McKinsey Health Institute

Technical appendix

Prioritizing Brain Health

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Technical appendix

This appendix outlines the methodology and key assumptions underlying the Prioritizing Brain Health model, which estimates the primary and associated disease burden of mental health conditions and models the potential impact of scaling proven mental health interventions in terms of population-level health improvement and the global economy boost. In this study, mental health conditions are defined as including both mental and substance use disorders. These conditions often co-occur with other noncommunicable diseases (NCDs), exacerbating the overall disease burden. This study is focused on showing the relationship between mental health conditions and NCDs and the advantages of reducing disease burden by expanding access to established interventions.

This analysis represents an "art of the possible" approach, aiming to estimate the potential benefits of expanding access to proven brain health interventions on a global scale. While it provides a high-level perspective on the opportunities and potential impact, it is important to acknowledge that there are inherent limitations in the data and assumptions applied. Further research in this area would be valuable to refine the estimates.

Primary and associated burden of mental health conditions

Primary disease burden of mental health conditions

Data from the Institute for Health Metrics and Evaluation (IHME) Global Burden of Disease (GBD) 2021 data suite was used to estimate the primary disease burden for mental health conditions, which includes both mental and substance use disorders. Specific conditions in the IHME hierarchy that were used as part of this definition are outlined as follows:

- Mental disorders:
  - anxiety disorders
  - attention-deficit/hyperactivity disorder
  - autism spectrum disorders
  - bipolar disorder
  - conduct disorder
  - depressive disorders
  - eating disorders
  - idiopathic developmental intellectual disability
  - other mental disorders
  - schizophrenia
- Substance use disorders:
  - alcohol use disorders
  - amphetamine use disorders
  - cannabis use disorders
  - cocaine use disorders
  - opioid use disorders
  - other drug use disorders

The total primary burden of mental health conditions was calculated based on the sum of the disease burden for each condition outlined above. The model quantified disease burden in terms of disability-adjusted life years (DALYs) using the IHME data set, which incorporates adjustments for comorbidities and excludes overlapping impacts in its calculations. This ensures that the burden is accurately measured without double counting across conditions.

We did not include self-harm and neurological disorders in the article figures and exhibits, but we estimated their disease burden and reduction potential separately using the same methodology as mental and substance use disorders.

Associated burden of mental health conditions

The model considered two types of associated mental health burden:

1. burden from other NCDs where substance use is a risk factor
2. additional risk of developing other NCDs if a person has a prior mental health diagnosis

Associated burden from substance use risks

To estimate the burden associated with substance use risk factors, the model leveraged the IHME GBD data set, which quantifies the disease burden across all diseases attributable to any modifiable risk factor. From this data set, the model extracted the non–mental health NCD burden linked to alcohol or drug use.

The model included only the burden from other NCDs, excluding the burden from mental health conditions, as these are already considered part of the primary burden. It is important to note that there may be a substantial time lag between substance use and the onset of related health issues, and substance use does not necessarily indicate a substance use disorder.

Associated burden from preexisting mental health conditions exacerbating other NCDs
People living with mental health conditions experience a higher prevalence of other NCDs compared to people without a mental health condition diagnosis. Additional burden was estimated following a three-step process:

1. Identify an estimate of the additional relative risk for people with a prior mental health condition diagnosis.
2. Calculate the population attributable fraction (PAF) for that condition pair.
3. Apply the PAF to the disease burden for the relevant non–mental health NCDs (per the IHME GBD projections in the reference forecast scenario).[1]

An evidence review was conducted to identify estimates of additional risk for all mental health and non–mental health NCD condition pairs, looking for studies that measure the additional risk of developing non–mental health NCDs following a prior mental health condition diagnosis compared to the population without a prior mental health condition diagnosis.[2]

To maximize consistency, the model relied on estimates from a recent, large-cohort longitudinal study wherever possible. This study is based on a population-based cohort of 5.9 million people born in Denmark between 1900 and 2015 and followed during the period 2000 to 2016 (83.9 million person-years).[3] Condition pair hazard ratios adjusted for age, sex, calendar time, and previous mental health or substance use disorders (identified as Model B estimates in the study) were extracted for use in this analysis. This source was used for 76 percent of the estimates in the model (267 individual data points). Where condition pairs within the scope of the model were not captured in the Danish study, alternative estimates from peer-reviewed, published studies from Europe, the Americas, and Asia were identified. Where multiple estimates were available, the largest and most recent study was selected for inclusion in the model. In total, 18 alternative studies were used to identify the remaining 24 percent of estimates included in the modeling (86 data points). The model assumed no additional risk where no estimates in the published literature could be found.

Condition categories used in the selected studies were mapped to the condition hierarchy used in the IHME GBD data set, and the PAF was calculated for every condition pair by using the estimate of additional risk from the literature and country-, sex-, and age band–specific prevalence estimates from the same data set. These values were added up to estimate the associated disease burden from mental health conditions on other NCDs.

This approach is outlined in Exhibit 1.

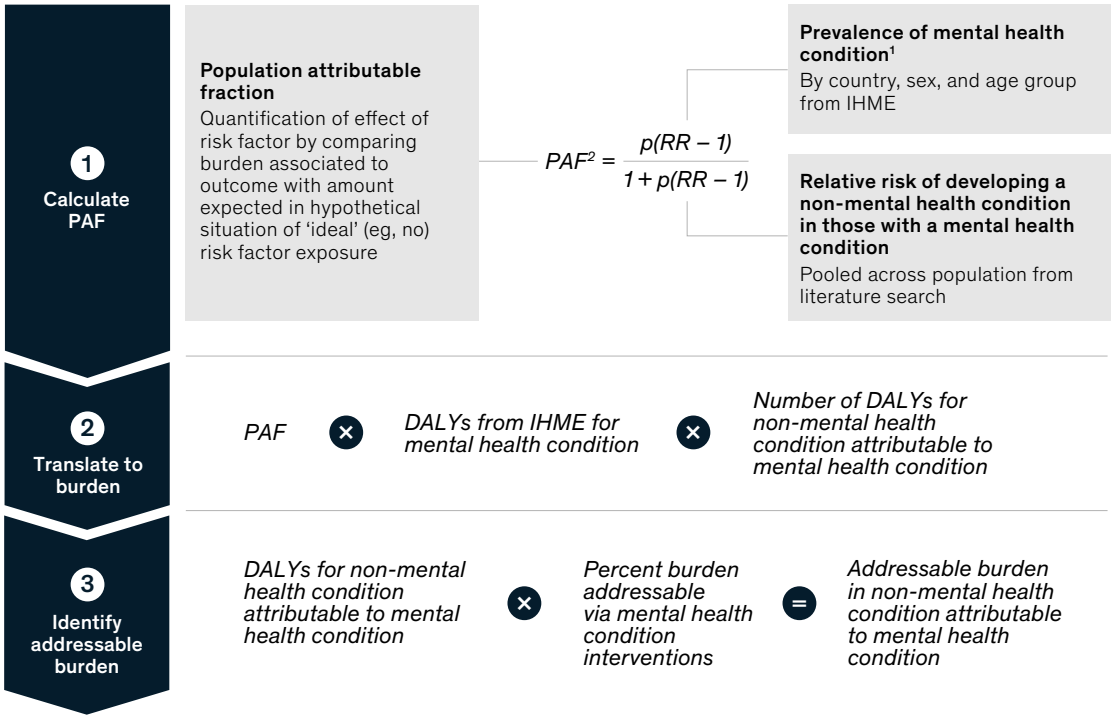
Mental health improvement through scaling interventions

The model estimates the potential to reduce the burden of mental health conditions by improving access to proven, effective interventions. Clinical practice guidelines were appraised to identify the most appropriate interventions to scale and reviewed with clinical experts. For each intervention, recent systematic reviews and meta-analyses were identified. If these were not available, high-quality individual studies were used to extract the best available estimates of effectiveness for disease burden reduction, looking separately at impact on morbidity and mortality. The model considered 100+ condition-intervention pairs using evidence from a comprehensive review of about 100 individual papers, some of which covered more than one intervention or health condition.

[1] Stein Emil Vollset, "Burden of disease scenarios for 204 countries and territories, 2022–2050: A forecasting analysis for the Global Burden of Disease Study 2021," *The Lancet*, May 2024, Volume 403, Number 10440.
[2] Although the underlying biology and causal pathways between mental health conditions and other NCDs are not well understood in many cases, temporal associations have been identified in multiple well-designed studies.
[3] "World Bank country and lending groups," World Bank, accessed April 1, 2025.

Exhibit 1

Methodology to determine burden in non-mental health conditions where comorbid mental health conditions drive disease burden



Note: Burden is calculated in disability-adjusted life years (DALYs).
[1]Includes mental health disorders and substance use disorders.
[2]Synonymous with population attributable risk (PAR).
Source: Fiona J. Charlson et al., "The contribution of major depression to the global burden of ischemic heart disease: A comparative risk assessment," *BMC Medicine*, November 2013, Volume 11, Number 250

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The model used the best available survey data, status reports, and evidence from experts to estimate current adoption levels for each intervention by country income archetype, using World Bank categories of high income, upper-middle income, lower-middle income, and low income.[4] For each intervention type, a ramp-up curve was assigned to consider the implementation time needed to increase access and, where relevant, any gap between intervention delivery and health impact.

The model then calculated the potential disease reduction that could be achieved by increasing adoption of the intervention from the current level to 90 percent (in other words, if 90 percent of eligible patients were able to access the intervention), applying each intervention in sequence.

Sequencing was based on the type of intervention, with behavioral and prevention interventions applied before treatment for established disease and treatment for early disease sequenced before management of later disease. Impact was measured annually until 2050. Exhibit 2 lays out the overall approach.

To illustrate how health improvement is scaled over time for one disease, Exhibit 3 highlights the steps followed in the example of anxiety disorders.

[4] "World Bank country and lending groups," World Bank, accessed April 1, 2025.

Exhibit 2

Approach to calculate health improvement through interventions

	Analytical step	Description
1	**Identify and categorize relevant health interventions**	Review clinical literature to identify scalable, cost-effective interventions, with the highest potential to prevent and treat disease burden.
2	**Determine health intervention efficacy and adoption rates**	Literature review for each intervention in each disease area to identify the effectiveness estimate in relation to mortality and morbidity reduction.
3	**Estimate time to see impact from scaling interventions**	Estimate approx. time required for implementation ramp up and time lag from intervention implementation to see impact on disease burden.
4	**Establish sequence to apply health interventions**	Environmental and behavioral interventions applied first, followed by medical prevention, and then therapeutic interventions.
5	**Calculate disease burden reduction potential by scaling interventions**	Estimate impact of applying health interventions for every disease, country, age group and gender sub-group over time.
6	**Estimate impact on life expectancy and health-adjusted life expectancy**	Estimate impact in health-adjusted life expectancy years using deaths and YLD values estimated as part of earlier steps in the model.
7	**Review outputs with experts**	Inputs/outputs tested and refined following review by relevant experts.

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Calculations of health improvement through interventions relied on seven steps, outlined below.

1. Identify and categorize relevant interventions
Health interventions were categorized into four groups.

- *environmental:* interventions related to policy and regulation (for example, alcohol taxation) and place-based interventions (for example, school-based programs for drug use, needle and syringe programs, or workplace programs for high-risk alcohol use)
- *behavioral:* interventions related to individual behavioral change (for example, support for smoking cessation or weight management through lifestyle change)
- *health promotion and prevention:* including screening and early detection, primary care, and medicines for prevention (for example, antihypertensives or GLP-1s for obesity)
- *therapeutic:* interventions such as specialized care (for example, nonsurgical brain stimulation), medicines for treatment (for example, antidepressants), care management, counseling and talking therapies (for example, peer support programs and psychotherapy), and digital tools and therapies

The objective was to identify high-impact, scalable interventions that could have the most impact on reducing disease burden if scaled more effectively and if access gaps were bridged. It does not represent a complete set of interventions that might be available in a well-resourced and comprehensive health system.

2. Determine health intervention efficacy and adoption rates
Intervention effectiveness. Estimates of intervention effectiveness were extracted from systematic reviews and, if no systematic review was identified, from other clinical literature. Effectiveness was estimated separately for morbidity and mortality. For morbidity reduction, the most appropriate available outcome measure was selected—for example, change in symptom severity.

Exhibit 3

Example of health improvement through interventions: Anxiety disorders

Step	1	2	3	4	5	6
Description	Clinical practice guidelines used to identify core high-impact, scale-able interventions	Effectiveness estimates from systematic reviews	Adoption estimates taken from WHO survey of 21 countries	Time required for implementation (ramp-up)	Order to apply interventions	Disease burden reduction	Other impact estimates

Components	Intervention category	Intervention sub-category	Intervention description	Estimate of effectiveness	Current & additional[1] adoption rates	Timeframe	Sequence	Reduction (2050)	HALE/LE impact
	Therapeutic 	Psychiatric medicines	**Medicines** used in generalized anxiety disorders, eg, SSRIs/SNRIs	**61% reduction** affecting morbidity severity only (YLD disability weight)	HICs: 22% *68%* UMICs: 13% *77%* LMICs: 9% *81%* LICs: 9% *81%*	HICs: 5 years UMICs: 10 years LMICs: 15 years LICs: 15 years	1	24%	Covered separately
	Therapeutic 	Talking therapies and counselling	**Psycho-therapeutic** approaches, eg, CBT and RT	**31% reduction** affecting morbidity severity only (YLD disability weight)	HICs: 22% *68%* UMICs: 13% *77%* LMICs: 9% *81%* LICs: 9% *81%*	HICs: 5 years UMICs: 10 years LMICs: 15 years LICs: 15 years	2	13%	
	Therapeutic 	Talking therapies and counselling	**Digital mental health apps** for anxiety	**15% reduction** affecting morbidity severity only (YLD disability weight)	HICs: 21% *69%* UMICs: 12% *78%* LMICs: 12% *78%* LICs: 5% *85%*	HICs: 5 years UMICs: 10 years LMICs: 15 years LICs: 15 years	3	6%	

7 Inputs and outputs reviewed by internal experts and external expert reviewer

Note: SSRI = selective serotonin reuptake inhibitor; SNRI = serotonin and norepinephrine reuptake inhibitor; CBT = cognitive behavioral therapy; RT = relaxation therapy; HIC/UMIC/LMIC/LIC = high-, upper middle-, lower middle-, and low-income countries.
[1]Calculated by taking the difference between an aspirational adoption rate of 90% minus the current adoption rate.

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Where an intervention was only applicable to a proportion of the disease burden, such as a specific age group, effect estimates were applied only to appropriate groups. For example, a schools-based cannabis prevention program was applied only to the associated burden in age groups from ten to 19 years. Efficacy was assumed to be consistent across country income archetypes. The estimates used in this model were intended as averages across relevant patient populations and may vary for specific subpopulations not considered in the model.

Intervention adoption rates. The model aims to estimate the additional impact of scaling mental health interventions compared with the current state. The intervention adoption assumptions used in the model were based on the difference between current adoption and aspirational target adoption.

Current adoption rates were estimated for each intervention and country income archetype using the best available evidence reviewed by experts in the field. The aspirational target adoption was assumed to be 90 percent in all cases. This is based on the Kennedy Forum's Alignment for Progress Goals for 2033 with a vision to ensure parity in resources, access, quality, and outcomes on mental and substance use disorders, known as the 90-90-90

framework. The framework sets out a target for 90 percent of individuals to be screened for mental health conditions or substance use disorders, 90 percent to receive the evidence-based services and supports they need, and 90 percent of those treated to manage their symptoms and achieve recovery.[5] This does not indicate that all burden is addressed, and it is not the maximum burden a country could aim to address. There are interventions not captured in the model, and there will be innovations over the time frame of this model that are not included.

3. Estimate time to see impact from scaling interventions

Expanding access to interventions takes time. Assumptions around implementation ramp-up times to reach peak (or aspirational target) adoption were built into the model, tailored to different types of intervention and to each of the four country income archetypes. These estimates were based on real-world examples of time to implementation in different health system contexts as well as universal health coverage trends. The analysis used an S-shaped ramp-up curve, reflecting a slower initial adoption rate followed by accelerated adoption over time, to better simulate real-life scenarios. If there was a time lag between accessing an intervention and realizing the health benefit for a specific condition, this was also accounted for through an adjustment to the ramp-up curve. Delays in seeing health benefits from treatment are not typical for mental and substance use disorders but may apply to some of the other NCDs captured in the additional burden. For example, smoking cessation support not only has immediate benefits for some conditions but also reduces the risk of developing other conditions over subsequent decades.

4. Establish a sequence for applying health interventions

For each included disease, the model quantified the impact of one or more relevant interventions, applying an intervention to multiple conditions where appropriate. To more accurately reflect real-world implementation, the impact of interventions was calculated sequentially. The order of these interventions was determined by their type: Environmental and behavioral interventions were applied first, followed by health promotion and preventive measures and then therapeutic interventions. Each subsequent intervention's potential impact was applied only to the remaining disease burden after accounting for the reduction achieved by the previous interventions. The sequencing of interventions within each category was determined in consultation with clinical experts in relevant fields. This sequencing approach was also used to avoid unintentionally double counting potential impacts and does not reflect real-life clinical practice, in which multiple interventions may be deployed simultaneously and treatment order is based on individual circumstances rather than a predefined sequence.

5. Calculate disease burden reduction potential

The model estimated the potential reduction in disease burden for primary and associated mental health conditions through scaling proven health interventions over time. The effects of applying health interventions were calculated at the level of intervention, disease, country, age group (five-year groups), and sex from 2025 to 2050.

Disease burden reduction for primary mental health conditions. To calculate the addressable burden from primary mental health conditions, the model used disease burden data from the IHME GBD data set and estimated the risk-attributable burden where applicable to ensure the attributable burden was mutually exclusive across risk factors.

A baseline data set of disease burden, including risk-associated burden and cause-level burden for all mental and substance use disorders in scope, was generated for the period from 2025 to 2050 by age group (five-year groups), sex, and country. Measures included in the model were years lived with disability (YLDs), years of life lost to premature mortality (YLLs), mean disability weight, incidence, prevalence, and disease-related deaths.

Health interventions and their effects were implemented sequentially over time as outlined in the previous section, beginning with those linked to modifiable risk factors. Subsequently, each further

[5] "Alignment for progress goals for 2033: 90-90-90," Kennedy Forum, accessed April 1, 2025.

intervention was applied to the residual condition-level burden. The interventions were applied to the appropriate age groups when applicable. For instance, school-based programs for alcohol use were implemented only for individuals under age 20. To determine the impact, the disease burden for each relevant population was multiplied by the intervention efficacy rate adjusted for the additional potential adoption rate and the ramp-up factor for the year (and specific to the category of intervention and income archetype of the country).

The potential disease burden reduction was estimated for multiple measures, including incidence, deaths, prevalence, YLDs, YLLs, and DALYs. Reductions in incidence were calculated using the IHME disease burden as the baseline for each year and applying the reduction impact (effectiveness adjusted for additional potential adoption) for preventive interventions as described previously. To estimate the impact on disease-related deaths, the change in death rate was calculated by considering both the reduction in mortality from interventions and the previously calculated reduction in incidence. The model estimated baseline recoveries using IHME prevalence, incidence, and death values, and it assessed the impact of any curative interventions. Baseline mean disability weight was determined using IHME prevalence and YLD values, with the impact estimated based on the potential effect of interventions on morbidity (for example, reduction in frequency, duration, or severity of symptoms). The impact on prevalence was estimated based on the newly calculated incidence, deaths, and recoveries.

Next, the impact on YLDs was calculated based on the estimated impact on prevalence and mean disability weight (morbidity), while the impact on YLLs was derived from the deaths estimated in the previous step. Finally, outputs were extrapolated for diseases not included in the detailed analysis, assuming the same average impact rate for diseases within the level 2 disease category as categorized in the IHME GBD data set. There was only one disease group for which this extrapolation was performed: other mental disorders.

Estimate disease burden reduction for associated mental health condition burden. To estimate the potential reduction in additional disease burden associated with a preexisting mental or substance use disorder (as described in the previous step, "Associated burden from preexisting mental health conditions exacerbating other NCDs"), the model uses a simplifying assumption of a direct relationship between each condition pair. It is implicit in this premise that the condition pair relationship is both linear and causal—that is, that a 10 percent reduction in anxiety disorder disease burden would lead to a 10 percent reduction in any additional associated burden (from non–mental health NCDs). There is insufficient evidence to test this premise, and it is beyond the scope of this work to do so. This could be a valuable area for further research.

6. Estimate impact on life expectancy and health-adjusted life expectancy

To estimate the impact of scaling mental health interventions on life expectancy (LE) and health-adjusted life expectancy (HALE), the model recalculated the underlying life tables using the remaining deaths and YLD per capita derived from the previous steps after scaling mental health interventions. Comparing pre- and postintervention values for LE and HALE resulted in a determination of the increase in LE and HALE that was due to the applied health interventions.[6]

7. Review outputs with experts

All model inputs gathered by the research team and model outputs from the model were reviewed by clinical experts in specific disease areas in mental health and substance use disorders. These experts assessed the basket of interventions identified for each disease, the potential for increased uptake, the order of implementation, and the overall health impact across different country income groups.

[6] Haidong Wang et al., "Global age-sex-specific fertility, mortality, healthy life expectancy (HALE), and population estimates in 204 countries and territories, 1950–2019: A comprehensive demographic analysis for the Global Burden of Disease Study 2019," *The Lancet*, October 2020, Volume 396, Number 10258. Abridged life table definitions by M. Greenwood, "Discussion on the value of life-tables in statistical research," *Journal of the Royal Statistical Society*, June 1922, Volume 85, Number 4; and Chin Long Chiang, *The Life Table and Its Application*, Krieger Publishing Company, 1984.

This process provided additional assurance of appropriate coverage and interpretation of the available literature and allowed for testing of assumptions where evidence was limited. Clinical expert review of model outputs (for example, projected reductions in disease burden) was used to test and refine the findings.

Impact of health improvements on the economy

To quantify the economic impact of reducing the global disease burden through scaling interventions, the model estimated the supply-side benefits of having a larger, healthier, and more productive workforce. Economic improvements resulting from an enhanced workforce were projected from 2025 to 2050, using the outputs that quantify disease burden reduction as estimated in the previous section, assuming all other factors remain constant. The impact on GDP was assessed through five main channels, outlined in Exhibit 4.

These estimates represent the GDP uplift of better health through workforce additions and productivity boosts, meant to illustrate what is at stake if mental health interventions were scaled globally. It does not take into consideration the impact of funding mental health interventions instead of other funding priorities.

Fewer early deaths

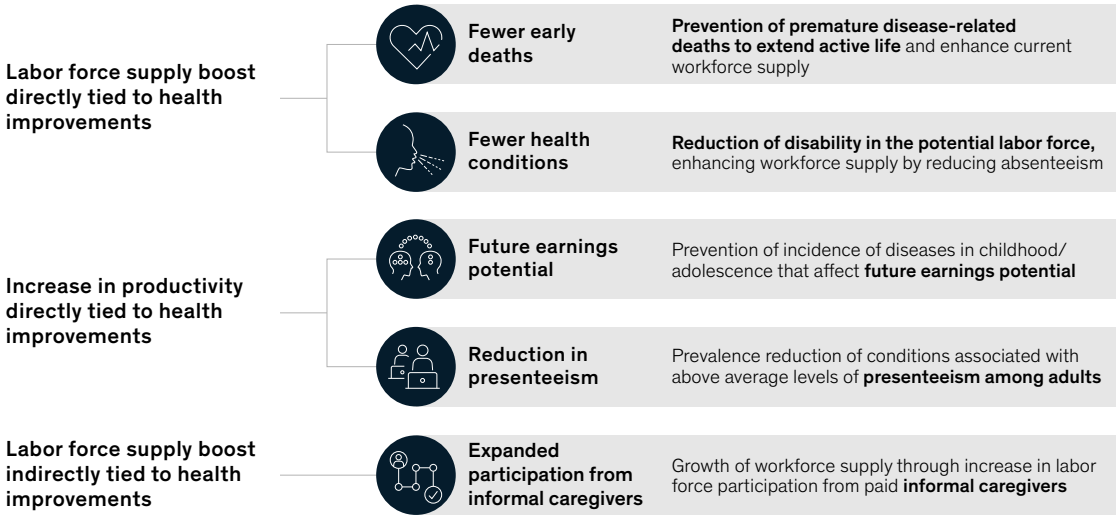
Improved health expands the labor force by preventing premature deaths. Based on the estimated averted deaths over time from the disease reduction portion of the model, it was possible to estimate the potential increase in labor supply. When a premature death is averted by preventing a disease, the model assumed the additional individuals would have the average labor force participation rate of others in their age group, sex, and country in a given year.

Labor force estimates used are from the International Labour Organization, which projects rates by country, sex, and year.[7] The model also considered an adjustment to the labor force participation rate using a factor that reflects the lower likelihood of returning to the workforce after a disease by assigning the probability of return to

[7] International Labour Organization Department of Statistics. Used latest forecasts available per country and calculated the average using a five-year lookback from the latest year available, assuming forecasted rates after that year remain consistent, for modeling purposes.

Exhibit 4

Approach to estimate economic impact from scaling interventions



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work post-therapy as a factor between zero and one.[8] The forecast size of the labor force was also adjusted by the unemployment rate because not everyone who is willing to work will find employment. Last, the total number of people added to each country's labor supply was multiplied by GDP per employed person.[9]

For deaths averted through better treatment or management of chronic health conditions, a wage discount was applied for people in high-income countries who were formerly chronically ill, because the evidence suggests that those conditions are negatively correlated with wages.[10] The authors anticipate similar wage penalties in non-high-income countries but were unable to find literature quantifying their magnitude. As a result, the wage penalties were applied exclusively to high-income countries. If comparable wage penalties were assumed for non-high-income countries, our estimated global GDP impact would decrease by about 3 percent.

Fewer health conditions

Improved health raises labor force participation by reducing absenteeism. The reduction in disability is based on the reduction in YLDs from the disease burden reduction portion of the model. For diseases prevented, labor market participation rates, unemployment, and wage discounts were applied similarly to the case of early deaths averted. For diseases treated, these estimates were adjusted considering a reduced likelihood of reentering the labor force after treatment, again consistent with the approach used for premature deaths averted by treatment of health conditions as described above.

Future earnings potential among children

Certain health conditions experienced during childhood and adolescence can affect future earning potential, primarily because of reduced educational attainment.[11] The model estimated the percentage improvement in annual future earnings by considering the potential increase in productivity.

To calculate the productivity impact and increase in future earnings potential, the process began with estimates of disease reduction in incidence among individuals aged 19 or younger. The model then quantified the number of people whose future productivity would be affected as they join the workforce using country-specific and age-specific participation and employment rates. The size of the benefit was estimated based on studies of enhanced earnings, and this was applied to earnings during the expected years of labor force participation (accounting for a time lag). The benefits were then multiplied by the estimated GDP per employed person, available at the country level and year level.

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[8] Kenneth Sandin et al., "Sick leave and return to work for patients with anxiety and depression: A longitudinal study of trajectories before, during and after work-focused treatment," *BMJ Open*, September 2021, Volume 11, Number 9; Geoffrey R. Waghorn and David C. Chant, "Employment restrictions among persons with ICD-10 anxiety disorders: Characteristics from a population survey," *Journal of Anxiety Disorders*, 2005, Volume 19, Number 6; Päivi Rissanen et al., "Factors associated with returning to work after long term absence due to mental disorders," *Humanities and Social Sciences Communications*, November 2021, Volume 8, Number 263; Barbara Biasi, Michael S. Dahl, and Petra Moser, *Career effects of mental health*, National Bureau of Economic Research (NBER) working paper, number 29031, July 2021; *The Buckland Review of Autism Employment: Report and recommendations*, Department for Work and Pensions (UK), February 28, 2024; "Fact sheet 1: Learning disability and employment," Mencap, September 5, 2023; Michael R. Frone et al., "Workplace supported recovery from substance use disorders: Defining the construct, developing a model, and proposing an agenda for future research," *Occupational Health Science*, December 2022, Volume 6, Number 4; "Workplace supported recovery," Centers for Disease Control and Prevention (CDC), December 21, 2023.

[9] Forecast data on GDP per employed person from Oxford Economics.

[10] Nikki Bond and Conor D'Arcy, *Mind the income gap*, Money and Mental Health Policy Institute, September 2020; Biasi Barbara, Michael S. Dahl, and Petra Moser, *Career effects of mental health*, National Bureau of Economic Research (NBER) working paper, number 29031, July 2021; "Disability pay gaps in the UK: 2014 to 2023," Office for National Statistics, October 17, 2024; *Paying the price: The economic and social impact of eating disorders in Australia*, Butterfly Foundation, November 2012; Jean Oggins, Joseph Guydish, and Kevin Delucchi, "Gender differences in income after substance abuse treatment," *Journal of Substance Abuse Treatment*, 2001, Volume 20, Number 3.

[11] Martin Knapp et al., "Economic outcomes in adulthood and their associations with antisocial conduct, attention deficit and anxiety problems in childhood," *Journal of Mental Health Policy and Economics*, September 2011, Volume 14, Number 3; James Patrick Smith and Gillian C. Smith, "Long-term economic costs of psychological problems during childhood," *Social Science & Medicine*, July 2010, Volume 71, Number 1; Jason M. Fletcher, "The effects of childhood ADHD on adult labor market outcomes," *Health Economics*, February 2014, Volume 23, Number 2; Andreas Jangmo et al., "Attention-deficit/hyperactivity disorder and occupational outcomes: The role of educational attainment, comorbid developmental disorders, and intellectual disability," *PLoS ONE*, March 2021, Volume 16, Number 3; Nasir Rajah, Richard Mattock, and Adam Martin, "How do childhood ADHD symptoms affect labour market outcomes?," *Economics & Human Biology*, January 2023, Volume 48; Jennifer Tabler and Rachel L. Utz, "The influence of adolescent eating disorders or disorder eating behaviors on socioeconomic achievement in early adulthood," *International Journal of Eating Disorders*, September 2015, Volume 48, Number 6.

Health interventions early in life improve lifetime health and earnings potential. The 2050 estimate included in the analysis thus reflects only a portion of the benefits because beneficiaries are young and will continue to be in their prime working years well beyond 2050.

Reduction in presenteeism

Some health conditions are associated with above average levels of presenteeism,[12] defined as unproductive time at work. The effect was estimated by considering the percent reduction in productivity associated with conditions where there is evidence for above-average presenteeism. After reviewing the literature to identify the list of health conditions that affect the productivity of working adults, the model identified the group of individuals that would benefit by taking the prevalence and potential reduction from the disease burden reduction portion of the model. Having assessed the productivity impact of each disease, the model multiplies the affected population by the labor force participation rate for the specific age group, the share of employed people, the assumed productivity increase after averting the specific disease, and GDP per employed person. For example, the authors have assumed a 5 percent productivity boost from avoiding presenteeism associated with depression and anxiety disorders.[13]

Expanded participation from informal caregivers

Healthier populations would result in fewer demands on informal caregivers, who could then choose to enter the formal economy. Informal caregivers are defined as family members, friends, and neighbors who provide long-term care to people who cannot perform daily activities without support.[14] The model considered the share of informal caregivers in the populations of OECD countries and made a simplified assumption that this share could be lowered in proportion to the disease burden that can be averted according to the disease burden reduction portion of the model. The share of informal caregivers was reduced in proportion to the disease burden avertable by country, age group, sex, and year. The model then applied the country's female labor force participation rate for those over age 50, given that women represent 60 percent of daily caregivers on average across OECD countries and given that caregivers aged 50 to 65 are much more likely to be women caring for a parent on a weekly or monthly basis.[15] Due to data limitations, the model only applied these estimates to OECD countries and age groups 50 and above, though we expect the impact could be similar for non-OECD countries.

Cost analysis and economic return calculation methodology

A high-level analysis was conducted to provide an estimate of the incremental expenditure that would be required to deliver the modeled interventions, and to shed light on the feasibility and economic return of scaling mental health interventions. The average net cost to deliver a mental health intervention (adjusted for country income archetype) was identified based on a sample of relevant interventions. This was then multiplied by the modeled estimates of additional uptake to estimate the total investment required across all conditions and interventions included in the model. This cost estimate was compared to the potential GDP impact of scaling mental health interventions as described above to estimate the economic return.

Identify cost data for relevant health interventions

The cost-per-DALY-averted metric was chosen as the most widely available measure of net

[12] Dan Chisholm et al., "Scaling-up treatment of depression and anxiety: A global return on investment analysis," *The Lancet Psychiatry*, May 2016, Volume 3, Number 5; Kiran E. Laxman, Kate S. Lovibond, and Miriam K. Hassan, "Impact of bipolar disorder in employed populations," *The American Journal of Managed Care*, November 2008, Volume 14, Number 11; Manjiri Pawaskar et al., "Comparison of quality of life, productivity, functioning and self-esteem in adults diagnosed with ADHD and with symptomatic ADHD," *Journal of Attention Disorders*, January 2020, Volume 24, Number 1; Toru Nakai et al., "Work productivity, quality of life, and depressive symptoms in undiagnosed adults with and without attention-deficit/hyperactivity disorder (ADHD) symptoms during the COVID-19 pandemic," *Neuropsychiatric Disease and Treatment*, July 2022, Volume 18; Eiji Kirino et al., "Sociodemographics, comorbidities, healthcare utilization and work productivity in Japanese patients with adult ADHD," *PLoS One*, July 2015, Volume 10, Number 7; Alain Joseph et al., "Health-related quality of life and work productivity of adults with ADHD: A U.K. web-based cross-sectional survey," *Journal of Attention Disorders*, December 2019, Volume 23, Number 13.

[13] Dan Chisholm et al., "Scaling-up treatment of depression and anxiety: A global return on investment analysis," *The Lancet Psychiatry*, May 2016, Volume 3, Number 5.

[14] *Health at a Glance 2023: OECD Indicators*, OECD, November 2023.

[15] Eileen Rocard and Ana Llena-Nozal, *Supporting informal carers of older people: Policies to leave no carer behind*, OECD Health working paper, number 140, April 26, 2022.

incremental costs of interventions that can be applied directly to the estimated disease burden averted in DALY units. The net unit cost considers both the costs of delivering the intervention to the target population and the savings in treatment costs that were avoided as a result. A limited number of gold-standard sources of data were identified, including the Tufts Medical Center Cost-Effectiveness Analysis (CEA) Registry[16] and Disease Control Priorities, Third Edition (DCP3).[17] Within these databases, cost-per-DALY-averted estimates were collected for various evidence-based interventions for mental health.

This analysis is limited by the availability of current data on cost-effectiveness. The exact methodology for calculating the cost-per-DALY-averted varies between sources and includes many complex variables that could differ between and within countries, such as price levels of supplies and salary levels of healthcare workers. Additionally, the estimates typically include only operational costs and do not include setup costs, such as training healthcare workers. Therefore, the cost analysis should be interpreted as directionally indicative and not a precise forecast of actual costs for any individual country.

Categorize cost-effective health interventions

The interventions were classified by cost-effectiveness based on WHO-CHOICE (World Health Organization Choosing Interventions That Are Cost-Effective) thresholds where three times GDP per capita was used as a guide to determining the cost-effectiveness of health interventions.[18] A set of cost-effective-intervention cost estimates were then classified by intervention type and condition type to ensure robust coverage. Selected intervention cost estimates were divided between two country income groups: lower income (low-income and lower-middle-income groups) and

[16] "CEA Registry," Tufts Medical Center, accessed April 1, 2025.
[17] D. T. Jamison et al. (eds), *Disease Control Priorities*, 3rd Edition, World Bank, November 24, 2017, Volume 9.
[18] M. Y. Bertram et al., "Cost-effectiveness thresholds: pros and cons," *Value in Health*, December 2016, Volume 19, Number 8.

Exhibit 5

Analysis of average cost per disability-adjusted life year by income and intervention type

	Lower income		Higher income	
Intervention type	**Number of estimates**	**Avg cost per DALY**	**Number of estimates**	**Avg cost per DALY**
Environmental and behavioral				
Place based interventions	1	$360	1	$25,503
Policy and regulation	21	$2,024	14	$258
Individual-level behavior change	2	$53	0	0
Health promotion and prevention				
Screening and early detection	0	0	4	$8,822
Therapeutic				
Counseling and talking therapies	9	$2,307	25	$9,189
Medicines for treatment	43	$14	16	$7,065

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Exhibit 6

Calculation of global average cost per disability-adjusted life year

Income group	Number of estimates	Average cost per DALY	% of baseline disease burden
Lower income	76	$846	42%
Higher income	60	$6,786	59%

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higher income (upper-middle-income and high-income groups) as defined by the World Bank.[19] These broader groupings were chosen because of limitations in the number of studies available.

Exhibit 5 provides additional details on the distribution of interventions by type.

Estimate global cost for scaling health interventions

The weighted average cost per DALY was calculated across the two country income groups based on 2025 share of disease burden to estimate the global weighted average cost per DALY for mental health interventions (Exhibit 6).

The incremental cost for scaling mental health interventions in 2025 was estimated by multiplying the relevant cost-per-DALY estimate by the volume of primary mental health DALYs averted for each country income archetype.

Calculate economic returns from scaling health interventions

To estimate the economic return of scaling access to mental health interventions, the model analyzed the boost to GDP, the investment required, and economic return assuming these interventions had already been scaled over the past 20 to 30 years to reach 90 percent adoption in 2025. This approach was taken to isolate the effects of scaling the interventions from other economic factors such as productivity growth over 2025–50 and are not meant to represent an implementation scenario. The final return ratio was determined by dividing the estimated GDP impact by the calculated investment.

[19] *World Bank Data Blog*, "World Bank country classifications by income level for 2024-2025," blog entry by Eric Metreau, Kathryn Elizabeth Young, and Shwetha Grace Eapen, World Bank, July 1, 2024.

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