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State Variation in Psychotropic Medication Use by Foster Care Children With Autism Spectrum Disorder

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Abstract

OBJECTIVE—The objective of this study was to compare on a national cohort of children with autism spectrum disorder (ASD) the concurrent use of ≥ 3 psychotropic medications between children in foster care and children who have disabilities and receive Supplemental Security Income, and to describe variation among states in the use of these medications by children in foster care.

METHODS—Studied was the concurrent use of ≥ 3 classes of psychotropic medications, identified from the 2001 Medicaid claims of 43 406 children who were aged 3 to 18 years and had ≥ 1 annual claim for ASD. Medicaid enrollment as a child in foster care versus a child with disabilities was compared. Multilevel logistic regression, clustered at the state level and controlling for demographics and comorbidities, yielded standardized (adjusted) estimates of concurrent use of ≥ 3 medications and estimated variation in medication use within states that exceeded 1 and 2 SDs from the average across states.

RESULTS—Among children in foster care, 20.8% used ≥ 3 classes of medication concurrently, compared with 10.1% of children who were classified as having a disability. Differences grew in relationship to overall use of medications within a state; for every 5% increase in concurrent use of ≥ 3 medication classes by a state's population with disabilities, such use by children in a state's foster care population increased by 8.3%. Forty-three percent (22) of states were >1 SD from the adjusted mean for children who were using ≥ 3 medications concurrently, and 14% (7) of the states exceeded 2 SDs.

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CONCLUSIONS—Among children with ASD, children in foster care were more likely to use ≥ 3 medications concurrently than children with disabilities. State-level differences underscore policy or programmatic differences that might affect the receipt of medications in this population.

Keywords

autism; foster care; psychotropic drugs; Medicaid

Above and beyond recent evidence suggesting that children in the general population are using increasing numbers of psychotropic medications,¹ the use of these medications among children in foster care has taken on greater importance for several reasons. First, children in foster care, representing $<3\%$ of all Medicaid enrollees, account for 25% to 41% of all mental health expenditures for children within the Medicaid program,^{2–4} suggesting that growing trends in the use of psychotropic medications might disproportionately affect these children. Second, a series of media reports on medication use reflect emerging public concern about this issue, and state systems are among the stakeholders now expressing the greatest concern.^{5–8} The General Accounting Office in Washington, DC, recently reported that nearly 1 in 3 states has identified the oversight of psychotropic medication use as 1 of the most pressing issues facing their child welfare systems in the next 5 years.⁹ Finally, research regarding children in foster care suggests that they are more likely than other children to use psychotropic medications either singly or in combination.^{5,10} A recent study documented that 13.5% of children in the child welfare system were using psychotropic medication, 2 to 3 times the rate of other children in the community.¹¹ Examination of Medicaid records from Texas in 2004 revealed that 41% of children in foster care were using ≥ 3 classes of psychotropic medication within the same year, and 22% were duplicating medications within the same pharmacologic class.¹²

Although concerning, interpretation of these findings is not without limitations. Many studies rely on small or single-state cohorts that may not be generalizable to children in other systems or states.^{12–17} Children in foster care also have greater needs than other children, raising the possibility that increased medication use might be appropriate.^{18–25} Nevertheless, Although one might expect the overall use of psychotropic medications to be higher for children in foster care than for other children, state-to-state differences in the average use of medication by their children, although expected to vary to some degree randomly, would not be expected to vary excessively unless system-level factors were exhibiting a high level of influence on such use independent of children's needs.

Such an examination of state-to-state differences in the use of psychotropic medications has not been reported in the literature; national data that have been reported have been principally aggregate in nature.^{11,26,27} We therefore sought to use the strengths of a national cohort of children enrolled in Medicaid to examine psychotropic medication use, using a multilevel analysis that would estimate variation among states in the use of these medications after adjustment for patient-specific characteristics. Building on the recent work of Mandell et al,²⁸ we restricted a Medicaid-enrolled cohort of children to those with a diagnosis of autism spectrum disorder (ASD) and thereby focused on a group both at higher risk for medication use and less prone to misclassification than children with other behavioral health diagnoses. The goal was to compare the concurrent use of multiple psychotropic medications between children in foster care and children who have disabilities and are in the Supplemental Security Income (SSI) program. As in other studies, children who have disabilities and are receiving SSI were chosen as a control for severity because of their high likelihood of resource use among Medicaid-enrolled children.^{3,29} We also sought to characterize the differences in psychotropic medication use between these groups of children and to consider the magnitude of interstate variation in medication use across the 50 states and the District of Columbia.

METHODS

Child-level data from demographic, eligibility, encounter, and pharmacy information came from the 2001 Centers for Medicare and Medicaid Services Medicaid Analytic Extract data files from all 50 states and the District of Columbia. The sample included 43 306 children who were between 3 and 18 years of age and received a primary or secondary diagnosis of autistic disorder (*International Classification of Diseases, Ninth Revision* code 299.00) or Asperger disorder/pervasive developmental disorder, not otherwise specified (299.8 or 299.9), associated with a Medicaid reimbursed claim in 2001.³⁰

The primary outcome was the concurrent use of ≥ 3 medication classes during the year. Concurrent use was coded when a child had prescriptions for ≥ 3 medications in different classes overlapping for at least 30 days. Medication class was categorized according to the American Hospital Formulary System³¹ and included neuroleptic, antidepressant, stimulant, anticonvulsant/mood stabilizer, anxiolytic, and hypnotic agents. Lithium was categorized with the anticonvulsants. Atypical agents, including $\alpha 1$ agonists (eg, clonidine) or other over-the-counter medications, were not included in this analysis.

The primary independent variable was the basis of eligibility for the child's enrollment in Medicaid. The 2 categories included children in foster care and children who had disabilities and were covered through SSI. Demographic characteristics, including age, race/ethnicity, gender, and state of residence, also were abstracted from the Medicaid eligibility file. Age was coded using date of birth and categorized as 3 to 5, 6 to 11, and 12 to 17 years. Race/ethnicity was coded as white, black or African American, Latino, or other. Clinical characteristics included children's number of non-pharmacy claims in behavioral health, categorized by quartile. We also identified other psychiatric diagnoses assigned in the Medicaid claims, which were coded using the *International Classification of Diseases, Ninth Revision* classification; diagnoses included schizophrenia (295), bipolar disorder (296.00–296.10 and 296.36–296.89), depression (296.20–296.35 and 311), anxiety disorder (300.00–300.29 and 301.4), conduct disorder (312.00–313.89), attention-deficit disorder (314), and mental retardation (317–319).³⁰

Demographic, clinical, and medication use characteristics were summarized as frequencies across categories of Medicaid eligibility (foster care versus SSI). Bivariate statistical associations between these characteristics and basis of eligibility accounted for the dependence of observations within states. For assessing adjusted differences in medication use between children in foster care and children with disabilities across states, we used a mixed-effects logistic regression model, clustered at the state level, for several outcomes measures, including the use of individual medication classes and overall and concurrent use of ≥ 3 medication classes. Covariates included demographic characteristics of the children, intensity of non-pharmacy claims during the year, and comorbid psychiatric diagnoses. Age was included as an interaction term with eligibility category to allow for variation in medication use across age groups. Results were standardized as probabilities and risk ratios (within age groups) by using predictive margins³² to assess the impact on medication use as though children in the sample were alternatively assigned to foster care versus SSI. Confidence intervals (CIs) for these probabilities and the corresponding risk ratios were estimated by using a bootstrap resampling at the state level.³² Bootstrapping involves picking samples of states with replacement repeatedly and then calculating the estimate of interest from each sample to arrive at a distribution of estimates that might occur with repeated samples from the states year after year.³³

Descriptive and multivariable approaches were used to assess state-level variation in medication use among children. Data for concurrent use of ≥ 3 medication classes during the

year were first described by state and by eligibility classification (foster care versus SSI) for the largest states ($n = 28$) in which >500 children were included in the sample. An unadjusted linear regression model with state-level fixed effects estimated the average absolute increase in the concurrent use of ≥ 3 medications by children in foster care for every 5% increase in such use by the state's SSI population. To estimate this absolute increase, the model included an interaction term for eligibility group and baseline percentage of concurrent use of ≥ 3 medications within the state's SSI population. CIs were generated from 100 bootstrap replications at the state level.

We next examined the variability in concurrent use of ≥ 3 medications between states for only the children in foster care. In this analysis, we first estimated the raw state-level percentages and their 95% CIs. To adjust for differences in patient characteristics across states, we used a logistic regression model with patient-level factors as fixed effects. Then, to model the variation across states, we included state as a random effect. The degree of variation of an individual state from the average is reduced or shrunk to compensate for the instability of raw estimates, especially those of the smaller states.³⁴ For the purpose of translating the state-level adjusted variation on the log odds scale to a metric with more meaning, we then transformed the predicted values for each state from the mixed effects model to the probability scale. Finally, to estimate the significance of the among-state variation of adjusted concurrent medication use, we calculated a state-specific z score by dividing the state-specific random effect by its SE. These normalized scores permitted the identification of states whose adjusted rates of medication use differed significantly from the overall average and could be classified as statistical outliers by using either 16% ($z > 1.0$) or 2.5% ($z > 1.96$) tails.

RESULTS

Of the 43 306 children in the study, 9.5% were in foster care and the remainder were classified as having disabilities within the SSI Program (Table 1). Fifty-eight percent used at least 1 psychotropic medication during the year; 17% used psychotropic medications from ≥ 3 classes, and 11% used $\geq$ medication classes concurrently. Of the total sample, 32% were prescribed neuroleptics, 25% were prescribed antidepressants, 24% were prescribed stimulants, and 22% were prescribed anticonvulsants and/or lithium. The most prevalent comorbid diagnoses included attention-deficit disorder (22%), mental retardation (23%), and conduct disorder (14%).

Children in foster care differed from children with disabilities in demographic and clinical characteristics (Table 1). Nearly one third (29%) of children in foster care used ≥ 3 medication classes during the year, compared with 16% of children with disabilities. Children in foster care were also twice as likely to use ≥ 3 medication classes concurrently (21% vs 10%) than children with disabilities. By medication class, children in foster care were significantly more likely to receive neuroleptics (46% vs 31%), antidepressants (36% vs 24%), stimulants (37% vs 22%), and anticonvulsants/lithium (31% vs 21%). Children in foster care also disproportionately received diagnoses of attention-deficit disorder (36% vs 20%), conduct disorder (29% vs 12%), depression (11% vs 3%), and bipolar disorder (8% vs 3%). Groups were similar in their gender distribution and diagnosis of mental retardation.

Controlling for demographic and clinical characteristics, children in foster care were more likely than children in the SSI program to receive concurrently ≥ 3 medication classes and within classes to receive more neuroleptics, antidepressants, stimulants, and anticonvulsants (Table 2). The largest absolute and proportional differences between children in foster care and those in SSI were among 6- to 11-year-olds, including for concurrent use of ≥ 3 medication classes; any use of ≥ 3 medication classes; and individual class use of neuroleptics, antidepressants, stimulants, and anticonvulsants. Among 6- to 11-year-olds, the adjusted probability that

children in foster care would use ≥ 3 medication classes concurrently was 49% greater (95% CI: 23%–74%) than the probability that children with disabilities would concurrently use such medications. In contrast, among 12- to 17-year-olds, the adjusted probability for such use among children in foster care was 32% greater (95% CI: 20%–46%) than for children with disabilities.

Across states, use of ≥ 3 medication classes during the year varied markedly (Fig 1). Among states with at least 500 children in the cohort, the proportion of children who were in foster care and concurrently using ≥ 3 medication classes ranged from 5% to nearly 50%. Differences between the foster care and children who had disabilities and were receiving SSI in the use of ≥ 3 medication classes grew in relationship to the overall use of medications within a state; for every 5% point absolute increase in the concurrent use of ≥ 3 medication classes by a state's SSI population, use by children in a state's foster care population increased by 8.3% points (95% CI: 5.1%–11.5%; $P = .041$).

After controlling for demographic and clinical characteristics, significant interstate variation remained in the concurrent use of ≥ 3 medications among children in foster care (Fig 2). Twenty-two (43%) states were outliers from the overall average using a 16% tails for the distribution of states' adjusted rates, and 7 (14% states) were outliers using 2.5% tails ($P < .001$ for random effects represented by states). Using the assumptions of the mixed-effects model used to arrive at these estimates, one would expect far fewer outliers (16 and 2), assuming variation by chance alone. These latter 7 states included 4 with low use (California, Minnesota, New York, and Oregon) and 3 with high use (Indiana, South Carolina, and Texas).

DISCUSSION

This study highlights that children in foster care are treated quite differently across the United States in terms of whether and how they receive psychotropic medications. Although the concurrent use of ≥ 3 psychotropic medications across the states by 21% of children in foster care is in itself an important topic, we focused instead on the spread of this statistic from state to state, finding that treatment practice varied excessively. The concurrent use of ≥ 3 psychotropic medications by children in foster care in 7 states, even after controlling for patient-level characteristics, varied significantly from the national average when under normal circumstances we would have expected excess variation by at most 2 (5%) from random chance. Furthermore, we are concerned that the true magnitude of variation might be larger than we report, because our method of analysis adjusted conservatively for other psychiatric conditions listed in the children's records; if these diagnoses were not accurate (as has been suggested by others)¹⁵ and were instead recorded as a means to justify treatment with medication, then our analysis might have underestimated the true extent of state-to-state variation. Finally, we also note that younger children in foster care were proportionately using more medication; as many as 1 in 8 children aged 3 to 5 years in foster care was receiving medications from ≥ 3 psychotropic classes in this sample from 2001.

Although children with ASD do not represent all children in foster care, we focus on their experience in this study for 2 reasons. First, previous studies revealed the assignment of the ASD diagnosis in administrative claims to be less prone to misclassification than other psychiatric diagnoses, potentially improving the comparability of children in foster care and children who have disabilities and were receiving in SSI for this study.²⁸ Second, beyond the cumulative impact of trauma on psychiatric symptoms after maltreatment, children with ASD in foster care are particularly vulnerable to the social and psychological disruptions that foster care placements can create, such that an excessive variation in the use of psychotropic medications between states may indicate problems in the ability of different foster care systems to achieve placement stability for these children or adequately provide for their well-being.

Indeed, only if one postulated that the clinical severity of pediatric ASD varied substantially state to state (and no evidence supports such a hypothesis) would the interstate variation observed in this study be attributable to anything other than state system-level differences.

Which attributes of states' foster care programs might explain these differences? Decades of research have documented that the health service delivery system for children in foster care is fragmented because of inadequate resources for assessment and treatment; multiple placement moves; lack of foster parent and caseworker training; limited provision of information to caregivers about children's specific needs and available services; and in-sufficient collaboration between child welfare, health, and mental health systems.^{35–38} Failed coordination of care for the 40% to 80% of all children^{18–25,39} who enter foster care with behavioral problems might actually increase the likelihood that children will be prescribed psychotropic medications as opposed to addressing the instability and failed attachments that may be at the root of these behaviors. In practical terms, mental health professionals might perceive the suitability and efficacy of alternative behavioral interventions to be limited when children are frequently moving between homes or when they are likely to be under their care for only brief durations. Frequent moves between homes create treatment discontinuity or the potential for loss of or poor access to previous health information, which in turn can expose children to increasing combinations of medications or to their inappropriate administration or abrupt discontinuation. Finally, children might lack an adult in their lives to consent to and advocate for alternatives to medication when behavioral problems are identified. The paramount concern is that the failure to provide high-quality mental health treatment will affect children's duration of care, level of care, and opportunities for permanence.

Our study has several limitations. Although previous literature suggests that excess use of medication by children in foster care is likely, we caution that administrative data cannot reliably distinguish specific instances of appropriate therapy, excessive use, or under treatment. Second, by aggregating medications into classes, we arguably underestimate the total use of medications by children, particularly when children are duplicating medications in the same class.¹² Third, this study examined only children with ASD and only in a single year. Future studies should expand the sample to all children in the child welfare system and examine trends over time. This is particularly important because our study occurred during a period before a number of newer, atypical antipsychotic agents came to market. Finally, we are unable to determine the differences between states in the structure of their child welfare and behavioral health systems that might influence the variation in medication use that we observed. For example, we were unable to examine whether children in different regions were more likely to be seen by primary care physicians or psychiatrists and whether such differences could account for the findings that we observed; therefore, a challenge remains to disaggregate the influence of specific practices, programs, and policies within states on the changing spectrum of medication use by these children.

CONCLUSIONS

The observation of excessive variation across the United States in the use of psychotropic medications among children in foster care substantiates concerns for oversight of such use, as expressed by the recent General Accounting Office report on child welfare.⁹ These findings warrant additional investigation of how programs and policies influence both positively and negatively the quality of behavioral health treatment for children in foster care.

WHAT'S KNOWN ON THIS SUBJECT: Although children in foster care might be more likely to use more combinations of psychotropic medications than other children, geographic disparities in use driven by important system-level differences have never been examined.

WHAT THIS STUDY ADDS: Significant excess variation among states in the use of psychotropic medications by children in foster care underscores important system-level differences that substantiate public concerns for oversight and additional investigation.

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FIGURE 1.

State variation in concurrent use of medications by children who had ASD, were in foster care, and were receiving SSI. Shown are states with at least 500 children in the sample (circles proportional to sample size); highlighted are the 8 states with the largest child welfare populations. The line represents equal proportions between foster care and SSI population for reference.

FIGURE 2.

Interstate variation (raw and adjusted) in the concurrent receipt of ≥ 3 psychotropic medications by Medicaid-eligible children who were in foster care and had claims for ASD in 2001. Raw percentages and CIs are based on simple binomial proportions for each state. The adjusted estimates and CIs are based on the results of a mixed-effects logistic regression model and depict the state-specific random effects and their 95% CIs, all transformed from log odds to proportions.

TABLE 1

Characteristics (%) of Children Aged 3 to 18 Years With a Diagnosis of ASD From 2001 Medicaid Claims According to Eligibility Group

Characteristic	All (N = 43 306)	Foster Care (9.5%)	SSI (90.5%)	<i>P</i> ^a
Age, y				
3–5	15.6	14.4	15.6	<.001
6–11	51.5	45.2	52.1	
12–17	33.0	40.4	32.3	
Race				
White	49.0	51.6	48.7	.003
Black	20.3	32.8	19.0	
Hispanic	5.7	4.6	5.8	
Other	25.1	11.0	26.6	
Gender				
Male	78.3	73.2	78.8	<.001
Female	21.7	26.8	21.2	
Other diagnostic claims				
Depression	3.9	11.3	3.2	<.001
Bipolar disorder	3.4	7.9	2.9	<.001
Anxiety disorder	2.1	3.6	2.0	<.001
Attention-deficit disorder	21.5	36.4	20.0	<.001
Conduct disorder	13.8	28.6	12.3	<.001
Schizophrenia	1.2	3.0	1.0	<.001
Mental retardation	23.4	20.8	23.7	.210
No. of other diagnoses				
0	68.1	46.0	70.4	<.001
1	21.6	29.2	20.8	
2	7.2	15.7	6.3	
≥3	3.1	9.1	2.4	
Medications received				
Neuroleptic	32.1	45.6	30.7	<.001
Antidepressant	25.0	36.2	23.8	<.001
Stimulant	23.7	37.1	22.3	<.001
Anticonvulsant	21.8	30.5	20.9	<.001
Anxiolytic	11.8	12.2	11.7	.580
Hypnotic	3.2	3.3	3.2	.850
No. of medications				
0	42.3	28.4	43.7	<.001
1	22.0	20.1	22.2	
2	18.6	22.8	18.1	
≥3	17.1	28.7	15.9	
Concurrent use of ≥3 medication classes	11.1	20.8	10.1	<.001

^aEstimated P values are based on variances that control for the lack of independence of children within states.

TABLE 2

Standardized Percentage (95% CI) of Medication Use According to Age, Comparing Children Who Had ASD and Were in Foster Care With Children Who Had ASD and Were Receiving SSI in 2001

Parameter	3-5 y		6-11 y		12-17 y		<i>P</i> ^a
	Foster Care	SSI	Foster Care	SSI	Foster Care	SSI	
Medication class							
Neuroleptic	12.8 (9.1-17.5)	12.4 (10.7-14.6)	37.0 (33.2-41.5) ^b	29.3 (26.7-32.0) ^b	49.5 (43.1-56.8) ^b	43.2 (36.5-47.8) ^b	.240
Antidepressant	11.0 (7.9-14.1)	9.3 (8.2-11.0)	29.1 (23.6-34.2) ^b	22.8 (20.8-25.0) ^b	39.5 (34.1-45.6) ^b	34.1 (29.2-38.9) ^b	.250
Stimulant	15.2 (11.0-20.0)	12.6 (10.6-14.7)	34.5 (28.8-39.8) ^b	26.6 (24.3-29.0) ^b	28.1 (22.9-32.5) ^b	22.4 (19.6-25.7) ^b	.030
Anticonvulsant	10.2 (7.9-12.1)	9.5 (8.5-10.7)	25.2 (21.5-29.1) ^b	18.8 (17.2-20.6) ^b	34.2 (27.8-39.8) ^b	30.4 (25.8-34.3) ^b	.005
Anxiolytic	9.5 (7.1-12.4)	7.4 (6.6-8.6)	10.4 (8.7-12.9)	10.4 (9.1-12.1)	13.5 (10.9-16.6) ^b	15.7 (12.9-18.3) ^b	.001
Hypnotic	4.4 (2.6-6.7)	3.5 (2.8-4.4)	2.7 (2.0-3.7)	2.8 (2.4-3.2)	3.7 (2.8-5.2)	3.6 (3.0-4.4)	.250
≥3 medication classes	7.5 (5.1-10.7)	4.9 (4.2-5.8)	20.7 (17.1-25.2) ^b	15.1 (13.5-16.8) ^b	29.2 (24.1-34.5) ^b	24.2 (20.3-27.9) ^b	.001
≥3 medication classes concurrently	2.3 (1.1-4.2)	1.6 (1.3-2.0)	13.4 (10.6-17.1) ^b	9.1 (8.1-10.4) ^b	23.0 (18.7-27.6) ^b	17.3 (14.6-20.1) ^b	.001

^aEstimated probabilities derived from age-stratified logistic regression models marginally standardized³¹ to compare foster care with SSI program eligibility according to the following factors: race, gender, number of service claims during the year, and comorbid claims (for depression, bipolar disorder, attention-deficit disorder, anxiety disorders, conduct disorders, and mental retardation). CIs are based on percentiles from bootstrap resampling.

^bSignificant differences between children in foster care and children who had disabilities and were receiving SSI within age group. The *P* value reflects significance of interaction between age and eligibility category.