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Global Burden of Disease and the Impact of Mental and Addictive Disorders

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Abstract

Purpose of Review This contribution reviews the newest empirical evidence regarding the burden of mental and addictive disorders and weighs their importance for global health in the first decades of the twenty-first century.

Recent Findings Mental and addictive disorders affected more than 1 billion people globally in 2016. They caused 7% of all global burden of disease as measured in DALYs and 19% of all years lived with disability. Depression was associated with most DALYs for both sexes, with higher rates in women as all other internalizing disorders, whereas other disorders such as substance use disorders had higher rates in men.

Summary Mental and addictive disorders affect a significant portion of the global population with high burden, in particular in high- and upper-middle-income countries. The relative share of these disorders has increased in the past decades, in part due to stigma and lack of treatment. Future research needs to better analyze the role of mental and addictive disorders in shifts of life expectancy.

Keywords Mental disorders · Substance-use disorders · Global burden of disease · Excess mortality · Deaths of despair · Life expectancy

Introduction

This contribution reviews the newest empirical evidence regarding the burden of mental and addictive disorders. It will present the indicators of fatal and non-fatal burden of such diseases. It will also discuss the importance of mental and addictive disorders in the context of a changing perspective on disease burden in populations as defined by the concept of epidemiologic transition as well as their importance in recent international efforts to set goals for addressing non-communicable diseases, i.e., the Global Monitoring Frameworks for Non-communicable Diseases (NCDs; [1]) and the United Nations Sustainable Development Goals (SDGs; [2]).

Mental and Addictive Disorders at the End of the Epidemiologic Transition

In the 1970s, Omran developed the theory of epidemiological transition [3••], stating that the economic development of

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countries is linked to a shift from communicable (infectious) diseases to NCDs. This shift has taken place over the past half century in most parts of the world, and NCDs now constitute an overwhelming majority of global premature mortality [4, 5], including in low- and middle-income countries [6, 7•]. Another consequence of this transition has been the increase of life expectancy [3••, 8], which has been increasing in most countries over the past decades [9, 10•].

The new realities of increasing relevance of NCDs as a global health issue led to a United Nations high-level meeting on the prevention and control of NCDs, following which the World Health Organization (WHO) member states committed to reducing premature mortality from four NCDs (cancers, cardiovascular and chronic respiratory diseases, and diabetes in people in the 30–69 year age range) by a quarter relative to their 2010 levels by 2025 [11]. While these four NCDs cause the majority of premature deaths [12], there have been some concerns with these goals:

- The restriction to these four specific non-communicable causes of death has led to other disease categories, such as mental and addictive diseases, becoming almost "forgotten diseases" [13]; even though in some regions of the world, current dynamics of life expectancy are determined by these forgotten diseases ([14]; see also below).
- The definition of the indicator as the number of deaths below an arbitrary age threshold was seen as not necessarily the best decision with respect to optimizing public health [15, 16].
- The emphasis on premature mortality seems problematic as it seems to undercut the importance of non-fatal health events now included in all summary health measures [17, 18], and thus the importance of diseases such as mental disorders which are highly disabling but not necessarily fatal [19•].

This has led to a shift in emphasis regarding NCDs in the United Nations' SDGs. In addition to a target of reducing premature mortality from NCDs by one third, relative to their 2015 levels, with the same target indicator as above, there are goals of promoting mental health and well-being by 2030 [19•]. Specifically for mental health, an indicator for reducing suicide mortality has been included [20••]. However, while suicides are strongly linked to mental health conditions such as depression or alcohol-use disorders [21], suicide mortality rates, despite their use as a mortality indicator for mental and addictive disorders, are not the best indicator to capture the full impact of mental health (e.g., [22, 23]; see also below).

Objective of This Paper

As this contribution focuses on the global burden of mental and addictive disorders, we will not use a mortality measures but a summary health indicator as the main measure (for a definition of summary indicators and discussion see [24]): disability-adjusted life years (DALYs). DALYs combine years of life lost due to premature mortality with years of life lost due to disability [17], and thus seem to be better able to capture the main burden of mental and addictive disorders.

We will have two main sections: the larger first section will summarize the latest estimates for global burden of mental and addictive disorders as presented by the Global Burden of Disease and Injury (GBD) study. Most publications on the global level use this data to highlight specific developments. However, we will also highlight the crucial impact of mental and addictive disorders for overall life expectancy in certain historical situations, illustrating this with the current decline of life expectancy in the USA. Finally, we will provide some general conclusions and recommendations.

The Global Burden of Mental and Addictive Disorders 2016

The GBD study updates all burden indicators for all disease categories annually, and this includes mental and addictive disorders (latest update for 2016, see [5, 25, 26]). However, mental and addictive disorders only make up a small part of these publications, and the last update focusing on these disorders was based on the 2010 GBD [27•]. This review is based on the 2016 GBD and compares the impact of mental and addictive disorders since 1990.

Prevalence

Overall, more than one billion people worldwide were affected by mental or addictive disorders in 2016: point prevalence 1,110,075,000 (uncertainty interval 1,060,431,000–1,158,078,000) [28]; making up about 16% of the world's population. These disorders affected women and men to a similar degree: 537,698,000 women (uncertainty interval 545,451,000–598,555,000) and 572,376,000 men (uncertainty interval 513,713,000–562,164,000) suffered. Consequently, the age-adjusted prevalence of mental and addictive disorders was relatively similar as well: men had a 5% higher point estimate with 15,400 vs. 14,700 cases per 100,000 population with highly overlapping uncertainty intervals (see Table 1).

However, the overall prevalence masked marked differences in age-adjusted rates for different categories of diseases. Women had higher rates in all internalizing disorders (for the distinction, see [30]: depressive, bipolar, anxiety, and eating disorders). The age-adjusted prevalence of schizophrenia was almost identical by sex, whereas for all other disorders—including but not limited to externalizing disorders—there was higher prevalence in men (although the uncertainty

Table 1 Prevalence of mental and substance-use disorders 2016 per 100,000

Disorder category*	Women			Men			Both sexes		
	Point estimate	Upper	Lower	Point estimate	Upper	Lower	Point estimate	Upper	Lower
Schizophrenia	283	317	251	282	317	249	282	317	250
Alcohol-use disorders	805	913	705	**1902**	**2107**	**1703**	1358	1510	1212
Drug-use disorders	615	672	566	**1070**	**1159**	**991**	844	914	780
Depressive disorders	*4428*	*4760*	*4122*	2839	3069	2635	3627	3904	3373
Bipolar disorder	*655*	*748*	*572*	534	611	467	594	679	519
Anxiety disorders	*4648*	*4984*	*4316*	2797	3012	2593	3715	3988	3454
Eating disorders	*218*	*262*	*181*	69	85	56	143	172	120
Autistic spectrum disorder	348	400	301	**1312**	**1511**	**1152**	834	957	734
Attention-deficit/hyperactivity disorder	510	560	469	**1178**	**1291**	**1084**	847	928	779
Conduct disorder	458	557	360	**865**	**989**	**740**	663	772	554
Idiopathic developmental intellectual disability	1371	1923	814	1732	2420	1058	1553	2183	940
Other mental and substance-use disorders	1582	1819	1386	**2188**	**2502**	**1911**	1887	2170	1651
Any mental substance-use disorder	14,666	15,333	14,011	15,362	16,065	14,639	15,017	15,666	14,345

*Definitions and ICD codes for the disease categories, see [29]

Italic values mark disease categories, where the point estimate for age-adjusted prevalence in women is higher than the upper uncertainty interval of men; bold values mark disease categories, where the point estimate for age-adjusted prevalence in men is higher than the upper uncertainty interval of women

Source: [28]

intervals were overlapping for idiopathic developmental intellectual disability; see Table 1).

We mainly report age-adjusted rates for indicators, as otherwise for trend analyses, we would mainly interpret changes in population (i.e., global population growth) or changes in population distribution (i.e., the changes associated with the epidemiologic transition described above—see also [31]).

Disability-Adjusted Life Years

Mental and addictive disorders cause considerable burden of disease (all data from [28]). In 2016, globally, 162.5 million DALYs were lost due to these disorders (95% uncertainty interval 121.9–206.5 million), 6.8% of all DALYs lost in that year. About the same burden was caused in women (77.6 million DALYs; 95% uncertainty interval 57.3–99.3 million) than in men (84.9 million DALYs; 95% uncertainty interval 64.7–107.2 million).

Overall, about two thirds of the DALYs from mental and addictive disorders are caused by depressive-, anxiety-, drug use-, and alcohol-use disorders, with overall age-adjusted rates of 598, 375, 276, and 220 per 100,000, respectively. Depressive disorders cause most DALYs for both sexes, followed by anxiety disorders in women, while drug-use disorders and alcohol-use disorders are the second and third highest, respectively, in men.

Table 2 gives an overview of age-standardized DALY rates associated with different disease categories.

Other Indicators for Global Burden of Mental and Addictive Disorders

Mental and addictive disorders have been associated with considerable excess mortality [22, 32], even though most of these disorders do not appear in large numbers in the cause of death statistics. The underlying cause of deaths in GBD or the WHO Global Health Estimates [33] is defined as the disease or injury that initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence that produced the injury [34]. For mental or addictive disorders, these would be injuries such as suicides, or other chronic disorders such as ischemic heart disease or liver cirrhosis (e.g., [17, 35, 36]. The only exceptions are drug and alcohol disorders, which make up over 99% or the total deaths of mental and addictive disorders. However, this is only due to a convention, as these deaths mainly refer to alcohol and illegal drug poisonings (overdoses), which are classified as unintentional injuries in ICD [37], but in GBD and other global burden studies, they are subsumed under addictive disorders ([5]; for ICD codes underlying the various mental and addictive disorders, see [29]).

Cause of death indicators are not reflective of the true impact of mental and addictive disorders, as the overwhelming part of the disease burden (92.6%) as measured in DALYs is non-fatal. Thus, disability indicators such as years lived with disability become a key statistic (YLD; see [38] for important indicators to measure the non-fatal health outcomes associated with mental and addictive disorders). In fact, in 2016, mental and addictive

Table 2 Age-adjusted rates per 100,000 of disability-adjusted life years caused by mental and substance-use disorders 2016

Disorder category	Women			Men			Both sexes		
	Point estimate	Upper	Lower	Point estimate	Upper	Lower	Point estimate	Upper	Lower
Schizophrenia	180	225	133	183	227	134	181	226	133
Alcohol-use disorders	103	133	77	**335**	**406**	**271**	220	270	176
Drug-use disorders	193	238	150	**358**	**431**	**285**	276	334	219
Depressive disorders	*729*	*986*	*508*	469	635	323	598	810	414
Bipolar disorder	133	195	83	110	161	68	121	178	76
Anxiety disorders	*445*	*600*	*310*	271	368	189	357	482	249
Eating disorders	*45*	*65*	*30*	14	21	9	29	42	19
Autistic spectrum disorders	57	80	38	**186**	**260**	**126**	122	172	83
Attention-deficit/hyperactivity disorder	6	10	4	**14**	**23**	**8**	10	16	6
Conduct disorder	55	86	33	**105**	**158**	**65**	80	122	50
Idiopathic developmental intellectual disability	54	92	25	71	121	34	62	107	30
Other mental and substance-use disorders	117	166	80	163	235	112	140	200	95
Any mental or substance-use disorder	2117	2709	1563	2278	2878	1736	2198	2794	1649

*Definitions and ICD codes for the disease categories, see [29]

Italic values mark disease categories where the point estimate for age-adjusted DALY rates in women is higher than the upper uncertainty interval of men; bold values mark disease categories where the point estimate for age-adjusted DALY rates in men is higher than the upper uncertainty interval of women

Source: [28]

disorders comprised the group with the largest disability burden of all larger disease categories, making up 18.7% of all global YLD (own calculations based on GBD 2016 data: [28]).

Regional Distribution and Implications

Figure 1 shows the regional distribution of age-standardized DALY rates in 2016. Clearly, there is an association between economic wealth and level of mental and addictive disorders (Pearson's product-moment correlation coefficient between the per capita gross domestic product at purchasing power parity GDP PPP [39] and age-standardized DALY rates = 0.55; 95% CI, 0.44 to 0.65; $p < 0.001$), with richer countries showing a higher rate of age-standardized DALYs (see also [40]). In addition, income inequality as measured by the GINI Index [41] and age-standardized DALY rates had a correlation coefficient of 0.56; 95% CI, 0.45 to 0.65; $p < 0.001$, with higher inequality being linked to higher rates of DALYs (see also [42]). In low- and middle-income countries, different dimensions of poverty such as low income or unemployment status or housing quality seem to be consistently related to mental and addictive disorders [43].

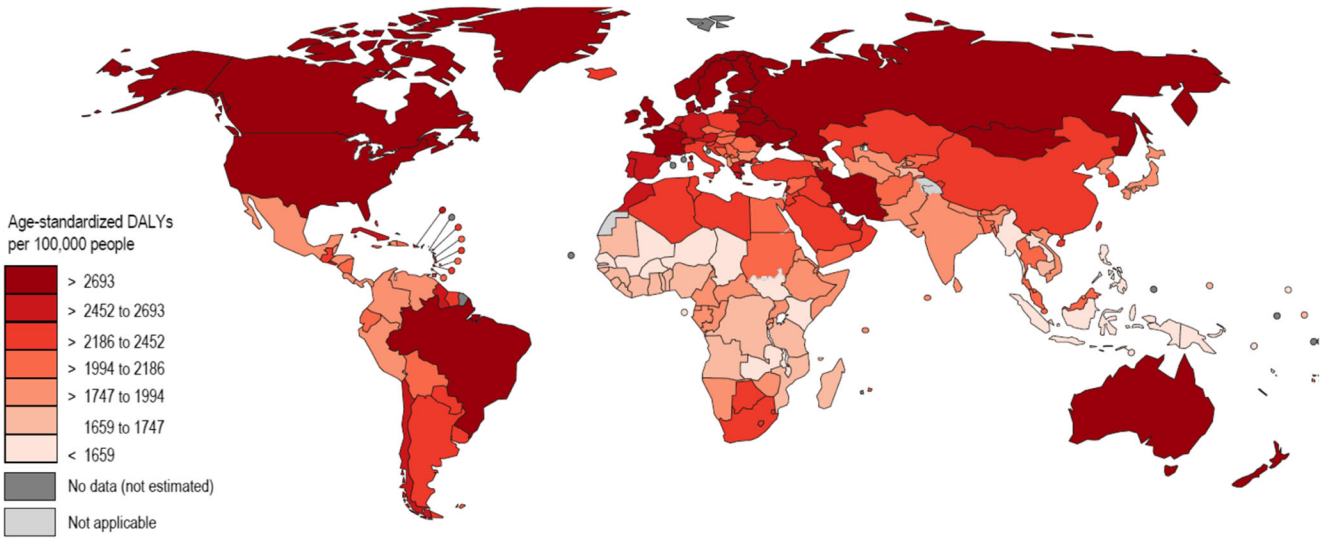

Fig. 1 Age-standardized DALY rates per 100,000 of addictive and mental disorders in 2016. Source: own graphics based on data from [28]

While low-income and lower-middle-income countries seem to have been less affected by mental disorders, two points need to be considered: first, the empirical evidence from these countries is more scarce [40], and it is mostly based on general population surveys in a situation where stigma of such disorders may introduce considerable bias [44•]. Secondly, despite efforts to scale up mental health interventions in low- and middle-income countries [45], treatment and prevention interventions for mental and addictive disorders are still lacking, so that the impact of existing disorders is more devastating in these regions [46•, 47].

Time Trends

Whereas age-standardized rates of DALYs and deaths of all diseases have been continuously decreasing between 1990 and 2016 (by 30.4% and 16.3%, respectively), the same rates for mental and addictive disorders increased by 4.3% and 12.0%, respectively [28]. The increases were not continuous: for DALYs, there were increases until 2005 in mental and addictive disorders, driven by increases in age-standardized prevalence, and then the trend leveled off. Interestingly, the trends in prevalence and DALYs until 2005 were the same for both sexes; after 2005, for women, prevalence and DALYs for mental and addictive disorders further increased, whereas they decreased for men. Death rates for mental and addictive disorders increased mainly between 1990 and 1995, and have been more or less stable since then.

The USA Serves as an Example Where Mental and Addictive Disorders Determine Trends in Life Expectancy

The association between income inequalities and mental and addictive disorders has already been mentioned. This association seems to increase if income inequality worsens, as in the USA, over the past decades [48], where the mortality gap between the rich and the poor has widened markedly (e.g., [49•, 50, 51]). Among the newly relegated lower socio-economic strata, so called "deaths of despair" (i.e., deaths linked to mental and addictive disorders such as suicides, overdose deaths and poisonings, and liver cirrhosis) played a key role in this development in the USA [49•, 52].

It has been pointed out that all of these causes of deaths were related to mental, and especially addictive, disorders, suicides to depression and substance use [21], overdose deaths and poisonings to opioid, and other illegal drug-use disorders, in addition to alcohol-use disorders [53] and liver cirrhosis due to alcohol and other drug-use disorders ([54, 55]; for analyses of the US trends in life expectancy, see [14, 52, 56]).

More generally, increases in mental and addictive disorders may be an important indicator, when life expectancies tend to shift in high-income countries (e.g., [56, 57, 58•]), often in relation to increases in income inequalities and increases in poverty. In that sense, the USA may serve as an important example in showing how increasing inequalities are associated with the life expectancy of a nation via an increase in burden of mental and addictive disorders.

Conclusions

While mental and addictive disorders comprised "only" 7% of all burden of disease as measured in DALYs, they affected more than 1 billion people globally and were responsible for 19% of all years lived with disability in 2016. In the twenty-first century, where health goals have shifted to increasing disability-free years of life rather than only to increasing life expectancy [59], mental and addictive disorders become more important. The increasing importance is corroborated by the fact that the relative weight of burden from these disorders has been increasing over the past decades.

Moreover, although mental and addictive disorders are not listed as underlying causes of death on death certificates, they are associated with marked excess mortality, from injuries and other chronic diseases [22]. Thus, their impact on global health tends to be underestimated.

Two points deserve special emphasis for the future: health systems need to better respond to the burden of mental and addictive disorders, in particular in low- and middle-income countries [46•, 47]. This concerns not only the treatment gap in part due to stigma but also other interventions needed for the people affected [60], and research is needed to best tailor such interventions in a cost-effective and culturally acceptable manner. Finally, there are some indications that rising inequality is associated with the marked increases of mental and addictive disorders in high-income countries. Further research is needed here to understand these dynamics and to prepare public health responses.

Compliance with Ethical Standards

Conflict of Interest Jürgen Rehm and Kevin D. Shield declare no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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