

# Trends in ADHD Diagnosis

And resultant problems

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McGill

# Perspective

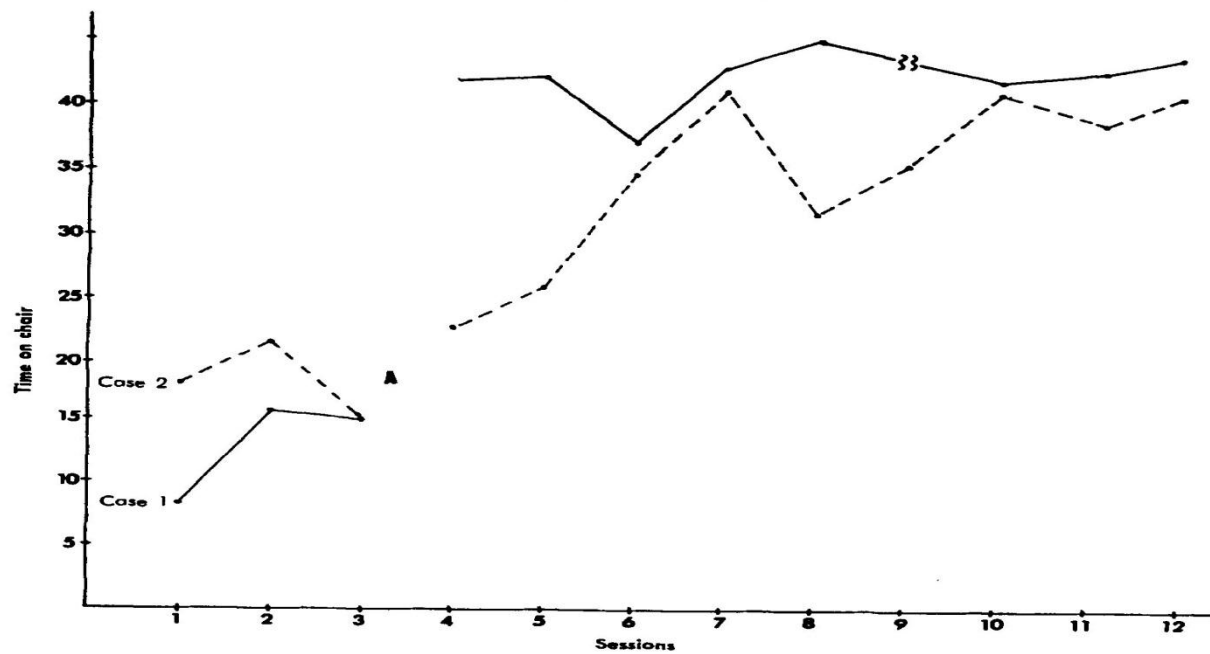


# A Very Brief History

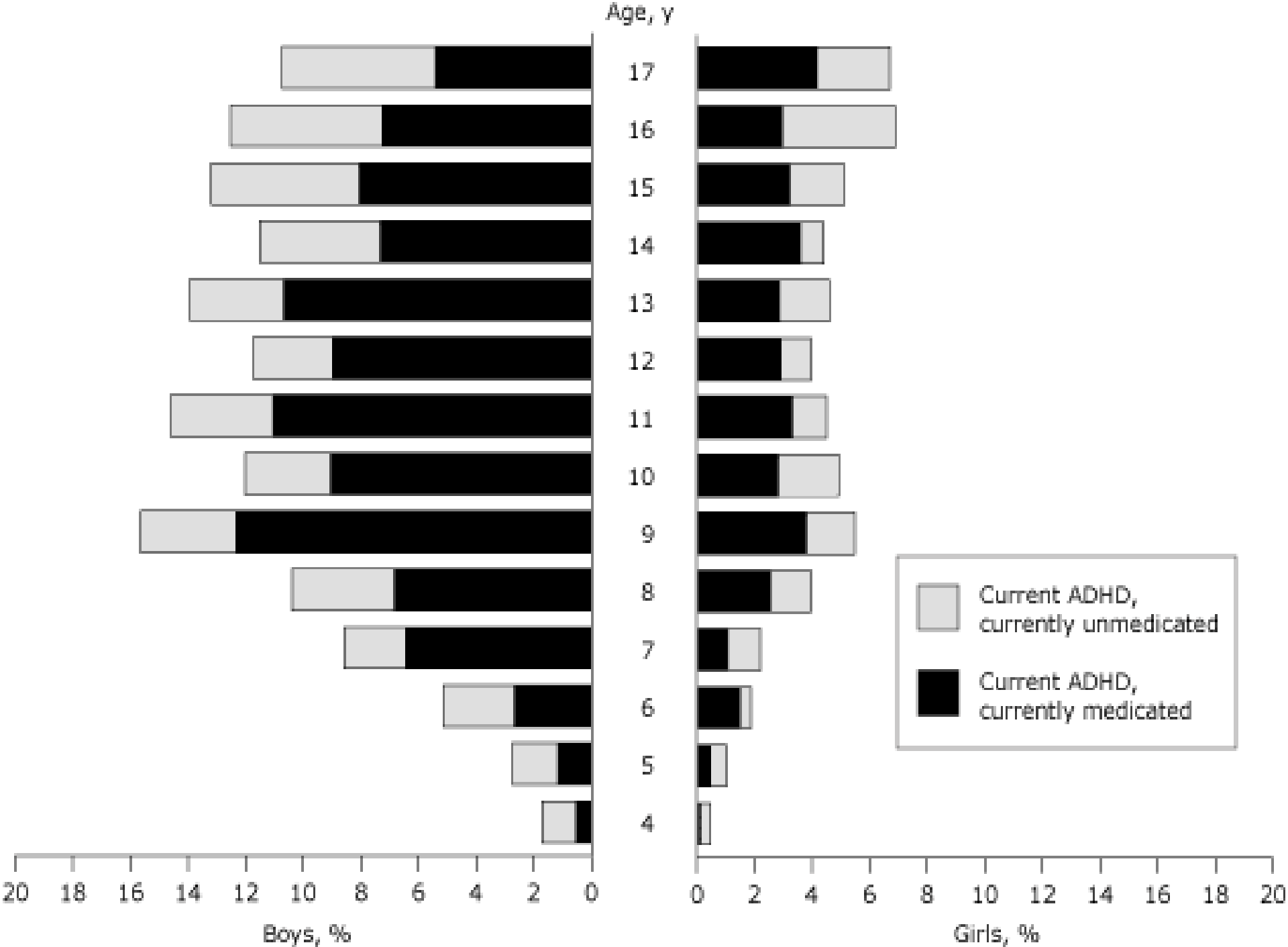
- 1902 Still- 43 children , symptoms of ADHD, before age 8, 3 to 1 male to female, problems in biological relatives, “ cortical disconnection syndrome.”
- 1923 Ebaugh et al.- 1917-1918 Encephalitis Epidemic , hyperactive, impulsive, attentional-memory deficits. Brain Injury.
- 1930s & 1940s brain injury particular to frontal lobes = ADHD symptoms.

- 1950s- Concept of Minimal Brain Dysfunction. Circular but idea brain damage/dysfunction on a continuum. Over stimulated.
- 1960s- Hyperactivity central ( Chess ) DSM II “ Hyperkinetic Reaction of Childhood.
- 1970s- Douglas, problem sustaining attention and impulse control. Task performance varies with reinforcement schedule. Attentional problems can persist into later life . DSM III 1980 Attention Deficit Disorder. With and without hyperactivity. Studies suggest under arousal.
- DSM IIIR 1987, Attention Deficit hyperactivity Disorder.

- 1990s to present DSM IV 1994, 3 types, emphasis on genetic, biochemical, brain research.
- Historical Consistencies
  1. Symptoms fairly consistent- focus on relative importance varied.
  2. Gender differences – genetic aspects
  3. Presumption of brain dysfunction.

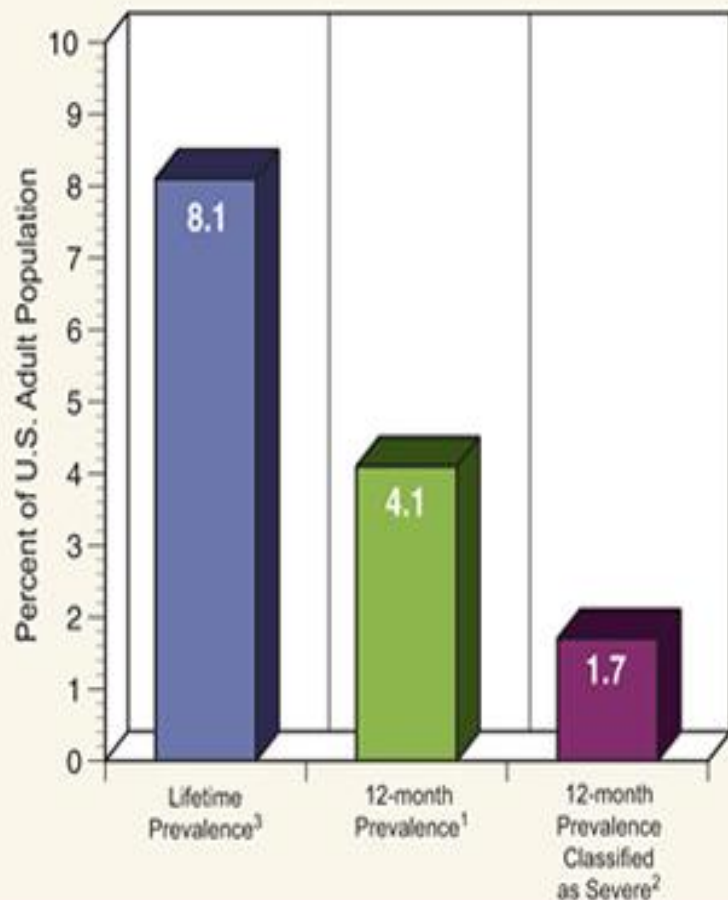


Time sitting on a chair plotted against sessions for Cases 1 and 2. After designation A, the patients earned points for remaining seated.

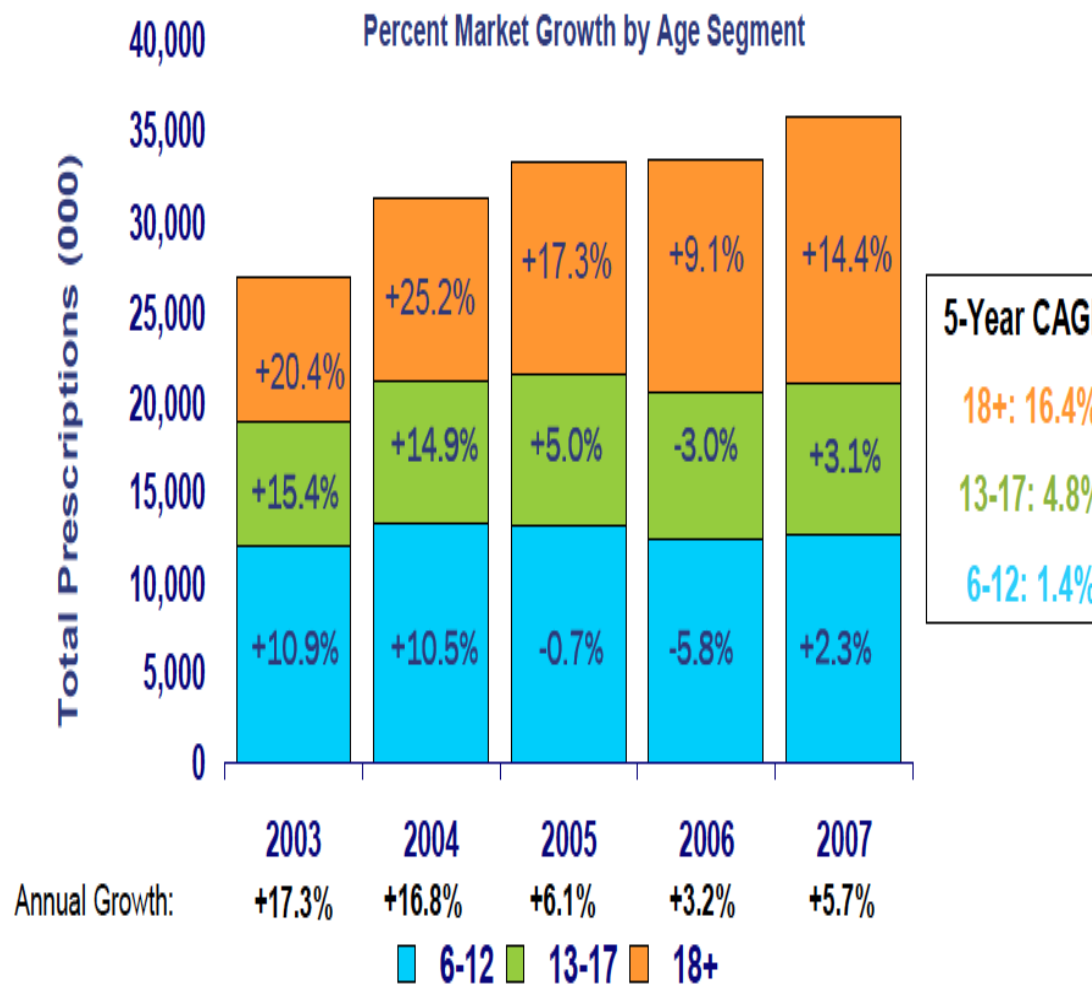


## Prevalence

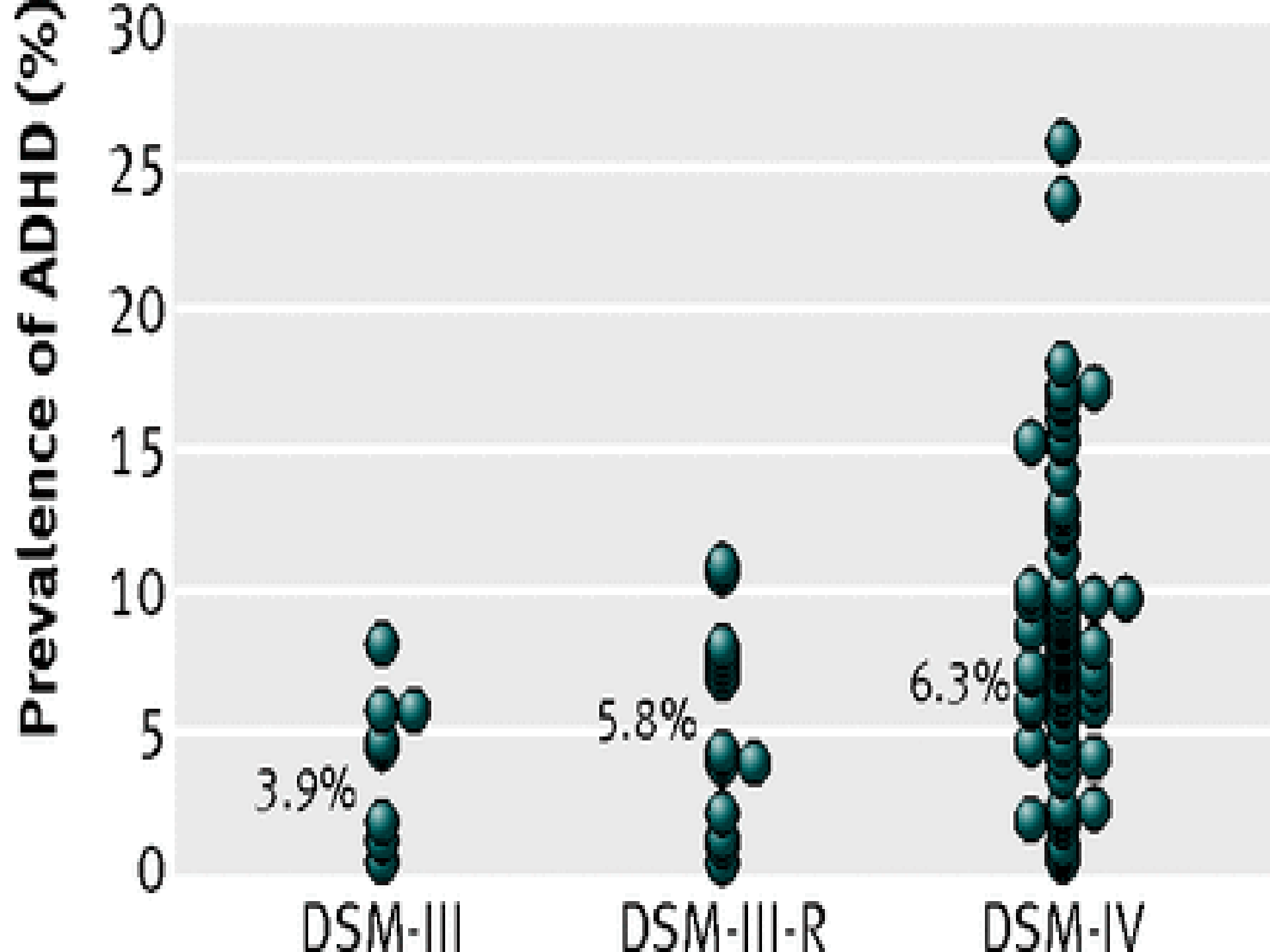
- **12-month Prevalence:** 4.1% of U.S. adult population<sup>1</sup>
- **Severe:** 41.3% of these cases (e.g., 1.7% of U.S. adult population) are classified as "severe"<sup>2</sup>

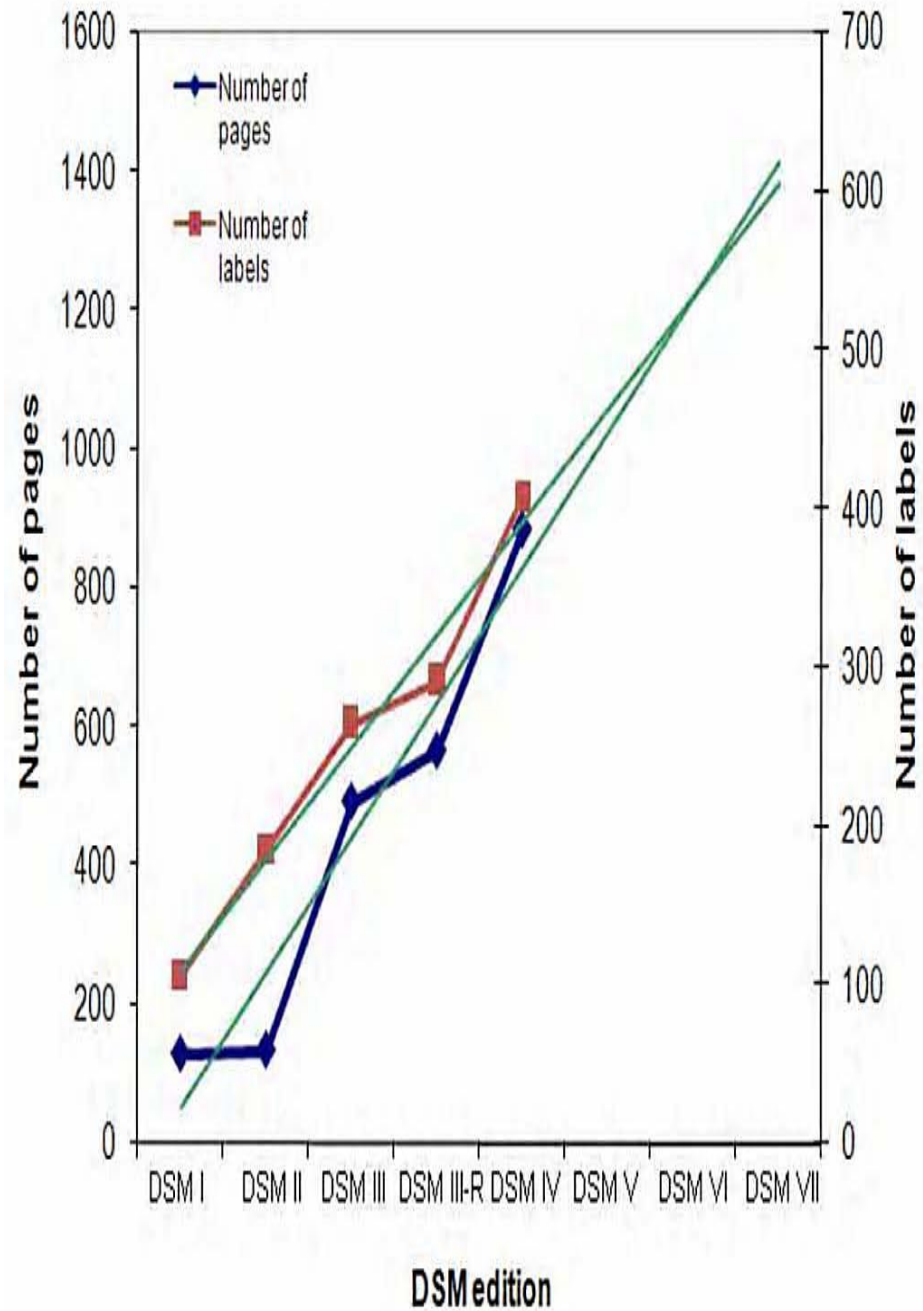
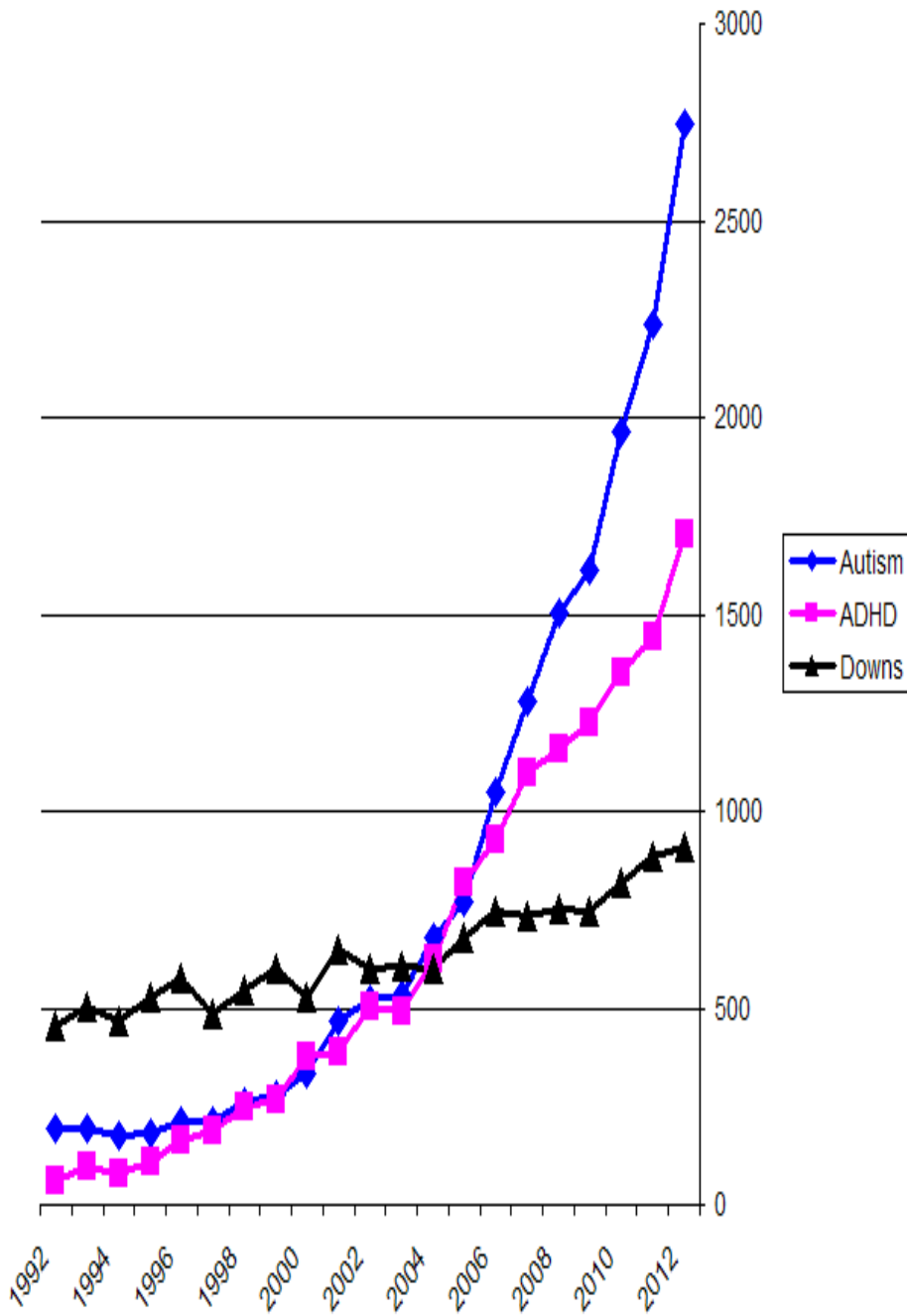


## Current ADHD Market Growth is Primarily Driven by Adults









For ADHD diagnosis

Combined Type:  
at least 6 inattention  
symptoms

Inattentive Type:  
at least 6  
hyperactivity  
symptoms

Hyperactive-  
impulsive Type:  
at least 6 of each

## ATTENTION DEFICIT HYPERACTIVITY DISORDER

### Inattention

Fails to give attention to details or makes careless mistakes

Difficulty sustaining attention in tasks or fun activities

Does not listen when directly spoken to

Does not follow instructions and/or fails to finish work

Has difficulty organizing tasks or activities

Avoids or dislikes tasks requiring a sustained mental effort.

Looses things necessary for tasks or activities

Easily distracted

Forgetful in daily activities

### Hyperactivity-Impulsivity

Fidgets with hands or feet or squirms in seat.

Difficulty remaining seated for prolonged periods

Restless

Difficulty engaging in leisure activities quietly

Always 'on the go' as if 'driven by a motor'

Talks excessively

Blurts out answers before questions have been completed

Difficulty waiting turn

Interrupts or intrudes on others.

## Gender

Male (44 studies)  
Female (40 studies)



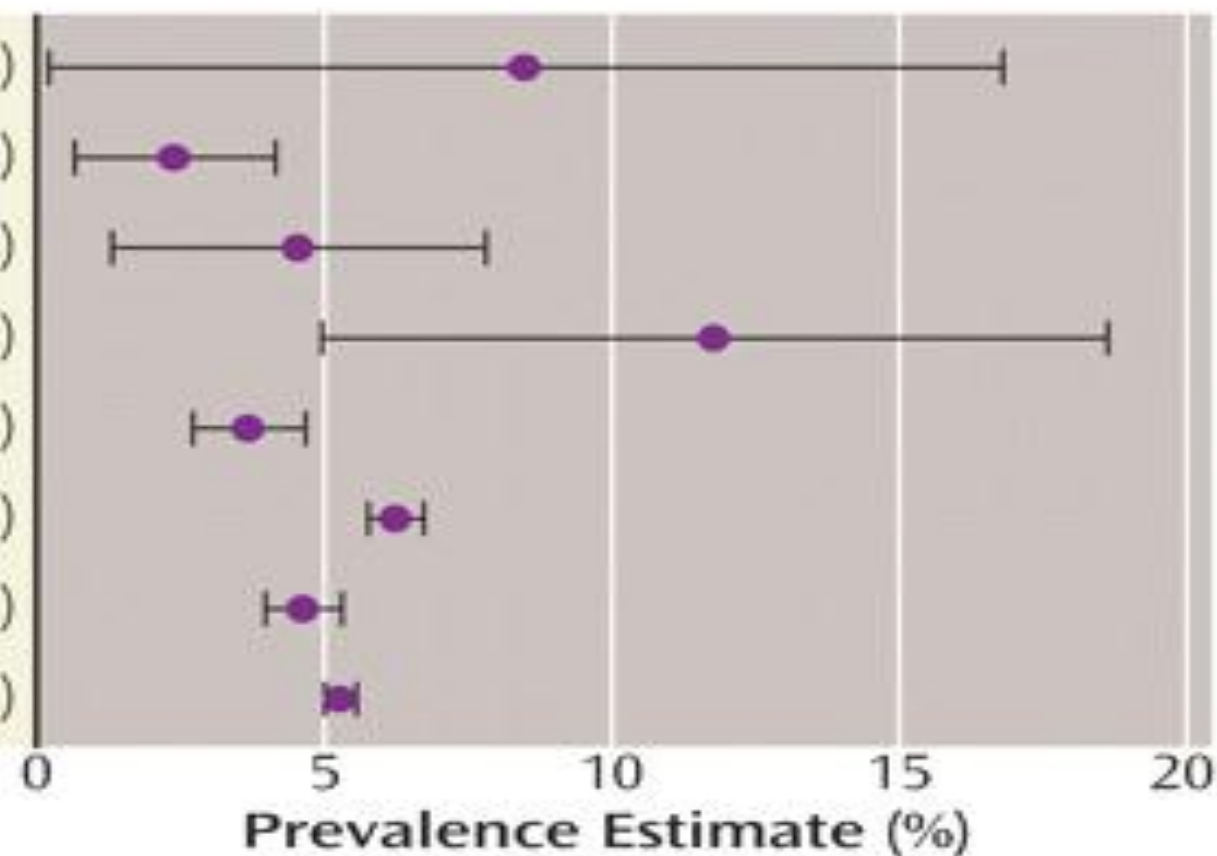
## Age

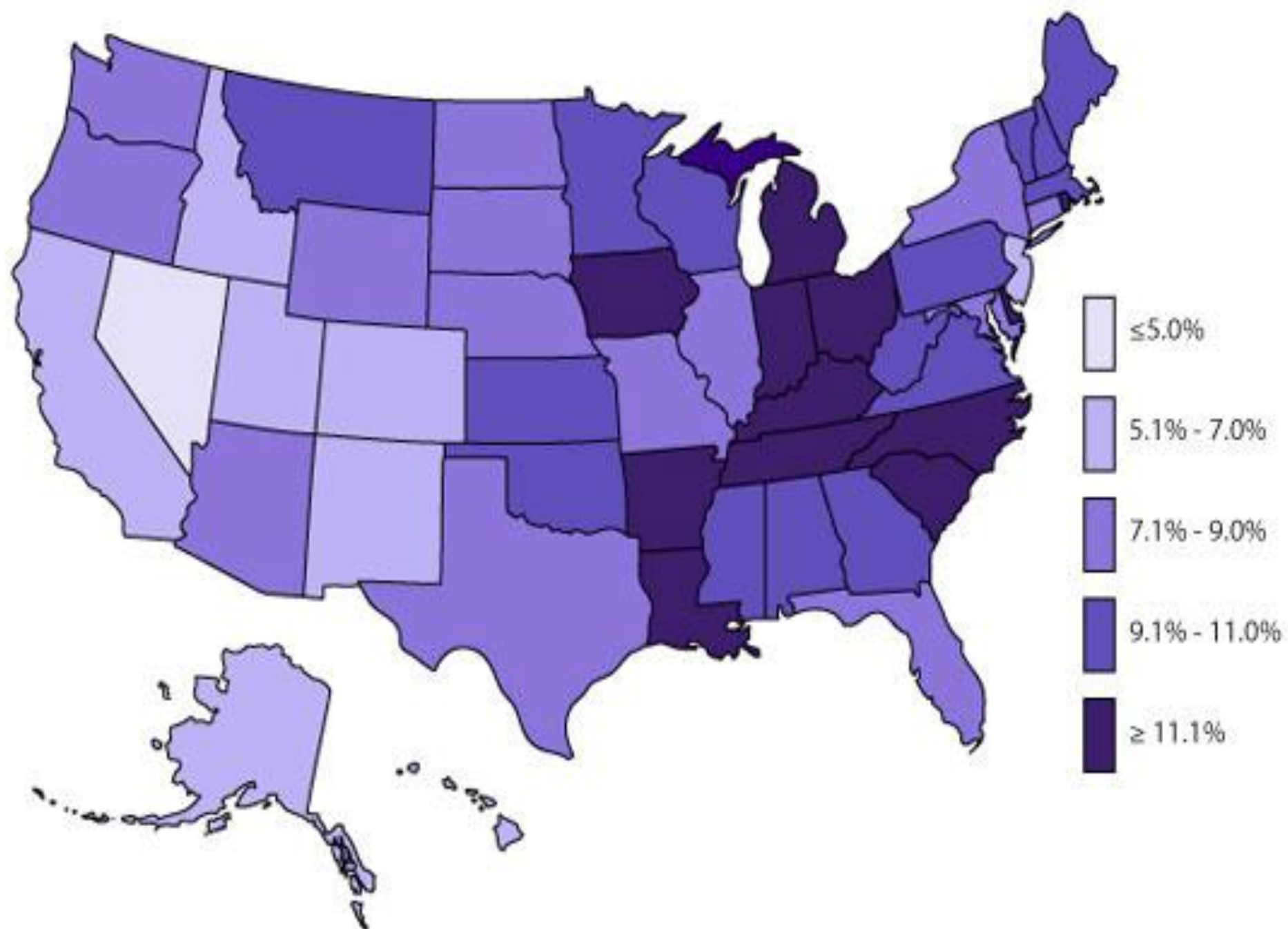
Children (43 studies)  
Adolescents (23 studies)



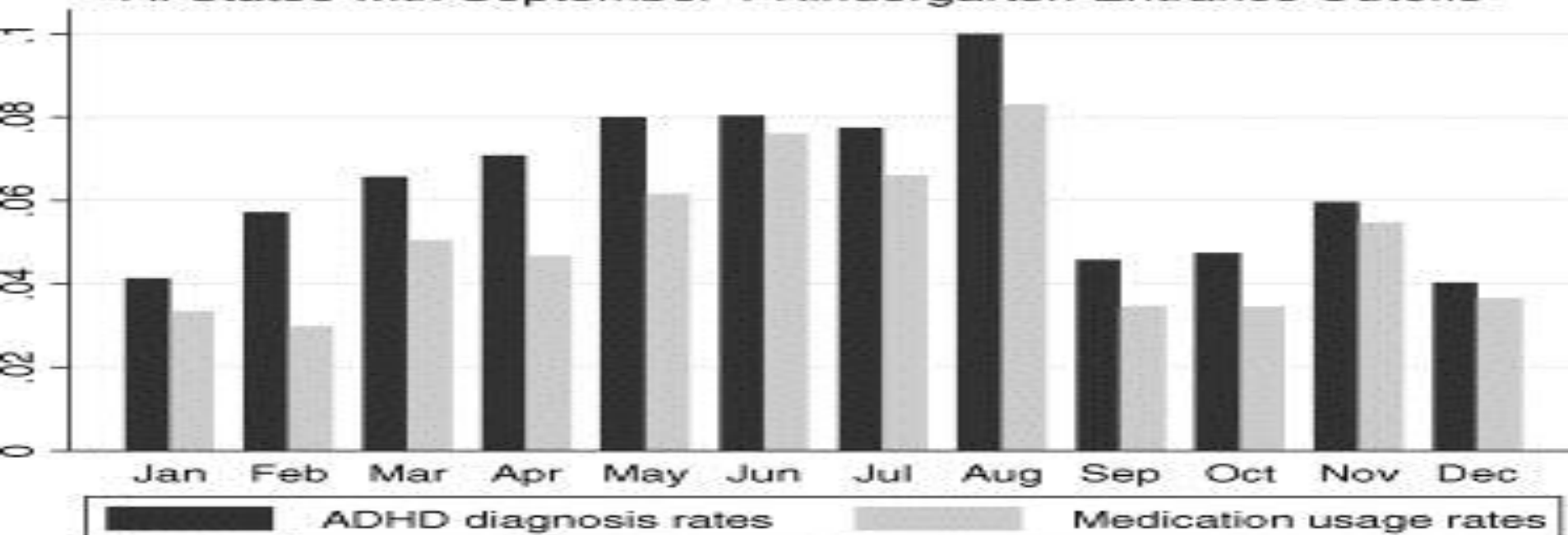
## Geographic Location

Africa (4 studies)  
Middle East (4 studies)  
Oceania (6 studies)  
South America (9 studies)  
Asia (15 studies)  
North America (32 studies)  
Europe (32 studies)  
Worldwide (102 studies)

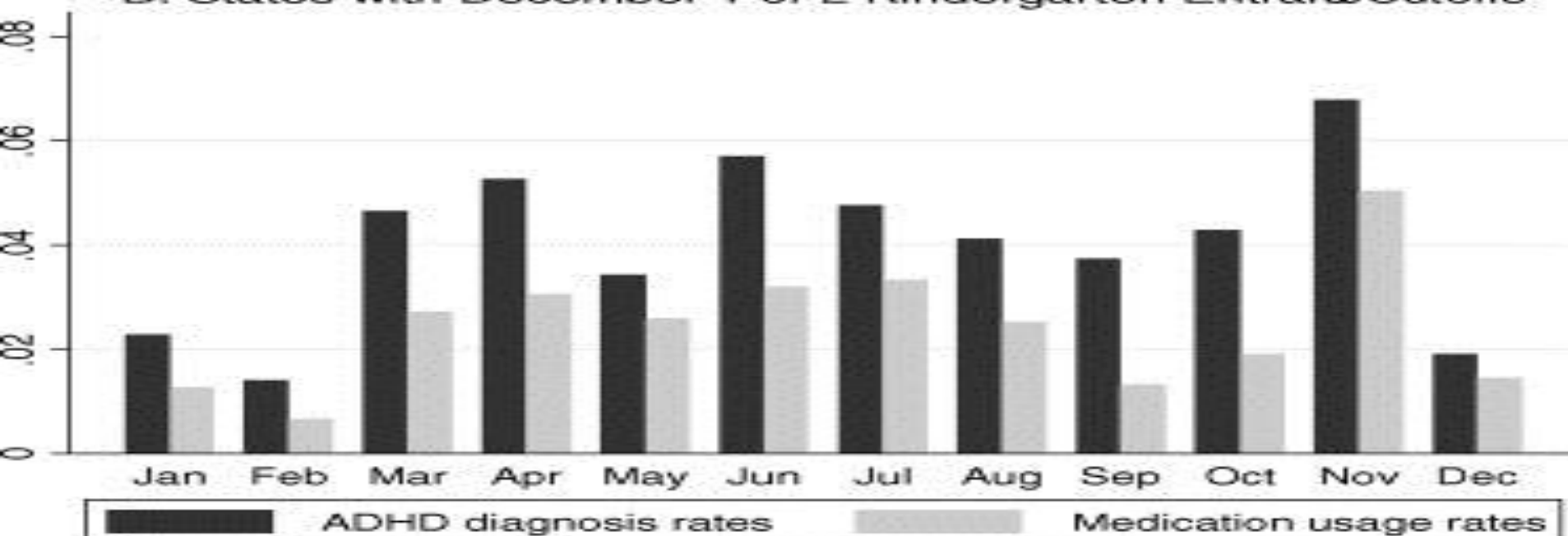


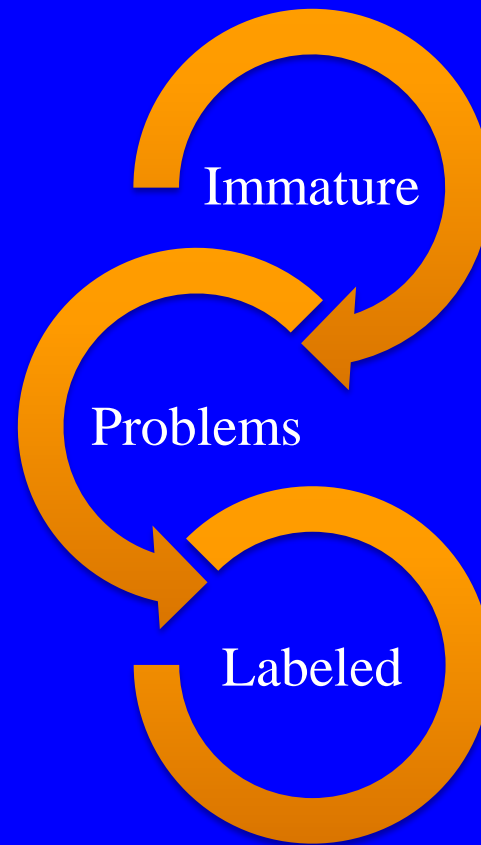


A: States with September 1 Kindergarten Entrance Cutoffs



B: States with December 1 or 2 Kindergarten Entrance Cutoffs





## **Bureaucratic Induced Disorders**

900,000 ADHD's misdiagnosed and treated in the US. ( Elder, 2010, Journal of Health Economics)





*So much easier  
than parenting.*

RITALIN

ILLUMIN SYSTEMS



# Frequency of ADHD Comorbidities

- Oppositional defiant disorder 40-60%
- Conduct disorder 25-35%
- Major depressive disorder 30 %
- Bipolar disorder 10 %
- Anxiety disorder 25 %
- Learning disabilities 20 %

# 33 year follow-up of ADHD's diagnosed at age 8

- Significantly worse  
Educational, Occupational, economic,  
and social outcomes.

Ongoing ADHD

Lifetime ASPD & SUD's

More Psychiatric hospitalizations

More Incarcerations , More Divorce

# Evidence of ADHD's relation to DA

- DA medication relatively effective
  - About 80% “ successfully “ treated
- Animal models of ADHD
  - Frontal lobe lesions of DA projections
    - Producing hyperactivity symptoms
    - Responds to stimulants
- Deficits in DA areas
  - Brain imaging studies: reduced volume in DA rich areas (striatum, frontal lobes)

# Evidence of ADHD's relation to DA

- DA transporter abnormalities
  - Increased DA transporter density in adults with ADHD
  - Results in DA not staying long in synaptic cleft
  - May be related to genetic marker 480 DT allele
    - 3-5 times more likely to have ADHD
- Genetic differences D4 & D2 receptor genes
  - DRD4 gene associated with ADHD
    - 7 repeat allele for this gene increases risk

## Instruments Used to Assess Externalizing Behavior (EB) and IQ

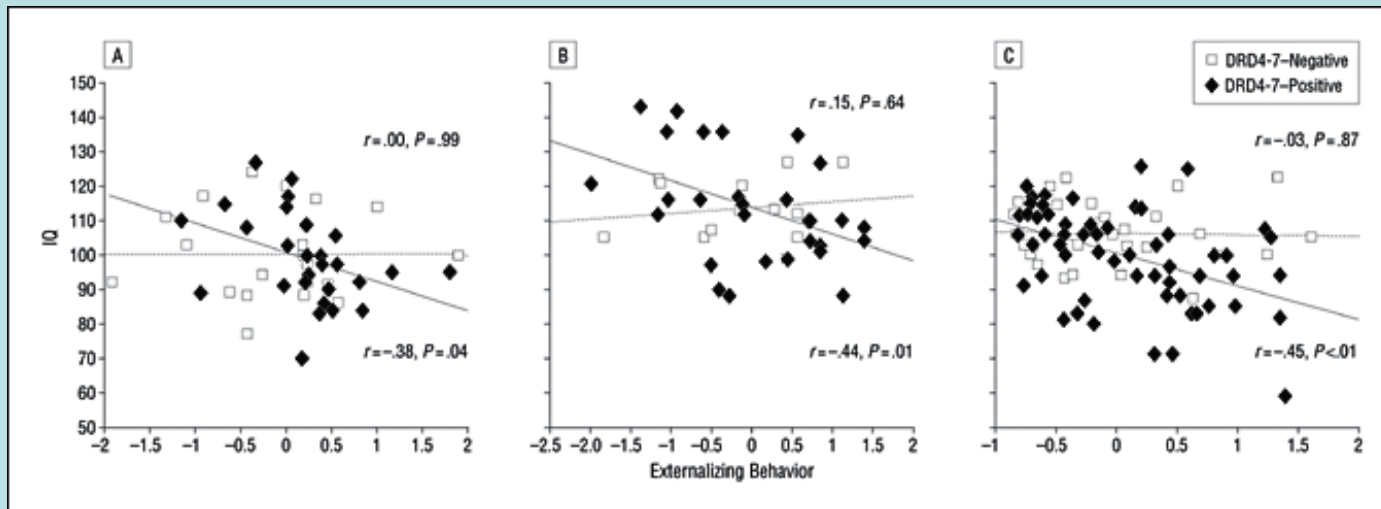
**Table 1. Instruments Used to Assess Externalizing Behavior (EB) and IQ**

Sample	Instrument
Sample 1	EB: Parent and teacher ratings of aggressive and delinquent behaviors on the Child Behavior Checklist and Teacher Report Form. <sup>41</sup> Parent ratings of child and adolescent indicators of psychopathy. <sup>42</sup> IQ: WISC-III or WPPSI-R <sup>43,44</sup> ; information and similarities subtests (24 participants); vocabulary and picture completion subtests (16); vocabulary (4); full-scale IQ from prior clinical testing (6).
Sample 2	EB: Spouse or mother ratings on 3 items: anger control, speech control, and impulsivity level ( $\alpha = .79$ ). IQ: Full-scale WAIS-III. <sup>45</sup>
Sample 3	EB: Teacher ratings on aggression, opposition, and hyperactivity scales at age 6 y and yearly from age 10 to 14 y. <sup>1,7,39,40</sup> IQ: WISC-R Vocabulary and Block Design subtests <sup>46</sup> ; yearly from age 9 to 12 y and at age 15 y; mean number of IQ assessments, 2.47 (SD = 1.67). <sup>40,47</sup>

Abbreviations: WAIS-III, Wechsler Adult Intelligence Scale, Third Edition; WISC-III, Wechsler Intelligence Scale for Children, Third Edition; WISC-R, Wechsler Intelligence Scale for Children—Revised; WPPSI-R, Wechsler Preschool and Primary Scale of Intelligence—Revised.

DeYoung, C. G. et al. Arch Gen Psychiatry 2006;63:1410-1416.

## Association between externalizing behavior (standardized within each sample) and IQ in 3 male samples, as a function of dopamine D4 receptor 7-repeat allele (DRD4-7) status



DeYoung, C. G. et al. Arch Gen Psychiatry 2006;63:1410-1416.

DRAFT RESEARCH DOMAIN CRITERIA MATRIX						
	-----			UNITS OF ANALYSIS		-----
	Genes	Molecules	Cells	Circuits	Behavior	Self-Reports
<b>Negative Affect</b>						
Fear/extinction						
Stress/Distress						
Aggression						
<b>Positive Affect</b>						
Reward Seeking						
Reward/Habit Learning						
<b>Cognition</b>						
Attention						
Perception						
Working Memory						
Declarative memory						
Language behavior						
Cognitive (effortful) control						
<b>Social Processes</b>						
Imitation, theory of mind						
Social dominance						
Facial expression identification						
Attachment/separation fear						
Self-representation areas						
<b>Arousal/Regulatory Processes</b>						
Arousal & regulation (multiple)						
Resting state activity						


# Measuring Impulsivity

- Sharma, Markon & Clark (2014)
  - 15 Behavioral Tasks, 4 factors  
Inattention, Inhibition, Decision Making, & Shifting.
  - 14 Self- Report Measures, 3 Factors  
Neuroticism, Disinhibition, Extraversion
  - Low  $r$ 's between types of measures
  - Moderate  $r$ 's to life problems



# Relevant Quotes

- “ Names are bestowed not found “
- “ Nosology necessarily precedes etiology”
- “ Before I build a wall, I would want to know what I was walling in and walling out”

A close-up photograph of a person's hands holding a small, white rectangular piece of paper. The paper has the text "That wasn't chicken" printed on it in a black, sans-serif font. The hands are positioned over a red surface, possibly a tablecloth. In the background, there is a white plate with a colorful border, containing some food and a pair of chopsticks. The lighting is warm and focused on the hands and the paper.

That wasn't chicken