

Early Identification of Autism Spectrum Disorder Among Children Aged 4 Years — Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2018

Supplementary Material

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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 are pulled from the National Vital Statistics System (NVSS) Vintage 2019 estimates for 2018.

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 2018 population estimates for kindergarteners (proxy for population of 4-year-olds because 2019 data are not available) 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 kids 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/bridged_race/data_documentation.htm

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

Geocorr – <http://mcdc.missouri.edu/applications/geocorr2014.html>

ACS – https://www2.census.gov/programs-surveys/acs/summary_file/2018/data/?#

Supplementary Table 1. Full counts of children with autism spectrum disorder and denominators, by site and race — Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2018

SITE	Denominator White	Denominator Black	Denominator Hispanic	Denominator Asian or Pacific Islander	Denominator American Indian or Alaska Native	Cases White	Cases Black	Cases Hispanic	Cases Asian or Pacific Islander	Cases American Indian or Alaska Native	Cases Other (including multiracial) or Unknown [†]
Arizona	6129	1113	5747	426	514	81	—*	49	—*	—*	4
Arkansas	9632	3998	1467	230	60	110	42	—*	—*	—*	20
California	4969	1535	7873	2325	94	129	47	358	97	—*	64
Georgia	6327	9171	5401	2092	49	76	157	54	37	—*	13
Maryland	11056	4979	1939	1804	40	101	67	17	28	—*	19
Minnesota	5598	2678	1189	876	188	93	63	29	27	—*	24
Missouri	15934	6410	1198	900	79	208	74	—*	27	—*	20
New Jersey	4480	5400	6408	975	23	68	108	132	16	—*	17
Tennessee	16088	4881	3467	851	48	270	103	86	17	—*	21
Utah	17729	694	5207	1213	221	136	—*	56	12	—*	18
Wisconsin	16887	5675	4369	1600	158	215	103	133	35	—*	25
Total	114829	46534	44265	13292	1474	1487	771	932	302	17	245

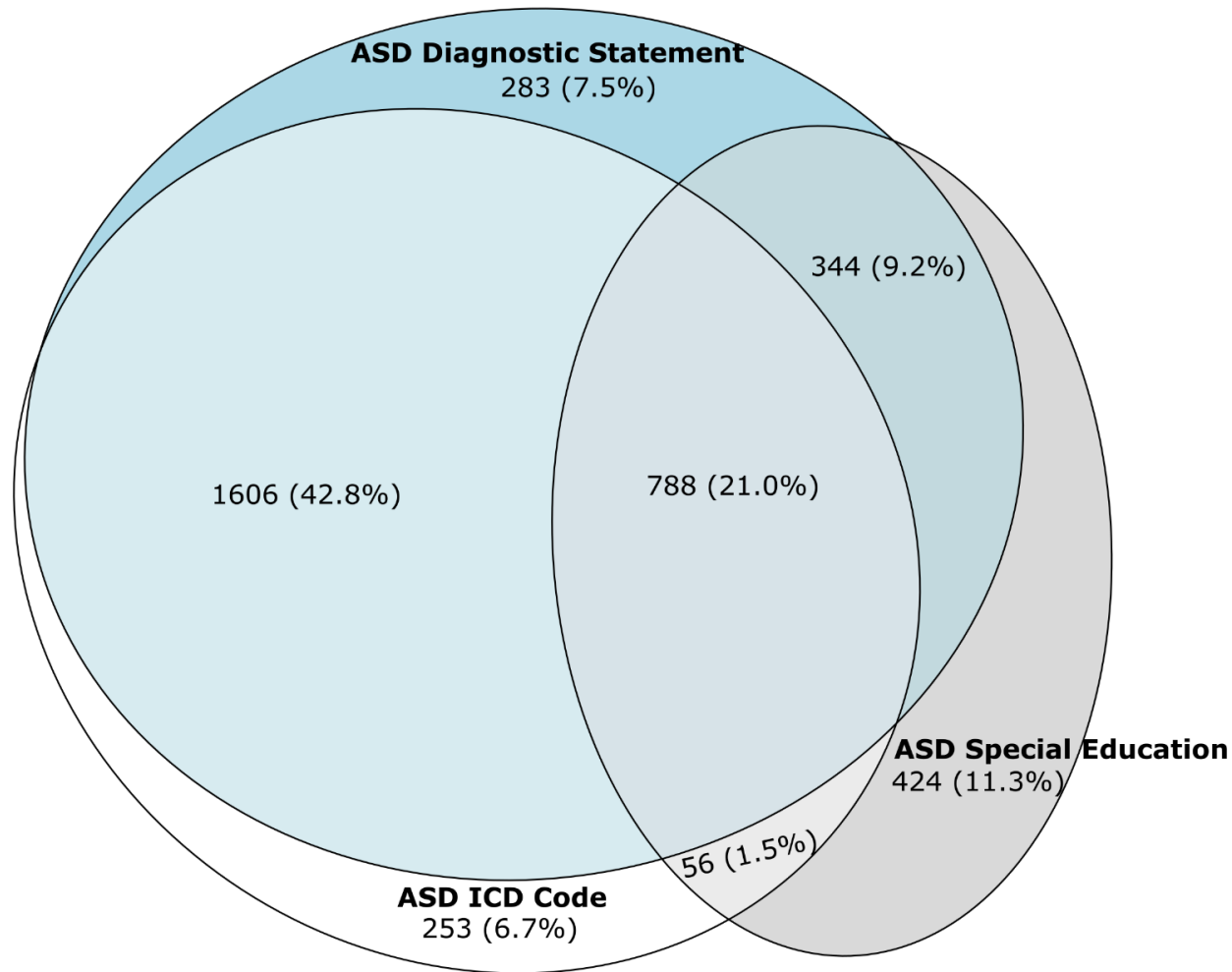
* Indicates value suppression due to unstable prevalence estimate (relative standard error $\geq 30\%$ estimate)

[†] No denominator available; excluded from analyses by race or ethnicity

Supplementary Table 2. American Community Survey denominators for census tracts included in cumulative incidence of autism spectrum disorder identification by median household income.

SITE	Median Household Income Low Tertile	Median Household Income Middle Tertile	Median Household Income High Tertile
Arizona	6770	5375	5005
Arkansas	9670	4710	998
California	5208	7451	8438
Georgia	8855	7215	6738
Maryland	2161	6229	10871
Minnesota	3647	4688	4325
Missouri	8315	8616	7492
New Jersey	8445	3111	5453
Tennessee	9262	9830	5945
Utah	3780	9598	11215
Wisconsin	11688	9463	7621
Total	77805	76290	74105

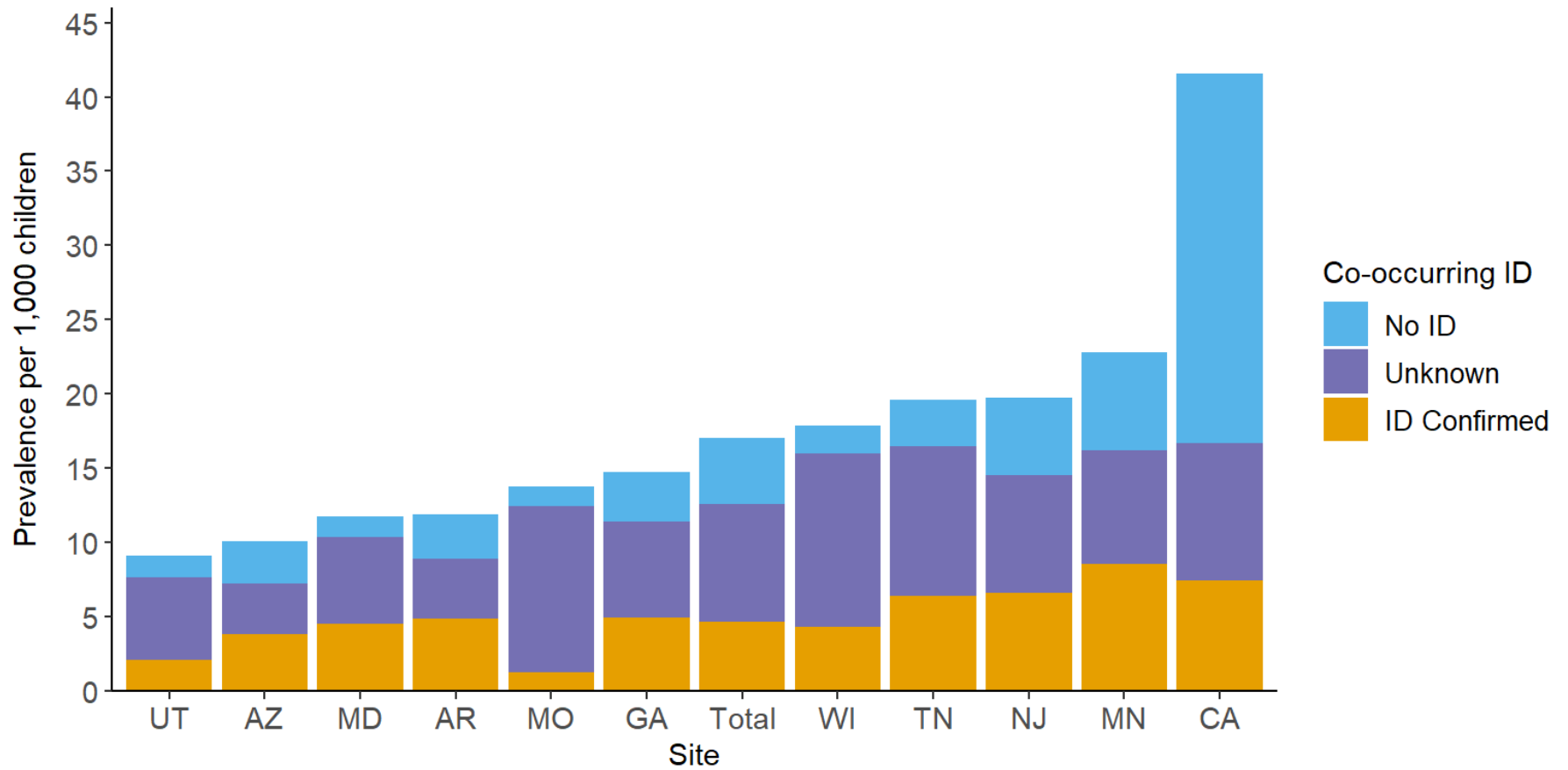
Supplementary Figure 1. Euler diagram showing presence and overlap of case definition components among children aged 4 years with ASD (N = 3,754) — Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2018



Supplementary Table 3. Intellectual disability data availability among children with autism spectrum disorder by site, Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2018

SITE	Children with intellectual disability data available	Total children with ASD	% with intellectual disability data
Arizona	94	141	66.7
Arkansas	121	183	66.1
California	542	698	77.7
Georgia	192	340	56.5
Maryland	118	233	50.6
Minnesota	159	240	66.2
Missouri	63	338	18.6
New Jersey	205	342	59.9
Tennessee	241	497	48.5
Utah	90	229	39.3
Wisconsin	178	513	34.7
Total	2003	3754	53.4

Supplementary Figure 2. Co-occurring intellectual disability among children aged 4 years with autism spectrum disorder — Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2018



Supplementary Table 4. Percent of children aged 4 years with autism spectrum disorder (ASD) who had earliest recorded evaluation by 36 months of age, by co-occurring intellectual disability — Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2018

Median household income tertile	With intellectual disability*		Without intellectual disability†	
	Total children with evaluation	% evaluated by 36 months	Total children with evaluation	% evaluated by 36 months
Low	296	72.2	224	81.8
Middle	289	80.7	255	79.9
High	213	83.9	291	78.0

*Cochran-Armitage Test of Trend p value=0.19; chi-square test comparing low to high tertile p value=0

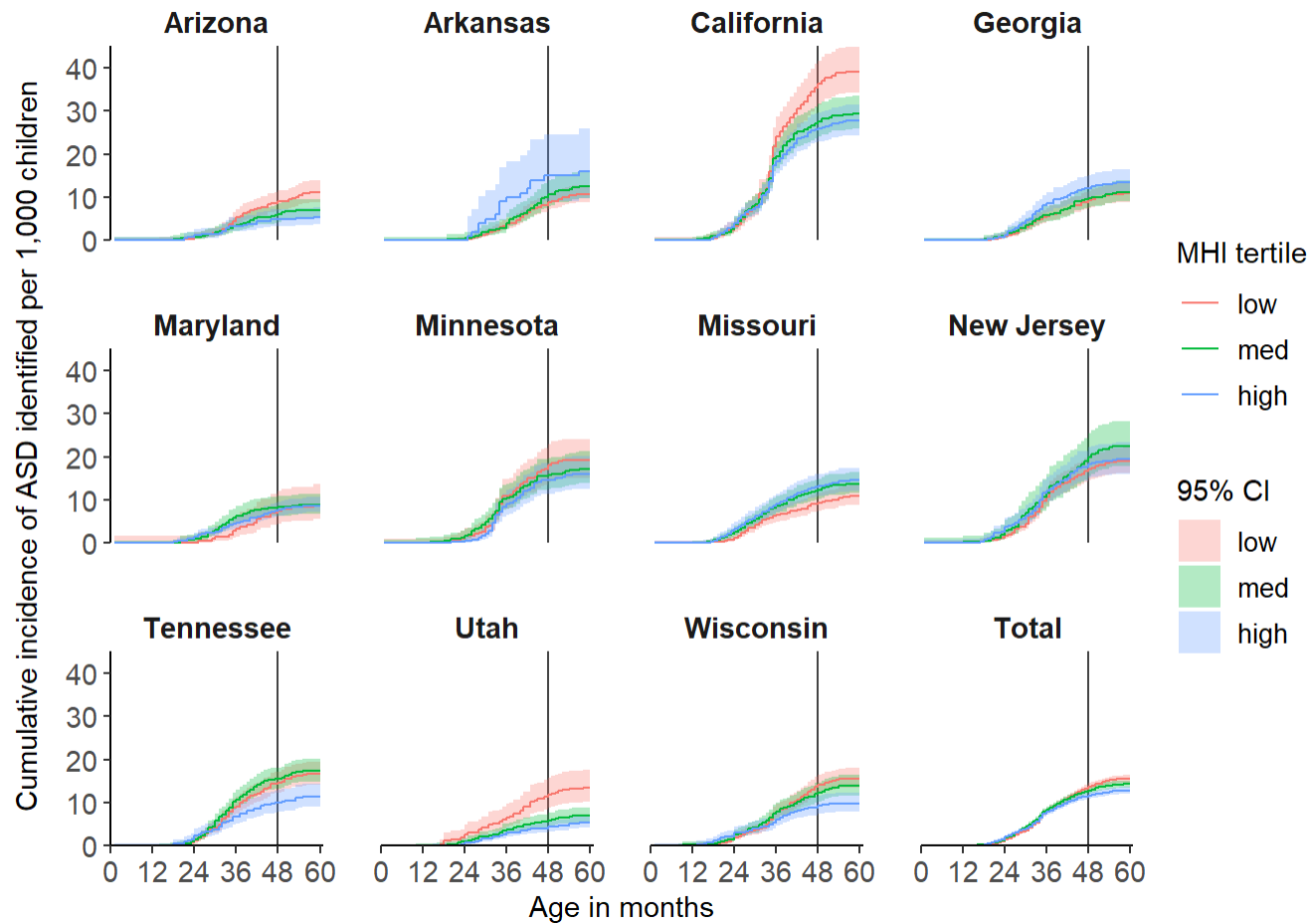
†Cochran-Armitage Test of Trend p value=0.69; chi-square test comparing low to high tertile p value=0.29

Supplementary Table 5. Cumulative incidence of 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, 2018

SITE	Identification by 48 months among children aged 4 years in 2018 (95% CI)	Identification by age 48 months among children aged 8 years in 2018 (95% CI)	Age 4 to age 8 risk ratio (95% CI)
Arizona	8.6 (7.2–10.3)	5.8 (4.6–7.2)	1.5 (1.1–2.0)*
Arkansas	9.9 (8.5–11.6)	8.6 (7.2–10.1)	1.2 (0.9–1.5)
California	36.6 (33.9–39.6)	23.3 (21.1–25.9)	1.6 (1.4–1.8)*
Georgia	10.2 (8.9–11.5)	7.0 (6.1–8.2)	1.4 (1.2–1.8)*
Maryland	9.7 (8.5–11.2)	6.6 (5.6–7.8)	1.5 (1.2–1.8)*
Minnesota	19.3 (16.8–22.1)	11.1 (9.2–13.4)	1.7 (1.4–2.2)*
Missouri	11.7 (10.4–13.1)	7.1 (6.1–8.2)	1.6 (1.4–2.0)*
New Jersey	17.8 (16.0–19.9)	14.8 (13.1–16.7)	1.2 (1.0–1.4)*
Tennessee	13.9 (12.5–15.4)	8.0 (6.9–9.1)	1.7 (1.5–2.1)*
Utah	6.1 (5.2–7.1)	6.6 (5.7–7.7)	0.9 (0.7–1.1)
Wisconsin	13.6 (12.3–15.0)	6.6 (5.7–7.6)	2.1 (1.7–2.5)*
Total	13.6 (13.2–14.1)	8.9 (8.6–9.3)	1.5 (1.4–1.6)*

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

Supplementary Figure 3. Cumulative incidence of autism spectrum disorder diagnosis or eligibility per 1,000 children aged 4 years, by median household income tertile and site — Autism and Developmental Disabilities Monitoring Network, eleven sites, United States, 2018



Supplementary Figure 4. Comparison of prevalence of children aged 4 years with confirmed vs. suspected autism spectrum disorder — Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2018

