Age of Diagnosis Among Medicaid-Enrolled Children With Autism, 2001–2004

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Abstract

Objective—This study examined child- and county-level factors associated with age of diagnosis of autism among Medicaid-enrolled children and the change in age of diagnosis over time.

Methods—National Medicaid claims from 2002 to 2004 were used to identify age of diagnosis and characteristics of children younger than ten years old with a diagnosis of autism (*ICD-9* codes 299, 299.0x, or 299.8x). These data were linked to county-level education and health care variables. Linear regression with random effects for state and county was used to examine associations between these variables and age of diagnosis.

Results—A total of 28,722 Medicaid-enrolled children newly diagnosed with an autism spectrum disorder were identified. Their average age of diagnosis was 64.9 months. Adjusted average age of diagnosis dropped 5.0 months for autistic disorder and 1.8 months for other spectrum disorders during the study period. Asian children were diagnosed earlier than children in other racial or ethnic groups, although these differences were much more pronounced for other spectrum disorders than for autistic disorder. Children eligible for Medicaid through the poverty category were diagnosed earlier, on average, than children who were eligible through disability, foster care, or other reasons, although this difference decreased over time. Children in large urban or rural counties were diagnosed later than children in small urban or suburban counties.

Conclusions—Findings showed that diagnosis of autism occurs much later than it should among Medicaid-enrolled children, although timeliness is improving over time. Analyses suggest that most

of the observed variation is accounted for by child-level variables, rather than county-level resources or state policies.

Growing evidence suggests the critical importance of early diagnosis of children with autism spectrum disorders (referred to in this article as autism). Observational studies suggest that children who begin treatment at an earlier age have better outcomes than those who initiate treatment later (1). The label of autism also frequently results in eligibility for early intervention services that otherwise would be unavailable (2). The symptoms of autism and associated behaviors can be bewildering and frustrating to parents; timely and appropriate diagnosis can result in better understanding and coping (3).

Autistic disorder, the most severe end of the autism spectrum, can be reliably diagnosed among children as young as 24 months (4,5), and a number of professional organizations urge that diagnosis be made by 36 months, so as to expedite initiation of intervention (6,7). Several studies indicate, however, that the disorder often is not diagnosed until much later. In the earliest of these studies, Mandell and colleagues (8), using mental health Medicaid claims from 1993 to 1999 in one U.S. city, found that among Medicaid-enrolled children, the average age of diagnosis was 81.6 months, with African-American children diagnosed at much older ages than white children. Data used for that study are now more than a decade old, present findings from one city, and were specific to the specialty mental health system. In another study by Mandell and colleagues (9) of a survey of Pennsylvania families, the authors found that among children younger than 21 years in 2004, the average age of diagnosis for autistic disorder was 37.2 months; for pervasive developmental disorder not otherwise specified, 46.8 months; and for Asperger's disorder, 86.4 months. The study found that children tended to be diagnosed at an older age if they were living in rural areas, were from a family that was near poor, or had less continuity of care, as measured by the number of different primary care physicians they had before diagnosis. Although the earlier age of diagnosis relative to the first study by Mandell and colleagues and lack of racial and ethnic disparities were heartening, differences between the two studies may reflect the convenience sample used in the Pennsylvania study.

More recently, Shattuck and colleagues (10), using data from the 13-site Autism and Developmental Disabilities Monitoring (ADDM) Network, in which the education and health care records of eight- and nine-year-old children diagnosed as having autism and phenotypically similar conditions were reviewed, found that among children meeting surveillance case criteria, the median age of diagnosis was 68.4 months; 25% of children identified as cases through the study had no previous record of autism diagnosis. This study found that males, those with lower IQs, and those who experienced developmental regression were diagnosed at earlier ages than other children. The researchers also found that median age of identification varied by site, ranging from 61.2 to 84.0 months, but they did not explore the reasons for this variation because of the small number of sites and the lack of site-level variables.

A recent Canadian study by Ouel-lette-Kuntz and colleagues (11) also found considerable regional variation in age of diagnosis. Using clinician-reported surveillance data from 1997 to 2005 in four regions, the authors found that age of diagnosis varied from 39 months in Newfoundland and Labrador to 55 months in Southeastern Ontario. The authors speculated that various policies, such as the "zero wait time" for assessment in Newfoundland, as well as local health care resources, may have affected age of diagnosis. They pointed out that their small sample (both subjects and number of sites) limited their ability to further examine these associations.

The site differences observed in the studies by Shattuck and colleagues (10) and Ouellette-Kuntz and colleagues (11) suggest that local factors—in addition to children's clinical

presentation and family characteristics—affect age of diagnosis. Understanding these causes of delay in diagnosis is critical, because they may be more malleable than child characteristics to policy or service interventions. The purpose of the study presented here, therefore, was to examine age of diagnosis in a national sample of Medicaid-enrolled children with autism and its association with local health care and education resources. We also extend previous cross-sectional studies by examining changes in age of diagnosis over the study period.

Methods

The University of Pennsylvania Institutional Review Board approved this study.

Conceptual model and rationale for included variables

Medicaid is the primary source of health care insurance for one in four children in the United States—approximately 26 million children were enrolled in each year of the study period (2002–2004). Although Medicaid is a federal program, states have considerable flexibility in whom they insure and what services they cover. Most Medicaid-enrolled children are eligible because their families' income is less than federally specified poverty levels. Children in foster care are automatically eligible for Medicaid. Most states have expanded Medicaid eligibility to include children of families with income as high as 300% of the poverty level. States also may cover children with disabilities that impair functioning; different states have different criteria for determining eligibility through this category, although the minimum standard is set by the federal Social Security Administration. Finally, states may determine that there is a group of children who frequently aren't covered by Medicaid or who require services traditionally not covered by Medicaid (for example, those with a specific diagnosis). The state can create a waiver to include these children and provide services that are traditionally not covered, using the argument that without these services, this group is at high risk of institutionalization. Forty-nine of 50 states use this mechanism to cover services for at least some children with disabilities; during the study period, five states had or were seeking a waiver specifically for children with autism (12,13).

It might be expected that this state-level variation in how Medicaid is used to cover services for children with disabilities would lead to variation in the quality of care they receive, including timely diagnosis. It is also possible that state-level variation is mediated by local health care resources. Other studies have found that local health care resources affect the identification of and delivery of care to children with autism (14–16).

Local early intervention resources, generally paid for through the education system, also may affect timely identification of children with autism (16). The needs of children with autism straddle the education and health care systems. Different jurisdictions have made different choices regarding how education and health care resources will substitute for or complement each other with regard to the identification and care of children with autism.

Age of diagnosis also may be consumer driven. Wealthier families or those with more information about child development may be more likely to notice deviations from usual behaviors and advocate for more timely evaluation (9). Finally, children who are more severely affected may be noticed and diagnosed earlier.

Data sources

This study combined three data sources. The Medicaid Analytic eXtract database from 2002 to 2004 provided information on the age of first autism diagnosis, demographic and clinical characteristics, and county of residence. Children were included only if they had no autism diagnosis in 2001 to increase the probability that the first observed claim associated with an

autism diagnosis represented a first diagnosis and not a gap in service delivery. County-level demographic and health care resource variables were obtained from the 2004 Area Resource File (ARF) (17). ARF data are obtained from the Bureau of the Census, the American Hospital Association, the American Medical Association, and the Centers for Disease Control and Prevention (CDC), along with other agencies. County-level data about education staffing and expenditures were obtained from the National Center for Education Statistics' Common Core of Data (http://nces.ed.gov/ccd).

Sample

The sample included all children meeting the following algorithm. First, only children younger than ten years were included (N=101,281) so that the results could be more readily compared with the ADDM Network study (10). Second, children had to be Medicaid eligible for at least nine out of the 12 months preceding their first Medicaid claim associated with autistic disorder (*ICD-9* code 299 or 299.0x) or Asperger's disorder or pervasive developmental disorder not otherwise specified (*ICD-9* code 299.8x) (N=48,367). Nine of 12 months were required because of "administrative churning," in which families may lose benefits for as much as three months in a row because of administrative sanctions (18). Because data were available starting January 1, 2001, the earliest diagnosis in the sample could occur on January 1, 2002. Third, children in the waiver program category were excluded, because of the high probability that these children were eligible because of their autism diagnosis and therefore had received the diagnosis before Medicaid enrollment (47,823 children not in the waiver category). Finally, within three months (one billing period) of the initial claims associated with an autism diagnosis, the child had to have a claim associated with both an autism diagnosis and a procedure code with a high probability of representing a diagnostic procedure. To identify these procedure codes, a complete list of procedure codes associated with a claim for autism services was created. All procedure codes associated with therapies, laboratory tests or X-rays, durable goods, or transportation or with missing definitions were removed from the list. By using this algorithm, a sample of 28,722 children with a first diagnosis of autism during the study period was identified. [A figure showing a graphical representation of the sample selection is available as an online supplement at ps.psychiatryonline.org.] As a sensitivity analysis, a more restrictive sample of 14,876 children was identified where the first diagnosis of autism was associated with a procedure code in which the word "assessment," "evaluation," or "diagnosis" occurred. There was less than .2 months difference in observed age of diagnosis between these groups. Therefore, the larger sample was used.

Variables

Age of diagnosis was calculated as the difference between the date of the first claim associated with an autism diagnosis and the child's date of birth.

Children's demographic and clinical characteristics were abstracted from the Medicaid claims data and included sex, race and ethnicity (African American, Asian, Latino, white, or other race or ethnicity), diagnosis (autistic disorder versus other pervasive developmental disorder), and reason for Medicaid eligibility (disability, foster care, poverty, or other reason).

Education characteristics included county-level education expenditures (calculated as [total expenditures – total capital outlay] ÷ total number of students) and pupil-teacher ratio. The number of children served in the early intervention system was included as a state-level variable because that information is not available at the county level. It was hypothesized that counties that invest more resources (that is, money or staff) into the education system would also conduct most of their identification of autism through this system. This may ultimately increase the treated prevalence of autism within that county; however, children identified through the Medicaid system may therefore be identified later than in other counties because they may

represent children who are missed by the education system. On the other hand, greater educational resources may increase the incentive for earlier identification of children with disabilities so that they can benefit from these services.

Health care resources included the per capita number of pediatricians and pediatric specialists (child psychiatrists, neurologists, occupational therapists, audiologists, physical therapists, speech-language pathologists, speech therapists, and psychologists). These data were based on work addresses captured by the relevant professional organizations and included in the ARF. It was hypothesized that greater pediatric health care capacity would result in earlier diagnosis.

Demographic characteristics of county residents included the median income, percentage of white residents, percentage of residents aged from birth through less than ten years of age, and urbanicity. Urbanicity was initially coded on the basis of nine categories available in the ARF: The first category was counties of metropolitan areas of one million population or more. The second was counties in metropolitan areas of 250,000 to one million population. The third was counties in metropolitan areas of fewer than 250,000 population. The fourth was urban population of 20,000 or more, adjacent to a metropolitan area. The fifth was urban population of 20,000 or more, not adjacent to a metropolitan area. The sixth was urban population of 2,500–19,999, adjacent to a metropolitan area. The seventh was urban population of 2,500–19,999, not adjacent to a metropolitan area. The eighth was completely rural or less than 2,500 urban population, adjacent to a metropolitan area. The ninth was completely rural or less than 2,500 urban population, not adjacent to a metropolitan area. To facilitate comparisons, these nine categories were recoded into four categories: counties of metropolitan areas of one million or more (code 1), counties in metropolitan areas of fewer than one million (codes 2 and 3; referred to as "suburban"), urban areas (codes 4, 5, 6, and 7), and rural areas or areas less than 2,500 urban population (codes 8 and 9).

The percentage of white residents has been associated with autism treatment decisions (15) and may affect age of diagnosis because it could act as a proxy for greater resources or health care provider bias, in that clinicians may be more likely to screen for autism in a predominantly white population (19). Urbanicity also has been associated with autism identification (16). Larger population is associated with proximity to tertiary care medical centers and greater absolute number of cases of autism, which may increase familiarity with the presentation of the disorder.

Statistical analysis

The purpose of the analysis was to examine the age of diagnosis of autism and its association with various child and county characteristics and to examine trends in age of diagnosis during the study period. To facilitate comparisons among strata of each variable and to avoid the assumption of linear relationships between variables, county characteristics were categorized by quartile. The exceptions were the number of pediatricians, which was categorized as none and then as a median split of the remaining counties (low versus high), and the number of pediatric specialists, which was categorized as any versus none.

Age of diagnosis was modeled using linear regression models with random effects for county and state. Trends in age of diagnosis were examined by adding year of diagnosis to the statistical model. We tested for interactions, without adjustment for multiple comparisons, among all child-level variables to determine whether the annual trends varied among levels of different child characteristics. Significant interactions were included in the final model. Covariate effects were reported in terms of the predicted mean age of diagnosis, associated standard error, and p values from the omnibus test across categories. Adjusted estimates were computed from the final model with other covariates centered at their mean value.

To estimate the total explainable variance at each level of this multilevel analysis (individual, county, and state), we estimated a pseudo-R^2 from the variance components and the intraclass correlation at each level in the null model (with no fixed effects added). To estimate the amount of explainable variance accounted for at each level by the variables at that level, we ran three regressions; in each regression, we entered sets of variables only at one level (that is, one model for child characteristics, one model for county characteristics, and so on) and calculated the percentage change in the pseudo-R^2 from the pseudo-R^2 in the null model. This percentage change quantifies the proportion of outcome variation explained by observed covariates (20).

Results

We identified 28,722 children with newly diagnosed autism in the Medicaid rolls from January 1, 2002, to December 31, 2004. Their average age of diagnosis was 64.9 months. Table 1 presents the bivariate and adjusted associations between each child-level variable and age of diagnosis. In the adjusted analysis, the average age of diagnosis during the study period dropped 5.0 months for autistic disorder and 1.8 months for other spectrum disorders. Compared with other racial and ethnic groups, Asian children were diagnosed as having autistic disorder at a younger age (60.9 months) and white children were diagnosed at an older age (63.0 months). The difference across ethnic groups was more pronounced for other spectrum disorder diagnoses, with Asian children diagnosed at an average of 66.9 months and white children diagnosed at an average of 72.1 months. In 2002 (the first year of the study), children who were Medicaid eligible through the disability program category were diagnosed 18.5 months older, on average, than children eligible through the poverty category. This difference decreased to 14.5 months in 2004.

Table 2 presents the bivariate and adjusted associations between county- and state-level variables and age of diagnosis. At the county level, increased proportion of impoverished county residents and living in a suburban county (as opposed to an urban or rural county) were associated with earlier age of diagnosis. States with the most stringent criterion for the State Children's Health Insurance Program, insuring children only up to 133% of the poverty level, had the lowest age of diagnosis, on average, whereas states in the middle range (insuring children between 140% and 185% of the poverty level) had the highest age of diagnosis.

The variance calculations estimated that 96% of the explainable variation in age of diagnosis is at the child level; adding the county level accounted for an additional 3%, and adding the state level accounted for another 1%. The child-level variables included in the model explained 9% of explainable variation at the child level in age of diagnosis. The county-level variables explained 16% of the variation across counties. The state-level variables explained 23% of the variation across states.

Discussion

Our study found that among Medicaid-enrolled children in the United States from 2002 to 2004, the average age of diagnosis of autism was 64.9 months, remarkably similar to the 68.4 months that Shattuck and colleagues (10) reported from using 2002 data from the ADDM Network, although the Shattuck study included children who met case criteria but did not have a diagnosis of autism in their records, which may have inflated their estimate of age of diagnosis. Even among children with autistic disorder, our study found that the average age of diagnosis was 59.3 months in 2004, confirming that for most children with autism in the United States, diagnosis occurs years later than it should (6). The average age of diagnosis differed by important sample characteristics and changed differentially by these characteristics over time.

The five-month drop in the average age of autistic disorder diagnosis over the three-year study period is encouraging and suggests greater awareness, perhaps fueled by campaigns conducted by the CDC and other organizations during the study period (for example, www.cdc.gov/ncbddd/actearly/index.html). Small differences in age of treatment entry may be important, because observational studies point to improved outcomes for children who, for example, enter treatment at three years of age instead of four years (21,22).

The decrease in age of diagnosis over time was significant only among children with autistic disorder. Other spectrum disorders comprise both Asperger's disorder and pervasive developmental disorder not otherwise specified; previous research showed that although the age of diagnosis of pervasive developmental disorder not otherwise specified is decreasing, older children increasingly are diagnosed as having Asperger's disorder (9). The smaller change over time for other spectrum disorders may therefore result from two countervailing trends: one for a decreasing age of diagnosis for pervasive developmental disorder not otherwise specified and the other for increased average age of diagnosis for Asperger's disorder. A second interpretation is that awareness of the symptoms of autistic disorder is increasing, but much work is left to do regarding the more subtle indications for other spectrum disorders.

The differences in age of diagnosis among ethnic groups are difficult to interpret in light of previous research on health disparities. For example, other studies have suggested late or underdiagnosis among Latino children (16,19,23), whereas we found that Latino and Asian children were diagnosed earlier than children in other racial or ethnic groups. Similarly, our study found that children in poorer counties were diagnosed earlier, on average. It may be that in an impoverished sample such as this one, racial- and ethnic-related health disparities are ameliorated. It may also be that only the most severely impaired children within some racial or ethnic groups or in poor counties are identified, with other children missed altogether, decreasing the observed age of diagnosis for that group. This hypothesis is supported by a study that used the same data as Shattuck and colleagues (10) and found that children with autism from racial or ethnic minority groups were less likely than white children to be diagnosed (19). Further support comes from the finding in the study presented here that the racial and ethnic difference in age of diagnosis was much less for children with autistic disorder (most likely more severely affected) than for children with other spectrum disorders, for which more variability in presentation may be observed.

Children who were eligible for Medicaid through the disability category were diagnosed much later than other children. Many states have expanded Medicaid eligibility to include children with autism, regardless of family income. The age of diagnosis in the disability category may represent age of Medicaid-reimbursed treatment entry, with diagnosis occurring earlier in another system. A second hypothesis is that children in the disability category are multiply impaired. The amelioration of the difference over time in age of diagnosis between children in different eligibility categories may again relate to clinicians' more sophisticated understanding of the presentation of autism and associated comorbidities.

Contrary to studies examining factors associated with autism treatment (15), few county- or state-level variables were significantly associated with age of diagnosis. In fact, the multilevel analysis of variance suggested that most of the variation in age of diagnosis was associated with child-level differences. This finding may have important implications for designing interventions to reduce age of diagnosis, which perhaps should focus more on increasing parental and clinician awareness, rather than changing policy. Two caveats to this interpretation should be considered: first, although Medicaid eligibility was entered into the model as a child-level variable, program eligibility is determined by both child characteristics and state practice. Therefore, there may be cross-level interactions (that is, child characteristics and state policies)

that could not be tested in this model. Second, one should use caution in placing emphasis on the estimates of proportion of variance explained. There is still debate in the literature on the most appropriate statistic for linear mixed models (20). Replication and careful study in other data sets are warranted before this hypothesis is accepted.

At least four study limitations should be mentioned; first among them is that the autism diagnosis in the Medicaid claims has not been validated. Although its accuracy has not been examined specifically, Fombonne and colleagues (24) found 97% positive predictive value for chart diagnoses and a diagnosis of autism administered by a trained research team, and Yeargin-Allsopp and colleagues (25) found that 98% of children with a chart diagnosis met research criteria for autism. Other studies have found good correspondence between psychiatric diagnoses in the claims and those in the charts (26). Taken together, these findings suggest acceptable validity of the diagnosis of autism in the Medicaid claims. A second limitation is that, as with any study relying on a diagnosed group, this study did not include those who were diagnosed very late or not at all. Previous CDC findings suggest that the age group we selected represents the overwhelming majority of individuals who ever will receive the diagnosis (25). With our new sample selection strategy, we also missed most individuals who were diagnosed in in-patient or residential settings (these providers rarely submit procedure codes) and those diagnosed in health care markets in which specific procedure codes may not be required. A third limitation is that children may have received a diagnosis of autism outside the Medicaid system before initiating Medicaid-reimbursed treatment. Other studies have found that many children receive their first autism diagnosis in the education system (10). We attempted to capture this by identifying children eligible through the disability category of Medicaid, which may indicate that they were Medicaid eligible because of their autism or a related impairment; overall this limitation may have artificially inflated the observed age of diagnosis. Finally, the analysis did not include other county variables (for example, autism-specific diagnostic resources or information about other systems that provide diagnostic services) that may be related to age of identification in the Medicaid system. On a related note, the geographic unit of analysis more relevant than county may be school district, because even within a given county, there may be substantial differences in resources and practices among the districts.

Conclusions

Despite these limitations, the results confirm, in a national sample, the late age of diagnosis for most children with autism and point to promising trends in improved timeliness of diagnosis. The lack of findings regarding the importance of county- and state-level variables in predicting age of diagnosis and the evidence that child-level variables, which also may include family and provider characteristics, are most associated with age of diagnosis, suggest avenues for intervention to ensure that children with autism are recognized and enter treatment in a timely and appropriate manner.

Acknowledgments

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Table 1

Child characteristics and age of first autism spectrum disorder diagnosis in the Medicaid system for children younger than ten years[a]

Variable	N	Unadjusted age of first diagnosis (months)	p	Adjusted age of first diagnosis[b] Months	SE	p
Total	28,722	64.9				
Sex			.55			.24
Male	22,414	64.7		65.0	.82	
Female	6,308	65.4		64.6	.87	
Interaction of diagnosis and ethnicity						
Autistic disorder			<.001			<.001
White	6,894	62.0		63.0	.81	
Asian	274	56.7		60.9	1.74	
Latino	2,385	58.8		61.6	.96	
African American	3,002	61.1		62.0	.92	
Other	4,261	63.8		60.3	.89	
Asperger's disorder or pervasive development disorder						
White	5,864	69.5		72.1	.82	
Asian	134	61.3		66.9	2.35	
Latino	1,407	62.7		67.1	1.08	
African American	2,854	72.9		67.9	.98	
Other	1,647	68.0		66.2	1.00	
Interaction of diagnosis and year of diagnosis						
Autistic disorder			<.001			<.001
2002	4,879	65.7		64.3	.95	
2003	5,530	61.5		61.0	.94	
2004	6,407	59.0		59.3	.92	
Asperger's disorder or pervasive development disorder						
2002	3,510	71.4		69.1	1.02	

Variable	N	Unadjusted age of first diagnosis (months)	p	Adjusted age of first diagnosis[b]		p
				Months	SE	
2003	3,736	69.1		67.8	1.01	
2004	4,660	67.7		67.3	.98	
Interaction of year of diagnosis and eligibility type						
2002			<.001			<.001
Disabled	3,762	76.2		78.5	.90	
Foster care	661	68.3		66.3	1.28	
Poverty	3,591	60.0		60.0	.89	
Other	375	64.1		62.2	1.54	
2003						
Disabled	3,848	71.6		74.5	.90	
Foster care	645	66.4		64.7	1.29	
Poverty	4,341	58.4		59.0	.88	
Other	432	61.1		59.4	1.47	
2004						
Disabled	4,214	69.6		72.7	.89	
Foster care	705	64.3		63.2	1.26	
Poverty	5,547	57.4		58.2	.86	
Other	601	60.7		59.1	1.33	

[a] Data are from January 1, 2002, to December 31, 2004.

[b] Adjusted for individual-, county-, and state-level variables

Table 2

County and state characteristics and age of first autism spectrum disorder diagnosis in the Medicaid system for children younger than ten years (N=28,722) [a]

Characteristic	Unadjusted age of first diagnosis (months)	p	Adjusted age of first diagnosis[b]		
			Months	SE	p
County characteristic					
Median income ($)		.08			.07
1st quartile (16,610–30,160)	62.2		65.8	.16	
2nd quartile (30,164–34,892)	62.7		64.1	.99	
3rd quartile (34,899–41,041)	66.8		65.2	.95	
4th quartile (41,042–93,927)	64.9		64.0	.06	
Residents living in poverty (%)		<.001			.03
1st quartile (2.3–9.6)	65.8		66.1	.13	
2nd quartile (9.7–12.7)	64.8		65.1	.97	
3rd quartile (12.8–16.8)	67.8		65.3	.97	
4th quartile (16.9–40.7)	60.8		62.7	.16	
White residents (%)		.12			.19
1st quartile (4.5–74.89)	65.1		64.9	.98	
2nd quartile (74.94–90.01)	63.8		64.2	.93	
3rd quartile (90.03–96.22)	65.1		64.3	.94	
4th quartile (96.23–99.46)	66.0		65.7	.01	
County residents on Medicaid (%)		.003			.36
1st quartile (3.28–28.53)	65.7		65.3	.05	
2nd quartile (28.56–37.98)	65.5		65.5	.96	
3rd quartile(38.00–48.95)	66.6		64.5	.92	
4th quartile (48.98–89.26)	61.4		64.0	.99	
Per capita pediatricians (per 1,000)		.54			.51
None (0)	65.0		65.2	.03	
Low (.03–.318)	65.1		64.9	.92	
High (.319–3.71)	64.8		64.3	.93	
Per capita pediatric specialists (per 1,000)		.99			.40

Characteristic	Unadjusted age of first diagnosis (months)	p	Adjusted age of first diagnosis[b] Months	SE	p
None (0)	64.4		64.5	.91	
Any (.02–35.84)	64.9		65.2	.94	
Teacher-student ratio (prekindergarten through 12th grade)		.25			.34
1st quartile (.028–.0617)	66.4		64.3	.94	
2nd quartile (.0621–.0671)	63.0		64.2	.93	
3rd quartile (.0676–.0735)	63.9		65.2	.93	
4th quartile (.0741–.3704)	64.1		65.5	.01	
Expenditures per student ($)		.46			.38
1st quartile (2,810–7,391)	63.9		64.7	.99	
2nd quartile(7,394–8,259)	63.6		65.2	.95	
3rd quartile (8,260–9,589)	64.7		65.2	.93	
4th quartile (9,594–67,898)	66.3		64.1	.95	
Non–English-speaking persons		.25			.09
1st quartile (0–16)	63.6		63.5	.12	
2nd quartile (17–50)	65.6		65.6	.00	
3rd quartile (51–171)	63.7		64.6	.94	
4th quartile (172–149,648)	65.1		65.6	.00	
Rural or urban					
County in metropolitan area of 1,000,000 or more (366 counties)	66.1	.04	65.7	.01	.05
County in metropolitan area of fewer than 1,000,000 (632 counties)	63.3		64.0	.90	
Urban area population (1,146 counties)	64.3		64.1	.86	
Rural areas or areas < 2,500 urban population (278 counties)	65.5		65.4	.46	
State characteristic					
Children 0–5 years in early intervention (%)		.30			.13
1st quartile (2.14–3.53)	64.0		65.3	.52	

Characteristic	Unadjusted age of first diagnosis (months)	p	Adjusted age of first diagnosis[b]		
			Months	SE	p
2nd quartile (3.64–4.15)	68.2		66.2	.24	
3rd quartile (4.17–5.37)	64.5		65.2	.24	
4th quartile (5.60–8.39)	62.1		62.5	.31	
Percentage of poverty level required					
for State Children's Health Insurance					
Program eligibility		.20			.04
Low (133%)	63.1		63.0	.99	
Middle (140%–185%)	70.7		66.8	.31	
High (200%–300%)	64.6		64.6	.35	

[a] Data are from January 1, 2002, to December 31, 2004.

[b] Adjusted for individual-, county-, and state-level variables