# Cost of Attention deficit / hyperactivity disorder in Germany

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## Objectives

Attention deficit hyperactivity disorder (ADHD) is a heterogeneous behavioral syndrome, which is a commonly diagnosed mental disorder / illness of childhood with often serious lifelong health and social consequences for quality of life, for both children and parents. The impact of ADHD is rising for the German health care system but data concerning costs and treatment patterns of these patients are scarce.

The aim of this claims data analysis was to examine the costs of hyperkinetic disorders from the perspective of the statutory health insurance.

## Method

Nation-wide claims data of the Techniker Krankenkasse was used to identify all continuously insured individuals with an ICD-10 coding of F90.0, F90.1, F90.8 or F90.9 in inpatient or outpatient care in 2008. Individuals with only outpatient care require a second diagnosis in another quarter of the same year.

All costs for outpatient care, inpatient care, pharmaceuticals, rehabilitation, behavioral therapy as well as remedies and aids, and sick leave payments were analysed.

The identified ADHD-patients were compared to an age and gender matched control group. Furthermore, this comparison allows to state odds ratios for the most important co-morbidities and present examples of incremental resource use.

**Figure 1** | Mean total health care costs of ADHD-patients per cost category

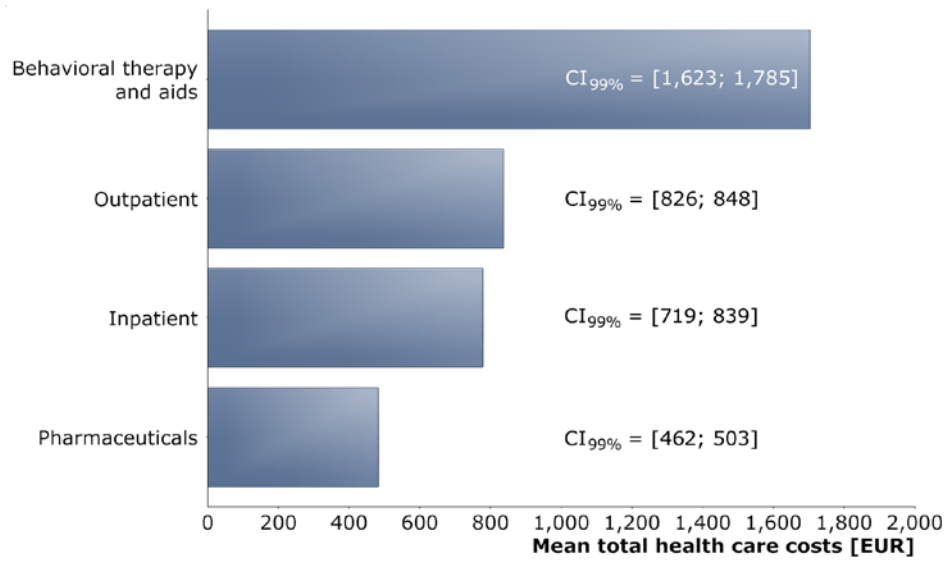


**Figure 2** | Mean incremental costs compared to a matched control-group

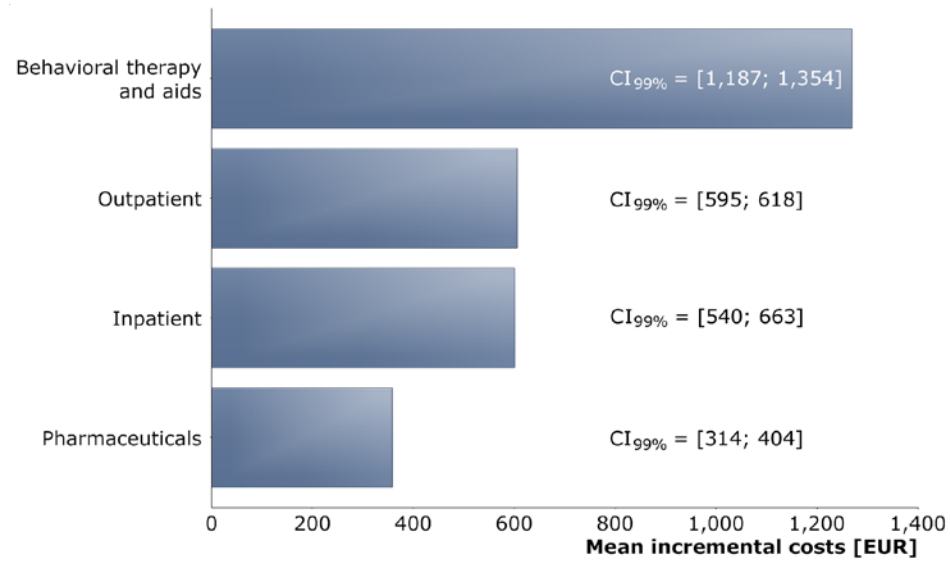


**Figure 3** | Mean incremental costs in different age-groups per cost category

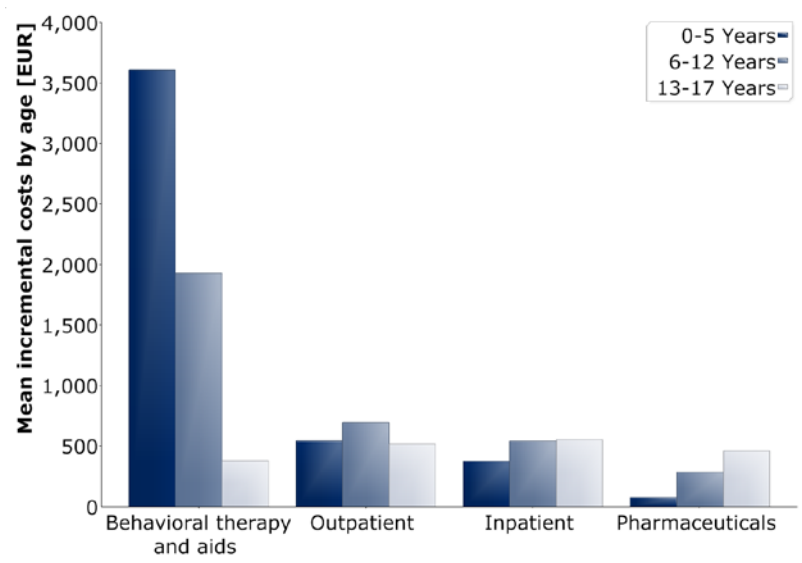


**Table 1** | Proportion of important co-morbidities and odds ratios

| | ADHD-group (n=30,264) Proportion of patients (%) | Control-group (n=151,320) Proportion of patients (%) | Odds ratio |
|---|---|---|---|
| Depressive episode & recurrent depressive disorder (F32.#; F33.#) | 3,846 (12.71) | 3,073 (2.03) | 7.02 |
| Mental and behavioral disorders due to psychoactive substance use (F10-F19) | 1,497 (4.95) | 1,417 (0.94) | 5.51 |
| Specific developmental disorders of scholastic skills (F81.#) | 5,218 (17.24) | 1,956 (1.29) | 15.91 |
| Phobic anxiety disorders & other anxiety disorders (F40.#; F41.#) | 1,917 (6.33) | 2,480 (1.64) | 4.06 |
| Injury, poisoning and certain other consequences of external causes (S00-T98) | 19,947 (65.91) | 73,507 (48.58) | 2.05 |

## Results

Based on the used identification algorithm, 30,264 ADHD-patients were identified. The mean age of the patients was 15 years and 24% of the patients were female. Mean overall costs of € 3,888 were incurred from the health insurance perspective in 2008. As shown in figure 1, € 1704 (44%) of these were due to behavioral therapy as well as remedies and aids; € 779 (20%) to inpatient care; € 837 (22%) to outpatient care and € 483 (12%) to pharmaceuticals. Not presented are the low costs for rehabilitation and sick leave payments (€ 35 and € 50, respectively).

The matched control group contains 151,320 patients. Compared to this control group, the incremental mean costs of ADHD-patients accounted for € 2,902 (figure 2). € 1,270 (44%) of these resulted from behavior therapy as well as remedies and aids, € 601 (21%) from inpatient care and € 606 (21%) from outpatient care.

Mean additional costs for pharmaceuticals in the ADHD-group added up to € 367 (13%), for rehabilitation were € 26 (≤ 1%) and for sick leave payments € 39 (1%). These results indicate that behavioral therapy is the major cost driver. In line with this, analyses of resource use have shown that ADHD-patients have about 11 times as often behavioral therapy per person compared to the control group.

Furthermore, especially co-morbidities contribute to the costs of disease. Therefore table 1 summarizes the odds ratios for the most important ICD-10-Diagnoses. For example ADHD-patients contract relative to controls 13 times as often a specific developmental disorder of scholastic skills diagnosis. Besides mental and behavioral disorders an often discussed succession is an increased risk of ADHD-patients to have several types of injuries.

The odds ratio in table 1 shows that the risk for these diagnoses for ADHD-patients is twice as high as in the control-group.

A subgroup analysis for three different age groups of ADHD-patients shows significant differences in overall additional costs. Patients in the age group between 0-5 had mean costs of € 4,629, for patients between 6-12 years mean costs of € 3,475 incurred and for the group of patients in the age class between 13-17 years costs of € 1,947 were deducted.

Figure 3 gives important insight to a shift in cost of therapy from behavioral therapy to drug treatment with increasing age. Younger patients seem to get more resource intensive behavioral therapy while for patients from 13 to 17 cost of drug treatment is slightly higher. The costs for inpatient and outpatient care are more or less constant over the different age classes.

## Conclusions

The costs of ADHD, both overall and incremental, are significant from the perspective of statutory health insurance. The major cost driver in ADHD is behavioral therapy. Additionally, co-morbidities contribute to the costs of disease. For instance the risk of several injuries is twice as high as in the control-group. In addition the results of this claims data analysis indicate a shift in cost of therapy from behavioral therapy to drug treatment with increasing age.

The advantage of the control-group design and the incremental cost analysis approach is that this method allows the inclusion not only of ADHD-specific costs but also of further succession like an increased risk for several injuries.

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