



Colorado Department  
of Public Health  
and Environment

## **Autism Spectrum Disorders Surveillance Summary, Denver Metropolitan Area, 2008**

**Colorado Autism and Developmental Disabilities Monitoring Project  
Disease Control and Environmental Epidemiology Division**

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## Table of Contents

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- Executive summary ..... Page 3
- Introduction and methods .....Page 4
- Education data in Arapahoe County, Colorado ..... Page 6
- Summary of ADDM surveillance results for the Denver Metropolitan Area ..... Page 7
  - Demographics
  - Intellectual ability
  - Adaptive behavior
  - Regression and plateau in development
  - Diagnostic behaviors
  - Autism discriminators
  - Associated behaviors
  - Previously documented ASD diagnosis
  - Age of diagnosis
  - Comparison of males and females
- Overall conclusions and next steps ..... Page 15
- Literature cited..... Page 16

## Executive Summary

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Autism spectrum disorders (ASD) are behaviorally defined neurodevelopmental disorders characterized by social and communication impairments and repetitive and restrictive behaviors and interests. The Colorado Autism and Developmental Disabilities Monitoring Project (CO ADDM) at the Colorado Department of Public Health and Environment is a surveillance system funded by the Centers for Disease Control and Prevention (CDC) and part of the Autism and Developmental Disabilities Monitoring (ADDMM) Network. Its primary objective is to determine the prevalence of ASD among 8-year-old residents in the seven counties of the Denver Metropolitan Area – Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, and Jefferson Counties. Prevalence is monitored every two years.

The surveillance process consists of two phases. The first phase involves screening and abstraction of evaluations from qualified examiners at health facilities and school districts for children with ASD-like behaviors. In the second phase, all abstracted evaluations are compiled and reviewed by specially-trained clinicians to determine ASD case status. A child meets the ASD case definition if he or she displays behaviors consistent with diagnostic criteria from the American Psychiatric Association's Diagnostic and Statistical Manual-IV, Text Revision (DSM-IV-TR) for ASD.

The following are key findings from the CO ADDM for the 2008 monitoring year for the Denver Metropolitan Area.

1. ASD prevalence estimates were provided for two regions in the surveillance area. In Arapahoe County where ASD was monitored in both health and educational settings, the prevalence was 11.8 per 1,000 8-year-old children. In the remaining six counties of the metropolitan area (Adams, Boulder, Broomfield, Denver, Douglas, and Jefferson Counties) ASD was monitored in health settings only and the prevalence was 6.4 per 1,000 8-year-old children. The difference in prevalence between the two geographic areas could be explained by the additional monitoring of ASD within educational settings in Arapahoe County. It is possible the actual prevalence of ASD for the seven-county area could be similar to that found in Arapahoe County if monitoring occurred in both education and health settings, however, the effect of education data on the prevalence of ASD will remain largely unknown without participation from all school districts in the surveillance area.
2. In the Denver Metropolitan Area, the prevalence of ASD was not the same among all racial and ethnic groups. It was significantly lower among Hispanic children compared with non-Hispanic, white children.
3. Thirty-two percent (n=63) of all the ASD cases who had testing information available were classified in the range of intellectual disability, which is defined as an IQ (intelligence quotient) test score of 70 or less or an examiner's report of intellectual disability based on standardized testing.
4. The median age cases had received their first developmental evaluation was 48 months, which is older than the Healthy People 2020 objective of 36 months.
5. Thirty-five percent (n=98) of children meeting the ASD case definition had not been diagnosed or identified with ASD by their community provider or school district.
6. More boys than girls met the case definition for ASD, with a ratio of 5.5 boys to every 1 girl. The ratio of Hispanic boys to girls was 15.3 to 1.

Further study is needed to develop programs to understand and address racial and ethnic differences, ways to improve the early evaluation of children with ASD, and barriers to the diagnosis of ASD.

## Introduction and methods

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Autism spectrum disorders (ASD) are behaviorally defined neurodevelopmental disorders characterized by social and communication impairments and by repetitive and restrictive behaviors and interests. The Autism and Developmental Disabilities Monitoring (ADDM) Network is a surveillance system funded by the Centers for Disease Control and Prevention (CDC) with the primary objective of estimating the prevalence of ASD among surveillance sites. Prevalence is monitored every two years. The data in this report reflect findings from 2008.

The ADDM Network surveillance methods are fully described in a previously published report (1). Briefly, the ADDM Network does not rely on the reporting of an existing ASD diagnosis to determine case status. Instead, information is obtained from children's evaluation records to determine the presence of ASD behaviors at any time from birth through 8 years. The surveillance process consists of two phases. The first phase involves screening and abstraction of evaluations from qualified examiners at health facilities and school districts for children with ASD-like behaviors. Examples of qualified examiners include developmental pediatricians, speech-language pathologists, psychologists, and occupational therapists. During the second phase, the abstracted evaluations are compiled and reviewed by specially-trained clinicians to determine ASD case status. A child meets the ASD case definition if he or she displays behaviors consistent with diagnostic criteria from the American Psychiatric Association's Diagnostic and Statistical Manual-IV, Text Revision (DSM-IV-TR) for any of the following conditions: autistic disorder; Asperger disorder; or pervasive developmental disorder—not otherwise specified (PDD-NOS), including atypical autism.

In 2013 the American Psychiatric Association published an updated version of the Diagnostic and Statistical Manual for Mental Diseases. Because this 5<sup>th</sup> edition was not published until 2013, information in children's records, and thus the ADDM Network case definition, will be in line with the DSM-IV-TR until that time.

As part of the ADDM Network, the Colorado Autism and Developmental Disabilities Monitoring Project (CO ADDM) conducts ASD surveillance in the seven-county Denver Metropolitan Area, which includes Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, and Jefferson Counties. It follows the ADDM Network surveillance guidelines. The Colorado Department of Public Health and Environment (CDPHE) directs the overall activities of the CO ADDM and collects data during the first phase of the surveillance process. JFK Partners at the University of Colorado Denver provides clinical expertise and determines case status during the second phase. Additionally, in 2008, the Colorado Department of Education participated in the monitoring project by collecting data within school districts during the first phase.

For the 2008 surveillance year, the ADDM Network published the ASD prevalence for the Denver Metropolitan Area as two separate estimates. The first estimate was for Arapahoe County where ASD was monitored in both health and educational settings. The second estimate was for the remaining six counties (Adams, Boulder, Broomfield, Denver, Douglas, and Jefferson Counties) where ASD was monitored in the health setting only.

In 2013, the Collaborative Addressing System Change in ASD and other Developmental disabilities (CASCADE) funded CDPHE to analyze its 2008 surveillance data in greater detail. The purpose of the analysis was to:

1. understand the role of surveillance in the educational setting on the prevalence of ASD in Arapahoe County;
2. use the information from the first objective to estimate the prevalence of ASD throughout the metropolitan area, if possible; and
3. describe the characteristics of the children meeting the ASD case definition who live in the seven-county Denver Metropolitan Area.

Population denominators for calculating ASD prevalence estimates were obtained from the CDC's National Center for Health Statistics vintage 2009 bridged-race postcensal population estimates for calculating vital rates. 95% confidence intervals (CIs) for prevalence estimates were derived under the assumption that the observed counts of children identified with ASD are random variables drawn from an underlying Poisson distribution. Differences in percent distribution were assessed by chi-square analysis and tests of the median were performed by a Wilcoxon-Mann-Whitney two-sample median test. A maximum value of  $p < 0.05$  was used for all tests of statistical significance.

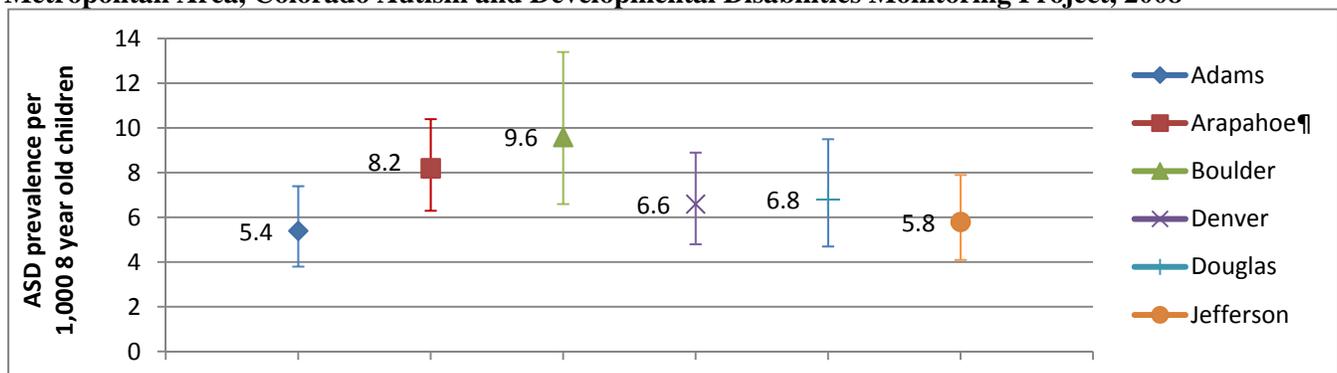
## Arapahoe County, Colorado: Summary of the role of education data in the prevalence of autism spectrum disorders

On March 30, 2012, the CDC published the 2008 prevalence estimates for the ADDM Network in the *Mortality and Morbidity Weekly Report* (2). This report found the overall prevalence of ASD for the 14 network sites was 11.3 per 1,000 8-year-old children (one in 88). In the Denver Metropolitan Area, prevalence estimates were provided for two regions. In Arapahoe County where ASD was monitored in both health and educational settings, the prevalence of ASD was 11.8 per 1,000 8-year-old children (one in 85). In the remaining six counties of the metropolitan area (Adams, Boulder, Broomfield, Denver, Douglas, and Jefferson Counties) ASD was monitored in the health setting only and the prevalence was 6.4 per 1,000 8-year-old children (one in 156).

Of note, some children are only evaluated for ASD-like behaviors in the health setting, while some children are only evaluated for these behaviors in the educational setting. To assure identification of all children meeting the ASD case definition, the ADDM Network sites seek to monitor the prevalence of ASD in both health and educational settings. In the Denver Metropolitan Area for the 2008 monitoring year, only the school districts in Arapahoe County participated in the monitoring effort and all health facilities in the entire surveillance area participated.

To assess the role of education data on the prevalence of ASD in Arapahoe County, the CO ADDM determined which cases were identified due to behaviors described in educational evaluations, n=28 (30.8% of the total cases in Arapahoe County), and removed these from the Arapahoe County case count. When comparing the prevalence estimates of cases only identified from data collected in health settings, the prevalence estimates for each county in the metropolitan area did not vary significantly from each other (p=0.10). See Figure 1. This suggests the difference in prevalence observed between Arapahoe County and the remaining six counties of the metropolitan area for the 2008 surveillance year could be explained by the additional monitoring of ASD within educational settings in Arapahoe County.

**Figure 1: Prevalence of autism spectrum disorders identified using only health data by county, Denver Metropolitan Area, Colorado Autism and Developmental Disabilities Monitoring Project, 2008**



¶Arapahoe County prevalence excludes children identified using education records.

It is possible the actual prevalence of ASD for the seven-county Denver Metropolitan Area could be similar to that found in Arapahoe County if monitoring occurred in both education and health settings, however, the effect of education data on the prevalence of ASD will remain largely unknown without participation from all school districts in the surveillance area.

## Denver Metropolitan Area: Summary of autism spectrum disorders surveillance

In the seven counties of the Denver Metropolitan Area – Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, and Jefferson Counties – 279 children aged 8 years were identified from health and education sources as meeting the CO ADDM case definition for ASD in 2008. The following is a summary of demographic and clinical characteristics of these cases.

### *Demographic characteristics*

Table 1 shows the demographic characteristics of children meeting the ASD case definition in the Denver Metropolitan Area, where 65.2% of ASD cases were non-Hispanic white, 7.2% non-Hispanic black and 17.6% Hispanic. The prevalence of ASD was lower among Hispanic children when compared with non-Hispanic white children. The majority of cases, 84.6%, were male.

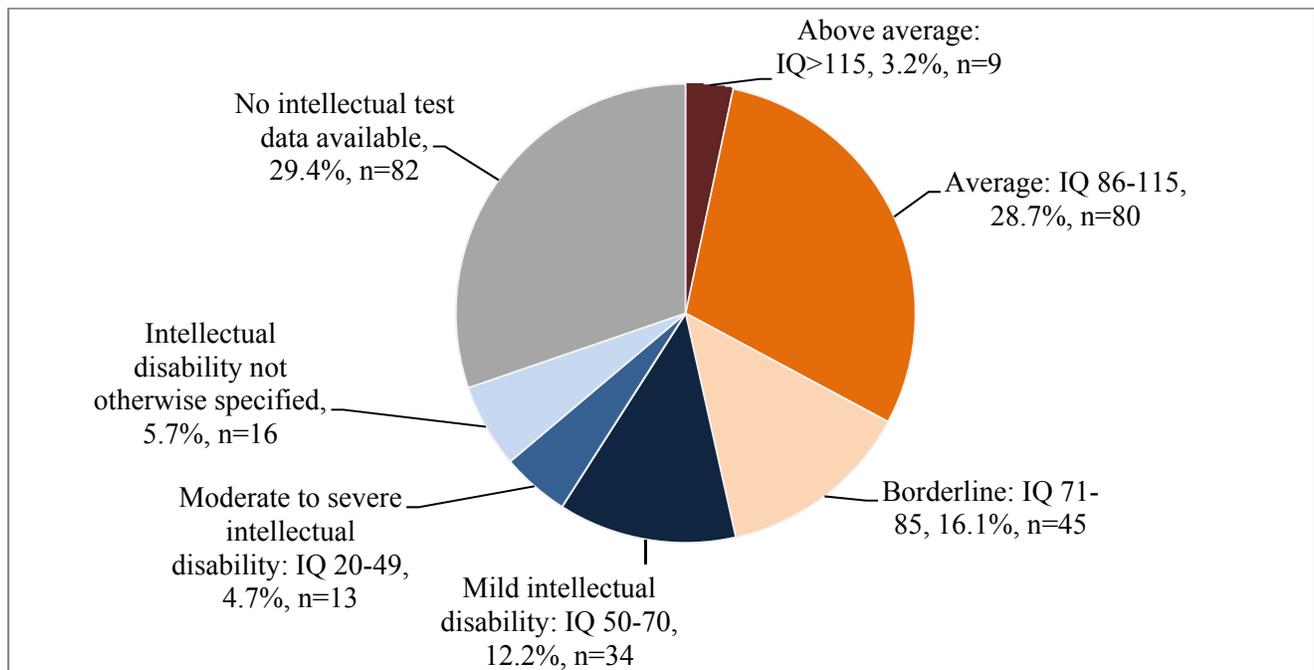
**Table 1: Prevalence of autism spectrum disorders by sex and race/ethnicity in the Denver Metropolitan Area, Colorado Autism and Developmental Disabilities Monitoring Project, 2008**

	Total 8-yo population	Percent	ASD cases	Percent	Prevalence/1000 (CI)	p-value
7-county Denver metropolitan area	37,061	--	279	--	7.5 (6.6-8.4)	--
Sex						
Females	18,141	48.9	43	15.4	2.4 (1.7-3.2)	<0.0001
Males	18,920	51.1	236	84.6	12.5 (10.8-14.2)	reference
Race/ethnicity						
White, non-Hispanic	20,913	56.4	182	65.2	8.7 (7.5-10.1)	reference
Black, non-Hispanic	2,441	6.6	20	7.2	8.2 (5.0-12.6)	0.7970
Other, non-Hispanic	1,814	4.9	4	1.4	2.2 (0.6-5.6)	0.4976
Hispanic, all races	11,893	32.1	49	17.6	4.1 (3.0-5.4)	<0.0001
Unknown	--	--	24	8.6	--	--

### *Intellectual ability*

The CO ADDM reports a child's intellectual ability using standardized test scores or clinician report of intellectual ability. The majority of the cases in the metropolitan area, 70.6%, had intellectual testing information available. Among these cases, the median age for the most recent intellectual test was 69 months, ranging from 12 to 104 months. Figure 2 illustrates the proportion of all children meeting the ASD case definition by intellectual ability. Of the 197 cases with testing information available, 32.0% were categorized in the range of intellectual disability (intelligence quotient (IQ) test score of 70 or less or clinician report of intellectual disability), 22.8% had borderline IQ scores (scores between 71 and 85), 40.6% had average IQ scores (scores between 86 and 115) and 4.6% had above average IQ scores (scores greater than 115).

**Figure 2: Proportion of all cases of autism spectrum disorder by intellectual ability, Denver Metropolitan Area, Colorado Autism and Developmental Disabilities Project, 2008 (n=279)**

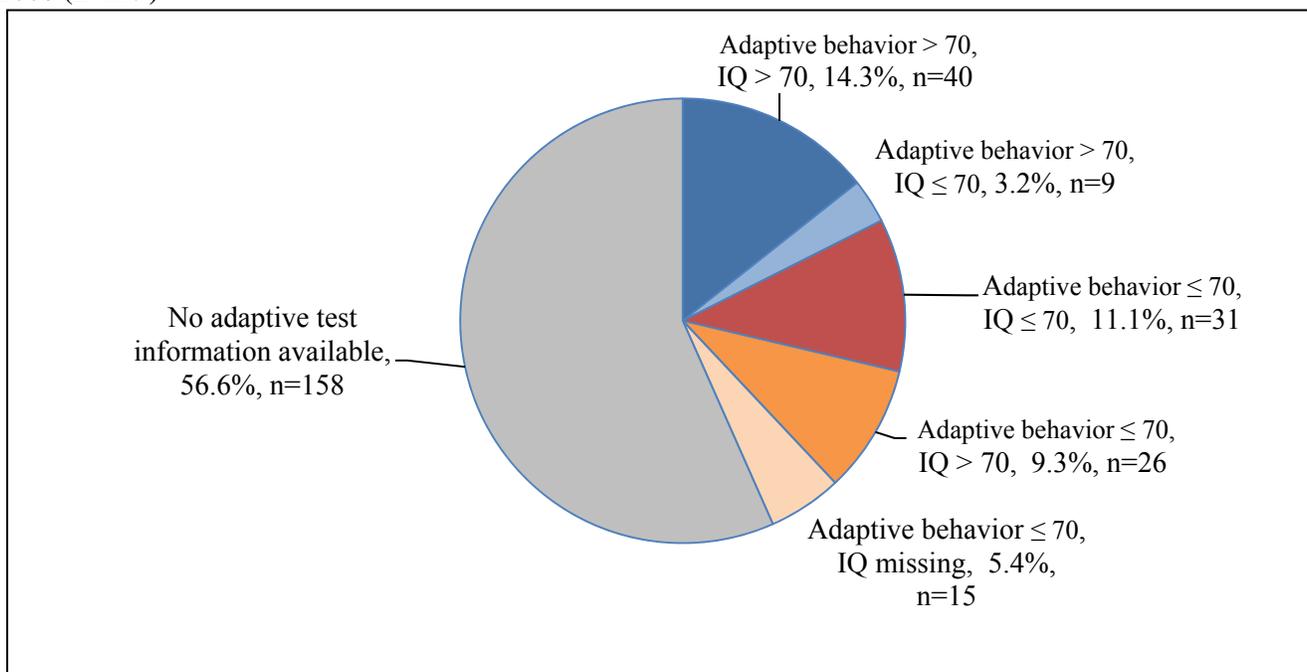


*Adaptive behavior*

Adaptive behavior is the age-appropriate behaviors necessary for a person to live independently and function in daily life. It includes skills such as grooming, dressing, safety, social skills, and personal responsibility. Among all Denver Metropolitan Area cases of ASD, a minority of cases, 43.4% (n=121), had adaptive test scores available. Of these, 72 cases (59.5%) had adaptive scores of 70 or less; 49 cases (40.5%) had adaptive scores greater than 70.

Some children with ASD may have IQ test scores greater than 70, but still have significant impairments in adaptive behavior. Figure 3 illustrates the proportion of children meeting the ASD case definition by adaptive behavior and IQ test scores. Of those with both IQ and adaptive testing information available (n=106), 33.0% (n=35) had discordant test scores, with 24.5% (n=26) having IQ test scores greater than 70 and adaptive behavior test score of 70 or less and 8.5% (n=9) having IQ test scores of 70 or less and adaptive test scores greater than 70.

**Figure 3: Proportion of all cases of autism spectrum disorder by intelligence quotient and adaptive behavior test scores, Denver Metropolitan Area, Colorado Autism and Developmental Disabilities Project, 2008 (n=279)**



*Regression and plateau in development*

Some children who met the ASD case definition experienced a plateau or regression in development. Plateau is where a child began to reach developmental milestones but then stopped acquiring new skills and affected 5.0% of the cases in the Denver Metropolitan Area in 2008. Regression is where previously acquired skills, such as language, motor, social, or daily living skills, are lost and affected 16.9% of cases.

*Diagnostic behaviors*

To meet the surveillance case definition for ASD, a child needed to display, as described on a comprehensive evaluation by a qualified examiner, a certain number and pattern of behaviors within three behavioral domains – social, communication and repetitive/restrictive behavior – as described in the DSM-IV-TR diagnostic code. The surveillance system does not differentiate between the ASD subtypes – autistic disorder, Asperger disorder, and pervasive developmental disorder, not otherwise specified (PDD-NOS). Table 2 lists the percent of children meeting the ASD case definition who displayed each of the 12 DSM-IV-TR diagnostic criteria.

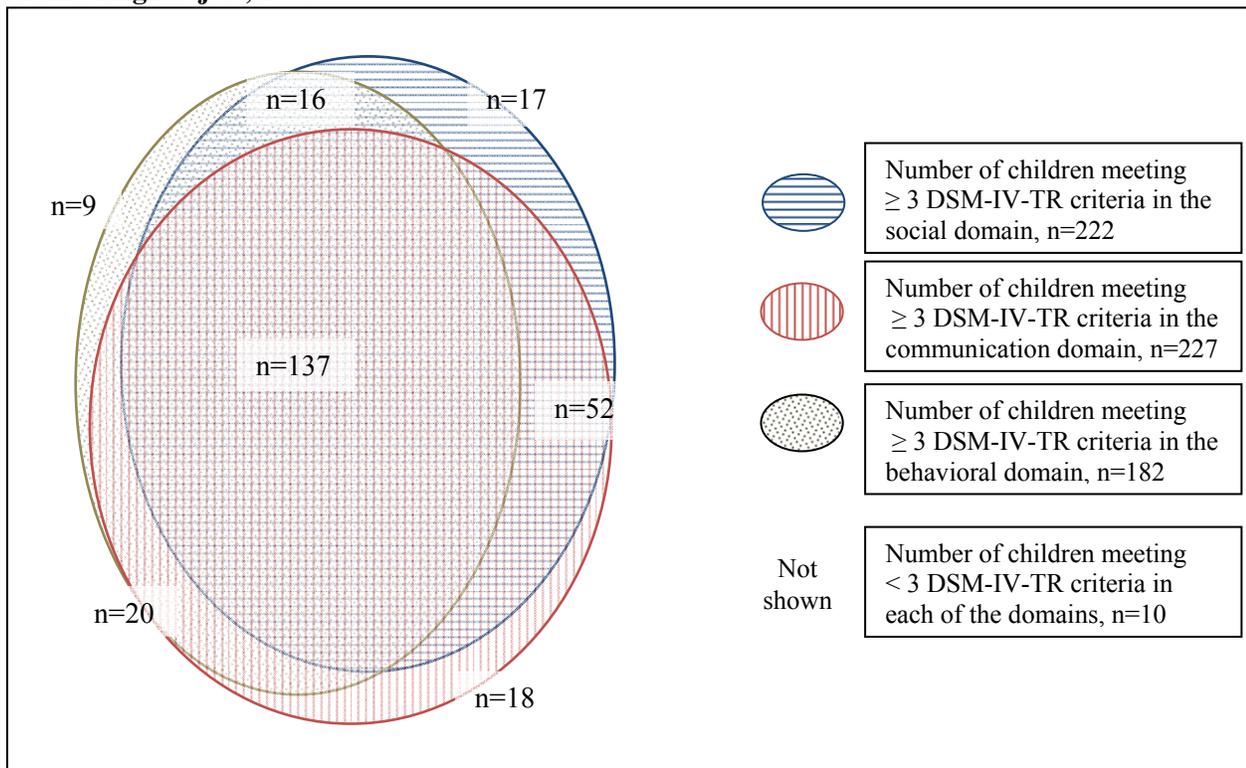
**Table 2: Proportion of autism spectrum disorder cases meeting Diagnostic Statistical Manual-IV, Text Revision criteria, Denver Metropolitan Area, Colorado Autism and Developmental Disability Monitoring Project, 2008**

	Number (n=279)	Percent
<b>Social impairments</b>		
DSM1a – Marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction	250	89.6%
DSM1b - Failure to develop peer relationships appropriate to developmental level	239	85.7%
DSM1c - A lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (for example, by a lack of showing, bringing, or pointing out objects of interest)	154	55.2%
DSM1d - Lack of social or emotional reciprocity	256	91.8%
<b>Communication impairments</b>		
DSM2a - Delay in, or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alternative modes of communication such as gesture or mime)	253	90.7%
DSM2b - In individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others	249	89.2%
DSM2c - Stereotyped and repetitive use of language or idiosyncratic language	213	76.3%
DSM2d - Lack of varied, spontaneous make-believe play or social imitative play appropriate to developmental level	199	71.3%
<b>Behavioral impairments</b>		
DSM3a- Encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus	180	64.5%
DSM3b - Apparently inflexible adherence to specific, nonfunctional routines or rituals	260	93.2%
DSM3c - Stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting or complex whole-body movements)	164	58.8%
DSM3d - Persistent preoccupation with parts of objects	192	68.8%

More than a quarter of the children meeting the ASD case definition, 27.9% (n=78), had marked impairments in 11 or more of the 12 DSM-IV-TR criteria listed in Table 2, illustrating the extent of challenging behaviors faced by cases and their families. The median number of diagnostic criteria exhibited by children meeting the case definition was 10, ranging from 2 to 12.

Figure 4 characterizes the variety of diagnostic behaviors displayed by children meeting the ASD case definition. It shows three overlapping ovals each representing one of the three DSM-IV-TR diagnostic domains – social, communication and repetitive/restrictive behaviors. Each oval represents children who display 3 or more criteria in that domain. As expected, some cases met three or more diagnostic criteria in more than one domain and this is illustrated by the overlapping circles. For example, 17 (6.1%) children had 3 or more diagnostic criteria in the social domain, but less than three in the other two domains. Almost half of the children meeting the case definition, 49.1% (n=137), presented similarly with 3 or more diagnostic criteria in all three domains. The remaining 50.9% exhibited a variety of diagnostic behaviors. Ten children meeting the case definition (3.6%) had less than three behaviors in each of the three domains and are not shown in the figure.

**Figure 4: Number of cases with three or more Diagnostic Statistical Manual-IV, Text Revision criteria met grouped by domain, Denver Metropolitan Area, Colorado Autism and Developmental Disabilities Monitoring Project, 2008**



*Autism discriminators*

Children meeting the ASD case definition also displayed behaviors related to ASD, but separate from the DSM-IV-TR diagnostic criteria. These behaviors, called autism discriminators by the surveillance system, provide additional information about a child’s behavioral characteristics and are shown in Table 3. The majority of children meeting the case definition, 92.1% (n=257), displayed at least one of these behaviors. The median number of discriminators exhibited by children was 2, ranging from 0 to 10.

**Table 3: Percent of children meeting the autism spectrum disorder case definition who exhibited behaviors described as autism discriminators, Denver Metropolitan Area, Colorado Autism and Developmental Disabilities Monitoring Project, 2008**

	Number (n=279)	Percent
Little or no interest in others	83	29.7%
Insists on sameness	79	28.3%
Absent or impaired imaginative play	74	26.5%
Sensory preoccupation	43	15.4%
Unusual preoccupation	41	14.7%
Visual inspection	37	13.3%
Lack of showing, bringing, etc.	26	9.3%
Oblivious to other children, adults, or others	25	9.0%
Uses others as tools	21	7.5%
Movement preoccupation	17	6.1%
Markedly restricted interests	16	5.7%
Excessive focus on parts	15	5.4%
Repeats extensive dialogue	13	4.7%
Language primarily echolalia or jargon	12	4.3%
Nonfunctional routines	7	2.5%

*Associated behaviors*

Children with ASD also exhibit behaviors not related to the diagnosis of ASD, but common among persons with ASD. The proportion of children who demonstrate these associated behaviors are shown in Table 4. The median number of associated behaviors displayed by children meeting the ASD case definition was 9, ranging from 2 to 14.

**Table 4. Percent of autism spectrum disorder cases with associated behaviors, Denver Metropolitan Area, Colorado Autism and Developmental Disabilities Monitoring Project, 2008**

	Number (n=279)	Total
Hyperactivity, attention deficits	261	93.5%
Delayed motor milestones	242	86.7%
Odd responses to sensory stimuli	237	84.9%
Abnormalities in mood or affect	236	84.6%
Argumentative, oppositional, defiant, destructive	227	81.4%
Lack of fear or excessive fearfulness	149	53.4%
Temper tantrums	148	53.0%
Aggression	141	50.5%
Abnormalities in the development of cognitive skills	122	43.7%
Abnormalities in eating/drinking only	91	32.6%
Abnormalities in both eating/drinking and sleeping	90	32.3%
Self-injurious behavior	89	31.9%
Staring spells, seizure-like activity	68	24.4%
Abnormalities in sleeping only	32	11.5%

### *Previously documented ASD diagnosis*

Although all children meeting the ASD case definition had behaviors described in comprehensive evaluations by a qualified examiner that were consistent with the DSM-IV-TR diagnostic criteria, not all had been diagnosed or identified with ASD by a community clinician or school district. Among all children meeting the ASD case definition, 35.1% (n=98) did not have a previously documented ASD diagnosis or identification.

### *Age of first evaluation*

The median age at which children were first evaluated for ASD-like behaviors was 48 months. Of the children who were diagnosed with ASD, the median age of diagnosis was 61 months. Only 17.6% (n=49) of all cases were diagnosed before 4 years of age.

### *ASD among males and females*

In the Denver Metropolitan Area, ASD is 5.5 times more prevalent in boys than girls, which is similar to what was seen across all the ADDM surveillance sites in 2008. This gap has been the subject of research into 1) the potential protective effect of the female sex and 2) the potential gap in identification of ASD among females due to differences in ASD phenotype. Table 5 is an unadjusted comparison of the demographic and clinical characteristics of boys and girls.

Notably, the proportion of cases who were Hispanic was significantly higher among boys than girls, with the male to female ratio of 15.3 to 1. Among all cases, girls tended to be seen for an evaluation at a younger age when compared with boys, although the difference was not significant. Of those with intellectual testing available, a higher proportion of girls (48.6%) had an IQ test score within the intellectually disabled range compared with boys (28.4%).

Among children who met the ASD case definition, girls did not significantly differ from boys in most monitored behaviors, including displaying similar numbers of DSM-IV-TR criteria in all domains. A higher percent of boys, though, showed impairments in imaginative play compared with girls (29.2% versus 11.6%) while a higher percent of girls showed an unusual response to fear, either lack of fear or excessive fear, compared with boys (67.4% versus 50.9%).

**Table 5. Unadjusted comparison of demographic and diagnostic characteristics by sex, Denver Metropolitan Area, Colorado Autism and Developmental Disabilities Monitoring Project, 2008**

	Males n=236	Females n=43	p-value
<b>Race/ethnicity</b>			
White, non-Hispanic	63.6%	74.4%	0.1700
Black, non-Hispanic	7.2%	7.0%	0.9700
Other, non-Hispanic	2.5%	7.0%	0.1301
Hispanic, all races	19.5%	7.0%	<b>0.0473</b>
Unknown	7.2%	<7.0%**	0.5412
Median age of first evaluation	48.0 months	38.0 months	0.2572
Percent without an ASD diagnosis	38.1%	46.5%	0.3013
Percent diagnosed before 4 years	17.8%	16.3%	0.8099
Percent diagnosed between 4 and 5 years	11.0%	11.6%	0.9067
Percent diagnosed after 5 years	33.1%	25.6%	0.3338
<b>Intellectual ability</b>			
Number (and percent) of children with IQ testing available	n=162 (68.6%)	n=35 (81.4%)	0.0914
Percent of those tested in the range of intellectual disability (IQ≤70)	28.4%	48.6%	<b>0.0203</b>
<b>Median number of DSM –IV-TR criteria</b>			
Social	3	3	0.2693
Communication	4	4	0.6841
Behavior	3	3	0.6707
<b>Significant* autism discriminators</b>			
Absent or impaired imaginative play	29.2%	11.6%	<b>0.0161</b>
Rarely responds to familiar social approach	<1.3%**	7.0%	<b>0.0009</b>
<b>Significant* associated behaviors</b>			
Hyperactivity, attention deficits	92.4%	100.0%	0.0612
Lack of fear or excessive fearfulness	50.9%	67.4%	<b>0.0448</b>
Abnormalities in sleeping	41.5%	55.8%	0.0824

\*Variables with tests for significance with a p-value <0.10 are included in this table.

\*\* Not reported due to small numbers.

## Overall conclusions and next steps

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The CO ADDM monitored the prevalence of ASD in 2008 among 8-year-old children residing in the Denver Metropolitan Area (Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, and Jefferson Counties). It found that education data significantly contributed to the number of cases identified in Arapahoe County. It also found that children meeting the ASD case definition demonstrate a variety of behaviors, as well as a range of cognitive and adaptive ability.

Among all cases identified in the Denver Metropolitan Area, the prevalence of ASD was not the same among all racial and ethnic groups. Disparities in identification exist between Hispanic and non-Hispanic white children. Further study is needed to understand this difference and the possible role of culture in health care seeking actions concerning childhood behaviors. Particular emphasis should be placed on understanding why the ratio of Hispanic boys to girls is so much greater than the ratio of boys to girls among other ethnicities.

Among cases, the median age a child first received a behavioral evaluation was 48 months, which is older than the objective described in Health People 2020 which encourages children with ASD to be evaluated by 36 months ([www.healthypeople.gov](http://www.healthypeople.gov)). Programs at the CDC such as the “Learn the signs. Act early.” campaign are aimed at improving the early identification and evaluation of children with developmental disabilities. Additionally, a current Colorado program, Assuring Better Child Health and Development (ABCD), emphasizes routine developmental screening for all children which is a positive step toward the goal of early evaluations for children with developmental concerns. Further study is needed to monitor and improve the early evaluation of children with ASD in Colorado.

Fewer than 65% of children meeting the ASD case definition were diagnosed with ASD by a community clinician by their 8<sup>th</sup> year of age. Although these children presented with complex and varying behaviors, further study is needed to better understand why some cases were diagnosed with ASD while others were not.

The children who met the ASD case definition were 8 years old in 2008 and are now, at the time of this report, approximately 13 years old. The data from this CO ADDM report, with the support from CASCADE, provide a better understanding of the number and characteristics of children with ASD who are living and aging in Colorado. These children are diverse in their behaviors and abilities, leading to a variety of challenges for their treatment and care. Particular study is needed to develop programs to understand and address racial and ethnic differences in prevalence, ways to improve the early evaluation of children with ASD, and barriers to the diagnosis of ASD.

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