Chapter 1: Quantifying the global burden of mental disorders and their economic value

Background: Epidemiological and economic estimates suggest that the global burden of mental disorders is considerable, both in its impacts on human health and losses to societal welfare. The availability of additional data and the emergence of new approaches present an opportunity to examine these estimates, which form a critical part in making the investment case for global mental health.

Methods: This study reviews, develops, and incorporates new estimates and methods in quantifying the global burden of mental illness. Using a composite estimation approach that accounts for premature mortality due to mental disorders and additional sources of morbidity and applying a value of a statistical life approach to economic valuation, we determine global and regional estimates of the economic cost that can be associated with mental disorders, building on data from the 2019 Global Burden of Disease study.

Findings: We estimate that 418 million disability-adjusted life years (DALYs) could be attributable to mental disorders in 2019 (16% of global DALYs)—a more than three-fold increase compared to conventional estimates. The economic value associated with this burden is estimated at about USD 5 trillion. At a regional level, the losses could account for between 4% of gross domestic product in Eastern sub-Saharan Africa and 8% in High-income North America.

Interpretation: The burden of mental illness in terms of both health and economic losses may be much higher than previously assessed.

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Firstbit

Mental health is an essential part of human flourishing. As defined by the World Health Organization (WHO), it encompasses "a state of well-being in which every individual realizes [their] own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to [their] community.[@worldhealthorganizationComprehensiveMentalHealth2013]" For much of the global population, however, attaining this state of mental health is an enduring challenge, with over one billion people worldwide living with a mental or addictive disorder.[@rehmGlobalBurdenDisease2019] Mental disorders are both leading causes of disability and significant risk factors for premature mortality.[@charlsonExcessMortalityMental2015; @rehmGlobalBurdenDisease2019] At all levels of sociodemographic development, this burden of morbidity and mortality is rising.[@patelLancetCommissionGlobal2018] Furthermore, as the COVID-19 pandemic continues, there is growing and alarming evidence of its detrimental psychological and psychiatric effects—for patients, health care workers, and the public overall.[@vindegaardCOVID19PandemicMental2020]

The magnitude of disability caused by mental disorders has galvanized a global movement and a call to action for greater investment and prioritization for mental health.[@patelRenewedAgendaGlobal2011] This movement has emphasized the importance of investing in mental health as a means of promoting sustainable development, human rights, and social inclusion.[@patelLancetCommissionGlobal2018]

A critical link between mental health and development arises from the economic consequences of mental disorders. A growing body of literature suggests that mental disorders are costly, both in the direct medical costs of care, outpatient visits, and hospitalizations, and in indirect costs, such as losses in income and productivity due to disability, which may cause absenteeism and presenteeism.[@trautmannEconomicCostsMental2016] These costs further worsen conditions of poverty[@patelPovertyCommonMental2003]—a vulnerability that, in turn, worsens mental health, feeding a vicious cycle of poverty and illness.[@lundPovertyCommonMental2010] At the national level, mental disorders deplete the supply of labor and capital, resulting in poorer economic output.[@canavanPsychologicalDistressGhana2013] Among households and nations alike, the burden of mental illness thus has considerable economic consequences and poses a challenge to both health and wealth.

Evaluating the economic burden of mental illness is a critical part in making the investment case for global mental health, informing public health decision-making, and guiding priority-setting and the scale up of much-needed interventions.[@chisholmScalingupTreatmentDepression2016] At the global level, however, the most recent estimate of the economic impact of mental disorders was published in 2011, using burden of disease estimates from 2004.[@bloomGlobalEconomicBurden2011] This study used three distinct approaches to quantify the economic burden of non-communicable diseases (NCDs), including mental illnesses.[@bloomGlobalEconomicBurden2011] The first is a cost-of-illness (COI) analysis, which includes the direct costs of illness as well as the indirect costs (e.g., lost productivity). The second is a value of lost output approach, which estimates the effects of illness on gross domestic product (GDP) due to the depletion of labor and capital. The third builds from value of a statistical life (VSL) approaches and attempts to capture a population's willingness to pay to reduce morbidity and mortality associated with illness. This expands on the COI and value of lost output approaches, as it puts an economic value on the loss of health itself.

With a third of disability-adjusted life years (DALYs) due to NCDs arising from mental disorders, this landmark paper estimated that the value of losses due to mental disorders was roughly $1 \cdot 3$ trillion USD in 2010 ($1 \cdot 6$ trillion USD in 2019) when DALYs were valued at one times GDP per capita.[@bloomGlobalEconomicBurden2011] The authors further projected that these losses would grow to nearly $2 \cdot 5$ trillion USD 2010 (or approximately $3 \cdot 0$ trillion USD in 2019) by 2030. (See Supplementary appendix Tables S1 and S2 for estimates from the other two approaches.) These estimates have been widely cited in calls to action concerning global mental health.[@patelLancetCommissionGlobal2018; @thelancetglobalhealthMentalHealthMatters2020]

While the estimates presented from this paper remain staggering and salient, new studies estimating the morbidity and mortality associated with mental illness have since become available.[@gbd2019mentaldisorderscollaboratorsGlobalRegionalNational2022; @vigoEstimatingTrueGlobal2016; @walkerMortalityMentalDisorders2015] These studies suggest that previous (and current) estimates of the global burden of mental disorders may be considerably underestimated, which, in turn, has implications for estimating the true economic burden of mental illness.

The most recent estimates of morbidity and mortality due to mental disorders come from the Global Burden of Disease (GBD) 2019 study.[@vosGlobalBurden3692020a] The GBD study provides disease burden estimates using DALYs, years of life lost (YLLs), and years lived with disability (YLDs), which are then aggregated within a hierarchical grouping scheme that classifies causes of disability and death at different levels of mutually exclusive and completely exhaustive categories. (Mental disorders are a Level 2 condition, nested under NCDs; see Table S3.)

While GBD remains the gold standard for global epidemiologic estimation, the nature of the GBD scheme—in particular, the rationale for grouping certain conditions under mental disorders or not—has been the subject of debate in the literature.[@atunChallengesEstimatingTrue2016; @vigoEstimatingTrueGlobal2016; @whitefordChallengesEstimatingTrue2016] In particular, work by Vigo et al. (2016) published in The Lancet Psychiatry argues for an expanded classification of mental disorders under the GBD classification scheme to account for underestimation of the burden of mental disorders.[@vigoEstimatingTrueGlobal2016] The authors attribute this underestimation to five main causes: 1) the distinction drawn between mental and neurological diseases; 2) the categorization of self-harm and suicide under injuries; 3) the classification of all chronic pain and somatoform disorders under musculoskeletal disorders; 4) the exclusion of personality disorders; and 5) the exclusion of premature mortality due to mental disorders. Using data from the 2013 GBD study, Vigo and colleagues re-allocated the entire burden of dementias, epilepsy, migraine, tension-type headache, and self-harm to mental disorders. In addition, a third of the burden of musculoskeletal disorders without anatomical correlate (i.e., somatoform disorders with prominent pain) was attributed to mental disorders.[@vigoEstimatingTrueGlobal2016] This reallocation attributed 13% of DALYs to mental disorders, a 6 percentage point increase from the GBD estimate of 7%.

In this paper, we attempt to revisit the estimation of the global burden of mental disorders and of its associated economic value. Our aim is to characterize potential underestimation of the burden of mental disorders and to quantify the economic value of this burden under different estimation approaches. Specifically, we expand on Vigo et al.[@vigoEstimatingTrueGlobal2016] by capturing premature mortality due to mental disorders using pooled risk ratios of mortality from a systematic review of mental disorders[@walkerMortalityMentalDisorders2015] to determine the population attributable fraction (PAF) of premature mortality. Inclusion of premature mortality through the PAF presents a novel composite approach that can more broadly capture attributable morbidity and mortality. Using this approach on GBD 2019 estimates, we then apply monetary values to DALYs to reach estimates of the global economic value of the mental burden of disease using a VSL approach. The VSL approach—in contrast to COI and VLO approaches—includes an economic valuation of mortality risk reductions in monetary terms, and thus enables comparison across sectors (beyond the sole health sector) which can motivate decision-making toward ameliorating welfare and societal mental health. Our findings suggest that both the epidemiological and economic burden of mental disorders could be larger than previously estimated, and that underestimation would be larger among regions where premature mortality due to mental disorders is greater.

Methods

To estimate the economic burden of mental disorders, we first estimate the attributable mental burden of DALYs under various estimation approaches using data from the 2019 GBD study (available from the Global Health Data Exchange at https://ghdx.healthdata.org/gbd-2019). Second, we apply a monetary value to a DALY to yield an economic assessment associated with these burden estimates.

Burden of mental disorders

In our analysis, we replicate the approach of Vigo et al. (2016) using GBD 2019 estimates, applying a similar re-allocation formula to YLLs, YLDs, DALYs, and deaths. Our approach, however, differs in some key respects.

First, we agree with Whiteford and colleagues in viewing the assigning of the entire burden of suicide and self-harm to mental disorders as an overestimate, and consequently do not reallocate all DALYs due to suicide towards the mental health burden.[@whitefordChallengesEstimatingTrue2016] While it is empirically clear that mental disorders elevate the risk of death by suicide and that the majority of suicides appear to be due

to mental disorders,[@bertoloteSuicidePsychiatricDiagnosis2002] we view assigning the entirety of this burden to mental disorders as overinclusive, which we avoid to favor a conservative estimation strategy.

Second, we attempt to capture premature mortality attributable to mental disorders, recognizing that persons with mental disorders are at elevated risk of all-cause mortality,[@walkerMortalityMentalDisorders2015] unnatural death,[@crumpMentalDisordersRisk2013] and deaths due to natural causes.[@coltonCongruenciesIncreasedMortality2006] Not capturing this share of mortality is likely to be a prominent cause of underestimating the burden of mental illness, particularly in countries where the dominant share of the DALY burden is mortality (rather than morbidity).

Following Vigo and colleagues, we replicate reallocations in neurological and musculoskeletal conditions, and further include alcohol and mental use disorders, as these were previously classified under mental disorders within the GBD classification.

This provides estimates of YLDs due to mental disorders. We then estimate the PAF of mortality due to mental disorders, using GBD prevalence estimates and relative risk estimates for natural-cause and unnatural-cause mortality generated from a systematic review and meta-analysis by Walker et al.[@walkerMortalityMentalDisorders2015] A comparison of our allocation approach with those of Vigo et al. and the original GBD hierarchical allocation is shown in Table 1.

Our approach to capturing premature mortality relies on a pooled relative risk estimate for mortality by natural and unnatural causes, drawn from 148 studies identified by Walker et al.[@walkerMortalityMentalDisorders2015] These studies collectively reflect over 338,000 deaths across 29 countries and 6 continents. The majority of deaths (67%) recorded in studies with disaggregated data arose from acute and chronic illnesses, while unnatural causes such as injury and suicide represented 18% of deaths (the rest being unallocated). Overall, the pooled risk of all-cause mortality was $2 \cdot 2$ times higher (95% confidence interval (CI): $2 \cdot 1$-$2 \cdot 3$) among people with mental disorders compared to those without. Using this relative risk estimate, Walker and colleagues calculated a PAF to estimate that 8 million deaths were due to mental disorders in 2012.

While Walker and colleagues used a global estimate of the worldwide prevalence of mental disorders in their study to calculate the PAF, we use GBD estimates of prevalence to derive both global- and country-level results. The PAF for a given disorder d and country c is given by:

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PAF_(d,c)=(p_(d,c)\ (RR_d-1))/(1+p_(d,c)\ (RR_d-1)\ )\ \ ,\ \ \ \ \ (1)
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