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PREDICTORS AND OUTCOMES OF CONTINUITY OF PSYCHOTROPIC TREATMENT AMONG MEDICAID CHILDREN

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ABSTRACT

This dissertation is composed of three related studies of continuity of psychotropic treatment among Medicaid children. The first study identifies predictors of children's psychotropic treatment continuity (psychotropic medication utilization and medication management service utilization). The second study examines whether continuity of psychotropic utilization and of management utilization improves children's behavioral and functioning outcomes. The third study examines the effect of continuity of psychotropic and management use on children's total mental health use and charges.

The objective of the first study was to examine predictors of continuity of psychotropic medication use and of quarterly medication management use among Medicaid children. TennCare claims data were used in combination with interview data and data from the Area Resource File. Claims-based measures of psychotropic continuity and continuity of management utilization were used. These measures are similar to HEDIS measures of psychotropic treatment quality. Logistic regression was used to determine which factors influenced the likelihood of a child having greater continuity of psychotropic utilization or having greater continuity of quarterly medication management use.

The results of this study suggest that the quality of children's psychotropic treatment in the TennCare program was within the range of previously reported rates of psychotropic use and psychotropic management service use. While nearly three-quarters of the children utilized quarterly medication management consistently, continuity of psychotropic use was particularly poor; only one-third of children utilized medication as prescribed during the 18-month study period. Logistic regression results indicated that

being white and having prior management service utilization increased the likelihood that a child would consistently utilize psychotropic medications during the 18-month study period. No other factors significantly predicted continuity of psychotropic utilization. The number of classes of medication a child was prescribed during the study period was the only significant predictor of the likelihood of continuity of quarterly medication management utilization; consistent utilization was positively associated with the number of medication classes prescribed.

The objective of the second study was to examine the effect of continuity of psychotropic utilization and of quarterly psychotropic medication management utilization on children's behavioral and functioning outcomes. TennCare claims and charge data were used in combination with survey data and data from the Area Resource File. The outcomes were measured as the change in a child's total Child Behavior Check List (CBCL) score and a child's total Columbia Impairment Scale (CIS) score from baseline to the end of the study (duration of 18 months). Propensity score analysis was used to control for confounders in estimating the treatment effect of utilizing psychotropic medication and management services consistently on children's behavior and functioning.

The results from study 2 indicated that neither consistent psychotropic utilization nor psychotropic management utilization improved children's behavior or functioning at standard levels of significance ($p<.05$). These findings may be an indication that clinicians readily prescribe medication, but are less consistent with the process necessary to achieve the correct medication or dose. Once the most appropriate medication and dosage is established, patients should take their medications as prescribed and continue to

receive close and regular monitoring. A second implication of these results is that the timing of management visits may be critical to achieving improvement in children's outcomes.

The objective of the third study was to examine the treatment effect of continuity of psychotropic utilization and of quarterly psychotropic medication management utilization on children's mental health service utilization and expenditures. A retrospective pre-post analysis of children's interview and administrative Medicaid claims data was conducted. The outcomes were measured as the logged sum of a child's total mental health-related Medicaid service use and charges. Propensity score analysis was used to control for confounders in estimating the treatment effect of receiving consistent psychotropic treatment.

The results from study 3 indicate that while no relationship was found between continuity of psychotropic utilization and total utilization of mental health services or total charges, continuity of quarterly medication management utilization resulted in higher utilization of total mental health services and charges in the post-study period. These results suggest that consistent psychotropic medication management can be implemented at moderately higher utilization and charges. The implication for clinical practice and policy making is the need to weigh the costs of more frequent follow-up versus the benefit of improved outcomes.

In conclusion, the contribution of this research to the literature was to address questions regarding children's psychotropic treatment that were previously unanswered. The financial burden of covering psychotropic drugs to treat children's mental illness is a threat to the long-term viability of the Medicaid program. As a result, Medicaid policy

makers and providers will continue to be challenged to provide quality services in a cost-effective manner.

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CHAPTER 1

INTRODUCTION

Organization of the Thesis

This thesis follows the alternate journal format authorized by The Graduate School of Penn State. My dissertation is composed of three papers that were written to be considered separately for peer-review publication. The papers are presented in Chapters 2, 3, and 4, with an overall summary presented in Chapter 5.

Background

Psychotropic medication use among children and adolescents has risen rapidly in the past two decades. For example, stimulant use among children ages 6 to 18 years old increased 3-fold from 1987 to 1996 (Olfson, 2002). To some extent, the increased use is encouraging since some research has indicated that many children and youth with significant impairment do not receive treatment given the proportion of unmet need among children with mental illness (Angold et al., 2000; Goldman et al., 1998). Furthermore, clinical trials have proven the efficacy and effectiveness of psychotropic medications for the treatment of mental disorders.

However, other aspects of this trend in psychotropic prescribing to children have caused concern among parents, physicians and policy makers. One concern is that medications with off-label indications are increasingly being prescribed to children and adolescents (Zito et al., 2000). For example, many psychotropic medications have not been approved for the treatment of children ages 2 to 4 years old, yet use among this group has increased at rates similar to older children (Zito et al., 2000). While the use of

any medication involves a risk of side effects, the implications regarding the safety of psychotropic use among children in the long-term have not been thoroughly studied.

Another concern is the effectiveness of medication therapy in community settings. Methylphenidate, for example, has proven effective in treating attention disorders among children participating in a study, but was found less effective among children receiving community care. This large clinical trial, the Multimodal Study of Treatment for Attention-Deficit Disorder (MTA) (MTA Cooperative Group, 2004), revealed that the difference was due to the delivery of high quality medication management in comparison to usual practice. It was concluded that regular medication management, provided either alone or in combination with intensive behavioral treatment, produced greater improvement in symptoms than did behavior therapy alone or pharmacological treatment as delivered in real-world settings. In addition to strict physician adherence to treatment protocols, utilization rates of medication and follow-up by children in the medication management arm greatly exceeded the rate in the community setting arm (MTA Cooperative Group, 2004). Therefore, provider and patient behavior in community settings can be major barriers to the effectiveness achieved by controlled trials.

However, few studies have examined the link between psychotropic treatment continuity and outcomes in community settings. This thesis investigates the factors that predict continuity of psychotropic treatment utilization by Medicaid children. Additionally, this thesis assesses what effect quality process of psychotropic care has on children's outcomes in practice.

Overview of the Three Studies

The objective of the first study, Predictors of children's continuity of psychotropic treatment utilization in Medicaid managed care, was to examine predictors of continuity of psychotropic treatment among Medicaid children. TennCare claims data were used in combination with survey data and data from the Area Resource File. Using claims-based measures of continuity of psychotropic utilization and of psychotropic medication management service utilization, this study examined factors which influenced the likelihood of a child utilizing psychotropic medication and management with continuity.

The objective the second study was to examine the effect of continuity of psychotropic treatment and management on Medicaid children's behavioral and functioning outcomes. TennCare claims data were used in combination with survey data and data from the Area Resource File. The outcomes were measured as the change in a child's total Child Behavior Check List (CBCL) score and Columbia Impairment Scale score (CIS) from baseline to the end of the study (duration of 18 months). Propensity score analysis was used to control for confounders in estimating the treatment effect of receiving appropriate psychotropic treatment on children's behavior and functioning.

The objective of the third study was to assess the effect of continuity of psychotropic treatment on Medicaid children's mental health service use and charges. A retrospective pre-post analysis of children's interview and administrative Medicaid claims data was conducted. The outcomes were measured as the logged sum of a child's total mental health-related Medicaid service use and charges. Propensity score analysis was used to control for confounders in estimating the treatment effect of receiving appropriate psychotropic treatment.

CHAPTER 2

STUDY 1

Predictors of children's continuity of psychotropic treatment utilization in Medicaid managed care

Abstract

Objective: To examine predictors of a putative indicator of quality of care, the continuity of children's psychotropic treatment utilization (medication and medication management), in a managed behavioral health care Medicaid program.

Methods: TennCare Medicaid claims and survey data (N=226) from the Medicaid Impact Study were analyzed. Logistic regression was used to examine predictors of children's continuity of psychotropic and management service utilization.

Results: On average, 33% of the sample consistently took medications as prescribed, and 77% attended management visits within three months of every medication claim. The results indicated that children who were white or who utilized management services in the pre-study period were more likely to consistently utilize psychotropic medications during the 18-month observation period. Children who were prescribed more complex medication regimes (multiple classes of medication) were more likely to utilize quarterly management services on a consistent basis.

Conclusions: Overall, the continuity of children's psychotropic and management services utilization was poor. Although three-quarters of the sample utilized management visits at least once every quarter, the rate of continual psychotropic utilization was particularly low; only one-third of the sample consistently utilized medication during the study period. As a result, the consistency to which children utilize psychotropic medication in the TennCare program is a concern. Appropriate measures should be taken at the policy and services delivery levels to ensure that Medicaid children, and minorities in particular, have greater continuity of psychotropic utilization. An initial yet challenging step is for policy makers and providers to establish a process for monitoring that includes quantifiable benchmarks of whether Medicaid children appropriately utilize psychotropic medications and management services. The need for state performance measurement of appropriate utilization will continue to grow given the increased pressure for accountability by stakeholders and payers. Further research is needed to determine the effectiveness of continuity of psychotropic and management utilization on Medicaid children's behavioral outcomes in managed care and community settings.

Introduction

Psychotropic medication therapy has become a prevalent component of behavioral treatment among Medicaid children in managed care plans (Martin, Sherwin, Stubbe, Van Hoof, Scahill, & Douglas, 2002; Rushton & Whitmire, 2001; Zito, Safer, dosReis, et al., 2000; Heflinger, Simpkins, Northrup, Saunders, & Renfrew, 2000). However, few studies have examined the individual and system characteristics that predict the continuity of psychotropic treatment and monitoring received by Medicaid children in managed care settings (Marcus, Wan, Kemner, & Olfson, 2005; Sanchez, Crismon, Barner, Bettinger, & Wilson, 2005; Richardson, DiGiuseppe, Christakis, McCauley, & Katon, 2004). Identification of these predictors is important in determining whether changes to policy or practice should be implemented to ensure quality psychotropic treatment is provided within a managed Medicaid program.

Safe and effective psychotropic treatment in community settings rests on three cornerstones. First, patients must have continuity of medication receipt; they must have access to medications and fill prescriptions on a continuous basis. Second, patients must adhere to the prescribed treatment plan by taking medications as prescribed. And third, patients must have continuity of management; regular contact with a provider to manage their medication use, to assess response to treatment, and to modify treatment accordingly. These issues are particularly important given the frequency of off-label prescribing practices, the potential for side effects, and the variation in individual treatment response among children prescribed psychotropic medications (Jensen, Bhatara, Vitiello, et al., 1999; Vitiello & Jensen, 1995; Vitiello, 1998).

Although specific guidelines for quality psychotropic treatment have not been established, the National Institutes of Health recommends the continuation of medications as prescribed and physician monitoring through regular medication management visits (National Institutes of Health, 1997, p. 8). In the case of psychostimulant treatment for attention-related problems, support for these practices is provided by the Multimodal Treatment Assessment (MTA) Study (2004) which concluded that children who consistently utilized psychotropic therapy and who were closely managed by a physician showed greater improvement (MTA Cooperative Group, 2004). As a result, greater continuity of psychotropic utilization and management is likely to result in better outcomes in community settings.

Several studies have examined characteristics associated with any psychotropic use among Medicaid children (Richardson et al., 2004; Radigan, Lannon, Roohan, & Gesten, 2005; Zito, Safer, dosReis, et al., 1998; Zito, Safer, dos Reis, et al., 1997; Fox, Foster, & Zito, 2000). However, only two studies were found to examine the characteristics associated with continuous psychotropic use. The primary focus of these studies was to determine whether the type of stimulant prescribed predicted the continuity of stimulant treatment among children in managed Medicaid plans.

Marcus and colleagues (2005) tested whether the type of methylphenidate prescribed (extended- versus immediate-release) was associated with continuity of methylphenidate therapy among children diagnosed with Attention-Deficit-Hyperactivity-Disorder (6 to 17 years old). Using statewide California Medicaid claims data (2000 – 2003), continuity was defined as a continuous measure of the gap in time between the most recent prescription and the following prescription less than or equal to

30 days; a treatment episode was terminated for gaps greater than 30 days. Survival analysis was conducted to estimate children's treatment duration controlling for gender, age, race and ethnicity, co-morbidity of diagnoses, case management, managed care participation, and seasonal effects. The findings indicated that utilization of extended-release stimulants predicted greater continuity of stimulant utilization than immediate-release stimulants.

Sanchez and colleagues (2005) examined continuity of stimulant therapy using Texas Medicaid pharmacy claims data (2001-2002) for children with ADHD aged 5 to 18 years old. Continuity of stimulant utilization was referred to as adherence by the authors. The Medication Possession Ratio (MPR) was used to assess children's adherence to stimulant therapy; the MPR is calculated using the number of days' supply of medication received from a pharmacy divided by the number of days' supply needed for continuous use. Independent variables included age, gender, and the type of stimulant or methylphenidate prescribed. The MPR was greater among children prescribed extended-release methylphenidate compared to immediate-release or mixed amphetamine salts. While no gender differences were observed, the MPR was equal or better among children ages 5-9 compared to children ages 10-14 or 15-18.

No studies have been identified that examine factors associated with the continuity of psychotropic management among Medicaid children. As a result, the lack of a thorough examination of system and individual characteristics that predict continuity of psychotropic treatment and management among Medicaid warrants further study.

This study examined the predictors of continuity of psychotropic treatment (medication and management utilization) among a sample of children enrolled in the

TennCare Medicaid program. Dependent variables were constructed using claims-based measures of psychotropic and management service utilization for an 18-month period (July 1, 1997 to December 31, 1998). The predictors of children's continuity of utilization of psychotropics and management services were framed using the Aday and Andersen (1974) Behavioral Model of Health Services Utilization. The likelihood of a child utilizing medications or management services on a continual basis was estimated using logistic regression.

The results of this study will be informative regarding the system and individual factors that influence children's continuity of psychotropic and management utilization in a prominent Medicaid managed behavioral health system. Findings regarding mutable characteristics, such as provider availability, may signal the need for policy or practice reform. Results regarding immutable characteristics, such as gender or race, may be used to target children at risk for discontinuity based on their characteristics. In combination, the results regarding the immutable and mutable characteristics will be useful in determining the actions necessary to maintain and improve the continuity and quality of managed Medicaid children's psychotropic treatment.

Theoretical Framework

The conceptual framework used for this study was the Behavioral Model of Health Services Utilization (Aday & Andersen, 1974). Developed in the 1960s, the original model explains the factors affecting health service utilization by families; due to the heterogeneity within families, however, the individual was eventually used as the unit of analysis (Andersen, 1995). The theoretical basis of the model is that health service utilization is contingent on an individual's predisposition for service use, ability to use

services (enabling), and need for services. Predisposing factors describe an individual's characteristics that induce or prompt service use such as gender, age, race, and education (Aday & Andersen, 1974). Enabling characteristics are described as the availability of individual (or family) and/or community resources that facilitate the use of services. For example, personal income and differences in community resources due to living in an urban versus a rural setting can either promote or prohibit the use of health services. Need characteristics refers to the severity of an individual's medical condition and may be based upon patient perception and provider evaluation (Aday & Andersen, 1974; Andersen, 1995).

To capture supply side factors, organizational characteristics were later added. Characteristics of the health delivery system that affect utilization include those elements necessary for the provision of services such as availability, organization, and financing. Health service availability, for example, refers to the volume and distribution of services including the quantity and placement of medical personnel, facilities, and equipment. Organization and financing include the structure and mechanisms necessary for an individual to utilize the health delivery system. Although organization and financing are important components of the delivery system, these characteristics were not examined in this study given the lack of variability among the population examined; children in a Medicaid managed behavioral health system comprise the study population. However, measures of availability are included given the importance of access on utilization, particularly for Medicaid populations and populations served by managed behavioral care.

An important element of this model is an emphasis on the inclusion of variables

that may be modified to affect health policy. While many of the factors posited to affect utilization, such as race, are fixed or immutable, mutable or changeable characteristics that influence utilization are of particular interest to policy makers and providers in a managed care environment. Though the demographic predisposing characteristics are immutable, examining whether utilization is associated with these characteristics will provide physicians and administrators with information regarding psychotropic and management services utilization that was previously unavailable. Findings regarding the individual enabling and need factors, and system availability characteristics, however, may have important implications for managed behavioral care implementation and provision among Medicaid populations. The adapted model, as shown in Figure 2.1, was used to frame the examination of individual and system characteristics that influence children's continuity of medication and management visit utilization. The variables used in this study are listed in Table 2.1.

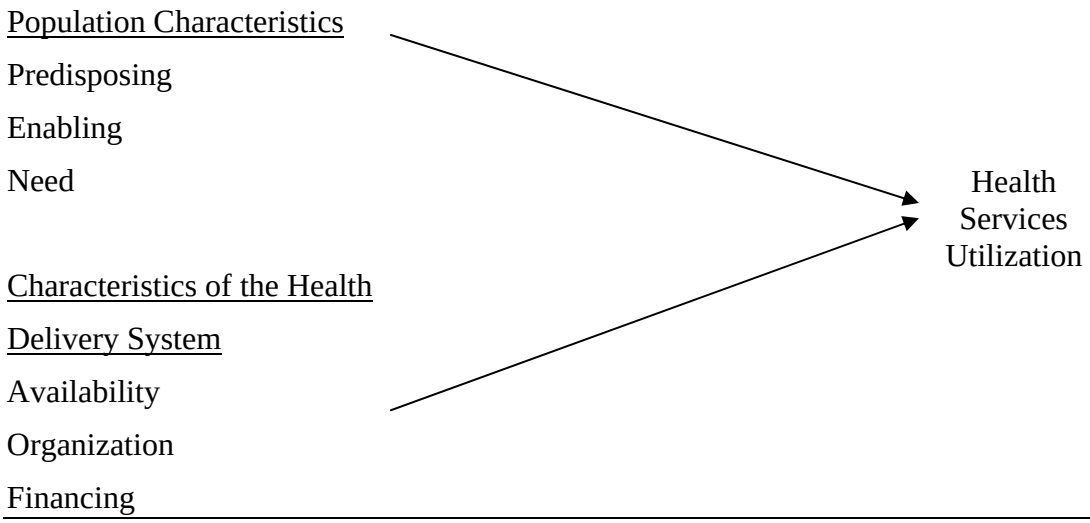
Methods

Data

Secondary survey data collected by researchers at Vanderbilt University's Center for Mental Health Policy and associated Medicaid administrative claims data were used for this study. Vanderbilt University participated in a national assessment of the impact of Medicaid managed care on vulnerable populations (Heflinger et al., 2000). Known as the Impact Study, this project, had 13 participating states funded by the Department of Health and Human Services (DHHS) and the Substance Abuse and Mental Health Services Administration (SAMHSA) (Heflinger et al., 2000). Vanderbilt's study examined the effect of Medicaid managed care on children's mental health services use

and outcomes; the TennCare Partners Program was initiated July 1, 1996 (Heflinger et al., 2000). This study included data from services provided to Tennessee Medicaid recipients.

Figure 2.1 The Adapted Behavioral Health Services Utilization Model



Setting

TennCare, a managed care delivery system of behavioral health services, was implemented to control public health care expenditures and to provide a continuum of care for its estimated 1 million enrollees (Bureau of TennCare, 2000). In 1994, Tennessee was granted a Health Care Financing Administration (HFCA) managed care site waiver and moved from a fee-for-service delivery model to a capitated system, known as the TennCare Partners Program.

Table 2.1 Predisposing, Enabling, Need, and Availability Measures used in this Study		
		Data Source
Characteristics of the Population at Risk		
Predisposing	Age of child (1=mean age of sample older (11.5 years old or older))	Interview
	Gender of child (1=male)	Interview
	Race of child (1=white)	Interview
	Level of parental education (1=Completed high school diploma or more)	Interview
	Parental marital status (1=married)	Interview
	Classes of medication prescribed during study period: CNS (or Stimulants) only (1=yes); Antidepressants only (1=yes); Others only (1=yes) Antidepressants and others (1=yes); CNS & Antidepressants (1=yes); CNS & Others (indicated when all the other medication class codes=0)	Administrative
Enabling	Rural-Urban Place of Residence (continuous)	Interview
	Family Income (1=>$18,000/year)	Interview
	Parent previously saw a psychiatrist, psychologist, social worker, doctor, or other health professional for a psychological, emotional, drug or alcohol problem (1=yes)	Interview
Need	Mental Health Diagnosis: Attention Deficit Hyperactivity Disorder (1=yes); Other diagnoses (indicated when ADHD=0)	Administrative
	Co-morbidity of Mental Health Diagnosis (1=yes)	Administrative
	Severity of Mental Health Problems (Child Behavior Check List) (continuous)	Interview
	Prior Use of Medication Management Services (1=yes)	Administrative
	Prior Psychotropic Medication Use (1=yes)	Administrative
	Complexity of Medication Regimen (continuous measure of the number of medication classes prescribed)	Administrative
Characteristics of the Health Delivery System		
Availability	Ratio of pediatricians to total population of children aged 4–17 years old by county (continuous)	ARF & Census
	Ratio of family practitioners to total population of children aged 4–17 years old by county (continuous)	ARF & Census
	Ratio of child psychiatrists to total population of children aged 4–17 years old by county (continuous)	ARF & Census

TennCare Partners was a complete managed care carve-out program whereby the state entered contracts with behavioral health managed care organizations (BHMCOs or BHOs) to manage mental health and substance abuse services (Substance Abuse and Mental Health Services Administration (SAMHSA), 1998). The program consisted of a system of two behavioral health organizations (BHOs) and nine managed care organizations (MCOs) that received capitated monthly payments for eligible[1] enrollees (SAMHSA, 1998); in 1997, the BHOs received $22.93 per month per TennCare enrollee, and approximately one-third of its 1 million enrollees were children (Diehl, Heflinger, Northrup, & Simpkins, 2000).

The BHO networks included regional mental institutions and community mental health centers as well as non-governmental organizations. The state required BHOs to coordinate care with the MCOs (SAMHSA, 1998). BHO enrollees were grouped by severity into one of two groups: Basic or Priority. Enrollees in need of acute care were categorized as "Basic" and received inpatient and pharmacy services as medically needed. The Priority benefits package was designed to meet the needs of the severely mentally ill and included expanded coverage; provisions were made for inpatient hospitalization and specialized outpatient management (SAMHSA, 1998). Both groups were entitled to the same pharmacy benefit and case management services, and a statewide formulary was used (Bureau of TennCare, 2000). Upon initiation of TennCare, the pharmacy benefit was managed by the BHOs; implementation of a pharmacy benefits manager was later selected (in 2003) to administer the pharmacy benefit. Appendix B

[1] TennCare eligibility requirements for children under age 19 are set according to the Medicaid poverty guidelines (Bureau of TennCare, 2000). In order to qualify for coverage, one of the following eligibility requirements must be satisfied: 1) the child is covered under Temporary Assistance to Needy Families (TANF)/Aid to Families with Children (AFDC); 2) the child is below 200% poverty in Tennessee; 3) the child had access to health insurance but can't afford it (Children's Health Insurance Program (CHIP));

provides a complete list of the mental health and substance abuse benefits covered under the Tennessee Department of Mental Health and Mental Retardation (TDMHMR) Partners Program.

Sample

The researchers at Vanderbilt University collected three waves of survey data between 07/1/96 and 12/31/97 through personal interviews of children receiving Medicaid health services and their primary caregiver. A stratified random sampling procedure was used to ensure a sufficient number of children with previous mental health service use. Sample selection and recruitment procedures were as follows.

The sampling frame consisted of claims data and eligibility history information obtained from the TennCare Bureau. The sample included children enrolled in Medicaid in the year prior to the implementation the managed care program. The following groups were excluded from the sample selection: children who were in state custody at the initiation of the interviews; children who had qualified for Medicaid through the uninsured/uninsurable eligibility category; and children whose birthdays did not occur between 4/1/1981 and 3/31/1993 (between ages 4 and 17 at the date of their first interview) (Heflinger et al., 2000). Three "study" groups of children were identified: Study Group 3 (High-Users of Mental Health Services); Study Group 2 (Low-Users of Mental Health Services); and Study Group 1 (Non-Users of Mental Health Services). Study Group 3, or the High-Users of Mental Health Services, consisted of children who had used an intensive mental health TennCare service or who had used a substantial amount of TennCare mental health services during 1996. Services defined as intensive

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or 4) the child is uninsured, regardless of income level (SAMHSA, 1998; HFCA, 1991). Appendix A provides the Medicaid eligibility poverty guidelines for the 48 contiguous states and the District of Columbia.

included psychiatric inpatient care, residential mental health treatment, day treatment or partial hospitalization, or mental health care management. Children who had at least 3 mental health services of any type within one week or who had received at least 10 mental health services during a 4-month period were considered to have used a substantial amount of services and were also categorized as high-users of services. Study Group 2 (Low-Users of Mental Health Services) consisted of children who had received at least one TennCare mental health service during the fiscal year (FY) 1996 but did not meet the criteria to be included in the High-User Group. Study Group 1 consisted of non-users of mental health services (Heflinger et al., 2000). Children from all 3 groups were sampled at different rates. The data were then weighted allowing the sample to be representative of the Tennessee Medicaid population.

A two-step recruitment method was used in the Impact Study. Parents of prospective participants were mailed a letter requesting their permission to be contacted regarding participation in the research study. They were able to respond by either calling a toll-free number or returning a postcard. Parents who responded were asked about their children's eligibility and state custody status; eligible children not in state custody were admitted to the study. The response rates are based on those parents/caregivers who contacted the project and agreed to be contacted (22.3%). Of the total 951 children in the responding sample, 473 participated in the interview process.

Personal interviews were conducted of both the children receiving Medicaid health services and their parents for three waves. No intervention was provided as the purpose of the Vanderbilt study was to assess the impact of Medicaid managed care implementation on beneficiaries; the children were neither encouraged to nor restricted

from accessing services. The age range of the children was 4 to17 years of age, at the beginning of the study. The survey instrument included questions about the child's mental and health status, demographic and background information, use of mental health and other services, and family issues that might impact service utilization. Additional information obtained through this study includes the children's claims data for both the period during the interviews and the pre-managed care period.

A subset of the Vanderbilt study sample was used for this study; all children who utilized psychotropic medication during the study period were included in this study (n=226). The majority of the sub-sample were white (83%), male (74%), with an average age of 11.2 (SD=2.9). Most of the children had a primary diagnosis of ADHD (60%) and had no co-morbidity of mental health diagnoses (60%). Associated administrative data for each child in this sub-sample were obtained from Tennessee's Medicaid Bureau (TennCare). Table 2.2 reports the characteristics of the sample.

Table 2.2 Sample characteristics

Variable	n	Mean	S.D.
Child's age 11.5 years old or more	226	11.2	2.9
Male child	226	0.74	
White child	226	0.83	
Child diagnosed with Attention Deficit Hyperactivity Disorder	226	0.59	
Child had co-morbid mental health diagnoses	226	0.40	
Child's severity of mental health problems	226	72.3	32.1
Child's prior medication management service use	226	0.84	
Child's prior psychotropic medication use	226	0.53	50
Number of classes of medication child was prescribed	226	1.8	1.1
Percentage rural	226	0.35	0.30
Parent earned high school diploma or more	226	0.59	
Parent married	224	0.49	

Dependent Variables

Two dependent variables were used in this study; continuity of psychotropic and management service utilization. Both variables were constructed using administrative claims data similar to quality measures of antidepressant treatment used by the National Council of Quality Assurance (NCQA) and HEDIS (NCQA, 2005; Center for Quality Assessment and Improvement in Mental Health (CQAIMH), 2004).

Continuity of Psychotropic Utilization

Continuity of psychotropic utilization was estimated by calculating the number of days between psychotropic pharmaceutical claims less the number of days' supply of medication. Other studies have used the timing and counts of medication claims to assess

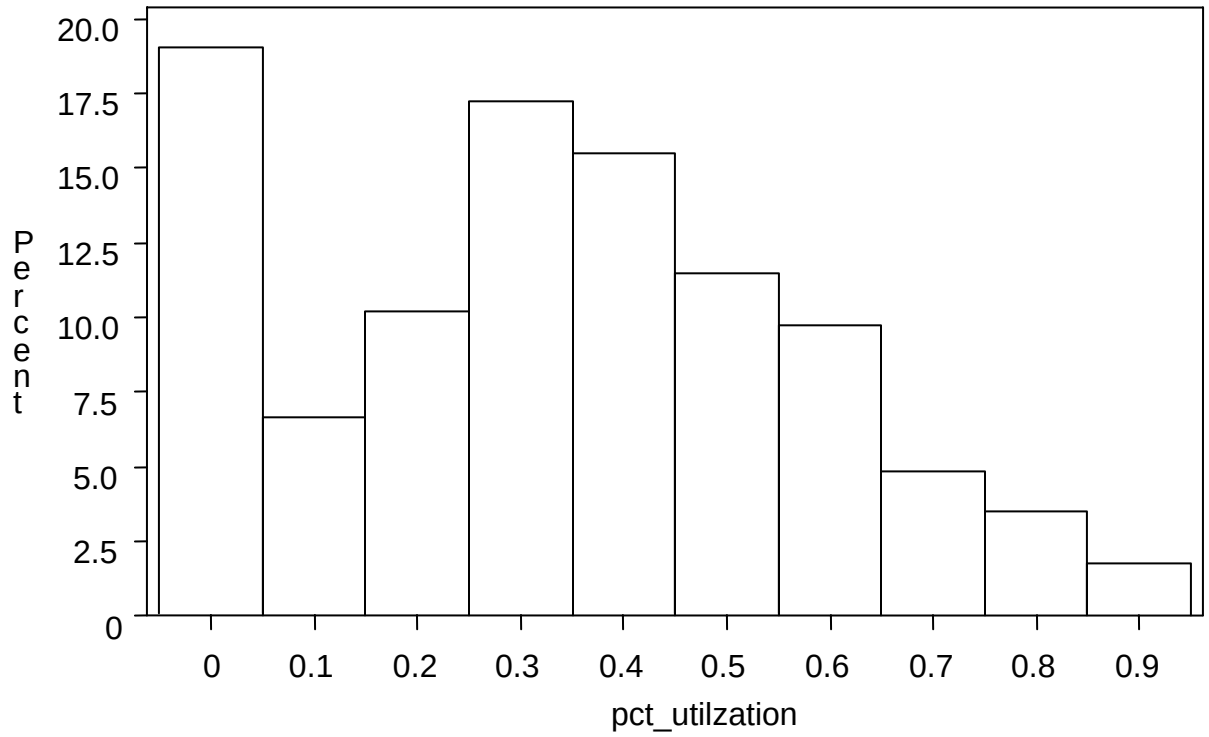
duration of psychotropic medication utilization (Melfi, Chawla, Croghan, Hanna, Kennedy, & Sredl, 1998; Shireman, Olson, & Dewan, 2002; Marcus et al., 2005). For example, as described, Marcus & colleagues (2005) defined continuity using a continuous measure of the gap in time between the most recent prescription and the following prescription less than or equal to 30 days; a treatment episode was terminated for gaps greater than 30 days. Sanchez & colleagues (2005) employed a more precise method by including the number of days' supply of medication rather than an arbitrarily defined gap; the Medication Possession Ratio is calculated using the number of days' supply of medication received from a pharmacy divided by the number of days' supply needed for continuous use.

Since drug-free weekends are standard practice in stimulant treatment regimens for children with ADHD (Thiruchelvam, Charach, & Schachar, 2001), special consideration was made for determining utilization among this group of children; consistent stimulant utilization was defined as taking stimulant medication 5 days per week. As such, consistent psychotropic utilization was defined as taking psychotropic medications daily by children not diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) or by children with ADHD who were prescribed medications other than stimulants. Additionally, it is likely that occasionally a day or two may transpire prior to a child obtaining a refill of his or her medication. In consideration of this and the distribution of psychotropic utilization among this sample as shown in Figure 2.2 (mean=.34, SD=.23), children were grouped according to whether they had low or high rates of utilization with the cut-off being psychotropic utilization below or above the 40th percentile; utilization rates were estimated as the proportion of medication claims for

which children refilled their medication as prescribed[2] (Valenstein, Blow, Copeland, McCarthy Zeber, Gillon, et al., 2004; Richardson et al., 2004). As a result, the dichotomous measure of psychotropic utilization continuity was constructed where: 1=Children who consistently utilized psychotropic medications for 40% of their medication claims or more, 0=Children who did not.

[2] It was assumed that pills were not to be split and days' supply of medication was an accurate measure of the timing of when medicines should be refilled.

Figure 2.2 Histogram of the Distribution of Psychotropic Utilization Continuity Rates



Note: Pct_utilization refers to a child level measure of the proportion of claims for which a child consistently utilized medication (obtained refills).

Continuity of Psychotropic Management Services Utilization (Management Utilization)

For the purposes of these analyses, management visits included the following mental health services: Medication management, case management, medication-related visit, outpatient visits (individual, family, group, or day treatments), and preventive mental health services[3]. The inclusion of services was based on instructions provided by the American Academy of Family Physicians (AAFP) to providers in determining when

to use certain Current Procedure Terminology (CPT) codes for psycho-pharmacologic management. Medication management (CPT code 90862) was defined as services in which a physician evaluates patient reactions to medication, assesses dosage level, prescribes medication for the period of time until the next patient visit, and notes whether the patient experienced drug interactions or adverse drug effects (Moore, 2003).

However, the AAFP recommended that the medication management code only be used in cases where minimal psychotherapy was provided. For visits where medication management services were provided in conjunction with more intensive services, such as individual or family psychotherapy, physicians were advised to use the more intensive service code as it included pharmacologic management (Moore, 2003). As a result, the services listed in addition to medication management above were included in the analyses to fully capture the Medicaid children's medication management service use.

The continuity of management utilization was determined by calculating the time between a psychotropic medication claim and the subsequent outpatient mental health service claim. A given date of service could be counted toward multiple previous pharmacy claim dates. For example, suppose that a child filled prescriptions on July 2, 1996 and July 30, 1996 and that the next service date was August 1, 1996. In that case, the August service claim date was used to determine the timing of medication management for both medication claims. Although the NIH recommended regular physician monitoring of children prescribed medications, the timing of follow-up visits was unspecified. Due to the sample distribution, the cut-off for timely or quality medication management was set at three months within a psychotropic claim. Similar to

[3] Please refer to Appendix C for descriptions and codes.

psychotropic utilization, children are not likely to have perfect attendance to quarterly management visits. So a measure of the proportion of claims for which a child received quality psychotropic management was constructed; this measure was estimated as the percentage of visits that occurred within three months of a psychotropic medication claim on average. Descriptive studies of medication management receipt indicated that the maximum expected rate of receipt was approximately 80% (Hoagwood, Kelleher, Feil, & Comer, 2000; Hoagwood, Jensen, Feil, Vitiello, & Bhatara, 2000). As a result, a dichotomous measure of management utilization continuity was used where: 1=children consistently utilized quarterly psychotropic management for 80% or more claims, 0=children who did not.

The continuous measures of psychotropic utilization and management services utilization are similar to quality measures of antidepressant treatment used by the National Council of Quality Assurance (NCQA) (CQAIMH, 2004). Dichotomous measures were used given our interest in identifying child, family, and system characteristics that decrease the likelihood of a child consistently utilizing psychotropic medications and management services; by using these characteristics, children can be targeted for additional management, education, or intervention to improve utilization. Sensitivity analysis indicated the decision to employ dichotomous measures rather than continuous measures had no bearing on the results.

Independent Variables

The Aday & Andersen model of health utilization (1974) was used as the conceptual framework for examining children's continuity of psychotropic utilization and medication management utilization. Table 2.1 describes the measures of the individual

and system characteristics that were analyzed, how they were coded, and their data source. The ratio of provider availability[4] was determined by merging the sample data with the Area Resource File (ARF) using the child's zip code and the Federal Information Processing Standards (FIPS) county code. The denominator, the total population of children between the ages of 4 and 17 years old, was obtained from the Census Bureau for 1998 (Population Estimates Program, Population Division, U.S. Census Bureau, Washington, DC); these data were linked by county code (FIPS) to determine the ratio of providers per population.

Analysis

Data preparation was performed using SAS statistical software, version 8.2, and analyses were performed using STATA, version 7.0. Preliminary analyses were conducted to describe the sample and to test for correlation between psychotropic utilization and management utilization. Separate logistic regressions were run using the dichotomous measures of psychotropic and management utilization to examine predictors of appropriate psychotropic treatment of Medicaid children.

Results

Results from the descriptive analysis of the predictors are presented in Table 2.2. Descriptive analysis of the dependent measures indicated approximately 33% (SD = 0.23) of the sample utilized psychotropic medications as prescribed and 77% (SD=0.34) utilized quarterly medication management services consistently. Tests of correlation

[4] Since the unit of analysis was the child and a child could have received services from multiple providers, I examined including a dichotomous measure of provider specialty that would indicate whether a mental health specialist was ever seen. The measure was not included in the analysis due to little variation; only 2% of the sample did not have a visit with a mental health specialist.

indicate consistent psychotropic utilization and quarterly management utilization were positively correlated (0.14).

Tables 2.3 and 2.4 report the results of the logistic analyses. Results from Table 2.3 indicate the likelihood of a child consistently utilizing psychotropic medications for 40% of more of his or her claims. For Table 2.4, the likelihood of a child consistently utilizing quarterly management services within three months of a psychotropic claim (for 80% of his or her claims) was estimated. Marginal effects were reported rather than logistic coefficients given the interest in showing how the probability of receiving a given treatment option changed based on the covariates. Marginal effects were evaluated at the mean for continuous variables and indicate the effect of a one-unit change of the covariate on the probability of being in a given treatment group; marginal effects for dichotomous variables were evaluated as the discrete change from 0 to 1 and indicate the effect where the covariate was equal to 1.

As shown in Table 2.3, race and prior management service use were significant predictors of children's continuity of psychotropic utilization. White children were 25.9% more likely to have greater continuity of psychotropic utilization (p=0.002). Children who utilized management services in the pre-study period were 18.5% more likely to have greater continuity of psychotropic utilization compared to children who did not utilize management services in the pre-study period (p=0.049).

Table 2.3 Logistic Analysis of Continuity of Psychotropic Utilization (n=224[5])

Covariate	Marginal Effect	SE	*p* value	[95% CI]	
Child age (1=11.5 or older)	-0.126	0.078	0.105	-0.278	0.026
Male child	0.072	0.087	0.408	-0.099	0.243
White child	0.259	0.084	**0.002**	0.095	0.423
Parent earned at least a high school diploma	-0.115	0.078	0.141	-0.269	0.038
Parent married	-0.004	0.079	0.958	-0.158	0.150
Child prescribed CNS or Stimulants only	0.174	0.110	0.114	-0.041	0.387
Child prescribed Antidepressants only	-0.122	0.147	0.409	-0.410	0.167
Child prescribed Other classes of medication only	0.372	0.217	0.087	-0.054	0.797
Child prescribed Antidepressants and other classes of medication	-0.124	0.164	0.451	-0.446	0.198
Child prescribed CNS & Antidepressants	0.096	0.107	0.368	-0.113	0.306
Child's Rural-Urban place of residence	-0.089	0.179	0.620	-0.440	0.262
Family income	-0.019	0.081	0.818	-0.178	0.140
Parent had a history of mental health treatment	0.041	0.078	0.597	-0.111	0.193
Child diagnosed with Attention Deficit Hyperactivity Disorder	0.033	0.089	0.714	-0.142	0.207
Child had co-morbid mental health diagnoses	0.012	0.083	0.884	-0.151	0.175
Child's severity of mental health problems	-0.001	0.001	0.702	-0.003	0.002
Child's prior management service use	0.185	0.094	**0.049**	0.001	0.369
Child's prior psychotropic use	0.027	0.084	0.747	-0.137	0.192
Number of classes of medication child was prescribed	-0.019	0.042	0.657	-0.101	0.064
Pediatrician ratio	35.125	159.93	0.826	-278.337	348.587
Family practitioner ratio	23.856	41.21	0.563	-56.914	104.625
Child psychiatrist ratio	-94.744	1,173.8	0.936	-2,395.31	2,205.82

Pseudo $R^2 = 0.12$; *p* value = 0.02

[5] Two individuals were dropped from the regression due to incomplete data of the variables regressed.

As shown in Table 2.4., the number of classes of medication a child was prescribed during the study period was the only significant predictor of a child's likelihood of consistently utilizing quarterly management (p=0.002); with each additional class of medication prescribed a child's likelihood of consistent quarterly medication management utilization during the 18-month study period increased by 68%.

Table 2.4 Logistic Analysis of Continuity of Medication Management Utilization (n=224[6])

Covariate	Marginal Effect	SE	*p* value	[95% CI]	
Child age (1=11.5 or older)	0.103	0.071	0.144	-0.035	0.242
Male child	-0.051	0.784	0.517	-0.204	0.103
White child	-0.102	0.087	0.244	-0.272	0.069
Parent earned at least a high school diploma	-0.019	0.072	0.788	-0.16	0.122
Parent married	0.054	0.070	0.440	-0.083	0.19
Child prescribed CNS or Stimulants only	0.079	0.091	0.385	-0.1	0.258
Child prescribed Antidepressants only	0.127	0.108	0.242	-0.086	0.339
Child prescribed Other classes of medication only	-0.338	0.256	0.187	-0.84	0.164
Child prescribed Antidepressants and other classes of medication	-0.093	0.206	0.650	-0.496	0.31
Child prescribed CNS & Antidepressants	0.131	0.087	0.133	-0.04	0.301
Child's Rural-Urban place of residence	-0.065	0.157	0.678	-0.373	0.243
Family income	0.003	0.074	0.973	-0.143	0.148
Parent had a history of mental health treatment	0.085	0.073	0.249	-0.059	0.228
Child diagnosed with Attention Deficit Hyperactivity Disorder	-0.131	0.081	0.104	-0.289	0.027
Child had co-morbid mental health diagnoses	-0.003	0.077	0.970	-0.153	0.147
Child's severity of mental health problems	-0.0003	0.001	0.767	-0.003	0.002
Child's prior management service use	0.014	0.098	0.883	-0.178	0.207
Child's prior psychotropic use	-0.037	0.076	0.627	-0.187	0.113
Number of classes of medication child was prescribed	0.68	0.217	**0.002**	0.256	1.105
Pediatrician ratio	106.483	153.24	0.487	-193.853	406.82
Family practitioner ratio	51.072	41.171	0.215	-29.621	131.765
Child psychiatrist ratio	-217.673	1,132.4	0.848	-2,437.2	2,001.85

Pseudo $R^2 = 0.13$; *p* value = 0.03

[6] Two individuals were dropped from the regression due to incomplete data of the variables regressed.

Discussion

Health researchers frequently assess the quality of health services delivery using measures of process or outcomes. This study examined the factors that influenced the quality of psychotropic treatment received by a sample of TennCare children; in this scenario, psychotropic management is an illustration of a process measure.

The results indicated that the rates of psychotropic and management utilization continuity among the sample children were within the range of aggregate or sample snapshot utilization rates previously reported (Kauffman, Smith-Wright, Reese, Simpson, & Jones, 1981; Firestone, 1982; Lloyd, Horan, Borgaro, Stokes, Pogge, & Harvey, 1998; Hoagwood et al., 2000(a)(b); Richardson et al., 2004). However, the average rate of consistent psychotropic utilization by the sample children was particularly poor in comparison to the average rate to which quarterly management services were utilized consistently. Despite this, nearly one-quarter of the sample did not consistently utilize monitoring services on a quarterly basis.

Race was the only predisposing characteristic found to predict children's psychotropic utilization; similar to previous utilization prevalence findings (Radigan et al., 2005; Zito et al., 1997; Fox et al., 2000; Richardson et al., 2004), the results indicated that being white increased the likelihood that a child would consistently utilize psychotropic medications. Although interview data were used in addition to claims data for this study, children were not questioned regarding their reasons for failing to obtain refills. As a result, the specific reasons why black children did not consistently utilize medication are unknown. Discontinuity of psychotropic utilization by black children may have been the result of disparity in prescribing practices (Zito, Safer, dosReis, et al.,

2003; Zito et al., 1998; 1997) or due to cultural differences in the willingness to take medication (Richardson et al., 2004).

Prior management service utilization was found to increase the likelihood that a child would consistently utilize psychotropic medications during the 18-month study period. This result supports previous research; the MTA study (2004) found that children who received monthly medication management had higher rates of psychotropic utilization compared to children who received community care. However, the measure examined in the current study was 'any previous use of management services' during the pre-study period rather than specifically timed follow-up as used in the MTA study. Further research is needed to examine whether variation in the timing of follow-up has an impact on the continuity of children's psychotropic utilization and the optimal amount of time between a prescription refill and management visit.

An important finding from a quality perspective was that the rate to which children consistently utilized quarterly management services was positively associated with the number of medication classes prescribed. The potential for side effects due to drug interactions increases with greater complexity of a child's medication regime. As a result, children taking multiple classes of medication should receive more frequent monitoring. Although greater complexity of medication regime also may be an indication of greater severity, which could account for more frequent service use, no relationship was found between severity and the likelihood of consistent medication management utilization; severity was measured using a child's CBCL score.

In contrast to prior research that examined predictors of any psychotropic use, this study found no relationship between consistent psychotropic utilization and a child being

male (Radigan et al., 2005; Fox et al., 2000; Zito et al., 1997), having a diagnosis of ADHD (Guevara, Lozano, Wickizer, Mell, & Gephart, 2002), or living in a non-metropolitan area (Radigan et al., 2005). Additionally, the class of psychotropic medication utilized did not predict either continuity of psychotropic utilization or of management utilization. Finally, neither the continuity of psychotropic or of management utilization was related to system characteristics such as the availability of pediatricians, family practitioners, or child psychiatrists.

Implications for clinical practice and research

These results have important implications regarding the continuity of children's psychotropic treatment in the TennCare program; a prominent managed health care system. Although small, the study sample was weighted in proportion to the population of children enrolled in TennCare. As a result, these findings will be useful to TennCare administrators and clinicians, as well as other state stakeholders faced with or considering the implementation of a managed behavioral health care system. However, the policy implications of these findings are limited given the use of state-specific Medicaid data and the low response rates.

In general, the findings illustrate that the continuity of psychotropic utilization among this sample of TennCare children was particularly poor and although management utilization was better, many children failed to utilize monitoring services with consistency.

The finding that black children were less likely to utilize psychotropic medication consistently generates questions regarding whether there was disparity in physician prescribing practices or if cultural differences influenced the continuity of psychotropic

utilization. The racial disparity may indicate the lack or underutilization of standardized prescribing protocols; the quality literature indicates that standardized practices, such as disease management, are an effective way to reduce racial disparity in health service delivery (Trivedi, Zaslavsky, Schneider, & Ayanian, 2005). From a policy perspective, standardized practices, such as patient reminders to refill medications, patient and caregiver education regarding the importance of consistent psychotropic utilization, and utilization of regular management visits should be implemented to improve the consistency of psychotropic utilization. From an administrative or clinical perspective, these findings imply the need for examination of current practice and patient behavior. If culture, rather than prescribing practices, is found to affect continuity of psychotropic utilization, MCBOs and providers could target minorities for additional patient education regarding the importance of taking medications regularly. Further discussion regarding the discontinuity of utilization would be necessary to assess the possibility of heightened side effects or lack of treatment response among certain ethnic groups (Lin, Anderson, & Poland, 1995; Risby, 1996; Keitel, Kopala, & Georgiades, 1995). Additionally, the interactions between providers and their patients could be assessed for cultural sensitivity and modified accordingly.

Provider availability predicted neither the continuity of psychotropic utilization nor of management utilization. As mentioned below in the limitations section, one possible explanation is the measure of provider availability was not specific in regards to the number of Medicaid providers for a given county; the measure indicated the number of providers per population of children between 4 and 17 years old. Although these results indicated no apparent policy level implications regarding the availability

providers, further investigation of the effect of managed behavioral health care system characteristics on children's continuity of psychotropic utilization and management utilization is needed.

Pre-study management service use significantly predicted greater rates of consistent psychotropic utilization by this group of Medicaid children; this supports previous findings that regular physician monitoring benefits children's psychotropic utilization and treatment (MTA Cooperative Group, 2004). As noted, the MTA study (2004) also found that consistency in psychotropic therapy and regular monitoring produced better patient outcomes. The implication for providers and administrators in a managed care environment is that the provision of consistent psychotropic management has the potential to improve children's the continuity of psychotropic utilization and ultimately children's outcomes of psychotropic treatment.

In consideration of the MTA results, the findings from this study also imply that targeting minority children for more frequent management may result in improvement in the continuity of their psychotropic utilization; black children were found to be less likely to consistently utilize psychotropic medications. The implication for managed care organizations is that improved continuity of psychotropic utilization may result in greater cost-effectiveness of psychotropic treatment. However, further research is needed to assess the outcomes and costs of quality psychotropic treatment provided to children in managed care and community settings.

Additionally, although this method of measuring psychotropic utilization has been used by numerous other researchers to assess patterns of patient utilization of medication (Valenstein et al., 2004; Sanchez et al., 2005; Perwien, Hall, Swensen, & Swindle, 2004),

future research should focus on validating and creating measures of quality medication use and monitoring that have practical application.

Overall, the findings from this study emphasize the need for effective monitoring and oversight of the quality of mental health services provided by behavioral health and managed care organizations. Legislation, such as the Government Performance Results Act of 1993, has increased the pressure for state agencies to demonstrate the effectiveness of service delivery. Increased accountability will require efficient utilization of data that is readily available, such as encounter records, to assess and monitor the performance of behavioral health care contractors. This study illustrated one method for using administrative data to assess the continuity of children's psychotropic treatment in practice. By developing and implementing similar measures, state Medicaid programs will have the tools necessary to evaluate the effectiveness of behavioral health organizations in the delivery mental health services and ultimately improve the quality of care delivered.

Limitations

The claims-based measures of continuity of psychotropic and medication management utilization are practical yet imperfect measures of assessing the continuity of psychotropic treatment. Psychotropic utilization as measured does not account for whether a patient actually took their medication as prescribed. Moreover, both of the dependent measures of continuity of utilization are limited in regards to the ability to specify the reasons for non-utilization; discontinuity in medication or management services utilization may have been due to a provider not prescribing medication or scheduling visits, or due to children not picking up refills or attending scheduled visits.

Medicaid administrative data also has limitations. Service use or prescriptions that were filled but paid for out-of-pocket are not accounted for. However, given that medication and services deemed "medically necessary" for the treatment of mental illness were covered in full under Medicaid, beneficiaries had a strong incentive to claim all psychotropic medications and services through Medicaid (Bureau of TennCare, 2000). Another limitation of Medicaid data is the possibility of lapses in coverage, or periods of ineligibility. However, analysis of the sample data indicated that continuous enrollment was the norm (98%).

In spite of these limitations, administrative claims represent data that is readily available, economical, and which contain measures used in assessing and tracking quality of care. The information necessary to assess the quality of children's psychotropic treatment could be obtained from various sources. But each source offers has trade-offs. Specific information is often obtained at the cost of representativeness. Interview data for example, can provide specific reasons why a child did not take medications as prescribed. When such data are available, however, the information often has been collected from a small convenience sample. Furthermore, measures of continuity of psychotropic utilization or management utilization obtained through interviews of patients and/or their families are subject to recall bias. Although more precise measures of consistency of psychotropic utilization are available, such as titration or blood work, such data would only prove short-term psychotropic utilization in most cases (Hack & Chow, 2001) given the short-lived effects of many medications (Greenhill, Abikoff, Arnold, Cantwell, Conners, Elliott, et al., 1996). Additionally, it would be costly and time-consuming to collect any of the data described above for the purposes of large-scale performance

measurement. Thus, there are problems with the practicality of measuring continuity of psychotropic utilization without the use of proxies. The key issue when using administrative data is whether the claims data contain measures of psychotropic utilization with sufficient specificity. However, the specificity of administrative data for this purpose has been substantiated by mental health quality researchers; the Center for Quality Assessment and Improvement in Mental Health (CQAIMH) lists administrative data as a source for assessing the quality of children's psychotropic treatment (CQAIMH, 2004).

Another limitation of this study is the ability to generalize based upon the response rate, sample size, and sample composition. However, the sample used in this study was larger than most of the studies previously conducted that examined children's psychotropic adherence. Additionally, the composition of this sample approximated that of other studies in regards to proportions of children by race, gender, and age.

Although measures of provider availability were examined, the measures only indicated the number of physicians available by county. Many providers do not accept Medicaid patients. Consequently, provider availability may have been overestimated, affecting whether a relationship between availability and continuity of psychotropic utilization or medication management utilization was found.

A final limitation is this study also lacked data of measures that may have influenced a child's continuity of psychotropic utilization such as information regarding: the release timing of medication (immediate-release versus extended release); a child's response to treatment; or a child's experience of adverse effects to medications.

In summary, despite high rates of consistent quarterly psychotropic management utilization, the continuity of psychotropic utilization among TennCare children with emotional or behavioral problems was poor. Children who were white or utilized management services during the pre-study period were more likely to utilize psychotropic medications consistently. Children who were prescribed multiple classes of psychotropic medication were more likely to have utilized quarterly management consistently. Further research is needed to determine whether treatment outcomes improve when Medicaid children utilize psychotropic medication and management services consistently in managed care settings.

CHAPTER 3

STUDY 2

The Effect of Continuity of Psychotropic Treatment and Management on Medicaid Children's Behavioral and Functioning Outcomes in Managed Care

Abstract

Objective: To examine whether continuity of psychotropic treatment and management utilization improves Medicaid children's behavior and functioning in a managed behavioral care system.

Method: Propensity score analysis was used to control for confounders in estimating the treatment effect. The outcomes were measured as the change in a child's total Child Behavior Check List (CBCL) score from baseline to the end of the study (duration of 18 months) and the change in a child's Columbia Impairment Scale (CIS) score from baseline to the end of the study.

Results: No relationship was found between the continuity of psychotropic or medication management utilization and children's behavioral or functioning outcomes.

Conclusions: The results indicate that continuity of psychotropic utilization had no effect on children's behavior or functioning. Additional study is needed to assess psychotropic effectiveness in community settings. The lack of a relationship between consistent quarterly management utilization and positive improvement in behavioral or functioning outcomes indicates that provider visits may need to occur more often than every three months, as based on findings by the MTA study. Further research of children and adolescents in community settings is needed to confirm this; additional examination should focus on other aspects of the management process that may influence outcomes.

Key Words: Continuity of psychotropic utilization and psychotropic management, functioning, behavior, CBCL, CIS, propensity scoring, children, and Medicaid.

Introduction

Despite the widespread use of psychotropic medications to treat emotional and behavioral problems among children and adolescents, few studies have examined of the effectiveness of current psychotropic treatment in practice. Practice guidelines indicate continuity of psychotropic medication and management are essential components of safe and effective psychotropic treatment. For example, the National Institutes of Health (NIH) recommend the continuation of medications as prescribed and physician monitoring through regular medication management visits (National Institutes of Health, 1998, p. 8). These two dimensions of medication use—continuity and monitoring—have been used as measures of the quality of antidepressant care (National Council of Quality Assurance (NCQA), 2005; Center for Quality Assessment and Improvement in Mental Health (CQAIMH), 2004). Using these measures in this way presumes that they predict better outcomes among individuals receiving psychotropic medication.

Recent findings from the Multimodal Treatment Assessment (MTA Cooperative Group) Study (2004) support these recommendations; children who consistently utilized psychotropic therapy and who were closely managed by a physician had better outcomes. The study examined the effectiveness of stimulant and behavioral therapy among 597 children and adolescents receiving one of four types of treatment for Attention-Deficit-Hyperactivity-Disorder (ADHD); combined medication management and behavioral modification, medication management, behavioral modification, and community care (predominantly, medication therapy). Medication management included access to medication as prescribed and monthly medication management visits. The groups receiving medication management only and medication management in combination with

behavioral modification achieved superior outcomes compared to children receiving behavioral modification and community care. Improved outcomes were largely due to continued use of medication and higher doses among the groups receiving medication management only and medication management in combination with behavioral modification relative to those in community care. The 10-month follow-up data indicated 85% of children in the medication management group continued to receive medication compared to 69% of children in the community setting ($p<.001$). The authors concluded that regular contact with a physician was essential for achieving the maximum medication benefit.

While previous findings provide important information regarding which treatments are efficacious and for whom, they may not apply to children in community settings. Physicians in the treatment arms of the MTA (2004) study followed specific guidelines and children's continuity of psychotropic and management services utilization exceeded previously reported rates; controlled studies have shown that 38% to 80% of children take psychotropic medications consistently (Kauffman, Smith-Wright, Reese, Simpson, & Jones, 1981; Firestone, 1982; Lloyd, Horan, Borgaro, Stokes, Pogge, & Harvey, 1998) while descriptive studies indicate that children's receipt of management ranges between 76% and 80% (Hoagwood, Kelleher, Feil, & Comer, 2000; Hoagwood, Jensen, Feil, Vitiello, & Bhatara, 2000; Richardson, DiGiuseppe, Christakis, McCauley, & Katon, 2004). Additionally, the MTA study did not differentiate whether receiving consistent care in the community arm resulted in greater effectiveness.

This study's contribution to the literature is to assess whether children who continually utilized psychotropic medications or management visits in community

settings had better outcomes over an 18-month period. To our knowledge, no other study has examined the effect of continuity of psychotropic and management utilization on Medicaid children's symptomatology or functioning in a community setting. Rushton & colleagues (2004) compared clinical practice with guideline recommendations for treatment of children's mental illness but only examined provider behavior; the focus was physician implementation of ADHD guidelines among primary care providers and thus lacked an examination of the effect on patient outcomes. The adult literature, however, indicates community treatment that is provided according to established parameters produces better outcomes. For example, patients who attended management visits and took medications regularly had either fewer reported symptoms or lower rates of relapse compared to those patients who did not (Miranda, Schoenbaum, Sherbourne, Duan, & Wells, 2004; Melfi, Chawla, Croghan, Hanna, Kennedy, & Sredl, 1998; Rost, Williams, Wherry, Smith, et al., 1995). These studies link guidelines to effective community treatment among adults (Miranda et al., 2004; Melfi et al., 1998; Rost et al., 1995).

A key issue in assessing the impact of treatment in community settings is that individuals are not randomly assigned to different levels of treatment utilization. As a result, individual- and family-level differences that may affect utilization may influence child outcomes as well; in particular, those children with higher quality service use may have fared better over time for reasons other than their service use. As a result, these pre-existing differences must be adjusted for when comparing groups that receive different care. To address the problem of confoundedness, propensity score analysis was used to examine the effect of continuity of psychotropic and management utilization on Medicaid children's behavior and functioning in a managed care system. The following hypothesis

was tested: Children with higher rates of continuous psychotropic utilization will have more of an improvement in behavior (lower CBCL scores) than children with lower rates of continuous psychotropic utilization, controlling for pre-treatment characteristics that may have influenced psychotropic utilization. Similarly, children with higher rates of continuous psychotropic utilization were hypothesized to have more improvement in functioning (lower Columbia Impairment Scores) than children with lower rates of continuous psychotropic utilization, controlling for pre-treatment characteristics that may have influenced continuity of psychotropic utilization. Based on findings from the adult literature, it was expected that children who received management within 3 months of every psychotropic medication claim will have more improvement in behavior (lower CBCL scores) or functioning (lower CIS scores) outcomes than children who did not receive management within 3 months, controlling for pre-treatment characteristics that may have influenced management visit attendance. By examining whether continuity of treatment results in better outcomes, these findings have the potential to influence the quality of care provided to children treated with psychotropic medication.

Theoretical Framework

The Behavioral Model of Health Services Utilization was used as the conceptual framework for this study (Aday & Andersen, 1974). The framework was used to identify factors that predict service use and may affect the outcomes of interest or potential confounders. The variables used in this study are listed in Table 3.1.

Table 3.1 Predisposing, Enabling, Need and Availability Measures used in this Study		
		Data Source
Characteristics of the Population at Risk		
Predisposing	Age of child (1=11.5 or older)	Interview
	Gender of child (1=male)	Interview
	Race of child (1=white)	Interview
	Parent had high school education or more	Interview
	Parental married	Interview
	Class of medication prescribed: CNS or Stimulants only (1=yes); Antidepressants only (1=yes); Others only (1=yes) Antidepressants and others (1=yes); CNS & Antidepressants (1=yes)	Administrative
Enabling	Rural-Urban Place of Residence	Interview
	Family Income	Interview
	Parent previously saw a psychiatrist, psychologist, social worker, doctor, or other health professional for a psychological, emotional, drug or alcohol problem	Interview
Need	Mental Health Diagnosis: Attention Deficit Hyperactivity Disorder (1=yes); Other diagnoses (indicated when ADHD=Other=0)	Administrative
	Co-morbidity of Mental Health Diagnosis (1=yes)	Administrative
	Severity of Mental Health Problems (Child Behavior Check List) (continuous)	Interview
	Child Functioning (Columbia Impairment Scale) (continuous)	Interview
	Prior Use of Medication Management Services (1=yes)	Administrative
	Prior Psychotropic Medication Use (1=yes)	Administrative
	Complexity of Medication Regimen (continuous measure of the number of medication classes prescribed)	Administrative
Characteristics of the Health Delivery System		
Availability	Ratio of pediatricians to total population of children aged 4–17 years old by county	ARF & Census
	Ratio of family practitioners to total population of children aged 4–17 years old by county	ARF & Census
	Ratio of child psychiatrists to total population of children aged 4–17 years old by county	ARF & Census

Methods

Data

Secondary survey data collected by researchers at Vanderbilt University's Center for Mental Health Policy and associated Medicaid administrative claims data were used for this study. Vanderbilt University participated in a national assessment of the impact of Medicaid managed care on vulnerable populations (Heflinger, Simpkins, Northrup, Saunders, & Renfrew, 2000). This project, known as the Impact Study, had 13 participating states funded by the Department of Health and Human Services (DHHS) and the Substance Abuse and Mental Health Services Administration (SAMHSA) (Heflinger et al., 2000). The focus of Vanderbilt's study was to estimate the effect of implementing Medicaid managed care on children's mental health services use and outcomes; the TennCare Partners Program was initiated July 1, 1996 (Heflinger et al., 2000). The current study included data from services provided to the Tennessee Medicaid participants.

Setting

The initiation of TennCare, a managed care delivery system of behavioral health services, was implemented in the attempt to control public health care expenditures and to provide a continuum of care for its estimated 1 million enrollees (Bureau of TennCare, 2000). In 1994, Tennessee was granted a Health Care Financing Administration (HFCA) managed care site waiver and moved from a fee-for-service delivery model to a capitated system, known as the TennCare Partners Program.

TennCare Partners was a complete managed care carve-out program whereby the state entered contracts with behavioral health managed care organizations (BHMCOs) to

manage mental health and substance abuse services (Bureau of TennCare, 2000). The program consisted of a system of two behavioral health organizations (BHOs) and nine managed care organizations (MCOs) that received capitated monthly payments for eligible[7] enrollees (Bureau of TennCare, 2000); in 1997, the BHOs received $22.93 per month per TennCare enrollee and approximately one-third of its 1 million enrollees were children (Diehl, Heflinger, Northrup, & Simpkins, 2000).

The BHO networks included regional mental institutions and community mental health centers as well as non-governmental organizations. BHOs were required by state mandate to coordinate care with the MCOs (Bureau of TennCare, 2000). BHO enrollees were grouped by severity into one of two groups: Basic or Priority. Enrollees in need of episodic care were categorized as "Basic" and received inpatient and pharmacy services as medically needed. The Priority benefits package was designed to meet the needs of the severely mentally ill and included expanded coverage; provisions were made for inpatient hospitalization and specialized outpatient management (Bureau of TennCare, 2000). Both groups were entitled to the same pharmacy benefit and case management services, and a statewide formulary was used (Bureau of TennCare, 2000). Upon initiation of TennCare, the pharmacy benefit was managed by the BHOs; implementation of a pharmacy benefits manager was later selected (in 2003) to administer the pharmacy benefit. Appendix B provides a complete list of the mental health and substance abuse benefits covered under

7 TennCare eligibility requirements for children under age 19 are set according to the Medicaid poverty guidelines (Bureau of TennCare, 2000). In order to qualify for coverage, one of the following eligibility requirements must be satisfied: 1) the child is covered under Temporary Assistance to Needy Families (TANF)/Aid to Families with Children (AFDC); 2) the child is below 200% poverty in Tennessee; 3) the child had access to health insurance but can't afford it (Children's Health Insurance Program (CHIP)); or 4) the child is uninsured, regardless of income level (SAMHSA, 1998; HFCA, 1991). Appendix A provides the Medicaid eligibility poverty guidelines for the 48 contiguous states and the District of Columbia.

the Tennessee Department of Mental Health and Mental Retardation (TDMHMR) Partners Program.

Sample

The researchers at Vanderbilt University collected three waves of survey data between 07/1/96 and 12/31/97 through personal interviews of children receiving Medicaid health services and their primary caregiver. A stratified random sampling procedure was used to ensure a sufficient number of children with previous mental health service use. Sample selection and recruitment procedures were as follows.

The sampling frame consisted of claims data and eligibility history information obtained from the TennCare Bureau. The sample included children enrolled in Medicaid in the year prior to the implementation the managed care program. The following groups were excluded from the sample selection: children who were in state custody at the initiation of the interviews; children who had qualified for Medicaid through the uninsured/uninsurable eligibility category; and children whose birthdays did not occur between 4/1/1981 and 3/31/1993 (between ages 4 and 17 at the date of their first interview) (Heflinger et al., 2000). Three "study" groups of children were identified: Study Group 3 (High-Users of Mental Health Services); Study Group 2 (Low-Users of Mental Health Services); and Study Group 1 (Non-Users of Mental Health Services). Study Group 3, or the High-Users of Mental Health Services, consisted of children who had utilized an intensive mental health TennCare service or who had used a substantial amount of TennCare mental health services during 1996. Services defined as intensive included psychiatric inpatient care, residential mental health treatment, day treatment or partial hospitalization, or mental health care management. Children who had at least 3

mental health services of any type within one week or who had received at least 10 mental health services during a 4-month period were considered to have used a substantial amount of services and were also categorized as high-users of services. Study Group 2 (Low-Users of Mental Health Services) consisted of children who had received at least one TennCare mental health service during the fiscal year (FY) 1996 but did not meet the criteria to be included in the High-User Group. Study Group 1 consisted of non-users of mental health services (Heflinger et al., 2000). Children from all 3 groups were sampled at different rates. The data were then weighted allowing the sample to be representative of the Tennessee Medicaid population.

A two-step recruitment method was used in the Impact Study. Parents of prospective participants were mailed a letter requesting their permission to be contacted regarding participation in the research study. They were able to respond by either calling a toll-free number or returning a postcard. Parents who responded were asked about their children's eligibility and state custody status; eligible children not in state custody were admitted to the study. The response rates are based on those parents/caregivers who contacted the project and agreed to be contacted (22.3%). Of the total 951 children in the responding sample, 473 participated in the interview process.

Personal interviews were conducted of both the children receiving Medicaid health services and their parents for three waves. No intervention was provided as the purpose of the Vanderbilt study was to assess the impact of Medicaid managed care implementation on beneficiaries; the children were neither encouraged to nor restricted from accessing services. The age range of the children was 4 to17 years of age, at the beginning of the study. The survey instrument included questions about the child's

mental and health status, demographic and background information, use of mental health and other services, and family issues that might impact service utilization. Additional information obtained through this study includes the children's claims data for the 18-month study period and the 18 months prior to the study period.

A subset of the Vanderbilt study sample was used for this study; all children who utilized psychotropic medication during the study period were included in this study (n=226). Additionally, children who were missing outcomes data from either wave of data collection were excluded. As a result, the sample for this study included 184 children. The majority of the sub-sample were white (83%), male (74%), with an average age of 11.2 (SD=2.9). Most of the children had a primary diagnosis of ADHD (60%) and had no co-morbidity of mental health diagnoses (60%). Table 3.2 reports the characteristics of the sample. The original researchers determined that "for subsample analyses, medium effect sizes (40%) are detectable with a subsample as small as 100 with 95% confidence level" (Heflinger et al., 2000, p. 84) (see Appendix E).

The data set used in this study was constructed by linking several sources to the interview data. The interview data contain the outcome measure of child behavior, demographic information for both the child and his/her parent, and information regarding family characteristics such as family income, ruralness of residency, and self-report regarding whether the parent had prior mental health service utilization. These data were linked with population administrative data obtained from the TennCare Bureau of Medicaid. The administrative data contain claims for drug and service utilization, Medicaid eligibility status, health and behavioral health information of diagnoses, and information regarding service dates and Current Procedure Terminology (CPT) codes. To

distinguish psychotropic medications from all other medications, these data were merged with the FDA drug classification file using the National Drug Code (NDC); a unique identifier created by the FDA. The interview data were merged with the Area Resource File (ARF) using a child's zip code and the Federal Information Processing Standards (FIPS) county code to obtain information regarding the availability of pediatricians, family practitioners, and child psychiatrists. Finally, the information obtained from the ARF was combined with county population totals obtained from the Census Bureau for children between the ages of 4 and 17 years old to create the provider ratios.

Dependent Variables

The focus of this study was to determine the treatment effect, or outcome, of continuous psychotropic treatment utilization in a managed care Medicaid setting.

Child Behavior Check List

The outcome of child behavior was measured as the change in child psychopathology during the 18-month study period, from baseline (wave 1) to wave 3. One measure used was the parental report of the total Child Behavior Check List (CBCL) score obtained from the interview data. The CBCL is a 112-item inventory designed to assess child psychopathology for children ages 4-18. This measure has been proven both reliable (Test-Retest Value ranges: 0.95 to 1.00; Inter-rater reliability ranges: 0.93 to 0.96; and Internal consistency ranges: 0.78 to 0.97) and valid (Achenbach, 1991). A total score was composed by using parental (or primary caregiver) report of the child's academic performance, social and peer relationships, and family relationships. The score serves as an overall index of adjustment problems (Externalizing, Internalizing) and sub-classifications for eight syndromes (Withdrawn, Somatic Complaints,

Anxious/Depressed, Social Problems, Thought Problems, Attention Problems, Delinquent Behavior, and Aggressive Behavior) (Achenbach, 1991). A total score ≥64 is considered clinical with higher scores indicating less age-appropriate behavior and greater clinical severity than lower scores (Heflinger et al., 2000).

Columbia Impairment Scale

The second outcome of interest was child functioning, measured as the change in a child's psychometric functioning using the Columbia Impairment Scale during the 18-month study period, from baseline (wave 1) to wave 3. The Columbia Impairment Scale (CIS) is a 13-item survey that was developed by the National Institutes of Health to assess global impairment for the Methods of Epidemiology of Child and Adolescent Mental Disorders (Flisher, Kramer, Grosser, Greenwald, Alegria, Bird, et al., 1997; Glied, Hoven, Garrett, & Moore, 1997). The scale assesses functioning in four broad categories including interpersonal relations, school/job functioning, use of leisure time, and psychopathological functioning (Bird, Shaffer, Fisher, et al., 1993). Self- and/or parent-reports are used to rate a child's impairment on each item using a 4-point Likert scale with 1="no problem" and 4="a big problem". A single, continuous measure of global impairment is generated, ranging from 0 to 52, with higher scores indicating greater impairment; a score ≥16 was determined to be indicative of definite impairment (Bird et al., 1993). The CIS has been shown to provide an adequately reliable and valid measure of impairment (Bird et al., 1993). Additionally, it has been demonstrated to be highly correlated with scores from the Children's Global Assessment Scale (CGAS), a clinician-determined scale of functioning (Bird et al., 1993). Parental report of the CIS was obtained from the interview data and used for the analyses in the current study.

Independent variables

Models of both continuity of psychotropic utilization and management utilization were estimated. Two dichotomous variables were constructed as described in the following paragraphs. The use of dichotomous measures was warranted given the method used to determine the treatment effect as discussed in the analysis section below. The methods for measuring psychotropic utilization and management services utilization used in this study have been used by other researchers to examine psychotropic treatment quality (Marcus, Wan, Kemner, & Olfson, 2005; Sanchez, Crismon, Barner, Bettinger, & Wilson, 2005; Melfi et al., 1998; Rost et al., 1995; Zhu, Gibson, Ascher-Svanum, Garies, & Opolka, 2003; Valenstein, Copeland, Blow, McCarthy, Zeber, Gillon, et al., 2002; Gilmer, Dolder, Lacro, Folsom, Lindamer, Garcia, et al., 2004; Lawrence, Guay, Benson, & Anderson, 2000). Additionally, these measures are similar to quality measures of antidepressant treatment used by the National Council of Quality Assurance (NCQA) and HEDIS (NCQA, 2005; Center for Quality Assessment & Improvement in Mental Health (CQAIMH), 2004).

Continuity of Psychotropic Medication Utilization

The literature indicates the calculation of gaps between administrative prescription claims is a common method for examining psychotropic treatment quality (Marcus et al., 2005; Sanchez et al., 2005; Melfi et al., 1998, Rost et al., 1995). The more precise method of using both the number of days between medication fills and the number of days' supply of medication was used in this study as described below.

Medicaid administrative claims were used to determine the continuity of children's psychotropic medication fills by calculating the number of days between

psychotropic pharmaceutical claims less the number of days' supply of medication, controlling for the child's diagnosis and the class of drug prescribed. Continuity of psychotropic medication utilization was defined as taking psychotropic medications daily by children not diagnosed with ADHD or by children diagnosed with ADHD who were prescribed medications other than stimulants. Since drug-free weekends are standard practice in stimulant treatment regimens for children with ADHD (Thiruchelvam, Charach, & Schachar, 2001), special consideration was made for determining utilization continuity among this group of children; continuity of psychotropic utilization was defined as taking stimulant medication 5 days per week. This definition included the assumption that pills were not to be split and day's supply of medication was an accurate measure of the timing medicines should be refilled.

The literature indicates even when access to medication is not an issue, children will not take their medications as prescribed all of the time; the anticipated maximum is 80% (Kaufmann et al., 1981; Firestone, 1982; Lloyd et al., 1998). In consideration of this and the distribution of continuous psychotropic utilization among this sample (mean=.34, SD=.23), children were grouped according to whether they had low or high continuity of utilization with the cut-off being utilization below or above the 40th percentile. As a result, the dichotomous measure of continuity of psychotropic utilization was constructed where: 1=Children who consistently utilized psychotropic medications for 40% of their medication claims or more, 0=Children who were not.

Continuity of Psychotropic Management Utilization

For the purposes of these analyses, continuity of psychotropic management utilization included the following mental health services: Medication management, case

management, medication-related visit, outpatient visits (individual, family, group, or day treatments), and preventive mental health services. The inclusion of services was based on instructions provided by the American Academy of Family Physicians (AAFP) to providers in determining when to use certain CPT codes for psycho-pharmacologic management. Medication management (CPT code 90862) was defined as services in which a physician evaluates patient reactions to medication, assesses dosage level, prescribes medication for the period of time until the next patient visit, and notes whether the patient experienced drug interactions or adverse drug effects (Moore, 2003). However, the AAFP recommended that the medication management code only be used in cases where minimal psychotherapy was provided. For visits where medication management services were provided in conjunction with more intensive services, such as individual or family psychotherapy, physicians were advised to use the more intensive service code as it included pharmacologic management (Moore, 2003). As a result, the services listed in addition to medication management above were included in the analyses to fully capture children's psychotropic management service use.

The continuity of psychotropic management utilization was determined by calculating the time between a psychotropic medication claim and the subsequent management service claim. As calculated, a given date of service could be counted toward multiple previous pharmacy claim dates. For example, when a child filled prescriptions on July 2, 1996 and July 30, 1996 and the next service date was August 1, 1996, the August service claim date was used to determine the timing of medication management for both medication claims. The NIH (1998) recommendations failed to define the cut-off or frequency for which children should receive follow-up. Preliminary

descriptive analyses indicated a disproportionate number of children in the sample utilized management within six months, and too few utilized management within one month (MTA Cooperative Group, 2004). As a result, a cut-off of three months was used to ensure sufficient power. The continuity of psychotropic management utilization was defined as service that occurred within three months of a psychotropic claim, regardless of diagnosis. Additionally, though perfect attendance to management visits is ideal, it is also unlikely. A search of the service literature, however, did not reveal expected attendance rates to visits for the management of a chronic illness. Prevalence studies of children's medication management utilization indicate 80% utilization is the likely maximum among children prescribed psychotropic medication for treatment of mental illness (Hoagwood et al., 2000(a)(b); Richardson et al., 2004). A cut-off of 80% was used to define the optimal percentage of management visits that occurred within three months for the 18-month study period. Thus, the dichotomous measure of continuity of psychotropic management was coded as follows: 1= Children who consistently utilized psychotropic management within three months for 80% of all psychotropic claims, 0=Children who did not.

Other Independent Variables

The basis of including other measures was to control for pre-treatment differences that may have influenced a child's continuity of psychotropic treatment and mental health outcomes. The Aday & Anderson Behavioral Model of Health Services Utilization was used to select covariates. Coding of the measures[8] included in the analyses is presented in

8 Although the medication management literature indicated physician specialty was the only significant predictor of children's psychotropic medication management receipt (Hoagwood et al., 2000b), a measure of physician specialty was not available at the

Table 3.2. With the exceptions of prior psychotropic management use and prior psychotropic use, the same independent variables were used in both models.

Children who lacked complete information for any of the covariates were excluded from the analyses[9]. The resulting sub-sample used to examine behavioral outcomes (CBCL) included 184 children who were primarily Caucasian (85%), male (72%), with an average age of 11 years old (SD=2.9). Eighty-six percent of these children had prior psychotropic management service use in the pre-study period while 56% had prior psychotropic use. As determined at baseline, 60% of children had a primary diagnosis of ADHD, 40% had co-morbid diagnoses, and the average total CBCL and CIS scores were 72.8[10] (SD=31.3) and 24.9[11], respectively.

child level of analysis and thus was excluded; this information was claim-specific and not able to be condensed to the child level for children who were seen by more than one type of provider.

9 Of the original 226 children, two children were missing information regarding their parent's marital status or income, and forty-two children were missing the Child Behavior Check List score from either wave 1 or wave 3; these children were excluded from the analyses.

10 Child Behavior Check List scores > 64 are indicative of clinical behavior.

11 Columbia Impairment Scale scores >16 are indicative of definite impairment.

Table 3.2 Sample Characteristics (n=184)

Characteristic	Mean	Std. Dev.
Age (continuous)	11.0	2.9
Gender (1=Male)	0.72	0.45
Race (1=White)	0.85	0.36
Prior medication use (1=prior use)	0.53	0.50
Prior medication management service use (1=prior use)	0.86	0.35
Parent's educational attainment (1=Completed high school diploma or more)	0.57	0.50
Parent's marital status (1=Married)	0.51	0.50
Number of medication classes prescribed (continuous)	1.86	1.14
Urbanicity (continuous, % of ruralness)	0.36	0.29
Family income (1=>$18,000/year)	0.39	0.49
Mental health diagnosis (1=ADHD)	0.60	0.49
Comorbidity of mental health diagnosis (1=Yes)	0.40	.049
CBCL at baseline (continuous)	72.8	31.3
CIS at baseline (continuous)	24.9	

Analysis

One problem with using non-experimental data is they lack the randomization necessary to produce unbiased estimates. As a result, an unadjusted comparison of children who received optimal psychotropic treatment versus those who did not would lead to a confounded treatment estimate due to selection bias. That is, the outcomes estimated would be based on individual characteristics that determined a child's course of treatment rather than the treatment received (Rosenbaum & Rubin, 1983). Even though

confoundedness is a concern when estimating the effect of appropriate care, few studies implement methods to address this problem.

Propensity score analysis was developed to address the problem of selection bias. Its been shown to produce an unbiased treatment estimate by either matching or weighting individuals with similar observable characteristics from the treatment and non-treatment groups, given certain assumptions (Imbens, 2000). A key assumption of this method is that the treatment assignment is "strongly ignorable"; that is, a child's outcomes are conditionally independent of treatment assignment given a set of covariates. The effect estimated is based on a 'balancing score', or propensity score, which is equal to the conditional probability that a child would be in a given treatment group versus all others (Rosenbaum & Rubin, 1983). This condition is satisfied by comparing individuals from the treatment group with individuals from the non-treatment group on the basis of having the same observable characteristics. Under these conditions, it is assumed the estimation of a treatment effect is the equivalent to estimation using random assignment (Dehejia & Wahba, 1999). No method is completely fail-proof, however, in reducing potential bias; a limitation of propensity scoring is the reliability of its estimation is reliant upon model specification and assumptions regarding treatment assignment.

For these analyses, propensity scores were estimated as the inverse of the predicted probability of a child choosing to consistently utilize psychotropic medications or psychotropic management services at a given treatment level as based on pre-treatment characteristics. The first step in estimating the propensity scores was to perform logistic analyses to determine the predicted probability that a child would utilize psychotropic medications continually (for 40% or more of their claims); the predicted probability that a

child would utilize psychotropic management visits every 3 months post a medication claim (for 80% or more of their service claims) was estimated separately.

Once the propensity scores were estimated, the second step was to verify conditional independence of the treatment groups; one of the key assumptions of propensity scoring is that there are no significant differences in the predicted probabilities conditional on the treatment group. As a result, an iterative process was conducted which included running the logistic regression to generate the predicted probabilities, stratifying the sample into quintiles based on the distribution of the predicted probabilities, and then running t-tests to verify that individuals had similar values (no statistically significant ($p>.05$) differences) for the covariates after being matched on the propensity scores. In order to achieve balance of the covariates, the model was modified by creating interaction or higher order terms which were then used to rerun the process as described. The process was complete once there was no significant difference between the distribution of covariates across treatment and non-treatment groups for all of the variables included in the model, resulting in the balanced propensity scores (Dehejia & Wahba, 1999). To estimate the treatment effect, weights were then created equal to the inverse of these scores.

The statistical software package SAS version 8.2 was used for data preparation. Stata version was used for all analyses; PSMatch was the final procedure used to estimate the impact of treatment on children's behavior and functioning.

Results

Tables 3.3 and 3.4 report the results of logistic analyses; propensity scores were based on the predicted probabilities of the likelihood of child continuously utilizing psychotropics for 40% of more of his or her claims and the likelihood of a child utilizing psychotropic management within three months of all psychotropic claims for 80% of his or her claims. These thresholds were assigned as based on the literature and the utilization distributions of the sample examined. Marginal effects were reported rather than logistic coefficients given the interest in showing how the probability of choosing a given treatment option changed based the covariates. Marginal effects were evaluated at the mean for continuous variables and indicate the effect of a one-unit change of the covariate on the probability of being in a given treatment group; marginal effects for dichotomous variables were evaluated as the discrete change from 0 to 1 and indicate the effect where the covariate was equal to 1.

Table 3.3 Logistic Analysis of Psychotropic Utilization Continuity (n=184)

Covariate	Marginal Effect	SE	*p* value	[95% CI]	
Child 11.5 years old or older	0.07	0.07	0.30	-0.06	0.20
Male child	-0.03	0.08	0.73	-0.18	0.13
Interaction of child's race (1=white) and parent's education (1=high school or more)	-0.06	0.07	0.42	-0.20	0.08
Parent married	-0.01	0.69	0.99	-0.14	0.14
CNS & Antidepressants (1=yes)	0.09	0.08	0.26	-0.07	0.24
Urbanicity	0.05	0.20	0.82	-0.35	0.44
Family Income (1=>$18,000/year)* urbanicity	0.16	0.16	0.29	-0.14	0.47
Child Diagnosed with Attention Deficit Hyperactivity Disorder (1=yes) * urbanicity	-0.16	0.16	0.14	-0.47	0.17
Co-morbidity of Mental Health Diagnosis (1=yes)	0.06	0.08	0.39	-0.08	0.21
Child Behavior Check List (CBCL) score baseline	0.01	0.01	0.12	-0.01	0.01
Columbia Impairment Scale (CIS) score baseline	-0.01	0.01	0.07	-0.02	0.01
Child's prior management services use (1=yes) * Ratio of child psychiatrists	-37.46	707.69	0.96	-1424.50	1349.60
Child's prior psychotropic use (1=yes) * Ratio of child psychiatrists	1014.79	765.02	0.19	-484.60	2514.20
Complexity of medication regimen (continuous measure of the number of medication classes prescribed)	0.12	0.04	0.01	0.04	0.20
Ratio of pediatricians to total population of children aged 4–17 years old by county	-6.39	152.28	0.97	-304.86	292.08
Ratio of family practitioners to total population of children aged 4–17 years old by county	58.44	41.95	0.15	23.78	140.66
Ratio of child psychiatrists to total population of children aged 4–17 years old by county	-47.13	1171.80	0.97	-2343.80	2249.54

Pseudo $R^2 = 0.12$; *p* value = 0.01

Table 3.4 Logistic Analysis of Continuity of Medication Management for CBCL (n=184)

Covariate	Marginal Effect	SE	*p* value	[95% CI]	
Child 11.5 years old or older	-0.10	0.08	0.20	-0.25	0.05
Male child	0.14	0.08	0.07	-0.01	0.30
Interaction of child's race (1=white) and parent's education (1=high school or more)	0.52	.014	**0.00**	0.24	0.80
Parent had high school education or more	-0.55	0.14	**0.00**	-0.83	-0.28
Parent married	-0.01	0.09	0.87	-0.17	0.14
Stimulants	0.14	0.09	0.12	-0.04	0.33
Urbanicity	-0.69	0.41	0.09	-1.50	0.11
Interaction of child's prior medication management service use (1=yes) with urbanicity	0.61	0.41	0.13	-0.19	1.41
Family income (1=>$18,000/year)	-0.08	0.08	0.34	-0.23	0.08
Interaction of parent's prior mental health service use (1=yes) with urbanicity	0.12	0.17	0.47	-0.21	0.45
ADHD diagnosis (1=yes)	0.09	0.08	0.29	-0.07	0.25
Comorbid diagnoses (1=yes)	0.07	0.084	0.43	0.10	0.23
Child Behavior Check List (CBCL) score baseline	-0.02	<0.01	0.25	<-0.01	<0.01
Columbia Impairment Scale (CIS) score baseline	0.01	0.01	0.63	-0.02	0.03
CIS score squared baseline	<-0.01	<0.01	0.80	<-0.01	<0.01
Child had prior medication management service use	0.01	0.17	0.96	-0.33	0.34
Child had prior medication use	0.01	0.08	0.87	-0.15	0.18
Number of medication classes prescribed	<-0.01	0.04	0.92	-0.08	0.07
Ratio of pediatricians to total population of children aged 4–17 years old by county	150.19	166.83	0.37	-176.78	477.17
Ratio of family practitioners to total population of children aged 4–17 years old by county	26.879	41.35	0.52	-54.18	107.99
Ratio of child psychiatrists to total population of children aged 4–17 years old by county	-1058.93	1247.40	0.40	-3503.86	1386.00

Pseudo R^2 = 0.141; *p* value = 0.005

Table 3.5 presents the estimated impact of the treatment effects on children's behavior measured as a change score equal to the difference in a child's CBCL total score (time3 – time1). The use of a change score decreases the influence of individual differences in baseline CBCL and CIS scores since each person's score post-treatment is assessed relative to their score measured at pre-treatment. Given that higher CBCL scores indicate greater severity of behavior the scores were reverse coded to indicate improvement. As shown in Table 3.5, a positive relationship was found between children's continuity of psychotropic utilization and behavior, though not at a statistically significant level (p=0.80). Children who had greater continuity of psychotropic utilization experienced slightly more improvement in reported behavior than children in the non-treatment group; psychotropic utilization continuity improved children's scores by 1.5 points on average. Although children who had greater continuity of management utilization experienced less improvement in reported behavior than children in the non-treatment group, this relationship also was not statistically significant (p=0.07); greater management continuity resulted in a decline in scores by 11 points on average. Sensitivity analyses indicate these findings were valid using other model specifications; other demographic information was used (child's permanency of residence and family structure) as well as different boundaries for continuity of psychotropic and management utilization.

Table 3.5 Impact of Continuity of Psychotropic and Management Utilization on Child Behavior Check List (CBCL) Change Scores[12]

	Psychotropic Utilization	Management Utilization
Mean of matched treated	6.69	3.53
Mean of matched controls	5.22	14.60
Mean Improvement	1.46	-11.08
R-squared	0.001	0.02
Observations	184	184
Significance level[13]	0.80	0.07

Table 3.6 presents the estimated impact of the treatment effects on children's functioning measured as a change score equal to the difference in a child's CIS score (time3 – time1). Given that higher CIS scores indicate greater impairment of functioning the scores were reverse coded to indicate improvement. The results indicated no significant improvement in functioning among children with greater continuity of psychotropic utilization compared to children with lower rates of consistent psychotropic utilization. Although children who had greater continuity of management utilization experienced less improvement in reported functioning than children in the non-treatment group, this relationship also was not statistically significant (p=0.68). Sensitivity analyses indicate these findings were valid using other model specifications; other demographic

12 Higher CBCL scores indicate greater severity. To account for this, the change scores were calculated as: Change score = (CBCL score time3 – CBCL score time1)*-1. The positive mean indicates that the sample children experienced an improvement in behavior from time 1 to time 3.

13 Significance level refers to the null hypothesis that there was no variation across treatment and non-treatment groups.

information was used (child's permanency of residence and family structure) as well as different boundaries for continuity of psychotropic and management utilization.

Table 3.6 Impact of Continuity of Psychotropic and Management Utilization on Columbia Impairment Scale (CIS) Change Scores[14]

	Psychotropic Utilization	Management Utilization
Mean of matched treated	4.29	3.74
Mean of matched controls	4.21	6.14
Mean Improvement	0.08	-2.41
R-squared	0.001	0.001
Observations	184	184
Significance level[15]	0.74	0.68

Discussion

The results of this study indicated consistent psychotropic utilization did not improve children's behavior or functioning at standard levels of significance ($p<.05$). One should note that the study does not prove these dimensions of service use do not improve outcomes. Rather, it fails to provide evidence of such a relationship. The validity of this finding depends on the assumptions on which propensity score methods rest—namely, that there are no remaining unmeasured factors that are confounded with service use. While it is impossible to know whether such factors exist, it is reassuring to note that

14 Higher CIS scores indicate greater impairment of functioning. To account for this, the change scores were calculated as: Change score = (CIS score time3 – CIS score time1)*-1. As a result, the positive mean indicates that the sample children experienced an improvement in functioning from time 1 to time 3.

15 Significance level refers to the null hypothesis that there was no variation across the treatment and non-treatment groups.

these analyses incorporate many factors not commonly available in other data sources, such as claims data. Furthermore, at first glance, many of the remaining factors not incorporated (e.g., parental motivation) presumably would be positively correlated with both medication use and child outcomes, leading to *overestimates* of the impact of service use.

If continuity of psychotropic use does not influence child outcomes, several explanations are indicated by previous research. Hinshaw & colleagues, for example, found medication is effective in reducing negative peer interactions but children experience less improvement in social behavior as a result of taking psychotropics (Hinshaw, Henker, Whalen, Erhardt, & Dunnington, 1989).

Secondly, recent research shows low rates of psychotropic effectiveness in practice settings; antidepressants were ineffective among 50% of patients receiving the highest standard of psychotropic treatment in community settings (Vedantam, 2006). It was reasoned that community patients have greater complexity of mental and physical health conditions compared to patients recruited for trials (Rush, Trivedi, Wisniewski, Stewart, Nierenberg, Thase, et al., 2006; Trivedi, Fava, Wisniewski, Thase, Quitkin, Warden, et al., 2006; Vedantam, 2006).

Another possibility is that the continuity of psychotropic utilization was not accurately measured. Although the measure has been shown to be valid (Valenstein, Blow, Copeland, et al., 2004) and used as a quality measure of adherence (CQAIMH, 2004), it reflects prescription filling behavior rather than whether medications were actually taken as prescribed. Further research is needed to determine the validity of this

measure for use in the assessment of psychotropic treatment continuity among children and adolescents treated in community settings.

This study also found no treatment effect of a child utilizing management services consistently on his/her behavior or functioning over time. These results differ from the MTA study (2004) findings which suggested that combined treatment that includes frequent follow-up with a provider will result in better child outcomes. In the MTA study (2004), researchers compared children who received monthly management with those who did not. Consequently, the divergence in the findings might be due in part to the timing specification of children's management visits; quarterly visits may not be frequent enough to achieve an improvement in outcomes. However, too few children in our sample utilized management services on a monthly basis to assess the effect at the monthly interval.

Implications for clinical practice and research

These results indicate that neither the continuity of a child's utilization of psychotropic medication nor management had an effect on behavior nor functioning among this sample of children treated in Medicaid managed care. From a clinical perspective, these findings indicate that when the use of psychotropics is warranted, the process should include careful titration and frequent monitoring to achieve the optimal dosage and medication. It may be that clinicians readily prescribe medication, but are less consistent with the process necessary to achieve the correct medication or dose. Once the most appropriate medication and dosage is established, patients should take their medications as prescribed and continue to receive close and regular monitoring. For example, some children only achieve the maximum benefit from medication when they

also receive close monitoring (MTA Cooperative Group, 2004). Furthermore, psychotropic medication and management should not be used in place of behavioral modification or traditional therapy when such treatment is warranted; children who received medication therapy in community settings had the poorest outcomes compared to children who received behavioral therapy in combination with medication management, medication management alone, or behavioral therapy alone (MTA Cooperative Group, 2004).

A second clinical implication of these results for managed care organizations and providers is that the timing of management visits may be critical to achieving improvement in children's outcomes. Previous studies indicated that children who utilized monthly psychotropic management had better behavioral outcomes (MTA Cooperative Group, 1999; 2004). However, quarterly psychotropic management utilization had no effect on behavior or functioning among this sample. In consideration this, management visits scheduled more frequently than every three months within a medication refill may be necessary to achieve the optimal benefit. These visits allow for modification or discontinuation of the medication regime when desired outcomes are not achieved.

From a research perspective, these results imply the need for further study of effective treatment for children and adolescents in community settings. Additional research should examine individual factors that may influence the effectiveness of psychotropic treatment including gender, ethnicity, or race (Keitel, Kopala, & Georgiades, 1995; Lin, Anderson, & Poland, 1995; Risby, 1996). Furthermore, studies should assess whether psychotropics are less effective among children with comorbid

mental and/or physical illness. In addition to assessing whether individual factors affect psychotropic effectiveness, research is needed to determine how variation in the timing of management visits influences children's behavior and functioning. In conclusion, although psychotropic medication is a prevalent component in the treatment of children's mental illness, further research of the factors influencing treatment effectiveness in practice is needed.

In general, the findings from this study emphasize the need for continued evaluation of the quality and effectiveness of community mental health services provided by behavioral health and managed care organizations. Finally, performance measurement of psychotropic and management practices is needed at the state level to monitor the quality of care provided. State agencies face mounting pressure to deliver effective services while under great financial constraint. Psychotropics have been perceived as a cost-efficient alternative to more expensive traditional mental health services. However, further assessment is needed to confirm the effectiveness and potential savings produced by medicating children and adolescents for the treatment of emotional or behavioral problems in community settings.

Limitations

Given the size of the sample and the use of state-specific Medicaid data, these findings are limited in regards to their generalizability to children receiving psychotropic treatment in other managed care organizations or Medicaid programs. Additionally, despite their widespread use, both the Child Behavior Check List and the Columbia Impairment Scale are limited regarding their sensitivity to measure change in behavior and functioning over time. However, these measures are two of the relatively few valid

and reliable global indicators of symptomlogy available and both measures have been shown to have strong psychometric properties (Achenbach, 1991; Bird et al., 1993). Additional research is needed to identify measures that can detect change in children's behavioral and functioning outcomes as a component of treatment and management.

The use of administrative claims data potentially limits this study's findings in several ways. The most significant limitation is that claims only indicate whether a prescription was filled, not whether the patient actually took the medication as prescribed. Thus, an imperfect measure of psychotropic utilization was used to estimate the treatment effect of psychotropic treatment continuity. However, this method of measuring medication use has been shown to be valid (Valenstein et al., 2004) and accepted among researchers examining medication use or adherence to medication therapy for mental illness (Sanchez et al., 2005; Marcus et al., 2005; Perwien, Hall, Swensen, et al., 2004) and other chronic diseases (Huybrechts, Ishak, & Caro, 2005; Hertz, Unger, & Lustik, 2005; Yu, Nichol, Yu, et al., 2005). Additionally, while this measure may not be the most precise method for assessing medication use, it is a cost-effective and appropriate measure of quality for performance monitoring of managed care companies.

Another limitation relates to lapses in coverage due to Medicaid ineligibility. However, continuous enrollment of the sample was extremely high for the duration of the study period (98%), which established eligibility to be inconsequential for this sample. The results could also be limited due to missing information; out-of-pocket expenditures are not represented in Medicaid data. As a result, medication or service use could be underestimated when using such data. There was strong incentive though for beneficiaries to claim all psychotropic medications and mental-health related services;

TennCare fully covered all medication and services deemed “medically necessary” for the treatment of mental illness (Bureau of TennCare, 2000). Administrative claims data also does not measure beneficiaries’ reasons for not using services or medications; children with poor rates of medication management receipt may have not attended visits or their providers may not have scheduled visits. As such, these findings may be limited by the inability to control for covariates shown to influence children’s psychotropic adherence including: children’s or parents’ intelligence, or knowledge and acceptance regarding medication treatment; family conflict; and the child’s response to treatment, experience of adverse effects to medications, or self-control. Finally, this study did not control for dosage which could influence the effectiveness psychotropic medication utilization.

CHAPTER 4

STUDY 3

The Effect of Continuity of Psychotropic Treatment on Medicaid Children's Mental Health Service Use and Charges

Abstract

Objective: To examine the effect of continuity of psychotropic utilization and of quarterly management utilization on Medicaid children's mental health service charges and utilization.

Method: A retrospective pre-post analysis of children's interview and administrative Medicaid claims data was conducted. The outcomes were measured as the log-transformed sum of a child's total mental health related Medicaid service use and charges. Propensity score analysis was used to control for additional confounders in estimating the treatment effect of psychotropic treatment continuity.

Results: No relationship was found between continuity of psychotropic use and utilization of total mental health services or charges. Children with greater continuity of quarterly medication management utilization, however, had higher utilization of total mental health services and charges in the post-study period.

Conclusions: Greater continuity of quarterly medication management utilization resulted in moderately higher mental health services utilization and charges. However, previous studies indicate that periodic medication management visits improve behavioral outcomes. As a result, the potential benefits of improved outcomes may outweigh the additional charge of greater service use. Further research of whether medication management results in a cost-offset of drug related charges is needed.

Key Words: Medicaid mental health service utilization, continuity of psychotropic treatment, charges, propensity scoring, children, medication management, and psychotropics.

Introduction

One-third of children receiving mental health services under Medicaid are also prescribed psychotropic medications (Buck, 1997). Although medications have been shown effective, increased use and rising drug costs add to the burden of allocating scarce Medicaid resources and could threaten program viability in the long-term (Hennessy, Green-Hennessy, Buck, and Miller, 2003). For example, Medicaid drug spending increased 16% annually over the past decade with the central nervous system drug category[16] accounting for the largest percentage of expenditures in 1997 (Baugh, Pine, Blackwell, and Ciborowski, 2004). Greater spending on medications, however, ultimately could be offset by the reduction of other expenditures and improved outcomes. The extent to which spending on medications is offset is largely contingent upon whether patients receive safe and effective treatment.

Continuity is essential to the three cornerstones of safe and effective psychotropic treatment in community settings. First, patients must have continuity in their access to medications; they must fill prescriptions on a continuous basis. Second, patients must adhere to the prescribed treatment plan by taking medications as prescribed. And third, patients must have continuity of management or regular contact with a provider to manage their medication use, to assess response to treatment, and to modify treatment accordingly. These cornerstones of treatment are broadly defined by the National Institutes of Health, which recommends the continuation of medications as prescribed and physician monitoring through regular medication management visits (National Institutes of Health, 1998, p. 8).

[16] Central nervous system (CNS) drugs are prescribed in the treatment of mental illness.

Though limited, evidence indicates these practices are linked to better outcomes. Research by the MTA Cooperative Group concluded that better outcomes was due in part to persistently higher rates of continued medication use; for some children the maximum medication benefit was only achieved with close management (MTA Cooperative Group, 1999; 2004). For patients who respond well to medication, consistent psychotropic use can decrease risk of relapse (Sood, Treglia, Obenchain, Dulisse, Melfi, and Croghan, 2000; Croghan, Melfi, Crown, and Chawla, 1998; Melfi, Chawla, Croghan, Hanna, Kennedy, and Sredl, 1998) and, in some cases, the need for more intensive services beyond regular management. Regular medication management can improve cost-effectiveness through reduced service utilization related to medication side effects, improved adherence to psychotropic treatment, and ultimately improve outcomes (MTA Cooperative Group, 2004). As a result, continuity of psychotropic medication and management utilization may increase the cost-effectiveness of state-funded programs without sacrificing quality of care.

To date, no other study has determined the effect of continuity of psychotropic medication and management utilization on Medicaid children's mental health service utilization and charges. The adult literature primarily indicates that patients with greater rates of continuous psychotropic medication use had lower medical charges excluding pharmacy charges (Cantrell, Eaddy, Shah, Regan, and Sokol, 2006; Eaddy, Druss, Sarnes, Regan, and Frankum, 2005; Katon, Cantrell, Sokol, Chiao, and Gdovin, 2005; McCombs, Nichol, Stimmel, Sclar, Beasley, and Gross, 1990). Additionally, their pharmacy-related charges were lower than (McCombs et al., 1990) or similar to (Eaddy et al., 2005) charges of patients who had lower rates of continuous psychotropic use.

However, Robinson and colleagues (2006) found adherence to guidelines resulted in higher charges. As a result, this study examines whether children with higher rates of psychotropic utilization continuity had lower or no difference in their mental health charges and utilization compared to children with higher rates of continuous psychotropic use.

The adult literature also indicates that ongoing monitoring of patient outcomes and psychotropic medication use increases expenditures modestly (Rost, Pyne, Dickinson, and LoSasso, 2005; Simon, Katon, VonKorff, Unützer, Lin, Walker, et al., 2001; Lave, Frank, Schulberg, and Kamlet, 1998). Rost and colleagues (2005) found that initially charges related to enhanced monitoring increased but were offset over time by incremental charge decreases and improved functioning; the group who received enhanced monitoring continued to have better functioning over time compared to the group who received usual care. Therefore, this study tests whether children who received quarterly psychotropic medication management visits on a continuous basis had higher mental health charges and utilization in comparison to children who did not.

This study examines the effect of continuity of psychotropic medication and management utilization on mental health service utilization and charges among Medicaid children. These data provide information on utilization and related charges for a state-funded program. However, given the inability to randomly assign treatment (i.e., continuity of care), the estimation of the treatment effect using observational data is subject to selection bias. Simple comparisons of children who received intermittent care with those provided continuity of care would produce estimates based on the individual differences determining the assignment to treatment rather than the treatment itself. One

method used to address this problem is propensity score analysis, which employs matching or weighting methods based on propensity scores. Matching is a well established statistical procedure but is difficult to implement when multiple covariates are used. The advantage of propensity score methodology is that it reduces matching based on multiple variables to a single variable, the propensity score (Rosenbaum and Rubin, 1983). This study uses propensity scoring to weight individuals in treatment and non-treatment groups based on their predicted probabilities of utilizing psychotropics and management consistently; this method has been shown effective in reducing potential bias subject to certain assumptions (Imbens, 2000). The results of this study will enable clinicians and policy makers to make more informed decisions regarding utilization and charges associated with implementing continuity of psychotropic therapy in treating children with mental illness.

Theoretical Framework

The Behavioral Model of Health Services Utilization was used as the conceptual framework to identify factors that predict both service use and the outcomes of interest (Aday and Andersen, 1974). These potential confounders are the basis for matching comparable individuals who received care of varying quality. The modified version of the model explains the factors affecting health service utilization by an individual (Andersen, 1995). The general premise of the model is that an individual utilizes health services contingent on his or her predisposition for service use, ability to use services (enabling), and need for services. Gender, age, race, and education are examples of predisposing factors, or individual characteristics that induce or prompt service use (Aday and Andersen, 1974). Enabling characteristics refer to the availability of individual (or

family) and/or community resources that facilitate the use of services. For example, the use of health services is influenced by income level and differences in community resources that may vary across urban and rural settings. Need characteristics refer to the severity of an individual's medical condition and may be based upon patient perception and provider evaluation (Aday and Andersen, 1974; Andersen, 1995).

Organizational characteristics were later incorporated to capture supply side factors. These characteristics include elements necessary for the provision of services from a health delivery system perspective: availability, organization, and financing. Health service availability refers to the volume and distribution of services including the quantity and placement of medical personnel, facilities, and equipment. Organization and financing include the structure and mechanisms necessary for an individual to utilize the health delivery system. Although organization and financing are important components of the delivery system, these characteristics were not examined in this study given the lack of variability among the population examined; children in a Medicaid managed behavioral health system comprise the study population. However, measures of availability are included given the importance of access on utilization, particularly for Medicaid populations and populations served by managed behavioral care.

Although this model uses fixed or immutable characteristics, such as race, to predict individual utilization of health services, it also includes variables that may be modified to affect health policy. Mutable or changeable characteristics, such as provider availability, are of particular interest to policy makers and providers in a managed care environment. The adapted model was used to frame the examination of individual and system characteristics that influence children's continuity of psychotropic medication and

management utilization. The variables used in this study are listed in Table 4.1.

Methods

Data

Data collected by Vanderbilt University researchers were used in this study to estimate the effect of consistent utilization of psychotropics and management on children's Medicaid charges and utilization of mental health services. Researchers at Vanderbilt University's Center for Mental Health Policy participated in a national evaluation of the impact of Medicaid managed care on vulnerable populations: the Impact Study (Heflinger, Simpkins, Northrup, Saunders, and Renfrew, 2000). Thirteen states took part in the assessment which was funded by the Department of Health and Human Services (DHHS) and the Substance Abuse and Mental Health Services Administration (SAMHSA) (Heflinger et al., 2000). The Vanderbilt data collection was focused on measuring the effect of implementing the TennCare Medicaid managed care program on children's mental health services use and outcomes (Heflinger et al., 2000). This study focused only on services provided to Tennessee Medicaid recipients.

Sample

Using Medicaid enrollment and eligibility information as the sampling frame, children who were enrolled in Medicaid in the year prior to the implementation the managed care program were included in the sample selection. A stratified random sampling procedure was used to ensure an adequate number of children with previous mental health service use. Children were excluded from sample selection based on the following criteria: children who were in state custody at the initiation of the interviews; children who had qualified for Medicaid through the uninsured/uninsurable eligibility

category; and children whose birthdays did not occur between 4/1/1981 and 3/31/1993 (between ages 4 and 17 at the date of their first interview) (Heflinger et al., 2000).

A two-step recruitment method was used in the Impact Study. Parents of prospective participants were mailed a letter requesting their permission to be contacted regarding participation in the research study. They were able to respond by either calling a toll-free number or returning a postcard. Parents who responded were asked about their children's eligibility and state custody status; eligible children not in state custody were admitted to the study. The response rates are based on those parents/caregivers who contacted the project and agreed to be contacted (22.3%). Of the total 951 children in the responding sample, 473 participated in the interview process.

Three waves of personal interviews were conducted for both the children receiving Medicaid mental health services and their parents. The age range of the children was 4 to17 years of age, at the beginning of the study. The survey instrument included questions about the child's mental and health status, demographic and background information, use of mental health and other services, and family issues that might impact service utilization. Additional information obtained as part of this study included the children's claims data for the pre-managed care period, the study period, and the post-study period. The majority of the sample were white (83%), male (74%), with an average age of 11.2 (SD=2.9). Most of the children had a primary diagnosis of ADHD (60%) and had no co-morbidity of mental health diagnoses (60%). Data were weighted by the Vanderbilt researchers to allow the sample to be representative of the Tennessee Medicaid population.

The data set used in this study was constructed by linking several sources to the interview data. The interview data contain demographic information for both the child and his/her parent, and information regarding family characteristics. Administrative and charge data obtained from the TennCare Bureau of Medicaid contain drug and service utilization claims, mental health diagnoses, Medicaid eligibility status, and charge information. A drug classification data file created by the Federal Drug Administration (FDA) was linked with the administrative data to distinguish psychotropic medications from all other medications. The ratio of provider availability[17] was determined by merging the sample data with the Area Resource File (ARF) using the child's zip code and the Federal Information Processing Standards (FIPS) county code. The denominator, the total population of children between the ages of 4 and 17 years old, was obtained from the Census Bureau for 1998 (Population Estimates Program, Population Division, U.S. Census Bureau, Washington, DC); these data were linked by county code (FIPS) to determine the ratio of providers per population. Every child in this study's sample had at least one psychotropic medication claim and one medication management visit within the 18-month observation period.

Dependent Variables

Two dependent variables used in this study; Medicaid mental health service use and charges. Both of these variables were constructed using administrative claims data for the 18-month study period as described below.

[17] A child could have received services from multiple providers. As such, the plan was to include a dichotomous measure of provider specialty indicating whether a mental health specialist was ever seen. However, the measure was not included in the analysis due

Medicaid Mental Health Service Use

The focus of this study was to determine outcomes of children's continuity of psychotropic treatment. The first outcome examined, mental health service use, was measured as the total number of mental health-related service encounters[18] in the post-study period. The services used to construct this measure and their associated Current Procedural Terminology (CPT) codes are listed in Appendix C. Utilization data were obtained from Medicaid administrative data files for a period of 18 months prior to the study period and 18 months after the study period. Children who were ineligible for Medicaid services for the entire period prior to or after the study period were excluded from the analyses. The logarithmic transformation of the sum of mental-health related encounters in the post-period was used as the continuous dependent measure of use[19]; the measure was retransformed post-analysis using smearing retransformation (Duan, 1983).

Mental Health Service Charges

The second outcome examined was measured as mental health service payments by Medicaid or charges in the post-study period. Mental health utilization data, as described above, were used to construct the outcome measure of mental health-related charges. Current Procedure Terminology (CPT) codes were used to link these data with Tennessee Medicaid Physician Fee Schedule information for 2000 obtained from the Center for Medicare and Medicaid Services (CMS) (2005). The charges reflect CMS payment amounts specific to Tennessee. The service payment amounts used to construct this measure are listed in Appendix D according to the associated Current Procedural

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insufficient variation; only 2% of the sample did not have a visit with a mental health specialist.

[18] Mental health-related services were defined according to CPT codes and included the following: Psychological diagnosis interview, case management, crises services, medication management, psychotherapy (individual, group, or family), mental health-related primary care visits or laboratory services.

Terminology (CPT) code. Charges of service use were adjusted to 2004 values using the Consumer Price Index (Bureau of Labor Statistics, 2004). Log-transformations[20] of the summed charges from the post-period were then used as a continuous dependent measure of total mental health service charges; the measure was retransformed post-analysis using smearing retransformation (Duan, 1983).

Independent Variables

Models of the effect of both continuity of psychotropic medication utilization and management utilization on total mental health utilization and charges during the study period were estimated. Two dichotomous variables were constructed as described in the following paragraphs. The use of dichotomous measures was warranted given the method used to determine the treatment effect as discussed in the analysis section below. The method of assessing continuity of psychotropic utilization and management services utilization used in this study is common to the literature examining quality of psychotropic treatment (Sanchez, Crismon, Barner, Bettinger, and Wilson, 2005; Marcus, Wan, Kemner, and Olfson, 2005). Additionally, these measures are similar to quality measures of antidepressant treatment used by the National Council of Quality Assurance (NCQA) and HEDIS (Center for Quality Assessment and Improvement in Mental Health (CQAIMH), 2004).

Continuity of Psychotropic Medication Utilization (Psychotropic Utilization)

Medicaid administrative claims were used to determine the timing of children's psychotropic fills by calculating the number of days between psychotropic pharmaceutical claims less the number of days' supply of medication, taking into

[19] The logarithmic transformation of utilization was used to normalize the distribution.

consideration the child's diagnosis and the class of drug prescribed. Continuity of psychotropic utilization was defined as taking psychotropics daily by children not diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) or by children with ADHD who were prescribed medications other than stimulants. Since drug-free weekends are standard practice in stimulant treatment regimens for children with ADHD (Thiruchelvam, Charach, and Schachar, 2001), special consideration was made for determining consistency of psychotropic utilization among this group of children; it was defined as taking stimulant medication 5 days per week. In line with HEDIS measures (CQAIMH, 2004) and previous research (Sanchez et al., 2005; Marcus et al., 2005), this definition included the assumption that pills were not to be split and day's supply of medication was an accurate measure of the timing medicines should be refilled.

The literature indicates that a utilization rate of 80% is the anticipated maximum (Kauffman, Smith-Wright, Reese, Simpson, and Jones, 1981; Firestone, 1982; Lloyd, Horan, Borgaro, Stokes, Pogge, and Harvey, 1998). In consideration of the anticipated maximum and the distribution of continual psychotropic utilization among this sample (mean=.37, SD=.24), children were grouped according to whether they had low or high continuity of psychotropic utilization rates with the cut-off being continual psychotropic utilization below or above the 40th percentile. As a result, the dichotomous measure of continuity of psychotropic utilization was constructed where: 1=Children who consistently took their psychotropics for 40% of their medication claims or more, 0=Children who were not.

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[20] The logarithmic transformation of charges was used to normalize the distribution.

Continuity of Psychotropic Management Services Utilization (Management Utilization)

For the purposes of these analyses, management visits included the following mental health services: Medication management, case management, medication-related visit, outpatient visits (individual, family, group, or day treatments), and preventive mental health services[21]. The inclusion of services was based on instructions provided by the American Academy of Family Physicians (AAFP) to providers in determining when to use certain Current Procedure Terminology (CPT) codes for psycho-pharmacologic management. Medication management (CPT code 90862) was defined as services in which a physician evaluates patient reactions to medication, assesses dosage level, prescribes medication for the period of time until the next patient visit, and notes whether the patient experienced drug interactions or adverse drug effects (Moore, 2003).

However, the AAFP recommended that the medication management code only be used in cases where minimal psychotherapy was provided. For visits where medication management services were provided in conjunction with more intensive services, such as individual or family psychotherapy, physicians were advised to use the more intensive service code as it included pharmacologic management (Moore, 2003). As a result, the services listed in addition to medication management above were included in the analyses to fully capture the Medicaid children's medication management service use.

The continuity of management utilization was determined by calculating the time between a psychotropic medication claim and the subsequent outpatient mental health

[21] Please refer to Appendix C for descriptions and codes.

service claim[22]. A given date of service could be counted toward multiple previous pharmacy claim dates. For example, suppose that a child filled prescriptions on July 2, 1996 and July 30, 1996 and that the next service date was August 1, 1996. In that case, the August service claim date was used to determine the timing of medication management for both medication claims.

Although the NIH recommended regular physician monitoring of children prescribed medications, the timing of follow-up visits was unspecified. As noted above, the MTA (2004) study examined the effects of monthly medication management visits; children who received monthly follow-up had higher rates of medication use and better outcomes over time compared with children who received community care. However, due to the sample distribution, the cut-off for timely or quality medication management was set at three months within a psychotropic claim. Similar to psychotropic utilization, children are not likely to have perfect attendance to quarterly management visits. So a measure of the proportion of claims for which a child received quality psychotropic management was constructed; this measure was estimated as the percentage of visits that occurred within three months of a psychotropic medication claim on average. Descriptive studies of medication management receipt indicated that the maximum expected rate of receipt was approximately 80% (Hoagwood, Kelleher, Feil, and Comer, 2000; Hoagwood, Jensen, Feil, Vitiello, and Bhatara, 2000). As a result, a dichotomous measure of management utilization continuity was used where: 1=children consistently

[22] Children are often assessed, prescribed medication and provided management by different physicians. For example, while diagnostic assessments are often performed by a psychiatrist who may also initiate medication therapy, primary providers are increasingly managing medication therapy. For the purposes of this study, continuity of medication management was not restricted according to whether the prescribing physician also provided management services.

utilized quarterly psychotropic management for 80% or more claims, 0=children who did not.

The Aday and Andersen model of health utilization (1974) was used as the conceptual framework for examining children's continuity of psychotropic utilization and medication management utilization. Table 4.1 describes the measures of the individual and system characteristics that were analyzed, how they were coded, and their data source. The ratio of provider availability[23] was determined by merging the sample data with the Area Resource File (ARF) using the child's zip code and the Federal Information Processing Standards (FIPS) county code. The denominator, the total population of children between the ages of 4 and 17 years old, was obtained from the Census Bureau for 1998 (Population Estimates Program, Population Division, U.S. Census Bureau, Washington, DC); these data were linked by county code (FIPS) to determine the ratio of providers per population.

[23] Since the unit of analysis was the child and a child could have received services from multiple providers, I examined including a dichotomous measure of provider specialty that would indicate whether a mental health specialist was ever seen. The measure was not included in the analysis due to little variation; only 2% of the sample did not have a visit with a mental health specialist.

Table 4.1 Predisposing, Enabling, Need and Availability Measures used in this Study		
		Data Source
Characteristics of the Population at Risk		
Predisposing	Age of child (1=11.5 or older)	Interview
	Gender of child (1=male)	Interview
	Race of child (1=white)	Interview
	Parent had high school education or more	Interview
	Parental married	Interview
	Class of medication prescribed: CNS or Stimulants only (1=yes); Antidepressants only (1=yes); Others only (1=yes) Antidepressants and others (1=yes); CNS & Antidepressants (1=yes)	Administrative
Enabling	Rural-Urban Place of Residence	Interview
	Family Income	Interview
	Parent previously saw a psychiatrist, psychologist, social worker, doctor, or other health professional for a psychological, emotional, drug or alcohol problem	Interview
Need	Mental Health Diagnosis: Attention Deficit Hyperactivity Disorder (1=yes); Other diagnoses (indicated when ADHD=Other=0)	Administrative
	Co-morbidity of Mental Health Diagnosis (1=yes)	Administrative
	Severity of Mental Health Problems (Child Behavior Check List) (continuous)	Interview
	Child Functioning (Columbia Impairment Scale) (continuous)	Interview
	Prior Use of Medication Management Services (1=yes)	Administrative
	Prior Psychotropic Medication Use (1=yes)	Administrative
	Complexity of Medication Regimen (continuous measure of the number of medication classes prescribed)	Administrative
Characteristics of the Health Delivery System		
Availability	Ratio of pediatricians to total population of children aged 4–17 years old by county	ARF & Census
	Ratio of family practitioners to total population of children aged 4–17 years old by county	ARF & Census
	Ratio of child psychiatrists to total population of children aged 4–17 years old by county	ARF & Census

The method for handling missing cases was to eliminate children who lacked complete information for all variables included in the model[24]. The sub-sample used in these analyses included 152 children who were primarily white (84%), male (73%), with an average age of 10.8 years old (SD=2.5). Eighty-nine percent (56%) of these children had prior medication management service use (psychotropic medication use) in the pre-study period. As determined at baseline, 64% of children had a primary diagnosis of ADHD, 46% had co-morbid diagnoses, and the average total CBCL score was 73.8 (SD=31.4). The original researchers determined that "for subsample analyses, medium effect sizes (40%) are detectable with a subsample as small as 100 with 95% confidence level" (Heflinger et al., 2000, p. 84) (see Appendix E).

[24] The assumption is that the missing cases occurred at random.

Table 4.2 Sample Characteristics

Characteristic	Obs	Mean	Standard Deviation
Age of child (1=11.5 or older)	153	10.8	2.6
Gender of child (1=male)	158	0.73	0.44
Race of child (1=white)	158	0.84	0.37
Parent had high school education or more	158	0.56	0.50
Urbanicity (% of ruralness)	158	0.37	0.30
Family income (1=>$18,000/year)	158	0.40	0.49
Mental health diagnosis (1=ADHD)	158	0.64	0.48
Co-morbidity of mental health diagnosis (1=yes)	158	0.46	0.50
Severity of mental health problems (Child Behavior Check List) (continuous)	158	73.8	31.4
Prior medication use (1=pre-study period use)	158	0.56	0.50
Prior medication management service use (1=pre-study period use)	158	0.89	0.32
Charges in the pre-period ($, continuous)	158	2,357	2,698
Charges in the post-period ($, continuous)	158	1,080	1,314
Service use in the pre-period (continuous)	158	18.8	19.7
Service use in the post-period (continuous)	158	13.9	14.8

Analysis

A challenge of using observational data is they lack the randomization necessary to produce unbiased treatment estimates. Bias is introduced when simple group comparisons are made due to pre-intervention differences in the treatment and non-treatment groups; individual characteristics may contribute to treatment assignment. Though matching is a method commonly used to address selection bias, it is a cumbersome process when matching on multiple covariates. Propensity scoring has become a common approach to addressing this problem (Foster, 2003; Dehejia and Wahba, 1999; Mojtabai, & Zivin, 2003; Stenestrand, & Wallentin, 2001; Levine & Painter, 2003). This method uses a single variable, the propensity score, to control for individual differences. Use of this scalar summary variable eliminates the problem related to trying to match on multiple variables. The use of propensity scoring also addresses the condition of common support, or overlap in the explanatory variables. For example, ordinary regression assumes the selection on observed covariates is linear. This assumption can obscure cases where conditioning variables do not match individuals in treatment and non-treatment groups. However, balancing the distribution of covariates across the treatment and non-treatment groups prior to estimating the treatment effect is a key step of propensity scoring, which enables us to focus on the comparability of the groups. Finally, propensity scoring makes no assumptions regarding the functional form linking the covariates to the outcomes whereas regression, for example, is subject to specification bias given the assumption of linearity. As described below, propensity score analysis was used to control for confounding effects.

The propensity score is estimated as the conditional probability that a child would be in a given treatment group versus all others given a set of covariates. The inverse of the propensity score is used to create weights to match individuals with similar scores in the treatment and control groups. The effect is estimated as the mean-difference in the outcome of interest for the two groups. Although propensity scoring can be used to produce an unbiased estimate of a treatment effect, it has been shown that this method works only under certain conditions. A key assumption of propensity scoring is that a child's outcomes are independent of treatment assignment, conditional on a given set of covariates (Rosenbaum and Rubins, 1983). Essentially this means that there are no significant differences in children who receive treatment versus those who do not on the basis of their pre-treatment characteristics, such as their race, gender, or age.

Once the propensity score is estimated, the next step is to test whether balance of the pre-treatment covariates is achieved between individuals in the treatment and non-treatment groups, conditional on the propensity score (Dehejia and Wahba, 1999). Testing proceeds by entering the covariates one at a time to estimate the propensity score. The sample is then divided into quintiles based on the predicted probabilities and checked for mean differences in the covariates across treatment groups. The covariates are considered balanced when no significant difference is observed between treatment and non-treatment groups for the specified set of covariates. When significant differences are found, an iterative process of altering the model specification and rerunning the testing is used until balance is achieved; specification is altered by entering interaction or higher order terms (Dehejia and Wahba, 1999). Thus, model specification must be customized to the treatment comparison groups and the specific sample examined. Satisfying the

assumption of independence of treatment assignment, however, does not ensure the reliability of a treatment effect estimate. Given that propensity scores are estimated based on observed covariates, the treatment effect is subject to bias due to omitted variables. However, other methods are similarly limited or require researchers to make assumptions regarding unobserved variables.

For these analyses, logistic regression was used to estimate the predicted probability of a child consistently utilizing psychotropics and management services. Children from the treatment group were matched to children with similar propensity scores from the control (non-treatment) group using two methods of matching: least-squares-smoothing matching and nearest neighbor matching. Local linear least-squares-smoothing matching uses a weighted local linear average to match over the outcomes of multiple observations in the non-treatment group (Sianesi, 2001). The non-treated are assigned weights based on the distance of the observables of the treated and non-treated. For example, this method would place a higher weight on children in the non-treated group who were similar or close to children in the treated group in terms of observed covariates, and lower weights on children who were dissimilar or more distant. In this sense, least-squares smoothing is similar to kernel matching. However, linear weights are used rather than kernel weights. The nearest neighbor matching method matches individuals with the closest propensity scores (Sianesi, 2001). The ten closest propensity scores were used for the nearest neighbor method. The effects of receiving treatment on mental health service utilization and charges were estimated using both methods.

The statistical software package SAS version 8.2 was used for data preparation. Stata version was used for all analyses; PSMatch was the final procedure used to estimate the impact of treatment on children's behavior and functioning.

Results

The first step in estimating the treatment effects for this analysis was to run separate logistical regressions using the dichotomous dependent measures of continuity of psychotropic utilization and management utilization. Tables 4.3, 4.4, 4.5, and 4.6 report the results of logistic regressions as marginal effects; marginal effects indicate how the probability of being in a given treatment group changes based on the covariates. Propensity scores were then estimated using the coefficents resulting from the logistic regressions. The inverse of the propensity scores were used to create weights to estimate the treatment effect. Tables 4.7 and 4.8 present the retransformed treatment effect estimates of continuity of psychotropic utilization and management utilization on children's utilization of mental health services and charges, respectively. Outcomes of the treatment effects were measured as the log-transformation of the sum of all mental health service encounters and associated charges for the 18 months after the post-study period. No relationship was found between continuity of psychotropic utilization and children's total mental health service utilization (p=0.44) or charges (p=0.27). However, significant positive relationships were found between continuity of psychotropic management and total mental health service utilization (p<0.05) and continuity of psychotropic medication management and total mental health service charges (p<0.01); children who had greater continuity of quarterly medication management service use during the 18-month study period had more encounters (2.5) and higher charges ($298) on average during the 18-

month post-study period. Similar estimates were produced using either the least-squares or nearest neighbor weights. Additionally, the results of sensitivity testing indicated similar estimates and levels of significance; interaction and higher order terms used to balance the covariates were omitted from analysis for the testing.

Table 4.3 Logistic Analysis of Continuity of Psychotropic Utilization[25] (Propensity Scores for Total Mental Health Utilization) (n=152)

Covariate	Marginal Effect	SE	*p* value	[95% CI]	
Pre-study period use (Utilization logged)	-0.02	0.06	0.74	-0.13	0.09
Columbia Impairment Scale	-0.03	0.02	0.27	-0.08	0.02
Columbia Impairment Scale squared	0.001	0.0004	0.17	-0.0003	0.002
Age of child (1=11.5 or older)	0.06	0.15	0.68	-0.24	0.36
Gender of child (1=male)	0.10	0.11	0.38	-0.12	0.32
Race of child (1=white) & Parent had high school education or more	0.72	0.15	0.000	0.43	1.01
Parent had high school education or more	-0.68	0.17	0.000	-1.01	-0.35
Caretaker married	-0.10	0.10	0.36	-0.30	0.11
CNS only	0.33	0.12	0.01	0.08	0.57
CNS and Antidepressants	0.20	0.12	0.10	-0.04	0.44
Comorbidity	-0.29	0.28	0.29	-0.84	0.25
Number of medication classes prescribed	0.03	0.05	0.59	-0.07	0.13
Urbanicity (% of ruralness)	-0.03	0.26	0.91	-0.54	0.48
Family income (1=>$18,000/year)	-0.12	0.11	0.28	-0.34	0.10
Parent's prior use of mental health services	0.07	0.10	0.53	-0.14	0.27
ADHD diagnosis	0.12	0.12	0.29	-0.10	0.35
CBCL	0.009	0.01	0.35	-0.01	0.03
CBCL sq	-0.0001	0.0001	0.14	-0.001	0.0001
Pre-study period medication use and child age (1=11.5 or older)	-0.22	0.16	0.16	-0.53	0.09
Pre-study period management and comorbidity	0.52	0.23	0.02	0.07	0.97
Ratio of pediatricians	189	224	0.40	-250	628.1
Ratio of family physicians	106.5	224.4	0.64	-333.3	546.3
Ratio of family physicians squared	-29503	51229	0.57	-129911	70904
Ratio of child psychiatrists	-1547.9	1667.2	0.36	-4815.5	1719.7

Chi sq=0.007; Pseudo R^2=0.21

[25] Predicted probabilities used to in estimating the effect on total service use.

Table 4.4 Logistic Analysis of Continuity of Psychotropic Medication Management Utilization[26] (Propensity Scores for Total Mental Health Utilization) (n=152)

Covariate	Marginal Effect	SE	*p* value	[95% CI]	
Pre-study period utilization (Use logged)	0.12	0.05	0.01	0.03	0.22
Columbia Impairment Scale	-0.01	0.02	0.56	-0.04	0.02
Columbia Impairment Scale squared	-0.0001	0.0003	0.70	-0.001	0.001
Age of child (1=11.5 or older)	0.06	0.12	0.62	-0.17	0.29
Gender of child (1=male)	-0.10	0.08	0.20	-0.26	0.05
Race of child (1=white) & Parent had high school education or more	-0.30	0.21	0.16	-0.71	0.12
Parent had high school education or more	0.36	0.22	0.10	-0.07	0.78
Caretaker married	0.002	0.08	0.97	-0.16	0.16
CNS only	0.10	0.09	0.26	-0.08	0.29
CNS and Antidepressants	0.07	0.09	0.45	-0.11	0.26
Comorbidity of mental health diagnosis	0.40	0.24	0.10	-0.07	0.86
Number of medication classes prescribed	0.17	0.05	0.001	0.07	0.28
Urbanicity (% of ruralness)	-0.12	0.22	0.59	-0.55	0.31
Family income (1=>$18,000/year)	0.10	0.09	0.23	-0.7	0.27
Parent's prior use of mental health services	0.01	0.09	0.89	-0.16	0.18
ADHD diagnosis	-0.6	0.09	0.52	-0.24	0.12
CBCL	0.004	0.01	0.57	-0.01	0.02
CBCL squared	9.03e-06	0.00004	0.81	-0.0001	0.0001
Pre-study period medication use and child age (1=11.5 or older)	-0.02	0.15	0.91	-0.31	0.28
Pre-study period management and comorbidity	-0.49	0.23	0.04	-0.95	-0.03
Ratio of pediatricians	-102.3	182.3	-0.58	-456.57	255
Ratio of family physicians	21.42	186.9	0.91	-344.9	387.75
Ratio of family physicians squared	5411.3	42966	0.90	-78801	89623
Ratio of child psychiatrists	980.25	1339	0.46	-1644.7	3605.2

Chi sq=0.0045; Pseudo R^2=0.25

[26] Predicted probabilities used to in estimating the effect on total service use.

Table 4.5 Logistic Analysis of Continuity of Psychotropic Utilization[27] (Propensity Scores for Charges) (n=152)

Covariate	Marginal Effect	SE	*p* value	[95% CI]	
Pre-study period charges (Charges logged)	-0.04	0.05	0.42	-0.13	0.05
Columbia Impairment Scale	-0.03	0.03	0.26	-0.08	0.02
Columbia Impairment Scale squared	0.001	0.0004	0.16	-0.0003	0.002
Age of child (1=11.5 or older)	0.06	0.16	0.69	-0.25	0.37
Gender of child (1=male)	0.12	0.11	0.30	-0.11	0.34
Race of child (1=white) & Parent had high school education or more	0.74	0.14	0.000	0.47	1.02
Parent had high school education or more	-0.69	0.17	0.000	-1.01	-0.36
Caretaker married	-0.10	0.11	0.32	-0.31	0.10
CNS only	0.32	0.13	0.01	0.07	0.57
CNS and Antidepressants	0.18	0.13	0.15	-0.06	0.43
Comorbidity	-0.34	0.27	0.21	-0.88	0.19
Number of medication classes prescribed	0.03	0.05	0.54	-0.07	0.14
Urbanicity (% of ruralness)	-0.07	0.27	0.81	-0.59	0.46
Family income (1=>$18,000/year)	-0.10	0.12	0.40	-0.33	0.13
ADHD diagnosis and Parent's prior use of mental health services	-0.35	0.17	0.04	-0.68	-0.02
Parent's prior use of mental health services	0.32	0.16	0.05	0.002	0.63
ADHD diagnosis	0.34	0.15	0.03	0.04	0.64
CBCL	0.01	0.01	0.37	-0.01	0.03
CBCL sq	-0.0001	0.0001	0.14	-0.0002	0.00003
Pre-study period medication use and child age (1=11.5 or older)	-0.21	0.16	0.02	-0.53	0.11
Pre-study period management and comorbidity	0.58	0.21	0.01	0.17	1.0
Ratio of pediatricians	129.4	228.1	0.57	-317.67	576.51
Ratio of family physicians	102.54	230.85	0.66	-349.93	555.01
Ratio of family physicians squared	-29498	52472	0.57	-132341	73344
Ratio of child psychiatrists	-1133.9	1699.5	0.51	-4464.9	2197

Chi sq=0.0035 Pseudo R^2=0.23

[27] Predicted probabilities used to in estimating the effect on service charges.

Table 4.6 Logistic Analysis of Continuity of Psychotropic Medication Management Utilization[28] (n=152)

Covariate	Marginal Effect	SE	*p* value	[95% CI]	
Pre-study period charge (Charge logged)	0.09	0.04	0.02	0.01	0.16
Columbia Impairment Scale	-0.01	0.02	0.59	-0.04	0.03
Columbia Impairment Scale squared	-0.0001	0.001	0.79	-0.0007	0.0006
Child age	0.11	0.11	0.33	-0.11	0.33
Gender	-0.8	0.08	0.34	-0.24	0.08
Race of child (1=white) & Parent had high school education or more	-0.30	0.21	0.15	-0.72	0.11
Parent had high school education or more	0.41	0.21	0.05	-0.005	0.82
Caretaker married	0.02	0.08	0.85	-0.15	0.18
CNS only	0.09	0.10	0.32	-0.09	0.28
CNS and Antidepressants	0.05	0.10	0.65	-0.15	0.24
Comorbidity	-0.05	0.09	0.61	-0.22	0.13
Number of medication classes prescribed	0.18	0.05	0.001	0.07	0.28
Urbanicity (% of ruralness)	-0.09	0.22	0.96	-0.52	0.35
Family income (1=>$18,000/year)	0.09	0.09	0.31	-0.08	0.25
Parent's prior use of mental health services	0.02	0.09	0.83	-0.15	0.19
ADHD diagnosis	-0.06	0.10	0.54	-0.25	0.13
CBCL	0.002	0.01	0.79	-0.010	0.02
CBCL sq	0.00	<0.001	0.68	-0.0001	0.0001
Pre-study period medication use and child age (1=11.5 or older)	-0.09	0.16	0.60	-0.41	0.24
Pre-study period management	-0.10	0.11	0.33	-0.31	0.10
Ratio of pediatricians	-84.05	186.39	0.65	-449.38	281.27
Ratio of family physicians	17.37	187.24	0.93	-349.60	384.35
Ratio of family physicians squared	7419.65	43092	0.86	-77040	91879
Ratio of child psychiatrists	940.53	1424.6	0.51	-1851.7	3732.8

Chi sq=0.0102; Pseudo R^2=0.2302

[28] Predicted probabilities used to in estimating the effect on service charges.

Table 4.7 Impact of Continuity of Psychotropic Utilization and of Management Services Utilization on Medicaid Mental Health Service Use

	Least-Squares Weighting		Nearest Neighbor Weighting	
	Psychotropic Utilization	Management Utilization	Psychotropic Utilization	Management Utilization
Mean of matched treated	8.9	9.8	8.9	9.8
Mean of matched controls	7.4	7.4	6.9	8.1
Difference in Retransformed Mean Counts of Service Utilization	1.5	2.5*	1.9	1.7*
R-squared	0.01	0.07	0.01	0.07
Observations	152	152	152	152

*$\underline{p}$<0.01 where significance level refers to the null hypothesis that there was no variation across treatment and non-treatment groups.

Table 4.8 Impact of Continuity of Psychotropic Utilization and of Management Services Utilization on Medicaid Mental Health Service Charges

	Least-Squares Weighting		Nearest Neighbor Weighting	
	Psychotropic Utilization	Management Utilization	Psychotropic Utilization	Management Utilization
Mean of matched treated	$559	$710	$559	$710
Mean of matched controls	$479	$412	$498	$412
Difference in Retransformed Mean Counts of Service Utilization	$80	$298*	$62	$297*
R-squared	0.01	0.11	0.01	0.11
Observations	152	152	152	152

*$p<0.05$ where significance level refers to the null hypothesis that there was no variation across treatment and non-treatment groups.

Discussion

This study is one of the few to link HEDIS measures of process quality to actual outcomes. The findings from this study indicated continuity of psychotropic utilization had no effect on children's total mental health service utilization or charges in the post-period. The results also indicated continuity of psychotropic medication management had a positive effect on subsequent mental health service utilization (p=0.01) and charges (p=0.003). Specifically, children who received medication management within three months of a psychotropic claim for 80% or more of their visits had 2.5 more total mental health encounters and $298 more in total mental health related charges in comparison to children who did not. These findings support prior research examining the charge and

outcomes of treating adults with depression using customary practices versus treatment involving more regular follow-up (Rost et al., 2005; Simon et al., 2001; Lave et al., 1998). Although greater continuity of psychotropic management utilization required more resources, the difference in average service volume and charge was relatively moderate considering they were incurred over an 18-month period. Additionally, previous studies have indicated that continuity of psychotropic medication management utilization resulted in better behavioral outcomes (MTA Cooperative Study, 2004). As a result, the cost of providing more frequent follow-up may be worth the benefit of improved outcomes and functioning.

Implications for Clinical Practice and Research

Children's continuity of psychotropic medication use had no effect on overall total mental health utilization and charges. In one aspect, these findings could be interpreted positively. For example, any child prescribed and using psychotropic medications should utilize management services and other services as needed. Research has shown that a combination of therapy and medication is the most effective treatment for children's emotional or behavioral problems (MTA Cooperative Group, 2004; Treatment for Adolescents with Depression Study (TADS) Team, 2004). From this perspective, the finding of no significant difference in total mental health service utilization regardless of whether children had continuity of psychotropic use could be interpreted positively given that all of the children included in this study were prescribed psychotropic medication. This interpretation, however, assumes that the level of total service utilization was appropriate when in fact all of the children may have underutilized services.

In consideration of previous findings (MTA Cooperative Group, 2004; TADS Team, 2004), these results suggest that implementation of consistent psychotropic medication management can improve children's behavioral outcomes at moderately higher utilization and charges. The implication for clinical practice and policy making is the need to weigh the costs of more frequent follow-up versus the benefit of improved outcomes. As a result, policy makers should consider encouraging the adoption of quarterly medication management practices for state-run programs. Additional study is needed to determine whether the costs of obtaining feedback through regular physician contact are offset by improvement in outcomes. Future research should include measures of costs and benefits related to psychotropic treatment that were unavailable for this study such as: medication costs; time-costs related to attending medication management visits; and benefits that may result from greater monitoring such as lower dosing, reduced adverse reactions to medication, and improved behavioral outcomes across various settings.

Limitations

One limitation of this study is related to the use of claims data; prescription claims do not indicate whether a patient took their medication as prescribed. As a result, bias may have been introduced in the estimation the treatment effect of psychotropic utilization continuity. However, this method of measuring medication utilization and adherence has been used by other researchers (Cantrell et al., 2006; Rost et al., 1995; Gilmer, Dolder, Lacro, Folsom, Lindamer, Garcia, et al., 2004; Simon et al., 2001) and shown to be valid among adult samples (Valenstein, Blow, Copeland, McCarthy, Zeber,

Gillon, et al., 2004) and is used by managed care companies to evaluate the quality of care.

A second limitation is related to the assumption of strong ignorability of the assignment to treatment. This requires that there are no significance differences between children who receive treatment and children who do not as based on pre-treatment characteristics. Although this assumption is strong, it becomes more plausible with the use of a large range of covariates (Foster, 2003). Furthermore, the results from balance testing indicated that the distribution of pre-treatment covariates did not differ across treatment and non-treatment groups.

A third limitation is the findings lack generalizability given the use of state-specific Medicaid data. Furthermore, Medicaid ineligibility could result in producing biased estimates of a treatment effect as lapses in coverage could prevent children from getting required care. However, continuous enrollment of the sample was extremely high for the duration of the study period (98%) and children who were ineligible during either the pre- or post-study periods were excluded from the analyses.

Another limitation is related to missing data or omitted variable bias. The data lacks account of out-of-pocket expenditures or services not covered by Medicaid which could result in an underestimation of service utilization and charges. However, eligible beneficiaries had incentive to obtain services through Medicaid; TennCare provided full coverage of medication and services for the treatment of mental illness (Bureau of TennCare, 2000). Claims data also lacks detail regarding why children may not have used services or medications. For example, it is possible that children with poor rates of medication management receipt may have not attended scheduled visits or that their

providers failed to schedule visits. However, most methods of analysis are similarly limited by the possibility of bias due to omitted variables.

CHAPTER 5

CONCLUSION

This dissertation sought to answer several related research questions regarding psychotropic treatment of Medicaid children using the alternate journal format. The first study identified predictors of children's continuity of psychotropic medication utilization and medication management utilization. The second study determined whether children who had higher rates of psychotropic medication continuity or of quarterly medication management had improved behavioral or functioning outcomes. The third study determined the effect of children's continuity of medication utilization and of management utilization on their total mental health service utilization and expenditures.

Medicaid is the primary payer of mental health services and a significant purchaser of psychotropic medication (National Mental Health Association, 2006); more than one-fifth of children receiving CMS-funded mental health services are prescribed psychotropics (Heflinger, Simpkins, Northrup, Saunders, & Renfrew, 2000). In light of financial constraints faced by Medicaid programs, increased use of medication can be a cost-effective option for treating mental illness. Cost-effectiveness is largely contingent upon continuity of psychotropic treatment; safe and effective treatment includes access to and utilization of medication and physician monitoring services regularly. However, little is known regarding the factors that predict continuity of treatment or whether continuity truly has a positive impact on behavior and cost outcomes among Medicaid children.

The paucity of research in this area may be related to issues of data quality and of measuring continuity of treatment. While the information necessary to assess

psychotropic treatment continuity could be obtained from various sources, each source offers trade-offs. Specific information is often obtained at the cost of representativeness. Interview data for example, can answer detailed questions related to the process of care, such as whether a physician had contact with a child's teacher regarding the effect of treatment on classroom behavior. When such data are available, however, the information often has been collected from a small convenience sample. Furthermore, measures of continuity of medication utilization or medication management obtained through interviews of patients and/or their families are subject to recall bias. Although more precise measures of continuity of psychotropic medication use are available, such as titration or blood work, such data would only prove short-term adherence in most cases (Hack and Chow, 2001) given the short-lived effects of many medications (Greenhill et al., 1996). Additionally, it would be costly and time-consuming to collect any of the data described above for the purposes of large-scale performance measurement. Thus, there are problems with measuring continuity of medication use without the use of proxies.

In contrast, administrative claims represent data that is readily available, economical, and which contain measures used in assessing and tracking quality of care. For example, the National Council on Quality Assessment (NCQA) uses patterns of medication and service utilization as proxies for indicators of quality antidepressant care. The NCQA specifies administrative and pharmacy data as appropriate data sources and the measurement of congruent claims of psychotropic medication refills and medication management visits as indicators of quality medication treatment for depression (Center for Quality Assessment and Improvement in Mental Health (CQAIMH), 2004). The use of claims data addresses the offsetting limitations of precision and representativeness

faced when using other forms of data. Additionally, these measures have practical application in the evaluation and performance monitoring of the quality of psychotropic treatment provided by Medicaid. As such, continued use of these measures to assess dimensions of service delivery related to structure and process is warranted. Further study is needed, however, to determine whether attainment of established benchmarks translates into better mental health outcomes for patients.

These studies are among the first to examine the link between psychotropic treatment continuity and outcomes in community settings. Although the findings from these studies are limited given the size of the sample and the use of state-specific data, these results have important implications regarding treatment in the TennCare program and may signal the need for investigation of other Medicaid programs. In general, the findings draw into question the quality of psychotropic treatment provided to children in the TennCare program. The continuity of psychotropic utilization among this sample was particularly poor and though the overall rate of management utilization was better, many children failed to utilize monitoring services with consistency. Black children were less likely to utilize psychotropic medication consistently which generates questions regarding whether there was disparity in physician prescribing practices or if cultural differences influenced the continuity of psychotropic utilization. From a clinical perspective these findings imply that TennCare providers should emphasize the use of standardized practices for all children, targeting black children in particular.

It was also found that among this sample of children, neither the continuity of a child's utilization of psychotropic medication nor of management had an effect on behavior or functioning. These findings imply that other components of the process of

care, such as appropriate titration and the timing of management visits, may be more critical to achieving improvement in children's outcomes. Future research should examine the influence of appropriate titration and variation in the timing of management visits on behavior and functioning. These findings also emphasize the need for further evaluation of the quality and effectiveness of community mental health services provided by behavioral health and managed care organizations.

Finally, it was found that while overall total mental health utilization and costs were not affected by children's continuity of psychotropic medication use, continuity of psychotropic medication management had a positive effect on subsequent mental health service utilization and charges. In consideration of previous findings which indicate that frequent medication management visits improve behavioral outcomes (MTA Cooperative Group, 2004) these results suggest that implementation of consistent psychotropic medication management can improve children's behavioral outcomes at moderately higher utilization and charges. The implication for clinical practice and policy making is the need to weigh the costs of more frequent follow-up versus the benefit of improved outcomes. Additional study is needed to determine whether the costs of obtaining feedback through regular physician contact can be offset by improvement in outcomes. Future research should include measures of costs and benefits related to psychotropic treatment that were unavailable for this study such as: medication costs; time-costs related to attending medication management visits; and benefits that may result from greater monitoring such as lower dosing, reduced adverse reactions to medication, and improved behavioral outcomes across various settings.

These findings were limited due to the use of claims-based measures of continuity of psychotropic and medication management utilization. For example, as measured in these studies, psychotropic utilization did not account for whether a patient actually took medication as prescribed. Additionally, both of the dependent measures of continuity of utilization are limited in regards to the ability to specify the reasons for non-utilization; discontinuity in medication or management services utilization may have been due to a provider not prescribing medication or scheduling visits, or due to children not picking up refills or attending scheduled visits. These findings were also limited in regards to the ability to generalize based upon the response rate, sample size, and sample composition. However, the sample used in this study was larger than most of the studies previously conducted that examined children's psychotropic adherence. Furthermore, the composition of this sample approximated that of other studies in regards to proportions of children by race, gender, and age.

Continued pressure to deliver quality services in a cost-effective manner will emphasize the need for efficient use of data that is readily available, such as encounter records, to assess and monitor the performance of behavioral health care contractors. This dissertation illustrated one method for using administrative data to assess the continuity of children's psychotropic treatment in practice. By developing and implementing similar measures, state Medicaid programs will have the tools necessary to evaluate the effectiveness of behavioral health organizations in the delivery mental health services and ultimately improve the quality of care delivered.

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APPENDIX A

1998 Poverty Guidelines for the 48 Contiguous States and the District of Columbia,

Bureau of TennCare

Size of family unit	Yearly Income
1	$8,050 (or less)
2	$10,850 (or less)
3	$13,650 (or less)
4	$16,450 (or less)
5	$19,250 (or less)
6	$22,050 (or less)
7	$24,850 (or less)
8	$27,650 (or less)

For family units with more than 8 members, add $2,800 for each additional member. (The same increment applies to smaller family sizes also, as can be seen in the figures above.)

Source: HCFA, 2000.

APPENDIX B

Mental Health and Substance Abuse Benefits Under the Tennessee Department of Mental Health and Mental Retardation (TDMHMR) Partners Program

Mental Health and Substance Abuse Benefits	Basic Benefit Package (all benefits must be medically necessary)	Enhanced Benefit Package (for those in the Priority Population)
Psychiatric Inpatient Facility Services Under 21	**As medically necessary**	**As medically necessary**
Physician Psychiatric Inpatient Services	**As medically necessary**	**As medically necessary**
Outpatient Mental Health Services	**As medically necessary**	**As medically necessary** ***(no lifetime dollar limit)***
Psychiatric Pharmacy Services[29] and Pharmacy-Related Lab Services	**As medically necessary**	**As medically necessary**
Mental Health Case Management	**As medically necessary**	**As medically necessary**
24-Hour Residential Treatment	**-**	**As medically necessary**
Specialized Crisis Services	**As medically necessary**	**As medically necessary**

[29] Effective May 16 through June 30, 1998, the State assumes financial responsibility for the following atypical anti-psychotics: Zyprexa, Risperdal, Clozaril, and Seroquel and the following three generic drugs manufactured by Mylan: Lorazepam (Ativan), Cholrazepate (Tranxene), and Diazepam (Valium) as described in Section 3.4.10 of the CONTRACT.

Mental Health and Substance Abuse Benefits	Basic Benefit Package (all benefits must be medically necessary)	Enhanced Benefit Package (for those in the Priority Population)
Housing/Residential Care	**-**	**As medically necessary**
Specialized Outpatient and Symptom Management	**-**	**As medically necessary**
Psychiatric Rehabilitation Services	**-**	**As medically necessary**
Transportation to Covered Mental Health Services	**As medically necessary for enrollees lacking accessible transportation. The availability of specialty services, as related to travel distance should meet the usual and customary standards for the community. However, in the event the BHO has no contracted provider for specialty services that meets the travel distance or other access requirements, transportation must be provided to an enrollee regardless of whether or not the enrollee has access to transportation. If the enrollee is a child and needs to be accompanied by an adult, transportation must be provided for both the child and the accompanying adult.**	**As medically necessary for enrollees lacking accessible transportation. The availability of specialty services, as related to travel distance should meet the usual and customary standards for the community. However, in the event the BHO has no contracted provider for specialty services that meets the travel distance or other access requirements, transportation must be provided to an enrollee regardless of whether or not the enrollee has access to transportation. If the enrollee is a child and needs to be accompanied by an adult, transportation must be provided for both the child and the accompanying adult.**

APPENDIX C
Current Procedural Terminology, Edition (CPT-4) Codes Used in Analyses

90804 Individual psychotherapy, insight-oriented, behavior modifying and/or supportive, in an office or outpatient facility, approximately 20 to 30 minutes, face-to-face with the patient

90805 Individual psychotherapy, insight-oriented, behavior modifying and/or supportive, in an office or outpatient facility, approximately 20 to 30 minutes, face-to-face with the patient, with medical evaluation and management services

90806 Individual psychotherapy, insight-oriented, behavior modifying and/or supportive, in an office or outpatient facility, approximately 45 to 50 minutes, face-to-face with the patient

90807 Individual psychotherapy, insight-oriented, behavior modifying and/or supportive, in an office or outpatient facility, approximately 45 to 50 minutes, face-to-face with the patient, with medical evaluation and management services

90808 Individual psychotherapy, insight-oriented, behavior modifying and/or supportive, in an office or outpatient facility, approximately 75 to 80 minutes, face-to-face with the patient

90809 Individual psychotherapy, insight-oriented, behavior modifying and/or supportive, in an office or outpatient facility, approximately 75 to 80 minutes, face-to-face with the patient, with medical evaluation and management services

90810 Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an office or outpatient facility, approximately 20 to 30 minutes, face-to-face with the patient

90811 Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an office or outpatient facility, approximately 20 to 30 minutes, face-to-face with the patient

90812 Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an office or outpatient facility, approximately 45 to 50 minutes, face-to-face with the patient

90813 Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an office or outpatient facility, approximately 45 to 50 minutes, face-to-face with the patient

90814 Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an office or outpatient facility, approximately 75 to 80 minutes, face-to-face with the patient 92

90815 Individual psychotherapy, interactive, using play equipment, physical devices, language interpreter, or other mechanisms of non-verbal communication, in an office or outpatient facility, approximately 75 to 80 minutes, face-to-face with the patient

90835 Psychiatric Therapeutic Procedures

90841 Psychiatric Therapeutic Procedures

90842 Psychiatric Therapeutic Procedures

90843 Psychiatric Therapeutic Procedures

90844 Psychiatric Therapeutic Procedures

90862 Pharmacologic management, including prescription, use, and review of medication with no more than minimal medical psychotherapy

99201 Office or other outpatient visit for the evaluation and management of a new patient (which requires all of these three components: problem focused history, problem focused examination, straightforward medical decision making)

99202 Office or other outpatient visit for the evaluation and management of a new patient (which requires all of these three components: an expanded problem focused history, expanded problem focused examination, straightforward medical decision making)

99203 Office or other outpatient visit for the evaluation and management of a new patient (which requires all of these three components: a detailed history, detailed examination, medical decision making of low complexity)

99204 Office or other outpatient visit for the evaluation and management of a new patient, which requires these three key components: a comprehensive history; a comprehensive examination; and a medical decision making of moderate complexity.

99205 Office or other outpatient visit for the evaluation and management of a new patient, which requires these three key components: a comprehensive history; a comprehensive examination; and medical decision making of high complexity.

99211 Office or other outpatient visit for the evaluation and management of an established patient that may not require the presence of a physician. Usually, the presenting problems are minimal. Typically, 5 minutes are spent performing or supervising these

99212 Office or other outpatient visit for the evaluation and management of an established patient (which requires two of these three components: a problem focused history, problem focused examination, straightforward medical decision making)

99213 Office or other outpatient visit for the evaluation and management of an established patient, which requires at least two of these three key components: an expanded problem focused history; an expanded problem focused examination; medical decision making

99214 Office or other outpatient visit for the evaluation and management of an established patient (which requires two of these three components: a detailed history, a detailed examination, medical decision making of moderate complexity)

99215 Office or other outpatient visit for the evaluation and management of an established patient, which requires at least two of these three key components: a comprehensive history; a comprehensive examination; medical decision making of high complexity.

99241 Office consultation for a new or established patient, which requires these three key components: a problem focused history; a problem focused examination, and straightforward medical decision making.

99242 Office consultation for a new or established patient, which requires these three key components: an expanded problem focused history; an expanded problem focused examination; and straightforward medical decision making.

99243 Office consultation for a new or established patient, which requires these three key components: a detailed history; a detailed examination; and medical decision making of low complexity.

99244 Office consultation for a new or established patient, which requires these three key components: a comprehensive history; a comprehensive examination; and medical decision making of moderate complexity.

99245 Office consultation for a new or established patient, which requires these three key components: a comprehensive history; a comprehensive examination; and medical decision making of high complexity.

99383 Preventive Visit, New, Age 5-11

99384 Preventive Visit, New, Age 12-17

Source: National Council for Community Behavioral Healthcare (NCCBH). Available online: http://www.nccbh.org/html/learn/HIPAA/exist.htm

APPENDIX D

Current Terminology Codes and Associated Medicaid Charges (2000)

CPT Code	Short Description	Non-Facility Price	Facility Price
90802	Intac psy dx interview	$134.74	$131.78
90804	Psytx, office, 20-30 min	$58.61	$56.64
90805	Psytx, off, 20-30 min w/e&m	$65.51	$63.21
90806	Psytx, off, 45-50 min	$89.79	$87.82
90807	Psytx, off, 45-50 min w/e&m	$95.50	$93.53
90808	Psytx, office, 75-80 min	$137.88	$135.90
90809	Psytx, off, 75-80, w/e&m	$143.46	$141.16
90810	Intac psytx, off, 20-30 min	$67.48	$65.50
90811	Intac psytx, 20-30, w/e&m	$74.05	$71.75
90812	Intac psytx, off, 45-50 min	$95.69	$93.06
90813	Intac psytx, 45-50 min w/e&m	$101.08	$98.77
90814	Intac psytx, off, 75-80 min	$134.89	$132.26
90815	Intac psytx, 75-80 w/e&m	$140.81	$136.86
90825	Intac psytx, hsp 20-30 w/e&m	$76.47	$73.50
90845	Psychoanalysis	$83.34	$81.37
90846	Family psytx w/o patient	$89.71	$87.73
90847	Family psytx w/patient	$104.46	$102.82
90849	Multiple family group psytx	$31.34	$29.70
90853	Group psychotherapy	$31.67	$29.37
90855	Intac group psytx	$31.12	$29.15
90862	Medication management	$47.81	$45.84
99201	Office/outpatient visit, new	$37.53	$22.39
99202	Office/outpatient visit, new	$58.88	$41.77
99203	Office/outpatient visit, new	$82.82	$62.09
99204	Office/outpatient visit, new	$119.96	$92.31
99205	Office/outpatient visit, new	$149.54	$120.58

99211	Office/outpatient visit, est	$18.45	$9.23
99212	Office/outpatient visit, est	$31.94	$21.73
99213	Office/outpatient visit, est	$44.07	$31.56
99214	Office/outpatient visit, est	$68.05	$50.94
99215	Office/outpatient visit, est	$101.80	$81.72
99235	Observ/hosp same date	NA	$162.37
99236	Observ/hosp same date	NA	$199.70
99238	Hospital discharge day	NA	$62.96
99239	Hospital discharge day	NA	$82.78
99241	Office consultation	$51.30	$33.20
99242	Office consultation	$84.86	$62.48
99243	Office consultation	$108.64	$82.64
99244	Office consultation	$151.27	$120.66
99245	Office consultation	$196.70	$160.82
99251	Initial inpatient consult	NA	$41.16
99252	Initial inpatient consult	NA	$71.45
99253	Initial inpatient consult	NA	$96.08
99254	Initial inpatient consult	NA	$134.98
99255	Initial inpatient consult	NA	$184.35
99261	Follow-up inpatient consult	NA	$24.61
99262	Follow-up inpatient consult	NA	$45.10
99263	Follow-up inpatient consult	NA	$66.76
99271	Confirmatory consultation	$36.55	$25.03
99272	Confirmatory consultation	$56.67	$43.51
99273	Confirmatory consultation	$79.12	$61.34
99201	Office/outpatient visit, new	$37.53	$22.39
99202	Office/outpatient visit, new	$58.88	$41.77
99203	Office/outpatient visit, new	$82.82	$62.09
99204	Office/outpatient visit, new	$119.96	$92.31
99205	Office/outpatient visit, new	$149.54	$120.58
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99214	Office/outpatient visit, est	$68.05	$50.94
99215	Office/outpatient visit, est	$101.80	$81.72
99241	Office consultation	$51.30	$33.20
99242	Office consultation	$84.86	$62.48
99244	Office consultation	$151.27	$120.66
99245	Office consultation	$196.70	$160.82
99383	Prev visit, new, age 5-11	$96.43	$83.26
99384	Prev visit, new, age 12-17	$107.31	$93.81
99393	Prev visit, est, age 5-11	$81.14	$72.91
99394	Prev visit, est, age 12-17	$91.82	$83.26

SOURCE: http://www.cms.hhs.gov/providers/pufdownload/carrpuf.asp

National Physician Fee Schedule Payment Amount File

Centers for Medicare and Medicaid

APPENDIX E

Power Analysis

The 473 interview cases available for analysis are estimated to yield subsamples for the special populations ranging from 100 to 350 per cell within the Tennessee sample and to 450+ when comparing Tennessee to other sites. The table below presents a sensitivity analysis of power for a range of alphas and effect sizes (Lipsey, 1990). The ranges represent small (.20) to medium (.50) effect sizes (Cohen, 1977), and alphas are relaxed due to the low cost of Type I error (Lipsey, 1990). Small effect sizes are the most difficult to detect and, thus, one must be sure to have sufficient statistical power. We selected the smallest sample size for all analyses (i.e., analyses across study groups as well as on the pooled sample) to be conservative in our estimates. Over the range of effect sizes, the project proposes a modestly powerful analytic design for analyses of even its smallest samples. A minimally acceptable power calculation is .75 and it can be seen from the table that even at the most stringent alpha of .05 (or at the 95% confidence level), this criterion is met for the sample of 473. For subsample analyses, medium effect sizes (40%) are detectable with a subsample as small as 100 with 95% confidence level.

Power Calculations for Cell Sizes, by Alpha (Confidence Level) and Effect Size (Shaded Cells Represent Adequate Power .75)

Alpha (Confidence Level)	Cell Size	Effect Size			
		.20	.30	.40	.50
.05 (95%)	N=100	.28	.56	.80	.94
	N=200	.52	.85	.98	.99
	N=350	.75	.97	.99	.99
	N=473	.87	.99	.99	.99
.10 (90%)	N=100	.40	.68	.88	.97
	N=200	.64	.91	.99	.99
	N=350	.84	.99	.99	.99
	N=473	.93	.99	.99	.99
.20 (80%)	N=100	.55	.80	.93	.98
	N=200	.76	.95	.99	.99
	N=350	.92	.99	.99	.99
	N=473	.96	.99	.99	.99

Source: Heflinger, C., Simpkins, C., Northrup, D., Saunders, R., and J. Renfrew. 2000. The Status of TennCare Children and Adolescents: Behavioral Health, Health, Service Use, and Consumer Satisfaction: the Impact Study Baseline Report on Interview Data. Appendix I. Power Analysis. Center for Mental Health Policy, Vanderbilt Institute for Public Policy Studies.

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