

# **The Use of Antipsychotic Medications with Children: A Comprehensive and Current View**

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## Table of Contents

Table of Contents.....	1
List of Tables.....	2
List of Figures .....	3
Executive Summary.....	4
Background.....	8
Methods.....	9
Results/Comparisons.....	13
Discussion/Recommendations.....	33
References.....	38
Appendices.....	40

## List of Tables

<b>Table</b>	<b>Page</b>
<b>1</b> Hierarchy of Diagnoses .....	10
<b>2</b> Atypical Antipsychotic Trends 2/02-4/04 vs. 5/04-12/05 Drug Atypical.....	16
<b>3</b> State Comparisons: quarterly Antipsychotic Utilization Rates Children 0-17 years (3/06-5/06).....	20
<b>4</b> Diagnostic distribution of children 0-18 receiving Antipsychotic Medication 7/05-12/05.....	21
<b>5</b> Diagnosis by Age Group (antipsychotic users).....	22
<b>6</b> Diagnosis by year (Children 0-5 years old).....	23
<b>7</b> Antipsychotic scripts by MD category (FY 04-05).....	24
<b>8</b> Percentages of Physicians writing Antipsychotic Scripts by Medical Specialties (FY 04-05).....	25
<b>9</b> Prescriptions written by Medical Specialties by age (FY 04-05).....	25-26
<b>10</b> Prescribers of Antipsychotics by Age (FY 04-05).....	26
<b>11</b> Percentages of Scripts of Antipsychotics by Fiscal Year (0-5).....	27

## List of Figures

<b>Figure</b>		<b>Page</b>
<b>1</b>	Child Antipsychotic Medicine Use in Florida Medicaid (Age 0-18).....	14
<b>2</b>	Child Antipsychotic Medicine Use in Florida Medicaid (Age 0-5).....	14
<b>3</b>	Child Antipsychotic Medicine Use in Florida Medicaid (Age 6-12).....	15
<b>4</b>	Child Antipsychotic Medicine Use in Florida Medicaid (Age 13-18).....	15
<b>5</b>	Atypical Antipsychotic Medicine Use in Florida Medicaid Children (Age 0-18).....	17
<b>6</b>	Atypical Antipsychotic Medicine Use in Florida Medicaid Children (Age 13-18).....	18
<b>7</b>	Antipsychotic Prescriptions per 1000 Enrollees (Ages 00-18).....	29
<b>8</b>	Number of claims Antipsychotic Polypharmacy.....	30
<b>9</b>	Number of claims Antipsychotic and (non) stimulants.....	31

## **Executive Summary**

Although there is a great deal of discussion concerning the use of antipsychotic medications with children, there are relatively few contemporary and comprehensive studies describing this phenomenon. This paper attempts to address this problem by analyzing the use of antipsychotic medications in Florida's Medicaid program during the period from 7/2002 to 12/2005. The study looks at utilization trends, diagnoses of recipients, the specialties of prescribers, and their rates of prescribing and attempts to discern if there are differences between specialists (psychiatrists) and non-specialists (primary care) in the quality of prescribing practices.

### ***Utilization Trends***

The use of antipsychotics with children of all ages increased significantly over the study period; however, nearly all the growth occurred between the summer of 2002 and the spring of 2004. From that point to the end of 2005, utilization trends were flat and in fact declined for very young children.

There was a dramatic change in the brands of antipsychotics used with children in the Medicaid program. This shift seems to mirror the contemporary understanding of the relative side effect burdens of the different atypical antipsychotics. The use of aripiprazole increased dramatically as risperidone and olanzapine use declined beginning in the winter and spring of 2004. Quetiapine use also increased steadily over the study period. The meaning of this trend will come into greater focus when we look at dosage trends over time. It is likely that some of the increase in quetiapine use is related to its employment in low doses as a sleep agent.

### ***State Comparisons of Antipsychotic Use***

It is difficult to compare antipsychotic usage rates in Florida's Medicaid program to those of other states. The professional literature offers little help and tends to be outdated. Requests from other states for current utilization information yielded limited response. Securing comparable enrollment numbers for these states was also difficult. Nevertheless, based on the historical and more current data we were able to collect, it does not appear that Florida's antipsychotic usage rate for children is significantly higher than those of other state's Medicaid programs. Comparisons from FY 02-03 and from FY 06-07 place Florida's rates within the utilization ranges of other states. However, antipsychotic usage rates for these Medicaid programs are dramatically higher than those observed in national or private insurance databases. Although the nature of the Medicaid populations would lead one to expect higher antipsychotic user rates (poor, disabled, in the child welfare system), we have no standard that can be applied to determine if these rates are appropriate.

### ***Diagnoses of Children Receiving Antipsychotic Medications***

The analyses of the diagnoses of children receiving antipsychotics reveal that the medications are used to treat a broad spectrum of disorders. Some of these disorders, for example, attention deficit hyperactivity disorder (ADHD) and major depression, clearly do not call for antipsychotic treatment. However, the MDTMP guidelines do indicate antipsychotics may be used to treat impulsive aggression that often accompanies diagnoses that do not of themselves justify antipsychotic treatment. Although we cannot precisely determine from the claims data used in the study the extent to which this is the rationale for antipsychotic use among children with non-psychotic disorders we did observe significant behavioral co-morbidities among children diagnosed with affective disorders, major depression and ADHD. For this reason the diagnosis analyses raise questions about the goals of antipsychotic treatment that require further investigation.

The diagnostic profile of children receiving antipsychotics has changed over the 42 months of the study. For all three age groups the percentages of children with affective disorders increased significantly from 2002 to 2005. This was especially the case for very young children where the frequency of affective disorders tripled. ADHD and autism increased significantly for the very young and declined among older children. The frequency of the diagnoses of schizophrenia, major depression and behavior disorders increased with the age of the child.

### ***Prescribers of Antipsychotic Medications***

Psychiatrists clearly play dominant roles in prescribing antipsychotic medications to children. They wrote 77% of antipsychotic prescriptions for children 0-18 years old during FY 04-05. Although, primary care MDs accounted for only 19% of antipsychotic prescriptions during this year, they represented 58% of all the physicians that wrote such prescriptions. This was the case because there were a large number of primary care physicians that on average wrote a small number of prescriptions during the year. With regard to differences among age groups, very young children were the least likely to be prescribed an antipsychotic by a psychiatrist and the most likely to be treated by a primary care physician. The probability of being served by a psychiatrist increased with age. Over time, the role of child psychiatrists in treating very young children receiving antipsychotics declined.

### ***Changes in Rates of Antipsychotic Prescribing by MD Category***

Changes in the rates of antipsychotic prescribing for specialists and non-specialists generally reflect the changes in overall utilization rates. Trends in prescribing rates of specialists and non-specialists increased from 7/02 to 4/04 and were flat from 5/04 to 12/05. There was no indication that non-specialist rates of prescribing of antipsychotics increased more than specialists over the study period. Non-specialists played a smaller role as measured by percentage of antipsychotic prescriptions written and their position relative to specialists did not increase disproportionately over time.

### ***Quality of Antipsychotic Prescribing by Medical Specialty***

It is extremely difficult to measure the quality of prescribing practices using Medicaid claims data. Although we can identify prescriptions appearing to be inconsistent with guidelines for the use of antipsychotics we have no way of determining if they are appropriately responsive to individual patient needs. The response to this difficulty was to use “quality edits” that identify “unusual prescribing”, like antipsychotic polypharmacy and the use of two antipsychotics in conjunction with a stimulant. These practices were relatively rare for both specialists and non-specialists. However, for both indicators and from the third quarter of 2004 to the second quarter of 2005, specialists (psychiatrists) had consistently higher percentages than non-specialists (primary care) of prescriptions that were implicated in these practices. This may well reflect a tendency for non-specialists to refer children that are unresponsive to usual antipsychotic prescribing practices to psychiatrists. Many of the relatively small percentages of prescriptions hitting these “quality edits” may reflect efforts to achieve therapeutic goals for children that were unresponsive to more usual antipsychotic prescribing practices.

The use of antipsychotics for children under 6 years is generally not recommended and according to the MDTMP guidelines should be considered only in very rare circumstances. When this practice was viewed through the specialist/ non-specialist prism it became evident that non-specialists played an important role. The percentages of total antipsychotic prescriptions written by primary care physicians that were for children under 6 were greater for primary care than for specialists although the total number of antipsychotic scripts written by psychiatrists was higher.

This reality as well as the diagnostic and prescriber information point to some potential risk for young children on antipsychotics. This risk is addressed in part along with other considerations in the recommendations of the reports listed below.

### ***Recommendations***

1. In view of the limited research on the safety, tolerability, and efficacy of antipsychotics with children, the state should continue its efforts to develop, refine, and regularly update its evidence-based guidelines for antipsychotic treatment of pediatric populations. These updates should incorporate the most current research and clinical experience so that risks of antipsychotic use can be minimized while benefits are enhanced.
2. The MDTMP should continue to engage pediatricians as well as psychiatrists in educational strategies that enhance understanding of the guidelines and their applicability to everyday practice.
3. Efforts to maximize the extent to which all mental health prescribers have access to guidelines and quality information at the point of care should be enhanced.

4. The state should explore the development of local consultation networks that could provide telephonic, on line, or personal assistance to general practitioners that are struggling to respond to the needs of children with serious emotional disturbances.
5. A statewide conference or series of regional conferences should be implemented to address the diagnosis and treatment of very young children with serious emotional disorders. It may be advisable to organize these events in collaboration with the American Academy of Child and Adolescent Psychiatry and the American Pediatric Association.
6. The state should continue to monitor prescribing practices using “edits” directly derived from the evidence- based guidelines developed by the MDTMP.
7. There should be follow-up with physicians who continue to write large numbers of prescriptions that appear to violate these “edits”. Follow-up should include reviews of medical records of patients of selected physicians to determine the rationale for large numbers of “unusual prescriptions.” The significant absence of rationale should result in referral to AHCA for regulatory actions.
8. The use of antipsychotics with very young children should be a focus for monitoring, follow-up, and special study using the strategies described in #6 and # 7 above.

## Background

In the last several years the use of antipsychotic medications with children has become increasingly controversial. (Anonymous. 2006; Anonymous. 2007; 2007) Feeding this controversy is the reality that while we know relatively little about the short or long term effects of these drugs on pediatric populations, their use has grown exponentially in the last decade. (Martin & Leslie, 2003; Patel, Crismon, & Hoagwood, 2005; Olfson, Blanco, Liu, Moreno, & Laje, 2006; Cooper et al., 2006) The risk associated with the increased usage would be significant even if the medications were prescribed for indications approved for adults since most would agree that in this context children cannot be considered "little adults". Antipsychotic prescribing for children has, however, gone several steps further. These medications are now being used to treat a broad spectrum of disorders never anticipated or approved for adult use. (Kapetanovic & Simpson, 2006; Kelly, Love, MacKowick, McMahan, & Conley, 2004) We therefore lack even the adult analogy in trying to estimate safety, tolerability, and effectiveness of antipsychotic agents in the pediatric population. (Towbin, 2006; Malone, Sheikh, & Zito, 1999)

The counterpoint to concerns about safety and efficacy of antipsychotic treatment are the demands of parents with children who have serious disorders and accompanying symptoms, which disrupt normal social and educational development. They want action. Emotional disturbances typically treated with antipsychotic medications are not benign and often have long term consequences for the health and well being of children and their families. There is clinical experience and some data supporting the efficacy of antipsychotic medications in treating a variety of disorders and target symptoms responsible for these problems. (Findling, Steiner, & Weller, 2005; Kapetanovic et al., 2006) (Arango, Parellada, & Moreno, 2004) Many argue that the treatment needs of children are immediate and cannot wait for the publication of compelling scientific data supporting antipsychotic efficacy.

Evidence based guidelines for the use of antipsychotic medications are clearly needed. Fashioning a constructive movement toward evidence based prescribing, however, requires a comprehensive understanding of current practice. What is the current usage of antipsychotic medications with children? Who are the providers? Do providers vary among age subgroups? What agents are used? For what purposes? By whom? What is the current quality of care issues? Do they vary by provider type? Have there been changes over time in the answers to any of these questions? Unfortunately, much of the existing literature on the use of antipsychotics with pediatric populations is narrow in scope addressing only one or two of these questions. It is also somewhat dated, generally, including data only through 2002. The purpose of this report is to present a comprehensive and more current picture of the use of antipsychotics focusing on children served by Florida's Medicaid program.

## Methods

The study uses Medicaid fee for service claims data for the period from 7/02 to 12/05. These data are secured from the state Medicaid Agency and updated on a quarterly basis. Although more recent data are available we chose to end the study period in December 2005, the last month before implementation of Medicare Part D. While the number of dual eligible children affected by Part D was not large, their departure from the Medicaid pharmacy claims in January 2006 distorted the post Part D trends and complicated the comparison of utilization and the characteristics of antipsychotic users over time.

### *Identification of antipsychotic medications*

Antipsychotic National Drug Codes (NDC) were used to define typical and atypical antipsychotics and the specific brands of atypical antipsychotic medications in use in December 2005.

### *Controlling for variations in enrollment*

In order to control for the potential impact of variations in monthly and annual enrollment, antipsychotic use is expressed in terms of users per 1,000 enrollees. For the most part users/1000 by month numbers were used in order to maximize the number of data points available for analysis.

### *Age classifications*

Children were classified into age categories of 0-5, 6-12, and 13-18 years old to approximate preschool, elementary and middle school, and high school populations. An age in years was assigned to each child based on his/her actual age during each month in which an antipsychotic prescription was filled.

### *Comparing antipsychotic prescribing rates*

We compared Florida's rates of antipsychotic prescribing with other states in two ways. First, we accessed historical Medicaid claims for Florida and compared FY 02-03 with rates reported in the literature for the same or similar time periods. These rates are reported as annual utilization or prevalence rates. Second, since these data are far removed from the present, we asked states to give us comparable utilization data for the period from 3/06-5/06. We were able to secure data from four states using this approach.

### *Diagnostic categories*

Diagnosis data are not available in the Medicaid pharmacy claims database. We therefore had to identify children receiving antipsychotics in the pharmacy claims database and then look in the services databases to identify diagnoses associated with specific service claims. Unfortunately, the diagnoses assigned to children who received a

number of different services were often inconsistent. In assigning specific diagnoses to these children we used the hierarchical scheme described in Table 1.

**Table 1: Hierarchy of Diagnoses**

'295.7: Schizoaffective Disorder' = '01'  
 '295.(other): Other Schizophrenia' = '02'  
 '296.2 - 296.39 : Major Depression' = '03'  
 '296.(other): Affective Disorder' = '04'  
 '297 - 299.99 (exc 299.0): Paranoia, Psychoses' = '05'  
 '291 - 293.99: Delirium, Alcohol, Drug Psychoses' = '06'  
 '299 - 299.09: Autism' = '07'  
 '307.2 - 307.39: Tourettes Disorder' = '08'  
 '314: ADHD' = '09'  
 '312, 313: Conduct Disorder' = '10'  
 '311: Depressive Disorder' = '11'  
 '300: Anxiety Disorder' = '12'  
 '309: Adjustment Disorder' = '13'  
 'Other not specified (290 - 316.99)' = '14'

In Table 1 diagnoses are consolidated based on classes of disorders and assigned a hierarchical order based on the seriousness of the illness. For example, if a child had a diagnosis of schizophrenia in one service claim during the study period and ADHD in another, they were assigned the diagnosis highest in the hierarchy, in this case schizophrenia. If they had a diagnosis of ADHD and adjustment disorder they were assigned a diagnosis of ADHD, which is also higher in the hierarchical scheme.

### ***Prescribers***

Prescribers were identified for each antipsychotic claim using Medicaid physician identification numbers. An individual could have different physicians associated with different 30-day prescriptions. Physician specialty was identified using the Department of Health Database in which physicians self identify their specialty by completing a form associated with the licensure function. This database has missing data making it impossible to associate all prescribers with a medical specialty.

### ***Rates of Prescribing over time***

In order to determine if the rates of antipsychotic prescribing changed differently over time (for example, did the child psychiatrists' antipsychotic prescribing for children 0-18 increase faster from 7/02 to 12/05 than the rate for pediatricians) we calculated the average number of antipsychotic prescriptions written by category of physician during the 15 quarters included in the study and compared the slopes of the lines describing prescribing rates over time for each category of physician.

### ***Measurement of quality prescribing practices***

The measurement of the quality of prescribing practices using administration data is extremely difficult and imprecise. While we have some definitions of quality practices based on our treatment guideline work, we do not have information about the unique needs of individual patients. Neither do we have good information about previous medication trials that might have served as the platform from which a more recent and unusual prescription was initiated.

The development of information in this section relies primarily on the work of Comprehensive Neuroscience (CNS), a subcontractor in the Medicaid Drug Therapy Management Program. CNS has developed a series of “quality edits” designed to be used in the analysis of pharmacy claims data. The edits identify patients that have received prescriptions that appeared to be inconsistent with quality prescribing practices and their associated physicians. Prescribers having a large number of patients whose prescriptions hit one or more of these quality edits are sent packages describing the practices and associated patients and asking the physician to review the care of each patient in the light of some enclosed best practice literature.

In an effort to measure and compare the quality of prescribing practices of different types of physicians we use the following CNS indicators.

1. Use of two or more antipsychotics for more than 45 days.
2. Use of 2 or more atypical antipsychotics and a stimulant or ADHD non-stimulant for 30 or more days.

In addition we looked at the percentages of all antipsychotic scripts written for children under 6 years old. Although this is not a CNS quality edit, it was identified by the program’s child expert panel as a practice that is not recommended and should be considered only under the most extraordinary circumstances (Flmedicaidbh.com, 2007) The first two indicators were used by determining the number of prescriptions that hit the quality edits during the period from the third quarter of 2004 to the second quarter of 2005 for each category of physician and dividing this by the total claims written for the involved drug category during the same period by each category of physician. Thus, the metric was the percentage of prescriptions with quality problems divided by all scripts that could have had quality problems.

### ***Statistical analysis***

Simple trend analysis was used to formulate pictures of what happened to antipsychotic use over time. What emerged from an examination of these trends are clearly different patterns for the period from 7/02 to 4/04 compared to 5/04 to 12/05. For this reason, piece-wise linear regression was used to compare the trends of antipsychotic use before and after April 2004. This month was chosen as the break point because an examination

of utilization trends clearly showed changes in most of the trends beginning in the spring of 2004.

The analyses of the diagnosis of children over time within age groups is complicated by the reality that some of the data are repeated measures; that is, some of the children included in fiscal year 02-03 are also included in 04-05. The diagnoses of these children are likely to be correlated. In order to deal with this, we used generalized estimating equations (GEE) which tell us the likelihood of children in each age category having a specific diagnosis in FY 04-05 compared to FY 02-03 adjusting for the fact that some of the children are the same.

The analysis of changes in rates of prescribing of antipsychotics over time for the different medical specialties faces similar challenges. There is overlap in the MD's included in each of the quarters of the analysis. Here we used a regression procedure with piece-wise comparisons of slopes for each of the comparisons of interest. For example, we compared the slope of the time by scripts/1,000 enrollee relationship for child psychiatrists from the third quarter of 2002 to the fourth quarter of 2005 with the slope for pediatricians using the same variables and time span. We then tested for the significance of differences between the two slopes to see if the change in scripts per 1,000 enrollees changed differently for pediatricians compared to child psychiatrists.

We used  $P < .0001$  because the number of subjects in all of this analysis is quite large.

## Results and Comparisons with the Literature

### *Trends in antipsychotic usage*

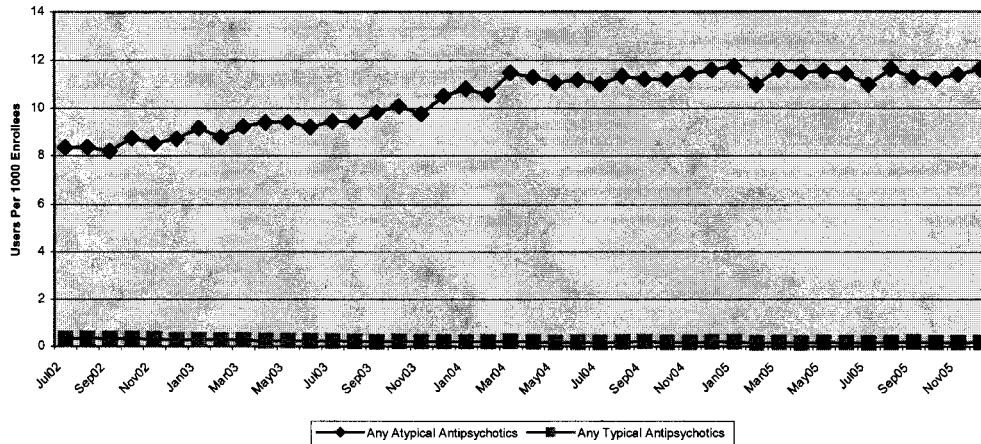
There is no question that pediatric use of antipsychotics increased in the late 1990s and early 2000s after a decline in the 1980s and relatively stable usage in the early 1990s (Olfson et al., 2006; Martin et al., 2003; Schirm, Tobi, Zito, & de Jong-van den Berg, 2001; Cooper et al., 2006; Cooper, Hickson, Fuchs, Arbogast, & Ray, 2004). The increases are largely attributable to the release of the atypical antipsychotics starting with risperidone in 1993. (Malone et al., 1999; Kelly et al., 2004; Towbin, 2006) Although both commercial and Medicaid populations experienced increased utilization, the former grew from a significantly lower baseline. For example, Martin et al documented a 75% increase in utilization in a commercially insured population of 0-17 years from 1997 to 2001 (1997=1.6/1000 enrollees, 2000 = 2.8/1000) (Martin, 2003). Patel et al, looked at trends in antipsychotic usage in a commercial managed care population from 1996 to 2001 and observed a 127% increase among children 0-18 years old. (1996 = 1.5/1000 enrollees, 2001 = 3.4/1000) (Patel, 2005). Several researchers using data from the National Ambulatory Medical Care Survey (NAMCS) have documented similar trends in the use of antipsychotic medications with children (Cooper, 2004) (Olfson, 2006).

Antipsychotic utilization rates in Medicaid populations in the late 1990s were already 3-4 times higher than commercial populations and also grew in the early 2000s. For example, in Texas antipsychotic prescriptions for this population grew from 6.3/1000 in 1996 to 15.5/1000 in 2001 (141% increase) (Patel, 2002). In another Medicaid program in the Midwest, antipsychotic usage grew from 4.7 to 14.3/1000 (0-18 years) over the same time period (304% increase) (Patel, 2005).

There is some evidence that the exponential growth in antipsychotic use in both the commercial and Medicaid populations at the end of the last century have given way to more modest increases in recent years. In a study of privately insured children whose pharmacy benefits were managed by Medco Health Solutions, Inc., antipsychotic users/1,000 enrollees increased from 3.8 in 2001 to 6.6 in 2005; however, the rate of increase declined significantly in the latter years. Usage among 0-18 years grew only 14% in 2004 and 3.4% in 2005.(Findling, McNamara, & Gragious, 2000) (AP, 2006)

Beginning in early 2004, a pattern of declining growth in the use of antipsychotics was also observed in Florida. Usage increased by more than 35% from 2002 to 2005. However, most of this growth occurred in 2002 and 2003. During the last two years increases were marginal. Typical antipsychotics accounted for a very small percentage of prescriptions in early 2002 and this percentage declined over the four-year period. The changing trends in utilization before and after the spring of 2004, as well as the relative contribution of typical and atypical antipsychotics can be seen by looking at the monthly users/1000 numbers for the 0-18 population in Figure 1.

Figure 1  
**Child Antipsychotic Pharmacy Use in Florida Medicaid (Age 0-18)**



Monthly atypical users/1,000 enrollees 0-18 years increased from 8.3 in July of 2002 to 11.3 in April 2004 (37% increase). In the subsequent 20-month period, atypical users/1,000 actually declined slightly. Similar trends were observed for specific age groups as detailed in Figures 2, 3, and 4.

Figure 2  
**Child Antipsychotic Pharmacy Use in Florida Medicaid (Age 0-5)**

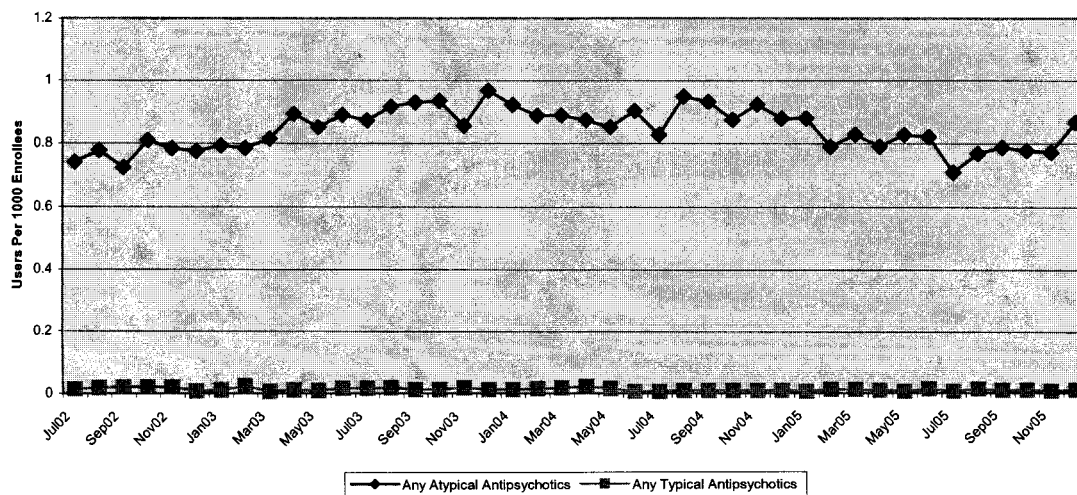


Figure 3

**Child Antipsychotic Pharmacy Use in Florida Medicaid (Age 6-12)**

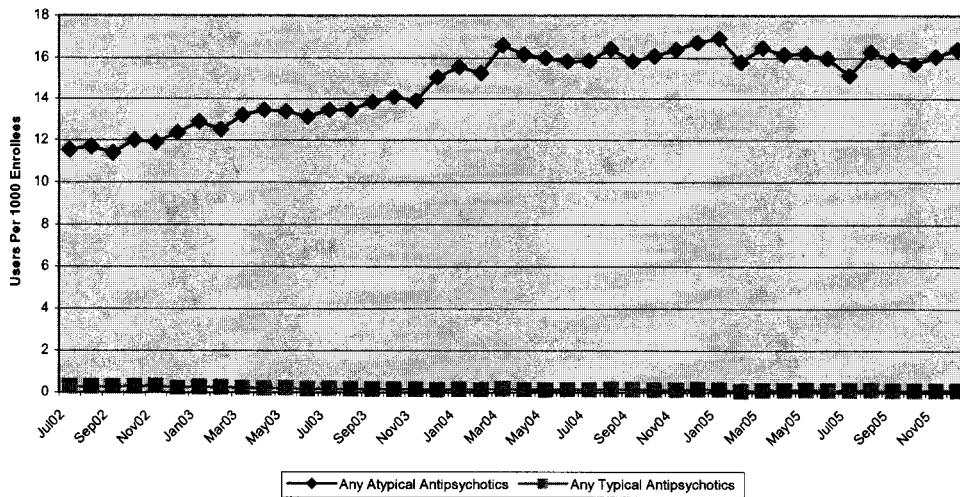
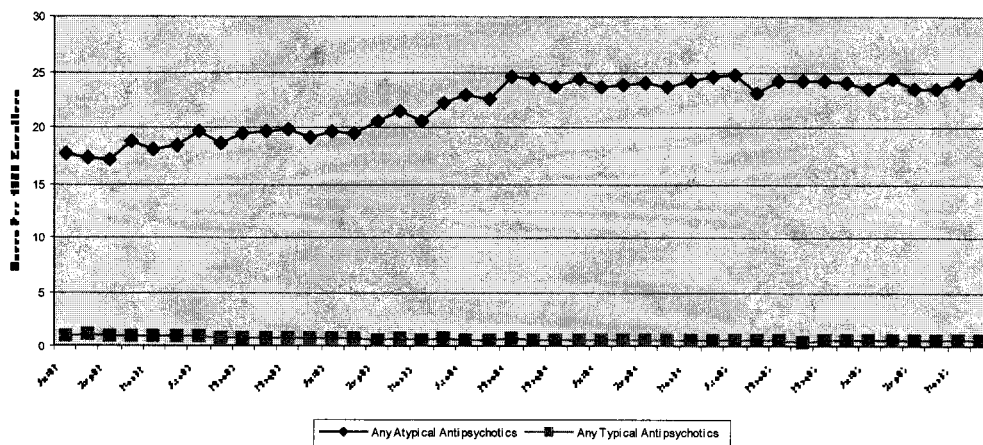


Figure 4

**Child Antipsychotic Pharmacy Use in Florida Medicaid (Age 13-18)**



Monthly antipsychotic users/1000 enrollees increased for the 0-5, 6-12, and 13-18 year old age groups from 7/2002 to 4/2004. For the 6-12 and 13-18 age groups statistically significant increases in the pre period gave way to insignificant trends in the post period. Utilization among very young children actually declined significantly during the 5/04-

12/05 period. The differences in utilization trends for the period from 2/2002 to 4/2004 compared to the period from 5/2004 to 12/2005 are statistically significant for all age groups ( $P < .0001$ ). The results of the piece-wise linear regression analysis are presented in Table 2.

**Table 2: Atypical Antipsychotic Trends 2/02-4/04 vs. 5/04-12/05**  
**Drug=Atypical**

<b>Age Group</b>	<b>Period</b>	<b>Slope</b>	<b>Lower 95% CI</b>	<b>Upper 95% CI</b>	<b>P(Slope = 0)</b>	<b>P(Slope pre = Slope post)</b>
<b>0-5</b>	<b>Pre</b>	0.00815	0.00561	0.01069	<.0001	<.0001
<b>0-5</b>	<b>Post</b>	-0.00790	-0.01044	-0.00535	<.0001	
<b>6-12</b>	<b>Pre</b>	0.23390	0.20896	0.25883	<.0001	<.0001
<b>6-12</b>	<b>Post</b>	0.01362	-0.01132	0.03856	0.2761	
<b>13-18</b>	<b>Pre</b>	0.33020	0.29131	0.36909	<.0001	<.0001
<b>13-18</b>	<b>Post</b>	0.03860	-0.00029367	0.07749	0.0517	
<b>0-18</b>	<b>Pre</b>	0.14794	0.13235	0.16352	<.0001	<.0001
<b>0-18</b>	<b>Post</b>	0.02682	0.01123	0.04240	0.0012	

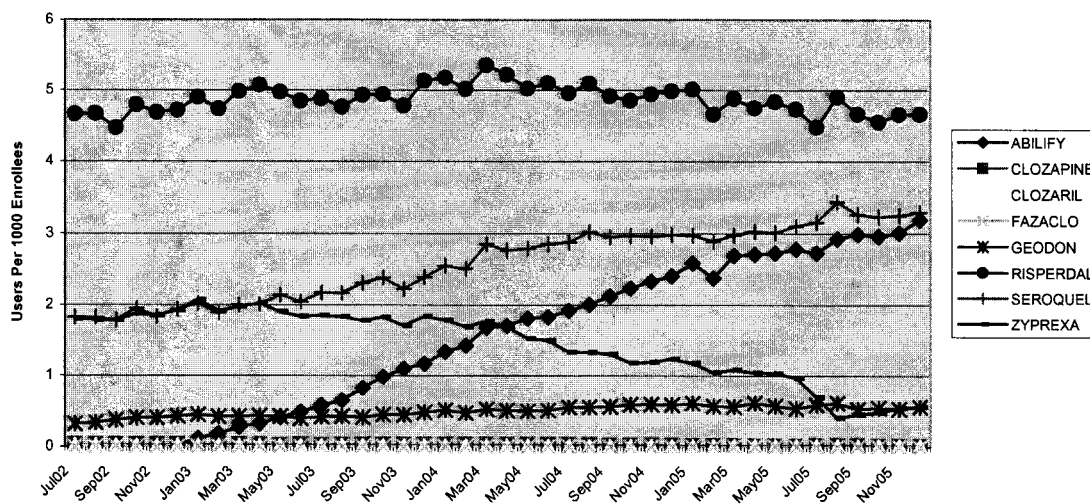
Clearly, something caused an alteration in prescribing patterns of antipsychotic medications for children in the spring of 2004.

### *Shifting usage of antipsychotic agents*

It has already been noted that atypicals had substantially replaced typical antipsychotics in 2002 in Florida's Medicaid program, and that the use of the latter continued to decline during the 42-month period of the study. The period also experienced dramatic shifts in the brands of antipsychotics used with children of all ages. These shifts are portrayed for the 0-18 year old population in Figure 5.

Figure 5

#### Atypical Antipsychotic Pharmacy Use in Florida Medicaid Children (Age 0-18)

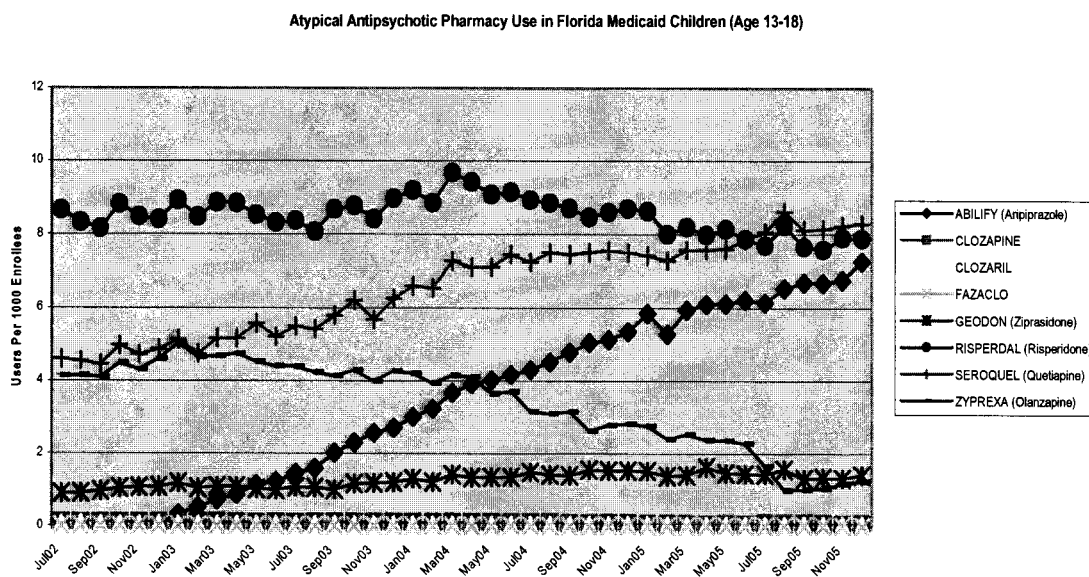


In Florida, as in many other parts of the country, risperidone was the most widely used atypical antipsychotic with children in the early part of the 21<sup>st</sup> century. (Doey, 2007; Harrison-Woolrych, 2007; Curtis et al., 2005) As can be seen in Figure 5, a decline in its use began in the spring of 2004 and continued to the end of 2005. Olanzapine use with children 0-18 years old actually began to decline in the summer of 2003. This decline steepened beginning in the spring of 2004. On the other hand, aripiprazole and quetiapine experienced significant growth in utilization with the former beginning in the fall of 2002. The differences in utilization trends from 2/02 to 4/04 compared to 5/04-12/05 are statistically significant for olanzapine, and risperidone ( $P < .0001$ ). (See Appendix 1). Increases in the use of aripiprazole are dramatic and do not appear to be completely explained by its use as a substitute for olanzapine and /or risperidone. Rather than displaying a sudden increase in utilization in the spring and summer of 2004 as olanzapine and risperidone use declined, the increase in aripiprazole use was steady and generally consistent across the entire period. Growth trends before and after April 2004 are not significantly different for either aripiprazole or quetiapine. In the case of

aripiprazole, it appears the prescribing community was rapidly adopting an innovation in antipsychotic treatment.

Changes in utilization of different antipsychotics for children 0-5 and 6-12 years old produce somewhat similar pictures (See Appendix 2) although the statistical analysis looks somewhat different. For the 0-5 age group, risperidone use declined significantly from 5/04 to 12/05 compared to 7/02 to 4/04. Comparing the two periods, olanzapine declined significantly for the 6-12 group but not for the 0-5 age children. Aripiprazole use increased significantly for the 0-5 group but not the 6-12. The reverse was true for quetiapine with significant declines for the 6-12 age group but not for the 0-5 age group. Changes in antipsychotic usage are particularly noteworthy in the 13-18 year old age group where antipsychotic use is most common. (Figure 6)

Figure 6



Comparing the use of risperidone and olanzapine before and after April of 2004 we see statistically significant declines in the latter period with the direction of the change turning negative after 4/04 for risperidone. At the same time there were dramatic and significant increases in the use of both quetiapine and aripiprazole. In the case of aripiprazole, usage began to steadily increase in late 2002 when the drug received FDA approval. Although the rate of increase was slightly less in the 5/04-12/05 compared to 2/02-4/04, the difference in slopes was not statistically significant. The same pattern held true for quetiapine with a slightly larger but not significantly different rate of increase in the first compared to the second period.

### *Florida's rate of antipsychotic use compared to national standards*

No standards exist for the rate of antipsychotic prescribing that should be expected in a Medicaid child and adolescent population. We can, however, identify rates of prescribing in different populations that are reported in the literature and place Florida's prescribing rates in the context of the most comparable groups.

Even this task is fraught with difficulties. First, there are relatively few studies reporting child antipsychotic use. Second, the studies that do report child and adolescent antipsychotic usage rates employ a variety of different databases that are more or less comparable to Medicaid populations. For example, (1998), Schirm (2000) and (Clavenna, 2007) used national pharmacy dispensing data bases. Olfson (Olfson et al., 2006; Goodwin et al., 2001) and Cooper (Cooper et al., 2006) used NAMCS data, and Martin (Martin et al., 2003) and Patel (Patel et al., 2005) used pharmacy claims from commercial insurers. A few studies report data for Medicaid populations providing the most comparable numbers to those reported in this study. (Patel, Sanchez, Johnsrud, & Crismon, 2002; Patel et al., 2005; Cooper et al., 2004) Third, utilization data published in the professional literature tend to be dated making direct comparisons with Florida difficult. The most current published data comes from Italy, showing incidence and prevalence of antipsychotic utilization in 2004 (Clavenna, 2007). Most other studies included data from the mid 1990s to 2001 (Schirm, 2001) (Curtis, 2005) (Cooper, 2004) (Olfson, 2006) (Patel, 2002) (Rawal, 2004) Fourth, the age ranges of children and adolescents used in previous research are varied. Some authors use fine grained age subgroups (Clavenna, 2007; Patel et al., 2002) while others use more inclusive age ranges (Cooper et al., 2006; Olfson et al., 2006) These variations in the specifications of age ranges and subgroups hinder direct comparison with Florida data. Notwithstanding these difficulties, we reviewed antipsychotic utilization data for a variety of populations, time frames, and age ranges in order to provide a comprehensive context to understand Florida's Medicaid data.

In a study of almost 1.5 million general population Italian children ages (0-17 years) Clavenna (2007) reported annual antipsychotic prevalence rates for 2004 of .53/1000. Prevalence increased from .62/1000 to .83/1000 from 1999 to 2001 and declined from a high of .83/1000 in 2001 to .53/1000 in 2004.

Several US based studies of general populations or commercially insured populations report somewhat higher antipsychotic annual prevalence numbers. Curtis (2005) in a one year study of commercially insured youth 0-19 years found an annual antipsychotic prevalence rate in 2001 of 2.7/1000 enrollees, and Martin (2003) looking at a national commercial population of youth 0-17 reported an annual prevalence rate of 2.8/1000 in 2000.

Not surprisingly, prevalence rates in Medicaid populations tend to be higher than those observed in commercial populations or national databases. Cooper (2004) reported new antipsychotic usage rates of 4.5/1000 enrollees in 2001 for children 2-18 enrolled in

TennCare. Patel (2002) documents a 19.9/1000 annual prevalence rate for children 0-18 years enrolled in the Texas Medicaid program in 2001. In another study comparing antipsychotic usage among children 0-18 in three different State Medicaid programs, Patel (2005) observed the following annual antipsychotic prevalence rates in 2001.

- Midwestern Medicaid program - 14.3/1000 enrollees
- Southern Medicaid program - 15.5/1000 enrollees
- Midwestern Medicaid program - 6.9/1000 enrollees

In order to get a historical comparison of Florida's antipsychotic prescribing rates with those mentioned above, we calculated an annual prevalence rate for Florida in FY 02-03. At that time Florida's rate of antipsychotic usage for the 0-18 year old Medicaid population was 12.3/1,000 enrollees placing it within the parameters of the other state Medicaid programs.

Recognizing how dated the antipsychotic utilization data are in the literature, we sought to find more up-to-date information to compare to Florida's current antipsychotic users/1000 enrollees. We were successful in securing two state comparisons from one of the program's subcontractors, Comprehensive Neuroscience, and two additional comparisons from requests submitted to State Mental Health Medical Directors. Both sets of comparisons are for recent three-month intervals. They are presented in Table 3:

Table 3: State Comparisons: Quarterly Antipsychotic Utilization Rates  
Children 0-17 years (3/06-5/06)

	Quarterly utilization/rates
Customer A	14.4/1,000 enrollees
Customer B	10.8/1,000 enrollees
State C	8.3/1,000 enrollees
State D	35/1,000 enrollees
Florida	14.84/1,000 enrollees

Florida's rate is about the same as Customer A's and below State D but higher than State C's and Customer B's. Although, the analyses would benefit from more state comparisons, based on these limited data it would appear that Florida's current antipsychotic user rate is in the same ballpark as other states.

#### ***Diagnostic characteristics of children receiving antipsychotic medications***

As previously mentioned, antipsychotics are used with children to treat disorders and/or target symptoms often not anticipated by the adult clinical trials that supported their FDA approvals. These include non-psychotic phenomena such as depression, disruptive

behavior disorders, maladaptive aggression, attention/deficit/hyperactivity disorder, Tourettes, and pervasive developmental disorders.(Findling et al., 2005; Findling et al., 2000) For example, from 1996 to 2001 the use of antipsychotics for the treatment of attention deficit/hyperactivity disorders and affective disorders increased 2.5 fold in Tennessee's Medicaid managed care plan (Cooper, 2004). In the Texas Medicaid program disruptive behavior disorders accounted for the highest percentage of diagnoses (35%) associated with children receiving antipsychotic treatment (Patel, 2002). Depressive disorders (18%) and bipolar disorders (12%) followed. In data from the NAMCS (1995-2002) Cooper et al found ADHD to be the most common diagnosis among children receiving antipsychotics (29%) followed by bipolar disorder (23.6%), non psychotic diagnoses (13.8%), schizophrenia/psychosis (13.5%), anxiety (7.7%), autism/pervasive developmental disorder (7.5%) and Tourette's syndrome 5% (Cooper, 2006). Using the same data source, from 2000 to 2002 Olfson et al found that among youth whose physician visit included an antipsychotic prescription, disruptive behavior disorders (37.8%) and mood disorders (31.8%) were the most common diagnoses (Olfson, 2006). Other less frequently occurring diagnoses included pervasive developmental disorder or mental retardation (17.3%) and psychotic disorders. (14.2%).

An analysis of Florida's claims during the most recent time segment of the study period (7/05-12/05) using the hierarchical scheme presented in the Table 1 yielded the following information on the diagnosis of children 0-18 year old receiving antipsychotic medication.

**Table 4**

Diagnostic distribution of children 0-18 receiving antipsychotic medications 7/05 - 12/05

<b>Diagnosis</b>	<b>Number of children</b>	<b>% of children on antipsychotics</b>
Schizophrenia	1409	7.2%
Major Depression	1394	7.1%
Affective Disorders(other)	3134	16.0%
Autism	797	4.1%
Tourettes Disorder	90	0.5%
ADHD	7782	39.6%
Conduct Disorder	2127	10.8%
Depressive Disorder	491	2.5%
Anxiety Disorder	459	2.3%
Adjustment Disorder	783	4.0%
Other not specified	1163	5.9%
	19629	100.0%

By far the most common diagnosis applied to children 0-18 years of age receiving antipsychotic treatment in Florida's Medicaid program is attention deficit/hyperactivity disorder (approximately 40%). This is followed by affective disorder (16%); conduct disorder (10.8%), and major depression (7.1%). The distribution of diagnoses looks

different depending on age group. These are presented in Table 5 for the 7/05-12/05 period.

Table 5: Diagnoses by age

Diagnosis by Age Group (antipsychotic users)

Diagnosis	0 to 5	% of children	6 to 12	% of children	13 to 18	% of children
Schizophrenia	115	4.5%	474	4.5%	820	12.7%
Major Depression	25	1.0%	537	5.0%	832	12.9%
Affective Disorders(other)	255	10.0%	1553	14.6%	1326	20.6%
Autism	211	8.3%	445	4.2%	141	2.2%
Tourettes Disorder	10	0.4%	55	0.5%	25	0.4%
ADHD	1372	53.8%	5197	48.8%	1213	18.9%
Conduct Disorder	179	7.0%	963	9.0%	985	15.3%
Depressive Disorder	9	0.4%	202	1.9%	280	4.4%
Anxiety Disorder	22	0.9%	224	2.1%	213	3.3%
Adjustment Disorder	102	4.0%	449	4.2%	232	3.6%
Other not specified	249	9.8%	548	5.1%	366	5.7%
	2549	100.00%	10647	100.0%	6433	100.0%

As expected, a diagnosis of schizophrenia, schizo-affective disorder or psychosis are collectively significantly more likely to appear for the 13-18 year old age group receiving antipsychotics than either the 0-5 or 6-12 groups. ( $Z= 24.42$ ,  $P<.0001$ ). Less expected is that the percentages of children 0-5 with these diagnoses are the same as for the 6-12 age group.

The frequency of affective disorders increases as one goes from 0-5 to 6-12 to 13-18 age groups. The 0-5 age group is significantly less likely than the 13-18 age group to have an affective disorder diagnosis. ( $Z= 12.01$ ,  $P<.0001$ ). The 13-18 age group is also significantly more likely to have this diagnosis than the 6-12 year old group. ( $Z=9.67$ ,  $P<.0001$ )

The appearance of conduct disorders among antipsychotic users follows the same age related pattern. The 6-12 age group is more likely to be diagnosed with a conduct disorder than the 0-5 age group. ( $Z= 6.06$ ,  $P<.0001$ ). The 13-18 age group in turn is more likely than the 6-12 group. ( $Z= 17.24$ ,  $P<.0001$ ) For major depression the oldest age group is significantly more likely than younger children to have a diagnosis of major depression.

The impact of increasing age on the diagnosis of children receiving antipsychotics is reversed for ADHD and autism. Very young children are significantly more likely to have a diagnosis of ADHD than older children. ( $Z= 17.94$ ,  $P<.0001$ ). In addition, the 6-12 group is significantly more likely to have such a diagnosis than the 13-18 year age group. For autism, the same pattern applies. The very young are more likely to be diagnosed with autism than older children. ( $Z=15.61$ ,  $P<.0001$ ). The 6-12 group is more likely to be diagnosed than the 13-18 age group.

The diagnostic picture of children receiving antipsychotic medications changed over the 42 months of the study. The most noteworthy changes were for the very young children. These changes are portrayed in Table 6. The GEE analysis is included in Appendix 3.

Table 6: Diagnosis by year (Children 0-5 years old)

Diagnosis	FY 02-03	% of children	FY 03-04	% of children	FY 04-05	% of children
Schizophrenia/psychoses	88	4.1%	116	4.4%	142	4.9%
Major Depression	17	0.8%	37	1.4%	51	1.8%
Affective Disorders(other)	70	3.3%	159	6.0%	299	10.4%
Autism	146	6.9%	191	7.2%	240	8.4%
Tourettes Disorder	7	0.3%	11	0.4%	15	0.5%
ADHD	961	45.2%	1376	52.1%	1591	55.4%
Conduct Disorder	237	11.2%	247	9.4%	178	6.2%
Depressive Disorder	10	0.5%	8	0.3%	12	0.4%
Anxiety Disorder	17	0.8%	23	0.9%	21	0.7%
Adjustment Disorder	140	6.6%	150	5.7%	101	3.5%
Other not specified	431	20.3%	321	12.2%	224	7.8%
	2124	100.0%	2639	100.0%	2874	100.0%

It is clear from Table 6 that the diagnostic distribution of children 0-5 years old changed over time. Among this age group, children were more 3.6 times likely to have a diagnosis of affective disorders in FY 04-05 compared to FY 02-03. ( $Z=9.7$ ,  $P<.0001$ ) They were also 1.7 times more likely to have a diagnosis of ADHD ( $Z=8.75$ ,  $P<.0001$ ), although the percentage of children with autism grew over time, the change from 2002 to 2004 was not statistically significant. Children 0-5 years old were about .9 times as likely to have a conduct disorder diagnosis in 04-05 compared to 02-03. ( $Z=6.71$ ,  $P.0001$ )

The tables regarding the relationships between diagnosis and time for the 6-12 and 13-18 age groups are included in Appendix 3. Children 6-12 were significantly less likely to have a diagnosis of ADHD and more likely to have a diagnosis of affective disorders in FY 04-05 compared to FY 02-03. Older children (13-18 years) were significantly more likely to be diagnosed with affective disorders in FY 04-05 versus 02-03 and significantly less likely to be diagnosed with ADHD.

Since previous studies reporting the diagnoses of children receiving antipsychotics probably used different hierarchical schemes to categorize children on antipsychotics with more than one diagnosis, they are difficult to compare. However, several observations are clear. First, antipsychotics are used to treat a wide variety of disorders in youth. Second, a small minority of children received antipsychotic medications for the treatment of psychosis. Third, antipsychotics are relatively infrequently used for the

treatment of aggression among children with autism (An FDA approved use for risperidone) since only 6-8% of antipsychotic recipients are diagnosed as autistic. Fourth, antipsychotics are frequently used for the treatment of disruptive behaviors in youth. In the Florida data, when additional diagnoses of children receiving antipsychotics were considered we found that 20% of children with an ADHD diagnosis also had a behavior disorder diagnosis in their Medicaid claims. For major depression, 31% had a co-occurring ADHD diagnosis and 26% had a behavior disorder. Forty four percent of children diagnosed with affective disorders had a co-occurring ADHD; 32% had a co-occurring behavior disorder.

### *Prescribers of antipsychotic medications*

Information on the characteristics of physicians who prescribe antipsychotic medications for children is sparse and somewhat inconsistent. Patel (2002) reported that psychiatrists prescribed for 80% of the children receiving antipsychotic medications in the Texas Medicaid program. Cooper (2006), looking at NACMS data found that 66% of pediatric prescriptions for antipsychotics were associated with visits to mental health providers. The question of who is prescribing antipsychotics to children can be addressed in at least two different ways. First, of all the scripts written for antipsychotics for children during a particular time frame, what percentage of them were written by different types of physicians? Second, of all physicians prescribing antipsychotics for children, what percentages fall into different MD categories?

Table 7 presents the data related to the first question for the period 7/1/04 – 6/30/05 for children 0-18 years.

Table 7: Antipsychotic scripts by MD category (FY 04-05)

MD Categories	Number of Scripts	% of scripts
Child Psychiatrist	53049	46.8%
Adult Psychiatrist	34838	30.7%
Clinical Nurse Spec Psych MH	3	0.0%
Primary care (Child)	13816	12.2%
Primary care (Adult)	7736	6.8%
Neurologist	2377	2.1%
Other Physician Prescriber	1563	1.4%
	113382	100.0%

In Table 7 we can see that psychiatrists, with child psychiatrists playing the dominant role, wrote 77.5% of all antipsychotic scripts written for children 0-18 years. Primary care physicians wrote only 19% of the scripts. Table 8 describes the distribution of medical specialties among physicians that wrote an antipsychotic script during FY 04-05.

Table 8: Percentages of Physicians Writing Antipsychotics Scripts by Medical Specialties (FY04-05)

MD Category	Number of MD's	% of MDs
Child Psychiatrist	248	9.5%
Adult Psychiatrist	493	18.9%
Clinical Nurse Spec Psych MH	2	0.1%
Primary Care (Child)	790	30.3%
Primary Care (Adult)	726	27.8%
Neurologist	66	2.6%
Other Physician Prescriber	284	10.9%

Whereas Table 7 reflects a dominant position for psychiatrists in general and for child psychiatrists in particular, Table 8 exhibits differing relative importance for the medical specialties. Of all the physicians who wrote prescriptions for an antipsychotic for children only 28% were psychiatrists, only 9% were child psychiatrists. Seventy-two percent of the physicians writing antipsychotic scripts for children in FY 04-05 were non-mental health specialists, with the majority being primary care physicians.

Taken together, Tables 7 and 8 tell us that psychiatrists are handling most of the prescribing of antipsychotic medications to children, however, there are a large number of non-psychiatrists also involved. Each of these physicians writes relatively small percentages of the total antipsychotic prescriptions. We do not have data that tells us directly how many of the non-psychiatrists who prescribed an antipsychotic did so in consultation with a mental health specialist.

The picture regarding the role of different medical specialties varies by the age group of the child. Tables 9 and 10 present the data on prescriptions and prescribers by age group for FY 04-05.

Table 9: Scripts Written by Medical Specialties by Age (FY04-05)

MD Category	0 to 5	% of Scripts	6 to 12	% of Scripts	13 to 18	% of Scripts
Child Psychiatrist	1195	33.6%	23348	46.8%	28506	47.5%
Adult Psychiatrist	845	23.7%	14009	28.1%	19984	33.3%
Clinical Nurse Spec Psych MH		0.0%	2	0.0%	1	0.0%
Primary Care (Child)	1033	29.0%	7653	15.4%	5130	8.6%
Primary Care	241	6.8%	2909	5.8%	4586	7.6%

(Adult)						
Neurologist	218	6.1%	1266	2.5%	893	1.5%
Other Physician Prescriber	27	0.8%	663	1.3%	873	1.5%
	3559	100.00%	49850	100%	59973	100%

Table 10: Prescribers of Antipsychotics by Age (FY 04-05)

MD Category	0 to 5	% of Prescribers	6 to 12	% of Prescribers	13 to 18	% of Prescribers
Child Psychiatrist	108	23.4%	229	14.2%	234	12.3%
Adult Psychiatrist	114	24.7%	318	19.7%	429	22.5%
Clinical Nurse Spec Psych MH		0.0%	1	0.1%	1	0.1%
Primary Care (Child)	143	31.0%	551	34.1%	486	25.5%
Primary Care (Adult)	66	14.3%	344	21.3%	509	26.7%
Neurologist	18	3.9%	47	2.9%	48	.5%
Other Physician Prescriber	13	2.8%	128	7.9%	198	10.4%
	462	100.00%	1618	100.00%	1905	100.00%

The roles of mental health specialists compared to other categories of MDs in antipsychotic prescribing tend to vary by age group. Primary care MDs and neurologists play a much more important role with very young children compared to older children and adolescents. Generally, as the age of children increases, the probability they received antipsychotic prescriptions from a psychiatrist increased and the probability they received prescriptions from primary care physicians and neurologists decreased.

The percentages of antipsychotic prescribers falling into each of the physician specialty categories by age group present some apparently contradictory conclusions. The total of prescribers for the 0-5, 6-12, and 13-18 age groups (Table 10) is significantly greater than the total number of physicians that wrote antipsychotic prescriptions for the 0-18 group (Table 8). In addition, the percentage of all prescribers of antipsychotics that are psychiatrists for the 0-18 age group is smaller than the same percentages for each of the age subgroups.

This is the case because there is a great deal of overlap between the groups of psychiatrists who wrote scripts for each of the age groups. Thus, total psychiatric prescribers for any age subgroup could not be greater than the totals for the 0-18 age group. However, if the same physicians treated children in all the age groups, total psychiatrists treating the 0-18 groups need not be much larger than the total of MDs serving the age group with the largest number of prescribers. In Table 8, the total number

of psychiatrists serving the 0-18 age group is 741 providers. The total serving each age group is 222 for the 0-5, 547 for the 6-12, and 663 for the 13-18 year old groups.

There is less overlap in the primary care physicians writing antipsychotic prescriptions for children in each of the age groups. Therefore the total number of primary care physicians serving the 0-18 age group is considerably larger than that serving any of the individual age groups. Over 1500 primary care MDs wrote prescriptions for a child in the 0-18 group while for the 13-18 group, which had the largest numbers of primary care MDs involved, the total was only 995 (Table 10). The differences in overlap between the group of psychiatrists treating children with antipsychotics in different age groups compared to primary care explains the apparent inconsistency between the percentages in Tables 8 and 10. Of all the prescribers of antipsychotics for children 0-5, 48% are psychiatrists compared to 34% of 6-12 children, and 35% for the 13-18 age group. (Table 10) Overall for the 0-18 year old group 28% of antipsychotic prescribers are psychiatrists. (Table 8)

In order to determine if the relative roles of medical specialties changed over time, we looked at the numbers and percentages of antipsychotic scripts that were written by different medical specialties from 2002-2003 to 2004-2005 by age group. There was little change in the roles for the 6-12 and 13-18 age groups. These tables are included in Appendix 4. However, there were significant changes in the kinds of physicians that wrote antipsychotic prescriptions for the very young. These changes are displayed in Table 11.

**Table 11: Percentages of Scripts of Antipsychotics by Fiscal Year (0 to 5)**

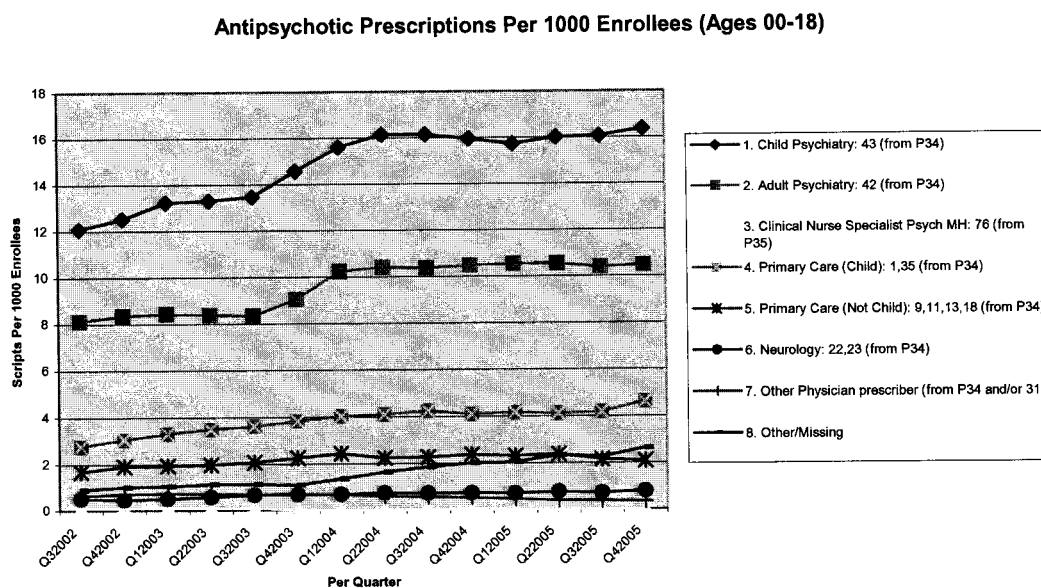
<b>Diagnosis</b>	<b>FY 02-03</b>	<b>% of scripts</b>	<b>FY 03-04</b>	<b>% of scripts</b>	<b>FY 04-05</b>	<b>% of scripts</b>
Child Psychiatrist	1299	39.7%	1370	35.6%	1195	33.6%
Adult Psychiatrist	677	20.7%	791	20.6%	845	23.7%
Clinical Nurse Spec Psych MH	2	0.1%	3	0.1%		0.0%
Primary care (Child)	860	26.3%	1115	29.0%	1033	29.0%
Primary care (Adult)	273	8.3%	274	7.1%	241	6.8%
Neurologist	81	2.5%	236	6.1%	218	6.1%
Other Physician Prescriber	82	2.5%	56	1.5%	27	0.8%
	3274	100.00%	3845	100.00%	3559	100.00%

In Table 11 we can see that child psychiatrists wrote 34% of the antipsychotic scripts for young children in 2004-2005. They wrote 40% of the scripts in 2002-2003. The reduction in the role of child psychiatrists in antipsychotic prescribing was offset by increases in the roles of pediatricians and adult psychiatrists. In addition, the role played by neurologists, although small, increased almost three fold from 2002-2003 to 2004-2005.

### *Rates of Prescribing by MD Type*

Since the users of antipsychotics/1000 enrollees for the 0-18 years of age increased significantly from 7/02 to 12/05, the overall rates of antipsychotic prescribing generated by physicians in the Medicaid program also had to increase. However, did the changes in prescribing rates/1000 enrollees differ based on MD specialty? Figure 7 depicts prescribing rates by quarter for each of the specialties.

Figure 7



As reflected in previous tables, the percentages of prescriptions written by child and adult psychiatrists were consistently higher than primary care physicians. The slopes of the scripts/1,000 enrollees by quarter for the period from the third quarter of 2002 to the fourth quarter of 2005 for the different medical specialties are presented in Table 14.

Table 12: Slopes Scripts/1,000 enrollees by Time by MD Specialty

	Estimate	SE	CI lower 95%	CI upper 95%	P value
<b>Slope Adult Psych</b>	0.2232	0.02255	0.1783	0.2682	<.0001
<b>Slope Child Primary</b>	0.1152	0.02255	0.0702 0	0.1601	<.0001
<b>Slope Child Psych</b>	0.3398	0.02255	0.2949	0.3848	<.0001
<b>Slope Neurology</b>	0.02187	0.02255	- 0.0230 8	0.0668 2	0.3354
<b>Slope Not Child Primary</b>	0.03405	0.02255	- 0.0109 0	0.0790 0	0.1354

We can see in Table 12 that there were significant increases in prescribing rates over time for both categories of psychiatrists and for primary care (child) but not for primary care (not child) or neurologists. The differences in slopes between child psychiatrists and primary care (child) are statistically significant indicating the rates of prescribing increased more over time for the former compared to the latter. The differences in the slopes of adult psychiatrists compared to primary care (Child) are not significant although the rates for the former tended to increase more than for the latter.

For both categories of psychiatrists and for pediatricians there were slight increases in rates in the last quarter of the study period. We will continue to monitor the trends into 2006 and 2007. However, we suspect the upward trend for the last quarter is related to the anticipated implementation of Medicare Part D in January 2006. There is no evidence of systematic differences between the medical specialties in the rates of change of antipsychotic prescribing over time.

### ***Quality of Prescribing Practices***

As mentioned in the Methods Section of this report we used three indicators to identify unusual prescribing practices. They include the following:

1. Use of two or more antipsychotics for more than 45 days
2. Use of two or more antipsychotics in conjunction with a stimulant or ADHD non-stimulant for 45 or more days
3. Prescribing of antipsychotics to children less than six years of age.

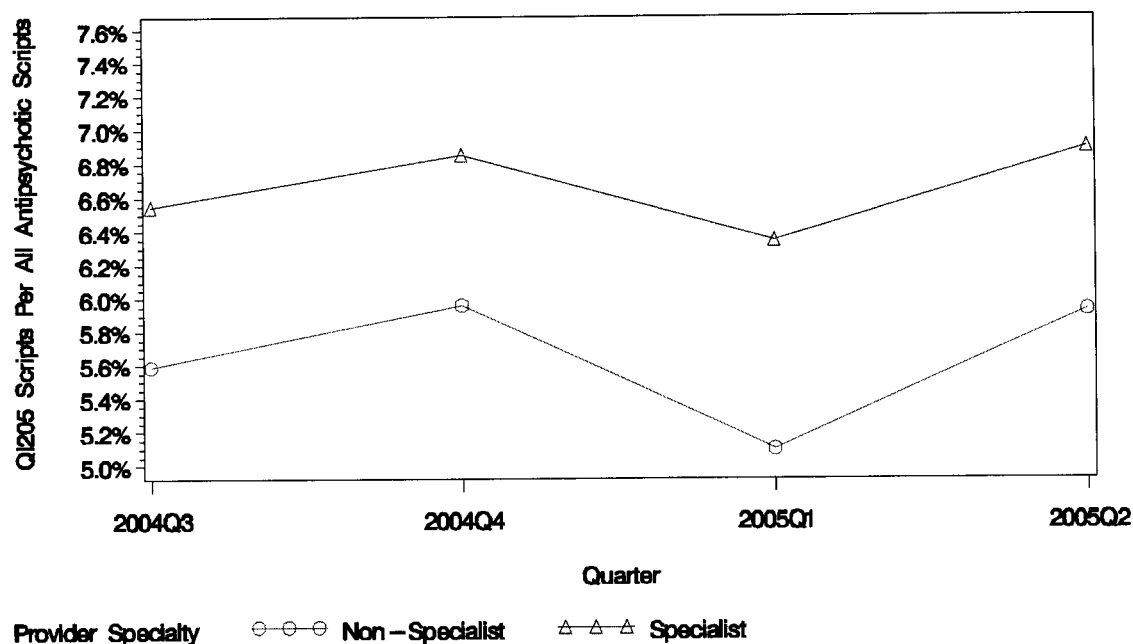
The data related to antipsychotic poly pharmacy are presented in Figure 8 where specialists include child and adult psychiatrists and non-specialists include all other categories of physicians (primarily primary care MDs).

Figure 8

Use of 2 or More Antipsychotics for 45 or More Days

### Child BH Pharmacy – Physician Specialty

Age Group 00–18



Looking at Figure 8 we see that during the four quarters depicted, the percentages of total antipsychotic scripts involved in poly pharmacy for specialists ranged from 6.3 to 6.9%. The percentage for the four quarters combined is 6.5%. The same percentage of claims for non-specialists ranged from 5.1 to 5.9. The percentage for all four quarters is 5.6%. For every quarter, the percentages of claims of non-specialist's antipsychotic prescriptions hitting the edit were lower than the percentages of specialist's. In addition, as expected from previous analyses, the total number of antipsychotic prescriptions was much larger for specialists. The total number of prescriptions with potential quality issues was therefore much larger for this group. For example, in the second quarter of 2005, 1540 antipsychotic prescriptions written by specialists were part of an antipsychotic poly pharmacy episode out of a total of 22,380 anti psychotic prescriptions.

The corresponding numbers for non-specialists was 380 out of 6,404 antipsychotic scripts.

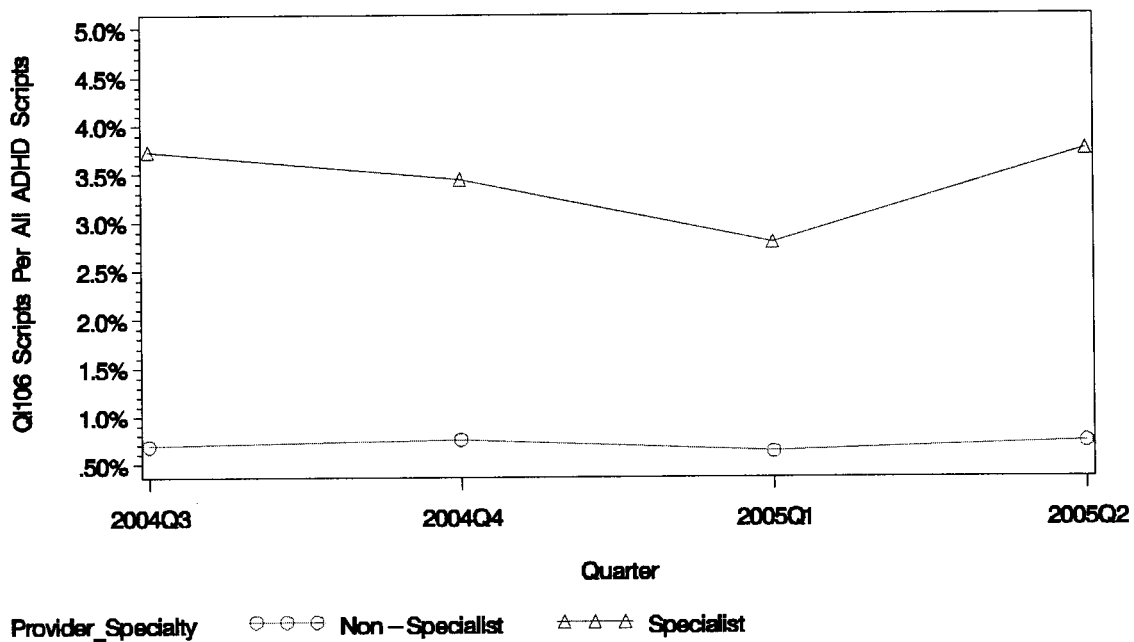
Antipsychotics are sometimes used in the treatment of children with ADHD that have problems of impulsive aggression. Although there are no FDA indications for this use outside of autism, clinical experience seems to indicate their potential effectiveness in some patients (Findling et al., 2005; Findling et al., 2000; Towbin, 2006). Therefore, the guideline developed by the MDTMP for the use of antipsychotics with children includes impulsive aggression as an appropriate target symptom. However, the use of two or more antipsychotics to treat children receiving stimulants is not recommended (CNS, 2007).

Figure 9 presents data on the number of claims per physician for stimulants that are accompanied by (overlapping time frames) antipsychotic polypharmacy.

Figure 9  
Use of Two or More Antipsychotics in Conjunction With a Stimulant

### Child BH Pharmacy – Physician Specialty

Age Group 00–18



We can see in Figure 9 that the percentages of claims of stimulant scripts accompanied by antipsychotic poly pharmacy is greater for specialists vs. non-specialists during all four quarters studied. In fact this combination of medications occurs in less than 1% of stimulant prescriptions written by non-specialists.

We have already presented data regarding the types of prescribers that wrote prescriptions for antipsychotics for children 0-5 years. Psychiatrists wrote fifty-seven percent of antipsychotic prescriptions for these children; non-specialists, primarily pediatricians, wrote the remainder of prescriptions. Since non-specialists tend to be most involved in antipsychotic prescribing of young children, this group has the highest percentage of antipsychotic scripts 0-5 years of age to total antipsychotic scripts 0-18 years of age. Approximately 7% of all antipsychotic prescriptions written by non-specialists were for children 0-5 years of age compared to approximately 2% for psychiatrists.

## Discussion and Recommendations

As early as 7/02 the use of typical antipsychotic medication was extremely small relative to atypical antipsychotic use. Furthermore there was a steady decline in the use of typical agents over the 42 months of the study. Atypical antipsychotic utilization, on the other hand, increased steadily from 7/02 – 4/04, from 4/04 to 12/05 utilization declined slightly. This decline was most noticeable for very young children.

The changes in trends for the period from 7/02 to 4/04 compared to 4/04 to 12/05 are consistent and significant. Clearly something happened in the winter of 2004 that altered the collective behavior of prescribers of antipsychotic medications to children. Two things occurred in this segment of time that are plausible explanations for the dramatic shift in trends. First, the FDA black box warning related to the use of antidepressants with children and adolescents required by the FDA in 2004 may have had a chilling effect on overall psychotherapeutic prescribing for children ([www.FDA.gov](http://www.FDA.gov)). Indeed, the utilization of antidepressants among the 0-18 group began to drop precipitously in the spring of 2004. Second, information about the metabolic side effects of some of the atypical antipsychotics began to be widely discussed and increasingly appreciated in the winter of 2003 and the spring of 2004 (Sacks, 2004) (Toalson, 2004)(Newcomer, 2004) and in fact precipitated a FDA required warning on all atypical antipsychotics in the spring of 2004. (Rosack, 2003) The shift to the use of atypical compared to typical antipsychotics had already occurred by 7/02. Underlying this shift and the corresponding increase in atypical antipsychotic use was the knowledge that the latter were significantly less likely to cause EPS and TD. Atypical antipsychotics appeared to be less risky than their earlier counterparts likely changing the risk/benefit calculation in the minds of prescribers and patients. The release of information about the metabolic side effects of some of the atypical agents probably once again altered the risk/benefit relationship making physicians more cautious about prescribing atypical antipsychotics to all age groups. It is not surprising that this caution would have been applied to children since there were no FDA indications for atypical antipsychotics with children at that point in time.

The utilization trends for the different brands of atypical antipsychotics seem to reinforce this interpretation. The rapid growth in the use of aripiprazole is consistent with its relatively lower metabolic burden (McQuade, ). The decline in the use of risperidone and especially olanzapine reflect its greater burden at least based on current information. (Melkersson & Dahl, 2004; Framaux T, Reymann, Shevreuil, & et al, 2007) The growth in the use of quetiapine requires further analysis. It is sometimes used in low doses as a sleep agent among patients who would not otherwise be prescribed an antipsychotic medication. (Becker, 2006; Findling, 2002) In a future paper we will sort this out by looking at utilization trends for differing doses of quetiapine.

The utilization trends reported in the first section of this paper apply only to Florida. Direct comparisons with other states and with information appearing in the literature are

difficult for the reasons earlier cited. In addition, given the changing patterns of managed care implementation among the states it is difficult to secure denominators (# of fee for service enrollees) that are unambiguously comparable. Nevertheless, based on the information available, it appears that Florida's antipsychotic utilization rates for children 0-18 in the early years of this century were consistent with those of the few states for which such data were reported. Its annual utilization rate was approximately 12/1000 enrollees 0-18 years old. This placed Florida below the Texas Medicaid System and below the rates of two other state Medicaid programs not specifically identified in the literature. Florida's rate was above one other state with reported utilization data.

In a more recent period (3/06-5/06) Florida's utilization rate for children 0-17 was higher than two states, equal to a third state and well below a fourth state. Based on these data and the early 2000's data, one cannot conclude that Florida's antipsychotic utilization rate is significantly higher than those of other state Medicaid programs. It should however, be pointed out that we have no basis for determining the appropriateness of any of these rates. Medicaid populations are poor and often-disabled probably justifying higher rates of antipsychotic use compared to general or commercially insured populations. However, the dramatically higher usage rates for children in Medicaid programs probably require further study.

The information on the diagnoses of children receiving antipsychotic medications mirrors the findings in the literature. These medications are used to treat children with a wide variety of diagnoses that do not, on their own, warrant such treatment. For example, antipsychotic treatment is generally not considered appropriate for the treatment of ADHD which is the most frequent diagnosis appearing in the Florida claims data. It also emerged as a prominent diagnosis in the study of other states Medicaid programs and of national antipsychotic usage patterns.

The difficulty in interpreting these results is that the MDTMP guidelines do suggest antipsychotic medications may be appropriate for the treatment of impulsive aggression in children. This may be the rationale for the use of antipsychotics with children having diagnoses of ADHD, major depression or affective disorders. A definitive resolution to this question would require reviews of medical records, an activity well beyond the scope of this study. We did, however, look at the claims histories of children on antipsychotics to see if there was evidence of co-occurring ADHD and/or behavior disorders. We found that 20% of children with an ADHD diagnosis also had a behavior disorder diagnosis in their Medicaid claims. For major depression, 31% had a co-occurring ADHD diagnosis and 26% with a behavior disorder. Forty-four percent of children diagnosed with affective disorders had a co-occurring ADHD diagnosis; 32% had a co-occurring behavior disorder diagnosis. It would appear that significant behavioral problems are present in children receiving antipsychotic treatment whose diagnoses may not directly call for such treatment.

The use of antipsychotic medications with children 0-5 is of concern. The guidelines developed by the program indicate this practice is generally "not recommended" while recognizing that disruptive aggression in autism is now an FDA indicated use. Only 8%

of the young children receiving antipsychotic treatment had a diagnosis of autism. ADHD was the most frequently used diagnosis for children 0-5 years on antipsychotic medication. Affective disorder is the next most frequently appearing diagnosis despite Florida's expert panel's assertion that the diagnosis is of questionable validity for children under 6 years old.

The data on changes in diagnostic patterns over time by age group also raises questions. Affective disorders appeared with increasing frequency from FY 02-03 to 05-06. For the very young children, the appearance of affective disorders tripled during this time period. ADHD also became an increasingly frequent diagnosis during this same time span. Detailed medical record reviews are required for an understanding of these changes in diagnostic patterns and their appropriateness for children 0-5 years old. Recognizing the fact that in FY 04-05 over 2,500 children under 6 years old were receiving antipsychotic medications, such a review is clearly justified.

The analysis of prescribing rates of antipsychotic medications for children 0-18 years by medical specialty parallels to some extent the trends in overall prescribing. Rates increased in the period from 7/02 to the spring of 2004. They generally were flat or declined from this time to 12/05. Changes in rates for specialists and non-specialists tended to parallel each other. There is no evidence in these data of disproportionate increases over time in the role of primary care. Their role remained relatively small compared to psychiatrists throughout the study period.

The information on the frequency of "unusual prescribing" of antipsychotics among specialists compared to non-specialists provide a potentially comforting perspective on the involvement of primary care physicians. While relatively large numbers of primary care physicians are involved in prescribing antipsychotics to children, they each write small numbers of antipsychotic prescriptions and are less likely to resort to unusual practices like antipsychotic polypharmacy. This is what one would expect. While primary care involvement may be essential, particularly in areas where access to psychiatrists is problematic, they may be referring treatment-resistant patients who require less usual prescribing to specialists. Since these children are more often at risk for adverse side effects, one would hope they are followed by physicians with the most psychiatric expertise.

We do not know from these analyses if children receiving unusual antipsychotic prescriptions had previously been tried on more usual regimes. Also unknown is the direction and timing of any referral of difficult cases from primary care to psychiatrist. Subsequent analyses may provide more information on this issue. We may, for example, be able to determine if children receiving unusual antipsychotic treatment have claims for a psychiatric office visit prior to or during their antipsychotic treatment by a primary care physician.

The information on the prescribers of antipsychotic medications in Florida is generally consistent with the limited information available in the literature. Clearly psychiatrists play a major role and may also be initiating antipsychotic treatment that is subsequently

followed by general practitioners. The large number of general practice physicians writing small numbers of scripts is of concern in that there may not have either sufficient training or experience to assure quality prescribing practices.

The situation for the 0-5 age group also offers the greatest cause for concern. While the use of antipsychotics with this age group is highly unusual according to the MDTMP guidelines, this group had the smallest percentages of antipsychotic scripts written by psychiatrists. Furthermore, the percentage of antipsychotic scripts for children 0-5 years to total antipsychotic scripts written was highest for pediatricians.

It is likely that some of these young children never come to the attention of psychiatric specialists. Over the 3.5 years of the study, involvement of child psychiatrist with these children, as measured by percentages of scripts written, declined while primary care involvement increased. There was also a significant increase in the role played by neurologists over the study period. Additional analyses of the diagnoses of young children treated by the different medical specialties may shed some light on their role as well as the role of pediatricians.

### ***Recommendations***

The results reported in this paper do not of themselves suggest the need for radical changes in antipsychotic prescribing in Florida's Medicaid program. Rates of antipsychotic prescribing seem to be consistent with those of other states. Furthermore, the growth in prescribing rates observed in the first part of the study period have leveled off and for some age groups even reversed. However, the state should continue and intensify monitoring and quality improvement strategies currently in place. This can be accomplished in the following ways:

1. In view of the limited research on the safety, tolerability, and efficacy of antipsychotics with children, the state should continue its efforts to develop, refine, and regularly update its evidence-based guidelines for antipsychotic treatment of pediatric populations. These updates should incorporate the most current research and clinical experience so that risks of antipsychotic use can be minimized while benefits are enhanced.
2. The MDTMP should continue to engage pediatricians as well as psychiatrists in educational strategies that enhance understanding of the guidelines and their applicability to everyday practice.
3. Efforts to maximize the extent to which all mental health prescribers have access to guidelines and quality information at the point of care should be enhanced.
4. The state should explore the development of local consultation networks that could provide telephonic, on line, or personal assistance to general practitioners

that are struggling to respond to the needs of children with serious emotional disturbances.

5. A statewide conference or series of regional conferences should be implemented to address the diagnosis and treatment of very young children with serious emotional disorders. It may be advisable to organize these events in collaboration with the American Academy of Child and Adolescent Psychiatry and the American Pediatric Association.
6. The state should continue to monitor prescribing practices using “edits” directly derived from the evidence-based guidelines developed by the MDTMP.
7. There should be follow-up with physicians who continue to write large numbers of prescriptions that appear to violate these edits. Follow-up should include reviews of medical records of patients of selected physicians to determine the rationale for large numbers of “unusual prescriptions.” The significant absence of rationale should result in referral to AHCA for regulatory actions.
8. The use of antipsychotics with very young children should be a focus for monitoring, follow-up, and special study using the strategies described in #6 and #7 above.

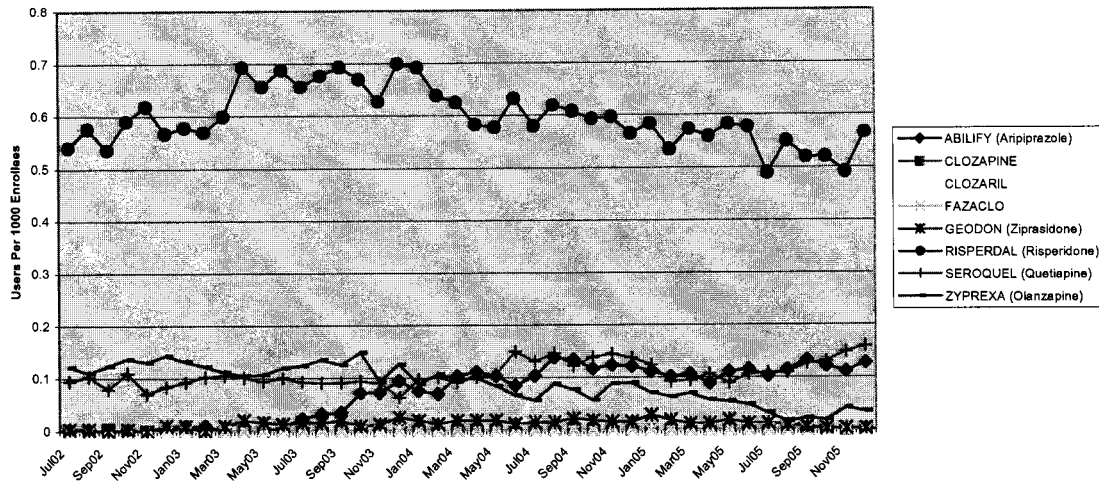
## References

- Anonymous. (2006, May 3). Antipsychotic Drug Use Among Kids Soars. New York Times.
- Anonymous. (2007, July 29). Use of Antipsychotic Drugs Soars Among Florida's Children. Tampa Tribune.
- Arango, C., Parellada, M., & Moreno, D.M. (2004). Clinical effectiveness of new generation antipsychotics in adolescent patients. Eur Neuropsychopharmacol, 14 Suppl 4, S471-9.
- Becker, P. (2006). Treatment of Sleep Dysfunction and Psychiatric Disorders. Curr Treat Options Neurol. 8(5), 367-375.
- Clavenna, A.Rossi, E., DeRosa, M et al, (2007). Use of Psychotropic Medications in Italian Children and Adolescents. Eur. J Pediatr, 166, 339-347.
- Cooper, W.O., Arbogast, P.G., Ding, H., Hickson, G.B., Fuchs, D.C., & Ray, W.A. (2006). Trends in prescribing of antipsychotic medications for US children. Ambul Pediatr, 6(2), 79-83.
- Cooper, W.O., Hickson, G.B., Fuchs, C., Arbogast, P.G., & Ray, W.A. (2004). New users of antipsychotic medications among children enrolled in TennCare. Arch Pediatr Adolesc Med, 158(8), 753-9.
- Curtis, L.H., Masselink, L.E., Ostbye, T., Hutchison, S., Dans, P.E., Wright, A., Krishnan, R.R., & Schulman, K.A. (2005). Prevalence of atypical antipsychotic drug use among commercially insured youths in the United States. Arch Pediatr Adolesc Med, 159(4), 362-6.
- Doey, T, Handelman, K , Seabrook, J et al. (2007). Survey of Atypical Antipsychotic Prescribing by Canadian Child Psychiatrists and Developmental Pedaitricians for Patients Aged Under 18 Years. Canadian Journal of Psychiatry, 52(6), 363-368.
- Findling, R.L., Steiner, H., & Weller, E.B. (2005). Use of antipsychotics in children and adolescents. J Clin Psychiatry, 66 Suppl 7, 29-40.
- Findling, R. (2002). Use of Quetiapine in Children and Adolescents. Journal of Clinical Psychiatry, 63(Suppl 13), 27-31.
- Findling, R., McNamara, N., & Gragious, B. (2000). Paediatric uses of Atypical Antipsychotics. Exp. Opin. Pharmacother., 1(5), 935-945.
- Framaux T, Reymann, J., Shevreuil, C., & et al. (2007). Prescription of Olanzapine in Children and Adolescents. Encephale, 33(2), 188-196.
- Harrison-Woolrych, M.G.-Q.J.A.J.e.a. (2007). Safety and Usage of Atypical Antipsychotic Medicines in Children: A Nationwide Prospective Cohort. Drug Saf, 30(7), 569-579.
- Kapetanovic, S., & Simpson, G. (2006). Review of Antipsychotics in Children and Adolescents. Expert Opin Pharmacother, 7(14), 723
- Kelly, D.L., Love, R.C., MacKowick, M., McMahan, R.P., & Conley, R.R. (2004). Atypical antipsychotic use in a state hospital inpatient adolescent population. J Child Adolesc Psychopharmacol, 14(1), 75-85.

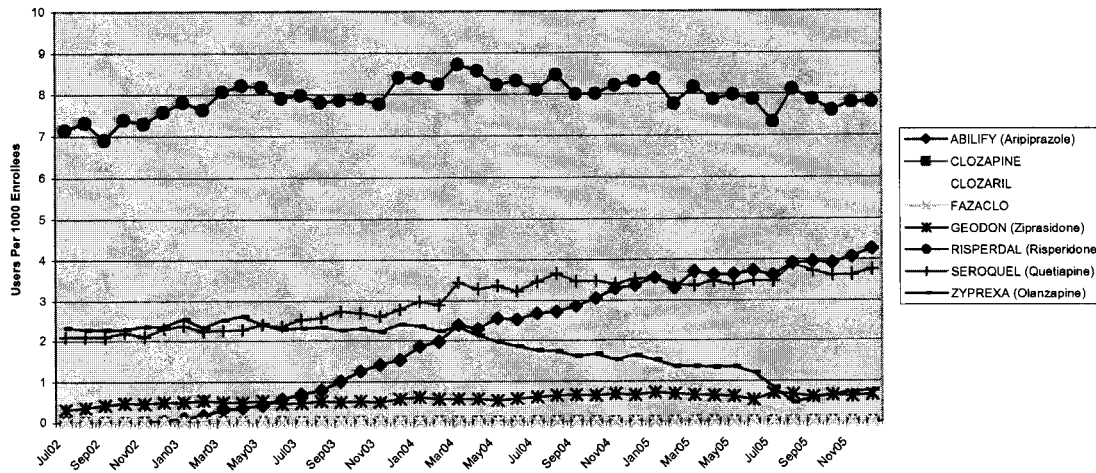
- Malone, R.P., Sheikh, R., & Zito, J.M. (1999). Novel antipsychotic medications in the treatment of children and adolescents. Psychiatr Serv, *50*(2), 171-4.
- Martin, A., & Leslie, D. (2003). Trends in psychotropic medication costs for children and adolescents, 1997-2000. Arch Pediatr Adolesc Med, *157*(10), 997-1004.
- McQuade, R, Stock, E, Marcus, R (2004) Comparison of Weight Change During Treatment with Olanzapine or Aripiprazole: Results from a standardized Double-blind Study. J Clin Psychiatry, *65*(S 18), 47-56.
- Melkersson, K., & Dahl, M.L. (2004). Adverse Metabolic Effects Associated With Atypical Antipsychotics: Literature Review and Clinical Implications. Drugs, *64*(7), 701-723.
- Newcomer, J.W. (2004). Abnormalities of Glucose Metabolism Associated with Atypical Antipsychotics. J Clin Psychiatry, *65*(18 S), 36-46.
- Olfson, M., Blanco, C., Liu, L., Moreno, C., & Laje, G. (2006). National trends in the outpatient treatment of children and adolescents with antipsychotic drugs. Arch Gen Psychiatry, *63*(6), 679-85.
- Patel, N.C., Sanchez, R.J., Johnsrud, M.T., & Crismon, M.L. (2002). Trends in antipsychotic use in a Texas medicaid population of children and adolescents: 1996 to 2000. J Child Adolesc Psychopharmacol, *12*(3), 221-9.
- Patel, N., Crismon, L., & Hoagwood, K. (2005). Trends in the use of typical and atypical antipsychotics in children and adolescents. Journal of the Academy of Child and Adolescent Psychiatry, *44*(6), 548-556.
- Rosack, J. (2003). FDA to Require Diabetes Warning on Antipsychotics. Psychiatric News, *38*(20), 26
- Schirm, E., Tobi, H., Zito, J.M., & de Jong-van den Berg, L.T. (2001). Psychotropic medication in children: a study from the Netherlands. Pediatrics, *108*(2), E25
- Towbin, K.E. (2006). Gaining: Pediatric Patients and Use of Atypical Antipsychotics. The American Journal of Psychiatry, *163*(12), 2034-2030.

# Appendix 1

Atypical Antipsychotic Pharmacy Use in Florida Medicaid Children (Age 0-5)



Atypical Antipsychotic Pharmacy Use by Florida Medicaid Children (Age 6-12)



## Appendix 2

Drug=Aripiprazole

Age Group	Period	Slope	Lower 95% CI	Upper 95% CI	P(Slope = 0)	P(Slope pre = Slope post)
0-5	Pre	0.00601	0.00501	0.00700	<.0001	<.0001
0-5	Post	0.00139	0.00038915	0.00238	0.0076	
6-12	Pre	0.13283	0.11891	0.14675	<.0001	0.0491
6-12	Post	0.10781	0.09389	0.12173	<.0001	
13-18	Pre	0.21145	0.19573	0.22717	<.0001	0.0268
13-18	Post	0.17944	0.16372	0.19516	<.0001	
0-18	Pre	0.09473	0.08661	0.10286	<.0001	0.0820
0-18	Post	0.08191	0.07378	0.09003	<.0001	

Drug=Ziprasidone

Age Group	Period	Slope	Lower 95% CI	Upper 95% CI	P(Slope = 0)	P(Slope pre = Slope post)
0-5	Pre	0.00093693	0.00066139	0.00121	<.0001	<.0001
0-5	Post	-0.00068388	-0.00095942	-0.00040833	<.0001	
6-12	Pre	0.00975	0.00710	0.01241	<.0001	0.0126
6-12	Post	0.00362	0.00096749	0.00627	0.0087	
13-18	Pre	0.02209	0.01642	0.02776	<.0001	0.0024
13-18	Post	0.00582	0.00014898	0.01149	0.0446	
0-18	Pre	0.00845	0.00654	0.01036	<.0001	0.0032
0-18	Post	0.00313	0.00122	0.00504	0.0020	

## Drug=Risperidone

Age Group	Period	Slope	Lower 95% CI	Upper 95% CI	P(Slope = 0)	P(Slope pre = Slope post)
0-5	Pre	0.00340	0.00116	0.00563	0.0039	<.0001
0-5	Post	-0.00730	-0.00953	-0.00506	<.0001	
6-12	Pre	0.05881	0.04553	0.07208	<.0001	<.0001
6-12	Post	-0.03768	-0.05095	-0.02440	<.0001	
13-18	Pre	0.03776	0.02140	0.05413	<.0001	<.0001
13-18	Post	-0.07181	-0.08818	-0.05544	<.0001	
0-18	Pre	0.02445	0.01749	0.03140	<.0001	<.0001
0-18	Post	-0.02663	-0.03358	-0.01967	<.0001	

## Drug=Quetiapine

Age Group	Period	Slope	Lower 95% CI	Upper 95% CI	P(Slope = 0)	P(Slope pre = Slope post)
0-5	Pre	0.00091881	-0.00017609	0.00201	0.0976	0.7652
0-5	Post	0.00121	0.00011515	0.00230	0.0312	
6-12	Pre	0.06319	0.05411	0.07227	<.0001	<.0001
6-12	Post	0.02812	0.01904	0.03720	<.0001	
13-18	Pre	0.12893	0.11369	0.14418	<.0001	0.0002
13-18	Post	0.07328	0.05803	0.08853	<.0001	
0-18	Pre	0.04937	0.04323	0.05552	<.0001	0.0028
0-18	Post	0.03207	0.02593	0.03821	<.0001	

## Appendix 3

## Diagnosis by Fiscal Year( 6 to 12)

Diagnosis	FY 02-03	% of children	FY 03-04	% of children	FY 0405	% of children
Schizophrenia	533	4.8%	537	5.1%	705	5.5%
Major Depression	566	6.5%	895	8.6%	929	7.3%
Affective Disorders(other)	1034	9.3%	1545	12.5%	1973	15.5%
Autism	446	4.0%	490	3.9%	482	3.8%
Tourettes Disorder	79	0.7%	98	0.8%	89	0.7%
ADHD	5827	52.7%	6500	52.5%	6405	50.3%
Conduct Disorder	837	7.7%	858	6.9%	860	6.8%
Depressive Disorder	496	4.5%	700	5.5%	187	1.5%
Anxiety Disorder	224	2.0%	202	1.6%	233	1.8%
Adjustment Disorder	596	5.4%	498	4.0%	416	3.3%
Other not specified	557	5.0%	469	3.8%	454	3.6%
	10066	100.0%	12389	100.0%	12733	100.0%

## Diagnosis by Fiscal Year( 13 to 18)

Diagnosis	FY 02-03	% of children	FY 03-04	% of children	FY 0405	% of children
Schizophrenia	1020	12.1%	1091	11.9%	1170	13.1%
Major Depression	1435	17.0%	1576	17.2%	1458	16.3%
Affective Disorders(other)	1317	15.6%	1669	18.2%	1842	20.6%
Autism	172	2.0%	185	2.0%	154	1.7%
Tourettes Disorder	48	0.6%	44	0.5%	41	0.5%
ADHD	1983	23.4%	1997	21.8%	1767	19.7%
Conduct Disorder	1255	14.8%	1341	14.6%	1247	13.9%
Depressive Disorder	268	3.2%	306	3.3%	327	3.7%
Anxiety Disorder	276	3.3%	287	3.1%	287	3.2%
Adjustment Disorder	338	4.0%	309	3.4%	270	3.0%
Other not specified	347	4.1%	362	3.9%	384	4.3%
	8459	100.0%	9167	100.0%	8947	100.0%

Drug=Olanzapine

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.0328	0.1251	0.0256	0.0419	-27.33	<.0001
FY	FY0405	3.5575	0.1309	2.7525	4.5979	9.70	<.0001
FY	FY0203	1.0000	0.0000	1.0000	1.0000	.	.

## Number=2 Diagnosis=ADHD Age\_Group=00-05

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.8065	0.0429	0.7415	0.8772	-5.02	<.0001
FY	FY0405	1.5334	0.0489	1.3933	1.6876	8.75	<.0001
FY	FY0203	1.0000	0.0000	1.0000	1.0000	.	.

## Number=3 Diagnosis=Conduct Disorder Age\_Group=00-05

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.1282	0.0678	0.1122	0.1464	-30.28	<.0001
FY	FY0405	0.5139	0.0983	0.4239	0.6231	-6.77	<.0001
FY	FY0203	1.0000	0.0000	1.0000	1.0000	.	.

## Number=4 Diagnosis=Autism Age\_Group=00-05

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.0694	0.0858	0.0587	0.0821	-31.08	<.0001
FY	FY0405	1.3152	0.0859	1.1114	1.5564	3.19	0.0014
FY	FY0203	1.0000	0.0000	1.0000	1.0000	.	.

## Number=5 Diagnosis=ADHD Age\_Group=06-12

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		1.1168	0.0186	1.0768	1.1583	5.94	<.0001
FY	FY0405	0.8966	0.0205	0.8612	0.9335	-5.31	<.0001
FY	FY0203	1.0000	0.0000	1.0000	1.0000	.	.

## Number=6 Diagnosis=Affective Disorder Age\_Group=06-12

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.1013	0.0327	0.0950	0.1080	-70.13	<.0001
FY	FY0405	1.8077	0.0353	1.6870	1.9370	16.79	<.0001
FY	FY0203	1.0000	0.0000	1.0000	1.0000	.	.

## Number=7 Diagnosis=ADHD Age\_Group=13-18

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.2987	0.0253	0.2842	0.3138	-47.77	<.0001
FY	FY0405	0.7886	0.0311	0.7420	0.8381	-7.64	<.0001
FY	FY0203	1.0000	0.0000	1.0000	1.0000	.	.

## Number=8 Diagnosis=Affective Disorder Age\_Group=13-18

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.1808	0.0299	0.1705	0.1917	-57.18	<.0001
FY	FY0405	1.4428	0.0350	1.3472	1.5452	10.48	<.0001
FY	FY0203	1.0000	0.0000	1.0000	1.0000	.	.

## Number=9 Diagnosis=Affective Disorder FY=FY0405

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.1161	0.0611	0.1030	0.1308	-35.25	<.0001
age_group	13-18	2.2336	0.0665	1.9608	2.5443	12.09	<.0001
age_group	00-05	1.0000	0.0000	1.0000	1.0000	.	.

## Number=10 Diagnosis=Affective Disorder FY=FY0405

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.1834	0.0245	0.1748	0.1924	-69.26	<.0001
age_group	13-18	1.4139	0.0358	1.3180	1.5167	9.67	<.0001
age_group	06-12	1.0000	0.0000	1.0000	1.0000	.	.

Number=11 Diagnosis=Major Depression FY=FY0405

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.0670	0.0330	0.0628	0.0715	-81.92	<.0001
age_group	13-18	2.9060	0.0437	2.6675	3.1657	24.42	<.0001
age_group	00-12	1.0000	0.0000	1.0000	1.0000	.	.

Number=12 Diagnosis=Schizophrenia FY=FY0405

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.0574	0.0353	0.0535	0.0615	-80.89	<.0001
age_group	13-18	2.6218	0.0472	2.3900	2.8762	20.40	<.0001
age_group	00-12	1.0000	0.0000	1.0000	1.0000	.	.

Number=13 Diagnosis=Autism FY=FY0405

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.0175	0.0813	0.0149	0.0205	-49.76	<.0001
age_group	00-05	5.2005	0.1056	4.2282	6.3965	15.61	<.0001
age_group	13-18	1.0000	0.0000	1.0000	1.0000	.	.

## Number=14 Diagnosis=Autism FY=FY0405

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.0175	0.0813	0.0149	0.0205	-49.76	<.0001
age_group	06-12	2.2464	0.0936	1.8699	2.6988	8.65	<.0001
age_group	13-18	1.0000	0.0000	1.0000	1.0000	.	.

## Number=15 Diagnosis=ADHD FY=FY0405

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.6050	0.0140	0.5886	0.6218	-35.86	<.0001
age_group	00-05	2.0511	0.0400	1.8962	2.2186	17.94	<.0001
age_group	06-18	1.0000	0.0000	1.0000	1.0000	.	.

## Number=16 Diagnosis=ADHD FY=FY0405

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.2461	0.0266	0.2336	0.2592	-52.80	<.0001
age_group	06-12	4.1128	0.0319	3.8633	4.3784	44.29	<.0001
age_group	13-18	1.0000	0.0000	1.0000	1.0000	.	.

**Number=17 Diagnosis=Conduct Disorder FY=FY0405**

<b>Parameter</b>	<b>Level1</b>	<b>Estimate</b>	<b>Empirical Standard Error Estimates</b>	<b>95% Lower Confidence Limit</b>	<b>95% Upper Confidence Limit</b>	<b>Z</b>	<b>Pr &gt;  Z </b>
Intercept		0.0660	0.0774	0.0567	0.0768	- 35.1 2	<.0001
age_group	06-18	1.6311	0.0807	1.3924	1.9106	6.06	<.0001
age_group	00-05	1.0000	0.0000	1.0000	1.0000	.	.

**Number=18 Diagnosis=Conduct Disorder FY=FY0405**

<b>Parameter</b>	<b>Level1</b>	<b>Estimate</b>	<b>Empirical Standard Error Estimates</b>	<b>95% Lower Confidence Limit</b>	<b>95% Upper Confidence Limit</b>	<b>Z</b>	<b>Pr &gt;  Z </b>
Intercept		0.0724	0.0353	0.0676	0.0776	- 74.3 4	<.0001
age_group	13-18	2.2358	0.0467	2.0404	2.4500	17.2 4	<.0001
age_group	06-12	1.0000	0.0000	1.0000	1.0000	.	.

## Appendix 4

### Percentage of Scripts of Antipsychotic by Fiscal Year (6-12)

Diagnosis	FY02-03	% of scripts	FY 03-04	% of Scripts	FY 04-05	% of Scripts
1. Child Psychiatry	18232	46.92%	22438	48.00%	23348	46.84%
2. Adult Psychiatry	10964	28.22%	12552	26.85%	14009	28.10%
3. Clinical Nurse Spec Psych MH	90	0.23%	26	0.06%	2	0.00%
4. Primary Care (Child)	5439	14.00%	7174	15.35%	7653	15.35%
5. Primary Care (Not Child)	2116	5.45%	2506	5.36%	2909	5.84%
6. Neurology	978	2.52%	1125	2.41%	1266	2.54%
7. Other Physician prescriber	1036	2.67%	924	1.98%	663	1.33%
	38855	100.00%	46745	100.00%	49850	100.00%

### Percentage of Scripts of Antipsychotics by Fiscal Year (13-18)

Diagnosis	FY 02-03	% of Scripts	FY 03-04	% of Scripts	FY 04-05	% of Scripts
1. Child Psychiatry	21190	46.74%	25957	46.53%	28506	47.53%
2. Adult Psychiatry	14896	32.86%	18316	32.83%	19984	33.32%
3. Clinical Nurse Spec Psych MH	240	0.53%	42	0.08%	1	0.00%
4. Primary Care (Child)	3759	8.29%	4677	8.38%	5130	8.55%
5. Primary Care (Not Child)	3587	7.91%	4720	8.46%	4586	7.65%
6. Neurology	560	1.24%	890	1.60%	893	1.49%
7. Other Physician prescriber	1106	2.44%	1185	2.12%	873	1.46%
	45338	100.00%	55787	100.00%	59973	100.00%

## Number=1 Diagnosis=Affective Disorder Age\_Group=00-05

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.0328	0.1251	0.0256	0.0419	-27.33	<.0001
FY	FY0405	3.5575	0.1309	2.7525	4.5979	9.70	<.0001
FY	FY0203	1.0000	0.0000	1.0000	1.0000	.	.

## Number=2 Diagnosis=ADHD Age\_Group=00-05

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.8065	0.0429	0.7415	0.8772	-5.02	<.0001
FY	FY0405	1.5334	0.0489	1.3933	1.6876	8.75	<.0001
FY	FY0203	1.0000	0.0000	1.0000	1.0000	.	.

## Number=3 Diagnosis=Conduct Disorder Age\_Group=00-05

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.1282	0.0678	0.1122	0.1464	-30.28	<.0001
FY	FY0405	0.5139	0.0983	0.4239	0.6231	-6.77	<.0001
FY	FY0203	1.0000	0.0000	1.0000	1.0000	.	.

## Number=4 Diagnosis=Autism Age\_Group=00-05

Parameter	Level1	Estimate	Empirical Standard Error Estimates	95% Lower Confidence Limit	95% Upper Confidence Limit	Z	Pr >  Z
Intercept		0.0694	0.0858	0.0587	0.0821	-31.08	<.0001
FY	FY0405	1.3152	0.0859	1.1114	1.5564	3.19	0.0014
FY	FY0203	1.0000	0.0000	1.0000	1.0000	.	.