

Update on the Rising Prevalence of Autism and Its Impacts

Maureen Durkin, PhD, DrPH

Waisman Center Investigator
Professor and Chair of Population Health Sciences
School of Medicine and Public Health
University of Wisconsin-Madison

Acknowledgments

Wisconsin Surveillance of Autism and Developmental Disabilities System (WISADDS) team:

Angelica Salinas, Erica Hans, Gina Carrola, Jacqueline Hansen,
Leann DaWalt, Olivia Pokoski, Sarah Furnier

Study to Explore Early Development (SEED) team:

Hayley Crain, Leslie Seltzer, Maria Stanley, Olivia Pokoski, Sarah Furnier

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Epidemiology of Autism

- The study of the frequency & distribution of *autism** in *populations*.
- A basis for understanding and informing
 - Prevalence, incidence, trends and impacts
 - Health disparities
 - Service needs
 - Causes and risk factors
 - Changes over the life course
 - Effectiveness & cost-effectiveness of treatments
 - Public health policy

* DSM 5 definition of autism spectrum disorder (ASD): persistent deficits in social communication and social interaction accompanied by restricted, repetitive patterns of behavior, interests or activities; onset early in life.

1st epidemiologic study of autism in the U.S. was conducted in the 1960s in Wisconsin and found it extremely rare.

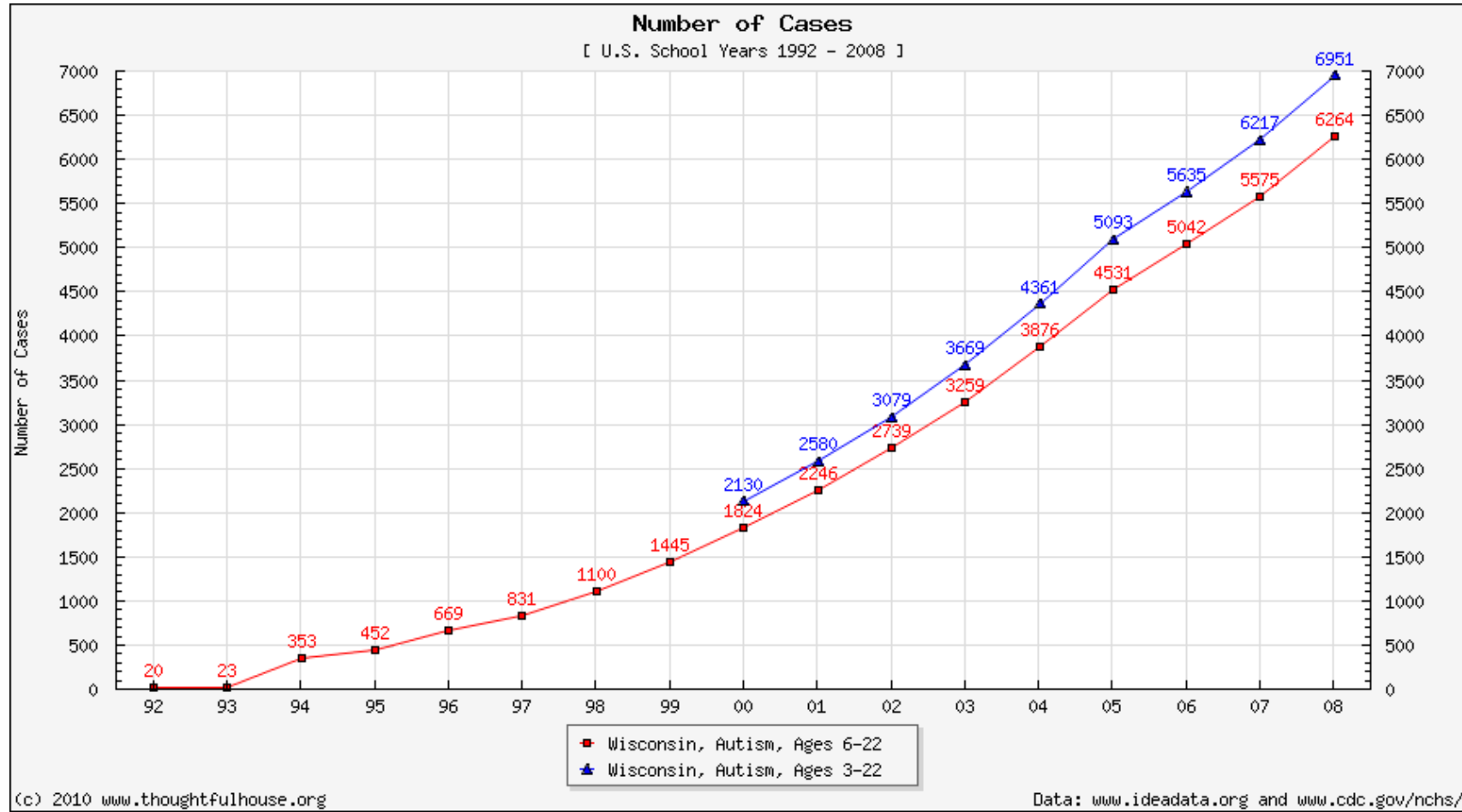
Epidemiology of Infantile Autism

Darold A. Treffert, MD, Winnebago, Wis
Arch Gen Psychiat—Vol 22, May 1970

- Prevalence:
 - 280 cases among 899,750 Wisconsin children, ages 3-12 years
 - 3.1 / 10,000 (1 in 3,226 children)
 - 3.4 : 1 ratio of boys to girls



Number of children with autism in Wisconsin: special education enrollment, 1992-2008



2011-2012 School Year: **8,885** ages 3-22, **8,154** ages 6-22;

2015-2016: **10,402** ages 6-21 2021-2022: **14,630** ages 3-21 **12,544** ages 6-21

http://sped.dpi.wi.gov/sped_cc-10-01-11; <https://dpi.wi.gov/sped/data/child-count/10-01-15>; <https://www2.ed.gov/programs/osepidea/618-data/static-tables/index.html#partb-cc>

ADDM Network

Centers for Disease Control and Prevention

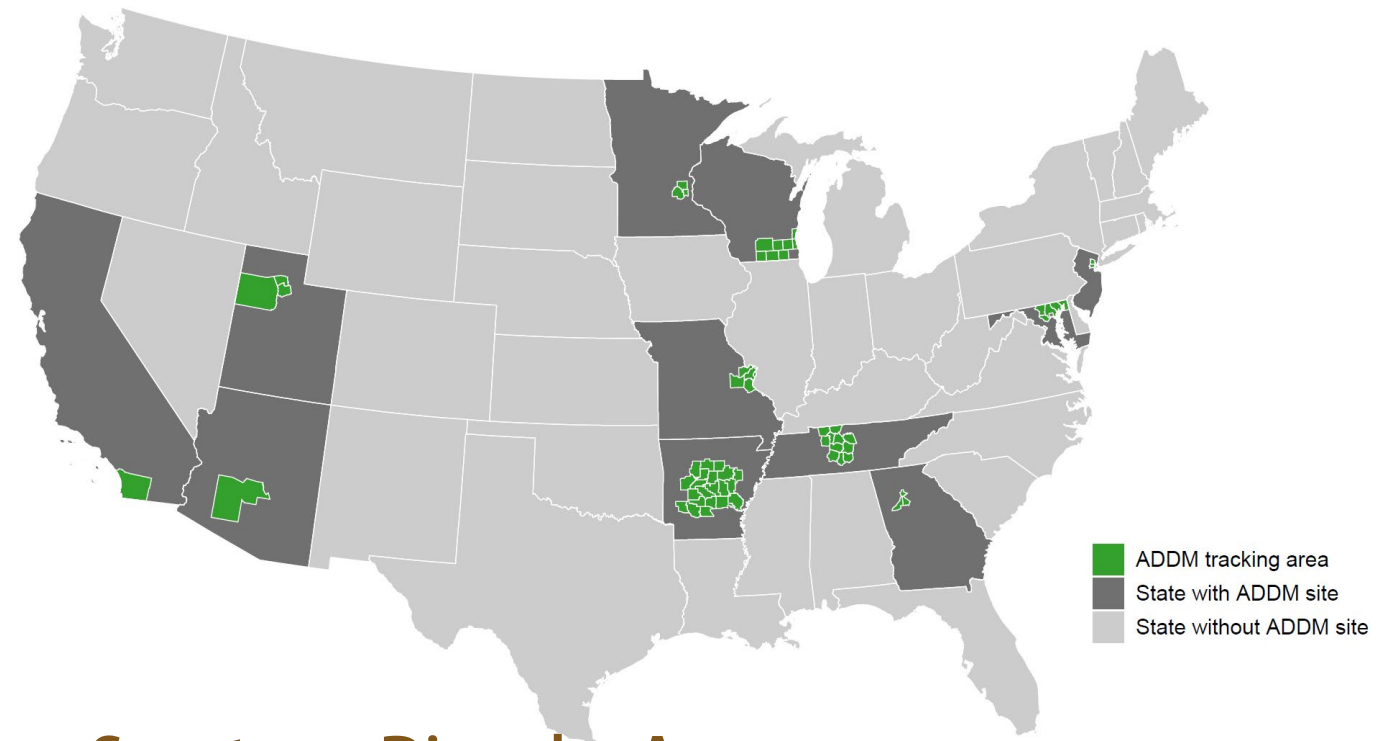
MMWR

Surveillance Summaries / Vol. 72 / No. 2

Morbidity and Mortality Weekly Report

March 17, 2023

Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2020

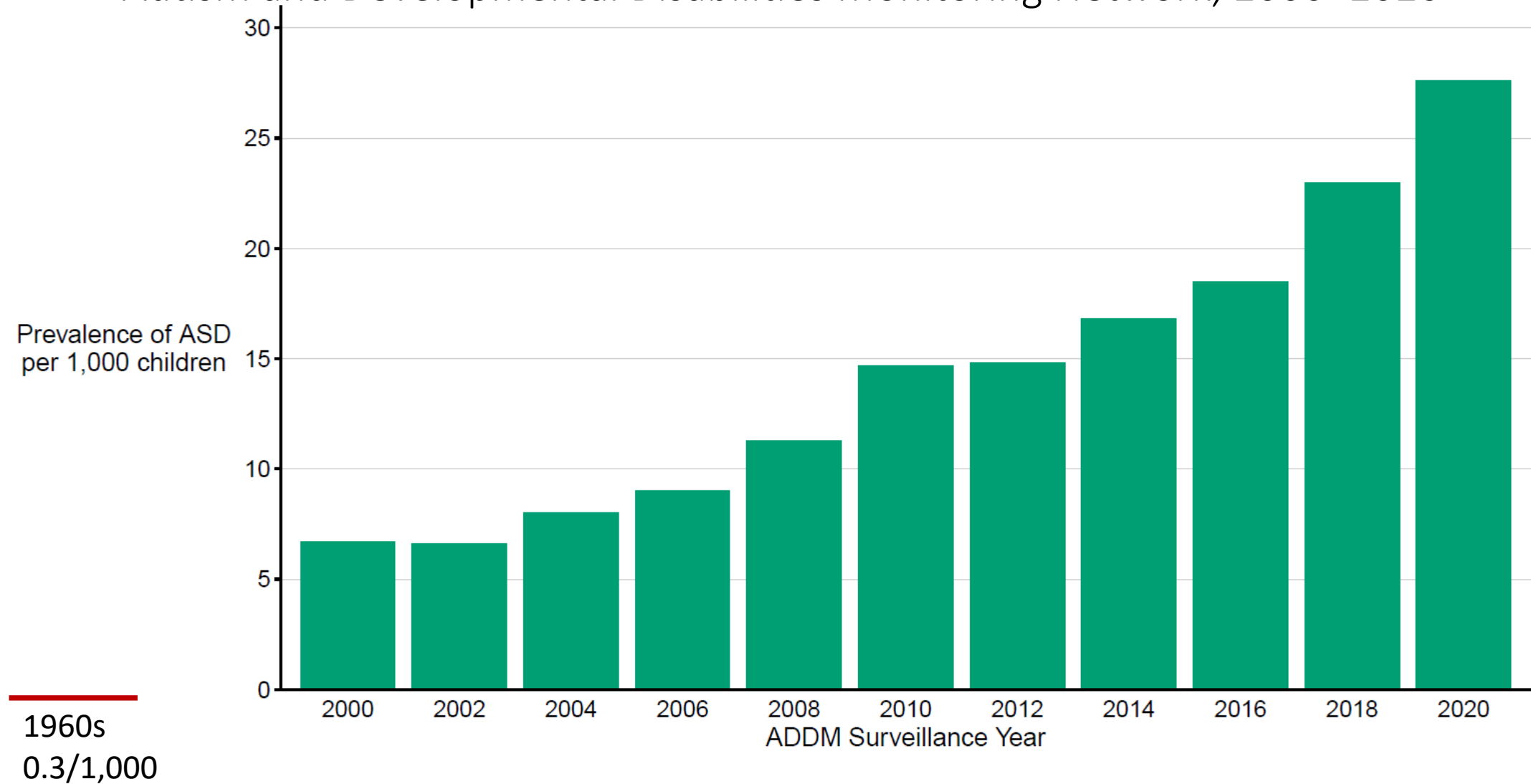


Prevalence and Characteristics of Autism Spectrum Disorder Among Children Aged 8 Years — Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2020

Matthew J. Maenner, PhD¹; Zachary Warren, PhD²; Ashley Robinson Williams, MPH^{1,3}; Esther Amoakohene, MPH¹; Amanda V. Bakian, PhD⁴; Deborah A. Bilder, MD⁴; Maureen S. Durkin, DrPH, PhD⁵; Robert T. Fitzgerald, PhD⁶; Sarah M. Furnier, MS⁵; Michelle M. Hughes, PhD¹; Christine M. Ladd-Acosta, PhD⁷; Dedria McArthur, MPH¹; Elise T. Pas, PhD⁷; Angelica Salinas, MS⁵; Alison Vehorn, MS²; Susan Williams¹; Amy Esler, PhD⁸; Andrea Grzybowski, MS⁹; Jennifer Hall-Lande, PhD⁸; Ruby H.N. Nguyen, PhD⁸; Karen Pierce, PhD⁹; Walter Zahorodny, PhD¹⁰; Allison Hudson¹¹; Libby Hallas, MS⁸; Kristen Clancy Mancilla¹²; Mary Patrick, MPH¹; Josephine Shenouda, MS¹⁰; Kate Sidwell¹⁰; Monica DiRienzo, MA¹; Johanna Gutierrez⁴; Margaret H. Spivey⁷; Maya Lopez, MD¹¹; Sydney Pettygrove, PhD¹²; Yvette D. Schwenk, MS¹¹; Anita Washington, MPH¹; Kelly A. Shaw, PhD¹

Prevalence of autism spectrum disorder per 1,000 children aged 8 years, by surveillance year

Autism and Developmental Disabilities Monitoring Network, 2000–2020

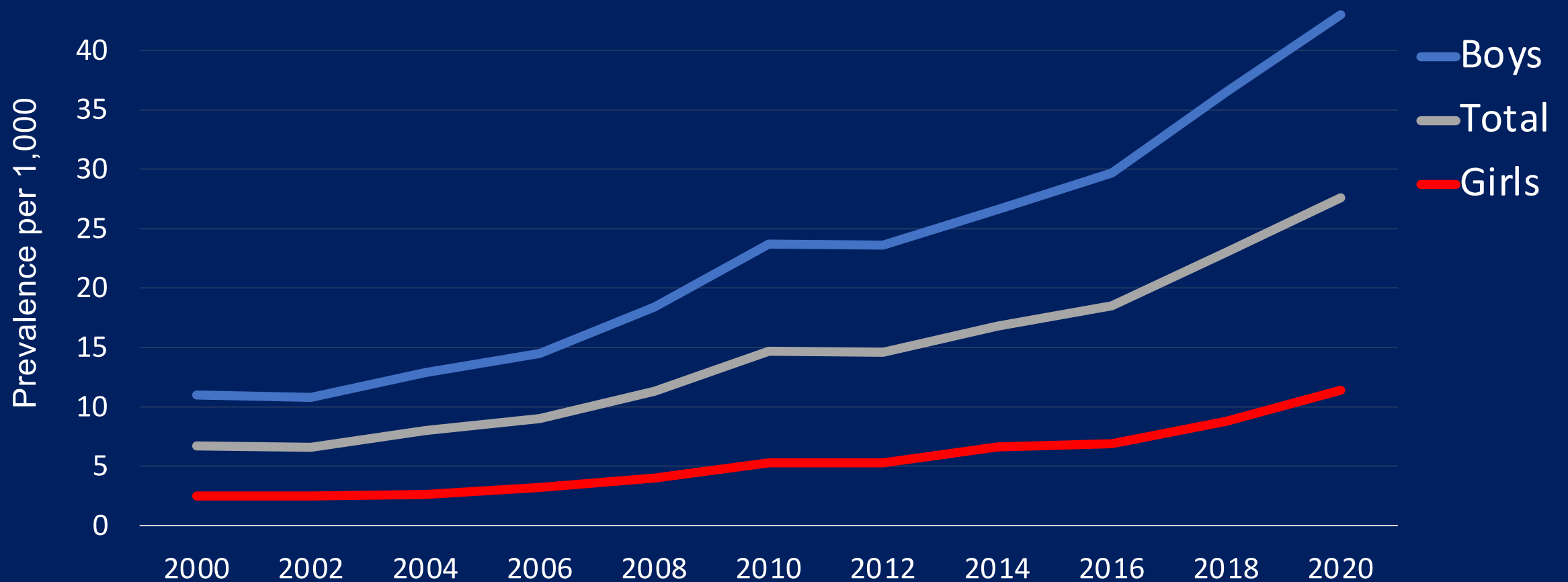


Biennial estimates of autism prevalence at age 8 years, ADDM Network, 2000–2020

Surveillance Year	Population Denominator	# Children with Autism	Prevalence /1,000 (site to site range)	This is about 1 in x children
2000	187,761	1,252	6.7 (4.5-9.9)	1 in 150
2002	407,578	2,685	6.6 (3.3-10.6)	1 in 150
2004	172,335	1,376	8.0 (4.6-9.8)	1 in 125
2006	307,790	2,757	9.0 (4.2-12.1)	1 in 110
2008	337,093	3,820	11.3 (4.8-21.2)	1 in 88
2010	363,749	5,338	14.7 (8.7-21.9)	1 in 68
2012	346,978	5,063	14.6 (8.2-24.6)	1 in 68
2014	325,483	5,473	16.8 (13.1-29.3)	1 in 59
2016	275,419	4,895	18.5 (15.1-31.4)	1 in 54
2018	220,281	5,058	23.0 (22.3-23.6)	1 in 44
2020	226,339	6,245	27.6 (23.1-44.9)	1 in 36

Total: **42,962**

Rise in Autism Prevalence Among 8 Year-Old Children in the US, 2000-2020, by Sex



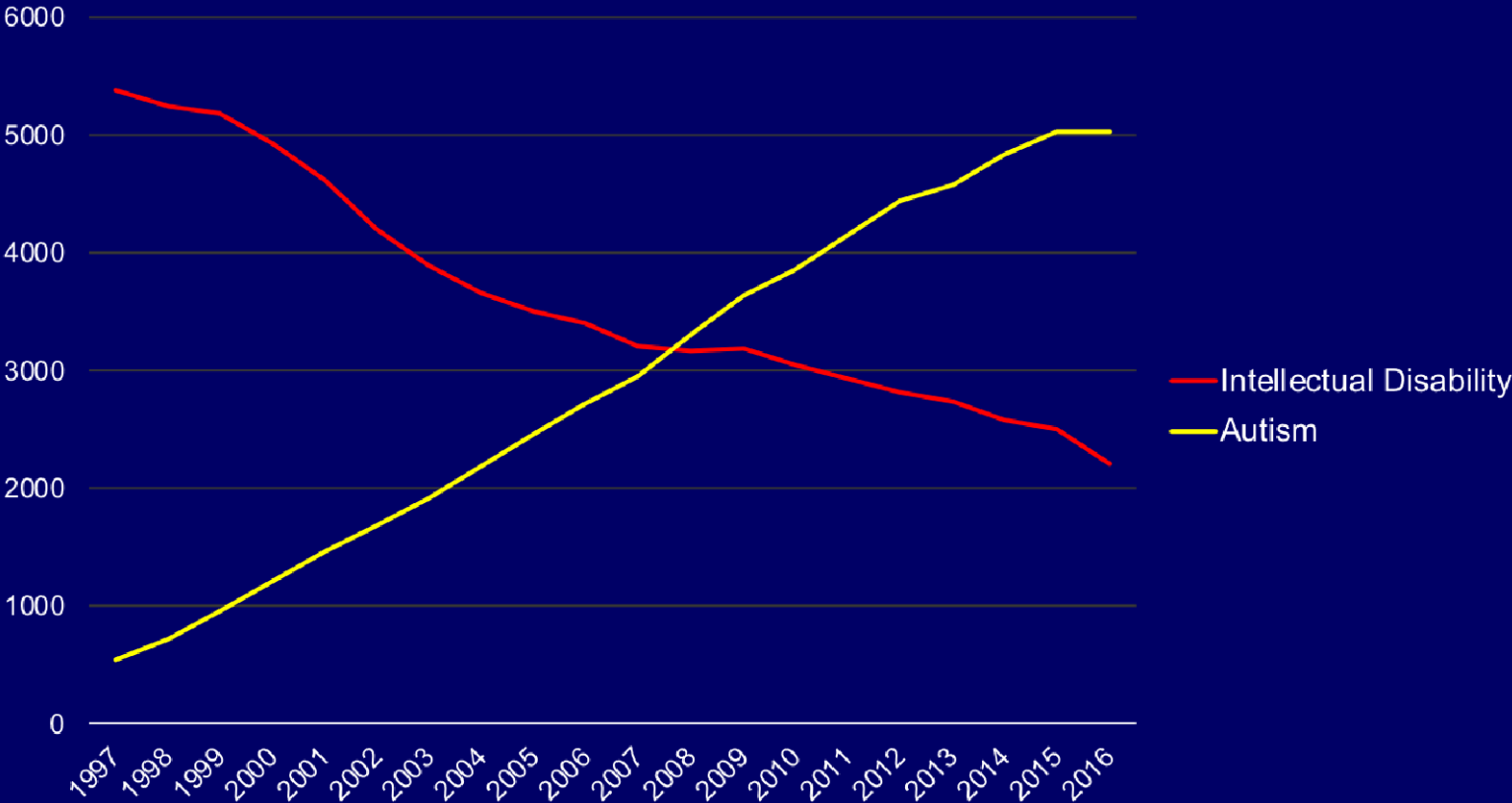
Sources: CDC's ADDM Network ASD prevalence reports, MMWR, published 2007-2023.

Possible explanations of the increase in autism prevalence

- Expansion of diagnostic criteria
- Gradual adoption of autism as a special education reporting category since 1992
- Increased awareness, training, treatment options
- Changes in diagnostic practices:
 - Diagnostic substitution
 - Diagnostic accretion
 - Expansion of developmental screening (AAP 2006)
- Change in risk factors

Evidence of Diagnostic Substitution

Trends in the Number of 6-11 Year-Old Children Receiving Special Education Services for Intellectual Disability and Autism, Wisconsin, 1997-2016



Factors associated with the prevalence of autism

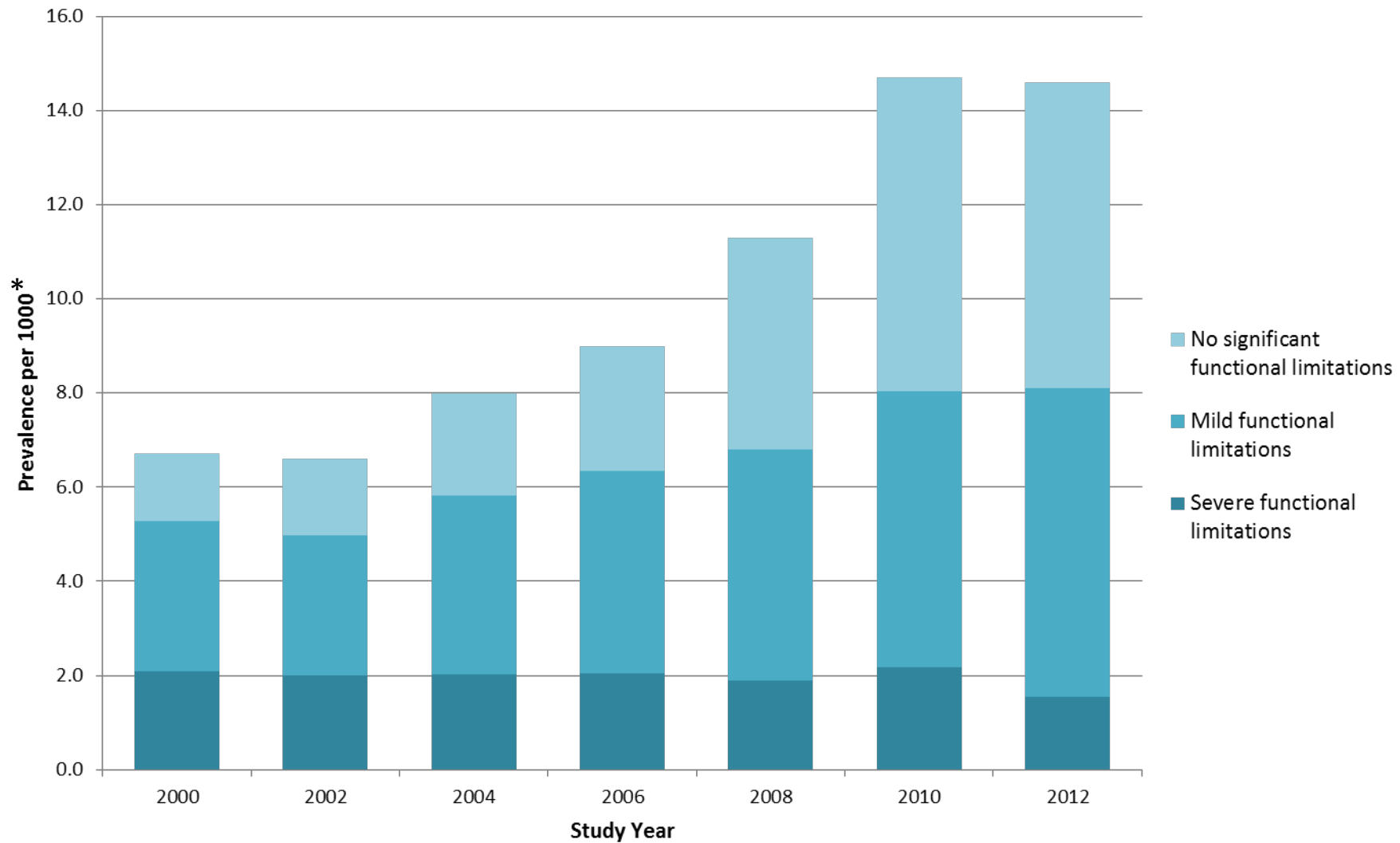
Have Secular Changes in Perinatal Risk Factors Contributed to the Recent Autism Prevalence Increase? Development and Application of a Mathematical Assessment Model

LAURA A. SCHIEVE, PhD, CATHERINE RICE, PhD, OWEN DEVINE, PhD,
MATTHEW J. MAENNER, PhD, LI-CHING LEE, PhD, ROBERT FITZGERALD, MPH,
MARTHA S. WINGATE, DrPH, DIANA SCHENDEL, PhD, SYDNEY PETTYGROVE, PhD,
KIM VAN NAARDEN BRAUN, PhD, AND MAUREEN DURKIN, PhD

Annals of Epidemiology, 2011; 21(12):930-45.

- Pre-term birth
- Low birth weight
- Birth spacing (inter-pregnancy interval <24 mo)
- Birth order
- Advanced parental age

ASD Prevalence per 1000 8-Year-Old Children by Level of Functional Limitation and Study Year



*These estimates assume that those cases missing functional limitation data are not more or less likely to be in a certain level of functional limitation than another.

Autism and Socioeconomic Status, Leo Kanner

Autistic Disturbances of Affective Contact, 1943

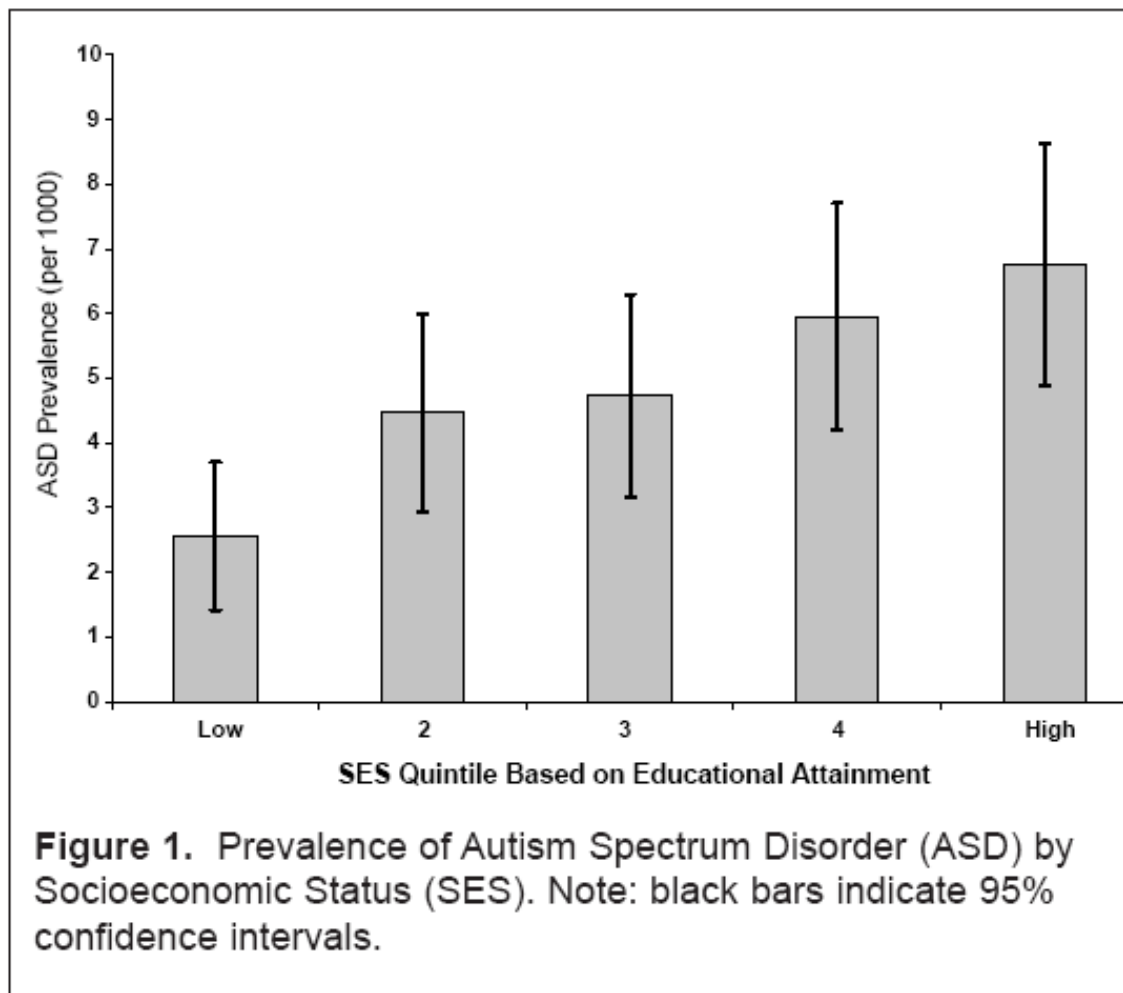
SINCE 1938, there have come to our attention a number of children whose condition differs so markedly and uniquely from anything reported so far, that each case merits—and, I hope, will eventually receive—a detailed consideration of its fascinating peculiarities. In this place, the limitations neces-

Perpetrated the idea that autism preferentially affects children from affluent families.



Socioeconomic Disparity in the Prevalence of Autism Spectrum Disorder in Wisconsin

Matthew J. Maenner, BS; Carrie L. Arneson, MS; Maureen S. Durkin, PhD, DrPH



• N = 181 cases, 36,989 children (age 8 years) under surveillance in 2002

Autism Spectrum Disorder Among US Children (2002–2010): Socioeconomic, Racial, and Ethnic Disparities

Maureen S. Durkin, PhD, DrPH, MPH, Matthew J. Maenner, PhD, Jon Baio, EdS, Deborah Christensen, PhD, Julie Daniels, PhD, Robert Fitzgerald, PhD, Pamela Imm, MS, Li-Ching Lee, PhD, Laura A. Schieve, PhD, Kim Van Naarden Braun, PhD, Martha S. Wingate, DrPH, and Marshalyn Yeargin-Allsopp, MD

Spectrum | Autism Research News

<https://spectrumnews.org>

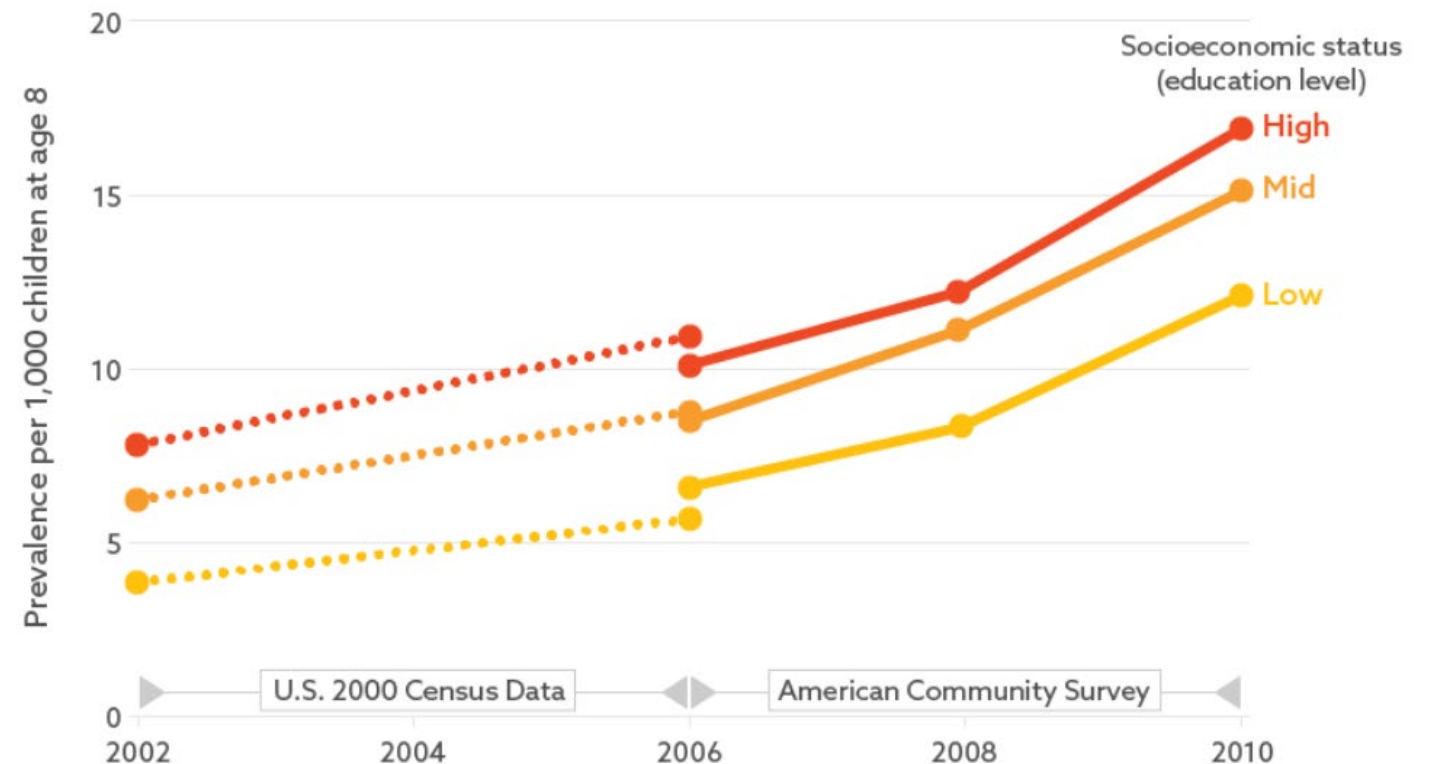
NEWS

Race, class contribute to disparities in autism diagnoses

BY HANNAH FURFARO

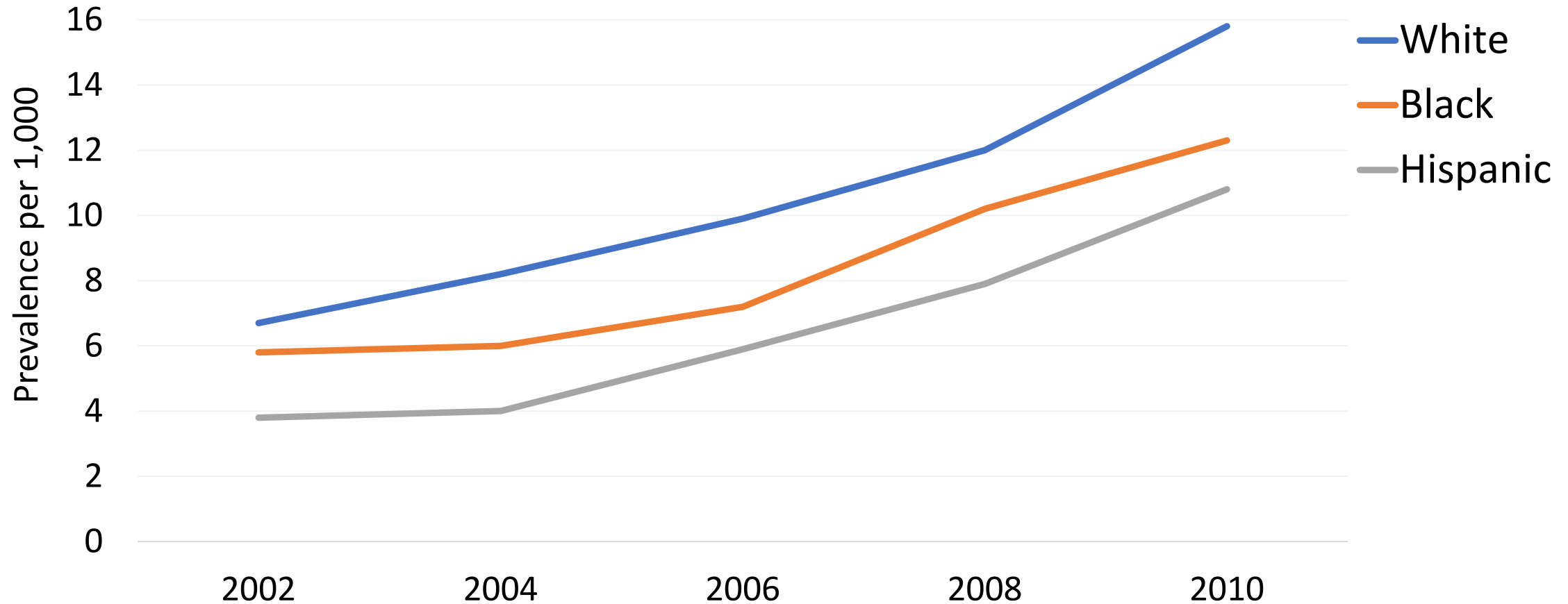
20 NOVEMBER 2017

Prevalence of autism by socioeconomic status



Racial and Ethnic Disparity in Autism

Prevalence, ADDM Network, 2002-2010



CDC's FREE Milestone Tracker App



Track Milestones



Share a Summary



Get Tips & Activities



CDC's FREE Milestone Tracker App



Track Milestones



Share a Summary



Get Tips & Activities



Campaigns to increase early
detection of autism in
diverse populations

CDC & Waisman Center Resources Learn the Signs. Act Early.

Milestone and Disability-Specific
Fact Sheets <https://actearly.wisc.edu/>

Act Early Wisconsin



Some signs of development are obvious.
Algunas muestras del desarrollo son obvias.

Some are not so obvious.
Algunas no son tan obvias.

It's time to change how we view a child's growth.

As they grow, children are always learning new things. These are just some of the things you should be watching for as your child grows. Because every child develops at his or her own pace, your child may reach these milestones slightly before or after other children the same age. This is OK as a guide, and if you have any concerns, talk with your child's doctor or nurse.

By the end of 12 months (12 months), many children are able to:

- say simple words (mama, daddy)
- make sounds such as "m" and "d"
- understand simple words (up, down)
- make simple gestures (point)

By the end of 18 months (18 months), many children are able to:

- say simple words (mama, daddy)
- make sounds such as "m" and "d"
- understand simple words (up, down)
- make simple gestures (point)

By the end of 24 months (24 months), many children are able to:

- say simple words (mama, daddy)
- make sounds such as "m" and "d"
- understand simple words (up, down)
- make simple gestures (point)

Why is this important?

- It's important to know when your child is growing.
- It's important to know when your child is not growing.
- It's important to know when your child is not growing.

Learn the Signs. Act Early.

www.cdc.gov/actearly

Developmental Screening FA

Important Milestones By The End Of 2 Years (24 Months)

Children develop at their own pace, so it's impossible to tell exactly when developmental milestones will be reached. But there are some signs that your child is growing.

Autism Spectrum Disorders FACT SHEET

What are autism spectrum disorders?

Autism spectrum disorders (ASDs) are a group of developmental disabilities caused by problems with the brain. Scientists do not know yet exactly what causes the problem. ASDs are caused by a variety of factors, including genetic factors, brain factors, and environmental factors. They are not caused by anything you did or didn't do.

What are some of the signs of ASD?

People with ASD may have problems with social, emotional, and communication skills. They might repeat certain behaviors and might not want change in their daily activities. Many people with ASD also have other conditions, such as epilepsy, anxiety, or depression. ASD is diagnosed by a doctor or a specialist.

What can I do if I think my child has an ASD?

You are doing the right thing now - talking with your child's doctor or nurse. If you or your doctor think there may be a problem, you can get your child's doctor to refer you to a specialist. You can also get your child's doctor to refer you to a specialist. You can also get your child's doctor to refer you to a specialist.

Learn the Signs. Act Early.

www.cdc.gov/actearly

It's time to change how we view a child's growth.

shows affection for playmates
uses four- to five-word sentences
points to object when named
imitates adults (claps after adult claps)
points to interesting objects
plays pretend (talks on toy phone)
uses simple gestures (waves "bye-bye")
makes sounds (such as "ma" and "ba")

It's time to change how we view a child's growth.

It's natural to measure your child's height and weight. But you should measure other ways your child is growing, too.

From birth to 5 years, there are milestones your child should reach in terms of how she plays, learns, speaks, and acts. A delay in any of these areas could be a sign of a developmental problem, even autism. The good news is, the earlier it's recognized the more you can do to help your child reach her full potential. Talk with a doctor or nurse about your child's total development.

www.cdc.gov/actearly

Learn the Signs. Act Early.



1 en 36

Niños de 8 años identificados con TEA en 2020

*Basado en el seguimiento dentro de 11 comunidades en los Estados Unidos.

1 in 44

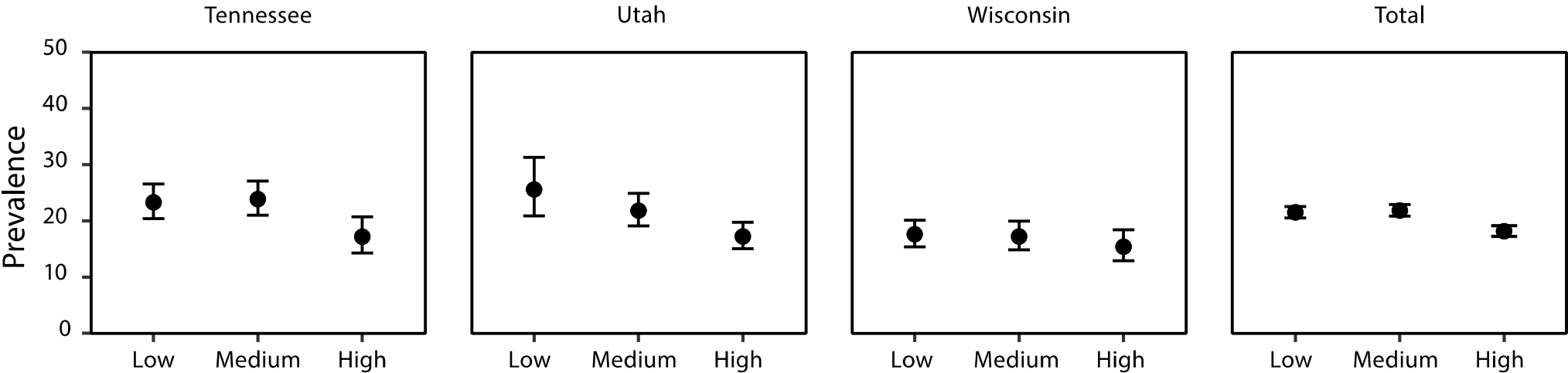
8 year old children living in ADDM Network sites were identified with ASD in 2018

1 in 36

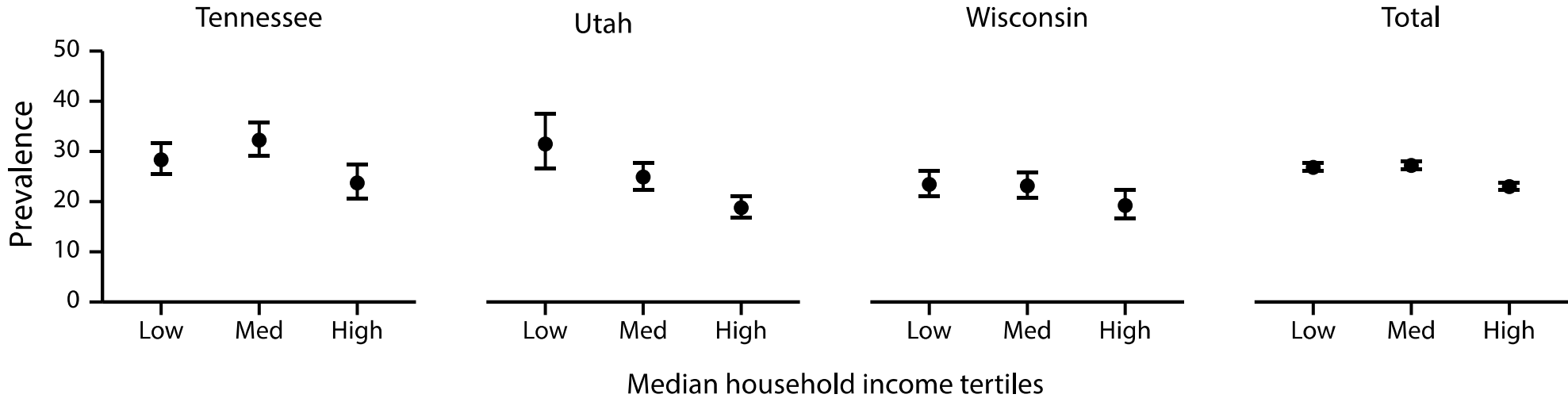
8-year-old children living in ADDM Network sites* were identified with ASD in 2020

Socioeconomic disparity in ASD prevalence in the U.S. has changed in recent surveillance years (2018 and 2020), with prevalence now lowest in high income communities

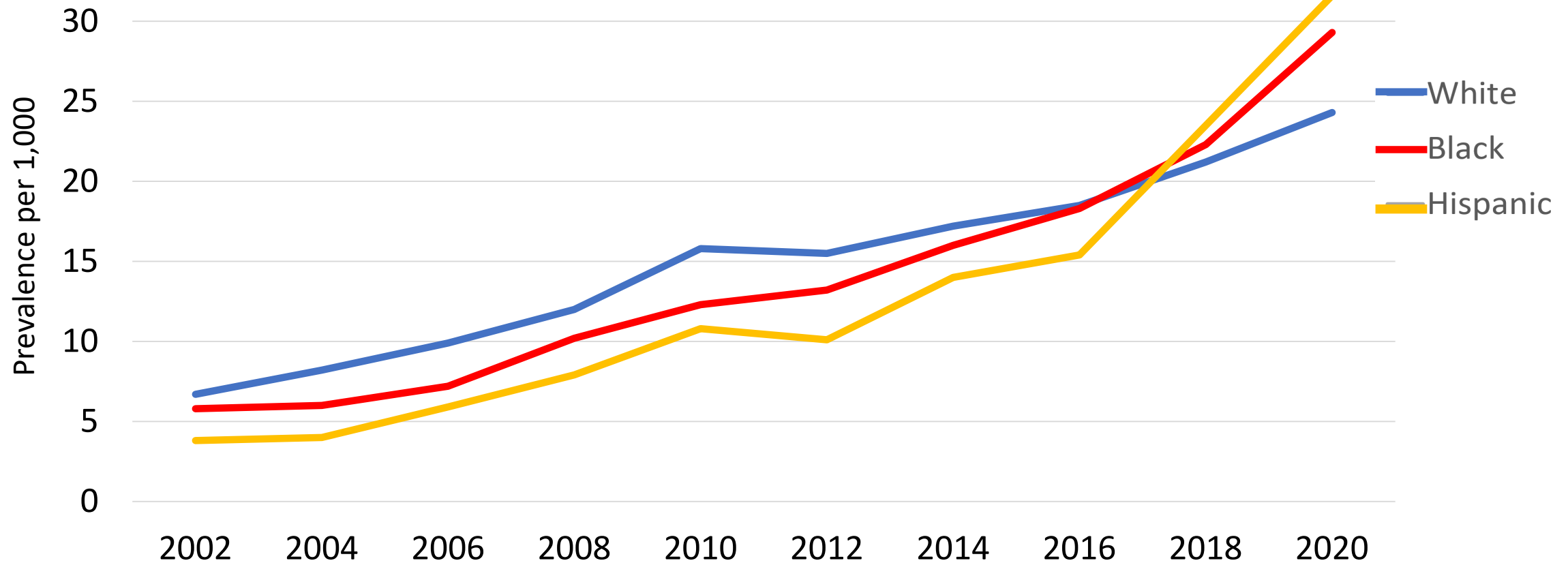
2018



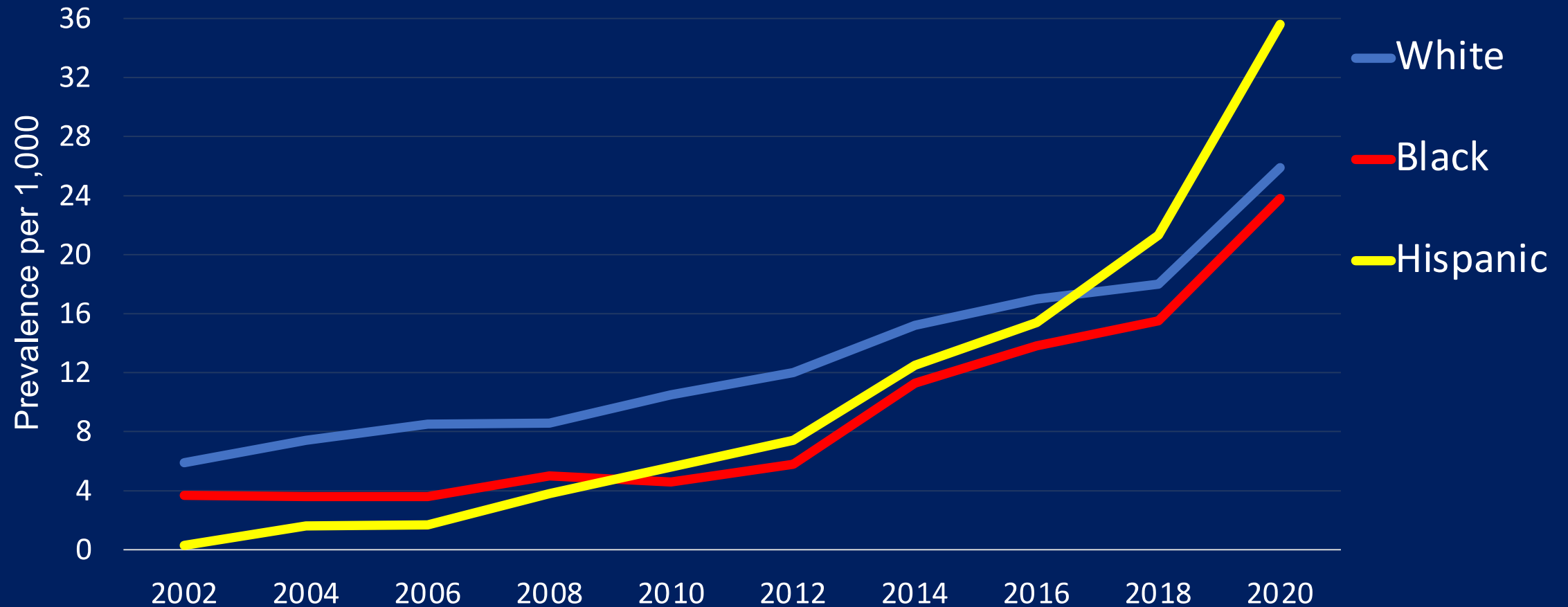
2020



Recent change in the pattern of racial and ethnic differences in autism prevalence



Rise in Autism Prevalence Among 8 Year-Old Children in the Wisconsin, 2002-2020, by Race/Ethnicity

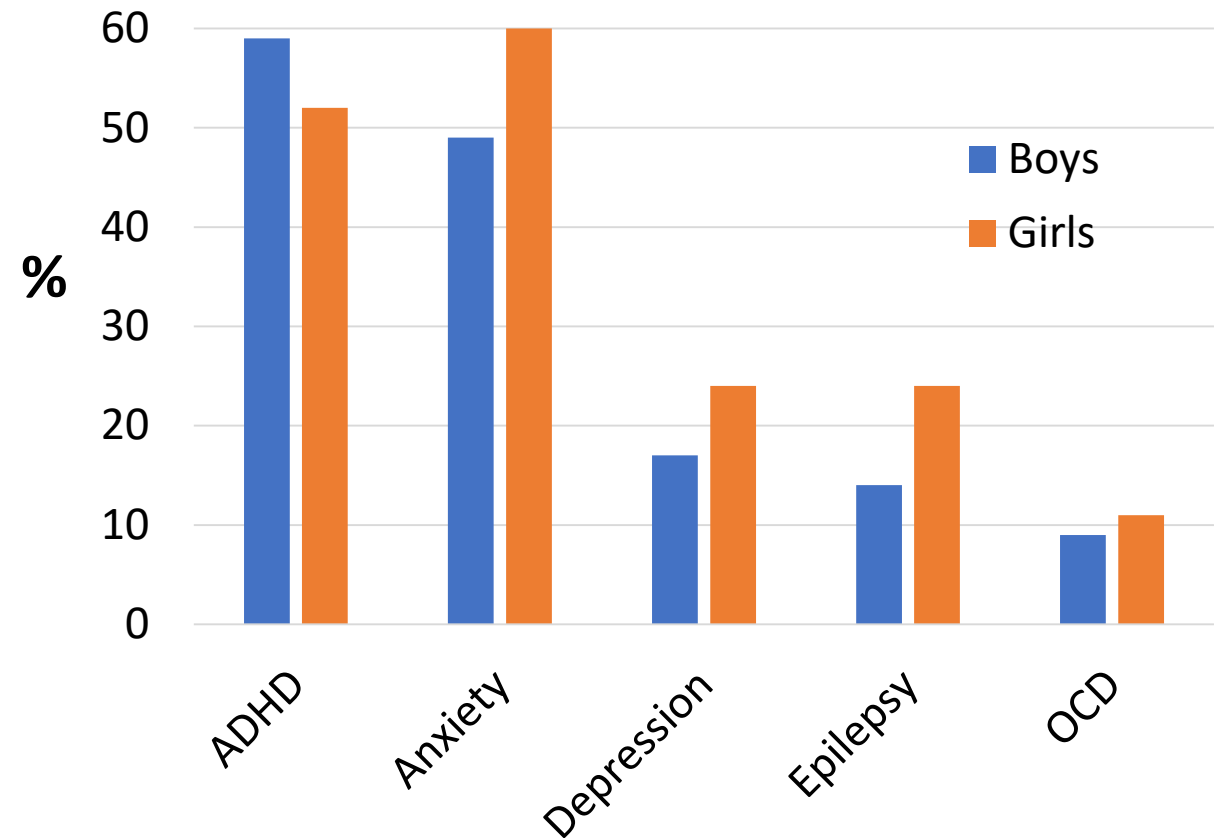
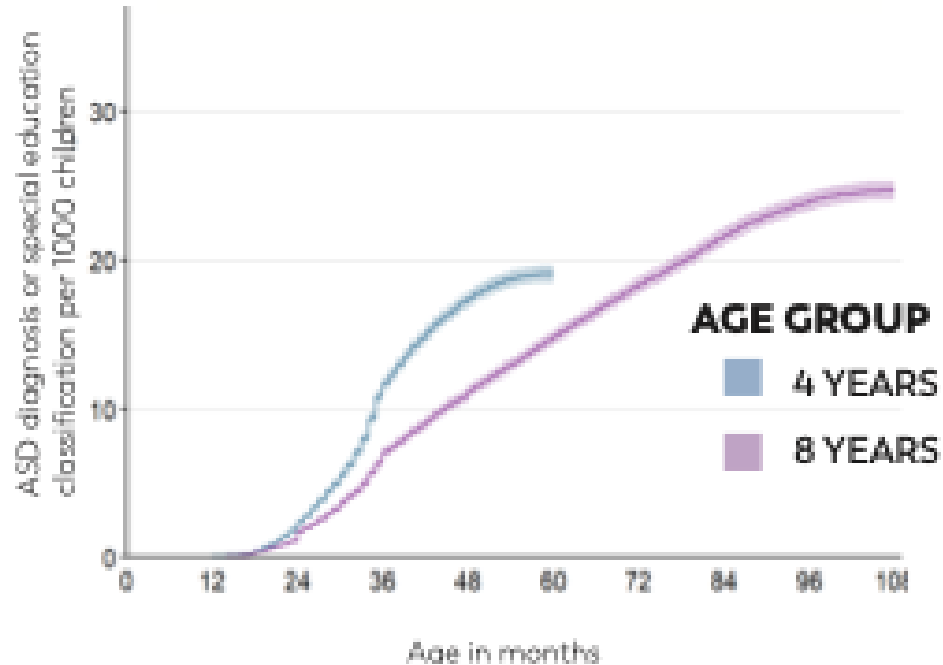


Sources: CDC's ADDM Network ASD prevalence reports, MMWR, published 2007-2023

Other Key Findings from the ADDM Network

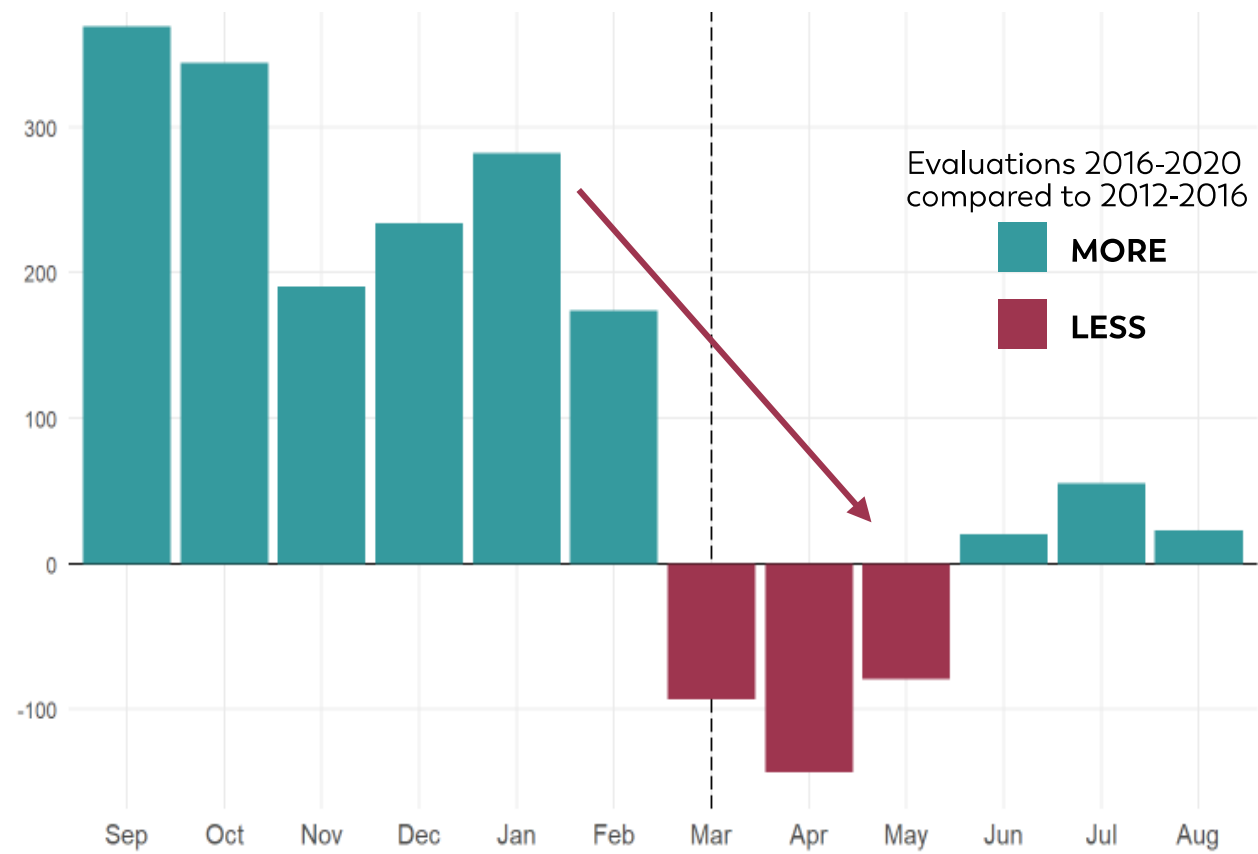
Outcomes in Adolescence: >50% with Co-Occurring Conditions at age 16

More children are being identified with ASD by 48 months



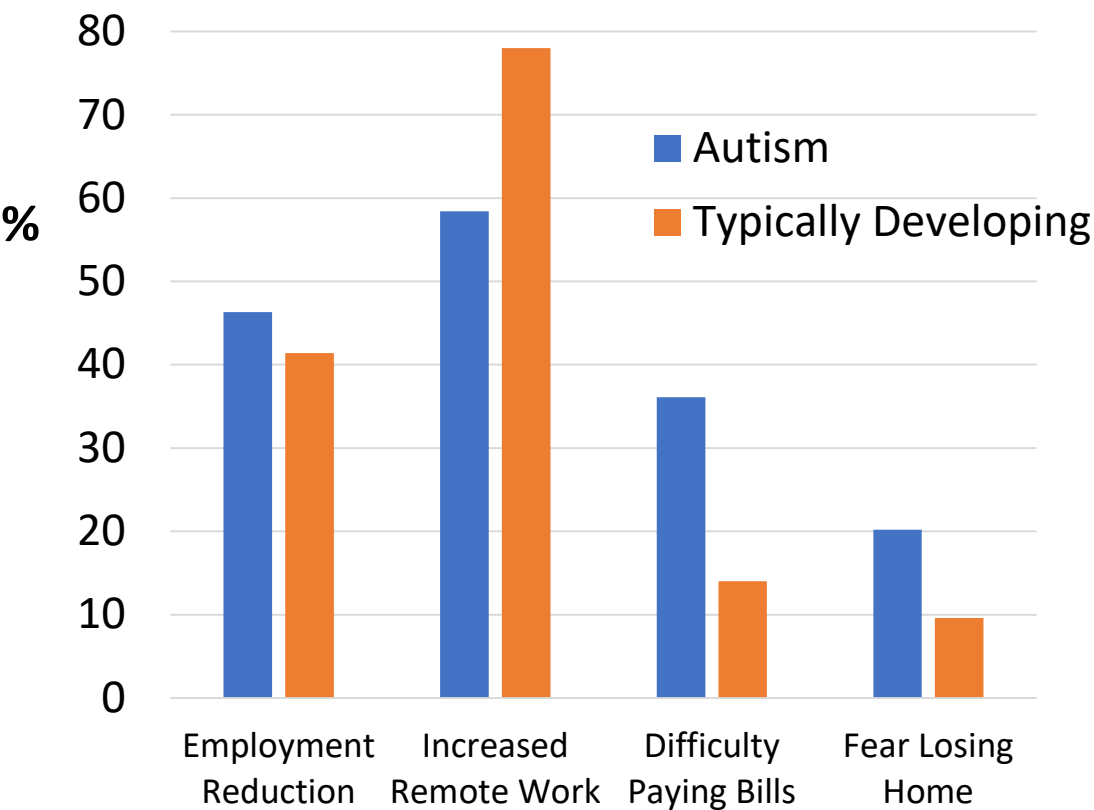
Impacts of the COVID-19 Pandemic

ADDM Network: Fewer Developmental Evaluations



Displayed as 6 months prior and 6 months post-pandemic

Study to Explore Early Development (SEED): Financial Impacts Greater for Families of Children with Autism



Conclusions

- Epidemiologic studies show increasing prevalence of autism over time, which now affects >2% of children
- Given the high cost of autism, this trend places considerable demands on schools, healthcare systems and increasing numbers of families
- Need for ongoing monitoring and understanding of:
 - Factors associated with increased prevalence of autism, including the elevated male-to-female ratio
 - The complexity and variability of autism symptoms and support needs
 - High frequency of co-occurring conditions and disabilities
 - Equitable access to autism diagnoses and proven interventions
 - Strategies for improving outcomes across the life-course for autistic persons and their families, especially during public health emergencies