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
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

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

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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

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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

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ADHD Prevalence

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


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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