

Mortality, ADHD, and Psychosocial Adversity in Adults with Childhood ADHD: A Prospective Study

WJ Barbaresi, RC Colligan, AL Weaver, RG Voigt, JM Killian and SK Katusic. Pediatrics 2013;131;637; originally published online March 4, 2013; DOI: 10.1542/peds.2012-2354

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Attention-Deficit/Hyperactivity Disorder (ADHD)

- Most common childhood neurodevelopmental disorder
- Manifests in childhood with symptoms of hyperactivity, impulsivity, inattention
- Symptoms affect cognitive, academic, behavioral, emotional, and social functioning

ADHD DSM-IV Criteria

1. Six (or more) of the following symptoms of inattention have persisted for at least six months to a degree that is maladaptive and inconsistent with developmental level:

Often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities

Often has difficulty sustaining attention in tasks or play activities

Often does not seem to listen when spoken to directly

Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)

Often has difficulty organizing tasks and activities

Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)

Often loses things necessary for tasks or activities (eg, toys, school assignments, pencils, books, or tools)

Is often easily distracted by extraneous stimuli

Is often forgetful in daily activities

ADHD DSM-IV Criteria

2. Six (or more) of the following symptoms of hyperactivity-impulsivity have persisted for at least six months to a degree that is maladaptive and inconsistent with developmental level:

Hyperactivity

Often fidgets with hands or feet or squirms in seat

Often leaves seat in classroom or in other situations in which remaining seated is expected

Often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)

Often has difficulty playing or engaging in leisure activities quietly

Is often "on the go" or often acts as if "driven by a motor"

Often talks excessively

Impulsivity

Often blurts out answers before questions have been completed

Often has difficulty awaiting turn

Often interrupts or intrudes on others (eg, butts into conversations or games)

ADHD DSM-IV Criteria

Additional criteria

Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age seven years.

Some impairment from the symptoms is present in two or more settings (eg, at school [or work] and at home).

There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

The symptoms do not occur exclusively during the course of a pervasive developmental disorder, schizophrenia, or other psychotic disorder and are not better accounted for by another mental disorder (eg, mood disorder, anxiety disorder, dissociative disorder, or a personality disorder).*

- Important to exclude any medical or situational conditions that could account for symptoms

ADHD Subtypes

1. Combined Type
2. Predominantly Inattentive Type
3. Predominantly Hyperactive-Impulsive Type

ADHD Comorbid Conditions

- Oppositional defiant disorder
- Conduct disorder
- Anxiety disorders
- Depression
- Learning disability
- Association between ADHD and poor long term school outcomes

Krull, KR. Attention deficit hyperactivity disorder in children and adolescents: Epidemiology and Pathogenesis. In: UpToDate, Basow, DS (Ed), UpToDate, Waltham, MA, 2013

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.

ADHD Prevalence

- Best estimates
 - 8-10% of American school children
 - 3-18% of school children world wide
- Male to female ratio
 - Hyperactive type- 4:1
 - Inattentive type- 2:1

Parker S, Zuckerman B, and Augustyn M. *Developmental and Behavioral Pediatrics: A Handbook for Primary Care*. 2nd ed. Philadelphia: Lippincott Williams & Wilkins, 2005.

Krull, KR. Attention deficit hyperactivity disorder in children and adolescents: Epidemiology and Pathogenesis. In: UpToDate, Basow, DS (Ed), UpToDate, Waltham, MA, 2013

ADHD in Adulthood: Persistence

- Reported to affect 4.4% of adults
- Estimated persistence from childhood to adulthood have varied widely, ranging from 6% to 66%
 - Limits:
 - Patient population: only boys, patients from specialty treatment programs, small samples
 - Dependence on adult recall
 - Diagnostic criteria that did not account for differences in ADHD symptoms between children and adults

ADHD in Adulthood: Psychiatric Conditions

- Reported high rates of comorbid psychiatric disorders
 - Limited by adult self-report of ADHD or patients from specialty treatment programs
- Possible risk factor for criminal behavior
- Possible association with increased mortality
 - Particularly from suicide or accidents

Questions to be answered

- What percentage of ADHD cases in childhood persist into adulthood?
- Are children with ADHD at higher risk for psychiatric comorbid conditions as adults?
- Are they at higher risk for criminal behavior?
- Does ADHD place you at increased risk of mortality from suicide or accidents?

Design

- **Study Setting**: Rochester, Minnesota
- **Data**:
 - Medical data from the Rochester Epidemiology Project (Mayo Clinic, Olmstead Medical Center, and affiliated hospitals)
 - Educational records from all 41 public and private schools in Minnesota Independent School District 535

Subjects

- Birth cohort consisting of all children born between January 1, 1976 and December 31, 1982
- Mothers must have lived in Minnesota Independent School District 535
- Children continued to live in Rochester until ≥ 5 years of age
- N = 5718

Identification of Childhood ADHD Cases and Controls in a Previous Retrospective Study

- ADHD identified if school and/or medical records included various combinations of:
 - Behavioral symptoms consistent with DSM-IV criteria
 - Positive ADHD questionnaire results
 - Clinical diagnosis of ADHD
- 379 cases of ADHD
 - 17 did not allow access to medical records
- Mean age of diagnosis 10.4 years old

Identification of Childhood ADHD Cases and Controls in a Previous Retrospective Study

- Non-ADHD controls from remaining cohort (N = 4946)
 - Excluded subjects with severe intellectual disability (N = 19) and those who denied access to medical records (N = 369)

Recruitment for Prospective Study

- Non-ADHD controls: random sample of 801 adults; N=335 participants
 - 5 subjects stated they had been diagnosed with ADHD, confirmed by review of records
 - Missed because “had moved from the community before receiving this diagnosis or because of the timing of the original data abstraction.”
- ADHD subjects: 367 eligible cases, N=232 participants

Determination of Mortality

- Death certificates examined for ALL deceased members of birth cohort to determine cause of death
- Between ADHD cases and remaining birth cohort compared
 - Overall survival (death from any cause)
 - Cause-specific survival (death from suicide or accidents, separately)

Incarceration Rates for Childhood ADHD Cases

- Determined based on responses received during attempted mail and telephone contacts
- Monthly screening of web sites containing public data on criminal convictions

Adult ADHD and Presence of Other Psychiatric Disorders

- All participants received Mini International Neuropsychiatric Interview (MINI): including module for adult ADHD
 - Structured diagnostic interview for DSM-IV TR and *International Classification of Diseases, 10th Revision* psychiatric disorders

Adult ADHD Case Status

- No agreed-on, norm-referenced diagnostic criteria for adult ADHD
- Based data on non-ADHD controls
- Constructed a distribution of number of symptoms of inattention and hyperactivity/impulsivity endorsed by controls

Adult ADHD Case Status

- Classified as persistent, adult ADHD if:
 - Number of inattentive and/or hyperactive/impulsive symptoms exceeded 2 SDs above the mean (4 symptoms)
 - Endorsement of MINI statement that ADHD symptoms were having a significant adverse impact in 2 or more settings