

A Model-Based Estimation of Productivity-Adjusted Life Years Due to Depression in Germany

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Objective

Depressive disorders are highly prevalent and significantly reduce quality of life and work ability, ranking among the leading causes of work absence in Germany.¹ The burden of depression has been well documented in terms of health outcomes, often measured in terms of Disability-Adjusted Life Years (DALYs) or Years of Life Lost (YLL), and direct medical costs. However, the impact on productivity at a population level remains underexplored.²

This study aims to quantify productivity losses, using Productivity-adjusted Life Years (PALYs), and the resulting economic burden of depression in Germany's working-age population (15-69) over a 10-year period.³

Productivity-Adjusted Life Years (PALYs)

PALYs capture both absenteeism (missed workdays) and presenteeism (reduced performance at work), as well as early workforce exit.³

The metric is calculated by multiplying a productivity index (ranging from 0 = no productivity to 1 = full productivity) by the years lived in a given health state. This index reflects the proportion of working days actually worked relative to the maximum possible.³

$$\text{Productivity index} = \frac{\text{Maximum working days} - \text{Days missed due to condition (incl. presenteeism)}}{\text{Maximum working days}}$$

Results

Over 10 years, the model simulated 570.9 million person-years (50.5% male, 49.5% female), with 1.7% spent in the death state (Fig. 2). A total of 56.6 million depressive episodes occurred (9% of total person-years; 61.1% in women, 38.9% in men). Compared to a control simulation, depressive disorders led to 9.8 million discounted PALYs lost, equating to discounted €1.1 trillion in productivity losses over the 10-year period.

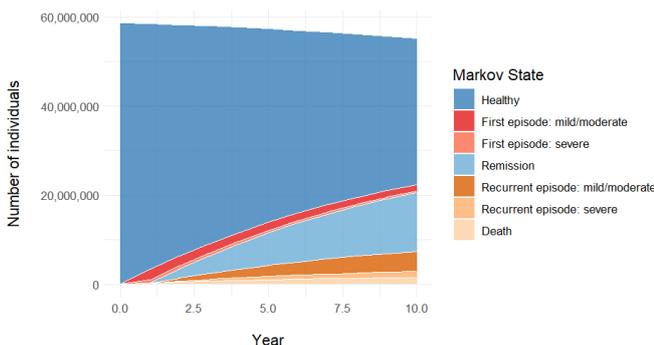
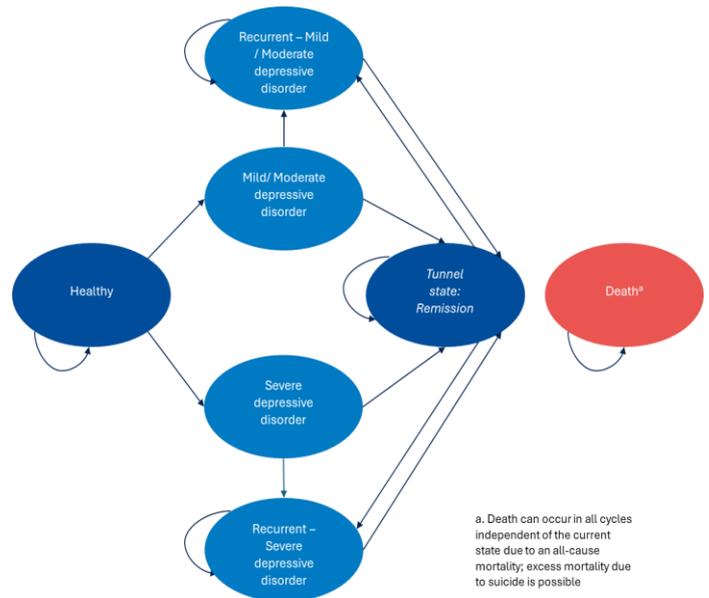


Figure 2: Simulation results by health state over 10 years

Methods



a. Death can occur in all cycles independent of the current state due to an all-cause mortality; excess mortality due to suicide is possible

Figure 1: Markov state model structure

This study employs a Markov state model (Fig.1) to simulate incident cases in a healthy working-age population in Germany by sex and age. The cycle length is one year. New individuals enter the model at each cycle to represent young adults joining the workforce. Productivity indices ranging from 0 to 1 are assigned to each state. Model inputs are sourced from national statistics and literature; future outcomes are discounted at 3% annually. The model was rerun assuming no depression to estimate the attributable impact of depression. PALYs are monetized based on salary estimates.

Conclusion

Depression places a considerable productivity burden on Germany's working-age population and economy, underlining the importance of effective prevention and timely treatment. The use of PALYs provides a robust framework for quantifying these losses and offers a valuable basis for e.g. assessing the cost-effectiveness of interventions to further guide mental health policy and resource allocation to reduce the societal and economic impact of depression in Germany.

References

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