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Rural and Urban Differences in Providers Visited and Services Utilized Among Publicly-Insured Children with Autism in Georgia

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I. Introduction

This was a retrospective study comparing children diagnosed with autism living in rural and urban areas of Georgia on the types of providers accessed, the distance travelled to different types of providers, and the categories and costs of health services utilized. Child-level data from the 2005 Georgia Medicaid and Children's Health Insurance Program (CHIP) claims and eligibility files were used to identify a cohort of children with a diagnosed autism disorder. Bivariate analyses were done using chi square tests to observe differences in the types of providers visited and t-tests to observe differences in mean monthly expenditures by category. A separate logistic regression equation was run for each provider type. Findings revealed that children living in urban areas were more likely to visit a pediatrician, while children living in rural areas were more likely to visit a family practitioner. There were no significant differences between children living in rural or urban areas on their visits to physician specialists or psychologists. Children in urban areas were, however, more likely to visit speech and language, occupational, and physical therapists. In regards to expenditures, children residing in rural areas utilize more pharmacy services while children residing in urban areas utilized more outpatient services.

II. Review of the Literature

While primary care is important to all children, those diagnosed with autism spectrum disorders (Brachlow, Ness et al. 2007) like other children with special health care needs (CHSCN), also rely on access to specialty care including various therapies (Chung & Schuster 2004; Mandell, Novak et al. 2005; Simpson & Dougherty 2007). Yet, children with autism have been shown to have an greater difficulties accessing referrals and specialists than other CSHCN (Kogan, Strickland et al. 2008). Results from a national survey found over a third of children with autism compared to a fifth of children with intellectual disability and other special health care needs had problems obtaining needed care from specialty doctors (Krauss, Gulley et al. 2003).

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While limited, previous research also suggests that CSHCN living in rural areas are less likely to be seen by a pediatrician, and more likely to be seen by a general practitioner, nurse practitioner or physician assistant when compared to their urban counterparts (Skinner & Slifkin, 2007). In the same study, rural families also reported more unmet health care needs for speech and language, occupational, and physical therapies, but no differences in utilization of specialists when adjusting for covariates (Skinner & Slifkin, 2007). Previous studies also suggest that differences may exist between providers in the types of care given for diagnoses common to CSHCN. For example, general practitioners and family physicians are less likely than pediatricians to refer children with possible developmental delays to specialists (Sices, Feudtner, McLaughlin, Drotar, & Williams, 2004).

There is some evidence that rural and urban differences have an impact on diagnosis of autism in children with urban children receiving diagnoses at younger ages than rural children (Mandell, Novak et al. 2005; Chen, Liu et al. 2008). Very few studies, however, have examined health utilization after diagnosis by rural and urban designation. Interestingly, the same study by Chen and colleagues (2008) did not find differences in health utilization by urbanicity when studying services one year post diagnosis (Chen, Liu et al. 2008). However, two studies done in the United States have identified differences in service use by urban density for children with autism. The first studied psychotropic medication use for all Medicaid-enrolled children countrywide. Findings suggest that children in counties with greater urban density had lower proportions of psychotropic medication use (Mandell, Morales et al. 2008). Furthermore, Thomas and colleagues ((Thomas, Ellis et al. 2007) found that access to care was limited for those living in nonmetropolitan areas specifically related to the use of summer camp and respite care; however, no provider capacity variables were included in their regressions. Mandell and colleagues (2008) included two measures of provider supply but found both insignificant when examining differences in health service use, while Chen and colleagues (2008) hypothesize that lack of specialty providers in rural areas is more important than the other factors they used to define urbanicity.

In sum, only a few studies in the published literature have studied utilization of services for children with autism in community settings. Fewer still have addressed delivery-system factors impacting children's access to services (Palmer, Blanchard et al. 2005; Chen, Liu et al. 2008; Mandell, Morales et al. 2008). Only three studies have examined utilization by some type of rural and urban designation and they report inconsistent results (Thomas, Ellis et al. 2007; Chen, Liu et al. 2008; Mandell, Morales et al. 2008). One study was done with self-reported data (Thomas, Ellis et al. 2007), the second was done in Taiwan (Chen, Liu et al. 2008), and the third limited outcomes to the utilization of psychotropic medications (Mandell, Morales et al. 2008). Our study will represent one of the first studies to use a large administrative data set to examine rural and urban differences in the utilization of health services in a publicly-insured population of children in the U.S. Findings from this research will identify the unique needs of geographically underserved populations and potentially identify key leverage points for health system intervention.

III. Study Design and Methods

Data Sources

Child-level data from the 2005 Georgia Medicaid and Children's Health Insurance Program (CHIP) claims and eligibility files were used to identify a cohort of children with a diagnosed autism disorder. Prior to June of 2006, all children in Georgia's Medicaid and CHIP programs, regardless of the Medicaid class of assistance, were faced with the same provider network and providers received the same reimbursement (under fee-for-service) for the services rendered. Using historic claims data allows us to limit the health system variability associated with public insurance coverage. We use county of residence information from the administrative claims data to identify the county-level Rural-Urban Continuum Code (RUCC) for each enrollee. We use the RUCC to define rural and urban residence for each child (USDA 2004). Furthermore, we use the Medicaid provider file to create county-level provider supply variables and average distance travelled by rural versus urban residence. County-level education characteristics were taken from the National Center for Education Statistics' Common Core of Data (http://nces.ed.gov/ccd/).

Sample

The study sample includes 5,665 children who were younger than 21 years of age and received a primary or secondary diagnosis for autistic disorder (International Classification of Diseases, Ninth Revision [ICD-9] code 299.00-299.80) associated with a Medicaid or CHIP reimbursed claim in calendar year 2005 in Georgia. This sample represents 0.47 % of the 1,209,997 Medicaid and CHIP enrolled children in that year.

Variables

The classic model of access defined by Aday and Andersen (1974) provides the framework for understanding the impact of both population (family and child) and health delivery system characteristics on the utilization of health services for child with autism and their families. Family and child characteristics that impact service use are divided into *predisposing, enabling,* and *need* factors. Although predisposing factors like values about health and healthcare as well as other immutable factors like age, gender, race and ethnicity are theoretically important for families of children diagnosed with autism, need and enabling factors appear to be the most critical elements of effective access for children with special health care needs (Simpson and Dougherty 2007) and they, along with health delivery system characteristics, are the most amenable to policy interventions.

Dependent Variables. To measure the type of provider visited, six dichotomous variables were created. The six provider types included: pediatricians/adolescent medicine, family practitioners, internal medicine, specialists (developmental pediatricians, neurologists, psychiatrists, etc.), therapists (speech, occupational, physical therapists) and psychologists. For each provider variable, the child is categorized as "1" if they had at least one visit to the provider during the year and "0" if they did not visit that type of provider. Service use was also measured in terms of total health care expenditures per child per month in each of four categories: Inpatient acute hospital, Outpatient, Long-term care, and Pharmacy.

Independent Variables. Our primary research question relates to differences in utilization by the geographic residence of families. We define the rural or urban location of

a families' primary residence by county using the Rural-Urban Continuum Code (RUCC) – a nine-part classification scheme that distinguishes metropolitan counties by the population size of the metro area, and nonmetropolitan counties by the degree of urbanization and proximity to a metropolitan area (USDA 2004). We categorize counties coded 1-4 as urban and counties coded 6-9 as rural. Georgia has no counties classified as category 5. In terms of provider care capacity, we develop an overall measure of capacity at the county-level as well as six provider-specific measures that correspond with the aforementioned provider type categorization. Using the administrative provider file we develop a provider site-to-enrollee ratio based on the number of registered Medicaid providers (total and by type of provider) practicing in a given county compared to all Medicaid enrollees residing in that county. We chose these measures rather than more global measures of provider supply available through the Health Resource and Services Administration's (HRSA) Area Resource File or Health Provider Shortage Area designations to more precisely measure the provider networks serving publicly-insured children and families in Georgia.

Control variables. Child-level demographic characteristics, including race/ethnicity, gender, and age as well as eligibility type, and whether or not the child was continuously enrolled in public insurance for the full year were extracted from the Medicaid eligibility file. *Predisposing* factors include the child's race/ethnicity and gender. Race/ethnicity is coded as white, black, other, and unknown. Two *enabling* factors are also measured. Insurance or eligibility type is coded according to low-income, disability, or waiver programs for the Medicaid children with CHIP children included as a separate category. Many children eligible through the deeming waiver in Georgia live in families who also have private health insurance. Because Medicaid serves as a secondary payer for these children, we remove them from some of our analyses to ensure that we are not missing services that are paid in full by private insurance. Furthermore, this measure also serves as a proxy for income as low-income and disabled children live in greater poverty than CHIP children. The second *enabling* factor measured is whether or not the child was continuously enrolled in public insurance for the full year or whether they had a break in coverage, as breaks in insurance coverage have also been linked to decreased access to services. In this study, the child's age is used as a measure of *need* because previous research has shown that age is associated with the breadth of services children use (Thomas, Ellis et al. 2007). Age is defined using date of birth to determine the child's age as of mid-year 2005 and categorized in five groups (0-3, 4-5, 6-10, 11-15, and 16-20).

Two county-level education measures—the percent of students in individualized education programs and school expenditures per student— were also included in the model to control for health and support services provided through the education system as these resources may complement or substitute for services paid for by Medicaid and CHIP (Mandell, Morales, Xie, Polsky, Stahmer, and Marcus, 2010)

Analysis

This was a retrospective cross-sectional study comparing children diagnosed with autism living in rural and urban areas of Georgia on the types of providers accessed, the distance travelled to different types of providers, and the categories and costs of health services utilized. Bivariate analyses were done using chi square tests to observe differences in the types of providers visited and t-tests to observe differences in mean

monthly expenditures by category. To assess the independent effects of the geographic variables on visits to each type of provider, a separate logistic regression equation was run for each provider type including all control variables and the corresponding provider supply variable. Odds ratios comparing children living in rural and urban areas on their use of each type of provider were estimated using SAS statistical software.

IV. Detailed Findings

Descriptive analyses of the independent and control variables are available in Table 1 stratified by geographic residence. The initial descriptive analysis suggests that children living in rural areas are somewhat similar on the *predisposing* characteristics, with black children less likely (15% vs. 24%) to live in rural areas in Georgia. There is a difference in the *enabling* characteristics regarding the program eligibility: more children with disabilities or receiving SSI (49% vs. 35%) live in rural areas, and more children on waivers (23% vs. 7%) with higher incomes live in urban areas. *Need* as measured by age group is similar between groups and only slight differences exist in the county-level education characteristics by rural and urban residence. Differences in the supply of providers serving publically-insured children is consistent with previous studies in that urban counties have a higher ratio of provider sites to enrollees for all provider types except for family practitioners (1.71/1000 vs. 1.44/1000) who are in slightly higher supply in rural areas.

A few interesting findings emerge from the bivariate analysis of the expenditure and utilization variables (Table 2). Overall, 63 percent of children with a diagnosis of autism visited a family practitioner in 2005, followed by pediatricians (48%), specialists (38%), therapists (33%), psychologists (28%), and internists (5%). Similar to previous research, children living in urban areas are more likely to visit a pediatrician, while children living in rural areas are more likely to visit a family practitioner. Surprisingly, there were no significant differences between children living in rural or urban areas on their visits to a physician specialist or psychologist; however, children in urban areas are more likely to visit therapists. In regards to expenditures, children residing in rural areas utilize more pharmacy services while children residing in urban areas utilize more outpatient services.

Delivery system factors seemed to account for some of the differences in visits by provider type that were observed in the bivariate analysis. An increased ratio of physician sites to enrollees for pediatricians (OR: 1.94), psychologists (OR: 2.03), and therapists (OR: 1.13) was positively related to the likelihood of at least one visit to that particular provider. While only marginally significant, the odds of a visit to a family practitioner were lower for counties with a higher site to enrollee ratio.

Multivariate analyses also suggest that black children have lower odds of utilizing specialists, psychologists, and therapists when compared to whites. Children receiving Medicaid waiver services utilize Medicaid for access to therapists (OR: 9.40; CI: 7.67—11.52) rather than other provider types when compared to low-income Medicaid recipients. Finally, patterns of access to providers by age group emerge with younger children utilizing pediatricians, family practitioners, and therapists more than older children and children in older age groups utilizing internists and specialists more than younger children.

Table 1: Independent and Control Variables

Variables	Pediatrician/ Adolescent Medicine	Family Practice/Internal Medicine	Specialist	Psychologist	Therapist
Independent Variable					
Geographic residence (Reference: Rural)					
Urban	1.06 (0.90, 1.24)	0.92 (0.77, 1.09)	1.09 (0.92, 1.28)	0.93 (0.77, 1.13)	**1.78 (1.45, 2.18)***
Predisposing characteristics					
Gender					
Male	0.965 (0.85, 1.10)	0.91 (0.79, 1.05)	0.99 (0.87, 1.13)	0.93 (0.77, 1.13)	1.06 (0.90, 1.24)
Race/ethnicity (Reference: White)					
Black	1.01 (0.87,1.175)	0.89 (0.76, 1.04)	0.80 (0.69, 0.94)*	0.76 (0.65, 0.90)*	0.84 (0.70, 1.01)
Hispanic	1.24 (0.73, 2.11)	2.05 (1.02, 4.13)*	0.58 (0.33, 1.01)	0.62 (0.35, 1.08)	0.86 (0.46, 1.64)
Other	1.10 (0.76, 1.61)	0.88 (0.59, 1.31)	0.77 (0.51, 1.15)	0.79 (0.53, 1.20)	1.58 (1.03, 2.43)*
Missing	1.10 (0.93, 1.31)	0.78 (0.65, 0.94)*	0.82 (0.69, 0.98)*	0.64 (0.53, 0.78)*	1.31 (1.05, 1.62)*
Enabling characteristics					
Eligibility / Poverty (Reference: Low income)					
Disabled	0.91 (0.77, 1.07)	0.90 (0.76, 1.08)	1.09 (0.93, 1.29)	0.43 (0.36, 0.52)*	1.21 (0.98, 1.50)
Waiver	0.56 (0.48, 0.67)*	0.28 (0.24, 0.34)*	0.45 (0.37, 0.53)*	0.23 (0.19, 0.28)*	9.48 (7.74, 11.61)*
CHIP	1.25 (1.02, 1.52)*	1.07 (0.86, 1.33)	1.09 (0.89, 1.34)	0.90 (0.73, 1.10)	1.30 (1.02, 1.66)*
Enrollment					
Continuous for study year	1.61 (1.37, 1.89)*	2.02 (1.72, 2.38)*	1.64 (1.38, 1.96)*	1.36 (1.13, 1.61)*	1.75 (1.44, 2.12)*
Need characteristics					
Age Group (Reference: 0-3)					
4-5	0.91 (0.75, 1.09)	0.847 (0.69, 1.04)	1.16 (0.94, 1.42)	1.09 (0.89, 1.34)	0.40 (0.33, 0.49)*
6-10	0.63 (0.53, 0.75)*	0.71 (0.59, 0.86)*	2.15 (1.78, 2.60)*	1.28 (1.06, 1.54)*	0.15 (0.12, 0.18)*
11-15	0.46 (0.38, 0.56)*	0.56 (0.46, 0.69)*	2.68 (2.19, 3.29)*	1.31 (1.07, 1.61)*	0.07 (0.05, 0.09)*
16-20	0.33 (0.25, 0.42)*	0.44 (0.34, 0.58)*	3.27 (2.53, 4.21)*	0.52 (0.38, 0.70)*	0.03 (0.02, 0.04)*
Delivery System factors					
County-level Provider Supply					
Pediatrician/Adolescent Medicine Sites per 1000 enrollees	1.87 (1.63, 2.14)*				
Family Practice/Internal Medicine Sites per 1000 enrollees		0.90 (0.85, 0.95)*			
Specialist Sites per 1000 enrollees			0.87 (0.74, 1.03)		
Psychologist Sites per 1000 enrollees				1.93 (1.51, 2.46)*	
Therapist Sites per 1000 enrollees					1.13 (1.07, 1.19)*

* P < .05

Table 2: Bivariate results for Service Utilization by Rural and Non-Rural Residence

Utilization	Rural Residence		Non-Rural Residence		Total	
	N=878		N=4,787		N=5,665	
	% / Mean	N / SE	% / Mean	N / SE	% / Mean	N / SE
Expenditures ($ per member per month)						
Outpatient *	$248	$5	$303	$3	$294	$3
Inpatient Acute Hospital	$35	$6	$35	$5	$35	$5
Long-term Care *	$-	$-	$20	$1	$17	$1
Pharmacy *	$199	$10	$145	$1	$154	$2
Provider Visit (having at least one visit)						
Pediatrician/Adolescent Medicine *	43%	379	48%	2,321	48%	2,700
Family Practice *	69%	603	62%	2,967	63%	3,570
Internal Medicine *	8%	71	5%	220	5%	291
Specialists	40%	350	37%	1,786	38%	2,136
Psychologists	28%	242	28%	1,359	28%	1,601
Therapists *	20%	172	35%	1,689	33%	1,861

** p< .01*

V. Discussion and Interpretation of Findings

Counter to the literature that rural CHSCN have more unmet needs for routine and specialty medical care than their urban counterparts (Mayer, Skinner, & Slifkin, 2004), we find that children diagnosed with a specific health need—Autism—living in rural areas do not utilize specialists or psychologists differently than children who live in more urban areas. However, children living in urban areas are 1.71 times more likely to access a therapist than children in more rural areas of the state. The rural urban disparity in any visit to a therapist persists even when waiver children, who tend to live in more urban areas and who are more likely to use their Medicaid coverage to pay for therapy services, are removed from the analysis. The resulting odds ratio suggests that children living in urban areas are 1.46 times (CI: 1.17, 1.83) more likely to access a therapist when compared to their rural counterparts.

One additional factor not included in our models was distance to a provider. We calculated a travel distance between the centroid of the patient's zip code and the centroid of the provider's zip code for all visits by provider in 2005 and stratified by residence. Results are included in Table 3. For children that do visit a provider, we find that the difference in distance travelled to each provider is greatest for specialists; rural families, on average, travel 49 miles. While it seems like families are willing to make this journey on a

more occasional basis to visit a medical specialist, they are less likely to travel 20 or more miles on a more frequent basis, perhaps each week, for their children to visit a therapist.

Table 3: Average Travel Distance (in miles)* by Residential Status by Provider Specialty

	Travel Distance		
	Rural	**Non-Rural**	**Total**
Total Providers	31	19	21
Pediatrician/Adolescent Medicine (4,170)	31	15	17
Family Practice (72)	12	10	10
Internal medicine (102)	10	14	13
Specialists (124, 173, 182, 220, 221)	49	20	25
Psychologists (222)	26	16	18
Therapists (251, 252, 151, 201)	20	11	12

**Travel distance is calculated using patient's residential zip code and provider's zip code.*

Consistent with previous findings from the National Survey of Children with Special Health Care Needs (Skinner & Slifkin, 2007), we find rural-urban differences in the types of primary care providers used. Our results find that rural children are more likely to access a family physician and urban children more likely to access a pediatrician. Overall children with a diagnosis of autism are most likely to have a visit with a family practitioner during the year, followed by a pediatrician, specialist, therapist, psychologist and internist. Overall, 38 percent of the children visited a specialist and 28 percent visited a psychologist and we do not find differences in the health seeking behaviors of rural families in terms of at least one visit to either of these providers. These results also do not suggest differences in referral patterns to physician specialists. Whether the rural urban differences in ever visiting a therapist are due to differential health seeking patterns by families and/or different provider referral patterns, rural families are receiving less physical, occupational, and speech & language therapy than their urban counterparts. These visit differences are supported by the bivariate data from Table 2 as they account for much of the differences observed between rural and urban residence in outpatient expenditures per member per month ($248 vs. $303). Skinner and Slifkin (2007) found parents of rural versus urban CSHCN to report a similar result (OR: 0.59) when asked about unmet needs for therapy; parents also identified lack of transportation and that services were unavailable in their area as the reasons for delaying care.

Table 2 also suggests an opposite pattern of pharmacy expenditures, with rural residents spending significantly more on prescriptions per month than children living in more urban areas. This finding is supported by one of the three previous studies of health utilization in children with autism (Mandell, Morales et al. 2008). Upon closer examination we find that this difference is mainly driven by psychotropic medications (75% of rural children with least one prescription versus 63% of urban children) that could not be prescribed by therapists. In our data, we cannot identify which provider type is prescribing the medications nor whether or not any of the children are in need of a specific medication or therapy; only that there is a geographic disparity in utilization that may or may not be associated with the type of provider visited and/or different health seeking patterns by rural and urban families.

We, like Thomas and colleagues (2007), used age-groupings of children with autism as a way to define *need*. One interesting finding was that the breadth of services used by children was highest for those aged 5-8 (Thomas, Ellis et al. 2007). Our results also illustrate provider visit patterns and how they might vary based on the age of the child. The utilization of pediatricians, family practitioners, and therapists decreases as the children age whereas the utilization of internists and specialists increases over time. While this pattern would be expected it does suggest that therapy differences are concentrated in the youngest children, 0-5 year olds, since overall they utilize the majority of the therapists. As the importance of therapy to early intervention can be linked to better outcomes for children, service providers and programs targeting at risk children should be made aware of the access disparities that exist for children living in rural areas.

Finally, while our data does contain a number of children with missing race, it does support previous research that *predisposing* factors of the children and families, specifically race, may also be associated with disparities in access. We find that black children are less likely to visit specialists, psychologists, and therapists when compared to white children in Georgia. Similarly, Thomas and colleagues (2007) found that families from racial and ethnic minority backgrounds had half the odds of using a case manager, and only a quarter the odds of using a psychologist, developmental pediatrician, and sensory integration therapy in a North Carolina study of access to autism-related services. Researchers have also identified racial and ethnic disparities in the recognition of autism spectrum disorders (ASD) both in terms of age at diagnosis and the patterns of care prior to an ASD diagnosis (Mandell, Ittenbach et al. 2007; Mandell, Wiggins et al. 2009) with black children receiving a diagnosis an average of 1.5 years later than white children (Mandell, Listerud et al. 2002). This is one of the first studies to examine the types of providers caring for children with a diagnosis of autism in practice. By holding other known access barriers constant—insurance status, provider networks, etc.—we can observe any disparities in access that may be associated with the rural versus urban residence of families. In the absence of strict practice guidelines for the care of children with a diagnosis of autism, we also observe a difference in the utilization of therapy and pharmacy services by residential status which suggests future research should more closely examine these differential care patterns for children to ensure that all children have access to the treatments and practices found to be the most effective in creating positive outcomes for children.

Our research has a few limitations. The autism diagnosis in medical claims has not been validated, although research has found that 98% of children with a chart diagnosis met research criteria for Autism Spectrum Disorder (Yeargin-Allsopp, Rice et al. 2003). The claims data do not allow us to measure the severity of a child's diagnosis of autism. To the extent that families' may change where they live based on their child's diagnosis or severity, it will not be possible to measure this using cross-sectional methods. We do note that while the prevalence of publicly-insured children diagnosed with autism varies somewhat by rural and urban residence, many children diagnosed with autism currently reside in rural areas. Finally, this study is conducted with Medicaid-eligible children and may not be generalizable to other children, although children with autism are disproportionately eligible for public insurance relative to children with other disabilities (Birenbaum, Guyot et al. 1990). In Georgia, more than 1 in 3 children are covered by public health insurance. These findings cannot determine whether the overall visit rates to each

provider are too high or too low. Additional work on outcomes for children who do and do not utilize therapy and/or certain psychotropic medications would further inform the work presented here.

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VI. List of Products

Publications

Snyder, A., Crimmins, D., & Zhou, M. (under revision). Rural and urban differences in providers visited and services utilized among publicly-insured children with autism in Georgia

Crimmins, D., Snyder, A., Peacock, G., & Zhou, M. (in preparation). Urban-rural differences in prescription drug use by Medicaid-eligible children with autism in Georgia.

Conference Presentations

Snyder, A., Crimmins, D., Zhou, M., & Wild, R. (2011, January). Rural–urban differences in primary and specialty care for publicly-insured children with autism in Georgia. Presentation to the Combatting Autism Act Initiatives grantee meeting, Washington, DC.

Snyder, A., Crimmins, D., Zhou, M., & Wild, R. (2010, June). Access to specialty care by Medicaid-eligible children with autism in Georgia: Preliminary findings. Presentation to the Annual Research Meeting of AcademyHealth, Boston, MA.

Snyder, A., Crimmins, D., Zhou, M., & Wild, R. (2010, June). Access to specialty care by Medicaid-eligible children with autism in Georgia: Preliminary findings.. Presentation to the Child Health Services Research Interest Group of the Annual Research Meeting of AcademyHealth, Boston, MA.