Attention-deficit/hyperactivity disorder: Diagnosis validity, prevalence and access to services

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University of São Paulo Medical School, Brazil
## Funding sources and conflicts of interest

<table>
<thead>
<tr>
<th>Source</th>
<th>Research Funding</th>
<th>Advisor/Consultant</th>
<th>Employee</th>
<th>Speakers’ Bureau</th>
<th>CME</th>
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Oct, 2016
OUTLINE

1. Diagnosis validity
2. Prevalence
3. Access to services
OUTLINE

1. Diagnosis validity
2. Prevalence
3. Access to services
Early descriptions of ADHD

“On Attention and its Diseases”

The morbid alterations to which attention is subject, may all be reduced under the two following heads: First. The incapacity of attending with a necessary degree of constancy to any one object. Second. A total suspension of its effects on the brain.

The incapacity of attending with a necessary degree of constancy to any one object, almost always arises from an unnatural or morbid sensibility of the nerves, by which means this faculty is incessantly withdrawn from one impression to another. It may be either born with a person, or it may be the effect of accidental diseases.

When born with a person it becomes evident at a very early period of life, and has a very bad effect, inasmuch as it renders him incapable of attending with constancy to any one object of education. But it seldom is in so great a degree as totally to impede all instruction; and what is very fortunate, it is generally diminished with age.

Early descriptions of ADHD

The story of Fidgety Philip
Heinrich Hoffmann - 1845

Some abnormal psychical conditions in children
Still. Lancet, 1902
History of ADHD

1775
- Weikard describes ADHD syndrome in a German textbook

1798
- Hoffman cartoons of ‘Fidgeting Philip’ and ‘Johnny Head-in-the-Air’

1845
- Bourneville, Boulanger, Paul-Boncour and Philippe describe ADHD symptoms as ‘mental instability’ in French medical and educational literature

1877
- Crichton describes ADHD syndrome in a Scottish textbook

1901
- Bradley shows that benzedrine reduces hyperactivity

1910
- Kramer–Pollnow syndrome discovered

1930s
- Still describes ‘defect of moral control’ in The Lancet

1940s
- DSM-II describes hyperkinetic reaction

1950s
- Douglas’ neurocognitive model of ADHD

1960s
- ADHD-like symptoms described as ‘minimal brain damage’

1970s
- US FDA approves methylphenidate for depression and narcolepsy

1980s
- DSM-III operationalizes diagnostic criteria

1985
- Twin studies document high heritability

1990s
- Omega-3 is a weak but effective treatment

2000s
- DSM-5 extends age of onset to 12 years and adjusts criteria for adults

2010s
- CBT for adult ADHD

- Rare genomic insertions and deletions discovered

- Molecular polygenic background confirmed

Prediagnostic era
Minimal brain dysfunction era
Attention-deficit disorder era
ADHD era

Parent training treatments
- Methylphenidate indicated for behavioural disorders in children

Methylphenidate
- DSM-IV refines criteria
- ADHD in adults recognized as a valid disorder
- Co-morbidity with anxiety, mood or autism spectrum disorders and executive dysfunction confirmed

Long-acting stimulants developed

Non-stimulants approved

Faraone et al. Nat Rev Dis Primers 2015;1:15020
Inattentive symptoms – ADHD DSM-5

• Does not give close attention to details or makes careless mistakes
• Has difficulty sustaining attention on tasks or play activities
• Does not seem to listen when directly spoken to
• Does not follow through on instructions and does not finish schoolwork, chores, or duties in the workplace
• Has trouble organizing tasks or activities
• Avoids, dislikes, or is reluctant to do tasks that need sustained mental effort
• Loses things needed for tasks or activities
• Easily distracted
• Forgetful in daily activities
Hyperactivity/impulsivity symptoms – ADHD DSM-5

• Fidgets with or taps hands or feet, or squirms in seat
• Leaves seat in situations when staying seated is expected
• Runs about or climbs when not appropriate (may present as feelings of restlessness in adolescents or adults)
• Unable to play or undertake leisure activities quietly
• “On the go”, acting as if “driven by a motor”
• Talks excessively
• Blurts out answers before a question has been finished
• Has difficulty waiting his/her turn
• Interrupts or intrudes on others
Summary of the clinical assessment process for children

- Obtain detailed clinical history from parents or carers and young person
- Carry out core ADHD symptom assessment: are symptoms out of keeping with child's age and developmental stage?
- Obtain information across settings (questionnaires as adjunct)
- Assess associated difficulties (eg, mental health symptoms, other neurodevelopmental or learning problems)
- Developmental history (eg, motor and language delay)
- Medical history (eg, epilepsy)
- Family history (eg, mental health, educational history, physical health problems)
- Medical histories (eg, cardiac)

Summary of the clinical assessment process for children

- Medical histories especially important in relation to cardiac or other risk factors if pharmacological treatment is being considered
- Consider severity of symptoms, effects on functioning, comorbid symptoms, medical history, and the family and child's strengths, resources, demands, and psychosocial context when deciding on treatment options
- Physical assessment:
  - Signs of other disorders (eg, dysmorphic features, skin lesions) and motor coordination (eg, handwriting, balance); to be undertaken more completely if considering pharmacological treatment
  - Baseline height, weight, blood pressure, pulse

Age at which symptoms of common mental disorders first appear and are diagnosed

![Graph showing age at first symptoms and first diagnosis for various disorders.](image-url)

*Source: Used with permission from Costello EJ, unpublished manuscript. ADHD, attention-deficit hyperactivity disorder; ODD, oppositional defiant disorder; CD, conduct disorder.*
Persistence of ADHD diagnosis by subtype from ages 4-6 to 11-13 years

Persistence of full and residual ADHD diagnosis over time

Genetic risk factors for ADHD

- 22q11.2 deletion syndrome
  - Jacobsen syndrome (deletions of the end of 11q)
  - Turner syndrome (X0)
  - Klinefelter syndrome (XXY)

- 16p13.11
  - 15q11–15q11 13 region containing nicotinic α7 acetylcholine receptor subunit gene
  - Rare point mutations expected from sequencing studies

- Monoamine systems genes
  - Neurite outgrowth genes

- Rare chromosomal anomalies

- Rare and low frequency copy number variants

- Common variants explain ~40% of heritability
Neural circuits implicated in ADHD

ADHD is characterized by a delay in cortical maturation

Shaw et al. PNAS 2007; 104(49):19649-54
Cognitive deficits in ADHD

- There is no cognitive profile that defines ADHD and significant heterogeneity between individuals.
- Executive functioning deficits: response inhibition, vigilance, working memory, and planning
- Reward disintegration: suboptimal decisions, prefer immediate rather than delayed rewards and over-estimate the magnitude of proximal relative to distal rewards
- Temporal information processing and timing
- Storage aspects of memory
- Reaction time variability and processing speed
- Arousal and activation
- Motor control

Faraone et al. Nat Rev Dis Primers 2015;1:15020
Distinct neuropsychological subgroups in typically developing youth inform heterogeneity in children with ADHD

Damien A. Fair\textsuperscript{a,b,c,1}, Deepti Bathula\textsuperscript{a,d}, Molly A. Nikolas\textsuperscript{e}, and Joel T. Nigg\textsuperscript{a,b}

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Life consequences of ADHD

- Health problems and psychiatric co-morbidities
- Social disability
- Risky behaviours
- Psychological dysfunction
- Academic and occupational failure

Specific learning disabilities and executive dysfunction

Disruptive behaviour, mood, anxiety, elimination, tic and autism spectrum disorders

Developmental coordination disorder, and speech and language disorders

Marital discord, separation and divorce, parenting problems, and legal problems, arrests and incarcerations

Poor social skills, impaired family relationships, poor peer relationships and rejection by peers

Suicidal ideation, suicide attempts and suicide

Lower quality of life and low self-esteem

Emotional dysregulation and lack of motivation

Underachievement, grade repetition, special education needs, school expulsion and dropping out

Reduced occupational performance, unemployment and lower socioeconomic status

Unplanned pregnancies

Accidents and injuries, traffic accidents and violation, and licence suspensions

Premature mortality

Overweight, obesity and hypertension

Delinquency and criminality, smoking and addictions

Faraone et al. Nat Rev Dis Primers 2015;1:15020
Mortality in children, adolescents, and adults with attention deficit hyperactivity disorder: a nationwide cohort study

Søren Dalsgaard, Søren Dinesen Østergaard, James F Leckman, Preben Bo Mortensen, Marianne Giertz Pedersen

MRR according to age at first diagnosis of ADHD, compared with those without ADHD at same age

<table>
<thead>
<tr>
<th>Age at first ADHD-diagnosis (years)</th>
<th>Number of deaths</th>
<th>Person-years</th>
<th>Mortality rate per 10 000 person-years</th>
<th>Crude model MRR (95% CI)*</th>
<th>Partly adjusted model MRR (95% CI)†</th>
<th>Fully adjusted model MRR (95% CI)‡</th>
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<tbody>
<tr>
<td>1-5</td>
<td>10</td>
<td>29 944</td>
<td>3.34</td>
<td>2.23 (1.11-3.91)</td>
<td>1.97 (0.99-3.54)</td>
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<td>6-17</td>
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<td>136 048</td>
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<tr>
<td>&gt;17</td>
<td>38</td>
<td>17 057</td>
<td>22.28</td>
<td>5.24 (3.73-7.12)</td>
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<td>24 724 510</td>
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<td>24 907 560</td>
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</table>

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1. Diagnosis validity
2. Prevalence
3. Access to services
ADHD prevalence estimates around the world

ADHD prevalence estimates in Brazil

Freire, 2005: 32%
Vasconcelos, 2003: 32%
Guardiola, 2000: 27%
Vasconcelos, 2003: 21%
Freire, 2005: 11%
Poeta, 2004: 20%
Rohde, 1999: 11%
Fleitlich-Bilyk, 2004: 9%
Goodman, 2005: 0.9%

Prevalence (%)
Search process for ADHD prevalence studies around the world

Location of included studies

- North America = 30
- Europe = 24
- South America = 7
- Africa = 3
- Asia = 11
- Middle East = 4
- Oceania = 6

K = 102
n = 144,726

Results: meta-regression and meta-analysis

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<tr>
<th>Variable</th>
<th>Univariate Model</th>
<th>Metaregression (Multivariate Model)</th>
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<td>Community</td>
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<tr>
<td>School</td>
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<td><strong>Source of information</strong></td>
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<td><strong>Number of stages of evaluation</strong></td>
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<td>One</td>
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<tr>
<td>Two</td>
<td>0.25</td>
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</tr>
<tr>
<td>Two, only screens positive at</td>
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<tr>
<td>first stage</td>
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<td><strong>Response rate</strong></td>
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<td>Europe</td>
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<tr>
<td>Oceania</td>
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Trends in ADHD diagnosis
Trends in ADHD prevalence estimates (1984-2012)
Prevalence, Severity, and Unmet Need for Treatment of Mental Disorders in the World Health Organization World Mental Health Surveys

The WHO World Mental Health Survey Consortium

Context  Little is known about the extent or severity of untreated mental disorders, especially in less-developed countries.

Objective  To estimate prevalence, severity, and treatment of Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) mental disorders in 14 countries (6 less developed, 8 developed) in the World Health Organization (WHO) World Mental Health (WMH) Survey Initiative.

Design, Setting, and Participants  Face-to-face household surveys of 60,463 community adults conducted from 2001-2003 in 14 countries in the Americas, Europe, the Middle East, Africa, and Asia.

Main Outcome Measures  The DSM-IV disorders, severity, and treatment were assessed with the WMH version of the WHO Composite International Diagnostic Interview (WMH-CIDI), a fully structured, lay-administered psychiatric diagnostic interview.

Results  The prevalence of having any WMH-CIDI/DSM-IV disorder in the prior year varied widely, from 4.3% in Shanghai to 26.4% in the United States, with an interquartile range (IQR) of 9.1%-16.9%. Between 33.1% (Colombia) and 80.9% (Nigeria) of 12-month cases were mild (IQR, 40.2%-53.3%). Serious disorders were associated with substantial role disability. Although disorder severity was correlated with probability of treatment in almost all countries, 35.5% to 50.3% of serious cases in developed countries and 76.3% to 85.4% in less-developed countries received no treatment in the 12 months before the interview. Due to the high prevalence of mild and subthreshold cases, the number of those who received treatment far exceeds the number of untreated serious cases in every country.

Conclusions  Reallocation of treatment resources could substantially decrease the problem of unmet need for treatment of mental disorders among serious cases. Structural barriers exist to this reallocation. Careful consideration needs to be given to the value of treating some mild cases, especially those at risk for progressing to more serious disorders.
Adult ADHD prevalence

Is Adult ADHD a Childhood-Onset Neurodevelopmental Disorder? Evidence From a Four-Decade Longitudinal Cohort Study

Terrie E. Moffitt, Ph.D., Renate Houts, Ph.D., Philip Asherson, M.D., Daniel W. Belsky, Ph.D., David L. Corcoran, Ph.D., Maggie Hamerle, B.A., HonaLee Harrington, B.A., Sean Hogan, M.S.W., Madeline H. Meier, Ph.D., Guilherme V. Polanczyk, M.D., Richie Poulton, Ph.D., Sandhya Ramrakha, Ph.D., Karen Sugden, Ph.D., Benjamin Williams, B.A., Luis Augusto Rohde, M.D., Avshalom Caspi, Ph.D.

Objective: Despite a prevailing assumption that adult ADHD is a childhood-onset neurodevelopmental disorder, no prospective longitudinal study has described the childhoods of the adult ADHD population. The authors report follow-back analyses of ADHD cases diagnosed in adulthood, alongside follow-forward analyses of ADHD cases diagnosed in childhood, in one cohort.

Method: Participants belonged to a representative birth cohort of 1037 individuals born in Dunedin, New Zealand, in 1972 and 1973 and followed to age 38, with 95% retention. Symptoms of ADHD, associated clinical features, comorbid disorders, neurocognitive deficits, genome-wide association study-derived polygenic risk, and life impairment indicators were assessed. Data sources were participants, parents, teachers, informants, neurocognitive test results, and administrative records. Adult ADHD diagnoses used DSM-5 criteria. Apart from onset age and cross-setting corroborations, which were study outcome measures.

Results: As expected, childhood ADHD had a prevalence of 6% (predominantly male) and was associated with childhood comorbid disorders, neurocognitive deficits, polygenic risk, and residual adult life impairment. Also as expected, adult ADHD had no prevalence of 3% (gender balanced) and was associated with adult substance dependence, adult life impairment, and treatment contact. Unexpectedly, the childhood ADHD and adult ADHD groups comprised virtually nonoverlapping sets; 90% of adult ADHD cases lacked a history of childhood ADHD. Also unexpectedly, the adult ADHD group did not show tested neuropsychological deficits in childhood or adulthood, nor did they show polygenic risk for childhood ADHD.

Conclusions: The findings raise the possibility that adults presenting with the ADHD symptom picture may not have a childhood-onset neurodevelopmental disorder. If this finding is replicated, then the disorder’s place in the classification system must be reconsidered, and research must investigate the etiology of adult ADHD.

# Dunedin Longitudinal Study

<table>
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<th>Age</th>
<th>Year</th>
<th>Number</th>
<th>Percent*</th>
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<tr>
<td>3</td>
<td>1975-76</td>
<td>1037</td>
<td>100%</td>
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<tr>
<td>5</td>
<td>1977-78</td>
<td>991</td>
<td>96</td>
</tr>
<tr>
<td>7</td>
<td>1979-80</td>
<td>954</td>
<td>92</td>
</tr>
<tr>
<td>9</td>
<td>1981-82</td>
<td>955</td>
<td>92</td>
</tr>
<tr>
<td>11</td>
<td>1983-84</td>
<td>925</td>
<td>90</td>
</tr>
<tr>
<td>13</td>
<td>1985-86</td>
<td>850</td>
<td>82</td>
</tr>
<tr>
<td>15</td>
<td>1987-88</td>
<td>976</td>
<td>95</td>
</tr>
<tr>
<td>18</td>
<td>1990-91</td>
<td>993</td>
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<td>21</td>
<td>1993-94</td>
<td>992</td>
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<td>26</td>
<td>1998-99</td>
<td>980</td>
<td>96</td>
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<td>32</td>
<td>2004-05</td>
<td>972</td>
<td>96</td>
</tr>
<tr>
<td>38</td>
<td>2010-12</td>
<td>961</td>
<td>95%</td>
</tr>
</tbody>
</table>
Prevalence

- Research diagnoses based on DSM-III criteria identified 61 children (ages 11, 13, 15) with ADHD - prevalence: 6%, 78.7% male (vs ctrl, p<0.001)

- Research diagnoses based on DSM-5* identified 31 adults (age 38) with ADHD - prevalence: 3%, 61.3% male (vs ctrl, p=.187)

*except age of onset
Continuity

Follow-Forward: Did those with childhood ADHD (N = 61) continue to have Adult ADHD?

Follow-Back: Did those with Adult ADHD (N = 31) have prior childhood ADHD?
Evaluation of the Persistence, Remission, and Emergence of Attention-Deficit/Hyperactivity Disorder in Young Adulthood

Jessica C. Agnew-Blais, ScD¹; Guilherme V. Polanczyk, MD, PhD²; Andrea Danese, MD, PhD¹,³,⁴; Jasmin Wertz, MSc¹; Terrie E. Moffitt, PhD¹,⁵,⁶; Louise Arseneault, PhD¹

[+] Author Affiliations

Attention-Deficit/Hyperactivity Disorder Trajectories From Childhood to Young Adulthood Evidence From a Birth Cohort Supporting a Late-onset Syndrome

Arthur Caye; Thiago Botter-Maio Rocha, MD, MSc; Luciana Anselmi, PhD; Joseph Murray, PhD; Ana M. B. Menezes, PhD; Fernando C. Barros, PhD; Helen Gonçalves, PhD; Fernando Wehrmeister, PhD; Christina M. Jensen, MSc; Hans-Christoph Steinhausen, MD, PhD, DMS; James M. Swanson, PhD; Christian Kieling, MD, PhD; Luis Augusto Rohde, MD, PhD

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1. Diagnosis validity
2. Prevalence
3. Access to services
Stimulant Medication Use in Children: A 12-Year Perspective


Estimated prevalence of parent-reported current ADHD medication treatment among children and adolescents by state of United States in 2011

6.1% (3.5 million nationwide) were receiving ADHD medication treatment
69.0% of those with a current ADHD diagnosis were taking ADHD medication
Medication Use in US Youth With Mental Disorders

Kathleen R. Merikangas, PhD; Jian-ping He, MSc; Judith Rapoport, MD; Benedetto Vitiello, MD; Mark Olfson, MD

Objective: To evaluate the prevalence, demographic and clinical correlates, and specificity of classes of psychotropic medications indicated for mental disorders.

Design: Cross-sectional survey.

Setting: Direct household interviews of combined household and school samples representative of the general population of adolescents in the United States.

Participants: Ten thousand one hundred twenty-three adolescents aged 13 to 18 years who participated in the National Comorbidity Survey Adolescent Supplement.

Main Exposures: Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition) (DSM-IV) mental disorders and neurodevelopmental disorders.

Outcome Measure: Psychotropic medication use in the past 12 months.

Results: Among youth with any DSM-IV mental disorder, 14.2% reported that they had been treated with a psychotropic medication in the past 12 months. Strong associations emerged between specific disorders and classes of medications with evidence for efficacy. Antidepressants were most frequently used among those with primary mood disorders (14.1%); stimulant use was most common among those with attention-deficit/hyperactivity disorder (20.4%); and antipsychotic use was infrequent and mostly seen among those with serious developmental disorders. Less than 2.5% of adolescents without a 12-month mental disorder had been prescribed psychotropic medications, and most had evidence of psychological distress or impairment reflected in a previous mental disorder, subthreshold condition, or developmental disorder. Appropriate medication use was significantly more frequent among those in treatment in the mental health specialty sector than general medicine or other settings.

Conclusions: These findings challenge recent concerns over widespread overmedication and misuse of psychotropic medications in US youth. In fact, these data highlight the need for greater recognition and appropriate treatment of youth with mental health disorders.

Table 1. Prevalence of Psychotropic Medication by Medication Class Among Those With 12-Month DSM-IV Disorder

<table>
<thead>
<tr>
<th>12-mo Conditions(^a): DSM-IV Disorders</th>
<th>Sample Size</th>
<th>Use of Psychotropic Medication</th>
<th>Any Medication(^b)</th>
<th>Received Specialty Mental Health Treatment(^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any anxiety disorder</td>
<td>1950</td>
<td>7.1 (5.5-9.1)</td>
<td>2.9 (1.8-4.7)</td>
<td>11.6 (9.2-14.4)</td>
</tr>
<tr>
<td>Agoraphobia</td>
<td>192</td>
<td>4.5 (1.8-10.9)</td>
<td>3.0 (0.9-9.5)</td>
<td>1.9 (1.1-3.3)</td>
</tr>
<tr>
<td>Generalized anxiety disorder</td>
<td>63</td>
<td>16.3 (7.9-30.6)</td>
<td>0.6 (0.1-4.8)</td>
<td>1.3 (0.2-7.3)</td>
</tr>
<tr>
<td>Social phobia</td>
<td>516</td>
<td>7.3 (4.7-11.2)</td>
<td>9.3 (4.3-19.8)</td>
<td>1.7 (0.9-3.7)</td>
</tr>
<tr>
<td>Specific phobia</td>
<td>1244</td>
<td>9.3 (7.1-12.1)</td>
<td>9.3 (5.3-13.8)</td>
<td>2.1 (1.1-3.9)</td>
</tr>
<tr>
<td>Panic disorder</td>
<td>191</td>
<td>14.1 (10.6-18.4)</td>
<td>5.4 (3.3-8.8)</td>
<td>1.2 (0.6-2.4)</td>
</tr>
<tr>
<td>Posttraumatic stress disorder</td>
<td>292</td>
<td>11.2 (7.8-16.0)</td>
<td>13.2 (8.5-19.9)</td>
<td>2.6 (0.9-6.7)</td>
</tr>
<tr>
<td>Separation anxiety disorder</td>
<td>143</td>
<td>11.9 (7.6-18.3)</td>
<td>12.8 (7.5-19.9)</td>
<td>2.7 (0.7-10.1)</td>
</tr>
<tr>
<td>Any behavior disorder</td>
<td>729</td>
<td>9.2 (9.1-12.1)</td>
<td>9.3 (5.3-13.8)</td>
<td>2.1 (1.1-3.9)</td>
</tr>
<tr>
<td>Conduct disorder</td>
<td>514</td>
<td>8.4 (5.9-12.0)</td>
<td>10.0 (6.2-15.7)</td>
<td>1.9 (1.0-3.6)</td>
</tr>
<tr>
<td>Oppositional defiant disorder</td>
<td>348</td>
<td>11.2 (7.8-16.0)</td>
<td>13.2 (8.5-19.9)</td>
<td>2.6 (0.9-6.7)</td>
</tr>
<tr>
<td>Any eating disorder</td>
<td>161</td>
<td>13.1 (6.4-25.0)</td>
<td>8.4 (3.0-21.2)</td>
<td>0.8 (0.3-2.3)</td>
</tr>
<tr>
<td>Any mood disorder</td>
<td>1021</td>
<td>14.1 (10.6-18.4)</td>
<td>5.4 (3.3-8.8)</td>
<td>1.2 (0.6-2.4)</td>
</tr>
<tr>
<td>Bipolar</td>
<td>246</td>
<td>14.2 (9.4-20.9)</td>
<td>5.8 (2.4-13.1)</td>
<td>2.6 (0.9-7.5)</td>
</tr>
<tr>
<td>Depression</td>
<td>788</td>
<td>14.1 (10.4-18.8)</td>
<td>5.4 (3.0-9.5)</td>
<td>0.7 (0.3-1.7)</td>
</tr>
<tr>
<td>Any substance use disorder</td>
<td>854</td>
<td>9.2 (6.7-12.6)</td>
<td>4.1 (2.5-6.7)</td>
<td>1.1 (0.5-2.3)</td>
</tr>
<tr>
<td>Any class of disorder(^d)</td>
<td>2350</td>
<td>7.8 (6.5-9.3)</td>
<td>6.6 (5.0-8.5)</td>
<td>1.0 (0.6-1.6)</td>
</tr>
<tr>
<td>0 class</td>
<td>4133</td>
<td>1.3 (0.9-1.9)</td>
<td>0.8 (0.5-1.3)</td>
<td>0.2 (0.1-0.7)</td>
</tr>
<tr>
<td>1 class</td>
<td>1469</td>
<td>4.7 (3.3-6.7)</td>
<td>5.0 (3.2-7.7)</td>
<td>0.8 (0.3-2.1)</td>
</tr>
<tr>
<td>2 classes</td>
<td>596</td>
<td>10.9 (7.8-14.9)</td>
<td>9.0 (5.0-15.6)</td>
<td>0.4 (0.2-0.9)</td>
</tr>
<tr>
<td>≥3 classes</td>
<td>285</td>
<td>16.1 (10.8-23.3)</td>
<td>9.6 (5.3-16.8)</td>
<td>2.5 (1.2-5.1)</td>
</tr>
<tr>
<td>Suicidality</td>
<td>515</td>
<td>18.5 (13.8-24.3)</td>
<td>6.2 (2.9-12.9)</td>
<td>2.3 (1.1-4.8)</td>
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<tr>
<td>Neurodevelopmental disorder(^f)</td>
<td>1675</td>
<td>6.1 (4.6-8.2)</td>
<td>7.6 (5.5-10.4)</td>
<td>1.1 (0.5-2.1)</td>
</tr>
<tr>
<td>Developmental disorders</td>
<td>31</td>
<td>19.3 (6.4-45.6)</td>
<td>19.6 (5.6-50.2)</td>
<td>7.6 (2.3-21.9)</td>
</tr>
<tr>
<td>Epilepsy</td>
<td>32</td>
<td>3.5 (0.9-12.9)</td>
<td>0.2 (0.0-1.3)</td>
<td>3.7 (0.7-16.5)</td>
</tr>
<tr>
<td>Headache(^g)</td>
<td>1219</td>
<td>5.5 (4.0-7.5)</td>
<td>4.2 (2.3-7.5)</td>
<td>0.6 (0.3-1.4)</td>
</tr>
<tr>
<td>Learning disability</td>
<td>562</td>
<td>8.0 (4.8-12.9)</td>
<td>15.3 (10.5-21.8)</td>
<td>2.1 (0.8-5.3)</td>
</tr>
</tbody>
</table>

Only 2.5% of adolescents without a 12-month DSM-IV disorder had been prescribed psychotropic medications. Of these, 78% had evidence of psychological distress or impairment reflected in a lifetime history of mental disorders, subthreshold conditions, or developmental disorders (data not shown). Not shown.
Racial and Ethnic Disparities in ADHD Treatment

aORs of ADHD Medication Use by Race/Ethnicity Over 3 Waves Among Children With a Diagnosis or Symptoms of ADHD

<table>
<thead>
<tr>
<th>Child Race/Ethnicity</th>
<th>Fifth Grade (n = 577)</th>
<th></th>
<th>Seventh Grade (n = 721)</th>
<th></th>
<th>10th Grade (n = 645)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (N)</td>
<td>aOR (95% CI)</td>
<td>% (N)</td>
<td>aOR (95% CI)</td>
<td>% (N)</td>
<td>aOR (95% CI)</td>
</tr>
<tr>
<td>Total</td>
<td>47 (270)</td>
<td>Ref</td>
<td>36 (261)</td>
<td>Ref</td>
<td>45 (282)</td>
<td>Ref</td>
</tr>
<tr>
<td>White</td>
<td>73 (125)</td>
<td>0.33 (0.17–0.62)*</td>
<td>61 (118)</td>
<td>0.34 (0.18–0.64)*</td>
<td>67 (143)</td>
<td>0.41 (0.22–0.75)*</td>
</tr>
<tr>
<td>African-American</td>
<td>41 (101)</td>
<td>0.33 (0.17–0.62)*</td>
<td>33 (97)</td>
<td>0.34 (0.18–0.64)*</td>
<td>35 (88)</td>
<td>0.41 (0.22–0.75)*</td>
</tr>
<tr>
<td>Latino</td>
<td>24 (31)</td>
<td>0.38 (0.16–0.90)*</td>
<td>19 (35)</td>
<td>0.51 (0.23–1.15)</td>
<td>29 (36)</td>
<td>0.42 (0.20–0.86)*</td>
</tr>
<tr>
<td>Other</td>
<td>45 (13)</td>
<td>0.37 (0.12–1.10)</td>
<td>29 (11)</td>
<td>0.24 (0.11–0.56)*</td>
<td>44 (15)</td>
<td>0.33 (0.11–0.96)*</td>
</tr>
</tbody>
</table>

aORs of ADHD Medication Use According to Race/Ethnicity Over 3 Waves Among Children With No Diagnosis or Symptoms of ADHD at Wave 1

<table>
<thead>
<tr>
<th>Child Race/Ethnicity</th>
<th>Fifth Grade (n = 3628)</th>
<th></th>
<th>Seventh Grade (n = 3628)</th>
<th></th>
<th>10th Grade (n = 3596)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (N)</td>
<td>aOR (95% CI)</td>
<td>% (N)</td>
<td>aOR (95% CI)</td>
<td>% (N)</td>
<td>aOR (95% CI)</td>
</tr>
<tr>
<td>Total</td>
<td>1 (44)</td>
<td>Ref</td>
<td>2 (86)</td>
<td>Ref</td>
<td>4 (138)</td>
<td>Ref</td>
</tr>
<tr>
<td>White</td>
<td>1 (7)</td>
<td>Ref</td>
<td>3 (25)</td>
<td>Ref</td>
<td>7 (56)</td>
<td>Ref</td>
</tr>
<tr>
<td>African-American</td>
<td>2 (22)</td>
<td>1.03 (0.27–3.96)</td>
<td>3 (33)</td>
<td>0.73 (0.30–1.74)</td>
<td>4 (39)</td>
<td>0.59 (0.28–1.22)</td>
</tr>
<tr>
<td>Latino</td>
<td>1 (13)</td>
<td>0.51 (0.12–2.23)</td>
<td>2 (23)</td>
<td>0.85 (0.31–2.34)</td>
<td>3 (38)</td>
<td>0.55 (0.24–1.29)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (2)</td>
<td>1.23 (0.13–11.64)</td>
<td>2 (5)</td>
<td>1.08 (0.30–3.92)</td>
<td>4 (5)</td>
<td>0.70 (0.25–2.02)</td>
</tr>
</tbody>
</table>

Cross-national comparisons of stimulant use

Table 5: Prevalence per 100 and 95% CIs for the use of stimulants during the year 2000

<table>
<thead>
<tr>
<th>Age (yr)</th>
<th>Male</th>
<th>Female</th>
<th>Total*</th>
<th>Male</th>
<th>Female</th>
<th>Total*</th>
<th>Male</th>
<th>Female</th>
<th>Total*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–4</td>
<td>0.76</td>
<td>0.20</td>
<td>0.49</td>
<td>0.08</td>
<td>0.02</td>
<td>0.05</td>
<td>0.02</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>0.67–0.86</td>
<td>0.15–0.25</td>
<td>0.48–0.49</td>
<td>0.04–0.14</td>
<td>0.00–0.05</td>
<td>0.04–0.06</td>
<td>0.01–0.04</td>
<td>0.00–0.03</td>
<td>0.01–0.02</td>
</tr>
<tr>
<td>5–9</td>
<td>10.72</td>
<td>3.68</td>
<td>7.29</td>
<td>2.86</td>
<td>0.63</td>
<td>1.77</td>
<td>1.74</td>
<td>0.40</td>
<td>1.09</td>
</tr>
<tr>
<td></td>
<td>10.19–11.26</td>
<td>3.36–4.03</td>
<td>7.28–7.29</td>
<td>2.58–3.16</td>
<td>0.50–0.78</td>
<td>1.76–1.78</td>
<td>1.62–1.87</td>
<td>0.34–0.46</td>
<td>1.08–1.09</td>
</tr>
<tr>
<td>10–14</td>
<td>11.43</td>
<td>3.16</td>
<td>7.40</td>
<td>3.57</td>
<td>0.59</td>
<td>2.12</td>
<td>2.37</td>
<td>0.48</td>
<td>1.45</td>
</tr>
<tr>
<td></td>
<td>10.80–12.07</td>
<td>2.82–3.53</td>
<td>7.39–7.41</td>
<td>3.26–3.9</td>
<td>0.46–0.73</td>
<td>2.11–2.12</td>
<td>2.24–2.50</td>
<td>0.42–0.55</td>
<td>1.45–1.45</td>
</tr>
<tr>
<td>15–19</td>
<td>2.75</td>
<td>0.59</td>
<td>1.70</td>
<td>1.17</td>
<td>0.22</td>
<td>0.71</td>
<td>0.42</td>
<td>0.06</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>2.39–3.16</td>
<td>0.44–0.76</td>
<td>1.69–1.71</td>
<td>1.01–1.35</td>
<td>0.15–0.31</td>
<td>0.70–0.71</td>
<td>0.36–0.48</td>
<td>0.04–0.09</td>
<td>0.24–0.25</td>
</tr>
<tr>
<td>Total*</td>
<td>6.52</td>
<td>1.94</td>
<td>4.29</td>
<td>1.95</td>
<td>0.37</td>
<td>1.18</td>
<td>1.16</td>
<td>0.24</td>
<td>0.71</td>
</tr>
<tr>
<td></td>
<td>6.52–6.53</td>
<td>1.94–1.95</td>
<td>4.29–4.29</td>
<td>1.95–1.96</td>
<td>0.37–0.37</td>
<td>1.18–1.18</td>
<td>1.16–1.16</td>
<td>0.24–0.24</td>
<td>0.71–0.71</td>
</tr>
</tbody>
</table>

*Totals were adjusted to the child and adolescent population of the US 2000 census by the direct standardization method.

Total number of methyphenidate prescribed in NHS primary care (2007-11)

The safer management of controlled drugs: Care Quality Commission; Annual Report 2012
Total numbers of methylphenidate privately prescribed in England (2007-11)

The safer management of controlled drugs: Care Quality Commission; Annual Report 2012
ADHD prescribing prevalence by age group and year in UK primary care

Incidence of medication initiation for ADHD in UK primary care

Figure 2. Incidence of pharmacologically treated attention deficit hyperactivity disorder (methylphenidate, dexamfetamine or atomoxetine) in patients aged 6 years and over in UK general practice (with 95% confidence intervals).

Persistence of pharmacological treatment into adulthood, in UK primary care, for ADHD patients who started treatment in childhood or adolescence.

![Graphs showing probability of continuing treatment over time.]

- Treatment started between 6–12 years
- Treatment started between 13–17 years

McCarthy et al. BMC Psychiatry 2012, 12:219
ADHD treatment rates in Brazil

• High Risk Cohort Study: 2500 children from 57 schools in SP and PoA: 7.7%
• 4 community studies in Brazil, Venezuela and Puerto Rico: 0, 3%, 4%, 7%

<table>
<thead>
<tr>
<th>Age range</th>
<th>Brazilian Population*</th>
<th>ADHD prevalence estimate</th>
<th>Estimated number of individuals with ADHD in Brazil</th>
<th>Estimated number of patients with ADHD under treatment in 2009**</th>
<th>Estimated number of patients with ADHD under treatment in 2010**</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 19 years old</td>
<td>49.127.006</td>
<td>0.9%</td>
<td>442.143</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 to 59 years old</td>
<td>107.242.035</td>
<td>0.45%</td>
<td>482.589</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 years old and more</td>
<td>20.590.599</td>
<td>Unknown</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>924.732</td>
<td>149.937</td>
<td>184.481</td>
</tr>
</tbody>
</table>

Governo quer protocolo para conter uso de Ritalina por crianças

NATÁLIA CANCIAN
DE BRASÍLIA

21/10/2015 02h00 - Atualizado às 11h32

Em São Paulo, a adoção do protocolo no ano passado reduziu o consumo do remédio na rede pública: de 54 mil comprimidos distribuídos em setembro de 2014 para 25 mil no mesmo mês deste ano. Já o número de usuários foi de 550 para 324.

"O protocolo mostrou que, quando há orientação clara do uso, do diagnóstico e do acompanhamento, há redução do uso abusivo", afirma o secretário municipal de saúde, Alexandre Padilha. "Antes, havia casos de inclusão [no tratamento] porque a criança mexia mais de quatro vezes na cama."

Total population 7-19 y: 2.027.454
ADHD 5%= 101.373
ADHD 1%= 20.275
I REMEMBER the moment my son’s teacher told us, “Just a little medication could really turn things around for Will.” We stared at her as if she were speaking Greek.

“Are you talking about Ritalin?” my husband asked.

Will was in third grade, and his school wanted him to settle down in order to focus on math worksheets and geography lessons and social studies. The children were expected to line up quietly and “transition” between classes without goofing around. This posed a challenge — hence the medication.
Conclusions

- ADHD as defined by DSM is heuristics that have proven extremely useful in clinical practice and research.

- Although it has been showed that ADHD diagnosis has validity, to further advance the field research will be focusing on neurobiological and genetic hypotheses, which will be followed by bottom-up reanalysis.

- It is unknown how (and if) the new knowledge will be translated to clinical care.

- In this respect, a growing number of children in need of treatment are receiving it, with substantial challenges ahead.

- Globally, a huge challenge relates to the mental health of children from LMICs, where few if any services are available.
Attention-deficit/hyperactivity disorder: Diagnosis, prevalence and access to services

Guilherme V. Polanczyk, MD, PhD
Assistant Professor of Child & Adolescent Psychiatry
University of São Paulo Medical School, Brazil

gvp@usp.br

The ADHD Tsunami? Global perspectives - UCD Child & Adolescent Psychiatry
Dublin, Ireland – Oct 14th, 2016