

Autism Spectrum Disorders in Preschool-Aged Children: Prevalence and Comparison to a School-Aged Population

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PURPOSE: The purpose of this study was to determine the prevalence and case characteristics of children with autism spectrum disorders (ASDs) among 4-year-olds and to compare findings to previous prevalence estimates for 8-year-olds in the same geographic area.

METHODS: South Carolina (SC) has been a participant in the Centers for Disease Control and Prevention's active, population-based, multiple-site ASD surveillance network for 8-year-olds since 2000. The 8-year-old methodology, designed to identify children both with and without prior diagnosis, was applied in SC with modification to include information sources for younger children.

RESULTS: The ASD prevalence among 4-year-olds in 2006 was 8.0 per 1000 (95% confidence interval [CI], 6.1–9.9), or 1 in 125. In comparison, ASD prevalence among 8-year-olds in the same geographic area was 7.6 (95% CI, 5.7–9.5) in 2000 and 7.0 (95% CI 5.1–8.9) in 2002. Developmental concerns were documented at earlier ages across time, and while most cases received services, only 20% to 29% received services specific to ASD.

CONCLUSIONS: Findings should provide useful information for the planning of health/education policies and early intervention strategies for ASD.

Ann Epidemiol 2009;19:808–814. © 2009 Elsevier Inc. All rights reserved.

KEY WORDS: Autism, Developmental Disabilities, Public Health Surveillance.

INTRODUCTION

Autism spectrum disorders (ASDs) are a group of developmental disabilities characterized by pervasive deficits in socialization and communication, as well as unusual behaviors or interests (1). The most recent estimates of ASD prevalence among 8-year-old children in the United States are from the Centers for Disease Control and Prevention's (CDC) Autism Developmental Disabilities and Monitoring (ADDM) Network and range from 3.3 to 10.6 per 1,000 children across the 14 Network sites, with an overall mean prevalence of 6.6 per 1000 (2). Based on other ADDM Network findings as well as a similar surveillance program among 8-year-old children in the metropolitan Atlanta area, this estimate places ASD as the second most prevalent serious developmental disability behind intellectual disability (intellectual disability, 12 per 1000 (3); cerebral palsy, 3.3 per 1000 (4); hearing loss and visual impairment, 2.1 per 1000 each (3)).

The purpose of this study was to determine the prevalence and case characteristics of children with ASD among

a population of 4-year-olds and to compare findings with previous surveillance of 8-year-olds in the same geographic area. In addition to providing population-based information on the frequency of ASD among younger children, findings should be useful to program planners and decision makers in developing health/education policies and early intervention strategies.

METHODS

South Carolina (SC) has been a member of the ADDM Network since its inception, conducting surveillance using standard ADDM Network methodology (2, 5, 6) among children aged 8 years across multiple birth-year cohorts. Description and results from SC's surveillance of 8-year-old children have been previously published (2, 6, 7). The surveillance of 4-year-old children reported in this study used the same methodology as these previous studies, modified to include state-specific sources for younger children and applied to a subregion of the surveillance area for 8-year-olds. The use of the subregion permitted comparison of case characteristics among 4-year-olds with those of previous cohorts.

Catchment Area and Data Sources

The catchment area for surveillance of 4-year-olds included a contiguous three-county subregion of our ADDM catchment area for 8-year-olds (Fig. 1). This subregion was

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Received December 31, 2008; accepted April 27, 2009.

Selected Abbreviations and Acronyms

ASD = autism spectrum disorder
CDC = Centers for Disease Control and Prevention
ADDM = Autism Developmental Disabilities and Monitoring (Network)
SC = South Carolina
DDSN = Department of Disabilities and Special Needs
DHEC = Department of Health and Environmental Control
DSM-IV-TR = *Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition, Text Revision*
PDD-NOS = Pervasive Developmental Disorder-Not Otherwise Specified
CI = confidence interval
ICD-9 = *International Classification of Diseases, Ninth Revision*
AAP = American Academy of Pediatrics
SD = standard deviation

selected because it is demographically similar to the total ADDM catchment area and thus afforded a suitable pilot area for the surveillance of younger children. Data sources for the surveillance of 4-year-old children included all usual surveillance sites for 8-year-olds, specifically all area public schools, SC Department of Disabilities and Special Needs (DDSN) boards, and the Medical University of SC. In addition, facilities providing early intervention services for 0- to 3-year-olds were added as data sources. In SC, the Department of Health and Environmental Control (DHEC) is the designated lead agency for services to 0- to 3-year-old children, with the majority of services provided through a statewide program called Babynet. Babynet offices in each subregion county were added as surveillance sites, as well as private, nonprofit agencies for early intervention (e.g., Easter Seals).

All necessary approvals for data access were obtained, including institutional review board approval, Health Insurance Portability and Accountability Act waiver, and agreements with the State Education Department and DHEC.

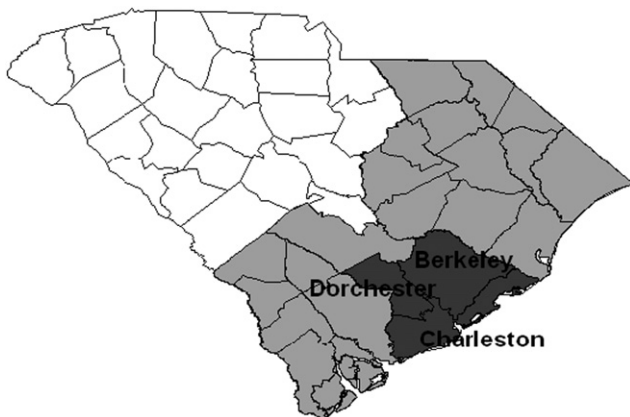


FIGURE 1. South Carolina Autism Developmental Disabilities Monitoring Study Area (SC ADDM). *Light gray area* represents the entire SC ADDM surveillance area. *Dark gray area* represents the three-county subregion used for surveillance of 4-year-olds.

Case Definition and Ascertainment

A child was included as a confirmed case of ASD if he or she displayed behaviors (as described in a comprehensive evaluation by a qualified professional) consistent with the *Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition, Text Revision (DSM-IV-TR)* diagnostic criteria for Autistic Disorder, Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS, including Atypical Autism), or Asperger Disorder. It is important to note that the case ascertainment process did not limit surveillance to previously diagnosed cases. The protocol is designed to capture children both with and without a previous ASD diagnosis by identifying possible cases with a range of diagnoses and/or classifications through careful record review of symptoms associated with ASD.

The case ascertainment process was completed in two phases: data abstraction and clinician review. In the data abstraction phase, our team used a computer system currently in use for the larger ADDM project to track and store all records throughout the case ascertainment process. The abstractors verified residency within the surveillance area and screened the records for the presence of behavioral triggers (5) found in evaluations. Residency was based on the child having at least one parent or legal guardian residing in the surveillance area during the surveillance year. Address was verified through the child's medical or school records, or in the absence of an address, by the child's enrollment in a school district within the surveillance area. Records of children who met the age and surveillance year requirements and who had any special educational classification were reviewed and abstracted if appropriate. Record requests from non-school sources were based on children who met the age and residency requirements and who were diagnosed with select *International Classification of Diseases, Ninth Revision (ICD-9)/DSM-IV* codes. There was no limit set on service date; the child may have received services or had a specific diagnosis code at any time between birth and Dec. 31, 2006. In the clinician review phase, composite records were systematically reviewed by an independent team of clinicians to determine case status. A clinician reviewer determined case status based on review of abstracted information by using a coding scheme based on *DSM-IV-TR* criteria for these disorders. Full cooperation of all agencies in the subregion was obtained for this study, allowing for maximum case ascertainment.

Major Variables Collected, Quality Assurance and Quality Control, Statistical Methods

Major variables collected in the surveillance system included, but were not limited to, demographic information such as race, gender, and ethnicity, school program information, adaptive and IQ test results, other medical conditions,

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