Article

Psychiatric Inpatient, Outpatient, and Medication Utilization and Costs Among Privately Insured Youths, 1997–2000

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Objective: The study examined trends in use of inpatient and outpatient mental health services, including pharmacotherapy, among privately insured children and adolescents from 1997 to 2000.

Method: Data from a national database of more than 1.7 million privately insured individuals were used in an analysis of inpatient, outpatient, and pharmacy claims of users of mental health care age 17 years and younger (approximately 20,000 patients per year). Annual utilization rates and adjusted costs for services and dispensed psychotropic medications were calculated. Results from 1997 and 2000 were compared across diagnostic and age categories.

Results: The proportion of youths with an inpatient psychiatric admission decreased by 23.7% from 1997 to 2000, and annual inpatient and outpatient costs decreased by $1,216 (18.4%) and $157 (14.4%), respectively. Decreases were driven by a reduction in inpatient days (20.0%) and by a combination of a reduction in outpatient visits (11.3%) and declining payments per outpatient visit (6.1%). Payment trends across diagnoses varied considerably, with the largest reductions seen in treatment of depression, hyperactivity, adjustment disorders, and anxiety disorders. Over the same period, the proportion of youths receiving medication increased by 4.9%, and mean annual medication-related costs per outpatient increased by $41 (12.1%).

Conclusions: Reductions in inpatient and outpatient mental health service intensity and reimbursements documented in previous research continued through the late 1990s. Declines were accompanied by concurrent increases in the use of and costs associated with psychotropic medications, particularly for youths with mood and anxiety disorders. These results document a shift toward medication-based outpatient treatment modalities.

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Mental health disorders are a common cause of disability among children and adolescents. It has been estimated that approximately 20% of youths age 18 years and younger meet criteria for a psychiatric diagnosis during any given year and that about half of them have significant functional impairment as a result of psychiatric illness (1). Mental health costs represent a substantial component of overall medical care expenditures among youths, but few recent cost estimates are available. The limitations of the cost studies in the literature can be divided into three main categories. First, little information is specific to minors, and much of it is dated or no longer relevant to current fiscal and clinical environments (e.g., reference 2). Second, more recent studies that are specific to minors reflect single points in time (e.g., reference 3) and thus provide limited information on practice and cost trends. Finally, to our knowledge, only one recent study has addressed utilization and cost trends among children and adolescents (4), but that study did not take into consideration costs specifically associated with use of psychotropic medications.

Among minors, fragmentation in clinical care and its site of delivery complicates reliable utilization and cost estimates. For example, it is common for multiple providers to be involved in the care of a child, as in the case of psychotropics being prescribed by pediatricians or family physicians (5). Moreover, structural and perceptual barriers to mental health care are widespread (6), leading to extensive provision of services—when they are provided at all—in medically "nontraditional" settings such as schools, welfare and child custody placements (e.g., foster care, residential homes), and the juvenile justice system (7, 8). High-intensity service users, who account for a large share of overall costs, are overrepresented in such systems of care (9), yet gaining access to information from these disparate settings can be a formidable task. Economic analyses based on extant data sets do not circumvent such complications, but they do provide one practical way of obtaining cost estimates to inform policy.

Despite a paucity of compelling evidence of long-term safety in the use of many agents, psychopharmacology is an increasingly common intervention in child psychiatry

(10, 11), even among preschoolers (12). Some of the reasons underlying this practice trend include 1) an expanding evidence base for conditions such as attention deficit hyperactivity, obsessive-compulsive, major depressive, and generalized anxiety disorders (for a recent review, see reference 13); 2) a growing awareness and acceptance by both professionals and the public for the conceptualization of certain mental health disorders as amenable to biological intervention; 3) the effect of federal and regulatory agency legislation, such as the Food and Drug Administration Modernization Act and the related "Pediatric Rule," which have greatly expanded pediatric clinical trials in both academic and industry sectors (14); and 4) a shift toward third-party payer arrangements that place a premium on overall cost containment.

Against this backdrop, the aims of the current study were to 1) provide recent utilization and cost trends for inpatient and outpatient mental health services for a group of privately insured children and adolescents and 2) specifically address psychotropic medication costs associated with such services.

Method

Source of Data

Data for this study came from MEDSTAT's MarketScan database, which compiles claims information from private health insurance plans. The data set contains claims information for individuals nationwide who are insured through the benefit plans of large employers. The covered individuals include employees, their dependents, and early retirees of companies that participate in the database. MEDSTAT collects the claims data, standardizes and combines them, and reports back to the firms that participate. Information about the firms is unavailable for reasons of confidentiality. The database contained information for more than 7 million covered lives between 1997 and 2000. These claims data were collected from more than 200 different insurance companies, including Blue Cross and Blue Shield plans and third-party administrators. The study group for the analysis reported here consisted of all individuals represented in the database age ≤17 years who had a claim for mental health services in any of the years under study and who could possibly have pharmacy claims data available (N=83,039). We also obtained demographic information on the entire enrolled population age ≤17 years (N=1,735,486).

The treatment of the subjects in our data set was largely subject to managed care mechanisms during the period under study. Comprehensive plans (those without incentives to use a particular list of providers) became most popular, representing 24.7% of the plans by 1999 (up from 14.3% in 1997). The percentage of subjects enrolled in either a preferred provider organization or a point-of-service plan remained at a stable average of 16.0% during the study period. For the traditional indemnity plans for which we have information, 49.9% used either case management or utilization review to control costs, 62.7% required precertification for outpatient services, 27.6% had a mental health or substance abuse carve-out, and 24.9% charged penalties for the use of nongeneric medication brands. Thus, virtually all health plans included in our database used a variety of managed care mechanisms to control costs.

Measures

From the claims data, we constructed variables describing the number of enrolled children receiving any mental health services, the total number of inpatient and outpatient treatment days per treated child during each year, the primary diagnosis, and the total costs for each year. We defined mental health diagnoses as ICD-9 codes between 290.00 and 319.99. Any claim with a diagnosis within this range of ICD-9 values was considered a mental health claim, regardless of whether care was received from a mental health specialist or in a primary care setting. We measured the cost associated with a claim as the actual paid amount instead of the billed charges. Since providers rarely receive all of the fees that they charge, the paid amount is a more accurate measure of costs. Paid amounts included patient payments (deductibles or copayments), payments made by the patient's insurance plan, and payment by other insurance providers. Costs were adjusted for inflation by using the medical care component of the Consumer Price Index, with all amounts reported as 1997 dollars.

Mental Health Service Use and Cost

We calculated the following measures for inpatient and outpatient mental health services and for psychotropic drug use for each year from 1997 through 2000: 1) the number and percent of enrolled children who received mental health services and, of those, the number and percent of outpatients who received psychotropic medications, 2) the number of treatment days per treated child per year, 3) the costs per day of treatment and the cost per month's supply for each psychotropic medication, and 4) the total annual costs of services and of psychotropic medications per treated child. For each child, the annual number of outpatient treatment days was calculated by summing across all outpatient claims during the year, counting multiple claims in any given day as a single day of treatment. Inpatient days were calculated by summing the length of stay for all inpatient episodes during the year. Annual inpatient, outpatient, and medication-related costs were each summed in a similar manner, which was consistent with methods used by others (4, 15, 16). Due to the inherent structure of the database, inpatient psychotropic costs could not be separated from overall inpatient costs. All time and cost measures were further stratified across diagnostic categories.

Diagnostic Groups

To control for diagnosis in examining trends in service use and cost over time, we defined eight mental health disorder categories for children receiving mental health services (the corresponding ICD-9 codes are tabulated in Appendix 1): 1) adjustment disorders, 2) anxiety disorders, 3) bipolar disorder, 4) depressive (nonbipolar) disorders, 5) hyperactivity, 6) substance abuse, 7) schizophrenia, and 8) other mental health disorders. Each patient was assigned to a major diagnostic category for each year in which mental health services were received, on the basis of the primary diagnosis in that year. The primary diagnosis was defined as the one associated with the majority of mental health services during the year, as measured by the total paid amount.

Other Patient Characteristics

Other independent variables of interest included patient demographic characteristics (age and gender) and three measures of illness severity: the number of different diagnoses in the year, whether the child had a dual diagnosis, and whether the child had incurred any inpatient mental health days during the year. Patient age was grouped into three levels: ≤6 years, 7–12 years, and 13–17 years. The number of different diagnoses included all diagnoses, not just those for mental health. Children were defined as having a dual diagnosis if they had a primary or secondary diagnosis of substance abuse in the same year in which they had a non-substance-abuse mental health diagnosis. Finally, children

TABLE 1. Demographic and Clinical Characteristics of Privately Insured Children and Adolescents Who Used Mental Health Care in 1997 and 2000[a]

Characteristic	Users of Mental Health Care in 1997 (N=17,230)		Users of Mental Health Care in 2000 (N=26,006)		Percent Change	Cochran Mantel-Haenszel Chi-Square Analysis	
	N	%	N	%		χ^2 (df=1)	p
Gender						0.77	0.38
Male	10,493	60.9	15,754	60.6	–0.5		
Female	6,737	39.1	10,252	39.4	0.8		
Age (years)						0.61	0.44
≤6	1,859	10.8	2,713	10.4	–3.3		
7 to 12	6,488	37.7	9,995	38.4	2.1		
13 to 17	8,883	51.6	13,298	51.1	–0.8		
Diagnostic group							
Adjustment disorders	3,292	19.1	5,043	19.4	1.5	0.32	0.57
Anxiety disorders	1,212	7.0	2,231	8.6	22.0	43.09	<0.0001
Bipolar disorder	206	1.2	474	1.8	52.4	28.51	<0.0001
Depressive disorders	2,875	16.7	4,349	16.7	0.2	0.90	0.34
Hyperactivity	5,580	32.4	8,976	34.5	6.6	29.77	<0.0001
Other mental health disorders	3,404	19.8	3,978	15.3	–22.6	204.21	<0.0001
Psychosis	225	1.3	426	1.6	25.4	6.00	<0.02
Substance abuse	436	2.5	529	2.0	–19.6	14.37	<0.0001
Dual diagnosis[b]	668	3.9	762	2.9	–24.4	30.29	<0.0001
Inpatient hospitalization	797	4.6	918	3.5	–23.7	35.57	<0.0001
Use of psychotropic medication	10,105	58.6	15,993	61.5	4.9	60.84	<0.0001

[a] Data were obtained from MEDSTAT's MarketScan database of claims data from more than 200 private health insurance plans of large employers. A total of 352,413 individuals age ≤17 years with possible pharmacy data were enrolled in 1997, and 473,954 in 2000, resulting in a 34.5% increase.
[b] A primary or secondary diagnosis of substance abuse in the same year as a non-substance-abuse mental health diagnosis.

who had any inpatient days coded with a mental health diagnosis during the year were classified as having inpatient mental health days.

Psychotropic Medication Use and Cost

Only those children with possible linked pharmacy data were included in the study. Those children with any claims for psychotropic drugs were identified on the basis of a comprehensive National Drug Code registry. Psychotropics included in this study were assigned to one of six drug classes: 1) α agonists, 2) antidepressants, 3) antipsychotics, 4) mood stabilizers, 5) stimulants, and 6) anxiolytics/sedative-hypnotics. Antihistamines (including hydroxyzine), β blockers, and anticholinergic agents were specifically excluded from analysis given the potential for ambiguity in determining their use as psychotropics. Medication payments and day supply per medication were used to derive annual and monthly cost estimates by using the same approach used for outpatient costs. The analyses presented here considered psychotropic drugs as an aggregate, single category; class- and drug-specific utilization rates and cost estimates are the subject of separate analyses, and patterns of combined pharmacotherapy (the concurrent use of two or more psychotropics) are separately addressed in two related papers (17, 18).

Analysis

The proportions of children who had claims for outpatient mental health services and for whom psychotropic drugs were dispensed were calculated for each year. Next, average annual treatment days, mental health care costs, and medication costs were analyzed to determine how these variables changed during the 4 years under study and what cost components were driving the change. We did separate regression analyses in which the dependent variables were 1) the annual number of treatment days, 2) the amounts paid for inpatient and outpatient services, 3) the amount paid for outpatient medications, 4) the cost per day for treatment, and 5) the cost per month of medication supplied. The independent variables included year, age group, gender, diagnosis, whether the child had a dual diagnosis, and total number of diagnoses.

Because the dependent variables are not normally distributed, we conducted a log transformation of these variables. We calculated adjusted means of the log-transformed dependent variables by calculating fitted values evaluated at the means of the independent variables. These adjusted means were retransformed from the log scale by using the smearing technique (19, 20). The proportion of total costs accounted for by psychotropics was determined for those outpatients who received medications. Finally, we stratified the analyses by primary diagnostic group and by age category to determine whether these groups were differentially affected by the change in treatment days and costs.

The linear trend for time was assessed from the type III sum of squares of general linear models by using the same dependent (log-transformed) and independent variables as in the corresponding regressions. By including all relevant time points (rather than the first and last ones only), this approach provided p values that are more conservative and representative than those obtained through z or t scores in earlier reports (4, 16). All analyses were conducted by using SAS version 8.2 software (SAS Institute, Cary, N.C.). Unless otherwise noted, results are presented as numbers and percents or as means and standard deviations. The level of significance was set at $p<0.01$.

Results

Study Group Characteristics

Table 1 reports demographic and clinical characteristics for outpatient mental health users in our study group in 1997 and 2000. Of 352,413 individuals age ≤17 years with possible pharmacy data who were enrolled in 1997, 17,230 (4.9%) received outpatient mental health services, compared to 26,006 of 473,954 (5.5%) in 2000, representing a 34.5% increase in membership enrollment and a 12.2% increase in outpatient mental health utilization rates. There were no marked changes in the gender or age distribution in the study group by year; the majority of subjects were

TABLE 2. Utilization and Cost of Inpatient Mental Health Care Among Privately Insured Children and Adolescents, 1997–2000, by Diagnostic Group[a]

Utilization or Cost Measure and Diagnostic Group	Users of Inpatient Mental Health Care in 1997 (N=797)		Users of Inpatient Mental Health Care in 2000 (N=918)		Percent Change	Analysis of Year Effect		
	Mean[b]	SD	Mean[b]	SD		F	df	p
Days of care	14.37	13.11	11.50	11.08	–20.0	4.30	3, 3060	<0.005
Adjustment disorders	5.96	4.39	6.44	6.30	8.1	2.30	3, 96	<0.09
Anxiety disorders	10.34	9.89	3.75	2.62	–63.8	0.38	3, 21	0.77
Bipolar disorder	15.77	14.19	13.76	13.16	–12.7	1.14	3, 453	0.33
Depressive disorders	13.43	11.75	11.07	9.42	–17.6	2.67	3, 1545	<0.05
Hyperactivity	10.75	8.75	15.45	18.14	43.8	0.31	3, 91	0.82
Other mental health disorders	16.67	19.44	16.53	19.62	–0.9	0.80	3, 331	0.49
Psychosis	12.89	11.34	14.32	13.42	11.1	0.67	3, 111	0.57
Substance abuse	11.66	10.64	16.10	18.89	38.0	3.17	3, 201	<0.03
Cost per day (dollars)[c]	554.08	324.47	677.03	528.30	22.2	1.76	3, 3056	0.15
Adjustment disorders	618.91	337.46	454.07	462.22	–26.6	1.93	3, 96	<0.02
Anxiety disorders	643.13	368.25	418.09	368.25	–35.0	0.47	3, 21	0.71
Bipolar disorder	637.43	344.40	825.57	610.99	29.5	0.83	3, 453	0.48
Depressive disorders	599.04	321.66	604.15	380.80	0.9	2.60	3, 1545	<0.06
Hyperactivity	559.87	263.91	844.34	781.13	50.8	0.16	3, 90	0.92
Other mental health disorders	717.06	620.71	758.44	714.81	5.8	1.09	3, 329	0.35
Psychosis	563.73	279.81	819.73	718.92	45.4	0.80	3, 111	0.50
Substance abuse	473.76	287.41	783.77	906.43	65.4	0.60	3, 200	0.62
Annual cost per inpatient (dollars)[c]	6,600.68	6,745.47	5,384.98	5,699.62	–18.4	5.83	3, 3056	0.0006
Adjustment disorders	3,625.64	3,648.33	2,373.80	3,036.60	–34.5	1.76	3, 96	0.16
Anxiety disorders	6,571.26	7,490.20	1,718.79	2,408.78	–73.8	0.48	3, 21	0.70
Bipolar disorder	7,921.71	7,439.08	7,180.99	6,277.06	–9.4	0.87	3, 453	0.46
Depressive disorders	6,906.26	6,625.70	5,288.29	5,023.02	–23.4	5.63	3, 1545	0.0008
Hyperactivity	4,949.17	3,525.27	7,309.02	7,068.55	47.7	0.21	3, 90	0.89
Other mental health disorders	8,879.23	12,320.85	9,700.32	13,486.29	9.2	0.94	3, 329	0.42
Psychosis	7,559.59	8,332.80	6,495.72	6,808.59	–14.1	1.03	3, 111	0.38
Substance abuse	4,145.97	3,954.01	5,915.62	6,776.59	42.7	1.79	3, 200	0.15

[a] Data were obtained from MEDSTAT's MarketScan database of claims data from more than 200 private health insurance plans of large employers. A total of 352,413 individuals age ≤17 years with possible pharmacy data were enrolled in 1997, and 473,954 in 2000.
[b] Adjusted for age, gender, number of different diagnoses, and whether the patient had a dual diagnosis (a primary or secondary diagnosis of substance abuse in the same year as a non-substance-abuse mental health diagnosis).
[c] Adjusted for inflation and expressed as 1997 equivalents.

male (60.9% in 1997) and adolescent (51.6% were age 13–17 years in 1997). The diagnostic mix remained relatively unchanged with regard to the most common conditions (hyperactivity, depressive disorders, adjustment disorders, and other mental health disorders). By contrast, there were major differences between 1997 and 2000 in the proportion of children with a diagnosis of bipolar disorder, schizophrenia, or anxiety disorders (with increases of 52.4%, 25.4%, and 22.0%, respectively). Even though there were more youngsters with primary or comorbid substance abuse in 2000 than in 1997, these changes reflected actual proportional decreases (–19.6% and –24.4%, respectively). A similar pattern was seen for inpatient hospitalization (with a proportionate decrease of 23.7%). During the 4-year period, there was a small (4.9%) but statistically robust (Cochran Mantel-Haenszel χ^2=60.84, df=1, p<0.0001) increase in the proportion of children prescribed psychotropics. Overall, more than half of outpatient service users (60.1% across the 4 study years) were prescribed at least one psychotropic medication during any given year.

Trends for Use and Cost in Inpatient Care

Table 2 reports results for inpatient mental health care utilization and costs. Overall, annual costs per inpatient decreased $1,216 (18.4%) between 1997 and 2000. The decrease was entirely driven by a reduction in the number of inpatient days (–20.0%), as payments per inpatient day remained stable during the study interval (F=1.76, df=3, 3056, p=0.15). When inpatient costs and use were stratified across diagnoses, the only significant changes were seen for the depressive disorders and substance abuse groups. Depressed youths had changes that paralleled the group as a whole. By contrast, those with a primary substance abuse diagnosis had more inpatient days (38.0%), even as the difference in their annual inpatient aggregate costs did not reach significance. The relatively small numbers of subjects for these stratified analyses suggest the need for caution in interpreting the findings.

Trends for Use and Cost in Outpatient Care

Table 3 reports results for outpatient mental health utilization and costs. Overall, annual costs per patient decreased $157 (14.4%) between 1997 and 2000. The decrease was driven by a combination of fewer outpatient visits (–11.3%) and a decline in payments per outpatient visit (–6.1%). There was considerable variation in payment trends across diagnoses, with the most marked reductions seen in depressive disorders, hyperactivity, adjustment disorders, and anxiety disorders. For the first three of these

TABLE 3. Utilization and Cost of Outpatient Mental Health Care Among Privately Insured Children and Adolescents, 1997–2000, by Diagnosis[a]

Utilization or Cost Measure and Diagnostic Group	Users of Outpatient Mental Health Care in 1997 (N=17,230)		Users of Outpatient Mental Health Care in 2000 (N=26,006)		Percent Change	Analysis of Year Effect		
	Mean[b]	SD	Mean[b]	SD		F	df	p
Visits (days)	7.18	7.39	6.37	6.32	–11.3	83.50	3, 82975	<0.0001
Adjustment disorders	8.23	7.93	7.85	7.61	–4.6	6.48	3, 15781	0.0002
Anxiety disorders	8.17	8.96	7.03	7.22	–14.0	3.95	3, 6564	0.008
Bipolar disorder	9.65	9.80	9.79	10.28	1.4	0.19	3, 1254	0.90
Depressive disorders	9.47	9.82	8.31	8.49	–12.2	9.39	3, 13751	<0.0001
Hyperactivity	5.62	5.36	4.83	4.26	–14.2	17.82	3, 28412	<0.0001
Other mental health disorders	8.23	9.24	7.55	8.48	–8.3	3.71	3, 13941	<0.02
Psychosis	10.21	11.88	8.89	10.21	–12.9	0.55	3, 1220	0.65
Substance abuse	5.74	6.33	7.69	8.38	34.0	3.00	3, 1764	<0.03
Cost per day (dollars)[c]	179.71	123.63	168.68	117.75	–6.1	45.82	3, 82974	<0.0001
Adjustment disorders	127.22	66.72	113.49	58.09	–10.8	27.84	3, 15781	<0.0001
Anxiety disorders	164.94	113.11	173.29	127.37	5.1	0.19	3, 6564	0.90
Bipolar disorder	298.30	246.69	264.47	216.02	–11.3	1.08	3, 1254	0.36
Depressive disorders	175.32	119.73	160.94	107.17	–8.2	4.23	3, 13751	<0.006
Hyperactivity	198.47	129.46	187.14	126.90	–5.7	45.73	3, 28411	<0.0001
Other mental health disorders	174.71	135.11	180.35	149.98	3.2	3.13	3, 13941	<0.03
Psychosis	299.68	260.10	351.90	331.97	17.4	0.03	3, 1220	0.99
Substance abuse	224.45	256.00	273.37	281.82	21.8	1.14	3, 1764	0.33
Annual cost per outpatient (dollars)[c]	1,094.88	1,281.05	937.04	1,095.11	–14.4	81.60	3, 83037	<0.0001
Adjustment disorders	954.02	1,007.12	815.56	868.19	–14.5	21.30	3, 15781	<0.0001
Anxiety disorders	1,116.57	1,408.25	1,021.85	1,264.76	–8.5	2.94	3, 6564	<0.04
Bipolar disorder	2,293.33	2,733.66	2,073.19	2,589.70	–9.6	0.48	3, 1254	0.70
Depressive disorders	1,443.70	1,678.41	1,153.30	1,320.42	–20.1	14.98	3, 13751	<0.0001
Hyperactivity	895.65	903.88	763.23	783.92	–14.8	66.73	3, 28411	<0.0001
Other mental health disorders	1,202.78	1,636.63	1,236.46	1,772.52	2.8	6.38	3, 13941	0.0003
Psychosis	2,649.40	3,864.27	2,130.83	2,877.39	–19.6	0.31	3, 1220	0.82
Substance abuse	1,215.98	2,020.36	1,823.11	2,814.97	49.9	3.26	3, 1764	<0.03

[a] Data were obtained from MEDSTAT's MarketScan database of claims data from more than 200 private health insurance plans of large employers. A total of 352,413 individuals age ≤17 years with possible pharmacy data were enrolled in 1997, and 473,954 in 2000.
[b] Adjusted for age, gender, number of different diagnoses, and whether the patient had a dual diagnosis (a primary or secondary diagnosis of substance abuse in the same year as a non-substance-abuse mental health diagnosis).
[c] Adjusted for inflation and expressed as 1997 equivalents.

groups, payment declines paralleled the overall cost pattern (of reductions being driven by both fewer outpatient days and lower daily costs), while for the anxiety disorders group, decreases were solely the result of fewer days of treatment. Although annual costs for patients with psychosis increased over the period, the change was not statistically significant. In contrast, yearly costs for the bipolar disorder and other mental health disorders groups remained fairly constant during the study period, and the substance abuse group had an actual increase in payments of $607 (49.9%), largely driven by more outpatient days (a 34.0% increase).

Trends for Use and Cost of Psychotropic Medications

Table 4 shows data for outpatient psychotropic medication utilization and costs for the study period. There was an overall $41 (12.1%) increase in annual medication-related costs. Similar increases were seen across all diagnostic groups, even though they failed to reach statistical significance for the psychosis, substance abuse, and other mental health disorders groups. The most pronounced increases were seen in the mood and adjustment disorders: $169 for the bipolar disorder group, $75 for the depressive disorders group, and $72 for the adjustment disorders group, each representing a 21% change from 1997. Smaller changes, both in the same direction, were seen for the anxiety disorders and hyperactivity groups.

Medication costs increased across all diagnoses, and the differences reached statistical significance for all but the substance abuse group. Such trends, adjusted for monthly pill count equivalence, suggest that the increases in medication costs were largely driven by higher per-prescription prices. Since the current study analyzed aggregate psychotropic medication costs only, we did not explore whether specific drug classes were primarily responsible for such changes. Drug- and category-specific analyses will be presented separately (manuscript submitted for publication by A. Martin and D. Leslie, 2003).

Psychotropic medications accounted for a substantial and steadily increasing fraction of overall outpatient costs. Expressed as a percentage of overall costs among medicated outpatients, psychotropic medications represented 36.3% of costs in 2000, a 12.8% increase from 1997. There was variability in the relative change of these proportions across diagnoses, with the steepest increases seen for adjustment, anxiety, depressive, and other mental health disorders. Smaller shifts were seen for the hyperactivity group (6.9%), no change was seen for the psychosis group

TABLE 4. Cost of Psychotropic Medications Dispensed to Privately Insured Children and Adolescents Receiving Outpatient Mental Health Care, 1997–2000, by Diagnosis[a]

Cost Measure and Diagnostic Group	Outpatients Receiving Psychotropic Medication in 1997 (N=10,105)		Outpatients Receiving Psychotropic Medication in 2000 (N=15,993)		Percent Change	Analysis of Year Effect		
	Mean[b]	SD	Mean[b]	SD		F	df	p
Annual cost of medication (dollars)[c]	339.80	408.60	380.91	455.59	12.1	3.25	3, 50316	<0.03
Adjustment disorders	292.51	365.63	354.02	438.69	21.0	5.75	3, 4952	0.0006
Anxiety disorders	519.42	782.43	557.89	758.93	7.4	3.16	3, 3470	<0.03
Bipolar disorder	778.94	991.50	947.75	1,203.21	21.7	3.29	3, 1109	0.02
Depressive disorders	356.28	428.71	431.12	511.40	21.0	7.86	3, 9211	<0.0001
Hyperactivity	336.11	362.08	347.95	381.45	3.5	6.40	3, 25093	0.0003
Other mental health disorders	361.67	511.59	421.64	601.69	16.6	1.49	3, 4766	0.21
Psychosis	910.85	1,251.98	982.92	1,322.61	7.9	1.23	3, 798	0.30
Substance abuse	311.67	354.29	483.45	583.95	55.1	0.67	3, 640	0.57
Cost per month's supply of medication (dollars)[c]	40.93	24.98	46.26	25.85	13.0	112.06	3, 48864	<0.0001
Adjustment disorders	41.29	27.21	47.21	28.60	14.3	22.70	3, 4900	<0.0001
Anxiety disorders	49.54	40.54	57.28	36.13	15.6	13.37	3, 3303	<0.0001
Bipolar disorder	46.91	29.50	57.62	34.19	22.8	7.85	3, 1077	<0.0001
Depressive disorders	48.56	30.22	51.80	25.74	6.7	21.40	3, 8929	<0.0001
Hyperactivity	34.53	17.80	37.35	18.78	8.2	49.53	3, 24347	<0.0001
Other mental health disorders	42.60	31.69	57.02	43.47	33.8	10.57	3, 4653	<0.0001
Psychosis	67.07	57.06	70.81	47.95	5.6	3.06	3, 764	<0.03
Substance abuse	48.00	21.66	55.67	29.21	16.0	1.44	3, 625	0.23
Percent of annual outpatient cost accounted for by psychotropics	34.33	36.53	38.71	36.27	12.7	86.89	3, 50317	<0.0001
Adjustment disorders	25.70	28.80	31.03	32.22	20.7	18.45	3, 4952	<0.0001
Anxiety disorders	36.38	43.87	43.04	44.71	18.3	17.17	3, 3470	<0.0001
Bipolar disorder	51.82	65.87	46.50	43.28	–10.3	5.34	3, 1109	<0.002
Depressive disorders	29.88	34.20	36.51	37.24	22.2	30.34	3, 9211	<0.0001
Hyperactivity	44.31	40.39	47.38	37.44	6.9	19.84	3, 25094	<0.0001
Other mental health disorders	31.77	40.27	35.87	41.93	12.9	6.94	3, 4766	0.0001
Psychosis	46.74	54.10	51.96	50.97	11.2	2.72	3, 798	0.04
Substance abuse	31.29	44.14	41.14	56.26	31.5	0.99	3, 640	0.40

[a] Data were obtained from MEDSTAT's MarketScan database of claims data from more than 200 private health insurance plans of large employers. A total of 352,413 individuals age ≤17 years with possible pharmacy data were enrolled in 1997, and 473,954 in 2000.
[b] Adjusted for age, gender, number of different diagnoses, and whether the patient had a dual diagnosis (a primary or secondary diagnosis of substance abuse in the same year as a non-substance-abuse mental health diagnosis).
[c] Adjusted for inflation and expressed as 1997 equivalents.

(p=0.04), and actual decreases were seen for the bipolar disorder group (–10.3%).

Trends by Age Group

Age-specific trends followed similar patterns as those described earlier, namely reductions in inpatient days and in outpatient visits and daily costs, concurrent with increases in medication-related costs (data not shown). The decrease in outpatient costs was more pronounced for the older age group (age 13–17 years) and was driven by a reduction in inpatient days or outpatient visits. Increases in medication-related costs reached significance only for the older age group, likely an effect of the number of subjects, given that similar patterns emerged for the other age groups. The proportional increase in the fraction of costs accounted for by drugs was greatest for the older age groups, increasing to as high as 42.9% of overall outpatient costs for adolescents in 2000.

Discussion

In this study, we used data from a national group of privately insured children and adolescents to examine changes in utilization and cost patterns associated with the delivery of mental health care. In contrast to the decreasing enrollment and utilization rates seen for a similar study population between 1993 and 1996 (4), our results reveal a steady increase in both parameters during the latter part of the decade. Despite these favorable changes, many of the trends that had been previously identified as causes for concern continued during the more recent study period, most notably an ongoing decrease in both inpatient and outpatient service intensity and associated reimbursements. Specifically, annual inpatient payments decreased by 18.4%, the result of fewer days (–20.0%), while outpatient treatment payments decreased by 14.4%, a change driven by a combination of fewer outpatient visits (–11.3%) and reduced payments per visit (–6.1%).

There was considerable variation in payment trends across diagnoses, with the most marked reductions seen for depressive disorders, hyperactivity, adjustment disorders, and anxiety disorders; no overt changes noted for bipolar disorder and psychosis; and actual increases seen for primary substance abuse. Such trends, divergent across diagnostic lines, are in keeping with the findings of earlier studies (4, 16, 21), in which steeper reductions have been documented for less severe and less costly condi-

tions (e.g., adjustment disorders, anxiety disorders, hyperactivity, and mild depressive disorders), compared to the more chronic and incapacitating ones (e.g., schizophrenia and bipolar disorder). Our finding of higher payments for substance abuse treatment is of interest. The fact that such change was largely driven by more inpatient days or outpatient visits suggests that, at least for those subjects who received treatment (19.6% fewer of them in 2000 than in 1997), care may have been more intensive.

In sharp contrast, the use and costs associated with psychotropic medications increased steeply during the same period. Psychotropic drug use went from a prevalence of 58.6% of outpatients in 1997 to 61.5% in 2000—a 4.9% change that was most significant for children age ≤6 years (6.5%) (Cochran Mantel-Haenszel χ^2=4.56, df=1, p=0.03) and for adolescents age 13–17 years (8.5%) (Cochran Mantel-Haenszel χ^2=72.94, df=1, p<0.0001). It is worth noting that by 2000 more than one in four (26.1%) children age ≤6 years had been prescribed at least one psychotropic during the study year.

Taken together, these opposing utilization and cost trends translate into a steady decrease in the intensity of both inpatient and outpatient mental health services, concurrent with an increase in the proportion of outpatient expenditures accounted for by psychotropic medications. Among outpatients who received medications, psychotropic-related costs increased by 12.1% during the study period, up to 38.7% of overall annual costs. Indeed, psychotropic costs represented more than 45% of annual outpatient expenditures for the bipolar disorder, hyperactivity, and psychosis groups. Given that changes remained constant even after costs were adjusted to the medication day supply, cost increases were instead the result of more expensive prescriptions being dispensed (manuscript submitted for publication by A. Martin and D. Leslie, 2003).

Several factors may alone or in combination be responsible for the described trends:

1. Managed care: A central goal of the cost containment mechanisms used by managed care is to substitute costly services, particularly those provided in inpatient settings, for appropriate and less costly outpatient alternatives (22). This study suggests that shifts in the delivery of both inpatient and outpatient treatments to a service mix characterized by the putatively more cost-efficient modality of pharmacotherapy are widespread in heavily managed care environments.
2. Clinical preference: Clinicians may have lower thresholds for prescribing medication for conditions viewed as amenable to pharmacological treatment, especially when resorting to newer agents and their perceived (although not always substantiated) more favorable safety and side effect profiles. This preference may help explain the clearer shift toward pharmacotherapy seen in the less severe forms of psychopathology (such as the adjustment disorders).
3. Empirical support: The expanding evidence base of pediatric psychopharmacology may be reflected in these trends, even if some of the more relevant publications did not appear in print until well within or after the study period (23, 24), making clinicians' uptake and implementation of research findings so early on an unlikely explanation for the large changes seen. Moreover, even conditions such as bipolar disorder, which lack an evidence base comparable to those for depressive and anxiety disorders in children and adolescents, experienced similar changes in medication-related costs.
4. Direct-to-consumer and direct-to-prescriber advertising: There is considerable interest in the effect of targeted marketing practices on prescribing and clinical trends (25). Although such forces may have been actively at play during the study period, one limitation of this study is its inability to determine the role of such forces in the changes described.

This study has several other limitations worth mentioning. First, the MarketScan database, despite its size and complexity, is not compiled through probability sampling and is limited to privately insured individuals. Thus, it is subject to limited generalizability, despite estimates that 47% of youths nationally are covered by some form of private insurance (3). Second, the lack of information regarding quality of care, clinical outcomes, or patient satisfaction does not allow for a real cost-benefit analysis or for assessment of "real-world" effectiveness. Third, the lack of data from other settings of care (such as schools, the juvenile justice system, and welfare agencies) further limits generalizability. Along a similar line, this study did not adjust for the specific site of care (primary versus mental health specialty clinic) or for provider type (specialist versus nonspecialist). In addition to providing information about different prescribing trends, such variables could be of interest in helping to assess undiagnosed or uncoded behavioral conditions. Finally, inpatient medication costs could not be separately analyzed through this database, and for this study we analyzed medication costs only at the aggregate level. Cost breakdowns along medication class and brand/generic lines are the subject of a separate report (manuscript submitted for publication by A. Martin and D. Leslie, 2003).

Despite these limitations, this study documents that reductions in both inpatient and outpatient mental health reimbursement continued through the late 1990s and were accompanied by concurrent increases in the use and costs of psychotropic medications, particularly for youths with mood and anxiety disorders. These results document shifts toward medication-based outpatient treatment modalities that are not equally justified across age- and diagnosis-specific indications on the basis of available research evidence. Data from clinical trials conducted in younger children and in those with a diagnosis of pediatric

bipolar disorder are notably lacking, and cost-benefit analyses and "real-world" effectiveness studies of pediatric psychopharmacology more generally have yet to be carried out. Future studies should further address the effect of managed care and of pharmaceutical marketing influences on trends in clinical care, and multiple measures (including cost) should be incorporated into future pediatric psychopharmacology outcomes research.

APPENDIX 1. ICD-9 Codes Corresponding to Mental Health Diagnostic Categories in a Study of Psychiatric Inpatient, Outpatient, and Medication Utilization and Costs Among Privately Insured Youths, 1997–2000

Diagnostic Category	ICD-9 Code
Adjustment disorders	309.00–309.09, 309.20–309.99
Anxiety disorders	300.00–300.39, 307.20–307.23, 308.00–308.99, 313.00–313.29
Bipolar disorder	296.00–296.19, 296.40–296.81, 296.89–296.99
Depressive disorders	296.20–296.39, 296.82, 300.40–300.59, 301.10, 309.10–309.19, 311.00–311.99
Hyperactivity	314.00–314.99
Other mental health disorders	290.00–290.99, 293.00–294.99, 300.60–301.09, 301.11–302.99, 306.00–307.19, 307.30–307.99, 310.00–310.99, 312.00–312.99, 313.30–313.99, 315.00–319.99
Psychosis	295.00–295.99, 297.00–299.99
Substance abuse	291.00–292.99, 303.00–305.99

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