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Title: Evaluating the economic impact of screening and treatment for depression in the workplace

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Abstract

Depression is the most common psychiatric illness and cause of disability, and associated with durable impacts on productivity and represents one of the major causes of workplace absenteeism and presenteeism. Few studies, however, examine the economic impact of treatment of depression in the workplace, particularly from the perspective of the employer. We estimated the relative cost-effectiveness of treatment for employees with depression in the workplace. We used a decision-analytic model to estimate the relative cost-effectiveness of (i) psychotherapy, (ii) pharmacotherapy and (iii) combination of psychotherapy and pharmacotherapy and whether they reduce sickness, absenteeism and presenteeism for people with depression. Costs and savings to the employer were also estimated, and policy recommendations made about how best to translate this evidence into practice. Both pharmacotherapy treatment and psychotherapy treatment were found to be cost-saving from the perspective of the employer. Psychotherapy was found to be the most cost-effective option with an incremental cost-effectiveness ratio of €22,225. This study provides evidence that screening and treatment for depression in the workplace is cost-effective and represents a worthwhile investment from the business perspective.

Key words: depression, employment, cost-effectiveness, economic evaluation, mental illness

Introduction

Depression is the most common psychiatric illness and cause of disability, ranking as the second leading cause of disability worldwide (Ferrari et al., 2013). In addition to the significant social and personal consequences, depression is associated with durable impacts on productivity and represents one of the major causes of workplace absenteeism and presenteeism. Depression in working age adults generates direct costs in the field of health services and indirect costs from lost working hours, loss of lifetime income, and early retirement. By far the greatest contributor to the overall economic impact of depression is loss in productivity and this represents a substantial cost to employers (Ekman et al, 2013; Thomas, 2003). It is estimated that the total productivity costs of absenteeism due to mood disorders in the EU-25 is €72 billion in 2010 prices –about twice that of cardiovascular disease (Gustavsson et al., 2011; Leal et al., 2006). This equates to approximately €454 per employed person in the EU at that time.

In high-income countries, trends suggest that sick days lost to mental health problems such as depression have increased in recent years (Henderson and Madan, 2014). In the past twenty years, in Germany, the contribution of mental disorders to the cost of permanent disability pensions has tripled and more than half of these are caused by depression, anxiety and related neurotic disorders (Techniker Krankenkasse, 2013).

Several studies demonstrate effectiveness and cost-effectiveness of treatment for depression (Churchill et al., 2001; Hollinghurst et al., 2014; Koeser et al., et al., 2015; NCCMH, 2009); but, these are mainly population-based studies which examine the outcomes from the perspective of the healthcare system and there are only a limited number of programmes which focus specifically on depression in the workplace and incorporate a robust evaluation (Hamberg-van Reenen et al., 2012). Given the growing impact of depression in the workplace, German data suggest that there has been nearly a 70% increase in workplace absenteeism associated with

depression between 2000 and 2013 (Techniker Krankenkasse, 2013). It is important for businesses to understand the economic case for recognition and treatment of depression among their employees and to help employers better understand their potential role in this process. There are only a limited number of businesses, however, which currently participate in workplace mental health programmes (Wolf, 2010).

We explore the cost-effectiveness of treatment for employees with depression in the workplace. We use a decision-analytic model based on the best available evidence synthesised from the literature to estimate the relative cost-effectiveness of (i) psychotherapy, (ii) pharmacotherapy and (iii) combination of psychotherapy and pharmacotherapy and whether they reduce sickness, absenteeism and presenteeism for people with mild, moderate and severe depression. The net cost to the employer is also estimated from the employer perspective. Finally, policy recommendations are made about how best to translate this evidence into practice.

Experimental procedures

Study population and data source

The target population is employed adults living in Germany with mild (F32.0, F33.0), moderate (F32.1, F33.1) or severe major depressive disorder (F32.2/F32.3, F33.2/F33.3) based on ICD-10 diagnoses. Population characteristics and costs were based on the 2013 Depression Atlas report of the Techniker Krankenkasse (Techniker Krankenkasse, 2013) which summarises aggregated and anonymised administrative data collected from health insurance companies in Germany. The data come from 4.1 million insured individuals in the labour force in Germany and estimates were then extrapolated based on weighted averages to provide national estimates for the 37.8 million insured and employed individuals in Germany aged 15-64 years of age. Variables which were not available

from the report were estimated based on national epidemiological data from Germany, and / or the most robust trial or meta-analyses available.

Model structure

To evaluate the cost-effectiveness of treatment for employees with depression in the workplace, we adapted a decision model previously described by Koeser *et al* which compares the cost-effectiveness of – drugs for depression, psychotherapy and a combination of –drugs for depression and psychotherapy treatment (Koeser et al.,, 2015) from the perspective of the healthcare system in England. Three potential clinical outcomes were modelled: full remission, partial response and non-response. Model parameters related to treatment outcomes were informed by a review of the literature and synthesis through meta-analyses and are described in Koeser et al (Koeser et al., , 2015). Further information on the model is also described in Figure 1.

The main model assumes a 27-month time horizon: 3 months of acute treatment, 12 months of maintenance treatment and 12 months of follow-up. These intervals were based on the time frame used for the majority of trials from which the model input parameters were derived. We also, however, examined a time frame of 4 months and 21 months of maintenance treatment for the pharmacotherapy condition (i.e., 7 months and 24 months total including acute treatment) and 8 months and 21 months for psychotherapy. The minimum time frame for the psychotherapy and combination therapy conditions was based on the range of time recommended in the German Society for Psychiatry, Psychotherapy, and Neurology (DGPPN) guidelines for unipolar depression (2015) and the upper limit (24 months) reflected the maximum amount of time for which German insurance companies would pay.

Costs associated with treatment, service use and productivity losses and / or gains were calculated based on the presumed underlying depression state, and are detailed below. While everyone began

the treatment pathway in the non-response state, it was assumed that if the treatment was successful that the individual would enter into remission at month three while those with partial response would spend half of their time in remission and those with no response would never enter remission and thus, service use and productivity estimates reflected these varying depression states.

Costs

Cost of screening, assessment and treatment

We estimated that €39.94 covered the cost of facilitating the completion of the screening questionnaire follow-up assessment to confirm depression, and care management costs for each employee (McDaid et al., 2011) and that 66% of employees would follow-up with treatment following the screening process. Based on nationally representative epidemiological data from Germany, we estimated that 7.5% of employees would meet criteria for a depression diagnosis (Jacobi et al., 2014). The cost of treatment was based on the recommended number of visits included in the guidelines for unipolar depression established by the German Society for Psychiatry, Psychotherapy, and Neurology (DGPPN) (2015). The guidelines suggest that during the acute phase, individuals should receive one surveillance visit per week for three to four weeks and clinical monitoring every two to four weeks for the rest of the acute phase. The maintenance phase involves clinical monitoring every four to eight weeks. It is recommended that for –a drug for depression - that the duration of the maintenance phase is four to nine months. The recommended maintenance phase for psychotherapy is longer, i.e., eight to twelve months. For the pharmacotherapy condition, we also included prescription costs (e.g., cost of a 20mg daily dose of citalopram, which was the most commonly drug prescribed -for people with depression according to the 2013 Depression Atlas report of the Techniker Krankenkasse (Techniker Krankenkasse, 2013). Costs were based on the

official German publisher of medical classifications Deutsches Institut für Medizinische Dokumentation und Information (2015).

We assumed that individuals with mild depression received the lower bound for the number of treatment visits and that all visits occurred with a primary care practitioner (rather than a psychiatrist). We assumed that individuals with severe depression received the upper bound in terms of number of recommended treatment visits and we used the median of these two estimates for individuals with moderate depression. For the pharmacotherapy condition, individuals with moderate depression were assumed to have half of their appointments with a GP and half with a psychiatrist while individuals with severe depression were assumed to have ninety percent of their appointments with a psychiatrist. The cost of each visit was estimated using the costs for treatment as described in Kassenzentrale Bundesvereinigung (2015a, 2015b). The cost for combination therapy in our model was the sum of the cost of pharmacotherapy and psychotherapy.

Cost of additional service use

Health service utilisation and associated costs, outside of those included in the treatment costs were based on estimates calculated by Kleine-Budde et al. who analysed insurance claims data for individuals with a diagnosis of depression from the German insurer AOK Plus between the years 2007 and 2009 (Kleine-Budde et al., 2013). These included inpatient hospitalisation costs which were extrapolated over the entire 27-month period and also outpatient primary care and psychiatric care costs following the 15 month treatment phase for those who did not achieve remission. All estimates were calculated according to varying depression severity (i.e., mild, moderate and severe) and accounted for the underlying depression state (i.e., remission, partial response and non-response) and were converted to 2013 costs.

Productivity losses

Costs associated with absenteeism were based on data collected from the 2013 Depression Atlas report of the Techniker Krankenkasse (Techniker Krankenkasse, 2013) which collected data on days taken off because of depression. It is estimated that 1.6% took time off because of their depression in Germany in 2013 and that on average those individuals took 64 days off (i.e., 33, 74 and 111 days per year for mild, moderate and severe depression, respectively) over a one year period. As presenteeism data were not available from the Depression Atlas, we used based estimates on a trial from Wang et al (2006). Thus, it was estimated that the reduction in presenteeism as a result of successful intervention was equivalent to an extra 2.6 hours of work per week. Wang et al. noted that there were no significant differences in impact on presenteeism following treatment according to depression severity (i.e., there was the same increase in number of hours following treatment across severity) and so we assumed the same impact across groups. Again based on estimates from nationally representative German epidemiological data, we assumed that 7.5% of individuals would meet criteria for depression and experience an impact on their presenteeism associated with the condition (Jacobi et al., 2014). As per the human capital approach, productivity losses were converted to costs based on the average gross added value per worker in Germany in 2013 (€66,448) based on the 2013 report of the Techniker Krankenkasse (Techniker Krankenkasse, 2013)

Health-related quality of life

Quality adjusted life years (QALYs) were used as an indicator of health-related quality of life. Current NICE guidelines recommend using the EuroQol 5 Dimensions (EQ-5D) when deriving preference weights for health states (NICE, 2013); however, there is no published evidence which is currently available, mapping EQ-5D scores by depression status as defined by the HAMD-17 in this model. Therefore, we used estimates from Koeser et al., as the authors calculated mean EQ-5D utilities for remitters, responders and non-responders as defined above based on previously collected trial data (Kuyken et al., 2008). To account for the fact that repeated measures were available for most patients, a pooled ordinary least squares model with cluster robust standard errors was used. The

same quality of life was assigned to individuals dropping out of treatment due to side effects or no response as to those who completed the treatment but who did not respond.

Analysis

Incremental cost-effectiveness ratios were calculated by dividing the difference in total costs of the treatments by the mean difference in QALYs. To reflect the current value of the benefits and costs accumulating over the time horizon of the model we discounted both at a rate of 3.4% as recommended for Germany (Gollier, 2011). We undertook sensitivity analyses to consider various treatment time frames, as described above, in relation to the minimum time frame recommended in the DGPPN guidelines for unipolar depression (2013) and the upper limit (24 months) reflected the maximum amount of time for which the insurance company would pay. We also compared findings when mild depression was and was not included.

For the cost-effectiveness analysis, we estimated productivity losses during the first fifteen months alongside treatment. Productivity losses were treated equivalently to cost of health service use for year 1, dependent on the depression state but not treatment. For the cost-offset analysis, we also used a conservative timeframe and estimated the impact of depression treatment on absenteeism and presenteeism over a one-year period. Based on -Kuyken et al., (2008) we assumed that the gain was slightly lower for those treated with pharmacotherapy vs. psychotherapy (i.e., 0.097).

We present the cost and payoffs from employer and healthcare perspectives for screening and treatment of employees with depression for a hypothetical cohort of 500 employees over a 27 month timeframe. We assume for this analysis that the intervention was for 15 months, 7.5% of individuals screened positive for depression and that (based on nationally representative data from the National Comorbidity Survey in the USA) among those with depression, the prevalence of mild, moderate and severe depression was 13.8%, 38.5% and 47.7%, respectively (Birnbaum et al., 2010). As in the cost-effectiveness analysis, costs and benefits were estimated based on 50% being full

responders, 22% being partial responders and 28% being non-responders for CBT and 52% being full responders, 23% being partial responders and 25% being non-responders for pharmacotherapy. Results are presented so that costs or expenditures associated with the treatment are shown with a plus sign, while savings or reductions in costs are shown with a minus sign.

Results

Cost-effectiveness analysis

Table 1 describes the incremental cost-effectiveness ratios for psychotherapy, pharmacotherapy and combination (psychotherapy and pharmacotherapy). As shown in table 1, our estimates suggest that pharmacotherapy had the lowest average cost (€30,598: treatment and service use costs: €5,895 and productivity costs: €24,703) while combination pharmacotherapy and psychotherapy had the highest average cost (€32,615: treatment and service use costs: €7,175 and productivity costs: €25,540).

In terms of outcomes, pharmacotherapy was associated with the lowest QALYs (1.26) while psychotherapy and combination pharmacotherapy and psychotherapy were almost equivalent (1.30 and 1.31, respectively). The incremental cost-effectiveness ratio for improvement in QALY score at 27 months suggested that psychotherapy was the most cost-effective option, using a commonly used willingness to pay threshold of (€50,000) based on NICE guidance as there is not an established threshold in Germany, although some authors have argued that at least for high income countries, societal willingness to pay may be higher (Speight and Reaney, 2009; Ubel et al., 2003). Sensitivity analysis which estimated results using varying time frames suggested that the costs narrowed slightly for the combination treatment and psychotherapy for the shorter time frame intervention (i.e. 7 months); however, the incremental cost-effectiveness ratio (ICER) did not change significantly.

Similarly for the longer time frame (i.e., 15 months intervention) there were no significant increases in the ICERs.

TABLE 1 ABOUT HERE

Cost-offset analysis from the perspective of the employer

Table 2 summarises the net cost for pharmacotherapy, psychotherapy and combination pharmacotherapy and psychotherapy among a hypothetical population of 500 employees people and then extrapolated to the entire population of employed persons in Germany, over a 27 month time frame. It is assumed that the costs of screening and treatment for depression are borne by the employer. The results show that from the perspective of the employer, both pharmacotherapy and psychotherapy appear to be cost-saving, despite the cost of needing to screen all employees. As we did not have absenteeism and presenteeism data specifically for combination treatment, we have not presented results for this condition here; however, if psychotherapy and pharmacotherapy intervention costs were added together (subtracting one set of screening costs) the intervention costs plus additional healthcare intervention costs would be approximately €101,944, which is only €1,000 to €2,000 greater than the projected gains in productivity. Benefits are gained mainly from a reduction in presenteeism.

TABLE 2 ABOUT HERE

Discussion

This study provides evidence that screening and treatment for depression in the workplace is cost-effective and represents a worthwhile investment from the business perspective. It adds to the existing literature supporting the economic case for employers to invest in interventions to address depression in the workplace (Goldberg and Steury, 2001; Knapp et al., 2011; McDaid, 2008),

particularly in the area of prevention and treatment (Hamberg-van Reenen et al., 2012). Both pharmacotherapy treatment and psychotherapy treatment were found to be cost-saving from the perspective of the employer.

Despite the lower overall cost associated with pharmacotherapy, psychotherapy was found to be the most cost-effective option. It may be that the durability of the outcomes associated with psychotherapy treatment in the long term allow for greater improvement in workplace productivity when compared with pharmacotherapy. A recent clinical trial also demonstrated greater improvement in employment status for cognitive therapy when compared with pharmacotherapy at two years follow up (Fournier et al., 2015). Cognitive changes and cognitive skills acquisition as well as cognitive restructuring, tackling negative thoughts that prevent return to employment, have all been suggested as potentially putative mechanisms underpinning the effectiveness of cognitive therapy (DeRubeis et al., 1990; Quilty et al., 2008). It might also be that cognitive therapy could promote coping skills which might hence confer long protection against relapse when compared to pharmacotherapy.

In a condition as complex as depression; however, personalised treatment which is tailored to the needs and preferences of individuals should be considered, in line with expert recommendations (Wykes et al., 2015). Although offering an array of treatment options may be most useful for improving outcomes across a diverse population of persons with depression (Rush et al., 2006), our findings suggest that psychotherapy was likely to be the most cost-effective option when compared with pharmacotherapy or combination pharmacotherapy and psychotherapy. Other authors have also suggested that psychotherapy is likely to be more cost-effective from the perspective of the health system (Koeser et al., 2015). It may be that certain treatments are more effective for individuals based on sociodemographic characteristics; clinical characteristics such as type of depression, chronicity or severity and individual values (Cuijpers et al., 2012). Although economic evaluation can provide evidence to inform decisions about how to allocate available resources so as

to get more out of them, any one treatment should not be ruled out based on cost alone. Other reviews suggest that getting individuals with depression to participate in some type of therapy with demonstrated effectiveness may be more important than type of treatment and this may depend heavily on what is readily accessible in the individual's context (Khan et al., 2012).

When considering the cost-effectiveness of these interventions, we assumed that only a proportion of individuals who screened positive for depression would take up treatment and continue to participate in treatment while experiencing depression. An important consideration in the cost-effectiveness of treatment is engagement with individuals who have depression to link them up with appropriate treatment. Although the intervention may be cost-effective, the impact can only be realised if individuals participate in treatment (Corrigan et al., 2014) and this could be influenced by workplace characteristics. We know that stigma is an important barrier to getting help for mental illness (Clement et al., 2014) and can influence population prevalence of treatment for depression (Lewer et al., 2015). Individuals may choose not to participate in treatment and / or to disclose a mental health problem in the workplace because of potentially negative consequences from their employer or colleagues (Brohan et al., 2014). Given that employers and colleagues may be less likely to accept an individual who has depression (Angermeyer et al., 2013; Brohan et al., 2012; Lasalvia et al., 2012), managers also have an important role to play in supporting employees and facilitating a positive environment. For example, we know that managers who support employees with depression may facilitate more positive perceptions in the workplace and more openness and disclosure among employees with depression (Evans-Lacko and Knapp, 2014) which could be important for treatment participation.

Strengths and limitations

There are very few robust economic studies of workplace interventions (Hamberg-van Reenen et al., 2012). A few studies have performed economic evaluation, but they focus on specific populations, for example, correctional officers (McCraty et al., 2009) and nurses (Noben et al., 2014) who may

have specific needs; focus on a specific intervention programme, for example, a return to work intervention (van Oostrom et al., 2010), collaborative care (Goorden et al., 2014) or a collaborative care approach (Wang et al., 2006) and follow-up is rarely longer than 1 year. Thus, our study adds to the literature by applying a 27 month time frame, comparing across 3 types of standard, evidence-based interventions and considering the impact in relation to the general population of employed individuals in Germany.

Although we believe that our findings are based on the best available evidence, our conclusions are based on a simulation model which requires several assumptions and the associated limitations need to be considered alongside our conclusions. There are certain costs which were not included in the model such as the impact on family members, premature death, recruitment and training costs for employers if their employees permanently withdraw from the workforce. We assume that the distribution of costs would not vary widely across the treatment conditions; however, they could increase the overall costs, particularly for individuals with severe depression who may require more support from a carer and be more likely to transition from employment to permanent disability status. We have not included disability and early retirement costs in the model which we know are increasing (McDaid, 2008) and which could also represent important savings if, for example, treatment was likely even to reduce early retirement among a very small proportion of employees. Some issues have been noted in previous work regarding direct comparisons of psychotherapy and pharmacotherapy treatments given differences in study designs and these should be considered. For example, some research suggests that methodological issues such as a nocebo effect associated with wait list controls, difficulty in blinding and small study bias may be associated with a higher effect size for psychotherapy compared to pharmacotherapy studies (Furukawa et al., 2014; Huhn et al., 2014). Additionally, our findings may not be relevant for individuals with highly recurrent depressive disorder as the length of maintenance treatment needed for these individuals may be longer than 21 months; however, our upper bound was also driven by the economic case of the maximum amount of time for which the insurance company would pay. Finally, there may be significant variation in

workplace setting or type of employment and more broadly, region or country. For instance, we know that some types of workplace stress are associated with greater levels of depression and these might represent particular targets for interventions (Fischer et al. 2001; Michie 2003) and should be further explored. Moreover, it is likely that the effects of treatment would be more positive if the treatments included a specific work-directed component and or were modified with an employment focus (Lagerveld et al., 2012; Nieuwenhuijsen et al., 2014).

In relation to the global context, although this model is based on a German employment perspective which has a specific set of national employment policies, we might assume that some of our findings could be broadly relevant for other high-income and / or European countries. However, we should also consider the health policy context in relation to generalisability. Germany is funded by a statutory contribution system that ensures free health care for all via health insurance funds. Insurance payments are based on a percentage of income, shared between employee and employer.¹ More research should be done across diverse countries to better understand potential differences across other settings and contexts. For example, although we know that depression has a significant economic impact via workplace productivity globally, the impact and the ratio of costs of presenteeism to absenteeism varies across countries (Evans-Lacko and Knapp, 2015). Moreover, workplace policies and context, access to appropriate interventions also vary and must be considered.

Implications

In order to realise the economic benefits outlined in this paper, there needs to be a better balance between the needs of employees with depression in the workplace and the services and interventions provided to them. In view of increasing productivity losses attributable to depression

¹ Health insurance in Germany is divided between statutory and private schemes. The statutory health insurance, the so-called Gesetzliche Krankenversicherung (GKV), occupies a central position in the healthcare system in the Federal Republic of Germany. Approximately ninety percent of the population is covered by statutory health insurance, which is compulsory for all with a gross income of less than 4,462.50 EUR per month. Private healthcare schemes can either provide a complete health service for those who opt out of the GKV, or top-up cover for those who remain within it. Further information on health care expenditure in Germany can be found here: <http://www.gbe-bund.de/pdf/GesInDtldSummary.pdf>

and the economic consequences associated with this, the need for better workplace policies is evident. There are, however, models of good practice available and therefore actions which can be taken to improve the workplace context and outcomes for employees and businesses. In general three approaches are described in the literature: (1) a focus on earlier intervention to reduce the gap between recognition and treatment, (2) support and training for employees, managers and other relevant staff and (3) complete support from the top of the organization through enactment of supportive policies and practices for both prevention and treatment of depression. . In relation to early intervention, the German AOK programme for treatment of depression and burn-out (<http://www.kvn.de/Praxis/Fortbildung/AOK-Behandlungsprogramm-Depression-und-Burn-out/>) is an example of good practice for closing the treatment gap. The programme improves access through enhanced treatment available through the GP practice and access to a specialist or psychotherapist within 14 days. Participating physicians and psychotherapists are paid a separate fee for their services and accessibility is increased via opening hours during evenings and weekends (AOK 2015). Other initiatives such as the Masto project in Finland, use a multifaceted approach involving different administrative sectors, social partners and the third sector to increase wellbeing at work, prevent depression, increase early recognition and improve care, rehabilitation and help-seeking for employees with depression (European Commission, 2015). Nevertheless, it is important to consider potential variation across Europe in relation to early intervention both in relation to need and delivery of evidence based programmes. The literature suggests that there is some variation across Europe in terms of when individuals with mood disorders initiate treatment, with only 28% of individuals in Italy initiating treatment during the year of onset while 52% made contact in the Netherlands (Wang et al., 2007); however, there is not a clear North – South divide and there may be certain country characteristics where a focus on early intervention is of greater need. For example, we know that greater health care spending and lower public stigma is associated with greater use and regularity of antidepressants (Lewer et al., 2015).

It is also now possible to use eHealth technologies to facilitate early recognition of mood problems among employees, for example, through mobile apps for monitoring symptoms and web-based programmes which can provide an effective form of prevention and treatment. There are also opportunities to use technology for training aids or supports for managers and HR staff; however, it is critical that a clear pathway to treatment and support is in place if such an intervention were to be introduced.

In relation to support and training for employees, managers and other relevant staff there are good examples of tools and supports which enable employers and managers to promote a positive psychosocial work environment and support employees with depression. Some companies such as Toshiba also use electronic questionnaires to collect regular feedback from employees in the organization. Finally, strong support from senior management at the top of the organization can help to ensure that adequate policies are put in place and implemented in a meaningful way. Policies may focus on supporting employees with depression, their line managers and key support figures in the organization such as those working in HR and occupational health.

A model of good practice, particularly in relation to development and implementation of risk assessment and prevention policies is the e-learning tool “Psychological health promotion as a leadership task” of the German INQA initiative (INQA 2015). INQA promotes exchanges between companies, government and researchers and uses a holistic approach to support companies to improve workplace conditions including through tailored tools and measures which facilitate early detection of symptoms of burn out and other psychological problems in addition to health promotion.

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Author contributions: The original study design and protocol was written by SEL and KK with contributions from CL, LK and MK. SEL performed data analysis and initial drafting of the manuscript with contributions from CL and KK. All authors participated in interpretation of the analysis, editing and rewriting of the manuscript and all authors have approved the final manuscript.

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References

- Angermeyer, M.C., Matschinger, H., Schomerus, G., 2013. Public attitudes towards people with depression in times of uncertainty: results from three population surveys in Germany. *Soc. Psychiatry Psychiatr. Epidemiol.* 48, 1513–8. doi:10.1007/s00127-012-0618-2
- Birnbaum, H.G., Kessler, R.C., Kelley, D., Ben-Hamadi, R., Joish, V.N., Greenberg, P.E., 2010. Employer burden of mild, moderate, and severe major depressive disorder: mental health services utilization and costs, and work performance. *Depress. Anxiety* 27, 78–89. doi:10.1002/da.20580
- Brohan, E., Evans-Lacko, S., Henderson, C., Murray, J., Slade, M., Thornicroft, G., 2014. Disclosure of a mental health problem in the employment context: qualitative study of beliefs and experiences. *Epidemiol. Psychiatr. Sci.* 23, 289–300. doi:10.1017/S2045796013000310
- Brohan, E., Henderson, C., Wheat, K., Malcolm, E., Clement, S., Barley, E.A., Slade, M., Thornicroft, G., 2012. Systematic review of beliefs, behaviours and influencing factors associated with disclosure of a mental health problem in the workplace. *BMC Psychiatry* 12, 11.
- Churchill, R., Hunot, V., Corney, R., Knapp, M., McGuire, H., Tylee, A., Wessely, S., 2001. A systematic review of controlled trials of the effectiveness and cost-effectiveness of brief psychological treatments for depression. *Health Technol. Assess.* 5, 1–173.
- Clement, S., Schauman, O., Graham, T., Maggioni, F., Evans-Lacko, S., Bezborodovs, N., Morgan, C., Rüschi, N., Brown, J.S.L., Thornicroft, G., 2014. What is the impact of mental health-related stigma on help-seeking? A systematic review of quantitative and qualitative studies. *Psychol. Med.* 1–17. doi:10.1017/S0033291714000129
- Commission, E., 2015. Mental health compass database of policies and good practices [WWW Document]. Mastro Proj. to reduce Depress. Relat. Work Disabil. URL https://webgate.ec.europa.eu/sanco_mental_health/public/POLICY/422/show.html (accessed 7.31.15).
- Corrigan, P.W., Druss, B.G., Perlick, D.A., 2014. The Impact of Mental Illness Stigma on Seeking and Participating in Mental Health Care. *Psychol. Sci. Public Interes.* 15, 37–70. doi:10.1177/1529100614531398
- Cuijpers, P., Reynolds, C.F., Donker, T., Li, J., Andersson, G., Beekman, A., 2012. Personalized treatment of adult depression: medication, psychotherapy, or both? A systematic review. *Depress. Anxiety* 29, 855–64. doi:10.1002/da.21985
- DeRubeis, R.J., Evans, M.D., Hollon, S.D., Garvey, M.J., Grove, W.M., Tuason, V.B., 1990. How does cognitive therapy work? Cognitive change and symptom change in cognitive therapy and pharmacotherapy for depression. *J. Consult. Clin. Psychol.* 58, 862–869. doi:10.1037/0022-006X.58.6.862
- Ekman M, Granstrom O, Omerov S, Jacob J, L.M., 2013. The societal cost of depression: Evidence from 10,000 Swedish patients in psychiatric care. *J. Affect. Disord.* 13, 00227–9.
- Evans-Lacko S., K.M., 2015. Global trends of workplace productivity for people with depression: absenteeism and presenteeism costs across eight diverse countries. under Rev.
- Evans-Lacko, S., Knapp, M., 2014. Importance of social and cultural factors for attitudes, disclosure and time off work for depression: findings from a seven country European study on depression in the workplace. *PLoS One* 9, e91053. doi:10.1371/journal.pone.0091053
- Ferrari, A.J., Charlson, F.J., Norman, R.E., Patten, S.B., Freedman, G., Murray, C.J.L., Vos, T., Whiteford, H.A., 2013. Burden of depressive disorders by country, sex, age, and year: findings from the global burden of disease study 2010. *PLoS Med.* 10, e1001547. doi:10.1371/journal.pmed.1001547
- Festbetragsarzneimittel nach 35 SGB V sortiert nach Arzneimittelname [WWW Document], 2015. . Dtsch. Inst. für Medizinische Dokumentation und Inf. URL <https://www.dimdi.de/static/de/amg/festbetrage-zuzahlung/festbetrage/index.htm> (accessed 6.10.15).

- Fischer, F.M.P., Morata, T.C.P., Latorre, M. do R.P., Krieg, E.F.P., Fiorini, A.C.P., Colacioppo, S.P., Gozzoli, L.Bs., Padrao, M.A.Bs., Zavariz, C.P., Lieber, R.P., Wallingford, K.M.M., Cesar, C.L.G.P., 2001. Effects of Environmental and Organizational Factors on the Health of Shiftworkers of a Printing Company. *J. Occup. Environ. Med.* 43, 882–889.
- Fournier, J.C., DeRubeis, R.J., Amsterdam, J., Shelton, R.C., Hollon, S.D., 2015. Gains in employment status following antidepressant medication or cognitive therapy for depression. *Br. J. Psychiatry* 206, 332–8. doi:10.1192/bjp.bp.113.133694
- Furukawa, T.A., Noma, H., Caldwell, D.M., Honyashiki, M., Shinohara, K., Imai, H., Chen, P., Hunot, V., Churchill, R., 2014. Waiting list may be a placebo condition in psychotherapy trials: a contribution from network meta-analysis. *Acta Psychiatr. Scand.* 130, 181–92. doi:10.1111/acps.12275
- German Society for Psychiatry, Psychotherapy, and N. (DGPPN), 2015. S3-Guideline/National Disease Management Guideline “Unipolar Depression” [WWW Document]. URL www.depression.versorgungsleitlinien.de a (accessed 6.4.15).
- Goldberg, R.J., Steury, S., 2001. Depression in the Workplace: Costs and Barriers to Treatment. *Psychiatr. Serv.* 52, 1639–1643. doi:10.1176/appi.ps.52.12.1639
- Gollier, C., 2011. On the Underestimation of the Precautionary Effect in Discounting*. *Geneva Risk Insur. Rev.* 36, 95–111. doi:10.1057/grir.2011.6
- Goorden, M., Vlasveld, M.C., Anema, J.R., van Mechelen, W., Beekman, A.T.F., Hoedeman, R., van der Feltz-Cornelis, C.M., Hakkaart-van Roijen, L., 2014. Cost-utility analysis of a collaborative care intervention for major depressive disorder in an occupational healthcare setting. *J. Occup. Rehabil.* 24, 555–62. doi:10.1007/s10926-013-9483-4
- Gustavsson, A., Svensson, M., Jacobi, F., Allgulander, C., Alonso, J., Beghi, E., Dodel, R., Ekman, M., Faravelli, C., Fratiglioni, L., Gannon, B., Jones, D.H., Jennum, P., Jordanova, A., Jönsson, L., Karampampa, K., Knapp, M., Kobelt, G., Kurth, T., Lieb, R., Linde, M., Ljungcrantz, C., Maercker, A., Melin, B., Moscarelli, M., Musayev, A., Norwood, F., Preisig, M., Pugliatti, M., Rehm, J., Salvador-Carulla, L., Schlehofer, B., Simon, R., Steinhausen, H.-C., Stovner, L.J., Vallat, J.-M., Van den Bergh, P., den Bergh, P. Van, van Os, J., Vos, P., Xu, W., Wittchen, H.-U., Jönsson, B., Olesen, J., 2011. Cost of disorders of the brain in Europe 2010. *Eur. Neuropsychopharmacol.* 21, 718–79. doi:10.1016/j.euroneuro.2011.08.008
- Hamberg-van Reenen, H.H., Proper, K.I., van den Berg, M., 2012. Worksite mental health interventions: a systematic review of economic evaluations. *Occup. Environ. Med.* 69, 837–45. doi:10.1136/oemed-2012-100668
- Henderson, M., Madan, I., 2014. Mental health and work, in: Davies, S., M.N. (Ed.), *Annual Report of the Chief Medical Officer 2013, Public Mental Health Priorities: Investing in the Evidence.* Department of Health, London, pp. 157–169.
- Hollingshurst, S., Carroll, F.E., Abel, A., Campbell, J., Garland, A., Jerrom, B., Kessler, D., Kuyken, W., Morrison, J., Ridgway, N., Thomas, L., Turner, K., Williams, C., Peters, T.J., Lewis, G., Wiles, N., 2014. Cost-effectiveness of cognitive-behavioural therapy as an adjunct to pharmacotherapy for treatment-resistant depression in primary care: economic evaluation of the CoBaT Trial. *Br. J. Psychiatry* 204, 69–76. doi:10.1192/bjp.bp.112.125286
- Holzhausen M, B., U, F.T., 2009. Patient view in the assessment of quality of life in old age: potentials and limits. *Zeitschrift für Gerontol. und Geriatr. Organ der Dtsch. Gesellschaft für Gerontol. und Geriatr., Die Patientenperspektive in der Erfassung von Lebensqualität im Alter: Möglichkeiten und Grenzen.*
- Huhn, M., Tardy, M., Spinel, L.M., Kissling, W., Förstl, H., Pitschel-Walz, G., Leucht, C., Samara, M., Dold, M., Davis, J.M., Leucht, S., 2014. Efficacy of pharmacotherapy and psychotherapy for adult psychiatric disorders: a systematic overview of meta-analyses. *JAMA psychiatry* 71, 706–15. doi:10.1001/jamapsychiatry.2014.112
- Jacobi, F., Höfler, M., Siegert, J., Mack, S., Gerschler, A., Scholl, L., Busch, M.A., Hapke, U., Maske, U., Seiffert, I., Gaebel, W., Maier, W., Wagner, M., Zielasek, J., Wittchen, H.-U., 2014. Twelve-

- month prevalence, comorbidity and correlates of mental disorders in Germany: the Mental Health Module of the German Health Interview and Examination Survey for Adults (DEGS1-MH). *Int. J. Methods Psychiatr. Res.* 23, 304–19. doi:10.1002/mpr.1439
- Kassenärztliche Bundesvereinigung, 2015a. Einheitlicher Bewertungsmaßstab - Psychiater.
- Kassenärztliche Bundesvereinigung, 2015b. Einheitlicher Bewertungsmaßstab - Psychotherapeutische Medizin.
- Khan, A., Faucett, J., Lichtenberg, P., Kirsch, I., Brown, W.A., 2012. A systematic review of comparative efficacy of treatments and controls for depression. *PLoS One* 7, e41778. doi:10.1371/journal.pone.0041778
- Kleine-Budde, K., Müller, R., Kawohl, W., Bramesfeld, A., Moock, J., Rössler, W., 2013. The cost of depression - a cost analysis from a large database. *J. Affect. Disord.* 147, 137–43. doi:10.1016/j.jad.2012.10.024
- Knapp, M., McDaid, D., Parsonage, M., 2011. Mental health promotion and prevention: the economic case. Personal Social Services Research Unit, London School of Economics and Political Science, London, UK.
- Koeser L, Donisi V, Goldberg DP, M.P., 2015. Modelling the cost-effectiveness of pharmacotherapy compared to CBT and combination therapy for the treatment of moderate to severe depression in the UK. *Psychol. Med.*
- Kuyken, W., Byford, S., Taylor, R.S., Watkins, E., Holden, E., White, K., Barrett, B., Byng, R., Evans, A., Mullan, E., Teasdale, J.D., 2008. Mindfulness-based cognitive therapy to prevent relapse in recurrent depression. *J. Consult. Clin. Psychol.* 76, 966–78. doi:10.1037/a0013786
- Lagerveld, S.E., Blonk, R.W.B., Brenninkmeijer, V., Wijngaards-de Meij, L., Schaufeli, W.B., 2012. Work-focused treatment of common mental disorders and return to work: A comparative outcome study. *J. Occup. Health Psychol.* 17, 220–234.
- Lasalvia, A., Zoppei, S., Van, B.T., Bonetto, C., Cristofalo, D., Wahlbeck, K., Bacle, S. V, Van, A.C., van, W.J., Reneses, B., Germanavicius, A., Economou, M., Lanfredi, M., Ando, S., Sartorius, N., Lopez-Ibor, J.J., Thornicroft, G., 2012. Global pattern of experienced and anticipated discrimination reported by people with major depressive disorder: a cross-sectional survey. *Lancet.*
- Leal, J., Luengo-Fernández, R., Gray, A., Petersen, S., Rayner, M., 2006. Economic burden of cardiovascular diseases in the enlarged European Union. *Eur. Heart J.* 27, 1610–9. doi:10.1093/eurheartj/ehi733
- Lewer, D., O'Reilly, C., Mojtabai, R., Evans-Lacko, S., 2015. Antidepressant use in 27 European countries: associations with sociodemographic, cultural and economic factors. *Br. J. Psychiatry.* doi:10.1192/bjp.bp.114.156786
- McCarty, R., Atkinson, M., Lipsenthal, L., Arguelles, L., 2009. New hope for correctional officers: an innovative program for reducing stress and health risks. *Appl. Psychophysiol. Biofeedback* 34, 251–72. doi:10.1007/s10484-009-9087-0
- McDaid, D., 2008. Mental health in workplace settings. Luxembourg.
- Michael, M.D.K.D.P., 2011. Workplace screening for depression and anxiety disorders, in: Knapp Martin, McDaid David, P.M. (Ed.), *Mental Health Promotion and Prevention: The Economic Case*. Personal Social Services Research Unit, London School of Economics and Political Science, London, UK.
- Michie, S., 2003. Reducing work related psychological ill health and sickness absence: a systematic literature review. *Occup. Environ. Med.* 60, 3–9. doi:10.1136/oem.60.1.3
- NCCMH, 2009. Depression in adults: The treatment and management of depression in adults.
- Nieuwenhuijsen, K., Faber, B., Verbeek, J.H., Neumeyer-Gromen, A., Hees, H.L., Verhoeven, A.C., van der Feltz-Cornelis, C.M., Bültmann, U., 2014. *Cochrane Database of Systematic Reviews*, The Cochrane database of systematic reviews. John Wiley & Sons, Ltd, Chichester, UK. doi:10.1002/14651858.CD006237.pub3
- Noben, C., Smit, F., Nieuwenhuijsen, K., Ketelaar, S., Gärtner, F., Boon, B., Sluiter, J., Evers, S., 2014.

- Comparative cost-effectiveness of two interventions to promote work functioning by targeting mental health complaints among nurses: pragmatic cluster randomised trial. *Int. J. Nurs. Stud.* 51, 1321–31. doi:10.1016/j.ijnurstu.2014.01.017
- Quilty, L.C., McBride, C., Bagby, R.M., 2008. Evidence for the cognitive mediational model of cognitive behavioural therapy for depression. *Psychol. Med.* 38, 1531–41. doi:10.1017/S0033291708003772
- Rush, A.J., Trivedi, M.H., Wisniewski, S.R., Nierenberg, A.A., Stewart, J.W., Warden, D., Niederehe, G., Thase, M.E., Lavori, P.W., Lebowitz, B.D., McGrath, P.J., Rosenbaum, J.F., Sackeim, H.A., Kupfer, D.J., Luther, J., Fava, M., 2006. Acute and longer-term outcomes in depressed outpatients requiring one or several treatment steps: a STAR*D report. *Am. J. Psychiatry* 163, 1905–17. doi:10.1176/appi.ajp.163.11.1905
- Speight, J., Reaney, M., 2009. Wouldn't it be NICE to consider patients' views when rationing health care? *BMJ* 338, b85–b85. doi:10.1136/bmj.b85
- Techniker Krankenkasse, 2013. *Depressionsatlas*.
- Thomas CM, M.S., 2003. Cost of depression among adults in England in 2000. *Br. J. Psychiatry* 183, 514–519.
- Ubel, P.A., Hirth, R.A., Chernew, M.E., Fendrick, A.M., 2003. What is the price of life and why doesn't it increase at the rate of inflation? *Arch. Intern. Med.* 163, 1637–41. doi:10.1001/archinte.163.14.1637
- van Oostrom, S.H., Heymans, M.W., de Vet, H.C.W., van Tulder, M.W., van Mechelen, W., Anema, J.R., 2010. Economic evaluation of a workplace intervention for sick-listed employees with distress. *Occup. Environ. Med.* 67, 603–10. doi:10.1136/oem.2009.051979
- Wang, P.S., Angermeyer, M., Borges, G., Bruffaerts, R., Tat Chiu, W., DE Girolamo, G., Fayyad, J., Gureje, O., Haro, J.M., Huang, Y., Kessler, R.C., Kovess, V., Levinson, D., Nakane, Y., Oakley Brown, M.A., Ormel, J.H., Posada-Villa, J., Aguilar-Gaxiola, S., Alonso, J., Lee, S., Heeringa, S., Pennell, B.-E., Chatterji, S., Ustün, T.B., 2007. Delay and failure in treatment seeking after first onset of mental disorders in the World Health Organization's World Mental Health Survey Initiative. *World Psychiatry* 6, 177–85.
- Wolf, K., 2010. Making the Link between Health and Productivity at the Workplace —A Global Perspective. *Ind. Health* 48, 251–255.
- Wykes, T., Haro, J.M., Belli, S.R., Obradors-Tarragó, C., Arango, C., Ayuso-Mateos, J.L., Bitter, I., Brunn, M., Chevreur, K., Demotes-Mainard, J., Elfeddali, I., Evans-Lacko, S., Fiorillo, A., Forsman, A.K., Hazo, J.-B., Kuepper, R., Knappe, S., Leboyer, M., Lewis, S.W., Linszen, D., Luciano, M., Maj, M., McDaid, D., Miret, M., Papp, S., Park, A.-L., Schumann, G., Thornicroft, G., van der Feltz-Cornelis, C., van Os, J., Wahlbeck, K., Walker-Tilley, T., Wittchen, H.-U., 2015. Mental health research priorities for Europe. *The Lancet. Psychiatry* 2, 1036–42. doi:10.1016/S2215-0366(15)00332-6

Table 1. Cost-effectiveness scenarios for antidepressants vs. psychotherapy vs. combination treatment for employees with depression.

Intervention	Costs¹ (€)	QALYs	ICERs (€ / QALY)
Pharmacotherapy	30,508	1.26	N/A
CBT	31,397	1.30	22225
Combination	32,615	1.31	121800

¹Productivity losses are treated equivalently to cost of health service use for year 1, dependent on the depression state but not treatment.

Table 2. Cost payoffs from an employer based and healthcare perspective for screening and treatment of employees with depression over a 27 month timeframe⁴

	Hypothetical cohort of 500 employees (€)	Total insured population in Germany ³ (€)
Pharmacotherapy		
Intervention costs ¹	41,491	3,136,719,600
Additional healthcare costs ²	26,908	2,034,244,800
Productivity losses (absenteeism)	-37,404	-2,827,742,400
Productivity losses (presenteeism)	-62,097	-4,694,533,200
Psychotherapy		
Intervention costs	53,515	4045734000
Additional healthcare costs	26,908	2034244800
Productivity losses (absenteeism)	-38,180	-2,886,408,000
Productivity losses (presenteeism)	-62,097	-4694533200

¹ Over 15 month period (3 months acute treatment and 12 months maintenance phase)

² Inpatient hospitalisation costs and additional service use costs following 15 month intervention

³ 37.8 million insured employees in Germany (Techniker Krankenkasse, 2013)

⁴ We assume for this analysis that the prevalence of mild, moderate and severe depression was 13.8%, 38.5% and 47.7%, respectively.

Figure 1. Decision tree model for antidepressant therapy, psychotherapy and combination treatment



