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Adherence to Recommended Care Guidelines in the Treatment of Preschool-Age Medicaid-Enrolled Children With a Diagnosis of ADHD

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Abstract

Objective: Attention-deficit/hyperactivity disorder (ADHD) is the most common neurodevelopmental disorder of childhood. Clinical guidelines recommend behavior therapy as the first-line treatment for preschool-age children with ADHD. This study evaluated longitudinal patterns of services received by Medicaid-enrolled children ages 2 to 5 with ADHD in seven southeastern states (Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, and South Carolina).

Methods: A discrete sequence clustering analysis was used with 2005–2012 Medicaid Analytic eXtract data to profile patient-level utilization for each state, with a focus on receipt of psychological services and medication. The model output was used to assess utilization behaviors longitudinally relative to recommended care guidelines and to characterize sources of variation in utilization patterns by demographic and ecological factors.

Results: Five states had a utilization profile with a high probability of receipt of psychological services before medication among children with ADHD, covering 16% of the total study population. Most young children's ADHD care experience in the seven states (65%) fit utilization profiles characterized by a high probability of receiving any ADHD medication. Black race was significantly associated with higher utilization of psychological services in three states.

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Conclusions: About 16% of Medicaid-enrolled preschool-age children with ADHD received care during 2005–2012 that appeared to be consistent with 2011 recommended care guidelines. State-level and subpopulation variations in utilization for ADHD-related clinical care were found. The findings indicate that there were major gaps in treatment for ADHD among young children and that the gaps are wider for some states and subpopulations of children.

Attention-deficit/hyperactivity disorder (ADHD) is the most common neurodevelopmental disorder of childhood (1), with 9.4% of children in the United States having received an ADHD diagnosis, including approximately 388,000 children ages 2 to 5 (2). ADHD is characterized by developmentally inappropriate levels of inattention, hyperactivity, or impulsivity, with symptom onset before age 12 and associated functional impairment (3). Children with ADHD are more likely to experience negative outcomes such as injury, emergency room visits, peer problems, and dropping out of high school, compared with peers who do not have ADHD (4–8).

In 2011, the American Academy of Pediatrics (AAP) published updated clinical practice guidelines for ADHD with treatment recommendations by age group (9). Behavior therapy is recommended as the first-line treatment for preschool-age children diagnosed as having ADHD, with medication prescribed only if moderate or severe functional impairment remains. Parent-based behavior therapy interventions have been shown to reduce disruptive behavior in young children, and therapeutic effects persist after treatment completion (10). Similar treatment recommendations are also included in clinical guidance for child psychiatrists (11), with an emphasis on monitoring for effectiveness and adverse events when medication is prescribed for young children (12). In addition, a recent study has shown that sequencing a behavioral intervention before initiating medication can lead to better outcomes than if medication is administered first (13).

Despite this evidence and clinical recommendations, administrative claims data indicated that during 2008–2011, approximately 78% to 79% of preschool-age children who were enrolled in Medicaid and were receiving clinical care for ADHD received prescriptions for ADHD medication, while only about one-half received psychological treatment services (14). However, that study took a cross-sectional approach and did not examine sequencing of treatment, specifically how many children received behavioral treatment before medication. Previous research has used Medicaid claims data to define treatment trajectories for children with mental disorders (15, 16) but has not focused on whether treatment patterns for young children with ADHD conform to clinical guidelines.

The objective of this study was to describe longitudinal utilization of outpatient care among Medicaid-enrolled children between ages 2 to 5 with ADHD in seven southeastern states with respect to clinical recommendations. We also examined demographic and ecological factors that were associated with membership in the utilization profiles most consistent with clinical practice guidelines. States from the southeastern part of the United States were selected for analysis because this region has been shown to have a higher estimated prevalence of diagnosed ADHD than at least two other regions (2, 17); however, previous work has shown considerable variation in estimates of ADHD treatment across states, even among states located within the same geographic region (14, 18). The analyses presented in

this study are stratified by state, informing state-level policies and programs related to young children with ADHD.

METHODS

Data

The 2005–2012 Medicaid Analytic Extract (MAX) files from the Centers for Medicare and Medicaid Services were used to obtain data for the study population, which consisted of Medicaid-enrolled children ages 2 to 5 with two or more claims with an *ICD-9* primary diagnosis code related to ADHD (314.XX) on different dates in Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, and South Carolina. In order to focus on newly diagnosed cases, each patient's data were subject to a washout period of 6 months of Medicaid enrollment during 2005–2012 prior to the patient's first claim with an ADHD diagnosis code. Claims that took place after the child turned six years of age were not included. This study was approved by the Institutional Review Board of Georgia Institute of Technology (protocol #H11287). [Additional details on data processing are available in an online supplement to this article.]

Profiling Patient-Level Utilization Behaviors

We used sequence clustering analysis methods to model utilization sequences into patient-level utilization profiles. A utilization sequence is a longitudinal realization of a patient's health care utilization in chronological order (19). We differentiated utilization into six types of events: physician's office (PO) visit, psychological services (PS), medication (RX), mental health facility (MHF) outpatient visit, emergency room (ER) visit, and other practitioner (OP) visit. Psychological services claims were identified as any claims with specified procedure codes for psychological treatment, and medication claims were identified for any prescription drug approved by the United States Food and Drug Administration for treatment of ADHD.

We assumed first-order Markov chains as the framework for modeling and clustering individual patient utilization sequences into profiles. The Markov modeling approach considered in this study combines the benefits of network analysis and model-based clustering for discrete event sequences and provide visual summaries of underlying utilization profiles. The proposed methodology has been applied to similar studies for asthma (20) and preventive dental care (21). We employed the expectation maximization algorithm (22, 23) to estimate the probability transition matrices for each profile (24), where an element in a probability transition matrix corresponds to the probability of transitioning from one event type to another.

Profile assignments were made by grouping similar individual patient utilization sequences based on the posterior probabilities. Although there are many similarity measures (25), we considered similarity from a probabilistic viewpoint, where groupings of sequences can be reproduced with high probability from a given probability transition matrix [see online supplement for details]. The profile assignment analysis was run separately for each of the seven states.

We further derived graphical probabilistic networks representing transitions and connectedness between providers to visualize the care pathway network, where the inputs were the Markov chain transition matrices. Specifically, we considered the event types (PO, PS, RX, etc.) as nodes in a directed graph. The directed edges represent transition probabilities between two event types (for example, the transition from PO to RX). The gray-scale gradient represents the proportion of the overall volume of utilization corresponding to each node. Only transitions that had a probability of at least 5% were included in the visualizations. To assess the "connectedness" of different event types, we determined the one-step transition probabilities between different event types and used these results to visualize the care networks on the transition matrix via simple linear algebra techniques (26). Similar types of profiles across states were then grouped together in a qualitative post hoc determination based on the extent to which each utilization network was consistent with clinical guidelines (that is, use of psychological treatment services before medication).

Modeling Variations Across Utilization Profiles

We conducted logistic regression using R Version 3.4.1 (27) to model the likelihood of a child belonging to the profile most consistent with clinical guidelines (that is, receipt of PS before RX) compared with the other utilization profiles for each state, while taking into account patient characteristics and ecological factors. The patient-level characteristics were age, race-ethnicity, gender, coverage type (fee-for-service or not fee-for-service), and basis of Medicaid eligibility (disability, foster care, or other). The regression models also included ecological factors such as urbanicity (large urban, small urban, or rural) and socioeconomic indicators. [Details about the logistic regression analysis are available in an online supplement to this article.]

To reduce the set of explanatory variables in each model, we applied stepwise model selection, comparing the models based on the Akaike information criterion.

RESULTS

This study included 53,460 children ages 2 to 5 (Table 1). The state-level per-patient-per-year rate for treatment events varied from 12.35 (Mississippi) to 0.26 (Louisiana) for psychological services visits and from 6.50 (North Carolina) to 3.61 (Mississippi) for medication (re)fills. [Information about the distribution of children in the study population by demographic characteristics is provided in the online supplement.]

Patient-Level Utilization Behaviors

Three utilization profiles were identified for six states, while only two unique utilization profiles were identified for North Carolina.

The identified profiles were characterized qualitatively relative to other utilization profiles in each state by using two main descriptors. High psychological services (HPS) or low psychological services (LPS) describes utilization profiles with overall high or low probability of transition into psychological service visits. Profiles without a labeled HPS or LPS designation had no transitions into psychological services with a probability of greater

than 5%. High medication (HRX) or low medication (LRX) describes utilization profiles with overall high or low probability of transition into medication. For each profile, additional descriptors show event types (MHF, PO, ER, or OP) from which transitions to psychological services or medication originated with a probability of higher than 10%.

In Table 2, the profiles for each state were grouped into four profile types by using these descriptors: group 1, HPS/LRX; group 2, LPS/LRX; group 3, LPS/HRX; group 4, HRX. Figure 1 shows a set of four utilization profiles as examples (labeled by state and profile group number) to illustrate a profile from each group. Table 3 presents a summary of profile characteristics for all profiles [see online supplement for a description of all utilization profiles for each state].

The first group of profiles had a high probability of transitioning into psychological services and a low probability of medication usage (HPS/LRX); five states had a profile with this description. These profiles represented 10% (N=586) (Alabama) to 30% (N=1,169) (Mississippi) of each state-level study population and 15.5% (N=8,294) of the total study population. In these profiles, more than one-half of the children transitioned into psychological services either directly or indirectly (that is, following another ADHD-related event). Of the sequences that included psychological services in these profiles, the highest probabilities were associated with sequences in which psychological services were received before medication, consistent with AAP guidelines. These profiles also generally had a high probability of continued psychological service receipt; the probability of having additional psychological services claims after the first psychological service event more than 0.80 for each state's profile except for South Carolina's (0.53). The probability of children in these utilization profiles receiving ADHD medications ranged from 0.02 (Mississippi) to 0.29 (Georgia).

The second group of profiles had comparatively lower probabilities of transitions to both psychological services and medication (LPS/LRX); five states had a profile in this group, representing between 0.20 (N=2,015) (North Carolina) and 0.31 (N=1,735) (Alabama) of the study populations in those states. In those profiles, the probability of transitioning into psychological services was between 0.12 (Florida) and 0.51 (Mississippi), and the probability of transitioning into medication was between 0.04 (Florida) and 0.53(Alabama).

The remaining profile groups were characterized by relatively high probabilities of medication treatment. The third profile group had a relatively low probability of transition to psychological service utilization (between 0.02 and 0.31) and contained profiles from five states, while each profile in the fourth group had a less than 5% transition probability from any single node to any psychological services events. Each profile in these two groups had a probability of a transition to medication treatment of more than 50%. Among those that transitioned to medication, none of the profiles had a probability greater than 0.05 of then transitioning to a psychological services event, except for the South Carolina profile (0.19). These profiles represented the largest proportion of the study population overall (0.65, N=34,866) and in each state.

Variations Across Utilization Profiles

The profile with the highest probability of a transition to psychological services was selected for each state (group 1 profiles indicated in Table 2) as the outcome of interest for the logistic regression models. Louisiana and North Carolina were excluded from the logistic regression analyses because neither had a profile with a high probability of transition to psychological services receipt. Table 4 presents logistic regression results for each state comparing membership in the profile with the highest probability of transition to psychological services with membership in the other profiles.

In Florida, Mississippi, and South Carolina, black race was significantly associated with a higher likelihood of being in a profile with a high probability of psychological services. In Florida and South Carolina, children living in areas with higher rates of poverty and higher percentages of adults with a bachelor's degree were more likely to be in a high psychological services profile, whereas in Georgia, the percentage of adults with a bachelor's degree was inversely associated with likelihood of being in a high psychological services profile. Children living in a rural or small urban setting in Georgia and Mississippi and children living in a rural setting in Alabama were more likely to be in a high psychological services profile than children living in a large urban setting in the same state, whereas in South Carolina, children living in a rural setting were less likely than children in large urban settings to be in a high psychological services profile.

DISCUSSION

This study evaluated the health care utilization patterns of Medicaid-enrolled children ages 2 to 5 following a new diagnosis of ADHD and compared these utilization patterns to clinical guidance. Only about 16% of young children in Medicaid in the southeastern United States had utilization consistent with a high probability of receipt of psychological services before medication and a high probability of repeated psychological service visits after diagnosis with ADHD. This finding indicates a major gap in treatment, because clinical guidance recommends behavior therapy as the first-line treatment for ADHD in young children (9,11). Although these results are largely from the period before the 2011 release of the AAP guidelines, guidance for child psychiatrists reflecting the preference for behavior therapy before medication for young children with ADHD had been published earlier (2007), suggesting that treatment of young children with ADHD in the community was not always consistent with recommended best practices.

These analyses revealed state-level variation in utilization profiles for ADHD-related health care. Five states (Alabama, Florida, Georgia, Mississippi, and South Carolina) had one utilization profile with a high probability of transitioning into psychological services that seemed to be consistent with pediatric clinical practice guidelines (9, 11). Most young children receiving care for ADHD (65%) were in utilization profiles characterized by low or no probability of psychological services and high probability of receiving ADHD medication. These results are consistent with previous research that showed that less than one-half of young children received any psychosocial treatment before being treated with antipsychotic medications (15). The variation in treatment receipt across these seven states is also consistent with previous studies showing differences in state-level estimates of

medication and behavioral treatment among children with ADHD (14, 18). We also found variation by race in the probability of being in a utilization profile most consistent with clinical guidelines. In three states, nonwhite children were more likely to be in profiles with a high probability of psychological services utilization, which corresponds with findings that nonwhite school-aged children with ADHD are more likely to have treatment initiated with psychosocial interventions than with medication alone (28) and have less consistent utilization of medication treatment (29). These results show that treatment for ADHD among young children varies across states and by subpopulations.

The misalignment between clinical guidance and utilization could be the result of a number of factors. Provider availability may be a key driver, because few trained professionals are available to deliver evidence-based psychosocial treatments for children (15). There may be differences by physician type in care of children with ADHD (30). Physicians may prescribe medication while families are placed on waiting lists for psychological services (15, 31, 32). Providers may also be influenced by other considerations in the clinical decision-making process for initiating ADHD treatment, such as physical safety and educational concerns (32). Although previous research found that nearly all child psychiatrists reported recommending parent training in behavior management as treatment for ADHD in preschoolers, it is unclear how many waited to prescribe medication until alter parental training implementation (33).

From the family perspective, lack of parental awareness of the availability of psychosocial treatments for ADHD can be a barrier (32, 34). Parent preferences and beliefs may also affect the uptake of psychosocial treatment. These beliefs may include perceptions of parental self-confidence and self-efficacy to engage in these treatments, ability and commitment to prioritizing attendance at psychosocial treatment visits (32, 34), varying levels of willingness to have their young child take psychotropic medications (35), and level of motivation to engage in psychosocial treatments after medication treatment has been initiated (13).

Although the profiles presented in this study provide a snapshot of ADHD-related health care utilization for young children in Medicaid in seven states, the results are subject to limitations. Because this was a longitudinal utilization study of claims data, we assessed only how often reimbursed care aligned with published guidelines. Another limitation was reliance on claims data to infer utilization. First, the MAX files only included claims that were submitted for reimbursement and did not include information on services that had no cost or were paid for outside of the Medicaid system. Second, these analyses only included children who had Medicaid claims with an indication of an ADHD diagnosis and did not include children who met the criteria for ADHD but did not have an indication of ADHD on submitted claims. Therefore, estimates of health care utilization may not be representative for subgroups susceptible to low access to care (36, 37).

Moreover, MAX files have data quality issues (for example, missing diagnosis or procedure codes on claims, incomplete submission of claims), especially for states with large populations receiving managed care (38). Variability in eligibility, coverage, and behavioral health carve-outs within state Medicaid programs may add to the potential differences

among states; such variations are challenging to capture. Another limitation is the lack of procedure codes that specifically identify evidence-based behavior therapy for ADHD. Instead, claims related to any psychological services served as a proxy for these types of treatments. Further, this analysis did not include any behavioral interventions that were administered in primary care if an associated procedure code was not included on the outpatient claim and did not include interventions in other settings (such as preschool educational settings, parent training classes) if Medicaid was not billed for reimbursement. An additional limitation was that this analysis did not account for co-occurring conditions that may affect utilization of either type of treatment, nor did this analysis address duration of time between treatment events. The statistical regression model assumed independence among the children with a diagnosis of ADHD; however, there may be geographic dependencies that could have led to less reliable confidence intervals for the regression coefficients. Finally, the study population may not be representative of service utilization elsewhere in the United States.

CONCLUSIONS

This study provided additional evidence that few young children with a diagnosis of ADHD were receiving treatment consistent with clinical recommendations, specifically receiving psychological treatment services before medication. Most young children with ADHD received medication treatment, with or without subsequent receipt of psychological services. Some demographic characteristics were associated with a lower probability of psychological services receipt, which may indicate groups that could be targeted for efforts to increase utilization of evidence-based behavior therapy and reduce gaps between states in psychological services utilization. These findings may be used to help target interventions to increase the number of young children with a diagnosis of ADHD who receive evidence-based behavior therapy as the first-line treatment for ADHD.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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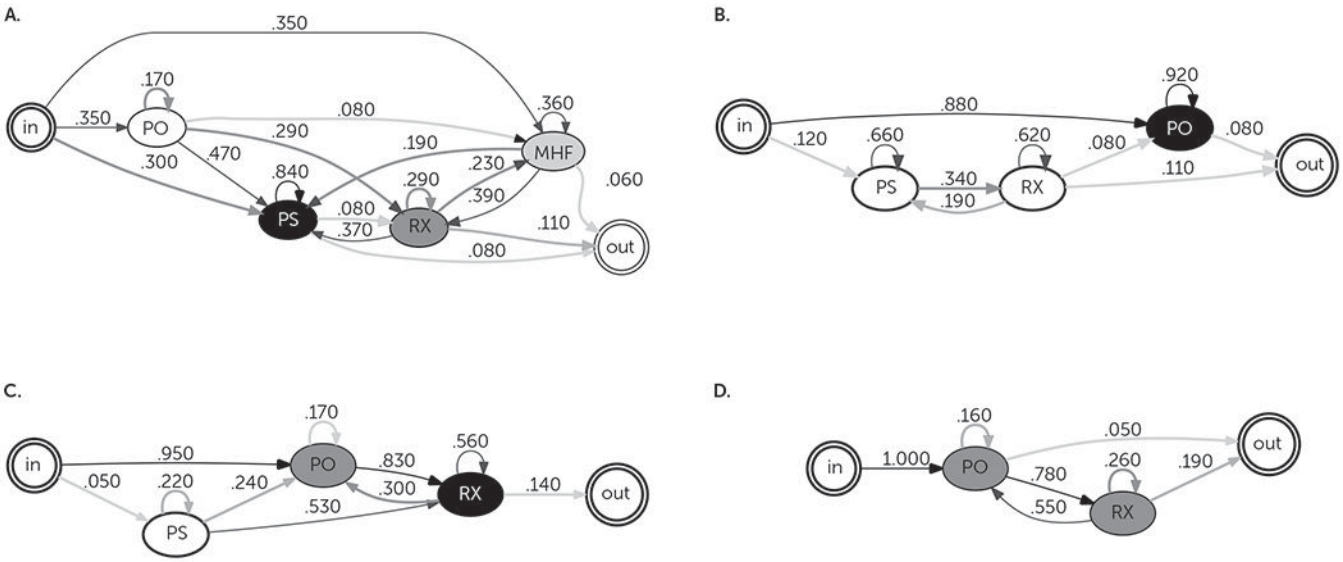

FIGURE 1. Examples of care pathway networks for four utilization profile types among children ages 2 to 5 with a diagnosis of ADHD[a]

[a] Profile group 1, Georgia (N=2,631) (panel A): high probability of transition to psychological services (PS)/low probability of transition to medication (RX); profile group 2, Florida, (N=2,727) (panel B): low probability of transition to PS/low probability of transition to RX; profile group 3, Alabama (N=3,264) (panel C): low probability of transition to PS/high probability of transition to RX; profile group 4, Louisiana (N=5,476) (panel D): high RX. Values shown beside the arrows correspond to the probabilities of transition from one event type to another; the thicker the line, the higher the probability. Different levels of gray shading for various event types represent the proportion of the overall volume of utilization corresponding to that event, with darker shades indicating a higher number of expected visits per patient per year. In profile 1, the probability that PS or RX originated with a mental health facility (MHF) outpatient visit or a physician's office (PO) visit exceeded 0.1; in profiles 2 and 3, the probability that PS or RX originated with a PO visit exceeded 0.1; and in profile 4, the probability that RX originated with a PO visit exceeded 0.1 and the probability of transition to PS from RX or any other event type was less than 0.05.

TABLE 1.

Services received by Medicaid-enrolled children ages 2 to 5 with ADHD, by state and event type, 2005–2012

				Event type											
				Psychological services		Medication		Emergency room visit		Mental health facility visit		Physician's office visit		Other provider visit	
State	Patients	Eligible months	Overall PPPY[a]	N	PPPY[a]	N	PPPY[a]	N	PPPY[a]	N	PPPY[a]	N	PPPY[a]	N	PPPY[a]
Alabama	5,585	64,047	21.08	59,224	11.10	30,626	5.74	3,053	.57	5,128	.96	13,485	2.53	1,008	.19
Florida	10,932	125,364	12.18	25,595	2.45	46,413	4.44	2,764	.26	6,954	.67	45,341	4.34	184	.02
Georgia	10,164	114,354	11.61	31,194	3.27	46,937	4.93	2,220	.23	5,344	.56	21,027	2.21	3,937	.41
Louisiana	9,348	110,167	10.46	2,389	.26	54,575	5.94	3,471	.38	712	.08	29,633	3.23	5,258	.57
Mississippi	3,843	43,905	20.62	45,202	12.35	13,217	3.61	1,806	.49	7,760	2.12	7,243	1.98	228	.06
North Carolina	10,020	115,891	11.74	9,283	.96	62,743	6.50	4,346	.45	2,240	.23	33,068	3.42	1,729	.18
South Carolina	3,568	40,898	12.66	13,256	3.89	16,341	4.79	1,551	.46	5,713	1.68	6,254	1.83	41	.01

[a]Per patient per year.

TABLE 2.

Characteristics of treatment utilization profiles and distribution of Medicaid-enrolled children ages 2 to 5 with ADHD for each profile, by state (2005–2012)

State	Profile group 1: HPS/LRX[a]		Profile group 2: LPS/LRX[b]		Profile group 3: LPS/HRX[c]		Profile group 3a: LPS/HRX[c]		Profile group 3b: LPS/HRX[c]		Profile group 4: HRX[d]	
	Description[e]	State study population (%)	Description[e]	State study population (%)	Description[e]	State study population (%)	Description[e]	State study population (%)	Description[e]	State study population (%)	Description[e]	State study population (%)
Alabama	MHF	11	ER, MHF, PO	31	PO	58						
Florida	MHF, PO	26	PO	25							PO	49
Georgia	MHF, PO	26	OP, PO	27	OP, PO	47						
Louisiana							ER, PO	26	OP, PO	16	PO	59
Mississippi	MHF	30	MHF, PO	27	PO	43						
North Carolina			ER, MHF, PO	20							PO	80
South Carolina	MHF, PO	29					MHF, ER	23	PO	48		

[a] Profile group 1 had high probability of transition to psychological services (PS) and low probability of transition to medication (RX).

[b] Profile group 2 had low probability of transition to PS and low probability of transition to RX.

[c] Profile group 3 had low probability of transition to PS and high probability of transition to RX. Louisiana and South Carolina had two profiles characterized by low probability of transition to PS and high probability of transition to RX but different patterns for utilization of other events and are thereby labeled with separate group numbers (3a and 3b).

[d] Profile group 4 had high RX probability. The probability of transition to PS from RX or any other event type was less than 5%.

[e] Profile description indicates utilization events that had a greater than 10% probability that PS or RX originated in another care event, including a mental health facility (MHF) outpatient visit, a physician's office (PO) visit, an emergency room (ER) visit, or a visit to other provider types (such as nurse practitioners).

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TABLE 3.

Characteristics of utilization profiles for Medicaid-enrolled children ages 2 to 5 with ADHD, by state, 2005–2012

State and profile group[a]	N	State patient population (%)	High probability of PS	Overall probability of transition into PS	Overall probability of transition into RX	Overall probability of PS before RX	Overall probability of RX before PS	Probability of transition from PS to RX	Probability of transition from RX to PS	Probability of follow-up PS after initial PS	Probability of follow-up RX after initial RX claim event
Alabama											
1	586	10	Yes	0.78	0.18	0.67	0.18	0	0.62	0.95	0.18
2	1,735	31	No	0.48	0.53	0.33	0.47	0.38	0.32	0.36	0.33
3	3,264	58	No	0.05	0.82	0.05	0.79	0.53	0	0.22	0.56
Florida											
1	2,876	26	Yes	0.51	0.16	0.49	0.16	0	0.13	0.92	0.38
2	2,727	25	No	0.12	0.04	0.12	0	0.34	0	0.66	0.62
4	5,329	49	No	0	0.82	0	0.82				0.59
Georgia											
1	2,631	26	Yes	0.62	0.29	0.54	0.25	0.08	0.37	0.84	0.29
2	2,787	27	No	0.30	0.45	0.18	0.33	0.66	0.39	0.26	0.38
3	4,746	47	No	0.09	0.87	0.09	0.83	0	0	0.34	0.60
Louisiana											
3a	2,393	26	No	0.02	0.85	0.02	0.84	0.60	0	0.26	0.70
3b	1,479	16	No	0.05	0.81	0.05	0.77	0.10	0	0.57	0.41
4	5,476	59	No	0	0.78	0	0.78	0	0		0.26
Mississippi											
1	1,169	30	Yes	0.92	0.02	0.92	0.02	0	0.10	0.92	0.77
2	1,036	27	No	0.51	0.23	0.43	0.19	0.11	0.43	0.71	0.22
3	1,638	43	No	0.10	0.69	0.10	0.64	0.37	0	0.39	0.49
North Carolina											
2	2,015	20	No	0.15	0.32	0.15	0.32	0	0	0.90	0.50
4	8,005	80	No	0	0.88	0	0.88	0	0		0.55
South Carolina											
1	1,032	29	Yes	0.52	0.16	0.50	0.09	0.13	0.23	0.53	0.53
3a	814	23	No	0.31	0.55	0.19	0.52	0	0.19	0.63	0.36

State and profile group[a]	N	State patient population (%)	High probability of PS	Overall probability of transition into PS	Overall probability of transition into RX	Overall probability of PS before RX	Overall probability of RX before PS	Probability of transition from PS to RX	Probability of transition from RX to PS	Probability of follow-up PS after initial PS	Probability of follow-up RX after initial RX claim event
3b	1,722	48	No	0.06	0.77	0.06	0.77	0	0	0.95	0.59

[a]Profile group 1, high probability of transition to psychological services (PS) and low probability of transition to medication (RX); profile group 2, low probability of transition to PS and low probability of transition to RX; profile group 3, low probability of transition to PS and high probability of transition to RX; profile group 4, high RX probability (probability of transition to PS from RX or any other event type was less than 0.05). Louisiana and South Carolina had two profiles corresponding to group 3. Profiles in group 1 were used to indicate positive outcomes for logistic regression models.

TABLE 4.

Association between characteristics of Medicaid-enrolled children ages 2 to 5 with ADHD and membership in the profile most consistent with clinical guidelines, by state, 2005–2012[a]

	Alabama			Florida			Georgia			Mississippi			South Carolina		
Characteristic	**OR**	**99% CI**	**p**	**OR**	**99% CI**	**p**	**OR**	**99% CI**	**p**	**OR**	**99% CI**	**p**	**OR**	**99% CI**	**p**
Race (reference: white)															
Other				2.13	1.86–2.44	<0.001				1.13	.80–1.59	.36	1.45	1.08–1.94	<0.001
Black	–		–	1.80	1.56–2.09	<0.001	–		–	2.15	1.78–2.59	<0.001	1.63	1.32–2.00	<0.001
Male (reference: female)	–		–	–		–	–		–	.79	.65–.96	<0.001	–		–
Fee for service (reference: other coverage type)	–		–	.36	.31–42	<0.001	1.52	1.20–1.94	<0.001	.26	.20–.34	<0.001	.42	.33–.53	<0.001
Medicaid eligibility (reference: poverty/ other)															
Foster care				1.00	.82–1.21	.99									
Disability	–		–	.68	.58–79	<0.001	–		–	–		–	–		–
Living in area of poverty[b]	–		–	11.11	5.39–22.90	<0.001	–		–	–		–	11.92	2.63–54.09	<0.001
Percentage of adults with a bachelor's degree[b]	–		–	3.26	1.14–9.31	<0.001	.46	.14–1.46	.08	–		–	7.85	1.39–44.26	<0.001
Urbanicity (reference: large urban)															
Rural	1.14	.97–1.34	.03				1.26	1.09–1.45	<0.001	1.29	1.04–1.60	.01	.63	.50–79	<0.001
Small urban	.98	.73–1.30	.82	–		–	1.51	1.27–1.81	<0.001	1.26	1.01–1.57	<0.001	.75	.50–1.13	.07

[a]The logistic regression analyses compared children in profile group 1, the profile most consistent with clinical guidelines, with those in the other two utilization profiles for each state, which had relatively high probability of medication treatment. Only results that were statistically significant at the α=.05 level are shown. Louisiana and North Carolina were excluded from the analyses because neither had a profile in group 1.

[b]Continuous predictors were normalized and set to a 0-to-1 scale for entry into the logistic regression. As a result, the ORs represent the comparison of odds for those at the top of the scale (for example, living in an area with the highest percentage of poverty) to the odds for those at the bottom of the scale (for example, living in an area with the lowest percentage of poverty).