
Tiffany White, PhD, MSPH
Colorado Department of Public Health and Environment
Objectives

• Describe the Autism and Developmental Disabilities Monitoring (ADDM) Network

• Describe changes in the monitoring area and demographics for Colorado ADDM between surveillance years 2002 and 2014

• Discuss Colorado ADDM findings and trends for 8-year-olds for surveillance years 2002-2014
ADDM Network

- A collaborative group of programs funded by the CDC to estimate the number of 4- and 8-year-old children with autism spectrum disorder (ASD) residing in multiple communities in the United States.

- Standard for setting ASD prevalence estimates in the U.S.

- Established in 2000 with Colorado participating since 2002
11 ADDM network sites - 8-year-olds

5 of 11 provided estimates of 4-year-old children with ASD during the 2014 surveillance year; First year for CO ADDM

Limited number of sites provided estimates of children with Cerebral Palsy, intellectual disability, hearing loss and vision impairment

* Community Report on Autism, CDC, 2016
ADDM Network Goals

• Obtain a complete count of the number of children with ASD.
• Describe the population of children with ASD.
• Determine whether ASD is more common in some groups.
• Identify changes in ASD over time.
• Understand the impact of ASD and related conditions.
Colorado ADDM Project

- Tiffany White, PhD, MSPH
- Leovi Madera, BSN
- Cynthia Vogel, MS
- Jean Menconi, RN
- Leanne Glenn, MS
- MJ Erickson-Eger, MS
- Julia Group, MPH

- Cordelia Robinson Rosenberg, PhD, RN
- Judy Reaven, PhD
- Terry Hall, MA, CCC-SLP
- Patti LaVesser, PhD, OTR
- Nuri Reyes, PhD
ADDM Network methods for ASD case ascertainment

- Multisite, multisource (educational and clinical settings) records-based surveillance methodology

Phase 1:

Screening and abstraction of records at multiple data sources in community

Records meeting requirements for abstraction go on to phase 2

Phase 2:

All abstracted evaluations reviewed by trained clinicians to determine ASD case status

Children with described behaviors that are consistent with DSM-IV-TR* criteria for autism are considered for inclusion as ASD surveillance cases

*Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition (Text Revision)
Growth in the Colorado ADDM ASD Monitoring Area
Surveillance Year 2002 versus 2014, 8-year-olds

2002 SY
- 2 Denver-metro counties: Arapahoe and Boulder
- Population in surveillance area: 11,020 8-year-olds

2014 SY
- 7 Denver-metro counties: Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas and Jefferson
- Population in surveillance area: 41,128 8-year-olds
Changes in Colorado ADDM Monitoring Area Demographics
Surveillance Year 2002 versus 2014

<table>
<thead>
<tr>
<th>Population Segment</th>
<th>2002 SY (2 Denver-metro counties)</th>
<th>2014 SY (7 Denver-metro counties)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-year-old population (% 8yo in CO)</td>
<td>11,020 (17.7%)</td>
<td>41,128 (57.2%)</td>
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<tr>
<td>White, non-Hispanic</td>
<td>68.2%</td>
<td>55%</td>
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<tr>
<td>Black, non-Hispanic</td>
<td>8.5%</td>
<td>7%</td>
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<tr>
<td>Hispanic</td>
<td>18.4%</td>
<td>33%</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>4.3%</td>
<td>5%</td>
</tr>
<tr>
<td>American Indian/Alaska Native</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>
Change in Estimated Prevalence of Autism Spectrum Disorder (ASD) per 1,000 children aged 8 years, by Race/Ethnicity, Colorado ADDM, 2002-2014

- Trend towards an increase in ASD prevalence for all racial/ethnic groups.
- ASD prevalence for white 8-year-olds is consistently higher than other racial/ethnic groups.
- Disparities in ASD prevalence and identification continue to persist among minority racial/ethnic groups relative to white children in Colorado.
Change in Estimated Prevalence of Autism Spectrum Disorder (ASD) per 1,000 children aged 8 years, by Sex, Colorado ADDM, 2002-2014

- Male-to-Female ASD prevalence ratio in Colorado has been similar for the last two surveillance years.
- Trend towards an increase in ASD prevalence for both genders, but more pronounced in males.
- ASD prevalence for male 8-year-olds is consistently higher than females, with no indication the gap is closing.
- ASD prevalence for female 8-year-olds in Colorado tripled between 2002 SY and 2014 SY.
- ASD prevalence for male 8-year-olds in Colorado doubled between 2002 SY and 2014 SY.
Proportion of Children Aged 8 years Identified with Autism Spectrum Disorder (ASD) with a Previous Documented ASD Diagnosis by Surveillance Year, Colorado ADDM, 2002-2014

- Colorado is consistently lower than the total ADDM network in the proportion of identified ASD cases who had a previously documented ASD diagnosis in an evaluation.
Proportion of Children Aged 8 years Identified with Autism Spectrum Disorder (ASD) with Available Special Education Records and Autism Eligibility, Colorado ADDM, 2002-2014

- Percentage of children aged 8 years in Colorado identified with ASD who had available special education records has decreased between the 2002 and 2014 SYs.
- Trend may be due to fewer school sources available and/or a smaller percent of the surveillance population for whom CO ADDM had access to educational records.
- Of ASD cases with special education records available, the percentage with autism as the primary eligibility has increased slightly over time (2002 SY to 2014 SY).

^ % of ASD cases with special education records.
* Primary eligibility not reported for 30% of ASD cases with a special education record
Most Recent Intelligence Quotient Score as of Age 8 Years Among Children with Autism Spectrum Disorder (ASD) for Whom Test Data were Available, Colorado ADDM, 2002-2014

- Percentage of CO ASD cases who had available IQ test data ranged from 70-76% between the 2002 and 2014 SYs, with the exception of the 2008 SY (~64%).

- Trend towards an increase in the percentage of CO ASD cases in the average or above average IQ range, and a decrease in the percentage of cases in the intellectual disability range.
Change in Median Age (in months) of First Evaluation for ASD-like Behaviors and Earliest Known Autism Spectrum Disorder (ASD) Diagnosis by Surveillance Year, Colorado ADDM, 2002-2014

- Trend towards a decrease in both median age (in months) of first evaluation for ASD-like behaviors and earliest known ASD diagnosis among ASD cases identified in Colorado.
- Increase in the percentage of ASD cases identified in Colorado who were evaluated at or before 36 months of age.
Colorado ADDM, Surveillance Years 2002-2014

- Significant growth in the monitoring area and 8 year old surveillance population for Colorado ADDM from 2002 to 2014.
  - Two Denver-metro counties to 7 Denver-metro counties.
  - 8 year old surveillance population was 3.7 time higher in 2014 than 2002.
  - Proportion of 8-year-old children identifying as Hispanic has almost doubled.

- Disparities in ASD prevalence have decreased over time, but continue to persist, especially between white and Hispanic 8-year-old children in Colorado.
  - Barriers to getting evaluated in a clinical setting?
  - Higher reliance on educational evaluations for black and Hispanic children in Colorado?

- ASD prevalence among 8-year-olds in Colorado steadily increased between 2002 and 2014 SY for both males and females.
  - ASD prevalence has doubled for male 8-year-olds in Colorado and tripled for females.
  - Male-to-female ratio leveled off between 2012 and 2014 SY.

- Proportion of 8-year-old ASD cases identified through Colorado ADDM who did not have a previous ASD diagnosis has been consistently higher than the proportion for the ADDM network for each surveillance year.
  - Reached the highest proportion in 2014 SY year at ~42%.
Colorado ADDM, Surveillance Years 2002-2014

- Proportion of 8-year-old ASD cases in Colorado with autism as their primary special education eligibility has increased slightly over time, but most are still being served under an eligibility other than autism.
  - Other developmental concerns more prominent?
  - Reluctance of parents to identify child as having autism?
  - Reluctance of schools to serve a child under autism?

- Trend towards an increase in the proportion of Colorado ASD cases identified through ADDM with an average or above average IQ range, and a decrease in those who fall within the intellectual disability range.

- Slight improvement in the median age at which Colorado ASD cases are getting a developmental evaluation for the first time, the age of their first known ASD diagnosis and the proportion of children being evaluated before 36 months of age.
A Snapshot of Autism Spectrum Disorder in Colorado (2014)

Findings from the Colorado Autism and Developmental Disabilities Monitoring (CO-ADDOM) Project help us to understand more about the number of children with autism spectrum disorder (ASD), the characteristics of those children, and the age at which they are first evaluated and diagnosed.

1.4% is lower than the average percentage identified with ASD in 2014 (1.7%) in all ADDM states.

1 in 72 8-year-old children were identified with ASD by CO-ADDOM in 2014.

Disparities in Identification
Boys were more likely to be identified with ASD than girls. White children were more likely to be identified with ASD than Hispanic children.

3.9x more likely among boys vs girls
1.4x more likely among white vs Hispanic children
No significant difference among black vs Hispanic children or white vs black children

Intellectual Disability in Colorado
Colorado had intelligence quotient (IQ) data available for 76% of children identified with ASD. Of those children, 21.4% had intellectual disability.

21.4% had intellectual disability

Intellectual disability is defined as an IQ score of 70 or lower.

Of children identified with ASD...
...about 69% had developmental concerns by 3 years of age.
...but only about 46% received a comprehensive developmental evaluation by 3 years of age.

Colorado ADDM Team, 2001-2014

**CO ADDM Principal Investigators**
- Corry Robinson Rosenberg, PhD, RN
- Lisa Miller, MD, MSPH
- Tista Ghosh, MD, MPH
- Chris Wells, PhD, MS
- Kelly Kast, MSPH
- Tiffany White, PhD, MSPH

**CO ADDM Project Coordinators**
- Andria Ratchford, MSPH
- Kelly Kast, MSPH
- Yolanda Castillo, MBA (CDE)

**CO ADDM Clinician Reviewers**
- Judy Reaven, PhD
- Terry Hall, MA, CCC-SLP
- Patti Lavesser, PhD, OTR
- Nuri Reyes, PhD
- Andrea Hoog

**CO ADDM Abstracters**
- Jean Menconi, RN
- Vicki Bondurant
- Leovi Madera, RN
- Cynthia Vogel, MS
- Stephanie Comienski
- Beverly Meek
- Sheila Gousman
- Leanne Glenn, MS
- Misty Ellis, MPH
- Amira Alexander, MS
- Shardel Jackson
- MJ Erickson-Eger, MS, MA
- Julia Group, MPH

**CO ADDM Database Managers**
- Kevin Hake
- Bill Vertress, MCIS
Resources and contact information for CO ADDM

Tiffany White, PhD, MSPH

Tiffany.white@state.co.us

303-692-2680

www.cdc.gov/mmwr

www.cdc.gov/ncbddd/autism/addm.html
<table>
<thead>
<tr>
<th>Site</th>
<th>Race/Ethnicity</th>
<th>Prevalence</th>
<th>95% CI</th>
<th>Race/Ethnicity</th>
<th>Prevalence</th>
<th>95% CI</th>
<th>Race/Ethnicity</th>
<th>Prevalence</th>
<th>95% CI</th>
<th>Race/Ethnicity</th>
<th>Prevalence</th>
<th>95% CI</th>
<th>White-to-Black</th>
<th>White-to-Black</th>
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<td>1.6&lt;sup&gt;§&lt;/sup&gt;</td>
<td>1.9&lt;sup&gt;§&lt;/sup&gt;</td>
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<td>(8.9–16.1)</td>
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<td>1.4&lt;sup&gt;§&lt;/sup&gt;</td>
<td>1.4&lt;sup&gt;§&lt;/sup&gt;</td>
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<td>(9.1–27.0)</td>
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<td>(7.5–25.8)</td>
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<td>1.1</td>
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<td>20.9</td>
<td>(14.7–29.7)</td>
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<td>(8.6–13.6)</td>
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<td>(13.5–19.2)</td>
<td>Hispanic</td>
<td>11.9</td>
<td>(9.3–15.2)</td>
<td>Asian/Pacific Islander</td>
<td>19.1</td>
<td>(13.7–26.8)</td>
<td>1.2</td>
<td>1.6&lt;sup&gt;§&lt;/sup&gt;</td>
<td>1.4†</td>
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<td>Tennessee</td>
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<td>16.1</td>
<td>(14.3–18.2)</td>
<td>Black</td>
<td>12.5</td>
<td>(9.7–16.0)</td>
<td>Hispanic</td>
<td>10.5</td>
<td>(7.6–14.7)</td>
<td>Asian/Pacific Islander</td>
<td>12.5</td>
<td>(6.7–23.3)</td>
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<td>Wisconsin</td>
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<td>(8.9–14.2)</td>
<td>Hispanic</td>
<td>12.5</td>
<td>(10.0–15.6)</td>
<td>Asian/Pacific Islander</td>
<td>10.2</td>
<td>(6.1–16.9)</td>
<td>1.3†</td>
<td>1.2</td>
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<td>All sites combined</td>
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<td>(16.5–17.8)</td>
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<td>16.0</td>
<td>(15.1–16.9)</td>
<td>Hispanic</td>
<td>14.0</td>
<td>(13.1–14.9)</td>
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<td>1.2&lt;sup&gt;§&lt;/sup&gt;</td>
<td>1.1&lt;sup&gt;§&lt;/sup&gt;</td>
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</table>

Abbreviation: CI = confidence interval.
* Per 1,000 children aged 8 years.
† Pearson chi-square test of prevalence ratio significant at p<0.05.
§ Pearson chi-square test of prevalence ratio significant at p<0.01.
Colorado Early ADDM Monitoring Area and Demographics
Surveillance Year 2014

2014 SY

Denver County

<table>
<thead>
<tr>
<th>Population Segment</th>
<th>2014 SY (Denver County only)</th>
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<tbody>
<tr>
<td>4-year-old population (% 4yo in CO)</td>
<td>8,438 (12.2%)</td>
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<tr>
<td>White, non-Hispanic</td>
<td>37.4%</td>
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<td>Black, non-Hispanic</td>
<td>11.2%</td>
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<tr>
<td>Hispanic</td>
<td>47.2%</td>
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<td>Asian/Pacific Islander</td>
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<td>American Indian/Alaska Native</td>
<td>&lt;1%</td>
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