ARTICLE

Psychotropic Practice Patterns for Youth

A 10-Year Perspective

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Objective: To examine changes in the full spectrum of psychotropic medication treatment for youths from 1987 to 1996.

Methods: A population-based analysis of community treatment data on nearly 900 000 youths enrolled in 2 US health care systems included (1) computerized Medicaid data from 2 states (a midwestern state and a mid-Atlantic state) composed of outpatient prescription claims and enrollment records and (2) computerized prescription dispensing records from a group-model health maintenance organization. Ten 1-year cross-sectional data sets from 1987 through 1996 were analyzed.

Results: Total psychotropic medication prevalence for youths increased 2- to 3-fold and included most classes of medication. The rapid growth since 1991 of α-agonists, neuroleptics, and "mood stabilizer" anticonvulsants was particularly notable. The 1996 prevalence of any psychotropic medication among youths younger than 20 years was remarkably similar (5.9%-6.3%) across all 3 sites, with stimulants and antidepressants consistently ranked first and second. Medicaid rates almost always exceeded health maintenance organization rates by large margins, particularly for α-agonists, neuroleptics, "mood stabilizer" anticonvulsants, and lithium. Youths in health maintenance organizations had rates similar to Medicaid-insured youths for antidepressants and hypnotics. Over the decade, there was a proportional increase in females receiving stimulants and in males receiving antidepressants, particularly for the 10- to 14-year-old group. The prevalence ratios of whites to African Americans narrowed substantially in 1 Medicaid site.

Conclusions: Youth psychotropic treatment utilization during the 1990s nearly reached adult utilization rates. Youth findings can be used to accurately assess the duration of treatment and unforeseen practice pattern changes, and to identify safety concerns.

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INCREASED UTILIZATION of psychotropic medication for the treatment of behavioral and emotional problems in children and adolescents has received widespread attention in the past decade. This attention is reflected in news coverage of research, in updated clinical practice standards,[1,2] in the Surgeon General's national action agenda for children's mental health,[3] in consumer-sponsored[4] and government-sponsored[5] consensus building, in federal initiatives related to drug product labeling for pediatric indications,[6] and in altered standards for evaluation and safety.[7] Heightened awareness of increased medication prevalence rates has generated explanations related to improved treatment access and referral[8] as well as to efforts that might ensure appropriateness by producing guidelines and algorithms.[9-11]

To date, the extent of psychotropic medication treatment for youths receiving care in community settings has been reported[12-18] with low-moderate reliability or from local samples. Moreover, most empirical studies[19-25] have focused on stimulants, the most commonly used psychotropic medications for the treatment of attention-deficit/hyperactivity disorder, the most common child psychiatric disorder. Knowledge of psychotropic utilization trends from data sources in multiple regions of the United States and large

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populations would enhance the evidence base for youth psychopharmacology. This article presents a systematic approach for defining youth populations and comparing psychotropic utilization with respect to the following 4 critical variables: age, gender, race or ethnicity, and insurance status. The specific aim is to provide an

overview of the prevalence and patterns of use across *all major* psychotropic medication classes during a decade in which there were substantial clinical and policy changes that affected the youth population in the United States.

METHODS

STUDY DESIGN

A cross-sectional design for each of 10 years (1987-1996) was used to characterize psychotropic medication utilization for youths younger than 20 years. Trends were depicted as the annual prevalence of psychotropic treatments during the decade.

DATA SOURCES

Data for the study are based on computerized administrative claims and medical records data from 2 health care systems. The computerized administrative claims data represent 2 geographically distinct Medicaid populations, 1 in a midwestern state (MWM) and 1 in a mid-Atlantic state (MAM). These data comprise the fee-for-service payment category, which in the study years represented most (≥75%) Medicaid-enrolled youths. The second health care system data set is derived from computerized records of a large, nonprofit, group-model health maintenance organization (HMO) serving a predominantly employed population in the Northwest region of the United States. The University of Maryland (Baltimore) institutional review board granted the study an exemption from written patient consent because data were received with coded identifiers that could not be linked to the individual.

STUDY POPULATION

The total enrollment (continuous and noncontinuous [coverage for part of the year]) for each 1-year period for youths younger than 20 years in 1987 and 1996, respectively, was as follows: MWM, 627 187 and 645 356; MAM, 138 018 and 121 700; and HMO, 111 686 and 130 638. Nonwhites were overrepresented in the Medicaid populations and were underrepresented among HMO enrollees according to general statistical profiles of the settings as previously described.[26]

STUDY PROCEDURES

Each state's Medicaid fee-for-service reimbursement claims for psychotropic prescription drugs were organized into a data set according to previously published methods.[27] The HMO medication records comprised computerized psychotropic prescription dispensing data for the study periods and were organized into the same pharmacologic categories as the Medicaid prescription data.

Medication categories were defined according to the American Hospital Formulary System.[28] The group included several medications that are typically used to treat behavioral and emotional disorders in children or that have both medical and psychiatric usage. The major classes of psychotropic medications included antidepressants, anxiolytics, hypnotics, lithium, neuroleptics, and stimulants. Subclasses were created for antidepressants (selective serotonin reuptake inhibitors [SSRIs], tricyclic antidepressants [TCA], and "other" antidepressants [trazodone hydrochloride, bupropion hydrochloride, maprotiline hydrochloride, and venlafaxine hydrochloride]); anxiolytics and hypnotics (benzodiazepines and nonbenzodiazepines); and stimulants (methylphenidate hydrochloride, amphetamines, and pemoline). Other medication groups that are often used in psychiatry included "mood stabilizer" anticonvulsants (valproate sodium, carbamazepine, and gabapentin), classically used to treat seizure disorders but increasingly used to control aggression or mania; α-adrenergic agonists (clonidine hydrochloride and guanfacine hydrochloride) that are indicated for the treatment of adult hypertension, but are increasingly used to treat the insomnia that accompanies attention-deficit/hyperactivity disorder or stimulant treatment; and an antianxiety-antihistamine (hydroxyzine hydrochloride), which has use for both medical and psychiatric purposes.

DATA ANALYSIS

In establishing the prevalence of use, the numerator data reflect youths with a prescription claim for any psychotropic medication during each of 10 one-year intervals from 1987 through 1996. The denominator data reflect the total enrolled youth population for each year and were subdivided for specific sociodemographic analyses. Population-based period prevalence and 95% confidence intervals for total, class-specific, and subclass-specific psychotropic medications were calculated according to health care site. Time trends for the 10-year period (1987-1996) were also assessed. Psychotropic medication prevalence was measured as the number of youths among each 100 (or 1000) enrolled youths with at least 1 prescription claim or dispensing record for a psychotropic medication in the study year. Descriptive measures of prevalence were established in terms of age, gender, and, for the Medicaid enrollees, race or ethnicity. Medicaid enrollee self-reported race or ethnicity information was categorized into white, African American, and all others. To measure gender and racial disparities, the male-female and white–African American prevalence ratios were calculated for any psychotropic medication and for specific drug classes. Confidence intervals for the prevalence ratios were calculated in a standard manner by means of a Taylor series approach.[29]

RESULTS

POPULATION CHARACTERISTICS

The sociodemographic characteristics of enrollees for each health care site at the start and end of the decade are shown in **Table 1**. Males and females were equally represented among enrollees in all 3 sites; however, the age distribution differed between Medicaid and HMO youth enrollees. Specifically, the Medicaid populations comprised proportionally more enrollees younger than 5 years and fewer 15- to 19-year-olds compared with the HMO populations, where enrollees were equally distributed across age groups. Most of the MAM population was African American, although there was a substantial proportional decline in these enrollees in 1996 (65%) from 1987 (50%), accompanied by an increase in whites and in other minorities (largely Hispanic). In MWM, there was a white predominance, which was stable across the study period.

TRENDS IN PSYCHOTROPIC MEDICATION PREVALENCE

During the decade examined in this study, there was an overall 3-fold increase in total psychotropic medication prevalence among HMO (to 5.9%) and MWM (to 6.3%) youths, and a doubling among MAM youths (to 6.2%) (**Table 2**). Most of this growth took place after 1991.

Table 1. Characteristics of the Population From 3 Health Care Sites

Demographic Characteristics	Health Care Service System					
	MAM		MWM		HMO	
	1987	1996	1987	1996	1987	1996
Enrollees, No.	138018	121700	627187	645356	111686	130638
Sex, %						
M	49	48	50	49	51	51
F	51	52	50	51	49	49
Age, % of patients, y						
0-4	35	36	30	38	23	23
5-9	26	26	29	28	26	25
10-14	20	18	21	19	25	26
15-19	19	20	20	15	26	26
Race/ethnicity, %						
White	33	39	63	63	NA	NA
African American	65	50	31	33	NA	NA
Other	2	11	6	4	NA	NA

Abbreviations: HMO, health maintenance organization; MAM, Medicaid data from a mid-Atlantic state; MWM, Medicaid data from a midwestern state; NA, not available.

Table 2. Annual Prevalence per 1000 Youths Younger Than 20 Years for Total Psychotropic (Any) Utilization and for 9 Psychotropic Categories in 3 Health Care Sites, and the Prevalence Ratio (10-Year Change [1987-1996])*

	MAM				MWM				HMO			
	Prevalence			Prevalence Ratio	Prevalence			Prevalence Ratio	Prevalence			Prevalence Ratio
	1987	1991	1996		1987	1991	1996		1987	1991	1996	
Enrollees, No.	138 018	165 502	121 700	. . .	627 187	669 164	645 356	. . .	111 686	131 038	130 638	. . .
Psychotropic, any	18.4 (17.7-19.1)	36.8 (35.9-37.7)	61.6 (60.3-63.0)	3.3 (3.2-3.5)	28.3 (27.9-28.7)	31.7 (31.3-32.1)	62.6 (62.0-63.2)	2.2 (2.2-2.2)	18.6 (17.8-19.4)	27.1 (26.2-28.0)	59.1 (57.8-60.3)	3.2 (3.0-3.3)
Medications												
α-Agonists	0.04 (0.01-0.08)	0.44 (0.3-0.5)	6.6 (6.2-7.1)	153.0 (68.0-341.0)	0.14 (0.11-0.17)	0.51 (0.45-0.56)	7.3 (7.1-7.5)	53.0 (43.0-65.0)	0.10 (0.05-0.17)	0.37 (0.26-0.47)	3.9 (3.6-4.2)	36.0 (20.4-64.2)
Anticonvulsants, "mood stabilizer"	2.2 (1.9-2.4)	5.9 (5.5-6.3)	12.8 (12.1-13.4)	5.9 (5.2-6.7)	4.9 (4.8-5.1)	6.6 (6.4-6.8)	10.8 (10.6-11.1)	2.2 (2.1-2.3)	1.1 (0.9-1.3)	1.9 (1.7-2.2)	2.7 (2.4-2.9)	2.5 (2.0-3.1)
Antidepressants	1.9 (1.7-2.2)	10.1 (9.6-10.5)	20.5 (19.7-21.3)	10.4 (9.1-11.7)	5.6 (5.5-5.8)	8.3 (8.1-8.5)	20.4 (20.0-20.7)	3.6 (3.5-3.7)	2.7 (2.4-3.0)	5.7 (5.3-6.1)	16.6 (15.9-17.3)	6.2 (5.5-7.0)
Anxiolytics	1.0 (0.85-1.2)	3.4 (3.1-3.7)	4.5 (4.1-4.9)	4.4 (3.7-5.3)	6.2 (6.0-6.4)	4.2 (4.1-4.4)	4.8 (4.6-5.0)	0.8 (0.7-0.8)	1.6 (1.4-1.9)	1.8 (1.6-2.0)	5.5 (5.1-5.9)	3.4 (2.9-4.0)
Hydroxyzine	0.86 (0.71-1.02)	2.3 (2.1-2.5)	3.1 (2.8-3.4)	3.6 (2.9-4.4)	1.8 (1.7-1.9)	1.7 (1.6-1.8)	2.7 (2.5-2.8)	1.5 (1.4-1.6)	4.3 (3.9-4.7)	7.0 (6.5-7.4)	9.5 (9.0-10.0)	2.2 (2.0-2.5)
Hypnotics	0.28 (0.19-0.37)	3.7 (3.4-3.9)	1.5 (1.3-1.7)	5.2 (3.7-7.4)	2.8 (2.7-2.9)	2.2 (2.1-2.3)	1.8 (1.7-1.9)	0.7 (0.6-0.7)	2.2 (1.9-2.4)	2.2 (1.9-2.4)	1.6 (1.4-1.8)	0.7 (0.6-0.9)
Lithium	0.25 (0.16-0.33)	2.6 (2.3-2.8)	3.7 (3.3-4.0)	14.8 (10.5-21.0)	0.32 (0.28-0.37)	0.9 (0.8-1.0)	1.6 (1.5-1.7)	5.1 (4.4-5.9)	0.16 (0.09-0.24)	0.5 (0.4-0.6)	0.8 (0.6-1.0)	4.9 (3.0-8.1)
Neuroleptics	1.5 (1.3-1.7)	4.5 (4.2-4.8)	8.0 (7.5-8.5)	5.5 (4.6-6.6)	3.3 (3.1-3.4)	3.3 (3.1-3.4)	5.4 (5.2-5.6)	1.6 (1.6-1.7)	0.41 (0.3-0.5)	0.5 (0.4-0.7)	1.0 (0.8-1.1)	2.3 (1.7-3.3)
Stimulants	14.3 (13.6-14.9)	16.2 (15.6-16.8)	38.4 (37.3-39.5)	2.7 (2.6-2.8)	10.1 (9.8-10.3)	12.9 (12.7-13.2)	37.2 (36.8-37.7)	3.7 (3.6-3.8)	3.6 (3.3-4.0)	6.5 (6.1-7.0)	25.4 (24.6-26.3)	7.0 (6.3-7.8)

Abbreviations: HMO, health maintenance organization; MAM, Medicaid data from a mid-Atlantic state; MWM, Medicaid data from a midwestern state.
*The 95% confidence intervals are given in parentheses. Ellipses indicate not applicable.

While the difference in the 1996 prevalence of "any" psychotropic use between the HMO and Medicaid populations was negligible, substantial differences in their populations are suggested by the differing patterns for particular medication classes. To illustrate, in 1996 the HMO youth population compared with Medicaid-enrolled youths had a 32% lower prevalence per 1000 for stimulants (25.4 vs 37.2 and 38.4) and a 19% lower prevalence for antidepressants (16.6 vs 20.4 and 20.5), respectively.

Among stimulants, methylphenidate ranked foremost, accounting for 77% to 87% of stimulant use, and the 10-year prevalence increase ranged from 2.5-fold to 3.7-fold for Medicaid youths and 7.2-fold for HMO youths. However, the most dramatic increase occurred for amphetamines (largely dextroamphetamine sulfate, since Adderall [Shire US, Inc, Florence, Ky] was not marketed until 1996), which experienced a 7-fold increase among MAM youths and 14-fold increase among HMO youths. Dextroamphetamine was not used in the MWM at the start of the decade, which most likely reflects a prior-authorization requirement in that state formulary. This restriction resulted in a disproportionately lower use of amphetamines at the end of the decade for the MWM (2.7%) compared with the MAM (19.8%) and the HMO (23.6%). Pemoline use increased 2- to 3-fold during the decade but declined subsequently.[30]

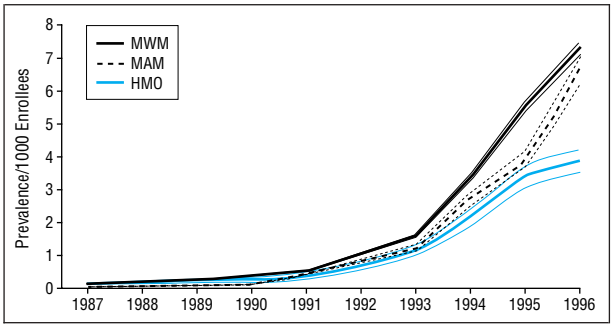

Figure 1. α-Agonist prevalence per 1000 enrollees across 10 years in 3 health care sites. MWM indicates Medicaid data from a midwestern state; MAM, Medicaid data from a mid-Atlantic state; and HMO, health maintenance organization. Thin lines surrounding the prevalance data represent the 95% confidence interval of the estimate.

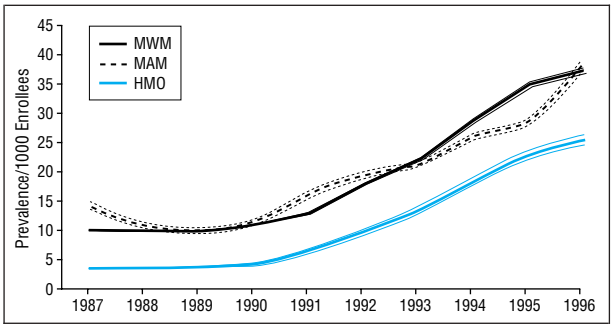

Figure 2. Stimulant prevalence per 1000 enrollees across 10 years in 3 health care sites. MWM indicates Medicaid data from a midwestern state; MAM, Medicaid data from a mid-Atlantic state; and HMO, health maintenance organization. Thin lines surrounding the prevalance data represent the 95% confidence interval of the estimate.

Antidepressant medications were the second most commonly prescribed medication by 1996 (Table 2), which was due in large part to the increase in SSRI use. During the mid-1990s, SSRIs comprised half of the total antidepressant use. The overall increased antidepressant usage, however, is not attributable to second-generation antidepressants alone. Although TCA usage represented virtually all antidepressants in 1987, its prevalence during the decade was maintained despite the growth of SSRI use.[31] The "other antidepressant" subclass had been negligible in 1987, but with the advent of new agents, eg, nefazodone hydrochloride (1995) and venlafaxine (1994), it represented a substantial proportion of antidepressant use by 1996.

α-Agonist medications (almost entirely clonidine) had the most dramatic increase, from near nonuse in 1987 to ranking among the top 5 medications by 1996 (**Figure 1**). Its prevalence had increased 2 orders of magnitude by 1996 to 3.9 (HMO), 6.6 (MAM), and 7.3 (MWM) per 1000. The rate of α-agonist use within the HMO was almost half that within Medicaid, a relationship that is consistent with the comparatively lower rate of stimulant use in the HMO. The relationship is clinically understandable, since α-agonists are typically prescribed in combination with stimulants.[16,32] The increased use of these 2 medication classes occurred for the most part between 1991 and 1996 (Figure 1 and **Figure 2**).

In 1996, medications for the treatment of anxiety showed a significantly *greater* prevalence per 1000 enrollees in the HMO population than in the Medicaid populations (5.5 [HMO] vs 4.5 [MAM] and 4.8 [MWM]) (Table 2). Overall, there was a 4-fold increase in anxiolytic use among MAM and HMO enrollees, which is largely explained by the growth of benzodiazepines during the 10 years to a 1996 prevalence of 5.3 (HMO) vs 3.8 (MAM). By contrast, the MWM had an overall drop in anxiolytic prevalence (0.78-fold), which was due to a large drop in benzodiazepine use. This drop is consistent with the introduction in January 1989 of a requirement for prior authorization to prescribe a widely used brand of alprazolam. The utilization of hypnotics was similar across the 3 sites, but hydroxyzine prevalence per 1000 was substantially greater in the HMO population than in either Medicaid group (9.5 [HMO]; 3.6 [MAM]; 2.7 [MWM]) for unclear reasons.

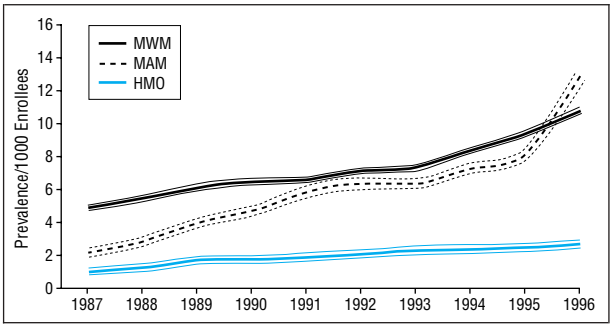

Figure 3. "Mood stabilizer" anticonvulsant prevalence per 1000 enrollees across 10 years in 3 health care sites. MWM indicates Medicaid data from a midwestern state; MAM, Medicaid data from a mid-Atlantic state; and HMO, health maintenance organization. Thin lines surrounding the prevalance data represent the 95% confidence interval of the estimate.

Neuroleptics, "mood stabilizer" anticonvulsants, and lithium are generally used to treat symptoms associated with psychotic disorders and mania or to control acting out and violent behaviors.[33] Neuroleptics were less likely to be prescribed for the HMO youths (1.0 [HMO]; 8.0 [MAM]; 5.4 [MWM]). "Mood stabilizer" anticonvulsant prevalence per 1000 had a similar variation (3.8 [HMO]; 13.8 [MAM]; 11.4 [MWM]), as did lithium (0.8 [HMO]; 3.7 [MAM]; 1.6 [MWM]). The modest lithium increases across the decade contrast sharply with the substantial increase in anticonvulsants. Most of the anticonvulsant increase is explained by the growth in the use of "mood stabilizer" anticonvulsants (5.9-fold [MAM]; 2.2-fold [MWM]; 2.5-fold [HMO]) and not by an increase in the use of other anticonvulsants (2.3-fold [MAM]; 0.8-fold [MWM]; 0.6-fold [HMO]) (**Figure 3**).

CHANGING CHARACTERISTICS OF MEDICATION-TREATED YOUTH POPULATIONS

Age-Specific Patterns

By 1996, the 10- to 14-year-old age group replaced 5- to 9-year-olds as the largest group of utilizers of any psychotropic in both Medicaid populations. By contrast, 15- to 19-year-olds were the most prominent age group utilizing any psychotropic medication in the HMO population (**Table 3**).

Table 3. Age-, Gender-, and Race/Ethnicity-Specific Prevalence of Any Psychotropic Medication*

	MAM		MWM		HMO	
	1996 Prevalence	1996-1987 Prevalence Ratio	1996 Prevalence	1996-1987 Prevalence Ratio	1996 Prevalence	1996-1987 Prevalence Ratio
Age group, y						
0-4	9.8 (8.8-10.7)	2.3 (2.0-2.7)	15.3 (14.8-15.7)	1.1 (1.1-1.2)	17.7 (16.2-19.2)	1.5 (1.3-1.7)
5-9	95.4 (92.0-99.0)	2.5 (2.3-2.7)	86.8 (86.0-88.0)	2.6 (2.5-2.7)	58.5 (55.9-61.0)	3.1 (2.8-3.4)
10-14	129.4 (125.0-134.0)	4.8 (4.4-5.2)	105.1 (103.0-107.0)	3.4 (3.2-3.5)	72.0 (69.3-74.8)	4.0 (3.6-4.3)
15-19	54.5 (52.0-57.0)	7.2 (6.2-8.3)	81.5 (79.0-83.0)	2.0 (1.9-2.1)	82.8 (79.8-85.7)	3.3 (3.1-3.6)
Sex						
Male	87.9 (86.0-90.0)	3.1 (3.0-3.3)	83.0 (82.0-84.0)	2.6 (2.5-2.6)	59.1 (57.8-60.3)	3.5 (3.2-3.7)
Female	37.5 (36.0-38.9)	4.0 (3.7-4.3)	42.7 (42.0-43.0)	1.8 (1.7-1.8)	68.5 (66.5-70.4)	2.8 (2.6-3.0)
M/F prevalence ratio	2.4 (2.2-2.5)	0.8 (0.7-0.9)	1.9 (1.8-1.9)	1.4 (1.4-1.5)	1.4 (1.3-1.5)	1.2 (1.1-1.3)
Race/ethnicity						
White (W)	86.6 (84.0-89.1)	2.5 (2.4-2.7)	75.2 (74.4-76.0)	2.2 (2.1-2.2)	NA	NA
African American (A)	51.3 (49.5-53.1)	4.8 (4.4-5.1)	34.6 (33.8-35.4)	2.2 (2.1-2.2)	NA	NA
W/A prevalence ratio	1.7 (1.6-1.8)	0.5 (0.5-0.6)	2.2 (2.1-2.2)	1.0 (1.0-1.1)	NA	NA

Abbreviations: HMO, health maintenance organization; MAM, Medicaid data from a mid-Atlantic state; MWM, Medicaid data from a midwestern state; NA, not available.
*Specific prevalence per 1000 youths in 3 health care sites in 1996, and the prevalence ratio (10-year change [1987-1996]). The 95% confidence intervals are given in parentheses.

Table 4. Age-, Gender-, and Race/Ethnicity-Specific Prevalence of Stimulants*

	MAM		MWM		HMO	
	1996 Prevalence	1996-1987 Prevalence Ratio	1996 Prevalence	1996-1987 Prevalence Ratio	1996 Prevalence	1996-1987 Prevalence Ratio
Age group, y						
0-4	4.2 (3.6-4.8)	1.8 (1.4-2.3)	6.8 (6.5-7.1)	2.4 (2.1-2.6)	3.7 (3.0-4.4)	4.7 (2.9-7.4)
5-9	78.4 (75.5-81.4)	2.3 (2.2-2.5)	69.8 (68.7-71.0)	3.4 (3.2-3.5)	40.3 (38.1-42.4)	5.1 (4.4-5.9)
10-14	81.8 (78.1-85.5)	4.0 (3.7-4.4)	67.9 (66.5-69.4)	5.1 (4.8-5.3)	42.6 (40.4-44.7)	8.1 (6.8-9.6)
15-19	12.1 (10.7-13.5)	4.5 (3.5-5.8)	12.9 (12.2-13.6)	6.1 (5.3-7.0)	13.1 (11.9-14.3)	25.4 (15.2-42.5)
Sex						
Male	60.4 (58.5-62.3)	2.6 (2.5-2.8)	57.9 (57.1-58.8)	3.7 (3.6-3.8)	40.3 (38.8-41.8)	6.4 (5.8-7.2)
Female	18.1 (17.1-19.2)	3.1 (2.7-3.4)	17.0 (16.5-17.4)	3.8 (3.6-4.1)	10.2 (9.4-11.0)	11.2 (8.4-14.9)
M/F prevalence ratio	3.3 (3.1-4.2)	0.9 (0.8-1.0)	3.4 (3.3-3.7)	1.0 (0.9-1.0)	4.0 (3.6-7.5)	0.6 (0.4-0.8)
Race/ethnicity						
White (W)	55.9 (53.9-58.0)	2.1 (1.9-2.2)	44.3 (43.7-45.0)	3.6 (3.5-3.7)	NA	NA
African American (A)	31.1 (29.7-32.4)	3.9 (3.6-4.3)	21.1 (20.5-21.7)	3.7 (3.5-4.0)	NA	NA
W/A prevalence ratio	1.8 (1.7-3.6)	0.5 (0.5-0.6)	2.1 (2.0-2.2)	1.0 (0.9-1.0)	NA	NA

Abbreviations: HMO, health maintenance organization; MAM, Medicaid data from a mid-Atlantic state; MWM, Medicaid data from a midwestern state; NA, not available.
*Specific prevalence per 1000 youths in 3 health care sites in 1996, and the prevalence ratio (10-year change [1987-1996]). The 95% confidence intervals are given in parentheses.

Age-specific prevalence trends for 1987 through 1996 for stimulants (**Table 4**), neuroleptics, lithium, and "mood stabilizer" anticonvulsants were examined. The findings for neuroleptics, lithium, and "mood stabilizer" anticonvulsants are not shown. The data showed proportionally larger stimulant use increases generally among 10- to 14- and 15- to 19-year-olds than among 5- to 9-year-olds. Thus, by 1996, stimulant prevalence for 10- to 14-year-old enrollees exceeded (and in 1 site equaled) the rates for 5- to 9-year-olds. This trend represented a reversal of the 1987 pattern, which was characterized by the 5- to 9-year-olds being the predominant stimulant-treated age group.

Antidepressant prevalence in 1996 in the HMO was highest in the 15- to 19-year-old age group (**Table 5**). Among Medicaid enrollees, however, the antidepressant prevalence in 10- to 14-year-olds was equal to or greater than that of 15- to 19-year-olds. In 1996, SSRI use in all 3 sites had grown to rates slightly exceeding that of TCAs for 10- to 14-year-olds and substantially exceeding TCA rates for 15- to 19-year-old enrollees. Nonetheless, the overall level of TCA use grew moderately during the decade in all 3 populations. Physician specialty and diagnostic findings related to antidepressant treatment trends have been presented elsewhere.[31]

Gender-Specific Patterns

In 1996, among males, prevalence rates for any psychotropic medication were twice those of females. The male-female prevalence ratio favored males in the Medicaid populations to a greater extent than in the HMO (Table 3).

Between 1987 and 1996, the overall stimulant prevalence for females increased to a greater degree than the

Table 5. Age-, Gender-, and Race/Ethnicity-Specific Prevalence of Antidepressants*

	MAM		MWM		HMO	
	1996 Prevalence	1996-1987 Prevalence Ratio	1996 Prevalence	1996-1987 Prevalence Ratio	1996 Prevalence	1996-1987 Prevalence Ratio
Age group, y						
0-4	1.3 (1.0-1.6)	5.6 (2.9-10.7)	2.0 (1.8-2.2)	1.4 (1.2-1.6)	0.5 (0.2-0.8)	1.9 (0.8-4.7)
5-9	21.6 (19.9-23.2)	6.6 (5.5-8.1)	17.7 (17.1-18.3)	3.1 (2.9-3.3)	7.6 (6.7-8.6)	2.3 (1.8-2.9)
10-14	49.6 (46.6-52.5)	12.8 (10.5-15.5)	38.5 (37.5-39.6)	5.7 (5.3-6.1)	19.7 (18.2-21.2)	5.8 (4.7-7.2)
15-19	29.1 (27.0-31.2)	21.0 (15.0-29.3)	48.0 (46.6-49.3)	4.5 (4.2-4.8)	36.2 (34.2-38.1)	10.3 (8.4-12.6)
Sex						
Male	27.1 (25.8-28.4)	9.2 (7.9-10.6)	22.7 (22.2-23.2)	4.1 (3.8-4.3)	14.8 (13.8-15.7)	5.3 (4.5-6.3)
Female	14.4 (13.5-15.3)	13.6 (10.8-17.3)	18.0 (17.6-18.5)	3.2 (3.0-3.3)	18.5 (17.4-19.5)	7.2 (6.0-8.6)
M/F prevalence ratio	1.9 (1.7-2.0)	0.7 (0.5-0.9)	1.3 (1.2-1.3)	1.3 (1.2-1.3)	0.8 (0.7-0.9)	0.7 (0.6-0.9)
Race/ethnicity						
White (W)	30.6 (29.0-32.1)	8.3 (7.1-9.8)	25.8 (25.3-26.3)	3.6 (3.4-3.7)	NA	NA
African American (A)	15.6 (14.7-16.6)	13.1 (10.7-15.9)	9.1 (8.7-9.5)	3.3 (3.0-3.7)	NA	NA
W/A prevalence ratio	2.0 (1.8-2.1)	0.6 (0.5-0.8)	2.9 (2.7-3.0)	1.1 (1.0-1.2)	NA	NA

Abbreviations: HMO, health maintenance organization; MAM, Medicaid data from a mid-Atlantic state; MWM, Medicaid data from a midwestern state; NA, not available.

*Specific prevalence per 1000 youths in 3 health care sites in 1996, and the prevalence ratio (10-year change [1987-1996]). The 95% confidence intervals are given in parentheses.

male prevalence. This was most pronounced in the HMO data set, which showed a narrowing of the male-female ratio for stimulants for 1987 (6.9:1; 95% confidence interval, 5.9-9.2) to 1996 (4.0; 95% confidence interval, 3.6-7.5). This trend may be due in part to the fact that the HMO population had a much lower female stimulant prevalence rate in 1987 compared with the Medicaid female prevalence rates. For Medicaid enrollees during the 10-year span, the male-female ratio narrowed only 18% (MAM) and 6% (MWM).

For antidepressant treatment of youths, the gender patterns varied substantially during the decade. In the Medicaid groups, male youths either increased their prevalence above that of female youths (MAM) or had comparable levels (MWM). In the HMO, proportionally more males than females were prescribed antidepressants in the 0- to 4-, 5- to 9-, and 10- to 14-year-old age groupings, but the reverse was true for the 15- to 19-year-old age group.

Race or Ethnicity–Specific Patterns

This variable was available only for the 2 Medicaid sites. In MWM, there was no change in the white–African American prevalence ratio for any psychotropic medication (2.2 in 1987 and 1996) and nonsignificant reductions in the disparity for stimulants and antidepressants. On the other hand, from 1987 to 1996, the white–African American disparity in MAM decreased by almost half (from 3.2 to 1.7) for any psychotropic medication. There was a 48.6% decrease (from 3.5 to 1.8) for the use of stimulants and 35.5% (from 3.1 to 2.0) for the use of antidepressants. Anticonvulsants showed the same substantial reduction in race or ethnic disparity for MAM (42.9%—from 2.8 to 1.6), but there was no change for MWM. Neuroleptic white–African American prevalence ratios for MWM in 1996 were 2.2:1, the same as in 1987, whereas in MAM they narrowed from 3.2:1 in 1987 to 1.7:1.

COMMENT

The major findings of this study are summarized as follows. The 1-year period prevalence of psychotropic medication use grew to 6% of youths younger than 20 years, which represents a 2-fold to 3-fold increase in the decade from 1987 through 1996. Most of the temporal change occurred between 1991 and 1996. Medication classes generally showed a proportionally greater prevalence with increasing age, but 10- to 14-year-olds emerged as the Medicaid age group most likely to receive psychotropic medications, while the 15- to 19-year-old group predominated among HMO medicated youths. Prominent changes occurred in the age-specific utilization of psychotropic medication. Youths aged 10 to 14 years surpassed 5- to 9-year-olds as the predominant stimulant-treated age group, reflecting a lengthening of the duration of treatment.[34] Substantial growth in stimulant and antidepressant use resulted in their ranking as the first and second most utilized classes, respectively. Large increases in the use of stimulant medication occurred for females. Antidepressant use, by contrast, showed a general proportional growth among boys during the decade. Among less prevalent psychopharmacologic agents, α-agonists (largely clonidine) rose very markedly from near nonuse in 1987 and 1991 across the 3 sites. "Mood stabilizer" anticonvulsants showed very large increases in use (particularly among Medicaid youths) compared with anticonvulsants primarily used for seizure disorders. Increased prevalence trends were observed as well for neuroleptics and lithium. Medications with mixed usage, ie, for both acute medical problems and emotional and behavioral disorders, had different profiles for the HMO and Medicaid populations. Greater use of hydroxyzine and benzodiazepines occurred in HMO youths, whereas the Medicaid sites split in their anxiolytic patterns, with one being comparable to the HMO trend and the other not. Racial disparities showed a varied pattern. There was a substantial narrowing of the white–

African American prevalence ratio for stimulants and for other psychotropic classes in the MAM and, to a far lesser degree, in the MWM.

Several limitations must be acknowledged for a fair interpretation of these study findings: (1) More than 5 years have elapsed since the study period ended, making the practice patterns of the decade somewhat dated. However, other authors' findings (though lacking the scope of the present study) are available only through 1998.[19,24,35] Their data show that many patterns have continued, which implies that community practice change is adopted at a slower rate than expected. (2) Although the data are generalizable to important segments of the insured populations (youths insured by Medicaid and nonprofit HMOs), they do not cover the universe of US youths in treatment across geographic locales. Neither commercially insured youths (preferred provider organizations and independent practice association plans) nor the uninsured are included—data that are difficult to obtain or nonexistent. Nevertheless, the inclusion of 0.9 million youths permitted an analysis of total, medication class, and subclass prevalence and allowed specific prevalence according to sociodemographic factors. The degree of statistical confidence produced by such large data sets is far greater than currently is possible with national visit data. (3) Physician specialty and diagnostic data are not presented herein, which is crucial to a clinical readership. However, the goal of this article was to provide an overview of the trends across all the major medications. More refined analysis is better left to specific classes, eg, antidepressants, and to studies designed for usual practice settings.[36] (4) Emotional or behavioral use of anticonvulsant-type medications was not clearly separated from seizure disorder use, although we restricted the anticonvulsants to those reported to have "mood stabilizer" use. However, this difference is likely to apply across the 3 sites to the same extent. (5) Utilization data do not necessarily comport with medication consumption. (6) The limitation introduced by period as opposed to point prevalence applies equally to each year across the decade, which tends to nullify any bias that exists while avoiding the temporal bias introduced by selecting a single time point. (7) Income may confound the racial and ethnicity data, although we attempted partial control of income by an analysis of Medicaid populations in which there is a restricted income range. Despite these limitations, the findings do project broadly the sweep of psychotropic practice patterns for a decade in which substantial socioeconomic and clinical change occurred.

TOTAL PSYCHOTROPIC PREVALENCE AND TRENDS

Office visit rate data[14,37] from the National Ambulatory Medical Care Survey confirm the trend findings of the present study. Beyond the visit trends, however, prevalence data permit more detailed, reliable estimates of patterns according to the entire population (treated and untreated) rather than being restricted to those who come into care. This distinction has important consequences from a public health perspective in regard to the way we assess mental health service use and needs.

Several utilization studies demonstrate that the increased psychotropic youth rates have produced a convergence of youth rates with adult psychotropic utilization rates. Specifically, (1) data from a 1996 federal survey (Medical Expenditure Panel Survey) showed a 4.1% psychotropic medication rate for 6- to 17-year-olds and a 5.0% rate for 18- to 44-year-olds[38]; and (2) in a 1998 commercially insured population, there was a 4.3% psychotropic medication rate for 1- to 17-year-olds compared with 4.7% for adults.[35] The similarity in medication prevalence for youths and adults in the United States mirrors their increasingly similar prevalence rates of mental disorders (11%-21% vs 19%).[39,40]

The following prevalence rates are more directly related to the results of the current study. Data from families with private insurance coverage in 1993 from a managed care plan produced a psychotropic prevalence of 3.9% among youths younger than 18 years,[15] although their definition of *psychotropic* did not include α-agonists, hydroxyzine, and "mood stabilizer" anticonvulsants. Similar data from 1998 produced a prevalence of 4.3% (with a less completely defined group of psychotropic drugs) among the same age group.[35] National survey data from the Medical Expenditure Panel Survey of 1987 and 1996 were analyzed and showed a tripling to a 1996 rate of 3.9% for psychotropic medication for youths younger than 19 years.[17] A recent Medicaid study (1998-1999) of psychotropic use made use of a managed care database from a northeastern state and reported a 4.8% period prevalence for psychotropic use in 1999.[16]

In regard to health service system differences, Medicaid prevalence rates have been consistently higher than those reported for HMO-enrolled youths.[37,41] In all likelihood, this is due to the fact that the Medicaid population includes more chronically ill as well as physically, developmentally, and psychologically impaired youths.[42,43] Specifically, Medicaid includes youths in foster care and disabled youths with Supplemental Security Income, who have clearly documented higher rates of chronic illness and psychotropic medication prevalence.[13,44]

RACIAL OR ETHNIC DISPARITY AND ITS IMPLICATIONS

The lessening of racial disparities over time has also been observed elsewhere in another state Medicaid program.[24] Our class-specific race-ethnicity findings confirm findings from the National Ambulatory Medical Care Survey showing a greater white–African American disparity for antidepressants and stimulants than for other psychotropic drugs.[14] By contrast, neuroleptics and "mood stabilizer" anticonvulsants are far less disparate.[14] These data are not sufficient to provide the reasons for a greater disparity associated with antidepressant and stimulant use. Notably, the conditions associated with the use of these medications differ in clinical severity (perceived and real) compared with the conditions associated with the use of neuroleptics and "mood stabilizer" anticonvulsants. To address this hypothesis, critically important work is needed to assess the acceptability of psychotropic treatments for each race-ethnicity group[45] and to understand the interaction of race-ethnicity, education, and income.

QUESTIONS FROM THE DATA NEEDING CLARIFICATION

Questions concerning the clinical rationale for the use of specific psychotropic medications commonly and increasingly used for the treatment of emotionally ill youths in community settings arise from the data presented herein. Specific practice trends needing further clarification include (1) the continuing prominence of TCA treatment for Medicaid youths across the decade despite safety concerns; (2) the greater use of antidepressants by adolescent males than adolescent females among Medicaid enrollees; (3) the continuing increase in stimulant prevalence,[22,23] in some cases beyond the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*[46] estimate for school-aged youths; (4) the clinical rationale for the increased prevalence of neuroleptics and "mood stabilizer" anticonvulsants; (5) the effectiveness and safety of α-agonists; (6) the continuing racial-ethnic disparity in Medicaid psychotropic utilization patterns; (7) the sizable Medicaid variation between states; and (8) the differences in psychotropic medication patterns within and across insurance groups.

CONCLUSIONS

Data on community-based psychotropic patterns for youths create a more complete picture of the medication use process. Such data are useful to generate hypotheses related to conformance with clinical practice guidelines and evidence-based practices. An overview from a large population of treatment records highlights practice changes for the major psychotropic classes across the decade. Greater detail is needed, however. This will require additional clinical trials and a research pharmacoepidemiology infrastructure to provide outcome studies that will expand the evidence base.[7,12] As such, this works toward the goals of the national action plan on children's mental health.[3] Descriptive data on the duration of treatments, the use of concomitant psychotropic medications, and the impact of concomitant psychosocial treatments are particularly needed. Much of this information can be obtained by expanding community-based physician practice networks and using simple standardized forms reporting clinical treatment contacts. The resultant data would show the extent to which information obtained from randomized clinical trials of psychotropic compounds are generalizable to the community at large.

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