

July 07, 2013

ADHD: A Longitudinal Analysis (2003-2009) of Prevalence, Health Care, and Direct Cost based upon Administrative Data from Nordbaden / Germany

Michael Schlander¹, Oliver Schwarz², Götz-Erik Trott³, and Tobias Banaschewski¹

¹University of Heidelberg

²Heilbronn University

³University of Würzburg

and

Institute for Innovation & Valuation in Health Care (INNOVAL^{HC})
University of Heidelberg & University of Applied Economic Sciences Ludwigshafen



BIBLIOGRAPHIC NOTE

Quote as: Michael Schlander, Oliver Schwarz, Götz-Erik Trott, Tobias Banaschewski: *Attention-Deficit/Hyperactivity Disorder (ADHD), 2003-2009: A longitudinal analysis of prevalence, health care and direct cost based upon administrative data from Nordbaden /Germany. European Child + Adolescent Psychiatry (2013) 22 (Suppl 2): S102.* (Abstract No. S2-06-05)

Abstract

PRIMARY OBJECTIVES: To assess recent trends in real-world diagnosis rates of ADHD, treatment patterns (including potentially inappropriate prescriptions of psychostimulants), and direct medical cost from a payers' perspective.

METHODS: The *Nordbaden Project* comprises an integrated patient-centered administrative database capturing the total population in Nordbaden insured by statutory health insurance (SHI, more than 2.2 million lives), combining claims data of the *Kassenärztliche Vereinigung* (KV, i.e., the organization of physicians registered with SHI) in Nordbaden/Germany, and reimbursement data of a major SHI organization, for the time period from 2003 to 2009.

RESULTS: Hyperkinetic disorder was the number one reason for contacts with health care providers in children (age group 6-12 years, 7.2%) and adolescents (13-17 years, 3.7%). From 2003 to 2009, the administrative prevalence of ADHD (HKD or HKCD) increased by 79%, i.e., from 0.53% in 2003 to 0.95% (all age groups; 6-12 years, 8.0%; 13-17 years, 4.2%; peak prevalence among 9-year old boys at 13.7%) in 2009. The total number of patients with ADHD in Nordbaden increased from 11,887 in 2003 to 21,287 in 2009. For further analyses, a control group was defined, 1:1 matched by age, gender, and type of health insurance.

Age and gender-specific comorbidity patterns were in line with data from epidemiological studies and did not change during the study period. Although the share of ADHD patients seen by a CNS specialist increased during the study period, the majority of patients were treated by pediatricians and general practitioners; most patients (52.9%) had no contact with CNS specialists (data for year 2009). Treatment patterns were highly age and gender specific. Overall, use of medication increased steadily, from 32.2% of ADHD patients in 2003 to 39.9% in 2009. Pharmacotherapy was used most widely in adolescents (age group, 13-17 years), with prescription rates (both genders combined) remaining stable at slightly less than 55% since 2006. No evidence was found for inappropriate prescribing of ADHD medication. Average annual cost per ADHD patient increased from €897 in 2006 to €1,006 in 2009 (controls, €261 in 2006 and €337 in 2009), and correlated positively with age, severity, and comorbidity. Physician services were the major cost component (on average, overall, €653 per case in 2009), followed by medication (€330).

CONCLUSIONS: The Nordbaden Project provides insights into prevalence, health care provision, treatment patterns, and direct medical cost of ADHD from 2003 to 2009.

- ▭ **Welcome and Introduction to Symposium**
 - ▭ Michael Schlander

- ▭ **Sociodemographic Characteristics of the Nordbaden Database**
 - ▭ Oliver Schwarz and Michael Schlander

- ▭ **Administrative Prevalence and Specialist Involvement in Health Care**
 - ▭ Götz-Erik Trott et al.

- ▭ **The Evolving Treatment Patterns for ADHD, 2003-2009**
 - ▭ Tobias Banaschewski et al.

- ▭ **The Direct Medical Costs Attributable to ADHD, 2003-2009**
 - ▭ Michael Schlander et al.

Research Objectives¹

- ▭ **“Real World” Prevalence of ADHD**
 - ▭ Administrative prevalence rate by age, gender, and severity
 - ▭ Physician groups involved in patient care
- ▭ **Co-Existing Conditions**
- ▭ **Treatment Patterns**
 - ▭ Quality of care compared with existing guidelines
- ▭ **Direct Medical Costs Attributable to ADHD**
 - ▭ Perspective of the Statutory Health Insurance
 - ▭ Types of cost (physicians, medication, psychotherapy, etc.)
- ▭ **Baseline for Future Health Care Utilization Research**

¹cf. Initial **Study Protocol** (“*Projektbeschreibung*”), Ludwigshafen, September 2004, and **Analysis Plan**, V2.2 of August 14, 2010

Project Design

▮ Population

- ▮ 2.238m persons covered by Statutory Health Insurance (SHI)
- ▮ Full coverage of the regional SHI insured population (all physician and psychotherapist claims data from KV)
- ▮ Representing ~82% of the total population in Nordbaden
- ▮ Sample representing ~3% of the total population of Germany
- ▮ Integrating prescription claims data from a major association of sick funds (VdAK / vdek)

▮ Retrospective Claims Database Analysis

▮ Case Control Technique

- ▮ Matched pairs (by age, gender, type of health insurance)
- ▮ For examination of co-morbidity, utilization, and costs

▮ Phase I: Cross-Sectional Study

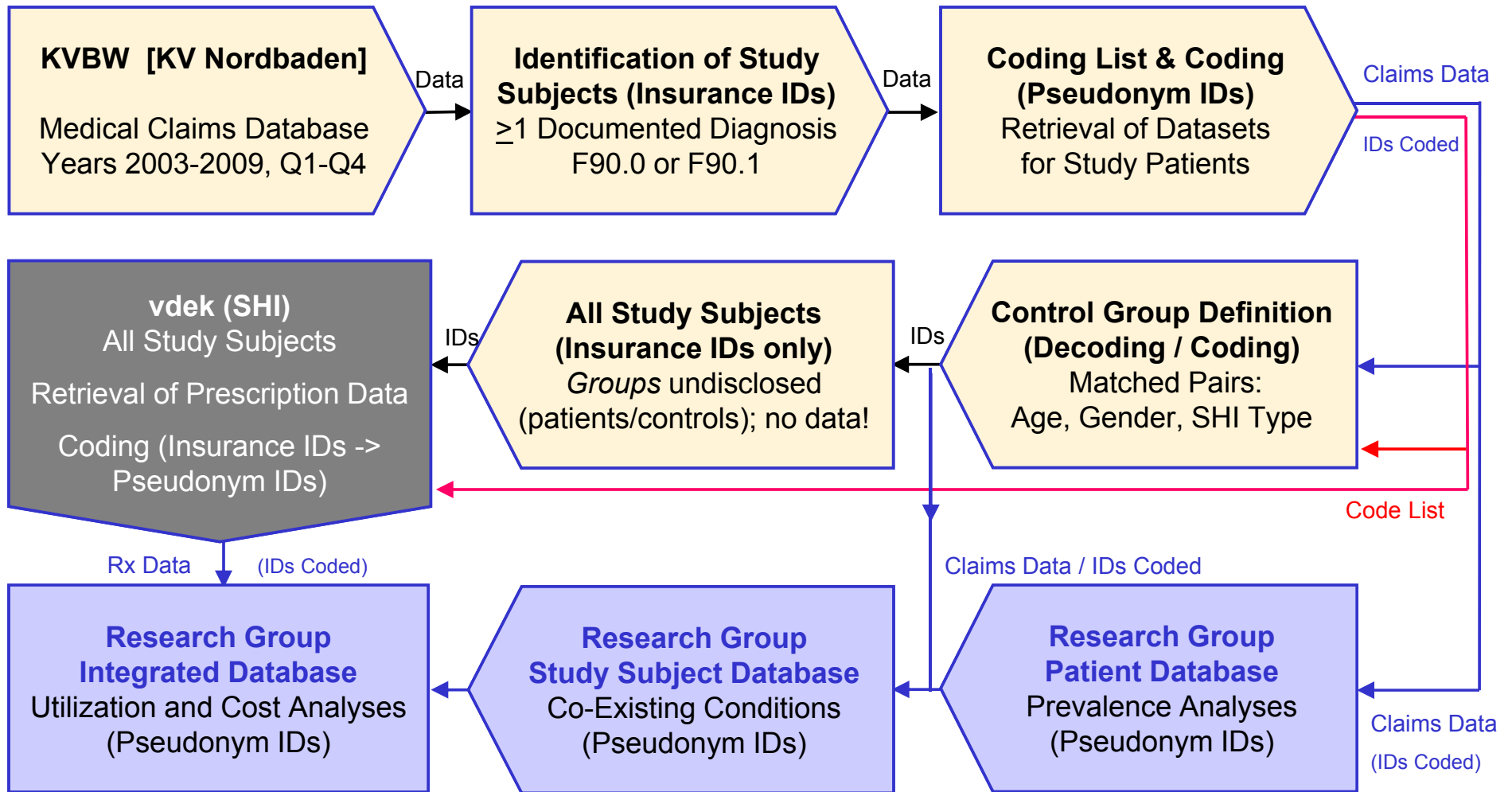
- ▮ Integrating patient-related data from four quarters of 2003

Project Design

Phase II: Longitudinal Study

- ▭ Full coverage of the regional SHI insured population over seven years (all physician and psychotherapist claims data from KV, 2003-2009)
- ▭ Database representing ~82% of the total population in Nordbaden, i.e., approximately 3% of the total population of Germany
- ▭ Integrating prescription claims data (available for years 2003, 2006, 2007, 2008, and 2009) from a major association of sick funds (VdAK / vdek)
- ▭ Matched pairs technique (by age, gender, type of health insurance)
- ▭ Capturing all regional contacts with health care providers from Q1 2003 through Q4 2009, following up identified persons (patients and controls) throughout the full study period
- ▭ Examination of trends in prevalence, co-morbidity, utilization, costs
- ▭ Longitudinal analyses, such as duration of treatment, as a function of severity, comorbidity, type of index treatment

Confidentiality, Data Flow & Integration¹



¹cf. Study Data Transfer Protocol

Project Strengths

- ▭ **Patient Centered Analysis**
 - ▭ Patient specific integrated datasets defined
- ▭ **Cross-Sectional (Phase I) and Longitudinal (Phase II) Design**
 - ▭ Longitudinal patient-centered claims data over 84 months (or for 28 consecutive quarters, from Q1 2003 to Q4 2009)
- ▭ **(Relative) Data Richness**
 - ▭ Patient demographics: age, sex, insurance
 - ▭ Patient diagnoses & co-diagnoses
 - ▭ Provider demographics: age, sex, specialty
 - ▭ Comprehensive claims data (types of service rendered by physicians and psychologists [covered by the SHI])
 - ▭ Prescription data
- ▭ **Integrated claims databases are the only source of information that provide a complete picture of patients.**

Project Limitations

- ▭ **Potential sources of bias**
 - ▭ “Reporting bias”:
 - ▭ underreporting unlikely, given the fee-for-service reimbursement system
 - ▭ potentially “compliant reporting” (incentives by system?)
 - ▭ “Formulary bias”: represents SHI insured patients only
- ▭ **Limited to the range of services covered**
 - ▭ Example 1: accidents covered by “*Unfallversicherung*”
 - ▭ Example 2: encounters of patients with (juvenile) justice system
 - ▭ Need to interpret data cautiously!
- ▭ **Claims databases typically do not provide information on clinical outcomes.**

July 07, 2013

European Society for Child
ESCAP
and Adolescent Psychiatry

15th International ESCAP Congress
Dublin, Ireland, July 06 - 10, 2013

Sociodemographic Characteristics of the Nordbaden Database

Oliver Schwarz and Michael Schlander

Heilbronn University
University of Heidelberg

and

Institute for Innovation & Valuation in Health Care (INNOVAL^{HC})
University of Heidelberg & University of Applied Economic Sciences Ludwigshafen



IV

BIBLIOGRAPHIC NOTE

Quote as: Oliver Schwarz, Michael Schlander:

*Mental health care research in Germany:
sociodemographic characteristics of the Nordbaden database.*

European Child + Adolescent Psychiatry (2013) 22 (Suppl 2): S100. (Abstract No. S2-06-01)

Abstract

OBJECTIVES: The Nordbaden Project was initiated in 2003 as a cross-sectional analysis of the real-world prevalence, resource use, and direct medical costs associated with attention-deficit/hyperactivity disorder (ADHD). Meanwhile, the project has evolved into a longitudinal patient-centered study, allowing to follow-up identified patients over prolonged periods of time and to study the impact of moderators (e.g., coexisting conditions) and mediators (e.g., specialist involvement) on the quality and cost of health care services provided. The database enables retrospective health care utilization studies based upon administrative claims data of the *Kassenaerztliche Vereinigung (KV)* in Nordbaden (“*Regierungsbezirk Karlsruhe*”), an above-average affluent region in Southwestern Germany.

METHODS: The database covers the complete regional population enrolled in statutory health insurance (SHI; >2.2 million lives). Based upon prospective data analysis plans, the vdek group of sick funds within SHI offers prescription data for the subsample of patients insured by its member companies (850,000 lives in year 2009). Here, sociodemographic data of the study sample are compared to national averages (year 2009) to assess its representativeness.

RESULTS: The demographic structure (by age and gender) of the Nordbaden sample (including its vdek subgroup) compares well to the national population. However, regional population density is much higher (396/sqkm versus 229/sqkm in 2009), and GDP per capita (34,800€ versus 29,300€) as well as the rate of persons insured by private sick funds (instead of SHI: 18.2% versus 14.6%) exceed the national average. There are also relatively more health care specialists in Nordbaden (for example, 11,400 persons per mental health care specialist and 3,200 per psychotherapist) compared to Germany (17,200 and 3,900, respectively), whereas the relative number of general practitioners is somewhat lower (with 1,500 persons per g.p. versus 1,400). The number of patients with a diagnosis of ADHD increased from 11,887 in 2003 to 21,287 in 2009. A control group was defined, matched by age, gender, and type of statutory health insurance.

CONCLUSIONS: The Nordbaden sample constitutes a well-characterized study population. Compared to Germany as a whole, the region is somewhat more affluent and the number of medical specialists (relative per population) exceeds the national average. Interpretation of observations should take into account the well-documented differences between region and nation.

BACKGROUND

Map of Germany



BACKGROUND

Map of Baden-Württemberg



ESCAP, Dublin / Ireland, 2013



BACKGROUND

Database Characteristics

Demographic Structure of Nordbaden Population¹

	Nordbaden	Germany
Population		
Total number	2.739 m	82.218 m
Insured by SHI	2.24 m (81.8%)	70.244 m (85.4%)
of those		
male/female ratio	0.88 / 1	0.86 / 1
0 - 5 years	113.175 (5.1%)	3.504 m (5%)
6 - 12 years	152.026 (6.8%)	4.578 m (6.5%)
13 - 17 years	123.303 (5.5%)	3.644 m (5.2%)
18 +	1.851.871 (82.7%)	58.518 m (83.3%)

¹as at December 31, 2008;
data source: BMG, *KM6 Statistik*, regional data

ESCAP, Dublin / Ireland, 2013

BACKGROUND

Database Characteristics

Key Socioeconomic Data¹

	Nordbaden	Baden-Württemberg	Germany
Population	2.74 million	10.745 million	81.802 million
Area	6,919 km ²	35,752 km ²	357,123 km ²
Population density	396 / km ²	301 / km ²	229 / km ²
GDP	90.658 billion €	341 billion €	2,397 billion €
GDP /capita	33,087 €	31,752 €	29,278 €

¹As at December 31, 2009.

Source: Statistische Ämter des Bundes und der Länder

ESCAP, Dublin / Ireland, 2013

A Longitudinal Study based upon Data from Nordbaden / Germany

BACKGROUND

Population, Physicians, and Physician Density in Nordbaden

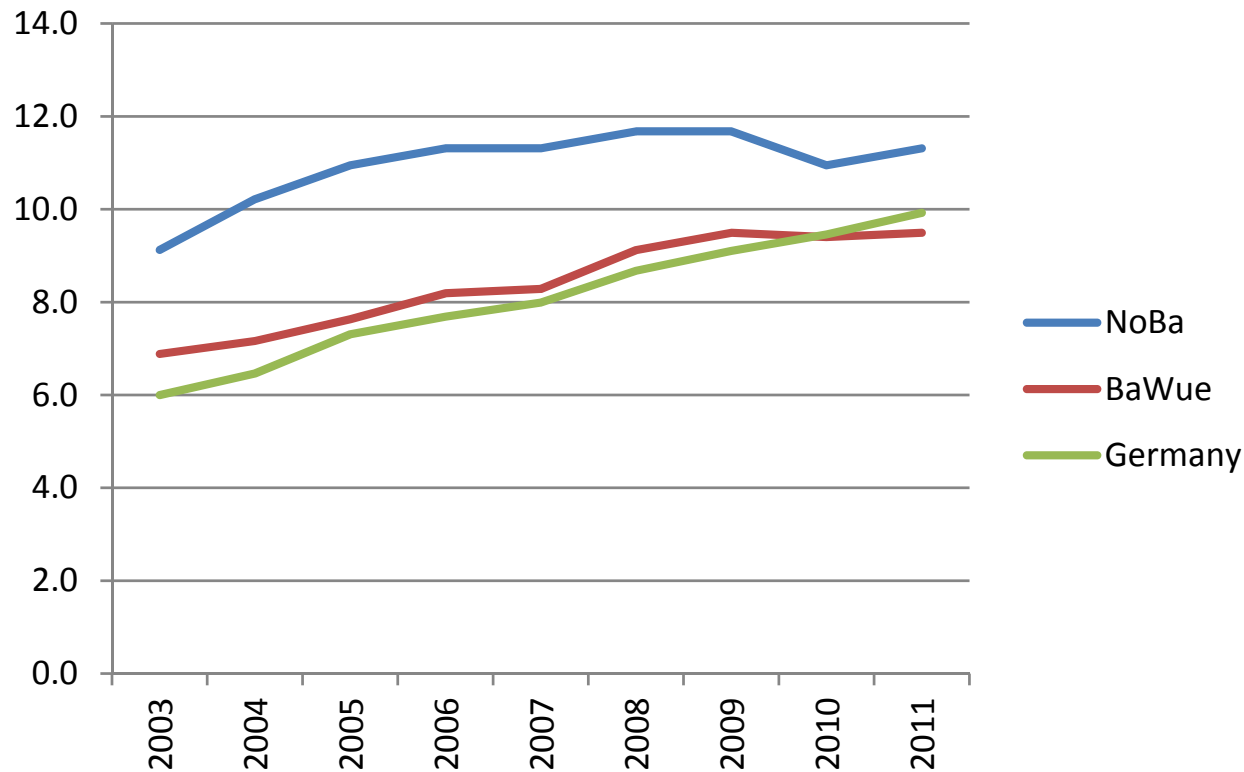
Local Area (Kreis)	Population (Dec. 31, 2009)	APIs	Population (persons) per API	Peds	Population (persons) per Ped	Mental Health (MH) - Specialists	Population (persons) per MH-Specialist	Psychotherapists	Population (persons) per Psychoth.
KA-S	291,959	200	1,460	28	10,427	43	6,790	131	2,229
BAD	54,494	52	1,048	5	10,899	5	10,899	19	2,868
PF-S	119,788	83	1,443	11	10,890	15	7,986	51	2,349
MA	311,969	222	1,405	34	9,176	39	7,999	159	1,962
HD-S	146,466	111	1,320	17	8,616	39	3,756	193	759
KA-L	431,606	255	1,693	29	14,883	22	19,618	58	7,441
RA	226,912	132	1,719	17	13,348	8	28,364	23	9,866
MOS	147,782	93	1,589	8	18,473	8	18,473	13	11,368
HD-L	536,281	374	1,434	49	10,945	37	14,494	120	4,469
CW	158,055	105	1,505	9	17,562	10	15,806	30	5,269
FDS	120,637	79	1,527	6	20,106	5	24,127	22	5,484
PF-L	194,554	128	1,520	12	16,213	9	21,617	25	7,782
NoBa (total)	2,740,503	1,834	1,494	225	12,180	240	11,419	844	3,247
<i>Urban Areas</i>	<i>924,676</i>	<i>668</i>	<i>1,384</i>	<i>95</i>	<i>9,733</i>	<i>141</i>	<i>6,558</i>	<i>553</i>	<i>1,672</i>
<i>Rural Areas</i>	<i>1,815,827</i>	<i>1,166</i>	<i>1,557</i>	<i>130</i>	<i>13,968</i>	<i>99</i>	<i>18,342</i>	<i>291</i>	<i>6,240</i>
<i>For comparison, Germany</i>			<i>1,363</i>		<i>13,986</i>		<i>17,200</i>		<i>3,864</i>



BACKGROUND

Child and Adolescent Psychiatrists

Child and Adolescent Psychiatrists



“Physician Density”

[number of physicians per million persons (regional population)]

BACKGROUND

Number of persons insured by SHI per physician by specialty:

Data used for analyses of provider group involvement in care
and for concentration analyses

Insured Persons / Physician in Nordbaden

	n	SHI insured persons per physician				Total
		0 - 5 years	6 - 12 years	13 - 17 years	≥18 years	
Practitioners (APIs)	1,660	67	89	72	1,118	1,347
Pediatricians	194	573	766	617	9,566	11,522
Psychotherapists	856	130	174	140	2,168	2,611
CNS Specialists	233	477	638	514	7,965	9,593
<i>hereof: CAPS</i>	32	3,474	4,642	3,740	57,997	69,853
<i>Psychiatrists</i>	178	625	835	672	10,426	12,558

“Abrechnungsstellen” – number of unique reimbursement accounts
Data for calendar year 2009.

ESCAP, Dublin / Ireland, 2013

Nordbaden

- ↪ The **demographic structure** (by age and gender) of the Nordbaden sample (including its vdek subgroup, available for prescription analyses) compares well to the national population.
- ↪ However, regional **population density** is much higher (396/sqkm versus 229/sqkm in 2009), and GDP per capita (34,800€ versus 29,300€) as well as the rate of persons insured by private sick funds (instead of SHI: 18.2% versus 14.6%) exceed the national average.
- ↪ There are also relatively more **health care specialists** in Nordbaden (for example, 11,400 persons per mental health care specialist and 3,200 per psychotherapist) compared to Germany (17,200 and 3,900, respectively), whereas the relative number of general practitioners in the region is somewhat lower (with 1,500 persons per g.p. versus 1,400).
- ↪ **The Nordbaden sample constitutes a well-characterized study population.**
- ↪ **Interpretation of observations** should take into account the well-documented differences between region and nation.

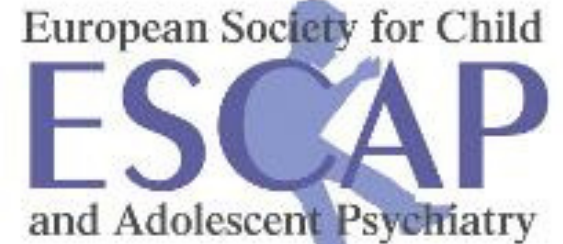
BACKGROUND

Nordbaden Database Characteristics

Number of ADHD Patients in Database

<u>Age [Years]</u>					
<u>Year</u>	0-5	6-12	13-17	≥18	Total
2003	1,134	7,815	2,157	781	11,887
2004	1,121	8,198	2,557	996	12,872
2005	1,135	8,704	2,986	1,296	14,121
2006	1,220	10,112	3,644	1,755	16,731
2007	1,242	10,797	4,047	2,173	18,259
2008	1,313	11,588	4,658	2,535	20,094
2009	1,263	11,905	5,049	3,070	21,287

July 07, 2013



15th International ESCAP Congress
Dublin, Ireland, July 06 - 10, 2013

ADHD in Nordbaden: Administrative Prevalence and Specialist Involvement in Health Care Provision

**Götz-Erik Trott¹, Oliver Schwarz, Tobias Banaschewski, Walter Scheller, Michael Viapiano,
Norbert Bonauer, and Michael Schlander**

¹University of Würzburg

and

Institute for Innovation & Valuation in Health Care (INNOVAL^{HC})
University of Heidelberg & University of Applied Economic Sciences Ludwigshafen



BIBLIOGRAPHIC NOTE

Quote as: Götz-Erik Trott, Oliver Schwarz, Tobias Banaschewski, Walter Scheller, Michael Viapiano, Norbert Bonauer, Michael Schlander: *The rising administrative prevalence of ADHD in Nordbaden, Germany, and specialist involvement in health care provision. European Child + Adolescent Psychiatry (2013) 22 (Suppl 2): S101-2.* (Abstract No. S2-06-04)

Abstract

OBJECTIVES: To determine the prevalence of attention-deficit/hyperactivity disorder (ADHD) in Nordbaden / Germany, to put this data in the context of mental health morbidity, and to assess specialist involvement in health care provision.

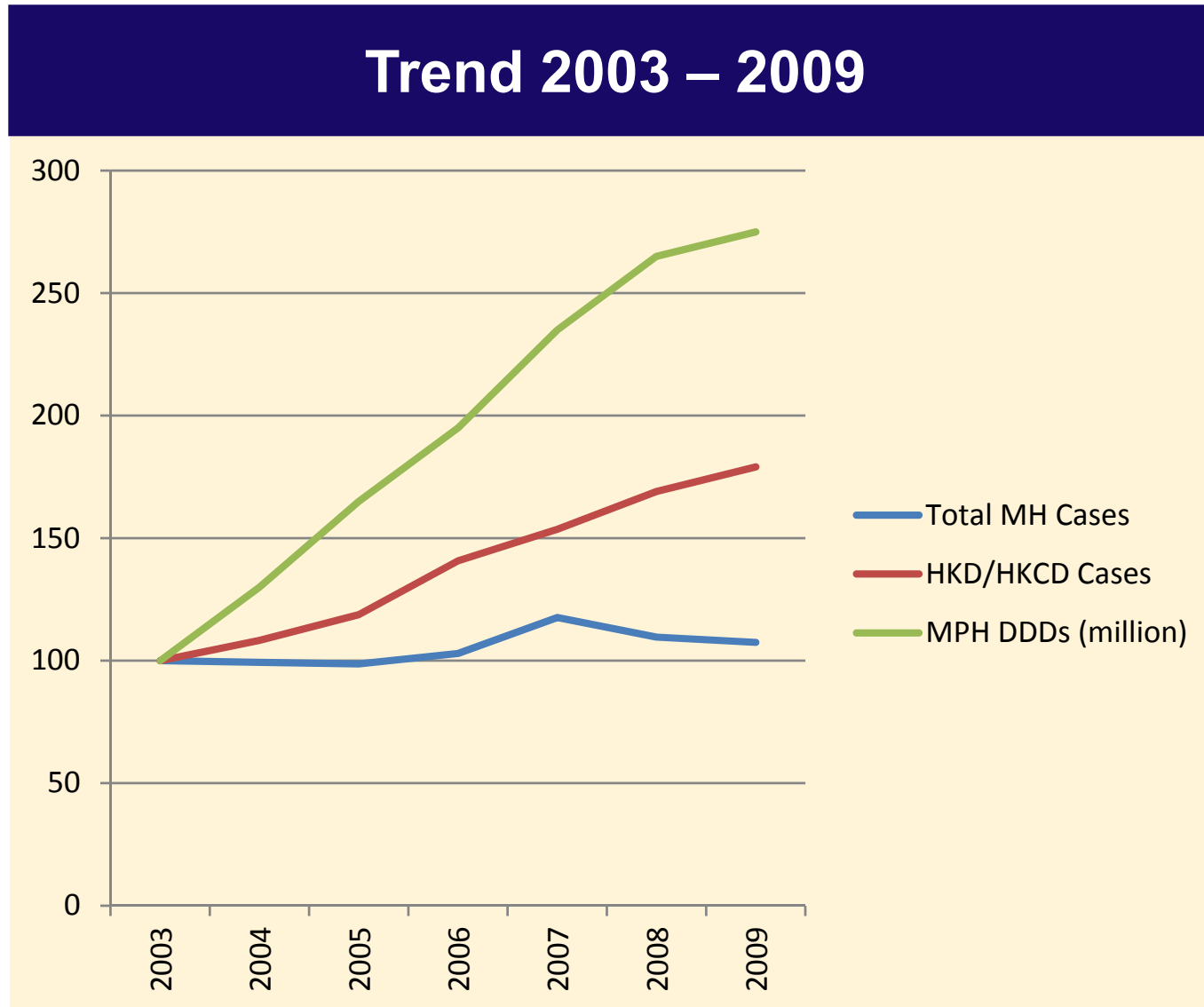
METHODS: The complete claims database of the organization of physicians registered with statutory health insurance [SHI] (*Kassenaerztliche Vereinigung, KV*) in Nordbaden/Germany was available for analysis, covering the total regional population enrolled in SHI (>2.2 million). The dataset for years 2003 to 2009 was reorganized as to allow patient-centered evaluation.

RESULTS: Uncomplicated hyperkinetic disorder (HKD, F90.0) was the number one reason for contacts with health care providers in children (age group 6-12 years, 7.2%) and adolescents (13-17 years, 3.7%), reported more than twice as often as the next frequently diagnosed mental health problems, namely various developmental, speech, and adjustment disorders. In preschoolers, speech and developmental problems were diagnosed more frequently than HKD (1.0%). From 2003 to 2009, the administrative prevalence of ADHD (HKD/F90.0 and hyperkinetic conduct disorder, HKCD/F90.1, combined) increased by 79%, i.e., from 0.53% in 2003 to 0.95% (overall; 6-12 years, 8.0%; 13-17 years, 4.2%) in 2009. Notwithstanding lower absolute numbers, ADHD prevalence in adults increased more than fourfold, from 0.04% (2003) to 0.17% (2009). Overall, the rate of ADHD patients seen at least once by a CNS specialist (physician) increased from 42.0% in 2003 to 49.1% in 2009; the rate of those seen at least twice during the calendar year increased from 26.4% to 33.2% (for age group 0-5 years, from 9.1% to 11.1%; 6-12 years, from 27.4% to 33.7%, 13-17 years, from 30.3% to 33.1%, 18+ years, from 26.4% to 33.2%). Patients with HKCD were more likely to be seen by CNS specialists than patients with HKD only. Most children (in 2009, 84.4%) and adolescents (61.0%) were seen at least once by a pediatrician. The rate of patients seen by psychotherapists remained stable at ~10%. Within provider groups, health care for patients with ADHD was highly concentrated. Each child and adolescent psychiatrist treated, on average, 231 patients with ADHD.

CONCLUSIONS: By 2009, ADHD represented the leading mental health related cause of service utilization among children and adolescents in Nordbaden. Despite a moderate increase since 2003, CNS specialist involvement in health care provision for patients with ADHD remains relatively low.

CONTEXT

Mental and Behavioral Health Disorder (“MH”) Diagnoses, ADHD (“HKD/HKCD”) Case Numbers, and Methylphenidate (“MPH”) Prescriptions



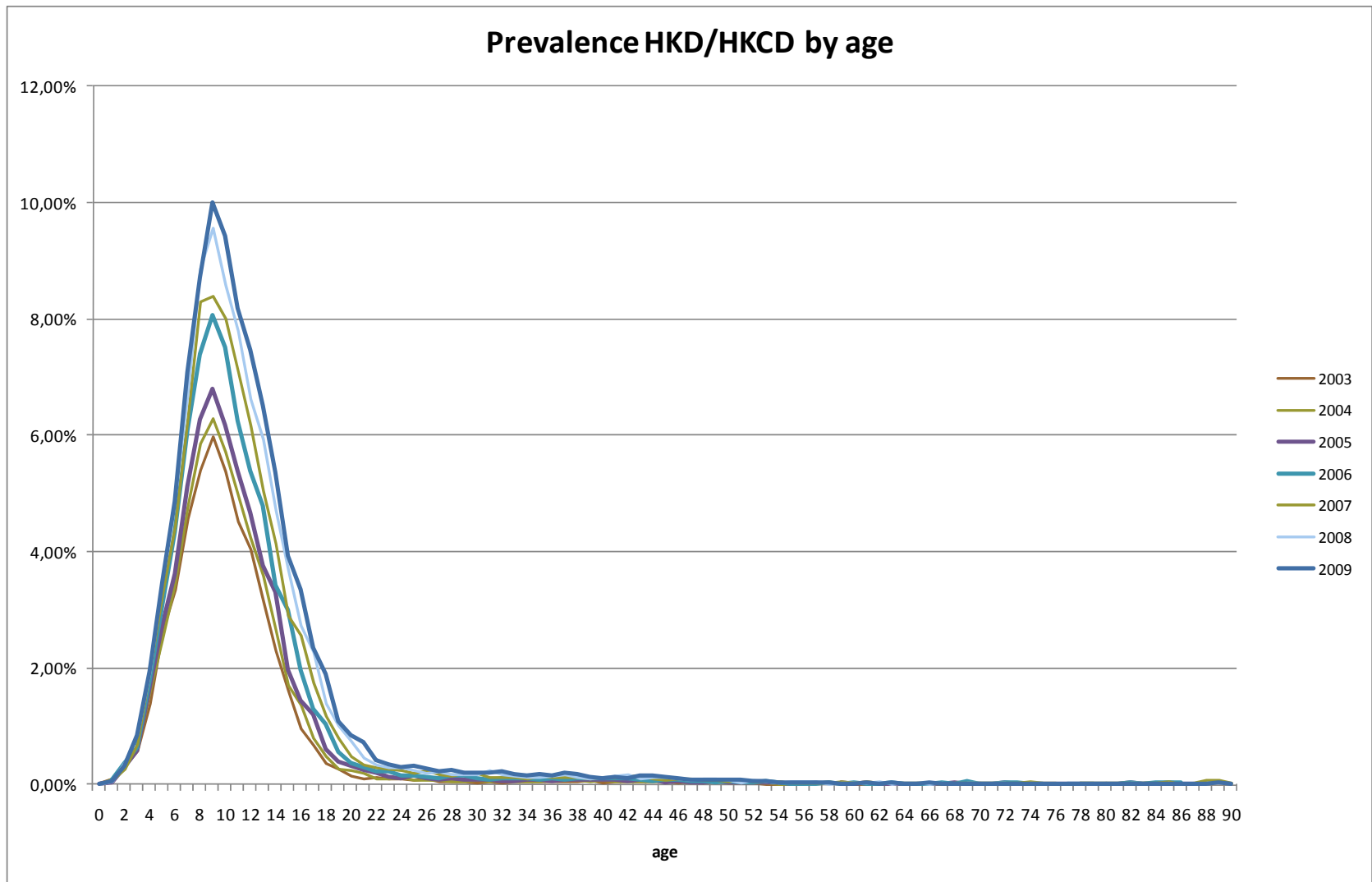
¹Data sources: absolute MH and HKD/HKCD case numbers, Nordbaden project; methylphenidate prescribed defined daily doses (MPH DDDs), U. Schwabe and D. Paffrath (2012)

ESCAP, Dublin / Ireland, 2013

ADHD IN NORDBADEN

Administrative Prevalence

Increasing Prevalence of ADHD, 2003-2009



© INNOVAL^{HC}, Prof. Dr. Michael Schlander et al., Wiesbaden / Germany, December 31, 2012, and Dublin / Ireland, July 07, 2013

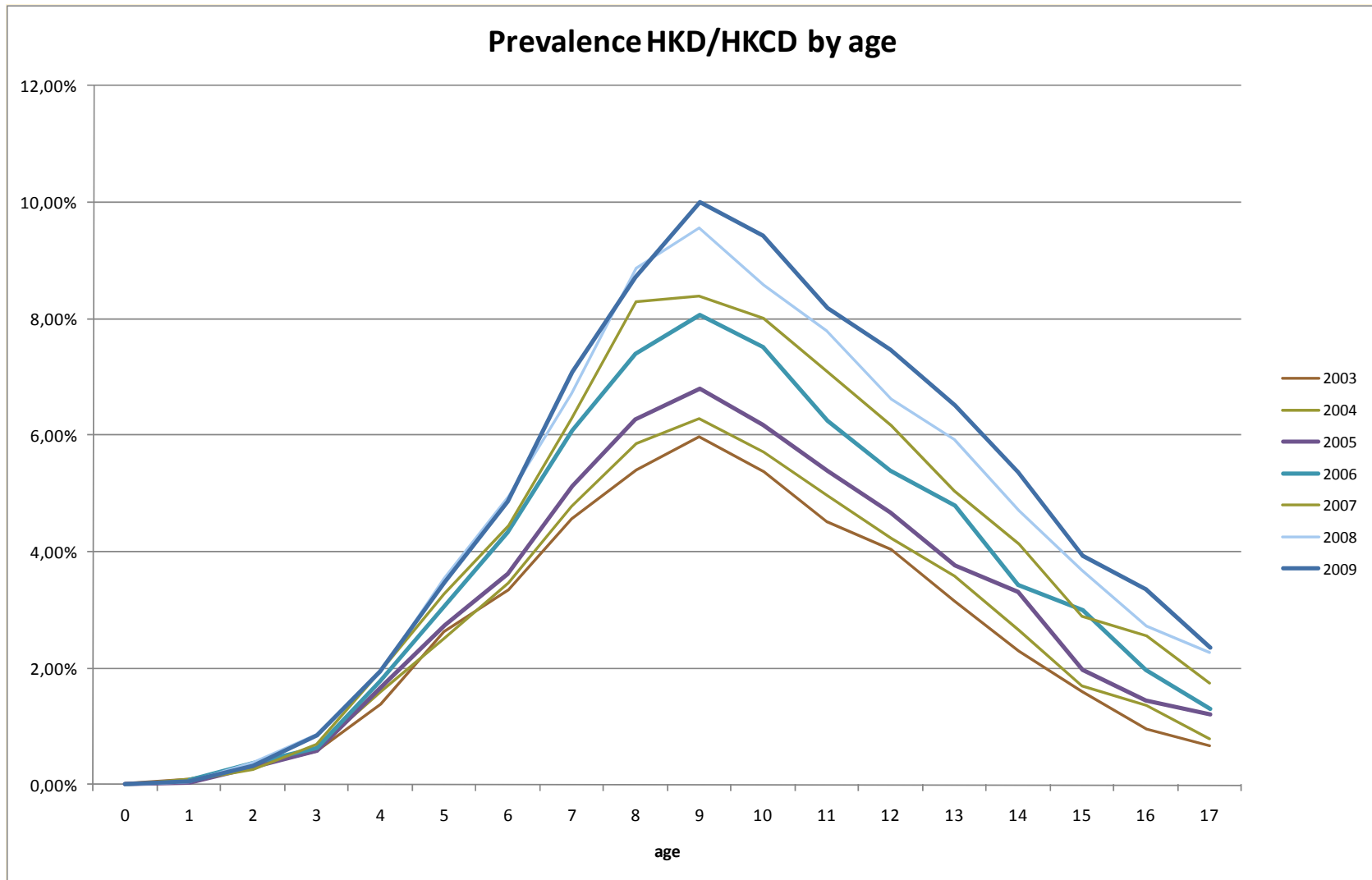
ESCAP, Dublin / Ireland, 2013



ADHD IN NORDBADEN

Administrative Prevalence

ADHD in Children and Adolescents, 2003-2009

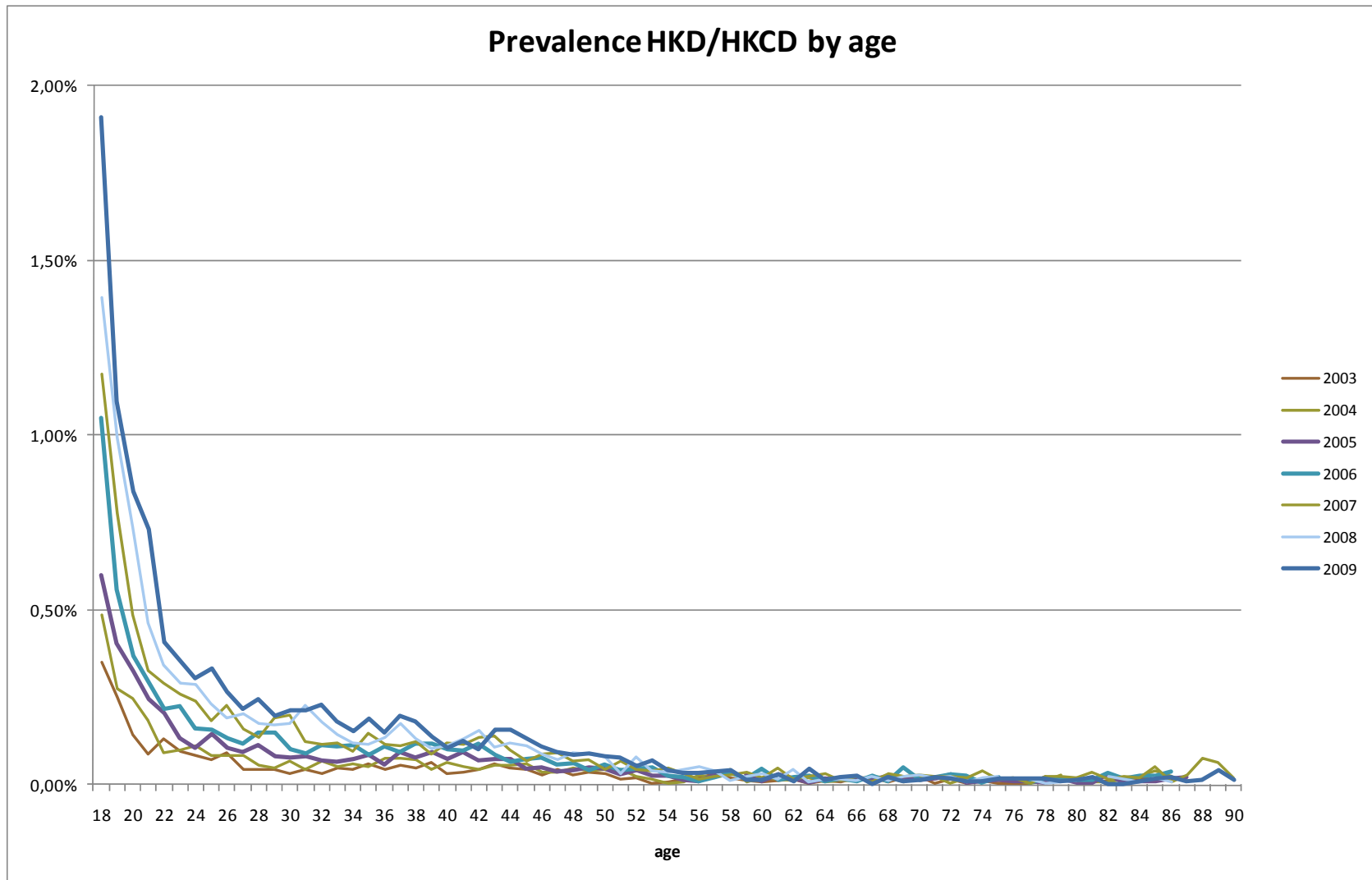


ESCAP, Dublin / Ireland, 2013

ADHD IN NORDBADEN

Administrative Prevalence

ADHD in Adults, 2003-2009



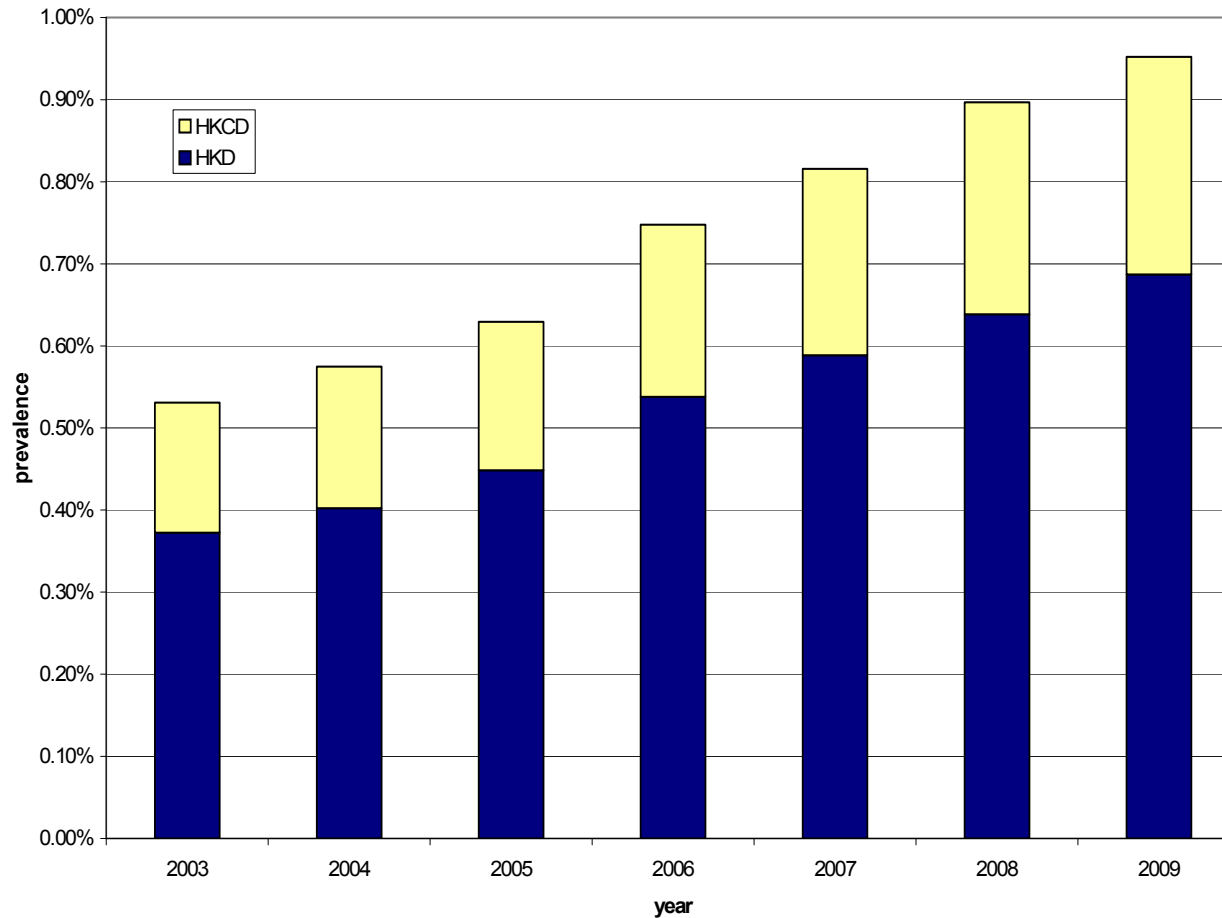
ESCAP, Dublin / Ireland, 2013



ADHD IN NORDBADEN

Administrative Prevalence

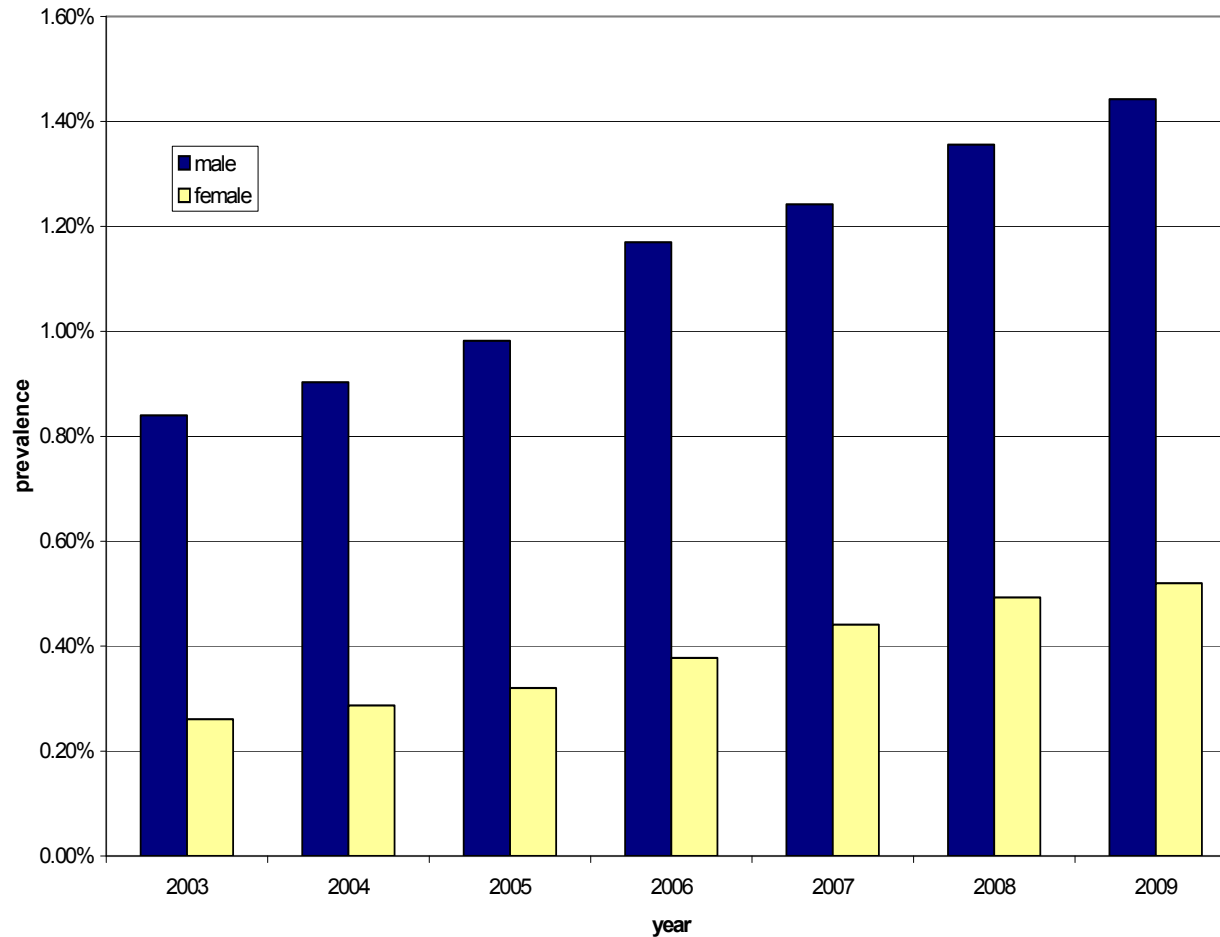
Increasing Prevalence of ADHD (by HKD / HKCD)



ADHD IN NORDBADEN

Administrative Prevalence

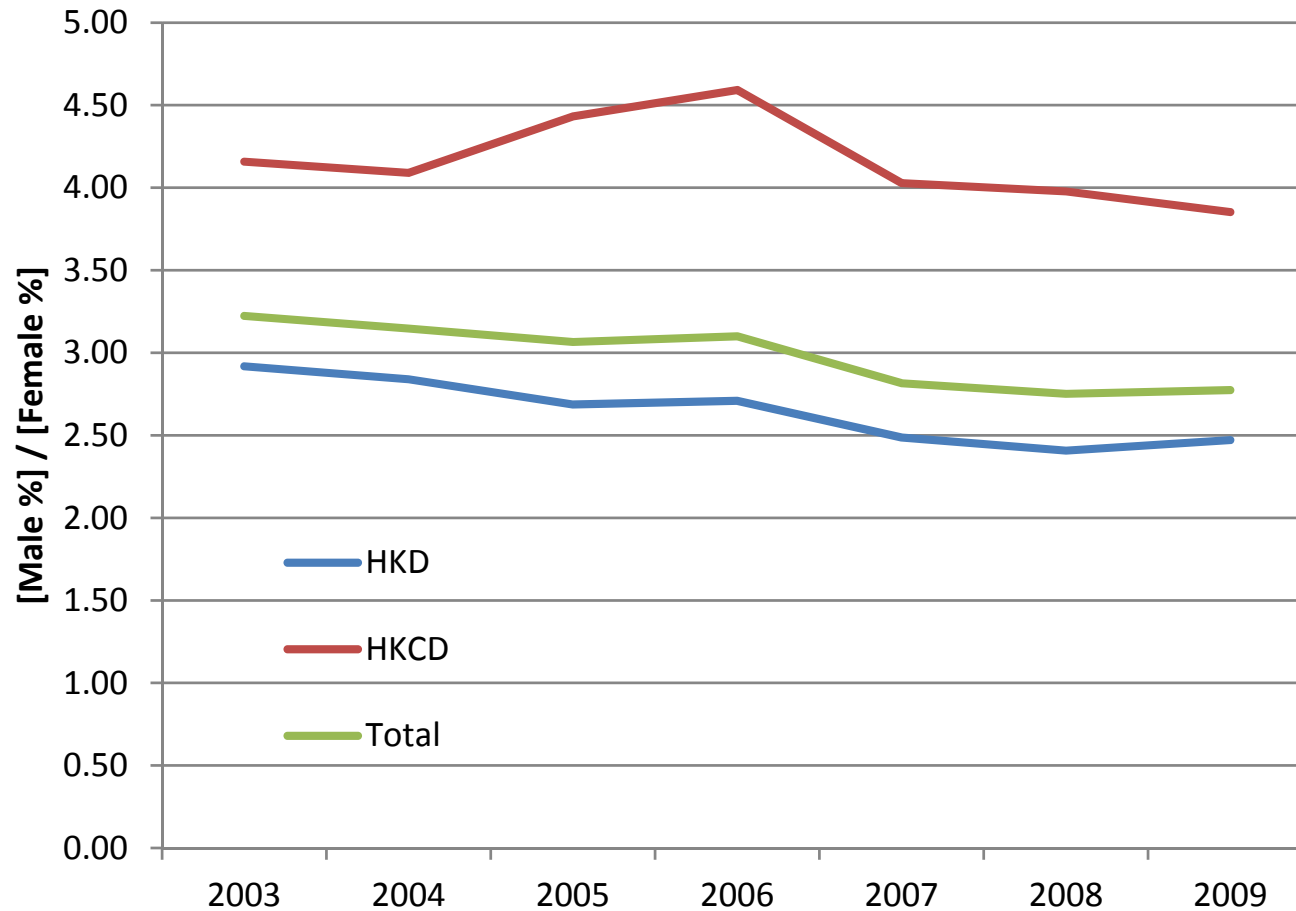
Increasing Prevalence of ADHD (by Gender)



ADHD IN NORDBADEN

Administrative Prevalence

Male / Female Ratio: ADHD (by HKD / HKCD)



ADHD IN NORDBADEN

Co-Existing Conditions (2009): Cluster Analysis

Co-Existing Internalizing & Externalizing Conditions

2009		Percent of ADHD Patients						
age group	gender	ADHD all	HKD	HKCD	ADHD & Intern.	ADHD & extern.	intern. & extern.	ADHD without intern. and extern.
0 - 5	male	910	73.30%	26.70%	18.02%	32.20%	9.23%	59.01%
	female	353	72.52%	27.48%	20.40%	30.31%	11.33%	60.62%
	total	1,263	73.08%	26.92%	18.69%	31.67%	9.82%	59.46%
6- 12	male	8,423	68.61%	31.39%	19.96%	35.01%	8.84%	53.88%
	female	3,482	77.08%	22.92%	23.95%	26.74%	8.85%	58.16%
	total	11,905	71.09%	28.91%	21.13%	32.59%	8.85%	55.13%
13 - 17	male	3,881	66.40%	33.60%	20.30%	36.46%	9.22%	52.46%
	female	1,168	72.86%	27.14%	29.45%	30.48%	11.90%	51.97%
	total	5,049	67.89%	32.11%	22.42%	35.08%	9.84%	52.35%
18+	male	1,894	79.36%	20.64%	41.18%	31.05%	16.37%	44.14%
	female	1,176	88.35%	11.65%	68.20%	29.34%	23.81%	26.28%
	total	3,070	82.80%	17.20%	51.53%	30.39%	19.22%	37.30%
total	male	15,108	69.67%	30.33%	22.59%	34.72%	9.91%	52.60%
	female	6,179	78.17%	21.83%	33.21%	28.14%	12.41%	51.06%
	total	21,287	72.14%	27.86%	25.67%	32.81%	10.64%	52.15%

Key Findings

- ↪ **Conduct & personality disorders (39.3% vs. 3.9%)**
- ↪ **Mood and affective disorders (38.0% vs. 8.9% in control group)**
 - ↪ 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%)**
- ↪ Adjustment disorders (8.3% vs. 1.6%)
- ↪ Sleep disorders (4.5% vs. 1.3%)
- ↪ Incontinence (4.4% vs. 2.3%)
- ↪ Mental retardation (3.8% vs. 0.8%)
- ↪ Tic disorders (2.4% vs. 0.7%)
- ↪ Disorders due to brain damage (1.8 vs. 0.4%)
- ↪ Pervasive development disorders (1.6% vs. 0.5%)
- ↪ Disorders due to substance use (0.4% vs. 0.1%)

CO-EXISTING CONDITIONS

Psychiatric Comorbidity in Adult Patients With ADHD (2003)

Key Findings

(Prevalence Rates >1% Only, Specific Disorders Within Some Groups Only, RR>3)

- ↪ **Mood / affective disorders (61.8% vs. 14.3% in control group)**
- ↪ **Conduct & personality disorders (33.2% vs. 0.6%)**
- ↪ **Adjustment disorders (18.9% vs. 3.0%)**
- ↪ **Sleep disorders (11.3% vs. 2.3%)**
- ↪ **Disorders due to substance abuse (7.8% vs. 1.9%)**
- ↪ **Disorders due to brain damage (5.1% vs. 0.6%)**
- ↪ Eating disorders (4.3% vs. 0.3%)
- ↪ Specific developmental disorders (3.8% vs. 0.6%)
- ↪ Mental retardation (2.4% vs. 0.2%)
- ↪ Developmental disorders of scholastic skills (2.2% vs. 0.3%)
- ↪ Habit and impulsive disorders (1.4% vs. 0.0%)

“Who Cares?” – Health Care Provider Involvement in Diagnosis and Treatment of Patients with ADHD

Physician Involvement: Trend over Time

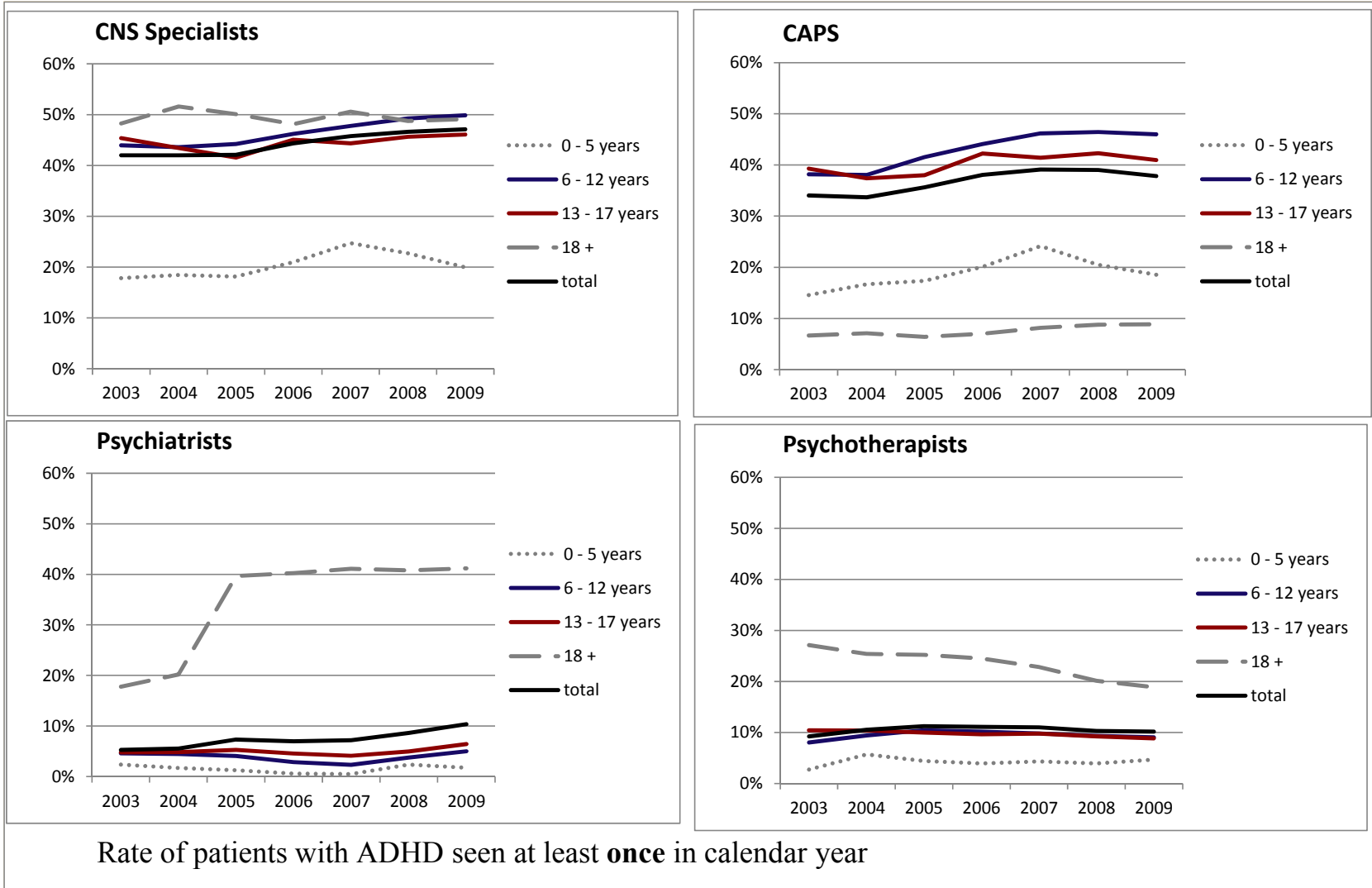
Year	Subjects with ADHD n	Subjects with ADHD seen at least once by a:							
		CNS Specialist		Pediatrician		Psychotherapist		Practitioner (API)	
		n	%	n	%	n	%	n	%
2003	11,887	4,995	42.0%	8,417	70.8%	1,099	9.2%	7,204	60.6%
2004	12,872	5,407	42.0%	9,041	70.2%	1,355	10.5%	7,481	58.1%
2005	14,121	5,945	42.1%	9,849	69.7%	1,585	11.2%	8,682	61.5%
2006	16,731	7,419	44.3%	11,372	68.0%	1,859	11.1%	9,976	59.6%
2007	18,259	8,359	45.8%	12,418	68.0%	2,009	11.0%	11,120	60.9%
2008	20,094	9,366	46.6%	13,698	68.2%	2,073	10.3%	11,740	58.4%
2009	21,287	10,027	47.1%	14,588	68.5%	2,167	10.2%	12,651	59.4%



ADHD IN NORDBADEN

“Who Cares?” – Health Care Provider Involvement in Diagnosis and Treatment of Patients with ADHD

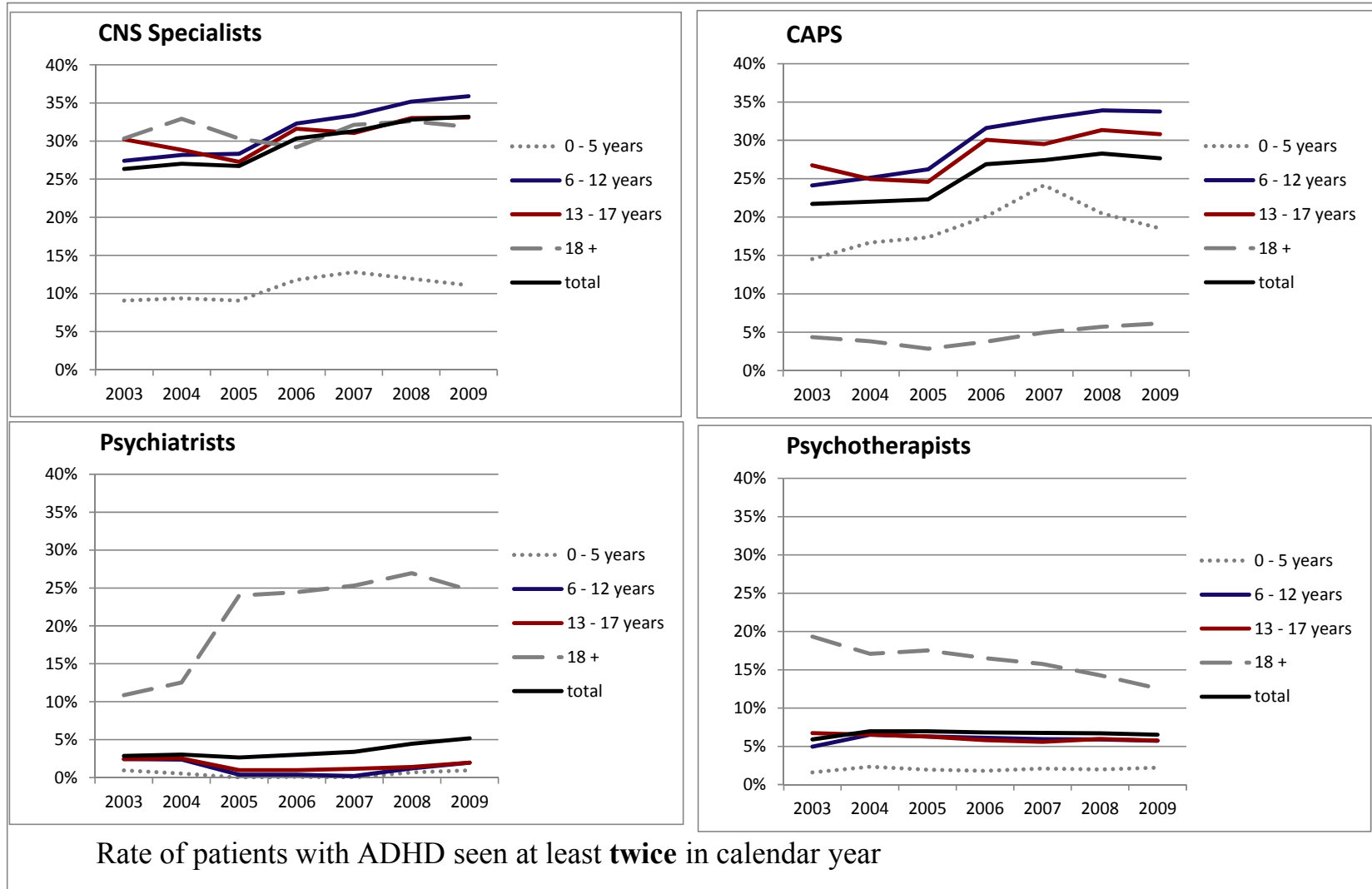
Mental Health Specialist Involvement



ADHD IN NORDBADEN

“Who Cares?” – Health Care Provider Involvement in Diagnosis and Treatment of Patients with ADHD

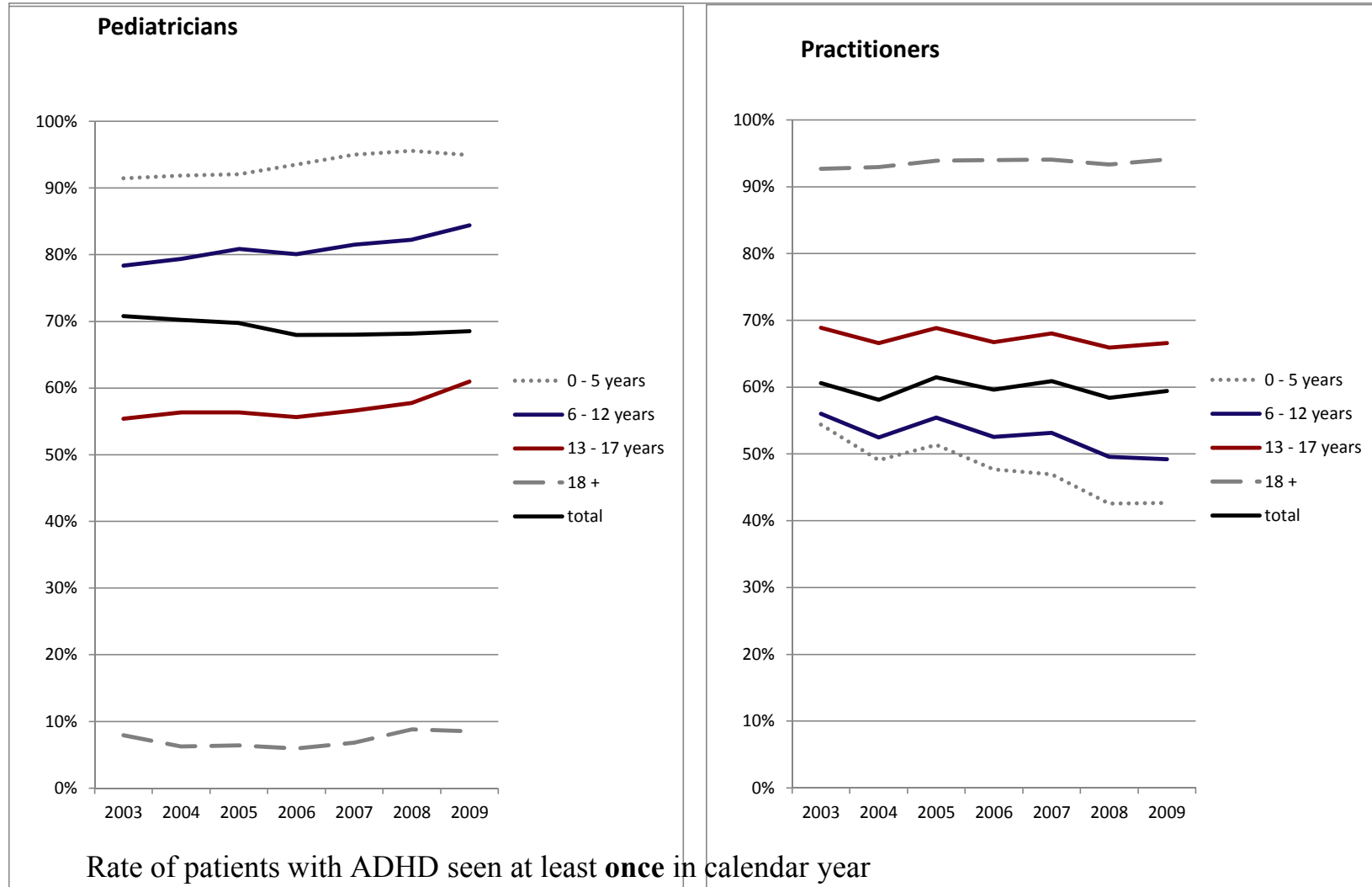
Mental Health Specialist Involvement



ADHD IN NORDBADEN

“Who Cares?” – Health Care Provider Involvement in Diagnosis and Treatment of Patients with ADHD

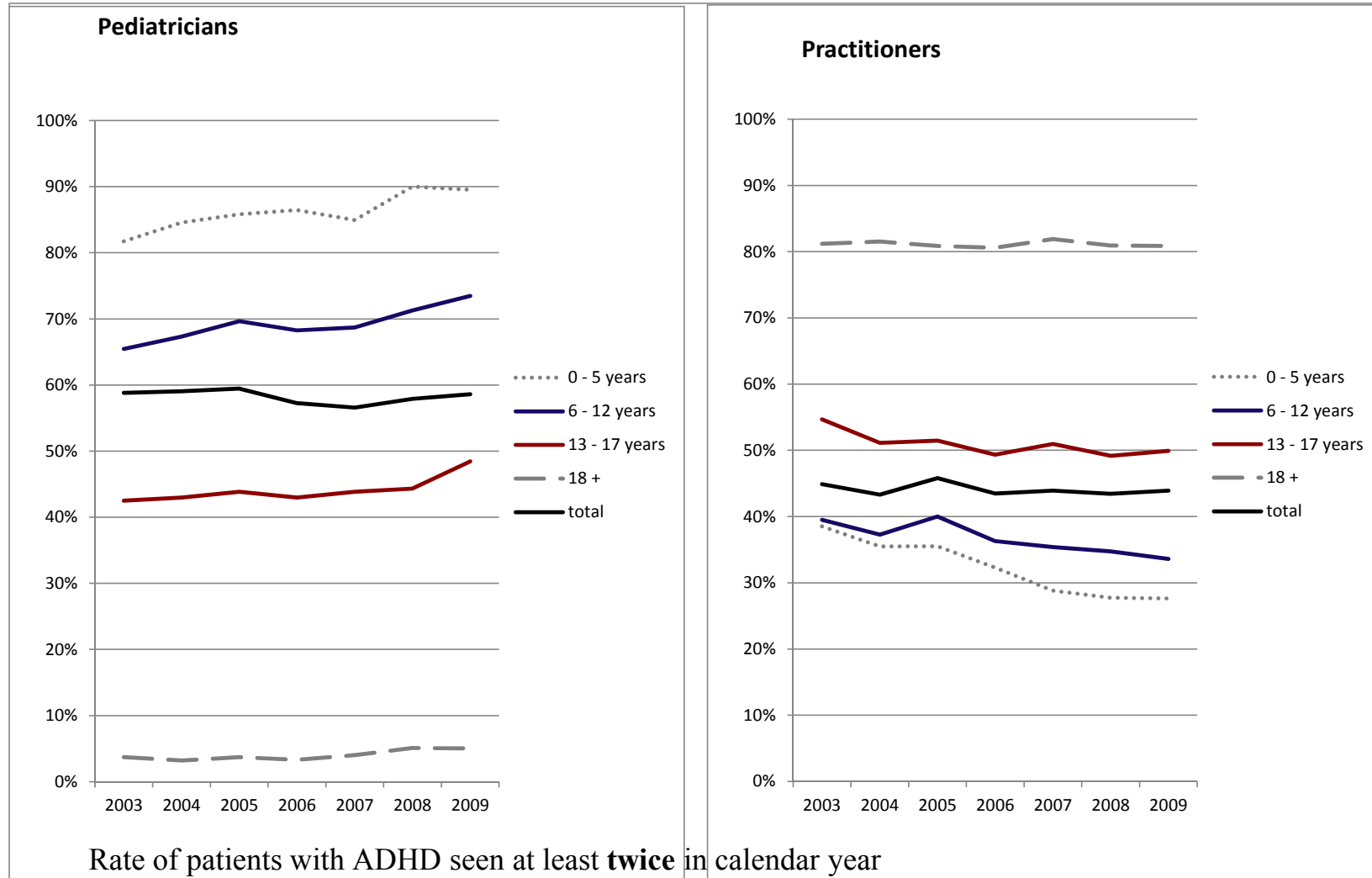
Non-MH-Specialist Physician Involvement



ADHD IN NORDBADEN

“Who Cares?” – Health Care Provider Involvement in Diagnosis and Treatment of Patients with ADHD

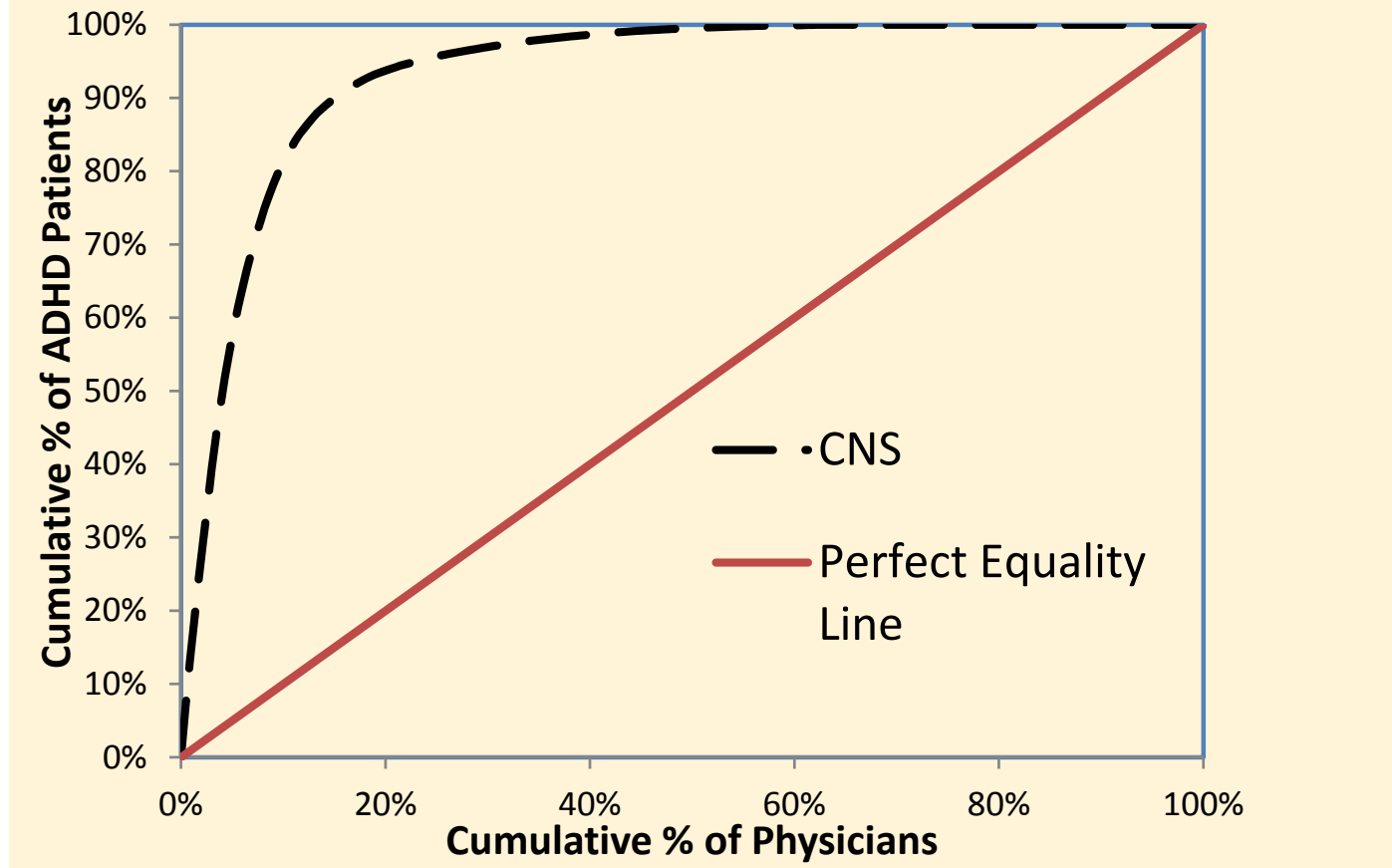
Non-MH-Specialist Physician Involvement



ADHD IN NORDBADEN

“Who Cares?” – Health Care Provider Involvement in Diagnosis and Treatment of Patients with ADHD

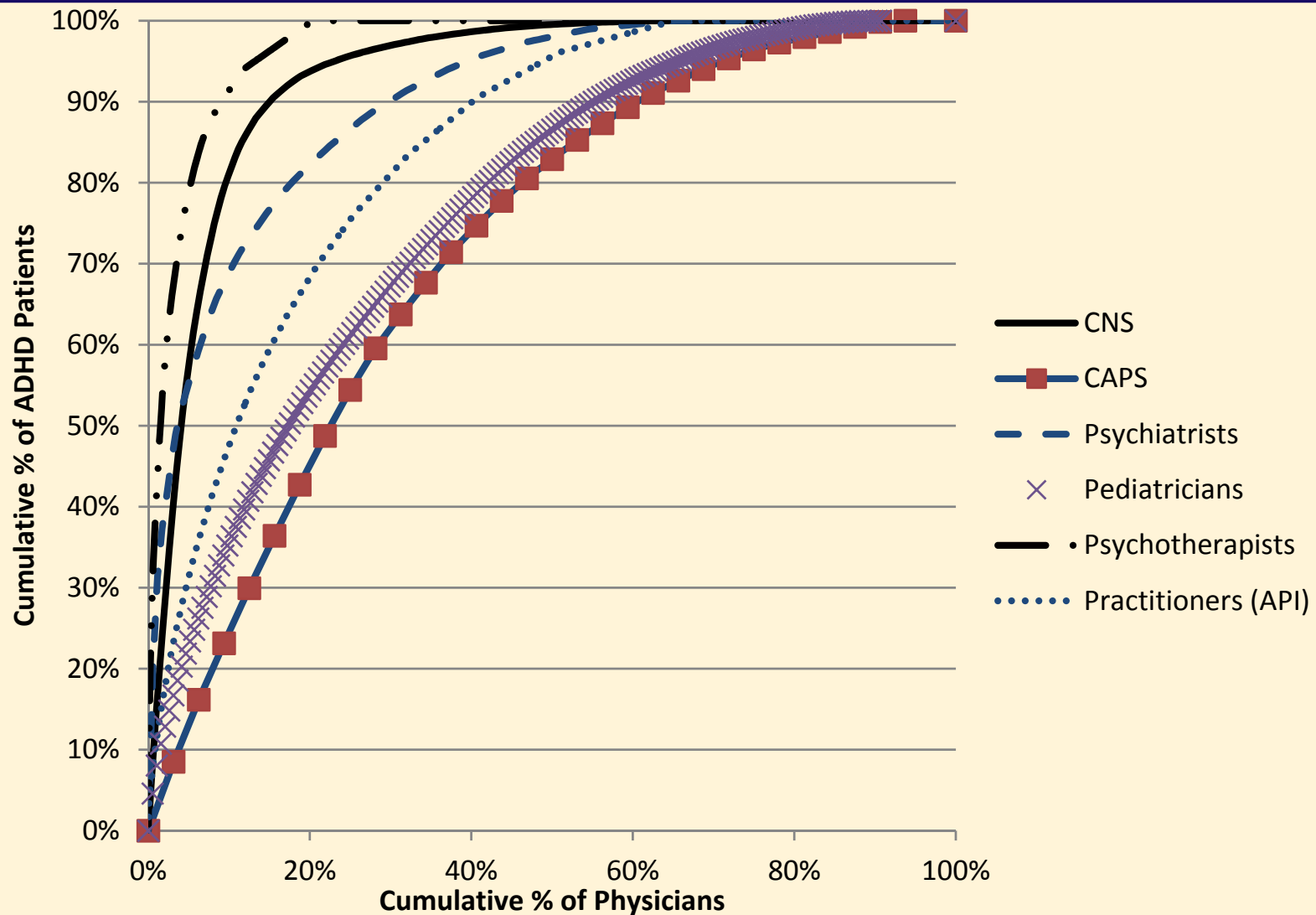
Concentration Analysis



ADHD IN NORDBADEN

“Who Cares?” – Health Care Provider Involvement in Diagnosis and Treatment of Patients with ADHD

Concentration of Care among Provider Groups



Data for calendar year 2009.

ESCAP, Dublin / Ireland, 2013

“Who Cares?” – Health Care Provider Involvement in Diagnosis and Treatment of Patients with ADHD

Concentration of Care among Provider Groups

Number of Patients per Physician

	Mean	Percentile					
		5%	25%	50%	75%	95%	99%
CAPS	231.3	0.0	72.5	175.5	400.5	566.0	631.0
CNS Specialists	43.0	0.0	0.0	3.0	14.0	310.0	516.0
Pediatricians	58.3	0.0	14.0	42.0	76.0	171.0	390.0
Practitioners (API)	3.6	0.0	0.0	2.0	5.0	14.0	25.0
Psychiatrists	9.7	0.0	0.0	2.0	8.0	34.0	193.0
Psychotherapists	1.4	0.0	0.0	0.0	0.0	6.0	30.0
Total	11.8	0.0	0.0	1.0	5.0	49.0	238.0

Data for calendar year 2009.

The percentiles shown in the Table above are the percentiles of the empirical distribution function of the number of patients per physician; for example, 25% of the pediatricians covered in the study (each) diagnosed 14 patients or less.

Key Observations

- ▭ The administrative prevalence of ADHD has been **increasing** steadily throughout the study period from 2003 to 2009.
- ▭ **Age and gender specific patterns** did not change significantly, including the apparent mismatch between the high diagnosis rates of ADHD in children and adolescents versus the low rate in adults.
- ▭ Most ADHD patients are diagnosed with co-existing mental health problems, with **comorbidity profiles** remaining stable during the observation period.
- ▭ Most patients are diagnosed and treated by **pediatricians**; while the rate of mental health care specialist involvement has been moderately increasing, it remains below 50% for diagnosis (at least one contact p.a.) and 33% for treatment (at least two contacts p.a.)
- ▭ Within health provider groups, **care remains highly concentrated** among a small number of high-volume providers, especially among psychiatrists and psychotherapists.

July 07, 2013

European Society for Child
ESCAP
and Adolescent Psychiatry

15th International ESCAP Congress
Dublin, Ireland, July 06 - 10, 2013

ADHD in Nordbaden:

The Evolving Treatment Patterns for ADHD, 2003-2009

Tobias Banaschewski¹, Oliver Schwarz, Götz-Erik Trott, Walter Scheller, Michael Viapiano, Norbert Bonauer, and Michael Schlander

¹University of Heidelberg



Institute for Innovation & Valuation in Health Care (INNOVAL^{HC})
University of Heidelberg & University of Applied Economic Sciences Ludwigshafen

IV

BIBLIOGRAPHIC NOTE

Quote as: Tobias Banaschewski, Oliver Schwarz, Götz-Erik Trott, Walter Scheller, Michael Viapiano, Norbert Bonauer, Michael Schlander: *The evolving treatment patterns for ADHD in Nordbaden/Germany: a retrospective study based on administrative data, 2003-2009. European Child + Adolescent Psychiatry (2013) 22 (Suppl 2): S101.* (Abstract No. S2-06-03)

Abstract

OBJECTIVES: To explore the evolving treatment patterns for patients with attention-deficit/hyperactivity disorder (ADHD) in Nordbaden / Germany, in particular psychostimulant prescriptions in children and adolescents.

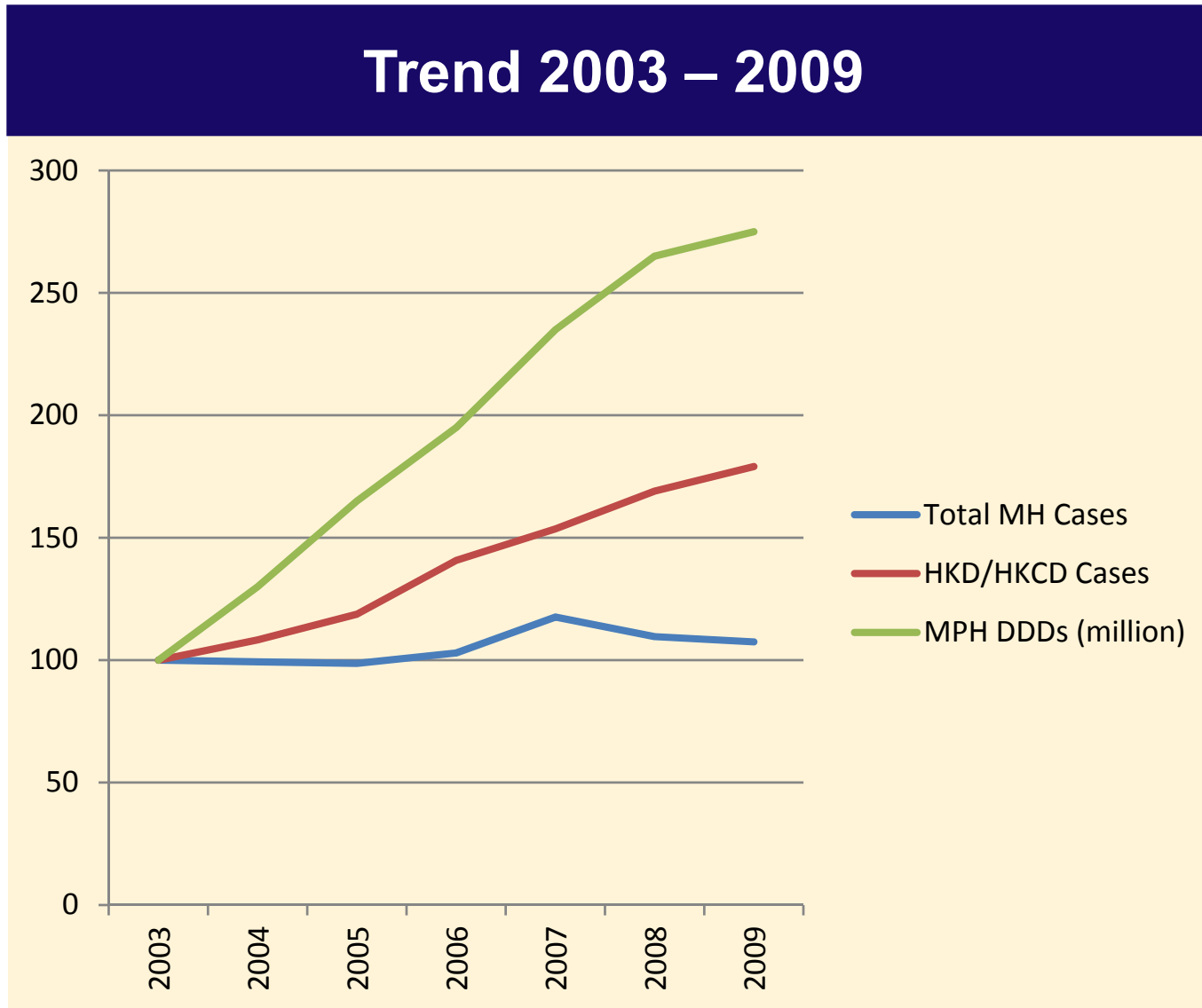
METHODS: The complete claims database of the organization of physicians registered with statutory health insurance [SHI] (*Kassenaerztliche Vereinigung, KV*) in Nordbaden/Germany was available for analysis, covering the total regional population enrolled in SHI (>2.2 million). The dataset for years 2003 to 2009 was reorganized as to allow patient-centered evaluation. For calendar year 2009, 21,287 patients with ADHD [“hyperkinetic disorder”, HKD; ICD-10 codes F90.0 or F90.1] (male, 15,108; female, 6,179; including 5,931 patients or 27.9% [male, 4,582; female, 1,349] with coexisting conduct disorder [HKCD; F90.1 or a combination of F90 and F91]) were available for analysis; of those, 846,677 patients were insured by a vdek member company.

RESULTS: Preschool children (age 0-5 years) were prescribed medication in very rare cases (1.6% in 2009) and after an average lead time of more than one year only. Most received some form of nonpharmacological therapy or were left untreated (42%). In contrast, 41% of children (age group 6-12 years, continuously increasing from 32% in 2003) and 54% of adolescents (age group 13-17 years, rate remaining stable since 2006) were prescribed either stimulant (methylphenidate, MPH, or amphetamine) or nonstimulant (atomoxetine) drugs. Males and patients with concomitant conduct disorder were more likely to receive medication treatment. Modified-release MPH formulations were more widely used than immediate-release MPH. Overall use of medication increased steadily, from 32.2% of ADHD patients in 2003 to 39.9% in 2009, whereas its rate decreased over time in adult patients (declining from 38% in 2003 to 26% in 2009). Upon identification and individual review of all prescriptions of ADHD medication for members of the control group, no evidence could be found supporting potentially inappropriate use of stimulant medication. Further data on average dosing, therapy duration, switches and augmentation will be presented by age group, gender, severity, and comorbidity status of patients as well as by category of treatment.

CONCLUSIONS: Treatment patterns were highly age and gender specific. Except for preschoolers, therapeutic management of patients with ADHD relied heavily on drug treatment. No evidence was found for inappropriate prescribing of ADHD medication.

CONTEXT

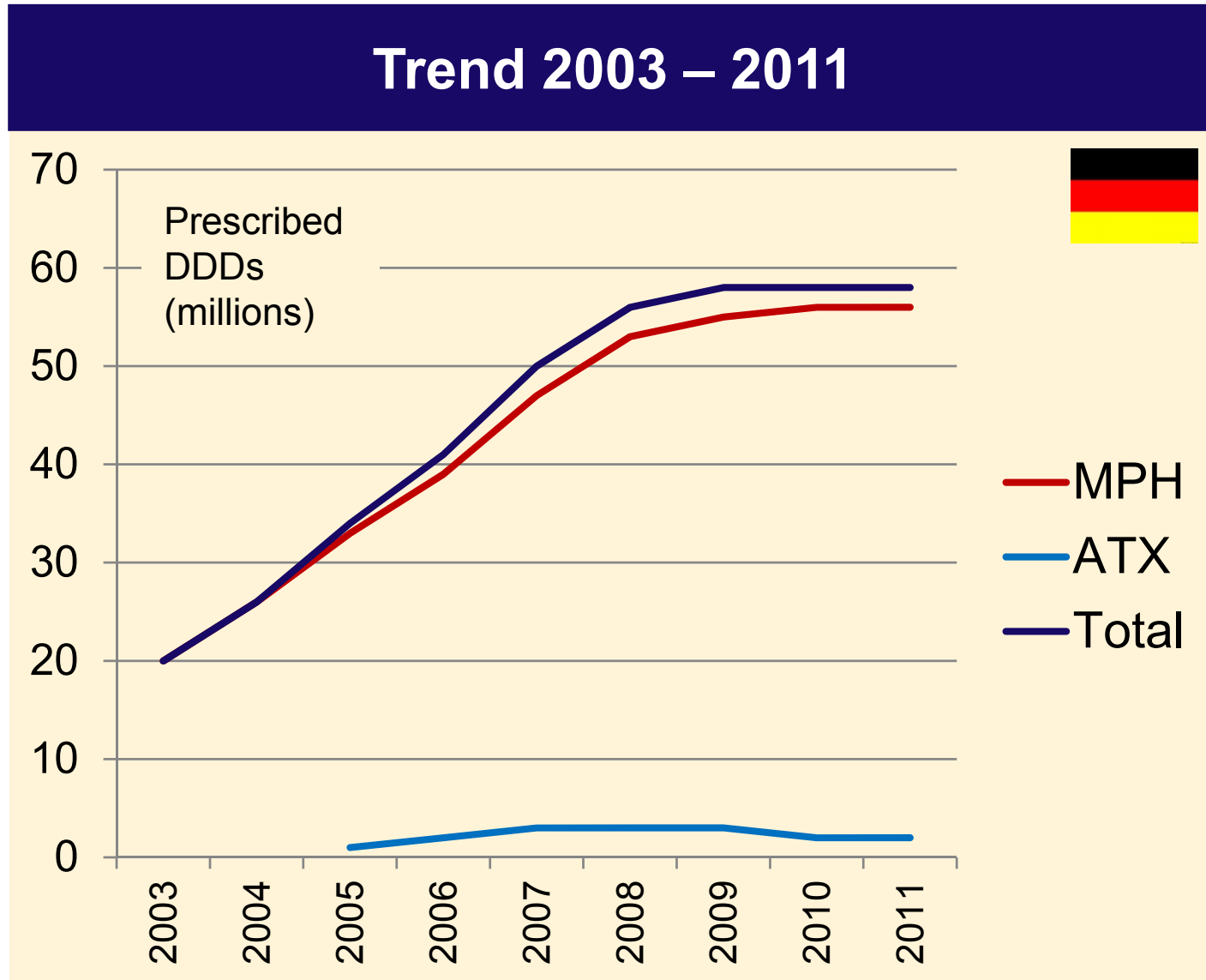
Mental and Behavioral Health Disorder (“MH”) Diagnoses, ADHD (“HKD/HKCD”) Case Numbers, and Methylphenidate (“MPH”) Prescriptions



¹Data sources: absolute MH and HKD/HKCD case numbers, Nordbaden project; methylphenidate prescribed defined daily doses (MPH DDDs), U. Schwabe and D. Paffrath (2012)

ESCAP, Dublin / Ireland, 2013

Prescriptions of Drugs Licensed for Treatment of ADHD in Germany¹



¹Data source: U. Schwabe and D. Paffrath (2012)

CONTEXT

Prescriptions of drugs licensed for treatment of ADHD in Germany¹

Trend 2003 – 2011			
Prescriptions Year	Methylphenidate (million DDDs) [in brackets: increase over previous year]	Atomoxetine (million DDDs) [in brackets: increase over previous year]	Total (million DDDs) [in brackets: increase over previous year]
2003	20	n.a	20
2004	26 [+30%]	n.a.	26 [+30%]
2005	33 [+27%]	1	34 [+31%]
2006	39 [+18%]	2 [+100%]	41 [+21%]
2007	47 [+21%]	3 [+50%]	50 [+22%]
2008	53 [+13%]	3 [+/-0%]	56 [+12%]
2009	55 [+4%]	3 [+/-0%]	58 [+4%]
2010	56 [+2%]	2 [-33%]	58 [+/-0%]
2011	56 [+/-0%]	2 [+/-0%]	58 [+/-0%]

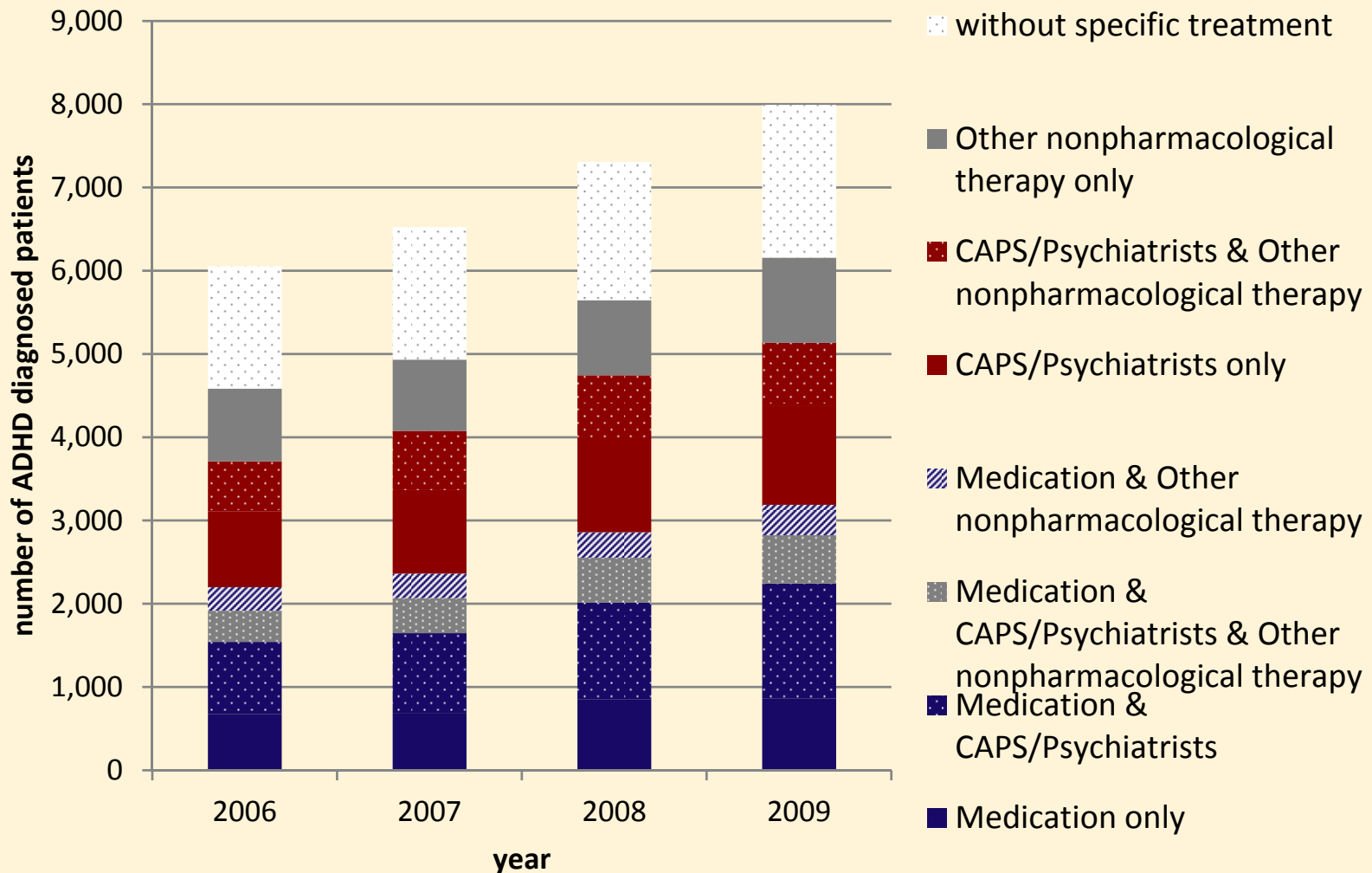
¹Data source: U. Schwabe and D. Paffrath (2012)



ADHD IN NORDBADEN

Therapeutic Management of Patients with ADHD

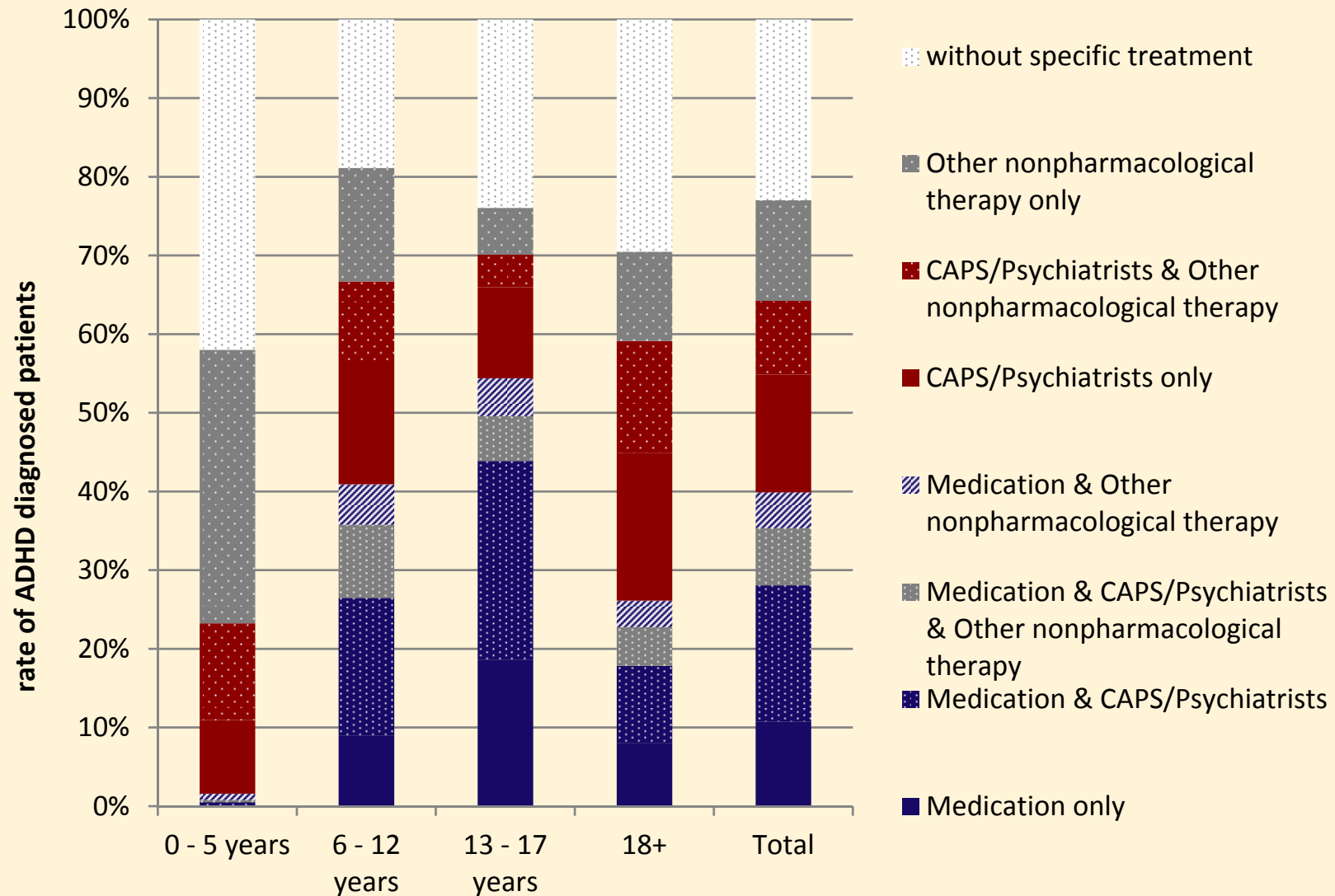
Types of Service Utilized, 2006-2009



ADHD IN NORDBADEN

Therapeutic Management of Patients with ADHD

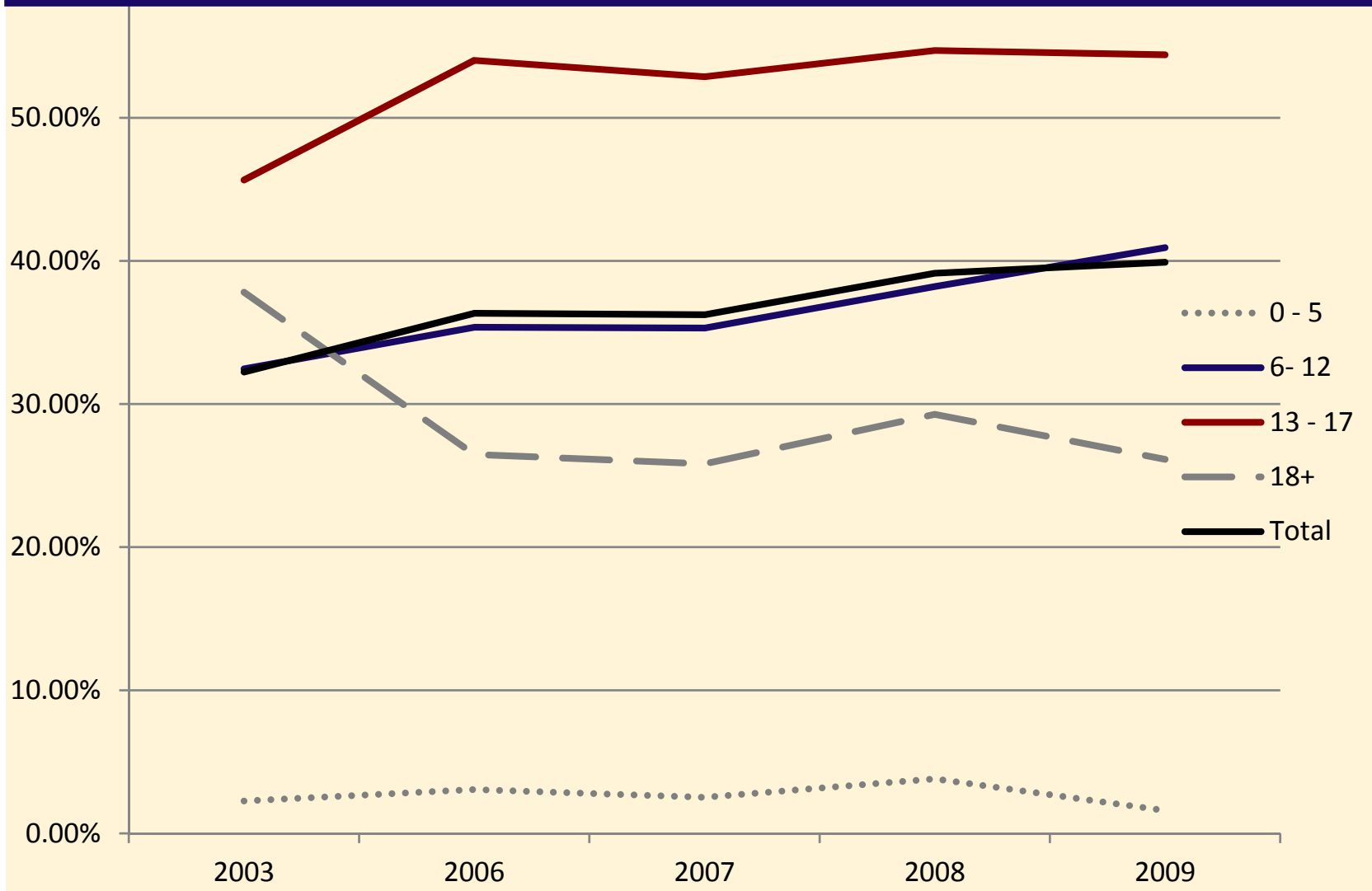
Types of Service Utilized (by Age Group), Year 2009



ADHD IN NORDBADEN

Therapeutic Management of Patients with ADHD

Medication Management (by Age Group and Year)



Patients with at least one prescription of ADHD medication as rate of patients with ADHD diagnosis in age group.

ESCAP, Dublin / Ireland, 2013

ADHD IN NORDBADEN

Therapeutic Management of Patients with ADHD

Medication Management (by Age Group, Active Compound, and Year)

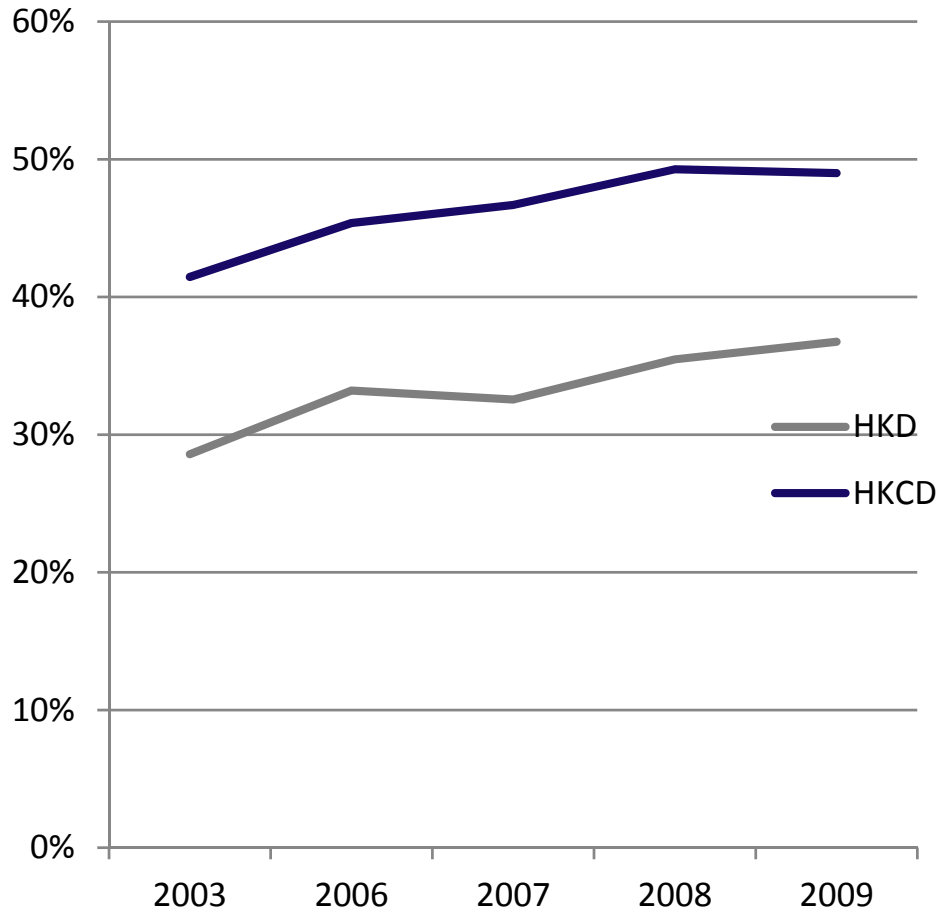
Age group	Active ingredient	2003	2006	2007	2008	2009
0 - 5	METHYLPHENIDATE	2.27%	2.81%	2.53%	3.81%	1.60%
	ATOMOXETINE	0.00%	0.26%	0.00%	0.00%	0.27%
	AMPHETAMINE	0.00%	0.77%	0.28%	0.82%	0.53%
	MPH/ATX/AMP	2.27%	3.07%	2.53%	3.81%	1.60%
6- 12	METHYLPHENIDATE	32.46%	34.05%	33.88%	36.70%	39.62%
	ATOMOXETINE	0.00%	3.10%	3.34%	3.83%	2.96%
	AMPHETAMINE	0.00%	3.27%	4.77%	5.61%	6.31%
	MPH/ATX/AMP	32.46%	35.36%	35.31%	38.21%	40.93%
13 - 17	METHYLPHENIDATE	45.66%	51.78%	50.40%	51.70%	51.64%
	ATOMOXETINE	0.00%	3.79%	4.08%	5.22%	4.56%
	AMPHETAMINE	0.00%	4.23%	7.49%	8.46%	9.27%
	MPH/ATX/AMP	45.66%	54.01%	52.87%	54.71%	54.41%
18+	METHYLPHENIDATE	37.81%	24.73%	24.17%	27.34%	24.20%
	ATOMOXETINE	0.00%	2.03%	2.22%	1.85%	2.17%
	AMPHETAMINE	0.00%	2.03%	3.88%	4.45%	4.48%
	MPH/ATX/AMP	37.81%	26.49%	25.83%	29.29%	26.14%
Total	METHYLPHENIDATE	32.24%	34.84%	34.62%	37.28%	38.19%
	ATOMOXETINE	0.00%	2.94%	3.17%	3.68%	3.09%
	AMPHETAMINE	0.00%	3.17%	5.03%	5.88%	6.45%
	MPH/ATX/AMP	32.24%	36.34%	36.24%	39.14%	39.90%

Patients with at least one prescription of ADHD medication as rate of patients with ADHD diagnosis in age group.

ADHD IN NORDBADEN

Therapeutic Management of Patients with ADHD

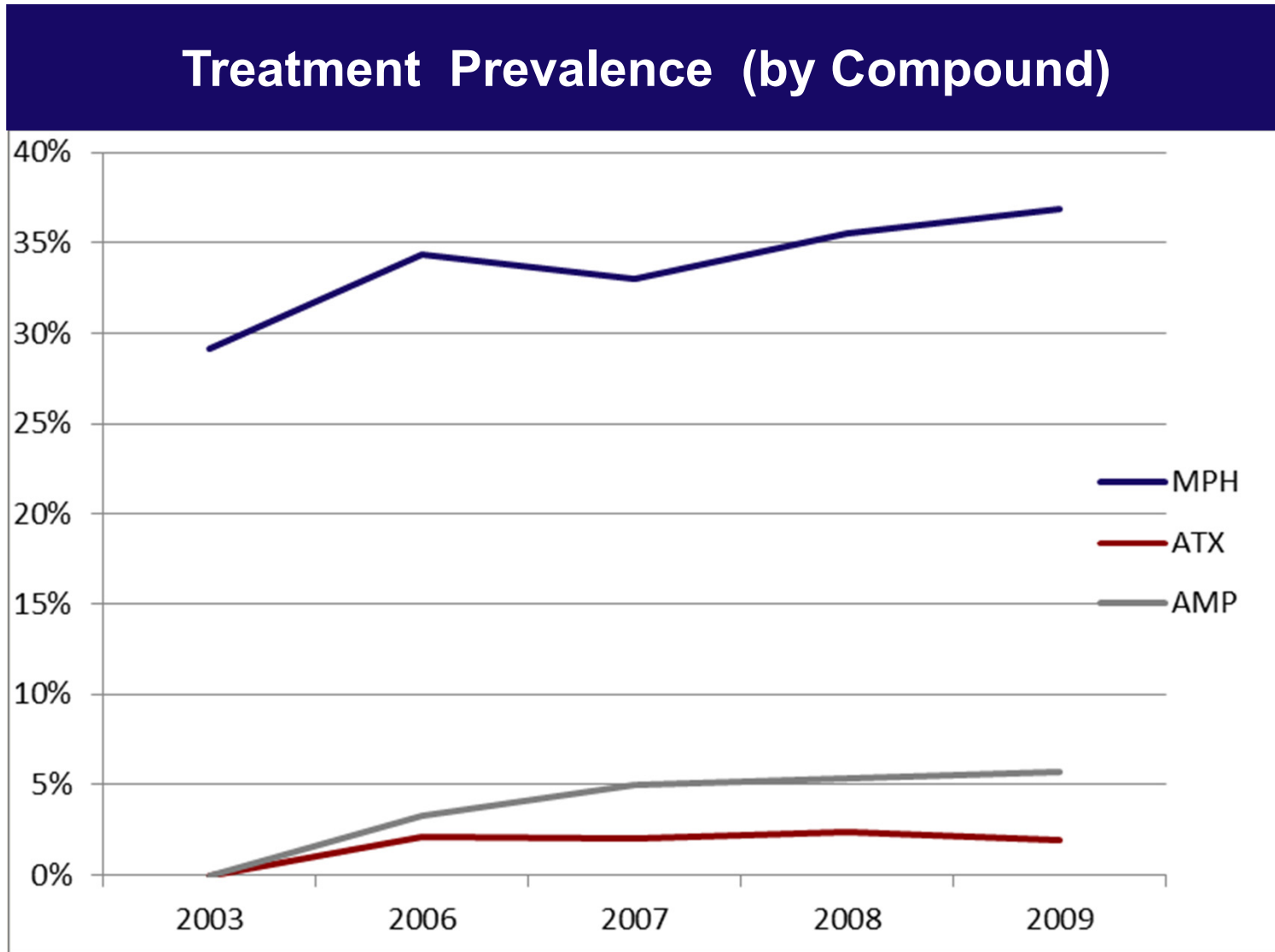
Treatment Prevalence (Medication)



Patients with at least one prescription of ADHD medication as rate of patients with ADHD diagnosis in age group.

ADHD IN NORDBADEN

Therapeutic Management of Patients with ADHD



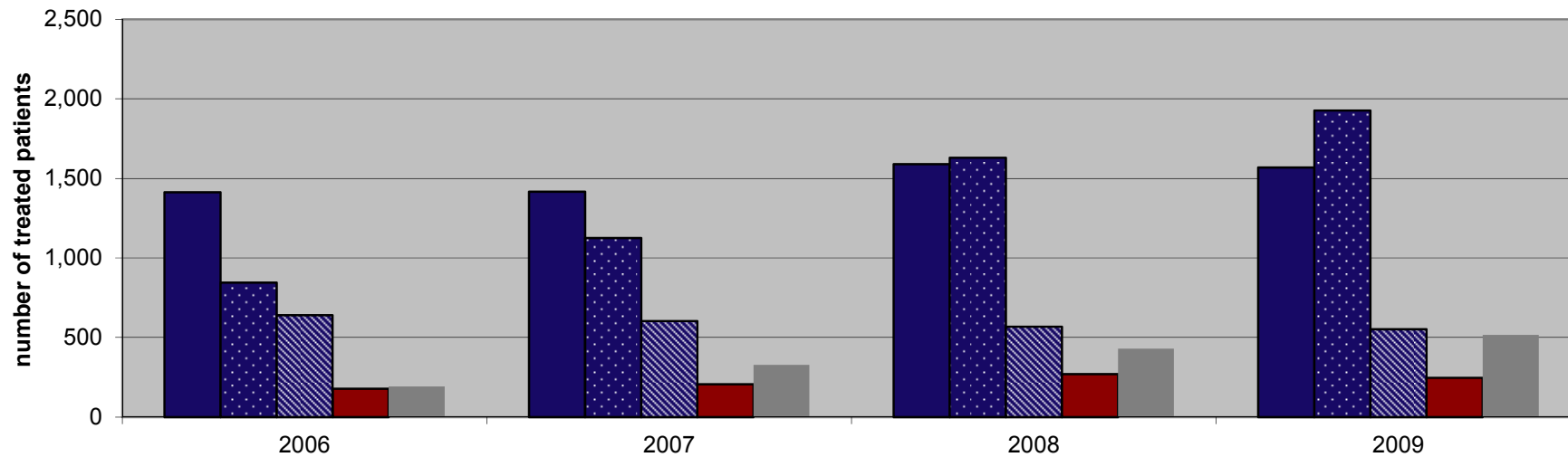
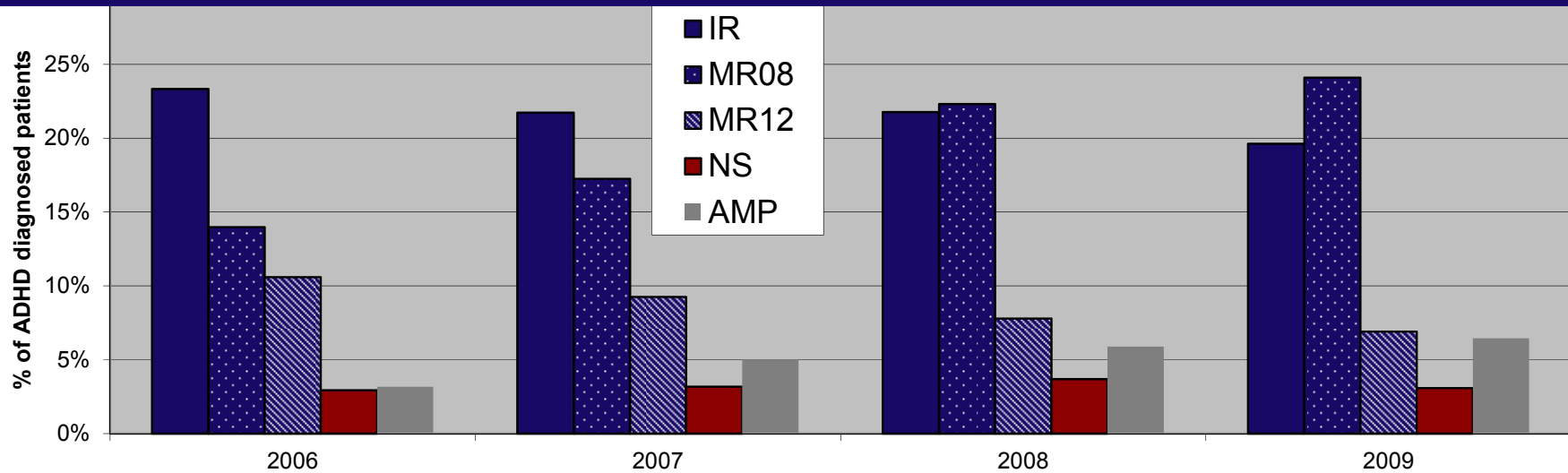
Patients with at least one prescription of ADHD medication as rate of patients with ADHD diagnosis in age group.

ESCAP, Dublin / Ireland, 2013

ADHD IN NORDBADEN

Therapeutic Management of Patients with ADHD

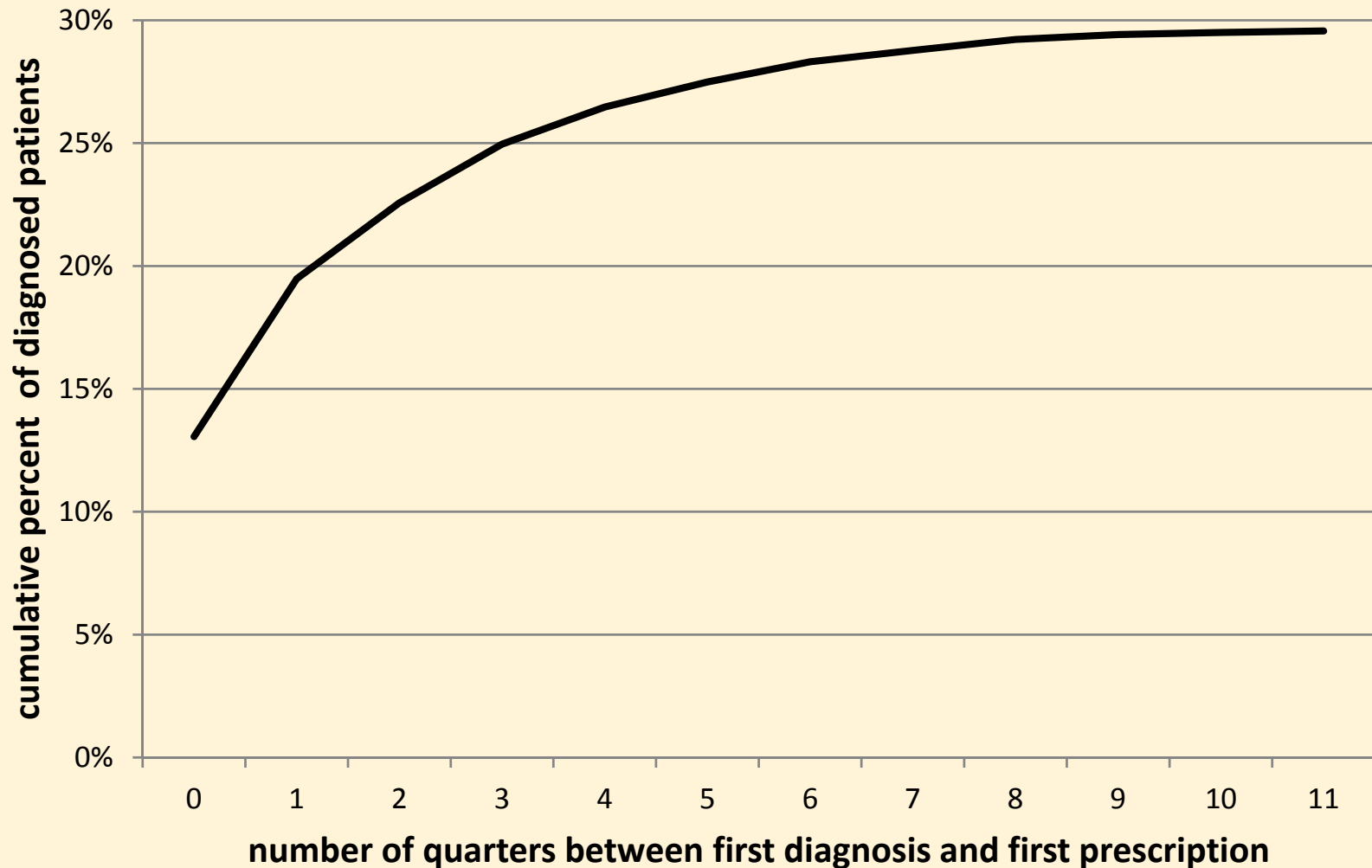
Treatment Prevalence (by Class of Drug and Year)



Patients with at least one prescription of ADHD medication as rate of patients with ADHD diagnosis in age group.

Therapeutic Management of Patients with ADHD

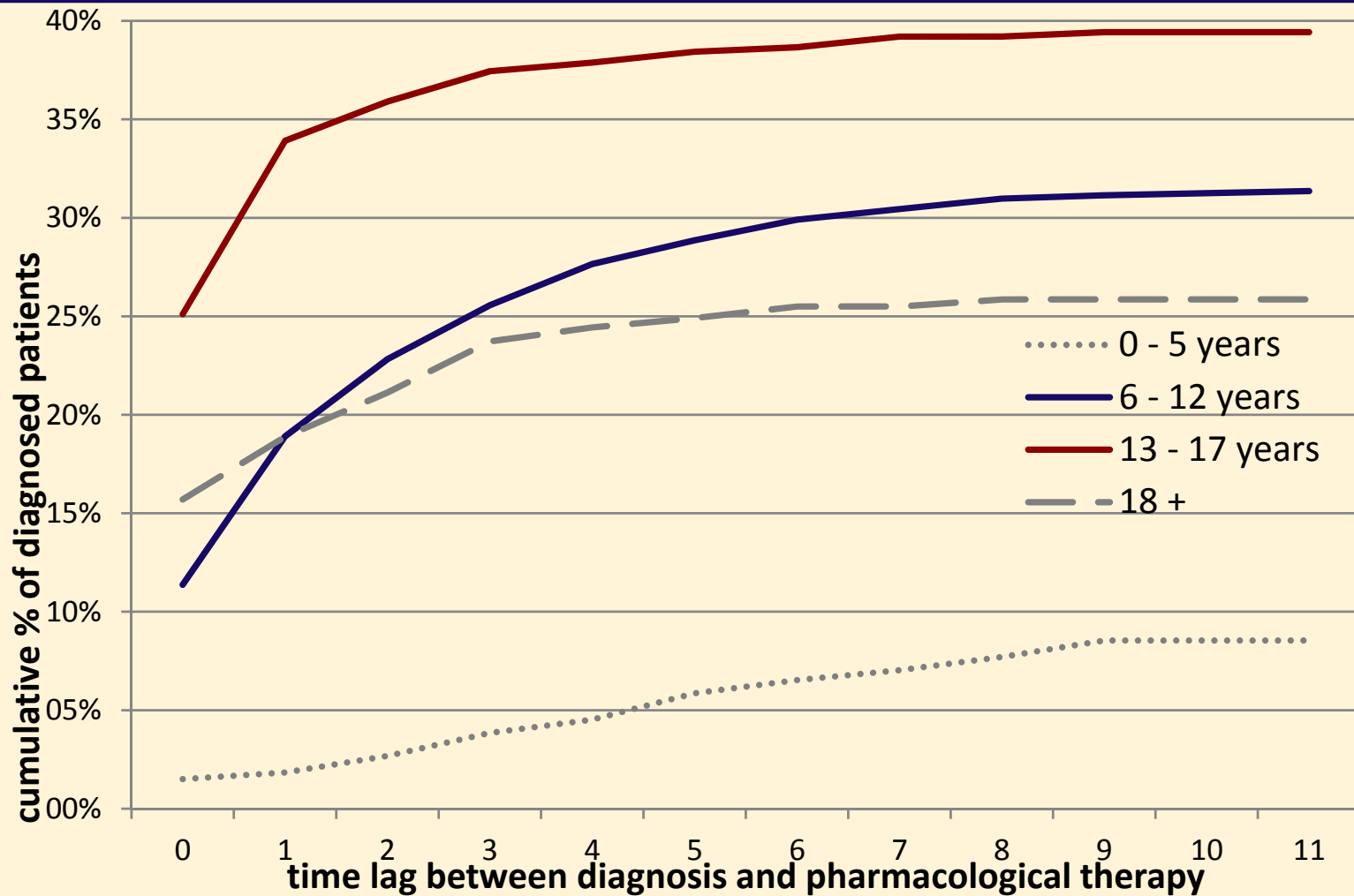
Time from Diagnosis to Initiation of Medication



ADHD IN NORDBADEN

Therapeutic Management of Patients with ADHD

Time from Diagnosis to Initiation of Medication



ADHD IN NORDBADEN

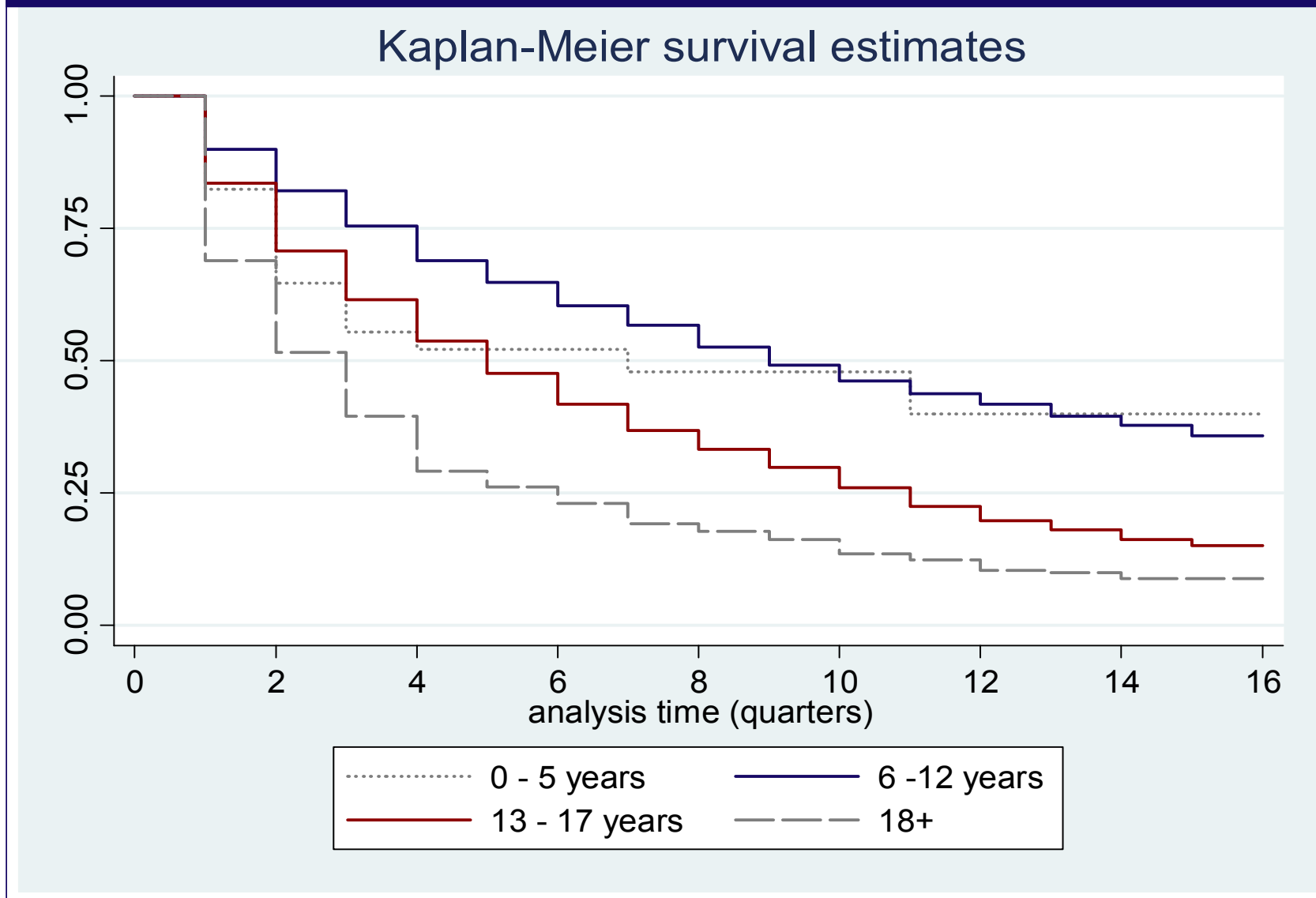
Therapeutic Management of Patients with ADHD

Time Lag from Diagnosis to Initiation of Medication

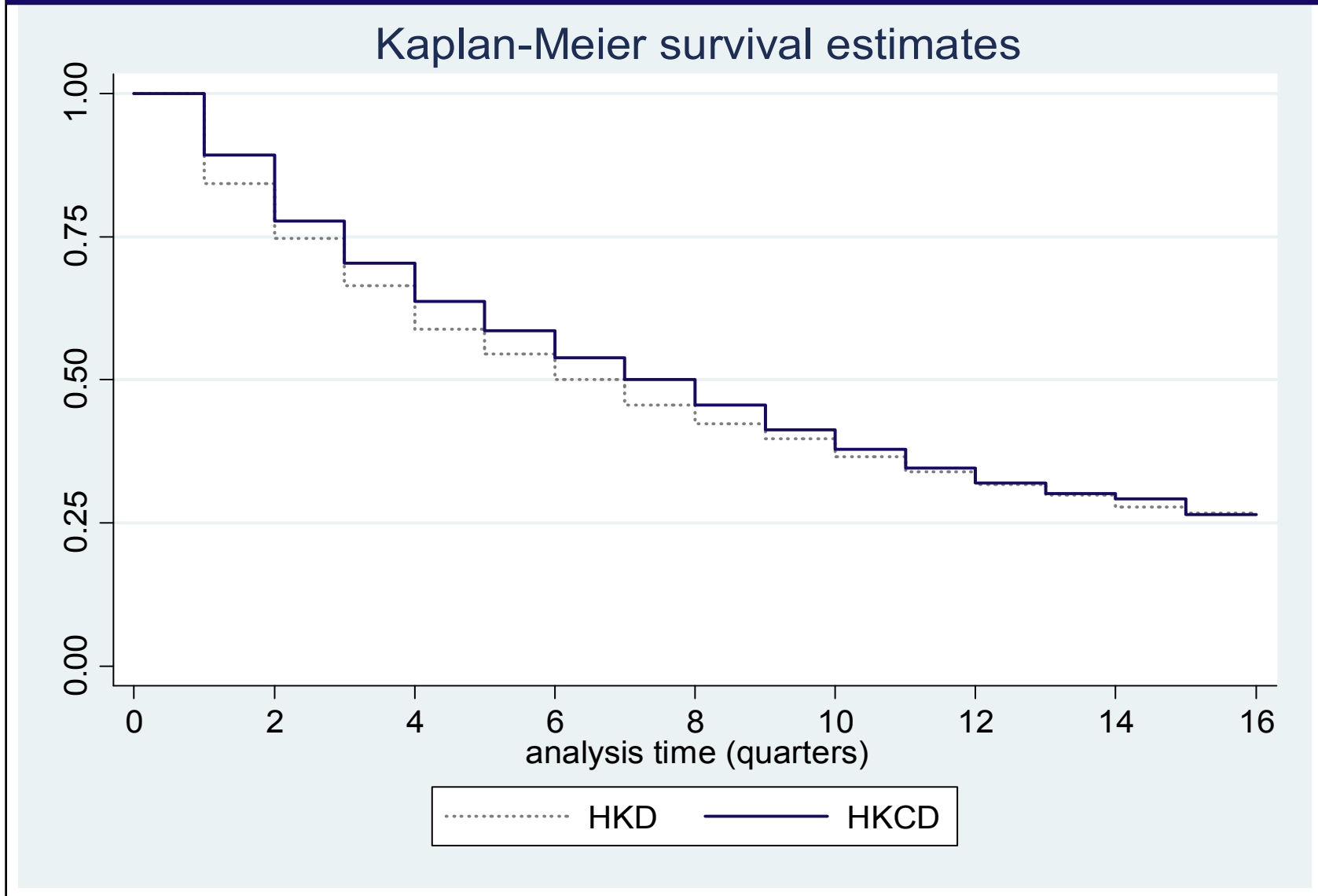
Age Group	n	mean	95% confidence interval		rate of "de novo" patients without medication
			lower bound	upper bound	
0 - 5 years	51	4.14	3.31	4.96	91.5%
6 - 12 years	1,169	1.79	1.66	1.91	68.6%
13 - 17 years	358	0.74	0.59	0.89	60.6%
18 +	219	1.05	0.82	1.27	74.1%
Total	1,797	1.56	1.46	1.66	70.4%

Therapeutic Management of Patients with ADHD

Analysis of Treatment Duration (Medication)

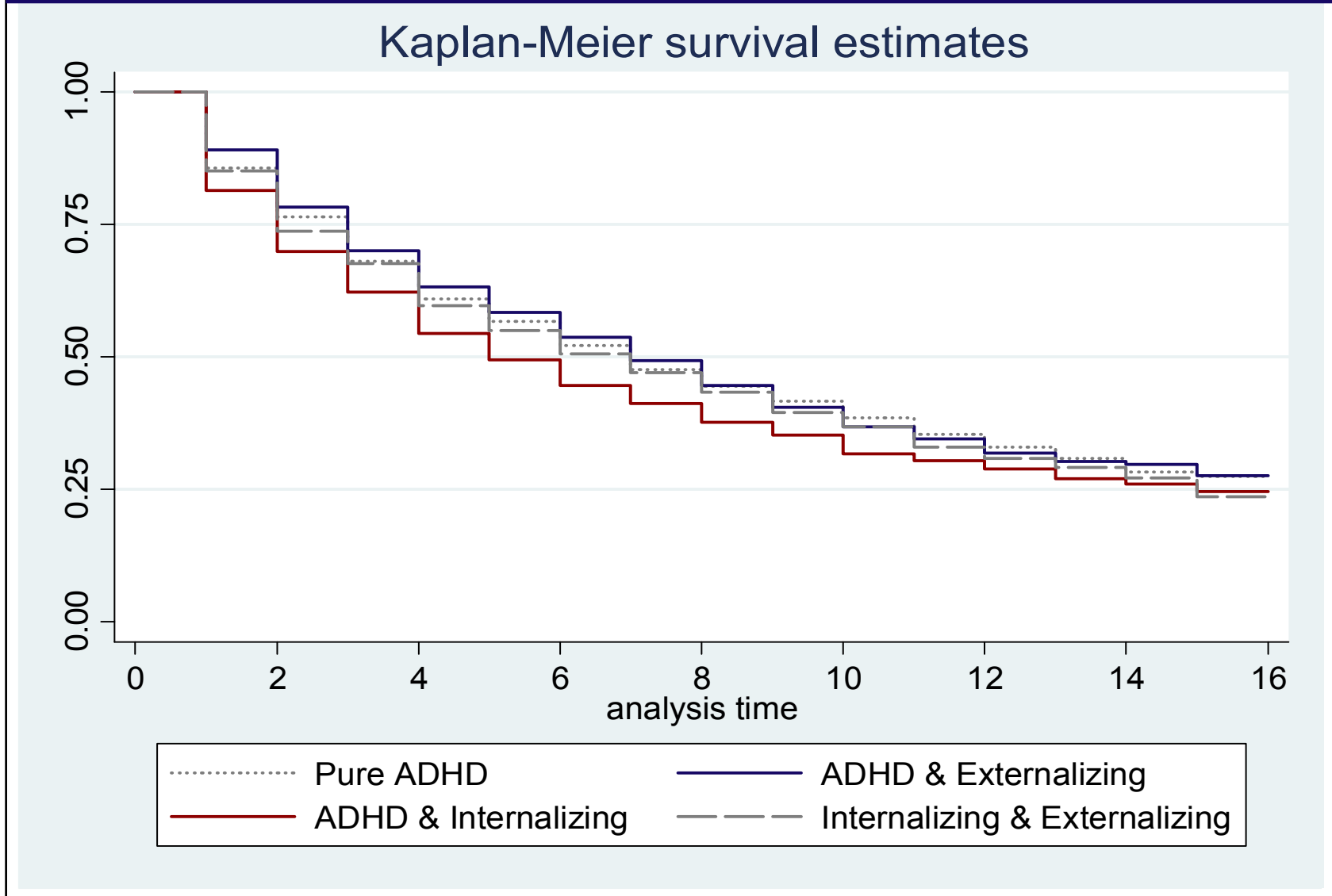


Analysis of Treatment Duration (Medication)



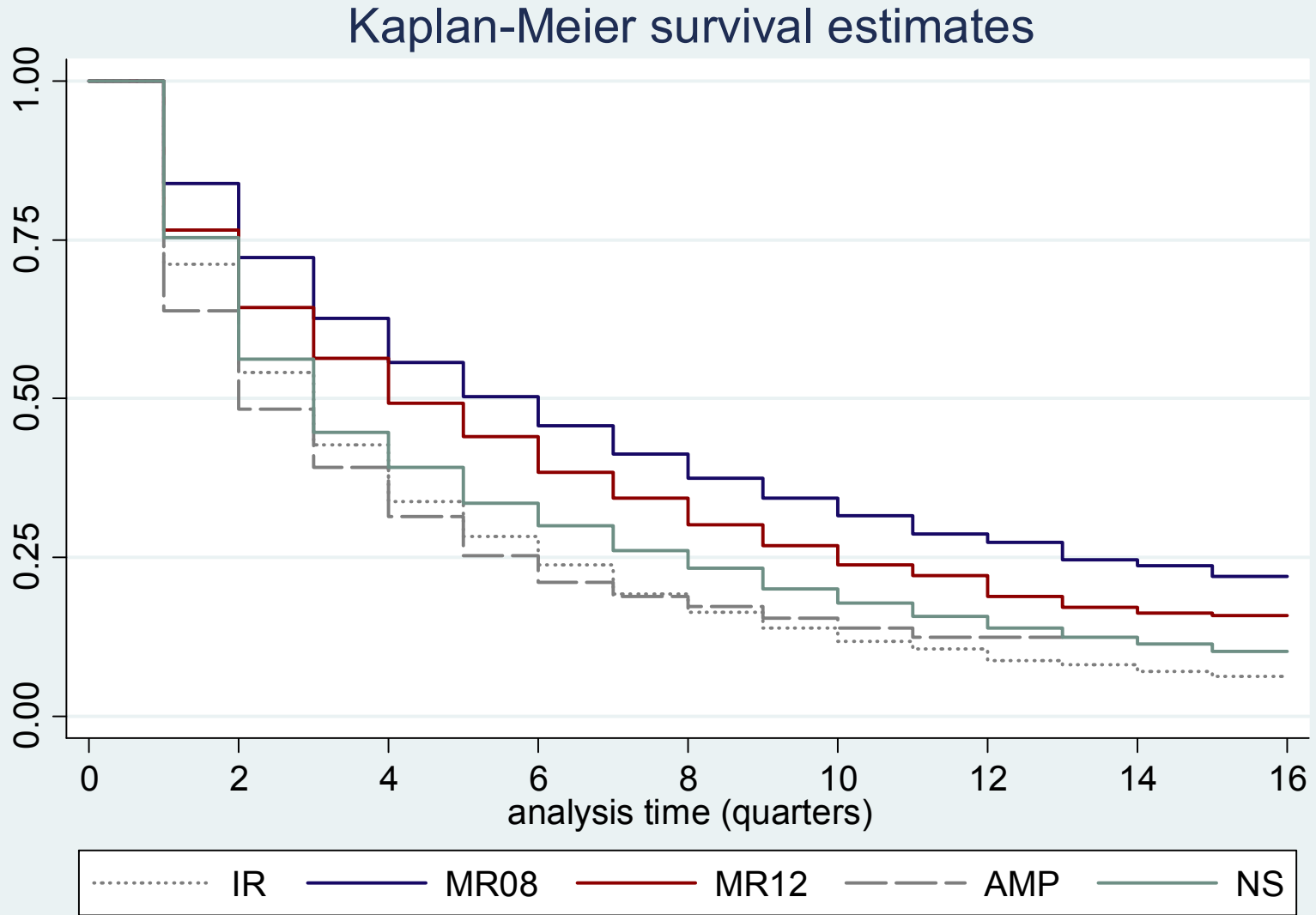
Therapeutic Management of Patients with ADHD

Analysis of Treatment Duration (Medication)



Therapeutic Management of Patients with ADHD

Duration of Drug Therapy by Class of Medication



Key Observations

- ↪ Except for the relatively small group of preschoolers (age 0-5 years), **medication management and physician-provided therapy** were more important than “other” nonpharmacological interventions.
- ↪ The rise of prescribed DDDs of ADHD medication during the study period (2003 to 2009) has not been mirrored by a similar increase in the number ADHD patients. This may be explained, in part, by medication augmentation; the rate of ADHD patients receiving drug treatment has increased only slightly during the observation period.
- ↪ **Stimulants** (MPH, in particular, long-acting formulations, and AMP) have remained the mainstay of drug therapy.
- ↪ There was **no evidence of inappropriate prescribing** of stimulants; of note, less than 2% of preschoolers with a diagnosis of ADHD received drug treatment for the condition on 2009.
- ↪ Mean **time from diagnosis to initiation of ADHD medication** (if any) was between two and five months (age dependent, with the exception of preschoolers, at >12 months).

July 07, 2013

ADHD in Nordbaden:

The Direct Medical Costs Attributable to ADHD, 2003-2009

Michael Schlander¹, Oliver Schwarz, Götz-Erik Trott, Tobias Banaschewski, Walter Scheller, Michael Viapiano, and Norbert Bonauer

¹University of Heidelberg

and



Institute for Innovation & Valuation in Health Care (INNOVAL^{HC})
University of Heidelberg & University of Applied Economic Sciences Ludwigshafen



BIBLIOGRAPHIC NOTE

Quote as: Michael Schlander, Oliver Schwarz, Götz-Erik Trott, Tobias Banaschewski, Walter Scheller, Michael Viapiano, Norbert Bonauer: *The medical cost attributable to ADHD in Nordbaden/Germany: a study from a health care payer's perspective based on claims data.* **European Child + Adolescent Psychiatry (2013) 22 (Suppl 2): S100-1.** (Abstract No. S2-06-02)

Abstract

OBJECTIVES: To assess the direct medical costs attributable to a diagnosis of attention-deficit/hyperactivity disorder (ADHD), comparing patients to controls in Nordbaden / Germany.

METHODS: The patient-centered Nordbaden database for years 2003 to 2009, integrating data from *Kassenärztliche Vereinigung Baden-Württemberg* (KVBaWue, the organization of physicians registered with statutory health insurance, "SHI") and a major SHI association (vdek) as to allow patient-centered evaluation, was used to determine health resource utilization and direct medical cost covered by SHI. Patients with a diagnosis of ADHD were compared to a control population matched by age, gender, and type of statutory health insurance ("SHI"). - Here we report on data for years 2006-2009, as nonpharmacological therapy-related cost data were not fully available for earlier years.

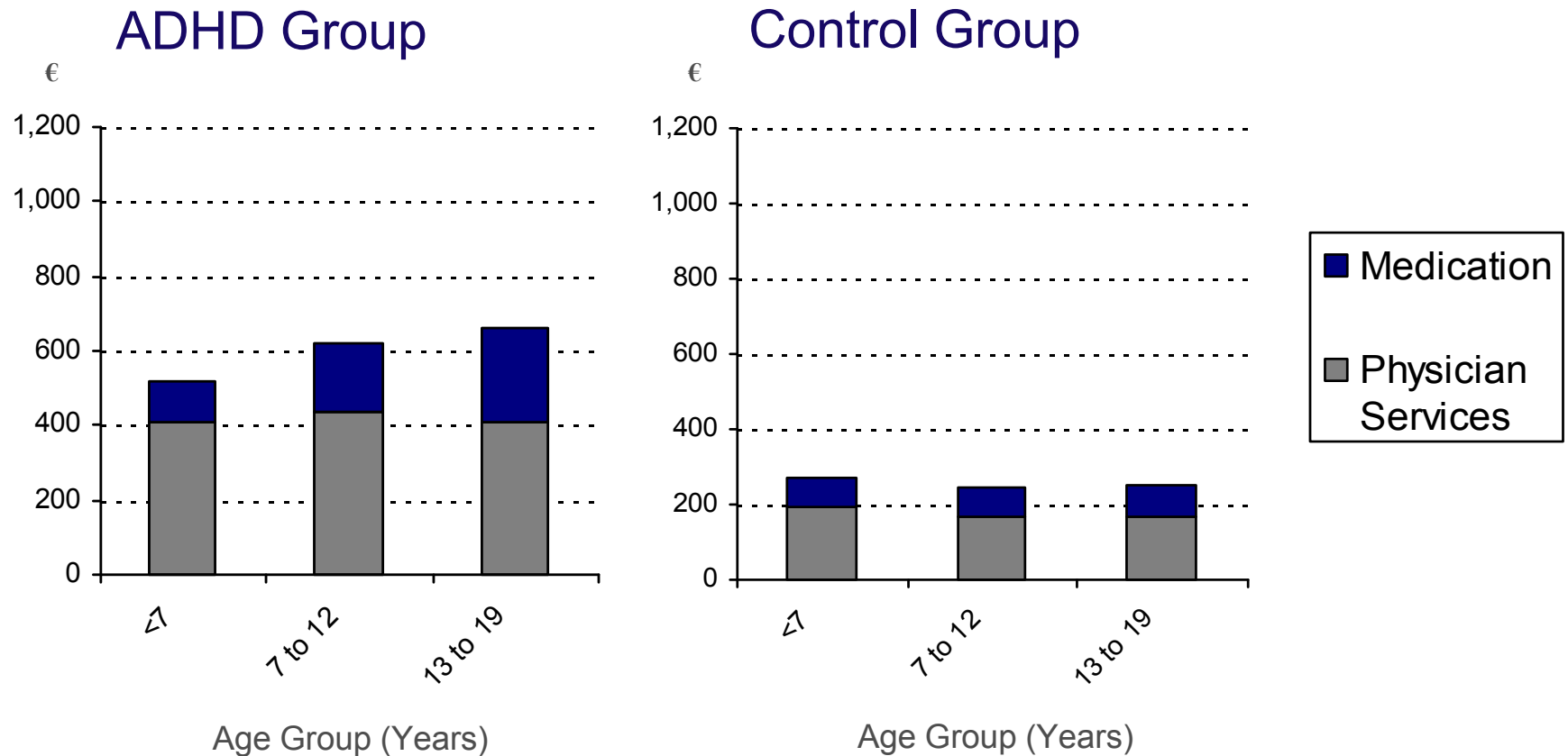
RESULTS: Average total cost per ADHD patient increased from €897 in 2006 to €1,006 in 2009 (controls, €261 in 2006 and €337 in 2009). Average annual cost per patient correlated positively with age, and female patients were generally more costly than males (in total as well as regarding costs attributable to ADHD). Increasing severity and comorbidity were also associated with higher costs per patient. Physician services constituted the major cost component (on average, overall, €653 per case in 2009), followed by pharmacological therapy (€330 in 2009).

CONCLUSIONS: The average excess cost (from the perspective of German SHI) per ADHD patient (over all age groups and irrespective of gender, compared to matched controls) was €669 per year in 2009. Although any extrapolation from the regional to the national level should be treated with caution, this data from Nordbaden suggests an approximate *dimension* of annual outpatient treatment costs attributable to ADHD in the magnitude of (roughly) €450 million (for year 2009), from the perspective of Statutory Health Insurance (SHI; i.e., excluding privately insured patients).

DISCUSSION: This compares to total annual expenditures for services ("*Leistungsausgaben*") of the German SHI system of €160 billion in 2009. - Of note, the figure (calculated bottom-up using actual micro-data, not estimates) is substantially lower than some recently published projections. This discrepancy clearly warrants further investigation, including data sources, their reliability, representativeness, and method of combination, broader research methodology, as well as an examination of vested interests potentially influencing design and presentation of studies.

ADHD-Related Health Care Expenditures

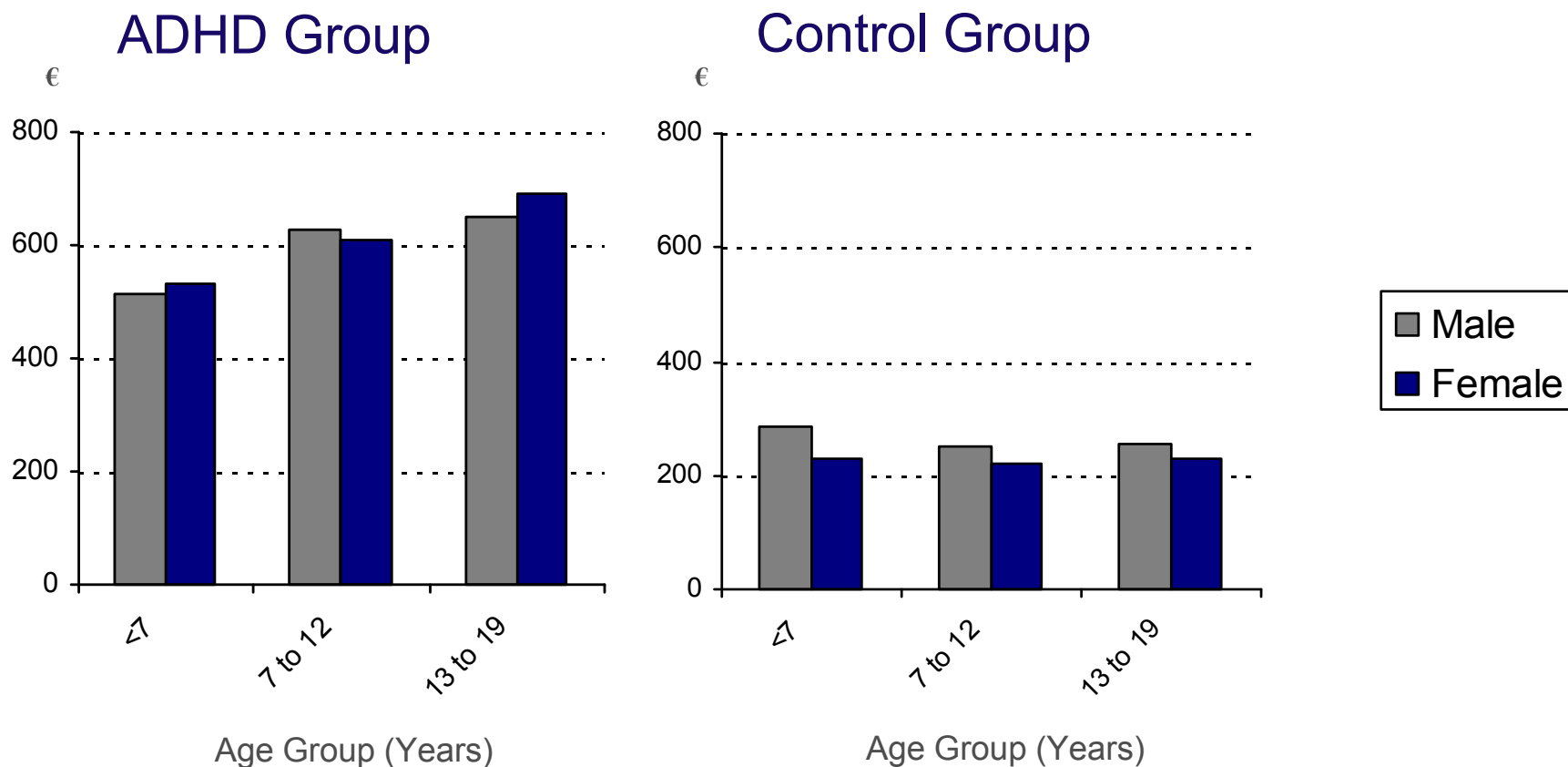
Average Cost per Patient (Nordbaden, 2003)¹



¹M. Schlander et al. (unpublished data)

ADHD-Related Health Care Expenditures

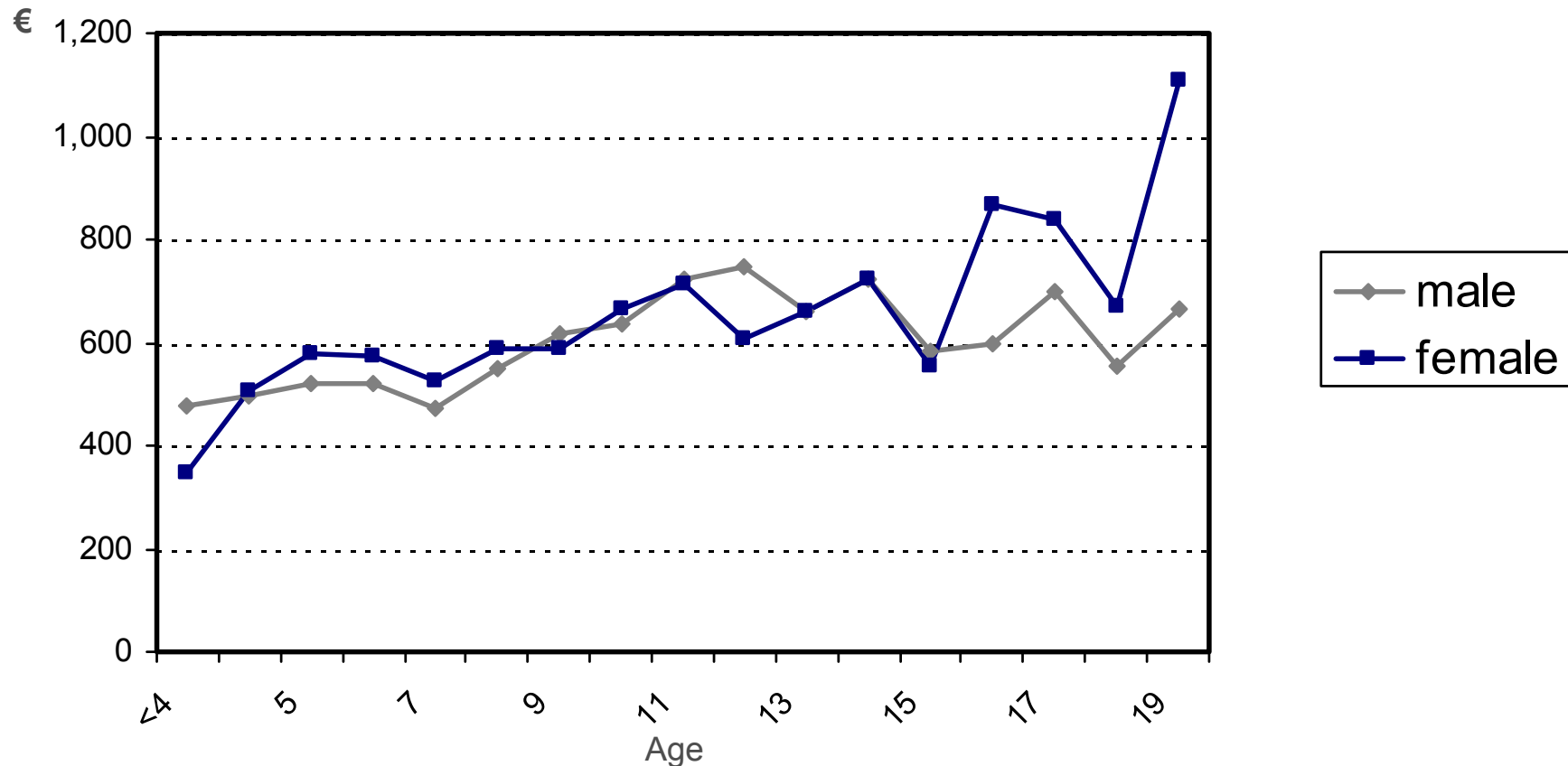
Average Cost per Patient by Gender (Nordbaden, 2003)¹



ADHD-Related Health Care Expenditures

Average Cost per Patient by Gender and Age¹

ADHD Group



¹M. Schlander et al. (unpublished data)

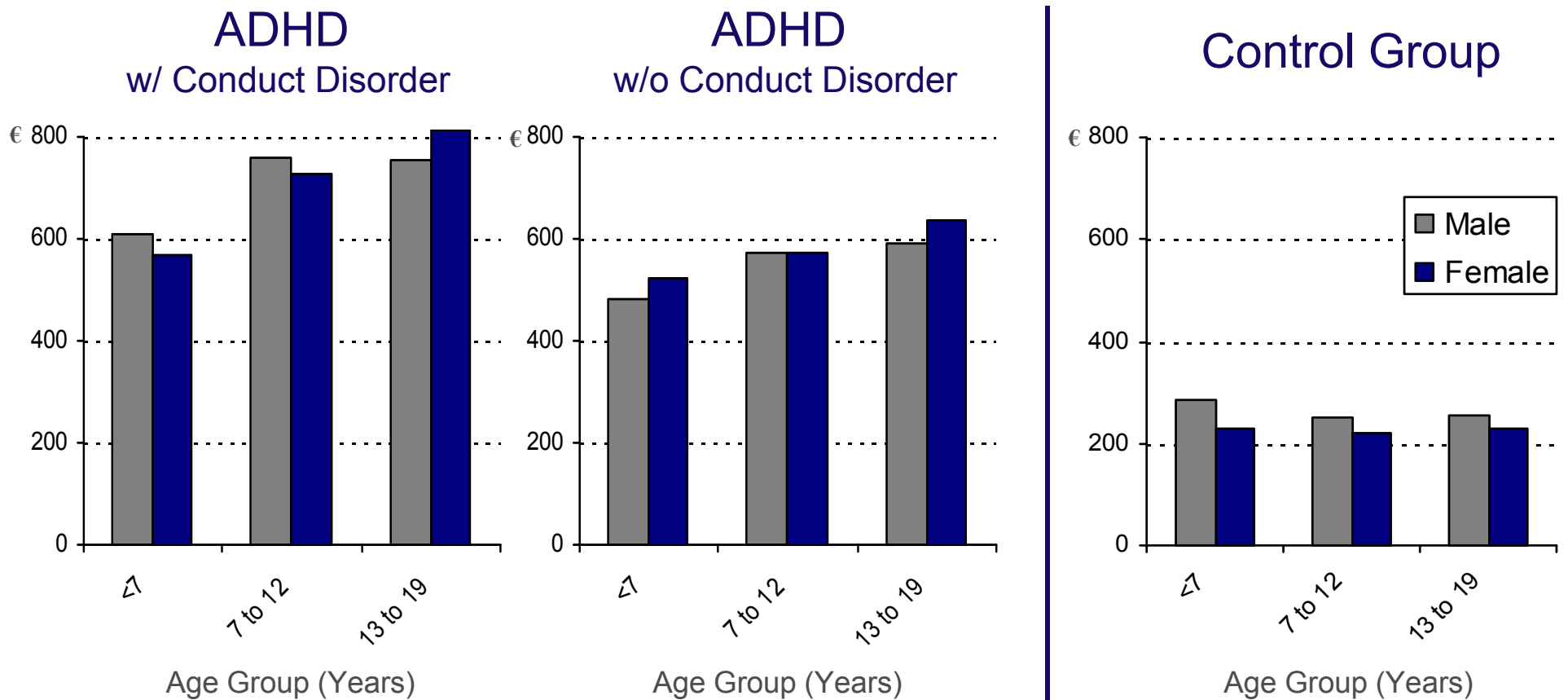
ESCAP, Dublin / Ireland, 2013

A Longitudinal Study based upon Data from Nordbaden / Germany



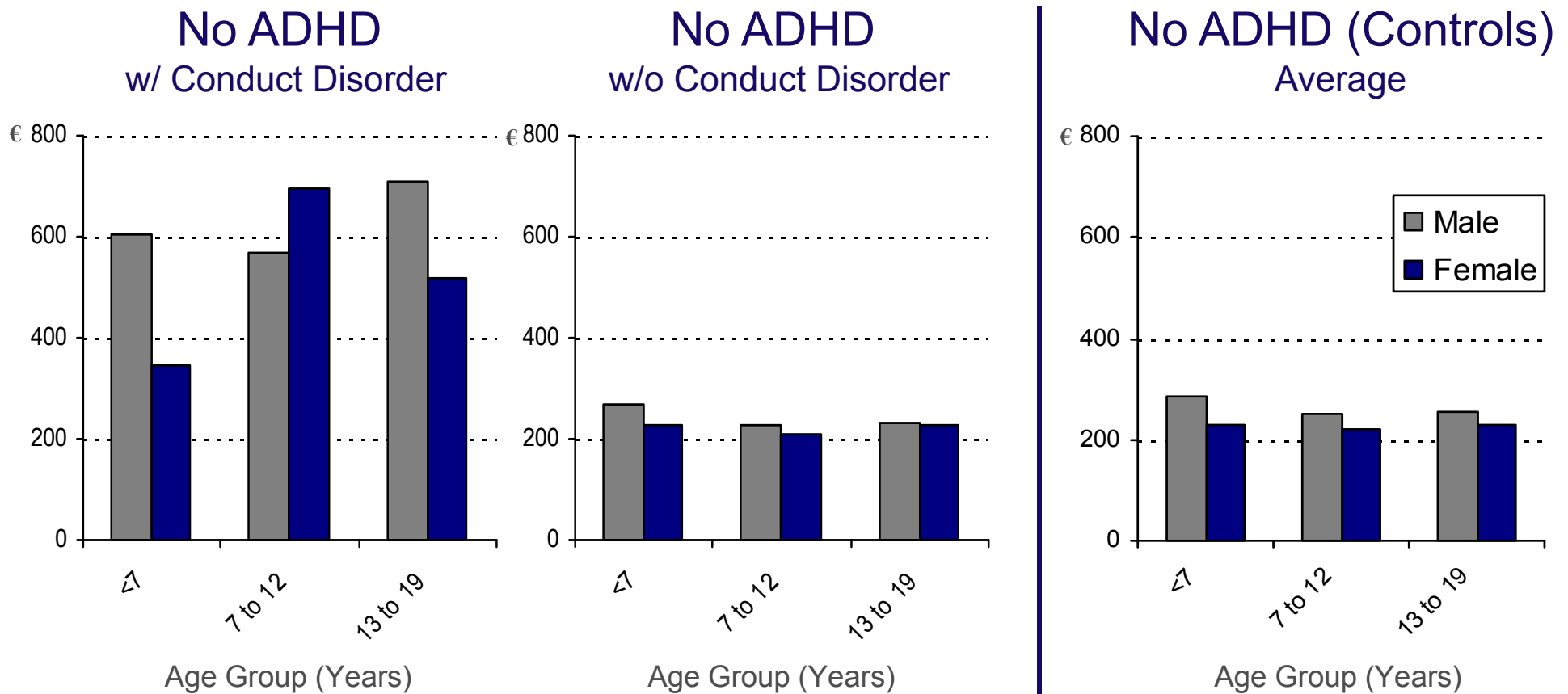
ADHD-Related Health Care Expenditures

Average Cost per **ADHD** Patient
in the Presence or Absence of **Conduct Disorder**¹



ADHD-Related Health Care Expenditures

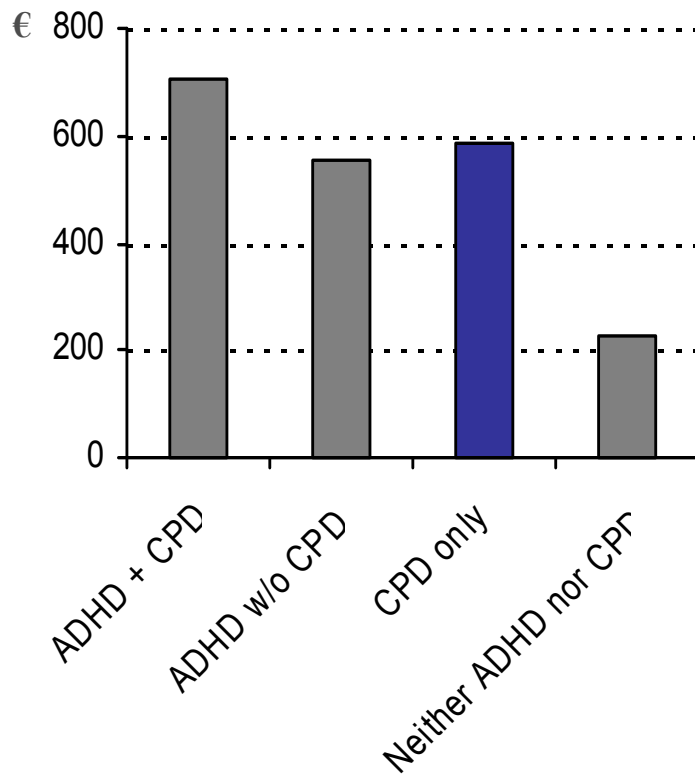
Average Cost per Patient without ADHD
in the Presence or Absence of **Conduct Disorder**¹



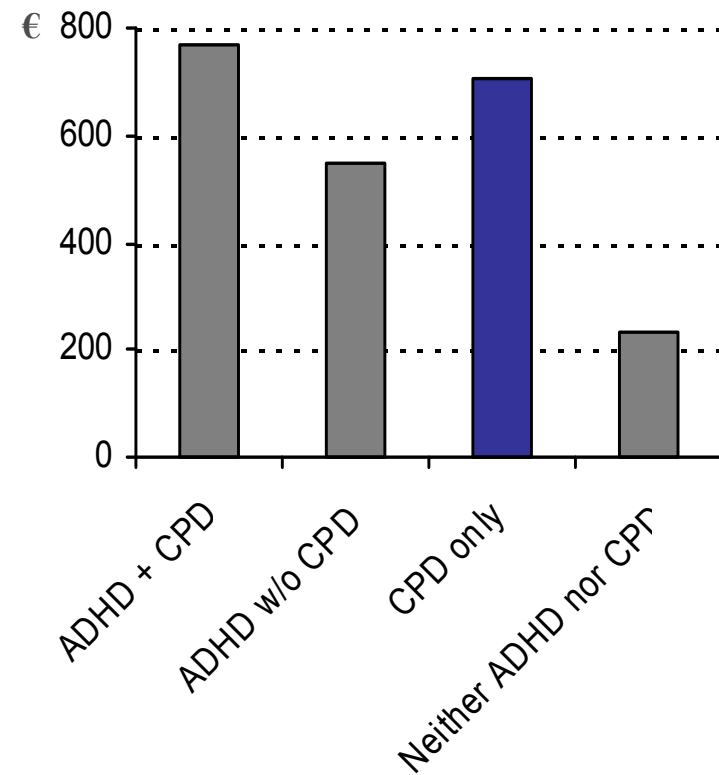
ADHD-Related Health Care Expenditures

Impact of ADHD and Conduct & Personality Disorders¹

Age 7 – 12 Years



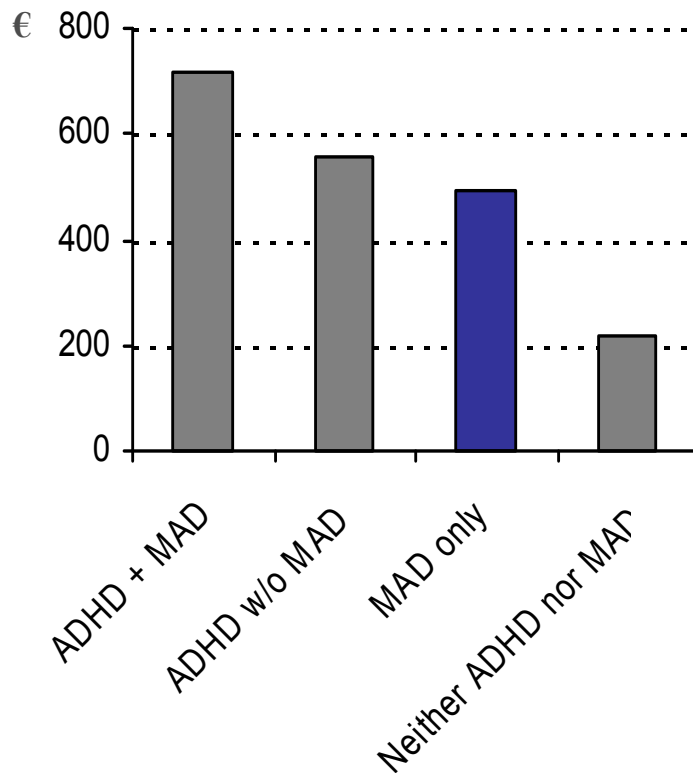
Age 13 – 19 Years



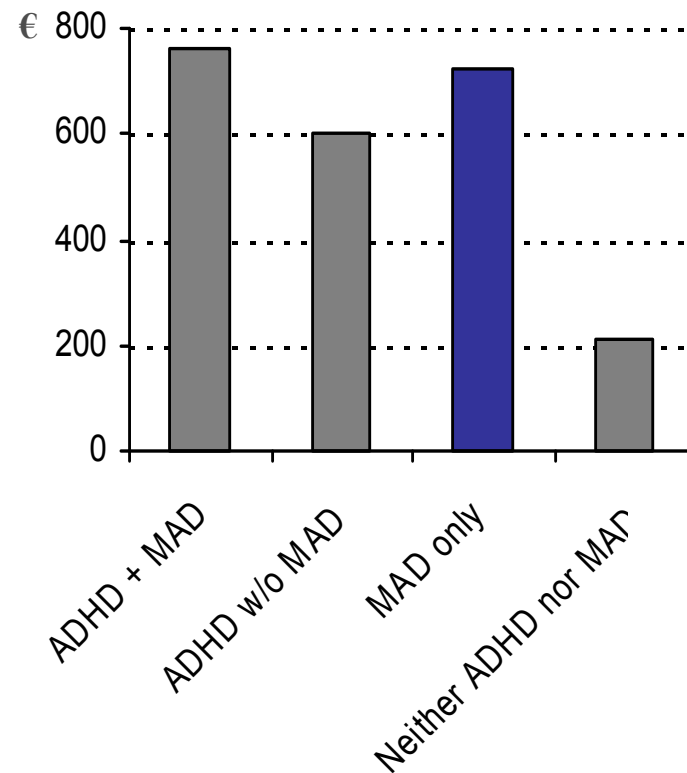
ADHD-Related Health Care Expenditures

Impact of ADHD and Mood & Affective Disorders¹

Age 7 – 12 Years



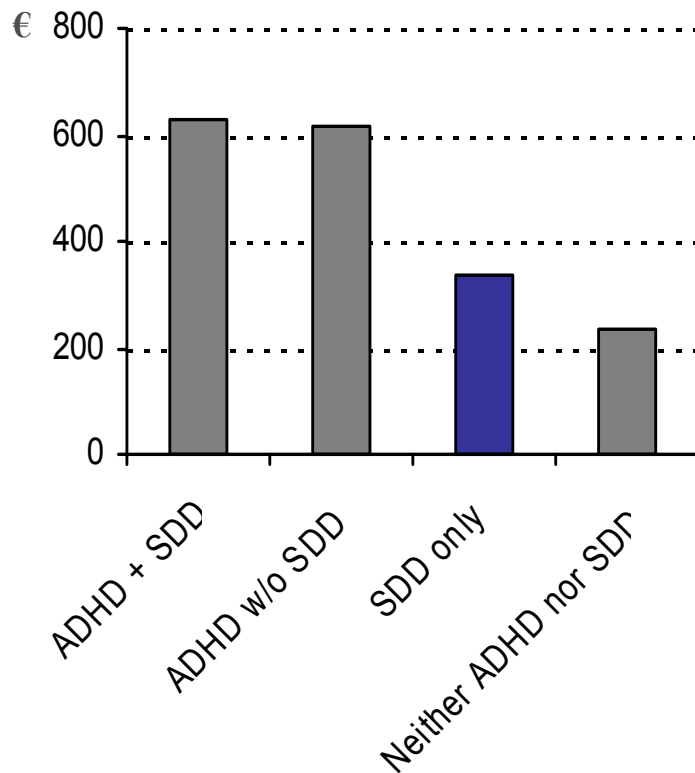
Age 13 – 19 Years



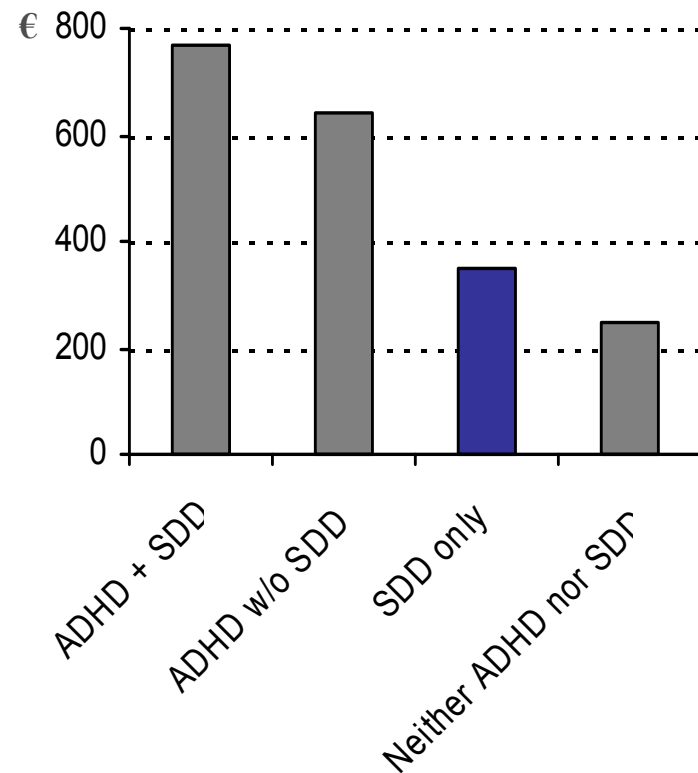
ADHD-Related Health Care Expenditures

Impact of ADHD and Specific Development Disorders¹

Age 7 – 12 Years



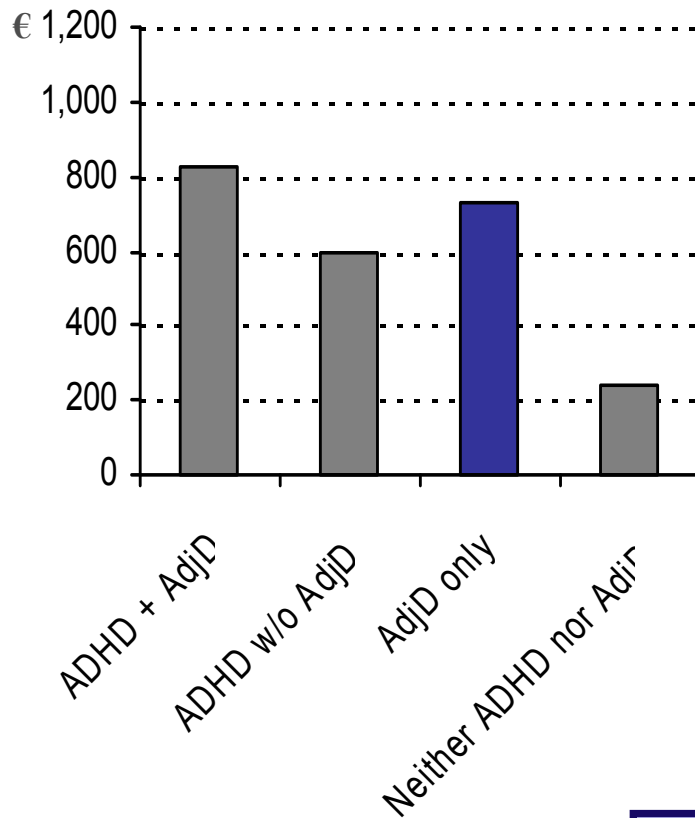
Age 13 – 19 Years



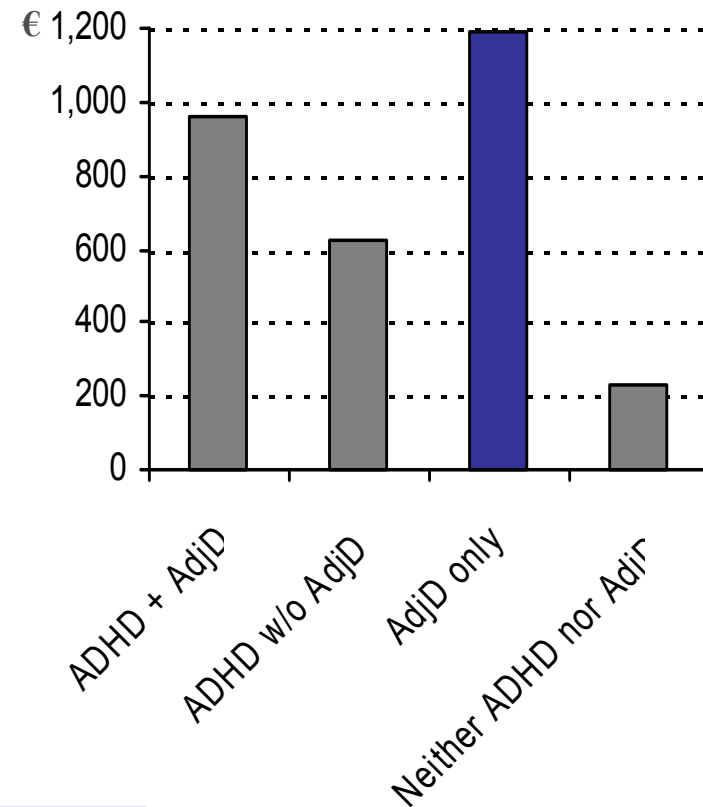
ADHD-Related Health Care Expenditures

Impact of ADHD and Adjustment Disorders¹

Age 7 – 12 Years



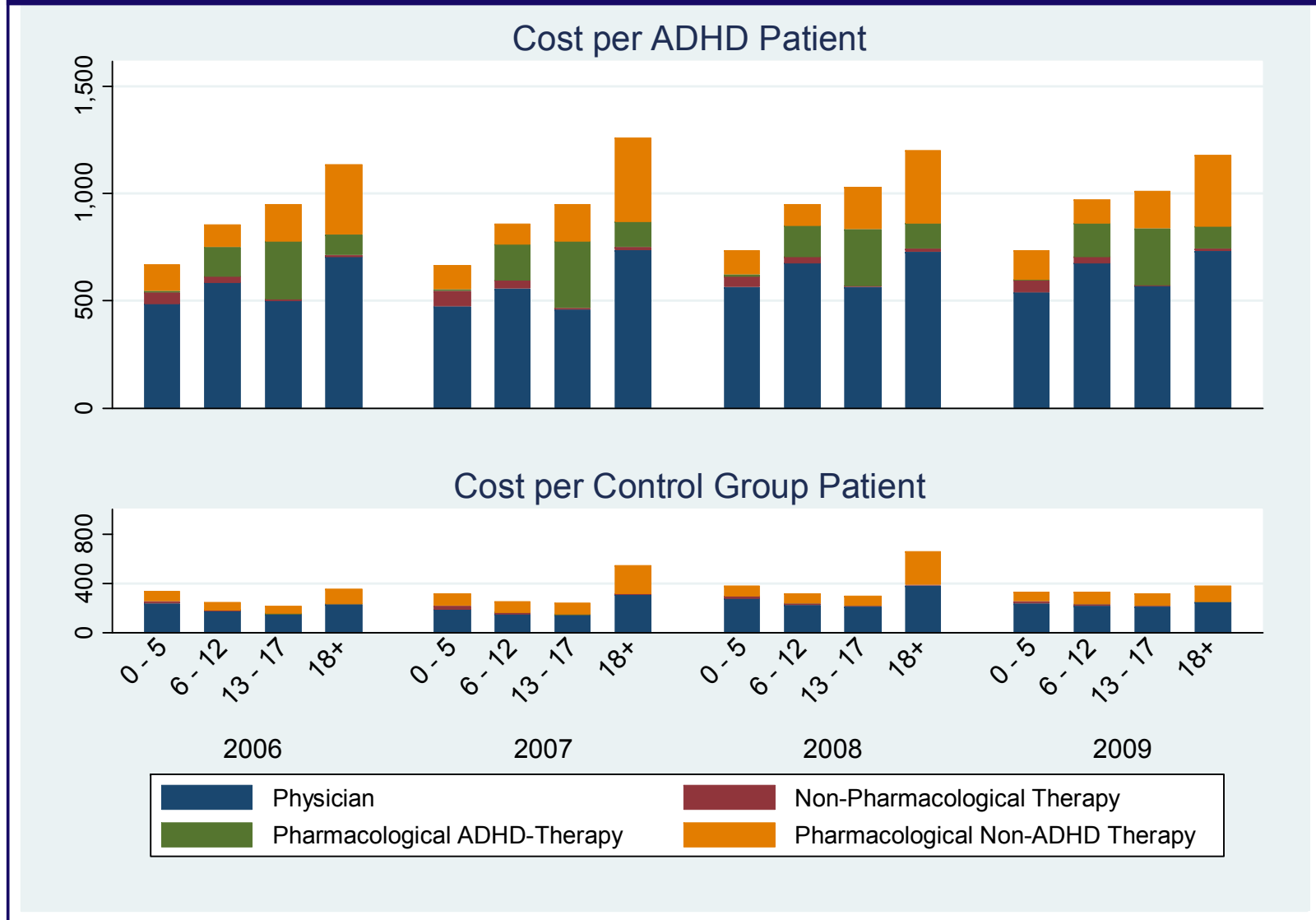
Age 13 – 19 Years



ADHD IN NORDBADEN

Cost Analysis

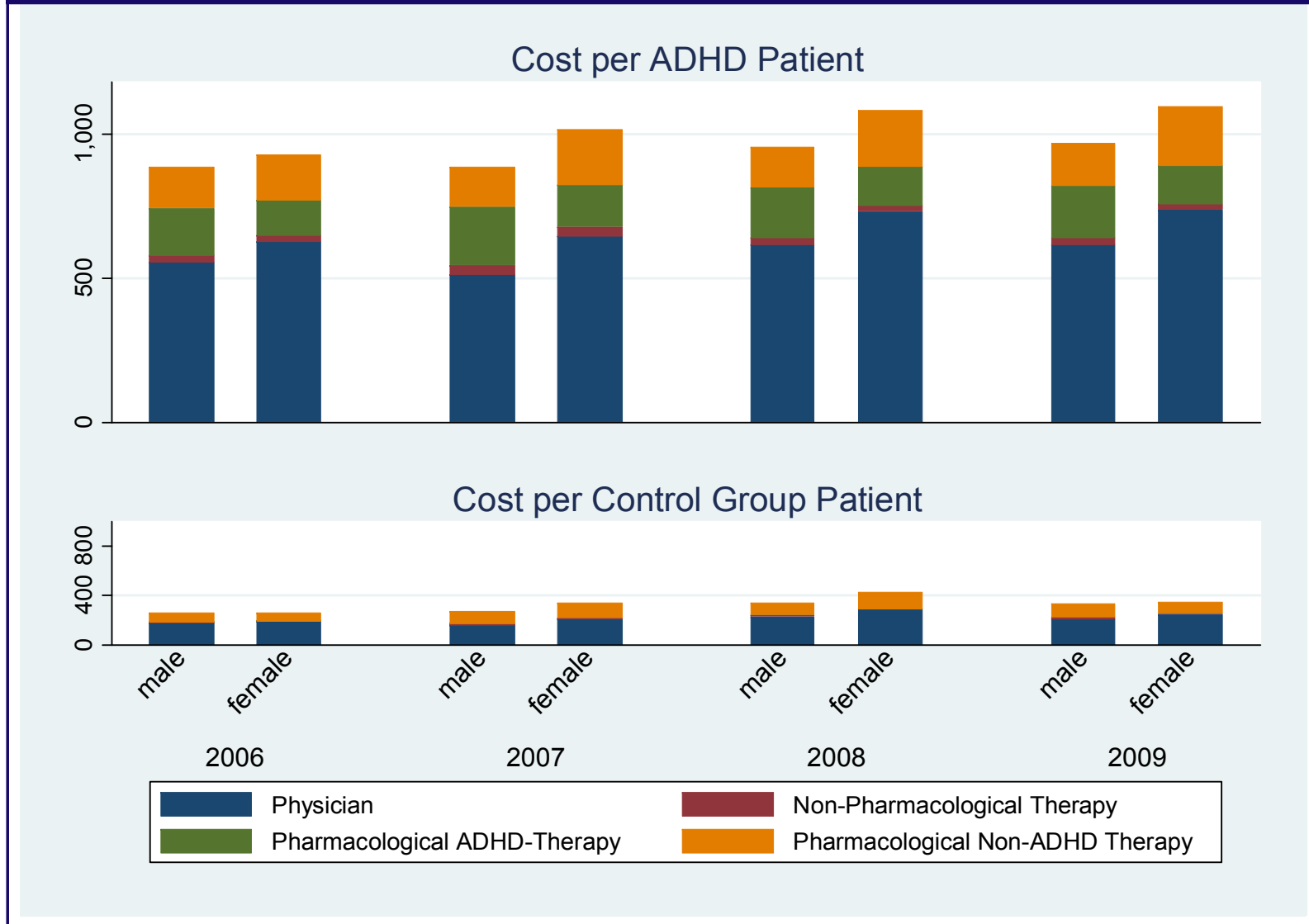
Average Cost per Patient (by Age Group, Category, and Year)



ADHD IN NORDBADEN

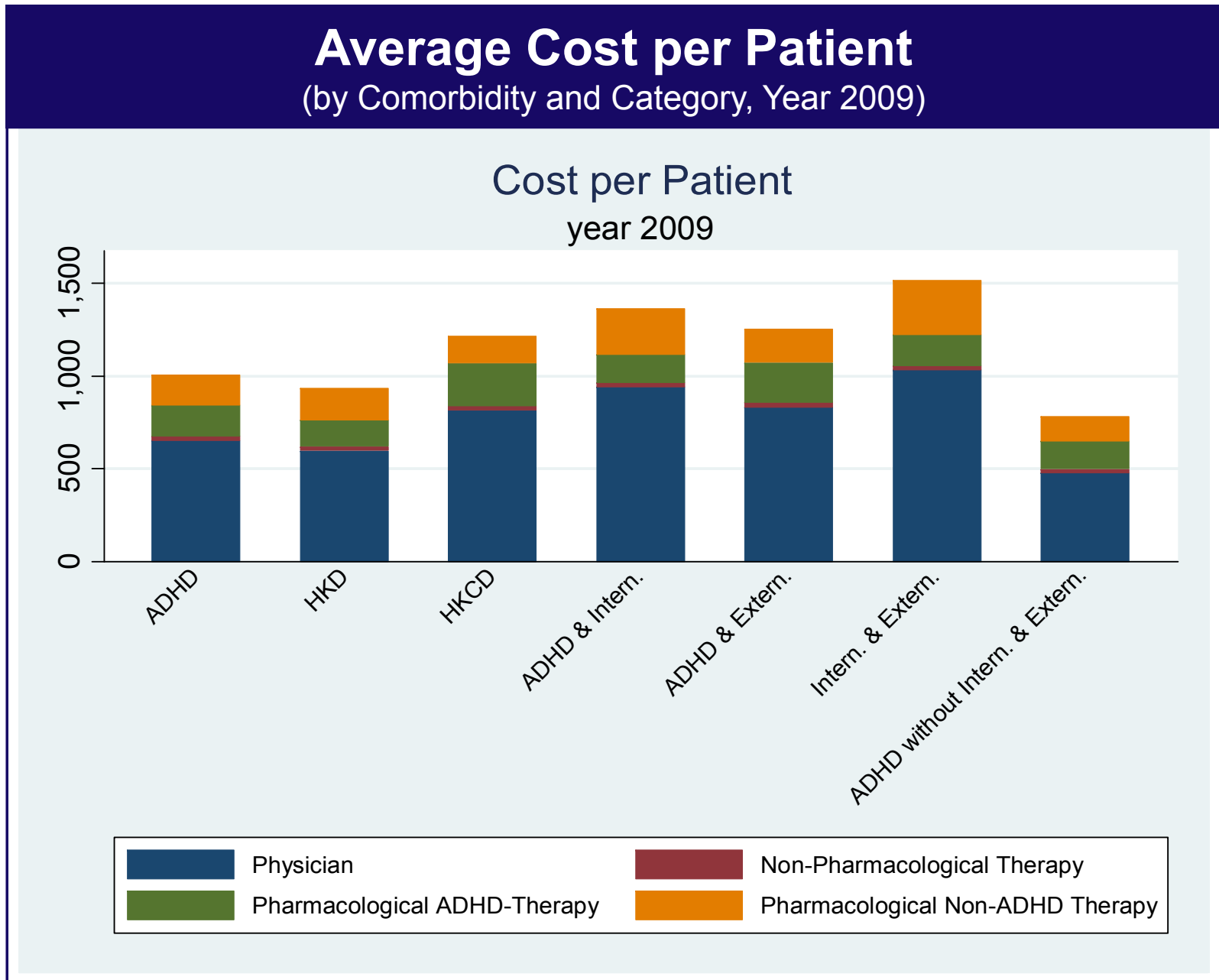
Cost Analysis

Average Cost per Patient (by Gender, Category, and Year)



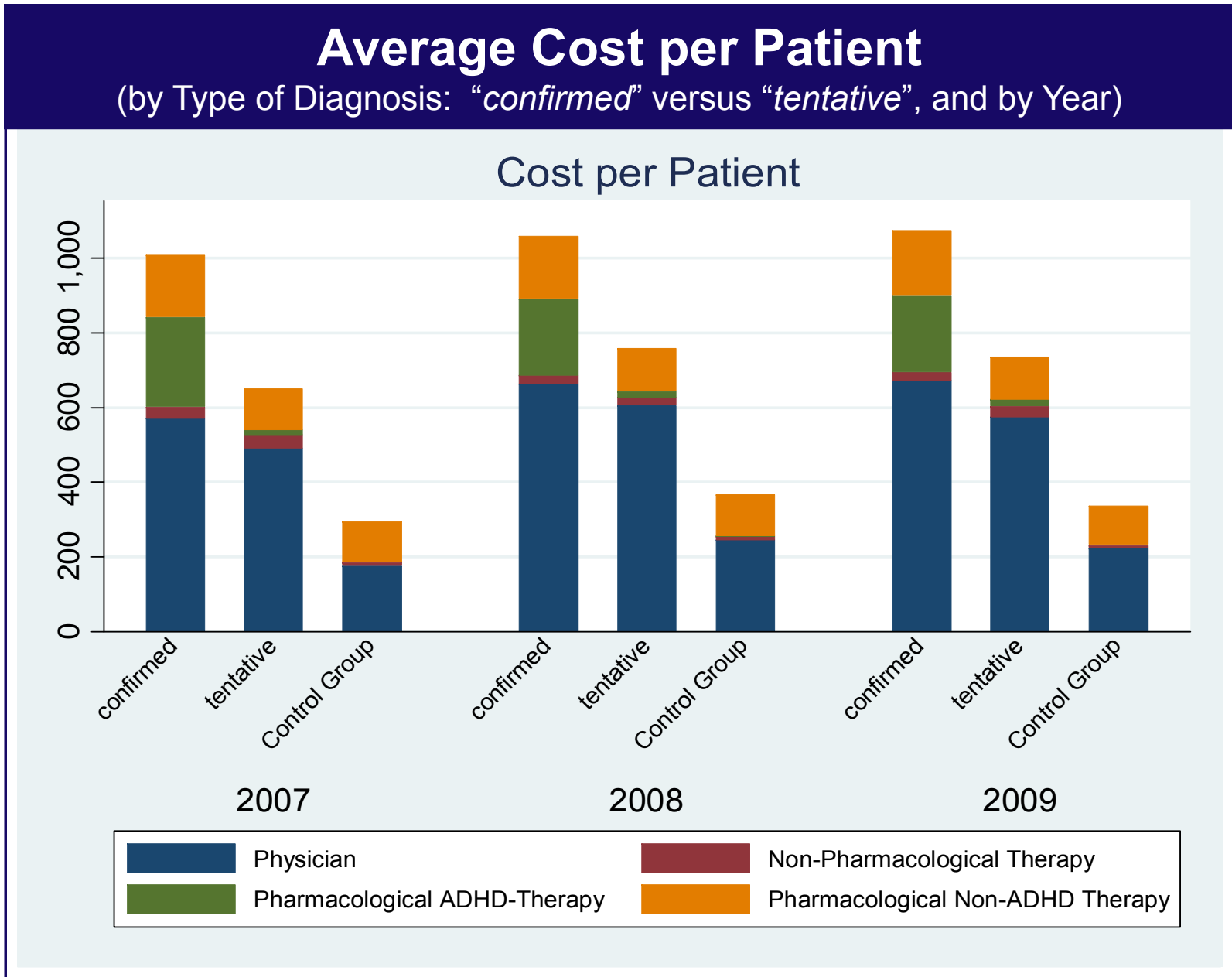
ADHD IN NORDBADEN

Cost Analysis



ADHD IN NORDBADEN

Cost Analysis



Some Implications of Direct Medical Cost Analysis

Direct Medical Cost of ADHD:



Dimension estimated on the back of an envelope (2009)

- ▭ **Population Germany (Zensus 2013):**
 - ▭ 80.2 million (total population, irrespective of type of health insurance)
- ▭ **Overall Administrative Prevalence (Nordbaden 2009):**
 - ▭ 0.95 percent
- ▭ **Projected Number of ADHD Patients (Germany):**
 - ▭ $(80.2\text{m} \times 0.95\%) = 761,900$
- ▭ **Excess Outpatient Cost per Patient (Nordbaden 2009):**
 - ▭ $(€ 1,006 - € 337) = € 669$
- ▭ **Projected Excess Direct Cost Associated with ADHD**
 - ▭ $(761,900 \times € 669) = € 509.7 \text{ million (p.a.)}$

Key Observations

- ▭ On average (over all age groups), a diagnosis of ADHD is associated with an **annual excess direct medical cost** of €669€.
- ▭ Total and excess costs tend to increase with increasing **age**, in **female patients**, in the presence of **comorbid mental health conditions**, and with increasing **severity** of the disorder.
- ▭ Some **co-existing mental health problems** appear to drive total and excess cost no less or even more than pure ADHD.
- ▭ **Physician costs** represent the most important cost category, accounting for almost two thirds of total costs (€653 in 2009), followed by the costs of pharmacological therapy (€330 in 2009, half of which were accounted for by ADHD medication).
- ▭ Based on bottom-up estimates based on Nordbaden data, the total **excess direct medical cost** associated with ADHD from a payer's perspective appears to represent well below 0.5 percent of total health insurance spending.

Observations Beyond Nordbaden

- ▭ ADHD is associated with **substantial medical** and **social costs**.
- ▭ Taken together, the social costs associated with ADHD **may well 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!

Contact:

On behalf of the Study Team:

Prof. Michael Schlander, M.D., Ph.D., M.B.A.
Prof. Oliver Schwarz, Ph.D., M.Sc.

Contact

www.innoval-hc.com
michael.schlander@innoval-hc.com
oliver.schwarz@innoval-hc.com

Address

An der Ringkirche 4
D-65197 Wiesbaden / Germany

INNOVAL^{HC}
Institute for Innovation & Valuation
in Health Care