

From Research to Clinical Care: 25 Years of ADHD Research and the Development of a New Practice Guideline

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Until every child is well™



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Learning Objectives

- Describe long-term outcomes associated with childhood ADHD, including the development of co-existing conditions, persistence of ADHD into adulthood, psychosocial outcomes and growth.
- Describe risk and protective factors that impact the long-term outcomes of childhood ADHD.
- Explain ways in which research can inform the development of new clinical practice guidelines to improve the care of children and adolescents with ADHD.



ADHD: The State of Affairs Circa 1986

- It's just annoying normal childhood behavior...
- It's due to poor parenting...
- You can't have a learning disability if you have ADHD...
- It's a creation of late 20th century America...
- We are drugging normal children into submission with stimulant medications...
- If it exists at all during childhood, don't worry—you'll grow out of it...

- And so much more...



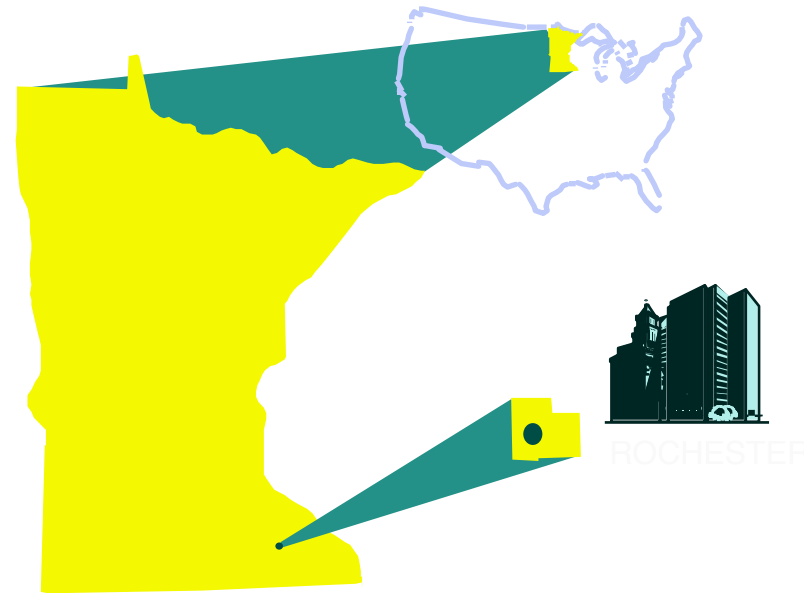
What Did We Know: Existing Literature

- **Previous research** limited by variety of issues:
 - relatively small sample sizes,
 - clinic-referred cases
 - variable childhood case definitions
 - use of variable adult diagnostic criteria
- **Our 25 year-long study** combined:
 - a population-based, retrospective approach
 - a long-term, prospective adult follow-up phase



Rochester Epidemiology Project

- School and medical records available for all residents
- We identified:
 - All children born in Rochester 1976-1982
 - Children who still resided in Rochester at age 5 (N=5,718)
 - All incidence cases of AD/HD using research criteria (N=379)
 - DSM-IV symptoms
 - ADHD-specific rating scale results
 - Clinical Diagnoses of ADHD



Beginning at the Beginning: How Common is AD/HD?

- Cumulative incidence by age 19 years*

CONSERVATIVE ESTIMATE	LIBERAL ESTIMATE
Boys--10.8% (9.3-12.3)	13.3 (11.7-15.0)
Girls--3.9% (2.8-5.1)	5.1% (3.8-6.4)
Overall--7.5% (6.5-8.4)	9.4% (8.3-10.4)

*How Common is Attention-Deficit/Hyperactivity Disorder? Incidence in a Population-Based Birth Cohort in Rochester, Minnesota. Barbaresi W, Katusic SK, Colligan RC, Pankratz VS, Weaver AL, Weber KJ, Mrazek DA, Jacobsen SJ. Minn. Arch Pediatr Adolesc Med 2002 Mar; 156(3):217-24.



Co-Morbid Learning and Psychiatric Disorders in the 1976-1982 Birth Cohort

- Presence of LD established previously, during a study of LD in this birth cohort
- All individually administered IQ and academic achievement test scores (reading-RD, math-MD, written language-WLD) collected from school and medical records for all birth cohort members
- Psychiatric Disorders defined as date of documented, expert-verified clinical diagnosis

Barbarese WJ, Katusic SK, Colligan RC, Weaver AL, Jacobsen SJ. Math learning disorder: Incidence in a population-based birth cohort, 1976-82, Rochester, Minn. *Ambul Pediatr* 2005 Sep-Oct; 5(5):281-9.

Yoshimasu K, Barbarese WJ, Colligan R, Killian J, Voigt RG, Weaver A, Katusic S. Written-language disorder in children with and without attention-deficit/hyperactivity disorder in a population-based birth cohort. *Pediatrics* 2011 September; 128(3):e1-e605-612.

Yoshimasu K, Barbarese WJ, Colligan RC, Killian JM, Voigt RG, Weaver AL, Katusic SK. Gender, Attention-Deficit/Hyperactivity Disorder and reading disability in a population-based birth cohort. *Pediatrics* 2010 October; 126(4):e788-e795.

Yoshimasu K, Barbarese WJ, Colligan R, Voigt RG, Killian J, Weaver A, Katusic S. Childhood ADHD is Strongly Associated with a Broad Range of Psychiatric Disorders during Adolescence : A population-based birth cohort study. *J Child Psychol Psychiatr* 2012 Oct; 53(10):1036-43.



Children with ADHD Don't Also Have Co-existing Psychiatric and Learning Disorders Do They?

- By age 19 years:
 - 60.7 % have at least one co-existing learning disorder (reading, writing, math)
 - 63.9% have at least one co-existing psychiatric disorder



Co-existing Psychiatric Disorders in Childhood AD/HD

- Cumulative incidence of psychiatric co-morbidities by age 19 years:
 - ADHD cases (n=379)-63.9%
 - Age-gender matched controls (n=758)-19.8%
- Common co-morbidities:

	CI	HR(case/control)
Adjustment disorders	34.5%	3.88
Mood disorders	22.9%	3.67
ODD/CD	22.5%	9.54
Anxiety	9.6%	2.94
SUD	21.2%	4.03



Stimulant Medication Treatment Provided to Research-Identified Childhood AD/HD Cases

- Among the 379 AD/HD cases, 295 (77.8%) were treated with psychostimulants
- Among the 295 cases treated with stimulants, 251 (85.1%) were treated with methylphenidate at some point
- Median duration of treatment with stimulants was 33.8 months (interquartile range (IQR), 8.8-66.1 months).

Barbarese WJ, Katusic SK, Colligan RC, Weaver AL, Leibson CL, Jacobsen SJ. Long-term stimulant medication treatment of attention-deficit/hyperactivity disorder: Results from a population-based study. *J Dev Behav Pediatr* 2006 Feb; 27(1):1-10.

Barbarese WJ, Katusic SK, Colligan RC, Weaver AL, Leibson CL, Jacobsen SJ. Long-term stimulant medication treatment of attention-deficit/hyperactivity disorder: results from a population-based study. *J Dev Behav Pediatr*. 2014 Sep;35(7):448-57. doi: 10.1097/DBP.0000000000000099.



Proportion of Substance Abuse Among Childhood AD/HD Cases (treated vs not treated with stimulants) and Controls, by Gender



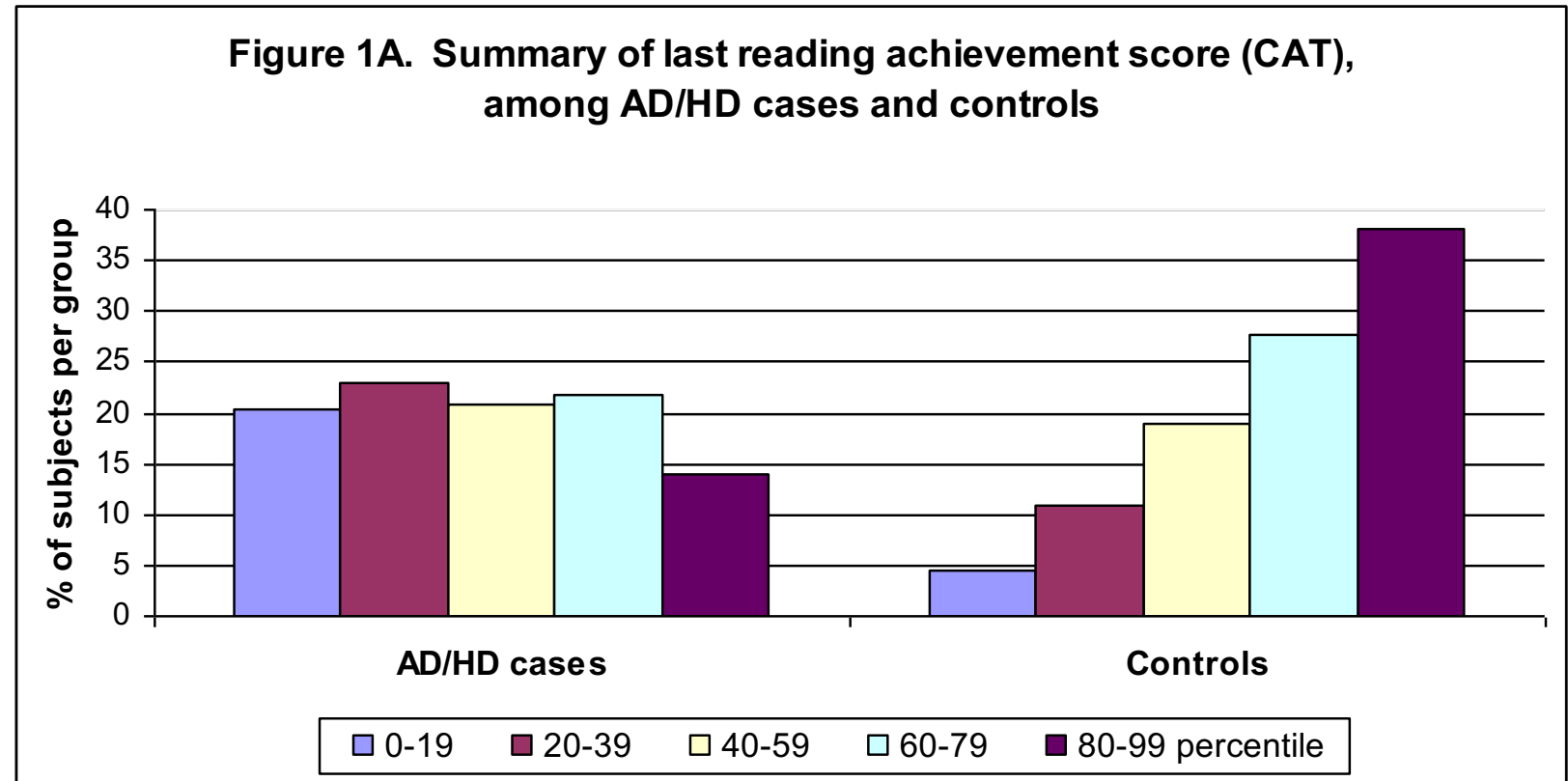
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Katusic SK, Barbaresi WJ, Colligan RC, Weaver AL, Leibson CL, Jacobsen SJ. Psychostimulant treatment and risk for substance abuse among young adults with a history of attention-deficit/hyperactivity disorder: A population-based, birth cohort study. *J Child Adolesc Psychopharmacol* 2005 Oct; 15(5):764-76.



Academic Achievement in Reading Among Childhood ADHD Cases Versus Controls

Barbarese WJ, Katusic SK, Colligan RC, Weaver AL, Jacobsen SJ. Long-term school outcomes for children with attention-deficit/hyperactivity disorder: a population-based perspective. *J Dev Behav Pediatr* 2007 Aug; 28(4):265-73.



Prospective Adult Follow-up Study of Long-term Outcomes of Childhood ADHD

- 232 adults with research-identified *Childhood ADHD* (61% of original cohort of Childhood ADHD Cases)
 - 167 males (72%); 65 females (28%)
 - Mean age 27.0 years
- 335 controls from birth cohort
 - 210 males (63%); 125 females (37%)
 - Mean age 28.6 years
- But how do we diagnose ADHD in adults?
 - Diagnostic tools?
 - Symptom threshold for diagnosis?



Determining the Rate of Persistence of Childhood ADHD into Adulthood

- MINI International Neuropsychiatric Interview
- Determined the mean and standard deviation of the number of Adult ADHD MINI items endorsed by **Childhood Controls**
- Established cutoffs representing **2.0 standard deviations** above the mean number of items endorsed by Controls, separately for hyperactive/impulsive and inattentive items
- Constructed 95% Confidence Intervals constructed around estimates of rates of persistence of ADHD into adulthood



Definition of Persistent ADHD

Childhood ADHD Cases:

who exceeded 2 SD above mean number of MINI ADHD items describing current inattentive *and/or* hyperactive impulsive symptoms endorsed by **Childhood Controls**

AND

who endorsed MINI item on adverse impact of adult ADHD symptoms in 2 or more settings



What is the Likelihood that Childhood ADHD Will Persist into Adulthood?

- Among 232 Childhood ADHD Cases, 68 fulfilled criteria for Adult ADHD [29.3% (95% CI 23.5-35.2)]
- Rates of persistent ADHD similar for:
 - Males 29.3% (95% CI 22.4-36.3)
 - Females 29.2% (95% CI 18.2-40.3)
- Disregarding requirement that subjects had to endorse adverse impact of symptoms in 2 or more settings:
 - Overall rate of persistence 38.8% (95% CI 32.5-45.1)
 - Males 40.1% (95% CI 32.7-47.6)
 - Females 35.4% (95% CI 23.8-47.9)

Barbaresi W, Colligan R, Weaver A, Voigt R, Killian J, Katusic S. Mortality, ADHD and psychosocial adversity in adults with childhood ADHD: A prospective study. *Pediatrics* 2013; 131 (4): 637-644.



Stimulants and Growth Among ADHD Cases and Non-ADHD Controls

- **Subjects:** 637 subjects (243 ADHD cases, 394 controls) with >1 recorded height measurement at ages: 6 to <9, 9 to <12, and 12 to <15 years of age
- **Peak height velocity (PHV)** age and magnitude determined for each subject
- Calculated height Z scores at the beginning, at the end, and 24 months after the end of treatment
- 243 childhood ADHD cases, **171 (70.4%) were treated with stimulants for >3 months**
- Age at onset of treatment (years):
Mean (SD): 10.2 (3.5)
- Duration of treatment (months):
Mean (SD): 53.0 (37.4)

Harstad EB, Weaver AL, Katusic SK, Colligan RC, Kumar S, Chan E, Voigt RG, Barbaresi WJ. ADHD, Stimulant Treatment, and Growth: A Longitudinal Study. Pediatrics. 2014 Sep 1. pii: peds.2014-0428.



Overall Growth Outcomes

- **No difference in adult height** between:
 - ADHD **cases** versus **controls** (males- 178.7 cm vs 179.1 cm; females- 164.6 cm vs 165.7 cm)
 - ADHD cases NEVER treated with **stimulants** versus those treated for > 3 years (males-178.2 cm vs 178.7 cm; females-164.6 cm vs 165.7 cm)
- But given the limited average duration of treatment, does this finding conclusively demonstrate that stimulant treatment does not affect growth outcomes?



Does Treatment with Stimulants Alter Growth Velocity or Trajectory?

- **No significant correlation between duration of treatment and change in height Z scores** ($r = 0.08$ for beginning vs end change, $r = 0.01$ for end vs 24 months later change)
- **No difference in magnitude of Peak Height Velocity (PHV)** between stimulant treated and stimulant naïve ADHD cases
- Among the 59 ADHD cases treated for **>3 years, there was a clinically** insignificant decrease in mean Z score from beginning (0.48) to end (0.33) of treatment ($P = .06$)
- **Among boys** treated with stimulants, **age at PHV for differed** for stimulant naïve vs stimulant treated > 3 years (12.9 vs 13.6 years)



Psychiatric Comorbidities Among Adults with History of Childhood ADHD

Yoshimasu K, Barbaresi WJ, Colligan RC, Voigt RG, Weaver AL, Katusic SK. Adults with Persistent ADHD: Gender and Psychiatric Comorbidities – A Population-Based Longitudinal Study. J Attn Disorder, Nov 2016.

	Adult ADHD status		OR (95% CI)	
	Persistent ADHD (N=68) N (%)	Non-ADHD Controls (N=335) N (%)	Unadjusted	Adjusted ^a
M.I.N.I. Psychiatric Disorders				
Any psychiatric comorbidity	55 (80.9)	117 (34.9)	7.9 (4.1-15.0)	7.8 (4.0-15.3)
PTSD – current	6 (8.8)	3 (0.9)	10.7 (2.6-44.0)	10.0 (2.9-35.0)
Social phobia – current	10 (14.7)	4 (1.2)	14.3 (4.3-47.0)	12.8 (4.2-39.4)
OCD – current	14 (20.6)	8 (2.4)	10.6 (4.2-26.5)	8.0 (3.3-19.2)
Hypomanic episode – current or past	24 (35.3)	12 (3.6)	14.7 (6.9-31.4)	16.5 (7.2-37.4)
Generalized anxiety disorder – current	22 (32.4)	30 (9.0)	4.9 (2.6-9.1)	4.7 (2.4-9.0)
Dysthymia – current	11 (16.2)	4 (1.2)	16.0 (4.9-51.9)	19.0 (5.4-66.1)
MDD – current	19 (27.9)	9 (2.7)	14.0 (6.0-32.8)	15.2 (6.2-37.4)
Antisocial personality disorder	23 (33.8)	13 (3.9)	12.7 (6.0-26.8)	12.2 (5.3-27.9)
Alcohol dependence/abuse (12 mo.)	28 (41.2)	51 (15.2)	3.9 (2.2-6.9)	3.6 (2.0-6.7)
Panic disorder – lifetime	9 (13.2)	17 (5.1)	2.9 (1.2-6.7)	2.6 (1.1-6.2)
Suicidality – current	24 (35.3)	35 (10.5)	4.7 (2.5-8.6)	4.9 (2.6-9.4)
Substance dependence/abuse (12 mo.)	18 (26.5)	22 (6.6)	5.1 (2.6-10.2)	4.4 (2.1-9.1)



Comorbidity Among Adults with ADHD: The Special Case of Substance Use Disorder (SUD)

- Childhood ADHD cases more likely to have alcohol (OR 14.38) and drug (OR 3.48) dependence in adulthood
- Childhood ADHD cases who DID NOT have SUD in adolescence were 3.5 times more likely to develop drug dependence compared to controls
- Among all subjects who DID have adolescent onset SUD, rates of drug exposure in adulthood tended to be higher in ADHD cases as compared to controls (49.1% vs. 20.0%)

Levy S, Katusic SK, Colligan RC, Weaver AL, Killian JM, Voigt RG, Barbaresi WJ. Childhood ADHD and risk for substance dependence in adulthood: a longitudinal, population-based study. PLoS One. 2014 Aug

27;9(8):e105640. doi: 10.1371/journal.pone.0105640.



Comorbidity Among Adults with ADHD: Alcohol Dependence

- Among the subgroup of individuals with adolescent-onset SUD, those with ADHD were **more likely to have alcohol dependence as adults compared to controls** (29.1% vs. 6.7%; adjusted OR 14.38)

Levy S, Katusic SK, Colligan RC, Weaver AL, Killian JM, Voigt RG, Barbaresi WJ. Childhood ADHD and risk for substance dependence in adulthood: a longitudinal, population-based study. PLoS One. 2014 Aug 27;9(8):e105640. doi: 10.1371/journal.pone.0105640.



Academic Achievement in Adulthood Among Childhood ADHD Cases Versus Controls

	ADHD Cases	Controls
Basic Reading	9.8 grade level	13.2 grade level
Reading Comprehension	12.5 grade level	>18 grade level
Word Attack	7.5 grade level	10.2 grade level
Arithmetic	7.0 grade level	“high school” level

Voigt RG, Katusic SK, Colligan RC, Killian JM, Weaver AL, Barbaresi WJ. Academic Achievement in Adults with a History of Childhood Attention-Deficit/Hyperactivity Disorder: A Population-Based Prospective Study. J Dev Behav Pediatr. 2017 Jan;38(1):1-11. doi: 10.1097/DBP.0000000000000358. PMID: 27902544



Adult Socioeconomic Outcomes for Childhood ADHD Cases vs Controls

Outcome Measure	Childhood ADHD (N=232)	Non-ADHD referents (N=335)	RR (95% CIOO for Childhood ADHD vs. non-ADHD)	
			Unadjusted	Adjusted†
Ever fired	118 (50.9%)	71 (21.2%)	2.40 (1.88, 3.06)	1.98 (1.48, 2.66)
Never married	168 (72.4%)	182 (54.3%)	1.33 (1.17, 1.51)	1.00 (0.86, 1.17)
Ever in trouble with the law as an adult	111 (47.8%)	104 (31.0%)	1.54 (1.25, 1.90)	1.28 (0.98, 1.68)
Ever convicted of DUI or DWI	43 (18.5%)	40 (11.9%)	1.55 (1.04, 2.31)	1.17 (0.71, 1.92)
Ever had driver's license revoked	86 (37.1%)	58 (17.3%)	2.14 (1.61, 2.86)	1.66 (1.14, 2.43)
Sexual activity initiated < 18 years	146 (62.9%)	153 (45.7%)	1.38 (1.18, 1.61)	1.22 (1.00, 1.48)
Pregnancy out of wedlock	81 (34.9%)	56 (16.7%)	2.09 (1.55, 2.81)	1.79 (1.24, 2.59)
Ever in a treatment program for alcohol, marijuana, or hard/street drugs	62 (26.7%)	31 (9.3%)	2.89 (1.94, 4.30)	1.83 (1.13, 2.96)
Highest degree obtained‡			1.93 (1.61, 2.32)	1.26 (0.99, 1.58)
<12years or GED or adult Diploma	41 (17.7%)	19 (5.7%)		
High school diploma only	105 (45.3%)	90 (26.9%)		
Some college	38 (16.4%)	46 (13.7%)		
Four-year college degree or higher	48 (20.7%)	180 (53.7%)		
Income in past year‡	N=215	N=325	1.48 (1.30, 1.68)	1.17 (0.99, 1.39)
<\$15,000	61 (28.4%)	55 (16.9%)		
\$15,000-\$35,000	102 (47.4%)	112 (34.5%)		
>\$35,000	52 (24.2%)	158 (48.6%)		

*95% CIs that do not bound “1” are bolded to indicate statistical significance with $p < 0.05$.

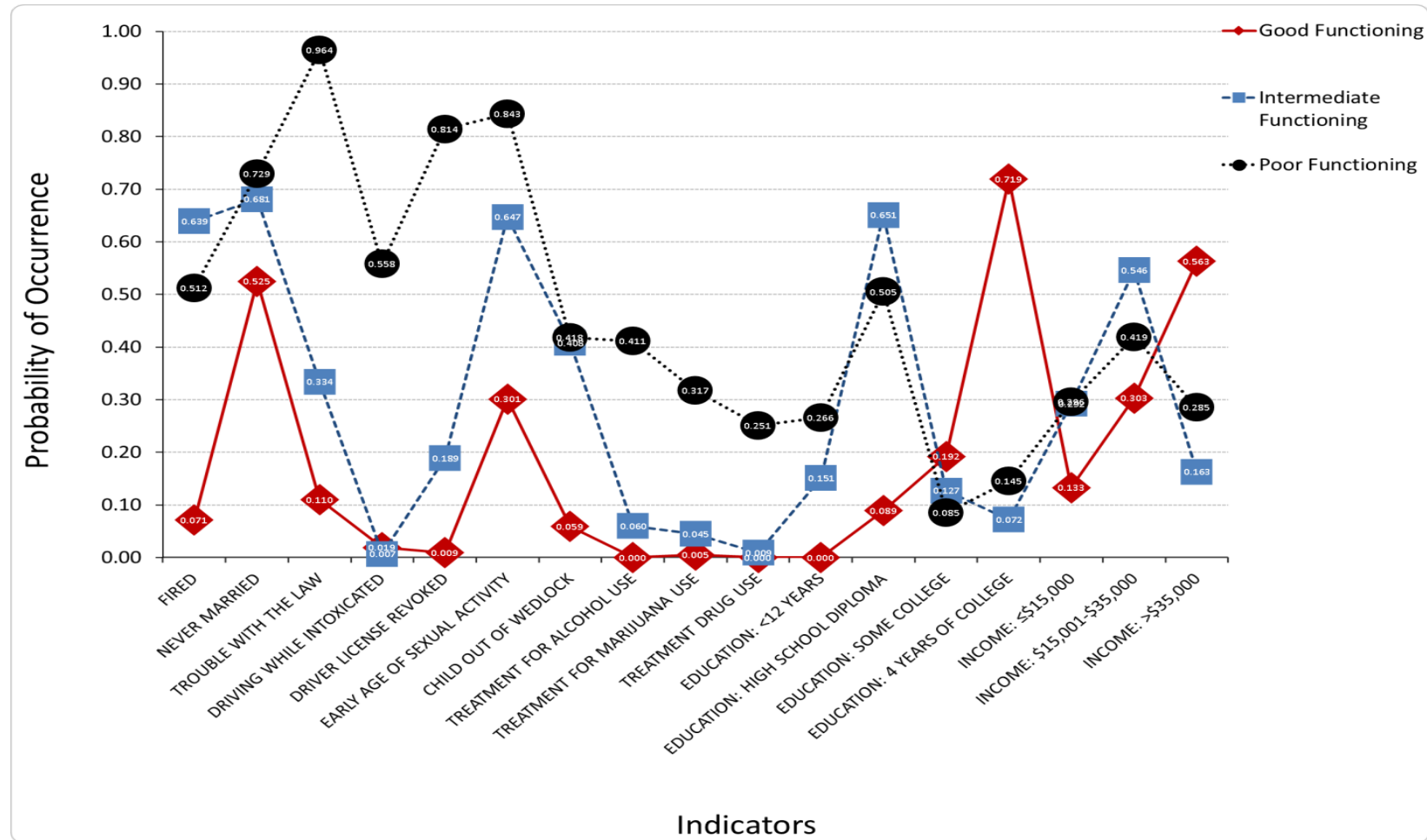
†Adjusted relative risk (RR) for the group effect were estimated from multivariable Poisson regression models with a robust error variance that also included sex, age at participation, presence of psychiatric disorder (none, internalizing only, externalizing only, both) and childhood learning disability (yes, no).

‡ For the relative risk calculations ‘highest degree obtained’ was dichotomized as high school diploma or less versus at least some college and ‘income in the past year’ was dichotomized as $\leq \$35,000$ vs $> \$35,000$.

Harstad EB, Katusic S, Sideridis G, Weaver AL, Voigt RG, Barbaresi WJ. Children With ADHD Are at Risk for a Broad Array of Adverse Adult Outcomes That Cross Functional Domains: Results From a Population-Based Birth Cohort Study. *J Atten Disord.* 2020 Oct 22:1087054720964578. doi: 10.1177/1087054720964578. Epub ahead of print. PMID: 33090057.



Psychosocial Outcomes in Adulthood: A Latent Class Analysis



Roles of Auxiliary Variables in the Latent Class Composition in the Optimal 3-Class Model

	Class 1 ("Good" Functioning)	Class 2 ("Intermediate" " Functioning)	Class3 ("Poor" Functioning)	Pearson Chi-square Test
Latent class prevalence	n=289 (51%)	n=157 (27.7%)	n=121 (21.3%)	
Gender				12.133**
Females	38.4% _a	34.4% _a	20.7% _b	
Males	61.6% _a	65.6% _a	79.3% _b	
Childhood ADHD				64.894***
Yes	24.9% _a	53.5% _b	62.8% _b	
Non-ADHD	75.1% _a	46.5% _b	37.2% _b	
Childhood Learning Disabilities (LD)				58.216***
LD	20.8% _a	50.3% _b	52.9% _b	
No LD	79.2% _a	49.7% _b	47.1% _b	
Childhood Psychiatric Disorders				50.922***
Psychiatric disorder	21.8% _a	41.4% _b	57.0% _c	
No psychiatric disorder	78.2% _a	58.6% _b	43.0% _c	
Childhood ADHD and LD status				68.705***
ADHD with LD	15.2% _a	40.8% _b	43.8% _b	
ADHD without LD	9.7% _a	12.7% _{a,b}	19.0% _b	
Non-ADHD	75.1% _a	46.5% _b	37.2% _b	
Childhood ADHD and Psychiatric status				75.331***
ADHD with psychiatric disorder	12.1% _a	30.6% _b	45.5% _c	
ADHD without psychiatric disorder	12.8% _a	22.9% _b	17.4% _{a,b}	
Non-ADHD	75.1% _a	46.5% _b	37.2% _b	



Results: Association of Stimulant Treatment Status During Childhood with Adult Outcomes

Outcome	Stimulant Treatment during Childhood (N=177)	Without Stimulant Treatment during Childhood (N=55)	P-Value*
>12 years of education, N (%)	103 (58.2)	37 (67.3)	0.45
Currently unemployed, N (%)	19 (10.7)	4 (7.3)	0.51
Ever fired, N (%)	89 (50.3)	29 (52.7)	0.94
Median yearly income	\$20,000	\$25,000	0.26
Ever married, N (%)	42 (23.7)	20 (36.4)	0.37
Currently living together,	45 (25.4)	8 (14.6)	0.07
Trouble with the law: N (%)			0.31
Unknown	1	1	
Never	61 (34.7)	24 (44.4)	
Only under age 17y	28 (15.9)	7 (13.0)	
Only over age 18y	32 (18.2)	8 (14.8)	
As minor and adult	55 (31.3)	15 (27.8)	

*P-value adjusted for age and sex



Results: Association of Stimulant Treatment Variables and Adult Outcomes

- Preliminary analysis of age of onset, average daily dose and duration of stimulant treatment
- No apparent association between age of onset or stimulant dose and most socioeconomic outcomes
- Some preliminary analyses suggest longer duration of treatment associated with improved outcomes:

Years of education Months of Treatment (mean/sd; median/IQR)

≤ 12 years 37.9 (35.6); 28.3 (8.9-60.2)

> 12 years 52.3 (40.3); 47.8 (17.6-81.3)

P=0.030

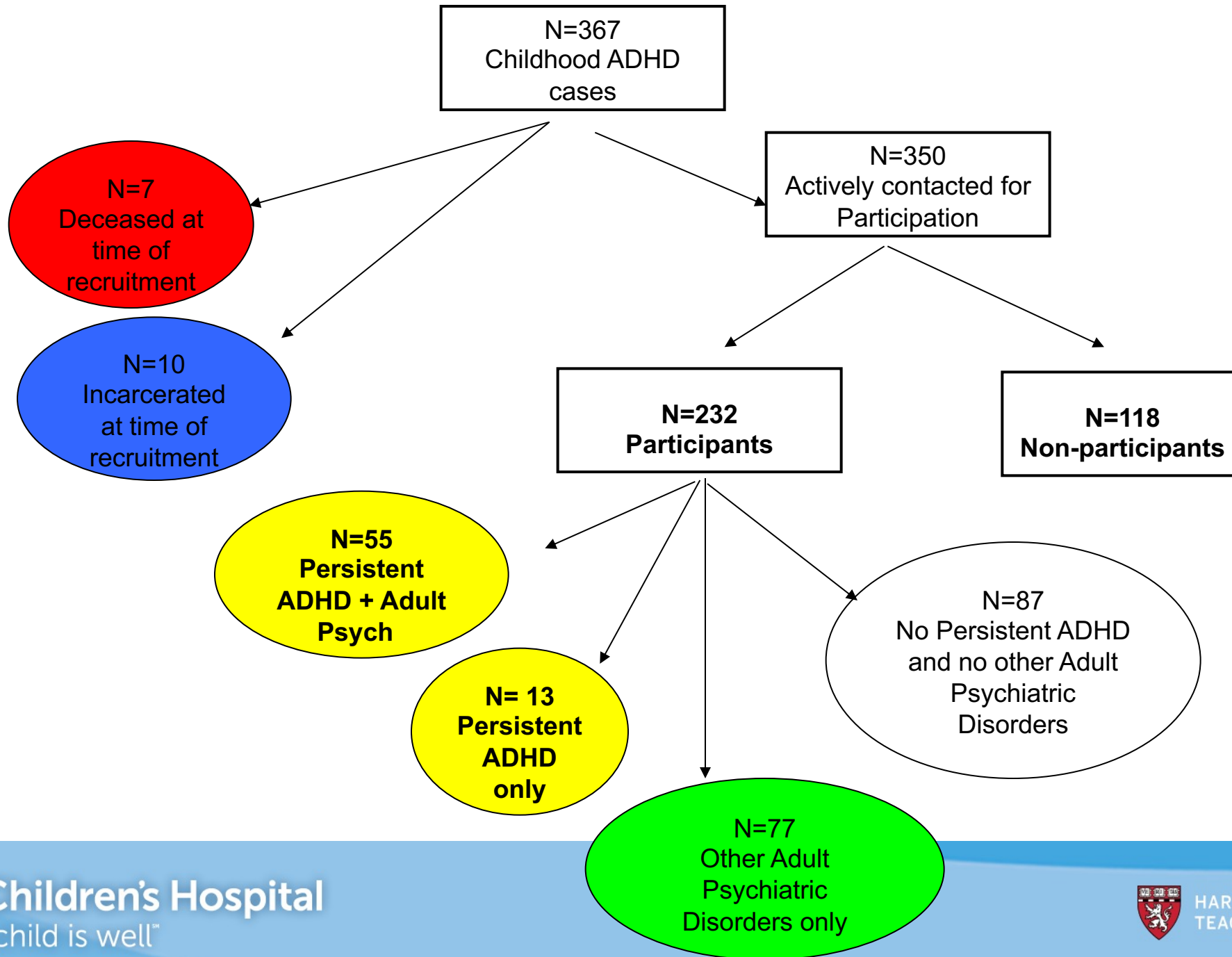


Mortality in Childhood AD/HD Cases VS Remainder of Birth Cohort

	ADHD Cases (N=367)	Remainder of Birth Cohort (N=4946)
Total Number of Deaths†	7	37
Medically related	1	13
Suicide‡*	3	5
Homicide	0	2
Accident*	3	15
Unknown	0	2
Mean Age of Death (yrs)	21.9	19.9

†*Overall Standardized Mortality Ratio (SMR) 1.88 (95% CI 0.83-4.26; p=0.13).*
‡ *SMR for Suicide Only 4.83 (95%CI 1.14-20.46; p=0.032).*
**SMR for Accidents Only 1.70 (95% CI 0.49-5.97; p=0.41)*
‡**SMR for Suicides Or Accidents Combined 2.51 (95% CI 1.00-6.35; p=0.050).*





Why a Guideline on ADHD?

Because it is Common

Because it Adversely Impacts Children, Adolescents and Adults

Because Current Outcomes Are Unacceptably Poor



Society for Developmental and Behavioral Pediatrics Clinical Practice Guideline for the Assessment and Treatment of Children and Adolescents with Complex Attention-Deficit/Hyperactivity Disorder

Barbaresi WJ, Campbell L, Diekroger EA, Froehlich TE, Liu YH, O'Malley E, Pelham WE Jr, Power TJ, Zinner SH, Chan E. Society for Developmental and Behavioral Pediatrics Clinical Practice Guideline for the Assessment and Treatment of Children and Adolescents with Complex Attention-Deficit/Hyperactivity Disorder. *J Dev Behav Pediatr.* 2020 Feb/Mar;41 Suppl 2S:S35-S57. doi: 10.1097/DBP.0000000000000770. PMID: 31996577.

Barbaresi WJ, Campbell L, Diekroger EA, Froehlich TE, Liu YH, O'Malley E, Pelham WE Jr, Power TJ, Zinner SH, Chan E. The Society for Developmental and Behavioral Pediatrics Clinical Practice Guideline for the Assessment and Treatment of Children and Adolescents with Complex Attention-Deficit/Hyperactivity Disorder: Process of Care Algorithms. *J Dev Behav Pediatr.* 2020 Feb/Mar;41 Suppl 2S:S58-S74. doi: 10.1097/DBP.0000000000000781. PMID: 31996578.



Components of the Guideline

- Main guideline document
 - Includes 5 Key Action Statements and related information
- Process of Care Algorithms
 - 10 algorithms addressing diagnosis and treatment of Complex ADHD
- Algorithm annotations
- Evidence Tables



Key Concepts and Definitions

- Focus on functional impairment to improve long-term outcomes
- Psychosocial treatment is foundation for treatment of Complex ADHD
- Interprofessional care
- Shared decision making and clinical judgment
- Psychological testing and mental health diagnostic assessment



Key Concepts and Definitions

- Modality of treatment, multimodal treatment
- Evidence-based psychosocial interventions
- Co-existing conditions
- Life course perspective



Key Action Statement 1

The clinician with specialized training or expertise should initiate a **comprehensive assessment** and develop an **interprofessional, multimodal treatment plan** for any child or adolescent through age 18 years with suspected or diagnosed **complex ADHD with functional impairments**, upon referral from a primary care clinician. **Complex ADHD is defined by** any of the following:

- **Age < 4 years or > 12 years** at the time of initial presentation of symptoms or impairment
- **Presence or suspicion of coexisting disorders and complicating factors:**
 - Other **neurodevelopmental disorders** (e.g., global developmental delay, intellectual disability, autism spectrum disorder, speech and language disorders, tic disorders)
 - Significant problems with the acquisition of **academic skills including specific learning disorders** (i.e., reading, math, written language)
 - **Mental health disorders** (e.g., depression, anxiety, oppositional defiant disorder, conduct disorder, substance use disorders, eating disorders)
 - **Chronic medical conditions** (e.g. history of extreme prematurity, epilepsy, cancer, traumatic brain injury, motor disabilities, fetal alcohol spectrum disorders)
 - **Genetic disorders** (e.g. Down syndrome, Fragile X syndrome)
 - Complicated psychosocial factors (e.g., adverse childhood experiences such as trauma, neglect and poverty; parental mental health disorders)
- **Moderate to severe functional impairments** in important aspects of daily living (e.g., relationships with family and peers, activities of daily living)
- **Diagnostic uncertainty** on the part of the primary care clinician
- **Inadequate response to treatment** (or uncertainty about treatment planning)



Key Action Statement 2

In the evaluation of a child or adolescent with complex ADHD, the clinician should **verify any prior diagnoses** and **assess for coexisting conditions**, employing an evidence-based approach that is developmentally appropriate, culturally sensitive, and inclusive of data from multiple settings and sources (home, school, community). The evaluation should include an **appropriate, comprehensive medical history and physical examination, and psychological assessment** based on the child's presenting problems and their severity, functional impairments, cognitive/developmental level, and the judgment of the treating clinician.



Key Action Statement 3

Psychoeducation about ADHD and its coexisting conditions and evidence-based **behavioral and educational interventions** are **foundational for the treatment of complex ADHD** and should be implemented at the outset of treatment whenever possible. Evidence-based behavioral and educational interventions (e.g., behavioral parent training [BPT], behavioral classroom management [BCM], behavioral peer interventions [BPI], and, for older children, organizational skills training) should be provided to all children and adolescents with complex ADHD. These treatment approaches in home, school, and peer settings address key functional domains (behavioral, educational, social) that are associated with long-term outcomes.



Key Action Statement 4

Treatment of complex ADHD should include **evidence-based approaches that address ADHD and account for co-existing conditions**, while respecting family background and preferences. Although behavioral and educational approaches serve as the foundation for intervention, it is **often necessary to combine these approaches** with pharmacological treatments. Treatment should **focus on areas of functional impairment**, and not just symptom reduction, by incorporating developmentally appropriate strategies for self-management, skill building, and prevention of adverse outcomes (e.g., substance use, conduct problems, problems of depression/anxiety, suicidal ideation, educational failure).



Key Action Statement 5

Given that **ADHD is a chronic condition** that often persists into adulthood, treatment of complex ADHD should include **ongoing, scheduled monitoring of patients throughout the lifespan**, commensurate with individual patient's needs and profile, with particular **emphasis on preparing for key developmental transitions** (preschool to school, elementary to middle school, middle to high school, and high school to post-secondary education or employment).



Process of Care Algorithms

- Meant to facilitate implementation of the Key Action Statements
- Incorporate key concepts outlined earlier
 - Focus on identifying and treating sources of functional impairment, not just symptoms
 - Psychosocial treatments foundational
 - Treatment focus shifts over time



The Process of Care Algorithms

- Evaluation of Child or Adolescent with Complex ADHD
- Behavioral/Educational Treatment for Complex ADHD (ages ≥ 6 years)
- Complex ADHD General Medication Treatment (ages ≥ 6 years)
- ADHD and Coexisting Autism Spectrum Disorder (ASD)
- ADHD and Coexisting Tics
- ADHD and Coexisting Substance Use Disorder
- ADHD and Coexisting Anxiety
- ADHD and Coexisting Depression
- ADHD and Coexisting Disruptive Behavior Disorders
- Preschool Age Complex ADHD General Medication Treatment (ages ≥ 3 years to ≤ 6 years)



Advocacy

- **Adequate insurance coverage and reimbursement** for diagnostic and treatment services including:
 - Psychological, psychoeducational, neuropsychological testing when indicated
 - Evidence-based psychosocial interventions in healthcare, school, and community settings
 - Care coordination among clinicians, parents, teachers and patients
- **Training of primary care clinicians** to improve understanding of the coexisting conditions that often accompany ADHD and contribute to risk for serious adverse outcomes as well as training to improve understanding of both psychosocial and pharmacological treatment approaches
- **Expanded workforce** of clinicians with special expertise in the management of complex ADHD



Advocacy

- **Expanded workforce of mental health providers** to offer evidence-based psychosocial treatment for ADHD in school and community settings
- **Adequate funding to support school-based** supports and intervention
- Recognition that typical **school-based assessments may not be sufficient** for children and adolescents with complex ADHD (i.e., comprehensive assessment by other healthcare professionals may be required)
- Understanding that the **availability of school-based assessments and services should not be the basis for refusal to provide insurance coverage** for recommended assessment and treatment services in the healthcare system



Areas for Future Research

- Diagnostic and treatment approaches for **children under age 4** years and for adolescents
- Diagnostic **approaches for coexisting conditions** and special circumstances (e.g., children living in poverty or from different cultures)
- **Psychosocial interventions**, including interventions for adolescents, generalizing treatment effects across settings, matching treatment intensity to severity of functional impairment, sequencing and combining psychosocial and pharmacological treatment



Areas for Future Research

- Prevention and treatment of **substance use disorders**
- **Multimodal treatment approaches** tailored for ADHD and specific coexisting neurodevelopmental and mental health conditions
- Optimal **timing** of visits, **screening** for emerging coexisting conditions, and process for **transition** to adult care
- Delineating the **functional impairments** experienced by persons with ADHD from childhood through adulthood



Some Concluding Thoughts...

- It's a step in the right direction, but it's not perfect
- Isn't it time for children and adolescents with ADHD to receive optimal care?
- We have a very long way to go...



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