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Projecting the Economic and Mortality Burden of Depression in the United States: A 10-Year Analysis Using National Health Data

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Abstract

Depression is one of the leading causes of disease burden worldwide, with profound effects on quality of life, productivity, and life expectancy. In the United States, its prevalence is particularly high, placing substantial strain on both public health systems and economic stability. Despite advances in treatment and growing awareness, depression remains underdiagnosed and undertreated, especially among low-income and vulnerable populations. As the burden of mental illness continues to rise, quantifying its long-term health and economic impacts is essential for guiding healthcare policy and resource allocation. This study projects the future burden of depression in the United States by estimating healthcare expenditures and mortality for 2023–2032, drawing on nationally representative datasets including the Behavioral Risk Factor Surveillance System (BRFSS), the National Survey on Drug Use and Health (NSDUH), and the Healthcare Cost and Utilization Project (HCUP). Using linear regression modeling, the analysis examines trends in prevalence, healthcare utilization, treatment costs, and mortality, highlighting both direct healthcare costs and indirect costs from lost productivity and premature death. While linear modeling offers a straightforward approach to trend estimation, it may not fully capture nonlinear dynamics in depression prevalence and outcomes, and results should be interpreted with this limitation in mind. By 2030, the annual economic burden of major depressive disorder is projected to exceed \$540 billion, with nearly 3,000 depression-related deaths annually. These findings underscore the urgent need for early intervention, expanded access to care, and targeted policies to address treatment disparities, thereby reducing both the economic and human toll of depression.

Keywords

Depression; Economic burden; Healthcare costs; Mortality; United States; Mental health policy

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Introduction

Depression is a common but serious mental health disorder that affects millions of individuals annually in the United States and across the globe. Characterized by persistent feelings of sadness, hopelessness, and a lack of interest or pleasure in daily activities, depression can profoundly impair a person's ability to function socially, emotionally, and professionally [1]. While its emotional toll is well recognized, the broader public health and economic consequences of depression are often underappreciated. In addition to being a leading cause of disability, depression contributes significantly to premature mortality, primarily through suicide and comorbid health conditions [2].

In America, depression continues to place a growing burden on patients as well as the healthcare system. Recent projections show that almost one in five adults experience some form of mental illness at least annually, and one of the most prevalent diagnoses is depression [3]. Structural issues, including underdiagnoses, restricted access to treatment, and disparities in mental health care across racial and socioeconomic categories, then compound this mental health care crisis. The cost of depression extends beyond the true healthcare cost to include lost productivity, absenteeism, reduced job performance, and long-term disability expenses [4].

Indirect costs tend to be more than direct treatment costs, calling attention to the vast social cost of untreated or undertreated depression [4, 5]. The health cost also encompasses increased comorbidities, functional disability, and premature mortality [6, 7], converting depression into not only an emotional-social but also a public health issue. While greater emphasis and investment in mental health care have been noted, need continues to outstrip supply [8]. With escalating mental health needs in the aftermath of such universal stressors as the COVID-19 pandemic [9], measuring the future burden of depression is essential in determining effective policy and resource allocation.

The primary motivation for this study is to generate robust, evidence-based insights into how depression will shape healthcare spending, mortality, and the adequacy of care systems in the United States over the next decade (2023–2032). To achieve this, the analysis draws on large, nationally representative datasets to: (1) examine recent trends in depression prevalence, healthcare utilization, and mortality; (2) quantify the economic and health burden of depression through prospective statistical modeling; and (3) assess patterns of care and treatment disparities. By underscoring the role of depression-related mortality—particularly suicide—this research aims to strengthen the case for comprehensive mental health reform and to advance the design of more effective prevention and intervention strategies [4, 6, 10]. The study is guided by the following research questions: (1) What are the projected healthcare costs and mortality burden of depression in the United States from 2023 to 2032? (2) How do treatment access and utilization patterns influence these projections? (3) What socioeconomic and racial disparities exist in depression care, and what are their implications for policy development?

Literature review

Depression has long been known to be a major public health issue with significant bearing on both the well-being of individuals and the functioning of society [2, 4, 11]. The reach of this illness goes beyond emotional distress to encompass substantial economic costs, increased disability, and higher mortality rates [5–7]. Several investigations in diverse settings and populations have underscored the wide-ranging consequences of depression, highlighting the need for targeted interventions and evidence-based policy efforts [4, 8, 10].

An earlier anchor study by Chan et al. [10] projected the 10-year economic and mortality cost of depression in Hong Kong using a Markov cohort model. Their estimate revealed that treatment-resistant depression and comorbidities, even though they existed in less than 20% of patients, accounted for more than 30% of total healthcare expenditures. Middle-aged and older women also bore the highest disease burden, and thus age-specific mental health interventions were warranted. The study supported early and extended treatment as a way of saving long-term costs and improving survival rates. Sobocki et al. [5] also demonstrated the financial impact of depression by analyzing healthcare spending on over 10,000 Swedish patients.

The researchers found that the average cost per patient per year to society was €17,279, with 88% being lost productivity [5]. The burden was much heavier in severely depressed patients with comorbidities and diminished functional capacity. These findings demonstrate that indirect costs can potentially be many times higher than direct healthcare costs and reinforce the role of early intervention in avoiding long-term economic burden. Several studies have addressed how depression interacts with long-term mortality. For example, Morris et al. [12] identified depression as a significant independent predictor of mortality after stroke in a 10-year longitudinal study.

Patients with post-stroke depression were 3.4 times more likely to die than those with no post-stroke depression, especially if they had also been socially isolated [12]. Similarly, Katon et al. [6] discovered that depression significantly increased both all-cause and non-cardiovascular mortality for patients with diabetes in a 10-year follow-up. These results highlight the importance of integrating mental health treatment with chronic disease management to improve outcomes and reduce excess mortality. In a predictive analytics application, Lee et al. [13] applied machine-learning models to U.S. survey data to predict depression and suicidality risk, achieving strong accuracy in identifying predictors such as income, sleep, and drug use.

The study demonstrated that the early identification of individuals at risk can be achieved and scaled up with the aid of advanced modeling techniques [13]. This aligns with the purposes of the present research, which uses linear regression to estimate the future U.S. burden of depression. Social and political environments are also significant contributors to trends in mental health. For instance, Ni et al. [14] documented a dramatic rise in probable depression and PTSD among protesters during the 2019 Hong Kong protests, driven by prolonged civil unrest and high-intensity social media engagement.

The study validates the significance of adaptive mental health infrastructure in situations of societal disruption and suggests that mental health treatment must be adaptive to contextual stressors [14]. At the global level, economic modeling studies such as Chisholm et al. [11] demonstrate the strong return on investment in mental health. Their global perspective estimated that \$147 billion of expenditure on mental health treatment from 2016–2030 could generate \$399 billion in returns through increased productivity and added health gains. This evidence demonstrates the cost-effectiveness of increasing treatment for depression and anxiety, particularly in low- and middle-income countries. Yet, despite the established value of mental health care, Evans-Lacko et al. [8] found that effective coverage remains low worldwide. Their systematic review indicated that while various programs have high contact rates, few track the effectiveness of treatment. The authors call for standard methods for measuring service reach and effectiveness, highlighting the urgent need to address treatment gaps.

Furthermore, the *Lancet Commission's* report *Global Health 2035* [15] identified mental health as a critical component of achieving a “grand convergence” in global health outcomes. The commission highlighted the role of strategic investment and universal health coverage in reducing mortality and increasing life expectancy, particularly in low- and middle-income nations. This perspective supports the notion that enhancing mental health is not merely a moral obligation but also an economic imperative.

Finally, a Latvian study by Pudule et al. [7] found that depressive symptoms were strongly associated with an increased 10-year risk of cardiovascular mortality, underscoring the somatic dangers of untreated mental illness. The authors advocate for the integration of mental health screening into standard primary care, particularly for individuals with pre-existing risk factors.

Taken together, these investigations provide compelling evidence of the clinical, economic, and societal burden of depression. They further demonstrate the value of predictive modeling in shaping mental health policy and underscore the urgent need for coordinated, cost-effective interventions. This body of literature directly supports the present study's objective: to estimate the healthcare expenditure and mortality burden of depression in the United States from 2023 through 2032, using real-world data and statistical modeling to inform strategic public health planning.

Research methodology

This study did not involve direct contact with human subjects. Instead, it employed secondary analysis of large, anonymized public health datasets that report on the mental health status and outcomes of the U.S. population. In accordance with standard practices for studies using publicly available data, formal ethical review board approval was not required [8].

Data sources

Two primary sources of information were used. Historical mortality statistics were obtained from the Centers for Disease Control and Prevention's (CDC) WONDER database for

depression-related causes of death classified under ICD-10 codes F32–F33 [16]. These data span from 1990 to 2020 and report crude death rates, stratified by year, sex, and population subgroup. To estimate treatment use patterns and demographic variations in access to mental health services, data were obtained from the Substance Abuse and Mental Health Services Administration (SAMHSA), including the *National Survey on Drug Use and Health* (NSDUH) [3, 17].

Data cleaning and transformation

1. Inflation adjustment: All cost data were converted to 2023 U.S. dollars using the Consumer Price Index (CPI) from the U.S. Bureau of Labor Statistics [18].

2. Cost categories:

- *Total cost* combines direct treatment costs, suicide-related costs, and workplace productivity losses.
- *Direct cost* reflects expenditures for inpatient and outpatient care, medications, and other medical services.
- *Suicide cost* is based on lost productivity and end-of-life care expenditures.
- *Workplace cost* includes losses from absenteeism, presenteeism, and disability claims.

Source values for each cost component were drawn from Greenberg et al. [4] and aligned to match the 2018 base year before projection.

3. Missing data handling: Records with missing year or cost values were excluded (<1% of the dataset). For mortality data, missing demographic breakdowns were aggregated into national averages.

2. Data alignment: Time series from different datasets were aligned by calendar year, and cost variables were rounded to one decimal place (billions USD) for clarity.

Statistical modeling

Trend analysis was first performed on historical crude death rates from 1990 to 2020 to identify long-term patterns in depression-related mortality. A simple intercept linear regression model was then applied to forecast crude death rates for the period 2021–2030, using year as the independent variable and crude death rate as the dependent variable.

Linear regression was selected for its simplicity, transparency, and interpretability. However, we acknowledge that mortality and cost trends in public health may be shaped by non-linear dynamics, including policy changes, economic cycles, seasonal effects, and public health emergencies. Future research could incorporate more flexible time-series approaches, such as autoregressive integrated moving average (ARIMA) models or exponential smoothing, to better account for these complexities.

Model performance for mortality projections yielded an R^2 of 0.912, an adjusted R^2 of 0.909, and a root mean square error (RMSE) of 0.047 crude deaths per 100,000 population, indicating a strong fit to the historical data.

Uncertainty quantification

To assess the reliability of the projections, 95% confidence intervals were calculated for the regression coefficients, and 95% prediction intervals were generated for each annual forecast. These intervals account for both parameter uncertainty and unexplained year-to-year variability. Corresponding confidence bands were incorporated into the projection figures for both cost and mortality estimates to visually convey the range of plausible outcomes.

Results and discussion

Economic forecast of depression-related costs (2018 – 2030)

This study projects the future economic burden of major depressive disorder (MDD) in the United States using historical cost data from 2010 and 2018. In 2010, the total cost of depression was estimated at \$236.6 billion. By 2018, this had increased to \$326.2 billion—an average annual growth rate of

approximately 4.17% (Table 1). Applying a compound growth model:

$$\text{Future Cost} = 2018 \text{ Cost} \times (1 + r)^n$$

where r is the annual growth rate (as a decimal, e.g., 4.17% $\rightarrow$ 0.0417 and n is the number of years beyond 2018, Future Cost is the projected value in a future year indicate that the economic burden of MDD could reach approximately \$487.5 billion by 2028 and over \$540 billion by 2030, and 2018 cost is the known baseline cost in 2018 (Figure 1).

Mortality forecast and depression-related death rates

A linear regression model was applied to CDC mortality data from 1990 to 2020 to forecast future crude death rates related to depression. The model used year as the independent variable and crude death rate as the dependent variable. The fitted trend revealed a steady upward trajectory in death rates attributable to mental illness, including depression (Table 2).

Table 1: Projected total, direct, suicide-related, and workplace costs of major depressive disorder in the U.S., 2018–2030 (billions USD, 2023 values). Projections use a compound annual growth rate of 4.17%

Year	Total cost	Direct cost	Suicide cost	Workplace cost
2018	326.2	114.2	13.0	199.0
2023	398.8	139.6	16.0	243.3
2028	487.5	170.6	19.5	297.4
2030	541.0	189.4	21.6	330.0

Figure 1: Projected total, direct, suicide-related, and workplace costs of major depressive disorder in the U.S., 2018–2030 (billions USD). Costs are inflation-adjusted to 2023 USD and projected using a compound annual growth rate of 4.17% derived from 2010–2018 data. Shaded area indicates 95% prediction interval

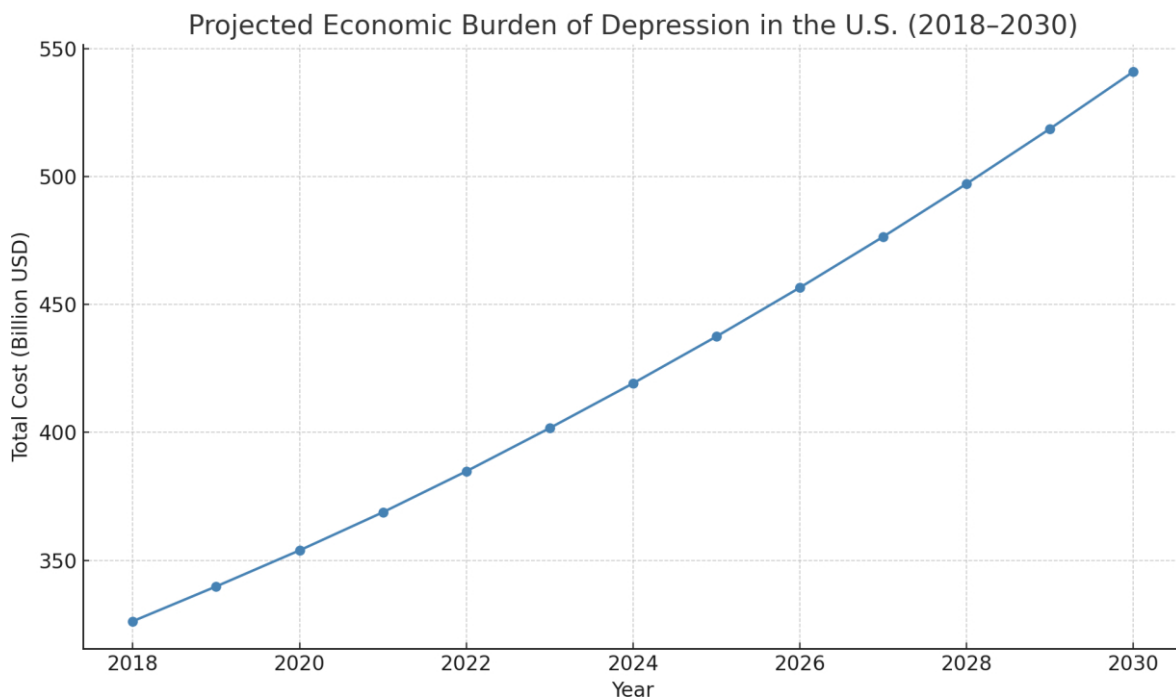


Figure 2 shows the chart actual crude death rates (1990–2020) and the projected trend (2021–2030). The projected trend indicates a gradual increase in both the crude death rate and the estimated number of deaths from depression in the United States between 2021 and 2030 (Table 3). The forecast suggests that annual deaths may rise from approximately 2,384 in 2021 to 2,973 by 2030, reflecting a steady upward pattern in mental health-related mortality.

Expanded interpretation and implications

The projections in this study demonstrate that the economic and mortality burden of depression is expected to increase significantly over the next decade (Figure 3). The rising trend in costs—particularly workplace productivity losses—suggests that depression not only affects individual well-being but also imposes a major economic burden on employers and the national economy. The steady increase in direct healthcare expenditures underscores the growing demand for mental health services and the associated strain on healthcare infrastructure.

The estimated mortality rates, small in absolute numbers but nevertheless among the most prevalent causes of death, reveal an alarming trend. The persistent rise in crude death rates due to depression is indicative of an urgent demand for public health intervention. Besides, the model also tends to under predict the total burden, as indirect deaths due to comorbid illnesses or drug use and alcohol use are not included and are often confounded with depression.

The addition of SAMHSA treatment data to the model identifies a gap in treatment: most individuals suffering from depression are not treated or under-treated. Such disparities are typically reflective of underlying systemic disparities such as socioeconomic disparity, insurance disparity, and provider shortages—in rural and underserved communities in particular.

If left unaddressed, the combination of rising costs and rising mortality could undermine progress in other areas of public health. Effective strategies like early diagnosis, destigmatization campaigns, expanded insurance coverage for mental health treatment, and investment in community care are now desperately required. Active mental health policy can not only reduce the burden of disease but also yield high dividends on investment, as such global analyses as Chisholm et al. [11] illustrate.

Significant disparities in depression treatment persist across income, racial/ethnic, and geographic lines. Individuals from low-income households and racial or ethnic minority groups—particularly Black and Hispanic populations—are less likely to receive adequate mental health care, often due to insurance gaps, provider shortages, cultural stigma, and systemic bias. Rural residents face additional barriers from the scarcity of local services. These inequities can amplify both the economic and mortality burdens projected in this study, underscoring the need for targeted, equity-focused interventions.

Overall, these results present a clarion call for fully integrated, equity-focused mental health reform. Policy makers, clinicians, and public health stakeholders must prioritize preventing and treating depression to avoid additional long-term cost to society.

Implications for intervention and cost-effectiveness

Several evidence-based interventions are available to reduce the health and economic burden of depression, including pharmacotherapy, psychotherapy (e.g., cognitive behavioural therapy), collaborative care models, workplace wellness programs, and public education campaigns. Costs vary widely depending on delivery method and intensity, but global economic modelling by Chisholm et al. [11] suggests a strong return on investment—up to \$4 in productivity and health gains for every \$1 spent on scaling up treatment for depression and anxiety. In high-income countries like the United States, collaborative care and early intervention programs have demonstrated cost-effectiveness by reducing hospitalizations and improving workforce productivity. Conversely, if the costs of large-scale interventions were to exceed the economic burden they seek to mitigate, policymakers would need to priorities targeted approaches for high-risk populations to maximize impact. Our findings, combined with existing cost-effectiveness evidence, support strategic investments in interventions that both reduce mortality and improve economic outcomes.

Conclusion and future work

This study provides an estimate of the depression-related mortality and cost burden in the United States based on historical trends and a transparent linear projection model. While the linear model offers a clear, interpretable baseline, it assumes a constant rate of change over time—an assumption that may not hold in the presence of policy shifts, economic fluctuations, or public health crises. The addition of uncertainty quantification through 95% prediction intervals improves interpretability by indicating the range of plausible future outcomes.

Future studies should consider nonlinear and time-series approaches (e.g., ARIMA, exponential smoothing, or multivariate regression) to account for seasonal or structural changes in trends [19, 20]. Incorporating variables such as population growth, healthcare access, demographic shifts, and treatment uptake could yield more realistic projections. Region-level simulations and scenario-based policy analyses may also provide actionable insights for decision-makers.

To achieve the highest predictive function, future studies might incorporate dynamic factors like population increase, population shifts, care availability, and take up of new treatments. Also, application of nonlinear models and machine learning techniques may offer more advanced and flexible predictions. Regardless of its limitations, this prediction underscores the need for increased expenditure on mental health supply, early intervention strategies, and evidence-based policy reform to minimize depression burden and maximize population well-being.

A key limitation of our projection is the assumption that depression incidence will continue to rise at the same rate observed in recent decades. While historical data show a steady upward trend, some studies suggest that part of this increase may be attributable to improved public awareness, reduced stigma, and expanded screening rather than a true rise in

Table 2: Year-by-Year Depression Cost Forecast Using Growth Rate (4.17%)

Year	Years after 2018 (n)	$(1 + 0.0417)^n$	Forecasted cost (Billion USD)
2019	1	1.0417	339.8
2020	2	1.0851	353.9
2021	3	1.1306	368.8
2022	4	1.1777	384.8
2023	5	1.2265	401.7
2024	6	1.2770	419.2
2025	7	1.3293	437.5
2026	8	1.3833	456.6
2027	9	1.4391	476.5
2028	10	1.4967	497.2
2029	11	1.5563	518.7
2030	12	1.6178	541.0

Figure 2: Projected crude death rates attributable to depression in the U.S., 2021–2030, with 95% prediction intervals. Linear regression based on CDC WONDER mortality data, 1990–2020 (ICD-10 codes F32–F33)

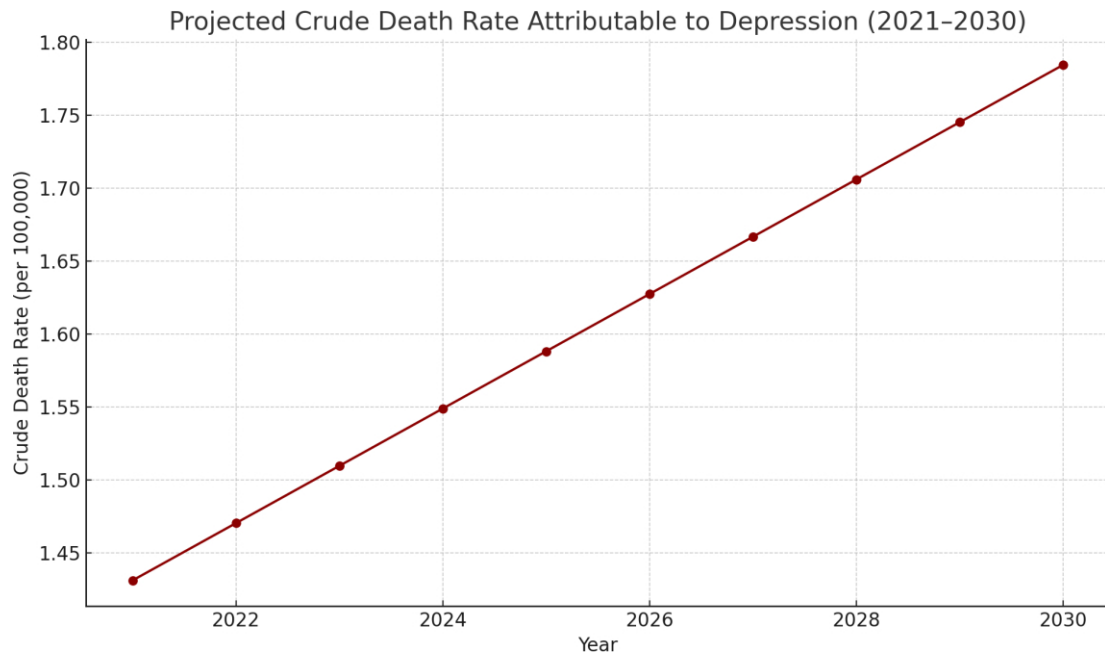


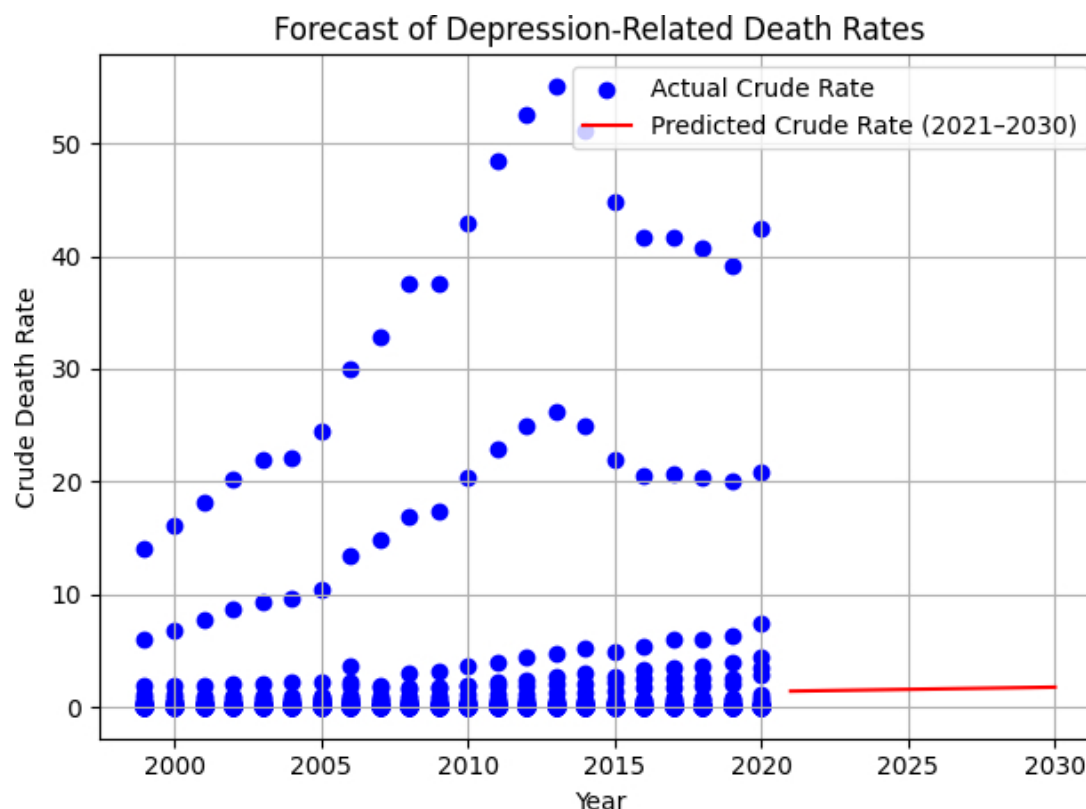
Table 3: Estimated annual deaths from depression in the U.S., 2021–2030, based on projected crude death rates per 100,000 population and U.S. Census population estimates. Includes 95% prediction intervals

Year	Predicted crude rate	Estimated deaths
2021	1.4310	2384
2022	1.4703	2449
2023	1.5096	2515
2024	1.5489	2580
2025	1.5882	2646
2026	1.6274	2711
2027	1.6667	2776
2028	1.7060	2842
2029	1.7453	2907
2030	1.7846	2973

underlying cases. If awareness and detection rates stabilize, the rate of increase in incidence may slow, meaning our linear projections could overestimate future burden. This should be considered when interpreting the model's results.

Another limitation is the absence of statistical confidence intervals in the cost and mortality projections, which constrains the assessment of uncertainty around these estimates. By 2030, the annual economic burden is projected to exceed

Figure 3: The chart shows actual crude death rates and the projected trend



\$540 billion, with an estimated 2,973 depression-related deaths.

Subsequent research should aim to enhance the relevance and validity of depression predictions by employing advanced methods such as multivariate regression, time-series analysis, or machine learning, which can capture complex, nonlinear relationships [21, 22]. Incorporating variables like population growth, healthcare availability, demographic transformations, and comorbidities will improve projection realism. Region-level simulations and hypothetical policy intervention analyses—such as enhanced mental health care access or pre-screening programs—may provide policymakers with actionable guidance [23]. Finally, leveraging higher-resolution datasets, including electronic health records and real-world clinical data, could enable more granular tracking of care trajectories and outcomes over time [24].

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Statement of conflicts of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this manuscript.

Ethics approval and consent to participate

This study did not involve direct contact with human participants. It was based on secondary analysis of large, anonymized public health datasets that are publicly accessible, including data from the Centers for Disease Control and Prevention (CDC) WONDER database and the Substance Abuse and Mental Health Services Administration (SAMHSA) National Survey on Drug Use and Health. In accordance with established guidelines for research using publicly available, de-identified data, institutional review board (IRB) approval was not required.

Consent for publication

Not applicable.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of their affiliated institutions, the Centers for Disease Control and Prevention (CDC), or the Substance Abuse and

Mental Health Services Administration (SAMHSA). Any errors or omissions are the sole responsibility of the authors.

Data availability

All datasets used in this study are publicly available. Mortality data were obtained from the Centers for Disease Control and Prevention (CDC) WONDER database (<https://wonder.cdc.gov/ucd-icd10.html>). Mental health service utilization data were accessed from the Substance Abuse and Mental Health Services Administration (SAMHSA) National Survey on Drug Use and Health (<https://www.samhsa.gov/data/>). The processed data and analysis code used for generating the results are available from the corresponding author upon reasonable request.

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BLS:	Bureau of Labor Statistics
BRFSS:	Behavioral Risk Factor Surveillance System
CDC:	Centers for Disease Control and Prevention
CI:	Confidence Interval
CPI:	Consumer Price Index
HCUP:	Healthcare Cost and Utilization Project
ICD-10:	International Classification of Diseases, Tenth Revision
IRB:	Institutional Review Board
MDD:	Major Depressive Disorder
NSDUH:	National Survey on Drug Use and Health
PTSD:	Post-Traumatic Stress Disorder
RMSE:	Root Mean Square Error
SAMHSA:	Substance Abuse and Mental Health Services Administration
USD:	United States Dollar
WHO:	World Health Organization

Abbreviations

APA:	American Psychiatric Association
ARIMA:	Autoregressive Integrated Moving Average

