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Costs and Benefits of ADHD:

An Economic View

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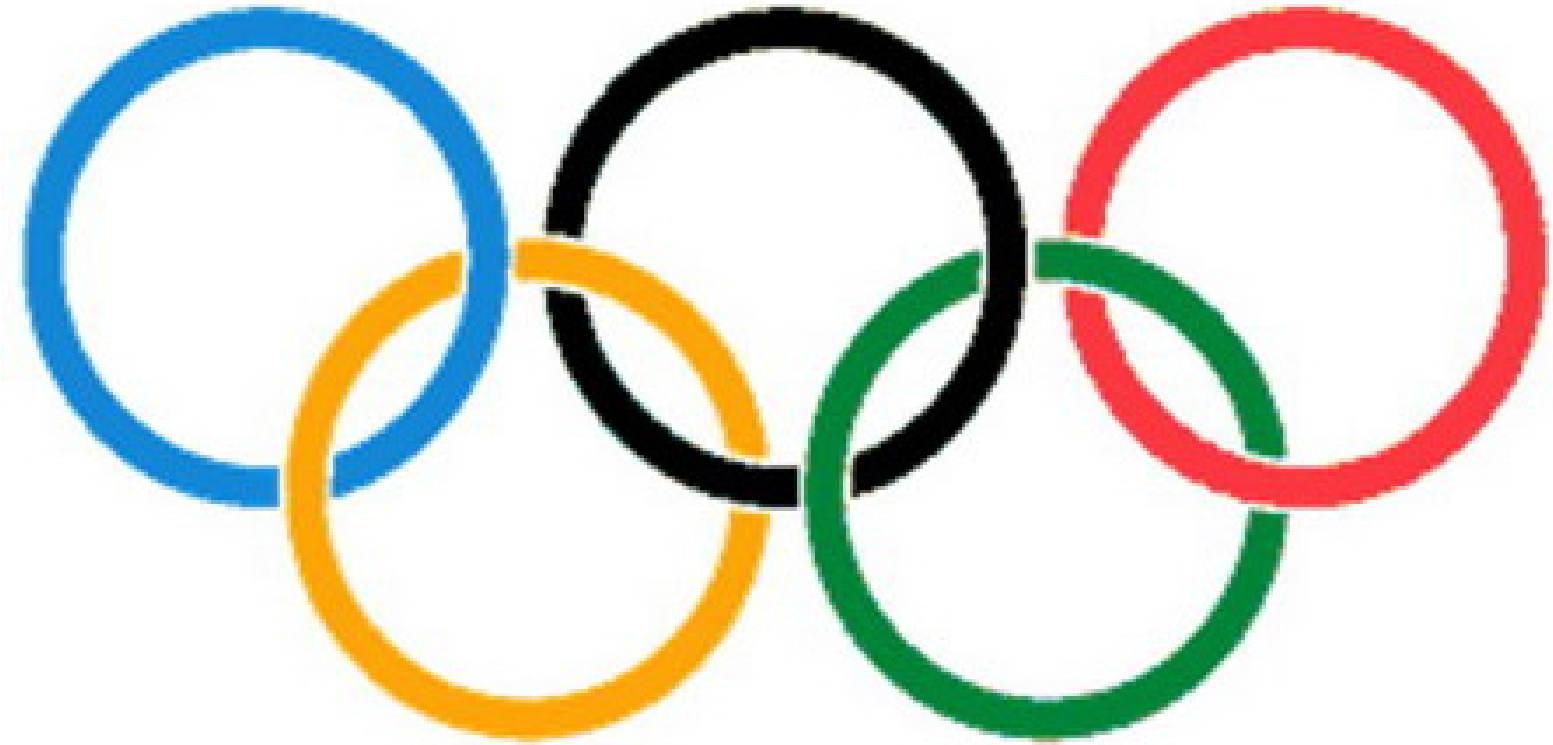
CITIUS, ALTIUS, FORTIUS ?



"The economic impact of ADHD" (1)

"A **conservative estimate** of the annual societal cost of illness for **ADHD in childhood and adolescence** is **$42.5 billion**…"

William E. Pelham et al. (2007)

So what?

Costs to society (United States):

- **US-$ 42.5 billion claimed to be attributable to ADHD (2005) in children and adolescents**
  - Hereof, US-$ 7.9 billion health and mental health services[1]

[1]Estimates by William E. Pelham et al. (2007)

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Costs to society (United States):

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Some comparative data:

- **US-$ 14,000 billion Gross Domestic Product (USA, 2008)**
  - Hereof, 15.7% (US-$ 2,200 billion) health spending (2008)[2]

- **US-$ 65 billion Greek trade balance deficit (2008)[2]**
  - Greece's budget balance: debt 112.6% of GDP (2008)[3]
- **US-$ 46.0 billion worldwide revenues Merck (2010)**
  - Hereof, US-$ 39.8 billion "Human Health"[4]

[1]Estimates by William E. Pelham et al. (2007); [2]The Economist, *World in Figures* (2011);
[3]The Economist, Feb. 4, 2010; [4]*Merck Annual Report 2010*, Whitehouse Station, NJ (2011)

"The economic impact of ADHD" (2)

"**Annual incremental costs of ADHD** ranged from $143 to **$266 billion**. Most of these costs were incurred by adults ($105 - $194 billion) …

Jalpa A. Doshi et al. (2012) – note that the figures presented would translate into roughly one to two precent of U.S. Gross Domestic Product

Really?

Costs to society (United States):

- **US-$ 143 billion to US-$ 266 billion claimed to be attributable to ADHD (year 2010)**[1]
  - Hereof, $105-194 billion incurred by adults, and $38-72 billion incurred by children and adolescents
  - Major cost categories, for adults: productivity and income losses ($87-138 billion); health care ($16-50 billion), justice system ($3-6 billion)
  - Major cost categories, for children and adolescents: health care ($21-44 billion) and education ($15-25 billion)

[1]Estimates by Jalpa A. Doshi et al. (2012)

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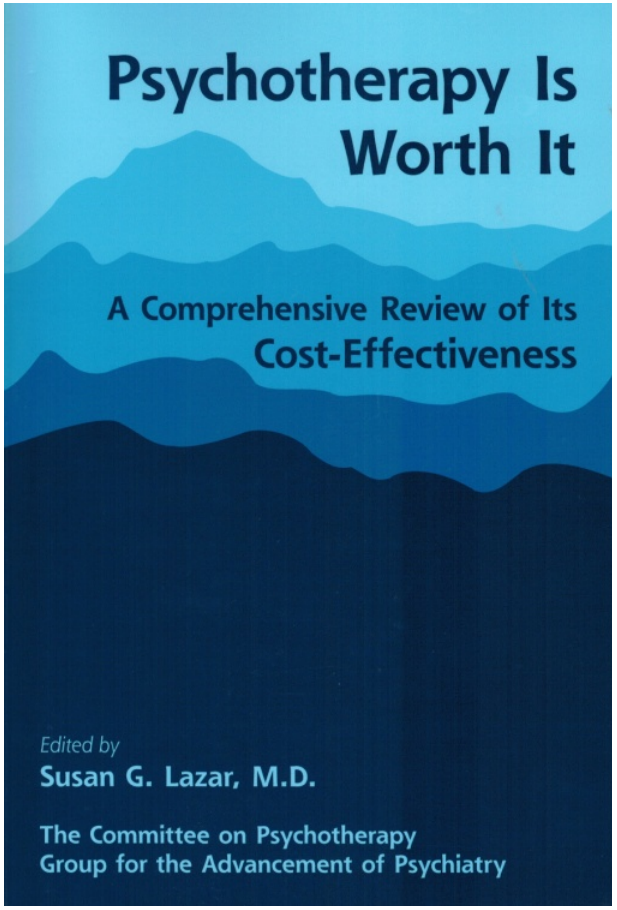
Some comparative data:

- **Estimated total cost of all cancers in the United States**[2]
  - Direct cost (2010), $125 bn; indirect cost (2000), $116 bn

[1]Estimates by Jalpa A. Doshi et al. (2012);
[2]National Cancer Institute (NCI), Bethesda, Md.: Robin Yabroff et al. (2008) and Angela B. Mariotto et al. (2011)

So what?



Washington, DC, and London, England:
American Psychiatric Publishing (2010)

Some claims (1)

Children, referring to the NIMH MTA Study:[1]

"Given **these considerations** [i.e., the broader societal costs incurred as a result of ADHD], the modest incremental costs for more effective versus less effective programs (the combination of medical management and behavioral treatment vs. the less costly medical management alone) should perhaps be considered."

?

[1]Peter S. Jensen et al. (2005)

So what?

Some claims (2)

Adult patients with ADHD:[1]

"**Early medical treatment of ADHD** is highly relevant for health policy and for economics due to:

- the social drawbacks that impact many areas of daily life
- the high risk of developing further mental illnesses and
- the costs to society."

?

[…]

"Apart from the unquestionable mental indication, it is already recommended by health economic reasons to establish the conditions for an adequate treatment with these medicaments also for adults.."

[1]A so-called "Health Technology Assessment" presented by Daniela Benkert et al. (2010) on behalf of DIMDI in Germany (a study initiated by Johnson & Johnson / Janssen-Cilag)

Fundamentals of economic evaluation

Cost analysis	Comparative analysis
¬ **Positive**	¬ **Normative**
¬ Purely descriptive by definition, cannot provide information on the "value for money" of interventions	¬ Prescriptive (conceptually), but always within the confines of the underlying theoretical framework

Economic evaluation

Perspectives of costing studies

- **Societal perspective**

  (all costs excluding transfer payments)

  Opportunity costs are not the same as monetary flows:

  - Transfers, taxes, insurance premiums (redistribution)
  - Opportunity costs may occur without monetary flows:
    e.g., voluntary work, air pollution
  - Monetary flows are often different from opportunity costs:
    distorted prices due to subsidies, incentives (tariffs, charges)
- **Insurance (/ payer) perspective**
- **Employer perspective**
- **Individual (/ family / household) perspective**

Economic evaluation

Types of costs in health economic evaluation

- **Direct costs**
  - Direct medical costs
  - Direct nonmedical costs
- **Indirect costs**
  - Days off work due to illness
  - Early retirement, premature death
  - Human capital versus friction cost approach
- **Intangible costs**
  - Pain and suffering due to illness
  - Pain and suffering due to treatment

Economic evaluation

Costing for analysis

Costs = Resource utilization X Unit costs

are influenced by

- **jurisdiction** (institutional and regulatory environment)
- **regional variation**
- **provider preferences**
- **patient** (/parent) **preferences**

- **jurisdiction** (type of health care system and regulatory enviroment)
- **perspective of analysis** (societal, insurance/payer, employer, indiviual/family)

ADHD: Burden of disease (children and adolescents)

- **Health care system**
  - Increased health care utilization and **direct medical costs** (reported to be comparable to children with asthma); including emergency room visits (…)
  - Increased risk of **substance abuse disorders** (including earlier onset and lower probability to quit in adulthood)
  - Increased risks of **injuries, bike and motor vehicle accidents**
- **Peer relationships, school and occupation**
  - Frequent **peer problems** and difficulties interfering with **friendships**
  - Many expelled; increased **drop-out rates**; special education programs; **impaired educational outcomes** and **lower occupational status**
- **Family and employers**
  - Parental **divorce** (or separation) rates increased; sibling fights
  - Parental **absenteeism** and **productivity loss**
- **Society**
  - **Criminal behavior; justice and legal system costs**

"The economic impact of ADHD"[1]

Sector	Per-child	Number	Aggregate
Health and mental health services	$ 2,636	3 million (assuming ADHD prevalence of 5% and 60 million school aged children based on US census 2000)	$ 7.9 billion
Education	$ 4,900		$ 13.6 billion
Crime and delinquency	$ 7,040		$ 21.1 billion
Total	**$ 14,576**	?	**$ 42.5 billion**

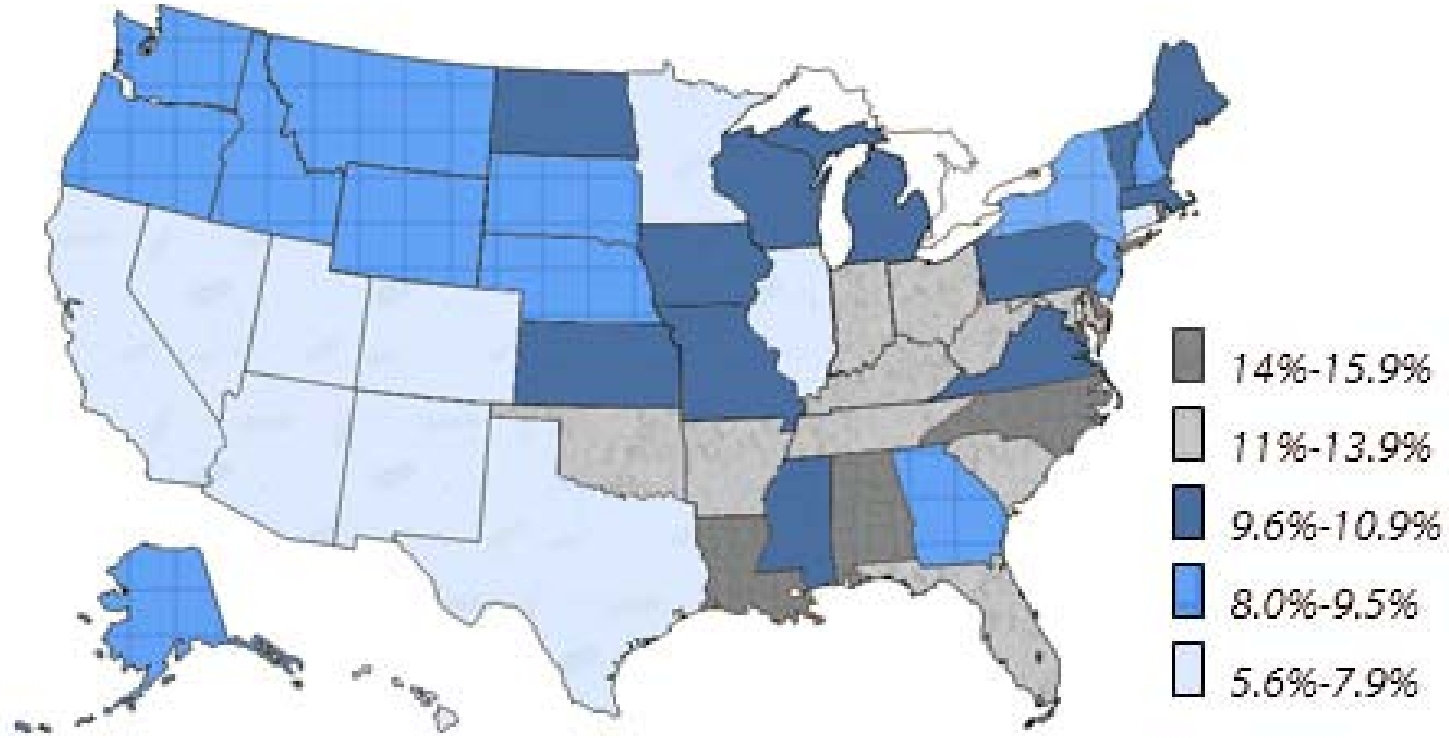
[1]Estimates presented by William E. Pelham et al. (2007) – note inconsistencies with review by Jalpa A. Doshi et al. (2012), for example re. 'crime and delinquency' costs

Some Caveats

- **Regional Variation**
- **Representative Samples**
- **Categories of Costs Included**
- **Economic Measurement Methods**
- **Skewed Distribution of Costs**
- **Impact of Sociodemographics**
  - Age, Gender
  - Household Income, Education, (Type of) Health Insurance
- **Impact of Severity**
- **Impact of Co-Existing Conditions**
- **International Portability**

Regional variation of ADHD diagnosis rates

State-based prevalence of ADHD among children (age 4-7 years, ever diagnosed, parent-reported)[1]

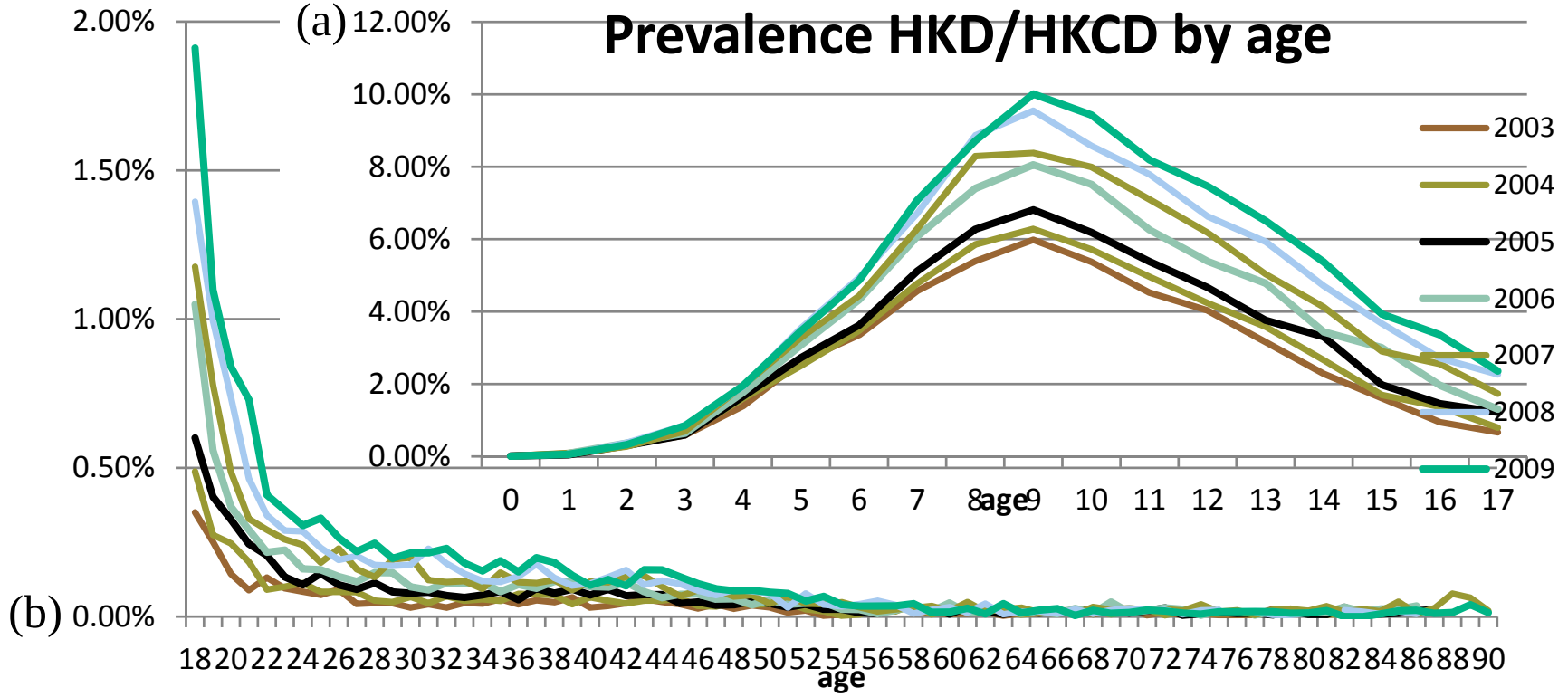


United States, 2007. The percentage of children with a parent-reported ADHD diagnosis increased by 22% between 2003 and 2007. There was substantial variation by state, with prevalence rates ranging from 5.6% in Nevada to 15.6% in North Carolina. Source: National Survey of Children's Health (NSCH); Centers for Disease Control and Prevention, Atlanta, GA: November 12, 2010

ADHD in Nordbaden, Germany

Nordbaden (left, red; right, green), the administrative district of "Karlsruhe" (*Regierungsbezirk Karlsruhe*) in the German state of Baden-Wuerttemberg, comprises of major parts of the Metropolitan Area Rhine-Neckar (*Metropolregion Rhein-Neckar*) including the cities of Mannheim and Heidelberg, as well as the urban areas (*Stadtkreise*) of Karlsruhe and Pforzheim.

ADHD administrative prevalence
2003 - 2009 (Nordbaden, Germany)

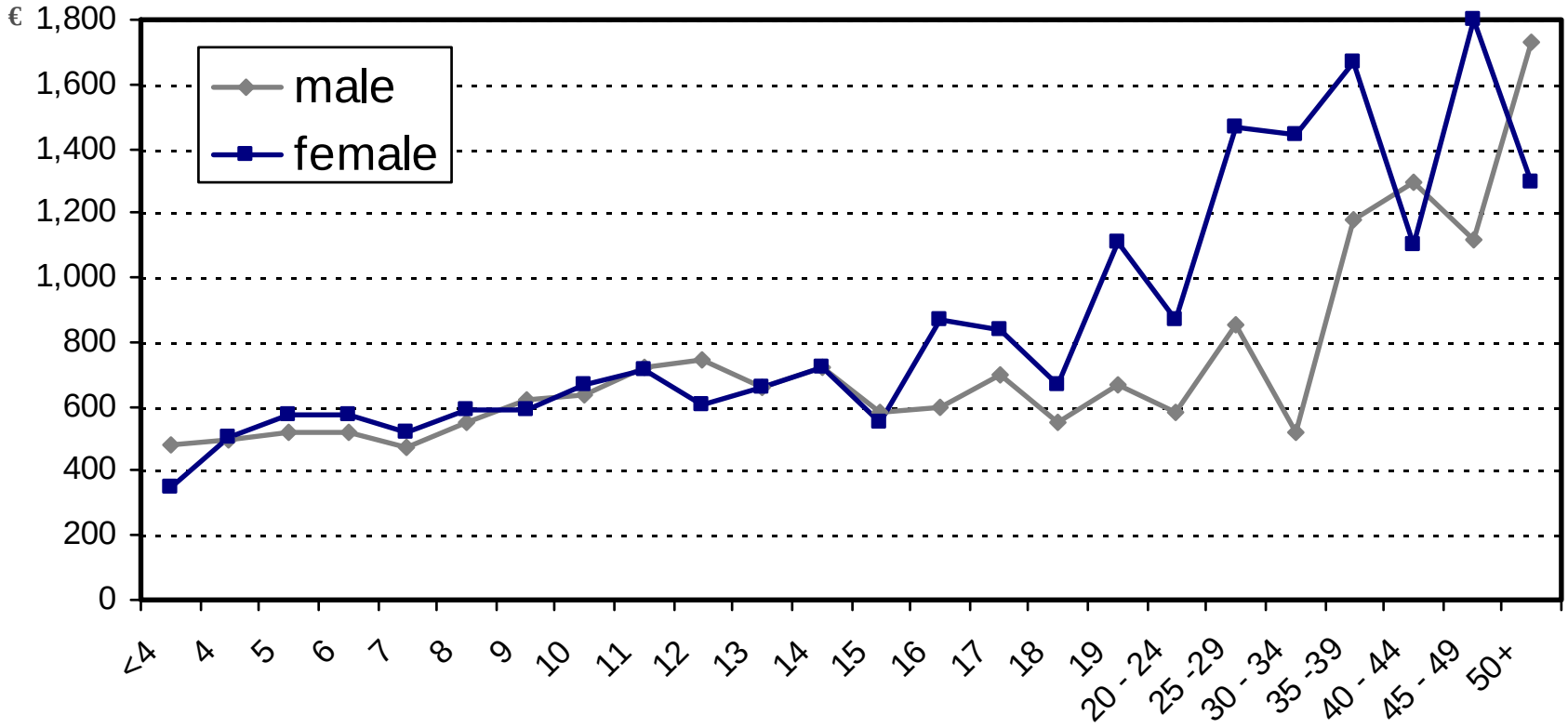


Both in children and adolescents (**a**) and in the adult population (**b**) of Nordbaden / Germany, the administrative prevalence of ADHD ("hyperkinetic disorder," with or without concomitant conduct disorder) increased continuously from 2003 to 2009. Age and gender related patterns remained stable during the observation period. Berlin, May 2011. M. Schlander et al. (2011).

ADHD-related direct health care expenditures

Average cost per patient (Nordbaden, 2003)[1]

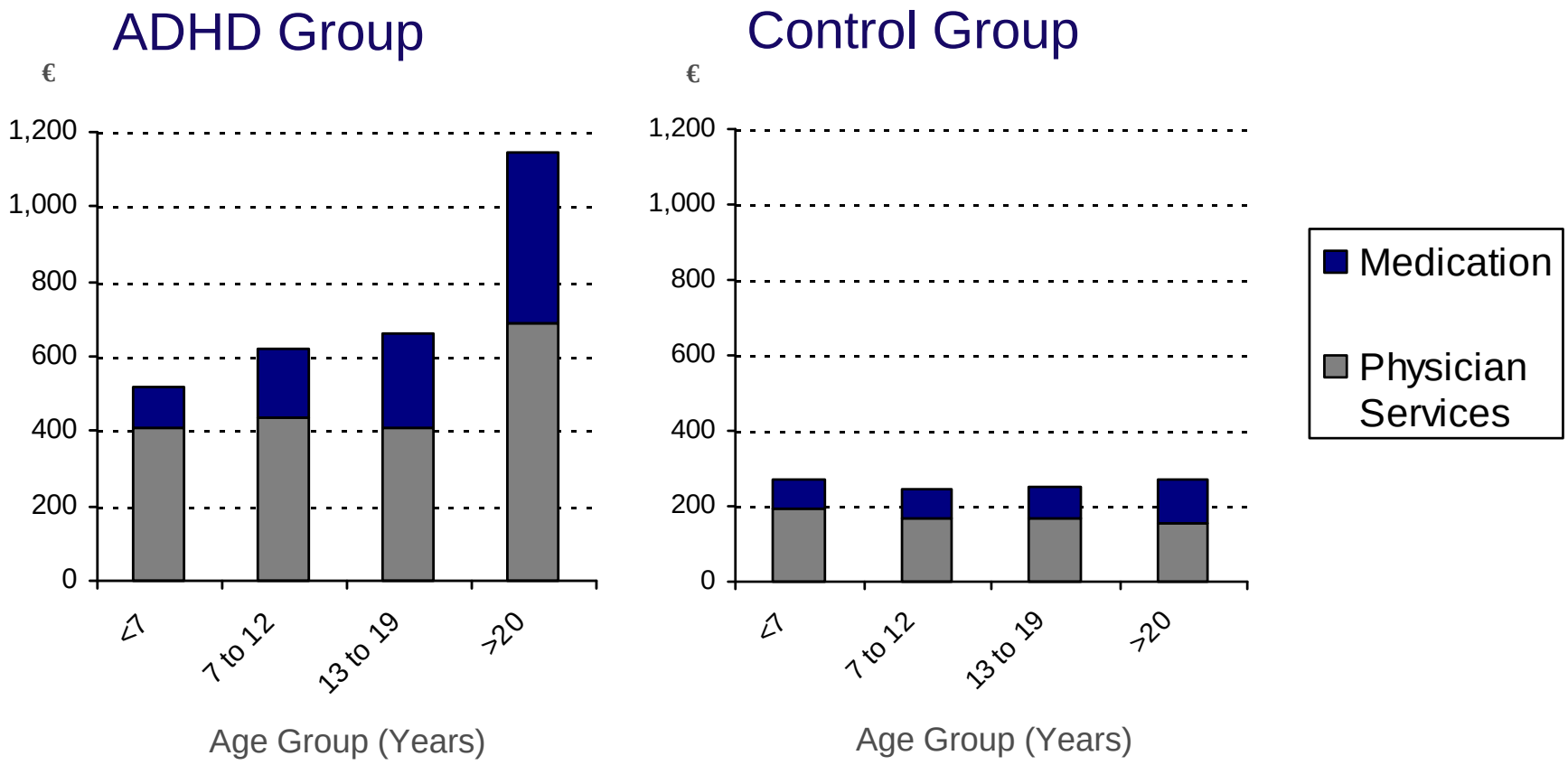
Impact of age and gender



[1]Schlander et al. (2008)

ADHD-related direct health care expenditures

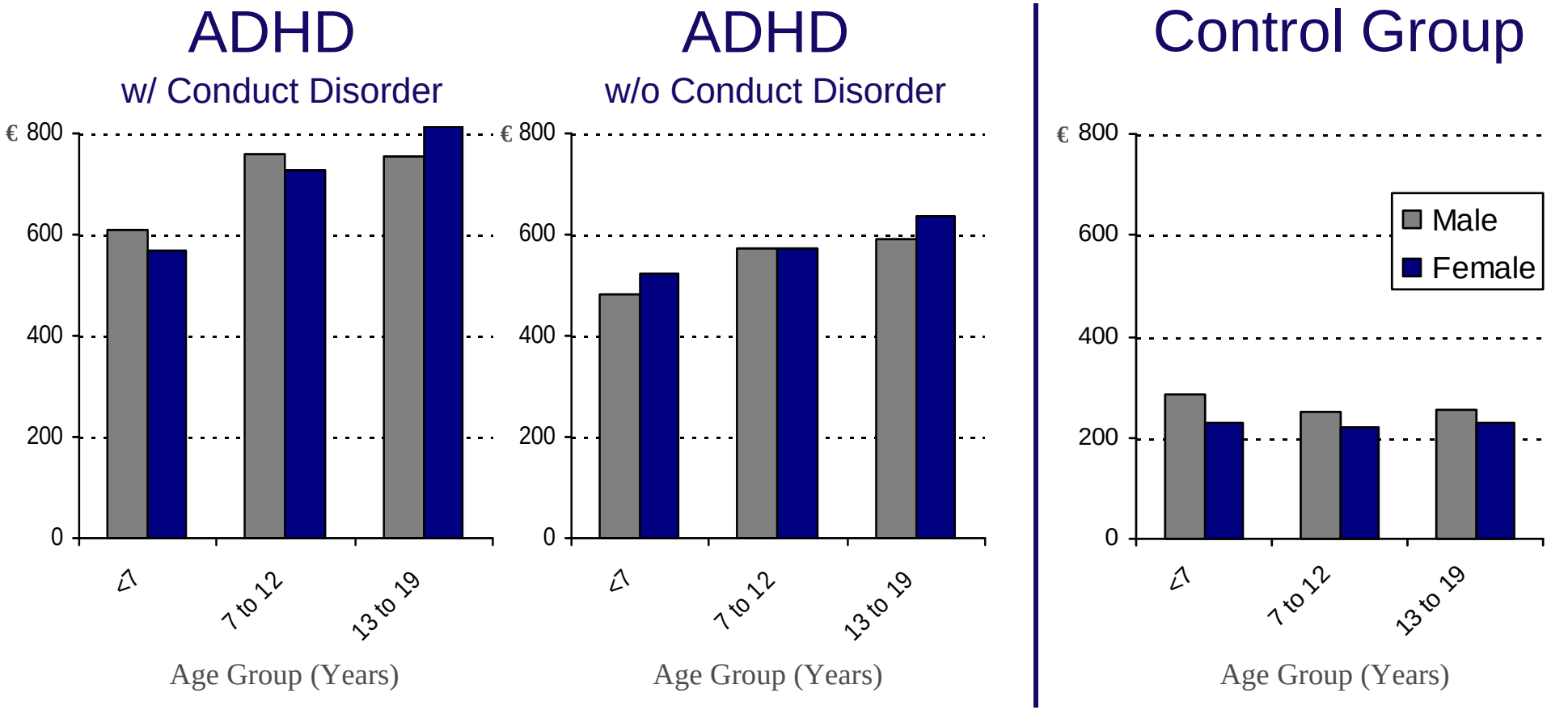
Average cost per patient (Nordbaden, 2003)[1]



[1]M. Schlander et al. (1008 and unpublished data)

ADHD-related direct health care expenditures

Average cost per **ADHD** patient in the presence or absence of **Conduct Disorder**[1]

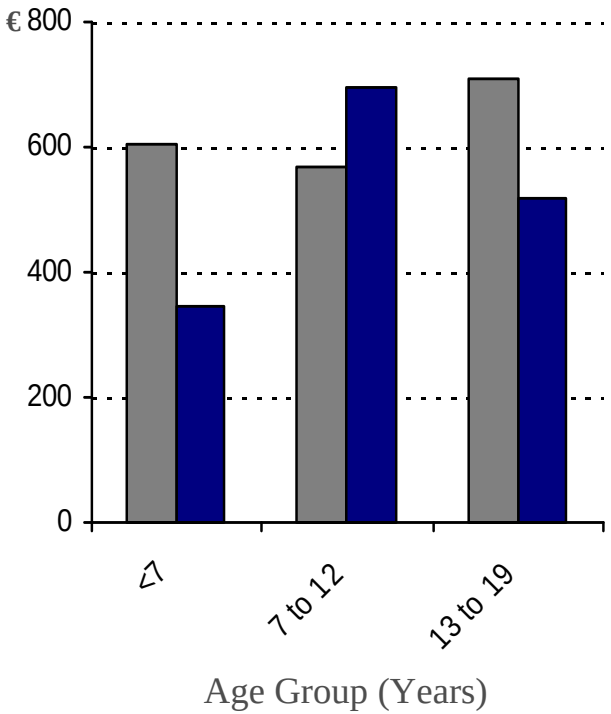


[1]Nordbaden 2003

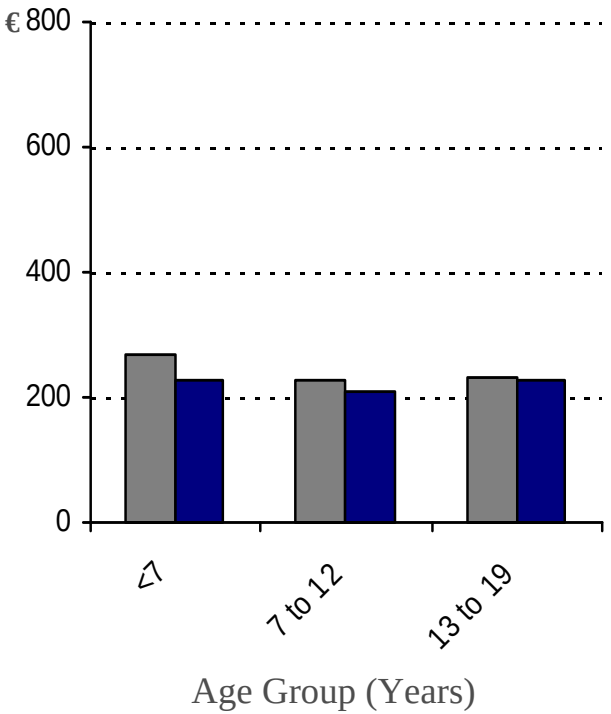
ADHD-related direct health care expenditures

Average cost per patient without ADHD in the presence or absence of **Conduct Disorder**[1]

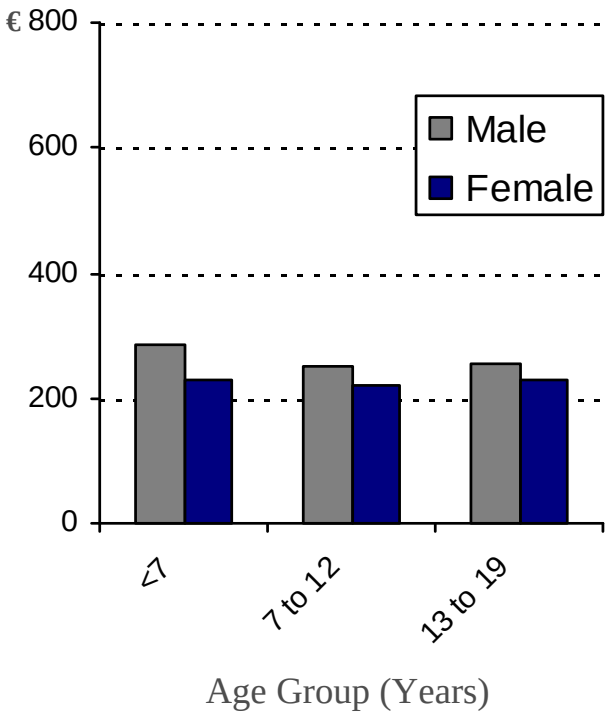
No ADHD w/ Conduct Disorder



No ADHD w/o Conduct Disorder



No ADHD (Controls) Average



[1]Nordbaden 2003

ADHD: Co-existing conditions I (children) (administrative data from Nordbaden, 2003)[1]

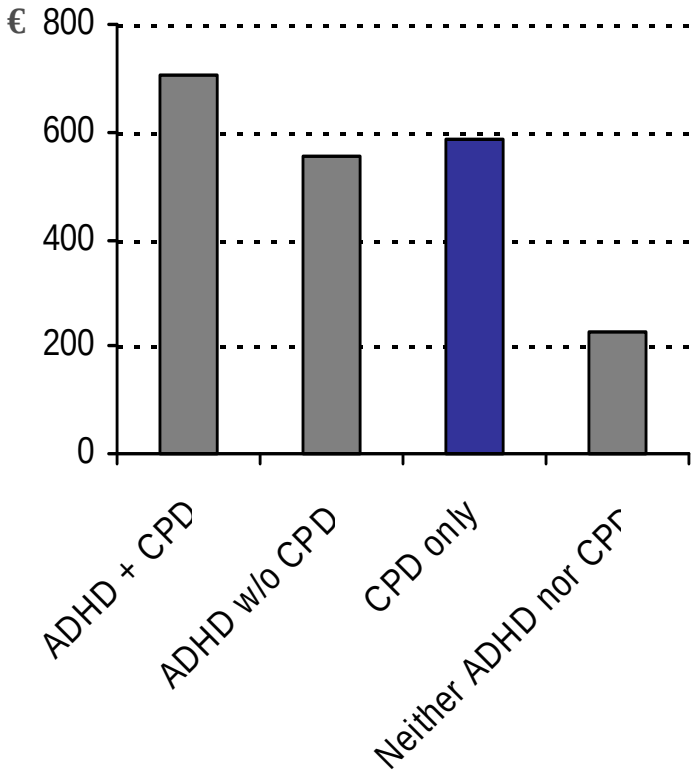
- **Conduct & personality disorders**
  - 39.*3% vs. 3.9%*
- **Mood and affective disorders**
  - 38.0% vs. *8.9%*
  - Emotional disorders, neurotic disorders, depression, phobia, anxiety
- **Specific development disorders**
  - 37.4% *vs. 13.4%*
- **Specific developmental disorders of scholastic skills**
  - 23.0% *vs. 2.8%*

[1]in children adolescents (n=11,245), compared to control group matched by age, gender, and type of health insurance.
M. Schlander, O. Schwarz, G.-E. Trott, et al. (2006)

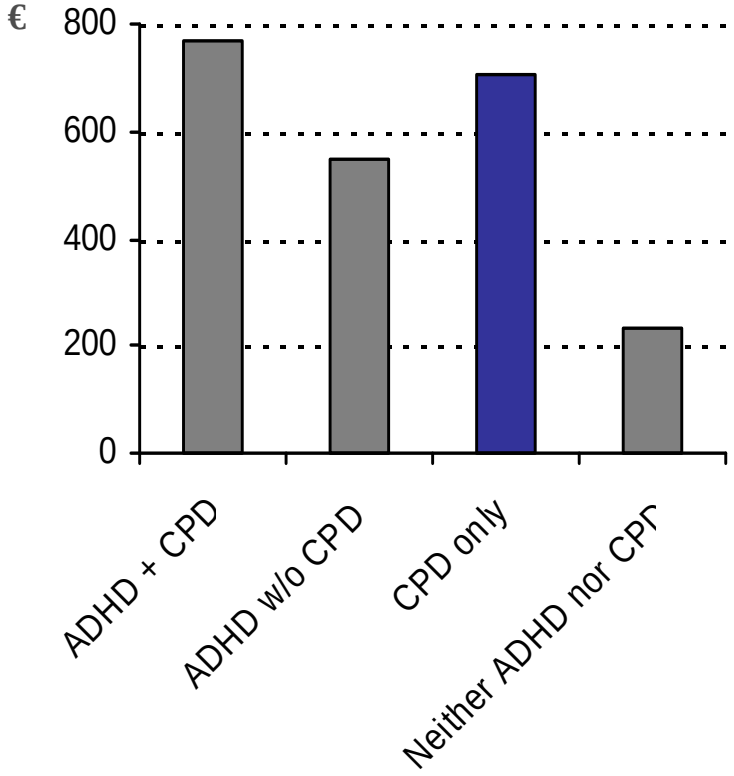
ADHD-related direct health care expenditures

Impact of **ADHD** and **Conduct & Personality Disorders**[1]

Age 7 – 12 Years



Age 13 – 19 Years



[1]Nordbaden 2003

ADHD-related direct health care expenditures

Impact of **ADHD** and **Mood & Affective Disorders**[1]

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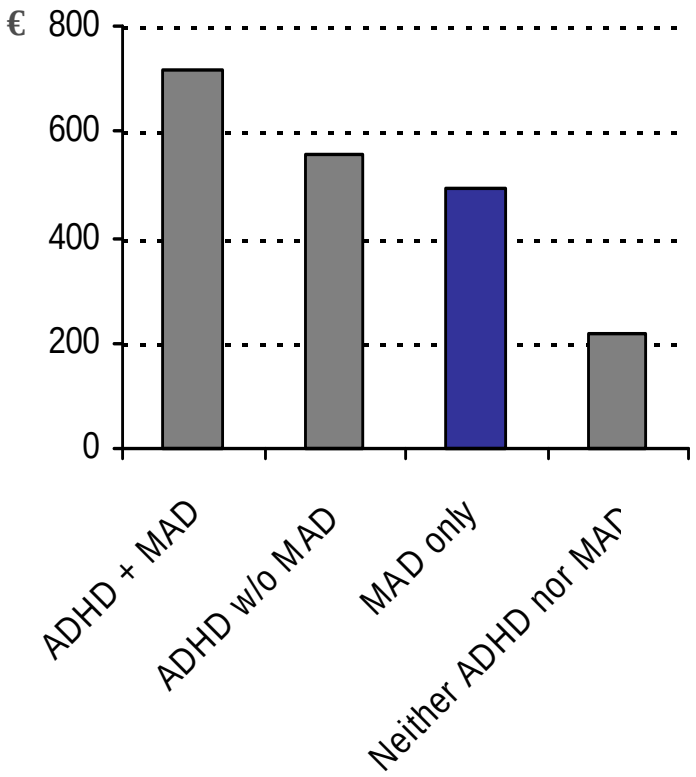
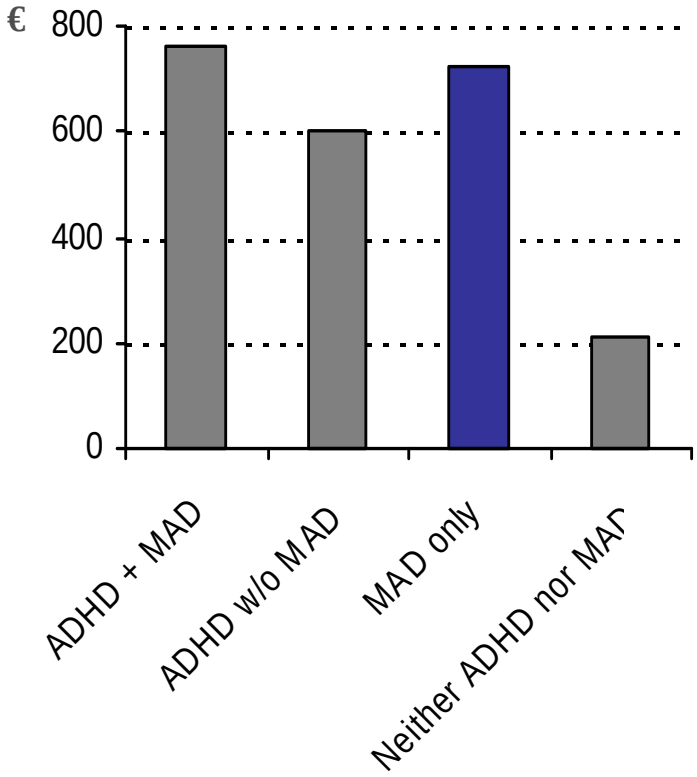


Age 13 – 19 Years

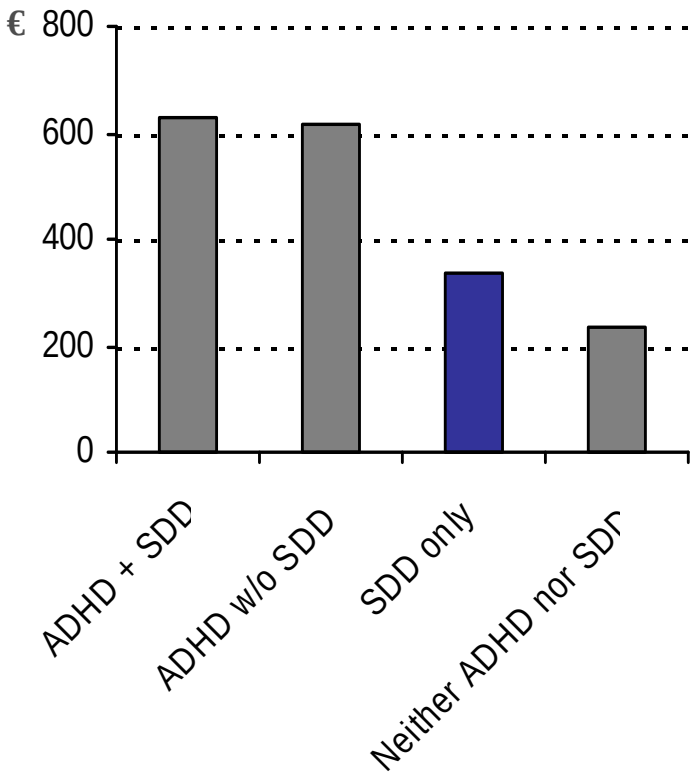


[1]Nordbaden 2003

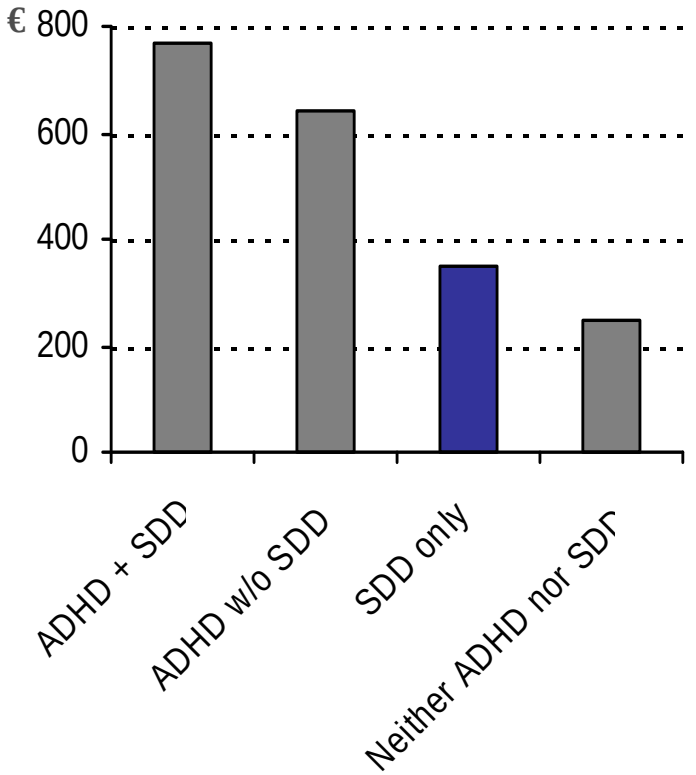
ADHD-related direct health care expenditures

Impact of **ADHD** and **Specific Development Disorders**[1]

Age 7 – 12 Years



Age 13 – 19 Years

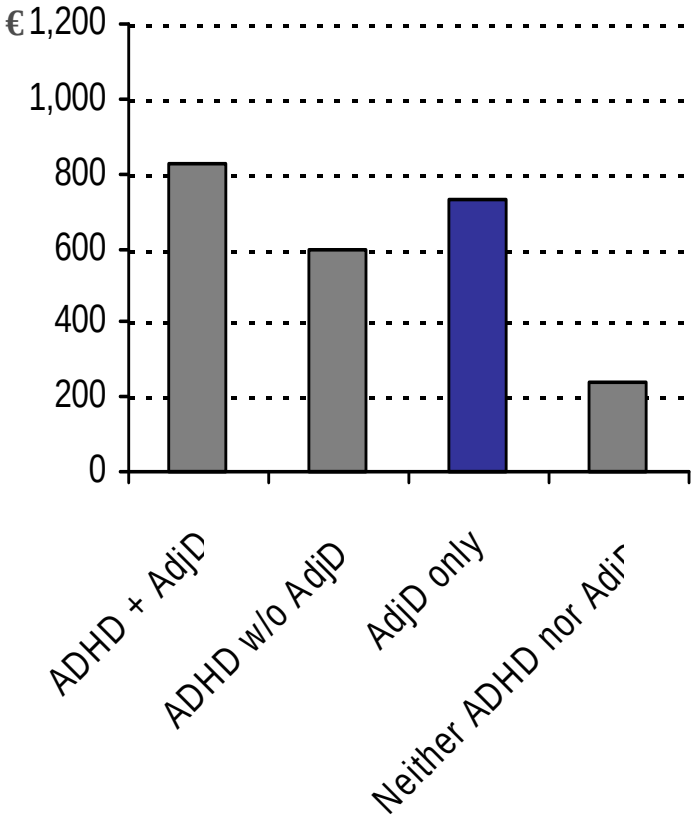


[1]Nordbaden 2003

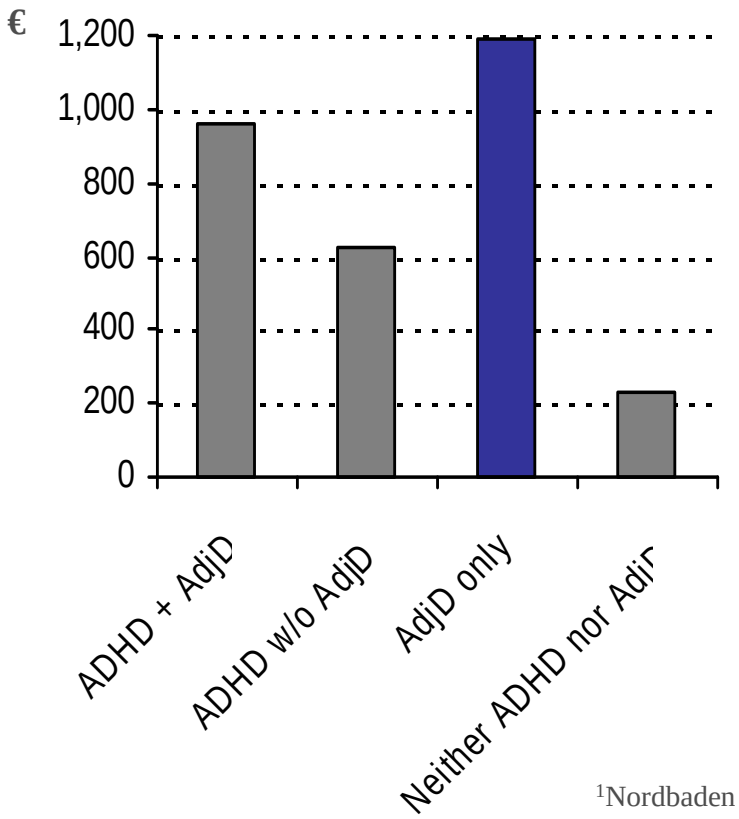
ADHD-related direct health care expenditures

Impact of **ADHD** and **Adjustment Disorders**[1]

Age 7 – 12 Years



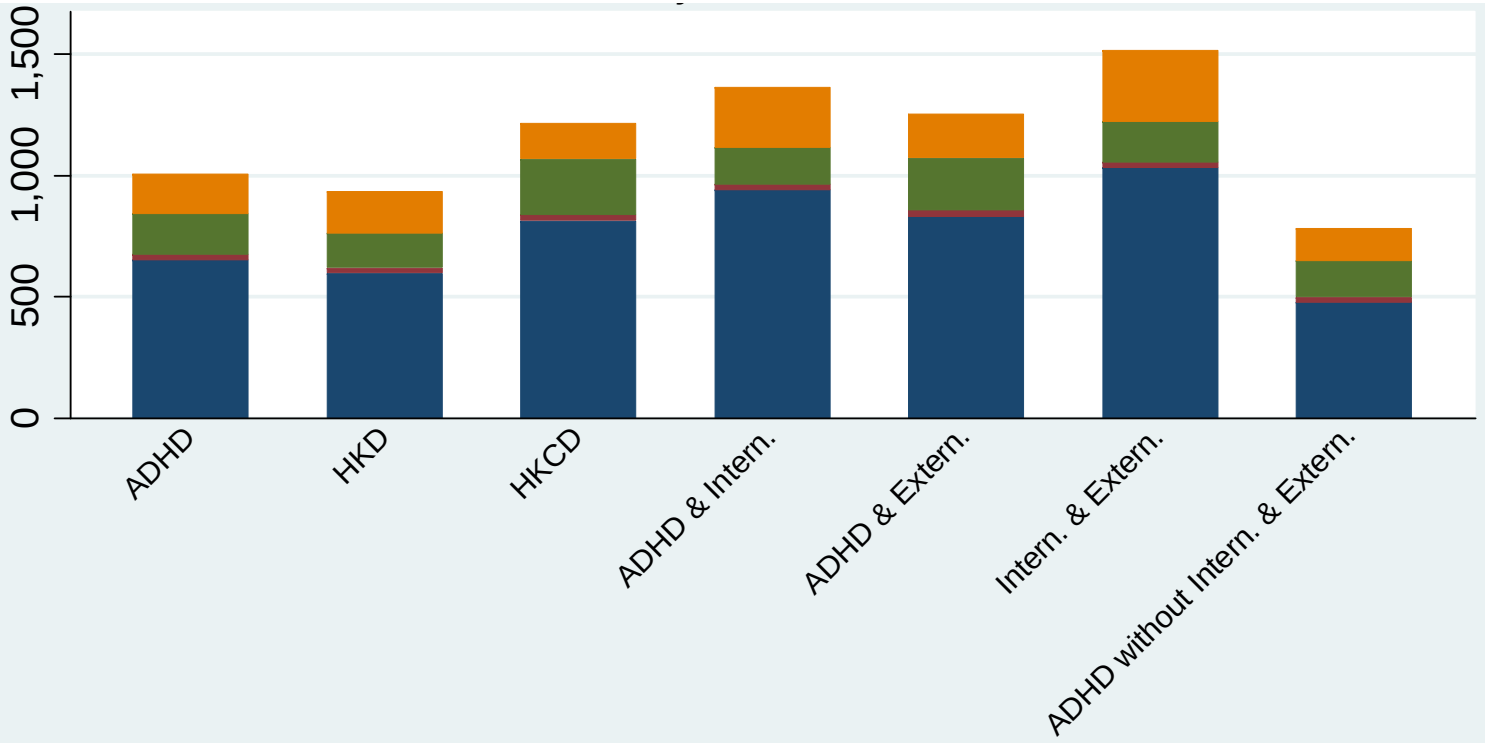
Age 13 – 19 Years



[1]Nordbaden 2003

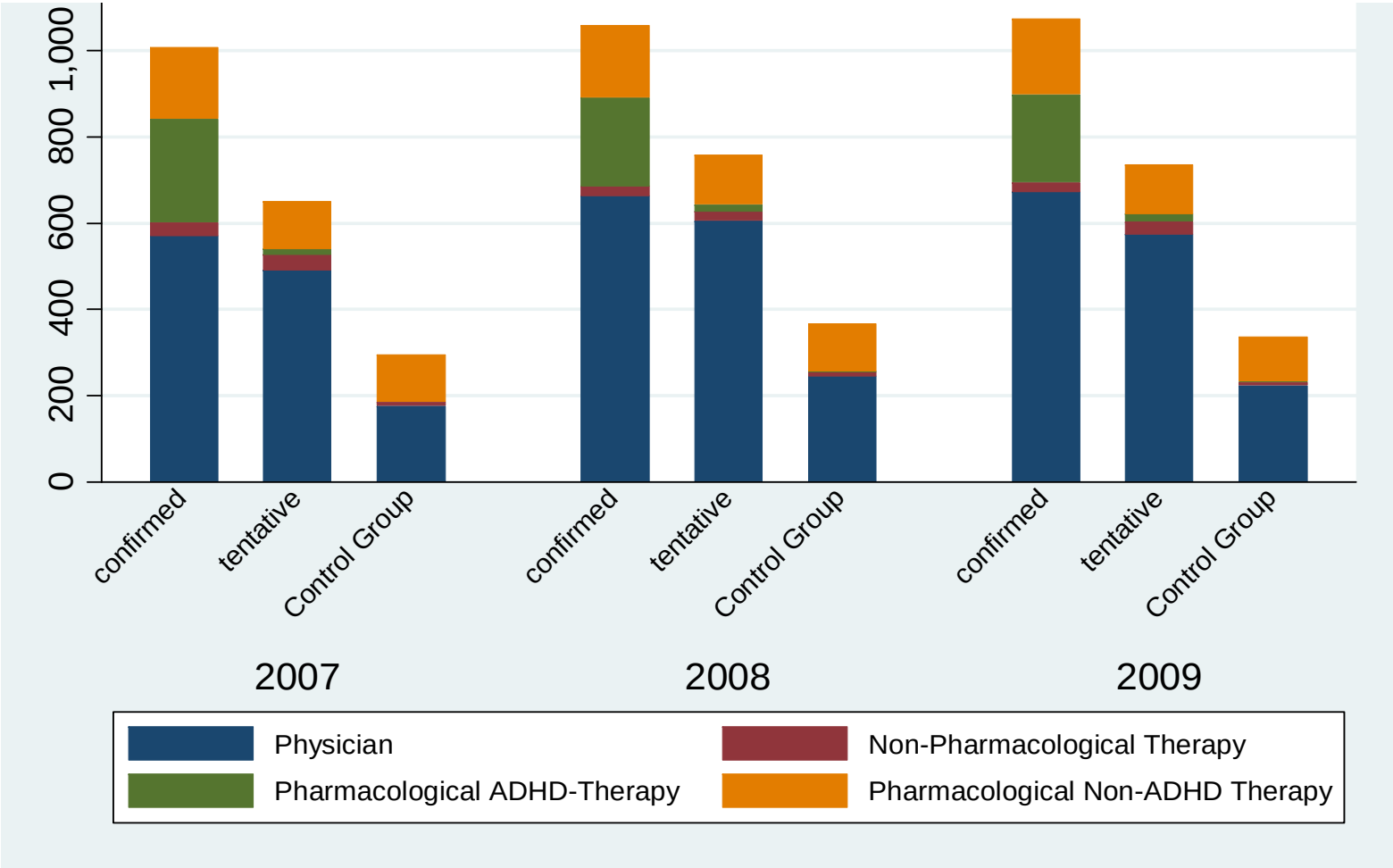
ADHD: Average Cost per Patient

by **Comorbidity** and Cost Category, Nordbaden, Year 2009



ADHD: Average Cost per Patient

by **Severity** and Cost Category, Nordbaden, Year 2009



Direct Medical Cost of ADHD:

Dimension estimated on the back of an envelope (2009)

- **Population Germany (Zensus 2013):**
  - 80.2 million
- **Overall Administrative Prevalence (Nordbaden 2009):**
  - 0.95 percent
- **Projected Number of ADHD Patients (Germany):**
  - (80.2m x 0.95% =) 761,900
- **Excess Outpatient Cost per Patient (Nordbaden 2009):**
  - (€ 1,006 - € 337 =) € 669
- **Projected Excess Direct Cost Attributable to ADHD**
  - (761,900 x € 669 =) **€ 509.7 million (p.a.)**

A tentative summary of key observations

- No doubt, ADHD is associated with **substantial social costs**.
- Taken together, the societal costs associated with ADHD **exceed the costs of health care interventions**.
- However, the **economic burden** associated with ADHD **has not yet been properly quantified**.
  - Reliable studies of the cost of ADHD are cumbersome and should
    - address the impact of severity and coexistent conditions on resource use and long-term consequences,
    - avoid "naive" extrapolation from selected patient populations,
    - take into account international and regional differences.
- As a matter of principle, **cost of illness studies cannot proof the value of interventions**.
  - They may nevertheless be politically useful – or harmful!

Thank you for your attention!

Prof. Michael Schlander, M.D., Ph.D., M.B.A.

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