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Research paper

# Excess costs of social anxiety disorder in Germany

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ABSTRACT

*Background:* Social anxiety disorder is one of the most frequent mental disorders. It is often associated with mental comorbidities and causes a high economic burden. The aim of our analysis was to estimate the excess costs of patients with social anxiety disorder compared to persons without anxiety disorder in Germany.
*Methods:* Excess costs of social anxiety disorder were determined by comparing two data sets. Patient data came from the SOPHO-NET study A1 ($n$=495), whereas data of persons without anxiety disorder originated from a representative phone survey ($n$=3213) of the general German population. Missing data were handled by "Multiple Imputation by Chained Equations". Both data sets were matched using "Entropy Balancing". Excess costs were calculated from a societal perspective for the year 2014 using general linear regression with a gamma distribution and log-link function. Analyses considered direct costs (in- and outpatient treatment, rehabilitation, and professional and informal care) and indirect costs due to absenteeism from work.
*Results:* Total six-month excess costs amounted to 451€ (95% CI: 199€–703€). Excess costs were mainly caused by indirect excess costs due to absenteeism from work of 317€ (95% CI: 172€–461€), whereas direct excess costs amounted to 134€ (95% CI: 110€–159€).
*Limitations:* Costs for medication, unemployment and disability pension was not evaluated.
*Conclusions:* Social anxiety disorder was associated with statistically significant excess costs, in particular due to indirect costs. As patients in general are often unaware of their disorder or its severity, awareness should be strengthened. Prevention and early treatment might reduce long-term indirect costs.

## 1. Introduction

Social anxiety disorder (SAD[2]) is one of the most frequent mental disorders with a lifetime prevalence of up to 12% (Kessler, 2003; Stein and Stein, 2008). Patients typically avoid social situations and interactions, or fear such everyday encounters (Lipsitz and Schneier, 2000; Steinert et al., 2013; Tolman et al., 2009). Many patients are socially isolated (Teo et al., 2013). Thus, the disorder often shows a negative influence on the patients' education and occupation (Russell and Topham, 2012). Furthermore, comorbidities such as depression, other anxiety disorders (AD[3]), substance abuse, and avoidant personality disorder restrict everyday life of patients with SAD (Fehm et al., 2005; Lipsitz and Schneier, 2000).

Even though patients are often unaware or ashamed of their disorder and therefore do not seek treatment, the economic burden of SAD is high (Fehm et al., 2005; Lipsitz and Schneier, 2000). Indirect

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[2] SAD=Social anxiety disorder
[3] AD=Anxiety disorder

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costs arise, because patients are often absent form work or retire early (Konnopka et al., 2009). Direct costs occur if treatment is indispensable for seriously affected patients (Konnopka et al., 2009). Moreover, quality of life associated with social interactions, such as friends, partnership or childhood memories is reduced (Bech and Angst, 1996).

A recently published cost-of-illness analysis (Stuhldreher et al., 2014) for SAD patients in Germany using baseline data from the SOPHO-NET trial A1 was in line with former cost-of-illness studies (Acarturk et al., 2009; Konnopka et al., 2009; Olesen et al., 2012; Smit et al., 2006) by finding high indirect costs due to presenteeism and absenteeism from work and comparatively lower direct costs (costs caused directly by the disorder (e.g. treatment costs, costs of care, medication and transportation)). Even though it was expected that patients with SAD might avoid health care utilisation, direct costs were higher for more severely affected patients. Furthermore, costs were associated with comorbidities. On the one hand, the presence of psychiatric comorbidities, e.g., substance abuse or personality disorders, resulted in lower direct costs. On the other hand, somatic disorders like rheumatoid arthritis or HIV infection were associated with increased direct costs. However, as no comparison of costs between patients with SAD and persons without AD was conducted, excess costs of SAD were not reported.

Only one study conducted in 2004 (Andlin-Sobocki and Wittchen, 2005) reported excess costs due to SAD for the German health care system. As its results might be outdated, we decided to calculate excess costs for the year 2014 based on the SOPHO-NET study A1 (Leichsenring et al., 2013). Data of persons without AD were taken from a representative German telephone survey (Grupp et al., 2016). Differences in sample characteristics were balanced using Entropy Balancing. This ensured that differences in costs were not caused by variations in social-demographical and clinical characteristics. In addition, the influence of age, gender and disorder severity was addressed in additional analyses.

## 2. Methods

### 2.1. Study population with social anxiety disorder

To determine costs for patients with SAD, we used baseline data of a health economic study conducted alongside a randomized trial within the Social Phobia Psychotherapy Research Network (SOPHO-NET A1). The goal of this study was to compare the cost-effectiveness of cognitive behavioural therapy and short-term psychodynamic therapy compared to a waiting list condition in patients with SAD (Egger et al., 2015; Leichsenring et al., 2013; Stuhldreher et al., 2014).

Recruitment took place between April 2007 and April 2009 in five outpatient university clinics in Germany (Bochum, Dresden, Goettingen, Jena, and Mainz). Patients (n=495) were eligible to participate if they were between 18 and 70 years old and showed a primary diagnosis of SAD on the DSM-IV (Wittchen et al., 1997) as well as a score on the Liebowitz Social Anxiety Scale (LSAS) ≥30 (Mennin et al., 2002). Health service use was assessed for the last six months before baseline assessment using a standardised Client Socio-Demographic and Service Receipt Inventory (CSSRI) questionnaire (Roick et al., 2001). The overall missing rate per variable was 3% (range 0–14%). A detailed description of the study concept and design can be found elsewhere (Leichsenring et al., 2013).

### 2.2. Study population without anxiety disorder

Data of the control group were obtained from a representative telephone survey conducted in March and April 2014 in Germany. All participants (≥18 years) were surveyed about their health service use (physician and non-physician outpatient treatment, rehabilitation and hospital stays, professional and informal care) and their disease status of further disorders within six months before the interview (Grupp et al., 2016). Self-reported diagnoses were used to record depression and anxiety disorders. In addition, the anxiety dimension GAD-2 of the PHQ-4 was used to screen for persons with anxiety who were not aware or were ashamed to declare the disorder (Kemper et al., 2014; Lowe et al., 2010). In total, 5005 participants completed the full telephone interview. We excluded participants if there was an indication of any anxiety disorder (GAD-2 > 3: n=631; self-reported anxiety disorder: n=988). Furthermore, cases with missing values (n=173, overall missing rate per variable 0.1% (range 0–0.7%)) were excluded. Overall, 3213 participants remained in the data set. Details on study conception and results can be found elsewhere (Grupp et al., 2016).

### 2.3. Health service use and costs

In order to calculate costs, six-month health service utilisation was monetarily valued with German unit costs for each health service category (supplementary material Table S1) (Bock et al., 2015). All costs were estimated from a societal perspective, which represents costs arise for the society including costs for care, in- and outpatient treatment as well as costs due to absenteeism. Furthermore, costs were inflated to the base year 2014 by applying the German consumer price index (Statistisches Bundesamt [Federal Statistical Office], 2014).

Direct costs included visits to physicians and non-physician providers, professional and informal care, days in general or psychiatric hospitals, as well as days in rehabilitation units. Costs for medication were not assessed for the control group and therefore not considered in our analyses.

In order to calculate indirect costs due to absenteeism from work, the number of sick leave days were valued monetarily by full- and part-time labour costs (human capital approach) (Statistisches Bundesamt [Federal Statistical Office], 2013).

### 2.4. Statistical analyses

Our analysis consisted of three steps: (1) imputation of missing values, (2) matching of the two data sets and (3) calculation of excess costs.

#### 2.4.1. Imputation of missing values

If missing does not occur completely at random, results may be influenced by the cause of missing. Even though no common threshold for an acceptable maximum of missing values is reported in the literature, most authors accepted a missing rate between 5% and 10% without imputation (Dong and Peng, 2013). Therefore, we did not replace missing values in the control group (maximum missing rate per variable of 0.7%).

As the maximum missing rate per variable for data of the SOPHO-NET trial A1 was 14%, we replaced missing values applying Multiple Imputation by Chained Equations (MICE) (van Buuren and Groothuis-Oudshoorn, 2011). In total we created 50 imputation data sets (Azur et al., 2011) using predictive mean matching (Enders, 2011; Little, 1988; Molenberghs and Kenward, 2007) as imputation method.

#### 2.4.2. Matching of the data sets

We used Entropy Balancing (Hainmueller, 2012) to match the data of the control group to each of the 50 multiple imputed SOPHO-NET A1 data sets. The aim was to derive a reweighting scheme for the data of the control group, which ensured similar means and standard error (SE) of clinical and social-demographical characteristics (age, gender, living situation, education, prevalence of further disorders). Costs of patients of the SOPHO-NET study A1 were used as reference and therefore received a weight of one. Costs in the control group were reweighted according to the weights estimated by the entropy balancing procedure.