

ADHD: Life Course Outcomes and Treatment Implications

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Sources:

Barkley, R. A. (2006). *Attention deficit hyperactivity disorder: a handbook for diagnosis and treatment* (3rd ed.). New York: Guilford.

Barkley R. A., Murphy, K. R., & Fischer, M. (2008). *ADHD in Adults: What the Science Says*.
New York: Guilford

Objectives

- Summarize the results of research on the outcomes of children diagnosed with ADHD in various domains of major life activities and health outcomes by adulthood
- Present new findings from the age 27 (23-32 yr) outcome of the Milwaukee follow-up study
- Discuss implications of impaired major life activities for treatment planning
- Highlight issues that remain to be more thoroughly investigated in future studies of health and mental health outcomes in ADHD

Qualifying Issues

- Results reflect only what is known about the ADHD-Combined (and Hyperactive) Subtypes; Inattentive subtype (SCT) remains to be studied for mental health outcomes in any follow-up studies
- May not represent girls with ADHD adequately given their under-representation in most adult follow-up studies
- May not represent middle age groups and older stages of the disorder (>35 years)
- Does not do justice to some important disparities between hyperactive kids followed to adulthood and adults with ADHD who are clinic (self) referred at adulthood.

Childhood Physical/Medical Risks

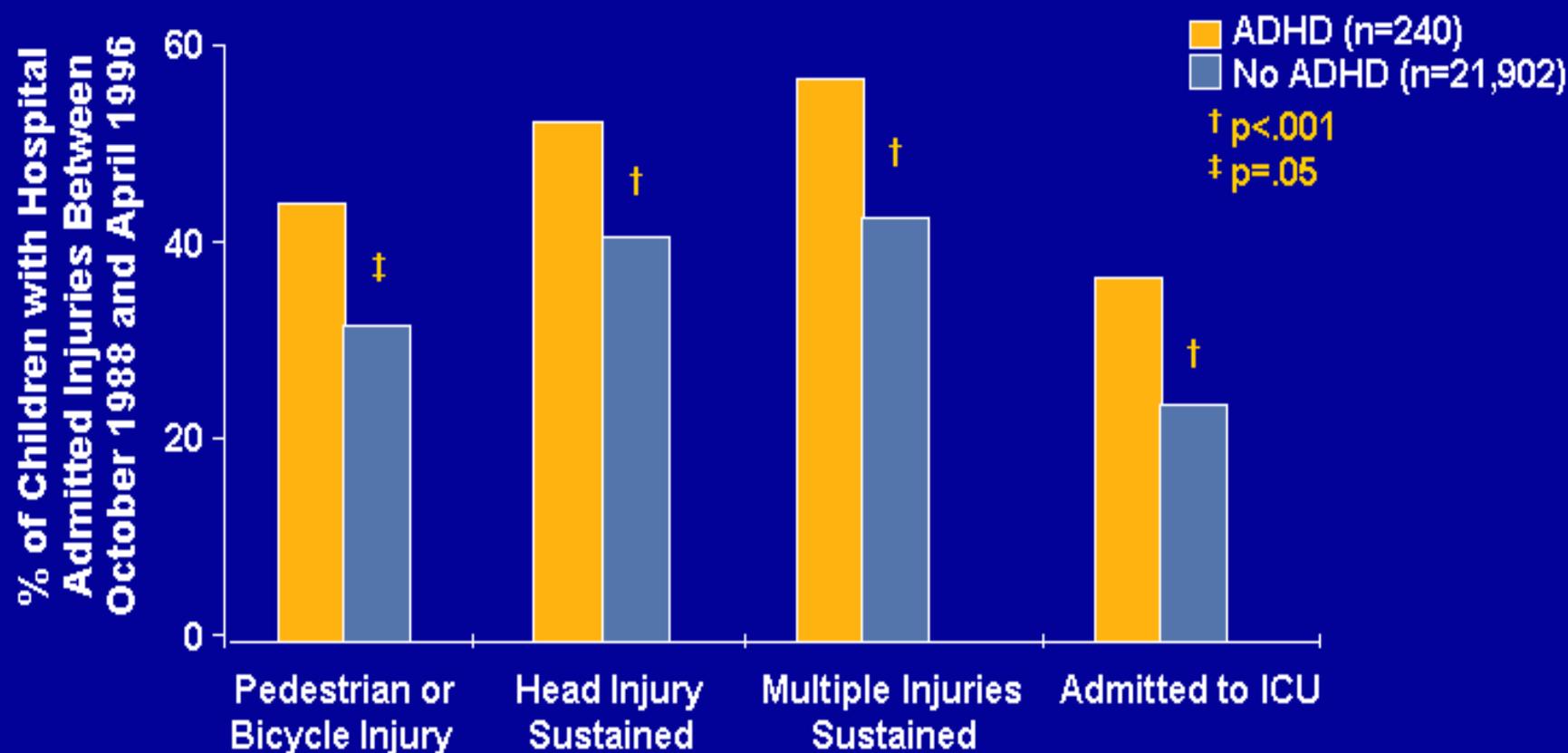
- Seizures – 2.5x increase in risk
- Sleep problems (39-56%); mainly delayed onset and greater night waking leading to shorter sleep time
- Developmental Coordination Disorder (50+%)
 - Deficient movement skills relative to peers*
- Reduced Physical Fitness, Strength, & Stamina (using physical fitness tests)
- Poorer oral health practices including lower likelihood of dental brushing each evening, more dental visit behavior problems, and more dental decay at age 11 (but not at 13)
- Accident Proneness 57%+
 - 1.5 to 4x risk of injuries (greater in ODD)
 - 3x risk for accidental poisonings
 - Why? Impulsive, risk-taking, less coordinated, more oppositional, and less parental monitoring
- 2-3 times the medical costs of normal children or those with non-ADHD behavior problems (also greater maternal medical and job-related costs – sick days, absenteeism, etc.)**

*Hervey, W. J. et al. (2007). Fundamental movement skills and children with attention-deficit hyperactivity disorder: peer comparisons and stimulant effects. *Journal of Abnormal Child Psychology*, 35, 871-882.

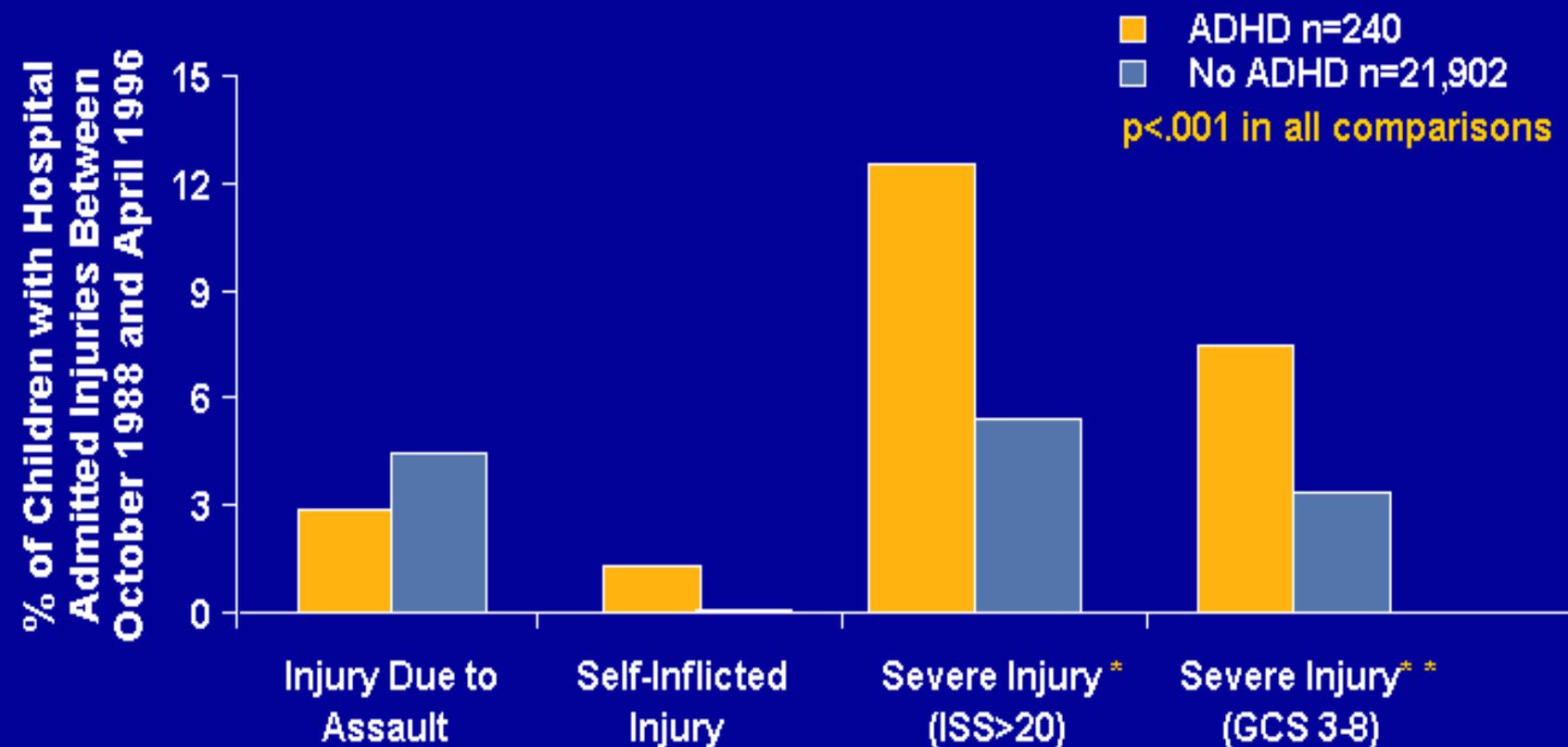
**Haackart-van Roijen, L. et al. (2007). *European Child & Adolescent Psychiatry*, 16, 316-326

**Leibson, C. et al. (2001). *Journal of the American Medical Association*, 285, 60-66.

Untreated ADHD Increases Risk of Injuries in Children



Untreated ADHD Increases Risk of Injuries in Children (cont.)

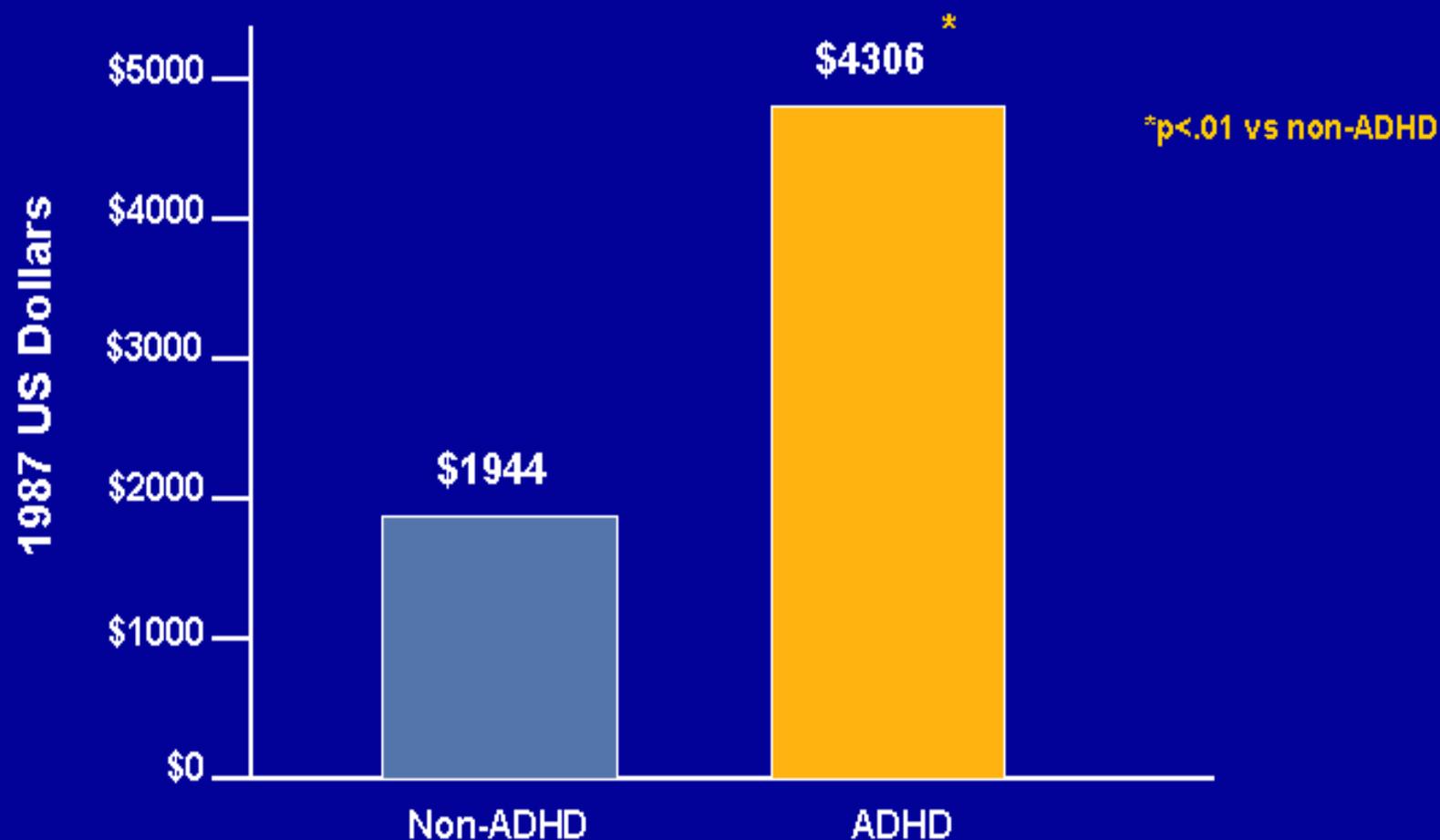


*ISS = Injury Severity Score

**GCS = Glasgow Coma Scale

ADHD: Cost of Medical Care

9-year Median Cost Per Person



Childhood Developmental Risks

- **Greater Risk for Language Disorders**
 - Expressive: 10-54% Pragmatic deficits in 60%
 - Excessive speech, reduced fluency, less logical, coherent, & organized
 - Delayed internalization of language
 - Reduce capacity for rule-governed behavior
- **Low Average Intelligence (7-10 point deficit)**
 - An apparent failure to keep pace with peers but could also result from poor executive functioning that partly affects IQ
- **More Adaptive Disability – 1 to 2 SD difference between IQ and adaptive functioning (self-sufficiency), particularly in communication and socialization domains**

Childhood Academic Impairments

- **Poor School Performance (90%+)**
 - reduced productivity is greatest problem
 - accuracy is only mildly below normal (85%)
- **Low Academic Achievement (10-15 pt. deficit)**
 - May be deficient even in preschool readiness skills
- **Learning Disabilities (24-70%)**
 - Reading (8-39%); (effect size (ES) = 0.64)
 - Spelling (12-30%) (ES = 0.87)
 - Math (12-27%) (ES = 0.89)
 - Handwriting (60%+)
 - Reading, viewing, & listening comprehension deficits
 - Likely due to impact of ADHD on working memory

Social Impairments

- Increased parent-child conflict & stress
 - Greater parental commands, hostility, reduced responsiveness, more lax yet harsh discipline
 - More child noncompliance, hostility, disruption
 - Poorer sense of competence in parental role
 - Greater parenting stress and maternal depression
 - Especially problematic for ODD/CD subgroup
- Peer Relationship Problems (50-70%+)
 - Less sharing, cooperation, turn-taking
 - Intrusive, angry; reduced empathy and guilt
 - Most serious in ODD/CD subgroup
 - More likely to be bullied and to be bullies in childhood
 - More likely to be beaten up, mugged, or assaulted with a weapon by young adulthood

Comorbid DSM-IV Disorders

- Oppositional Defiant Disorder (40-84%; M = 55%)
- Conduct Disorder (15-56%; Mean = 45%)
- Anxiety Disorders (20-35%; odds = 3.0)
- Major Depression (25-35%; odds = 5.5)
- No elevated rates of PTSD except in comorbid ODD and especially Bipolar cases (22-24%)
- Bipolar Disorder (0-27%; likely 6-10% max.)
 - Not documented as elevated in any follow-up studies to date (2-3% in MKE study)
 - A one-way comorbidity? (80-97% BPDs have ADHD but only 2-3% of ADHD cases have BPD)

Milwaukee Study Methods

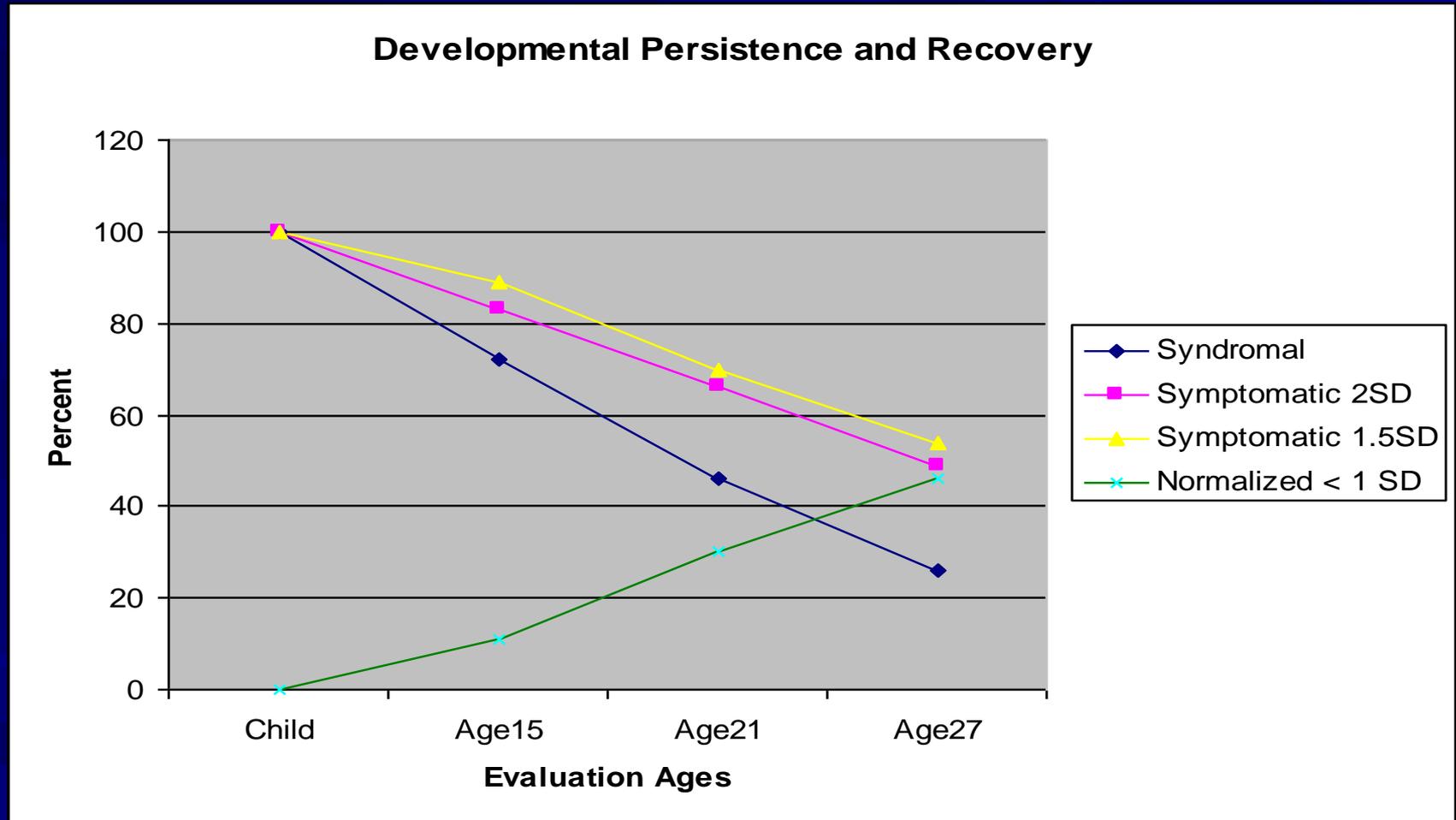
- 158 children ages 4-11 years diagnosed as hyperactive child syndrome in 1978-1980
 - Had significant symptoms of inattention, impulsiveness, and hyperactivity as reported by parents
 - Were +2SDs on Conners Hyperactivity Index & Werry-Weiss-Peters Activity Rating Scale, and +1SD (6 or more settings) on Home Situations Questionnaire
 - Onset of symptoms by 6 years of age
 - Excluded children with autism, psychosis, deafness, blindness, epilepsy, significant brain damage, etc.
- 81 control children from same schools and neighborhoods matched on age and obtained via a “snowball” sampling procedure
- Most children re-evaluated at mean ages of 15 (C=78% & H=81%), 21 (C=93 & H=90%), and now 27 years (C=93% & H=85%).
- To be currently ADHD (H+ADHD), participants had to have 4+ symptoms on either DSM-IV symptom list and 1+ domains of impairment (out of 8) by self report (N=55). Remainder (N=80) were grouped as H-ADHD.
- Groups were 83-94% males

Persistence of Disorder

- Into adolescence: (by parent reports)
 - 50% persistence (1970-80s) using clinical symptoms
 - 70-80% persistence (1990s onward) using DSM
- Young Adulthood (Mean Age 21) (Barkley et al. 2002)
 - Depends on whom you ask (self vs. parents):
 - 3-8% Full disorder (self-report using DSM3R)
 - 46% Full disorder (parent reports using DSM3R)
 - Depends on what diagnostic criteria you use:
 - 12% - Using 98th percentile (+ 2SDs; self-report)
 - 66% - Using 98th percentile (parent report)
 - 85-90% remain functionally impaired
 - Who to believe? Parent reports have greater veracity – they correlate more highly with various domains of major life activities than do self reports
- What Happens By Adulthood (Mean age 27 yrs.)???

Developmental Persistence and Recovery

(parent and parent/other reports; MKE Study)



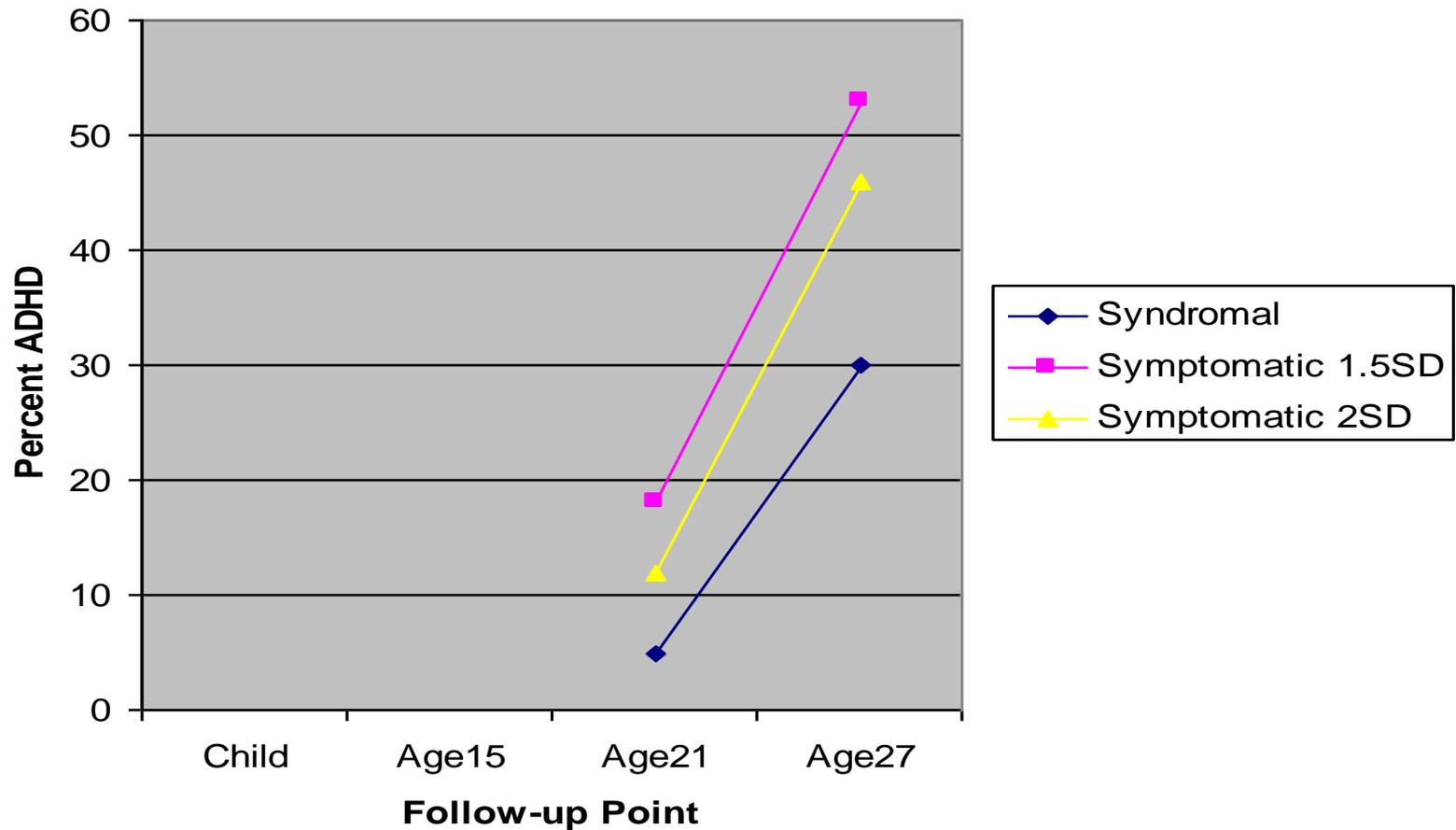
ADHD Across Development

(Based on parent/other reports)

	Childhood	Age 15	Age 21	Age 27
Syndromal	100	72	46	26
+2 SDs 98 th %	100	83	66	49
+1.5 SDs 93 rd %	100	89	70	54
Normal <84 th % (+1 imprt)	0 (0)	11	30	46 (35)

Developmental Changes (self-reports; MKE Study)

Developmental Changes in ADHD (Self-Reports)



Are Their Predictors of Recovery?

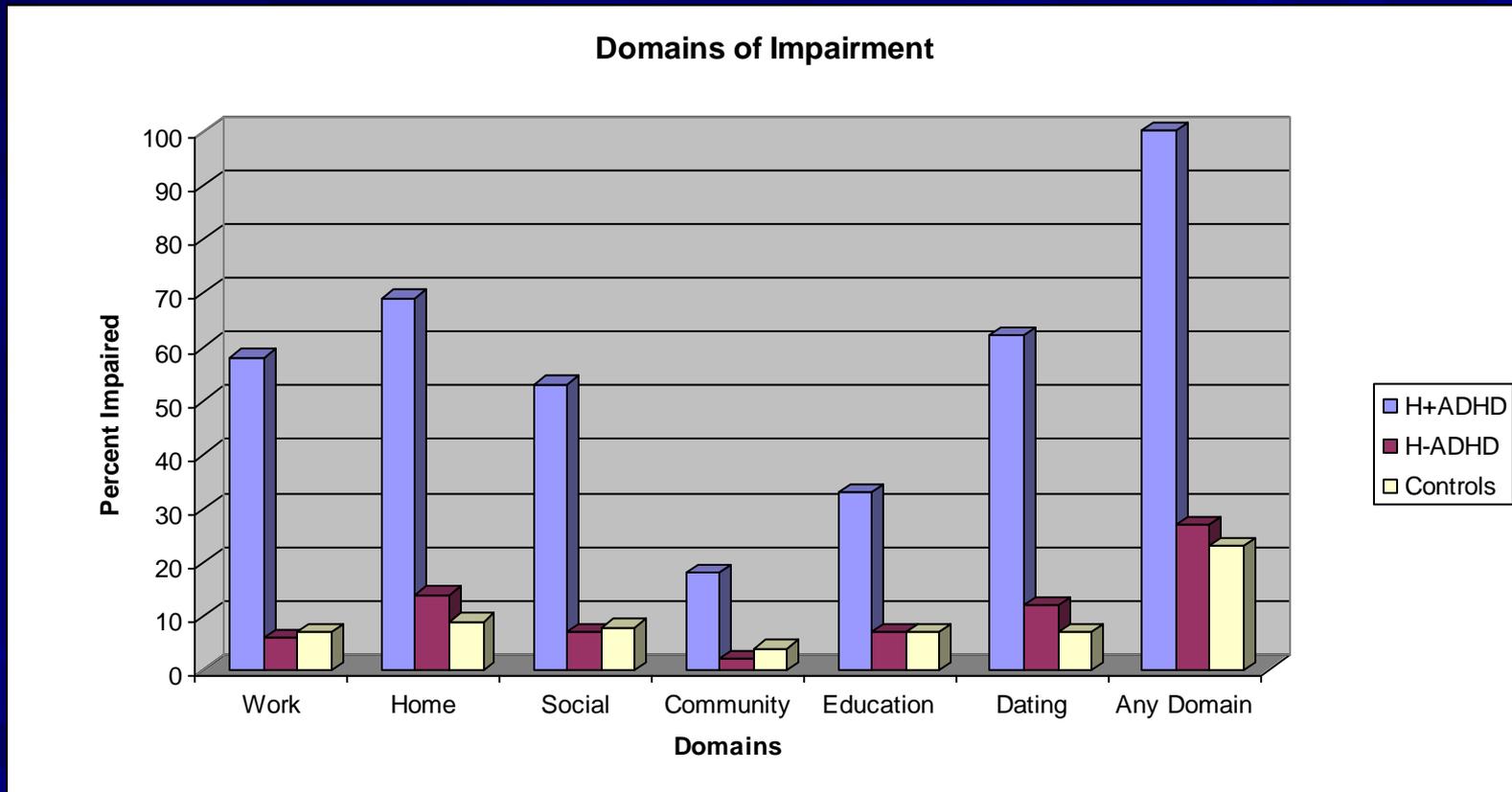
- Severity of ADHD symptoms at age 21
- Level of education
- Not significant were:
 - Childhood severity of ADHD; pervasiveness of behavioral problems, age of ADHD onset, or child IQ
 - Adolescent ADHD, ODD, or CD
 - Duration of stimulant treatment

What Have We Learned?

- From 1/6th to 1/3rd of children diagnosed with ADHD in childhood will recover or fall within the normal range in their symptoms and extent of impairment
- There is a growing self-awareness about ADHD symptoms between ages 21 and 27
- There is a growing convergence between self-reports and those of others about the severity of ADHD symptoms
- There are few reliable predictors of recovery and those found are rather modest in predictive power
- Medication treatment duration in childhood was not related to likelihood of recovery

Domains of Impairment

(self-reported by interview at age 27 follow-up; MKE Study)



H+ADHD = Hyperactive as a child and still ADHD at adult outcome (4+ symptoms and 1+ impairments);

H-ADHD = Hyperactive as a child but is not diagnosable as ADHD at adult outcome;

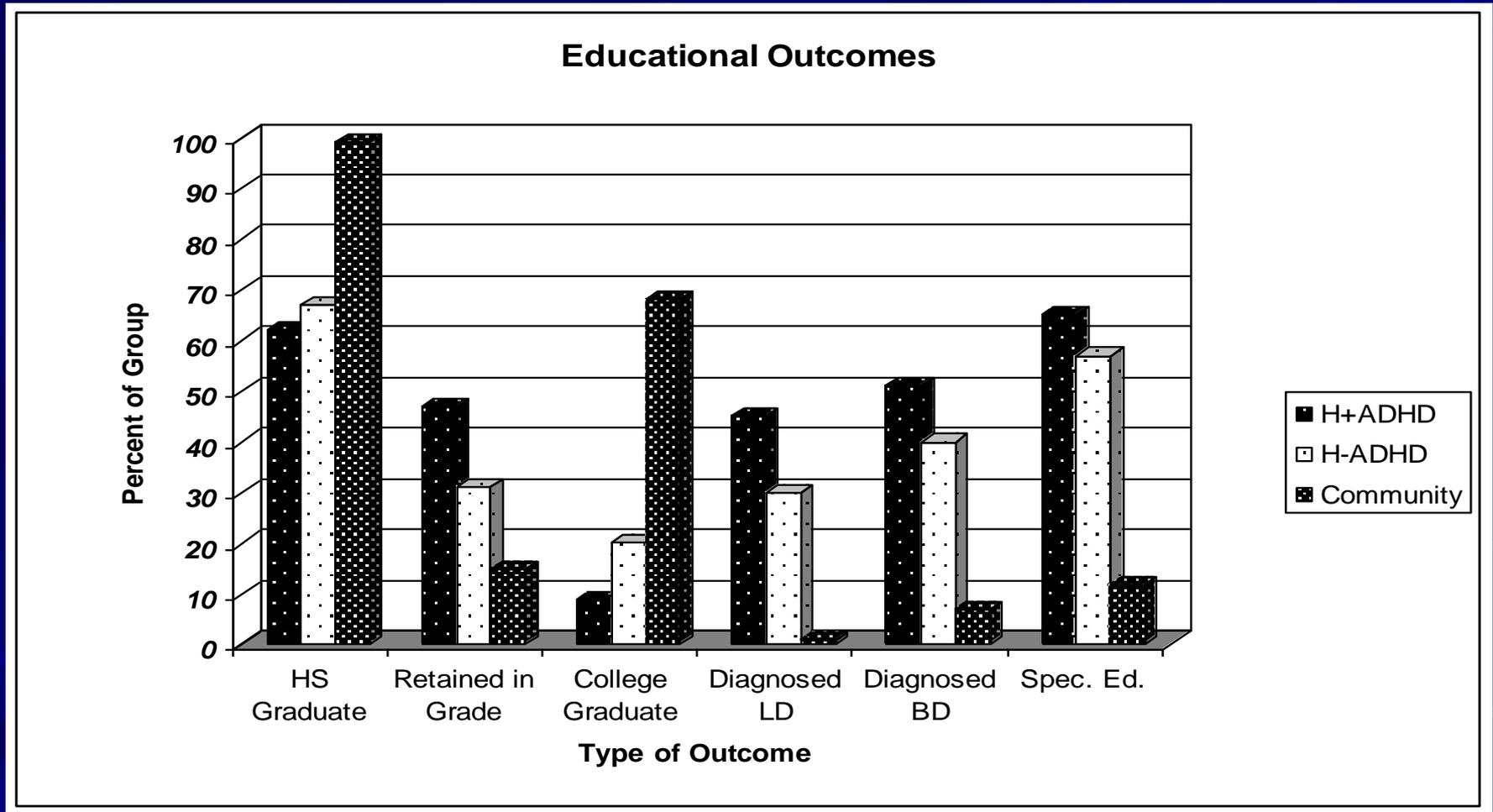
Controls = Community control group

Educational Outcomes

- More grade retention (20-45%; MKE: 42 vs. 13)
 - Pagani et al. (2001) & Hauser (2007) show retention is harmful
- More placed in special educational (25-50%)
- More are suspended (40-60%; MKE: 60 vs. 19)
 - Reflects disciplinary action; more associated with CD
- Greater expulsion rate (10-18%; MKE: 14 vs. 6)
- Higher drop out rate (23-40%; MKE 32 vs 0)
- Lower academic achievement test scores
- Lower Class Ranking (MKE: 66% vs. 53%)
- Lower GPA (MKE: 1.8 vs. 2.4)
- Fewer enter college (MKE: 22 vs. 77%)
- Lower college graduation rate (5-10 vs. 35%)

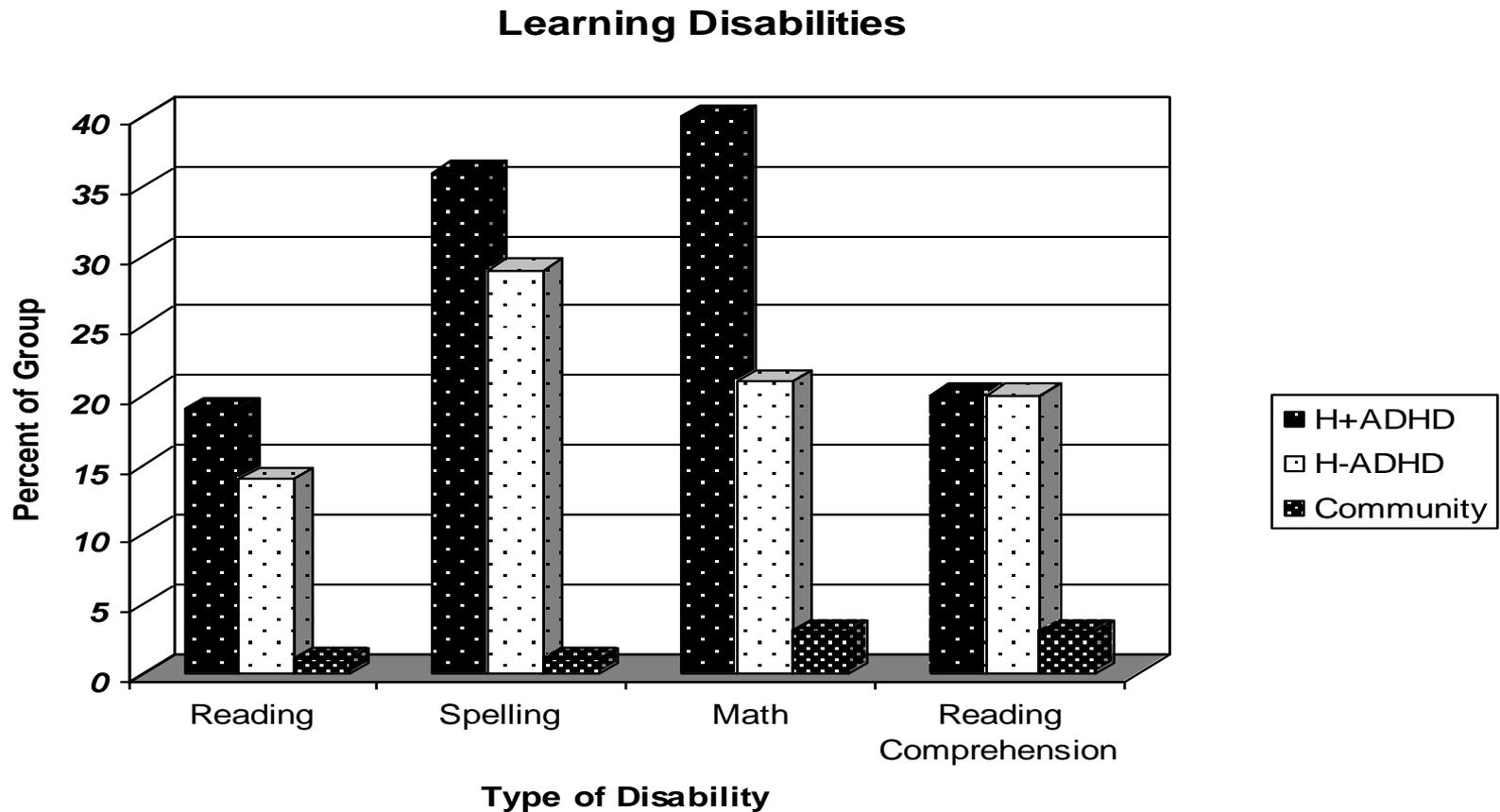
MKE = Milwaukee Young Adult Outcome Study

Educational Outcomes (age 27) (Milwaukee Study)



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Learning Disorders at Age 27 ($<14^{\text{th}}$ percentile; MKE Study)



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Implications for Treatment

■ Educational problems

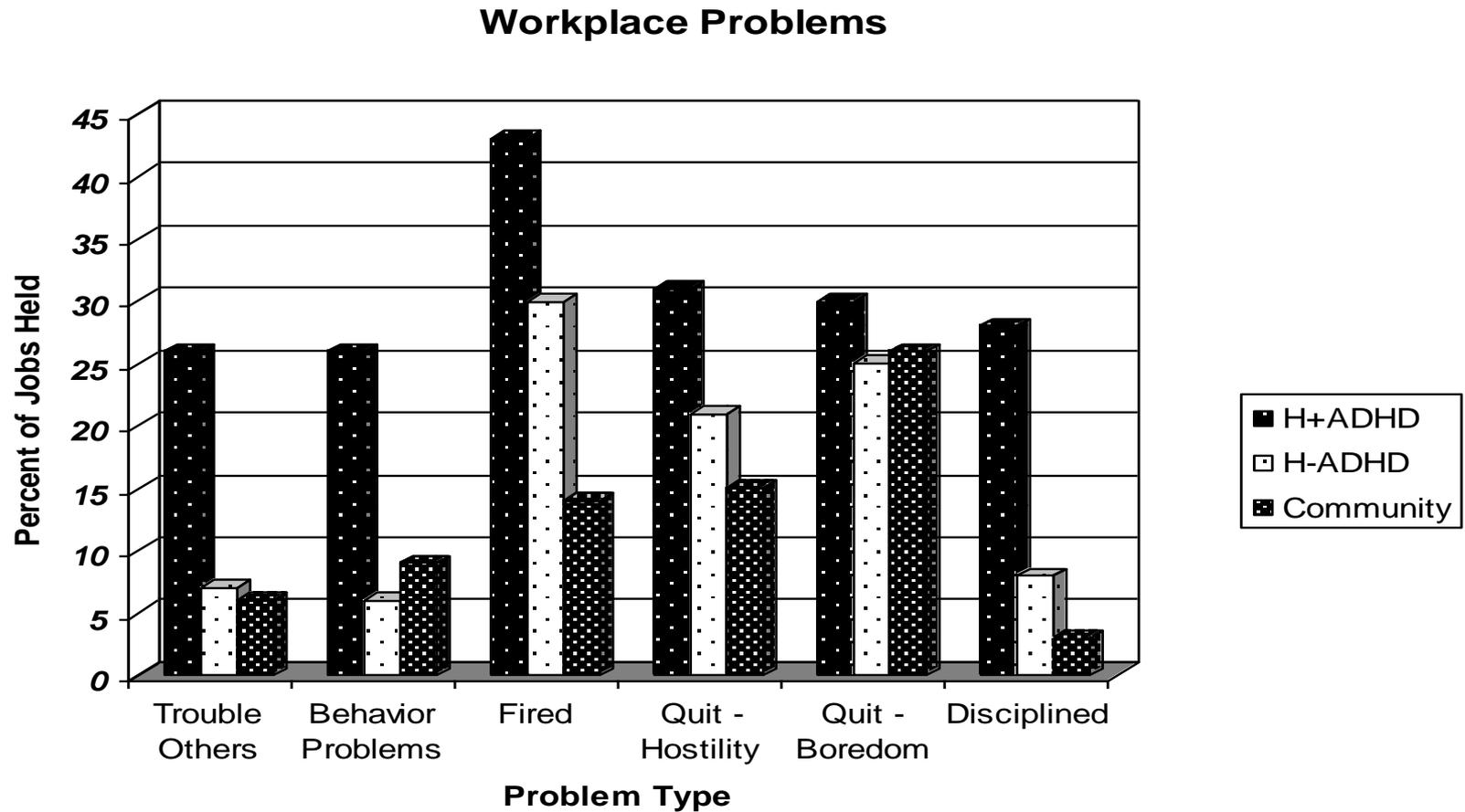
- Early screening and identification of ADHD cases at school entry
- Pre-referral assistance to regular classroom teachers on sound behavior management tactics
- Pre-referral curriculum adjustments
- If necessary, eventual referral for formal special educational services (IDEA, 504)
- Earlier and more sustained use of medication management as necessary; extended release delivery systems should be the standard of care
- Vocational assessment and job skills training during high school

Employment Problems

- Enter workforce at unskilled/semi-skilled level
- Greater periods of unemployment
 - at age 21 (22 vs. 7%)
 - At age 27 (25% currently ADHD, 9% for controls and no longer ADHDs)
- More likely to be dismissed or fired
 - 55 of ADHD cases vs. 23% of controls had been fired by age 27
 - Fired from 16% vs. 6% of all jobs held
- Change jobs more often
 - 2.6 vs. 1.4 times over 8-12 years since leaving high school
- More ADHD/ODD symptoms on the job
 - As rated by current supervisors
- Lower work performance ratings
 - As reported by current supervisors
- Lower job status rating and overall socio-economic status
- By 30s, 35% may be self-employed (NY Study by Mannuzza et al.)

Workplace Problems

(MKE - age 27)



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Treatment Implications

■ Employment problems:

- Vocational assessment for ADHD-friendly jobs
- Technical school rather than college?
 - If college, consider community colleges
- Military enlistment if not going on to college?
- Workplace adjustments when feasible
 - Similar to school behavior management tactics
- Medication management across longer periods
 - Extended release formulations; supplement with IR
- ADA accommodations and protections
 - Must declare and document ADHD (can backfire)

Motor Vehicle Driving Risks

- Poorer steering, slower braking reaction time
- Rated by self, others, and driving instructors as using fewer safe driving habits
- More likely to drive before legally licensed
- More accidents (and more at faults) (2-3x risk)
 - % with 2+ crashes: 40 vs. 6
 - % with 3+ crashes: 26 vs 9
- More citations (Speeding - mean 4-5 vs. 1-2)
- Worse accidents (\$4200-5000 vs \$1600-2200)
 - (% having a crash with injuries: 60 vs 17%)
- More Suspensions/Revocations (Mean 2.2 vs 0.7)
 - (% suspended: 22-24 vs. 4-5%)
- Greater adverse impact of alcohol on driving

Treatment Implications

■ Driving Impairments:

- Longer learner's permit period
- Graduated licensing approach
 - Daytime with adults, night-time with adults, alone, with peers, full independence (3 months, gradual)
- No (!) cell phone use/text messaging while driving
- Greater supervision of vehicle use
 - Charting, random spot checking on destinations, critical incident cameras in vehicle (DriveCam Inc., San Diego, CA), or GPS car monitoring devices (MobileTeen GPS, AIG Insurance Co.).
- Behavior contracting for safe and responsible driving
 - (*Barkley Safe Driving Program, Compact Clinicals, Kansas City, MO*; Maureen Synder's book on ADHD and driving, addwarehouse.com)
- Medication management
 - Extended release formulations with supplemental immediate release as needed
- Avoid alcohol use while driving

Psychiatric Disorders (by age 27)

- Current ODD (12%+ by self-report)
- Conduct Disorder (26%+ by self-report)
- Depression or Mood Disorders (27% age 21)
 - 9% H+ ADHD by age 27 vs. 5% H-ADHD, 3% controls
 - But 18% (H+ADHD) have depressive personality disorder at age 27 vs. 6% (H-ADHD)
- Suicidal ideation:
 - High school (33% of all ADHDs vs. 22% controls)
 - Post-high school (25% vs 9% controls)
- Suicide Attempts:
 - High school (16 vs. 3% controls)
 - Post-high school (6 vs 3% controls)

Psychiatric Disorders

- Anxiety Disorders (MKE)
 - 33% for H+ADHD vs. 11% for H-ADHD, 8% controls
- Eating disorders: 16% vs. 5% of girls (MGH Boston Study)*
 - Breakdown of disorders: 50% bulimia, 30% anorexia, and 20% mixed anorexia & bulimia
- Any Substance Use/Abuse Disorders (MKE)
 - 24% for H+ADHD vs. 16% for H-ADHD, 7% control
 - Alcohol Dependence (11 vs. 4 vs. 3%); Abuse (18 vs. 8 vs. 5%)
 - Alcohol, Tobacco and Marijuana used more frequently
 - Hard drug use related to CD & deviant peers
- Personality Disorders (H-ADHD vs. H+ADHD vs. Control)
 - Antisocial (28 vs. 15 vs. 3%)(H+ADHD, H-ADHD, Controls)
 - Passive Aggressive (33 vs. 19 vs. 3%)
 - Avoidant (18 vs. 5 vs. 3%)
 - Borderline (30 vs. 13 vs. 0%)
 - Paranoid (28 vs. 11 vs. 1%)

*Biederman et al. (2007). *Journal of Developmental and Behavioral Pediatrics*, 28, 302-307.

Antisocial Activities (age 21; Milwaukee Study)

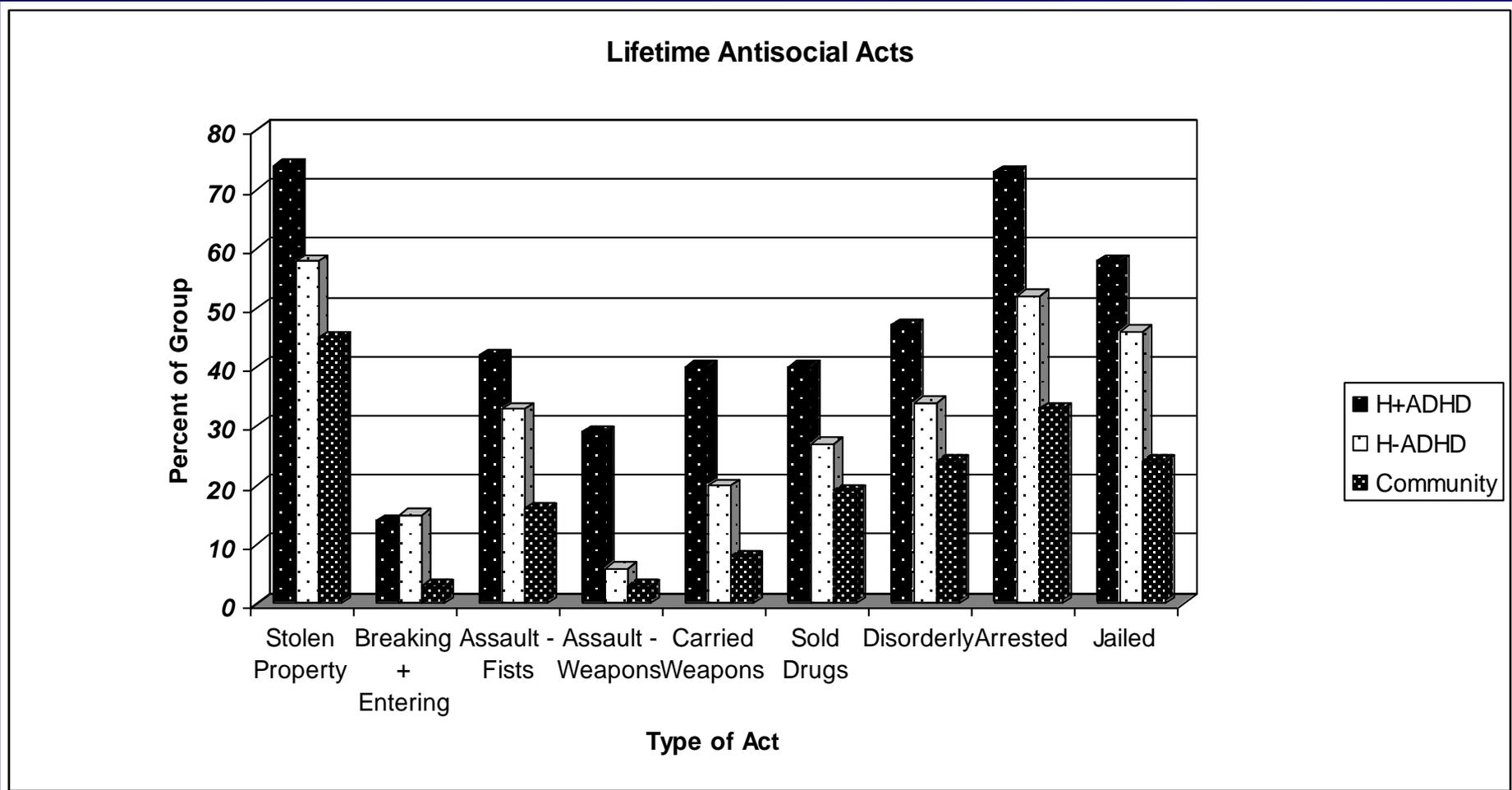
Self-reports for lifetime occurrences

Antisocial Activities	Hyper Mean	Control Mean	Hyper %	Control %
Stolen Property	18.6	5.1	85	64
Stolen Money	6.0	2.3	50	36
Disorderly Conduct	18.5	8.3	69	53
Assaulted with Fists	13.8	4.1	74	52
Assaulted with a Weapon	2.7	0.3	22	7
Carries Concealed Weapon	15.1	4.9	38	11
Illegal Drug Possession	234.5	130.6	51	42*
Illegal Drug Sales	14.3	4.5	24	20*
Breaking and Entering	2.1	0.5*	20	8
Sets Fires	0.4	0.1*	15	6
Runaway from home	3.9	2.0*	31	16

Dimensions of Antisocial Acts

- **Predatory:**
 - Mugs, fights, carries & uses weapons
 - Related chiefly to CD
- **Self-sufficiency:**
 - Runs away, steals money, prostitution
 - Associated with CD
- **Drug-related:**
 - Possesses, uses, & sells drugs; steals
 - Related to both CD and ADHD

Antisocial Activities (age 27)



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Judicial Costs of ADHD (by age 21)

- ADHD children followed to young adulthood are more than twice as likely to be arrested as control children (48% vs. 20%)
- Mean judicial costs have been estimated to be \$8,814 per ADHD person vs. \$341 per control. Regression modeling placed the total criminal costs at \$37,830 per ADHD person having CD.

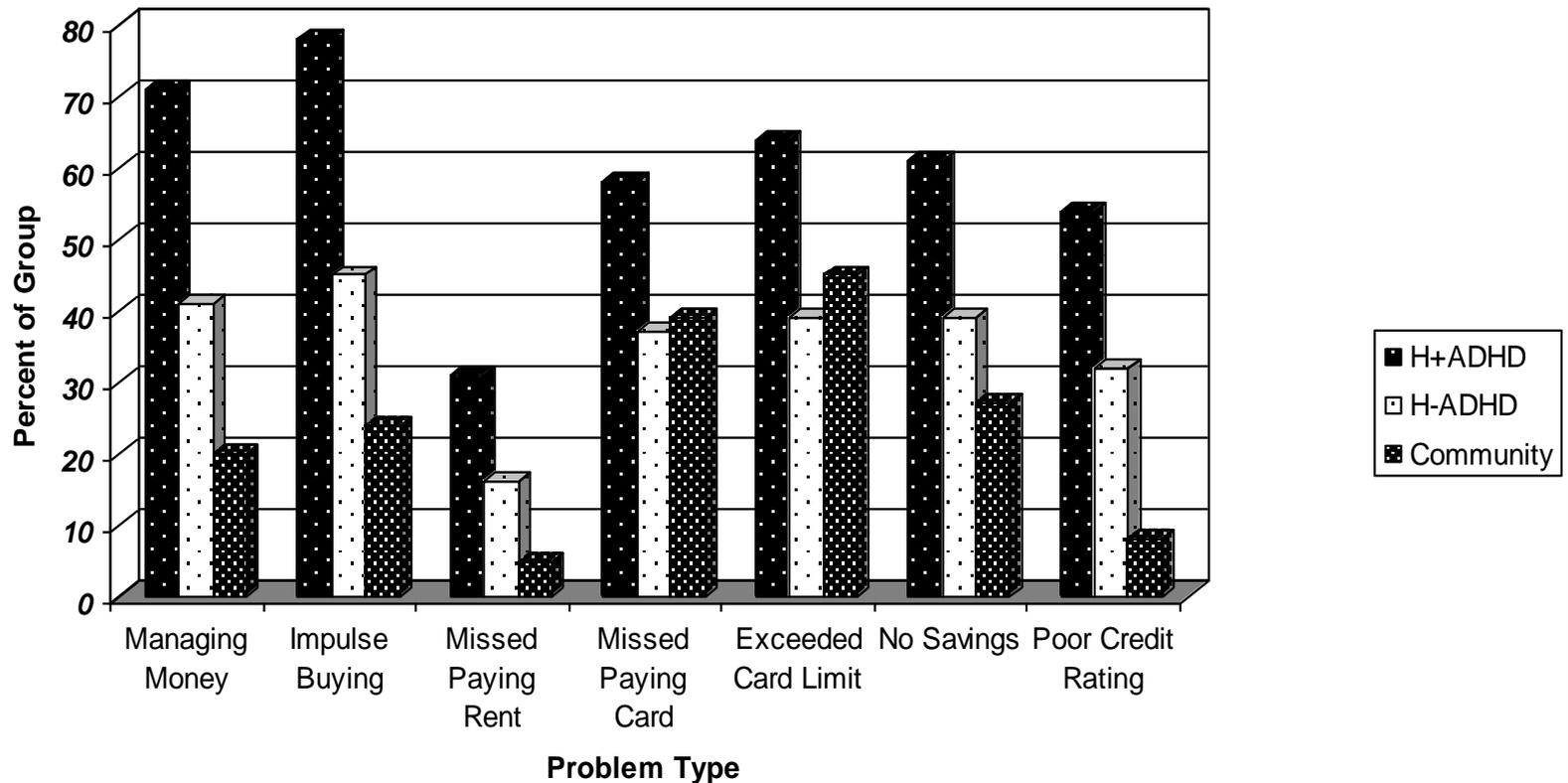
Data from the Milwaukee follow-up study as reported in the paper by Secnik, Swensen, Buesching, Barkley, Fischer, & Fletcher (submitted for publication).

Social & Lifestyle

- Fewer close friends; shorter duration of relations
- Rated by parents as more socially impaired
- Lower levels of marital satisfaction by both proband and partner
- Greater parenting stress in parental role
- Differences in leisure time use:
 - Spend more time talking on phone, watching TV and playing videogames, and socializing
 - Spend less time reading, getting adult education, and exercising

Money Problems (age 27; MKE)

Money Problem Areas



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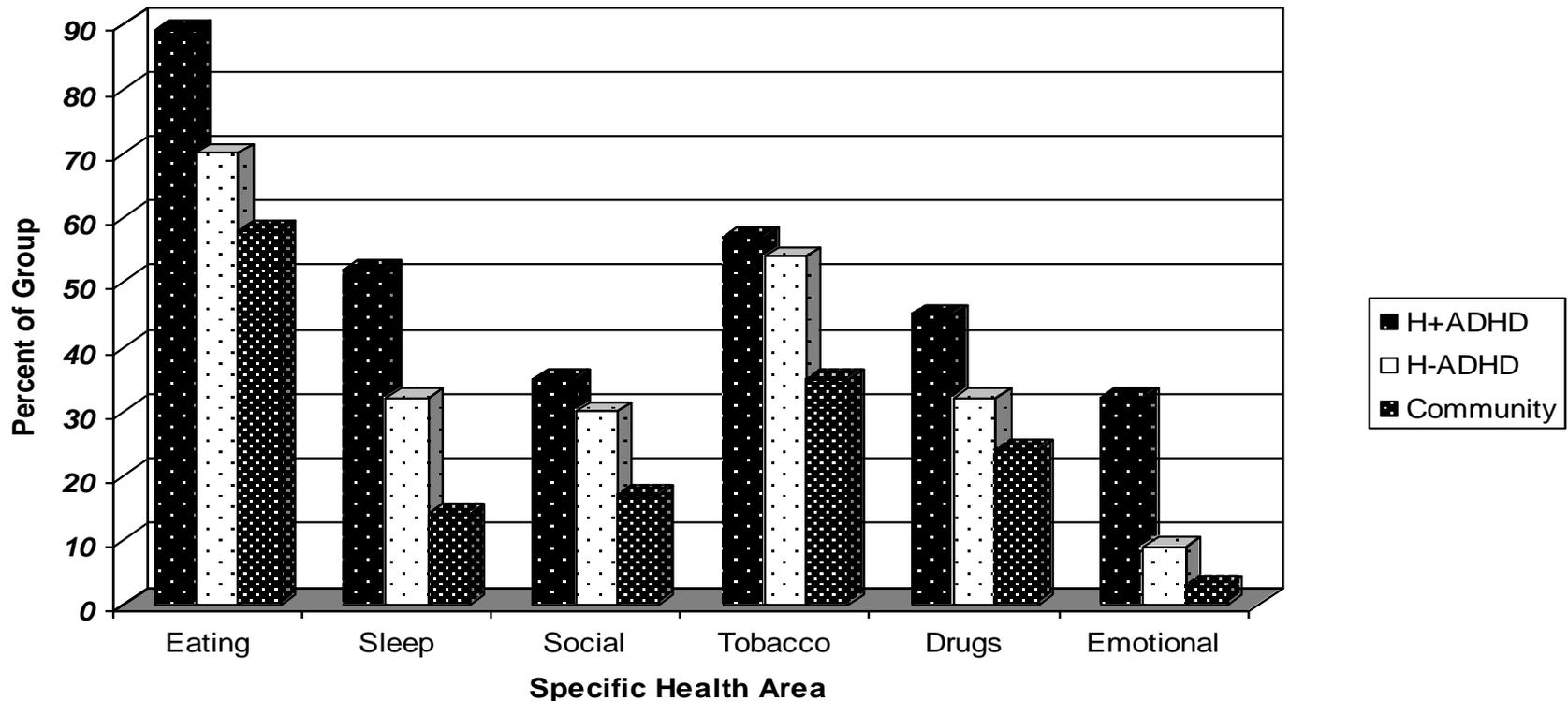
Sexual-Reproductive Risks

- No Higher Incidence of Sexual Disorders
- Begin Sexual Activity Earlier (15 vs 16 yrs.)
- More Lifetime Sexual Partners (13.6 vs. 5.4)
 - % having more than 4 partners by early adulthood 60 vs. 28%
- More Partners in Prior Year (2.4 vs. 1.6)
- Less Time with Each Partner
- More casual sex (outside relationships)(37 vs. 19%)
- Less Likely to Employ Contraception
- Greater Teen Pregnancies (24-38 vs. 4-5%)
 - 32% males, 68% females
- Ratio for Number of Births by age 21(37:1)
 - 54% Do Not Have Custody of Offspring
- By age 27, 51% have children vs. 13% for controls
- Higher Risk for STDs (17 vs. 4%)
- Overall riskier sexual behavior

Health Risks and Concerns

Skinner Health and Lifestyle Interview – MKE Study

Health Concerns



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Medical and Health Concerns

- Greater risk for accidental injuries, nonsurgical hospitalizations, ER utilization, and driving accidents
- Greater medical and dental health problems
 - More sick days off from work
 - Greater workman's compensation claims
 - Poorer preventive dental care and more cavities as children
- Greater sleeping problems
- Higher frequency of vague medical complaints
 - Related to somatization and anxiety levels on SCL-90-R
- Greater likelihood of smoking and alcohol use and greater frequency of using these substances
- Growing risk of cardiovascular disease
 - Greater body mass index (higher percent obese)
 - Lower HDL cholesterol and higher Total/HDL ratio
 - Higher atherosclerotic risk to coronary arteries
 - Higher Framingham CHD risk percent over next 5 and 10 years
- Possibly greater risk for cancer
- Shortened life expectancy as a consequence ????

Treatment Implications

■ Risky sexual activities:

- Greater awareness of problems by primary care professionals
- Greater parental supervision of teen activities
- Formal sex education programs
- Discuss contraception with teens and parents
- Medication management to reduce impulsive conduct

■ Health and lifestyle problems:

- Increase regular exercise
- Increase preventive medical/dental care visits
- Assistance with managing legal substances
 - Smoking cessation, alcohol abuse treatments
- Referral for drug detox and rehab programs
- Openly discuss growing cardiovascular and cancer risks with age and need for more attention to health maintenance practices (diet, exercise)

How Adult Self-Referrals Differ From Kids Growing Up with ADHD

- Greater correspondence between self and other reports of symptoms and impairments
- More education, higher salaries, higher SES, lower rates of LDs, and higher IQs
- Less antisocial, less drug use, fewer arrests & jail
- More comorbid anxiety and depression
- Less likely to have personality disorders
- Equivalent neuropsychological profiles (EF tasks)
- Equivalent in impairments in risky sexual activities, dating and marriage, child-rearing, money management, driving, health care

Future Issues

- Determine if outcomes are different for the SCT type
- Further examine for sex differences
- Extend findings past age 35
- Determine occupational costs (e.g., sick days, absenteeism, accidents on job, etc.)
- Study accident rates at home and community
- Examine impact in more detail on child-rearing and marriages
- Further evaluate apparent risk for medical illnesses (cardiovascular disease, cancer, obesity, etc.)
- Assess impact on life expectancy (Friedman et al. found lowest 25% of impulsive children had average 7 year reduction in life expectancy)

Advising Families of Uncooperative Adults

- Cease moral interpretations of patient's behavior – acceptance of ADHD as a neuro-genetic disorder (frontal lobe syndrome) and patient as mentally ill
- Be a safety net (financial and otherwise)
 - Not enabling misconduct; instead you are keeping them from homelessness and worse
 - Health maintenance, medical & dental care
- Be ready to support them in constructive life activities (encouragement, therapy, medication, furthering education, job retraining, locating employment, drug detox., etc.)
- Avoid using your continued relationship to them as an ultimatum for change
- Stay involved in their lives – estrangement won't help them
 - you can't be a constructive influence if you have abandoned them

Conclusions

- ADHD is associated with numerous childhood and adult impairments in major life activities
- ADHD persists into adulthood in 65 to 86% of cases diagnosed in childhood
- ADHD is more impairing than most outpatient psychiatric disorders
- Interventions need to be started earlier, sustained longer across the day and across development, and target more domains than just education given the pervasive adverse impact of ADHD in other major life activities