



Review article

Mortality landscape in the Global Burden of Diseases, Injuries and Risk Factors Study

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ABSTRACT

The Global Burden of Diseases, Injuries and Risk Factors Study 2010 (GBD 2010) is an initiative that involved 486 scientists from 302 institutions in 50 countries, under the leadership of a consortium formed by the Institute for Health Metrics and Evaluation of the University of Washington, World Health Organization, the University of Queensland School of Population Health, the Harvard School of Public Health, the Johns Hopkins Bloomberg School of Public Health, the University of Tokyo and Imperial College London. The study has provided a state of the art understanding of the burden of 67 risk factors and their clusters, 291 diseases and injuries on global, regional and national levels in period from 1990 to 2010 for 187 countries. GBD 2010 estimates covered both mortality (expressed in number of deaths, years of life lost (YLL) due to premature mortality) and morbidity (mainly expressed as years lived with disability (YLD)), while the incidence and prevalence were not reported for majority of causes so far, although they were accounted and used for YLD calculations. Finally, each disease and risk factor was presented in terms of the disability-adjusted years of life (DALY) that is merely a sum of YLL and YLD. The major published results of GBD 2010 cover global and regional levels for all diseases and risk factors. Reports focused on specific conditions are also available. At country-level detailed estimates are published for UK, China and USA, and data on other countries are accessible only as aggregate partial representation via web-based tools.

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1. Introduction

The Global Burden of Diseases, Injuries and Risk Factors Study 2010 (GBD 2010) is an outstanding initiative that involved 486 scientists from 302 institutions in 50 countries, under the leadership of a consortium formed by the Institute for Health Metrics and Evaluation of the University of Washington, World Health Organization, the University of Queensland School of Population Health, the Harvard School of Public Health, the Johns Hopkins Bloomberg School of Public Health, the University of Tokyo and Imperial College London [1]. The study has provided a state of the art understanding of the burden of 67 risk factors and their clusters, 291 diseases and injuries on global, regional and national levels in period from 1990 to 2010 for 187 countries. GBD 2010 estimates covered both mortality (expressed in number of deaths, years of life lost (YLL) due to premature mortality and their rates per 100,000 persons) and morbidity (mainly expressed as years lived with disability (YLD)), while the incidence and prevalence were not reported for majority of causes so far, although they were accounted and used for YLD calculations. Finally, each disease and risk factor was presented in

terms of the disability-adjusted years of life (DALY) that is merely a sum of YLL and YLD. The major published results of GBD 2010 cover global and regional levels for all diseases and risk factors [2–8]. Reports focused on specific conditions are also available [9–16]. At country level detailed estimates are published for UK [17], China [18] and USA [19], and data on other countries are accessible only as aggregate partial representation via web-based tools [20]. It was announced that in the fall of 2013 comprehensive estimates for all diseases and risk factors both on country, regional and global levels will be put in the public domain [20].

2. Global mortality due to diseases and injuries

Mortality estimates in GBD 2010 have been developed based on a wide range of published and unpublished data of vital registration, verbal autopsy, mortality surveillance, and other sources [3]. These tremendous amounts of data were analyzed according to uniform approaches for communicable, maternal, neonatal and nutritional disorders (CMNND), non-communicable diseases (NCD) and injuries. Accounting all causes in one model aimed to prevent overestimation of mortality from separate diseases and represented the great advantage of GBD 2010 over other analyses that concentrated only on single cause of death.

The estimated worldwide number of deaths in the year 2010 was 52.8 million, most of which caused by NCD (35.5 mln deaths, 65.5% of total deaths number), followed by CMNND deaths (13.2 mln, 24.9%)

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Table 1

Top 30 causes of global deaths for all ages and both sexes combined, ordered by the number of deaths in 2010.

Modified from Lozano et al. [3].

Causes	Number of deaths in 2010	% of total deaths in 2010	% of change in number of deaths, 1990 to 2010	Age-adjusted death rates, per 100,000 population in 2010	% of change in age-adjusted death rates, 1990 to 2010
Ischaemic heart disease	7,029,300	13.3	34.9	105.7	–19.5
Cerebrovascular disease	5,874,200	11.1	26.0	88.4	–24.6
Chronic obstructive pulmonary disease	2,899,900	5.5	–6.4	43.8	–43.3
Lower respiratory infections	2,814,400	5.3	–17.6	41.0	–34.1
Trachea, bronchus, and lung cancers	1,527,100	2.9	47.4	23.4	–8.3
HIV/AIDS	1,465,400	2.8	390.4	21.4	258.4
Diarrhoeal diseases	1,445,800	2.7	–41.9	20.9	–49.0
Road injury	1,328,500	2.5	46.3	19.5	6.2
Diabetes mellitus	1,281,300	2.4	92.7	19.5	19.7
Tuberculosis	1,196,000	2.3	–18.7	18.0	–46.0
Malaria	1,169,500	2.2	19.9	16.7	0.5
Cirrhosis of the liver	1,030,800	2.0	32.5	15.6	–15.8
Self-harm	883,700	1.7	31.9	13.1	–9.6
Hypertensive heart disease	873,200	1.7	47.8	13.1	–11.5
Preterm birth complications	859,700	1.6	–28.6	11.9	–28.0
Stomach cancer	754,900	1.4	–2.5	11.5	–39.5
Liver cancer	752,100	1.4	62.4	11.5	2.3
Chronic kidney diseases	735,600	1.4	82.3	11.1	15.4
Colon and rectum cancers	714,600	1.4	45.7	10.8	–10.9
Other cardiovascular and circulatory diseases	685,900	1.3	45.8	10.3	–10.9
Other neoplasms	608,400	1.2	47.4	9.2	0.6
Protein–energy malnutrition	599,800	1.1	–32.1	8.7	–43.7
Falls	540,500	1.0	55.0	8.0	2.0
Sepsis and other infectious disorders of the newborn baby	513,700	1.0	–3.9	7.1	–3.1
Neonatal encephalopathy	511,400	1.0	–19.9	7.1	–19.2
Congenital anomalies	510,400	1.0	–23.0	7.2	–28.3
Alzheimer's disease and other dementias	485,700	0.9	244.0	7.1	95.4
Other neurological disorders	481,100	0.9	89.3	7.2	25.9
Interpersonal violence	456,300	0.9	34.7	6.6	–1.0
Breast cancer	438,700	0.8	37.5	6.6	–15.3

and injuries (5.1 mln, 9.6%). These data emphasise the continuing epidemiological transition in the global mortality towards non-communicable diseases (that accounted to 57.1% of all deaths in 1990). Globally age- and sex-specific death rates are decreasing in comparison with 1990 (by 52.7% for CMNND, 32.1% for NCD and 16.3% for injuries), highlighting important achievements in prevention and treatment for many diseases. But due to world population growth and aging, the absolute number of deaths increased from 46.5 mln in 1990 to 52.8 mln in 2010, challenging health and social security systems in all countries. The growth in number of deaths for the past 20 years was as high as 30.0% for NCD and 24.0% for injuries, while it declined by 17.0% for CMNND. Despite the striking evidence of the relevance of NCD epidemic in all regions of the world, there is a substantial disproportion in resource allocation both on global level and inside some countries. In 2010 a total of \$28.2 billion were invested for development assistance for health, with the health sector support aimed for general strengthening of local health services amounted to only to \$1.5 billion and for NCD to only \$185 million (5.3% and 0.8% from the development assistance for health, respectively) [21]. Moreover, from the 20 countries with the highest all-cause DALYs only 12 are included in the top 20 recipients of development assistance for health, and globally the total expenditures on health sector support and NCD decreased respectively by 2.5% and 5.1% in 2010 [21].

The global landscape of mortality causes has changed substantially from 1990 to 2010 by several dimensions of disease burden (Table 1). Allocation of resource in public health to fight specific disorders should be based on several considerations, not only on the formal rank in the top list because the latter doesn't reflect well the true burden. Both number of deaths and proportion of deaths in the total mortality structure indicate the relatively small differences between disorders that could be ranked as 5 or 10 leading cause of deaths (the same is true for the comparison of 20 and 25 top ranked causes). These differences loose significance especially keeping in mind the 95% uncertainty

interval in estimated number of deaths and imperfection of vital statistic systems in many countries [3,22]. It should be taken into account that changes in mortality rates were extremely non-uniform for different causes (Table 1), some of them being dramatically increased thus bringing intense pressure on health and economic systems, and suggesting even more prominent impact on global mortality in the nearest future. Number of deaths in comparison with 1990 are more than doubled not only for HIV/AIDS (accounting for 1.4 mln deaths in 2010), Alzheimer's disease and other dementias (485,700 deaths) that already accounted among top 30 mortality causes, but also for atrial fibrillation and flutter (114,700 deaths), Parkinson's disease (111,100 deaths), adverse effects of medical treatment (83,700 deaths), illicit drug use (77,600 deaths) and peripheral vascular disease (49,800 deaths). For the past 20 years the number of deaths for diabetes mellitus and chronic kidney diseases (that are already in the top 20 mortality causes) increased by 70–95% (accounting in 2010 for almost 1.3 million and 735,600 deaths respectively). Also other causes of death such as other urinary diseases (267,100 deaths), kidney and other urinary organ cancers (162,100 deaths), interstitial lung disease and pulmonary sarcoidosis (115,100 deaths) showed an increasing trend over the two decades. During the studied period the age-adjusted death rates (Table 1) declined for many diseases while it substantially increased for several disorders, indicating the lack of control by current prevention and treatment strategies irrespective of population aging. These diseases need special attention from the health policy makers all over the world in order to stop the impending threat that they pose.

Global mortality patterns expressed in YLL differ reasonably, given more emphasis for disorders with deaths occurred in the younger age. Therefore the YLL based top ten global mortality causes accounted (in descending order) for ischemic heart disease, lower respiratory infections, cerebrovascular disease, diarrhoeal diseases, malaria, HIV/AIDS, preterm birth complications, road injury, chronic obstructive pulmonary disease, and neonatal encephalopathy [3].

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