Time trends in United States autism prevalence

Should we be casually disregarding the alarming increases in our best available data?

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Education

Stanford University,	Atmospheric Science	Ph.D.	1994
Stanford University,	Environmental Engineering	M.S.	1988
University of California, Berkeley,	Chemistry	B.S.	1987

Publications on Autism

Nevison, C.D. A comparison of temporal trends in United States autism prevalence to trends in suspected environmental factors. *Environ Health.* 2014;13(1):73.http://www.ncbi.nlm.nih.gov/pubmed/25189402.

Bilbo, S.D., CD. **Nevison, C.D.**, & W. Parker. (2015) A Model for the Induction of Autism in the Ecosystem of the Human Body: The Anatomy of a Modern Pandemic? *Microbial Ecology in Health and Disease*, 26: 26253. http://dx.doi.org/10.3402/mehd.v26.26253.

Nevison, C.D., and Blaxill, M. (2017) Diagnostic substitution for intellectual disability: a flawed explanation for the rise in autism, *J. Autism and Dev Disord,* 47(9), 2733-2742. doi:10.1007/s10803-017-3187-0. https://link.springer.com/article/10.1007/s10803-017-3187-0

Parker, W., C.D. Hornik, S. Bilbo, Z.E. Holzknecht, L. Gentry, R. Rao, S.S. Lin, M.R. Herbert, and **C.D. Nevison**, 2017. The role of oxidative stress, inflammation and acetaminophen exposure from birth to early childhood in the induction of autism, *J. of International Medical Research*, 0(0), 1-32. http://journals.sagepub.com/doi/pdf/10.1177/0300060517693423

Nevison, C.D., Blaxill, M. and Zahorodny, W. (2018) California autism prevalence trends from 1931-2014 and comparison to national ASD data from IDEA and ADDM, *J. Autism and Dev Disord,* (in second review)

Best sources of autism data in the United States

1. California Department of Developmental Services (CDDS)

CDDS focuses on the most severe cases and historically has been restricted to those with an Autistic Disorder diagnosis who show significant functional disability in 3 out of 7 life challenges, which include things like language, self care and ability to live independently. To qualify for CDDS services, these individuals also must have a level of impairment that rises to the level of a "developmental disability," where the latter is defined as a non-physical, substantial disability that is expected to continue indefinitely. CDDS is widely considered the most reliable long-term record of autism prevalence trends in the United States.

2. Individuals with Disabilities Education Act (IDEA)

The Individuals with Disabilities Education Act (IDEA) requires the collection of special education enrollment counts for 14 specific disability categories. IDEA is federally mandated and regulated under the U.S. Department of Education, but allows individual states discretion in determining special education categories, without reference to DSM or other diagnostic criteria. Rather, the determination of whether a student qualifies for autism services is made by district-level professionals in concert with the student's parents and teachers. Autism was added as an IDEA category in 1991. Depending on the state, this category may be restricted to more severe cases (as in Colorado) or include all ASD.

3. Autism and Developmental Disabilities Monitoring (ADDM)

The Autism and Developmental Disabilities Monitoring (ADDM) Network is a surveillance system conducted in selected regions of the United States that was established by the Centers for Disease Control (CDC) in 2000 to provide estimates of autism prevalence among 8 year-old children. Reports are available biannually for birth years from 1992-2004, for a total of 7 reports to date. ADDM ASD cases are determined by systematic review and abstraction of information contained in existing evaluations conducted for developmental health and special education purposes, followed by independent scoring and analysis by experienced clinicians to determine which children satisfy the DSM-based definitions of ASD. The new ADDM report for birth year 2006 is due out soon and is expected to show an increase to ~1/50 or ~1/60 children.

California DDS 2017 age-resolved snapshot

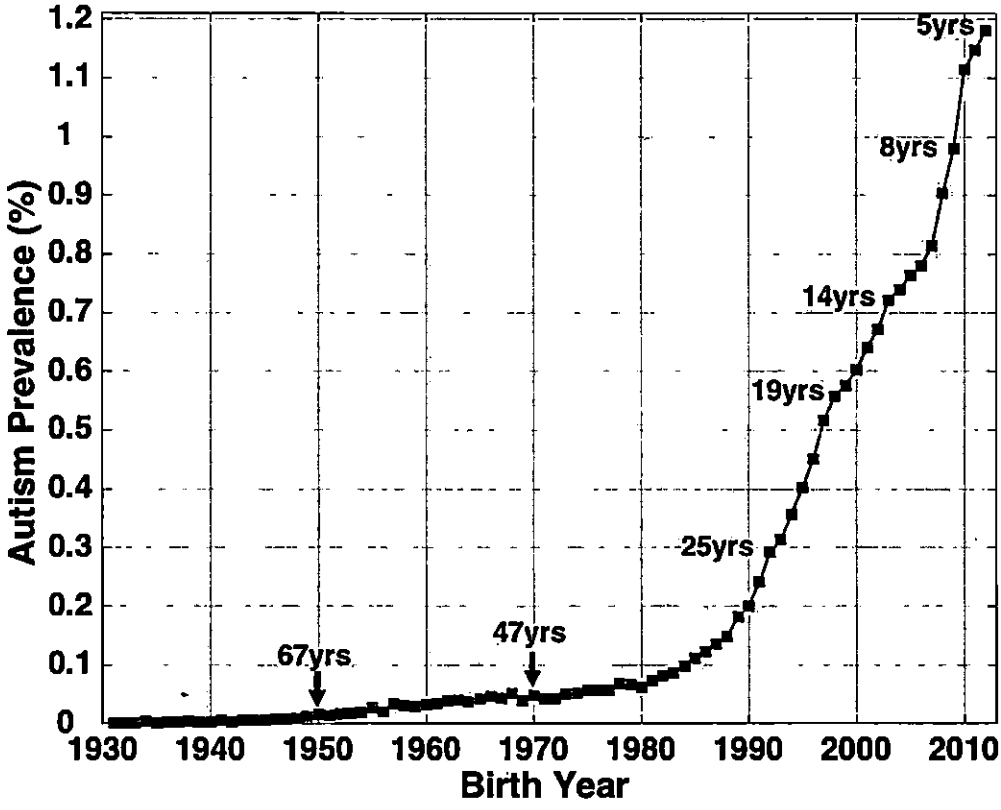

Figure 1. Age-resolved snapshot for 2017, showing the growth in California Department of Developmental Services (CDDS) Code 1 autism prevalence from 0.001% in birth year 1931 to 1.18% in birth year 2012. Code 1 historically meant Autistic Disorder, although after November 2014 it was revised to Autism Spectrum Disorder following the adoption of DSM-5. CDDS cases are updated every 1 to 3 years and consumers must meet a 3 out of 7 life challenges requirement to be eligible for services.

California age-resolved snapshot vs. 8 year-old tracking

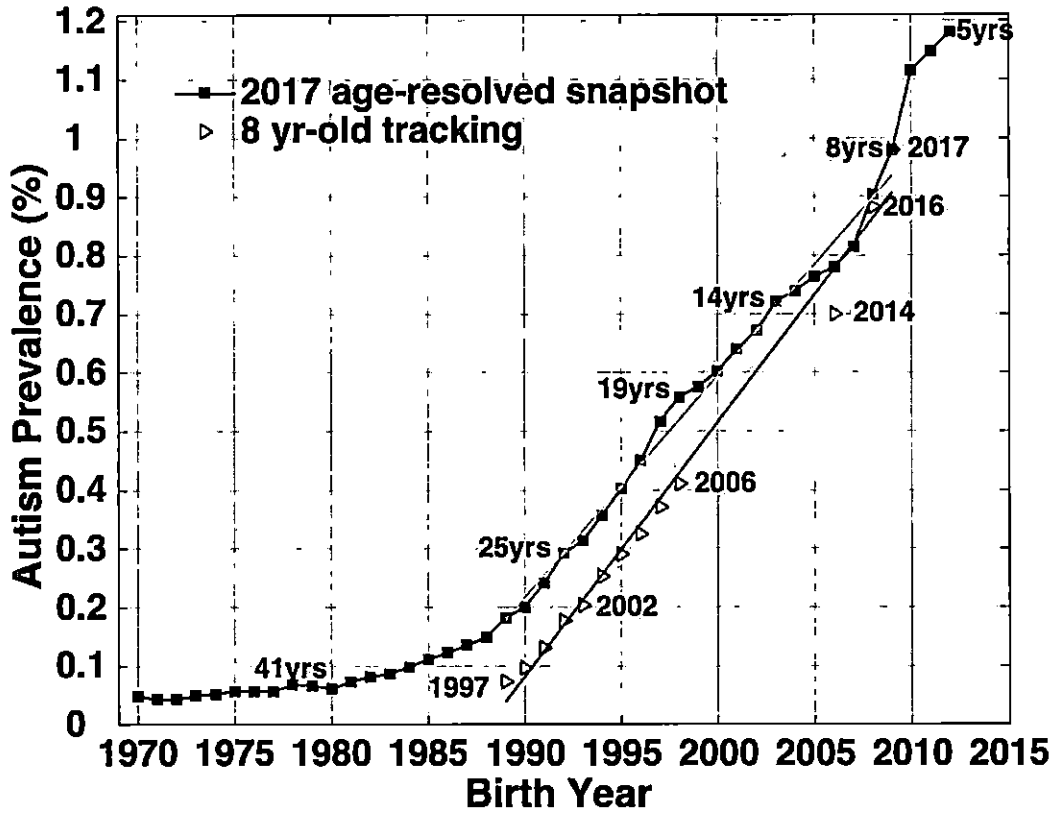

Figure 2. Comparing the 2017 CDDS age-resolved snapshot (blue squares) to 8 year-old tracking (red triangles, data from 1997-2006, 2014, 2016 and 2017 CDDS reports). Linear regression slopes are fit over birth year interval 1989-2009. The snapshot:tracking slope ratio, representing the ratio of the grey:red slopes, is 0.87. Selected ages are labeled on the blue age-resolved snapshot curve, indicating the age of each birth cohort in 2017. Selected CDDS report years are labeled on the red 8 year-old tracking curve.

IDEA vs. ADDM 8 year-old tracking ASD prevalence

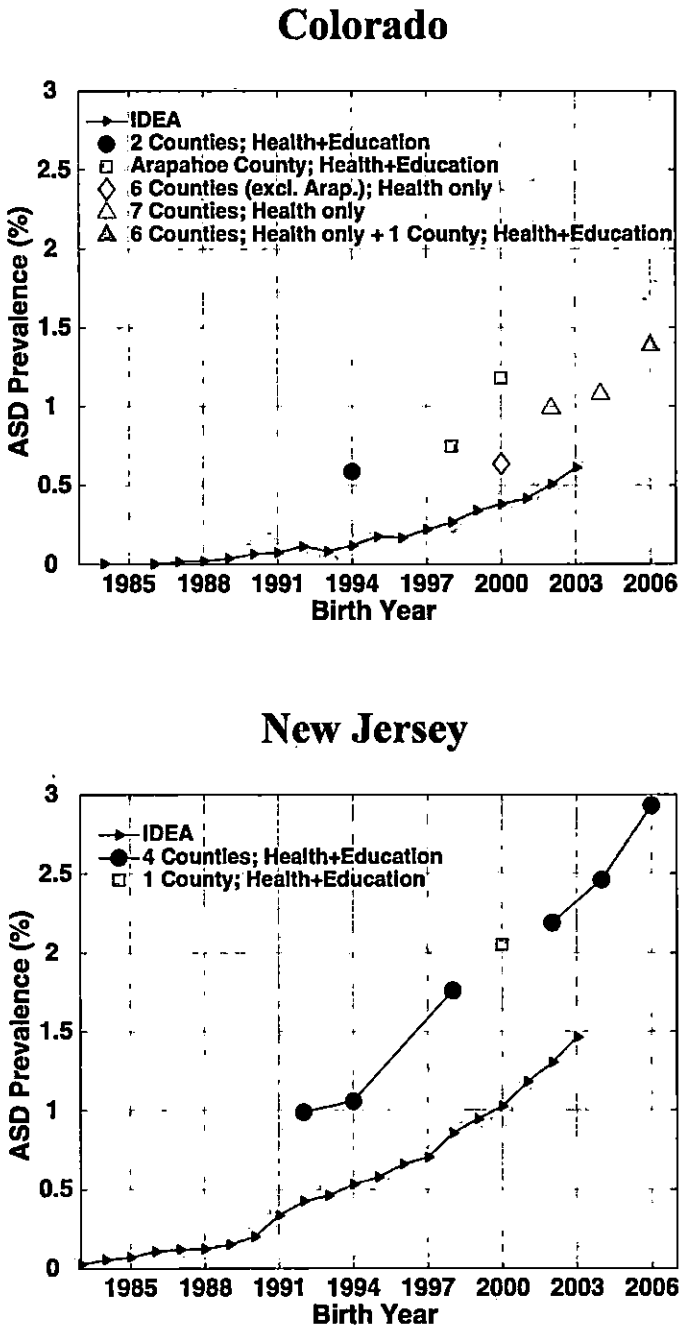

Figure 3. ASD prevalence tracked among 8 year-olds from IDEA (red triangles) and ADDM (black/gray), where different black and gray symbols denote shifts and inconsistencies in the number of counties sampled. In addition, the ADDM data are plotted as solid symbols for prevalence derived based on both health and education records and as open symbols when only health records were available. Top panel: Colorado. Bottom panel: New Jersey.

Inconsistencies in ADDM data may affect reliability of "nationwide" time trend

8 year-old tracking curves compared among 3 datasets

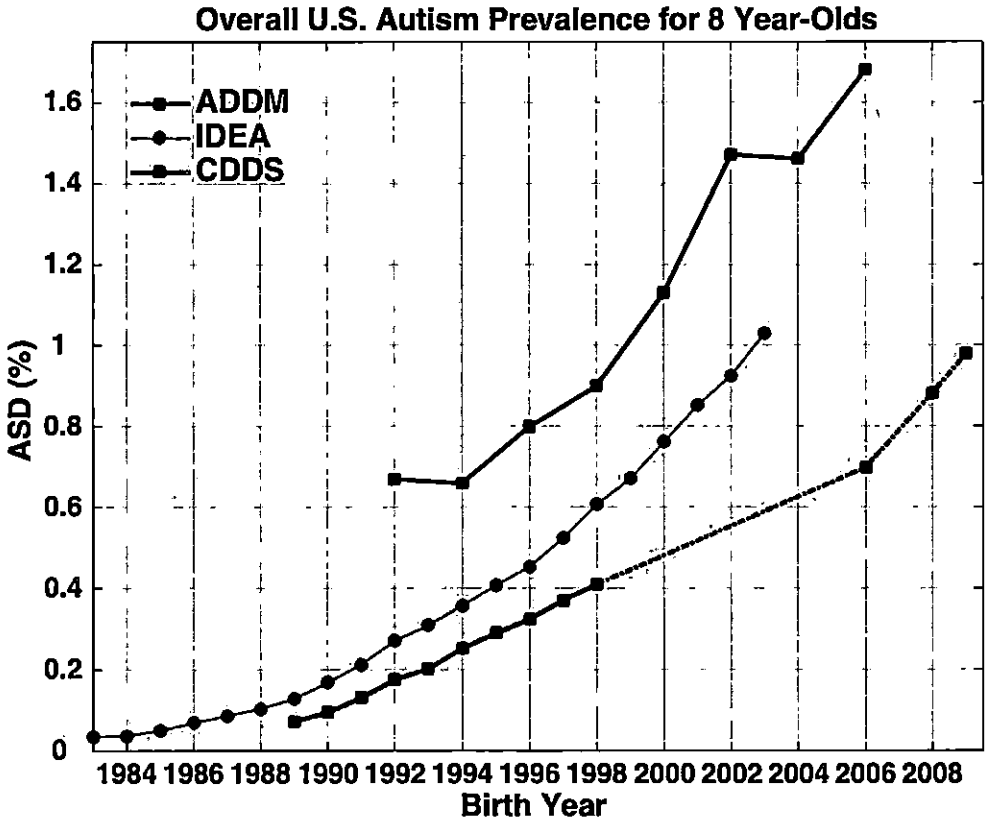

Figure 4. Comparison of data tracking overall U.S. ASD prevalence among 8 year-olds from the IDEA and ADDM networks. Also shown are the California DDS 8 year-old data (covering Code 1 autism cases in California only). Depending on report year, the ADDM "nationwide" total is based on data from 6-14 states, which vary with each report. The IDEA curve is consistently the sum of all 50 states + D.C. (Note that IDEA stopped reporting fully age-resolved data after the 2011 report.)

Denial of autism epidemic based largely on qualitative anecdotes and wishful thinking

•William of Newburgh in 12th-century England described "green children" who could not communicate or follow social customs.

•In other cultures, autistics continue to exist behind other categories: "eternal children," among the Navajo, "marvelous children" in Senegal.

•Retrospective diagnosis is now something of a subspecialty for both psychologists and historians, and the catalogue of famous figures who have been placed on the spectrum now includes ***Newton, Mozart, Beethoven, Jane Austen, Kant, Jefferson, Darwin, Lewis Carroll, Emily Dickinson, and Wittgenstein***.

Autism epidemic occurring in the context of high and increasing rates of other neurological conditions among U.S. children

- 15-20% with dyslexia
- 10% with ADHD
- 5% (under age 5) with at least one seizure

"Something is happening to the brains of our children that is igniting, inflaming, irritating, agitating and interfering with the proper (way) the nerve cells sequence and develop."

Pediatrician Dr. Larry Palevsky

https://www.cdc.gov/ncbddd/adhd/data.html

https://www.ninds.nih.gov/Disorders/Patient-Caregiver-Education/Fact-Sheets/Febrile-Seizures-Fact-Sheet

https://www.edweek.org/ew/articles/2016/04/20/number-of-us-students-in-special-education.html

U.S. children have high rates of other disorders related to the immune system

- 8% with food allergies
- 10% with asthma
- 6% with chronic ear infections
- childhood cancer* increased 0.6%/yr from 1975-2012

(* 26% of childhood cancers are brain or other nervous system tumors)

https://www.cdc.gov/nchs/fastats/allergies.htm
(https://www.cdc.gov/nchs/fastats/asthma.htm)
https://www.cancer.org/latest-news/cancer-statistics-report-death-rate-down-23-percent-in-21-years.html

Conclusions

- Prevalence of severe autism (based on long-term California data) rose by a factor of ~1000 between birth year 1931 and 2012

- Rate of growth is not slowing; rather it accelerated as of birth year 2007.

- In Colorado, IDEA data are relatively low compared to other states and ADDM sampling has been done inconsistently.