SUPPLEMENTARY MATERIALS
Early Identification of Autism Spectrum Disorder Among Children Aged 4 Years
Autism and Developmental Disabilities Monitoring (ADDM) Network, 11 Sites, United States, 2020

Supplementary Methods: Technical detail on the calculation of ADDM study area denominators

For all counties included in a site's study area, 4- and 8-year-old population counts were provided by the National Vital Statistics System (NVSS).

- If an entire county is included, the denominator is equal to the NVSS population estimates for 4- and 8-year-olds.

- If only certain school districts are included in a county:

    1. The proportion of each race/sex category in included districts compared to all school districts in the county is calculated using National Center for Education Statistics (NCES) Common Core of Data population estimates for kindergarteners (4-year-olds) and 3rd graders (8-year-olds).

    2. NVSS race/sex category estimates are adjusted for the county based on the NCES race/sex enrollment proportions.

    If a school crosses county boundaries and only one county is in the study area:

    1. For the included county, census tracts assigned to the school district and proportion of children in those tracts assigned to the school district are determined using the Missouri Census Data Center Geographic Correspondence Engine (Geocorr).

    2. American Community Survey (ACS) population estimates of 5-to-9-year-olds in the same census tracts by race/sex category are adjusted based on the Geocorr assignment proportions.

    3. The ACS race/sex category counts in the assigned census tracts are then divided by the ACS 5-to-9-year-old estimate for the entire county, and NVSS race/sex category estimates are adjusted based on that proportion.

Links to data sources:

NVSS – https://www.cdc.gov/nchs/nvss/

NCES – https://nces.ed.gov/ccd/files.asp

Geocorr - https://mcdc.missouri.edu/applications/geocorr.html

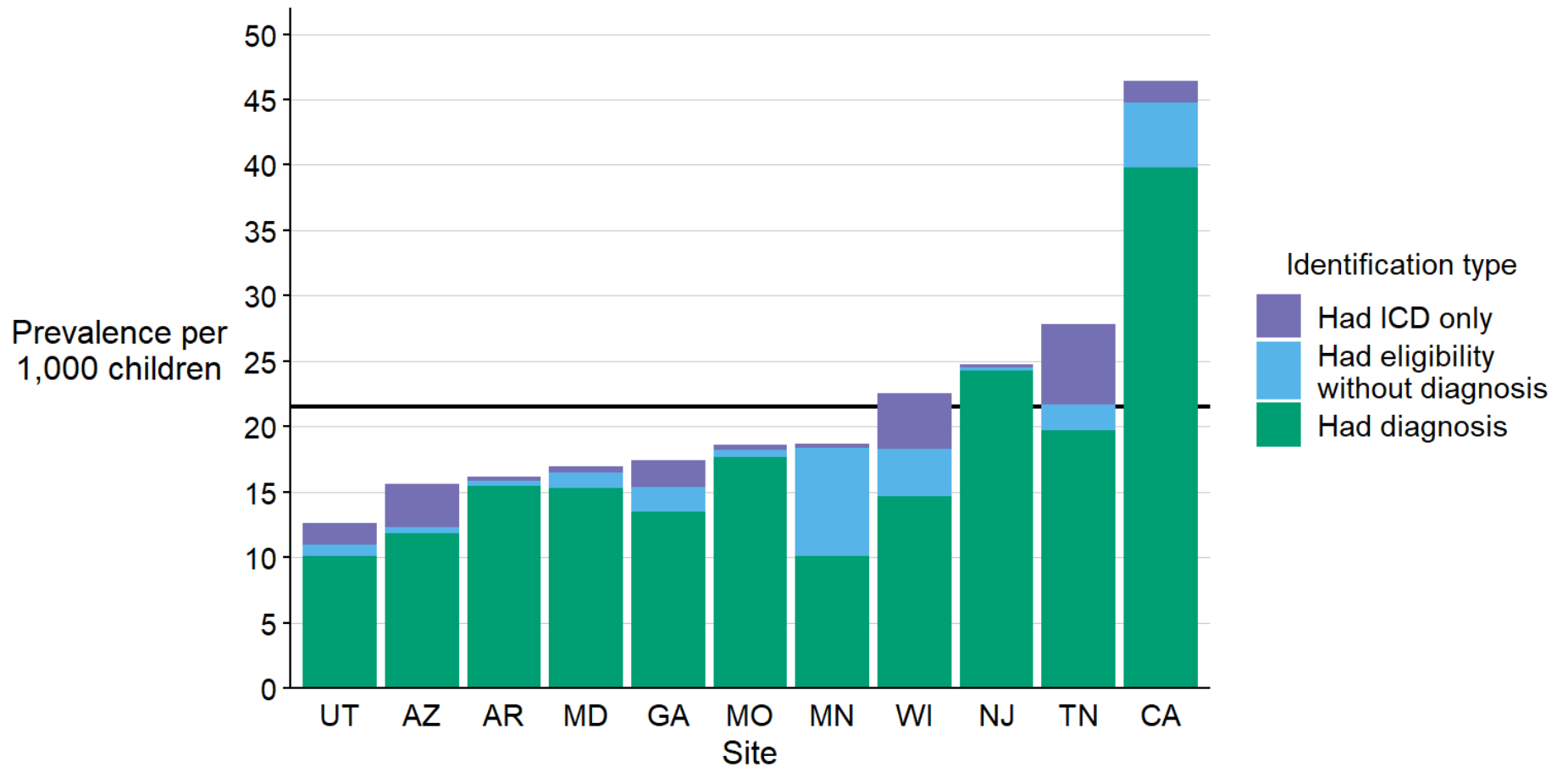ACS – https://www2.census.gov/programs-surveys/acs/summary_file/

Supplementary Table 1. Population denominators for children aged 4 years, by site and race — Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2020

SITE	White	Black	Hispanic	Asian or Pacific Islander	American Indian or Alaska Native	Two or more races
Arizona	5053	934	5834	421	374	733
Arkansas	9041	3616	1535	213	49	696
California	4294	1161	7940	1957	31	1336
Georgia	5708	10770	2663	1950	29	865
Maryland	10547	4862	2171	1835	39	1291
Minnesota	6998	3723	1746	2587	165	1107
Missouri	15312	5771	1205	920	32	1236
New Jersey	5052	5552	6783	1136	33	564
Tennessee	15794	4486	3754	905	48	1487
Utah	16292	406	5243	1169	131	1089
Wisconsin	15562	5244	4926	1597	61	1462
Total	109653	46525	43800	14690	992	11866

Supplementary Figure 1. Prevalence of autism spectrum disorder per 1,000 children aged 4 years, by identification type and site — Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2020

Abbreviation: ASD = autism spectrum disorder; diagnosis = ASD diagnostic statement; ICD = autism International Classification of Diseases (ICD) code (revisions 9 or 10); eligibility = autism special education classification.
Note: Line represents overall prevalence estimate of 21.5 per 1,000 children aged 4 years.

Supplementary Table 2. Cumulative incidence of autism spectrum disorder diagnosis or eligibility by age 48 months per 1,000 children by age group and site — Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2020
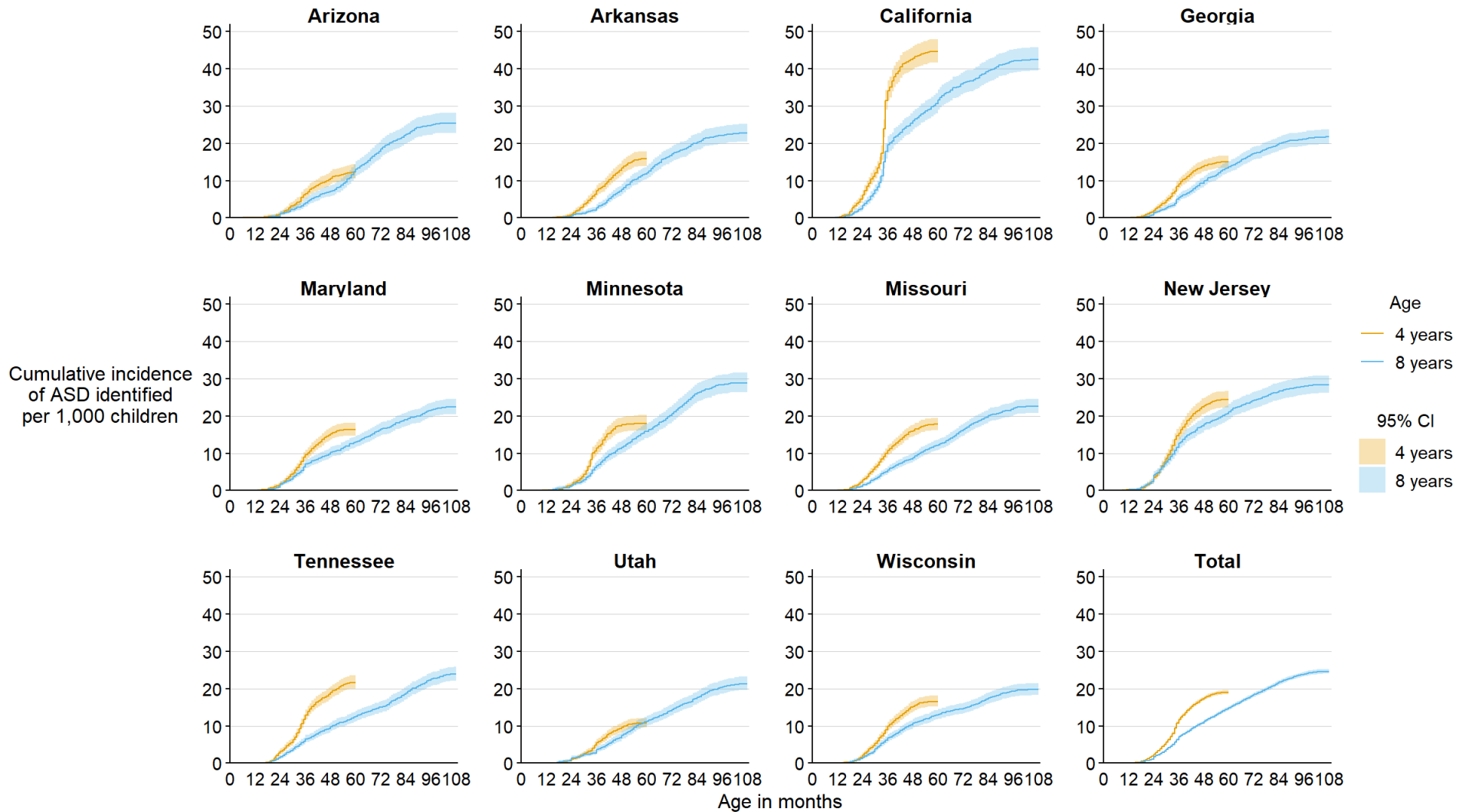**Abbreviation:** ASD = autism spectrum disorder; CI = confidence interval.

Site	ASD diagnosis or eligibility by 48 months among children aged 4 years in 2020 (95% CI)	ASD diagnosis or eligibility by age 48 months among children aged 8 years in 2020 (95% CI)	Age 4 to age 8 Risk Ratio (95% CI)
Arizona	10.6 (9.0-12.5)	7.2 (5.9-8.8)	1.5 (1.1-1.9)*
Arkansas	13.3 (11.6-15.3)	7.6 (6.3-9.1)	1.8 (1.4-2.2)*
California	42.9 (39.9-46.1)	26.1 (23.7-28.7)	1.6 (1.5-1.9)*
Georgia	14.0 (12.5-15.7)	9.9 (8.7-11.3)	1.4 (1.2-1.7)*
Maryland	15.2 (13.7-17.0)	10.2 (9.0-11.7)	1.5 (1.3-1.8)*
Minnesota	17.6 (15.7-19.7)	11.6 (10.1-13.4)	1.5 (1.3-1.8)*
Missouri	16.1 (14.6-17.7)	8.8 (7.7-10.1)	1.8 (1.5-2.1)*
New Jersey	22.7 (20.7-24.9)	17.9 (16.1-19.9)	1.3 (1.1-1.5)*
Tennessee	19.0 (17.4-20.7)	9.7 (8.6-11.0)	2.0 (1.7-2.3)*
Utah	9.6 (8.4-10.9)	7.4 (6.4-8.6)	1.3 (1.1-1.6)*
Wisconsin	15.2 (13.9-16.7)	10.7 (9.6-12.0)	1.4 (1.2-1.6)*
Total	17.5 (16.9-18.0)	11.2 (10.8-11.7)	1.6 (1.5-1.6)*

* Statistically significant risk ratio (95% CI excludes 1)

Supplementary Figure 2. Cumulative incidence of autism spectrum disorder diagnosis or eligibility per 1,000 children aged 4 or 8 years, by site and month of age at identification — Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2020
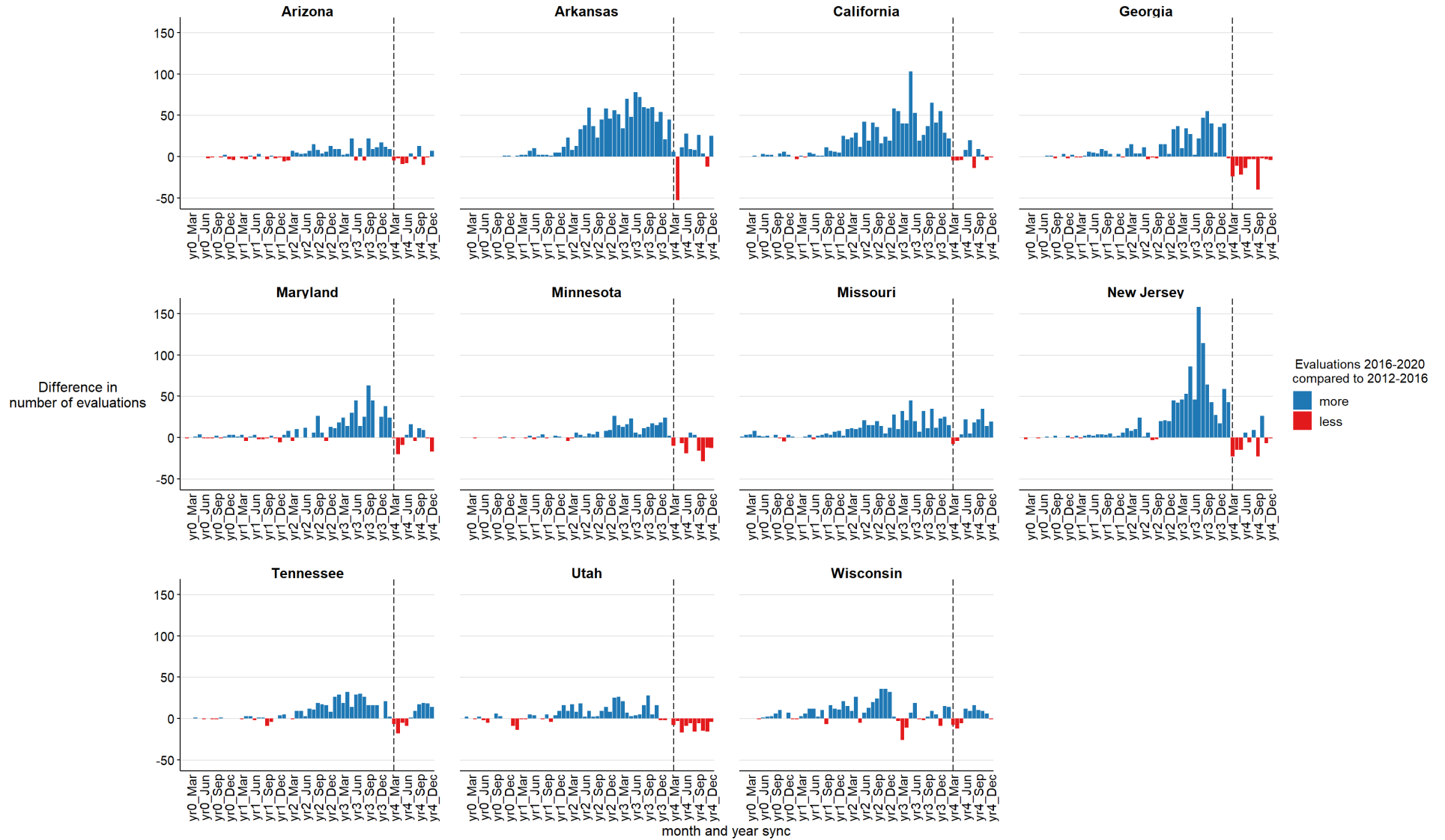
Abbreviation: ASD = autism spectrum disorder; CI = confidence interval.

Supplementary Figure 3.

Comparing number of evaluations for children with autism spectrum disorder (ASD) aged 4 years in 2020 during calendar years 2016-2020 and children aged 8 years with ASD in 2020 during calendar years 2012-2016, by month

Note: For children aged 4 years, yr0 to yr4 represents 2016-2020; for children aged 8 years, yr0 to yr4 represents 2012-2016. The dashed line shows the comparison at pandemic onset for children aged 4 years.

Supplementary Figure 4.

Comparing incidence of autism spectrum disorder identification per 1,000 children for children aged 4 years in 2020 during calendar years 2016-2020 and children aged 8 years in 2020 during calendar years 2012-2016, by month

Abbreviation: ASD = autism spectrum disorder

Note: For children aged 4 years, yr0 to yr4 represents 2016-2020; for children aged 8 years, yr0 to yr4 represents 2012-2016. The dashed line shows the comparison at pandemic onset for children aged 4 years.

Supplementary Table 3. Difference in numbers of evaluations for children with autism spectrum disorder (ASD) aged 4 years in 2020 during the 6 months prior to pandemic onset (September 2019 through February 2020) and 6 months after pandemic onset (March 2020 through August 2020) compared to the corresponding age periods for children aged 8 years with ASD (September 2015 through February 2016 and March 2016 through August 2016) — Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2020

Site	Difference in evaluations September 2019 through February 2020 for children aged 4 compared to evaluations received by children aged 8 four years previously	Difference in evaluations March 2020 through August 2020) for children aged 4 compared to evaluations received by children aged 8 four years previously
Arizona	80.0	-23.0
Arkansas	280.0	9.0
California	249.0	0.0
Georgia	174.0	-77.0
Maryland	195.0	-15.0
Minnesota	89.0	-27.0
Missouri	121.0	37.0
New Jersey	253.0	-44.0
Tennessee	71.0	-29.0
Utah	45.0	-59.0
Wisconsin	36.0	11.0
Total	1593.0	-217.0

Supplementary Table 4. Difference in incidence of autism spectrum disorder (ASD) identification per 1,000 children among children aged 4 years in 2020 during the 6 months prior to pandemic onset (September 2019 through February 2020) and 6 months after pandemic onset (March 2020 through August 2020) compared to the corresponding age periods for children aged 8 years with ASD (September 2015 through February 2016 and March 2016 through August 2016) — Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2020

Site	Difference in ASD identification September 2019 through February 2020 for children aged 4 compared to identification received by children aged 8 four years previously	Difference in ASD identification March 2020 through August 2020 after for children aged 4 compared to identification received by children aged 8 four years previously
Arizona	1.018	0.126
Arkansas	0.900	-0.015
California	6.506	-0.643
Georgia	0.857	-0.552
Maryland	1.738	0.281
Minnesota	2.720	-1.741
Missouri	1.559	-0.116
New Jersey	1.960	-0.283
Tennessee	2.019	0.060
Utah	0.644	-0.336
Wisconsin	1.659	-0.004
Total	1.891	-0.257

Supplementary Table 5. Prevalence of suspected autism spectrum disorder per 1,000 children aged 4 years— Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2020

Site	No. of children aged 4 yrs with suspected ASD	Suspected ASD prevalence (95% CI*)
Arizona	118	8.8 (7.4-10.6)
Arkansas	157	10.4 (8.9-12.1)
California	8	0.5 (0.2-0.9)
Georgia	57	2.6 (2.0-3.4)
Maryland	100	4.8 (4.0-5.9)
Minnesota	55	3.4 (2.6-4.4)
Missouri	39	1.6 (1.2-2.2)
New Jersey	98	5.1 (4.2-6.2)
Tennessee	42	1.6 (1.2-2.1)
Utah	210	8.6 (7.5-9.9)
Wisconsin	101	3.5 (2.9-4.3)
Total	985	4.3 (4.1-4.6)

Abbreviations: ASD = autism spectrum disorder; CI = confidence interval.
* 95% CIs were calculated using the Wilson score method.

Supplementary Table 6. Characteristics of children aged 4 years with autism spectrum disorder compared with suspected autism spectrum disorder — Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2020

Characteristic	Children with ASD No. (%)	Children with suspected ASD* No. (%)
Sex[†]		
Female	1159 (23.7)	261 (26.5)
Male	3733 (76.3)	724 (73.5)
Race/Ethnicity[§]		
Non-Hispanic White	1783 (37.1)	401 (41.4)
Non-Hispanic Black	1177 (24.5)	206 (21.3)
Hispanic	1257 (26.2)	254 (26.2)
Asian/Pacific Islander	345 (7.2)	47 (4.9)
American Indian or Alaska Native	11 (0.2)	8 (0.8)
Multiracial	229 (4.8)	53 (5.5)
Intellectual disability[¶]		
Confirmed intellectual disability	1384 (48.5)	224 (45.1)
Evaluation**		
Earliest recorded evaluation age ≤36 mos	3555 (78.0)	704 (71.5)

Abbreviation: ASD = autism spectrum disorder.

* Chi-square or Fisher test p values for significant comparisons: Asian/Pacific Islander: p = 0.02, American Indian or Alaska Native: p = 0.01.

[†] 4 children with ASD missing sex information

[§] Excludes children of other or unknown race.

[¶] Limited to children with intellectual disability data available.

** Limited to children with an evaluation (N = 4,560 children with ASD; N = 985 children with suspected ASD).