

The Autism Epidemic, Fact or Fiction? Insights from a Population-Based Incidence Study

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Background

- The **Diagnostic and Statistical Manual of the American Psychiatric Association** suggests prevalence of Autism is **2 to 5 cases per 10,000**
- **Reported prevalence** rates of autism have **varied widely and are increasing (4 to 10 per 10,000 in 1980's to 30 to 50 per 10,000 in recent studies)**
- February 2007—Centers for Disease Control Autism and Developmental Disorders Monitoring Network (ADDM)—6.6 per 1000 children age 8 years (1 of every 152 children)
- December 2009—Centers for Disease Control—9.0 per 1000 children age 8 years (1 of every 100 children)
- Recent study in Minnesota, based on the number of children receiving special education services, with similar findings
- **Problems** with existing literature
 - Small sample size; method of case identification; prevalence, not incidence

Background

- **“It remains an open question whether there has also been a genuine rise in the numbers of children with autistic spectrum disorders and, if so, how large it is and whether it is still continuing. It is not possible to return to the past in order to apply current diagnostic criteria to all the early studies.”**
 - **From “The Epidemiology of Autistic Spectrum Disorders: Is the Prevalence Rising”, by Wing and Potter, MRDD Research Reviews 8: 151-161 (2002).**

Specific Aims

- To determine the **incidence of autism** in Olmsted County, Minnesota from 1976 to 1997, using contemporary, DSM-IV criteria to identify incident cases
- To study the **time trend of autism incidence** from 1976 to 1997
- To study the **time trend of clinical diagnoses** given to patients with research-identified autism
- To study the **time trend** of the incidence of **other developmental disorders** during these years
- To explore other factors that might explain any changes in the incidence of autism from 1976 to 1997

Cognitive Profile of Research-Identified Autism Incident Cases

Table 1. Cognitive Profile of Research-Identified Autism Incident Cases*

Level of Cognitive Functioning	Boys, No.	Girls, No.	Total, No. (%) (N = 112)	Male-Female Ratio
No cognitive impairment (IQ>70)†	34	10	44 (39.3)	3.4
IQ test				
IQ>110	1	0	1 (0.9)	
IQ 90-110	9	3	12 (10.7)	3.0
IQ 71-89	23	7	30 (26.8)	3.3
Developmental test				
IQ 71-89	1	0	1 (0.9)	
Cognitive impairment (IQ≤70)‡	52	16	68 (60.7)	3.3
IQ test				
IQ 50-70 (mild MR)	25	7	32 (28.6)	3.6
IQ 35-49 (moderate MR)	17	5	22 (19.6)	3.4
IQ 20-34 (severe MR)	5	1	6 (5.4)	5.0
IQ<20 (profound MR)	0	1	1 (0.9)	
Total				
Developmental test				
IQ 71-89 (profound MR)	1	0	1 (0.9)	
IQ 50-70 (mild MR)	4	1	5 (4.5)	4.0
IQ 35-49 (moderate MR)	1	0	1 (0.9)	
IQ 20-34 (severe MR)	0	1	1 (0.9)	

Abbreviation: MR, mental retardation.

*Of the 124 children, 112 had either an IQ or a developmental quotient measured within ±1.5 years of the date the child fulfilled the criteria for research-identified autism.

†The mean (SD) age of testing in this group was 8.7 (4.6) years.

‡The mean (SD) age of testing in this group was 5.9 (4.2) years. The closest IQ or developmental quotient within the ±1.5-year window was less than 35 for 8 of the 112 children. However, these 8 children also had at least 1 IQ of 35 or higher.

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Research-Identified Autism Incident Cases: Other Characteristics

- Males (n=95) outnumbered females (n=29) by a 3.3 to 1 ratio
- Documented symptoms of autism were observed by medical professionals (48.1%), school professionals (30.4%), and parents or caregivers (20.9%)
- Median age at first *documented* autism symptom was 2.6 years
- Most subjects (90.3%) had some symptoms documented in their school records
- Co-morbid clinical diagnoses between 1976 and 1997 included, among others, speech or language disorder (n=96) and epilepsy (n=17)

Age- and Sex-Adjusted Incidence of Research-Identified Autism

Table 2. Age- and Sex-Adjusted Incidence of Research-Identified Autism

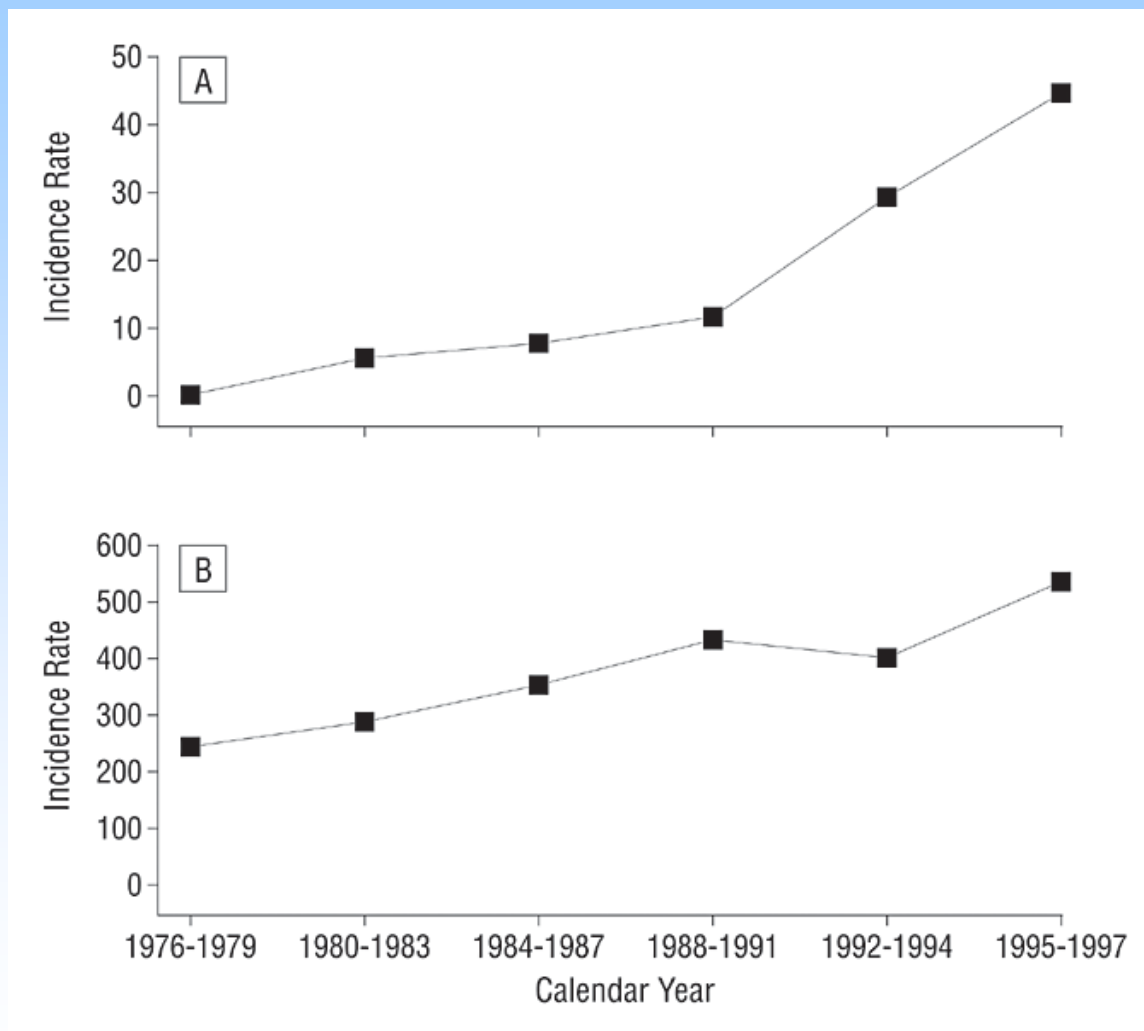
Year	No. of Incident Cases	Incidence Rate Per 100 000 People (95% CI)*
1976-1979	0	0
1980-1983	7	5.5 (1.4-9.5)
1984-1987	11	7.9 (3.2-12.6)
1988-1991	18	11.8 (6.3-17.3)
1992-1994	34	29.4 (19.4-39.3)
1995-1997	54	44.9 (32.9-56.9)

Abbreviation: CI, confidence interval.

*Age- and sex-adjusted to the structure of the US white population 21 years or younger in 2000.

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Overall age- and sex-adjusted incidence per 100 000 children by period of research-identified autism (A) and all other clinical diagnoses of developmental, neurologic, and psychiatric disorders (B) among residents of Olmsted County, Minnesota, between 1976 and 1997

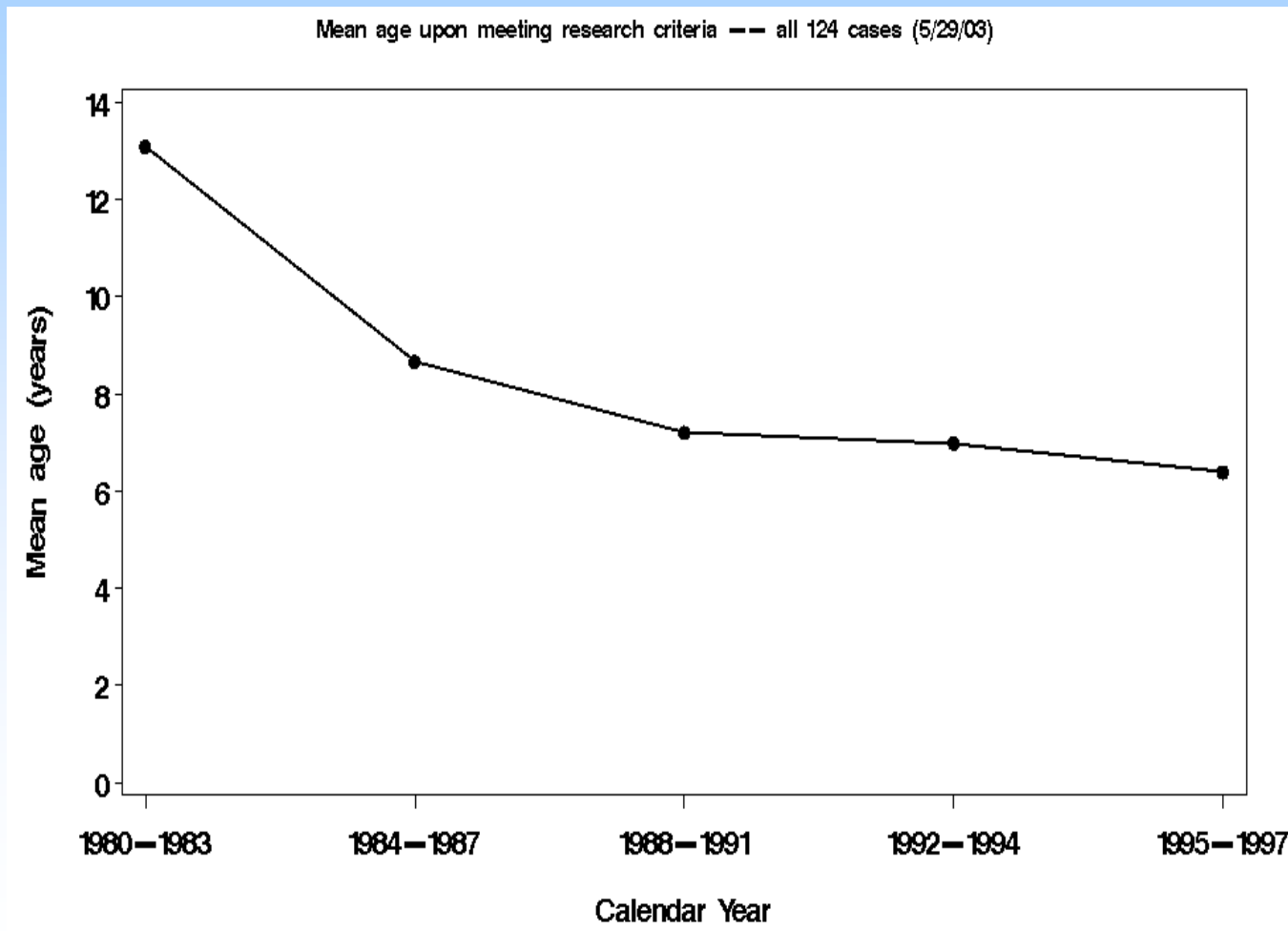


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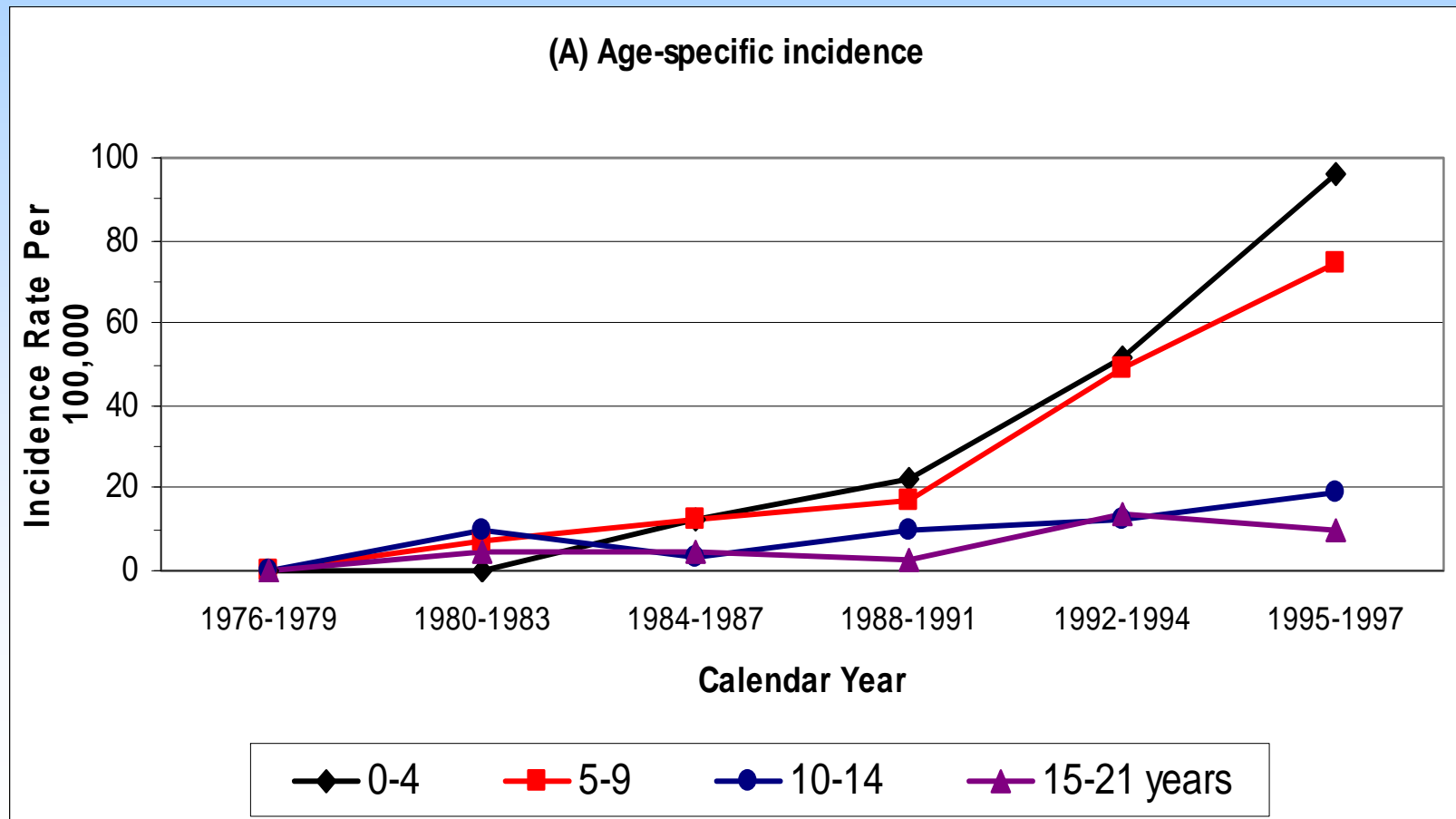
Incidence of Clinical Diagnoses of Autism Spectrum Disorders

	Research-Identified Autism		Clinical Diagnoses of Autism	
	No. of Incident cases	Incidence rate per 100,000 (95% CI)	No. of Incident cases	Incidence rate per 100,000 (95% CI)
1976-1979	0	0	1	0.8 (0, 2.2)
1980-1983	7	5.5 (1.4, 9.5)	2	1.5 (0, 3.7)
1984-1987	11	7.9 (3.2, 12.6)	6	3.6 (0.4, 6.7)
1988-1991	18	11.8 (6.3, 17.3)	8	4.8 (1.2, 8.3)
1992-1994	34	29.4 (19.4, 39.3)	22	18.8 (10.9, 26.7)
1995-1997	54	44.9 (32.9, 56.9)	42	33.1 (22.8, 43.3)

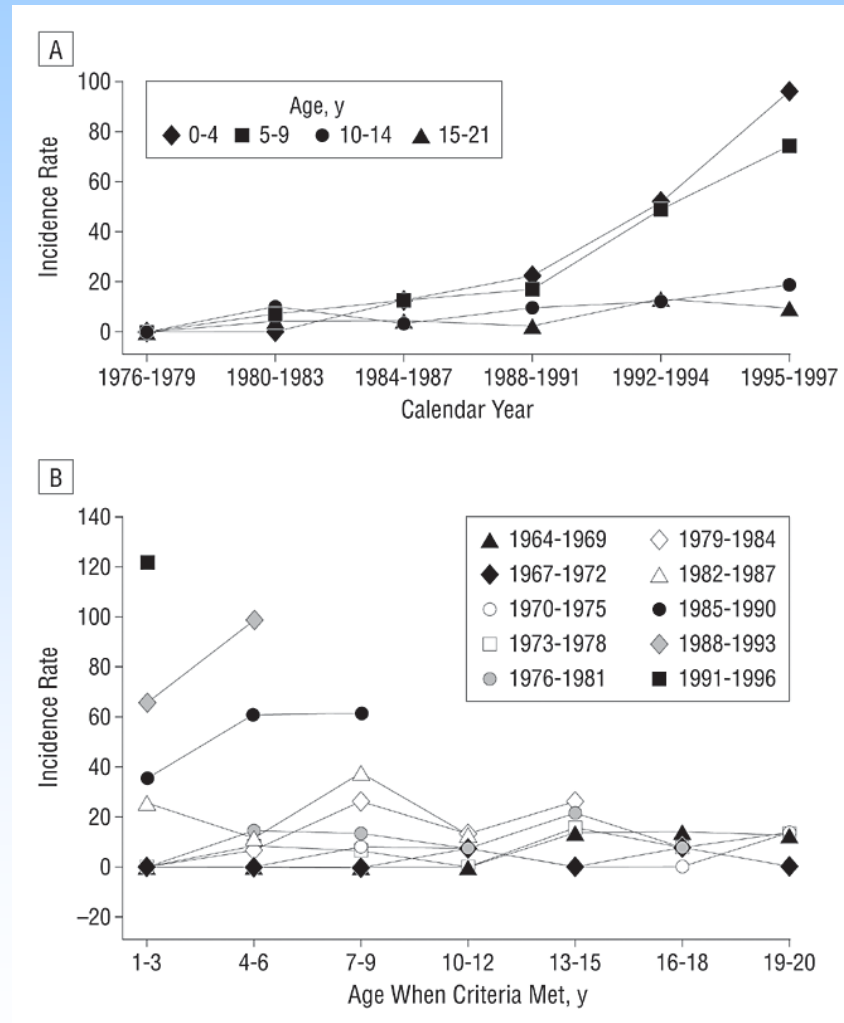
Are We Identifying Children at Younger Ages?



Age-Specific Incidence of Autism

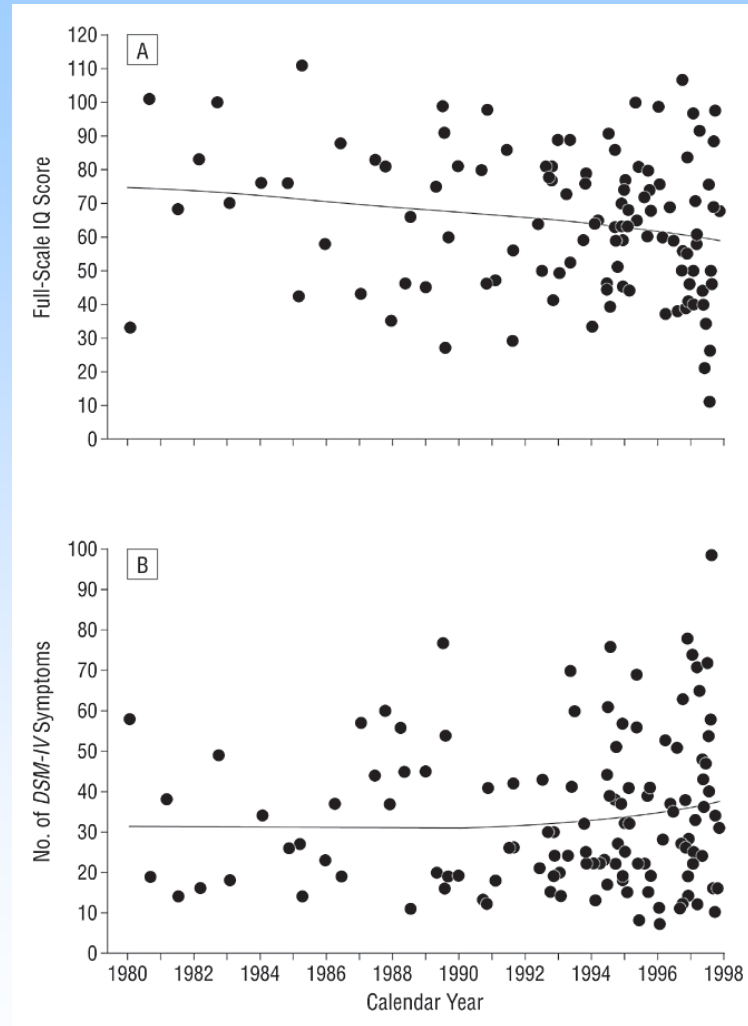


Age-specific (A) and birth cohort-specific (B) incidence of research-identified autism among residents of Olmsted County, Minnesota, between 1976 and 1997



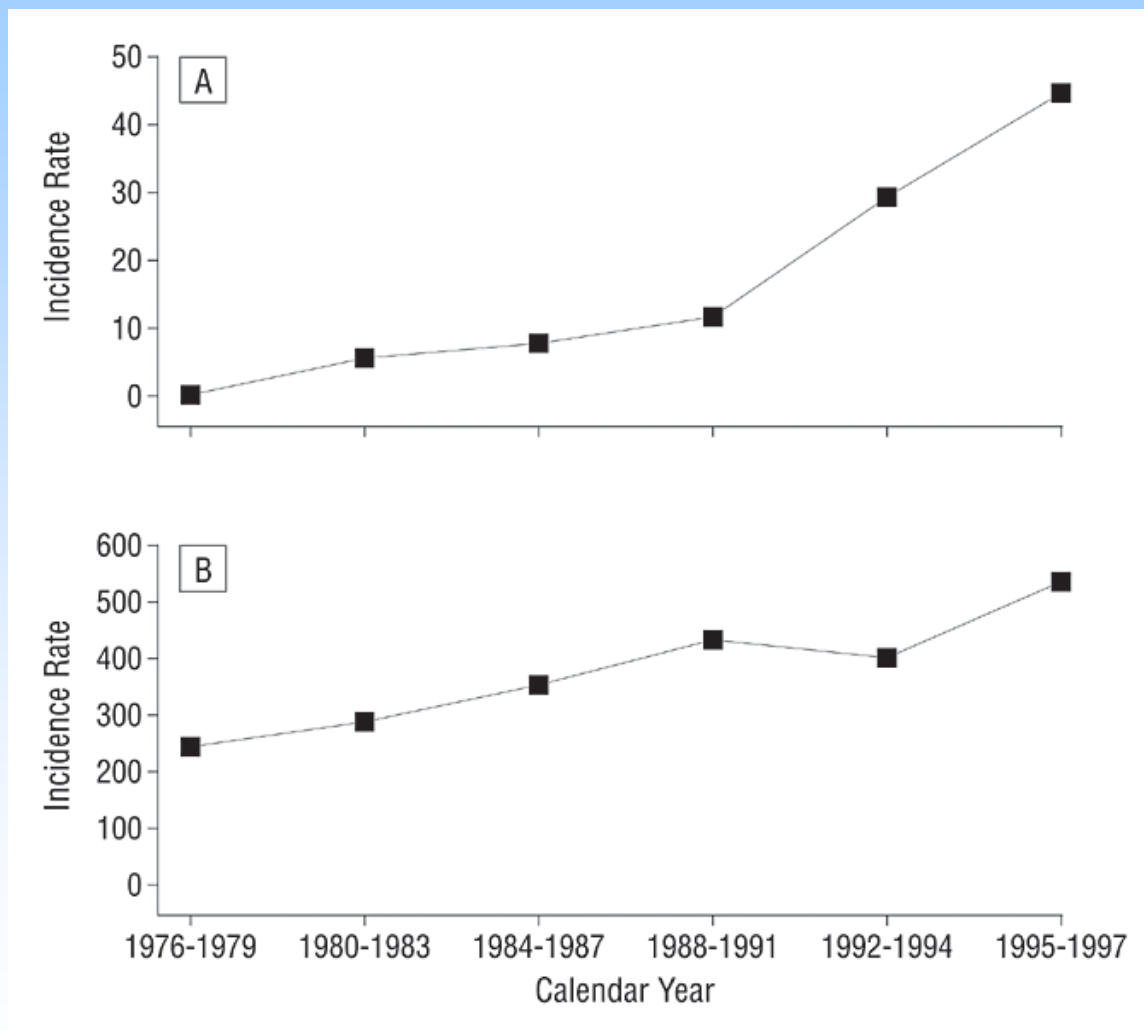
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Comparison of mean cognitive scores and mean number of autism symptoms of incident cases across time



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Overall age- and sex-adjusted incidence per 100 000 children by period of research-identified autism (A) and all other clinical diagnoses of developmental, neurologic, and psychiatric disorders (B) among residents of Olmsted County, Minnesota, between 1976 and 1997



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What About Immunizations and the Incidence of Autism in Olmsted County?

- Recent studies have failed to demonstrate an association between the MMR vaccine and onset of autism
- There continues to be widespread concern that there is an association between the MMR vaccine and autism
- In Minnesota, immunization against measles has been mandated for entry into kindergarten since 1967, rubella since 1973 and mumps since 1978
- Our findings **do not** support the hypothesis that immunizations have contributed to the modest increase in autism incidence in Olmsted County

What About Immunizations and the Incidence of Autism in Olmsted County?

- In Denmark, a recently published study found the **SAME** trend and magnitude of change in the incidence of autism as we found in Olmsted County
- Thimerosal was removed from immunizations in Denmark in 1992
- Thimerosal remained in immunizations in the US throughout the timeframe relevant to our study
- Despite the difference in exposure to thimerosal, the findings of the two studies are very similar
- Our findings **do not** support the hypothesis that thimerosal has contributed to the apparent increase in autism incidence in Olmsted County

Some Other Recent Reports: ASD Prevalence and Associations with Thimerosal and MMR Exposure in Montreal Canada*

- **ASD cases identified for receipt of special education services in birth cohorts from 1987-1998**
- **Cumulative thimerosal exposure and MMR administration established**
- **Thimerosal discontinued in 1996, second dose of MMR initiated in 1996**
- **Prevalence of ASD among school age children 64.9 per 10,000**
- **Prevalence of ASD significantly higher in thimerosal free birth cohorts (82.7 per 10,000) versus thimerosal exposed cohorts 59.5 per 10,000)**
- **ASD prevalence increased despite significant decrease in MMR uptake**
- **ASD prevalence increased after two-dose MMR policy initiated**

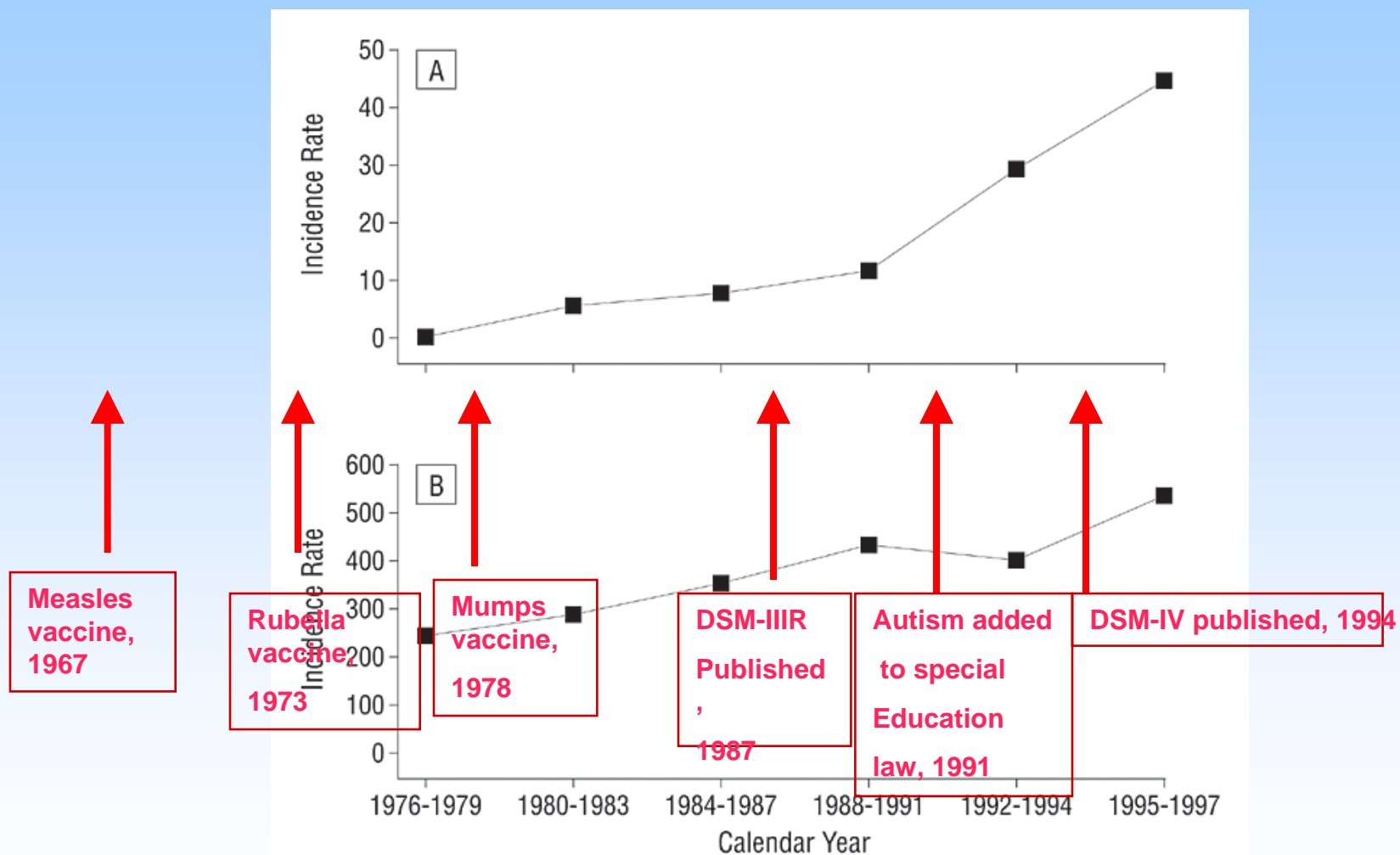
***Fombonne E, et al, Pervasive developmental disorders in Montreal, Quebec, Canada: Prevalence and links with immunizations. Pediatrics 2006;118:139-150.**

Some Other Recent Reports: Early Thimerosal Exposure and Neuropsychological Outcomes at 7 to 10 Years*

- **1047 children ages 7-10 years, administered standard neuropsychological tests (46 specific outcomes)**
- **Exposure to thimerosal explicitly determined from immunization records**
- **Association between thimerosal exposure and outcomes were “small and almost equally divided between positive and negative effects”**
- **Increased exposure from birth to 7 months associated with better performance on measures of fine motor and executive functioning**
- **Increased exposure from birth to 28 months associated with poorer performance on one speech articulation measure and better performance on one fine motor measure**
- **“Our study does not support a causal association between early exposure to mercury...and neuropsychological functioning at age of 7 to 10 years.”**

***Thompson WW, et. al. Early thimerosal exposure and neuropsychological outcomes at 7 to 10 years. NEJM 2007;357:1281-1292.**

Overall age- and sex-adjusted incidence per 100 000 children by period of research-identified autism (A) and all other clinical diagnoses of developmental, neurologic, and psychiatric disorders (B) among residents of Olmsted County, Minnesota, between 1976 and 1997



Conclusions

- **There has been an increase in the incidence of research-identified autism among children ages ≤ 21 years in Olmsted County, Minnesota from 1976 to 1997**
- **Age-specific incidence rates were stable from 1976 to 1997 for children ages 10 to 21 years**
- **Subsequent to 1988-1991, rates increased for children under 10 years of age**
- **Cohort-specific incidence rates were much higher for children born after 1987**

Conclusions

- **Had we relied on clinically diagnosed cases to determine incidence, the apparent magnitude of the change in incidence would have been greatly exaggerated (22.1-fold for clinically diagnosed vs 8.2-fold for Research-identified autism)**
- **The incidence of all other developmental disorders also increased during these same years**
- **However the incidence of other disorders increased steadily during this time-frame, in contrast with the trend for autism incidence**

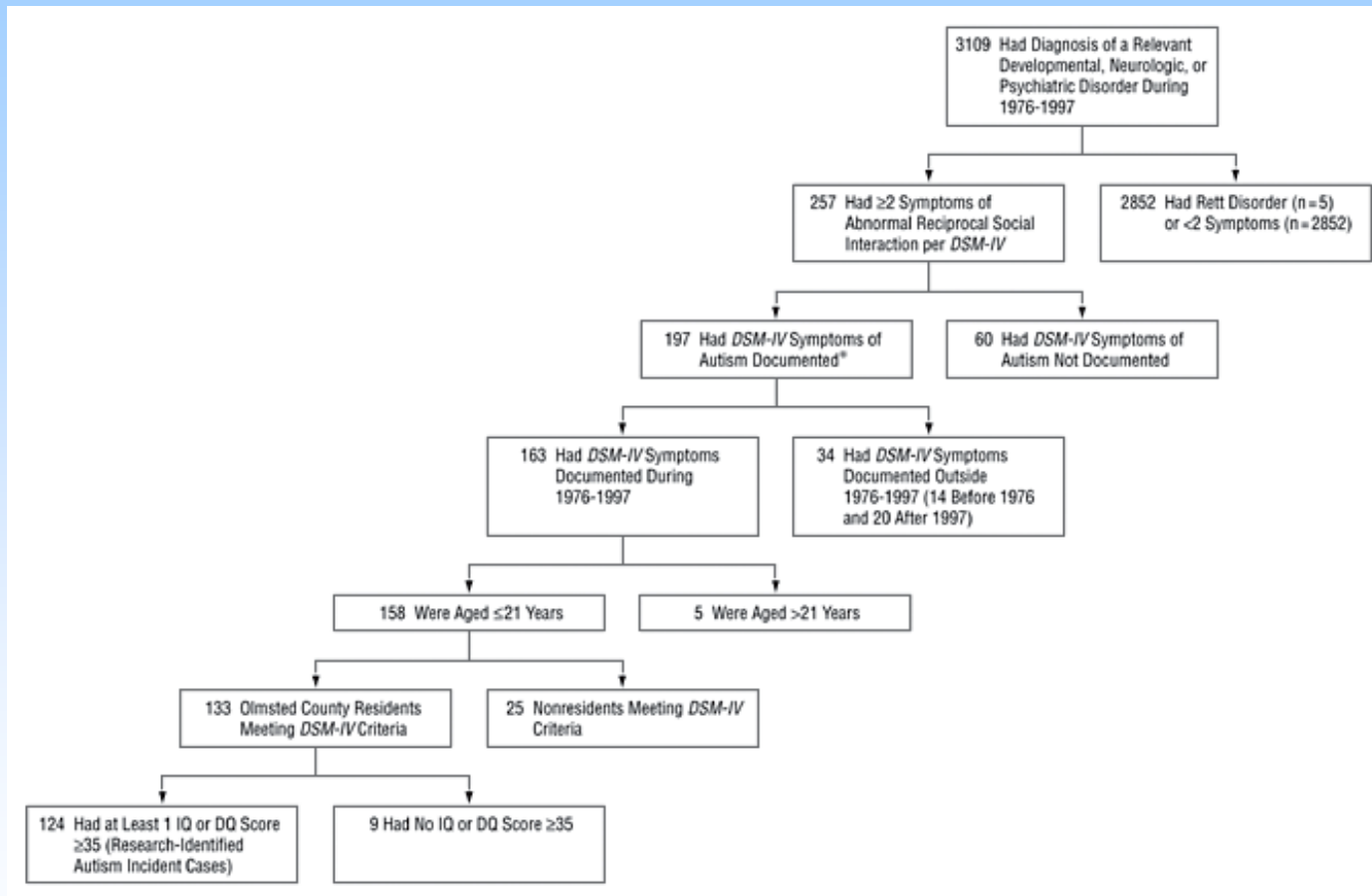
Conclusions

- Possible explanations for the apparent increase in Autism incidence
 - Publication of DSM-III-R, DSM-IV
 - Effects of passage of special education laws
 - Increased awareness of autism
 - Our findings **DO NOT** suggest that immunization policies have caused the incidence of autism to increase
 - True increase in the incidence of autism

Conclusions

- Perhaps the “true” incidence of autism has increased?
- However, our findings suggest that previously unrecognized cases of autism may have been recognized with increasing frequency since 1989, and that there may not have been an actual increase in the number of children with autism in Olmsted County from 1976 to 1997.

Flow diagram of ascertainment of research-identified autism incident cases among residents of Olmsted County, Minnesota, 21 years or younger between 1976 and 1997



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