

National Estimates of Health Services Expenditures for Children With Behavioral Disorders: An Analysis of the Medical Expenditure Panel Survey

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ABSTRACT. *Background.* Children with attention-deficit/hyperactivity disorder and asthma incur similar health care costs that are greater than those of most children without these conditions. Preliminary findings suggest that children with emotional behavioral disorders, anxiety and depression, incur even greater costs.

Objective. To determine if children with behavioral disorders have similar health services expenditures as children with physical conditions and to assess whether children with emotional behavioral disorders incur greater expenditures than children with disruptive behavioral disorders.

Methods. Children 2 to 18 years old who were members of households participating in the 1996 Medical Expenditure Panel Survey were eligible for this retrospective cohort study. Children with common behavioral disorders selected a priori were identified by using truncated *International Classification of Diseases* (Ninth Revision) codes obtained from household interviews. Children with common physical conditions (asthma, epilepsy, and diabetes) and children without these conditions served as controls. Estimates were weighted to reflect the complex sampling scheme. Expenditures for health services were compared.

Results. Of 3955 eligible children weighted to represent >44 million, 7.1% were identified with a behavioral disorder: 4.5% with disruptive disorders; 2.1% with emotional disorders; and 0.5% with miscellaneous disorders. Children with behavioral disorders incurred overall expenditures similar to children with physical conditions (adjusted \$1492 vs \$1245; $P = .18$) but greater than children without these conditions (adjusted \$1492 vs \$834; $P = .001$). Children with behavioral disorders had greater expenditures for office-based visits (adjusted \$410; 95% confidence interval: \$146–672) and prescription medications (adjusted \$361; 95% confidence interval: \$72–648) than those of children in either control group. Among children with behavioral disorders, children with emotional disorders incurred substantially greater overall expenditures (adjusted \$2152 vs \$1026; $P = .003$) than children with disruptive disorders. Children with emotional

disorders incurred greater hospitalization expenditures (\$664 vs \$43; $P = .01$) but lower pharmacy expenditures (\$154 vs \$307; $P = .001$) than children with disruptive disorders.

Conclusions. In this nationally representative sample, children with behavioral disorders incurred overall health care costs similar to children with physical conditions but greater than children without any of these conditions because of increased costs for office-based visits and prescription medications. However, costs were not uniform among children with behavioral disorders. Children with emotional disorders incurred two-fold higher costs than children with disruptive disorders. Greater recognition of children with emotional disorders and efforts to address the high rate of hospitalizations in this population are warranted. *Pediatrics* 2003;112:e440–e446. URL: <http://www.pediatrics.org/cgi/content/full/112/6/e440>; costs, mental health, children.

ABBREVIATIONS. ADHD, attention-deficit/hyperactivity disorder; MEPS, Medical Expenditure Panel Survey; HC, household component; MPC, medical provider component; ICD-9, *International Classification of Diseases*, Ninth Revision; CCS, clinical classification software; CI, confidence interval.

A renewed interest in children's behavioral problems has arisen as exemplified by the recent Surgeon General's conference on children's mental health.¹ Behavioral disorders in children are increasingly recognized as chronic disorders that impact academic, social, and family functioning substantially.^{2–4} Although epidemiologic studies have estimated the community prevalence in children at 10% to 20%,^{5,6} the treated prevalence of behavioral disorders (that is, the prevalence among those who receive medical care) has lagged behind significantly, although identification of these disorders may be increasing.⁷

Although more recent studies have provided information on the costs associated with attention-deficit/hyperactivity disorder (ADHD), little is known about the costs of providing care for children with other behavioral disorders. Studies of children's health care costs suggest that children with ADHD incur greater ambulatory care and pharmacy costs than other children.^{8,9} These studies also suggest that children with ADHD incur costs that are similar to children with asthma.^{10,11} One study has found that the high costs associated with ADHD, however, still may be less than those associated with emotional

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disorders such as depression and anxiety.¹² Studies of adults with behavioral disorders suggest that individuals with emotional disorders, anxiety and depression, incur considerably higher costs than the general population,^{13,14} but this issue is not as well-studied among children.

The aims of the current study were to estimate differences in health care expenditures among children with common behavioral disorders, children with common physical health conditions, and children without these conditions by using a nationally representative sample. Based on previous research, we hypothesized that children with behavioral disorders would incur expenditures similar to children with physical conditions but greater than children without these conditions. In addition, we hypothesized that among children with behavioral disorders, children with emotional disorders would incur greater overall expenditures than children with disruptive disorders. Information concerning related health care costs is urgently needed to better understand the impact of behavioral disorders on service use and to inform the allocation of scarce health care resources. This information could be used by payers to allocate funds for behavioral health care that reflect national estimates of use. This information could also be used by policy-makers to advocate for greater resources for mental health care or to assess the cost effectiveness of mental health care interventions.

METHODS

Setting

The 1996 Medical Expenditure Panel Survey (MEPS), a nationally representative survey of the US civilian noninstitutionalized population, constituted the data set for analysis. MEPS used a complex sampling scheme that included oversampling of minorities and individuals with disabilities. Person-level weights were applied that accounted for an individual's probability of selection in the sample and used to generate a nationally representative sample. MEPS comprised 4 components: the household component (HC), the medical provider component (MPC), the insurance component, and the nursing home component.¹⁵ The HC was the core survey and included data on demographic characteristics, health conditions, use of medical services, health care expenditures, health insurance coverage, income, and employment among eligible individuals and their households. By using computer-assisted personal-interviewing technology, data on medical expenditures and service use for each calendar year were collected from each household over a 2-year period. The MPC sample includes all hospitals, hospital- and office-based physicians, home health agencies, and pharmacies reported in the HC. Information collected through the MPC from a sample of medical providers and pharmacies was linked back to respondent reports to supplement and validate reported information on medical care events including diagnoses, procedures, prescription medications, and charges and payments. The insurance component includes data on health insurance plans obtained through employers, unions, and other sources of private health insurance. Data from the first sampling frame were linked back to data provided by the HC respondents. The nursing home component was not relevant to this study. All identifying information on subjects was removed before public release of the MEPS data files. This study received an exemption from review by the institutional review board at the Children's Hospital of Philadelphia.

Subjects

Children 2 to 18 years old who were civilian noninstitutionalized members of participating households during 1996 were eligible for inclusion in the analysis. We identified eligible children

using the HC 1996 full-year consolidated data file.¹⁶ The full-year file contained one record for each subject in the HC and included information on demographics, insurance, health status, service utilization, and health care expenditures. We identified children with specified behavioral or physical disorders from the 1996 medical-conditions file of the HC by using truncated 3-digit *International Classification of Diseases*, Ninth Revision (ICD-9) codes. The medical-conditions file contained separate records for each medical condition reported for an individual. The conditions were recorded verbatim during any of 3 interviews during the year and then were coded into fully specified ICD-9 codes by professional coders. Codes were verified, and error rates did not exceed 2.5% for any coder. To preserve subject confidentiality, nearly all condition codes were collapsed into 3-digit codes before public release.

We selected the following common behavioral disorders for identification because of their greater prevalence and specificity using truncated 3-digit ICD-9 codes: affective psychoses (ICD-9 code 296), anxiety (ICD-9 code 300), miscellaneous behavioral disorders (ICD-9 code 307), depression (ICD-9 code 311), conduct disorder (ICD-9 code 312), oppositional-defiant disorder (ICD-9 code 313), and ADHD (ICD-9 code 314). Similarly, we selected the following physical conditions for identification because of their greater prevalence and specificity: asthma (ICD-9 code 493), diabetes (ICD-9 code 250), and epilepsy (ICD-9 code 345). Other behavioral disorders and physical conditions with specific truncated ICD-9 codes were exceedingly rare in this data set and were not selected. For the purposes of analysis, we categorized affective psychoses, anxiety, and depression as emotional behavioral disorders, and we categorized conduct disorder, oppositional-defiant disorder, and ADHD as disruptive behavioral disorders. We selected all remaining children without any of these disorders or conditions as a separate control group.

Measures

Utilization and expenditure variables designating office-based medical provider visits, hospital outpatient visits, emergency department visits, inpatient hospital stays (MEPS does not distinguish between medical and psychiatric hospitalizations), and prescription medication fills represented the main outcome variables. The utilization variables were actual counts of medical events as reported by survey respondents. The expenditure variables were derived from both the HC and MPC and represent the sum of direct payments for care provided during the year including out-of-pocket expenses and payments made by insurance plans and other sources. For emergency department visits and hospitalizations, expenditures included payments for both physician services and facility expenses. Weighted, sequential hot-deck imputation methods were used by MEPS to derive expenditures for services rendered under capitated arrangements or through public clinics.¹⁷ Free care or free medicine samples resulted in zero expenditures. Payments for over-the-counter medications, alternative care services, and indirect payments not related to specific events were not included. Data were collected for each subject at the event level and then summed across all interview rounds for the year to produce per-capita annual utilization and expenditure data.

Analysis

We weighted analyses to reflect the complex sampling scheme of the survey. We assessed unadjusted differences in service use and expenditures among children with behavioral disorders, children with physical conditions, or controls for statistical significance using the adjusted Wald test for continuous variables and the χ^2 test for dichotomous variables. A *P* value of <0.05 was indicative of statistical significance. Children identified with both behavioral disorders and physical conditions were excluded from the unadjusted analysis. We then estimated adjusted expenditures for children with behavioral disorders, physical conditions, or controls by using 2-step econometric models with both logged and nonlogged expenditures as the dependent variable of interest.¹⁸ Logged expenditures have the property of normalizing skewed distributions and reducing heteroscedasticity inherent in cost studies but do not reflect actual system costs, whereas nonlogged expenditures better reflect system costs by allowing for the influence of outliers but may not conform to statistical assumptions. Models were adjusted for age, sex, race (black, Hispanic, or white/

other), insurance (private, public, or none), income category (poor/near poor or middle/high), family size, and chronic physical comorbidities other than asthma, epilepsy, and diabetes. Clinical classification software (CCS) codes were used to adjust for chronic physical comorbidities, eg, cerebral palsy or congenital heart disease, that might account for expenditures.¹⁹ CCS aggregates fully specified ICD-9 codes into 260 mutually exclusive clinically meaningful categories that group similar conditions. The CCS codes pertaining to sickle cell anemia, cerebral palsy, congenital heart disease, trisomy 21, cancer, immunocompromised states, autoimmune diseases, major organ diseases, mental retardation, and congenital anomalies were selected for model inclusion.²⁰ We fit separate models for each category of service use and for total expenditures. Covariates from log-linear models were interpreted according to standard econometric convention.²¹ Interactions between behavioral disorders and physical disorders were explored. Preplanned subgroup analyses were undertaken to determine differences in expenditures between children with emotional and disruptive disorders. Analyses were conducted by using the survey module in Stata (Stata Corporation, College Station, Texas), version 7.

RESULTS

Sample Characteristics

A total of 3955 children 2 to 18 years old who were members of households participating in the 1996 MEPS were eligible for inclusion in this analysis. After appropriate weighting, this sample was representative of >44.6 million children in the US. We identified 7.1% of children with one or more common behavioral disorders and 7.7% of children with one or more common physical conditions. Of those with a behavioral disorder, most (6.5%) had only a single disorder, whereas 0.5% had 2 disorders and 0.1% had 3 disorders. The few (0.5%) children who had both a physical condition and a behavioral disorder were excluded from the unadjusted analysis. Children with behavioral disorders were older than children with physical conditions or controls (Table 1). They were also less likely than other children to

be Hispanic or to lack health insurance. Children with behavioral disorders had a similar male predominance as children with physical conditions but were less likely to be low-income than children with physical conditions.

The most prevalent behavioral disorder was ADHD (4.2%), followed by depression (1.4%), anxiety (1.1%), miscellaneous disorders (0.5%), conduct disorder (0.3%), affective psychoses (0.2%), and oppositional-defiant disorder (0.1%). When grouped together, disruptive disorders were more prevalent (4.5% vs 2.5%) than emotional disorders. Adolescents had the highest proportion of emotional disorders, whereas school-aged children 6 to 12 years old had the highest proportion of disruptive disorders. Asthma was the most prevalent physical condition (7.4%). Few children had epilepsy (0.15%) or diabetes (0.18%). There were no statistically significant age differences among children with physical conditions.

Unadjusted Health Care Expenditures

Children with behavioral disorders incurred over twofold higher mean total expenditures (\$1468 vs \$710) than control children with neither physical nor behavioral health conditions (Table 2). The difference in total expenditures between children with behavioral disorders and children with physical conditions (\$397) was not statistically significant ($P = .09$). Children with behavioral disorders incurred significantly greater mean expenditures for office-based visits (\$425 vs \$236 and \$171, respectively) and prescription medications (\$235 vs \$156 and \$49, respectively) than children with physical conditions or controls. In addition, children with behavioral disorders incurred greater mean expenditures for emergency department visits (\$155 vs \$61) than children with

TABLE 1. Characteristics of Children With Behavioral Disorders, Physical Conditions, and Controls

Characteristic	Behavioral*, Weighted % = 6.6	Physical†, Weighted % = 7.2	Controls, Weighted % = 85.7
Age (%)			
2–5 y	6.0	24.9	27.1
6–12 y	51.8	43.7	41.9
13–17 y	42.2	31.4	31.0
Sex (%)			
Male	65.4	64.1	49.2
Female	34.6	35.9	50.8
Race (%)			
Hispanic	8.0	16.1	13.7
Black and non-Hispanic	12.2	25.2	13.3
White/other	79.8	58.7	73.0
Insurance (%)			
Private	71.7	60.0	73.0
Public	22.4	30.8	17.0
None	5.9	9.2	10.0
Poverty status (%)			
Poor/low income	41.3	52.2	39.1
Middle income	33.6	22.8	36.6
High income	25.1	25.0	24.3
Family size (mean)	4.2	4.2	4.4

Children 2 to 18 years old were weighted to reflect complex sampling scheme. Numbers (%) represent percent of column total.

* Behavioral disorders were based on ICD-9 diagnoses for affective psychoses, anxiety, depression, oppositional defiance, conduct, ADHD, and miscellaneous disorders.

† Physical conditions were based on ICD-9 diagnoses for asthma, diabetes, and epilepsy.

TABLE 2. Unadjusted Health Services Expenditures by Children With Behavioral Disorders, Physical Conditions, and Controls

Service Category	Behavioral*, Weighted % = 6.6, Mean (\$) (95% CI)	Physical†, Weighted % = 7.2, Mean (\$) (95% CI)	P Value for Difference Between Behavioral and Physical	Controls, Weighted % = 85.7, Mean (\$) (95% CI)	P Value for Difference Between Behavioral or Physical and Controls
Office-based visits	425 (295, 555)	236 (182, 290)	.01	171 (150, 191)	.03
Outpatient hospital visits	53 (24, 82)	173 (0, 385)	.27	50 (35, 66)	.25
Emergency department visits	155 (63, 247)	61 (41, 81)	.04	67 (30, 105)	.08
Inpatient stays	233 (67, 399)	214 (61, 367)	.85	157 (65, 249)	.43
Pharmacy fills	235 (185, 286)	156 (125, 186)	.007	49 (30, 67)	.001
Total	1468 (1120, 1816)	1071 (744, 1397)	.09	710 (573, 848)	.04

Children ages 2 to 18 years were weighted to reflect complex sampling scheme.

* Behavioral disorders were based on ICD-9 diagnoses for affective psychoses, anxiety, depression, oppositional defiance, conduct, ADHD, and miscellaneous disorders.

† Physical conditions were based on ICD-9 diagnoses for asthma, diabetes, and epilepsy.

physical conditions. There was no statistically significant difference in expenditures for outpatient hospital visits or inpatient stays among the 3 groups.

To assess the variability in costs and to assess if outliers influenced the analysis, we divided children in all 3 groups into deciles of increasing total expenditures (Fig. 1). Children with behavioral disorders had higher mean expenditures than children with physical conditions or control children in each decile. Mean expenditures for children with behavioral disorders increased modestly with each succeeding decile and then markedly increased in the top 2 deciles. Children in these top 2 deciles accounted for 71.6% of all expenditures.

Adjusted Health Care Expenditures

After adjusting for demographic characteristics and other physical comorbidities (Table 3), children with either behavioral disorders or physical conditions incurred greater mean total expenditures (\$1492 and \$1245, respectively, vs \$834; $P = .01$) than controls. The difference in expenditures between

children with behavioral disorders and physical conditions was not significant ($P = .18$). The confidence intervals (CIs) were wide, suggesting that outliers may have had an important effect on mean expenditures. When these expenditures were log-transformed to reduce the influence of outliers, mean total expenditures shrank significantly in all groups, but differences between children with behavioral disorders or physical conditions and controls remained significant ($P < .001$). Expenditures among children with behavioral disorders were not uniform, however. Children with emotional disorders had twofold higher mean total expenditures (\$2237 vs \$1167; $P = .01$) than children with disruptive disorders (Table 4). These differences remained significant (\$2152 vs \$1027; $P = .003$) after adjusting for demographic characteristics and other physical comorbidities. There were no statistically significant interactions involving behavioral disorders and physical conditions.

Differences in the expenditures for different categories of service use were examined next. Children

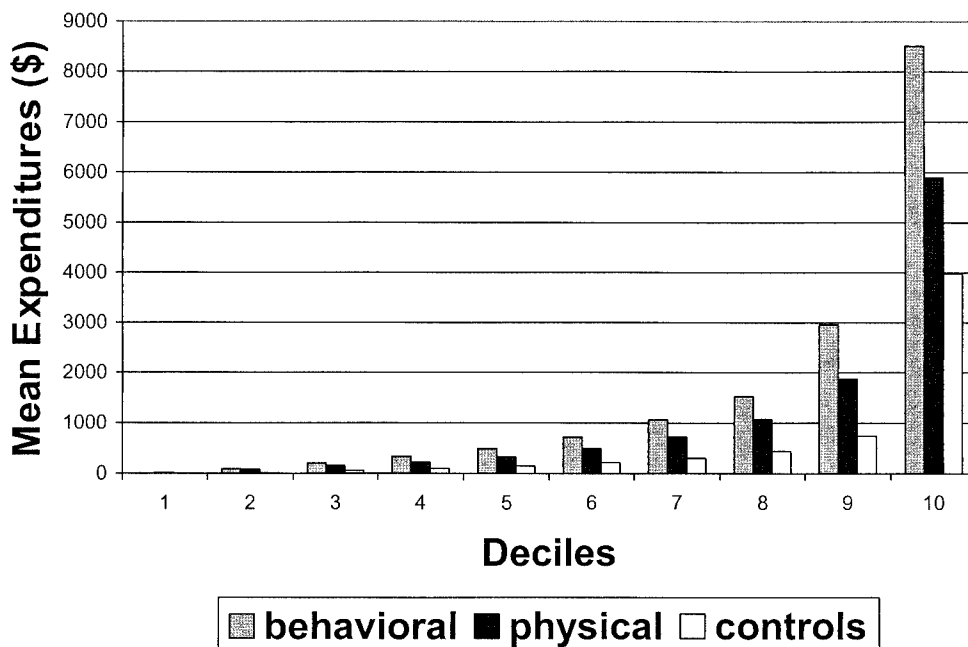


Fig 1. Mean total expenditures within deciles for children with behavioral disorders, physical conditions, or controls.

TABLE 3. Adjusted Expenditures for Children With Behavioral Disorders, Physical Conditions, or Controls

Category of Service*	Behavioral†, Weighted % = 6.6, Mean (\$) (95% CI)	Physical‡, Weighted % = 7.2, Mean (\$) (95% CI)	Controls, Weighted % = 85.7, Mean (\$) (95% CI)
Office-based visits			
Non-logged	410 (146, 672)	250 (61, 437)	126 (27, 224)
Logged	180 (107, 302)	143 (89, 233)	96 (70, 132)
Outpatient hospital visits			
Non-logged	974 (−764, 2712)	2239 (−747, 5224)	1437 (147, 2726)
Logged	483 (59, 3984)	1153 (170, 7943)	846 (209, 3429)
Emergency department visits			
Non-logged	825 (−461, 2111)	345 (−621, 1811)	512 (−263, 1287)
Logged	191 (64, 562)	97 (37, 250)	104 (51, 209)
Inpatient stays			
Non-logged	19 029 (−5417, 43476)	16382 (−6975, 39 739)	20894 (1068, 40 720)
Logged	8955 (1107, 73130)	4537 (−8882, 44 033)	9045 (1826, 45 251)
Pharmacy fills			
Non-logged	361 (72, 648)	251 (−26, 528)	154 (−73, 380)
Logged	113 (57, 219)	80 (44, 151)	31 (20, 49)
Total expenditures			
Non-logged	1492 (297, 2688)	1245 (106, 2386)	834 (11, 1658)
Logged	308 (125, 757)	279 (119, 652)	109 (60, 196)

Children 2 to 18 years old were weighted to reflect the complex sampling scheme.

* Models compare children with behavioral disorders or children with physical disorders to control children. Models were restricted to those with positive expenditures in a category of service except for total expenditures. Models were adjusted for age, race, sex, poverty, insurance, family size, and other chronic physical comorbidities.

† Behavioral disorders were based on ICD-9 diagnoses for affective psychoses, anxiety, depression, oppositional defiance, conduct, ADHD, and miscellaneous disorders.

‡ Physical conditions were based on ICD-9 diagnoses for asthma, diabetes, and epilepsy.

TABLE 4. Unadjusted Health Care Expenditures for Children With Emotional and Disruptive Behavioral Disorders

Service Category	Emotional*, Weighted % = 2.1, Mean (\$) (95% CI)	Disruptive†, Weighted % = 4.5, Mean (\$) (95% CI)	P Value for Difference Between Emotional and Disruptive
Office-based visits	542 (201, 883)	443 (318, 568)	.59
Outpatient hospital visits	81 (14, 148)	68 (10, 127)	.78
Emergency department visits	165 (36, 294)	154 (36, 271)	.90
Inpatient discharges	664 (177, 1151)	43 (−12, 98)	.01
Pharmacy fills	154 (87, 222)	307 (243, 372)	.001
Total	2237 (1426, 3050)	1167 (903, 1430)	.01

Children 2 to 18 years old were weighted to reflect the complex sampling scheme.

* Emotional disorders were based on ICD-9 codes for affective psychoses, anxiety, and depression.

† Disruptive disorders were based on ICD-9 codes for oppositional defiance, conduct, and ADHD.

with behavioral disorders had significantly greater adjusted mean expenditures for office-based visits (\$410 vs \$250 or \$126, respectively; $P = .02$) than children with physical conditions or controls (Table 3). After log transformation, the differences in mean expenditures between children with behavioral disorders and children with physical conditions or controls remained significant, but the magnitude of the differences was reduced. Among children with behavioral disorders, children with emotional disorders had similar expenditures for office-based visits (\$542 vs \$443; $P = .59$) as children with disruptive disorders (Table 4).

Children with behavioral disorders had significantly greater mean expenditures for prescription medications (adjusted \$361 vs \$251 or \$154, respectively; $P = .001$) than children with physical disorders or controls (Table 3). When expenditures for prescription medications were log-transformed, these differences were reduced but still statistically significant. Among children with behavioral disorders, children with emotional disorders had lower

mean pharmacy expenditures (\$154 vs \$307; $P = .001$) than children with disruptive disorders (Table 4). This was most likely because of the fact that children with emotional disorders were less likely to receive a prescription medication (odds ratio: 0.34; 95% CI: 0.16–0.74) than children with disruptive disorders. Among those who received any prescription medications, children with emotional disorders had similar expenditures for pharmacy services (\$355 vs \$359; $P = .96$) as children with disruptive disorders.

There was little difference in hospital expenditures among the 3 groups (Table 3). Among children with behavioral disorders, however, children with emotional disorders incurred substantially greater hospital expenditures (\$664 vs \$43; $P = .01$) than children with disruptive disorders (Table 4). This finding was most likely because of the increased odds of hospitalization (odds ratio: 4.1; 95% CI: 1.1–15.4) among children with emotional disorders relative to those with disruptive disorders. Among those who were hospitalized, there was no difference in adjusted hospital expenditures (\$19 536 vs \$20 880; $P = .73$) be-

tween children with emotional and disruptive disorders. There were few differences in outpatient hospital or emergency department visits among the 3 groups.

Subgroup Analyses

Among children with emotional disorders, children with affective psychoses had the greatest total expenditures (\$3237), followed by children with depression (\$2555) and children with anxiety (\$1824). We did not adjust these costs for other factors because of the small numbers of children in each category. Higher overall expenditures for children with affective psychoses were in part caused by higher expenditures for office-based (\$1879 vs \$481 and \$414, respectively) and emergency department (\$554 vs \$169 and \$248, respectively) visits than children with depression or anxiety. Children with depression had higher mean inpatient expenditures (\$815 vs \$424 or \$186, respectively) than children with anxiety or affective psychoses.

Among children with disruptive disorders, children with oppositional-defiant disorder had greater mean total expenditures (\$2196 vs \$1172 or \$1093, respectively) than children with either ADHD or conduct disorder. Again, we did not adjust these costs for other factors because of the relatively small numbers. These higher total expenditures were in part caused by greater mean outpatient hospital expenditures for children with oppositional-defiant disorder (\$1052 vs \$64 and \$128, respectively) than for children with ADHD or conduct disorder.

DISCUSSION

In this nationally representative sample, children with common behavioral disorders incurred overall expenditures similar to those of children with asthma, epilepsy, and diabetes. These expenditures were significantly greater than those of children without these conditions. Children with behavioral disorders had increased overall expenditures mainly as a result of greater office-based ambulatory care and prescription medication costs. Among children with behavioral disorders, children with emotional disorders incurred twofold higher expenditures than children with disruptive disorders. These increased expenditures were in part caused by substantially greater expenditures for inpatient hospital stays.

Our finding that children with common behavioral disorders and physical conditions incur similar health care costs is consistent with previously reported findings involving comparisons of children with ADHD and asthma. For instance, Kelleher et al, using Medicaid data from southwestern Pennsylvania, found that children with ADHD had similar overall costs but higher pharmaceutical and outpatient costs and lower inpatient costs as children with asthma.¹¹ Chan et al, using MEPS data, also reported that children with ADHD had similar overall costs as children with asthma but higher pharmaceutical costs than children with asthma.¹⁰ None of these studies addressed differences in costs among children with other behavioral disorders.

Our finding that children with emotional disor-

ders have significantly greater health care costs than children with other behavioral disorders is also consistent with findings from a recent study using Medicaid data from a large urban area. In this study, Mandell et al compared health care costs among children with various common psychiatric conditions.¹² They found that children with depression had the highest mean expenditures, followed by children with conduct disorder and children with ADHD. Other studies suggest that adults with emotional disorders have similarly high health care costs.¹³ Our findings suggest that much of the increase in costs associated with depression and anxiety in children is caused by increased inpatient utilization. Further investigation to confirm our findings with regard to children with emotional disorders and to investigate reasons for hospitalization is needed.

Finally, our data suggest that a relatively small number of children accounted for a large percentage of overall health care costs. It would be of benefit to be able to identify such children to target them for interventions that may improve the quality of their care and reduce inappropriate utilization. In studies of Medicaid-eligible individuals, Hadley et al also found that relatively few individuals incurred high costs among a population with mental health disorders.^{22,23} Although they were only able to identify a minority of heavy users who consistently incurred large costs over time, they found that individuals with more disabling mental health disorders such as schizophrenia and major affective disorders accounted for a greater proportion of those with heavy use. Similarly, our data suggest that children with emotional disorders, which include major affective disorders, account for an increased proportion of high-cost children.

Our study is limited by several factors. First, although the study was nationally representative, the number of children with behavioral disorders and physical conditions in the sample was relatively small. This resulted in less precise estimates and limited our ability to estimate expenditures for specific disorders. Second, diagnoses were derived from caregiver reports, coded into fully specified diagnostic codes and then truncated at 3 digits to preserve confidentiality. The validity of caregiver reports for behavioral disorders in children is unclear. In addition, analyses using truncated codes may result in a mixing of mild and more severe disorders and bias cost estimates for more severe disorders downward. Third, our cost data were highly skewed with relatively few children incurring the majority of costs. However, results from log-linear models that reduced the influence of outliers produced estimates that were relatively similar to models using nonlogged expenditures. Fourth, we were unable to estimate the effects of managed care practices, carve-outs, and behavioral health benefits on expenditures. We suspect that these effects may have a substantial negative impact on expenditures for behavioral health services.

This study has important implications for the care of children with behavioral problems and for future

research. First, we found that the impact of behavioral disorders on health care use and costs using nationally representative data were substantial and comparable to that of common physical conditions. This suggests that health plans should account for an increase in pharmacy and ambulatory care resource use among those children with behavioral disorders. Second, we found that costs were not consistent across behavioral disorders. Children with emotional disorders had twofold higher costs than children with other types of behavioral problems, mainly for hospitalizations. This suggests that further investigations of health service use among children with emotional disorders are warranted to elucidate reasons for hospitalization and identify remediable causes. Third, we were unable to investigate the effects of managed care practices on health care expenditures. Further study to investigate the effects of managed behavioral care and parity legislation on costs is essential to inform policy decisions. Finally, our study was restricted to the impact of behavioral disorders on health costs. Further study should be directed to estimate the costs of educational and juvenile justice services for children with behavioral disorders to provide a more complete picture of overall expenditures.

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