signs of accelerating. These advances almost always add to costs by providing new treatments or new ways to develop medically useful information. Typically, innovation creates procedures that are more costly than are the methods they replace. Innovations may eventually curb growth of health care costs, but currently ‘cost-reducing medical advance’ is almost an oxymoron.”

traditional health care diagram (Figure 3). “The natural solution to the potential distortions of cost-based pricing or reimbursement in this context is to try to uncouple prices from the cost incurred by a particular supplier (Joskow, 1983 [27], p. 168).” In current practice, a uncoupling action is carried out primarily by delegating pre-defined and prepaid health services to a third parties, perhaps HealthCare Maintenance Organizations (HMOs) or Behavioral HealthCare Organizations (BHOs), who acting as agents or vendors integrating and bridging interests between payors, stakeholders, consumers and providers. Through the ‘uncoupling’ process, direct payors will be able to change their role in market exchange from direct paying or purchasing services to purchasing insurance (Frank, McGuire and Newhouse, 1995 [30], p. 54)¹⁴.

Just adding the delegates in a health care system may not be enough to control a health care financing crisis. Joskow further explained that the “uncoupling” process functions to establish prices (and simultaneously define the quality and amenity level of care) that do not depend directly on an individual

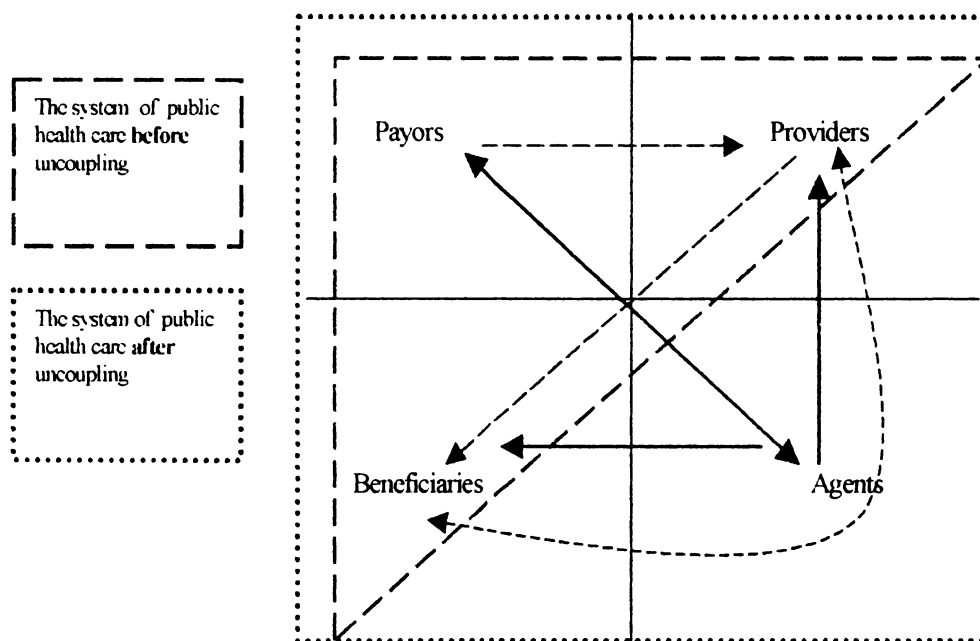


Figure 3: The Change of Health Care Diagram

¹⁴ These authors also presented the observation that managed care contracts introduce a fourth player into the relationship among the traditional three parties in health care: the payor delegates to the vendor responsibility for managing and often paying for mental health care.

supplier's costs. "Profit-maximization suppliers will take prices as given and will have incentive to produce efficiently (Joskow, 1983 [27], p. 168)." These established prices, taking the form of capitation payments or global budgeting, have now become the backbone or principle strategy of managed care reform.

Capitation can be considered as a higher level variation of the conventional price control application. Compared to the traditional technique of price control, capitation payments are usually not directly tied to an individual product but rather to a bundle of goods and services of a pre-defined category of care or population. The volume purchase of services at negotiated rates is straightforward price reduction and a keystone of carve-out contracts' use of economies of scale (Scheffler, 1998 [31]). In practice, the DRG (Diagnosis-Related Grouping) prospective payment system is a typical example of categorical capitation. Under such a payment system, each specific DRG-related admission is capped; a hospital will be paid by the number of DRG-related admissions and not by days or procedures incurred during each admission (Sorkin, 1992 [18]; Feldstein, 1999 [11]). A population-based, sometimes referred to as volume-based, capitation approach is popular in recent managed care development, widely used between payors and HMOs or BHOs, and between healthcare maintenance organizations and providers.

Perhaps the greatest strength of capitation payment policy is its ability to control costs effectively while still promoting market efficiency internally. As elaborated above, under a capitation arrangement, affected vendors who are facing targeted revenues will still be able to apply market production principles to some extent, such as profit maximization, factor or price substitution, and supply and demand intervention.

Figure 4 displays a simple picture of a capitation-predominated health care market. Vendors of the market face a shadow price ceiling, c , imposed as a capitation payment. Hence a finite amount of revenue is given by the area of $c \ 0 \ q1 \ a$.

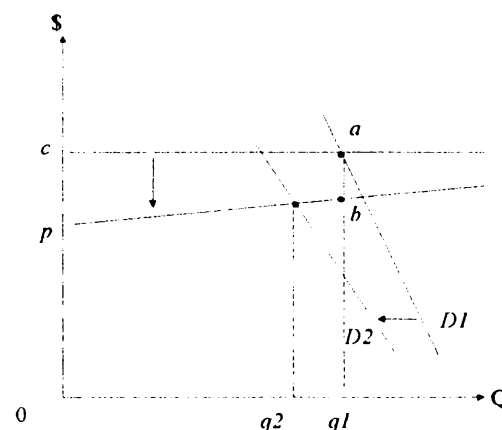


Figure 4: Illustration of a Capitated Market

They also face a perceived, inelastic demand curve of a given population of a public mental health care system, $D1$. To comply with these capitation-based system constraints, vendors will have to manage care, both the demand for care and the supply for care, in order to create profit margins.

Two main strategies are often used in managing the demand for care. One strategy is utilization management to reduce the excessive services induced under the FFS system. As mentioned earlier, the demand curve of a traditionally substituted FFS market is usually very inelastic, and the level of utilization is inflated from both supply-push and public policy-pull. Therefore, unnecessary and inefficient services become the initial target in managing consumer demand. Another strategy is care management. Consumers, especially high-risk patients, are encouraged to have routine maintenance or preventative visits in order to avoid costly catastrophic events. Through heavy involvement in the decision process of each individual consumer's day-to-day service needs, the capitated providers tend to pull the market demand curve back to the left, from $D1$ to $D2$ (Figure 4). In doing so, they form a demand side profit margin in the capitation market.

Key strategies in managing the supply of care include service, product, and factor substitution, as well as selective contracting and networking. For example, optimally arranging substitutions among categories of services and procedures, among production sectors (outpatient, community care, inpatient, home health, pharmacy), among labor divisions in healthcare (psychologist versus psychiatrists, doctors versus practitioners and nurses), or among selectively contracted or capitated providers, can reduce factor prices. In so doing, the capitated vendors can improve service and management efficiencies so that the real unit cost of care, p , can deviate from the shadow price ceiling, c , and form a supply-side profit margin (the area within $abpc$) under capitation (Figure 4).

Capitation as a preferred policy instrument in healthcare and mental healthcare reform may offer more practical and political accountability than other alternatives in fulfilling the immediate needs of cost containment in public health financing. Among economists, some question whether health care costs must be contained and whether either competition or global budgets are 'magic bullets' for doing so (Newhouse, 1995 [7]). In the lecture on "Economists, Policy Entrepreneurs, and Health Care Reform," professor

Newhouse argued that if health care cost had to be contained¹⁵, when a trade-off exists between risk aversion and moral hazard, cost sharing would be the best policy resolution. Since the poor cannot afford much cost sharing in government subsidized health care programs, managed care becomes the second best solution to the risk aversion and moral hazard trade-off. Further, Professor Newhouse points out that the open-ended subsidy for health care insurance increases and distorts the demand¹⁶ for health insurance and should be capped.

Further discussions about the approaches to health care reform was centered on Professor Alain Enthoven's concept of managed competition. Enthoven's notion of managed competition is built upon the concept of using a Health Insurance Purchasing Cooperative (HIPC). The HIPC, as a sponsor "(an employer, a government entity, or purchasing cooperative) acting as an agent on behalf of a large group of subscribers, structures and adjusts the market to overcome attempts by insurers to avoid price competition (Enthoven, 1993 [32])." The sponsor will manage the competition by establishing rules of equity, selecting participating plans, managing enrollment processes, creating price-elastic demand, and managing risk selection. As in managed care or capitation contracting, Enthoven placed emphasis on using joint bargaining power in price negotiation (Enthoven, 1993 [33]).

Other scholars seem to be more conservative in endorsing the managed competition approach. Jonathan Fielding and Thomas Rice indicate that according to the theory of the second best, Enthoven's managed competition may not solve the problem of health care market failure (Fielding and Rice, 1993 [34]). They state that increased competition would likely result in undesirable policy outcomes, such as, an increase in the number of insurance carriers or health plans (as a result of managed competition) could result in higher health care costs and in reduced access to care.¹⁷ More competition could induce insurers to try to outdo each other by offering more and more different kinds of benefits, and consumers may pay more in

¹⁵ J.P. Newhouse and others have questioned whether the growth rate of health care costs is truly too high.

¹⁶ "The greater the protection of people from the random expenses of sickness, the greater the potential overconsumption of medical care, at least in the traditional fee-for-service system." (Newhouse, 1995 [7])

¹⁷ They argue that as the number of health plans increases beyond some threshold, each has less market power over individual providers. Because of this, plans will be at a disadvantage in bargaining with providers, and the price they receive may not be as low as it would otherwise be.

premiums than they otherwise would. Furthermore, competition may result in more costly technology and more costly amenities.

Managed competition may not be ideal in public health care for several reasons. First, it may weaken and dissolve the traditional public healthcare networks by exposing them to vigorous market competition. For this reason, many states transformed their safe-net provider networks into grass-roots, prepaid mental health plans, and then contract with these plans for services. In practice, if only public grass-roots providers are eligible for contracts, there will be no bidding process¹⁸. Some early-stage state reforms, such as in Utah and Oregon, are examples of these experiments. Second, managed competition may not guarantee a 'cost containment' outcome if price elasticity of demand is too high. Third, insurers may not engage sufficient price and non-price competition¹⁹ (Joskow, 1983 [27]) in order to avoid adverse selection.

1.2 Public Mental Health Care in Tennessee—The Need for Reform

Tennessee's public mental health care system was created in 1953 and has since then evolved from an institutional care system into a comprehensive mental health service system offering institutional and inpatient care, outpatient services and treatments, and various community supports. By the end of the 1980s, the state administrative agency, the Tennessee Department of Mental Health and Mental Retardation (TDMHMR), began to operate a network of five regional mental health institutes and thirty plus community mental health centers (TDMHMR, 1989 [22]).

In inpatient care, five Regional Mental Health Institutes (RMHIs)²⁰ were fully accredited psychiatric hospitals with a capacity of about 2,300 beds. Typically, approximately 8,000 Tennesseans were admitted to the RMHIs during a 12-month period. On the outpatient side, 37 not-for-profit Community Mental Health Centers and Agencies (CMHAs) were in the TDMHMR network serving approximately 62,500 consumers during a typical 12-month period. About 48 percent of the consumers in the system were assessed as SPMI (adults) and SED (children). The network provided four broad categories of services,

¹⁸ Once granted a waiver, a state announces a Request for Proposals, perhaps using competitive bidding. If only public providers are eligible for contracts, there is no bidding process.

¹⁹ Quality and amenity-related competition are examples of non-price competition.

including Integrating Services: assessment, case management, transportation, evaluation; Basic Supports: housing and employment; Treatment Services: psychiatric assessment and medication, psychotherapeutic services, crisis and emergency services, substance abuse services; and Rehabilitation Services: supported living, social skill development (TDMHMR, 1989 [22]).

The program funding (current dollars) of Tennessee's public mental health care increased from about \$67 million²¹ in the mid 1970s to \$125 million²² in the mid 1980s, then, to \$252 million²³ in the mid 1990s. From fiscal year 1987-88 to fiscal year 1995-96, the average rate of increase in expenditure was approximately 10 percent. Depending on the funding sources, the TDMHMR operated under three types of payment mechanisms: fee-for-service, semi-capitation/grand-in-aid, and self- or private payment²⁴ (McFarland, 1994 [35]).

Figure 5 below depicts the fact that service utilization²⁵, funded by government and reimbursed through a FFS arrangement grew much more quickly than other programs funded by other payment alternatives. The top line in Figure 5 trending upward represents the FFS type of claims that include all services delivered to Medicaid and Medicare eligible clients which were not first billed to other payor sources. The FFS claims also include services paid for with state or possibly federal funds. Payments to these public funded claims were made after services were rendered, with the demand for services not limited at any time. The bottom line in Figure 5 represents the volume of semi-capitation/grant-in-aid claims that were pre-funded by various state or federal dollars. These services were generally earned by allowable expenses. The middle line incurred by self-pay claims trending downward represents services paid by either users only, by non-public insurance only, or both. In general, no government funding or government insurance was involved in this type of claim.

²⁰ The five RMHIs are the Lakeshore Mental Health Institute, the Middle Tennessee Mental Health Institute, the Moccasin Bend Mental Health Institute, the Memphis Mental Health Institute, the Western Mental Health Institute.

²¹ Source: TDMHMR 1975-76 Annual Report, p. 20

²² Source: TDMHMR FY1980-86 Retrospective, p. 10

²³ Source: TDMHMR FY1995-96 Annual Plan, P. 73

²⁴ McFarland (p. 222): "Under the grant-in-aid approach, the state mental health agency transfers funds to local programs, such as the federal government did under the Community Mental Health Centers Act of 1963. Reflecting the 1963 community mental health center philosophy, the grant-in-aid mechanism assumes that the provider will take responsibility for delivery of mental health services needed by residents of a geographically defined catchment area."

"Services may also be provided on a fee-for-services basis particularly for the clients of Medicaid programs. Medicaid providers may, in theory, render services to any Medicaid clients. Reimbursement for these services depends on each states' Medicaid program."

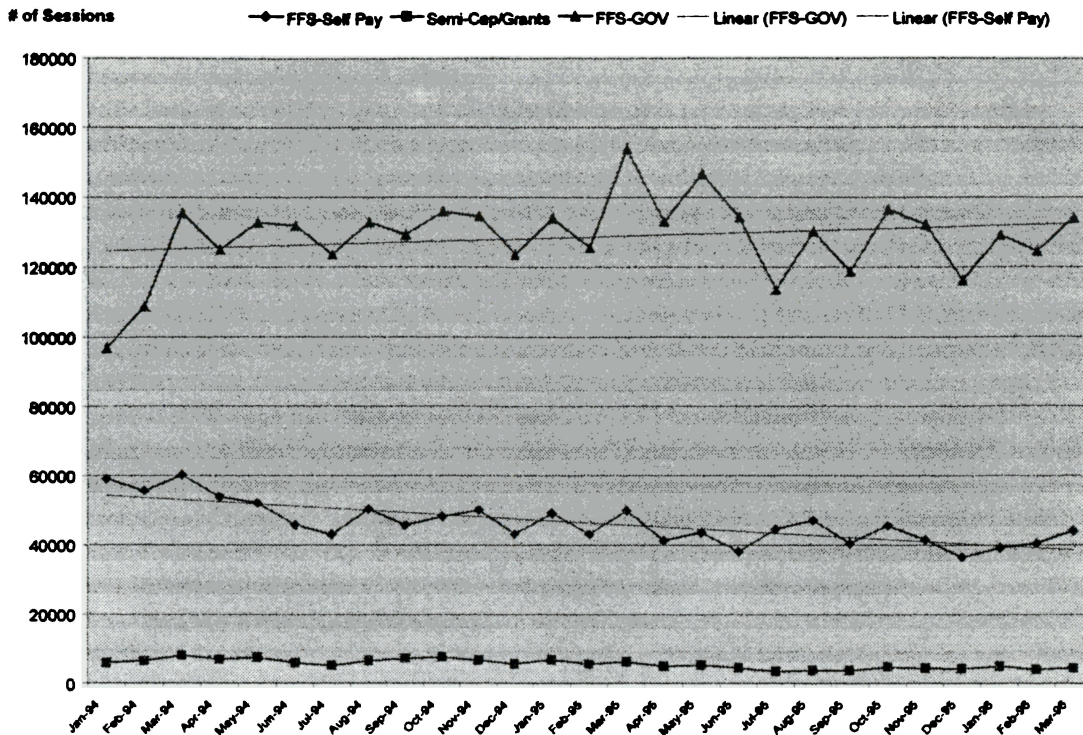


Figure 5: Public Mental Health Service Utilization by Payor Source

The TDMHMR administrators became increasingly conscious of efficiency and cost issues with the system's performance in the late 1980s. For example, they realized that almost one person in four who was discharged from a RMHI would be readmitted within one year. There was a wide range in the amount of services available per 100,000 population when regions were compared, indicating inconsistency in services and costs in efficiencies across regions. Also, the distribution of expenditures was largely concentrated in that almost two-thirds of funding appropriated by the state was allocated to the most restrictive and expensive level of care, the RMHI system, and almost half of those resources were used by about only one percent of total consumers in the system (TDMHMR, 1989 [22]).

In order to overcome these system inefficiencies, the TDMHMR system underwent a series of significant policy and strategic changes to improve performance and efficiency. Most of these reforms happened at the dawn of national public mental health care reform. First, as the result of a continuing emphasis on expansion in community services and further deinstitutionalization, community or outpatient

²⁴ Source: TDMHMR Direct Patient Service database

funding and services began to outweigh inpatient funding and services in 1992. Second, the TDMHMR system began to emphasize management and preventative types of services by adding case management into the service array in the early 1990s²⁶. Third, the state developed and implemented Tennessee's Mental Health Master Plan (TDMHMR, 1992 [67]). The Plan was considered as the best practice guideline in establishing empirical quantitative norms for Tennessee's public mental health service system in order to deliver the most effective and appropriate service programs. With the implementation of the Master Plan TDMHMR was able to reduce outpatient service intensity²⁷ (number of services per user per month) by about 50 percent. Unfortunately, by only regulating the service intensity, TDMHMR was not able to release any financial pressure of cost containment under the FFS system. The FFS providers simply added more clients or users each month to make up the revenue difference due to the reduction in service intensity. Given continuous increases in mental health spending, the state effort at overhauling the Medicaid program prompted the initiative of managed mental health reform.

Taking advantage of the Health Care Financing Administration's (HCFA's) section 1115 research and demonstration waiver under the Social Security Act (Holahan, et al., 1995 [36]) and the momentum of national managed care reform, on January 1, 1994, the state launched an ambitious public health care reform program--TennCare. The reform plan was designed to not require new state tax and revenue in extending health coverage to not only the existing 800,000 Medicaid population, but also to approximately 400,000 uninsured or uninsurable Tennesseans using a system of managed care (TennCare, 1996 [37]).

In the beginning, Tennessee's behavioral health care reform proceeded through two parallel tracks. One track was built on the carve-in concept²⁸. General mental health and substance abuse service needs of TennCare consumers who were not previously served by TDMHMR were the responsibility of Managed Care Organizations (MCOs). Capitation payments to MCOs included \$7.53 per member per month (a total

²⁶ P.L. 99-660 requires the establishment and implementation of an organized, comprehensive, and community-based system of care for the severely mentally ill. P.L. 99-660 also specifically requires phasing in case management in public mental health services that the plan shall provide for case management services for individuals with serious mental illness who receive substantial amounts of public funds or services.

²⁷ In this study, the term intensity is defined as number of outpatient services per user per month or number of bed-days per user per month.

²⁸ Here the term "carve-in" refers to a situation where a previous stand-alone mental health care program is folded into a managed care program under a single capitation arrangement covering both physical health and mental health care.

of \$108 million²⁹ in capitation payments for MCOs to provide behavioral health services in the first year of TennCare operations) [37] to cover behavioral health benefits, excluding severe mental illness. Some MCOs, then, subcontracted with behavioral health care organizations to provide the services.

The other track of state mental health care was the continuation of the state's traditional mental health and substance abuse care system. The TDMHMR system was to continue providing comprehensive, long-term and deep-end services to the system's existing population, regardless of their TennCare eligibility. Most of the consumers in the population are severely and persistently mentally ill adults and seriously emotional disturbed children. In essence, the TDMHMR tract could be viewed as a partial carve-out service arrangement to TennCare through the fee-for-services payment arrangement.

The overall managed care reform for state public behavioral health care came two and one-half years after TennCare's inception. In July 1996, after many months of debate and preparation, the state implemented a complete carve-out managed care program--the TennCare Partners Program (TPP)--to replace Tennessee's traditional public mental health care system. Under the new program, all TennCare behavioral health services were contracted to two consolidated behavioral health care organizations known as Premier Behavioral Health of Tennessee (Premier) and Tennessee Behavioral Health, Inc. (TBH). After the carve-out, MCOs and the TDMHMR were no longer responsible for mental health services, financially and administratively. At first, the BHOs received a single capitation rate of \$22.93 (current dollars) per member per month (PMPM) for each of TennCare's 1.2 million enrollees, regardless of whether they were in the priority population (SPMI/SED) [37]. When BHOs complained about the revenue loss due to enrollment variations³⁰, TennCare amended the blended single rate to a differentiated one for everyone in the SPMI and SED population. The TPP paid \$319.41 PMPM (per member per month) to the SPMI/SED members and a variable PMPM rate³¹ to the non-SPMI/non-SED members, depending on the size of the payment to the priority population.

²⁹ In current dollars

³⁰ With a single blended rate, a BHO with a larger SPMI/SED population would face cost disadvantage even though the SPMI/SED consumers were randomly assigned to the BHOs by state.

³¹ After a payment is made to the SPMI/SED population (\$319.41 multiplied by number of SPMI/SED in the system), whatever amount is left from the capitation revenue will be divided based on the size of the non-SPMI/SED population to arrive at a variable PMPM rate.

The TennCare Partners Program is a partial risk based managed care product. It is designed with major managed care principles. First, it is a carve-out program by way of risk-share contracting³² (TDMHMR, 1996 [38]). Second, it employs the capitation pricing mechanism. Under the TPP, all government funding sources are consolidated. A lump-sum payment in the form of negotiated capitation rates³³ is made to the BHOs monthly for delivering the contracted mental health and substance abuse benefit packages. Third, the TPP utilizes managed care techniques to monitor program quality, such as hiring external quality review organizations to conduct independent program reviews. Finally, the program encourages cost-efficient and effective care practices. For example, the TPP placed explicit terms in its contract with the BHOs to encourage inpatient to outpatient substitution.³⁴

The TennCare's Partners Program (TPP) is a unique experiment in public mental health care reform. It is the only reform program that has been implemented in full scale, involving approximately 400,000 uninsurable and uninsured beneficiaries, and all sectors of care--inpatient, outpatient and pharmacy. Several goals were clearly set for the TPP: cost-containment, at a minimum, slowing down the rate of growth; increasing access to mental health care, making mental health care available to 1.2 million TennCare enrollees; and improving quality of care. From a financial point of view, decision makers were determined to adopt a capitation payment method for Tennessee's public mental health care so that the drain on the state's Medicaid resources could be plugged up. To many observers, even the program's critics, there was no doubt that the state had brought the Medicaid financing crisis under control initially, and did remarkably well in expanding health insurance coverage to a significant number of needy Tennesseans. Most of the concerns, not only to the TennCare managed care plan, but more so to the TennCare Partners Program, were centered on quality of care for the state's most vulnerable population. Are the consumers better off under managed

³² The TDMHMR and BHO Contract (3.15.2) specifies the contractor shall be allowed to retain only ten percent of the monthly capitation amount paid by the Bureau of TennCare for administrative and management fees and profits, with the remaining 90 percent of the capitation payments being made available for providing or arranging direct mental health and substance abuse services to participants and payment of any applicable premium tax by the contractor to the State. Any and all benefit costs in excess of the amounts allowed pursuant to this contract shall be the responsibility of the contractor. TDMHMR shall not be liable for any excess benefit costs distributed as a reduction to contract providers. Any administrative and management fees and profits exceeding the 10 percent limitation shall be borne by the contractor.

³³ There was also a reduction in the MCOs' capitation payment of about \$7 PMPM.

³⁴ The Tennessee Department of Mental Health Mental Retardation and the BHO Contract specifies that *if medically appropriate for the patient, the BHO may authorize substitution of outpatient days, partial hospitalization days, or residential treatment days for*

care than they were with the traditional public health care system? Is cost containment the “initial effect,” i.e., only a one-time savings at the beginning of the carve-out of managed care or a sustainable containment over time? In the end, people were concerned if the cost containment achievement was the result of quantity and/or quality reduction of care. Obviously, a reduction via efficiency improvements eliminating excessive utilization would be welcomed. On the other hand, if the reduction was at the expense of quality of care, the managed care approach of cost containment should be re-evaluated.

This empirical research is set up to evaluate Tennessee’s public mental health systems from a historical perspective. The study reviews cost-efficiency (a quantity or productivity issue of services) and cost-effectiveness (a quality or satisfaction issue of services) outcomes across two distinct systems of mental health care. One is the traditional public mental health care system, from January 1994 to June 1996, characterized by a FFS payment mechanism and a safe-net provider network. The other is the managed care system, from July 1996 to December 1998, distinguished by a capitation payment method and risk based contracting with private behavioral health care organizations. The status quo of the traditional mental health care FFS system serves as the baseline to evaluate the TPP’s financial performance and outcomes conditioned on program pricing modalities: FFS vs. Capitation.

1.3 Review of the Literature

Among the community of health care professionals, there is little doubt in the effectiveness of capitation based managed care reform in fulfilling needs of immediate cost containment, although many do question whether managed care can sustain long-term cost savings, especially improving quality and access to care. In light of the debate on whether managed care will lead the United States to its health care prosperity, a significant amount of literature contributed to the discussion of cost- and quality-related outcomes of capitation-based managed care reform.

Frank and McGuire conducted an independent evaluation of financial performance in the Massachusetts’ managed public mental health program (Frank and McGuire, 1997 [39]). The reformed

covered psychiatric inpatient facility days. Two substitute days will count as one inpatient day. When medically appropriate, services

program was implemented in July 1992. Massachusetts contracted with First Mental Health Inc., which did business in Massachusetts as Mental Health Management of America (MHMA), providing specialty mental health and substance abuse care to approximately 375,000 Medicaid eligible persons under the Massachusetts Medicaid program. Data on financial performance for the managed care organization obtained from documents related to 1995 rebidding of the contract and other publicly available documents were reviewed. The actual expenditures of the managed care program were compared with the projected expenditures based on expenditures from fiscal year 1992, the last full year before the carve-out contract, inflated by the medical care component of the Consumer Price Index. The authors found that spending by the managed care organization averaged about 25 percent lower than projected expenditures adjusted for inflation: 30.8 percent in 1993, 26.9 percent in 1994, and 28.0 percent in 1995, although explicit financial incentives associated with the cost reduction were not strong inducements to attain these savings. Findings show that savings were maintained in the later years. Profit and loss features based on cost targets were quite limited. The organization had a much greater incentive and opportunity to make profits by conserving its administrative costs rather than by controlling Medicaid claims' costs.

Teh-wei Hu, Brian J. Cuffel, and Mary C. Masland analyzed the impact of contracting with the private sector on unit costs of core services of public mental health services for fiscal year 1999 in California (Hu, Cuffel and Masland, 1996 [40]). These core services were identified as inpatient care, individual therapy, crisis intervention, case management, medication management, rehabilitative day care, and intensive day care. The cost per unit of each service was estimated by dividing the total expenditures for that service by the total units of service provided. The proportion of private contracting for each mental health service was estimated by dividing expenditures on contracted private mental health providers by total expenditures for each mental health service in county level mental health programs. Ordinary least-squares regression modeled the effect of county contracting on average mental health costs. The regression analysis controlled for population demographic variations. Results showed that the unit costs of four of the seven services had significant inverse relationships with the volume of the expenditures in private contracting: the higher the

in a licensed substance abuse residential treatment facility may be substituted for inpatient substance abuse services.

percentage of total expenditures devoted to contracted services, the lower the unit costs for inpatient care, case management, medication management, and rehabilitative day care. Quantitatively, a 10 percent increase in private contracting would lead to approximately a three percent reduction in hospital inpatient unit costs and case management unit costs. Similarly, a 10 percent increase in private contracting would lead to a 2.5 percent and 2.7 percent reduction in medication management unit costs and rehabilitative day care costs, respectively. With respect to the other three services studied, individual therapy, crisis intervention, and intensive day care, no statistically significant relationships between cost and private contracting were found.

Lindrooth, Nortona and Dickey analyzed how and why a Medicaid mental health carve-out achieved significant cost savings from the perspective of business strategy (Lindrooth, Norton and Dickey, [41]). They attribute the cost savings to a selective contracting effect, bargaining effect, and to utilization management. The cost savings attributable to the bargaining effect were measured as the difference between pre- and post-period per diem rates set by Medicaid in the pre-period and through bargaining in the post-period. The carve-out managed care program can funnel patients to cost-effective providers to generate savings. The cost savings attributable to utilization management were measured as the effect of the program on length of stay after controlling for the selection of hospitals. The research concluded that the contracting of hospitals accounted for about two-thirds of the cost savings, conditional on inpatient admission; another one-third of the cost savings through bargaining came in the form of lower per diem rates. Changes in the length of stay due to utilization management were negligible. The researchers, testing whether quality suffered from selecting hospitals that practice a shorter length of stay by analyzing the probability of readmission within 30 days in both the pre- and post-periods, they also analyzed the length of time between admissions in the pre-period as an indicator of quality. The data revealed that the probability of rapid readmission declined by 0.001 points in the post-period, and the mean length of community tenure (Cook, 1992 [42]) between admissions of patients discharged was down from 188 days in the pre-period to 182 days in the post-period. Although all changes in the quality indicators were not significant, these changes may be an indication of comparable quality of care both before and after capitation implementation.

From the long-term perspective, Goldman, McCulloch, and Sturm (Goldman, McCulloch and Sturm, 1998 [43]) tracked access, utilization, and costs of mental health care for a private employer over nine years during which mental health benefits were carved out of the medical plan and managed care was introduced. The study demonstrated that prior to the carve-out, mental health costs increased by around 30 percent annually; in the first year after the change, costs dropped by more than 40 percent; in the six follow-up years, costs continued to decline slowly. The study pointed out that the cost reduction was not attributable to decreased initial access since the number of persons using any mental health care increased following the change. Instead, the cost reduction was the result of fewer outpatient sessions per user, reduced probability of an inpatient admission, reduced length-of-stay for an inpatient episode, and substantially lower costs per unit of service.

A working paper by Roland Sturm of RAND made another effort at answering the question of the potential of long-term cost savings of managed behavioral health carve-out plans (Sturm, 1998 [44]). Sturm collected data on 52 managed behavioral health plans completing their first year of operation in 1991 or later. He followed through to the end of 1997. The findings of the research demonstrated that although it is well established that switching from unmanaged to managed behavioral health care leads to a dramatic immediate drop in health care costs³⁵, the additional costs continued to decline during the following years of managed care, about 10-15 percent with every doubling of the managed care experience. The research attributes these clinical cost reductions in behavioral health plans to increases in organizational learning curves rather than to time trends and scale economies. With respect to the concerns of reduction in utilization and quality, Sturm's study also demonstrated positive quality improvement trends indicated by increased appropriateness of follow-up care after hospital discharges and reduced 30-day rehospitalization.

To many, it is believed that "reducing admissions, length-of-stay, hospital days, or other services, and their associated expenditures, is the easy part of the process. Doing so in a manner that provides high-quality care and good outcomes is the more difficult and more important task (Mechanic and McAlpine, 1999 [45], p. 15)." Despite the difficulties in quantifying and demonstrating effectiveness and quality-related

issues, there is a significant amount of work focused on quality of care aspects in the recent literature to address the concerns pertaining to qualities of care of managed public mental health reforms. These studies focus on a wide range of measures, such as reductions in the rate and duration of psychiatric hospitalization, reduced clinical symptoms, increased social functioning, increased residential stability and independent living, increased ratings of objective and subjective quality of life, significantly greater levels of satisfaction with services, and overall cost savings. The majority of these studies were conducted either at clinical trials or on a survey basis. Most studies have the focus of treatment effectiveness and quality of care with the implicit assumption of cost-efficiency of the capitation system over the FFS system. Although there were mixed results in that regard, a majority of the related literature demonstrated comparable quality of care outcomes.

Joan R. Bloom et al. presented some early findings for the first nine months of the state of Colorado's Medicaid capitation Pilot Project, implemented in selected areas of Colorado (Bloom, et al. 1998 [46]). Capitation contracts were carved out to seven free-standing mental health assessment and service agencies (MHASAs), which were the formations of a single CMHC, alliances of CMHCs, or joint ventures of CMHC(s) and a for-profit managed care firm. A random sample of 513 SPMI consumers was drawn to compare the utilization, cost, and outcomes of inpatient and outpatient services between the capitated MHASAs and the CMHCs for whom the services were still reimbursed with the FFS method. The consumer outcomes were collected through interviews on measures of symptoms, health status, functioning, quality of life, and consumer satisfaction. The results of ordinary least squares regressions indicated consistent reductions in inpatient user costs and probability of outpatient use under capitation. Examination of measures of outcomes across capitated areas suggested that samples drawn from the FFS setting and from the capitation setting were comparable in severity of psychiatric symptoms, function, health status and quality of life. In sum, the study found no changes in outcomes.

Additional Colorado-based studies reinforced Joan R. Bloom and colleagues' general finding above (Warner and Huxley, 1998 [47]). Richard Warner and Peter Huxley conducted a clinical trial-based study on

³⁵ According to the author, the study focused on only clinical costs and excluded administrative costs, which may experience a steeper

the outcomes of people with schizophrenia before and after Medicaid capitation at a community agency in Colorado. Interview data were collected one year before and after implementation of Medicaid capitation for two sample groups of 100 clients each. The results showed that psychopathology was lower after capitation in most dimensions. The number of subjects admitted to the hospital during a six-month period beginning a year after capitation was 57 percent lower than in the equivalent period before capitation with no increase in the amount of outpatient treatment provided. Clients reported improved quality of life in the domains of work, finance, and social relations. Significant change in needs or service satisfaction was not detected. The research concluded that no evidence was found that Medicaid capitation had an adverse effect on the client population after one year of capitation implementation. In fact, capitation lead to an efficient use of treatment.

Funded by the Arizona Division of Behavioral Health Services and by a National Institute of Mental Health grant, Leff and his team evaluated the influence on service access, adequacy and appropriateness in four capitated public mental health programs (Leff, et al. 1994 [48]). The evaluation clients for the capitation programs were selected randomly from a pool of SMI (serious mental illness, age ≤ 40) persons in FFS programs who were willing to participate in the capitation programs. The four capitation programs were compared to two FFS programs where clients were randomly selected and assigned. Leff, et al. considered six variables related to services in their evaluation: probability of use, intensity of service, utilization, access to service, adequacy of amount of service, and appropriateness. The first three variables were the result of descriptive utilization statistics; the last three variables were evaluative and judgmental as the inputs of a consensus panel of a group of mental health professionals. They found that access, adequacy, and appropriateness were higher than for the peer fee-for-services programs, suggesting that the financial incentive in capitation was not a significant limiting factor for service access, adequacy and appropriateness. In all comparisons the capitation programs outperformed the FFS programs to a significant degree in all measuring areas. This evaluation concurs with other studies that the capitation programs decrease both the probability of use and intensity of service in the inpatient sector and increase probability of use and

decreasing intensity of service in the outpatient sector. The overall monthly probability of use is 0.955, and the overall monthly service frequency is 2.72. By service domain, the evaluation shows that access, adequacy, and appropriateness were greatest for ambulatory treatment and least for inpatient and residential services. The highest scores were for case management services. Leff, et al. attributed the advantages of the capitation programs to the result of being motivated to improve upon pre-existing FFS programs with respect to service access and adequacy. On the cost side, excluding pharmacy, the average capitation rate for the four programs was \$962 per client per month to cover the full complement of services of inpatient and outpatient care. The net income for the capitation programs was, on average, 20 percent of revenue.

During the two-year follow-up period of the Monroe-Livingston demonstration Capitation Payment System (CPS), Cole, et al. found that patients in the CPS experimental group had significantly fewer hospital inpatient days than those not in the CPS, although the two groups had no significant differences in functioning as measured by the Global Assessment Scale (GAS), in level of symptoms as measured by the Brief Psychiatric Rating Scale (BPRS), and the Scale for Assessment of Negative Symptoms (SANS). For the group of continuous patients in the CPS, defined as patients with more than 270 inpatient days during a three-year period before enrollment in the capitation experimental program in the CPS, Cole, et al. found that these patients not only experienced similar care outcomes, as the control group did, but also did so with a lower cost. They also enjoyed a significantly longer time out of the hospital before being rehospitalized (Cole, et al. 1994 [49]).

In addition to a favorable financial evaluation received for the first year reform, the Massachusetts first-year experience on quality of care in Medicaid MH/SA managed care was also positive. In an independent review on program expenditures, access, and relative quality, Callahan, et al. concluded that for over a one-year period since the program's inception, state expenditures were reduced by 22 percent below the predicted levels without managed care, without any overall reduction in access or relative quality (Callahan, et al., 1995 [50]). The indicator that the review used to measure relative quality is the 30-day readmission rate. Overall, the rate dropped slightly from 19.9 percent in FY 1992 to 18.9 percent in FY

1993, with some group exceptions³⁶. The authors suggest that the savings realized in Massachusetts were generated by instituting rather dramatic shifts in treatment patterns for MH/SA problems. In particular, large savings stemmed from a reduction in acute inpatient care. The decline in outpatient spending resulted from a combination of reduced utilization and reduced prices to providers. Accompanying these important reductions in spending were some notable increases in specific treatment modalities. It has been suggested that the shifting of treatment settings is what enables a managed behavioral healthcare (MBHC) organization to maintain both access to care and quality of care while reducing overall costs. Also in line with Goldman's findings were reduced lengths-of-stay, lower prices, and fewer inpatient admissions as major factors in Massachusetts' first-year achievement. Along with substituting less costly types of 24 hour care for costly inpatient hospital care, the configuration of program services has changed. Of the 13 types of mental health services, six showed increases and seven decreases. It is worth noting that, although it was not included as a countable factor for cost containment in the review, the program's overall service utilization per enrollee fell three percent below the expected volumes.

Beginning in 1987, an early-stage capitation demonstration project was carried out in Hennepin county, Minnesota. Lurie and colleagues conducted a randomized trial to determine the effect of the capitation experiment on health outcomes of enrollment for chronically mentally ill (CMI) Medicaid recipients in prepaid plans versus traditional fee-for-service (Lurie, et al. 1992 [51]). In Hennepin county, 35 percent of all Medicaid beneficiaries were randomly assigned to prepaid care administrated by four health plans³⁷. These plans received a capitation payment targeted at 95 percent of estimated FFS costs, to care for enrolled individuals. At the baseline, 369 prepaid and 370 FFS clients were interviewed to collect outcome measures related to general health status, physical functioning, social functioning, and psychiatric symptoms. At the end of the demonstration period, 96 percent of the prepaid and 95 percent of the FFS clients were reinterviewed. A subset (370) of clients with schizophrenia was followed up 11 months after the return of

³⁶ However, for the nondisabled group, C&A (children and adolescents) patients in particular, there was an increase.

³⁷ These included a county-sponsored network HMO, a Blue Cross and Blue Shield-sponsored plan, and two smaller independent practice association plans. Seven months after the demonstration began, Blue Cross and Blue Shield, the plan with the most Medicaid beneficiaries enrolled, announced its intent to withdraw from the demonstration. Because of concerns about whether the other plans could accommodate the large number of disabled enrollees who would need to be transferred, the state withdrew all disabled clients from the demonstration after the first year.

the prepaid patients to FFS care. The effectiveness of cost-containment strategies was evident by the utilization data. Based on unadjusted, self-reported measures, fewer prepaid than comparison group enrollees received outpatient physical health care (61 percent versus 71 percent). The prepaid group also averaged four to five fewer annual visits and fewer inpatient admissions for physical health problems. A separate analysis based on claims data indicated a shorter length of stay for the prepaid group (1.56 versus 4.30 days). As for health outcome related measurements, the authors drew conclusions that there were no statistically significant differences between the prepaid and the FFS groups in general health or psychiatric symptoms from the baseline to the follow-up point (approximately 11 months into the capitation period). However, the GAS scores for clients with schizophrenia declined over the study period, with the prepaid plan clients experiencing a greater decline. The authors concluded that there was no consistent evidence of harmful effects in enrolling chronically mentally ill Medicaid clients into prepaid care, at least in the short run.

Overall, the reviewed research on cost and quality aspects of mental health care reform demonstrated that managed care can be not only an effective instrument in controlling cost, but also effective in delivering the desired outcome of quality of care. In achieving cost savings, most studies identified that decreased inpatient utilization (admissions, bed days), reduced outpatient service intensity (units of services per user), and effective contracting in reducing per diem rates and unit costs are the major process drivers. As to quality of care, managed care outcomes, through different measuring instruments, can be as comparable as those obtained under a FFS arrangement.

1.4 About the Research

Having been a close observer and information gleaner to Tennessee's public mental health care reform, this researcher sees the opportunity of and the significance in conducting an empirical and systematic research on outcomes of Tennessee's public mental health care reform program with respect to its cost-efficiency and cost-effectiveness. This researcher believes that such research would be not only of empirical value in furthering development of public mental health policies, but would contribute also to the theoretical

development of health economics when cost-efficiencies and cost-effectiveness can be quantified, compared, and analyzed between two distinct economic pricing frameworks: Fee-For-Service (FFS) and capitation. Over a five-year study period, both the TDMHMR and the TPP have devoted tremendous effort at improving efficiency, quality, and access to public mental health care programs. Although there are still various concerns with the reformed program, it is this researcher's view that Tennessee has accumulated rich managed care experience and established a rather complete information infrastructure that would be worth a devoting research effort in bringing Tennessee's experience to the national front.

This research has the following objectives: (1) Measure and compare cost-efficiencies and cost-effectiveness of Tennessee's public mental health care system across two alternative public funding regimes: Fee-For-Service and capitation; (2) Test for possible structural change of public mental health care systems and the significance of the reform impact in both the inpatient care and outpatient care environments; (3) Analyze treatment, policy, and programmatic factors associated with the research findings; (4) Discuss economic and policy relevance, including implications of the research findings.

This research can be distinguished from other research by several aspects. First, the research deals with a full carve-out, capitation-based public mental health care reform program. To date, it is one of two reform programs that have been implemented on a full carve-out basis. The operation of the reform is enriched with many areas of economic and policy interests: eligibility and enrollment, risk-based contracting and risk sharing, adverse selection, capitation determination, antitrust and market competition, resource and utilization optimization, and trade-off between efficiency and equality. Outcomes and experiences of such a reform trail should be valuable and informative for the future development of public mental health care policies.

Second, the research is unique because it has broad orientation and deals with a large population. It covers program costs and service utilization activities from both inpatient and outpatient sectors through a five-year period, from 1994 to 1998. These five years were separated equally by two public mental health reigns—the TDMHMR and the TPP. On an annual basis, it deals with a program that covers about 1.2 million enrollees. Over 100,000 of these enrollees use specialized mental health services with more than 50

percent of them assessed as SPMI/SED. Further, population-based claims and encounter data are aggregated monthly to obtain summary statistics in cost, utilization, and quality for the TDMHMR (FFS) system and the TPP (capitation) system. Such a data and system structure allows hypothesis testing for structural change in cost-efficiency (a quantity and cost issue in mental health care) and cost-effectiveness (a quality of care and cost issue in mental health care). Few studies were able to offer such a comparison due to difficulties in linking large population data from pre- to post-reform periods at the program level.

This research is performed independently from the perspective of this researcher. Although privileged in using the state's information system and documentation to accomplish this dissertation, this researcher, not the state, will be responsible for the data and information accuracy provided in the research. For proprietorship concerns, raw data used in this study will not be made public in this manuscript. Further, it is the researcher's intent to solely delegate this research for the purpose of an academic achievement, and reserve the right to distribute and publish this dissertation if the State gives further consenting in that regard.



Chapter one discussed common cost drivers of public health care financing from the perspective of demand and supply in the mental health care market. On the demand side, it is recognized that the mental health care system still faces the reality of growing unmet health care demand, indicated by the increasing sizes of the uninsured and uninsurable population, and by shortages of providing sufficient and effective services to consumers under care. Pressures from the supply side were attributed mainly to funding adequacy, policy design on funding distribution, and payment methodology. Several factors were identified as major forces in driving up expenditures on public mental health care, including transferred or adversely selected demand, inadequate and indirect financial incentives, moral hazard, and high technology and high cost associations.

Development and implementation of the Mental Health Master Plan, TennCare reform, and TennCare Partners Program reform were considered as significant milestones in the 1990s in the history of

Tennessee's public mental health care. The chapter discussed the state's effort at developing and implementing the Master Plan to improve system efficiencies under a Fee-For-Service payment arrangement. Although there was about a 50 percent reduction in outpatient service intensity (number of services per user per month), neither volume nor spending on inpatient and outpatient care was reduced. A reform proposal—the TennCare Partners Program—was initiated at the time TennCare was implemented in January 1994, and finally being executed on July 1, 1996 replacing the traditional FFS system. The capitation-based managed mental health care program was carved-out to two Behavioral Healthcare Organizations (BHOs): Premier Behavioral Health of Tennessee (Premier) and Tennessee Behavioral Health, Inc. (TBH). The reformed system, known as the TennCare Partners Program (TPP), offered mental health coverage to about one-fourth of Tennesseans, including 800,000 Medicaid eligible and 400,000 uninsured and uninsurable.

This chapter presented literature reviews on a series of empirical studies dealing with cost-containment and quality of mental health care issues. Overall, the research on cost and quality aspects of mental health care reform demonstrated that managed care can be not only an effective instrument in controlling cost, but also effective at delivering the desired outcome of quality of care. In achieving cost savings, most studies identified that decreased inpatient utilization (admissions, bed days), reduced outpatient service intensity (units of services per user), and effective contracting were the major process drivers. As for the quality of care, most studies demonstrated that the quality outcomes from managed care programs were comparable to those obtained under a FFS arrangement.

Chapter 2: Methodology

Chapter two discusses definitions of efficiency and effectiveness measurement. A brief discussion is made about the advantages of using recidivism as the quality indicator. Data collection, regressions, and testing techniques will be discussed.

2.1 Measurement of Cost-Efficiency and Cost-Effectiveness

Although in many situations the terms “efficiency” and “effectiveness” appear interchangeable, they are used distinctively in this research. The term “cost-efficiency” as used here is defined to measure the relative volume of service utilization of mental health care on the base of public mental health care expenditures. The term “cost-effectiveness” is defined to measure the quality of care on the base of public mental health expenditures.

The intention of using cost-effectiveness measurement is to understand whether and, if so, to what extent, the quality aspects of one system of mental health care may differ from another system of mental health care; and whether and, if so, to what extent, the lower costs realized by one health care system are due to purchases of fewer quantities or lower quality products, or the result of service efficiency improvements. A dynamic link between effectiveness and efficiency measures can be established according to the proposition of substitution or trade-off effects between quantity and quality aspects of health care products. The formation of a three-dimensional production system is necessary in demonstrating the interrelationship between quality and quantity within a system of health care production.

An example of such a three-dimensional system is presented in Figure 6, where axis x represents the quantity dimension of health care production; axis z represents the quality dimension; and axis y represents the price dimension. Assume that a preferred location of a system of health care production was anchored at position $H(x,p,y)$, the traditional price and quantity relationship would be H 's projection point (x,y) on the price-quantity surface indicating the cost-efficiency of the system of health care production H , while the price and quality relationship was H 's projection point (y,z) on the price-quality surface indicating the cost-effectiveness of the system. Further, H 's projection point (x,z) on the quantity-quality surface

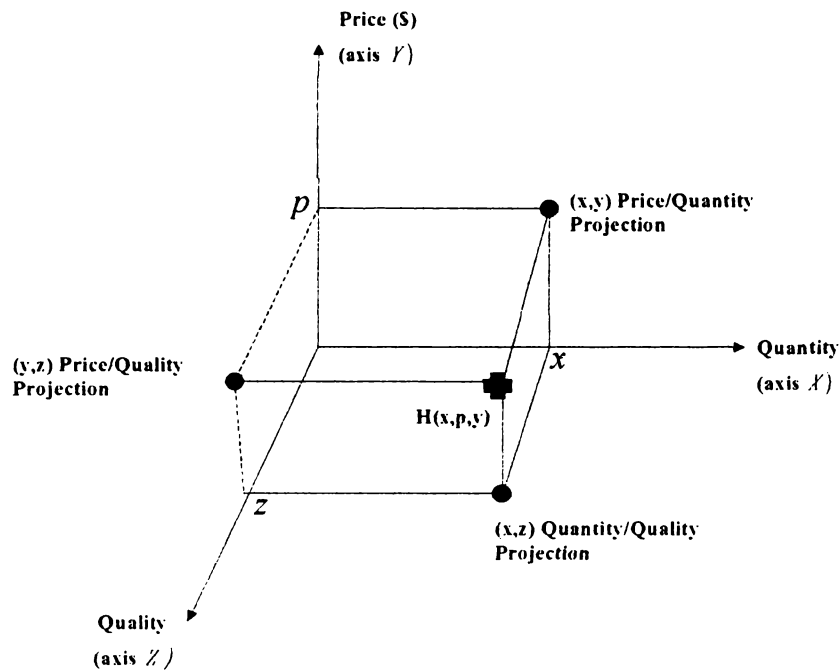


Figure 6: Three-Dimensional Health Care Production System

would represent the trade-off or substitution relationship between the quantity and quality attributes of the system of health care production. Conceptually, “quality cannot be provided with inadequate resources; however, more may not be better. Efficiency can lead to better care. Whenever ‘unnecessary services’ are avoided, there is improvement in care because the risks associated with those services are eliminated. However, excluding necessary procedures will decrease quality. In mental health, there are large variations in the lengths and intensity of treatment without significant differences in outcome (Savitz, 1992 [52], p. 45).”

In essence, this analysis of cost-effectiveness of public mental health care has very much in common with cost-benefit analysis. Benefits and effectiveness alike are usually secondary outcomes of economic activities lacking in unique indicators that would fully reflect the complexities of the benefits or effectiveness of economic activities. Here, the cost-effectiveness of a system of mental health care is concerned with the quality of mental health care production and is designed to be measured by quality-related indicators. Dollar values will be explicitly placed on selected indicators so that quality aspects of care can materialize as well.

For example, in cost-effectiveness terms, one could compare a six-month symptom stabilization period per \$1,000 depression treatment cost from visiting Dr. A versus a three-month symptom stabilization period per \$1,000 depression treatment cost from visiting Dr. B, *ceteris paribus*. Or, x dollars spent on a patient's mental health treatments resulted in a 60-day community tenure (Cook, 1992 [42], p. 184)³⁸ after discharge versus a 30-day community tenure, holding everything else the same. In each case, we would conclude there was a 50 percent difference in the cost-effectiveness of the system of care.

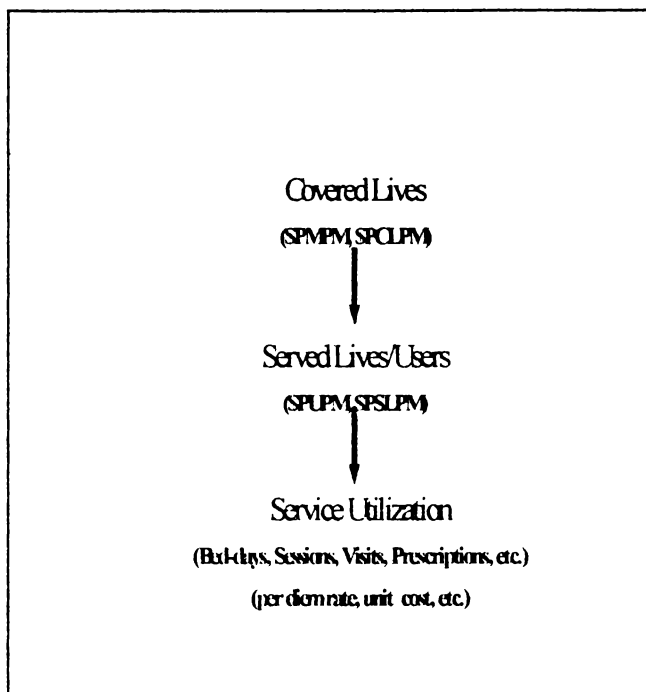
To summarize, cost-efficiency measurements defined in this study will evaluate the financial performance of a system of mental health care production in tangible units of traditional health care output; cost-effectiveness measurements will value quality attributes of health care production on the bases of unit program expenditures. Perhaps two things can differentiate the two measures most. One is the subject of purchasing, whether the subject fits the traditional dimension of health care production, such as bed days or it fits the quality dimensions of the production, such as consumer satisfaction. Second, effectiveness measures are usually secondary results of primary health care production activities. Recidivism rates, for example, are dependent on the completion of primary health care activities, such as hospital admissions, treatments, and discharges. In other words, the recidivism outcome will not exist unless these primary health care activities are carried out.

In this study, the measurements of cost-effectiveness and cost-efficiency of the TDMHMR system of mental health care and the TPP system of mental health care are aggregated and compared at the program level, not the provider level. The denominators of both measures are expenditures, or equivalently, costs at the program or payor level. For the TDMHMR system, the denominator is total program expenditures appropriated to CMHAs and RMHIs through the TDMHMR after administrative costs. For the TPP system, it is the total TPP expenditures paid to BHOs, less estimated administrative costs³⁹ and pharmacy costs.

Traditional health care output as the numerators of cost-efficiency measures can be estimated in three tiers: covered lives or enrolled members, served lives or program users, and service utilization. The top tier output is the number of lives or members covered by a program during a defined time period. From a

³⁸ The period between two inpatient encounters.

payor's perspective, average expenditure per covered life per month or per eligible member per month (PMPM) directly indicates the purchasing power of payors' investments in terms of consumers' entitled access to public mental health care. The second tier in output is the number of consumers who are actually being served by the system during the measuring time frame, termed "served lives," or "program users" here. This measure disperses program expenditures among the actual users, arriving at the average program expenditure per user per month (PUPM). The third tier in the output measures service utilization rather than access. After the annual program expenditures are divided between the inpatient and outpatient sectors across 12-month intervals, average and marginal



program expenditures or costs are then estimated based on service utilization trends of inpatient bed days, outpatient service and treatment sessions. Consequently, four basic cost-efficiency measures are evaluated: (1) program expenditure per member per month (PMPM); (2) program expenditure per user per month (PUPM); (3) program expenditure per outpatient session (unit cost); and (4) program expenditure per inpatient bed-day (per diem rate). In essence, these efficiency measurements can be considered as the observed maximum shadow prices of mental health care products since they are measured on the base of program funding or expenditures and not on the base of true production costs incurred at the provider level.

In general, the quality related measures could be classified into three basic groups: consumer and family satisfaction; outcome of services and treatments; and appropriateness of process-of-care, as summarized in Table 1 below.

³⁰ Estimated at ten percent of total revenues, according to the TDMHMR and BHO contract.

Table 1: Quality Indicators of Mental Health Care

Category	Indicator	Measuring Method
Consumer Satisfaction	Levels of consumer/family satisfaction	Survey
	Ratings of quality of life	Survey
	Complaint and appeal statistics	Administrative Data
	Plan turnover rates (due to satisfaction concerns)	Administrative Data
Outcome of Services and Treatments	Personal and social functioning improvement: --Global Assessment Scale (GAS) for measuring overall severity of psychiatric disturbance	Clinical Review
	Symptom stabilization or reduction: --Brief Psychiatric Rating Scale --clinical status improvement, such as change from a clinical related group 1 (severe) status to a clinical related group 3 (moderate) status --Community tenure --Hospital/Institution recidivism rate (≥ 60 day readmission)	Clinical Review, Claims/Encounters
Appropriateness of Process-of-care	Usage of preventative care	Claims/Encounters
	Usage of routine care management services (case management, medication management)	Claims/Encounters
	Hospital/Institution recidivism rate (≤ 30 day readmission)	Claims/Encounters
	Follow-up after discharge	Claims/Encounters

Consumer satisfaction-related indicators usually reflect consumers' experiences on the overall performance of health care systems, ranging from financing to management to service utilization and treatment. Service- and treatment-related outcomes directly measure service and treatment effectiveness of mental health care. Functional improvements, for example, in patients' abilities to handle their daily personal and social activities, are often considered as a desired indicator of quality of care (Cole, et al. 1994 [49]; Overall and Gorham, 1962 [53]; Andreasen, 1982 [54]; Endicott, Spitzer and Fleiss, [55]). Process-of-care related measures, compared to the satisfaction and the service- and treatment-related outcome measures, indirectly gauge the effectiveness of mental health care. The rationale for using such measurements is based on the belief that the appropriateness of process-of-care will contribute positively to quality of care. An example of this is appropriately using preventative and routine care to reduce probabilities of symptom deterioration or re-occurrences of crisis episodes. When first hand quality of care indicators are not available, these process-of-care indicators, usually obtained through examining the utilization patterns of

preventative care and maintenance-type services, can be instrumental in predicting the status of quality of care.

In this research, claims and encounter-based hospital recidivism rates are used to measure the effectiveness of a system of mental health care. Several justifications prompted this selection. First, systematic inpatient claim or encounter data are available for compiling the readmission rates for both the TDMHMR period and the TPP period. The application of such large-scale, encounter-based quality indicators brings consistency and uniqueness to the econometric evaluation of mental health care. Second, since readmission rates can be measured in various intervals (30-day readmission rate, 60-day readmission rate, 90-day readmission rate, and so on), they can provide the possibility to measure short-run and long-run effectiveness of a system of care. There are some discussions about using the very short-term, typically, less-than-30-day readmission rates, in measuring the quality of treatment. In some mental health professionals' views, the 30-day readmission rate presents the indication of poor treatment planning, particularly preceding inpatient care which would result in premature discharges. Consequently, these premature discharges could be considered an issue of appropriateness of process-of-care rather than a poor treatment outcome. Regardless of which category the 30-day readmission rate belongs to, the 30-day readmission rates are presented in this research along with the 60-, and 90-day readmission rates in evaluating the cost-effectiveness of the mental health care programs. Third, it is this researcher's opinion that hospital recidivism rates, especially mid- and long-term, can measure the effectiveness of the system of care beyond the preceding inpatient treatment point⁴⁰ (Hafemeister and Banks, 1996 [56]; TDMHMR, 1992 [67]). They can be used to measure the effectiveness of integration and coordination of inpatient and outpatient care, especially when such interactions are promotional goals of a system of care. It is clear that any poorly planned treatment elements such as premature discharge, delayed follow-up treatment and services, or insufficient community care management after discharge would result in some earlier than necessary readmissions⁴¹ (Dincin, et al. 1993 [57]). Hence, the longer a discharged individual stays in the community

⁴⁰ The Master Plan (p. 1): "The explicit goal of community treatment was to keep people out of hospital settings, and recidivism was the primary measure of system effectiveness."

⁴¹ Dincin, et al. evaluated whether use of inpatient services at a state hospital among persons in one of the hospital's catchment areas who were at high risk for rehospitalization was reduced by implementation of an assertive community treatment program. The study

without rapidly relapsing back to an inpatient facility, the stronger the indication of a more successful or efficacious system of care. Fourth, recidivism rates are more stringent measurements for effectiveness of care than other system-wide quality indicators. In health care, especially in mental health care, populations of consumers who frequently use inpatient services are considered high-risk, both medically and financially. Consequently, using recidivism rates derived from such a high-risk population to generalize the outcomes of quality of care would place health care systems in a more challenging position than using measures derived from a general population.

Recidivism rates have long been used in mental health literature for measuring inpatient treatment effectiveness⁴² (McGlynn, 1992 [58]). Close to the objective of this research, Hafemeister and Banks have suggested using recidivism rates to assess treatment program effectiveness or to examine such treatment at the macro or system-wide level, although their work is limited to inpatient facilities only (Hafemeister and Banks, 1996 [56]). To date, there were many studies using recidivism rates to measure effectiveness of care in the context of a system of integrated and coordinated care. However, there is not much work linking program expenditures and mental health care outcomes together in evaluation largely because the systematic data on financial information and utilization are often hard to come by together.

The reliability of using readmission rates to measure the effectiveness of a system of care is highly dependent on the mobility of the population under consideration. Ideally, all patients in the discharge and readmission population should exhibit no large eligibility gaps throughout each measuring term; otherwise, the measurements could be misleading if long gaps between discharges and readmissions are due to treatment received elsewhere. For the TDMHMR and the TPP mental health care systems, the users in the public mental health system, especially ones in the high-risk population, are usually system dependent. As an example, high-risk consumers in the TDMHMR system made up about 90 percent of the TPP high-risk

found that the assertive community treatment program significantly reduced use of inpatient days and improved community care. The utilization of bed-days by persons in the program's catchment area was reduced by 28% in the third year after program implementation.

This researcher also conducted an analysis of cost-effectiveness of using outpatient services to reduce inpatient utilization within the Tennessee public (FFS) mental health system. The findings indicate that the average length of community tenure was positively correlated with the average frequency of outpatient services. The measure of average length of community tenure was significantly different between recidivists with pre-admission community supports (180 days) and recidivists without such supports (108 days).

⁴² McGlynn stated that while hospitalization is incorporated into some outcome scales, it is used directly as a marker of outcomes (generally negative). There are at least four ways of using hospitalization as an outcome measure: number of hospitalizations annually; time interval between hospitalizations; duration of hospitalization; and type of admission (voluntary versus involuntary).

population. However, eligibility verifications were not performed on an individual basis for the high-risk population.

Additional data and statistical facts are provided throughout this research whenever it is available to reinforce analyses and findings. For instance, the percentages of monthly effective admissions or discharges, defined as the ratio of total admissions or discharges deducting the number of readmissions from the total admissions or discharges, are presented in Chapter 3, both for the TDMHMR and the TPP systems, in order to reinforce the suitability of using recidivism rates in the cost-effectiveness analysis.

2.2 Data Preparation

Data used in this research cover a series of longitudinal, financial, and utilization information for Tennessee's public mental health care system from January 1994 to December 1998. The first 30 months of data are associated with the FFS system under the administration of the TDMHMR. The remaining 30 months of data are associated with the capitation system administrated by the TPP. The payment definitions used here are based on payment methodologies set at the program level, i.e., the payment arrangement between the TDMHMR to CHMAs and RMHIs, and the payment arrangement between the TPP and BHOs, regardless of the payment methods existing between the CMHAs and their providers or between the BHOs and their providers. In fact, under the capitation system, there are substantial FFS payment arrangements among the BHOs and their contracted providers, mostly in the inpatient care sector (Figure 7).

The TDMHMR financial data on program expenditures were gathered and consolidated from various TDMHMR documents. Although the inpatient and outpatient expenditures were documented separately, monthly distributions were not available at the TDMHMR program level. However, since the TDMHMR system was a FFS system and payments were made based on services rendered, it was reasonable to divide the yearly expenditures based on the volume of services each month across the 12-month period. This volume-based approach was used in distributing the annual TDMHMR program payments across 12 monthly installments.

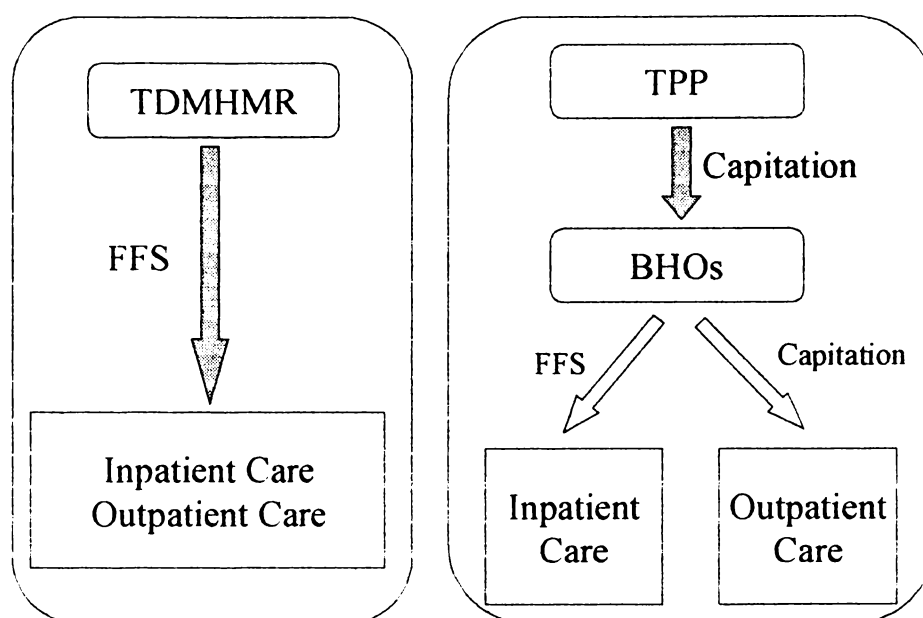


Figure 7: Payment Arrangements in the TDMHMR and the TPP systems

The TPP financial data for program expenditures were from TennCare capitation payment reports. Lump-sum capitation payments were made to the BHOs each month. With capitation payments, the BHOs were expected to cover inpatient, outpatient and pharmacy services. The BHOs' responsibility for paying for pharmacy services was relaxed twelve months into the program, then totally removed from the third year contract. Consequently, capitation payments to the BHOs were also reduced accordingly⁴³. For the TDMHMR system, pharmacy expenditures were not budgeted in TDMHMR expenses at all, thus, not recorded and documented in the TDMHMR information system. To make the expenditures comparable between the TPP and the TDMHMR systems, pharmacy costs were deducted from total BHO capitation payments based on pharmacy payment information generated through the pharmacy encounter files. Furthermore, the monthly distribution of the expenditures between the inpatient and outpatient sectors was not known at the TPP level. Since payment arrangements from the BHOs to the inpatient facilities were still FFS in nature, and the payment information was documented by the encounter system, it was feasible to

⁴³ By \$3 PMPM

estimate monthly actual spending on the TPP's inpatient care. Further, upon arriving at the inpatient expenditures, it was appropriate to divide the monthly capitation payment between the inpatient and outpatient sectors via deduction of encounter-based inpatient costs from monthly program expenditures. All expenditures used in this analysis were adjusted for inflation using the medical care services component of the consumer price indices, published by Bureaus of Labor Statistics.

Data for covered lives or enrolled members were compiled from the TDMHMR's census information system and TennCare's eligibility (enrollment) information system. The TDMHMR census information system was a register documenting the TDMHMR recipients' basic demographic and financial information. Since the TDMHMR system was not operated as an insurance system per se, the term "covered lives" or members, is loosely applied to the system to arrive at a potential population needing care. Nevertheless, covered lives under both systems were counted as individuals who had open census or enrollment records during each measurement period. On one hand, the statistics of covered lives may not be quite comparable in this research because eligibility criteria have changed dramatically from the TDMHMR system to the TPP system. On the other hand, the expansion of the eligible population from about 130,000 lives in the TDMHMR program to about 1.2 million lives in the TPP program has been viewed as a dramatic success for Tennessee's managed public mental health care reform.

The number of served lives or program users in the TDMHMR system is compiled from the Direct Patient Service (DPS) database and the TDMHMR Census database. The DPS database houses the outpatient service utilization information under the FFS system, while the TDMHMR census database houses general census information on the TDMHMR consumers, as well as claims information on inpatient or institutional care. The population of served lives or users is defined as unduplicated consumers who have used either inpatient or outpatient services, or both, during each measuring period. The number of served lives in the TPP system are compiled from the TPP inpatient and outpatient encounter database using the same population definition, but only those for whom claims were paid. Consumers who used only the services that have been denied payment by BHOs are not included in the user population.

The same data bases used for identifying program users are used to produce inpatient and outpatient service utilization statistics. Major categories of outpatient services include therapy (individual, family, and group), day treatment, medication management, case management, crisis intervention, evaluation, intake and assessment, and transportation, also, supportive community services (housing and employment). All claim or encounter-based services, regardless of the category, are aggregated by month for each program by production sector. For the TPP system, again, only paid⁴⁴ encounters or claims are included.

Hospital admission data are extracted from the TDMHMR census database and the TPP's inpatient encounter and claim databases. Monthly admissions are indexed from previous dates of discharges of patients; so the lengths between the readmission and the patient's previous discharge can be measured. Readmissions in a month can then be counted and classified as 30-, 60-, 90-day readmissions accordingly. It is recognized that since the TPP's encounter system is a new system, the initial readmission counts are expected to be low; though in relative measures, such as readmission per 1,000 members or per 1,000 patients discharged, the rates should be comparable. Further, it is also recognized that under a managed care system, hospital readmissions may be reduced due solely to restrictions on hospital utilization. As data indicate here, admissions in general under the TPP system actually increased. Thus, it is believed that the managed care practices have not had discriminative influences on patient readmissions.

2.3 Multiple Variable Regressions, Hypotheses, and Testing

Cost-efficiency and cost-effectiveness analyses are based on estimations of multi-variable, linear regressions of service utilization and quality of care functions. For inpatient and outpatient utilization regressions, the volume of service utilization measures (IPDAYS, OPSVC) are assumed to depend on program funding (IPFUND, OPFUND), population of consumers in care (IPSVD, OPSVD), and whether or not utilization is impacted by managed mental health care reform. Because the state public mental health care system is built on the basis of government funding, and because the primary objective of this research is to

⁴⁴ Some claims are denied for payment by BHCs.

determine whether or not public investment in mental health care can be used more efficiently and effectively when distribution or payment methodology changes, program funding is considered as the key exogenous factor in the utilization and outcome regressions. In practice, both the TDMHMR and the TPP systems featured pre-budgetary processes. For the TDMHMR system, program expenditures or funding were usually budgeted ahead of time based on the funding availability of various resources. Utilization levels at CMHAs and RMHIs were also often planned in advance based on experience of past utilization and revenue expectations. For the TPP system, program expenditures were calculated on a capitation base and prepaid to the BHOs at the beginning of each payment period. Because the TDMHMR was a FFS system with not-for-profit safe-net providers, providers would usually produce to the point where all available funding was consumed. Therefore, it is expected that the correlation between the TDMHMR utilization and the TDMHMR funding would be positive under normal circumstances. For the TPP system, the public mental health care program was administered by for-profit business entities. Once revenues were advanced in payment, the BHOs would manage utilization in order to maximize profits and maintain quality of care, while minimizing financial and contractual risks. How utilization would respond to program funding under a capitation system is under scrutiny in this research. In the short run, one may observe none or an inverse relationship between utilization and program expenditures. In the long run, this researcher believes that a positive relationship between utilization and program expenditure would still dominate because program funding should be eventually adjusted to meet demand in an efficient manner. However, the degree of responsiveness between utilization and program expenditures given by a capitation system may not be as strong as a one given by a FFS system. Any change in policy, management, medical care technology, or scale of economy could also alter a positive relationship toward zero, or even a negative one. Given long enough observation periods, the positive correlation should then resume through funding adjustments.

The population of consumers in need of care is also considered as an independent variable affecting utilization outcomes. In general, it is assumed that utilization and population of consumers in need of care are correlated positively: the more people in need of care, the higher the utilization volume. Like the funding and utilization relationship, exceptions may exist also when policy and management strategies, such as

utilization management in relative service intensity, shift dramatically, and when an observation period is short. A typical example to demonstrate this is the level of outpatient service utilization and the size of the population in services during the final days of the TDMHMR period. Under the influence of the Master Plan, the intensity of outpatient utilization was dramatically reduced while the size of the user population actually increased because the CMHAs had to add more patients on service lists in order to prevent potential revenue loss caused by reductions in service intensity.

At the focus of this study, capitation-based managed care reform is expected to influence the utilization outcome significantly as well. At a minimum, it is believed that managed care would reduce unnecessary utilization in the initial stage of transition from a traditional FFS system to a capitation system.

The structures of the inpatient and outpatient utilization functions are presented below.

Inpatient Utilization Function

The restricted form of the function is:

$$\begin{bmatrix} IPDAYS_{t1} \\ IPDAYS_{t2} \end{bmatrix} = \begin{bmatrix} i_{t1} & 0 & IPFUND_{t1} & IPSVD_{t1} \\ 0 & i_{t2} & IPFUND_{t2} & IPSVD_{t2} \end{bmatrix} \begin{bmatrix} \alpha_{t1} \\ \alpha_{t2} \\ \beta_{IPFUND} \\ \beta_{IPSVD} \end{bmatrix} + \mu$$

The unrestricted form of the function is:

$$\begin{bmatrix} IPDAYS_{t1} \\ IPDAYS_{t2} \end{bmatrix} = \begin{bmatrix} i_{t1} & IPFUND_{t1} & IPSVD_{t1} & 0 & 0 & 0 \\ 0 & 0 & 0 & i_{t2} & IPFUND_{t2} & IPSVD_{t2} \end{bmatrix} \begin{bmatrix} \alpha_{t1} \\ \beta_{IPFUND,t1} \\ \beta_{IPSVD,t1} \\ \alpha_{t2} \\ \beta_{IPFUND,t2} \\ \beta_{IPSVD,t2} \end{bmatrix} + u$$

where *IPDAYS* is monthly aggregated bed-days incurred at institution or inpatient facilities; *IPFUND* represents monthly public program expenditures in inpatient care; *IPSVD* represents monthly patients served

or user census in inpatient care; $t1$ is the time indices for the TDMHMR period (January 1994 to June 1996), and $t2$ is the time indices for the TPP period (July 1996 to December 1998).

Outpatient Utilization Function

The restricted form of the function:

$$\begin{bmatrix} OPSVCS_{t1} \\ OPSVCS_{t2} \end{bmatrix} = \begin{bmatrix} i_{t1} & 0 & OPFUND_{t1} & OPSVD_{t1} \\ 0 & i_{t2} & OPFUND_{t2} & OPSVD_{t2} \end{bmatrix} \begin{bmatrix} \alpha_{t1} \\ \alpha_{t2} \\ \beta_{OPFUND} \\ \beta_{OPSVD} \end{bmatrix} + \mu$$

The unrestricted form of the function:

$$\begin{bmatrix} OPSVCS_{t1} \\ OPSVCS_{t2} \end{bmatrix} = \begin{bmatrix} i_{t1} & OPFUND_{t1} & OPSVD_{t1} & 0 & 0 & 0 \\ 0 & 0 & 0 & i_{t2} & OPFUND_{t2} & OPSVD_{t2} \end{bmatrix} \begin{bmatrix} \alpha_{t1} \\ \beta_{OPFUND,t1} \\ \beta_{OPSVD,t1} \\ \alpha_{t2} \\ \beta_{OPFUND,t2} \\ \beta_{OPSVD,t2} \end{bmatrix} + u$$

In these equations, $OPSVCS$ is monthly aggregated number of outpatient services; $OPFUND$ represents monthly public program expenditures on outpatient care; $OPSVD$ represents monthly patients served or user census in outpatient care; $t1$ is the time index for the TDMHMR period, and $t2$ is the time index for the TPP period.

Quality of Care Functions

The restricted form of the function (30-day readmissions):

$$\begin{bmatrix} RCID30DPT_{t1} \\ RCID30DPT_{t2} \end{bmatrix} = \begin{bmatrix} i_{t1} & 0 & FUNDPT_{t1} & SVDPT_{t1} \\ 0 & i_{t2} & FUNDPT_{t2} & SVDPT_{t2} \end{bmatrix} \begin{bmatrix} \gamma_{t1} \\ \gamma_{t2} \\ \gamma_{FUNDPT} \\ \gamma_{SVDPT} \end{bmatrix} + \mu$$

The unrestricted form of the function (30-day readmissions):

$$\begin{bmatrix} RCID\ 30\ DPT_{i1} \\ RCID\ 30\ DPT_{i2} \end{bmatrix} = \begin{bmatrix} i_{i1} & FUNDPT_{i1} & SVDPT_{i1} & 0 & 0 & 0 \\ 0 & 0 & 0 & i_{i2} & FUNDPT_{i2} & SVDPT_{i2} \end{bmatrix} \begin{bmatrix} \gamma_{i1} \\ \gamma_{FUNDPT\ .i1} \\ \gamma_{SVDPT\ .i1} \\ \gamma_{i2} \\ \gamma_{FUNDPT\ .i2} \\ \gamma_{SVDPT\ .i2} \end{bmatrix} + u$$

The restricted form of the function (60-day readmissions):

$$\begin{bmatrix} RCID\ 60\ DPT_{i1} \\ RCID\ 60\ DPT_{i2} \end{bmatrix} = \begin{bmatrix} i_{i1} & 0 & FUNDPT_{i1} & SVDPT_{i1} \\ 0 & i_{i2} & FUNDPT_{i2} & SVDPT_{i2} \end{bmatrix} \begin{bmatrix} \gamma_{i1} \\ \gamma_{i2} \\ \gamma_{FUNDPT} \\ \gamma_{SVDPT} \end{bmatrix} + \mu$$

The unrestricted form of the function (60-day readmissions):

$$\begin{bmatrix} RCID\ 60\ DPT_{i1} \\ RCID\ 60\ DPT_{i2} \end{bmatrix} = \begin{bmatrix} i_{i1} & FUNDPT_{i1} & SVDPT_{i1} & 0 & 0 & 0 \\ 0 & 0 & 0 & i_{i2} & FUNDPT_{i2} & SVDPT_{i2} \end{bmatrix} \begin{bmatrix} \gamma_{i1} \\ \gamma_{FUNDPT\ .i1} \\ \gamma_{SVDPT\ .i1} \\ \gamma_{i2} \\ \gamma_{FUNDPT\ .i2} \\ \gamma_{SVDPT\ .i2} \end{bmatrix} + u$$

The restricted form of the function (90-day readmissions):

$$\begin{bmatrix} RCID\ 90\ DPT_{i1} \\ RCID\ 90\ DPT_{i2} \end{bmatrix} = \begin{bmatrix} i_{i1} & 0 & FUNDPT_{i1} & SVDPT_{i1} \\ 0 & i_{i2} & FUNDPT_{i2} & SVDPT_{i2} \end{bmatrix} \begin{bmatrix} \gamma_{i1} \\ \gamma_{i2} \\ \gamma_{FUNDPT} \\ \gamma_{SVDPT} \end{bmatrix} + \mu$$

The unrestricted form of the function (90-day readmissions):

$$\begin{bmatrix} RCID90DPT_{t1} \\ RCID90DPT_{t2} \end{bmatrix} = \begin{bmatrix} i_{t1} & FUNDP_{t1} & SVDPT_{t1} & 0 & 0 & 0 \\ 0 & 0 & 0 & i_{t2} & FUNDP_{t2} & SVDPT_{t2} \end{bmatrix} \begin{bmatrix} \gamma_{t1} \\ \gamma_{FUNDP,t1} \\ \gamma_{SVDPT,t1} \\ \gamma_{t2} \\ \gamma_{FUNDP,t2} \\ \gamma_{SVDPT,t2} \end{bmatrix} + u$$

In these equations, *RCID30DPT*, *RCID60DPT*, and *RCID90DPT* are monthly aggregated number of 30-, 60-, and 90-day readmissions; *FUNDP* represents monthly total program expenditures of mental health care; *SVDPT* represents monthly patients served or user census in both inpatient and outpatient care; *t1* is the time indices for the TDMHMR period, and *t2* is the time indices for the TPP period.

Two hypotheses will be tested to provide inferences for cost-effectiveness and cost-effectiveness analyses:

Hypothesis 1: The parameters of the TPP (capitation-based managed care) form of the utilization functions will not be different from the parameters of the TDMHMR (FFS) form of the utilization functions.

Hypothesis 2: The parameters of the TPP (capitation-based managed care) form of the quality of care function will not be different from the parameters of the TDMHMR (FFS) form of the quality of care function.

All hypotheses are tested using Chow tests (testing for structural change). The critical value of the *F*-statistic with three degrees of freedom and 54 observations is 2.76 at 5 percent level of significance.

Access-related cost-efficiencies are tested with analysis of variance analyses (ANOVA) to compare the cost-efficiencies before and after managed care reform in terms of nominal and positive access of consumers to public mental health care systems.

Along with hypothesis testing of the utilization and quality of care functions, funding-related parameters are also compared between the two systems to assess the direction and magnitude of the

reform's impact. Two immediate assessments are evaluated in the regressions. First, has managed care reform had any structural impact on Tennessee's mental health care system in terms of its cost-efficiency and cost-effectiveness of behavioral healthcare? Second, if the answer to the first question is "yes," in what direction and magnitude has managed care impacted Tennessee's public mental health care system? Or, has reform advanced the system of cost-effectiveness? If so, how significant is it?

2.4 Regression Specifications

In all regressions it is assumed that the dependent variables are directly and linearly influenced by two important factors: program expenditures and mental health care demands, measured by served populations at each measuring point. The factor of managed reform is not explicitly expressed in the regressions, rather, is illustrated through testing the structural changes of the utilization and quality of care functions using pre- and post-managed care data. Several concerns, such as multicollinearity, heteroscedasticity, and autocorrelation are examined⁴⁵ for possible violations of the basic assumptions of classical normal linear regressions.

Concerns of Multicollinearity It is likely that a certain degree of multicollinearity exists between the explanatory variables program expenditure and measures of service demand, such as lives covered or served, because the programs (TDMHMR or TPP) were usually budgeted in advance with some knowledge of current or projected population size. To quantify the degree of multicollinearity, total program expenditure, program inpatient expenditure, and outpatient expenditures were regressed with respect to served lives, inpatients served, and outpatients served. Also, Pearson correlation coefficients were examined for these paired explanatory variables. On a scale of 0 to 1, the closer to zero the correlation coefficients and the R-squares are, the less collinear the paired variables. The results are presented in Table 2. Both the Pearson correlations and R-squares indicate limited multicollinearities between these paired explanatory variables.

⁴⁵ These examinations were based on the raw data before the inflation adjustments.

Table 2: Testing of Multicollinearity

Explanatory Variables	Pearson Correlation	Results of Paired Regressions		
		R-square	F Value	Prob>F
ALLSVD/TOTFUND	0.12841	0.0165	0.972	0.3282
OPSVD/OPFUND	0.65985	0.4354	44.729	0.0001
IPSVD/IPFUND	-0.36087	0.1302	8.684	0.0046

Concerns of Heteroscedasticity Heteroscedasticity concerns the disturbance term of the regressions being spread out unequally, so that the property of homoscedasticity for the ordinary linear square (OLS) residuals is violated. Heteroscedasticity is not a real concern in this research since the research does not involve cross-sectional data where heteroscedasticity is more likely to occur, as opposed to time-series data. Nevertheless, the plotting of squared estimated residuals for inpatient and outpatient output are examined for distinct patterns of heteroscedasticity. As Figure 8 and Figure 9 display, the plots do not indicate the typical patterns of heteroscedasticity. Consequently, the ordinary least squares (OLS) condition of homoscedasticity or the constant variance assumption is assumed to hold.

Concerns of Autocorrelation Autocorrelation is more likely to be present in the regressions because the research deals with time-series data. Autocorrelation violates basic OLS assumptions for arriving at best linear unbiased estimators (BLUE) through correlation between members of a series of observations ordered in time. In this research, examination of the Durbin-Watson *d* statistic of OLS residuals indicated the error term for the time series data in the cost-efficiency and cost-effectiveness regressions are at least first-order autoregressive in nature; hence, it is necessary to consider alternative regression techniques so that the impact of autocorrelation can be minimized in estimating regression parameters.

Concerns of Specification Errors Another basic assumption of classical regression analysis is that the regression equations used are correctly specified. The specification of the service utilization and quality of care functions are largely guided by theoretical and empirical assumptions. It is assumed here that public mental health care output is predominantly affected by expenditure and demand for such care, as well as the presence of managed care reform activities. The possibility of making specification errors are examined for the fitted equations after the correction for autocorrelations using two alternatives: the Durbin-Watson *d* statistic and the *R*-square statistic that indicates the goodness-of-fit of the regression. In general,

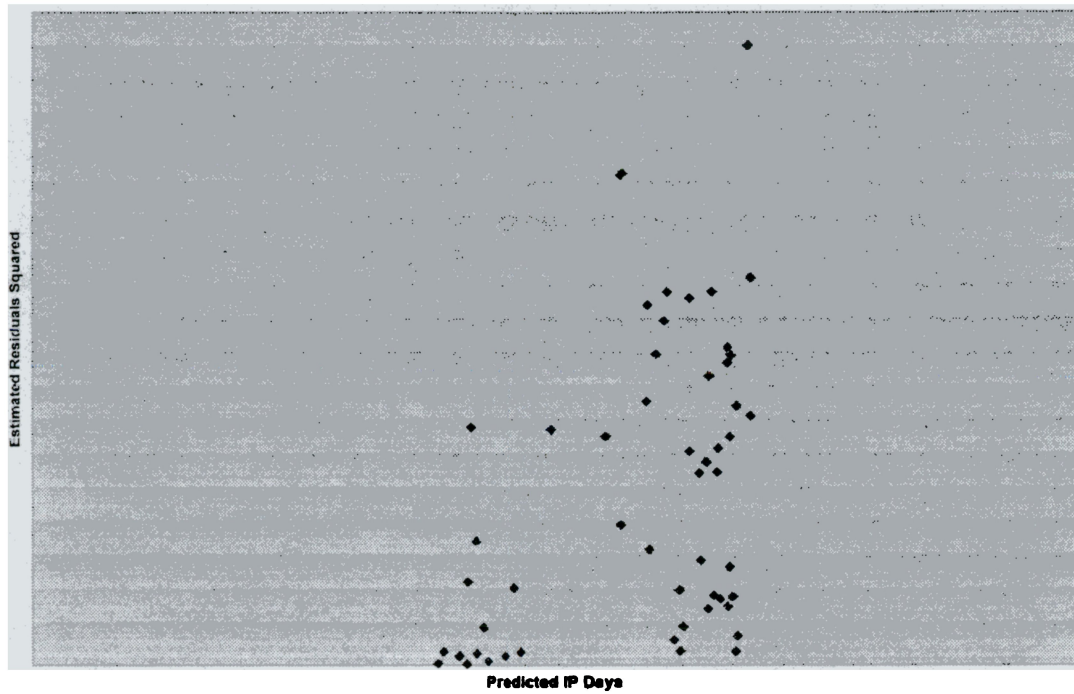


Figure 8: Plot of Estimated Residuals—Inpatient Bed-Days

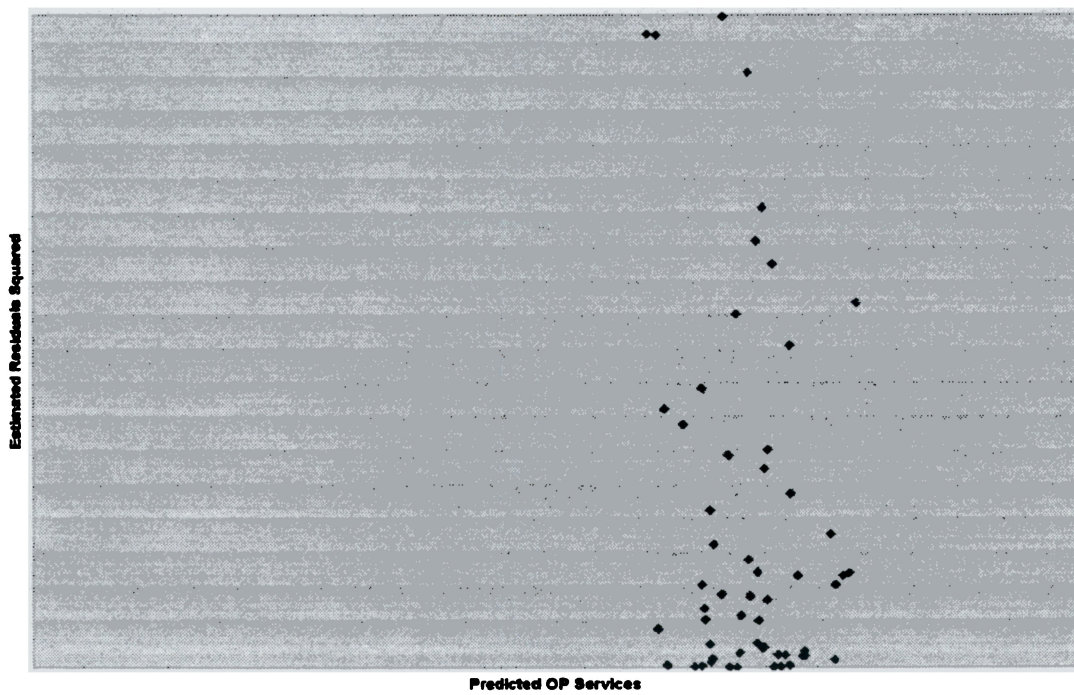


Figure 9: Plot of Estimated Residuals—Outpatient Services

closer to one the R -square statistics are, the better the goodness-of-fit and the fewer specification errors of the service utilization and quality of care functions. Table 3 below lists these d statistics and R -square statistics. All results but the outpatient determination coefficient (R -square) do not suggest severe specification errors.

With due consideration, it appears that autocorrelation is the only problem in the data sets of the research that could lead to a violation in the basic assumptions for arriving at estimators with the desired properties of classical normal linear regression. Therefore, this research will employ the autoregression (AR/SAS[®]) procedure in fitting data to the equations in order to minimize the impact of autocorrelation on

Table 3: Durbin-Watson d Statistics and R -square Statistics for Detecting Specification Errors

Regressions	D	R-square
Outpatient utilization	1.9669	0.3356
Inpatient utilization	1.8219	0.9590
Cost-effectiveness measured by 30-day recidivism	2.0230	0.8833
Cost-effectiveness measured by 60-day recidivism	1.9550	0.9076
Cost-effectiveness measured by 90-day recidivism	1.9593	0.9264

the quality of the estimators. Also, in these autoregressions, maximum likelihood computation is employed in the regressions with autoregressive (AR) schemes. The use of maximum likelihood estimation would minimize the sum of squares and maximize the log likelihood, respectively. Also, relevant optimization is performed simultaneously for both the regression and AR parameters.



This chapter defined terms and definitions of efficiency and effectiveness measurement. Cost-efficiency and cost-effectiveness are evaluated from five basic measures: (1) program expenditure per member per month (\$PMPM); (2) program expenditure per user per month (\$PUPM); (3) program expenditure per outpatient session; (4) program expenditure per inpatient bed-day; (5) reduction in

recidivism rates per \$1,000 program expenditures. Program expenditures, adjusted for inflation in medical care services, were considered as the base of the cost analysis.

A brief discussion was made about using recidivism rates (30-day, 60-day, and 90-day) as quality indicators. This researcher believes that recidivism rates can be used to measure the effectiveness of integration and coordination of inpatient and outpatient care, especially when such interactions are promotional goals of a system of care. The chapter justified the validity of using recidivism rates under a managed care system, while stating that the likelihood of readmission rates being skewed by the practice of prior authorization was small.

Data used in this research covered a series of longitudinal, financial, and utilization information for Tennessee's public mental health care system from January 1994 to December 1998. The first 30 months of data were associated with the FFS system under administration of the TDMHMR. The remaining 30 months of data were associated with the capitation system administrated by the TPP. All data were aggregated monthly.

The chapter also discussed specifics about regression and testing techniques used in this research. Cost-efficiency and cost-effectiveness analyses were based on estimations of multi-variable, linear regressions of service utilization and quality of care. For inpatient and outpatient utilization functions, the volume of service utilization measures (IPDAYS, OPSVCS) were assumed to depend on program funding (IPFUND, OPFUND), population of consumers in care (IPSVD, OPSVD), and whether or not utilization was impacted by managed mental health care reform. For quality of care functions, rates on 30-day, 60-day, and 90-day readmissions per 1,000 members were assumed to depend on program funding per 1,000 members, total program users per 1,000 members, and whether a system was under managed care.

These regressions were used to test two hypotheses of various forms of cost-efficiency and cost-effectiveness measures using an econometric methodology of testing structural changes using Chow test: (1) the parameters of the inpatient and outpatient utilization functions given by the capitation-based managed mental health care system (TPP) will not be different from the parameters of the utilization regressions given by the fee-for-service mental health care system (TDMHMR); (2) the parameters of the quality of care

regressions given by the capitation-based managed mental health care system (TPP) will not be different from the parameters of the quality of care regressions given by the fee-for-service mental health care system (TDMHMR).

Several typical concerns in classical normal linear regressions were investigated. Only autocorrelation, which could lead to a violation in basic assumptions for arriving at estimators with the desired properties concerning behavior of regression disturbances in the classical regressions, was indicated. Therefore, this research employed the Autoregression (AutoReg/SAS®) procedure along with maximum likelihood estimation in fitting data to equations in order to minimize the impact of autocorrelation on desired qualities of the parameters of the estimations.

Chapter 3: Analysis of Cost-Efficiency and Cost-Effectiveness

Chapter three presents cost-efficiency and cost-effectiveness analyses in the areas of program access, inpatient care, outpatient care, and quality of care. Actual TPP expenditures are compared to projected expenditures as if there were no changes made to the system to quantify the overall cost containment effort. Average and marginal utilization costs are estimated. Costs of access to care in per member per month and per user per month are evaluated also. Further observations are made regarding strategic factors of managed care, such as service substitution, contracting, and service system reconfiguration.

3.1 Program Funding Trend and Cost-Efficiency of Access to Care

State expenditures⁴⁶ (Table 4) on public mental health care services increased progressively throughout the TDMHMR and the TPP periods. Significant increases in Tennessee's public mental health expenditures were concentrated in the outpatient sector. Outpatient expenditures increased from about \$25 million in fiscal year 1987-88 to about \$56 million in fiscal year 1989-90, then to \$147 million in fiscal year 1995-96, averaging about a 27.6 percent annual rate of increase over eight years during the TDMHMR administration. Funding in inpatient care had a relatively small change for the same period, from \$87 million in fiscal year 1987-88 to \$104 million in fiscal year 1995-96, averaging about a 2.7 percent increase. The disproportionate distribution between inpatient and outpatient sectors was the result of a long-term national

⁴⁶ Sources:

FY1987-88: State Submission to NIMH, Implementation Status Report (revised). May 1993, p. 19

FY1988-89: State Submission to NIMH, Implementation Status Report (revised). May 1993, p. 19

FY1989-90: Tennessee Implementation Status Report, Adult. July 1, 1992-June 30, 1993, p. 23

FY1990-91: Tennessee Implementation Status Report, Adult. July 1, 1992-June 30, 1993, p. 23

FY1991-92: Tennessee Implementation Status Report, Adult. July 1, 1992-June 30, 1993, p. 23

FY1992-93: Tennessee Implementation Status Report, Adult. July 1, 1992-June 30, 1993, p. 23

FY1993-94: Annual Plan for a Comprehensive System of Mental Health Services in Tennessee, Adult, July 1, 1994 - June 30, 1995, p. 53

FY1994-95: 1995 Annual Report, Breakthrough, TDMHMR. vol. 21, No. 1, p5

FY1995-96: TDMHMR CMHCs and RMHIs cost reports

FY1996-97: TennCare Partners Program Monthly Capitation Payment Reports and Encounter Estimates

FY1997-98: TennCare Partners Program Monthly Capitation Payment Reports and Encounter Estimates

FY1998-99: TennCare Partners Program Monthly Capitation Payment Reports and Encounter Estimates

Table 4: Tennessee's Public Mental Health Program Expenditures

TDMHMR Expenditures	Outpatient	Inpatient	Total
FY1987-88	\$25,427,673.74	\$86,642,443.85	\$112,070,117.59
FY1988-89	\$27,215,425.35	\$90,998,655.88	\$118,214,081.23
FY1989-90	\$55,971,144.97	\$75,519,551.45	\$131,490,696.43
FY1990-91	\$56,843,755.81	\$83,760,140.99	\$140,603,896.80
FY1991-92	\$71,277,427.83	\$84,329,528.25	\$155,606,956.09
FY1992-93	\$92,739,677.50	\$91,899,136.62	\$184,638,814.12
FY1993-94	\$122,112,682.15	\$94,776,845.48	\$216,889,527.62
FY1994-95	\$130,411,339.62	\$99,645,982.27	\$230,057,321.89
FY1995-96	\$146,947,161.93	\$104,060,165.01	\$251,007,326.94
TPP Expenditures	Outpatient	Inpatient	Total
FY1996-97	\$185,575,522.56	\$82,884,380.90	\$268,459,903.46
FY1997-98	\$170,049,968.36	\$65,692,629.87	\$235,742,598.23
FY1998-99	\$197,912,517.75	\$61,430,049.26	\$259,342,567.00

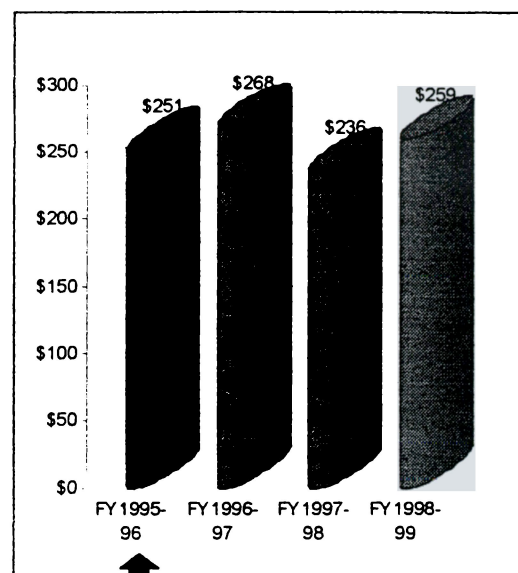
Source: Reconciliation of Various TDMHMR and TPP Documents, and Claims/Encounter Estimates.

All Expenditures are Medical Care Services Components of Consumer Price Indices adjusted (1982-1984=100).

strategic emphasis on community-based care and deinstitutionalization. Together, inpatient and outpatient, the average annual rate of increase from fiscal year 1987-88 to fiscal year 1995-96 is about 10.7 percent, from \$112 million to \$251 million (Table 4).

The first three years of the TPP expenditures are also shown in Table 4. The total annual TPP expenditures, after 10 percent administrative cost, were apportioned into pharmaceutical, inpatient, and outpatient sectors. With the knowledge of encounter-based inpatient and pharmacy costs, outpatient expenditures were estimated as the balance of total annual TPP expenditures less inpatient and pharmacy costs. Because TDMHMR program expenditures do not include pharmacy expenditures⁴⁷, the comparable equivalents of the TPP expenditures in this analysis comprise expenditures only in inpatient and outpatient care. The first three years of the TPP expenditures and the last year of the TDMHMR expenditures are shown in Figure 10. The second year drop in the TPP program expenditures has much to do with

unanticipated but significant increases in behavioral pharmacy costs. Pharmacy costs were not initially anticipated and appropriately budget in total TPP expenditures because cost estimates of the TennCare Mental Health and Substance Abuse Waiver were developed according to the TDMHMR fiscal year 1995-96 (Waiver baseline year) expenditures which were spending projections in the Master Plan⁴⁸. Consequently, with fixed revenues and an unforeseeable magnitude of pharmaceutical spending, the BHOs would have taken away funding that could have been made available for other types of care--outpatient and inpatient, or



TennCare MH/SA
Waiver Baseline Year

Figure 10: TPP Expenditures (Inpatient and Outpatient Care) Compared to the Last Year Expenditure of the TDMHMR Operations (constant dollars, \$ million)

dip into their reserve to pay for pharmacy costs. Therefore, at an extreme, the excessive spending in prescription drugs would erode BHO profitability had there been any savings from other types of care. In fact, by the middle of fiscal year 1997-98, pharmacy spending became so significant⁴⁹ that not only the expenditures on inpatient and outpatient care took a deep plunge, but it hindered BHO profitability. In fact, one of the BHOs reported negative profits in the second year of the TPP operation. The financial pressure on the BHOs became so intense that it led eventually to the state decision to oversee the management and financial responsibility of the TPP's pharmaceutical care beginning in the third year of the TPP operation.

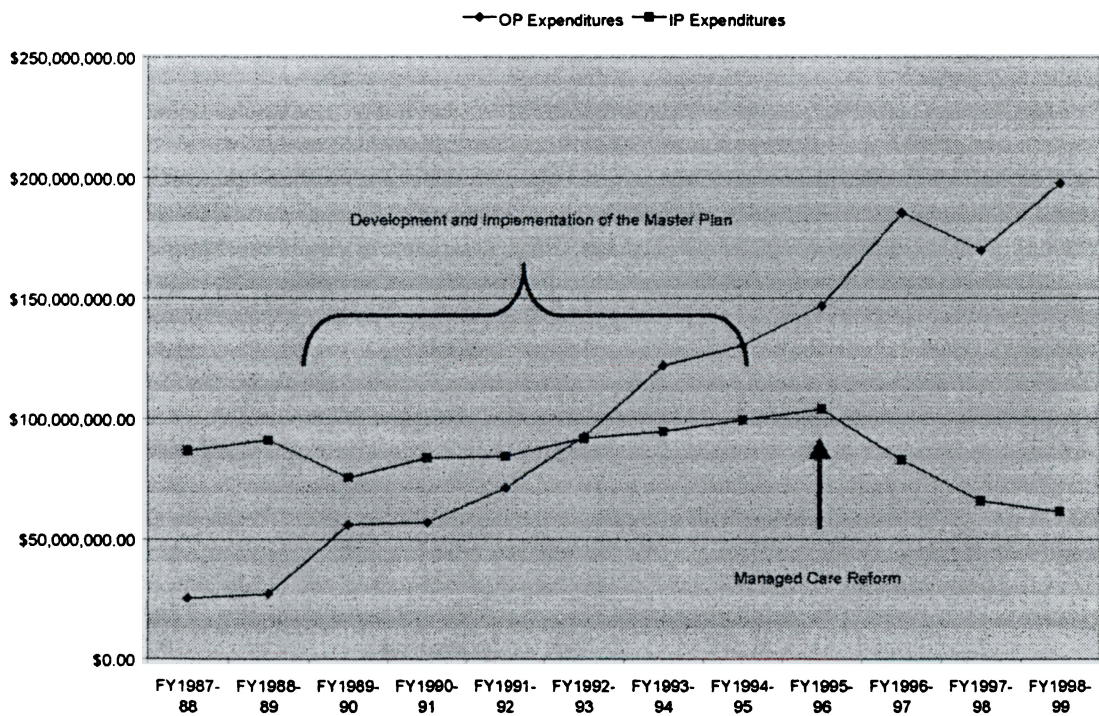
⁴⁷ During the TDMHMR period, prescription drugs were reimbursed directly from the Medicaid/TennCare budget. They were not captured by the TDMHMR Direct Patient Services (DPS) claims information system.

⁴⁸ A task force report in 1998 by the state acknowledged new drugs are available now that were not available at the time the Master Plan was developed. The costs of all of these drugs has not been factored appropriately into expenditure projections.

⁴⁹ It is recognized that a complex of factors attributed to such an increase, including price hikes, dispense volume per prescription increases, more prescriptions written, more people using behavioral drugs, more expensive drugs, non-mental health usage of behavioral drugs, etc. As a result, behavioral prescription costs, in current dollars, increased from \$1.45 PMPM in July 1996 to \$5 in June 1997 during the first year of the TPP operation. The trend continued during the second year of the TPP operation. By the end of fiscal year 1997-98, behavioral prescription costs reached \$8.22 PMPM. Over a 30-month period, the average rate of behavioral pharmacy cost increase in PMPM is roughly eight percent. (MCO crossover behavioral prescription claims contribute to about 20-30 percent of the

Figure 11 depicts the distribution trends of the TDMHMR and the TPP expenditures over a 12-year period. Two significant turning points in recent years are worth mentioning. One, for the first time in Tennessee's history of public mental health care, during the development and implementation of the TDMHMR Master Plan since fiscal year 1989-90, spending on the outpatient sector increased significantly, eventually outweighing spending on inpatient care. Two, under managed care reform, spending on inpatient care began to decrease dramatically.

The course of the first three years of the TPP spending, shown as the continuation of and the trending of the TDMHMR program's spending, is depicted in Figure 12. The downward departure of the actual TPP program expenditures from the linear trend of the TDMHMR expenditures indicates that the growth momentum of program expenditures abated. The linear trend based on the TDMHMR's past experience of program spending predicted that fiscal year 1996-97, 1997-98 and 1998-99 public expenditures would be about \$263, \$282 and \$300 million, respectively. The actual spending of the TPP



**Figure 11: Impact of the Master Plan and Managed-care Reform
(current dollars)**

total volume of prescription claims. About 80 percent of crossover behavioral pharmacy recipients had never used any services from the

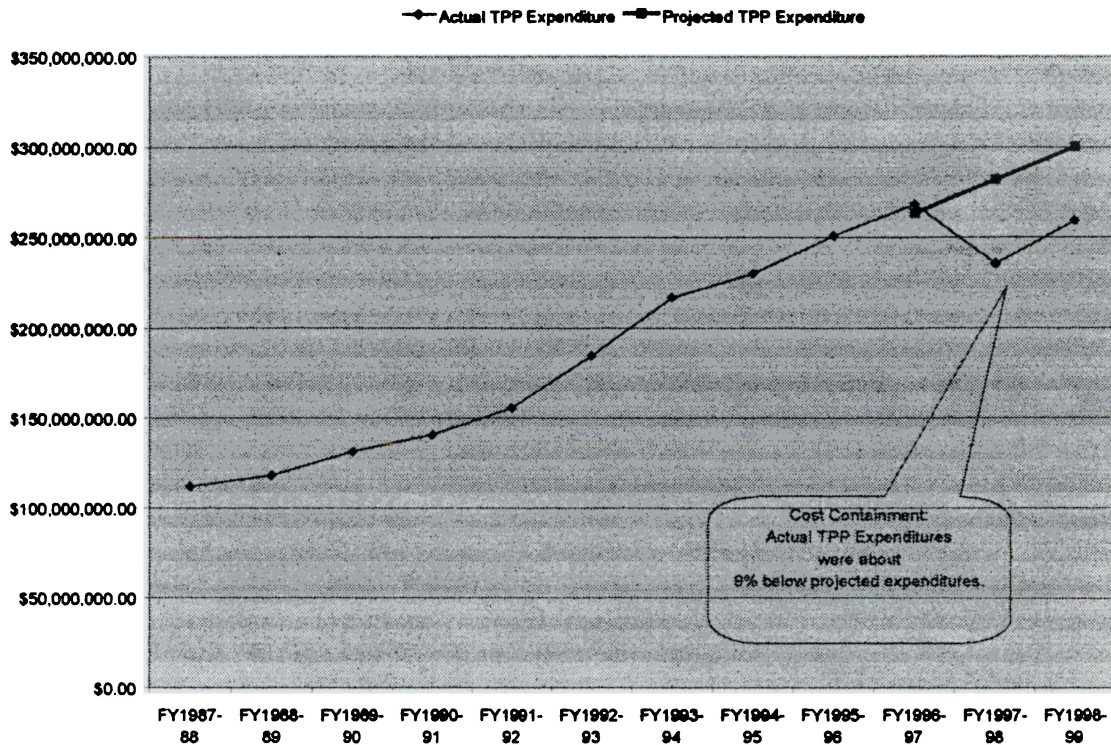


Figure 12: Demonstration of the TPP Programs' Short-term Cost Containment (constant dollars)

program was about \$269, \$236 and \$259 million (Table 4), averaging a nine percent annual savings. Consistent with most literature, short-term spending momentum of the public mental health program expenditures was contained in growth rates and magnitude during the first three years of managed care reform. Still, long-term sustainability of such abatement is yet to be seen.

As important as the primary objective of cost containment was, managed care reform in Tennessee's public health care system was called upon to broaden health care access as well, especially for uninsured and uninsurable Tennesseans. Since the TPP program was designed to be the partner of the TennCare program, about 1.2 million TennCare enrollees (approximately 800,000 Medicaid/Medicare consumers and about 400,000 uninsured and uninsurable) were automatically covered by the TPP program under designed mental health benefits starting July 1, 1996. In terms of nominal access or members covered

BHO providers.) (TennCare, [64]).

by the TDMHMR and TPP programs, defined as the population that had open census records or open eligibility records during each measuring period in either the TDMHMR system or the TPP system, it is indisputable that the state has fulfilled its goal of expanding mental health care access. The nominal access to the TDMHMR system was about 85,000 individuals in January 1994, and was about 113,000 individuals in June 1996. These compare to about 1.2 million enrollees in July 1996 and 1.3 million enrollees in December 1998 in the TPP period. The accessibility was also measured by positive access or program users in the TDMHMR system and the TPP system, defined as unique consumers who actually used mental health services during the measuring periods. Unlike nominal access, the TPP system had a sustained period of about a two-year span during which the levels of positive access were actually lower when compared to the positive access formed under the TDMHMR system during fiscal year 1995-96, indicating a possibility of restricting consumers' access to care. It was not until fiscal year 1998-99 that the number of users matched and exceeded the pre-TPP level, depicted by Figure 13.

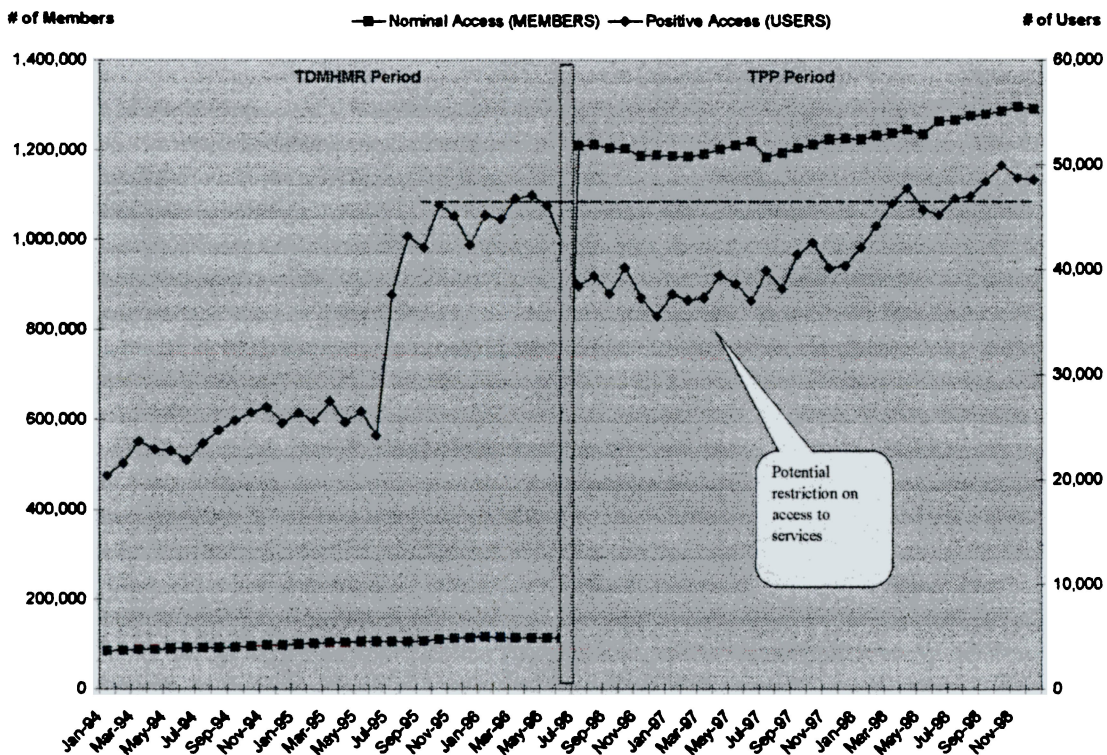


Figure 13: Program Access in the TDMHMR and the TPP Systems

Program expenditures are measured by cost per member per month (PMPM) and cost per user per month (PUPM). Because of dramatic increases in size of population, PMPM cost in the TPP system was much lower than that in the TDMHMR system, averaging about \$196 PMPM during the TDMHMR period to \$16 PMPM during the TPP period (Figure 14). However, program user-based costs were more comparable across the two study periods. Also demonstrated in Figure 14, start-up costs in PUPM in the TPP system were actually much higher than the TDMHMR's cost in \$PUPM in fiscal year 1995-96. Such an outcome was mainly the result of restricted positive access⁵⁰ at the beginning of the TPP program. In general, program user costs (PUPM) have been decreasing progressively within both periods. In 30-month average terms, PUPM cost in the TPP system (\$477) is statistically significantly lower than PUPM cost (\$658) in the TDMHMR system, at a 95 percent confidence interval. However, if the TPP PUPM is compared to the average PUPM cost in the Waiver baseline year, the rates are the same (\$477).

Regardless, the underlying reasons for both systems' achieving reductions in per user costs during

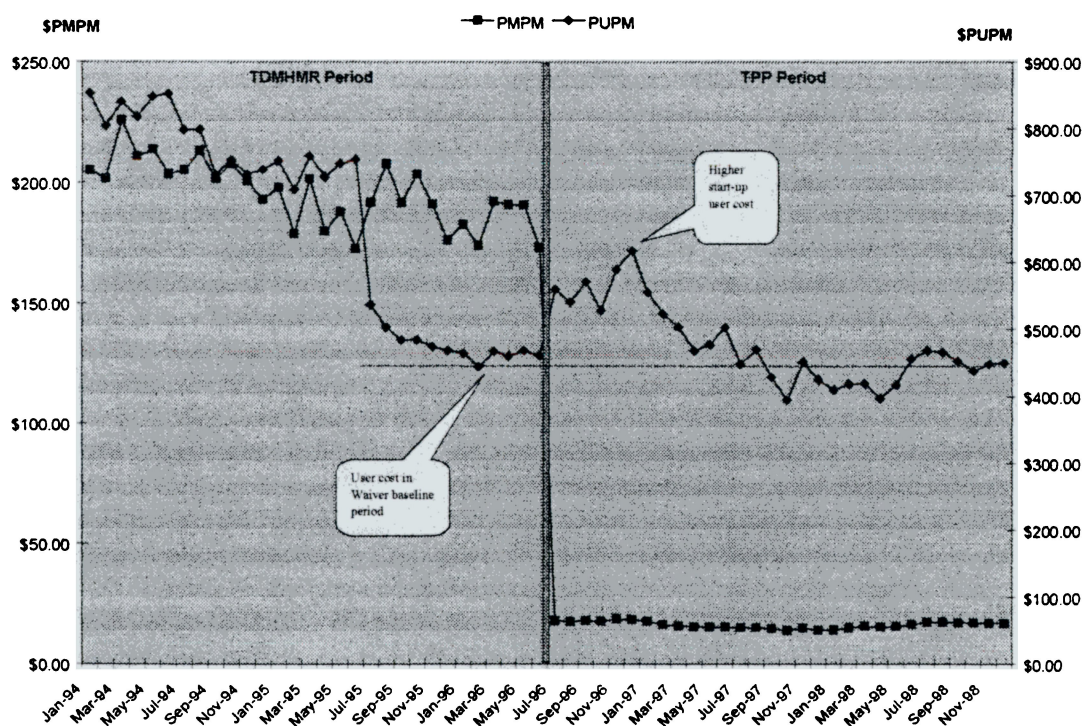
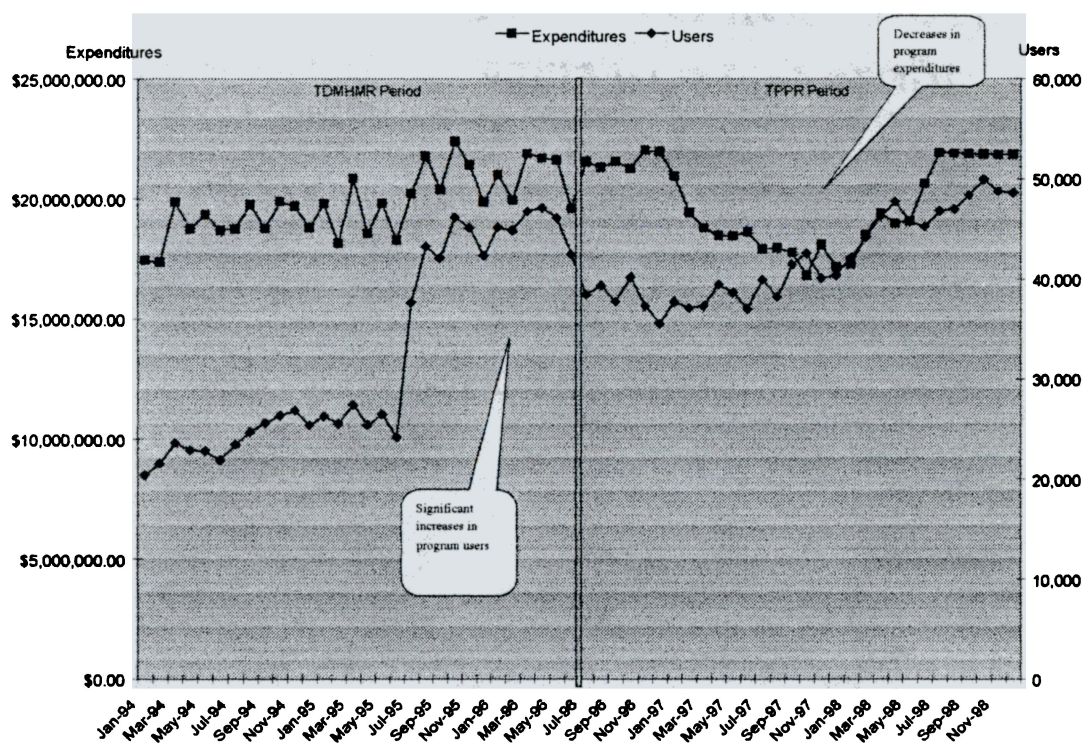


Figure 14: Program Expenditures in SPMPM and SPUPM

⁵⁰ The user population is estimated using paid claims/encounter records only. When denied claims were included, there were additional

the two study periods are quite different. For the TDMHMR system, particularly in its last year of operation, a reduction in per user costs was realized by stimulating positive access to care, namely, by serving more people in the system each month (Figure 15). The TDMHMR user population increased from about 24,000 users in June 1995 to 42,500 users in June 1996 (a 77 percent increase in a 12-month period). As a consequence, relative frequencies of outpatient services per user and program user cost (PUPM) decreased during the TDMHMR period. For the TPP period, the reduction in cost PUPM was primarily the result of limited program spending on inpatient and outpatient care, also demonstrated in Figure 15.

Unfortunately, the accomplishment of the TPP's cost containment efforts was overshadowed by the TPP's skyrocketing spending on behavioral drugs during the TPP study period. Although magnitude was not assessed, there was potential cost and service shifting from the inpatient and outpatient sectors of behavioral



**Figure 15: Trends of Program Expenditures and Users
(constant dollars)**

users identified.

care into the pharmaceutical sector. According to a BHO pharmacy study⁵¹ (TennCare, 1999 [64]), from July 1996 to December 1998, behavioral pharmacy spending, including MCO crossovers⁵², increased from \$1.75 million per month to \$12.4 million per month (a 609 percent increase), and the prescription user costs increased from \$1.45 per member per month to \$9.62 per member per month (a 563 percent increase). Among leading contributing factors, the increase in number of prescriptions per user per month was significant. There was a 50 percent increase among the SPMI/SED population during the TPP period, from about two prescriptions per patient per month in July 1996 to about four prescriptions per patient per month in December 1998. The number of prescriptions per month used by the non-SPMI/SED population increased from about one prescription per patient per month in July 1996 to about two prescriptions per patient per month in December 1998. In terms of cost, the SPMI/SED population generally used more expensive prescriptions than others, increasing from \$27.95 per patient per month in July 1996 to \$41.91 per patient per month in December 1998.

3.2 Cost-Efficiency--Inpatient Care

This section investigates cost-efficiency of the managed care program in the inpatient sector. Patterns of hospital utilization, bed-days, are evaluated according to the overall changes in healthcare system, policy, expenditure, and demand for inpatient care. Cost-efficiencies in the TDMHMR period are used as baseline measures in making comparisons.

Institutional or hospital-based inpatient utilization has long been targeted for health and mental health care cost reduction primarily because of its dominant share in health care spending and restrictive treatment settings. As shown in Table 4, in fiscal year 1987-88 about 77 percent of Tennessee's public mental health care spending was spent on mental health institutes and psychiatric facilities. Efforts at deinstitutionalization date back to the 1960s. Since the early 1960s, national strategy on public mental health care began to shift from institutionally focused mental health care systems toward community-based care.

⁵¹ Lead by this researcher

⁵² All behavioral health care related drugs prescribed by MCO providers, regardless of whether the purpose of the prescriptions was to treat medical conditions or mental health conditions, were paid as behavioral health pharmacy expenditures.

The decision in expanding community-based care in the early days was primarily compelled by the concern for appropriateness of care, rather than cost containment. From a medical perspective, community-based care was considered as more desirable than institutional approaches because it could offer care in less restrictive, community-like environments. Funding balances resulting from deinstitutionalization were simply transferred to expand systems of community-based care.

Significant redistribution between inpatient and outpatient care came in the early 1990s when cost reduction in inpatient care became a major concern in mental health strategic planning. About the same time many states were conducting managed care-like experiments in the public mental health care arena, Tennessee developed and implemented the Master Plan in the early 1990s (TDMHMR, 1994 [59]). The most significant contribution of the Master Plan to the development of Tennessee's public mental health care system was that for the first time in the history of Tennessee's public mental health care, the weights of outpatient and inpatient expenditures became reversed. During the first three years of development and implementation of the Master Plan, the expenditure on outpatient care began to outweigh expenditure on inpatient care as a result of systematic discharges of residence patients from institutions into community care. Figure 16 depicts the progress of this proportional redistribution. As the figure indicates, the redistribution effects were reinforced after managed mental health care reform, after fiscal year 1996-97. Overall, in an eight-year time span, the proportional distribution between inpatient and outpatient care completely reversed. Expenditures in institutional care dropped from approximately 77 percent in fiscal year 1987-88 to approximately 24 percent in fiscal year 1998-99, while community care increased from about 23 percent in fiscal year 1997-88 to about 76 percent in fiscal year 1998-99.

The next significant milestone set by managed care reform in reshaping the landscape of Tennessee's public mental health care came with a significant reduction in inpatient spending. Figure 17 depicts the trends of aggregated cost and utilization statistics for the study periods. From a utilization perspective, bed-days decreased significantly during the TPP period. Over a 30-month period, the number of bed-days decreased about 13,000 days from about 33,000 days. Such reduction does not appear

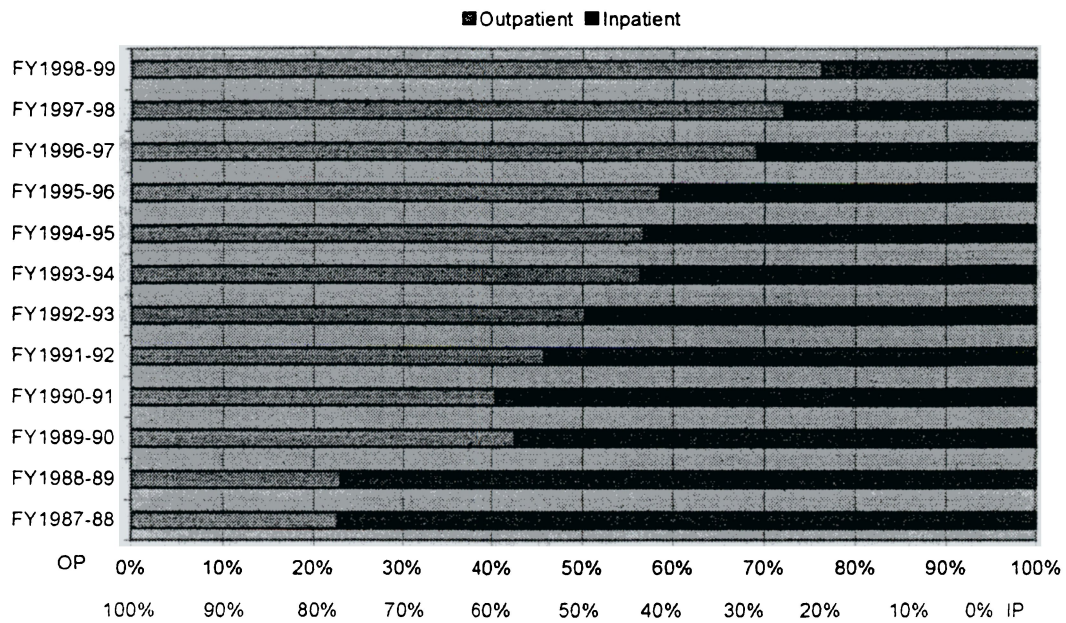


Figure 16: Redistribution of Inpatient and Outpatient Expenditures (constant dollars)

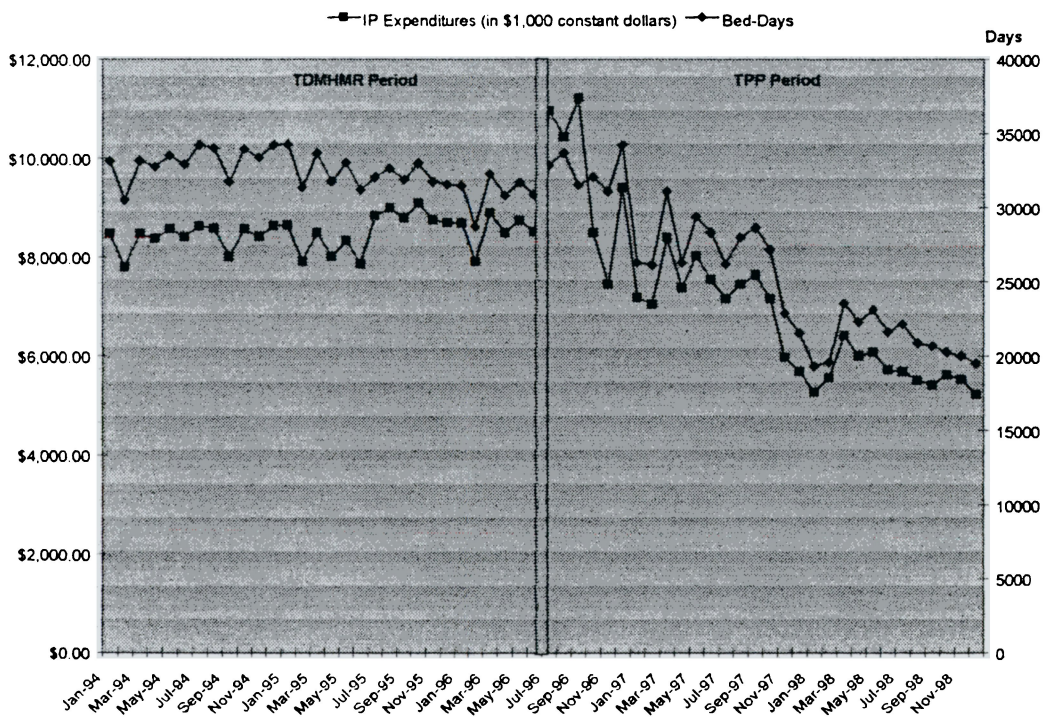


Figure 17: Trends of Inpatient Bed Days and Inpatient Expenditures

to be the result of restricting access to inpatient care because the numbers of monthly patient census (users) and admissions in the TPP period were much higher than they were in the TDMHMR system, as depicted by Figure 18.

Figure 18 displays the trends of the TDMHMR's and the TPP's monthly admission and patient censuses, reviewing the distinct performance patterns of the two systems. The trends of admission and patient censuses in the TDMHMR system were fairly stable, characterized by small but stable admissions and a large population of resident patients, indicating that the system was oriented toward providing long-term mental health care. On the other hand, the TPP inpatient system, being a newly started system, had relatively volatile performance paths as regards both the admission and the patient censuses. Distinctively, the TPP's inpatient system had reversed the order of the admission and the patient censuses: the admission census began to surpass the patient census indicating a strategic shifting from long-term inpatient care to acute (short-term) inpatient care. Consequently, average length of stay per patient had decreased from around 19 days in the TDMHMR system to 11 days with the TPP system.

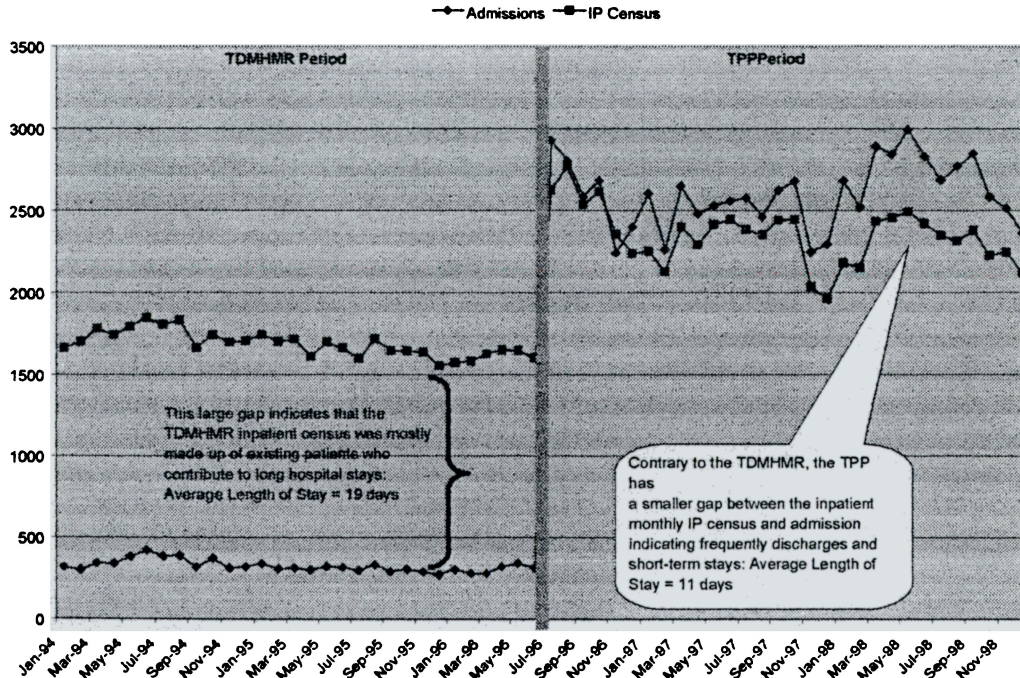


Figure 18: Trends of Admission and Resident Patient Census

Expenditures on inpatient care decreased significantly as well after managed care reform, shown also by Figure 17. The relative cost-efficiency of inpatient care between the two systems is quantified by the following forms of the inpatient utilization function:

The restricted form of the function is:

$$\begin{bmatrix} IPDAYS_{t1} \\ IPDAYS_{t2} \end{bmatrix} = \begin{bmatrix} i_{t1} & 0 & IPFUND_{t1} & IPSVD_{t1} \\ 0 & i_{t2} & IPFUND_{t2} & IPSVD_{t2} \end{bmatrix} \begin{bmatrix} \alpha_{t1} \\ \alpha_{t2} \\ \beta_{IPFUND} \\ \beta_{IPSVD} \end{bmatrix} + \mu$$

The unrestricted form of the function is:

$$\begin{bmatrix} IPDAYS_{t1} \\ IPDAYS_{t2} \end{bmatrix} = \begin{bmatrix} i_{t1} & IPFUND_{t1} & IPSVD_{t1} & 0 & 0 & 0 \\ 0 & 0 & 0 & i_{t2} & IPFUND_{t2} & IPSVD_{t2} \end{bmatrix} \begin{bmatrix} \alpha_{t1} \\ \beta_{IPFUND,t1} \\ \beta_{IPSVD,t1} \\ \alpha_{t2} \\ \beta_{IPFUND,t2} \\ \beta_{IPSVD,t2} \end{bmatrix} + u$$

where *IPFUND* represents monthly public program expenditures on inpatient care; *IPSVD* represents monthly patients served or user census in inpatient care; *t1* is the time indices for the TDMHMR period, and *t2* is the time indices for the TPP period.

The specific null hypothesis of no structural change is formulated as, the utilization parameters in the TDMHMR period and the TPP period have not changed despite of the present of managed care reform.

$$H_0 : \alpha_{t1} = \alpha_{t2} ; \beta_{IPFUND,t1} = \beta_{IPFUND,t2} ; \beta_{IPSVD,t1} = \beta_{IPSVD,t2}$$

$$H_a : H_0 \text{ is not true.}$$

Table 5 presents SAS® Auto-Regression output. Because the calculated Chow test statistic of 12.71 is greater than the critical value of 2.76 ($\alpha = 0.05$), the null hypothesis of no structural change in regression coefficients is rejected at a five percent level of significance. Based on these results, it is

**Table 5: Summary of SAS® Output and Chow Test Statistics – Inpatient Care
(AUTOREG, AR=1, ML)**

		Intercept	IPFUND	IPSVD	Total-Rsq	SSE
TDMHMR		-931.0357	0.003202	3.6011	0.8772	6040862.82
	<i>t</i>	-0.34	14.55	2.24		
	<i>p</i>	(0.7353)	(< .0001)	(0.0335)		
TPP		-1405	0.001886	5.7616	0.9014	65373854.2
	<i>t</i>	-0.27	5.98	2.44		
	<i>p</i>	(0.7892)	(< .0001)	(0.0217)		
TDMHMR & TPP		12973	0.00251	-1.7437	0.9122	121830979
	<i>t</i>	4.85	9.76	-1.44		
	<i>p</i>	(< .0001)	(< .0001)	(0.1556)		

Chow test = 12.71

Cost-Efficiency Estimates

Marginal:

TDMHMR period:

$$\beta_{IPFUND.TDMHMR} = \frac{\partial IPDAYS}{\partial IPFUND} = 3.202 \text{ days per \$1,000 expenditure, or \$312.31 per diem.}$$

TPP period:

$$\beta_{IPFUND.TPP} = \frac{\partial IPDAYS}{\partial IPFUND} = 1.886 \text{ days per \$1,000 expenditure, or \$530.22 per diem.}$$

Average:

TDMHMR period (30-month average) = \$262.27 per diem.

Waiver Baseline-Year (12-month average) = \$275.60 per diem.

TPP period (30-month average) = \$274.51 per diem.

The TPP average per diem rate is statistically significantly different from the TDMHMR average per diem rate in the TDMHMR 30-month period, but not statistically significantly different from the average per diem rate in the Waiver Baseline period, at a 95% confidence interval.

concluded that the utilization function of Tennessee's public mental health inpatient care has experienced structural change since managed care reform. Hence, system parameters such as levels of program funding and program users in the TPP period did not affect inpatient utilization in the same way as they did in the TDMHMR period.

Typically, the TDMHMR form of the inpatient utilization function and the TPP form of the inpatient utilization function are quantified as:

$$\text{TDMHMR: } IPDAYS_{t1} = -931.0357 + 0.003202IPFUND_{t1} + 3.6011IPSVD_{t1} + e_{t1},$$

(-0.34) (14.55) (2.24)

$$\text{TPP: } IPDAYS_{t2} = -1405 + 0.001886IPFUND_{t2} + 5.7616IPSVD_{t2} + e_{t2}.$$

(-0.27) (5.98) (2.44)

The partial coefficients of inpatient funding (IPFUND) indicate that, at the margin, per \$1,000 TPP inpatient incremental expenditures would yield about two bed-days, while per \$1,000 TDMHMR inpatient incremental expenditures would yield about three bed-days. In other words, the marginal inpatient program expenditure per inpatient day for the TPP period was about \$530, and the marginal program expenditure per inpatient day in the TDMHMR period was about \$312. Therefore, a day of inpatient care required more program funding in the TPP/capitation program during July 1996 to December 1998 than in the TDMHMR/FFS program during January 1994 to June 1996. Notice that the above conclusion of cost-efficiency was evaluated from the perspective of the program funding, not from the perspective of true production costs. In order to compare the true production costs per diem across the two periods, one would need to know what kinds of inputs were included in a typical day of inpatient care, such as staff time and skills, equipment and suppliers, etc. Because these factors were not known to this researcher, it would not be conclusive that if the actual cost per diem in the TPP period was comparable or not comparable to the actual cost per diem in the TDMHMR period.

Average cost estimates per diem were also listed in Table 5. Overall, the 30-month average cost per diem for the TPP system was \$274.51 which was significantly higher than the 30-month average cost per diem, \$262.27, for the TDMHMR system. When compared to the average cost per diem in the Waiver baseline period, \$275.60, the TPP rate was low but not statistically significant. Over a 30-month period, the TPP rate displayed a fairly stable trend (Figure 19).

The fact that inpatient spending was down but marginal expenditure was up for the TPP period could be an indication that during the first 30 months of its journey the TPP system was able to achieve inpatient savings mainly through a substantial volume reduction in inpatient bed-days, not through improvement in cost-efficiency. Although, within the managed care framework, there were indications that the BHOs could have reduced factor prices of inpatient care through contracting and redirecting significant amounts of utilization to where factor prices were lower. In fact, a separate analysis⁵³ indicated that during

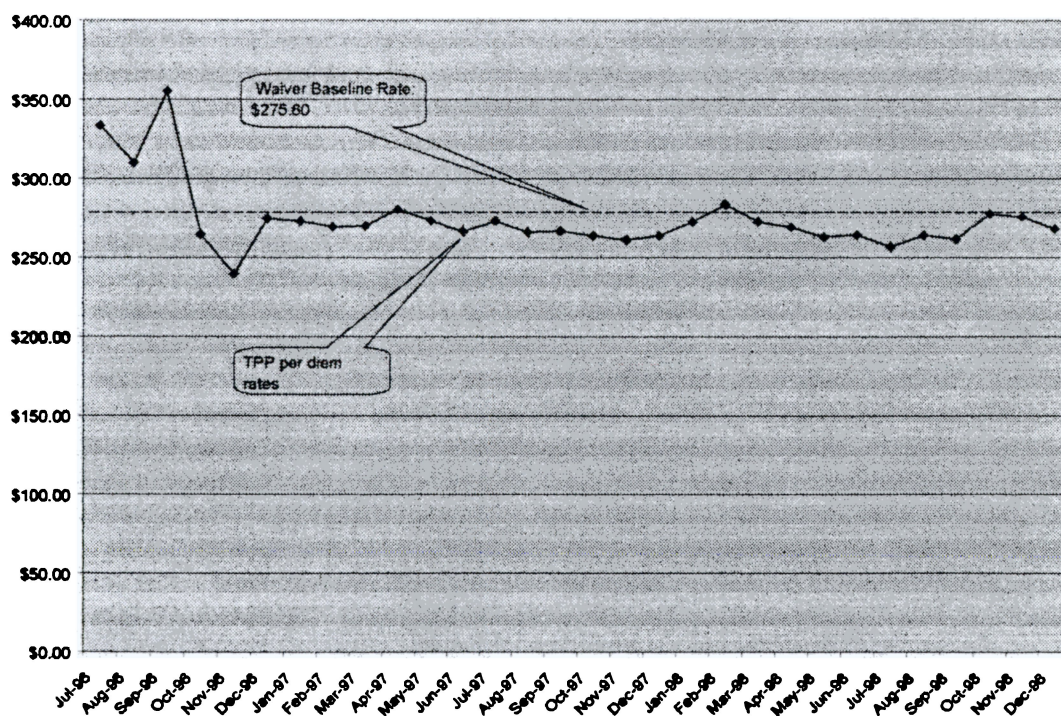


Figure 19: Trend of Per Diem Rate (FY 1995-96 – FY 1998-99)

⁵³ The TPP's encounter estimates, compiled by this researcher.

the TPP period, about 45 percent of the inpatient days were directed toward private facilities where, on average, the estimated per diem rate was 5 percent below that of the RMHIs.

3.3 Cost-Efficiency--Outpatient Care

The purpose of this section is to compare cost-efficiencies of the TPP's outpatient delivery system with the cost-efficiencies of the TDMHMR's outpatient delivery system. To accomplish this, all services and program users are first aggregated on a monthly basis from January 1994 to December 1999. The observed cost-efficiencies of the outpatient delivery systems are then measured and evaluated by unit costs of services in marginal and average terms. In formulating the comparisons, the parameters of the two systems are hypothesized not to be different despite structural changes in business and management strategies. This hypothesis is tested with a two-variable linear regression using the Chow test. The forms of the outpatient utilization functions are:

The restricted form of the function:

$$\begin{bmatrix} OPSVCS_{t1} \\ OPSVCS_{t2} \end{bmatrix} = \begin{bmatrix} i_{t1} & 0 & OPFUND_{t1} & OPSVD_{t1} \\ 0 & i_{t2} & OPFUND_{t2} & OPSVD_{t2} \end{bmatrix} \begin{bmatrix} \alpha_{t1} \\ \alpha_{t2} \\ \beta_{OPFUND} \\ \beta_{OPSVD} \end{bmatrix} + \mu$$

The unrestricted form of the function:

$$\begin{bmatrix} OPSVCS_{t1} \\ OPSVCS_{t2} \end{bmatrix} = \begin{bmatrix} i_{t1} & OPFUND_{t1} & OPSVD_{t1} & 0 & 0 & 0 \\ 0 & 0 & 0 & i_{t2} & OPFUND_{t2} & OPSVD_{t2} \end{bmatrix} \begin{bmatrix} \alpha_{t1} \\ \beta_{OPFUND,t1} \\ \beta_{OPSVD,t1} \\ \alpha_{t2} \\ \beta_{OPFUND,t2} \\ \beta_{OPSVD,t2} \end{bmatrix} + u$$

In these equations, *OPFUND* represents monthly public program expenditures on outpatient care; *OPSVD* represents monthly patients served or user census in outpatient care; *t1* is the time indices for the TDMHMR period, and *t2* is the time indices for the TPP period.

The null hypothesis is formed that the parameters of the TPP form of the outpatient delivery function are the same as for the TDMHMR form of the outpatient delivery function:

$$H_0 : \alpha_{t1} = \alpha_{t2}; \beta_{OPFUND,t1} = \beta_{OPFUND,t2}; \beta_{OPSVD,t1} = \beta_{OPSVD,t2}$$

$$H_a : H_0 \text{ is not true.}$$

As was discussed in chapter two, the regression data are time series in nature and possess autocorrelation problems. Therefore, an Autoregressive procedure (AutoReg/SAS®) was used in parameter estimations. Table 6 presents the results of the analysis. A Chow test statistic was calculated based on regression output. Since the calculated *F* value 35.70 is greater than the critical value 2.76, the null hypothesis that the parameters of the TDMHMR's outpatient delivery function are the same as the parameters of the TPP's outpatient delivery function is rejected at a 95 percent confidence interval.

The TDMHMR form of the outpatient utilization function and the TPP form of the outpatient utilization function are quantified as follows:

$$\text{TDMHMR: } OPSVCS_{t1} = 39960 + 0.0195OPFUND_{t1} - 2.5196OPSVD_{t1} + e_{t1},$$

$$(8.3) \quad (57.94) \quad (-16.18)$$

$$\text{TPP: } OPSVCS_{t2} = 71476 - 0.005882OPFUND_{t2} + 4.1425OPSVD_{t2} + e_{t2}.$$

$$(3.68) \quad (-3.39) \quad (5.3)$$

**Table 6: Summary of SAS® Output and Chow Test Statistics – Outpatient Care
(AUTOREG, AR=6, ML)**

		Intercept	OPFUND	OPSVD	Total-Rsq	SSE
TDMHMR		39960	0.0195	-2.5196	0.9812	90733323.4
	<i>t</i>	8.3	57.94	-16.18		
	<i>p</i>	(< .0001)	(< .0001)	(< .0001)		
TPP		71476	-0.005882	4.1425	0.6302	3446456738
	<i>t</i>	3.68	-3.39	5.3		
	<i>p</i>	(0.0014)	(0.0028)	(< .0001)		
TDMHMR & TPP		124401	0.003409	0.1662	0.3521	10553300000
	<i>t</i>	4.8	1.59	0.27		
	<i>p</i>	(< .0001)	(0.1185)	(0.7907)		

Chow test = 35.70

Cost-Efficiency Estimates

Marginal:

TDMHMR period:

$$\beta_{OPFUND.TDMHMR} = \frac{\partial OPSVC}{\partial OPFUND} = 19.5 \text{ services per \$1,000, or \$51.28 per unit of services.}$$

TPP period:

$$\beta_{OPFUND.TPP} = \frac{\partial OPSVC}{\partial OPFUND} = -5.88 \text{ services per \$1,000, or -\$170.01 per unit of services.}$$

Average:

TDMHMR period (30-month average) = \$63.62 per unit of services.

Waiver Baseline-Year (12-month average) = \$71.42 per unit of services.

TPP period (30-month average) = \$77.43 per unit of services.

The TPP average unit cost is statistically significantly different than the average unit costs in the TDMHMR 30-month period and in the Waiver Baseline period, at a 95 percent confidence interval.

The sign of partial coefficient of the TPP outpatient funding (OPFUND) in the TPP outpatient utilization function indicates that under a “top-down”⁵⁴ capitation arrangement, the relationship between program funding and output of outpatient services was no longer positive. In other words, more funding devoted in the outpatient care did not necessary induce more services (Figure 20). Therefore, from the perspective of outpatient program funding and outpatient services, the outpatient care in the first 30 months of the TPP program was not as efficient as the outpatient care in the last 30 months of the TDMHMR program.

Average cost-efficiency estimates are also presented in Table 6. Overall, the average program expenditure per unit of outpatient services in the TPP system was about \$77.43, which was statistically significantly higher than the average program expenditure per unit of outpatient services in the 30-month TDMHMR period (\$63.62), and higher than the average unit cost in the Waiver baseline period (\$71.42) at a 5 percent level of significance.

Theoretically and empirically, a negative correlation between program funding and volume of

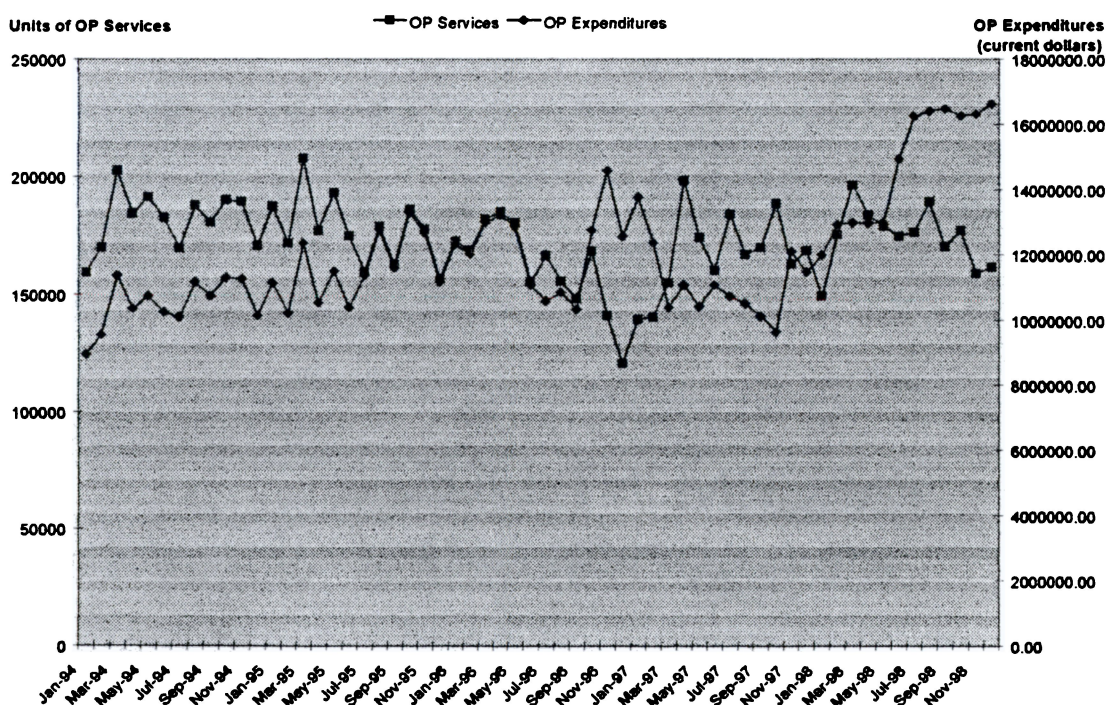


Figure 20: Trends of Outpatient Expenditures and Outpatient Services

⁵⁴ A capitation payment arrangement is in place between not only the TPP and the BHOs, but also between the BHOs and the providers.

outpatient services under a capitation-based system should not come as a surprise as many have expressed concern about the possibility that a capitation program may restrict access and service utilization. The reason is fairly straightforward. Under a prepaid capitation arrangement, what directly matters to BHOs is the number of covered lives (members) which contribute to BHO revenues directly and positively if increased. Once the revenue is advanced, increases in the volume of services (visits or bed days) would reduce to profits, assuming other population actuarial characteristics and medical technologies stay unchanged, and quality of care was maintained. Therefore, under a capitation system the relationship between volume of services and levels of program expenditure may take various signs, especially when the measuring period is short. For the TPP outpatient system scrutinized here, an inverse relationship was found.

The regression results also reviewed a negative correlation between population served and volume of services received under the TDMHMR system. Such an outcome could be largely attributed to the implementation of the Master Plan during the last few years of the TDMHMR administration. Because the community care system was making progress in reducing the frequency of patient services from about eight sessions per patient per month to three or four sessions per patient per month, the dramatic reduction in relative service frequencies should have led to not only a significant reduction in the volume of services, but also to reduction in CMHAs revenues. Rather, as demonstrated by Figure 21, the potential reduction in the volume of services was made up for by increases in the monthly patient census. In so doing, the revenue to the CMHAs was not affected. These opposing trends, the increase in clients and the decrease in claims, were underlying reasons for having a negative correlation between OPSVD and OPSVCS during the TDMHMR period. Monthly frequency of outpatient services per outpatient user were reduced about 50 percent in the TDMHMR period as a result of the implementation of the Master Plan, from about eight services per patient per month to four services per patient per month. During the TPP period, service frequency has been maintained at about three to four services per user per month (Figure 22).

Utilization patterns have been reformatted strategically under the managed care program (Table 7). Much emphasis in outpatient care was centered on management and stabilization of symptoms, rather than on aggressive and lengthy treatment. Some services that were often considered as cash cows during the

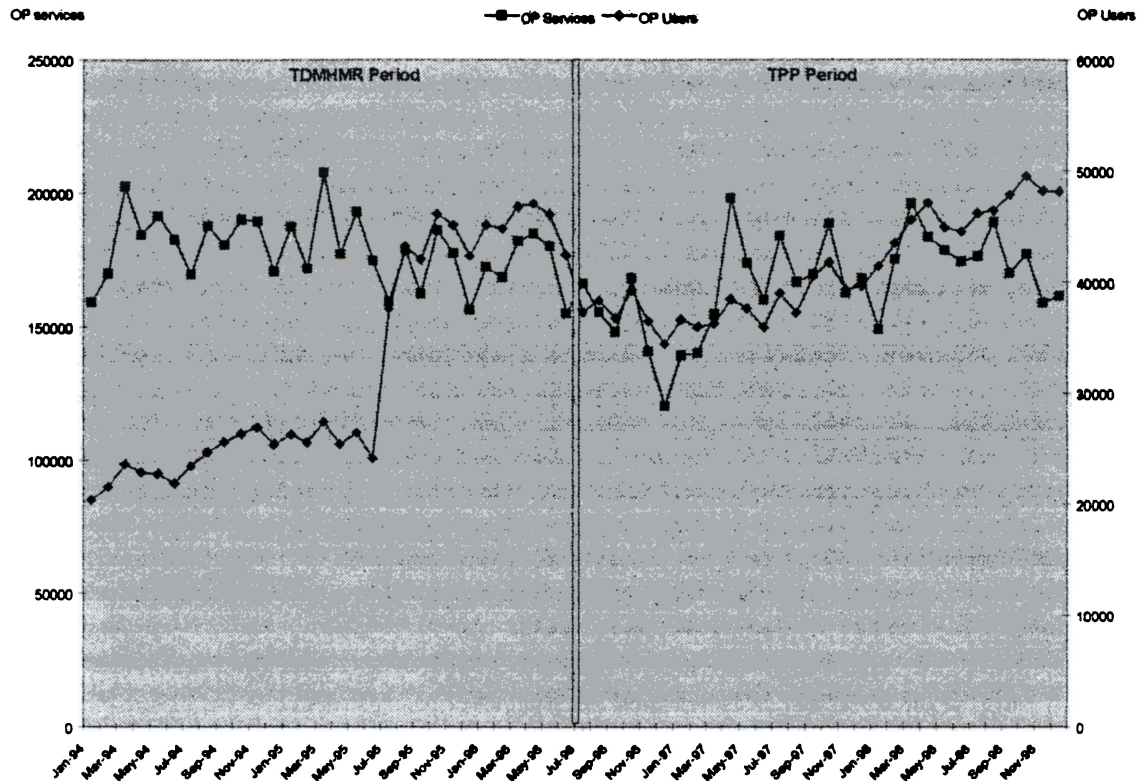


Figure 21: Outpatient Service Utilization Trends

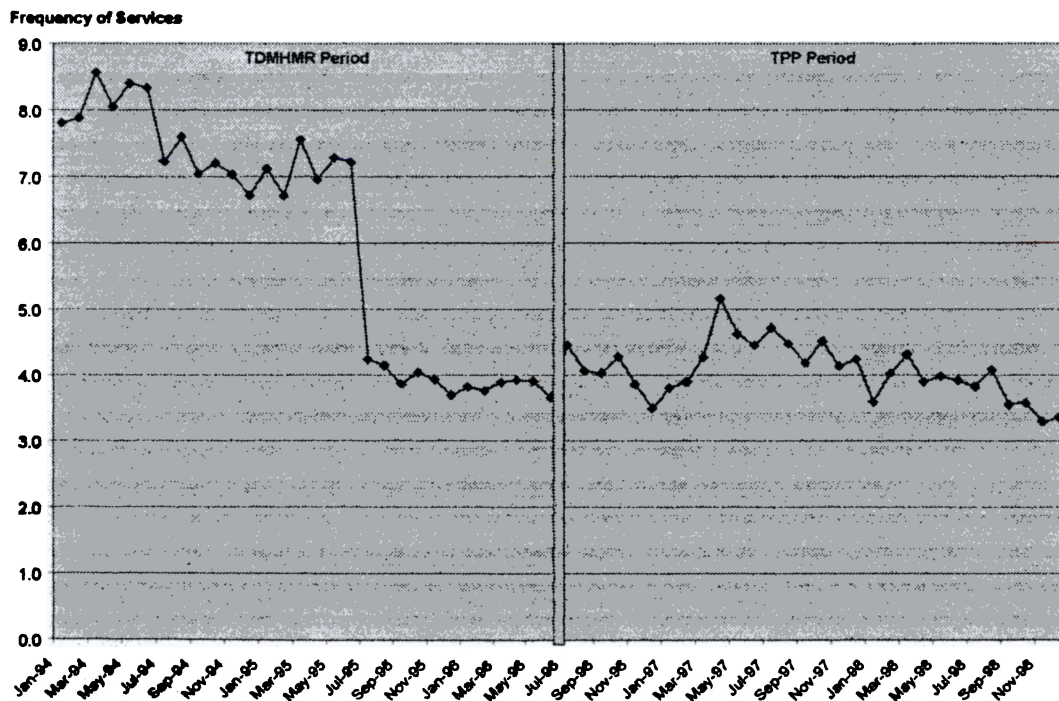


Figure 22: Trend of Service Frequencies

Table 7: Reconfiguration of Outpatient Service Utilization Patterns

Service Volume for selected Service/Treatment Categories in Percentage of Total Units of Services	Jun-94	Jun-95	Jun-96	Jun-97	Jun-98	% Change of Jun-98 Volume as Compared to Jun-96 Volume
CASE MANAGEMENT	15.71	18.8	18.07	18.13	22.33	+23.58%
CRISIS INTERVENTION	0.04	0.02	0.05	1.5	1.35	+26.00%
MEDICATION MANAGEMENT	7.5	8.15	9.95	10.64	11.79	+18.49%
DAY TREATMENT	20.22	20.44	18.52	3.98	2.23	-87.96%
PSYCHO REHABILITATION	8.14	7.94	8.5	0.39	0.39	-95.41%
THERAPY	30.22	27.68	28.94	24.15	12.89	-55.45%
OP SUBSTANCE DETOXIFICATION	1.42	0.38	0.25	0.04	0.01	-96.00%

Source: TDMHMR and TPP claim/encounter data compiled by this researcher.

TDMHMR system were no longer being used extensively under the TPP system (TDMHMR, 1997 [60]). Day treatment⁵⁵ services experienced the highest volume reduction, falling from about 20 percent of the total volume of services each month under the TDMHMR system to about two percent of the total volume of services each month in the TPP system, followed by therapy treatment and psychological rehabilitation-related services (supported living, social skill development, and the like). Social support and rehabilitation types of services, such as supported employment, were also minimized in use. In the meantime, utilization of management and intervention types of services, such as case management, crisis intervention, and medication management, are reinforced over time under the managed care program. Such findings with the change in utilization patterns are consistent with findings from a TDMHMR survey (TDMHMR, 1997 [60]) assessing levels of services at the CMHAs three months after implementation of the TPP program. The result of the survey indicates that under the TPP program, day treatment services declined while crisis services and case management services increased. The survey also reports that there has been a decrease in non-MD outpatient services but an increase in outpatient MD services.

The change of service utilization pattern would impact estimated unit service costs. If an average unit of services in the TPP period, as suggested, consisted of proportionally more costly services (case management, crisis intervention, etc.) than it did in the TDMHMR period, then, it could result in a higher

⁵⁵ Day Treatment is a program for patients who need less than full time hospitalization but more intensive and structured treatment than on an intermittent hourly basis. Basic Day Treatment components include Group Therapy, Interpersonal Skill Training, Day Living Skills Training, Leisure Skills Training, Education Activities, and Pre-Vocational Activities (TDMHMR, 1993 [63])

unit cost of services. In that case, the actual cost-efficiency of outpatient care in the TPP period could also be comparable to that given in the TPP period if the estimated average unit cost could be weighted and adjusted by the staff and technology intensities of the service components.

Service substitutions between sectors may also be a contributing factor to the observed outcome of program inefficiency in the TPP's outpatient delivery system. As mentioned before, utilization of behavioral pharmacy services increased dramatically during the TPP period. Prescriptions increased from about two prescriptions per user per month to four prescriptions per user per month for the SPMI/SED population, and from about one prescription per user per month to two prescriptions per user per month for the non-SPMI/SED population (TennCare, 1999 [64]). These changes could produce two effects. One is the reduction in frequencies of non-pharmacy service in outpatient and inpatient sectors. In all likelihood, patients who were put on regular or effective prescriptions would not have to use outpatient services as often as if they were not on such treatment routines. The second effect of such substitution is redistributing revenues and cost shifting from mental health service sectors, such as inpatient and outpatient care, to a pharmacy sector. If drug therapy could be used to reduce intensity of outpatient service utilization while revenues traditionally distributed into the outpatient sector were not adjusted accordingly, it would result in cost shifting from the outpatient sector to the pharmacy sector, and therefore, higher unit cost of program spending in the outpatient sector.

Feldstein (Feldstein, 1999 [11], p. 25) presented some other scenarios on how inefficiencies or low productivity could occur when substitutions between different health care programs exist. He states that the input-output relationship for each health care program is not always independent of changes in scale in the other programs. "For example, if one health program emphasizes prevention, then an increase in resources for this program is likely to affect the productivity of others, such as acute care services. These interrelationships between health programs may cause the input-output curve of particular programs to shift either to the left or to the right; that is, the marginal benefits of the affected program may be increased without changing expenditures for that program. In some cases, acute care programs may become more productive as, for example, after an increase in knowledge or technology (perhaps resulting from increased

expenditures on research programs). An increase in knowledge or technology may enable a provider to see more patients or to have a favorable effect on the outcome of the treatment provided. Alternatively, an increase in preventative programs may decrease the need for acute treatment in the population, thereby lowering the number of patients treated in existing acute care programs. The productivity of existing programs would therefore be lessened.”

Particular to this outpatient cost-effectiveness analysis, it also needs to be cautioned that the observed cost-efficiency of the TPP outpatient care system was arrived at under the assumption that the TPP program broke even financially. The result could be different from the actual cost-efficiency if the analysis was evaluated from the perspective of capitated providers of the BHOs. The key issue is that true profits and costs of outpatient care of these providers are not available for this study. Any savings or profits realized from outpatient care at the provider level would mean a reduction in the real unit cost of services. For example, if the providers were able to retain two percent of the revenue as profit, the actual unit cost of outpatient services would be about \$71, which was the same as the unit cost given in the Waiver year.⁵⁶ If the providers were able to retain nine percent of the revenue as profit, the actual unit cost of outpatient services would be about \$63, which was the same as the unit cost given in the TDMHMR period.⁵⁷ Any savings beyond nine percent of the capitated revenue at the provider level, would place the TPP program in a competitive advantage in real unit cost. Therefore, the actual cost-efficiency of the TPP outpatient care system is dependent on knowledge of the BHO profit level each month.

⁵⁶ The 2% profit is calculated by:

$$2\% \cong \frac{\$12,200,066.44 - (\$71 * 166,633)}{\$19,843,342.5}$$

where, \$12,200,066.44 is the TPP’s monthly average outpatient expenditure after pharmacy cost; \$71 multiplied by 166,633 units of services yields the expected outpatient cost if the BHO providers produce with \$71 as the unit cost; and \$19,843,342.5 is the TPP’s average monthly expenditure in total.

⁵⁷ The 9% profit is calculated by:

$$9\% \cong \frac{\$12,200,066.44 - (\$63 * 166,633)}{\$19,843,342.5}$$

where, \$12,200,066.44 is the TPP’s monthly average outpatient expenditure after pharmacy cost; \$63 multiplied by 166,633 units of services yields the expected outpatient cost if the BHO providers produce with \$63 as the unit cost; and \$19,843,342.5 is the TPP’s average monthly expenditure in total.

3.4 Cost-Effectiveness—Recidivism Rates

The objective of this section is to measure quality of care of the two study periods and to quantify and determine how program expenditures contribute to quality of care outcomes under different healthcare reigns. For the TPP program, with definite reductions seen in average length of stay and in frequency of outpatient services per user per month, perhaps the greatest challenge imposed by such reductions is about the TPP's ability to assure quality of care. As many others have demonstrated, it is not a very difficult task for managed care programs to realize savings in the first few years of program implementation. A stronger testimony for the advocacy of managed care relies largely in the ability to maintain or even improve upon quality of care, in addition to the ability to demonstrate long-term cost advantages. From payor and consumer perspectives, quality outcomes of managed mental health care reform are as essential as the desire for less expensive premiums. If the reduction in medical spending was associated with a notable deterioration in quality of care, the significance of cost-containment would be lessened even though the trade-off between quantity of services and quality of care could be justified because marginal costs of care and marginal benefits of care were brought close together. Consequently, managed care companies will have to explore a production region where the restraint in volume of services imposes a minimal negative impact on quality of care, or to develop an alternate production system in which the increase or decrease in certain types of services would promote better quality of care.

Readmissions rates are considered to be quality of care measures. Proportional to a population in consideration, it is assumed that the fewer the number of patients being readmitted to inpatient facilities, the better the quality of a system of care; or, the longer the discharged patients stay in the community, the better the quality of a system of care. Naturally, one would question if the BHOs' managed care strategies, such as utilization management and pre-authorizations, would restrict inpatient utilization, so that readmissions were affected as well. However, this concern is not supported by the data. As presented in section 3.3, the number of inpatient admissions has increased during the TPP period, from averaging about 300 admissions each month during the TDMHMR period to averaging 2,600 admissions each month in the TPP period. Therefore, there has been no evidence that admissions have been restricted during the TPP

period. Further, it is generally believed that a decision on the acceptance or rejection of a patient admission should be determined by medical necessities a patient presented rather than by ones' history of hospitalization; i.e., a system should not make it difficult for a patient to be admitted just because he was recently discharged. For these reasons, recidivism rates are considered as valid measurements here.

Hospital readmissions per 1,000 members and hospital readmissions per 1,000 discharges (RCID30D, RCID60D, RCID90D) are plotted in Figure 23 and Figure 24. The two measures resemble the same pattern of outcomes at all measuring intervals. These figures demonstrate a pattern that the TPP system had lower recidivism rates compared to the TDMHMR system. Table 8 below compared the readmission rates between the TDMHMR and the TPP periods. All rates between the two systems are found to be statistically significantly different ($p < 0.05$). Therefore, in terms of relative levels of recidivism rates seen in the two study periods, the managed care system was able to maintain and improve quality of care outcomes as compared to the traditional FFS system.

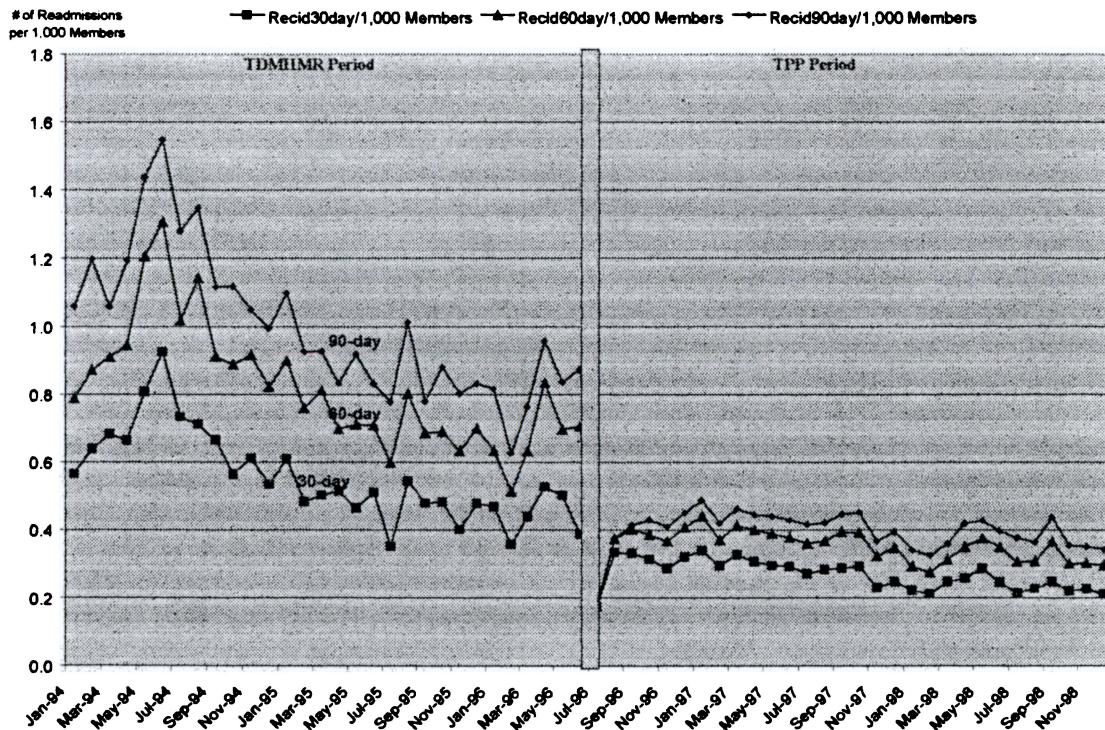


Figure 23: Comparison of Trends of Recidivism Rates (Readmission per 1,000 Members)

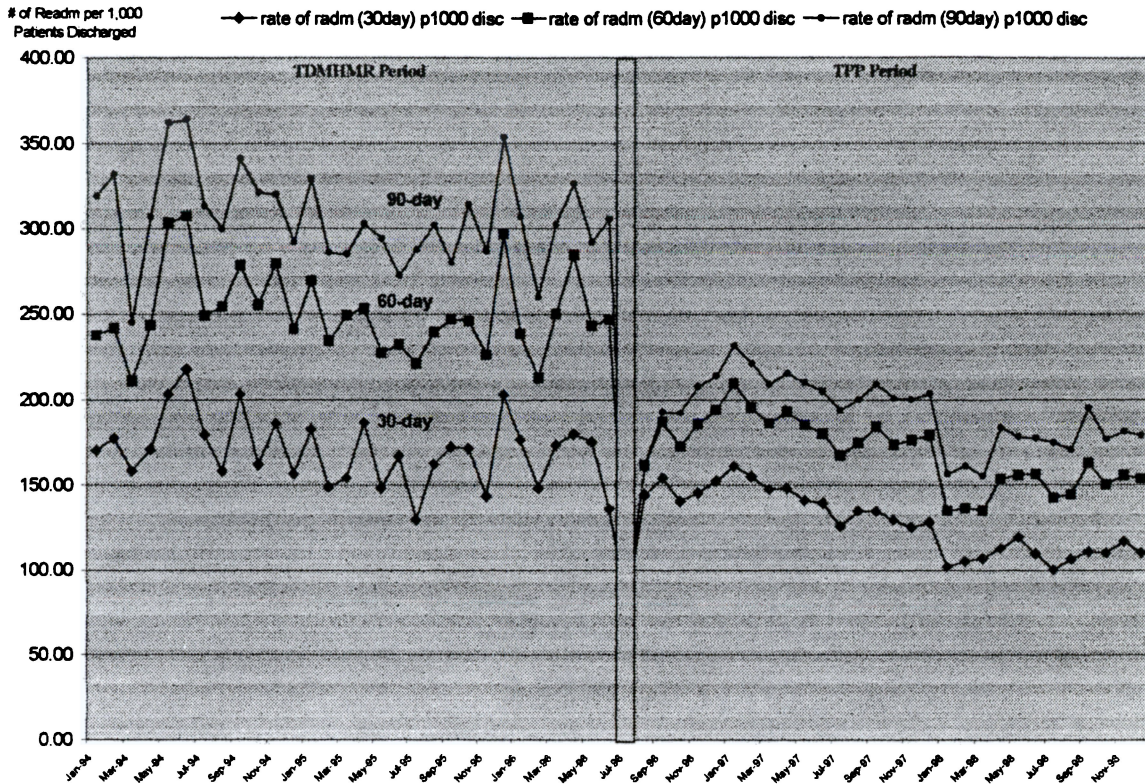


Figure 24: Comparison of Trends of Recidivism Rates (Readmission per 1,000 Patients Discharged)

Table 8: Comparison of 30-month Average Readmission Rates

Recidivism Rates	30 Days		60 Days		90 Days	
	TDMHMR	TPP	TDMHMR	TPP	TDMHMR	TPP
Average Readmission per 1,000 Discharged Patients	170.13	126.56	250.70	165.64	360.82	187.96
% Readmission as of Total Discharged Patients	17.0%	12.7%	25.1%	16.6%	36.1%	18.8%
Average Readmission per 1,000 Members	0.55	0.27	0.82	0.32	1.00	0.40

Note: All rates between the TDMHMR and the TPP periods are statistically significantly different ($\alpha = 0.05$).

Similar readmission rates were found in Callahan and colleagues' evaluation of Massachusetts' Medicaid MH/SA managed care experiment [50]: 19.9 percent in fiscal year 1992 and 18.9 percent in fiscal year 1993 during which managed care experiment was sought. Fisher, et al. found in their research that between 1986 and 1989 the probability of readmission within 30 days was between 11 percent and 20 percent; the probability of readmission within 60 days was between 16 percent and 26 percent. The probability of remaining outside a state facility for four years after discharge was about 50 percent (Fisher, et al. 1992 [61]). As presented in Table 8, there were about 13 percent of the TPP patients discharged who were likely to be readmitted within 30 days, as compared to 17 percent of the TDMHMR patients discharged. And about 17 percent of the TPP patients discharged were likely to be readmitted within 60 days, as compared to 25 percent of the TDMHMR patients discharged. These rates seem to be within the range of probabilities indicated in Fisher's study. Although, the TPP rates appear to be at the lower end of the range, the TDMHMR rates appear to be at the high end of the range.

In order to observe how quality of care measures respond to key system factors, particularly to levels of program expenditures, recidivism rates per 1,000 members (RCIDPT) are assumed to be linearly dependent on program funding per 1,000 members (FUNDPT) and on the number of program users per 1,000 members (SVDPT). The impact of the public mental health reform effort on program effectiveness is embedded in the time series estimated by the equations and tested by the hypothesis of no structural change. The association between program cost and quality outcome will then be examined in a dynamic manner by measuring and comparing the funding coefficients of hospital recidivism rates, if significant structural changes are found.

There are three outcome equations to test the equalities of the parameters of the TDMHMR system and the TPP system:

$$RCID30PT_t = r_{1,t} + r_{2,t}FUNDPT_t + r_{3,t}SVDPT_t + e_t ,$$

$$RCID60PT_t = r_{1,t} + r_{2,t}FUNDPT_t + r_{3,t}SVDPT_t + e_t ,$$

$$RCID90PT_t = r_{1,t} + r_{2,t}FUNDPT_t + r_{3,t}SVDPT_t + e_t,$$

where γ_2 is the partial coefficient of program funding with respect to recidivism rates, measuring the cost-effectiveness of the program, and t are indices of time series data. If *January 1994* $\leq t \leq$ *June 1996*, then data points are from the TDMHMR period, and if *July 1996* $\leq t \leq$ *December 1998*, then data points are from the TPP period.

The general form of the hypotheses of these regressions is:

$$H_o : r_{1,t \leq June, 1996} = r_{1,t >= July, 1997}, r_{2,t \leq June, 1996} = r_{2,t >= July, 1997}, r_{3,t \leq June, 1996} = r_{3,t >= July, 1997};$$

i.e., the parameters of the quality of care functions for the TDMHMR system and for the TPP system have not changed despite structural change in the payment mechanism.

$$H_a : H_o \text{ is not true.}$$

Autoregressive (AR) factors are selected accordingly for regressions to accommodate autocorrelation situations for the measurements. Table 9 and Table 10 present the output of the SAS AutoReg® procedures. Chow test statistics are calculated and presented in the last column of Table 9 based on regression results. According to the Chow tests with respect to 30-day, 60-day, and 90-day regressions, the hypotheses that the parameters of the TDMHMR form of the quality of care function and the TPP form of the quality of care functions have not changed could not be rejected. Therefore, the tests suggest that cost-effectiveness across the two systems is not different despite the changes in payment methodology, level of program funding, and health care strategies.

Table 9: Maximum Likelihood Estimates (Output A)

Model	Period	DW	P < DW	Total Rsqr	SSE	CHOW TEST
RCID30PT (AR = 1)	TDMHMR	2.029	0.4363	0.6776	0.16288885	0.27
	TPP	1.7424	0.1501	0.3559	0.03576765	
	ALL	2.0335	0.4639	0.8868	0.20161564	
RCID60PT (AR = 2)	TDMHMR	1.9254	0.3205	0.6898	0.295739	1.21
	TPP	2.2063	0.6758	0.2571	0.06169621	
	ALL	1.9481	0.3376	0.9106	0.38139425	
RCID90PT (AR = 3)	TDMHMR	1.9149	0.3123	0.7175	0.37771729	1.55
	TPP	2.2672	0.7526	0.3231	0.06815967	
	ALL	1.9503	0.3391	0.9289	0.48433061	

Table 10: Maximum Likelihood Estimates (Output B)

Model	PERIOD	INTERCEPT		FUNDPT		SVDPT	
		γ_1	t ($p > 1$)	γ_2	t ($p > 1$)	γ_3	t ($p > 1$)
RCID30PT (AR = 1)	TDMHMR	0.1107	0.42 (0.6782)	3.7876E-06	3.04 (0.0053)	-0.000962	-2.98 (0.0061)
	TPP	0.5455	3.51 (0.0017)	1.233E-07	0.02 (0.9842)	-0.008205	-2.61 (0.0147)
	ALL	0.2446	10.87 ($< .0001$)	3.1275E-06	7.68 ($< .0001$)	-0.000946	-4.00 (0.0002)
RCID60PT (AR = 2)	TDMHMR	0.1417	0.39 (0.6983)	5.3365E-06	3.04 (0.0055)	-0.001194	-2.42 (0.0229)
	TPP	0.651	2.27 (0.0318)	-0.0000011	-0.95 (0.3531)	-0.003811	-0.70 (0.4880)
	ALL	0.2949	8.22 ($< .0001$)	4.3674E-06	6.95 ($< .0001$)	-0.0010332	-2.79 (0.0072)
RCID90PT (AR = 3)	TDMHMR	0.1	0.23 (0.8203)	6.8676E-06	3.29 (0.0031)	-0.001425	-2.72 (0.0120)
	TPP	0.7798	1.97 (0.0603)	-0.000026	-1.59 (0.1243)	0.000954	0.15 (0.8844)
	ALL	0.3303	8.46 ($< .0001$)	5.4106E-06	7.61 ($< .0001$)	-0.001197	-2.77 (0.0077)

Instead of levels of program funding and size of user population, what could have contributed to the improvement in quality of care in the TPP period were the particular services that received much emphasis under the managed care program. As indicated in the previous section, managed mental health care reform has reformatted the service and treatment modalities of public mental health care. Case management, crisis intervention, and medication monitoring and management type of services received growing emphasis in utilization.

Beyond efforts in case management and medication management, the BHOs also put great emphasis on pre- and post-hospitalization intervention. In one sense, there was significant emphasis on using mobile crisis intervention (MCI) to deal with acute or crisis mental health episodes. The important functions of the MCI are designed to assess each crisis situation, provide medical and psycho interventions on site if necessary, and make referrals for inpatient admission if the on-site interventions are deemed not effective. In another sense, the BHOs have aggressively pursued offering outpatient follow-up and case management services to each patient after hospital discharge. For example, during the study period of the TPP system, the seven-day hospital discharge follow-up rate increased from 43 percent in July 1996 to 77 percent in October 1998. The 14-day hospital discharge follow-up rate increased from 47 percent to 82 percent during the same period. These combined efforts have made a significant difference in maintaining and promoting sustainable outcomes of quality of care. Evidently, this finding was supported by Fisher's observation that "... large numbers of individuals with serious and persistent mental illness can be served in the community without developing a disproportionately large chronically readmitted population if a comprehensive array of services is made available to them [61]."



This chapter reviewed the funding history of Tennessee's public mental health care from fiscal year 1987-88 to 1998-99. It was concluded that the managed care program achieved the goal of cost containment by about nine percent during the first three years of implementation. In 30-month averages,

program member costs and user costs during the TPP period were also significantly lower than those during the TDMHMR period: \$196 PMPM versus \$16, and \$658 PUPM versus \$477 PUPM, respectively. However, the TPP PUPM cost was the same as the PUPM cost estimated in the Waiver baseline year (fiscal year 1995-96).

This chapter also presented statistics demonstrating that access to care has been broadened under managed care. Total program users increased from an average of 32,355 individuals each month to 41,969 individuals each month, indicating the possibility that either more established patients were using regular care, or new patients gained access to care under the managed care program.

Total inpatient expenditures experienced a sharp and persistent reduction immediately after managed care reform, from about \$104 million in fiscal year 1995-96 to \$61 million in fiscal year 1998-99 (constant dollars). Bed-days decreased to about 13,000 days from about 33,000 days during the TPP period. While monthly admissions increased significantly in the TPP period, the average monthly number of bed-days per inpatient user decreased from around 19 days in the TDMHMR period to 11 days in the TPP period.

The cost-efficiency estimates of inpatient care indicated that at the margin the TPP program was not as efficient (\$530 per diem, or an output of two bed-days per \$1,000 input of inpatient expenditures) as what was under the TDMHMR (\$312 per diem, or output of three bed-days per \$1,000 input of inpatient expenditures). Without demonstrating a comparative cost advantage at the margin, the study suggested the TPP system achieved savings in inpatient care in the study period mainly through volume reduction, rather than productivity improvement.

In outpatient care, the TPP program did not demonstrate comparative cost advantages. The correlation between program funding and the volume of services was found to be negative during the first 30 months of the TPP program. Such a phenomenon is being considered as typical with a capitated system. It is cautioned that the conclusion could be different when true costs at the provider level were known.

As to quality of care, this chapter demonstrated that the managed care program has maintained and improved outcomes of quality of care measured by 30-, 60-, and 90-day recidivism rates. Further analysis concluded that changes in program expenditures did not affect quality of care outcomes differently across the two study periods; therefore, cost-effectiveness held unchanged across the two periods. Factors other than program expenditure attributing to quality of care outcomes were thought to be, though not tested, management and intervention types of services, which were greatly emphasized under the managed care program.

Chapter 4: Summary of Findings and Further Discussion

Chapter four outlines findings obtained in this research. Policy relevance and implications associated with these findings will be discussed. Lastly, some research limitations are also discussed.

4.1 Summary of Findings

Consistent with much of the literature reviewed, the macro level results of managed public mental health care reform in the state of Tennessee are fairly positive. First and foremost, the reform program was able to meet the expectation of cost containment. The overall growth rate and funding magnitude of public expenditure on inpatient and outpatient mental health care were checked during the first two and one-half years of the TPP program. The comparable spending of the TPP program during its first three years of implementation, on average, was about nine percent below the projected level of that of the TDMHMR. Based on the linear trend of funding experience for the TDMHMR system, the expected public expenditures for fiscal years 1996-97, 1997-98, and 1998-99 would be about \$263, \$282, and \$300 million, respectively. The actual spending of the TPP program was about \$269, \$236, and \$259 million. Hence, the reformed program has demonstrated its ability at realizing immediate cost savings.

Also consistent with the literature, the major source of cost savings for the reform program came from the inpatient sector. As demonstrated in Figure 10, actual spending on inpatient care decreased continuously and significantly since the first year of the TPP's implementation, down from about \$104 million (FY1995-96) to \$83 million (FY1996-97), to \$66 million (FY1997-98), and then to \$61 million (FY1998-99). The reduction in inpatient utilization in the TPP program was not associated with a reduction in admissions, but solely to reduced hospital stays. Since admission rates were up while average length of stay was down, it indicates the BHOs have not aggressively 'managed' access to inpatient care or aggressively pursued the substitution of outpatient care on a patient by patient basis. Rather, the BHOs acted more aggressively in regulating the length of inpatient stay. Further, BHOs diverted a significant volume of inpatient utilization to contracted private facilities where stays were short and per diem rates were relatively

low. In this manner, the TPP program was able to reduce about 21 percent of the inpatient bed days and reduce the average length of inpatient stay from roughly 19 days in the TDMHMR system to roughly 11 days in the TPP system, and reduce inpatient spending about 50 percent by the end of the period.

Second, despite the effort at cost containment, the TPP program also achieved the goal of expanding access to public mental health care. As summarized in Table 11 below, all levels of access have increased significantly under the managed care program. On the basis of monthly averages, the actual number of program users increased approximately 23 percent as a result of extending access to new consumers or offering more services to the established though not frequently served users. On an monthly basis, actual program users increased from about 44,000 users in FY 1995-96 to about 48,000 in FY 1998-

Table 11: Summary of Program Access

Type of Access	TDMHMR 30-month Average	TPP 30-month Average	Change
Covered Lives/Members	101,826	1,225,372	↑ 1103.4%
Served Lives/Users	32,355	41,969	↑ 22.9%
Inpatient Users	1,685	2,348	↑ 39.3%
Outpatient Users	32,354	41,192	↑ 23.7%

99,⁹⁶ indicating that more consumers getting routine services and (or) more consumers previously not being served by the TDMHMR system were able to gain access through the TPP program. Overall, the significant reduction in service utilization under Tennessee's public managed care reform did not place a negative impact on consumers' access to public mental health care, both in inpatient and in outpatient care settings.

Third, the managed care program demonstrated better outcomes using recidivism-based quality of care measures. The 30-day, 60-day, and 90-day readmission rates are summarized in Table 12. Further, the econometric testing indicated that program expenditures did not affect quality of care outcomes differently across the two study periods. Therefore, cost-effectiveness held unchanged across the two periods. Factors

Table 12: Changes in Hospital Readmission Rates

Readmission Rate	TDMHMR 30-month Average	TPP 30-month Average	Change
30-day readmission per 1,000 members	0.6	0.3	↓ 50%
30-day readmission per 1,000 patients discharged	170	127	↓ 26%
60-day readmission per 1,000 members	0.8	0.4	↓ 50%
60-day readmission per 1,000 patients discharged	251	166	↓ 34%
90-day readmission per 1,000 members	1.0	0.4	↓ 60%
90-day readmission per 1,000 patients discharged	307	188	↓ 39%

other than program expenditure attributing to quality of care outcomes were thought to be, though not tested, management and intervention types of services which were greatly emphasized under the managed care program.

Fourth, under the reform program, both inpatient and outpatient sectors experienced significant volume and intensity reductions in service. As summarized in Table 13, about seven percent of the TDMHMR outpatient services and 21 percent of the TDMHMR inpatient bed days were deemed as excessive because the study demonstrated that the standard for quality of care was upheld under the capitation system without these services. Obviously, without restricting consumer access, the only means

Table 13: Changes in Service Utilization

Service Utilization	TDMHMR 30-month Average	TPP 30-month Average	Change
Outpatient Services	178,554	166,633	↓ 6.7%
Frequency of Outpatient Services per user	5.5	4.0	↓ 27%
Bed days	32,395	25,685	↓ 20.7%
Admissions	324	2,603	↑ 703%
Average LOS	19	11	↓ 42%

⁵⁸ The user counts for the TPP system were from the inpatient and outpatient databases only. Fiscal year 1998-99 user population is an annualized number based on statistics from the first six months of the year.

that the reform program could use to realize such reductions was to reduce the relative intensity of services; i.e., reduce length of inpatient stay per admission or frequency of outpatient services per user per month. As a result, the inpatient average length of stay was down from about 19 days in the TDMHMR period to about 11 days in the TPP period; the frequency of outpatient visits was down from about eight units of services per person per month in the TDMHMR (FFS) system to about four units of services per person per month in the TPP (capitation) system.

Fifth, on a per member and per user basis, the observed program funding efficiencies improved. As presented in Table 14, the capitation program holds distinct cost advantages in member cost (\$PMPM) and user cost (\$PUPM) as a direct result of restricted funding and increased access. Coincidentally, the PUPM cost in the TPP period was the same as the PUPM cost in the Waiver baseline period (fiscal year 1995-96). However, at the micro level, the TPP program has not demonstrated cost-efficiencies in traditional output measures (i.e., per diem rate and unit cost of outpatient services) in the period observed. Although it is cautioned that outpatient cost-efficiency was estimated with the implicit assumption that the TPP program broke even financially during the first 30 months of production. If, in fact, the capitated providers in the BHOs' network had experienced positive or negative financial earnings over capitation revenues, the actual outpatient cost-efficiency could be over- or under-estimated

Table 14: Changes in Unit Costs

Unit Cost	TDMHMR 30-month Average	TPP 30-month Average	Change
\$PMPM	\$196	\$16	↓92%
\$PUPM	\$658	\$477	↓28%
\$per diem (average)	\$262	\$275	↑5%
\$per diem (marginal)	\$312	\$530	↑70%
\$per unit of service (average)	\$64	\$77	↑20%
\$per unit of service (marginal)	\$52	< 0	↓

4.2 Policy Relevance and Implications

Without a doubt, Tennessee's experience in public mental health care reform is of great significance in public mental health care policy making for its magnitude and its broad focus in managed care reform. Unlike most other states, Tennessee boldly rolled out the reform program overnight to cover the entire TennCare population, SPMI/SED and non-SPMI/SED alike, TDMHMR consumer or not. There was concern that a newly started managed care program would not be capable of handling the entire SPMI/SED population at once. There was also concern that SPMI/SED consumers would be worse off under the capitation program because of the potential for service reductions. Based on demonstrated outcomes of quality of care with respect to the high-risk population, Tennessee's experiment has proven that large-scale managed care reform in the public mental health arena can be achieved with minimal, if any, reduction in the quality of care for the most vulnerable population.

Still, the transition from a traditional FFS system to a capitation-based managed care system was not painless. This is largely because the "design of the new managed care system reflects the distribution of power in a policy community where advocates seeking to protect Medicaid beneficiaries, as well as safety-net providers seeking to protect their patient base, have exerted considerable influence. Throughout the process of Medicaid reform, the economic expectations and practices associated with managed care and market competition collided with the political accommodations necessary to make such a transition (Oliver, 1998 [62], p. 61)." As could be expected, the reform process, and the TPP program which resulted, could not satisfy all parties. Not everyone and every interest group was convinced and pleased with the reform effort. Six months into the program, the closeout of Spectra Community Mental Health Center in Memphis sent the TPP program into its first crisis. In December 1996, over disputes on payment issues, Spectra CMHC closed its doors to public mental health care forcing the TPP program to face not only the threat of an unstable provider network and an incomplete claims and payment system, but also the challenge of ensuring continuity of care for these affected enrollees. Early in 1998 the TPP program had experienced its second crisis triggered by skyrocketing pharmacy spending leading to the state decision in taking over behavioral pharmacy management and payment responsibility. To date, some serious problems, particularly

with provider networks and reimbursement processes, still need to be worked out for the TPP program. However, the program is continuing to make inroads in the reform.

Could the TDMHMR or a FFS system also achieve the goal of cost containment with managed care principles? Instead of adopting a carve-out managed care approach, some states have experimented in transforming FFS programs into capitation or capitation-like programs. The objectives are to reduce transitional shock to consumers, and greater protection to safe-net providers, mostly community mental health agencies (CMHAs). Colorado, for example, was one of the states that had parallel experiments between a CMHA-run capitation program and a BHO-run program. Based on early findings, the CMHA-run capitation program was not able to generate a PMPM saving while the BHO-run capitation program did. In Tennessee's case, the state had also made a substantial effort to improve the FFS system since the beginning of the 1990s. This was culminated in the development and implementation of the Mental Health Master Plan in 1992, four years before managed care reform. With the Master Plan in place, the FFS system was able to reduce outpatient services with relative frequency, although the total volume of services did not come down simply because more users were added to the system. Obviously, volume of services directly mattered to the CMHAs' revenue base. With the volume of services maintained, so was the CMHAs' revenues base. Further, in the inpatient sector, two of the five RMHIs were not closed, as the Master Plan had suggested⁵⁹, nor were the volume of inpatient bed-days and average length of stay reduced.

Over the TDMHMR period, the inpatient days and inpatient costs were kept at about 30,000 days, 19 days per hospital stay, and \$8 million expenditure each month. With mounting pressure for cost containment and the frustration of being unable to cut costs under the FFS mental health care system, a carve-out capitation system was called upon to replace the FFS mental health system completely. This followed the reform of Tennessee's Medicaid program. The resulting managed mental health program did secure decisive cost savings immediately. Evidently, Tennessee's case further confirms the observation made by Strum of the UCLA/RAND Research Center in a carve-out managed mental health care study: ...even

⁵⁹ The Master Plan proposed to close down two of the five state institutes by 1996.

unmanaged fee-for-service plans experienced a trend away from inpatient care, but a switch to managed care substantially accelerated this trend (Strum, 1997 [8]).

As was seen through 30 months of the TPP period, the capitation system achieved the goal of cost containment through significant reduction in relative service intensity (length of stay, number of services per patient per month). To FFS proponents, the challenge is finding economic and management systems that will govern behavior of FFS providers if they do not produce efficiently. To managed care advocates, the challenge is to demonstrate continuous efficiency and effectiveness. Once excessive services are eliminated from the system, outpatient and inpatient service intensities will approach thresholds eventually under certain service modalities. Therefore, from a long-term perspective, additional efficiency gain will rely largely on seeking productivity improvement, economies of scale, optimal resource and service modality reconfiguration, or substitution. Nevertheless, in Tennessee's experiment, immediate utilization reduction was the critical driver for the achievement of short-term cost containment.

In theory, increasing market competition could be an effective policy instrument that would further reinforce or improve Tennessee's cost containment effort. In the TPP period, the market competition did exist but has not played a significant role in Tennessee's managed care reform. BHOs in the TPP program faced direct and indirect market competitions. First, the managed care program was indirectly challenged by the FFS system unlike in most other states where managed care programs were often put side-by-side with FFS programs for direct comparisons. This challenge was considered as indirect because the TPP program operated under predetermined capitation payments. These payments were derived based on 'shadow prices' (Feldstein, 1999 [11])⁶⁰ or FFS equivalents in fiscal year 1995-96, so that the budget neutral clause specified in the federal waiver would hold. Thus, the reform program was forced to produce a budget neutral result as if it were a FFS program in order to stay viable. Further, the managed care program needed to demonstrate savings in order to be differentiated from the FFS program.

The second source of competition that the managed care program faced was internal market competition among managed care plans. Soon after inception of the program, managed care plans were

consolidated to just two major behavioral health plans--Premier and TBH. Competition between the plans was not direct because contracts, capitation rates, market share and adverse selection issues were mostly under regulation and arbitration by the state. However, with the existence of other competitors, players of a newly started managed care program had to moderate their goal of higher revenue or profit earnings somewhat. To starting BHOs, the initial objective might not be profit earnings but to get in and stay in the game. The issue was, would managed care plans change their tactics once they secured positions as major carriers of a public mental health care program? In August 1998 the landscape of Tennessee's managed public mental health care evolved into a one-player market with the acquisition of TBH's parent company by Premier's parent company Magellan. With monopoly power in hand, whether the potential of long-term cost savings of the reformed public mental health program can be jeopardized is an issue dependent largely on how well state legislators can keep BHO monopoly power in check, perhaps by introducing sufficient competition or by effective regulation and contract negotiation.

In contributing to Tennessee's public mental health care reform, the TDMHMR system paved necessary ground indeed for Tennessee's overnight mental health care transition. Redistribution and optimization between inpatient and outpatient care expenditures and services were under way long before the reform. Outpatient expenditure began to outweigh inpatient expenditure in 1993. Perhaps the most significant contribution of the TDMHMR administration was the development of the Master Plan, a valuable document that clearly identified the key mental health services and laid out the baseline benchmarks of many services, such as case management, crisis interventions, and medication management. Unfortunately, the TDMHMR program was not able to capitalize on the Master Plan to stay viable because of the nature of the FFS system.

Besides the concern whether managed care has the ability to control cost in the long run, many raised concerns whether care outcomes would suffer under managed care. As suggested by this research and much other research, managed care programs have the ability to maintain quality. In fact, it would be in the best interest of managed care companies to promote better treatment and care outcomes, short-run and

[∞] The "shadow prices" here has the similar connotation as was described by Paul J. Feldstein: "When HMOs began to enter the group

long-run. In addition to the internal monetary incentive for promoting effectiveness of managed care, a better outcome in quality of care will also help the managed care company in gaining a competitive edge when facing stiff market competition (Dorwart and Epstein, 1995 [10]).⁶¹ In a competitive health care marketplace, a health plan must manage costs while contributing satisfaction and effectiveness of care. Poor quality service undermines a health plan's ability to compete. Further, ineffective or inferior services and treatments also leads to low satisfaction and a waste of resources. In theory, when there is sufficient market competition and financial disincentive to poor service performance, pursuing high quality and effective care should become an internal and natural process in a managed care system. Therefore, further promotion of market competition should improve the TPP program's cost-efficiency.

4.3 Further Discussion and Research Limitations

Considering that consumer satisfaction is positively correlated to the level of quality of care consumers received, several related consumer satisfaction surveys are reviewed here to provide additional evaluation on the TPP program. A consumer satisfaction survey conducted at the end of the first year of the TPP program did not find significant dissatisfaction from the TPP recipients (TDMHMR, 1997 [19]). Seventy percent of overall respondents felt they were somewhat or much better off as a result of their services. Only 24 percent of respondents reported they felt about the same as a result of services they received. Six percent felt worse. Another consumer satisfaction survey was conducted by one of the BHOs in the second year of the TPP operation (TPP/Premier, 1998 [20]). The survey reported that 72 percent of the SPMI consumers surveyed agreed they were improving as a result of the services they received; 84 percent of SPMI consumers surveyed were satisfied with their case managers. Overall for the SPMI consumers surveyed, 61 percent were satisfied with their BHO. As for the non-SPMI consumers surveyed, 67 percent were satisfied with the quality of care and services they received. One recent survey conducted by

health insurance market in the early to mid-1980s, they set their premiums just below the premiums charged by traditional insurers. This practice was referred to as 'shadow pricing'."

⁶¹ Dorwart and Epstein: Now, federal qualification for an HMO have come to represent a minimum standard. Federal status as a proxy for quality assurance is often sought by HMOs as a marketing advantage to reassure prospective members they will receive an approved level of care. Companies negotiating health care for their employees have usually required federal qualification from an HMO they planned to offer.

the University of Tennessee at Knoxville on the TennCare program, did not find significant dissatisfaction from TennCare recipients surveyed (TennCare, 1999 [21]). The survey reported that TennCare recipients were continuing to manifest increased satisfaction with TennCare since its inception. The survey indicated that, consistent with other indicators, the TennCare population adjusted to the move to managed care and the provider community improved care provided under TennCare.

Within some exceptions, most of the findings presented in this research demonstrate the similarity to other studies comparing capitation and FFS outcomes reviewed in section 1.4. Typical findings included an overall reduction in program expenditures or growth rates; increased access to care; reduction in user costs; and reduction in inpatient utilization and costs. This research found unusual increases in inpatient admissions and inpatient users along with a significant reduction in inpatient utilization under the TPP system which were not seen from other studies. Also not seen from other studies are empirical discussions about quantified correlation between program expenditures and traditional production output (bed-days and services) under a capitation system. As seen in this study, a newly started capitation program may demonstrate a negative, consequently inefficient, correlation between program expenditures and traditional production output in the short-run. In the long-run, a capitation program should also be able to demonstrate cost-efficiencies, even in traditional output measures given sufficient market competition.

Although the overall economic implication of managed care reform in Tennessee was positive, the transition process was not painless. Particularly with the dramatic change to the public mental health care structure, interests between safe-net providers (CHMAs and RMHIs) and newly empowered managed care organizations (BHOs) collided. Anxieties associated with the redistribution of revenue, market share, and political power accelerated when the BHOs failed to distribute or reimburse payments (or costs) promptly. With the closeout of the Spectra Community Mental Health Centers in Memphis six months after the managed care program began, pressure mounted further. The TPP program had to deal with not only provider network uprising, but also had to work to assure continuity of care and consumer satisfaction for those affected consumers.

Besides the realization that this study did not address administrative-related performance issues, this study was not able to include cost and utilization performance of the pharmacy sector as well due to lack of comparable pharmacy information from the TDMHMR period. Given the facts that pharmaceutical expenditures sky-rocketed during the TPP period and BHOs were released from responsibility for covering behavioral drugs during the study period, the potential for cost shifting or redistribution between the mental health service sectors (inpatient and outpatient) and the pharmaceutical sector was likely to skew the cost containment effort. For one thing, as medication treatment becomes more effective after the 1990s than before, service substitution between drug therapy and other types of services traditionally provided in an outpatient or inpatient routine could become substantial. Therefore, if the magnitude of these substitutions and associated costs are not appropriately estimated, and if the payment responsibilities of services are under different entities, cost shifting is likely to skew a cost containment effort oriented to just inpatient and outpatient sectors.

The dramatic increase in pharmaceutical costs in Tennessee's public mental health program is not unique. Managed care programs in the nation are experiencing steeply rising drug costs starting from the late 1990s (Kleinke, 2000 [65]). "Rising pharmaceutical costs now account for the largest portion of health cost increases, in part because of slowed increases elsewhere in the industry. Disease management efforts, for example, have brought offsetting savings in hospital and physician costs. New treatment options and long-term prevention strategies have offset costs in other areas. Advances in molecular biology and information technology will bring more rapid development of important new drugs, so the pharmaceutical sector will continue to be an important source of cost increases in the future (Ginsburg, 1998 [66], p. 168)." Some view that the cost shifting or increment to the pharmaceutical sector is a predicament of managed care. "In the short run, the typical disease management program conspires to induce prescriptions and increase pharmacy costs [66]." The question is, to what extent the redistribution of costs from psychiatric service sectors to behavioral pharmaceutical sectors can be considered as medically appropriate and economically efficient. Such an issue would be less complicated when a managed care company is, at least to some degree, financially responsible for medical and pharmaceutical costs. Namely, the company would bear

some economic incentive in considering optimization in allocating costs between the psychiatric services and pharmaceutical utilization. In the TPP's case, separation of financial responsibility for pharmaceutical care and behavioral health care of the BHOs would not be the solution to optimizing overall program efficiency.



Overall, this research demonstrated that at the macro level, overall economic implications of Tennessee's managed care reform were positive: program spending abated, access to care and quality of care improved. At the micro level, the research shows that the managed care program was lacking in cost-efficiency when traditional health care output were measured at the program level (inpatient bed-days and number of outpatient services). Such a finding suggests that future cost containment potential for the managed care program should be focused on improving the program's productivity in inpatient and outpatient care. This research cautioned on over- and under-estimations due to unknown provider profits, potential service substitution, and cost shifting impacts between the mental health care service sectors (inpatient care and outpatient care) and the behavioral pharmacy sector.

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VITA

Dong Zhao-Siegel (Zhao Dong) was born in Beijing, People's Republic of China, on January 28, 1956. She attended Peking University in Beijing, China, where she earned a Bachelor of Science in Environmental Chemistry and a Master of Science in Environmental Management and Planning. After working four years as an environmental engineer and administrator in Henan Province, China, she entered the University of Tennessee, Knoxville (UT-K), in 1989 and earned a Master of Arts in Economics in 1991. A year later, she entered the Ph.D. program in Economics at UT-K.

After obtaining the candidacy in the program, she joined the Department of Mental Health and Mental Retardation, State of Tennessee, as a statistical analyst. Later, she worked at the Bureau of TennCare, State of Tennessee, as manager of the Data and Statistical Analysis unit.

At present, she is working at CIGNA HealthCare of Tennessee, Inc. as a senior medical economics analyst while completing her degree in Economics.