Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010

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Summary

Background Non-fatal health outcomes from diseases and injuries are a crucial consideration in the promotion and monitoring of individual and population health. The Global Burden of Disease (GBD) studies done in 1990 and 2000 have been the only studies to quantify non-fatal health outcomes across an exhaustive set of disorders at the global and regional level. Neither effort quantified uncertainty in prevalence or years lived with disability (YLDs).

Methods Of the 291 diseases and injuries in the GBD cause list, 289 cause disability. For 1160 sequelae of the 289 diseases and injuries, we undertook a systematic analysis of prevalence, incidence, remission, duration, and excess mortality. Sources included published studies, case notification, population-based cancer registries, other disease registries, antenatal clinic serosurveillance, hospital discharge data, ambulatory care data, household surveys, other surveys, and cohort studies. For most sequelae, we used a Bayesian meta-regression method, DisMod-MR,

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For interactive versions of figures 2, 4, 5, and 6 see http://healthmetricsandevaluation.org/gbd/visualizations/regional

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designed to address key limitations in descriptive epidemiological data, including missing data, inconsistency, and large methodological variation between data sources. For some disorders, we used natural history models, geospatial models, back-calculation models (models calculating incidence from population mortality rates and case fatality), or registration completeness models (models adjusting for incomplete registration with health-system access and other covariates). Disability weights for 220 unique health states were used to capture the severity of health loss. YLDs by cause at age, sex, country, and year levels were adjusted for comorbidity with simulation methods. We included uncertainty estimates at all stages of the analysis.

Findings **Global prevalence for all ages combined in 2010 across the 1160 sequelae ranged from fewer than one case per 1 million people to 350 000 cases per 1 million people. Prevalence and severity of health loss were weakly correlated (correlation coefficient –0·37). In 2010, there were 777 million YLDs from all causes, up from 583 million in 1990. The main contributors to global YLDs were mental and behavioural disorders, musculoskeletal disorders, and diabetes or endocrine diseases. The leading specific causes of YLDs were much the same in 2010 as they were in 1990: low back pain, major depressive disorder, iron-deficiency anaemia, neck pain, chronic obstructive pulmonary disease, anxiety disorders, migraine, diabetes, and falls. Age-specific prevalence of YLDs increased with age in all regions and has decreased slightly from 1990 to 2010. Regional patterns of the leading causes of YLDs were more similar compared with years of life lost due to premature mortality. Neglected tropical diseases, HIV/AIDS, tuberculosis, malaria, and anaemia were important causes of YLDs in sub-Saharan Africa.**

Interpretation **Rates of YLDs per 100 000 people have remained largely constant over time but rise steadily with age. Population growth and ageing have increased YLD numbers and crude rates over the past two decades. Prevalences of the most common causes of YLDs, such as mental and behavioural disorders and musculoskeletal disorders, have not decreased. Health systems will need to address the needs of the rising numbers of individuals with a range of disorders that largely cause disability but not mortality. Quantification of the burden of non-fatal health outcomes will be crucial to understand how well health systems are responding to these challenges. Effective and affordable strategies to deal with this rising burden are an urgent priority for health systems in most parts of the world.**

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Introduction

Non-fatal health outcomes from diseases and injuries are a crucial consideration in the promotion and monitoring of individual and population health. In an era in which the Millennium Development Goals (MDGs) have refocused global health attention on prevention of mortality from selected disorders, it is important to emphasise that health is about more than avoiding death. Individuals, households, and health systems devote enormous resources to the cure, prevention, and amelioration of non-fatal sequelae of diseases and injuries. Some form of periodic accounting about the burden of non-fatal illness in populations, and how it is changing, should therefore be available for policy making and planning. Quantification of the burden of non-fatal health outcomes was one of the main goals in launching the Global Burden of Disease study (GBD) in the 1990s.[1] The study introduced the disability-adjusted life-year (DALY) as a time-based measure of health that enables commensurable measurement of years of life lost due to premature mortality (YLLs) with years of life lived in less than ideal health (years lived with disability [YLDs]). The amalgamation of both components of individual and population health under a comprehensive framework for measuring population health can provide important insights into a broader set of causes of disease burden than can consideration of mortality alone.

To our knowledge, the various revisions of the GBD are the only effort to quantify non-fatal health outcomes across an exhaustive set of disorders at the global and regional level.[2–8] Many national burden of disease studies and subnational studies have analysed local patterns of YLDs as well.[9–16] Publication of the GBD 1990 results raised awareness about a range of disorders that primarily cause ill health and not death, such as unipolar major depression, bipolar disorder, asthma, and osteoarthritis.[17–19] This attention has led to greater policy debate and action on mental health and other non-communicable diseases at WHO,[4,20,21] in non-governmental organisations, and in many countries.[22] The burden of non-fatal illness attributed to some parasitic diseases has also been an important issue highlighted by the GBD findings.[23–26]

Despite the unique role of the GBD in provision of comparative quantification of the burden of non-fatal health outcomes, there have been important limitations. The evidence on MDG-related diseases has been regularly revised and incorporated into updates of the GBD, but many disorders have not been systematically analysed since 1990. *Global Health Statistics*, a companion volume to the original *Global Burden of Disease and Injuries* book, provided estimates of incidence, prevalence, remission, and case fatality for 483 sequelae, by age and sex, for eight regions of the world.[27] The GBD 2000 revisions included 474 sequelae. A substantial number, but not all, of these sequelae were revised since GBD 1990. Those that were

not revised were approximated with constant relations between YLLs and YLDs or YLD rates estimated from the GBD 1990. Even when revisions were undertaken, however, many were not based on systematic analyses of published studies and unpublished sources. The epidemiological inputs to YLD estimates such as prevalence have been released for only 40 sequelae. The most important limitation of both the GBD 1990 and 2000 efforts is that YLDs have not been estimated with uncertainty. Uncertainty can come from many sources, including heterogeneity in the empirical data that are available and uncertainty in the indirect estimation models used to make predictions for populations with little or no data. Because the empirical basis for estimating prevalence or incidence is much weaker for some sequelae than it is for others, uncertainty is likely to vary substantially across sequelae and across countries and regions for the same sequelae.[8,28]

The Global Burden of Diseases, Injuries, and Risk Factors Study 2010 (GBD 2010) provided an important opportunity to address the key limitations of past burden of disease assessments, including a more standardised approach to evidence synthesis, epidemiological estimation with uncertainty, and assessment of comorbidity. In this Article, we describe the approach to undertaking these analyses with the available evidence, and discuss key comparative results. Subsequent disease-specific and injury-specific papers are planned that will provide much more detail on data, methods, and results for various disorders of interest.

Panel: **Terminology used in the Global Burden of Disease study (GBD)**

Disability
Disability refers to any short-term or long-term health loss. Many other definitions of disability are in use such as those in the WHO World Report on Disabilities.[31] These definitions often stress moderate to severe health loss and the role of the environment in the loss of individuals' wellbeing.

Sequelae
In the GBD 2010 cause list there are 291 diseases and injuries, of which 289 cause disability. In total, we have identified 1160 sequelae of these diseases and injuries. For example, diabetic neuropathy is a sequela of diabetes mellitus. To avoid double counting, a sequela can only be counted in the cause list once even if the same outcome might be caused by more than one disease.

Health state
Across the 1160 sequelae, we identified 220 unique health states. For example, both malaria and hookworm have mild anaemia as a sequela. Mild anaemia is a unique health state. The list of unique health states serves two purposes: to allow assessment of the total burden of some health states such as anaemia across various causes, and to simplify the task of measuring disability weights for sequelae.

Disability weights
A quantification of the severity of health loss associated with the 220 unique health states on a scale from 0 to 1, when 0 is commensurate with perfect health and 1 is commensurate with death. In the GBD 2010, disability weights for health states are measured based on survey respondents representing the general public.

Years lived with disability (YLDs)
For the GBD 2010, YLDs per person from a sequela are equal to the prevalence of the sequela multiplied by the disability weight for the health state associated with that sequela. YLDs for a disease or injury are the sum of the YLDs for each sequela associated with the disease or injury.

Impairments
In the GBD 2010 we estimated the prevalence and burden of several unique health states that are sequelae for multiple diseases including anaemia, heart failure, vision loss, seizures, hearing loss, infertility, and intellectual disability. These are referred to as impairments.

Methods

Overview

Details of the GBD 2010 hierarchical cause list, the 21 epidemiological regions (and combinations of these into seven super-regions), the 20 age groups, and the relation between different components of GBD 2010 are published elsewhere.[29] For the GBD 2010, YLDs are computed as the prevalence of a sequela multiplied by the disability weight for that sequela without age weighting or discounting. The YLDs arising from a disease or injury are the sum of the YLDs for each of the sequelae associated with that disease. Across the 291 diseases and injury causes in the study, 289 cause disability—for these causes there were 1160 sequelae that captured the major outcomes of these diseases and injuries.[29,30] The key analytical task for the study was to estimate the prevalence with uncertainty of each of the 1160 sequelae for 20 age groups, both sexes, and 21 regions for 1990, 2005, and 2010. See panel for terminology used in GBD 2010.

For each disease or injury, we identified the key sequelae from that cause. Sequelae could include the disease itself, such as diabetes, or the outcomes associated with that disease such as diabetic foot, neuropathy, or retinopathy. Some clinical disorders were classified as a disease but also can be a consequence of another disease—eg, chronic kidney disease secondary to diabetes is a consequence of diabetes but was classified as a disease. Any given outcome appears in the GBD cause and sequela list only once to avoid double counting of the associated burden. Across the 1160 sequelae, we identified 220 unique health states, representing a parsimonious list providing enough detail to describe the large variations between health states while still a manageable number for which we were able to derive disability weights by survey. In principle, we estimated YLDs at the level of an individual and then assigned individual health loss to all the contributing sequelae present in an individual. The analysis can be divided into seven specific steps (figure 1) which are briefly described below.

Identification and documentation of data sources

The analysis for each sequela began with the identification and documentation of sources of data for incidence, prevalence, remission, duration, and excess mortality. We used nine types of data sources. First, contributors to the GBD have undertaken systematic reviews for disease sequelae. For example, for epilepsy we retrieved:

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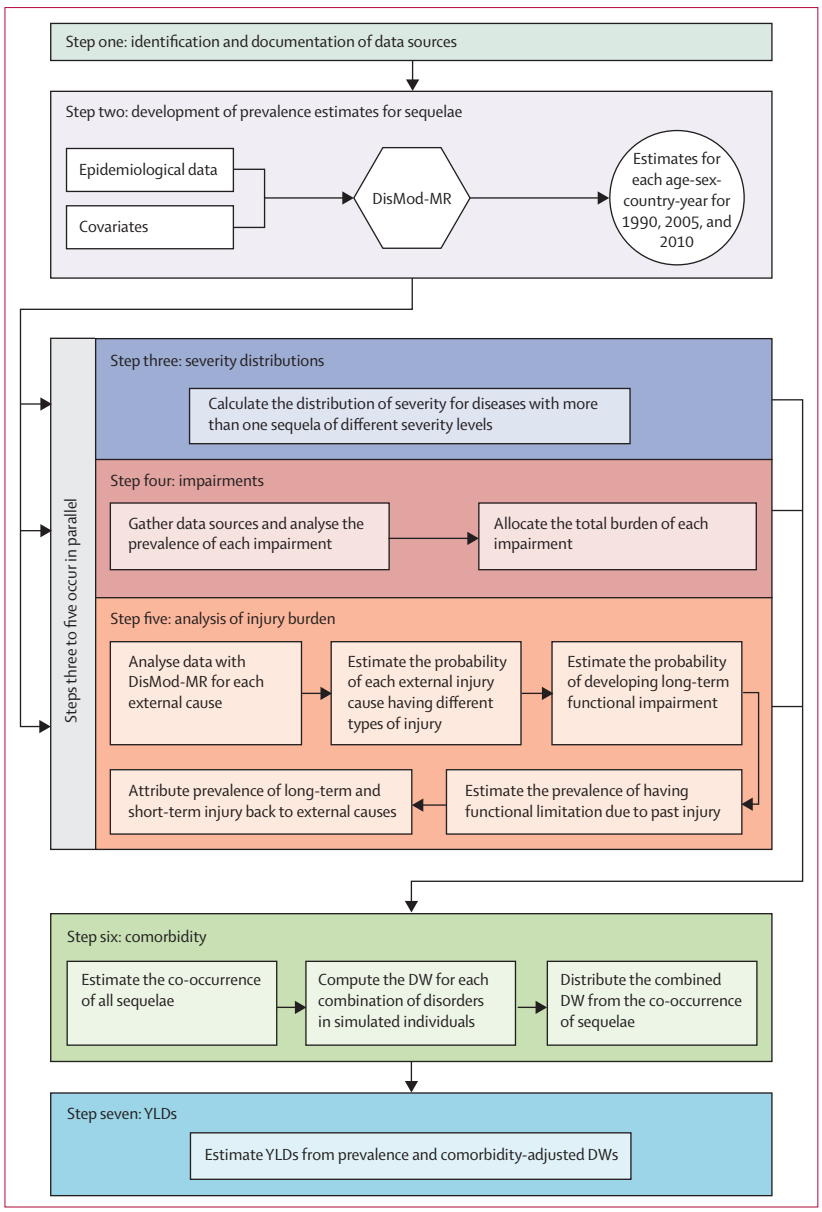

Figure 1: **Overview of the seven steps in the estimation of prevalence and years lived with disability (YLDs)**
DW=disability weight.

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230 prevalence studies from 83 countries in all 21 world regions, a further 97 studies of incidence, 25 studies of the mortality risk in people with epilepsy, and only one study on remission meeting inclusion criteria. For other disease sequelae, only a small fraction of the existing data appear in the published literature, and other sources predominate such as local surveys of schistosomiasis prevalence or antenatal clinic serosurveillance for HIV/AIDS. Second, reports to governments of cases have been used for African trypanosomiasis, measles, pertussis, tuberculosis, leprosy, dengue, cholera, and yellow fever. Use of these data for burden of disease assessment required explicit modelling of the case detection rate for every disease. Third, we used population-based disease registry data for cancers,[32–40] chronic kidney diseases, multiple sclerosis,[41] Parkinson's disease,[42,43] and congenital anomalies.[44] Cancer registries have been established in many developed countries and are being rapidly established in developing countries. For example, by the end of 2010, cancer registries had expanded in China to 149 registries covering 31 provinces;[45] India now has 23 registries.[46] Fourth, many countries, in collaboration with UNAIDS and WHO, have established networks of antenatal clinics that test women presenting for antenatal care for HIV, syphilis, and other disorders. Fifth, for 43 countries, we obtained hospital discharge data coded to ICD9 or ICD10. Use of these data required an explicit model of selection bias to take into account variations in access to care. Additionally, for chronic diseases, we had to estimate the average number of admissions to hospital per person per year with a disease to interpret the results. We analysed datasets with unique identifiers for every patient for seven US states from 2003 to 2007 for cirrhosis and pneumoconiosis. Hospital discharge data were an important source for acute disorders such as stroke, myocardial infarction, appendicitis, or pancreatitis, and for injuries. Sixth, for skin diseases and other mental and behavioural disorders, outpatient data collected in health systems with nearly complete or at least representative samples of ambulatory data[47–55] have also been used after taking into account selection bias. Seventh, we used interview questions, direct measurements (eg, hearing, vision, and lung function testing), serological measurements, and anthropometry from the re-analysis of multiple household surveys. Surveys of selected populations such as school children for intellectual disability,[56] nursing home residents for dementia,[57] or mental health clinic attendees for schizophrenia[58] have also been used after taking into consideration selection bias. Eighth, re-analysis of cohort or follow-up studies has been used for some causes such as impairment due to injury. We also used cohort studies to provide information about remission rates, duration, and mortality risks for many chronic disorders. Finally, we used indirect prevalence studies as an input to estimate the total number of drug users.[59] These estimates were produced from a combination of multiplier, capture-recapture, and back-projection methods combining data from treatment centres, police records, court records, and survey data.

Developing prevalence estimates for sequelae

Meta-analysis or meta-regression of descriptive epidemiological studies[60–63] poses many challenges. First, for many regions and for many sequelae data are scarce. Predictions of prevalence need to take advantage of relations with covariates in a meta-regression or default to the average of a region, super-region, or the world. Second, in settings with multiple measurements, study results can be highly heterogeneous because of much non-sampling error. Sources of non-sampling error include selection bias in the population studied, study design, implementation issues in data collection, widely varying case definitions

across studies, and the use of different diagnostic technologies or laboratory techniques. Third, available studies have often used diverse age groups like 17–38 years or 15 years and above. Fourth, data for various disorders were collected for many different outcomes such as incidence, prevalence, remission, excess mortality, or cause-specific mortality. The mix of data varies across diseases and across regions for a disease. All of these sources provide some relevant information for the estimation of prevalence. Fifth, within regions or countries, the true prevalence of a sequela can vary enormously. Sixth, on the basis of biology or clinical series, there might be strong prior views on the age pattern of incidence or prevalence for a disorder that should be reflected in the results. For instance, we would not expect prevalence of Alzheimer's disease before age 40 years and diagnostic rules stipulate that the onset of attention deficit and hyperactivity disorder cannot occur before age 4 years or after age 8 years.[64]

To address these challenges, we have developed a Bayesian meta-regression method, DisMod-MR, which estimates a generalised negative binomial model for all epidemiological data. The model includes the following: covariates that predict variation in true rates; covariates that predict variation across studies because of measurement bias; super-region, region, and country random intercepts; and age-specific fixed effects. When appropriate, the rates were assumed to have been constant over time, which allowed data for incidence, prevalence, excess mortality, and cause-specific mortality to inform prevalence estimates. The differential equations governing the relation between the parameters of incidence, remission, mortality, prevalence, and duration are well characterised.[65,66] DisMod-MR can use data reported for any age group to inform the maximum likelihood estimate. We used a large set of 179 covariates that have been appropriately imputed so that the data provide a complete time series for all 187 countries in the analysis (see the appendix for details of the estimation equations used for DisMod-MR and the approach to numerical solution, as well as an example of its application).[29]

For cancer incidence and prevalence, we used the approach applied by Forouzanfar and colleagues[67] to breast and cervical cancers. We estimated the mortality-to-incidence ratio for each cancer for all country, age, and sex groups using data from all high-quality registries that reported on both incidence and mortality. We developed separate models for both sexes. Cause of death estimates for each cancer by country, year, age, and sex[68] were divided by the predicted mortality-to-incidence ratio to generate incidence estimates. To estimate the prevalence of each of four sequelae of cancer including: diagnosis or treatment phase, remission, recurrence, and terminal phase, we estimated the natural history of incident cases using a calculated 5 year survival and relative duration of each cancer phase. We also used a variant of this approach to estimate incidence and prevalence for visceral leishmaniasis.

We used four sets of alternative methods for some disorders because of variation in the types of data available and the complexity of their spatial and temporal distributions (see appendix for further details). For HIV/AIDS, we used the UNAIDS natural history model developed with the Spectrum platform.[69,70] Detailed estimates of prevalence and mortality with uncertainty by age and sex have been provided based on the 2012 revision of HIV/AIDS epidemiology. We developed natural history models for measles and pertussis. For ascariasis, trichuriasis, hookworm, and schistosomiasis, prevalence of the disease has been estimated with geospatial estimation methods.[71–73] For diphtheria, tetanus, and rabies, we have used systematic reviews of data for case-fatality rates with estimates of mortality to estimate incidence—the mortality estimates for these diseases are described elsewhere.[68] For these disorders, DisMod-MR was used as a meta-regression method to estimate the case-fatality rate by age, sex, and region. For tuberculosis and dengue, the key source of information was registered cases. We developed statistical models that simultaneously model the expected rates as a function of covariates and the undercount of cases as a function of health system access.

Severity distributions

For 41 diseases, the sequelae of the disease have been linked to more than one health state including stroke, anxiety, major depressive disorder, symptomatic heart failure, and chronic obstructive pulmonary disease (COPD). After analysing the prevalence of the overall disorder, we estimated the distribution of these prevalent cases across severity levels. Disability weights were measured in population surveys[30] for individuals without comorbidity. Two estimates are needed to calculate YLDs: the disability weight for individuals with a single sequela and the disability weight for individuals with multiple sequelae, which is a common occurrence. The prevalence of comorbid disorders can be estimated with micro-simulation. However, we needed to estimate the distribution of severity controlling for comorbidity, otherwise the severity distribution would be systematically biased towards more severe symptoms caused by comorbidity. For example, if individuals with depression are also likely to have anxiety and substance-use disorders, the reported distribution of functional health status would be shifted towards the more severe end.

Data for severity distributions are often scarcer and of poorer quality than are data for prevalence of disorders, with some exceptions.[74,75] Approaches to severity classification are inconsistent across disorders.[76] Because of the heterogeneity of the available evidence for disease severity, we supplemented disease specific reviews with an analysis of three data sources: the US Medical Expenditure Panel Survey (MEPS) 2000–09,[77] the US National Epidemiological Survey on Alcohol and Related Conditions (NESARC) 2000–01 and 2004–05,[78] and the Australian National Survey of Mental Health and Wellbeing of Adults (AHS) 1997.[79]

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These sources allow the assessment of the severity distributions taking into account comorbidity (see appendix for more details of this analysis). For some diseases for which data are available for the distribution of severity by age, sex, and region, we pooled proportions in each health state using DisMod-MR or simple meta-analysis methods.

Impairments

For selected impairments, we have constrained the estimates for sequelae related to that impairment to sum to estimates of the impairment prevalence from independent sources of data. For example, nine disorders have blindness as a sequela. We have analysed all available blindness survey data and we constrain the prevalence of all blindness sequelae to sum to blindness prevalence. We did this impairment prevalence analysis for anaemia, blindness, low vision, hearing impairment, infertility, heart failure, epilepsy, and intellectual disability (appendix).

Analysis of injury burden

The analysis of YLDs from injuries needed careful consideration because injuries are classified in the cause list according to the external cause such as a road injury, animal bite, or drowning, whereas the functional

	Prevalence (both sexes)		Male prevalence		Female prevalence	
	Total (thousands)	Proportion of population (%)	Total (thousands)	Proportion of population (%)	Total (thousands)	Proportion of population (%)
Dental caries of permanent teeth	2 431 636	35·29%	1 194 051	34·37%	1 237 585	36·23%
Tension-type headache	1 431 067	20·77%	655 937	18·88%	775 131	22·69%
Migraine	1 012 944	14·70%	371 072	10·68%	641 873	18·79%
Fungal skin diseases	985 457	14·30%	516 167	14·86%	469 291	13·74%
Other skin and subcutaneous diseases	803 597	11·66%	417 129	12·01%	386 468	11·32%
Chronic periodontitis	743 187	10·79%	378 407	10·89%	364 780	10·68%
Mild hearing loss with perinatal onset due to other hearing loss	724 689	10·52%	386 147	11·11%	338 543	9·91%
Acne vulgaris	646 488	9·38%	311 349	8·96%	335 140	9·81%
Low back pain	632 045	9·17%	334 793	9·64%	297 252	8·70%
Dental caries of baby teeth	621 507	9·02%	352 085	10·13%	269 421	7·89%
Moderate iron-deficiency anaemia	608 915	8·84%	269 596	7·76%	339 319	9·93%
Other musculoskeletal disorders	560 978	8·14%	262 779	7·56%	298 199	8·73%
Near sighted due to other vision loss	459 646	6·67%	235 052	6·77%	224 593	6·58%
Mild iron-deficiency anaemia	375 438	5·45%	152 523	4·39%	222 915	6·53%
Asthma	334 247	4·85%	160 346	4·61%	173 901	5·09%
Neck pain	332 049	4·82%	135 134	3·89%	196 915	5·77%
Chronic obstructive pulmonary disease	328 615	4·77%	168 445	4·85%	160 170	4·69%
Genital prolapse	316 897	4·55%	..	..	316 897	9·28%
Major depressive disorder	298 441	4·33%	111 441	3·21%	187 000	5·48%
Pruritus	280 229	4·07%	117 758	3·39%	162 471	4·76%
Anxiety disorders	272 777	3·96%	95 731	2·76%	177 046	5·18%
Mild anaemia due to hookworm disease	260 254	3·78%	149 572	4·30%	110 681	3·24%
Osteoarthritis of the knee	250 785	3·64%	88 885	2·56%	161 900	4·74%
Schistosomiasis	238 366	3·46%	124 289	3·58%	114 077	3·34%
Eczema	229 761	3·33%	104 259	3·00%	125 502	3·67%
Uncomplicated diabetes mellitus	227 588	3·30%	114 817	3·30%	112 771	3·30%
Uterine fibroids	225 259	3·23%	..	..	225 259	6·60%
Sexually transmitted chlamydial diseases	215 621	3·13%	85 675	2·47%	129 946	3·80%
Benign prostatic hyperplasia	210 142	3·05%	210 142	6·05%	..	..
Premenstrual syndrome	199 072	2·89%	..	..	199 072	5·83%
Moderate hearing loss with perinatal onset due to other hearing loss	189 919	2·76%	103 629	2·98%	86 290	2·53%
Goitre due to iodine deficiency	187 181	2·72%	69 752	2·01%	117 429	3·44%
Lacerations, multiple wounds, other dislocations, and eye injuries due to falls	185 700	2·70%	110 263	3·17%	75 438	2·21%
Upper respiratory infections	183 137	2·66%	92 394	2·66%	90 743	2·66%
Lacerations, multiple wounds, other dislocations, and eye injuries due to road injury	180 683	2·62%	118 964	3·42%	61 719	1·81%

(Continues on next page)

	Prevalence (both sexes)		Male prevalence		Female prevalence	
	Total (thousands)	Proportion of population (%)	Total (thousands)	Proportion of population (%)	Total (thousands)	Proportion of population (%)
(Continued from previous page)						
Edentulism	158 284	2·30%	67 264	1·94%	91 020	2·66%
Trichomoniasis	152 232	2·21%	49 731	1·43%	102 501	3·00%
Chronic urolithiasis	144 346	2·10%	90 446	2·60%	53 901	1·58%
Mild hearing loss due to otitis media	141 600	2·06%	79 359	2·28%	62 241	1·82%
Mild anaemia due to sickle cell disorders	141 419	2·05%	64 343	1·85%	77 075	2·26%
Impetigo	140 495	2·04%	67 464	1·94%	73 031	2·14%
Diabetic neuropathy	131 930	1·91%	63 509	1·83%	68 421	2·00%
Other cardiovascular and circulatory diseases	127 990	1·86%	48 040	1·38%	79 950	2·34%
Molluscum contagiosum	122 601	1·78%	65 841	1·89%	56 760	1·66%
Otitis media (chronic)	117 881	1·71%	55 891	1·61%	61 989	1·81%
Polycystic ovarian syndrome	116 730	1·68%	..	..	116 730	3·42%
Angina due to ischaemic heart disease	111 705	1·62%	59 683	1·72%	52 022	1·52%
Dysthymia	105 520	1·53%	43 863	1·26%	61 657	1·81%
Scabies	100 625	1·46%	51 736	1·49%	48 889	1·43%
Mild anaemia due to thalassaemias	95 731	1·39%	44 362	1·28%	51 370	1·50%

Table 1: **Global prevalence of the 50 most common sequelae**

limitations after injury are determined by the nature of injury such as brain trauma, femur fracture, or spinal cord transection. We did the injuries analysis in five steps, which are briefly outlined here with further details in the appendix. First, we analysed household survey and hospital discharge data using DisMod-MR for each external cause to generate estimates of incidence by age, sex, country, and year. Survey data included recall of injuries warranting admission to hospital as well as injuries that warranted medical attention but not admission to hospital. The meta-regression included a covariate for whether an individual was admitted to hospital or not, which we used to generate predictions both for injury warranting hospital admission and injury warranting outpatient care. Second, we analysed hospital data from 28 countries that had dual coding of discharges by external cause and nature of injury after ICD9 and ICD10, using negative binomial models to estimate the probability of different groups of nature of injury as a function of age, sex, and an indicator variable for developed versus developing countries. Separate models were created for injury warranting hospital admission and injury warranting other health care. Third, for each nature of injury we estimated the probability of individuals developing long-term functional impairment. We re-analysed follow-up data from four studies using data from the Dutch Injury Surveillance system (LIS),[80] the South Carolina Traumatic Brain Injury Follow-up Registry (SCTBIFR),[81] the National Study on Costs and Outcomes of Trauma (NSCOT),[82] and MEPS.[77] Fourth, we used DisMod-MR to estimate the prevalence of individuals in the population who are likely to have functional limitation because of a previous injury. Prevalence was estimated from incidence assuming zero remission and a relative risk of death compared with the general population based on available studies. In the fifth step, the YLDs due to prevalent cases of long-term injury were attributed back to external causes in proportion with the contributions of these causes to every type of injury.

Comorbidity

Comorbidity was taken into account in the calculation of YLDs, which needed three analytical steps (appendix). First, we estimated the co-occurrence of all the sequelae for each age, sex, country, and year. Co-occurrence is a function of the prevalence of each sequela and whether the probabilities of co-occurrence are independent of, or dependent on, each other.[83] We could not identify sufficiently large datasets to estimate these dependent probabilities reliably within age groups. We therefore adopted the simplifying assumption of independence. For each age-sex-country-year, we used a Monte Carlo simulation of 20 000 individuals to estimate the co-occurrence of sequelae. To capture uncertainty in the prevalences of each of the sequelae, for each age-sex-country-year, we ran 1000 different micro-simulations of 20 000 individuals.

Second, we calculated the combined disability weight for the estimated individuals with every combination of disorders. For all combinations of disorders generated in the micro-simulation, the combined disability weight for a simulated individual with two or more disorders is one minus the product of one minus each disability weight. Tests on real data such as MEPS as well as other studies suggest that this multiplicative model was the most appropriate.[84,85] To propagate uncertainty in disability weights into the YLD estimates, each computation was based on a draw from the uncertainty distribution of each disability weight. Third, the combined disability weight

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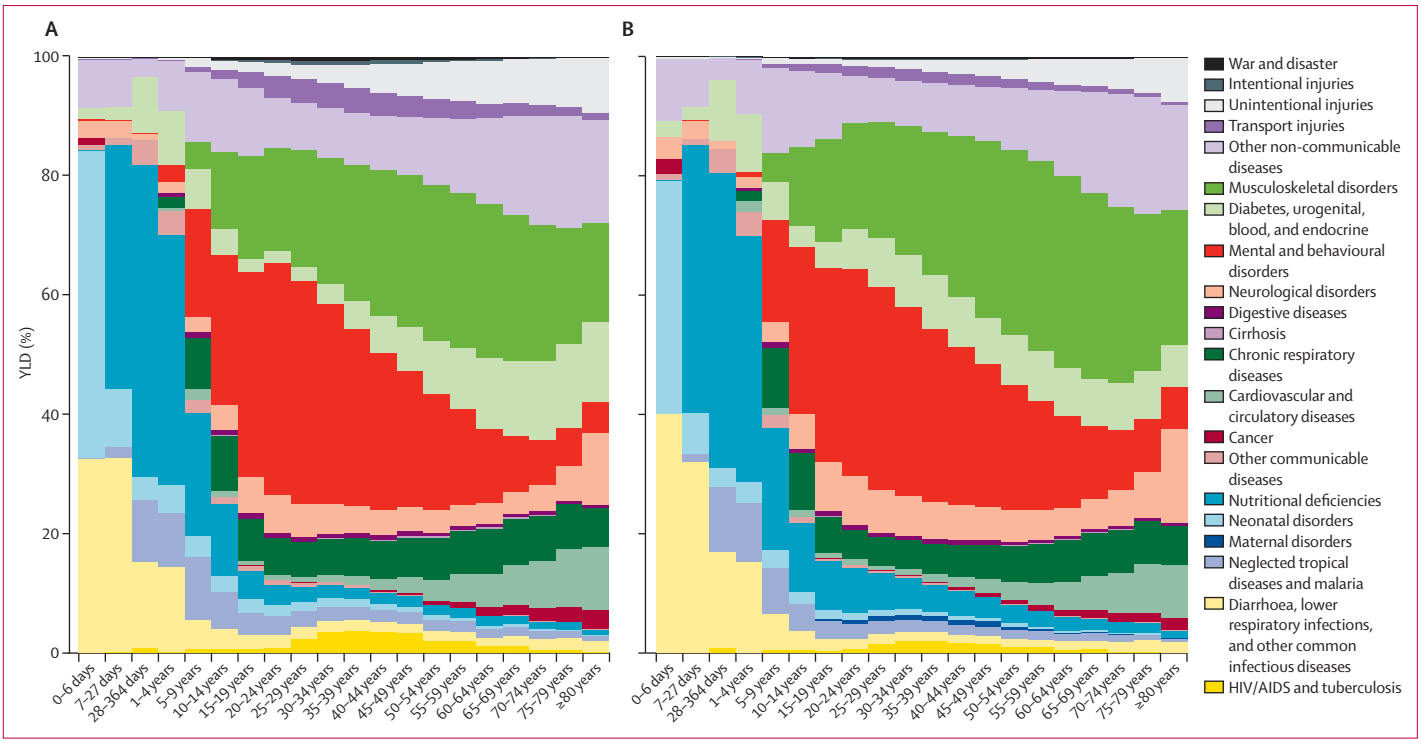

Figure 2: **Percentage of years lived with disability (YLDs) in 2010, by cause and age**
(A) In male individuals. (B) In female individuals. An interactive version of this figure is available online at http://healthmetricsandevaluation.org/gbd/visualizations/regional.

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from the co-occurrence of sequelae was apportioned to each of the contributing sequelae in proportion to the disability weight of a sequela on its own.

We tested the validity of our assumption of independence within an age-sex-country-year using the MEPS data (described above), which includes both individual-level measurement of functional status using SF-12 and ICD-coded diagnoses. We applied the GBD approach assuming multiplicative disability weights and independent disorder probabilities to estimate YLDs and we computed directly from the MEPS data taking into account actual comorbid patterns at the individual level. The correlation coefficient for the two approaches was 0·999.

YLDs from residual categories

There are nine causes on the cause list such as other neglected tropical diseases, other neurological disorders, or other congenital anomalies that are groupings of a large number of often rare disorders. We approximate the YLDs for these disorders using the ratio of YLDs to YLLs for similar or related disorders to then estimate YLDs for these residual categories from YLLs that have been directly estimated.[68]

Ranking lists

For the presentation of leading causes of YLDs, the level at which causes are ranked is subject to debate. We have opted to use the level of disaggregation that seems most relevant for public health decision making. For example, we have chosen to include diarrhoeal diseases, lower respiratory infections, maternal disorders, stroke, liver cancer, cirrhosis, drug use, road injury, exposure to mechanical forces, animal contact, interpersonal violence, and congenital anomalies in the ranking list.

Decomposing changes in YLDs into demographic and epidemiological factors

To help understand the drivers of change in the number of YLDs by cause or region, we have estimated the proportion of the change from 1990 to 2010 due to growth in total population, change in population age-structure and sex-structure, and change in age-specific and sex-specific rates. We computed two counterfactual sets of YLDs. First, a population growth scenario computed as the number of YLDs expected in 2010 if only total population numbers increased to the level of 2010 but the age-sex structure of population stayed the same as in 1990 and age-sex specific rates remained at 1990 levels. Second, a population growth and population ageing scenario computed as the number of YLDs expected in 2010, using 1990 age-specific and sex-specific rates and 2010 age-specific and sex-specific population numbers. The difference between 1990 numbers and the population growth scenario is the change in YLDs due strictly to the growth in total population. The change from the population growth scenario to the population growth and ageing scenario is the number of YLDs due to ageing of the population. The difference between 2010 YLDs and the population growth

	All ages YLDs (thousands)			YLDs (per 100 000)		
	1990	2010	%Δ	1990	2010	%Δ
All causes	**583 393 (484 649–694 406)**	**777 401 (648 158–921 711)**	**33·3%**	**11 004 (9142–13 098)**	**11 283 (9407–13 378)**	**2·5%**
Communicable, maternal, neonatal, and nutritional disorders	**113 925 (85 875–148 463)**	**119 164 (91 399–152 096)**	**4·6%**	**2149 (1620–2800)**	**1730 (1327–2207)**	**–19·5%**
HIV/AIDS and tuberculosis	7681 (5222–10 722)	11 117 (7718–15 187)	44·7%	145 (99–202)	161 (112–220)	11·4%
Tuberculosis	6085 (4020–8737)	6774 (4500–9756)	11·3%	115 (76–165)	98 (65–142)	–14·3%
HIV/AIDS	1596 (1132–2125)	4342 (3142–5629)	172·2%	30 (21–40)	63 (46–82)	109·4%
HIV disease resulting in mycobacterial infection	220 (143–314)	1224 (793–1746)	456·8%	4 (3–6)	18 (12–25)	328·4%
HIV disease resulting in other specified or unspecified diseases	1376 (967–1857)	3119 (2241–4107)	126·7%	26 (18–35)	45 (33–60)	74·4%
HIV pre-AIDS asymptomatic	376 (227–569)	889 (546–1338)	136·8%	7 (4–11)	13 (8–19)	82·2%
HIV pre-AIDS symptomatic	289 (193–411)	531 (350–756)	83·6%	5 (4–8)	8 (5–11)	41·3%
AIDS with antiretroviral treatment	0 (0–0)	389 (251–578)	..	0 (0–0)	6 (4–8)	..
AIDS without antiretroviral treatment	711 (483–958)	1309 (913–1758)	84·2%	13 (9–18)	19 (13–26)	41·7%
Diarrhoea, lower respiratory infections, meningitis, and other common infectious diseases	18 579 (13 419–25 301)	19 921 (14 241–27 439)	7·2%	350 (253–477)	289 (207–398)	–17·5%
Diarrhoeal diseases	7654 (5135–10 855)	8045 (5371–11 366)	5·1%	144 (97–205)	117 (78–165)	–19·1%
Cholera	115 (59–188)	80 (42–134)	–30·1%	2 (1–4)	1 (1–2)	–46·2%
Other salmonella infections	263 (150–410)	341 (202–523)	29·8%	5 (3–8)	5 (3–8)	–0·1%
Shigellosis	703 (391–1111)	744 (440–1147)	5·8%	13 (7–21)	11 (6–17)	–18·6%
Enteropathogenic *E coli* infection	972 (438–1652)	845 (387–1416)	–13·0%	18 (8–31)	12 (6–21)	–33·1%
Enterotoxigenic *E coli* infection	889 (520–1409)	1065 (649–1643)	19·8%	17 (10–27)	15 (9–24)	–7·8%
Campylobacter enteritis	753 (407–1211)	746 (416–1180)	–1·0%	14 (8–23)	11 (6–17)	–23·8%
Campylobacter enteritis	753 (406–1211)	746 (415–1181)	–0·9%	14 (8–23)	11 (6–17)	–23·8%
Guillain-Barré syndrome due to *C enteritis*	1 (0–1)	1 (1–2)	35·7%	<0·5 (0–0·5)	<0·5 (0–0·5)	4·4%
Amoebiasis	142 (84–217)	205 (126–314)	44·1%	3 (2–4)	3 (2–5)	10·9%
Cryptosporidiosis	651 (312–1101)	661 (316–1096)	1·6%	12 (6–21)	10 (5–16)	–21·8%
Rotaviral enteritis	1159 (624–1885)	1269 (701–2006)	9·5%	22 (12–36)	18 (10–29)	–15·8%
Other diarrhoeal diseases	2007 (1027–3412)	2089 (1054–3521)	4·1%	38 (19–64)	30 (15–51)	–19·9%
Typhoid and paratyphoid fevers	134 (25–348)	172 (33–435)	27·8%	3 (0–7)	2 (0–6)	–1·7%
Typhoid and paratyphoid fevers	124 (16–337)	159 (20–423)	27·8%	2 (0–6)	2 (0–6)	–1·6%
Liver abscess and cysts due to typhoid and paratyphoid fevers	10 (7–15)	13 (8–20)	27·4%	<0·5 (0–0·5)	<0·5 (0–0·5)	–1·9%
Lower respiratory infections	2113 (1444–2941)	2331 (1592–3240)	10·3%	40 (27–55)	34 (23–47)	–15·1%
Influenza	510 (344–714)	583 (393–815)	14·2%	10 (6–13)	8 (6–12)	–12·1%
Influenza	510 (343–713)	582 (392–814)	14·2%	10 (6–13)	8 (6–12)	–12·1%
Guillain-Barré syndrome due to influenza	1 (1–2)	2 (1–3)	34·3%	<0·5 (0–0·5)	<0·5 (0–0·5)	3·3%
Pneumococcal pneumonia	298 (203–414)	367 (248–509)	23·2%	6 (4–8)	5 (4–7)	–5·2%
H influenzae type B pneumonia	216 (145–306)	201 (134–286)	–6·6%	4 (3–6)	3 (2–4)	–28·2%
Respiratory syncytial virus pneumonia	52 (31–82)	36 (21–55)	–31·3%	1 (1–2)	1 (0–1)	–47·2%
Other lower respiratory infections	1037 (702–1459)	1144 (779–1589)	10·2%	20 (13–28)	17 (11–23)	–15·2%
Upper respiratory infections	1438 (755–2542)	1728 (911–3050)	20·2%	27 (14–48)	25 (13–44)	–7·5%
Upper respiratory infections	1437 (753–2541)	1727 (910–3048)	20·2%	27 (14–48)	25 (13–44)	–7·5%
Guillain-Barré syndrome due to upper respiratory infections	1 (1–2)	2 (1–3)	33·8%	<0·5 (0–0·5)	<0·5 (0–0·5)	3·0%
Otitis media	3794 (2456–5829)	4436 (2887–6668)	16·9%	72 (46–110)	64 (42–97)	–10·0%
Otitis media	1359 (819–2150)	1613 (979–2594)	18·7%	26 (15–41)	23 (14–38)	–8·7%
Hearing loss due to otitis media	2435 (1423–3929)	2824 (1669–4533)	16·0%	46 (27–74)	41 (24–66)	–10·8%
Meningitis	2757 (1973–3732)	2628 (1857–3643)	–4·7%	52 (37–70)	38 (27–53)	–26·7%
Pneumococcal meningitis	920 (624–1298)	886 (595–1254)	–3·7%	17 (12–24)	13 (9–18)	–25·9%
S pneumoniae meningitis	9 (5–14)	11 (6–17)	19·6%	<0·5 (0–0·5)	<0·5 (0–0·5)	–8·0%
Long term sequelae due to *S pneumoniae* meningitis	571 (324–899)	488 (261–806)	–14·5%	11 (6–17)	7 (4–12)	–34·2%
Seizures due to *S pneumoniae* meningitis	80 (52–118)	79 (55–113)	–0·4%	2 (1–2)	1 (1–2)	–23·4%

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	All ages YLDs (thousands)			YLDs (per 100 000)		
	1990	2010	%Δ	1990	2010	%Δ
(Continued from previous page)						
Hearing loss due to *S pneumoniae* meningitis	261 (154–420)	308 (185–500)	18·2%	5 (3–8)	4 (3–7)	–9·0%
H influenzae type B meningitis	646 (429–933)	371 (247–524)	–42·6%	12 (8–18)	5 (4–8)	–55·8%
H influenzae type B meningitis	10 (6–17)	7 (4–12)	–32·0%	<0·5 (0–0·5)	<0·5 (0–0·5)	–47·7%
Long term sequelae due to *H influenzae* type B meningitis	448 (253–715)	233 (124–368)	–48·1%	8 (5–13)	3 (2–5)	–60·0%
Seizures due to *H influenzae* type B meningitis	65 (38–110)	31 (18–51)	–52·2%	1 (1–2)	<0·5 (0–1)	–63·3%
Hearing loss due to *H influenzae* type B meningitis	123 (74–198)	100 (60–160)	–18·5%	2 (1–4)	1 (1–2)	–37·3%
Meningococcal infection	424 (302–597)	403 (281–566)	–4·8%	8 (6–11)	6 (4–8)	–26·7%
Meningococcal infection	6 (4–10)	7 (4–12)	13·0%	<0·5 (0–0·5)	<0·5 (0–0·5)	–13·0%
Long term sequelae due to meningococcal infection	195 (115–306)	165 (92–269)	–15·2%	4 (2–6)	2 (1–4)	–34·8%
Seizures due to meningococcal infection	35 (23–52)	28 (18–40)	–21·4%	1 (0–1)	<0·5 (0–1)	–39·5%
Hearing loss due to meningococcal infection	187 (110–297)	203 (119–325)	8·6%	4 (2–6)	3 (2–5)	–16·5%
Other meningitis	733 (509–1036)	930 (647–1361)	27·0%	14 (10–20)	14 (9–20)	–2·3%
Other meningitis	37 (24–53)	49 (31–72)	34·4%	1 (0–1)	1 (0–1)	3·4%
Long term sequelae due to other bacterial meningitis infection	283 (157–446)	289 (149–476)	2·2%	5 (3–8)	4 (2–7)	–21·4%
Seizures due to other bacterial meningitis infection	48 (32–71)	46 (31–66)	–4·0%	1 (1–1)	1 (0–1)	–26·1%
Hearing loss due to other bacterial meningitis infection	365 (221–572)	546 (322–883)	49·6%	7 (4–11)	8 (5–13)	15·1%
Encephalitis	183 (120–260)	205 (133–292)	12·6%	3 (2–5)	3 (2–4)	–13·4%
Encephalitis	5 (3–9)	7 (4–12)	35·7%	<0·5 (0–0·5)	<0·5 (0–0·5)	4·4%
Motor cognitive impairments due to encephalitis	177 (117–253)	198 (128–283)	11·9%	3 (2–5)	3 (2–4)	–13·9%
Diphtheria	<0·5 (0–2)	<0·5 (0–1)	–49·1%	<0·5 (0–0·5)	<0·5 (0–0·5)	–60·9%
Whooping cough	181 (103–287)	122 (70–195)	–32·5%	3 (2–5)	2 (1–3)	–48·0%
Tetanus	78 (35–159)	21 (9–43)	–72·3%	1 (1–3)	<0·5 (0–1)	–78·7%
Tetanus	77 (35–158)	21 (9–43)	–72·3%	1 (1–3)	<0·5 (0–1)	–78·7%
Long-term sequelae from neonatal tetanus	1 (0–2)	<0·5 (0–1)	–73·2%	<0·5 (0–0·5)	<0·5 (0–0·5)	–79·4%
Measles	106 (58–180)	31 (17–51)	–70·8%	2 (1–3)	<0·5 (0–1)	–77·5%
Varicella	142 (87–219)	202 (124–308)	42·0%	3 (2–4)	3 (2–4)	9·3%
Chickenpox	7 (2–16)	7 (2–16)	–0·9%	<0·5 (0–0·5)	<0·5 (0–0·5)	–23·8%
Herpes zoster	135 (84–209)	195 (120–295)	44·3%	3 (2–4)	3 (2–4)	11·0%
Neglected tropical diseases and malaria	23 491 (15 715–36 639)	22 219 (15 693–31 544)	–5·4%	443 (296–691)	322 (228–458)	–27·2%
Malaria	2662 (1257–4481)	4070 (1853–6980)	52·9%	50 (24–85)	59 (27–101)	17·7%
Malaria	433 (194–854)	498 (218–933)	14·8%	8 (4–16)	7 (3–14)	–11·6%
Anaemia due to malaria	2127 (833–3972)	3367 (1312–6294)	58·3%	40 (16–75)	49 (19–91)	21·8%
Motor cognitive impairments due to malaria	104 (41–273)	211 (81–556)	102·8%	2 (1–5)	3 (1–8)	56·0%
Chagas disease	324 (108–594)	303 (106–573)	–6·4%	6 (2–11)	4 (2–8)	–28·0%
Acute Chagas disease	31 (7–62)	28 (7–59)	–8·8%	1 (0–1)	<0·5 (0–1)	–29·8%
Chronic heart disease due to Chagas disease	213 (38–429)	195 (36–411)	–8·4%	4 (1–8)	3 (1–6)	–29·5%
Chronic digestive disease due to Chagas disease	73 (8–178)	67 (7–157)	–8·5%	1 (0–3)	1 (0–2)	–29·6%
Heart failure due to Chagas disease	7 (4–10)	13 (8–19)	92·6%	<0·5 (0–0·5)	<0·5 (0–0·5)	48·2%
Leishmaniasis	113 (53–215)	124 (60–235)	10·2%	2 (1–4)	2 (1–3)	–15·2%
Visceral leishmaniasis	8 (2–16)	6 (2–13)	–17·2%	<0·5 (0–0·5)	<0·5 (0–0·5)	–36·3%
Cutaneous leishmaniasis	105 (47–206)	118 (56–229)	12·2%	2 (1–4)	2 (1–3)	–13·7%
African trypanosomiasis	33 (12–86)	8 (2–25)	–75·2%	1 (0–2)	<0·5 (0–0·5)	–80·9%
Schistosomiasis	1797 (923–3413)	2986 (1541–5666)	66·2%	34 (17–64)	43 (22–82)	27·9%
Schistosomiasis	696 (229–1579)	1148 (377–2607)	65·0%	13 (4–30)	17 (5–38)	27·0%
Mild diarrhoea due to schistosomiasis	1 (0–1)	1 (1–2)	77·2%	<0·5 (0–0·5)	<0·5 (0–0·5)	36·3%
Anaemia due to schistosomiasis	433 (219–766)	687 (344–1217)	58·8%	8 (4–14)	10 (5–18)	22·2%
Hepatomegaly due to schistosomiasis	104 (47–200)	185 (84–355)	77·8%	2 (1–4)	3 (1–5)	36·8%
Haematemesis due to schistosomiasis	39 (26–55)	69 (46–97)	76·6%	1 (0–1)	1 (1–1)	35·9%

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	All ages YLDs (thousands)			YLDs (per 100 000)		
	1990	2010	%Δ	1990	2010	%Δ
(Continued from previous page)						
Ascites due to schistosomiasis	31 (21–44)	56 (38–77)	78·9%	1 (0–1)	1 (1–1)	37·7%
Dysuria due to schistosomiasis	174 (80–334)	298 (135–572)	71·0%	3 (2–6)	4 (2–8)	31·5%
Bladder pathology due to schistosomiasis	159 (72–304)	268 (122–515)	68·9%	3 (1–6)	4 (2–7)	30·0%
Hydronephrosis due to schistosomiasis	162 (74–310)	277 (126–533)	71·5%	3 (1–6)	4 (2–8)	32·0%
Cysticercosis	484 (378–600)	457 (357–566)	–5·5%	9 (7–11)	7 (5–8)	–27·3%
Echinococcosis	89 (44–187)	110 (55–228)	23·9%	2 (1–4)	2 (1–3)	–4·7%
Chronic respiratory disease due to echinococcosis	2 (1–6)	3 (1–7)	22·8%	<0·5 (0–0·5)	<0·5 (0–0·5)	–5·5%
Epilepsy due to echinococcosis	13 (6–28)	16 (8–32)	24·1%	<0·5 (0–1)	<0·5 (0–0·5)	–4·5%
Abdominopelvic problems due to echinococcosis	73 (36–155)	91 (43–193)	23·9%	1 (1–3)	1 (1–3)	–4·7%
Lymphatic filariasis	2368 (1551–3399)	2775 (1807–4000)	17·2%	45 (29–64)	40 (26–58)	–9·9%
Lymphoedema	955 (585–1454)	1151 (698–1773)	20·5%	18 (11–27)	17 (10–26)	–7·3%
Hydrocele due to lymphatic filariasis	1414 (842–2103)	1624 (981–2450)	14·9%	27 (16–40)	24 (14–36)	–11·6%
Onchocerciasis	512 (361–687)	494 (360–656)	–3·5%	10 (7–13)	7 (5–10)	–25·7%
Skin disease due to onchocerciasis	407 (277–559)	352 (240–486)	–13·3%	8 (5–11)	5 (3–7)	–33·3%
Vision loss due to onchocerciasis	105 (79–134)	142 (108–185)	34·5%	2 (1–3)	2 (2–3)	3·5%
Trachoma	144 (104–189)	334 (243–438)	132·5%	3 (2–4)	5 (4–6)	78·9%
Dengue	6 (2–13)	12 (6–23)	103·9%	<0·5 (0–0·5)	<0·5 (0–0·5)	56·9%
Dengue	5 (2–11)	10 (5–20)	105·9%	<0·5 (0–0·5)	<0·5 (0–0·5)	58·5%
Post-dengue chronic fatigue syndrome	1 (0–2)	2 (0–4)	92·6%	<0·5 (0–0·5)	<0·5 (0–0·5)	48·2%
Yellow fever	<0·5 (0–0·5)	<0·5 (0–0·5)	15·1%	<0·5 (0–0·5)	<0·5 (0–0·5)	–11·4%
Rabies	<0·5 (0–1)	<0·5 (0–1)	–56·7%	<0·5 (0–0·5)	<0·5 (0–0·5)	–66·7%
Intestinal nematode infections	8741 (4778–15 094)	4980 (2722–8442)	–43·0%	165 (90–285)	72 (40–123)	–56·2%
Ascariasis	3950 (2080–6805)	1111 (618–1864)	–71·9%	75 (39–128)	16 (9–27)	–78·4%
Ascariasis infestation	1995 (1091–3254)	758 (419–1232)	–62·0%	38 (21–61)	11 (6–18)	–70·8%
Severe wasting due to ascariasis	49 (32–72)	43 (28–62)	–12·8%	1 (1–1)	1 (0–1)	–32·9%
Mild abdominopelvic problems due to ascariasis	1906 (871–3673)	310 (139–598)	–83·7%	36 (16–69)	4 (2–9)	–87·5%
Trichuriasis	857 (465–1420)	638 (349–1061)	–25·5%	16 (9–27)	9 (5–15)	–42·7%
Trichuriasis infestation	677 (367–1104)	504 (277–821)	–25·6%	13 (7–21)	7 (4–12)	–42·8%
Severe wasting due to trichuriasis	9 (5–13)	9 (5–13)	–0·5%	<0·5 (0–0·5)	<0·5 (0–0·5)	–23·4%
Mild abdominopelvic problems due to trichuriasis	171 (77–327)	126 (57–246)	–26·3%	3 (1–6)	2 (1–4)	–43·3%
Hookworm disease	3934 (2056–6983)	3231 (1695–5732)	–17·9%	74 (39–132)	47 (25–83)	–36·8%
Hookworm infestation	1315 (718–2150)	1011 (556–1655)	–23·1%	25 (14–41)	15 (8–24)	–40·9%
Severe wasting due to hookworm disease	34 (21–49)	42 (27–61)	23·4%	1 (0–1)	1 (0–1)	–5·0%
Mild abdominopelvic problems due to hookworm disease	241 (110–462)	217 (98–422)	–10·0%	5 (2–9)	3 (1–6)	–30·8%
Anaemia due to hookworm disease	2344 (983–4348)	1962 (895–3672)	–16·3%	44 (19–82)	28 (13–53)	–35·6%
Food-borne trematodiases	2394 (635–8501)	1875 (708–4837)	–21·7%	45 (12–160)	27 (10–70)	–39·7%
Heavy clonorchiasis	367 (95–1145)	296 (100–822)	–19·4%	7 (2–22)	4 (1–12)	–37·9%
Heavy fascioliasis	32 (18–53)	42 (26–65)	32·5%	1 (0–1)	1 (0–1)	2·0%%
Heavy intestinal fluke infection	101 (58–179)	106 (64–170)	4·9%	2 (1–3)	2 (1–2)	–19·3%
Heavy opisthorchiasis	48 (29–77)	60 (37–92)	27·0%	1 (1–1)	1 (1–1)	–2·3%
Cerebral paragonimiasis	57 (7–245)	43 (8–148)	–25·2%	1 (0–5)	1 (0–2)	–42·4%
Heavy paragonimiasis	1789 (233–7696)	1328 (280–4234)	–25·8%	34 (4–145)	19 (4–61)	–42·9%
Other neglected tropical diseases	3825 (2517–6057)	3690 (2556–5303)	–3·5%	72 (47–114)	54 (37–77)	–25·8%
Other neglected tropical disease	1007 (533–2568)	949 (657–1557)	–5·8%	19 (10–48)	14 (10–23)	–27·5%
Anaemia due to other neglected tropical diseases	2873 (1920–4163)	2800 (1857–4054)	–2·5%	54 (36–79)	41 (27–59)	–25·0%
Maternal disorders	1394 (935–2271)	1790 (1138–2936)	28·4%	26 (18–43)	26 (17–43)	–1·2%
Maternal haemorrhage	143 (84–234)	98 (61–151)	–31·7%	3 (2–4)	1 (1–2)	–47·5%
Maternal haemorrhage	29 (18–46)	19 (12–29)	–34·2%	1 (0–1)	<0·5 (0–0·5)	–49·4%

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	All ages YLDs (thousands)			YLDs (per 100 000)		
	1990	2010	%Δ	1990	2010	%Δ
(Continued from previous page)						
Anaemia due to maternal haemorrhage	114 (65–193)	79 (47–124)	–31·1%	2 (1–4)	1 (1–2)	–47·0%
Maternal sepsis	80 (46–128)	42 (25–65)	–48·4%	2 (1–2)	1 (0–1)	–60·3%
Hypertensive disorders of pregnancy	69 (41–111)	93 (53–151)	33·2%	1 (1–2)	1 (1–2)	2·5%
Pre-eclampsia	60 (33–100)	83 (44–141)	38·9%	1 (1–2)	1 (1–2)	6·9%
Eclampsia	4 (1–7)	3 (1–7)	–14·6%	<0·5 (0–0·5)	<0·5 (0–0·5)	–34·3%
Long-term sequelae for hypertensive disorders of pregnancy	6 (1–15)	7 (2–15)	6·3%	<0·5 (0–0·5)	<0·5 (0–0·5)	–18·2%
Obstructed labour	809 (458–1493)	1182 (641–2194)	46·0%	15 (9–28)	17 (9–32)	12·4%
Obstructed labour	77 (40–140)	34 (19–57)	–56·1%	1 (1–3)	<0·5 (0–1)	–66·3%
Fistula	732 (390–1425)	1148 (601–2138)	56·8%	14 (7–27)	17 (9–31)	20·6%
Abortion	27 (15–52)	32 (19–59)	19·8%	1 (0–1)	<0·5 (0–1)	–7·8%
Other maternal disorders	264 (180–420)	343 (225–526)	30·1%	5 (3–8)	5 (3–8)	0·1%
Neonatal disorders	8422 (6368–10 706)	9464 (7167–11 937)	12·4%	159 (120–202)	137 (104–173)	–13·5%
Preterm birth complications	2298 (1743–2895)	2982 (2236–3716)	29·7%	43 (33–55)	43 (32–54)	–0·2%
Impairment due to preterm birth complications	2041 (1471–2613)	2636 (1882–3359)	29·1%	39 (28–49)	38 (27–49)	–0·7%
Retinopathy of prematurity due to preterm birth complications	257 (154–376)	347 (212–508)	34·9%	5 (3–7)	5 (3–7)	3·8%
Neonatal encephalopathy (birth asphyxia/trauma)	5625 (4116–7298)	6132 (4471–8030)	9·0%	106 (78–138)	89 (65–117)	–16·1%
Sepsis and other infectious disorders of the newborn baby	18 (9–32)	23 (12–40)	24·9%	<0·5 (0–1)	<0·5 (0–1)	–3·9%
Other neonatal disorders	481 (357–618)	328 (244–417)	–31·8%	9 (7–12)	5 (4–6)	–47·5%
Nutritional deficiencies	49 887 (34 714–70 780)	49 942 (34 705–70 350)	0·1%	941 (655–1335)	725 (504–1021)	–23·0%
Protein–energy malnutrition	3200 (2071–4743)	2720 (1766–3972)	–15·0%	60 (39–89)	39 (26–58)	–34·6%
Kwashiokor or marasmus due to protein–energy malnutrition	298 (155–520)	197 (103–339)	–33·7%	6 (3–10)	3 (1–5)	–49·0%
Severe wasting due to protein–energy malnutrition	2906 (1803–4418)	2530 (1604–3772)	–12·9%	55 (34–83)	37 (23–55)	–33·0%
Iodine deficiency	3181 (2049–4912)	3889 (2468–6136)	22·3%	60 (39–93)	56 (36–89)	–5·9%
Goitre due to iodine deficiency	2902 (1823–4617)	3767 (2382–5990)	29·8%	55 (34–87)	55 (35–87)	–0·1%
Idiopathic intellectual disability due to iodine deficiency	271 (181–386)	113 (73–167)	–58·4%	5 (3–7)	2 (1–2)	–68·0%
Heart failure due to iodine deficiency	7 (5–11)	10 (6–14)	33·3%	<0·5 (0–0·5)	<0·5 (0–0·5)	2·6%
Vitamin A deficiency	740 (565–941)	806 (612–1037)	9·0%	14 (11–18)	12 (9–15)	–16·1%
Iron-deficiency anaemia	42 731 (28 506–61 896)	42 494 (28 170–61 626)	–0·6%	806 (538–1167)	617 (409–894)	–23·5%
Iron-deficiency anaemia	42 728 (28 497–61 897)	42 505 (28 166–61 656)	–0·5%	806 (538–1168)	617 (409–895)	–23·5%
Heart failure due to iron-deficiency anaemia	17 (11–24)	24 (16–36)	46·7%	<0·5 (0–0·5)	<0·5 (0–1)	12·9%
Other nutritional deficiencies	35 (31–44)	32 (24–36)	–9·2%	1 (1–1)	<0·5 (0–1)	–30·1%
Other communicable, maternal, neonatal, and nutritional disorders	4472 (3188–6195)	4711 (3352–6562)	5·3%	84 (60–117)	68 (49–95)	–18·9%
Sexually transmitted diseases excluding HIV	1111 (589–2072)	1298 (704–2439)	16·9%	21 (11–39)	19 (10–35)	–10·0%
Syphilis	73 (3–156)	91 (4–200)	25·5%	1 (0–3)	1 (0–3)	–3·4%
Sexually transmitted chlamydial diseases	560 (268–1025)	669 (324–1233)	19·6%	11 (5–19)	10 (5–18)	–8·0%
Sexually transmitted chlamydial diseases	507 (233–952)	609 (281–1143)	20·1%	10 (4–18)	9 (4–17)	–7·6%
Salpingitis, inflammatory disease of cervix, and other female pelvic inflammatory diseases due to sexually transmitted chlamydial diseases	27 (16–43)	25 (15–40)	–7·5%	1 (0–1)	<0·5 (0–1)	–28·8%
Infertility due to sexually transmitted chlamydial diseases	25 (9–53)	35 (14–72)	37·7%	<0·5 (0–1)	1 (0–1)	6·0%
Gonococcal infection	184 (94–336)	249 (123–450)	35·1%	3 (2–6)	4 (2–7)	4·0%
Gonococcal infection	147 (69–282)	207 (96–390)	40·7%	3 (1–5)	3 (1–6)	8·3%
Salpingitis, inflammatory disease of cervix, and other female pelvic inflammatory diseases due to gonococcal infection	20 (12–33)	19 (11–31)	–7·7%	<0·5 (0–1)	<0·5 (0–0·5)	–29·0%
Infertility due to gonococcal infection	17 (7–35)	23 (9–47)	37·7%	<0·5 (0–1)	<0·5 (0–1)	5·9%

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	All ages YLDs (thousands)			YLDs (per 100 000)		
	1990	2010	%Δ	1990	2010	%Δ
(Continued from previous page)						
Trichomoniasis	182 (0–549)	167 (0–493)	–8·4%	3 (0–10)	2 (0–7)	–29·5%
Other sexually transmitted diseases	112 (68–181)	122 (74–200)	9·3%	2 (1–3)	2 (1–3)	–15·9%
Other sexually transmitted diseases	70 (42–111)	64 (39–105)	–7·8%	1 (1–2)	1 (1–2)	–29·0%
Infertility due to other sexually transmitted diseases	42 (17–91)	58 (23–125)	37·7%	1 (0–2)	1 (0–2)	5·9%
Hepatitis	449 (230–810)	542 (280–981)	20·7%	8 (4–15)	8 (4–14)	–7·1%
Acute hepatitis A	172 (85–294)	185 (95–311)	7·6%	3 (2–6)	3 (1–5)	–17·2%
Acute hepatitis B	194 (24–456)	248 (28–585)	28·1%	4 (0–9)	4 (0–8)	–1·4%
Acute hepatitis C	24 (4–50)	39 (7–79)	61·2%	<0·5 (0–1)	1 (0–1)	24·1%
Acute hepatitis E	59 (20–121)	69 (24–142)	17·8%	1 (0–2)	1 (0–2)	–9·3%
Leprosy	26 (12–48)	6 (3–11)	–76·6%	<0·5 (0–1)	<0·5 (0–0·5)	–82·0%
Other infectious diseases	2886 (1920–4175)	2864 (1902–4141)	–0·8%	54 (36–79)	42 (28–60)	–23·6%
Other infectious diseases	922 (615–1330)	957 (635–1386)	3·8%	17 (12–25)	14 (9–20)	–20·2%
Anaemia due to other infectious diseases	2000 (1329–2897)	1947 (1292–2812)	–2·7%	38 (25–55)	28 (19–41)	–25·1%
Guillain-Barré syndrome due to other infectious diseases	1 (0–1)	1 (0–1)	35·8%	<0·5 (0–0·5)	<0·5 (0–0·5)	4·5%
Non-communicable diseases	**435 400 (365 526–515 063)**	**611 076 (512 645–721 956)**	**40·3%**	**8213 (6895–9715)**	**8869 (7440–10 478)**	**8·0%**
Neoplasms	2540 (1876–3348)	4483 (3324–5861)	76·5%	48 (35–63)	65 (48–85)	35·8%
Oesophageal cancer	61 (42–86)	75 (49–103)	22·8%	1 (1–2)	1 (1–1)	–5·5%
Stomach cancer	204 (137–286)	229 (150–323)	12·3%	4 (3–5)	3 (2–5)	–13·6%
Liver cancer	77 (53–104)	140 (96–189)	82·7%	1 (1–2)	2 (1–3)	40·6%
Liver cancer secondary to hepatitis B	35 (23–49)	64 (43–89)	81·4%	1 (0–1)	1 (1–1)	39·6%
Liver cancer secondary to hepatitis C	19 (13–27)	34 (23–47)	80·5%	<0·5 (0–1)	<0·5 (0–1)	38·9%
Liver cancer secondary to alcohol use	15 (9–21)	29 (19–42)	100·2%	<0·5 (0–0·5)	<0·5 (0–1)	54·1%
Other liver cancer	8 (4–12)	12 (7–19)	60·3%	<0·5 (0–0·5)	<0·5 (0–0·5)	23·3%
Larynx cancer	47 (26–77)	63 (34–102)	32·5%	1 (0–1)	1 (0–1)	2·0%
Trachea, bronchus, and lung cancers	227 (154–317)	355 (234–493)	56·5%	4 (3–6)	5 (3–7)	20·5%
Breast cancer	504 (351–714)	898 (623–1268)	78·0%	10 (7–13)	13 (9–18)	37·0%
Cervical cancer	99 (59–146)	111 (64–160)	11·8%	2 (1–3)	2 (1–2)	–14·0%
Uterine cancer	47 (25–82)	68 (30–107)	44·5%	1 (0–2)	1 (0–2)	11·2%
Prostate cancer	165 (109–249)	464 (298–729)	181·3%	3 (2–5)	7 (4–11)	116·4%
Colon and rectum cancers	307 (223–411)	564 (408–759)	83·9%	6 (4–8)	8 (6–11)	41·5%
Mouth cancer	63 (44–84)	101 (71–136)	61·6%	1 (1–2)	1 (1–2)	24·3%
Nasopharynx cancer	15 (9–23)	25 (14–39)	64·1%	<0·5 (0–0·5)	<0·5 (0–1)	26·3%
Cancer of other part of pharynx and oropharynx	29 (16–42)	45 (25–67)	53·3%	1 (0–1)	1 (0–1)	18·0%
Gallbladder and biliary tract cancer	19 (12–29)	35 (20–53)	81·2%	<0·5 (0–1)	1 (0–1)	39·5%
Pancreatic cancer	23 (15–33)	37 (23–54)	59·4%	<0·5 (0–1)	1 (0–1)	22·6%
Malignant melanoma of skin	24 (15–40)	45 (25–74)	84·5%	<0·5 (0–1)	1 (0–1)	42·0%
Non-melanoma skin cancer	115 (85–148)	255 (192–326)	122·2%	2 (2–3)	4 (3–5)	71·0%
Ovarian cancer	41 (27–56)	63 (39–89)	53·8%	1 (1–1)	1 (1–1)	18·3%
Testicular cancer	8 (4–12)	12 (7–20)	64·2%	<0·5 (0–0·5)	<0·5 (0–0·5)	26·4%
Kidney and other urinary organ cancers	32 (21–48)	79 (52–118)	143·4%	1 (0–1)	1 (1–2)	87·3%
Bladder cancer	81 (57–110)	125 (85–171)	54·6%	2 (1–2)	2 (1–2)	18·9%
Brain and nervous system cancers	57 (34–84)	94 (51–134)	63·3%	1 (1–2)	1 (1–2)	25·6%
Thyroid cancer	21 (13–32)	48 (28–75)	132·4%	<0·5 (0–1)	1 (0–1)	78·8%
Hodgkin's disease	13 (8–20)	17 (10–27)	25·7%	<0·5 (0–0·5)	<0·5 (0–0·5)	–3·3%
Non-Hodgkin's lymphoma	60 (42–80)	110 (77–147)	83·5%	1 (1–2)	2 (1–2)	41·2%
Multiple myeloma	22 (13–34)	36 (21–53)	64·9%	<0·5 (0–1)	1 (0–1)	26·9%
Leukaemia	79 (53–110)	123 (83–170)	57·2%	1 (1–2)	2 (1–2)	20·9%
Other neoplasms	99 (67–139)	266 (174–366)	168·2%	2 (1–3)	4 (3–5)	106·4%
Cardiovascular and circulatory diseases	14 373 (11 094–18 134)	21 985 (16 947–27 516)	53·0%	271 (209–342)	319 (246–399)	17·7%
Rheumatic heart disease	1150 (765–1709)	1430 (944–2067)	24·3%	22 (14–32)	21 (14–30)	–4·4%

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	All ages YLDs (thousands)			YLDs (per 100 000)		
	1990	2010	%Δ	1990	2010	%Δ
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Valvular disease due to rheumatic heart disease	861 (477–1429)	1009 (557–1646)	17·3%	16 (9–27)	15 (8–24)	−9·8%
Heart failure due to rheumatic heart disease	290 (191–412)	420 (278–592)	45·1%	5 (4–8)	6 (4–9)	11·6%
Ischaemic heart disease	5952 (3679–8768)	8795 (5447–12 806)	47·8%	112 (69–165)	128 (79–186)	13·7%
Myocardial infarction due to ischaemic heart disease	29 (15–45)	42 (22–67)	45·5%	1 (0–1)	1 (0–1)	11·9%
Angina due to ischaemic heart disease	5030 (2942–7567)	7234 (4232–10 986)	43·8%	95 (55–143)	105 (61–159)	10·7%
Heart failure due to ischaemic heart disease	894 (609–1236)	1518 (1038–2128)	69·9%	17 (11–23)	22 (15–31)	30·8%
Cerebrovascular disease	2328 (1864–2837)	4346 (3476–5298)	86·7%	44 (35–54)	63 (50–77)	43·6%
Ischaemic stroke	1857 (1489–2263)	3384 (2705–4121)	82·2%	35 (28–43)	49 (39–60)	40·2%
Ischaemic stroke (acute)	77 (52–107)	133 (90–183)	72·8%	1 (1–2)	2 (1–3)	32·9%
Ischaemic stroke (chronic)	1780 (1416–2187)	3251 (2583–3999)	82·6%	34 (27–41)	47 (37–58)	40·5%
Haemorrhagic and other non-ischaemic stroke	471 (373–585)	961 (769–1178)	104·1%	9 (7–11)	14 (11–17)	57·0%
Haemorrhagic non-ischaemic stroke (acute)	28 (18–38)	56 (37–78)	104·1%	1 (0–1)	1 (1–1)	57·1%
Haemorrhagic non-ischaemic stroke (chronic)	444 (345–558)	905 (717–1121)	104·1%	8 (7–11)	13 (10–16)	57·0%
Hypertensive heart disease	292 (202–412)	460 (315–639)	57·4%	6 (4–8)	7 (5–9)	21·1%
Cardiomyopathy and myocarditis	272 (183–378)	394 (269–551)	44·8%	5 (3–7)	6 (4–8)	11·4%
Acute myocarditis	1 (0–1)	1 (0–1)	30·9%	<0·5 (0–0·5)	<0·5 (0–0·5)	0·7%
Heart failure due to cardiomyopathy and myocarditis	271 (182–378)	393 (268–551)	44·8%	5 (3–7)	6 (4–8)	11·4%
Atrial fibrillation and flutter	1433 (970–1987)	2425 (1631–3382)	69·2%	27 (18–37)	35 (24–49)	30·2%
Peripheral vascular disease	256 (132–453)	419 (218–744)	63·7%	5 (2–9)	6 (3–11)	26·0%
Endocarditis	42 (28–60)	62 (42–87)	46·1%	1 (1–1)	1 (1–1)	12·4%
Endocarditis	<0·5 (0–1)	1 (0–1)	87·7%	<0·5 (0–0·5)	<0·5 (0–0·5)	44·4%
Heart failure due to endocarditis	42 (28–59)	61 (42–87)	45·8%	1 (1–1)	1 (1–1)	12·2%
Other cardiovascular and circulatory diseases	2646 (1448–4148)	3655 (2053–5581)	38·1%	50 (27–78)	53 (30–81)	6·3%
Heart failure due to other circulatory diseases	183 (123–259)	268 (180–372)	46·3%	3 (2–5)	4 (3–5)	12·6%
Other cardiovascular and circulatory diseases	2463 (1271–3992)	3388 (1783–5346)	37·5%	46 (24–75)	49 (26–78)	5·8%
Chronic respiratory diseases	34 976 (24 536–47 579)	49 303 (33 874–67 087)	41·0%	660 (463–897)	716 (492–974)	8·5%
Chronic obstructive pulmonary disease	20 097 (13 793–28 248)	29 373 (19 850–41 822)	46·2%	379 (260–533)	426 (288–607)	12·5%
Chronic obstructive pulmonary disease	19 805 (13 571–27 835)	28 893 (19 455–41 183)	45·9%	374 (256–525)	419 (282–598)	12·3%
Heart failure due to chronic obstructive pulmonary disease	292 (195–410)	480 (316–678)	64·1%	6 (4–8)	7 (5–10)	26·3%
Pneumoconiosis	212 (104–477)	445 (193–1377)	109·9%	4 (2–9)	6 (3–20)	61·5%
Silicosis	76 (22–199)	136 (38–408)	79·8%	1 (0–4)	2 (1–6)	38·3%
Asbestosis	44 (4–253)	130 (8–974)	192·4%	1 (0–5)	2 (0–14)	125·0%
Coal workers' pneumoconiosis	24 (10–43)	33 (13–64)	41·1%	<0·5 (0–1)	<0·5 (0–1)	8·6%
Other pneumoconiosis	43 (12–108)	101 (26–261)	135·2%	1 (0–2)	1 (0–4)	80·9%
Heart failure due to pneumoconiosis	25 (17–36)	45 (31–63)	77·1%	<0·5 (0–1)	1 (0–1)	36·3%
Asthma	10 835 (7247–15 268)	13 835 (9286–19 487)	27·7%	204 (137–288)	201 (135–283)	−1·7%
Interstitial lung disease and pulmonary sarcoidosis	111 (68–182)	162 (99–268)	45·8%	2 (1–3)	2 (1–4)	12·2%
Interstitial lung disease and pulmonary sarcoidosis	69 (37–134)	99 (52–191)	44·6%	1 (1–3)	1 (1–3)	11·3%
Heart failure due to interstitial lung disease and pulmonary sarcoidosis	42 (28–60)	62 (42–90)	47·9%	1 (1–1)	1 (1–1)	13·8%
Other chronic respiratory diseases	3722 (2529–5177)	5488 (3773–7675)	47·5%	70 (48–98)	80 (55–111)	13·5%
Cirrhosis of the liver	455 (309–630)	613 (415–862)	34·8%	9 (6–12)	9 (6–13)	3·7%
Cirrhosis of the liver secondary to hepatitis B	156 (93–235)	198 (120–298)	26·7%	3 (2–4)	3 (2–4)	−2·5%
Cirrhosis of the liver secondary to hepatitis C	113 (67–170)	155 (93–235)	37·5%	2 (1–3)	2 (1–3)	5·8%
Cirrhosis of the liver secondary to alcohol use	109 (65–163)	160 (94–241)	46·6%	2 (1–3)	2 (1–3)	12·8%
Other cirrhosis of the liver	77 (46–118)	101 (61–150)	30·2%	1 (1–2)	1 (1–2)	0·2%
Digestive diseases (except cirrhosis)	4467 (3265–5979)	5473 (3916–7380)	22·5%	84 (62–113)	79 (57–107)	−5·7%
Peptic ulcer disease	355 (224–570)	311 (196–485)	−12·3%	7 (4–11)	5 (3–7)	−32·5%
Peptic ulcer disease	190 (111–328)	154 (93–254)	−18·8%	4 (2–6)	2 (1–4)	−37·5%

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	All ages YLDs (thousands)			YLDs (per 100 000)		
	1990	2010	%Δ	1990	2010	%Δ
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Anaemia due to peptic ulcer disease	165 (89–325)	157 (87–273)	–4·8%	3 (2–6)	2 (1–4)	–26·7%
Gastritis and duodenitis	820 (498–1253)	855 (525–1386)	4·2%	15 (9–24)	12 (8–20)	–19·8%
Gastritis and duodenitis	178 (120–259)	182 (121–264)	2·3%	3 (2–5)	3 (2–4)	–21·3%
Anaemia due to gastritis and duodenitis	642 (368–1046)	673 (389–1174)	4·7%	12 (7–20)	10 (6–17)	–19·4%
Appendicitis	154 (99–226)	176 (112–257)	14·3%	3 (2–4)	3 (2–4)	–12·0%
Paralytic ileus and intestinal obstruction without hernia	10 (4–24)	12 (6–27)	24·4%	<0·5 (0–0·5)	<0·5 (0–0·5)	–4·2%
Inguinal or femoral hernia	333 (144–689)	441 (189–861)	32·5%	6 (3–13)	6 (3–12)	1·9%
Non-infective inflammatory bowel disease	1582 (1130–2151)	1795 (1272–2460)	13·5%	30 (21–41)	26 (18–36)	–12·7%
Non-infective inflammatory bowel disease due to ulcerative colitis	932 (583–1492)	1169 (734–1801)	25·4%	18 (11–28)	17 (11–26)	–3·5%
Non-infective inflammatory bowel disease due to Crohn's disease	541 (356–775)	513 (334–733)	–5·2%	10 (7–15)	7 (5–11)	–27·0%
Non-infective inflammatory bowel disease severe episodes due to ulcerative colitis	54 (32–89)	64 (39–102)	18·6%	1 (1–2)	1 (1–1)	–8·7%
Non-infective inflammatory bowel disease severe episodes due to Crohn's disease	54 (31–91)	50 (30–81)	–8·5%	1 (1–2)	1 (0–1)	–29·6%
Vascular disorders of intestine	6 (4–10)	14 (8–20)	121·6%	<0·5 (0–0·5)	<0·5 (0–0·5)	70·5%
Gallbladder and bile duct disease	314 (215–440)	453 (310–635)	44·6%	6 (4–8)	7 (4–9)	11·2%
Pancreatitis	133 (85–198)	206 (131–303)	54·9%	3 (2–4)	3 (2–4)	19·2%
Other digestive diseases	761 (553–1025)	1209 (852–1638)	58·9%	14 (10–19)	18 (12–24)	22·3%
Neurological disorders	29 389 (23 635–35 837)	42 943 (34 605–52 115)	46·1%	554 (446–676)	623 (502–756)	12·4%
Alzheimer's disease and other dementias	3785 (2720–5007)	6801 (4898–9043)	79·7%	71 (51–94)	99 (71–131)	38·3%
Parkinson's disease	356 (231–560)	606 (396–964)	70·5%	7 (4–11)	9 (6–14)	31·2%
Epilepsy	6415 (4993–7799)	8740 (6762–10 594)	36·2%	121 (94–147)	127 (98–154)	4·8%
Multiple sclerosis	373 (276–473)	524 (379–660)	40·8%	7 (5–9)	8 (5–10)	8·3%
Migraine	15 927 (10 394–22 023)	22 362 (14 395–31 121)	40·4%	300 (196–415)	325 (209–452)	8·0%
Tension-type headache	1266 (754–2016)	1779 (1056–2822)	40·5%	24 (14–38)	26 (15–41)	8·1%
Other neurological disorders	1267 (958–1616)	2129 (1619–2723)	68·0%	24 (18–30)	31 (23–40)	29·3%
Other neurological disorders	1399 (1056–1789)	2353 (1785–3011)	68·2%	26 (20–34)	34 (26–44)	29·4%
Guillain-Barré syndrome due to other neurological disorders	2 (1–3)	3 (2–4)	35·6%	<0·5 (0–0·5)	<0·5 (0–0·5)	4·4%
Mental and behavioural disorders	129 377 (106 771–154 032)	176 626 (145 613–209 122)	36·5%	2440 (2014–2905)	2564 (2113–3035)	5·0%
Schizophrenia	9760 (6186–13 369)	14 400 (9160–19 752)	47·5%	184 (117–252)	209 (133–287)	13·5%
Alcohol use disorders	10 470 (7173–14 644)	13 826 (9248–19 212)	32·1%	197 (135–276)	201 (134–279)	1·6%
Alcohol dependence	10 385 (7086–14 556)	13 735 (9164–19 108)	32·3%	196 (134–275)	199 (133–277)	1·8%
Fetal alcohol syndrome	85 (49–133)	91 (55–138)	6·9%	2 (1–3)	1 (1–2)	–17·7%
Drug use disorders	11 764 (8388–15 468)	16 412 (11 836–21 583)	39·5%	222 (158–292)	238 (172–313)	7·3%
Opioid use disorders	4812 (3350–6281)	7170 (5143–9257)	49·0%	91 (63–118)	104 (75–134)	14·6%
Cocaine use disorders	800 (475–1214)	1085 (633–1639)	35·7%	15 (9–23)	16 (9–24)	4·4%
Amphetamine use disorders	1894 (1067–2955)	2596 (1460–3957)	37·1%	36 (20–56)	38 (21–57)	5·5%
Cannabis use disorders	1693 (1105–2418)	2057 (1348–2929)	21·5%	32 (21–46)	30 (20–43)	–6·5%
Other drug use disorders	2565 (1583–3817)	3503 (2108–5170)	36·6%	48 (30–72)	51 (31–75)	5·1%
Unipolar depressive disorders	54 010 (40 381–68 450)	74 264 (55 670–94 240)	37·5%	1019 (762–1291)	1078 (808–1368)	5·8%
Major depressive disorder	46 139 (34 517–58 427)	63 179 (47 779–80 891)	36·9%	870 (651–1102)	917 (693–1174)	5·4%
Dysthymia	7871 (5266–10 858)	11 084 (7297–15 447)	40·8%	148 (99–205)	161 (106–224)	8·4%
Bipolar affective disorder	9129 (5757–13 169)	12 867 (8084–18 654)	40·9%	172 (109–248)	187 (117–271)	8·5%
Anxiety disorders	19 664 (13 868–26 820)	26 826 (18 779–36 795)	36·4%	371 (262–506)	389 (273–534)	5·0%
Eating disorders	1120 (749–1554)	1956 (1316–2742)	74·6%	21 (14–29)	28 (19–40)	34·3%
Anorexia nervosa	95 (65–136)	188 (125–265)	97·1%	2 (1–3)	3 (2–4)	51·7%
Bulimia nervosa	1025 (687–1417)	1768 (1183–2480)	72·5%	19 (13–27)	26 (17–36)	32·7%
Pervasive development disorders	5918 (4133–8130)	7666 (5355–10 565)	29·5%	112 (78–153)	111 (78–153)	–0·3%
Autism	3088 (2119–4260)	4007 (2752–5563)	29·8%	58 (40–80)	58 (40–81)	–0·2%

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	All ages YLDs (thousands)			YLDs (per 100 000)		
	1990	2010	%Δ	1990	2010	%Δ
(Continued from previous page)						
Asperger's syndrome	2830 (1917–4016)	3659 (2463–5150)	29·3%	53 (36–76)	53 (36–75)	–0·5%
Childhood behavioural disorders	5472 (3277–8359)	6245 (3785–9347)	14·1%	103 (62–158)	91 (55–136)	–12·2%
Attention-deficit hyperactivity disorder	424 (244–667)	491 (280–775)	15·8%	8 (5–13)	7 (4–11)	–10·9%
Conduct disorder	5047 (2960–7840)	5753 (3428–8748)	14·0%	95 (56–148)	84 (50–127)	–12·3%
Idiopathic intellectual disability	1247 (746–1924)	1043 (572–1687)	–16·4%	24 (14–36)	15 (8–24)	–35·7%
Other mental and behavioural disorders	822 (485–1307)	1121 (661–1774)	36·4%	16 (9–25)	16 (10–26)	5·0%
Diabetes, urogenital, blood, and endocrine diseases	38 626 (28 236–51 159)	56 924 (42 172–75 399)	47·4%	729 (533–965)	826 (612–1094)	13·4%
Diabetes mellitus	12 412 (8403–17 524)	20 758 (14 415–28 762)	67·2%	234 (158–331)	301 (209–417)	28·7%
Uncomplicated diabetes mellitus	4260 (2420–6828)	6569 (3684–10 380)	54·2%	80 (46–129)	95 (53–151)	18·7%
Diabetic foot	209 (108–356)	308 (160–518)	47·1%	4 (2–7)	4 (2–8)	13·2%
Diabetic neuropathy	7325 (4967–10 520)	11 914 (7977–17 035)	62·6%	138 (94–198)	173 (116–247)	25·2%
Amputation due to diabetes mellitus	392 (192–669)	905 (481–1427)	130·9%	7 (4–13)	13 (7–21)	77·6%
Vision loss due to diabetes mellitus	227 (166–307)	1062 (795–1395)	368·6%	4 (3–6)	15 (12–20)	260·6%
Acute glomerulonephritis	1 (0–2)	1 (0–2)	1·6%	<0·5 (0–0·5)	<0·5 (0–0·5)	–21·8%
Chronic kidney diseases	2558 (1900–3288)	4018 (2972–5204)	57·1%	48 (36–62)	58 (43–76)	20·9%
Chronic kidney disease due to diabetes mellitus	621 (453–796)	1003 (740–1317)	61·5%	12 (9–15)	15 (11–19)	24·2%
Stage IV chronic kidney disease due to diabetes mellitus	88 (58–126)	141 (94–205)	60·5%	2 (1–2)	2 (1–3)	23·5%
End-stage renal disease due to diabetes mellitus	388 (270–506)	626 (436–817)	61·5%	7 (5–10)	9 (6–12)	24·2%
Anaemia due to chronic kidney disease stage III from diabetes mellitus	145 (79–237)	235 (126–378)	62·0%	3 (1–4)	3 (2–5)	24·7%
Chronic kidney disease due to hypertension	550 (411–711)	872 (645–1123)	58·4%	10 (8–13)	13 (9–16)	21·9%
Stage IV chronic kidney disease due to hypertension	88 (59–128)	138 (93–198)	56·7%	2 (1–2)	2 (1–3)	20·6%
End-stage renal disease due to hypertension	326 (225–422)	515 (359–670)	58·0%	6 (4–8)	7 (5–10)	21·6%
Anaemia due to chronic kidney disease stage III from hypertension	136 (77–222)	219 (124–354)	60·6%	3 (1–4)	3 (2–5)	23·6%
Chronic kidney disease unspecified	1386 (1032–1800)	2143 (1585–2779)	54·6%	26 (19–34)	31 (23–40)	19·0%
Stage IV unspecified or other chronic kidney disease	229 (154–335)	352 (233–506)	53·9%	4 (3–6)	5 (3–7)	18·4%
End-stage renal disease from unspecified or other chronic kidney disease	799 (555–1042)	1242 (872–1607)	55·5%	15 (10–20)	18 (13–23)	19·6%
Anaemia due to unspecified or other chronic kidney disease stage III	359 (208–579)	549 (314–889)	53·1%	7 (4–11)	8 (5–13)	17·8%
Urinary diseases and male infertility	4651 (3057–7025)	8188 (5398–11 978)	76·0%	88 (58–133)	119 (78–174)	35·5%
Tubulointerstitial nephritis, pyelonephritis, and urinary tract infections	156 (84–269)	207 (109–360)	33·2%	3 (2–5)	3 (2–5)	2·5%
Urolithiasis	480 (306–842)	716 (447–1425)	49·1%	9 (6–16)	10 (6–21)	14·7%
Urolithiasis episodes	204 (107–526)	225 (104–918)	10·5%	4 (2–10)	3 (2–13)	–15·0%
Chronic urolithiasis	277 (156–443)	491 (276–785)	77·5%	5 (3–8)	7 (4–11)	36·6%
Benign prostatic hyperplasia	3726 (2392–5645)	6834 (4377–10 179)	83·4%	70 (45–106)	99 (64–148)	41·1%
Male infertility	126 (50–270)	173 (70–365)	36·9%	2 (1–5)	3 (1–5)	5·3%
Other urinary diseases	162 (103–267)	258 (167–415)	58·8%	3 (2–5)	4 (2–6)	22·2%
Gynaecological diseases	7671 (4880–11 715)	10 042 (6226–15 619)	30·9%	145 (92–221)	146 (90–227)	0·7%
Uterine fibroids	2341 (1568–3340)	3037 (1967–4551)	29·7%	44 (30–63)	44 (29–66)	–0·2%
Uterine fibroids	934 (401–1852)	1527 (664–3059)	63·5%	18 (8–35)	22 (10–44)	25·8%
Anaemia due to uterine fibroids	1407 (943–2023)	1509 (1000–2199)	7·3%	27 (18–38)	22 (15–32)	–17·4%
Polycystic ovarian syndrome	2027 (971–3786)	2756 (1312–5212)	35·9%	38 (18–71)	40 (19–76)	4·6%
Polycystic ovarian syndrome	1982 (931–3747)	2694 (1245–5171)	35·9%	37 (18–71)	39 (18–75)	4·6%
Infertility due to polycystic ovarian syndrome	45 (18–95)	62 (25–128)	37·5%	1 (0–2)	1 (0–2)	5·8%
Female infertility	91 (36–189)	125 (50–259)	37·6%	2 (1–4)	2 (1–4)	5·9%
Endometriosis	404 (142–738)	544 (188–1007)	34·6%	8 (3–14)	8 (3–15)	3·5%
Endometriosis	388 (129–715)	522 (166–974)	34·4%	7 (2–13)	8 (2–14)	3·4%

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	All ages YLDs (thousands)			YLDs (per 100 000)		
	1990	2010	%Δ	1990	2010	%Δ
(Continued from previous page)						
Infertility due to endometriosis	16 (6–35)	22 (9–46)	37·8%	<0·5 (0–1)	<0·5 (0–1)	6·0%
Genital prolapse	1339 (544–2686)	1811 (741–3649)	35·2%	25 (10–51)	26 (11–53)	4·1%
Premenstrual syndrome	983 (49–2592)	1249 (63–3337)	27·0%	19 (1–49)	18 (1–48)	–2·3%
Other gynaecological diseases	485 (330–703)	520 (345–759)	7·3%	9 (6–13)	8 (5–11)	–17·4%
Haemoglobinopathies and haemolytic anaemias	8271 (5746–11 276)	10 197 (7166–13 843)	23·3%	156 (108–213)	148 (104–201)	–5·1%
Thalassaemias	3725 (2499–5279)	4636 (3098–6621)	24·4%	70 (47–100)	67 (45–96)	–4·2%
β-thalassaemia major	31 (17–56)	33 (19–59)	7·9%	1 (0–1)	<0·5 (0–1)	–16·9%
Haemoglobin E/β-thalassaemia	22 (14–34)	24 (15–37)	8·8%	<0·5 (0–1)	<0·5 (0–1)	–16·3%
Haemoglobin H/β-thalassaemia	10 (6–16)	10 (6–16)	3·7%	<0·5 (0–0·5)	<0·5 (0–0·5)	–20·2%
Anaemia due to thalassaemias	3653 (2427–5219)	4557 (3024–6530)	24·7%	69 (46–98)	66 (44–95)	–4·0%
Heart failure due to thalassaemias	10 (6–14)	13 (8–19)	34·1%	<0·5 (0–0·5)	<0·5 (0–0·5)	3·2%
Sickle cell disorders	2647 (1829–3615)	3665 (2612–4949)	38·5%	50 (34–68)	53 (38–72)	6·5%
Homozygous sickle cell and severe sickle cell/β-thalassaemia	334 (238–441)	546 (389–736)	63·8%	6 (4–8)	8 (6–11)	26·1%
Haemoglobin sickle cell disorders	78 (54–107)	130 (88–182)	65·5%	1 (1–2)	2 (1–3)	27·3%
Mild sickle cell/β-thalassaemia	26 (18–37)	38 (27–53)	43·8%	<0·5 (0–1)	1 (0–1)	10·6%
Anaemia due to sickle cell disorders	2211 (1439–3181)	2954 (1957–4240)	33·6%	42 (27–60)	43 (28–62)	2·8%
G6PD deficiency	120 (81–174)	146 (97–210)	22·1%	2 (2–3)	2 (1–3)	–6·1%
Anaemia due to G6PD deficiency	116 (77–171)	141 (93–205)	21·5%	2 (1–3)	2 (1–3)	–6·5%
Heart failure due to G6PD deficiency	4 (2–6)	5 (3–8)	40·2%	<0·5 (0–0·5)	<0·5 (0–0·5)	7·8%
Other haemoglobinopathies and haemolytic anaemias	1779 (1193–2565)	1750 (1171–2503)	–1·6%	34 (23–48)	25 (17–36)	–24·3%
Anaemia due to other haemoglobinopathies and haemolytic anaemias	1757 (1173–2545)	1720 (1138–2483)	–2·1%	33 (22–48)	25 (17–36)	–24·7%
Heart failure due to other haemoglobinopathies and haemolytic anaemias	22 (14–32)	31 (20–45)	39·5%	<0·5 (0–1)	<0·5 (0–1)	7·4%
Other endocrine, nutritional, blood, and immune disorders	3063 (2256–4177)	3721 (2713–5114)	21·5%	58 (43–79)	54 (39–74)	–6·5%
Other endocrine, nutritional, blood, and immune disorders	1254 (739–1952)	1919 (1133–2991)	53·0%	24 (14–37)	28 (16–43)	17·7%
Anaemia due to other endocrine, nutritional, blood, and immune disorders	1777 (1187–2562)	1756 (1166–2542)	–1·2%	34 (22–48)	25 (17–37)	–23·9%
Heart failure due to other endocrine, nutritional, blood, and immune disorders	33 (22–47)	48 (33–69)	46·1%	1 (0–1)	1 (0–1)	12·4%
Musculoskeletal disorders	114 719 (87 053–145 247)	165 955 (126 364–208 779)	44·7%	2164 (1642–2740)	2409 (1834–3030)	11·3%
Rheumatoid arthritis	2566 (1831–3381)	3776 (2672–4954)	47·1%	48 (35–64)	55 (39–72)	13·2%
Osteoarthritis	10 449 (7100–14 788)	17 135 (11 884–24 256)	64·0%	197 (134–279)	249 (172–352)	26·2%
Osteoarthritis of the hip	1821 (1200–2616)	2917 (1945–4389)	60·2%	34 (23–49)	42 (28–64)	23·2%
Osteoarthritis of the knee	8627 (5929–12 276)	14 218 (9809–19 968)	64·8%	163 (112–232)	206 (142–290)	26·8%
Low back and neck pain	82 111 (56 962–110 433)	116 704 (80 615–156 527)	42·1%	1549 (1074–2083)	1694 (1170–2272)	9·4%
Low back pain	58 245 (39 934–78 139)	83 063 (56 632–111 880)	42·6%	1099 (753–1474)	1206 (822–1624)	9·7%
Neck pain	23 866 (16 535–33 105)	33 640 (23 469–46 476)	41·0%	450 (312–624)	488 (341–675)	8·5%
Gout	76 (48–112)	114 (72–167)	49·3%	1 (1–2)	2 (1–2)	14·9%
Other musculoskeletal disorders	19 517 (16 148–22 127)	28 226 (23 201–31 884)	44·6%	368 (305–417)	410 (337–463)	11·3%
Other non-communicable diseases	66 478 (45 586–97 937)	86 771 (59 561–128 605)	30·5%	1254 (860–1847)	1259 (864–1867)	0·4%
Congenital anomalies	2620 (2088–3333)	3279 (2594–4167)	25·2%	49 (39–63)	48 (38–60)	–3·7%
Neural tube defects	569 (330–901)	754 (439–1142)	32·6%	11 (6–17)	11 (6–17)	2·0%
Congenital heart anomalies	498 (350–711)	563 (388–804)	13·0%	9 (7–13)	8 (6–12)	–13·0%
Congenital heart anomalies	189 (86–354)	226 (103–425)	19·1%	4 (2–7)	3 (1–6)	–8·3%
Heart failure due to congenital heart anomalies	308 (203–442)	337 (221–486)	9·3%	6 (4–8)	5 (3–7)	–15·9%
Cleft lip and cleft palate	259 (180–362)	254 (181–346)	–1·7%	5 (3–7)	4 (3–5)	–24·4%
Down's syndrome	462 (306–664)	627 (425–888)	35·7%	9 (6–13)	9 (6–13)	4·4%
Other chromosomal abnormalities	191 (127–274)	276 (182–392)	44·1%	4 (2–5)	4 (3–6)	10·8%

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	All ages YLDs (thousands)			YLDs (per 100 000)		
	1990	2010	%Δ	1990	2010	%Δ
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Turner syndrome	3 (1–6)	4 (2–8)	35·6%	<0·5 (0–0·5)	<0·5 (0–0·5)	4·3%
Klinefelter syndrome	5 (2–10)	6 (3–14)	38·7%	<0·5 (0–0·5)	<0·5 (0–0·5)	6·8%
Chromosomal unbalanced rearrangements	184 (123–261)	265 (176–377)	44·3%	3 (2–5)	4 (3–5)	11·1%
Other congenital anomalies	642 (464–868)	806 (596–1053)	25·6%	12 (9–16)	12 (9–15)	–3·3%
Other congenital anomalies	437 (325–580)	595 (446–775)	36·4%	8 (6–11)	9 (6–11)	4·9%
Hearing loss due to other congenital anomalies	225 (142–336)	240 (152–363)	6·6%	4 (3–6)	3 (2–5)	–17·9%
Skin and subcutaneous diseases	26 273 (16 798–40 932)	33 744 (21 503–52 280)	28·4%	496 (317–772)	490 (312–759)	–1·2%
Eczema	6890 (3508–10 872)	8897 (4518–14 049)	29·1%	130 (66–205)	129 (66–204)	–0·6%
Psoriasis	742 (371–1179)	1059 (528–1690)	42·8%	14 (7–22)	15 (8–25)	9·8%
Cellulitis	302 (126–648)	376 (163–831)	24·5%	6 (2–12)	5 (2–12)	–4·2%
Abscess, impetigo, and other bacterial skin diseases	1038 (473–2016)	1322 (599–2511)	27·4%	20 (9–38)	19 (9–36)	–1·9%
Impetigo	871 (417–1624)	1088 (514–2048)	24·9%	16 (8–31)	16 (7–30)	–3·9%
Abscess and other bacterial skin diseases cases	167 (54–386)	235 (78–539)	40·8%	3 (1–7)	3 (1–8)	8·3%
Scabies	1881 (956–3384)	1580 (807–2792)	–16·0%	35 (18–64)	23 (12–41)	–35·4%
Fungal skin diseases	1618 (532–3754)	2303 (740–5435)	42·3%	31 (10–71)	33 (11–79)	9·5%
Viral skin diseases	2354 (1058–4369)	2731 (1203–4941)	16·0%	44 (20–82)	40 (17–72)	–10·7%
Molluscum contagiosum	289 (88–702)	270 (85–645)	–6·6%	5 (2–13)	4 (1–9)	–28·1%
Viral warts	2065 (816–3960)	2461 (984–4720)	19·2%	39 (15–75)	36 (14–69)	–8·3%
Acne vulgaris	3281 (1545–6205)	4002 (1869–7575)	22·0%	62 (29–117)	58 (27–110)	–6·2%
Alopecia areata	1002 (313–1906)	1352 (424–2567)	35·0%	19 (6–36)	20 (6–37)	3·9%
Pruritus	1433 (682–2676)	2086 (1004–3951)	45·6%	27 (13–50)	30 (15–57)	12·1%
Urticaria	1968 (757–3431)	2600 (980–4441)	32·1%	37 (14–65)	38 (14–64)	1·6%
Decubitus ulcer	320 (165–524)	476 (237–779)	48·8%	6 (3–10)	7 (3–11)	14·5%
Other skin and subcutaneous diseases	3445 (1638–6437)	4961 (2324–9239)	44·0%	65 (31–121)	72 (34–134)	10·8%
Sense organ diseases	25 169 (18 140–35 220)	34 733 (25 167–47 663)	38·0%	475 (342–664)	504 (365–692)	6·2%
Glaucoma	443 (338–561)	943 (725–1178)	112·7%	8 (6–11)	14 (11–17)	63·7%
Cataracts	4225 (3283–5364)	4732 (3647–6010)	12·0%	80 (62–101)	69 (53–87)	–13·8%
Macular degeneration	513 (388–647)	1329 (1026–1668)	158·9%	10 (7–12)	19 (15–24)	99·2%
Refraction and accommodation disorders	3608 (2688–4762)	5593 (4117–7468)	55·0%	68 (51–90)	81 (60–108)	19·3%
Other hearing loss	12 211 (7258–19 495)	15 761 (9455–25 210)	29·1%	230 (137–368)	229 (137–366)	–0·7%
Other vision loss	4069 (2171–7180)	6240 (3260–11 208)	53·4%	77 (41–135)	91 (47–163)	18·0%
Other sense organ diseases	100 (34–231)	136 (46–309)	35·4%	2 (1–4)	2 (1–4)	4·2%
Oral disorders	12 417 (6824–20 984)	15 015 (7795–26 482)	20·9%	234 (129–396)	218 (113–384)	–7·0%
Dental caries	3704 (1523–7150)	4984 (2086–9356)	34·5%	70 (29–135)	72 (30–136)	3·5%
Dental caries of baby teeth	403 (164–774)	425 (172–818)	5·7%	8 (3–15)	6 (3–12)	–18·7%
Dental caries of permanent teeth	3302 (1347–6455)	4559 (1907–8554)	38·1%	62 (25–122)	66 (28–124)	6·2%
Periodontal disease	3440 (1310–7305)	5410 (2051–11 286)	57·3%	65 (25–138)	79 (30–164)	21·0%
Edentulism	5273 (3100–8127)	4621 (2678–7296)	–12·4%	99 (58–153)	67 (39–106)	–32·6%
Injuries	**34 068 (24 209–47 034)**	**47 162 (32 958–66 050)**	**38·4%**	**643 (457–887)**	**685 (478–959)**	**6·5%**
Transport injuries	12 062 (8524–16 826)	16 268 (11 304–22 717)	34·9%	228 (161–317)	236 (164–330)	3·8%
Road injury	10 363 (7315–14 487)	13 485 (9362–18 950)	30·1%	195 (138–273)	196 (136–275)	0·1%
Pedestrian injury by road vehicle	3106 (2183–4360)	4520 (3139–6367)	45·6%	59 (41–82)	66 (46–92)	12·0%
Pedal cycle vehicle	755 (536–1056)	1025 (714–1436)	35·7%	14 (10–20)	15 (10–21)	4·4%
Motorised vehicle with two wheels	1750 (1234–2435)	2224 (1529–3133)	27·1%	33 (23–46)	32 (22–45)	–2·2%
Motorised vehicle with three or more wheels	4138 (2901–5793)	5792 (4041–8114)	40·0%	78 (55–109)	84 (59–118)	7·7%
Road injury other	1440 (1 013–2 020)	1196 (824–1673)	–16·9%	27 (19–38)	17 (12–24)	–36·1%
Other transport injury	1699 (1184–2386)	2783 (1902–3872)	63·8%	32 (22–45)	40 (28–56)	26·0%
Unintentional injuries other than transport injuries	19 036 (13 233–26 794)	26 620 (18 472–37 641)	39·8%	359 (250–505)	386 (268–546)	7·6%
Falls	13 324 (9110–18 725)	19 459 (13 559–27 481)	46·0%	251 (172–353)	282 (197–399)	12·4%
Drowning	233 (161–326)	281 (191–391)	20·9%	4 (3–6)	4 (3–6)	–7·0%

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	All ages YLDs (thousands)			YLDs (per 100 000)		
	1990	2010	%Δ	1990	2010	%Δ
(Continued from previous page)						
Fire, heat, and hot substances	1010 (637–1575)	1398 (857–2232)	38·4%	19 (12–30)	20 (12–32)	6·5%
Poisonings	323 (210–470)	417 (276–621)	29·3%	6 (4–9)	6 (4–9)	–0·5%
Exposure to mechanical forces	922 (599–1387)	1021 (662–1490)	10·8%	17 (11–26)	15 (10–22)	–14·7%
Mechanical forces (firearm)	526 (346–784)	467 (305–676)	–11·2%	10 (7–15)	7 (4–10)	–31·7%
Mechanical forces (other)	710 (460–1074)	910 (588–1336)	28·2%	13 (9–20)	13 (9–19)	–1·3%
Adverse effects of medical treatment	585 (401–824)	1088 (727–1537)	85·9%	11 (8–16)	16 (11–22)	43·1%
Animal contact	437 (293–634)	234 (154–329)	–46·4%	8 (6–12)	3 (2–5)	–58·7%
Animal contact (venomous)	355 (233–526)	168 (110–242)	–52·5%	7 (4–10)	2 (2–4)	–63·4%
Animal contact (non-venomous)	82 (55–119)	66 (44–93)	–20·0%	2 (1–2)	1 (1–1)	–38·4%
Unintentional injuries not classified elsewhere	2202 (1484–3108)	2720 (1866–3827)	23·5%	42 (28–59)	39 (27–56)	–4·9%
Self-harm and interpersonal violence	1571 (1066–2188)	1985 (1366–2726)	26·4%	30 (20–41)	29 (20–40)	–2·8%
Self-harm	308 (209–428)	407 (278–577)	32·3%	6 (4–8)	6 (4–8)	1·8%
Interpersonal violence	1263 (840–1775)	1578 (1085–2180)	24·9%	24 (16–33)	23 (16–32)	–3·9%
Assault by firearm	504 (336–714)	587 (404–808)	16·5%	10 (6–13)	9 (6–12)	–10·4%
Assault by sharp object	368 (245–516)	540 (369–743)	46·8%	7 (5–10)	8 (5–11)	12·9%
Assault by other means	543 (362–758)	678 (464–940)	25·0%	10 (7–14)	10 (7–14)	–3·9%
Forces of nature, war, and legal intervention	1399 (903–2080)	2289 (1550–3341)	63·6%	26 (17–39)	33 (22–48)	25·9%
Exposure to forces of nature	173 (110–269)	2187 (1480–3210)	1164·7%	3 (2–5)	32 (21–47)	873·1%
Collective violence and legal intervention	1226 (779–1854)	102 (66–153)	–91·7%	23 (15–35)	1 (1–2)	–93·6%

Data are YLDs (95% uncertainty interval) or percentage change (%Δ). G6PD=glucose-6-phosphate dehydrogenase deficiency. *E coli=Escherichia coli*. *H influenzae=Haemophilus influenzae*. *S pneumoniae=Streptococcus pneumoniae*.

Table 2: **Global years lived with disability (YLDs) for a comprehensive set of 289 causes and select sequelae in 1990 and 2010, for all ages, both sexes combined, and per 100 000**

and ageing scenario is the difference in YLDs due to epidemiological change in age-specific and sex-specific YLDs per person. Each of these three differences is also presented as a percentage change with reference to the 1990 YLD estimate. Further details about the data and methods used for specific causes of YLDs are available on request from the corresponding author.

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Results

Global prevalence for all ages combined in 2010 across the 1160 sequelae varied from fewer than one case per 1 million people to 350 000 cases per 1 million people. 58 sequelae each affected more than 1% of the global population. Table 1 shows the global prevalence of the 50 most common sequelae in 2010. Of these sequelae, four were oral health disorders (dental caries of permanent teeth, chronic periodontitis, dental caries of baby teeth, and edentulism). Four skin diseases were also very common: fungal skin disease, acne vulgaris, pruritus, and eczema; collectively these disorders affected 2·1 billion individuals (table 1). The number of individuals affected by tension-type headaches or migraine was also very large—these neurological causes respectively ranked as the second and third most common. Low back pain, neck pain, other musculoskeletal, and osteoarthritis of the knee were also very common (table 1). Hearing loss affected 1·3 billion people and vision loss affected 661 million people. Two mental and behavioural disorders, anxiety and major depressive disorder, were in the top 30 most common causes. Two respiratory disorders, COPD and asthma, were also highly prevalent. Although prevalences varied substantially across communities, iron-deficiency anaemia affected 14·9% and infection with schistosomiasis affected 3·5% of the world's population. Five of the top 50 most common sequelae affected only one sex: genital prolapse, uterine fibroids, benign prostatic hyperplasia, premenstrual syndrome, and polycystic ovarian disease. Table 1, however, shows prevalences at the level of only sequelae and not at the level of disease or injuries. Disorders such as chronic kidney diseases (CKD) does not appear in the top 30 causes because, at the sequelae level, we have separate estimates for CKD from hypertension, CKD from diabetes, and CKD from other causes.

We detected a huge range of severity across sequelae with similar prevalence when comparing prevalence rate per 100 000 individuals on a log scale for each sequela compared with the average disability weight (appendix p 36). In general, more severe disorders were less common than less severe disorders, but there were notable

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exceptions. The variation in prevalence across disorders extended by more than a factor of 100 000. A weak relation exists when the more common sequelae are milder than the less common sequelae (correlation coefficient –0·37). The lack of a strong association between prevalence and severity plus the substantial number of highly prevalent, but mild, disorders draws attention to why consideration of prevalence of disorders alone is insufficient in quantifying burden of disease. To understand which causes contribute the greatest burden, we need to take into account both prevalence and severity of the health states. The disability weights collected from the general public provide the mechanism by which the highly diverse set of sequelae can be compared by adjusting for severity.[30]

In 2010, there were a total of 777 million YLDs globally, implying an average health loss of 0·11 years per person. By sex, the YLD rate was 10 819 per 100 000 male individuals and 11 755 per 100 000 female individuals, with female individuals accounting for 51·6% of all YLDs globally. Disaggregated into three broad cause groups, 15·3% of YLDs in 2010 were due to communicable, maternal, neonatal, and nutritional disorders, 78·6% to non-communicable diseases, and 6·1% to injuries. The heavy preponderance of YLDs from non-communicable diseases is substantially different from the distribution of years of life lost because of premature mortality (YLLs; 42·8%).[68]

We detected a characteristic pattern of the prevalence of disease adjusted for severity by age and sex at the global level in 2010 (figure 2). This figure provides an analysis using the 21 mutually exclusive and collectively exhaustive cause categories at the second level in the GBD cause list for male and female individuals. In children younger than 5 years, leading causes of YLDs included neonatal disorders, nutritional deficiencies, diarrhoea, lower respiratory infections, other infectious diseases, and neglected tropical diseases and malaria. Beginning at age 10 years and extending to age 65 years, mental and behavioural disorders were a major cause, contributing as much as 36% at age 20–29 years. Nearly as important but with an older age distribution, the other dominant cause was musculoskeletal disorders. The third most important factor in adults was other non-communicable diseases, which includes congenital anomalies, skin diseases, sense organ disorders, and oral disorders (figure 2). Diabetes, urogenital, blood, and endocrine diseases made a progressively larger contribution with age. Neurological disorders (Alzheimer's disease and Parkinson's disease in particular) started to make a major contribution in individuals aged 80 years or older. Chronic respiratory disorders made a substantial contribution in individuals aged 10 years and older, whereas cardiovascular diseases seemed progressively more important at older ages. The long-term cumulative disability from unintentional injuries is also an important factor. This age-sex pattern of the leading causes was very different from the pattern for mortality by cause, which was dominated by causes such as cancers, cardiovascular diseases, HIV and tuberculosis, diarrhoea, pneumonia, and other infectious diseases.[68]

The GBD 2010 includes the assessment of 1160 sequelae, of which 600 are 40 different nature of injury sequelae (such as hip fracture or traumatic brain injury) for each of the 25 external causes of injury (such as falls or road injury). For simplicity of presentation, table 2 shows YLD estimates for all non-fatal health outcomes and some select groupings of sequelae. For example, we estimated YLDs for mild, moderate, and severe anaemia from a variety of causes but the table shows YLDs from all three forms of anaemia. For injuries we show only the YLDs by external cause without giving details for each nature of injury. Furthermore, we show results for both sexes combined for summary age groups (table 2) and the full age and sex detail for 2010 and 1990 (appendix pp 37–270). A substantial number of causes contribute to the overall YLDs at the global level (appendix pp 37–270). The leading causes were low back pain, which contributed 10·7% of total YLDs, and major depressive disorder, which contributed 8·1% of total YLDs. Within the broad category of

	All causes	Communicable, maternal, neonatal, and nutritional disorders	Non-communicable diseases	Injuries
1990 YLDs (thousands)	583 393	113 925	435 400	34 068
YLDs expected with 2010 population, 1990 population age structure, and 1990 YLD rates (thousands)	759 024	158 213	557 726	43 084
YLDs expected with 2010 population, 2010 population age structure, and 1990 YLD rates (thousands)	822 452	150 982	621 220	50 250
2010 YLDs (thousands)	777 401	119 164	611 076	47 162
Percentage change from 1990 due to population growth	30·1%	38·9%	28·1%	26·5%
Percentage change from 1990 due to population ageing	10·9%	–6·3%	14·6%	21·0%
Percentage change from 1990 due to change in YLD rates	–7·7%	–27·9%	–2·3%	–9·1%
Percentage change from 1990 to 2010	33·3%	4·6%	40·3%	38·4%

YLD=years lived with disability.

Table 3: **Decomposition analysis of the change of global years lived with disability (thousands) by level 1 causes from 1990 to 2010 into total population growth, population ageing, and changes in age-specific, sex-specific, and cause-specific years lived with disability rates**

communicable, maternal, neonatal, and nutritional disorders, the most important causes of YLDs included iron-deficiency anaemia, which accounted for 5·5% of all YLDs. Other causes within this group that caused 4 million or more YLDs included tuberculosis, HIV, diarrhoeal diseases, otitis media, malaria, intestinal nematodes, and neonatal disorders. Several neglected tropical diseases caused between 1 million and 4 million YLDs, including schistosomiasis, lymphatic filariasis, and food-borne trematodiases. Although major contributors to YLLs, the entire list of cancers caused a total of 4·5 million YLDs. Cardiovascular and circulatory diseases accounted for 2·8% of all YLDs with ischaemic heart disease and stroke accounting for 60% of the total for the cardiovascular category and the rest distributed across a wide range of causes. Chronic respiratory diseases accounted for 6·3% of global YLDs with the largest contributor being COPD (29·4 million YLDs) followed by asthma with 13·8 million YLDs. YLD rates for COPD have risen since 1990 whereas asthma rates have decreased marginally in this period. Neurological disorders accounted for another 42·9 million YLDs—migraine accounted for more than half of these YLDs.

Mental and behavioural disorders accounted for 22·7% of all YLDs. YLDs for the category as a whole have increased by 37% from 1990 to 2010 from 129 million to 177 million and rates have also increased slightly by 5% over the two decades (from 2440 per 100 000 people to 2564 per 100 000 people). Within this category, six disorders or clusters of disorders accounted for more than 10 million YLDs each. The largest category was depressive disorders: major depressive disorder caused 63 million YLDs and dysthymia caused 11 million YLDs—together accounting for 9·6% of all YLDs. Schizophrenia, alcohol use disorders, drug use disorders, and bipolar disorder accounted for 12·9–16·4 million YLDs. Anxiety disorders were also a major global cause, contributing 3·5% of all YLDs. Another important category of diseases causing YLDs was diabetes, urogenital, blood, and endocrine diseases, which accounted for 56·9 million YLDs. Major causes included diabetes mellitus (20·8 million YLDs), benign prostatic hyperplasia (6·8 million YLDs), gynaecological disorders (10·0 million YLDs), and haemoglobinopathies and haemolytic anaemias (10·2 million YLDs). Together, musculoskeletal disorders caused 21·3% of all YLDs. The main contributors were low back pain (83·1 million YLDs), neck pain (33·6 million YLDs), osteoarthritis (17·1 million YLDs), and the other musculoskeletal category (28·2 million YLDs). Osteoarthritis of the knee accounted for 83% of the total osteoarthritis burden. We included the assessment of 13 separate skin diseases. Collectively they caused 33·7 million YLDs, with the largest cause being eczema followed by acne vulgaris. Many of the skin diseases have low disability weights but because of very high prevalences, they still accounted for a substantial number of YLDs. Oral disorders combined caused 15·0 million YLDs, with about equal shares caused by dental caries, periodontal disease, and edentulism. Injuries collectively caused 6·1% of global YLDs. Falls accounted for 41% of the total YLDs caused by injuries. The other major contributors were road injuries, causing 13·5 million YLDs.

Between 1990 and 2010, the total number of YLDs increased by 194 million—a 33·3% increase. We have decomposed this change into three components (table 3): growth in total population, ageing of the global population, and changes in the YLD rates. We have decomposed change both for YLDs from all causes and also for the three broad cause groups. For YLDs from all causes, population growth alone led to a 30·1% increase in YLDs and population ageing led to a further 10·9% increase in YLDs. Reductions in age-sex specific prevalence rates would have reduced YLDs by 7·7%, leading to an overall increase of about a third. Examination of change by the three broad groups shows distinct patterns. Age-specific and sex-specific YLD rates for communicable, maternal, neonatal, and nutritional disorders have decreased, and alone would have led to a 27·9% decrease in YLDs. Overall, YLDs from this cluster of causes increased, slightly, by 4·6% because of population growth, which increased more in the regions with the highest YLDs from these causes. For non-communicable diseases, the overall increase has been 40·3%, but this increase was driven by both population growth and population ageing, with very small decreases in prevalence rates. For injuries we saw a similar pattern, except that the decrease in age-sex specific rates would have caused a 9·1% decline.

For all causes of YLDs combined, the small decrease expected because of changes in age-specific and sex-specific YLDs per person of 7·7% shown in table 3 can also be seen in figure 3, which shows age-specific YLDs per person in 1990 and 2010 for both sexes. Values in figure 3 can be interpreted as the fraction of health lost to short-term and long-term disabling sequelae in each age group. As expected, the YLDs per person rose with age; YLDs per person aged 5 years were 5·4%, rising to

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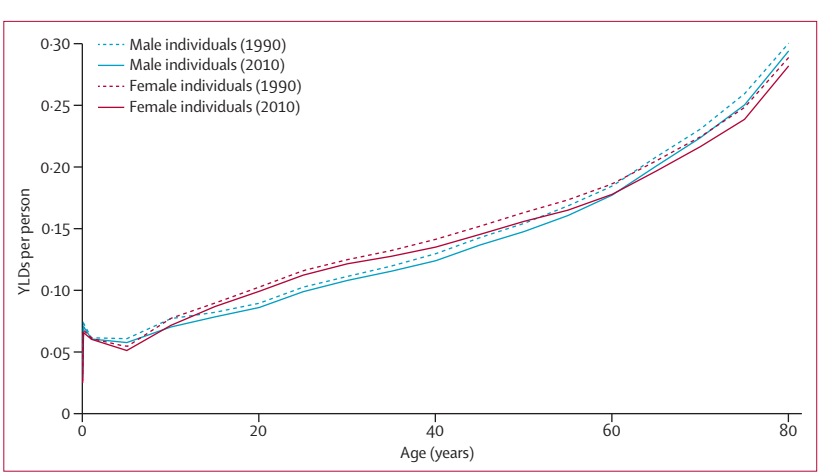

Figure 3: **Global years lived with disability (YLDs) per person in 1990 and 2010 for all ages, by sex**

Cape Town, South Africa (R Matzopoulos MPhil, Prof B M Mayosi DPhil); **Legacy Health System, Portland, Oregon** (J H McAnulty MD); **Northwestern University Feinberg School of Medicine, Evanston, IL, USA** (Prof M M McDermott MD); **National Institute on Psychiatry Ramón de la Fuente, Mexico City, Mexico** (M E Medina-Mora PhD); **Thomas Jefferson University, Philadelphia, PA, USA (M Meltzer MD); College of Medicine, Alfaisal University, Riyadh, Saudi Arabia** (Prof Z A Memish); **Pacific Institute for Research and Evaluation, Calverton, MD, USA (T R Miller PhD); National Institute of Health, Maputo, Mozambique** (Prof A O Mocumbi MD); **University Eduardo Mondlane, Maputo, Mozambique** (Prof A O Mocumbi MD); **Duke University, Durham, NC, USA** (Prof T E Moffitt PhD); **Institute for Maternal and Child Health, IRCCS Burlo Garofolo, Trieste, Italy** (L Monasta DSc, M Montico Msc, L Ronfani PhD, G Tamburlini PhD); **Mailman School of Public Health** (Prof M M Weissman PhD), **Columbia University, New York City, NY, USA** (A Moran MD); **Queensland University of Technology, Brisbane, QLD, Australia** (Prof L Morawska PhD); **National Center for Child Health and Development, Tokyo, Japan** (R Mori MD); **Watford General Hospital, Watford, UK** (M E Murdoch FRCP); **Kemri-Wellcome Trust, Kilifi, Kenya** (M K Mwaniki MBChB); **AVRI, University of KwaZulu-Natal, Durban, South Africa** (Prof K Naidoo PhD); **Centro Studi GISED, Bergamo, Italy** (L Naldi MD); **Charité-Universitätsmedizin Berlin, Berlin, Germany** (S Nolte PhD); **HRB-Clinical Research Facility, National University of Ireland Galway, Galway, Ireland, UK** (M O'Donnell PhD); **Deakin University, Melbourne, VIC, Australia** (Prof R Osborne PhD); **B P Koirala Institute of Health Sciences, Dharan, Nepal** (B Pahari MD); **Betty Cowan Research and Innovation Center, Ludhiana, India** (J D Pandian MD); **Hospital Juan XXIII, La Paz, Bolivia** (A Panozo Rivero MD);

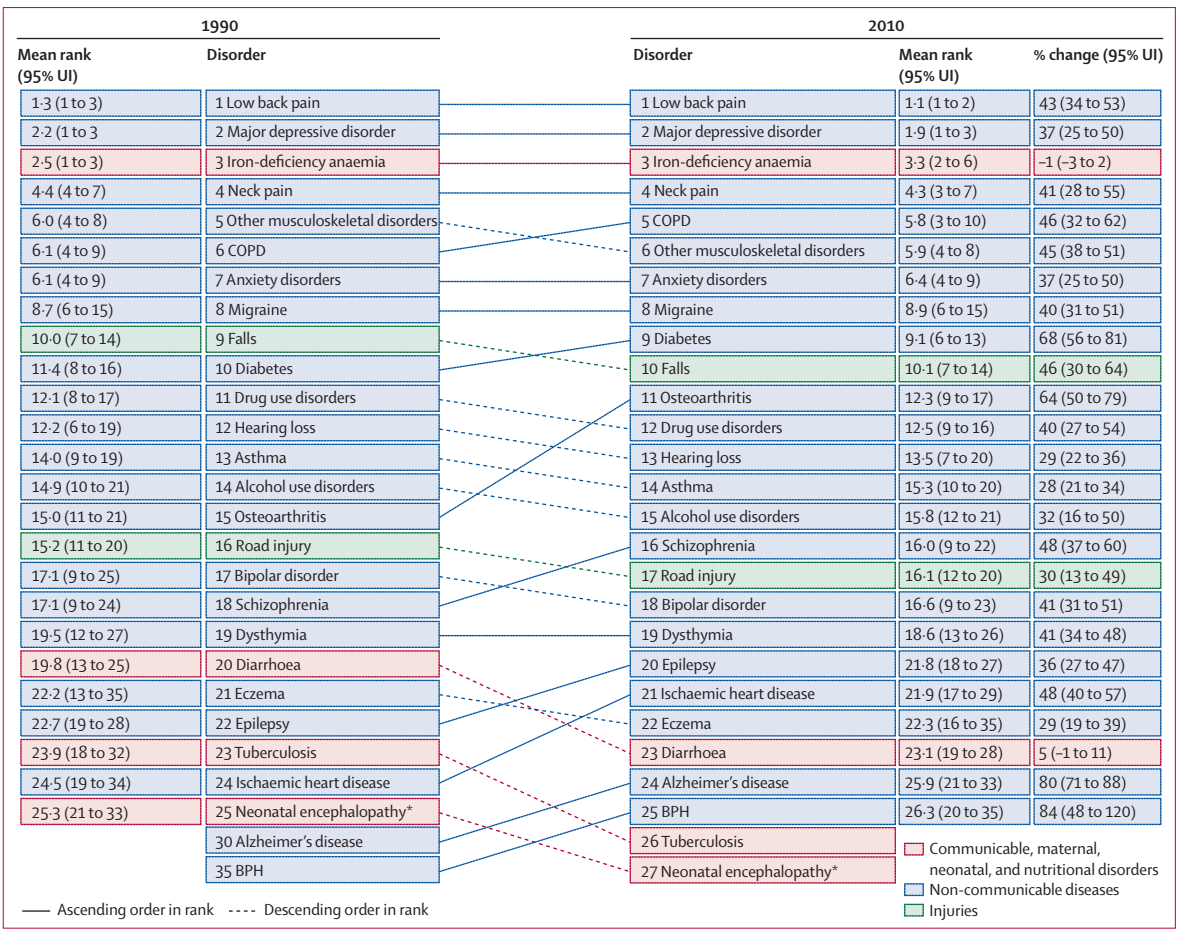

Figure 4: **Global years lived with disability (YLDs) ranks with 95% uncertainty intervals (UI) for the 25 most common causes in 1990 and 2010**
COPD=chronic obstructive pulmonary disease. BPH=benign prostatic hyperplasia. *Includes birth asphyxia/trauma. An interactive version of this figure is available online at http://healthmetricsandevaluation.org/gbd/visualizations/regional.

28·6% (28·2% for women; 29·4% for men) for individuals aged 80 years. Female YLDs per person were higher than male YLDs for individuals aged 10–60 years at the global level; the difference is highest for individuals aged 30 years, when YLDs per woman were 1·4 percentage points higher than YLDs per man. The decrease in overall YLDs per person over the 20 year period (between 1990 and 2010) was much smaller than the approximate 20% decrease in mortality.[68]

Faster rates of increase in YLDs for non-communicable diseases led to their share of total YLDs increasing from 74·6% in 1990 to 78·6% in 2010. Causes are ordered by their mean rank across 1000 draws. The order based on the mean rank across draws is not the same as the order based on the mean value of YLDs. The 25 most common causes in 1990 and 2010 are shown in figure 4. Non-communicable diseases were the most common cause of YLDs (figure 4); 21 of the 25 leading causes are from non-communicable diseases, up from 19 of the 25 most common in 1990. The four leading causes in 2010 were also the four leading causes in 1990: low back pain, major depressive disorder, iron-deficiency anaemia, and neck pain. COPD increased from sixth to fifth, and anxiety and migraine retained the same ranking as in 1990 (figure 4). Other notable changes over the time period include the drop in the ranking of asthma, although the number of YLDs it caused increased by 28%. Road injury YLDs also increased but to a lesser extent than the increase in many of the non-communicable diseases, meaning that it also dropped in the rank list. We detected larger decreases in the rank of diarrhoea and tuberculosis than the other 25 most common causes in 1990.

The appendix (pp 280–88) shows YLDs per person by age and sex for the 21 GBD regions in 2010 and 1990. In general, in almost all age groups, the lowest YLDs per person were in the high-income Asia Pacific and east Asia regions. Western Europe and Australasia had the next lowest levels of YLDs per person, with rates of YLDs typically 10–15% lower than in high-income North America for most age groups. We estimate that the highest levels of YLDs per person were in the Caribbean, Oceania, and sub-Saharan Africa, particularly in the age groups affected by HIV in southern sub-Saharan Africa. The ratio of YLDs per person, comparing regions with the highest

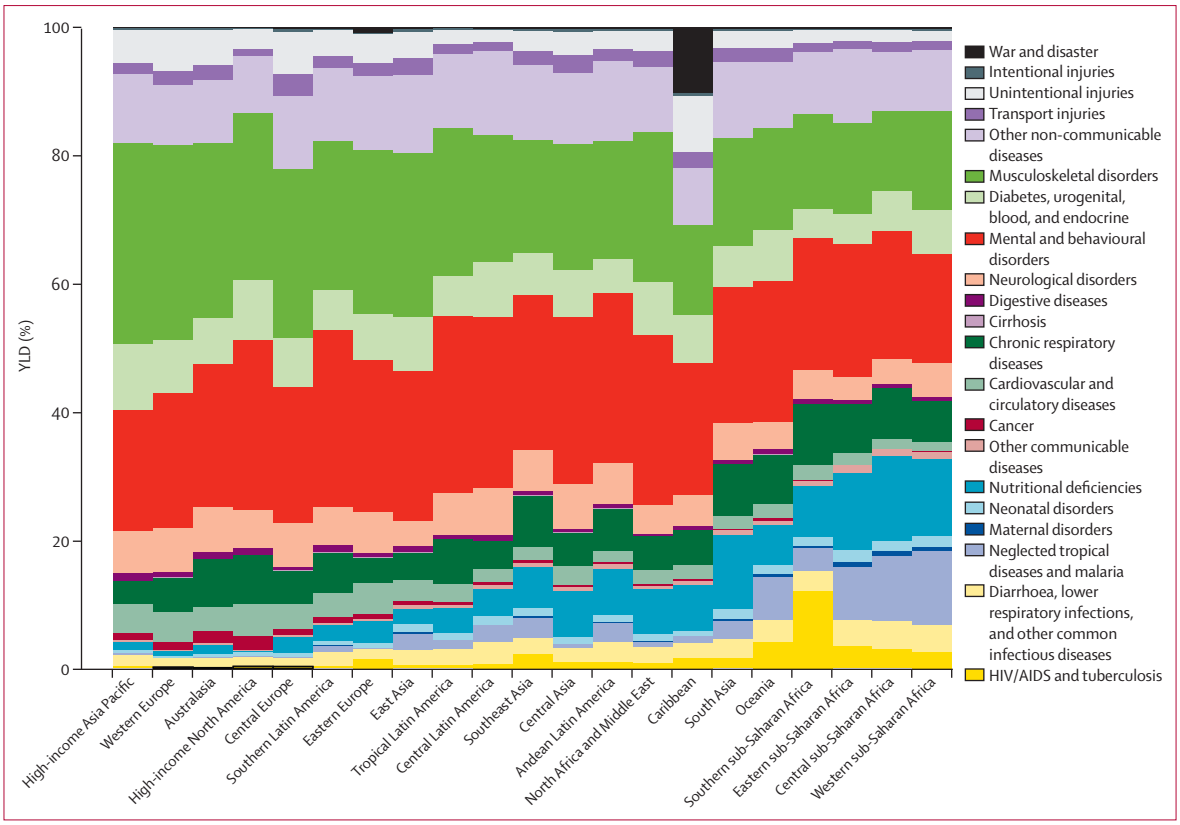

Figure 5: **Percentage of years lived with disability (YLDs) by 21 major cause groupings and region for 2010**
An interactive version of this figure is available online at http://healthmetricsandevaluation.org/gbd/visualizations/regional.

rates to the lowest rates, ranges from 9·71 in post-neonatal boys to 1·39 in men aged 80 years or older. This range is much smaller than we saw for YLLs across the same region-age-sex groups (the highest being 84·90 in male individuals aged 1–4 years and the lowest being 2·04 in male individuals aged 80 years or older).

Figure 5 shows how the broad composition of the causes of YLDs varied by region in 2010. At the 21 cause-group level, which is level 2 in the GBD cause hierarchy,[29] we detected a clear association between the demographic and epidemiological transition. Mental and behavioural, musculoskeletal, other non-communicable, and chronic respiratory causes were consistently important in all regions. Some causes played a much more important part in regions that are less advanced in the demographic and epidemiological transition as measured by the mean age of death.[86] HIV/AIDS and tuberculosis, neglected tropical diseases, and nutritional deficiencies stand out as being the most variable. For example, neglected tropical diseases and malaria ranged from 11·4% of total YLDs in western sub-Saharan Africa to less than 0·01% in high-income North America. Injuries have made a greater contribution to overall disability, in percentage terms, in those regions that are more advanced in the demographic and epidemiological transition. The contribution of stroke and diabetes, urogenital, blood, and endocrine diseases also increased with the demographic and epidemiological transition. Cardiovascular diseases did not contribute more than 5% of YLDs. The large fraction in the Caribbean attributable to war and disaster in 2010 is related to the Haiti earthquake.

Figure 6 shows how the leading causes of YLDs varied by region in 2010. Causes were included if they were in the 25 most common globally or in the 25 most common for any region. By contrast with a similar analysis for YLLs,[68] we recorded much consistency in the ranking of causes of YLDs for the 15 most common causes, with the exception of iron-deficiency anaemia, which was the third most common cause globally. Iron-deficiency anaemia ranged from the most common cause in sub-Saharan Africa (western, eastern, and central) to the 88th most common cause in high-income North America. Other causes that were highly variable across regions included malaria, cataracts, hookworm disease, sickle cell anaemia, thalassaemia, lymphatic filariasis, onchocerciasis, and schistosomiasis. The consistency of ranks for most major causes is related to the comparatively small variation in the prevalence of major mental and behavioural disorders and musculoskeletal disorders across different regions of the world.

Injuries accounted for a total of 47·2 million YLDs in 2010, up from 34·1 million in 1990. Table 2 provides the

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Ranking legend
1–10 11–20 21–30
31–50 51–90 91–176

Cause	Global	High-income Asia Pacific	Western Europe	Australasia	High-income North America	Central Europe	Southern Latin America	Eastern Europe	East Asia	Tropical Latin America	Central Latin America	Southeast Asia	Central Asia	Andean Latin America	North Africa and Middle East	Caribbean	South Asia	Oceania	Southern sub-Saharan Africa	Eastern sub-Saharan Africa	Central sub-Saharan Africa	Western sub-Saharan Africa
Low back pain	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	4	1	2	4	3	3	2
Major depressive disorder	2	4	2	2	2	2	2	2	2	2	1	1	1	1	2	2	3	1	2	2	2	3
Iron-deficiency anaemia	3	26	48	22	88	14	11	10	15	6	6	3	3	3	3	3	2	3	3	1	1	1
Neck pain	4	3	4	3	4	4	3	3	3	3	3	6	5	5	6	8	7	8	6	6	7	5
Chronic obstructive pulmonary disease	5	21	9	10	6	10	8	11	8	12	18	4	8	10	8	16	4	9	5	5	5	7
Other musculoskeletal disorders	6	2	5	4	3	5	4	4	4	8	4	8	7	6	7	12	8	10	8	9	10	11
Anxiety disorders	7	8	6	6	5	6	5	12	12	4	5	7	4	4	4	6	6	7	7	4	6	9
Migraine	8	11	8	8	15	8	13	8	17	7	8	5	6	8	11	10	5	12	10	25	12	8
Diabetes mellitus	9	7	7	11	8	7	12	5	5	13	7	12	9	17	5	5	11	4	18	27	29	23
Falls	10	5	3	5	12	3	7	9	7	16	21	11	11	16	12	11	12	15	20	26	24	26
Osteoarthritis	11	6	13	15	10	9	14	7	6	11	10	17	12	12	10	14	19	14	17	19	26	20
Drug use disorders	12	12	11	9	7	16	6	17	18	9	11	10	14	11	9	13	9	16	12	16	21	21
Other hearing loss	13	13	18	19	20	12	15	14	11	15	15	9	15	14	17	18	10	19	14	10	18	13
Asthma	14	15	12	7	11	21	10	25	39	5	12	18	21	7	13	9	15	11	9	8	8	12
Alcohol use disorders	15	16	17	17	16	18	9	6	9	10	16	20	10	9	35	17	14	13	11	30	33	40
Schizophrenia	16	17	21	13	9	13	16	16	10	14	13	13	16	15	15	19	17	18	16	21	23	19
Road injury	17	19	14	14	27	11	19	15	13	22	22	15	13	19	14	15	13	17	21	24	22	25
Bipolar affective disorder	18	20	19	20	19	19	17	19	14	17	14	16	17	18	16	20	16	20	19	18	25	22
Dysthymia	19	22	20	21	21	20	20	20	16	20	19	19	19	22	19	22	20	23	22	20	31	27
Epilepsy	20	32	33	44	32	25	23	28	31	18	9	21	20	13	20	25	26	24	15	13	17	14
Ischaemic heart disease	21	18	15	18	17	15	22	13	19	21	25	28	18	31	22	27	31	29	34	41	48	37
Eczema	22	24	26	23	25	22	24	24	22	23	17	23	22	20	21	21	22	22	23	17	20	24
Diarrhoeal diseases	23	30	31	31	29	41	27	37	24	25	20	24	25	21	18	23	23	25	25	14	14	15
Alzheimer's disease and other dementias	24	10	10	12	14	17	18	18	26	28	31	40	30	33	41	30	50	69	48	64	67	64
Benign prostatic hyperplasia	25	9	16	16	13	23	25	29	20	31	36	34	42	36	29	36	45	51	47	61	56	57
Tuberculosis	26	38	83	93	102	56	56	34	42	42	56	14	24	27	24	24	18	6	13	22	16	32
Neonatal encephalopathy*	27	62	66	58	55	44	45	45	29	29	30	30	29	30	31	37	24	30	28	15	27	18
Other vision loss	28	27	22	25	26	27	26	27	33	19	24	26	26	23	26	26	34	26	26	34	39	45
Refraction and accommodation disorders	29	74	60	68	75	24	63	21	37	64	51	32	32	41	28	60	21	36	39	35	37	35
Conduct disorder	30	39	42	38	37	38	32	44	30	27	23	31	27	24	25	32	29	27	30	23	30	29
Periodontal disease	31	31	29	26	35	28	21	23	23	24	27	29	28	28	38	46	40	73	45	33	47	50
Cataracts	32	60	46	67	65	30	52	32	49	49	35	25	40	26	33	44	25	52	58	51	66	52
Thalassaemias	33	41	36	37	46	40	47	48	28	38	50	22	33	54	27	68	32	28	42	49	72	51
Dental caries	34	64	59	71	67	29	50	33	25	37	34	33	31	34	32	40	28	34	32	38	38	36
Edentulism	35	28	27	27	28	26	28	22	41	26	33	45	35	29	36	31	37	59	44	55	57	68
HIV/AIDS	36	131	76	89	50	99	62	31	88	61	52	56	76	68	95	34	55	33	1	11	19	16
Cerebrovascular disease	38	14	23	29	18	34	38	26	27	41	53	42	49	64	68	43	61	70	78	94	85	82
Chronic kidney diseases	39	25	25	30	23	33	30	39	38	32	26	37	47	44	46	54	63	66	62	71	74	71
Malaria	41	154	152	146	147	152	158	149	148	101	116	44	158	111	94	93	57	21	74	12	4	4
Iodine deficiency	42	66	45	53	82	37	79	36	59	56	73	51	23	56	23	38	33	31	24	29	15	38
Rheumatoid arthritis	43	23	24	24	24	31	31	35	45	34	40	58	37	38	53	42	58	62	54	63	63	61
Sickle cell disorders	45	51	32	66	22	80	78	100	114	30	29	123	93	81	50	28	52	101	94	44	9	10
Hookworm disease	49	141	163	159	161	162	76	163	32	40	28	27	133	63	89	63	46	5	29	40	34	49
Schistosomiasis	52	163	163	159	161	162	167	163	122	82	152	147	167	169	54	98	171	167	27	7	11	6
Lymphatic filariasis	53	163	163	159	161	162	167	163	171	136	162	62	167	169	128	147	27	63	79	31	58	17
Exposure to forces of nature	62	86	79	77	79	60	65	30	67	76	74	66	59	55	55	1	73	65	68	72	69	66
Food-borne trematodiases	70	69	153	159	161	162	167	137	21	171	170	64	148	25	102	169	163	167	170	154	172	173
Adverse effects of medical treatment	79	63	65	59	53	76	60	41	82	97	86	85	86	83	76	7	91	89	88	93	91	89
Onchocerciasis	97	163	163	159	161	162	167	163	171	171	170	170	167	169	171	169	171	167	170	58	13	43

Figure 6: **Variation in the leading causes of years lived with disability (YLDs), by region, in 2010**
Causes in the figure are ordered according to global ranks for causes. The figure shows all causes that are in the 25 leading causes in at least one region. Ranks are also colour shaded to indicate rank intervals. *Includes birth asphyxia/trauma. An interactive version of this figure is available online at http://healthmetricsandevaluation.org/gbd/visualizations/regional.

results of YLDs for each external cause of injury (see appendix pp 37–270 for more detailed results by age and sex). In terms of external causes, falls and road injuries combined accounted for more than two-thirds (69·8%) of all YLDs due to injuries. YLDs from injuries stem from the nature of the injury rather than the external cause. Figure 7 shows the global breakdown of the nature of injury by age. In terms of the nature of injury that health services should address, 52·3% of YLDs were accounted for by the following: lacerations, multiple wounds, other dislocations, and eye injuries; fractures of the patella, fibula, tibia, or ankle; and moderate-to-severe traumatic brain injury. The number of YLDs from lacerations, multiple wounds, other dislocations, and eye injuries stemmed from the large numbers of people who had this type of injury and the evidence from follow-up studies that some individuals have long-term decreases in functioning. More severe injuries such as spinal cord injury are much less common according to the hospital and non-hospital data for external cause and nature of injury, even though they have more severe long-term consequences for individuals affected. The age pattern shows a slow rise by age of the fraction of the nature of injury due to fractures of the sternum, face, and pelvis. The percentage due to burns decreased with age as did moderate to severe brain trauma. (figure 7).

An important innovation in GBD 2010 was the assessment of selected impairments overall as well as their attribution by cause. The results of the impairment analysis are not easily discernible in table 2 because the burden is distributed across multiple disease or injury sequelae. Anaemia was perhaps the most important of these disorders in terms of its overall contribution to global YLDs. The burden of anaemia overall was large—68·2 million YLDs or almost a tenth (8·8%) of all YLDs worldwide, showing the high prevalence as well as the moderately severe disability weight especially for severe anaemia. By far the most important contributor to this health loss was iron-deficiency anaemia, which accounted for 62·2% of anaemia YLDs globally. However, our assessment of iron-deficiency anaemia was based on the results of iron supplementation trials which by their nature will capture both iron deficiency anaemia due to inadequate dietary intake but also some anaemia due to blood loss that is iron sensitive. The second leading specific cause of anaemia YLDs was thalassaemia (6·7% of total anaemia YLDs) followed by malaria (4·9%). Hookworm and sickle cell anaemia together account for a further 7·2%. Figure 8 shows the YLD rate per 100 000 individuals across regions; YLD rates varied from nearly 2300 in central sub-Saharan Africa to less than 300 in high-income North America. The cause composition of anaemia YLDs also varied across regions. In sub-Saharan Africa, higher anaemia rates were caused mainly by malaria, hookworm, schistosomiasis, sickle cell anaemia, and higher iron-deficiency anaemia. South Asia had the highest rates after sub-Saharan Africa, with the largest contributor being iron-deficiency anaemia. Although in absolute terms not a major cause of global anaemia, chronic kidney diseases accounted for a substantial proportion of anaemia burden in high-income regions.

Left-side and right-side heart failure was another impairment that was included in the GBD cause-sequelae list in many locations. Worldwide, we recorded an estimated 37·7 million cases of prevalent heart failure in 2010, leading to 4·2 million YLDs. This assessment of heart failure includes only symptomatic heart failure and does not include the large number of individuals with pre-symptomatic disease. For those with symptoms, the average disability weight was 0·12, although severity varies widely between individuals. Heart failure was distributed across 17 causes (figure 9). Slightly more than two-thirds (68·7%) of heart failure globally was due to four causes: ischaemic heart disease, COPD, hypertensive heart disease, and rheumatic heart disease. The pattern varied by region: ischaemic heart disease and COPD caused proportionally more YLDs in developed regions, whereas hypertensive heart disease, rheumatic heart disease, and cardiomyopathy and myocarditis made a larger contribution in some developing regions.

Another important cause of global YLDs is blindness and low vision. Overall, visual impairment accounted for 21·1 million YLDs or 2·7% of the global total. Figure 10 shows the main causes of low vision and blindness. The largest global cause of YLDs from vision impairment globally was other vision loss (mainly from trauma, occupational exposures, and idiopathic disorders), which accounted for 29·5% of the total number of vision-loss

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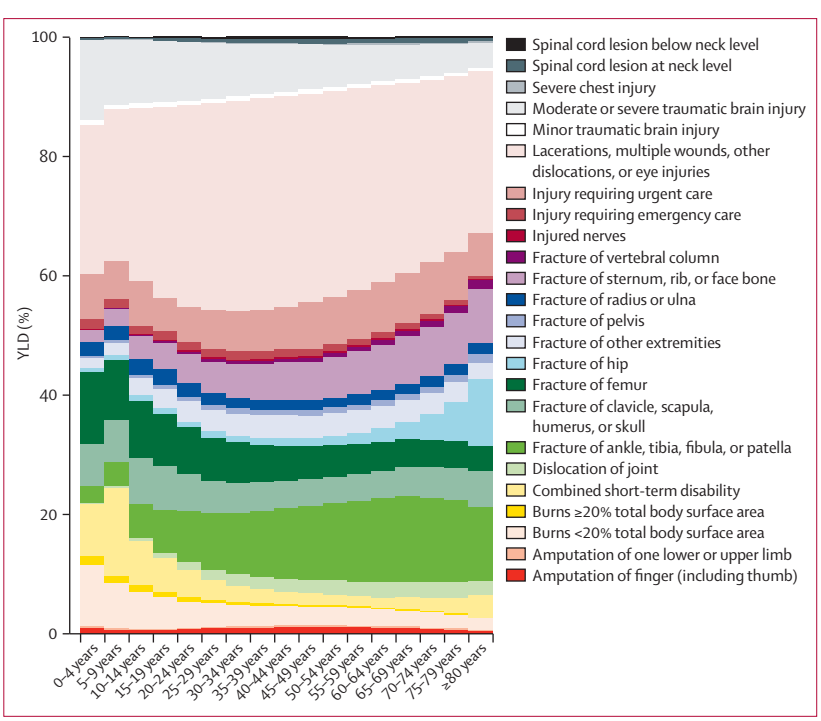

Figure 7: **Global years lived with disability (YLDs) for injury in 2010, by type of injury and age**

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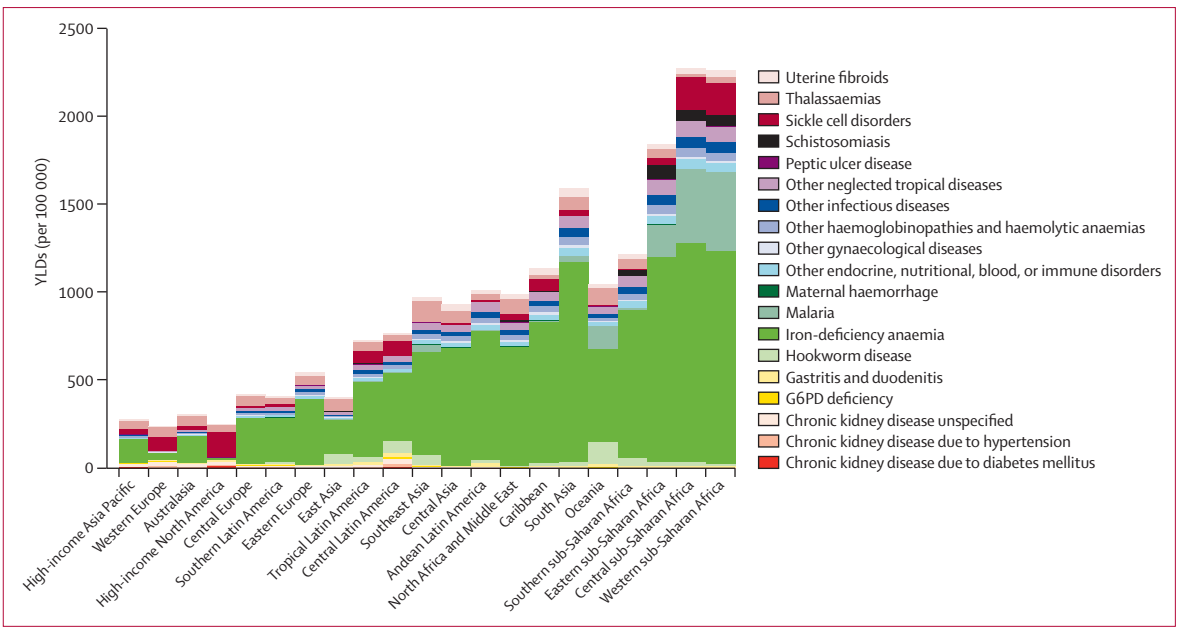

Figure 8: **Years lived with disability (YLD) estimates for anaemia in 2010, by cause and region**

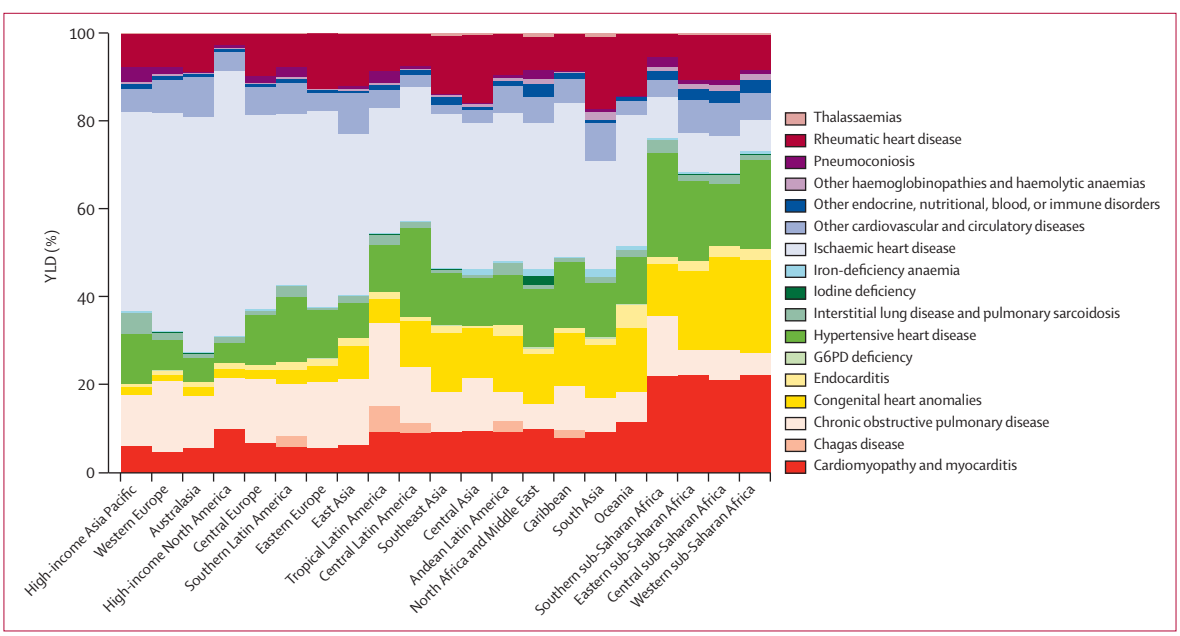

Figure 9: **Years lived with disability (YLD) estimates for heart failure in 2010, by cause and region**

YLDs. Uncorrected refractive error was the second most common cause and accounted for 26·5% of vision impairment. Cataracts were the third largest contributor (22·4% of vision-loss YLDs). Glaucoma and macular degeneration together accounted for a further 10·7%, with trachoma and onchocerciasis accounting for 2·1% of YLDs from vision loss in 2010. Most blindness and low vision YLDs were in individuals aged 45 years or older. We recorded a substantial increase in the absolute number of YLDs from low vision and blindness since 1990, primarily driven by changes in population age structure. The regional pattern shows that in sub-Saharan Africa, uncorrected refractive error, trachoma, onchocerciasis, and vitamin A deficiency play a much greater part than in other regions. As expected in more epidemiologically advanced regions, the composition of causes of blindness and low vision burden was shifted towards macular degeneration, glaucoma, diabetes, and other vision loss.

Hearing impairment accounted for 19·9 million YLDs—2·6% of the total number of YLDs. Adult-onset hearing loss unrelated to a specific disease process accounted for 79·0% of the total YLDs due to hearing

impairment. Other major causes included otitis media, which caused 14·1% of hearing loss YLDs. Smaller causes included congenital hearing loss and meningitis. Of the 19·9 million YLDs due to hearing loss, mild-to-moderate severity accounted for 74·7%, whereas complete hearing loss accounted for only 3·7%. We detected a substantial increase in the number of YLDs due to hearing impairment since 1990, again driven by the ageing of populations.

Intellectual disability and borderline intellectual impairment accounted for 3·1 million YLDs. The prevalence of these disorders were quite low, ranging from 0·5% in high-income Asia Pacific to 2·2% in sub-Saharan Africa and south Asia, with disability weights from 0·003 for mild disorders to 0·149 for profound disorders. Prevalence varied across regions by about two-fold from east sub-Saharan Africa to high-income Asia Pacific. Figure 11 shows YLD rates per 100 000 people across regions by cause. Globally, the main causes of intellectual disability YLDs were idiopathic, Down's syndrome, autism, preterm birth, and other congenital disorders. Some causes, however, were much more important in selected regions, such as meningitis in west and central sub-Saharan Africa and cretinism in south Asia. In terms of YLD rates, the largest variation across regions was from idiopathic causes.

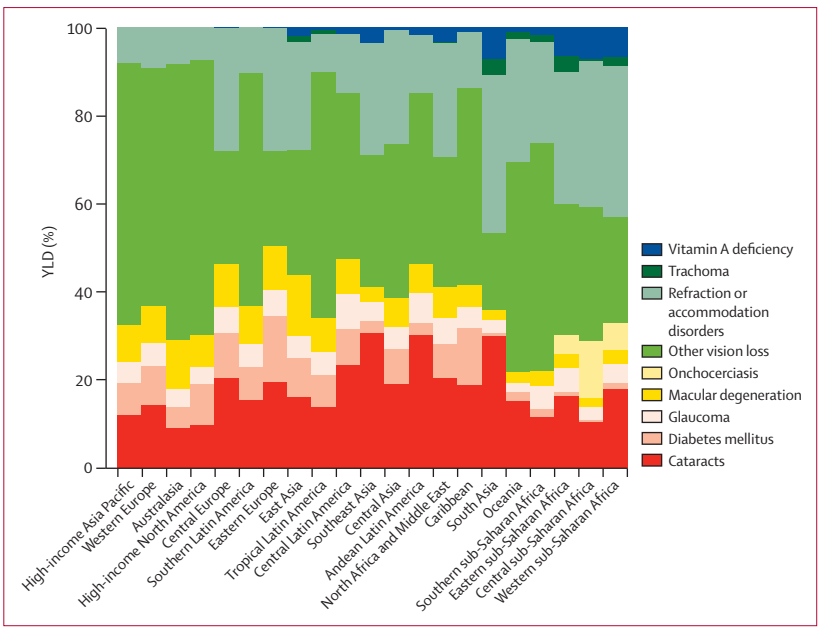

Figure 10: **Years lived with disability (YLD) estimates for vision loss in 2010, by cause and region**

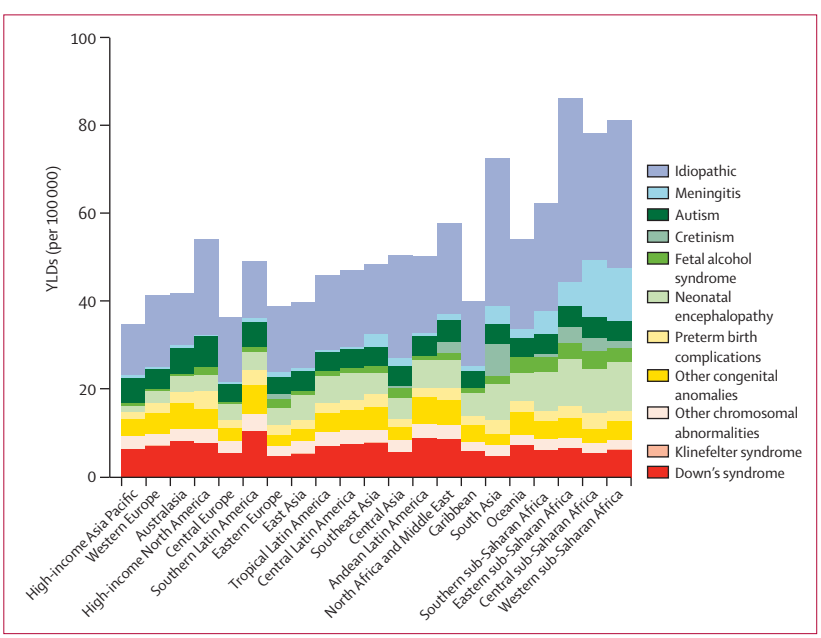

Figure 11: **Years lived with disability (YLDs) estimates for intellectual disability in 2010, by cause and region**

Discussion

We know of no other complete assessment of the prevalence of sequelae from diseases and injuries and their associated YLDs since GBD 1990. Prevalences of the 1160 sequelae ranged by more than a factor of 100 000 from the least to the most common. Taking into account severity, on average, every person in the world had an 11% reduction in their overall health in 2010 because of diseases and injuries. The prevalence of diseases and injuries and YLDs per person increased steadily with age in all regions. We have identified the main causes that contributed to YLDs as mental and behavioural disorders and musculoskeletal disorders. Neurological disorders, chronic respiratory diseases, some neglected tropical diseases, gynaecological disorders, and long-term disability from injuries were also important causes of YLDs. Compared with causes of mortality and years of life lost because of premature mortality, the main drivers of disability were much more consistent across regions. YLDs from non-communicable diseases ranged from 62·0% (central sub-Saharan Africa) to 92·6% (high-income North America) of the total. However, we detected large regional variation when assessing all disorders; the 25 most common disorders in any region included 49 different disorders globally.

There has been much debate in demographic, epidemiological, and gerontological studies about whether the prevalence of morbidity and disability increases or decreases with the epidemiological transition.[87–93] Fries[88] argued that with mortality reduction the onset of disabling chronic illness could be delayed, leading to individuals spending fewer years with morbidity—this hypothesis is known as the compression of morbidity hypothesis. Alternative views have stressed the effect of medical intervention in extending the lifespan of people with disabling disorders,[92] which is commonly referred to as expansion of morbidity. Manton and colleagues[94] argued using self-reported data that the prevalence of disability in elderly people in the USA was decreasing, providing support for the compression hypothesis. Demographic historians have noted the rise in reported morbidity as mortality decreases,[87,89] which could be indicative of a real rise in disease pathology or a changing perception of the

importance of lesser morbidities. The results reported here, constructed from multiple sources for nearly all major contributors to functional impairment, suggest that the prevalence of disability in nearly all regions of the world has been stable over the past two decades. In four regions (the Caribbean, western Europe, high-income North America, and southern sub-Saharan Africa), age-standardised YLDs per person increased, whereas in all other regions they decreased, although in all cases the changes were small. The implications of stable age-specific YLDs per person that steadily rise with age are important. As life expectancy increases, people can expect to spend a greater number of years living with reduced health because the added years are at older ages with increased rates of disability. If compression is defined as a decreasing number of years of life lived with disability, then our findings are not consistent with this hypothesis. Of course, the evidence for some causes of YLDs over time is scarce, which might mean that we did not identify important secular decreases in disability. However, for the leading causes of YLDs, such as major depressive disorder and most musculoskeletal disorders, much available evidence does not suggest clear trends in age-specific prevalences.

We detected a clear difference between patterns of self-rated health and the YLD rate per person estimated in the GBD 2010, which was constructed from a careful assessment of the evidence for 1160 disabling sequelae across regions. Analysis of the general health question in the World Health Survey,[95] for example, suggests that levels of self-reported health are much lower in North America than they are in Africa. Yet we saw that YLDs per person are higher in Africa than they were in North America. The gap between these self-assessments and the results of the GBD derives from several key factors. First, many studies have been done on variations in the use of categorical responses across cultures;[96–98] attempts to correct for this variation (eg, anchoring vignettes) have been proposed and implemented in various surveys.[99,100] Second, in this study, we assumed the health loss, but not the welfare loss, associated with a sequela would be the same over time or across populations. Responses to general health questions could be confounded by other welfare or wellbeing considerations. In this analysis, however, we saw that self-rated functional health status measured using SF-12 or EQ5D survey instruments in cohort follow-up studies provided useful inputs into the assessment of long-term disability after an event and the distribution of severity within a disorder. Yet the same self-rated health data seem problematic when used to compare overall prevalence of functional impairment across linguistic or cultural groups. Our view of the gap is that substantial research will be needed to enhance the cross-population comparability of self-rated health instruments to the point at which they can be useful inputs for the assessment of the level of YLDs across populations.

The largest contributor to global YLDs were mental and behavioural disorders. In this study, the number of mental and behavioural disorders that we included increased from eight in GBD 1990 to 22 in GBD 2010. The present analysis used a much more extensive database than was used for GBD 1990, using data from multiple sources and survey programmes. Prevalence estimates for these disorders are based largely on self-reported symptoms with standardised screening instruments. In GBD 1990 and 2000, we included three specific anxiety disorders: post-traumatic stress disorder, panic disorder, and obsessive-compulsive disorder. On the basis of the high degree of comorbidity across anxiety disorders, we chose to assess the burden of all anxiety disorders but not to provide estimates for specific forms of anxiety disorders. Despite some claims to the contrary,[101,102] our systematic analysis and meta-regression have not detected notable trends in the age-specific prevalences of these disorders overall; a notable exception is the rise in some regions in drug use disorders. The overall YLDs per person due to mental and behavioural disorders ranged from 2·0% in western sub-Saharan Africa to 3·3% in high-income North America. This narrow variation in the estimated YLD rates contrasts with some published analyses of variations in prevalence; the differences stem from both the data sources used and the methods applied for meta-regression.[103] The findings of large and increasing YLDs due to mental and behavioural disorders draws attention to the urgent need for identification and implementation of effective and affordable strategies for this set of problems.

The second largest contributor to YLDs globally and in nearly all regions were musculoskeletal (MSK) disorders. Osteoarthritis (OA) of the knees and hips combined was the third most prevalent MSK disorder, and, because we did not include OA in other joints or the spine, is an underestimate of OA, although the burden of OA in other joints or the spine was captured under the categories of low back pain, neck pain, and other MSK. Low back pain stands out as the leading MSK disorder because of a combination of similarly high prevalence and a greater disability weight associated with this health state. Low back pain was one of the four most common disorders in all regions, and was the leading cause of YLDs in all developed countries; neck pain was also a major contributor in many regions. Low back and neck pain accounted for 70% of all YLDs from musculoskeletal disorders, and for every YLD due to neck pain there were 2·5 YLDs related to low back pain. The burden as estimated here is substantially higher than previously assessed in the GBD 1990 and GBD 2000 rounds of estimations. We believe the estimates presented here are more accurate because the empirical basis for prevalence generated through the systematic reviews and the analysis of survey data such as the World Health Survey is much stronger than in the past and a greater body of data was available for analysis. The increase in burden is also attributable to the higher disability weights that emerged from the disability weight surveys of the general population. Across all countries surveyed, respondents

consistently recorded high levels of health loss caused by pain. These findings combined with the 33·3% increase in YLDs from 1990 to 2010 driven largely by population growth and ageing have important implications for health systems. Health systems will need to develop effective and affordable strategies to respond to this growing and nearly universal burden.

Intellectual disability (ID) accounted for 3·1 million YLDs, or 0·4% of the global total. This magnitude of ID is small compared with some claims about cognitive impairment in developing countries.[102] There are several explanations for this discrepancy. First, the epidemiological data, especially those from low-income settings, are very scarce and our estimations consequently have large uncertainty intervals. Better data collection for ID would help in future revisions to narrow uncertainty intervals. Second, the disability weights selected by the general public for mild, moderate, severe, and profound intellectual disability ranged from 0·031 to 0·157, which were quite low. Some studies of anaemia and of helminth infections have reported evidence of irreversible cognitive deficits associated with these disorders.[103–109] The reversible component of cognitive deficit associated with anaemia that is related to lethargy is captured in the disability weight for anaemia. The important issue, however, is the irreversible component of ID. In this analysis, this burden is classified as idiopathic intellectual disability. In the allocation of ID to different causes, 1·0 million YLDs were allocated to the idiopathic category in developing countries. If there are irreversible cognitive deficits associated with anaemia and helminth infections that lead to affected individuals being classified as disabled, we would capture this health loss in our estimates of intellectual disability. In sub-Saharan Africa and south Asia, the residual category of intellectual disability is larger than in other regions, which might be an indication of the effect of these other disorders. Nevertheless, the number of YLDs from idiopathic intellectual disability is not large enough to substantially change the ranks of the parasitic diseases or nutritional deficiencies presented here. Also, only IQs below 85 are assigned a disability weight so that if parasitic infections or nutritional deficiencies lowered IQ by two or three points in individuals but did not lower them below the threshold of 85, this effect would not be represented here. The disability weight, even for borderline ID (IQs of 70–84), is very small, suggesting that the general public does not consider small IQ reductions as a health loss; although such changes might have important effects on the general welfare of populations.

Hearing impairments accounted for less than 3% of all YLDs, which was a smaller contribution than that estimated in the GBD 2004 revision (4·5%).[8] The main reason for this lower estimate is that disability weights for severe hearing loss are substantially lower in the current study than in the GBD 1990. As discussed by Salomon and colleagues,[30] the main basis for estimation of disability weights comes from population-based surveys in which respondents make a series of paired comparisons between health states presented as brief lay descriptions. For hearing loss, the lay descriptions focused on the hearing impairment itself, excluding other possible outcomes that might accompany severe levels of hearing loss—eg, depression or learning disabilities. So far as these outcomes are part of the construct being measured in the Global Burden of Disease, their exclusion from the descriptions for hearing outcomes would be expected to lower the overall burden estimated for these causes. Furthermore, findings from some studies suggest that hearing loss can itself be a contributor to depression and other outcomes.[110–112] To the extent that these relations are causal, the YLDs estimated in the present study for hearing loss do not capture these relations. These issues might also apply to the YLDs estimated for blindness or low vision.

A study of this magnitude with so many outcomes estimated for many different age-sex-country-years inevitably has many limitations. In view of the GBD philosophy that it is better to make estimates based on the best available evidence than not to make estimates, some YLD figures are based on a restricted database. The uncertainty intervals are meant to convey the strength of the evidence. Nevertheless, there are likely sources of uncertainty that have not been captured. In the GBD 2010 causes of death analysis,[68] we used out-of-sample predictive validity to more objectively quantify the validity of uncertainty intervals. We have not been able to apply this approach to the Bayesian meta-regression step in the YLD analysis for two reasons. First, the meta-regression step with DisMod-MR needed too much computing time to allow for repeated out-of-sample predictive validity testing. Future improvements in computational efficiency might allow such analysis, but at present it is not feasible. Second, data for many disorders are more scarce than they are for causes of death. Out-of-sample predictive validity testing is not very stable when data are very scarce. Another important limitation of the study is the disease and sequelae list itself. Although we included 1160 sequelae, there are many smaller sequelae of diseases and less common diseases that are only captured in the residual categories in the cause list. The estimates for these residual categories are, by their nature, very approximate. Compared with GBD 2000, the percentage of YLDs estimated in these residual categories has decreased from 9·0% to less than 2·0%. Future iterations of the GBD could add more disorders and reduce the uncertainty that stems from the residual categories.

Other limitations of this study include the restricted evidence-base for some disorders for crosswalking (adjusting data inputs based on less desirable study characteristics to the expected level of data inputs from optimally conducted studies) different case definitions or item recall periods such as 12-month versus 1-month recall. These crosswalks are estimated on the basis of a comparison of datapoints identified as having the desirable case definition, recall period, or other study

quality characteristic with values with the less desirable attributes. This approach assumes that the relation between different study attributes is constant across age, sex, and region. In some cases, when such a relation does not exist, we estimated the crosswalks separately by age and sex using data collected with multiple definitions, such as for different decibel thresholds for hearing loss. The idea of using results of studies done with different definitions or diagnostic approaches in the final systematic analysis has substantially expanded the empirical basis available for assessing prevalence across age, sex, and regions. It does, however, draw attention to the importance of investigators publishing or making available data from existing studies using alternative case definitions or diagnostic approaches.

Another limitation of the study is that long-term follow-up data for injuries were available only from high-income countries. Long-term follow-up in developing countries could be different. Because of higher case-fatality rates in such countries, the average severity in surviving cases might be better than it is in high-income countries, if medical and surgical intervention extends the lifespan of those with more severe disabilities. Alternatively, the probability of long-term disability could be higher because of care that lowers mortality but does not restore function as effectively as does care in developed countries.

For the first time, we have adjusted GBD results for YLDs for comorbidity. The analysis of comorbidity, however, has several major limitations. Very few data are available that have been collected with a sufficiently large sample size and covering enough sequelae to estimate the correlation matrix for sequelae prevalence by age. National health information systems that capture detailed ICD-coded encounter data could provide a source of data for this type of analysis in the future. In general, if substantial dependent comorbidity (ie, one disease predisposes a person to be more or less likely to have another disease) exists, our estimates of YLDs might be slightly overestimated.[83] The effect, however, is unlikely to be large because of the validation results seen in the 171 354 respondents in MEPS.[77] In the microsimulation step for each country, age, sex, and year, we used 20 000 simulated individuals, then repeated the microsimulation 1000 times to capture uncertainty in the prevalences of all sequelae and disability weights. The effect of the microsimulation, especially for rare disorders, is to increase the estimated uncertainty in YLDs. For most disorders, this increase in uncertainty is small, but it can be quite substantial for rare disorders. The comorbidity process will tend to overestimate uncertainty in uncommon disorders. There are many potential uses of the comorbidity results of the GBD other than correction to YLD calculations. For instance, estimations of the expected number of individuals with multiple disorders might be useful for health planning purposes. We expect that comorbidity will be an important area for future burden research.

Consideration of comorbidity has put more emphasis on understanding the distribution of severity of disease. We directly model combinations of disorders and their effect on individual disability weights; to avoid double-counting, severity distributions for each disorder need to be estimated either controlling for comorbidity or in individuals without comorbidities, although the latter might be intractably affected by selection bias. In either case, the available data are limited. Datasets like the MEPS[77] that collect repeated observations over time on functional health status and collect ICD-coded information on multiple conditions can be extremely useful for future assessments of severity. Other data collection strategies are possible but future burden of disease research needs to foster new data collection that provides direct assessments of severity distributions. Studies of severity need also to take into account that individuals might be asymptomatic for some time, and to quantify this as part of the protocol. In datasets in which clinical diagnoses can be verified, more routine collection of information using a standard self-reported functional health status instrument will enhance their utility.

In view of the fact that there is almost no relation between the prevalence of a sequela and the severity of the sequela as captured in the disability weights, recognition that our results depend on the validity of the disability weights themselves is crucial. Some disability weights have changed substantially compared with GBD 1990 weights, such as for blindness or profound hearing loss. Elsewhere, Salomon and colleagues[30] describe the methods used to measure the GBD 2010 disability weights in multiple populations around the world. The shift to the use of samples of the general population, rather than small panels of health-care professionals as used for the GBD 1990 disability weights, we believe strengthens the findings presented here. Nevertheless, the crucial mechanism by which the general public can assess the level of health for different health states is through brief descriptions in lay language. Salomon and colleagues[30] lay out a future research agenda to better understand how alternative lay descriptions of health states might affect the resulting disability weight.

One important function for health information systems should be to provide national decision makers with timely information about the burden of non-fatal health outcomes. The GBD 2010 analysis of YLDs provides important insights into which types of data can be informative for assessing non-fatal health outcomes. Not surprisingly, there is an important role for household surveys that involve interviews and the collection of blood and other functional tests (eg, hearing, vision, and lung function). Making sure a household survey collects data with a general functional health status instrument and collects information on a broad array of sequelae can make such data collection opportunities even more valuable. Building on the analysis of YLDs and YLLs as well, construction of a household interview and examination

survey instrument that can capture the main sources of disease burden would be useful. The detail in the GBD 2010 now makes this approach feasible. Beyond household surveys, however, we have seen that ICD-coded hospital discharge and ambulatory care data, when individual records are available and other sociodemographic data have been collected, can be very valuable, especially if these datasets can be linked. Disease registries for cancer, renal disease, and congenital anomalies have also been an important resource, drawing attention to the importance of tracking individuals with chronic disorders over time who come into contact with health services.

Health priorities have, for much of the past 100 years or more, been largely driven by the imperative of improving the survival of populations, particularly child survival. This was justified, in view of the availability of technologies to treat and prevent childhood illness. However, societies also spend substantial resources on keeping people healthy, not only on keeping them alive into old age, so the availability of strategies to monitor their effectiveness in doing so is important. In this Article, we have shown that quantification of health loss in populations is possible, using comparable metrics that identify the leading causes of non-fatal illness in different regions, at different ages, and at different points in time. The principal findings, namely that mental health, musculoskeletal health, and the rising importance of diabetes need urgent policy responses, are well established. Monitoring progress in reducing the effect of these, and other major contributors to health loss, is as important for improving population health as monitoring progress against the leading causes of death. YLDs provide a convenient framework and metric to do so; ensuring the routine availability of data collection suitable for computation of these measures of health loss should be a key focus of national health information system strategies.

Contributors

CJLM, ADL, and TV prepared the first draft. TV, AF, MN, RL, CM, ME, KS, JS, ADL, and CJLM finalised the draft on the basis of comments from all other authors and reviewer feedback. CJLM and ADL had the idea for the study and provided overall guidance. All other authors developed cause-specific models, reviewed results, provided guidance on the selection of key covariates, and reviewed the paper.

Conflicts of interest

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