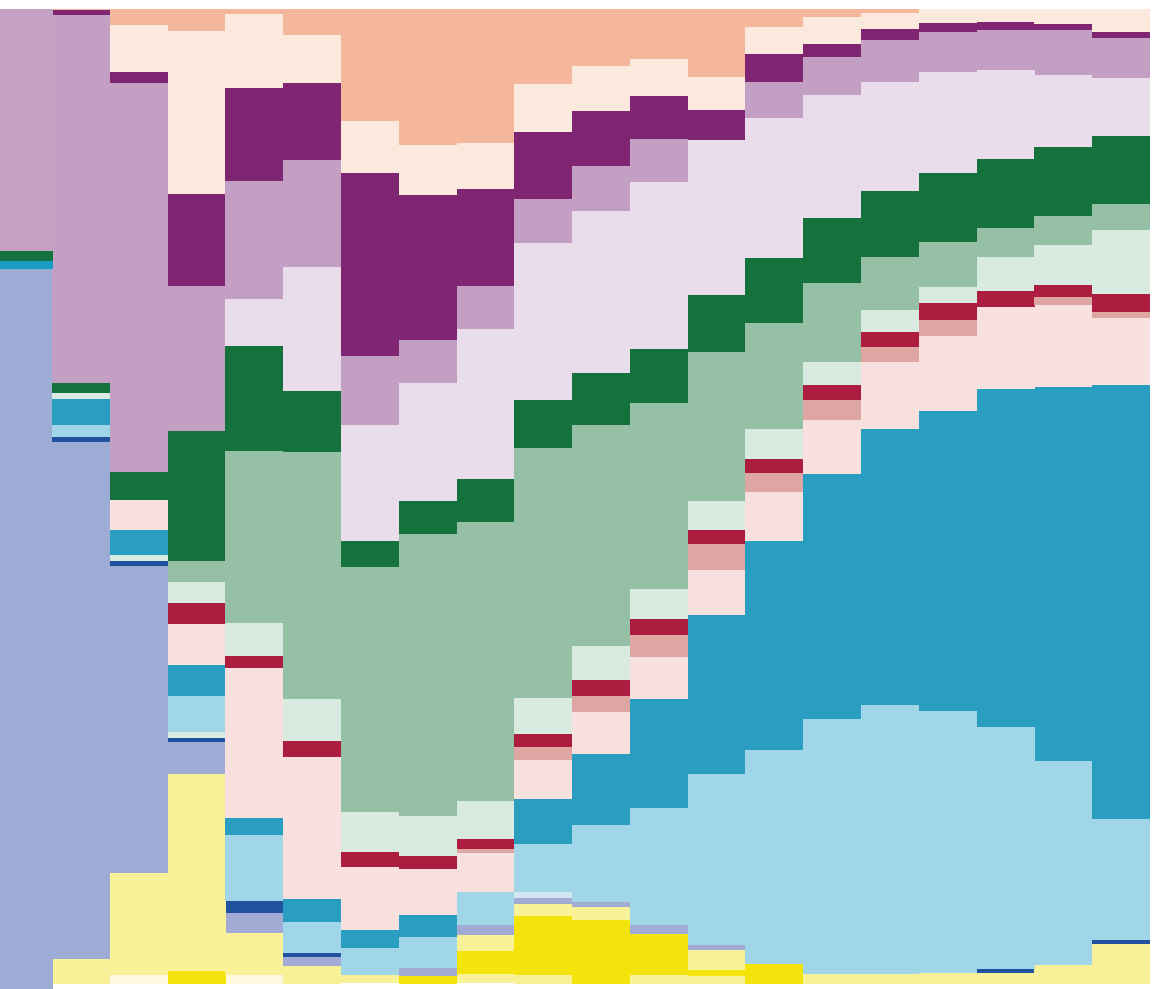# THE GLOBAL BURDEN OF DISEASE:
GENERATING EVIDENCE,
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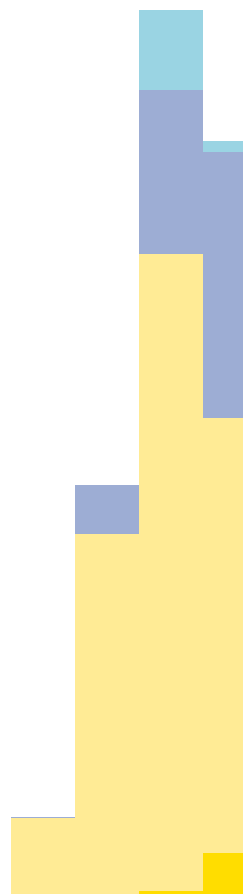INSTITUTE FOR HEALTH METRICS AND EVALUATION   UNIVERSITY OF WASHINGTON

The Global Burden of Disease:

Generating Evidence,
Guiding Policy

INSTITUTE FOR HEALTH METRICS AND EVALUATION   **UNIVERSITY OF WASHINGTON**

GBD

THE GLOBAL BURDEN OF DISEASE: GENERATING EVIDENCE, GUIDING POLICY

ABOUT IHME

The Institute for Health Metrics and Evaluation (IHME) is an independent global health research center at the University of Washington that provides rigorous and comparable measurement of the world's most important health problems and evaluates the strategies used to address them. IHME makes this information freely available so that policymakers have the evidence they need to make informed decisions about how to allocate resources to best improve population health.

To express interest in collaborating, participating in GBD training workshops, or receiving updates of GBD or copies of this publication, please contact IHME at:

Institute for Health Metrics and Evaluation
2301 Fifth Ave., Suite 600
Seattle, WA 98121
USA

Telephone: +1-206-897-2800
Fax: +1-206-897-2899
E-mail: comms@healthmetricsandevaluation.org

www.healthmetricsandevaluation.org

INTRODUCTION

Over the last two decades, the global health landscape has undergone rapid transformation. People around the world are living longer than ever before, and the population is getting older. The number of people in the world is growing. Many countries have made remarkable progress in preventing child deaths. As a result, disease burden is increasingly defined by disability instead of premature mortality. The leading causes of death and disability have changed from communicable diseases in children to non-communicable diseases in adults. Eating too much has overtaken undernutrition as a leading risk factor for illness. These global trends differ across regions, and nowhere is this contrast more striking than in sub-Saharan Africa. Communicable, maternal, nutritional, and newborn diseases continue to dominate throughout sub-Saharan Africa.

The Global Burden of Disease (GBD) approach is a systematic, scientific effort to quantify the comparative magnitude of health loss due to diseases, injuries, and risk factors by age, sex, and geography for specific points in time. The latest iteration of that effort, the Global Burden of Diseases, Injuries, and Risk Factors Study 2010 (GBD 2010), was published in *The Lancet* in December 2012. The intent is to create a global public good that will be useful for informing the design of health systems and the creation of public health policy. It estimates premature death and disability due to 291 diseases and injuries, 1,160 sequelae (direct consequences of disease and injury), and 67 risk factors for 20 age groups and both sexes in 1990, 2005, and 2010. GBD 2010 produced estimates for 187 countries and 21 regions. In total, the study generated nearly 1 billion estimates of health outcomes.

GBD 2010 was a collaborative effort among 488 researchers from 50 countries and 303 institutions. The Institute for Health Metrics and Evaluation (IHME) acted as the coordinating center for the study. The collaborative strengthened both the data-gathering effort and the quantitative analysis by bringing together some of the foremost minds from a wide range of disciplines. Our intention is to build on this collaborative by enlarging the network in the years to come. Similarly, IHME and its collaborators hope to expand the list of diseases, injuries, and risk factors included in GBD and routinely update the GBD estimates. Continual updates will ensure that the international community can have access to high-quality estimates in the timeliest fashion. Through sound measurement, we can provide the foundational evidence that will lead to improved population health.

Box 1: History of the Global Burden of Disease and innovations in GBD 2010

The first GBD study was published as part of the World Development Report 1993. This original study generated estimates for 107 diseases, 483 sequelae (non-fatal health consequences), eight regions, and five age groups.

The authors' inspiration for the study came from the realization that policymakers lacked comprehensive and standardized data on diseases, injuries, and potentially preventable risk factors for decision-making. A second source of inspiration was the fact that disease-specific advocates' estimates of the number of deaths caused by their diseases of interest far exceeded the total number of global deaths in any given year. GBD authors chose to pursue a holistic approach to analyzing disease burden to produce scientifically sound estimates that were protected from the influence of advocates.

The GBD 1990 study had a profound impact on health policy as it exposed the hidden burden of mental illness around the world. It also shed light on neglected health areas such as the premature death and disability caused by road traffic injuries. Work from this study has been cited over 4,000 times since 1993.

The study also sparked substantial controversy. Many disease-specific advocates argued that the original GBD underestimated burden from the causes they cared about most. The use of age weighting and discounting also caused extensive debates. Age weighting assumed that a year of life increased in value until age 22, and then decreased steadily. Discounting counted years of healthy life saved in the present as more valuable than years of life saved in the future. Also controversial was the use of expert judgment to estimate disability weights (estimations of the severity of non-fatal conditions). As a result of this feedback and consultation with a network of philosophers, ethicists, and economists, GBD no longer uses age weighting and discounting. Also, GBD 2010 updated its methods for determining disability weights and used data gathered from thousands of respondents from different countries around the world.

GBD 2010 shares many of the founding principles of the original GBD 1990 study, such as using all available data on diseases, injuries, and risk factors; using comparable metrics to estimate the impact of death and disability on society; and ensuring that the science of disease burden estimation is not influenced by advocacy.

Despite these similarities, GBD 2010 is broader in scope and involved a larger number of collaborators than any previous GBD study. While the original study had the participation of 100 collaborators worldwide, GBD 2010 had 488 co-authors. Thanks to that network, the study includes vast amounts of data on health outcomes and risk factors. Researchers also made substantial improvements to the GBD methodology, described in detail in the "Methods" section and in the published studies. Among these improvements, highlights include using data collected via population surveys to estimate disability weights for the first time, greatly expanding the list of causes and risk factors analyzed in the study, detailed analysis of the effect of different components of diet on health outcomes, and reporting of uncertainty intervals for all metrics. GBD 2010 researchers reported uncertainty intervals to provide full transparency about the weaknesses and strengths of the analysis. Narrow uncertainty intervals indicate that evidence is strong, while wide uncertainty intervals show that evidence is weaker.

THE GBD APPROACH TO TRACKING HEALTH PROGRESS AND CHALLENGES

For decision-makers striving to create evidence-based policy, the GBD approach provides numerous advantages over other epidemiological studies. These key features are further explored in this report.

A CRITICAL RESOURCE FOR INFORMED POLICYMAKING

To ensure a health system is adequately aligned to a population's true health challenges, policymakers must be able to compare the effects of different diseases that kill people prematurely and cause ill health. The original GBD study's creators developed a single measurement, disability-adjusted life years (DALYs), to quantify the number of years of life lost as a result of both premature death and disability. One DALY equals one lost year of healthy life. DALYs will be referred to by their acronym, as years of healthy life lost, and years lost due to premature death and disability throughout this publication. Decision-makers can use DALYs to quickly assess the impact caused by conditions such as cancer versus depression using a comparable metric. Considering the number of DALYs instead of causes of death alone provides a more accurate picture of the main drivers of poor health. Thanks to the use of this public health monitoring tool, GBD 2010 researchers found that in most countries as mortality declines, disability becomes increasingly important. Information about changing disease patterns is a crucial input for decision-making, as it illustrates the challenges that individuals and health care providers are facing in different countries.

One DALY equals one lost year of healthy life.

In addition to comparable information about the impact of fatal and non-fatal conditions, decision-makers need comprehensive data on the causes of ill health that are most relevant to their country. The hierarchical GBD cause list, seen in the Annex, has been designed to include the diseases, injuries, and sequelae that are most relevant for public health policymaking. To create this list, researchers reviewed epidemiological and cause-of-death data to identify which diseases and injuries resulted in the most ill health. Inpatient and outpatient records were also reviewed to understand the conditions for which patients sought medical care. For example, researchers added chronic kidney disease to the GBD cause list after learning that this condition accounted for a large number of hospital visits and deaths.

GBD provides high-quality estimates of diseases and injuries that are more credible than those published by disease-specific advocates. GBD was created in part due to researchers' observation that deaths estimated by different disease-specific studies added up to more than 100% of total deaths when summed. The GBD approach ensures that deaths are counted only once. First, GBD counts the total number of deaths in a year. Next, researchers work to assign a single cause to each death using a variety of innovative methods (see the "Methods" section). Estimates of cause-specific mortality are then compared to estimates of deaths from all causes to

ensure that the cause-specific numbers do not exceed the total number of deaths in a given year. Other components of the GBD estimation process are interconnected with similar built-in safeguards, such as for the estimation of impairments that are caused by more than one disease.

Beyond providing a comparable and comprehensive picture of causes of premature death and disability, GBD also estimates the disease burden attributable to different risk factors. The GBD approach goes beyond risk-factor prevalence, such as the number of smokers or heavy drinkers in a population. With comparative risk assessment, GBD incorporates both the prevalence of a given risk factor as well as the relative harm caused by that risk factor. It counts premature death and disability attributable to high blood pressure, tobacco and alcohol use, lack of exercise, air pollution, poor diet, and other risk factors that lead to ill health.

The flexible design of the GBD machinery allows for regular updates as new data are made available and epidemiological studies are published. Similar to the way in which a policymaker uses gross domestic product data to monitor a country's economic activity, GBD can be used at both the global and national levels to understand health trends over time.

The flexible design of the GBD machinery allows for regular updates.

Policymakers in Brazil, Norway, Saudi Arabia, and the United Kingdom are exploring collaborations with IHME to adopt different aspects of the GBD approach. Box 3 contains decision-makers' and policy-influencers' reflections about the value of using GBD tools and results to inform policy discussions.

GBD data visualization tools on the IHME website allow users to interact with the results in a manner not seen in past versions of the study. Users of the visualization tools report that they provide a unique, hands-on opportunity to learn about the health problems that different countries and regions face, allowing them to explore seemingly endless combinations of data. The following list illustrates the range of estimates that can be explored using the GBD data visualization tools:

- Changes between 1990 and 2010 in leading causes of death, premature death, disability, and DALYs as well as changes in the amount of health loss attributable to different risk factors across age groups, sexes, and locations.
- Rankings for 1990 and 2010 of the leading causes of death, premature death, disability, DALYs, and health loss attributable to risk factors across different countries and regions, age groups, and sexes.
- Changes in trends for 21 cause groups in 1990 and 2010 in different regions, sexes, and metrics of health loss.
- The percentage of deaths, premature deaths, disability, or DALYs in a country or region caused by myriad diseases and injuries for particular age groups, sexes, and time periods.
- The percentage of health loss by country or region attributable to specific risk factors by age group, sex, and time period.

In addition to promoting understanding about the major findings of GBD, these visualization tools can help government officials build support for health policy changes, allow researchers to visualize data prior to analysis, and empower teachers to illustrate key lessons of global health in their classrooms.

THE EGALITARIAN VALUES INHERENT IN GBD

When exploring the possibility of incorporating GBD measurement tools into their health information systems, policymakers should consider the egalitarian values on which this approach is founded.

The core principle at the heart of the GBD approach is that everyone should live a long life in full health. As a result, GBD researchers seek to measure the gap between this ideal and reality. Calculation of this gap requires estimation of two different components: years of life lost due to premature death (YLLs) and years lived with disability (YLDs).

To measure years lost to premature death, GBD researchers had to answer the question: "How long is a 'long' life?" For every death, researchers determined that the most egalitarian answer to this question was to use the highest life expectancy observed in the age group of the person who died. The "Methods" section contains more information about the estimation of YLLs.

In order to estimate years lived with disability, or YLDs, researchers were confronted with yet another difficult question: "How do you rank the severity of different types of disability?" To determine the answer, researchers created disability weights based on individuals' perceptions of the impact on people's lives from a particular disability, everything from tooth decay to schizophrenia.

Box 2: Key terms

Years of life lost (YLLs): *Years of life lost due to premature mortality.*

Years lived with disability (YLDs): *Years of life lived with any short-term or long-term health loss.*

Disability-adjusted life years (DALYs): *The sum of years lost due to premature death (YLLs) and years lived with disability (YLDs). DALYs are also defined as years of healthy life lost.*

Healthy life expectancy, or health-adjusted life expectancy (HALE): *The number of years that a person at a given age can expect to live in good health, taking into account mortality and disability.*

Sequelae: *Consequences of diseases and injuries.*

Health states: *Groupings of sequelae that reflect key differences in symptoms and functioning.*

Disability weights: *: Number on a scale from 0 to 1 that represents the severity of health loss associated with a health state.*

Uncertainty intervals: *A range of values that is likely to include the correct estimate of health loss for a given cause. Limited data create substantial uncertainty.*

Box 3: Views on the value of GBD for policymaking

"While the GBD 2010 offers significant epidemiologic findings that will shape policy de-bates worldwide, it also limns the gaps in existing disease epidemiology knowledge and offers new ways to improve public health data collection and assessment." **Paul Farmer,** *Chair, Department of Global Health and Social Medicine, Harvard Medical School*

"If we look at sub-Saharan Africa, you've got the double burden of communicable dis-eases and the rising instances of non-communicable diseases. The dilemma will be how to deal with the non-communicable diseases without compromising what you've already been doing for communicable diseases." **Christine Kaseba-Sata,** *First Lady of Zambia*

"At UNICEF we've always had a focus on metrics and outcomes as a driver of the work we do. We welcome the innovation, energy, and attention that this work is bringing to the im-portance of holding ourselves accountable to meaningful outcomes and results." **Mickey Chopra,** *UNICEF Chief of Health/Associate Director of Programmes*

METHODS

The analytical strategy of GBD

The GBD approach contains 18 distinct components, as outlined in Figure 1. The components of GBD are interconnected. For example, when new data is incorpo-rated into the age-specific mortality rates analysis (component 2), other dependent components must also be updated, such as rescaling deaths for each cause (compo-nent 5), healthy life expectancy, or HALE (component 12), YLLs (component 13), and estimation of YLLs attributable to each risk factor (component 18). The inner work-ings of key components are briefly described in this publication, and more detailed descriptions of each component are included in the published articles.

Estimating age- and sex-specific mortality

Researchers identified sources of under-5 and adult mortality data from vital and sample registration systems as well as from surveys that ask mothers about live births and deaths of their children and ask people about siblings and their survival. Researchers processed that data to address biases and estimated the probability of death between ages 0 and 5 and ages 15 and 60 using statistical models. Finally, researchers used these probability estimates as well as a model life table system to estimate age-specific mortality rates by sex between 1970 and 2010.

Estimating years lost due to premature death

Researchers compiled all available data on causes of death from 187 countries. Information about causes of death was derived from vital registration systems, mortality surveillance systems, censuses, surveys, hospital records, police records, mortuaries, and verbal autopsies. Verbal autopsies are surveys that collect informa-tion from individuals familiar with the deceased about the signs and symptoms the person had prior to death. GBD 2010 researchers closely examined the complete-ness of the data. For those countries where cause of death data were incomplete, researchers used statistical techniques to compensate for the inherent biases. They also standardized causes of death across different data sources by mapping different versions of the International Classification of Diseases (ICD) coding system to the GBD cause list.

Next, researchers examined the accuracy of the data, scouring rows and rows of data for "garbage codes." Garbage codes are misclassifications of death in the data, and researchers identified thousands of them. Some garbage codes are instances where we know the cause listed cannot possibly lead to death. Examples found in records include "abdominal rigidity," "senility," and "yellow nail syndrome." To correct these, researchers drew on evidence from medical literature, expert judg-ment, and statistical techniques to reassign each of these to more probable causes of death.

After addressing data-quality issues, researchers used a variety of statistical models to determine the number of deaths from each cause. This approach, named CODEm (Cause of Death Ensemble modeling), was designed based on statistical techniques called "ensemble modeling." Ensemble modeling was made famous by the recipi-ents of the Netflix Prize, BellKor's Pragmatic Chaos, in 2009, who engineered the best algorithm to predict how much a person would like a film, taking into account their movie preferences.

To ensure that the number of deaths from each cause does not exceed the total number of deaths estimated in a separate GBD demographic analysis, researchers apply a correction technique named CoDCorrect. This technique makes certain that estimates of the number of deaths from each cause do not add up to more than 100% of deaths in a given year.

Figure 1: The 18 components of GBD and their interrelations

After producing estimates of the number of deaths from each of the 235 fatal outcomes included in the GBD cause list, researchers then calculated years of life lost to premature death, or YLLs. For every death from a particular cause, research- ers estimated the number of years lost based on the highest life expectancy in the deceased's age group. For example, if a 20-year-old male died in a car accident in South Africa in 2010, he has 66 years of life lost, that is, the highest remaining life expectancy in 20-year-olds, as experienced by 20-year-old females in Japan.

Figure 2: Leading causes of global death and premature death, 2010
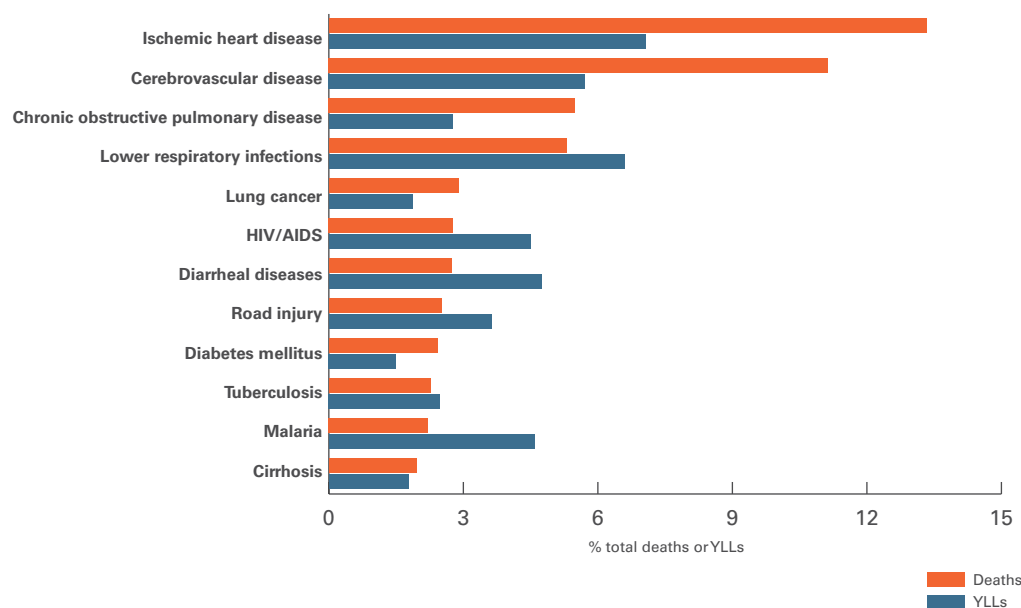
When comparing rankings of the leading causes of death versus YLLs, YLLs place more weight on the causes of death that occur in younger age groups, as shown in Figure 2. For example, malaria represents a greater percentage of total YLLs than to- tal deaths since it is a leading killer of children under age 5. Ischemic heart disease, by contrast, accounts for a smaller percentage of total YLLs than total deaths as it primarily kills older people.

Estimating years lived with disability
Researchers estimated the prevalence of each sequela using different sources of data, including government reports of cases of infectious diseases, data from population-based disease registries for conditions such as cancers and chronic kidney diseases, antenatal clinic data, hospital discharge data, data from outpatient facilities, interview questions, and direct measurements of hearing, vision, and lung- function testing from surveys and other sources.

Confronted with the challenge of data gaps in many regions and for numerous types of sequelae, they developed a statistical modeling tool named DisMod-MR (Disease Modeling–Metaregression) to estimate prevalence using available data on incidence, prevalence, remission, duration, and extra risk of mortality due to the disease.

Researchers estimated disability weights using data collected from almost 14,000 respondents via household surveys in Bangladesh, Indonesia, Peru, Tanzania, and the United States. Disability weights measure the severity of different sequelae that result from disease and injury. Data were also used from an Internet survey of more than 16,000 people. GBD researchers presented different lay definitions of sequelae grouped into 220 unique health states to survey respondents, and respondents were then asked to rate the severity of the different health states. The results were simi- lar across all surveys despite cultural and socioeconomic differences. Respondents consistently placed health states such as mild hearing loss and long-term treated fractures at the low end of the severity scale, while they ranked acute schizophrenia and severe multiple sclerosis as very severe.

Finally, years lived with disability, or YLDs, are calculated as prevalence of a sequela multiplied by the disability weight for that sequela. The number of years lived with disability for a specific disease or injury are calculated as the sum of the YLDs from each sequela arising from that cause.

Estimating disability-adjusted life years
DALYs are calculated by adding together YLLs and YLDs. Figure 3 compares the 10 leading diseases and injuries calculated as percentages of both global deaths and global DALYs. This figure also shows the top 10 risk factors attributable to deaths and DALYs worldwide. It illustrates how a decision-maker looking only at the top 10 causes of death would fail to see the importance of low back pain, for example, which was a leading cause of DALYs in 2010. DALYs are a powerful tool for priority setting as they measure disease burden from non-fatal as well as fatal conditions. Yet another reason why top causes of DALYs differ from leading causes of death is that DALYs give more weight to death in younger ages. As another example, road injuries and diarrhea cause a greater percentage of total DALYs than total deaths because DALYs capture both premature death and disability from these causes. In contrast, stroke causes a much larger percentage of total deaths than DALYs as it primarily impacts older people.

Estimating DALYs attributable to risk factors
To estimate the number of healthy years lost, or DALYs, attributable to potentially avoidable risk factors, researchers collected detailed data on exposure to different risk factors. The study used data from sources such as satellite data on air pollu- tion, breastfeeding data from population surveys, and blood and bone lead levels from medical examination surveys and epidemiological surveys. Researchers then collected data on the effects of risk factors on disease outcomes through systematic reviews of epidemiological studies.

Figure 3: The 10 leading diseases and injuries and 10 leading risk factors based on percentage of global deaths and DALYs, 2010
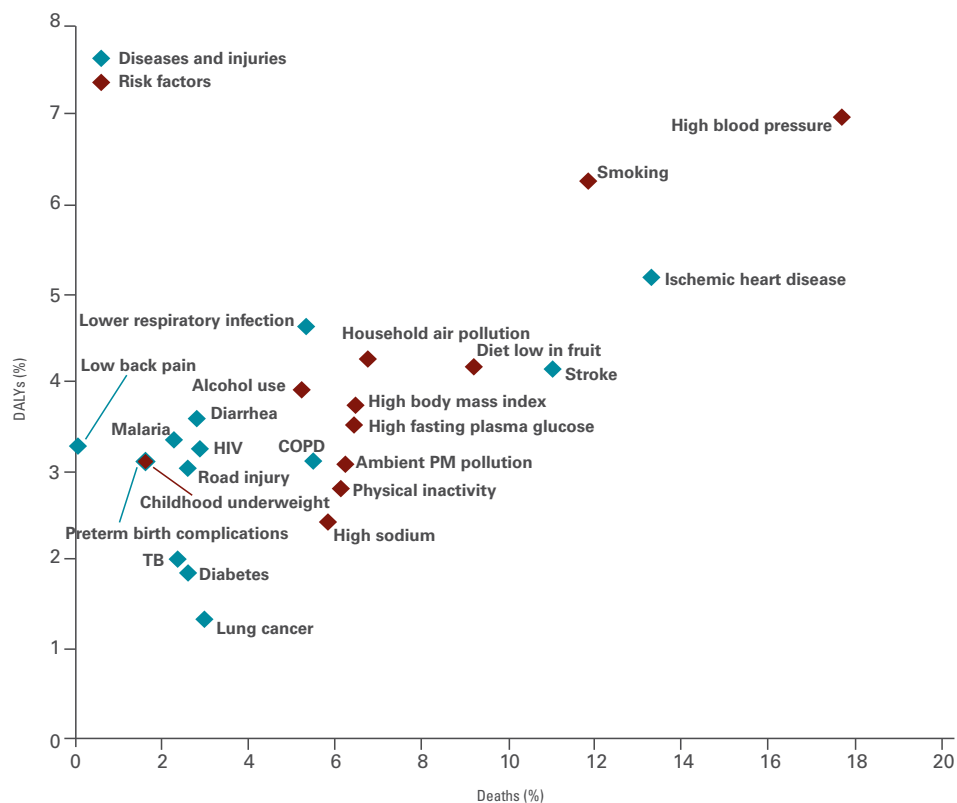
All risk factors analyzed met common criteria in four areas:

1. The likely importance of a risk factor for policymaking or disease burden.
2. Availability of sufficient data to estimate exposure to a particular risk factor.
3. Rigorous scientific evidence that specific risk factors cause certain diseases and injuries.
4. Scientific findings about the effects of different risk factors that are relevant for the general population.

To calculate the number of DALYs attributable to different risk factors, researchers compared the disease burden in a group exposed to a risk factor to the disease burden in a group that had zero exposure to that risk factor. When subjects with zero exposure were impossible to find, as in the case of high blood pressure, for example, researchers established a level of minimum exposure that leads to the best health outcomes.

RAPID HEALTH TRANSITIONS: GBD 2010 RESULTS

GBD 2010 found that the leading causes of premature death and disability, or DALYs, have evolved dramatically over the past 20 years. Figure 4 shows the changes in the leading causes of DALYs in 1990 and 2010. Communicable, newborn, maternal, and nutritional causes are shown in red, non-communicable diseases appear in blue, and injuries are shown in green. Dotted lines indicate causes that have fallen in rank during this period, while solid lines signal causes that have risen in rank.

Causes associated with ill health and death in adults, such as ischemic heart disease, stroke, and low back pain, increased in rank between 1990 and 2010, while causes that primarily affect children, such as lower respiratory infections, diarrhea, preterm birth complications, and protein-energy malnutrition, decreased in rank. Unlike most of the leading communicable causes, HIV/AIDS and malaria increased by 351% and 21%, respectively. Since 2005, however, premature mortality and disability from these two causes have begun to decline. Four main trends have driven changes in the leading causes of DALYs globally: aging populations, increases in non-communicable diseases, shifts toward disabling causes and away from fatal causes, and changes in risk factors.

Box 4: GBD data visualization tools

For the first time in the history of GBD research, IHME has developed many free data visualization tools that allow individuals to explore health trends for different countries and regions. The visualization tools allow people to view GBD estimates through hundreds of different dimensions. Only a few examples are explored in the figures throughout this document. We encourage you to visit the IHME website to use the GBD data visualization tools and share them with others.

To use the GBD data visualization tools, visit www.ihmeuw.org/GBDcountryviz

Figure 4: Global disability-adjusted life year ranks, top 25 causes, and percentage change, 1990-2010

| 1990		2010		
Mean rank (95% UI)	Disorder	Disorder	Mean rank (95% UI)	% change (95% UI)
1·0 (1 to 2)	1 Lower respiratory infections	1 Ischemic heart disease	1·0 (1 to 2)	29 (22 to 34)
2·0 (1 to 2)	2 Diarrhea	2 Lower respiratory infections	2·0 (1 to 3)	-44 (-48 to -39)
3·4 (3 to 5)	3 Preterm birth complications	3 Cerebrovascular disease	3·2 (2 to 5)	19 (5 to 26)
3·8 (3 to 5)	4 Ischemic heart disease	4 Diarrhea	4·9 (4 to 8)	-51 (-57 to -45)
5·2 (4 to 6)	5 Cerebrovascular disease	5 HIV/AIDS	6·6 (4 to 9)	351 (293 to 413)
6·3 (5 to 8)	6 COPD	6 Malaria	6·7 (3 to 11)	43 (34 to 53)
8·0 (6 to 13)	7 Malaria	7 Low back pain	6·7 (3 to 11)	21 (-9 to 63)
9·9 (7 to 13)	8 Tuberculosis	8 Preterm birth complications	8·0 (5 to 11)	-27 (-37 to -16)
10·2 (7 to 14)	9 Protein-energy malnutrition	9 COPD	8·1 (5 to 11)	-2 (-8 to 5)
10·3 (7 to 15)	10 Neonatal encephalopathy	10 Road injury	8·4 (4 to 11)	34 (11 to 63)
11·3 (7 to 17)	11 Road injury	11 Major depressive disorder	10·8 (7 to 14)	37 (25 to 50)
11·8 (8 to 15)	12 Low back pain	12 Neonatal encephalopathy	13·3 (11 to 17)	-17 (-30 to -1)
12·9 (8 to 16)	13 Congenital anomalies	13 Tuberculosis	13·4 (11 to 17)	-19 (-34 to -6)
15·0 (8 to 18)	14 Iron-deficiency anemia	14 Diabetes	14·2 (12 to 16)	69 (58 to 77)
15·2 (11 to 18)	15 Major depressive disorder	15 Iron-deficiency anemia	15·2 (11 to 22)	-3 (-6 to -1)
15·3 (3 to 36)	16 Measles	16 Neonatal sepsis	15·9 (10 to 26)	-3 (-25 to 27)
15·4 (8 to 24)	17 Neonatal sepsis	17 Congenital anomalies	17·3 (14 to 21)	-28 (-43 to -9)
17·3 (15 to 19)	18 Meningitis	18 Self-harm	18·8 (15 to 26)	24 (0 to 42)
20·0 (17 to 26)	19 Self-harm	19 Falls	19·7 (16 to 25)	37 (20 to 55)
20·7 (18 to 26)	20 Drowning	20 Protein-energy malnutrition	20·0 (16 to 26)	-42 (-51 to -33)
21·1 (18 to 25)	21 Diabetes	21 Neck pain	21·1 (14 to 28)	41 (28 to 55)
23·1 (19 to 28)	22 Falls	22 Lung cancer	21·8 (17 to 27)	36 (18 to 47)
24·1 (21 to 30)	23 Cirrhosis	23 Cirrhosis	23·0 (19 to 27)	28 (19 to 36)
25·1 (20 to 32)	24 Lung cancer	24 Other musculoskeletal disorders	23·1 (19 to 26)	50 (43 to 57)
25·3 (18 to 34)	25 Neck pain	25 Meningitis	24·4 (20 to 27)	-22 (-32 to -12)
	29 Other musculoskeletal disorders	32 Drowning		
	33 HIV/AIDS	56 Measles		

☐ Communicable, newborn, nutritional, and maternal
☐ Non-communicable
☐ Injuries

—— Ascending order in rank
---- Descending order in rank

Note: UI = uncertainty interval.

MOST OF THE WORLD'S POPULATION IS LIVING LONGER AND DYING AT LOWER RATES

In much of the world, GBD 2010 found that people are living to older ages than ever before, and the entire population is getting older. Since 1970, the average age of death has increased 35 years. Figure 5 illustrates the dramatic changes that have occurred in Asia and Latin America. In East Asia, which includes China, the Democratic People's Republic of Korea, and Taiwan, people lived 36 years on average in 1970, increasing to 66 years in 2010. The average age of death increased from 31 to 63 in tropical Latin America, which includes Brazil and Paraguay. People in the Middle East and North Africa lived 30 years longer on average in 2010 than they did in 1970.

Figure 5: Average age of death, 1970 compared with 2010
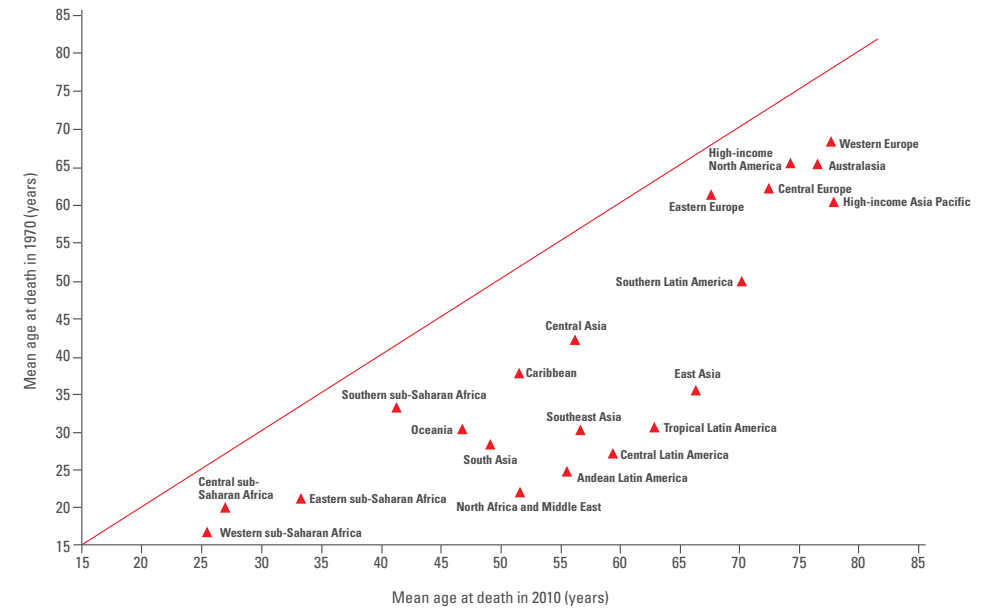
Sub-Saharan Africa has not made nearly as much progress as other developing regions, and people in this part of the world tend to die at much younger ages than in any other region. Eastern sub-Saharan Africa made the most progress out of the four sub-Saharan African regions, with people living on average 12 years longer in 2010 than they did in 1970. In western, southern, and central sub-Saharan Africa, the average age at death has risen by less than 10 years. Compared to the rest of the developing world, progress in sub-Saharan Africa has in particular been held back by the HIV/AIDS epidemic, maternal deaths, and child mortality caused by infectious diseases and malnutrition. Some of those trends are changing, though. Over the past decade, sub-Saharan African regions have made encouraging strides in reducing child mortality and in lowering mortality from HIV/AIDS and malaria. These successes are explored elsewhere in this report.

Another way to understand changes in global demographic trends is to explore reductions in mortality rates by sex and age group. Figure 6 shows how death rates have declined in all age groups between 1970 and 2010. These changes have been most dramatic among males and females aged 0 to 9 years, whose death rates have dropped over 60% since 1970. Among age groups 15 and older, the decrease in female death rates since 1970 has been greater than the drop in male death rates. The gap in progress between men and women was largest between the ages of 15 to 54, most likely due to the persistence of higher mortality from injuries among men.

Figure 6: Global decline in age-specific mortality rate, 1970-2010

Figure 7: Global shifts in leading causes of DALYs, 1990-2010
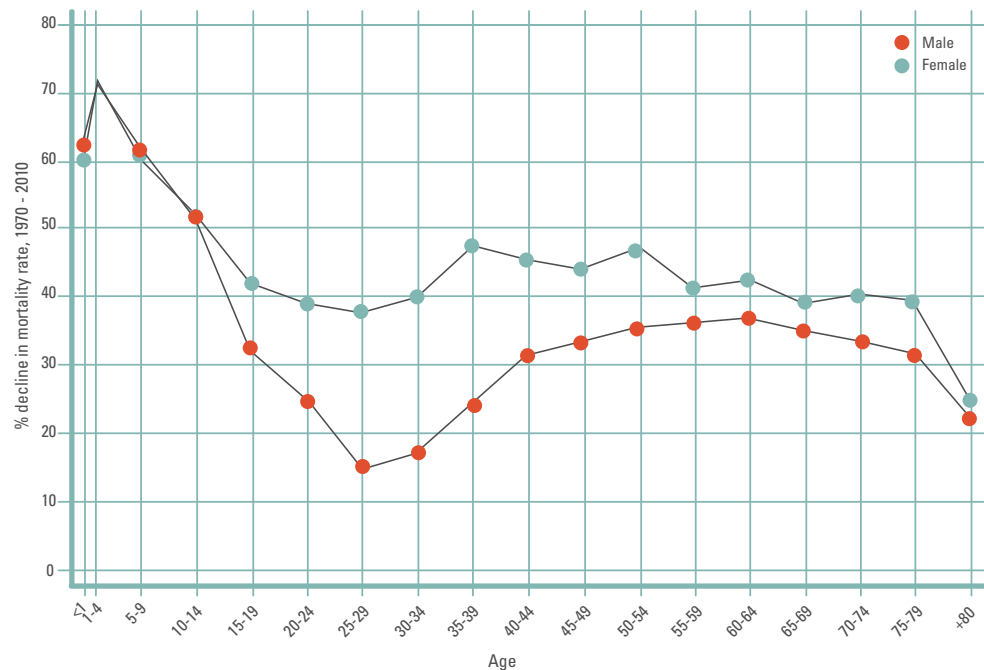
LEADING CAUSES OF DEATH ARE SHIFTING TO NON-COMMUNICABLE DISEASES

In part because many people are living longer lives and the population is growing older, the leading causes of death have changed. Worldwide, the number of people dying from non-communicable diseases, such as ischemic heart disease and diabetes, has grown 30% since 1990. Population aging and, to a lesser extent, overall population growth also contributed to this increase in deaths from non-communicable diseases. At the same time, the death rate from non-communicable diseases decreased over this period from 645.9 deaths per 100,000 people to 520.4, which is an indication that the world is making progress in this area.

The rise in the total number of deaths from non-communicable diseases has increased the number of healthy years lost, or DALYs, from these conditions. Figure 7 shows changes in the 25 leading causes of DALYs between 1990 and 2010 ordered from highest to lowest ranking cause from left to right. Non-communicable causes are shown in blue; communicable, nutritional, maternal, and newborn causes in red; and injuries in green.
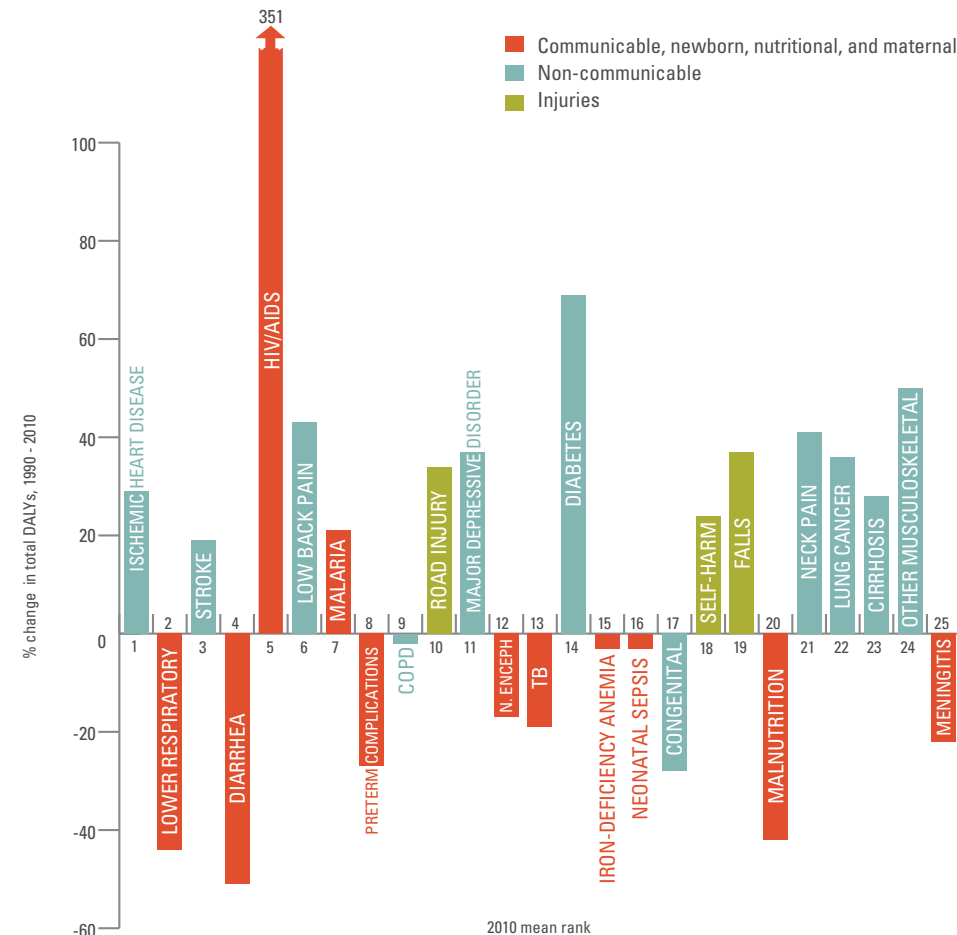
Figure 7 shows that among non-communicable diseases, diabetes and different types of musculoskeletal disorders such as low back and neck pain increased the most between 1990 and 2010.

In many countries, non-communicable diseases account for the majority of DALYs. Figure 8 shows the percent of healthy years lost from this disease group by country in 2010. In most countries outside of sub-Saharan Africa, non-communicable diseases caused 50% or more of all healthy years lost, or DALYs. In Australia, Japan, and richer countries in Western Europe and North America, the percentage was greater than 80%.

Figure 8: Percent of global DALYs due to non-communicable diseases, 2010
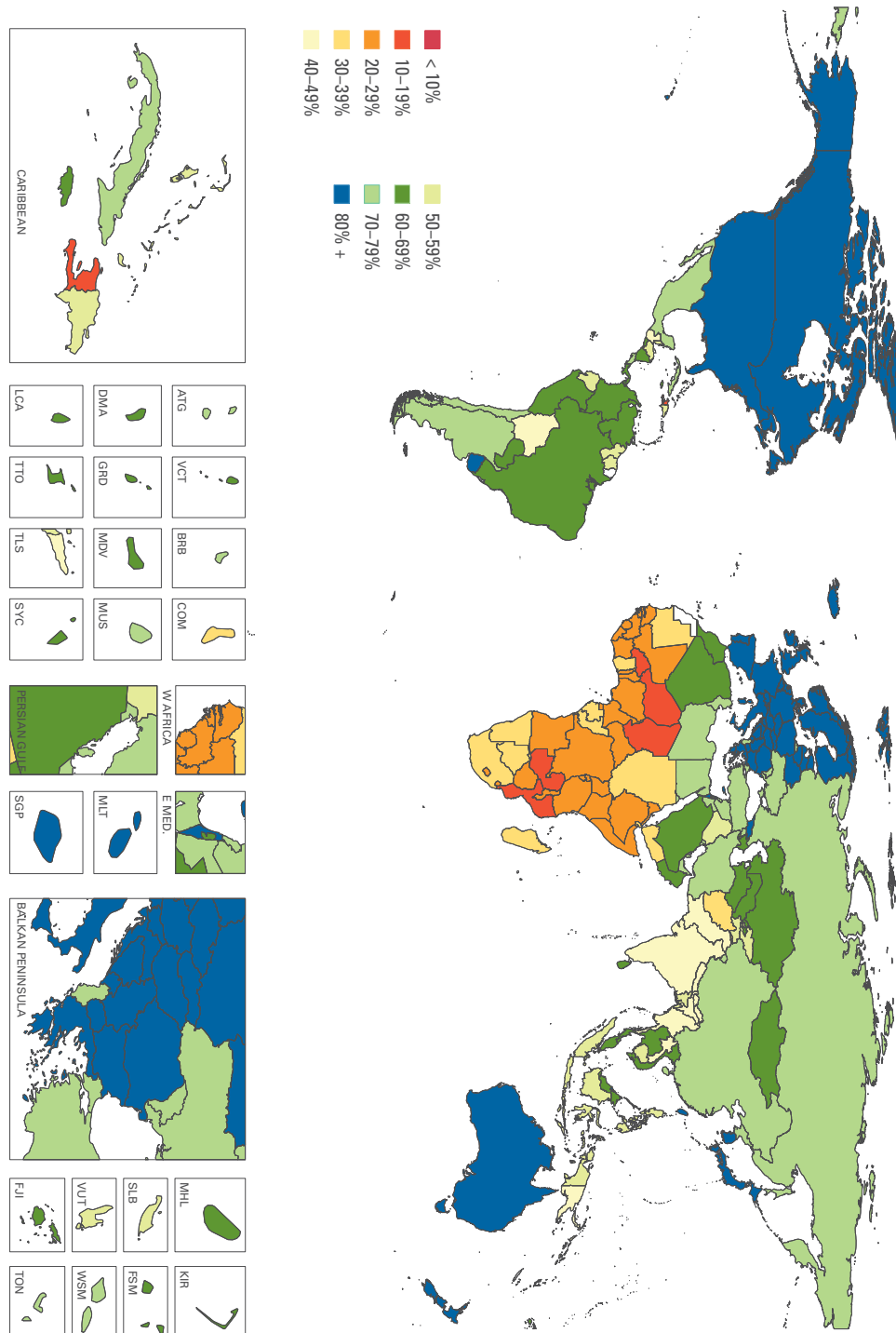
An in-depth look at the country-level data reveals the specific diseases that are driving overall shifts from communicable to non-communicable diseases. As an example, Figure 9 displays the changes in the top 25 causes of DALYs in Mexican women between 1990 and 2010. The top causes are organized by ranking from left to right. Most non-communicable diseases rose over time, while communicable, new-born, nutritional, and maternal conditions have fallen during this period. Among the top five causes in 2010, chronic kidney disease increased the most (211%), followed by other musculoskeletal conditions and diabetes, which grew 88% and 75% each. Among communicable, nutritional, newborn, and maternal conditions, lower respiratory infections and diarrheal diseases experienced the most dramatic declines, falling by 65% and 83%, respectively.

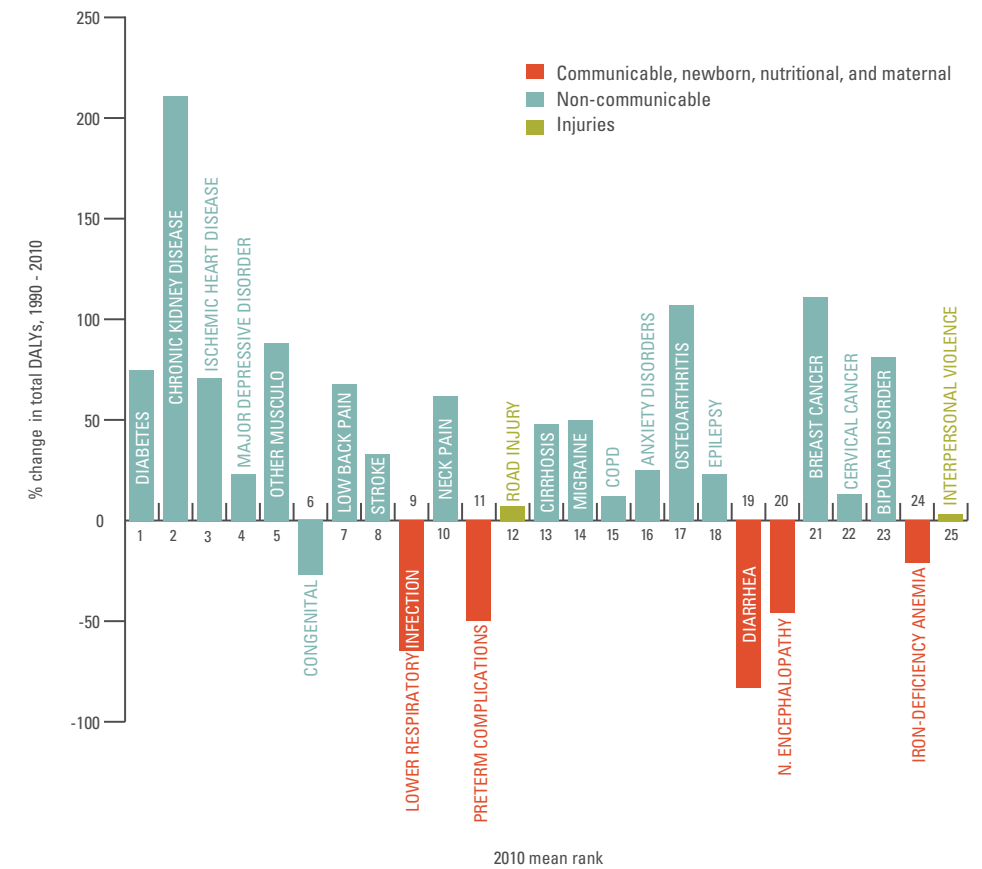**Figure 9: Leading causes of DALYs for females, Mexico, 1990-2010**

Figure 10 shows declines in DALYs among Mexican men from communicable, nutritional, and newborn conditions coupled with increases in non-communicable diseases between 1990 and 2010. Out of all the non-communicable diseases shown in this figure, chronic kidney disease increased the most over the period (348%). Other leading causes of DALYs such as diabetes increased by 104%, ischemic heart disease grew by 98%, and cirrhosis by 58%. In addition to displaying the rising prominence of non-communicable diseases, this visualization shows that injuries are among the most dominant causes of healthy life lost in men in Mexico. DALYs caused by interpersonal violence ranked the highest in 2010, while road traffic injuries ranked third.

Figure 10: Leading causes of DALYs for males, Mexico, 1990-2010
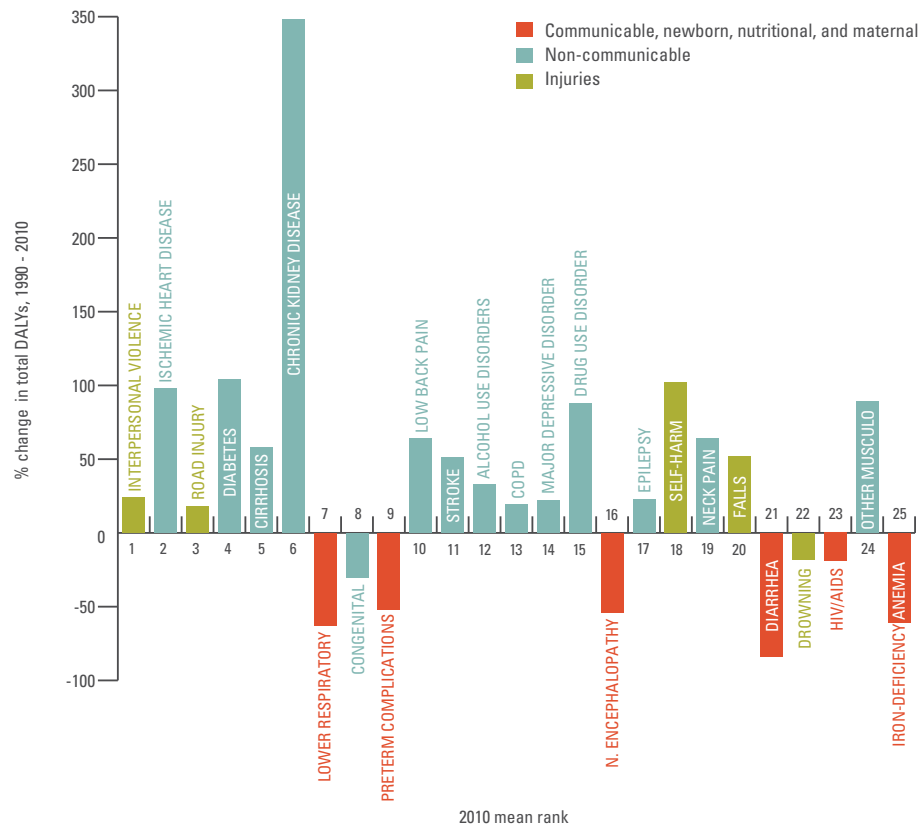
Another visualization tool, GBD Compare, displays proportional changes in disease patterns over time using a treemap diagram, which is essentially a square pie chart. Causes of premature death and disability are shown in boxes. The size of each box represents the percentage of total DALYs, or numbers of healthy years lost, due to a specific cause. Figures 11a and 11b show how DALYs have changed in India between 1990 and 2010. In 1990, non-communicable diseases accounted for 31% of DALYs

in both sexes, while communicable, nutritional, maternal, and newborn causes accounted for 43%. By 2010, they represented 45% and 43% of total disease burden, respectively. Premature death and disability from most communicable, nutritional, maternal, and newborn causes decreased during this period, with the exception of HIV/AIDS. DALYs from many non-communicable causes rose. Dramatic increases occurred in causes such as ischemic heart disease (66% increase), depression (53% increase), diabetes (93% increase), migraine (57% increase), and low back and neck pain (57% increase). In 2010, ischemic heart disease caused nearly 26 million DALYs, the largest number of any non-communicable cause. In addition to non-communicable disease burden, health loss from injuries such as self-harm and road traffic injuries increased 136% and 63%, respectively.

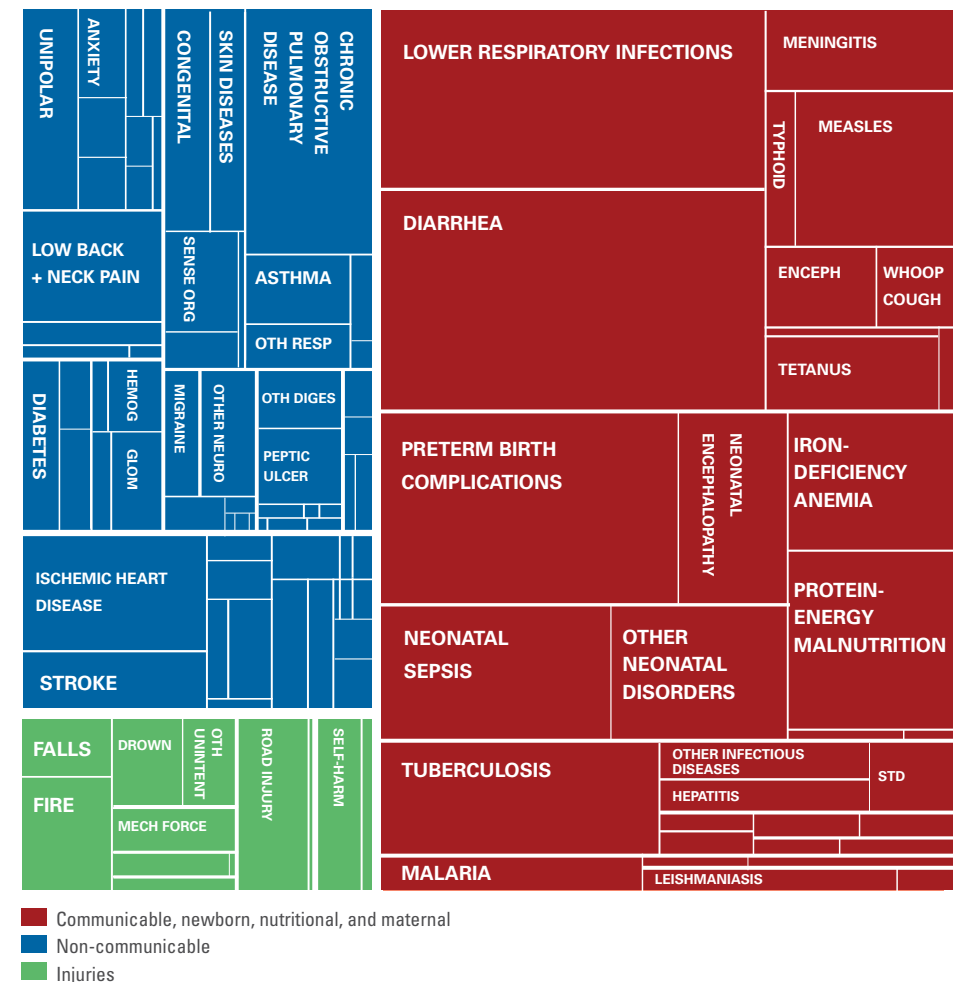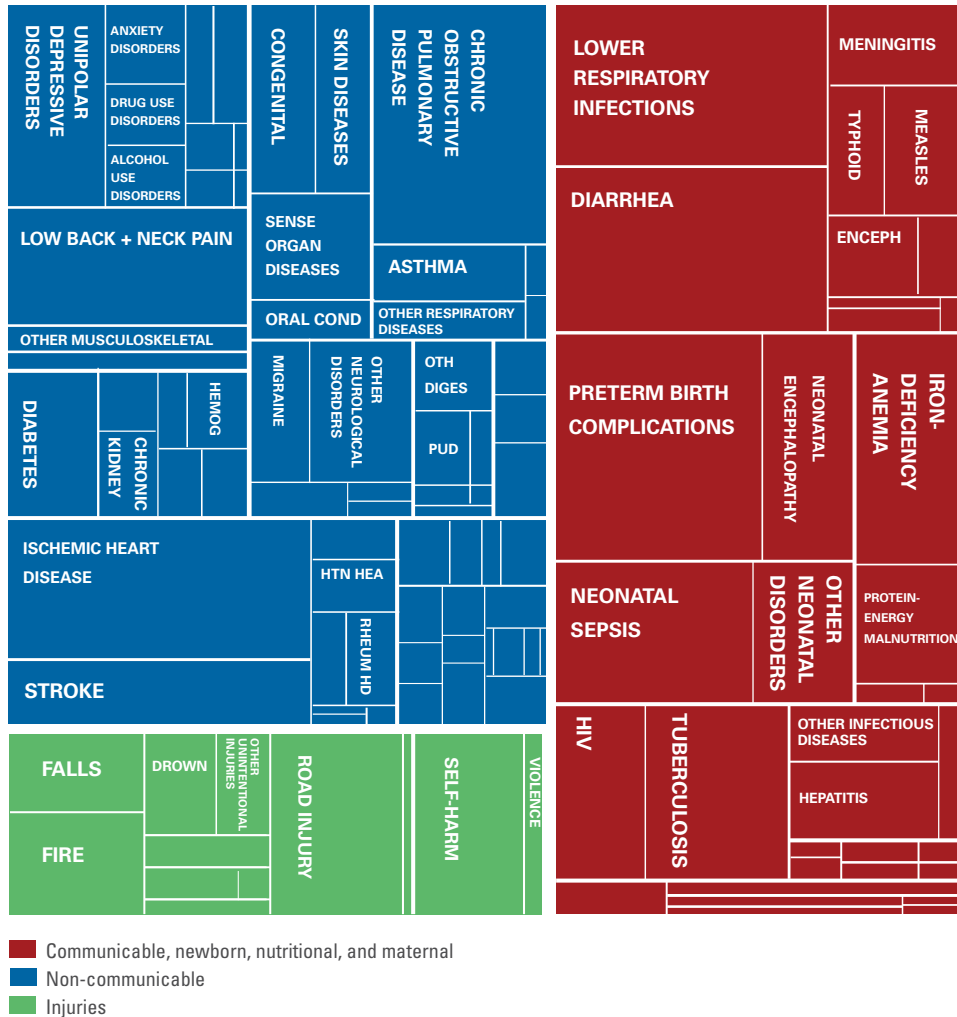**Figure 11a: Causes of DALYs, both sexes, all ages, India, 1990**

Figure 11b: Causes of DALYs, both sexes, all ages, India, 2010

UNIPOLAR DEPRESSIVE DISORDERS

ANXIETY DISORDERS

DRUG USE DISORDERS

ALCOHOL USE DISORDERS

CONGENITAL

SKIN DISEASES

CHRONIC OBSTRUCTIVE PULMONARY DISEASE

LOWER RESPIRATORY INFECTIONS

MENINGITIS

TYPHOID

MEASLES

LOW BACK + NECK PAIN

SENSE ORGAN DISEASES

ASTHMA

DIARRHEA

ENCEPH

ORAL COND

OTHER RESPIRATORY DISEASES

OTHER MUSCULOSKELETAL

MIGRAINE

OTHER NEUROLOGICAL DISORDERS

OTH DIGES

PRETERM BIRTH COMPLICATIONS

NEONATAL ENCEPHALOPATHY

IRON-DEFICIENCY ANEMIA

DIABETES

CHRONIC KIDNEY

HEMOG

PUD

ISCHEMIC HEART DISEASE

HTN HEA

NEONATAL SEPSIS

OTHER NEONATAL DISORDERS

PROTEIN-ENERGY MALNUTRITION

RHEUM HD

STROKE

FALLS

DROWN

OTHER UNINTENTIONAL INJURIES

ROAD INJURY

SELF-HARM

VIOLENCE

HIV

TUBERCULOSIS

OTHER INFECTIOUS DISEASES

HEPATITIS

FIRE

Communicable, newborn, nutritional, and maternal

Non-communicable

Injuries

DISABILITY INCREASES IN MIDDLE- AND HIGH-INCOME COUNTRIES

Most countries in the world have succeeded in reducing deaths early in life, increasingly longer lives are redefining "old age" in many countries, and people in all age groups are dying at lower rates than in the past. Simply living longer does not mean that people are healthier. Little progress has been made in reducing the prevalence of disability, so people are living to an older age but experiencing more ill health. Many people suffer from different forms of disability throughout their lives, such as mental and behavioral health problems starting in their teens, and musculoskeletal disorders beginning in middle age. These findings have far-reaching implications for health systems.

While life expectancy can be used to measure a country's health, it does not reflect the quality of life throughout a person's lifespan. For this reason, GBD calculates healthy life expectancy, which reflects the number of years that a person can expect to live in good health free from disability. The difference between life expectancy and healthy life expectancy is the number of years lost to disability.

Figure 12 shows healthy years lost to disability versus life expectancy for males in 1990 and 2010. Researchers found that countries with higher life expectancies tend to have more years lived with disability. Three countries, Australia, Norway, and the US, are highlighted in the figure. Australia experienced the largest increase in life expectancy (5.4 years) during this period, and healthy years lost to disability increased by 1.1 years. While Norway's life expectancy did not increase by as many years as Australia's, rising just 4.9 years, its healthy years lost to disability increased by a greater amount, 1.5 years. In the US, life expectancy rose by 4.1 years from 1990 to 2010, and its healthy years lost to disability increased by 0.88 years. These countries illustrate how years lived with disability tend to increase as life expectancy rises. Valuable public health lessons could potentially be learned by understanding how Australia managed to increase its life expectancy while more effectively mitigating the corresponding increase in healthy years lost to disability compared to Norway.

Figure 12: Global healthy years lost to disability versus life expectancy, males, 1990 and 2010

Figure 13: Shift in burden by region from premature mortality to years lived with disability, 1990 and 2010
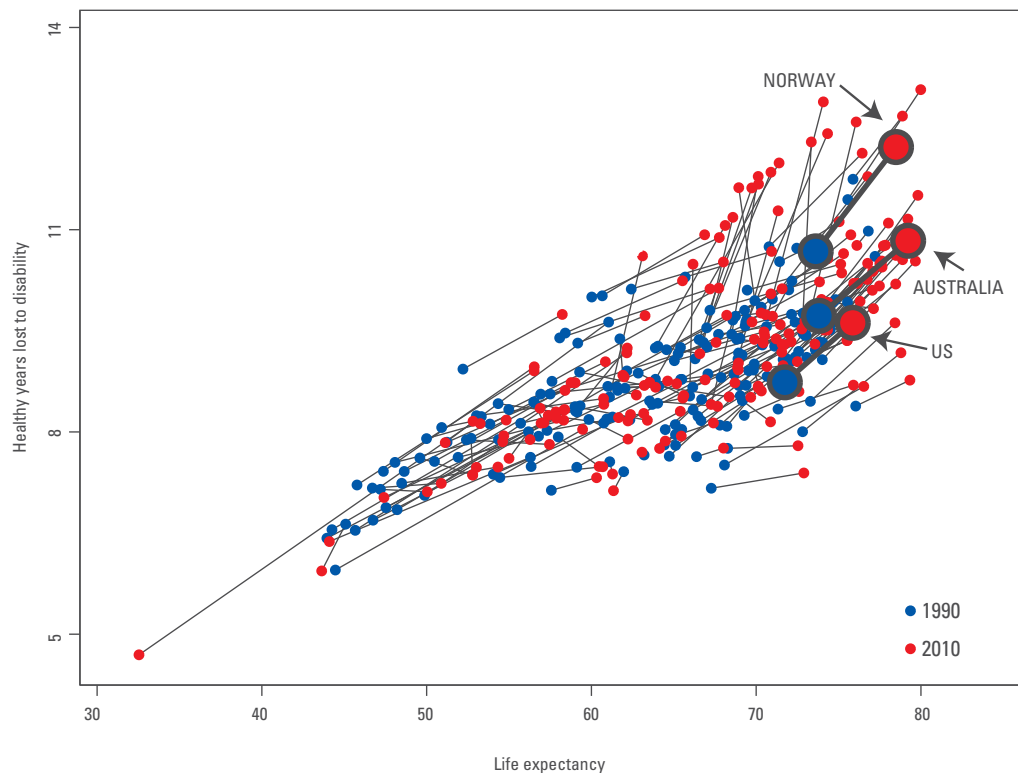
To further elucidate the global shift towards disability, Figure 13 illustrates regional changes in the composition of healthy years lost, or DALYs. DALYs are broken out into years lived with disability (YLDs) and years of life lost (YLLs), also known as years lost to premature death. Outside southern sub-Saharan Africa, Eastern Europe, and the Caribbean, a greater percentage of healthy years were lost from disability in 2010 compared to 1990. As shown in Figure 13, this disability transition has been most dramatic in the Middle East and North Africa, parts of Latin America, and East, South, and Southeast Asia. For example, in the Middle East and North Africa region, 42% of healthy years lost were caused by disability in 2010, compared to 27% in 1990. In Andean Latin America, disability accounted for 41% of healthy years lost in 2010 and 25% in 1990.

Figure 14 tells a more detailed story about the different conditions that cause disability globally. It is important to keep in mind that these estimates reflect both how many individuals suffer from a particular condition as well as the severity of that condition. Mental and behavioral disorders, such as depression, anxiety, and drug use, are the primary drivers of disability worldwide and caused over 40 million years of disability in 20- to 29-year-olds. Musculoskeletal conditions, which include low back pain and neck pain, accounted for the next largest number of years lived with disability. People aged 45 to 54 were most impacted by these conditions, as musculoskeletal disorders caused over 30 million years of disability in each of these age groups. These findings have far-reaching implications for health systems.

Figure 14: Global disability patterns by broad cause group and age, 2010

Figure 15: Rankings of leading causes of disability by region, 2010
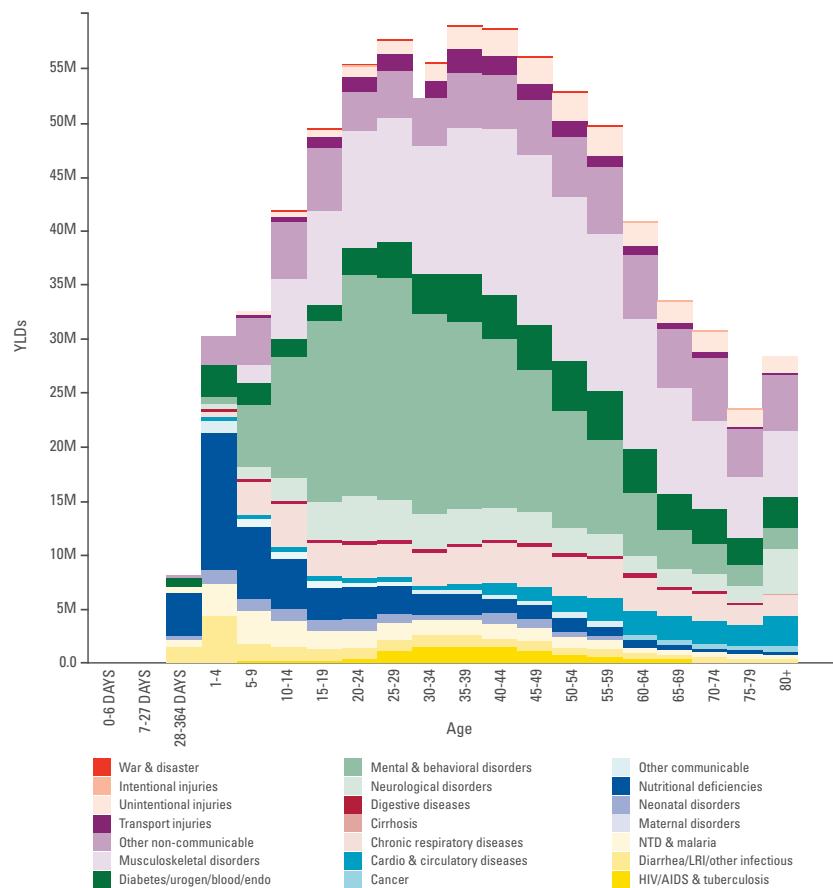
Another way to view the world's health challenges is by comparing how different conditions rank. Figure 15 ranks the leading causes of disability by region, using color coding to indicate how high a condition ranks in a region. Low back pain causes the most disability in many regions of the world. This condition can inhibit people's ability to perform different types of work both inside and outside the home and impair their mobility. In addition to low back pain, neck pain and other musculoskeletal disorders rank in the top 10 causes of disability in most regions. Another musculoskeletal disorder, osteoarthritis, appears in the top 20 causes of disability in every region except central sub-Saharan Africa.

Depression is a major cause of disability across regions and is one of the top three causes of disability in every region except high-income Asia Pacific, where it ranked fourth. This disorder can cause fatigue, decreased ability to work or attend school, and suicide. Anxiety, a different type of mental disorder, is one of the top 10 causes of disability in most regions. Additionally, two other mental disorders, schizophrenia and bipolar disorder, appear among the top 20 causes of disability in many regions.

While mental and musculoskeletal disorders rank high among causes of disability across regions, Figure 15 also reveals substantial regional variation among other causes. Iron-deficiency anemia is a more important cause of disability in developing regions than in developed ones, and is the primary cause of disability in eastern, central, and western sub-Saharan Africa. Iron-deficiency anemia can lead to fatigue and lowered ability to fight infection, and may decrease cognitive ability.

Chronic obstructive pulmonary disease (COPD), a term used to describe emphysema and other chronic respiratory diseases, causes shortness of breath and difficulty breathing and ranks among the top five causes of disability in South and Southeast Asia and most of sub-Saharan Africa.

In many other regions, COPD appears in the list of the top 10 causes. COPD is caused by potentially modifiable risk factors like smoking, second-hand smoke, and air pollution. To further aid decision-makers as they shape health policy, GBD has developed analytic tools to estimate the number of premature deaths and disability, or DALYs, attributable to different risk factors. These tools are explored in the following section.

Using GBD tools to identify leading causes of disability, such as mental and behavioral disorders and musculoskeletal disorders, can help guide health system planning and medical education. Decision-makers can use GBD's findings to ensure that health care systems are designed to address the primary drivers of disability in a cost effective way.

THE GLOBAL RISK FACTOR TRANSITION

Data on potentially avoidable causes of health loss, or risk factors, can help policymakers and donors prioritize prevention strategies to achieve maximum health gains. GBD tools estimate the number of deaths, premature deaths, years lived with disability, and DALYs attributable to 67 risk factors worldwide. This study benefited from the availability of new data, such as newly available epidemiologic evidence about the health impacts of different risk factors; population, nutrition, health, and medical examination surveys; and high-resolution satellite data on air pollution.

Figure 16 shows changes in the 25 leading global risk factors for premature death and disability, or DALYs, between 1990 and 2010. Over this period, many risk factors that primarily cause communicable diseases in children declined. Examples of these risk factors are childhood underweight and suboptimal breastfeeding, which dropped by 61% and 57% from 1990 to 2010, respectively. Childhood underweight is commonly used to measure malnutrition, and was formerly the leading risk factor for DALYs in 1990, but ranked eighth in 2010. Household air pollution, which contributes to lower respiratory tract infections in children, dropped by 37% between 1990 and 2010. Unlike other risk factors that primarily cause DALYs from communicable diseases, progress in reducing premature death and disability from iron deficiency was much lower, declining by just 7% between 1990 and 2010. Slow progress in reducing iron deficiency helps explain why iron-deficiency anemia ranks as the third leading cause of disability globally.

Figure 16: Rankings of global DALYs for top 25 risk factors, 1990-2010
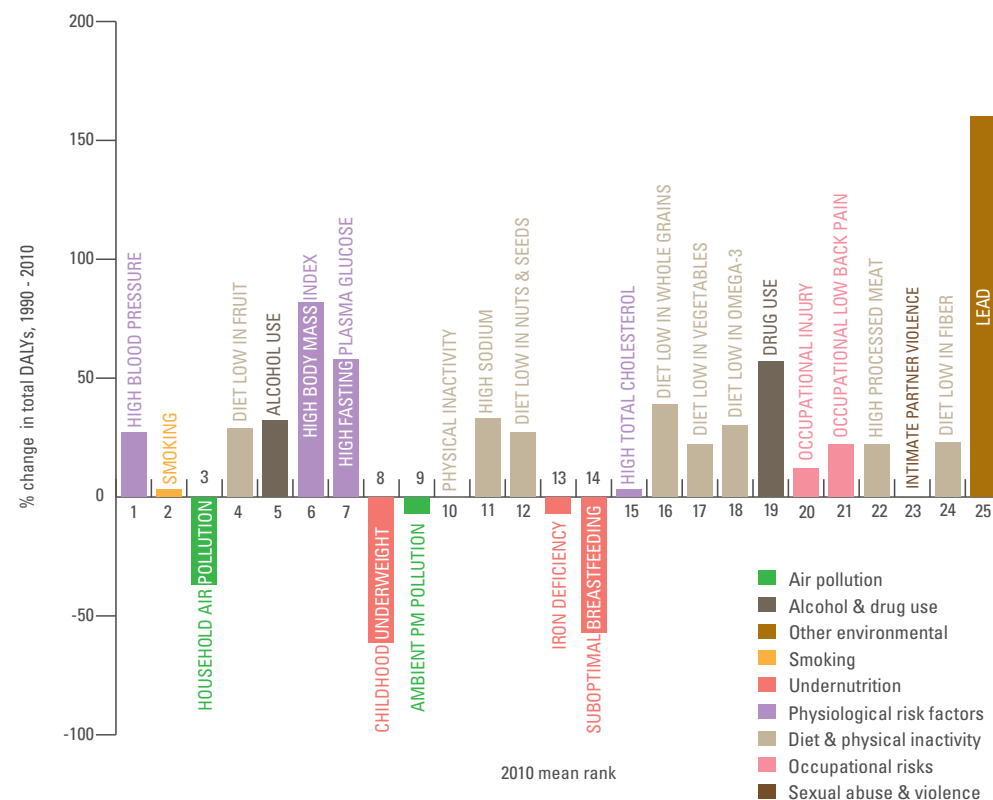
Note: Attributable DALYs were not quantified for physical inactivity and intimate partner violence for 1990.

As most risk factors for communicable diseases in children have declined, many risks associated with non-communicable diseases have grown. DALYs from high blood pressure increased by nearly 30% between 1990 and 2010. High blood pressure is a major risk factor for cardiovascular and circulatory diseases. DALYs attributable to another risk factor for non-communicable diseases, tobacco smoking, increased slightly by 3% between 1990 and 2010. Smoking increases the risk of chronic respiratory diseases, cardiovascular and circulatory diseases, and cancer. DALYs attributable to another substance, alcohol use, increased 32% during this period. Alcohol use contributes to cardiovascular and circulatory diseases, cirrhosis, and cancer. In addition to being a contributor to non-communicable diseases, alcohol increases the risk of injuries.
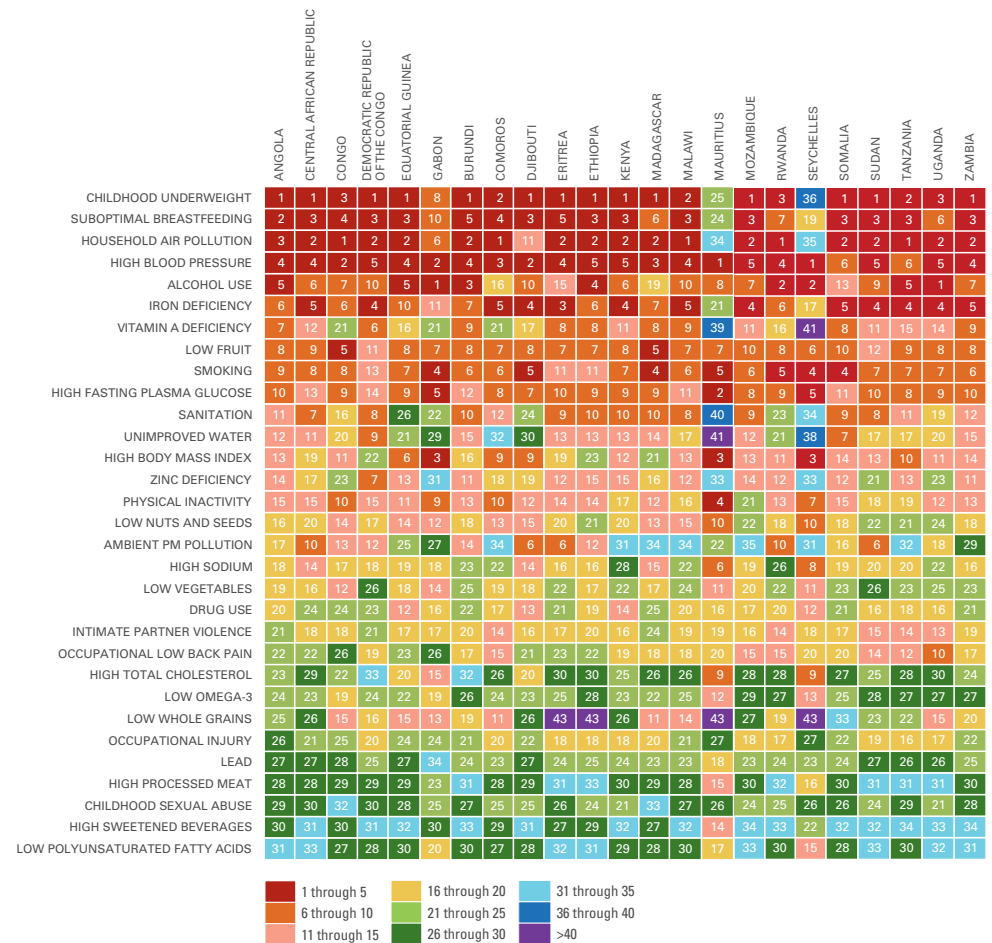
GBD 2010 measured the health effects of different aspects of diet and physical inactivity. Together, all 15 dietary and physical inactivity risk factors measured in the study accounted for 10% of DALYs globally. Diets low in fruits ranked as the fourth leading cause of DALYs in 2010. The other risk factors responsible for the largest number of DALYs were physical inactivity and diets high in sodium, low in nuts and seeds, low in whole grains, low in vegetables, and low in seafood omega-3 fatty acids. GBD found the main diseases linked to poor diets and physical inactivity are primarily cardiovascular diseases as well as cancer and diabetes. While the focus of many public health messages about diet have stressed the importance of eating less saturated fat, GBD 2010's findings indicate that these messages should emphasize a broader range of dietary components.

GBD 2010 used the most recent data available on the effects of different dietary risk factors. It is important to note that these data are constantly evolving as new studies on diet are conducted. Compared to data on the negative health impacts of smoking, which has been well understood for decades, the scientific evidence surrounding dietary risk factors is much newer. Future updates of GBD will incorporate new data on risk factors as they emerge.

High body mass index (BMI) was another major contributor to DALYs in 2010 and was the sixth leading risk factor. High BMI is typically used as an indicator of over-weight and obesity. It increased by a dramatic 82% over the period 1990 to 2010. High BMI is a leading risk factor for cardiovascular and circulatory diseases as well as diabetes. It is striking that high BMI was a more important cause of poor health worldwide than childhood underweight in 2010, whereas childhood underweight was a much more prominent risk factor than high BMI in 1990.

Global rankings of risk factors mask important differences across countries and regions. The leading risk factors in sub-Saharan Africa differ greatly from other regions of the world. For example, Figure 17 shows the leading risks in central and eastern sub-Saharan African countries. In contrast to the global risk factor ranking, childhood underweight was the leading cause of premature death and disability, or DALYs, in most of these countries. Causes of communicable diseases in children dominate in these regions, such as suboptimal breastfeeding, household air pollution, and iron deficiency. Risk factors for non-communicable diseases also feature prominently in certain countries, such as Uganda, where alcohol is the top cause of DALYs, and the Congo, where high blood pressure is the second-highest cause. The rankings of risk factors among wealthier countries in this region, such as Gabon, Mauritius, and the Seychelles, exhibit very different patterns from other nations.

Figure 17: Rankings of DALYs attributable to leading risk factors, central and eastern sub-Saharan Africa, 2010

Risk factor	ANGOLA	CENTRAL AFRICAN REPUBLIC	CONGO	DEMOCRATIC REPUBLIC OF THE CONGO	EQUATORIAL GUINEA	GABON	BURUNDI	COMOROS	DJIBOUTI	ERITREA	ETHIOPIA	KENYA	MADAGASCAR	MALAWI	MAURITIUS	MOZAMBIQUE	RWANDA	SEYCHELLES	SOMALIA	SUDAN	TANZANIA	UGANDA	ZAMBIA
CHILDHOOD UNDERWEIGHT	1	1	3	1	1	8	1	2	1	1	1	1	1	2	25	1	3	36	1	1	2	3	1
SUBOPTIMAL BREASTFEEDING	2	3	4	3	3	10	5	4	3	5	3	3	6	3	24	3	7	19	3	3	3	6	3
HOUSEHOLD AIR POLLUTION	3	2	1	2	2	6	2	1	11	2	2	2	2	1	34	2	1	35	2	2	1	2	2
HIGH BLOOD PRESSURE	4	4	2	5	4	2	4	3	2	4	5	5	3	4	1	5	4	1	6	5	6	5	4
ALCOHOL USE	5	6	7	10	5	1	3	16	10	15	4	6	19	10	8	7	2	2	13	9	5	1	7
IRON DEFICIENCY	6	5	6	4	10	11	7	5	4	3	6	4	7	5	21	4	6	17	5	4	4	4	5
VITAMIN A DEFICIENCY	7	12	21	6	16	21	9	21	17	8	8	11	8	9	39	11	16	41	8	11	15	14	9
LOW FRUIT	8	9	5	11	8	7	8	7	8	7	7	8	5	7	7	10	8	6	10	12	9	8	8
SMOKING	9	8	8	13	7	4	6	6	5	11	11	7	4	6	5	6	5	4	7	7	7	7	6
HIGH FASTING PLASMA GLUCOSE	10	13	9	14	9	5	12	8	7	10	9	9	9	11	2	8	9	5	11	10	8	9	10
SANITATION	11	7	16	8	26	22	10	12	24	9	10	10	10	8	40	9	23	34	9	8	11	19	12
UNIMPROVED WATER	12	11	20	9	21	29	15	32	30	13	13	14	14	12	41	12	21	38	7	17	17	20	15
HIGH BODY MASS INDEX	13	19	11	22	6	3	16	9	9	19	23	12	21	13	3	13	11	3	14	13	10	11	14
ZINC DEFICIENCY	14	17	23	7	13	31	11	18	19	12	15	15	16	12	33	14	12	33	12	21	13	23	11
PHYSICAL INACTIVITY	15	15	10	15	11	9	13	10	12	14	14	17	12	16	4	21	13	7	15	18	19	12	13
LOW NUTS AND SEEDS	16	20	14	17	14	12	18	13	15	20	21	20	13	15	10	22	18	10	18	22	21	24	18
AMBIENT PM POLLUTION	17	10	13	12	25	27	14	34	6	6	12	31	34	34	22	35	10	31	16	6	32	18	29
HIGH SODIUM	18	14	17	18	19	18	23	22	14	16	16	28	15	22	6	19	26	8	19	20	22	22	16
LOW VEGETABLES	19	16	12	26	18	14	25	19	18	22	17	22	17	24	11	20	22	11	23	26	23	25	21
DRUG USE	20	24	24	23	12	16	22	17	13	21	19	14	25	20	16	17	20	12	21	16	18	16	21
INTIMATE PARTNER VIOLENCE	21	18	18	21	17	17	20	14	16	17	20	16	24	19	19	16	14	18	17	15	14	13	19
OCCUPATIONAL LOW BACK PAIN	22	22	26	19	23	26	17	15	21	23	22	19	18	18	20	15	15	20	20	14	12	10	17
HIGH TOTAL CHOLESTEROL	23	29	22	33	20	15	32	26	20	30	30	25	26	26	9	27	28	9	27	25	28	30	24
LOW OMEGA-3	24	23	19	24	22	19	26	24	23	25	28	23	22	25	12	29	27	13	25	28	27	27	27
LOW WHOLE GRAINS	25	26	15	16	15	13	19	11	26	43	43	26	11	14	43	27	19	43	33	23	22	15	20
OCCUPATIONAL INJURY	26	21	25	20	24	24	21	20	22	18	18	18	20	21	27	18	17	27	22	19	16	17	22
LEAD	27	27	28	25	27	34	24	23	27	24	25	24	23	15	18	23	24	23	24	27	26	26	25
HIGH PROCESSED MEAT	28	28	29	29	29	23	31	28	29	31	33	30	29	28	15	30	32	16	30	31	31	31	30
CHILDHOOD SEXUAL ABUSE	29	30	32	30	28	25	27	25	25	26	24	21	33	27	26	24	25	26	26	24	29	21	28
HIGH SWEETENED BEVERAGES	30	31	30	31	32	30	33	29	31	27	29	32	27	32	14	34	33	22	32	32	34	33	34
LOW POLYUNSATURATED FATTY ACIDS	31	33	27	28	30	20	30	27	28	32	31	29	28	30	17	33	30	15	28	33	30	32	31

Legend:
- 1 through 5
- 6 through 10
- 11 through 15
- 16 through 20
- 21 through 25
- 26 through 30
- 31 through 35
- 36 through 40
- >40

In addition to allowing users to explore how different risk factors rank across countries, decision-makers can use GBD visualization tools to understand how many DALYs could potentially be averted by addressing different risk factors. Figure 18 shows the number of DALYs attributable to outdoor air pollution for each cause, also known as ambient particulate matter (PM) air pollution, in China. The percentage of DALYs that could be averted by reducing this risk factor is shown in dark shading.

Figure 18: DALYs attributable to ambient particulate matter air pollution, both sexes, all ages, China, 2010

Communicable, newborn, nutritional, and maternal
Non-communicable
Injuries
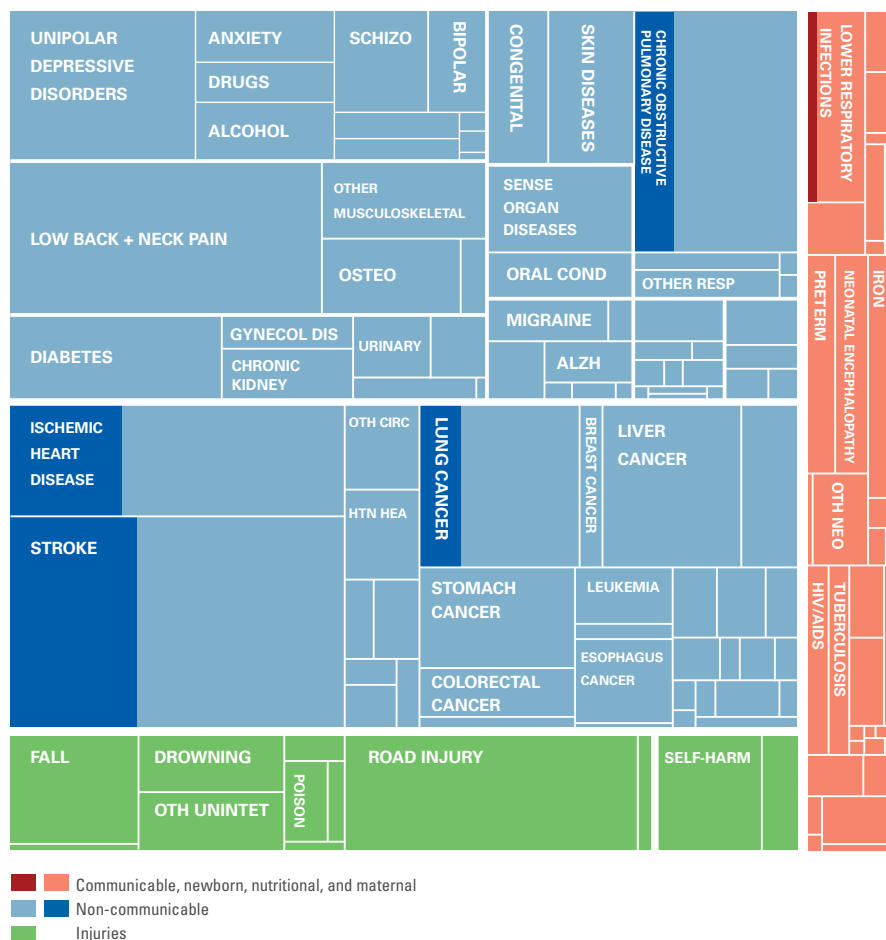
Note: The proportion of each cause attributable to the risk factor is shaded dark.

The figure indicates how reducing exposure to air pollution could prevent substantial amounts of premature death and disability from ischemic heart disease and stroke, as indicated by the portion of these causes that are shaded in dark blue. Lower levels of air pollution could also reduce DALYs from lung cancer and COPD.

Figure 19 shows how, in the UK, many DALYs could be averted by eliminating tobacco smoking, including second-hand smoke.

Figure 19: DALYs attributable to tobacco smoking and second-hand smoke, both sexes, all ages, United Kingdom, 2010

Communicable, newborn, nutritional, and maternal
Non-communicable
Injuries
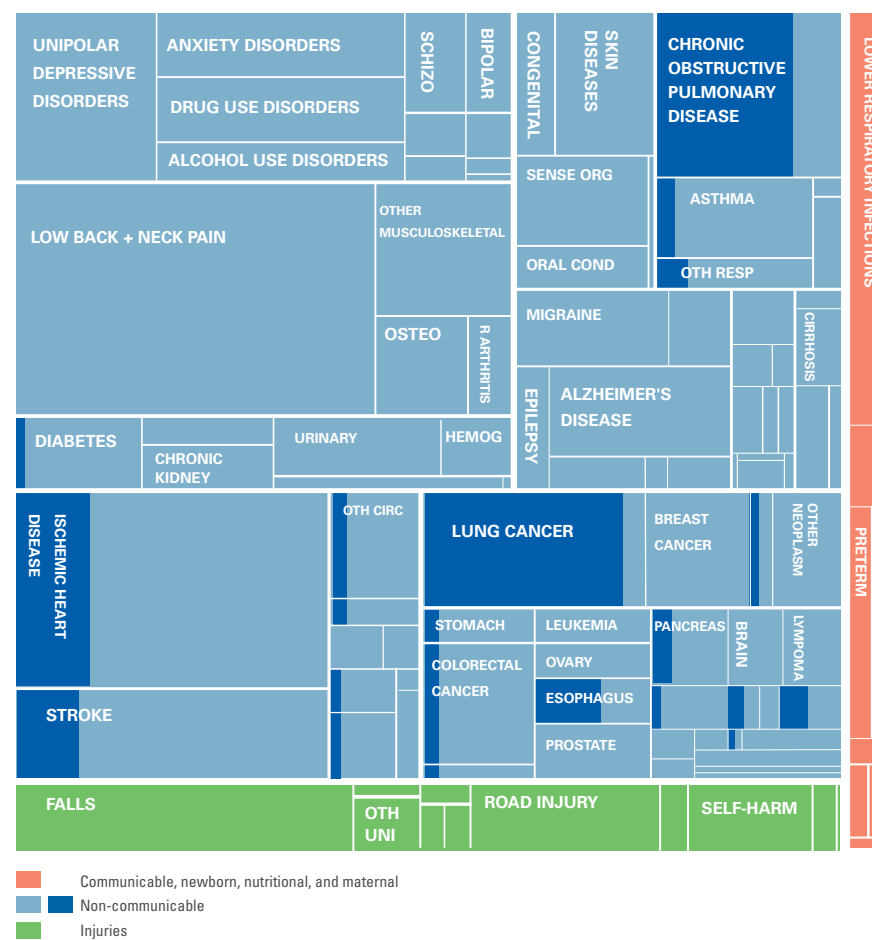
Note: The proportion of each cause attributable to the risk factor is shaded dark.

Most COPD and lung cancer is caused by tobacco smoking and second-hand smoke, as indicated by the dark blue portion of the boxes representing these causes. Substantial numbers of healthy years lost from ischemic heart disease, stroke, and esophageal cancer could also be prevented by reducing exposure to these risk factors.

Figure 20 shows the number of DALYs attributable to suboptimal breastfeeding in children from one month to 1 year old in Zambia.

Figure 20: DALYs attributable to suboptimal breastfeeding, both sexes, ages 1-11 months, Zambia, 2010

Communicable, newborn, nutritional, and maternal
Non-communicable
Injuries

Note: The proportion of each cause attributable to the risk factor is shaded dark.
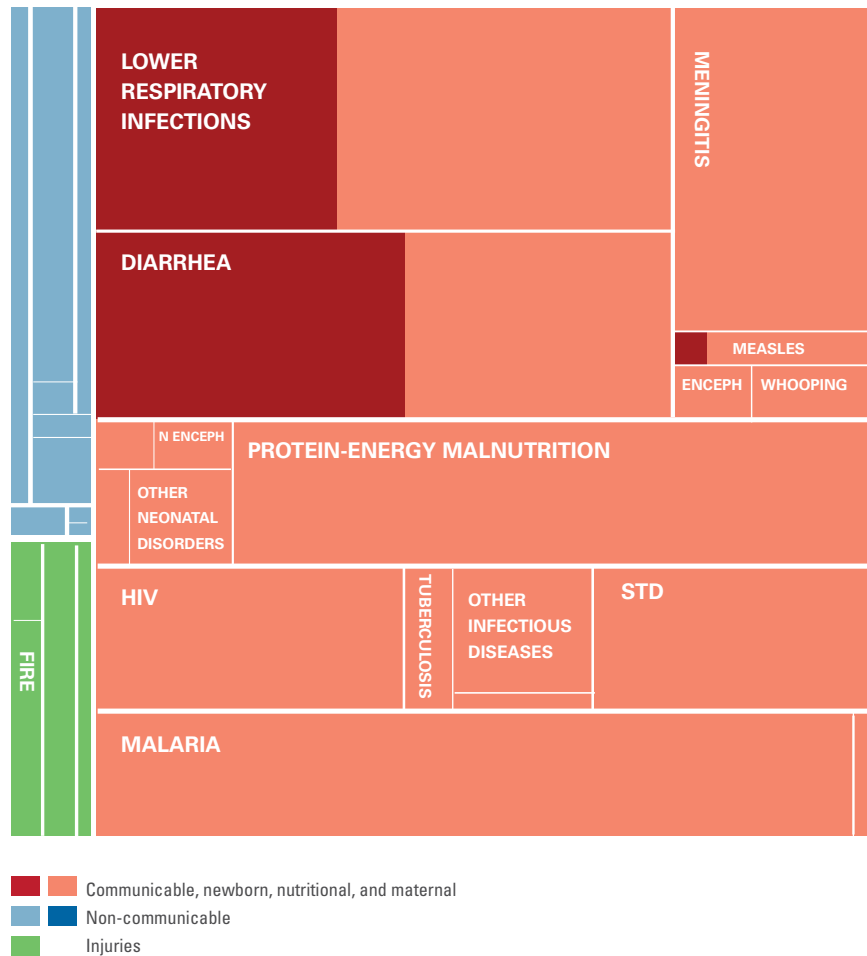
This figure can be used to understand the number of years of healthy life that could potentially be gained by ensuring that all Zambian children in this age group are adequately breastfed. Adequate breastfeeding is defined as exclusive breastfeeding of children for the first six months of life, and continued breastfeeding after the child reaches six months of age until age 2. Half of the DALYs attributable to diarrhea could potentially be prevented in this age group, as indicated by the dark shading in the boxes representing this cause. Adequate breastfeeding would also greatly reduce illness from lower respiratory infections among these children.

TREMENDOUS PROGRESS IN SUB-SAHARAN AFRICA, BUT MAJOR CHALLENGES REMAIN FOR MDGs 4, 5, AND 6

The rapid transition away from communicable, maternal, newborn, and nutritional conditions toward non-communicable diseases at the global level has not been universal. Communicable diseases that primarily affect children and young adults remain top causes of premature death and disability, or DALYs, in sub-Saharan Africa, as shown in Figure 21.

Figure 21: Causes of DALYs, both sexes, all ages, sub-Saharan Africa, 2010

Communicable, newborn, nutritional, and maternal
Non-communicable
Injuries
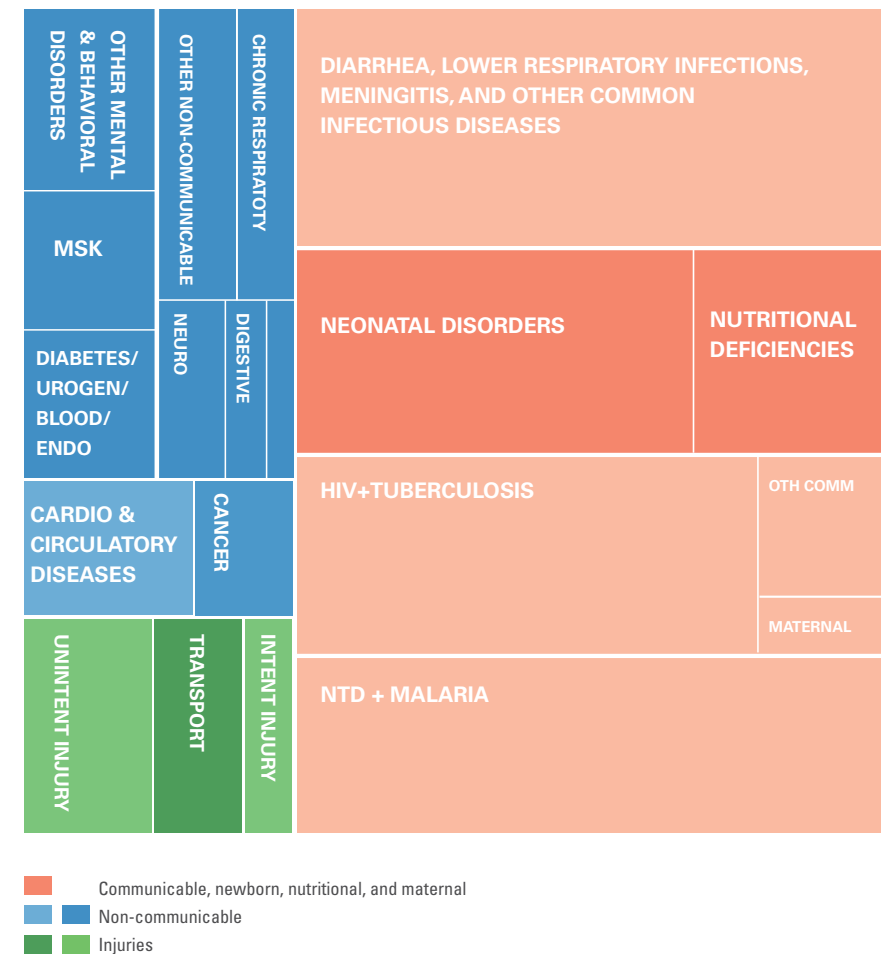
In 2010, in sub-Saharan Africa nearly 20% of DALYs were caused by diarrhea, lower respiratory infections, meningitis, and other common infectious diseases. Neglected tropical diseases and malaria accounted for nearly 15% of total DALYs. HIV/AIDS,

tuberculosis, newborn disorders, and nutritional deficiencies are also responsible for a large portion of the premature death and disability in this region.

As 2015 is fast approaching, the Millennium Development Goals (MDGs) remain highly relevant for sub-Saharan Africa. MDGs 4, 5, and 6 accounted for 60% to 70% of DALYs in this area of the world in 2010, as shown in Figure 22. MDG 4 is intended to reduce by two-thirds, between 1990 and 2015, the under-5 mortality rate, while MDG 5 aims to reduce by three-quarters the maternal mortality ratio. The purpose of MDG 6 is to halt and begin reversing the spread of HIV/AIDS in that same period. In other regions, MDGs 4, 5, and 6 accounted for less than 40% of DALYs and, in some, the percentage was less than 20%.

The considerable differences between sub-Saharan Africa and other regions of the world highlight how GBD 2010 findings could be used to guide the establishment of region- and country-specific goals in the post-2015 era.

Figure 22: Percent DALYs related to Millennium Development Goals 4, 5, and 6 as a proportion, by region, 1990 and 2010
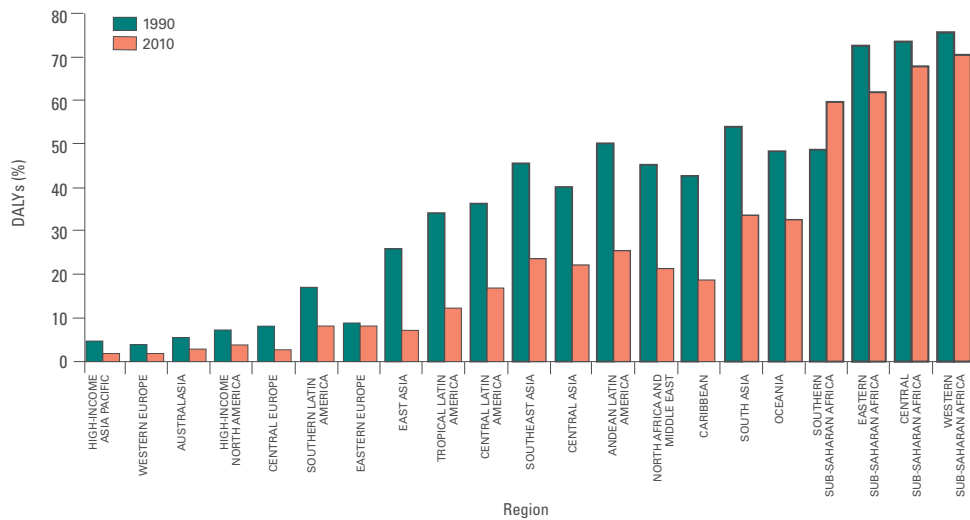
Despite the fact that disease patterns in sub-Saharan Africa have changed less than in other parts of the world over the past 20 years, most African countries have made impressive progress in reducing mortality rates for children under the age of 5. Figure 23 shows the annualized rate of decline in under-5 mortality in sub-Saharan African countries between 1990 and 2000 compared to 2000 to 2010. All countries that appear on the right side of the diagonal line had accelerated declines in child mortality rates between 2000 and 2010. Countries such as Botswana, Rwanda, Senegal, Sierra Leone, and Uganda made the most rapid progress out of all the sub-Saharan African countries. Other countries including Angola, Eritrea, Kenya, Republic

of the Congo, and Swaziland also made substantial strides in this area. In contrast to the majority of countries in sub-Saharan Africa, multiple countries in western sub-Saharan Africa had higher rates of decline in under-5 mortality between 1990 and 2000 compared to 2000 and 2010, such as Burkina Faso, Côte d'Ivoire, Liberia, and Togo. Unlike other countries in the "HIV corridor" that extends from Kenya to South Africa, rates of under-5 mortality in Lesotho and Zimbabwe increased in the later period compared to the earlier period.

Figure 23: Annualized rate of decline in under-5 mortality, 1990-2000 compared to 2000-2010
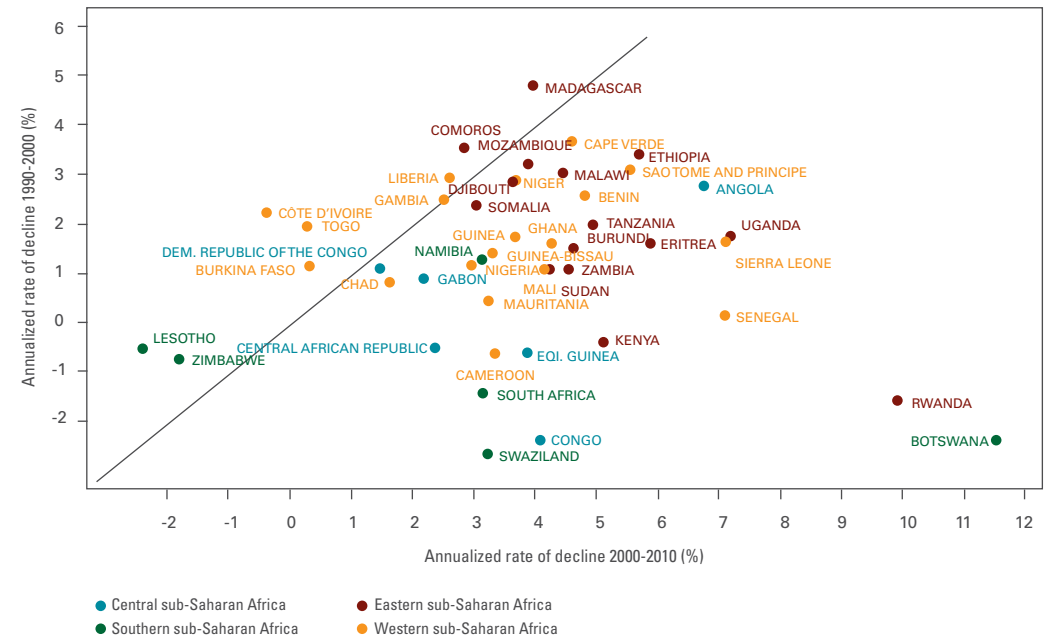
While HIV/AIDS has exacted a devastating toll on many countries in sub-Saharan Africa, increasing by 328% in terms of healthy years lost from 1990 to 2010, the epidemic appears to have peaked in 2004. The number of years lost to premature death and disability declined by 22% between 2005 and 2010. This success is largely attributable to the massive scale-up in antiretroviral therapy over the past decade. Another encouraging area of progress is the reduction in the number of deaths from malaria in sub-Saharan Africa. Figure 24 shows how malaria deaths in children under 5 in sub-Saharan Africa started to decline rapidly in 2005. That same year, the number of malaria deaths in the over-5 age group in this region also began a steep decline. Increased availability of insecticide-treated bed nets and artemisinin combination therapy contributed to these declines. These interventions have been financed primarily by the Global Fund to Fight AIDS, Tuberculosis and Malaria

(GFATM) as well as the US President's Malaria Initiative. GBD 2010 echoes findings of past IHME research studies in highlighting the life-saving role of development assistance in sub-Saharan Africa.

Reduction of maternal deaths in sub-Saharan African countries is yet another positive finding of GBD 2010. Between 2005 and 2010, maternal mortality declined by 11.4%. Delving deeper into trends at the country level, Rwanda stands out as a major success story. While other countries in sub-Saharan Africa have made progress in saving mother's lives, Rwanda is the only country on track to achieve MDG 5. Between 1990 and 2010, Rwanda reduced maternal deaths by 61%, as seen in Figure 25.

Figure 24: Trends in malaria deaths by age within Africa and outside Africa, 1980-2010
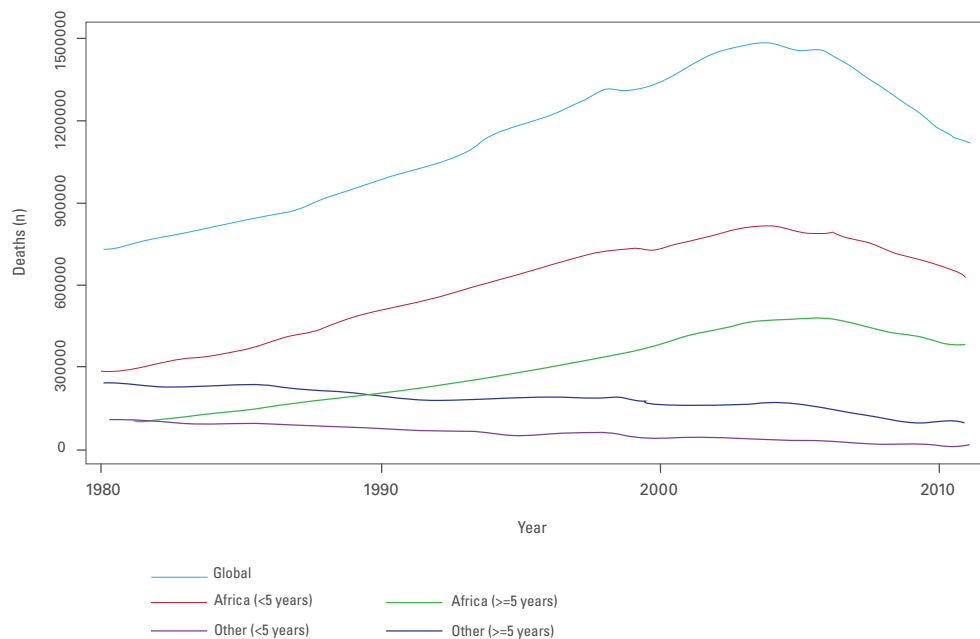
Figure 25: Change in leading causes of death among females, all ages, Rwanda, 1990 and 2010

Most countries in sub-Saharan Africa have made tremendous strides in reducing child mortality between 1990 and 2010. The success of the fight against malaria has contributed to this reduction in child deaths. Finally, while the devastating impact of HIV/AIDS appears to be declining, many challenges remain in combating this disease. GBD 2010 findings highlight the important role of continuing donor health funding in addressing MDGs 4, 5, and 6. Future updates of GBD will closely monitor developments in health in this and other regions.

USING GBD TO ASSESS COUNTRIES' HEALTH PROGRESS

The GBD approach affords countries a unique opportunity to explore their success in improving health outcomes over time. GBD can also be used to better understand how fast a country's health is improving relative to similar countries. This type of progress assessment is called benchmarking. Benchmarking is a tool that can help countries put their health achievements in context and identify areas for improvement. IHME invites countries interested in collaborating on benchmarking exercises to contact us.

As an example of a benchmarking exercise, Figure 26 shows levels of premature mortality in the US ranked relative to countries with similar levels of health expenditure in 2010. The columns are arranged from left to right by the top 30 causes of premature death in the US. The countries are ordered according to levels of premature mortality, with the country having the highest levels of premature mortality at the bottom (the US) and the lowest levels at the top (Sweden). Levels of premature mortality are measured using age-standardized years of life lost. For each cause, rankings are coded to reflect each country's level of premature mortality relative to the others. The best performers for each cause are in green while the worst performers for each cause appear in red. The US performed best in brain cancer (first) and colorectal cancer (third) in comparison to the 18 other countries, while it performed better than average for prostate cancer (fifth), stroke (fifth), falls (seventh), and breast cancer (eighth). Relative to the other countries shown in Figure 26, the US was the worst (nineteenth) performer for conditions including COPD, diabetes, interpersonal violence, preterm birth complications, chronic kidney disease, cardiomyopathy, hypertensive heart disease, poisonings, and kidney cancers.

To further illustrate how benchmarking can be implemented at the country level, IHME is currently working with public health experts in the UK to explore changes in population health over time and to compare its health performance to other countries with similar and higher levels of health spending. Through close collaboration with decision-makers at the National Health Service and Public Health England, the IHME-UK benchmarking project is examining the context in which health progress has occurred, such as the UK's provision of universal health coverage and its implementation of numerous public health interventions.

For the UK, GBD estimates of life expectancy and healthy life expectancy (HALE), years lost due to premature death (YLLs), years lived with disability (YLDs), and healthy years lost (DALYs) will provide a detailed and comprehensive picture of changes in health outcomes over time. Comparing GBD estimates across countries will elucidate areas of health where the UK performs both better and worse than its peers. In addition, analysis of potentially modifiable risk factors can shed light on ways that public health policy could address major causes of ill health and premature death. The IHME-UK benchmarking study aims to identify key opportunities to speed up the pace of health improvements in the nation.

Figure 26: Leading years of life lost, United States relative to comparison countries, 2010

CONCLUSION

The Global Burden of Disease provides detailed data on diseases, injuries, and risk factors that are essential inputs for evidence-based policymaking. This collaborative project shows that the world's health is undergoing rapid change.

GBD 2010 identified major trends in global health that can be summarized by the three Ds: demographics, disease, and disability. As most countries have made great strides in reducing child mortality, people are living longer and the population is growing older. These demographic changes are driving up premature deaths and disability, or DALYs, from non-communicable diseases. Health problems are increasingly defined not by what kills us, but what ails us. In 1990, childhood underweight was the leading risk factor for ill health, but high body mass surpassed it in 2010 as a more important cause of premature death and disability. This finding illustrates global shifts away from risk factors for communicable disease in children toward risk factors for non-communicable diseases.

> **Future updates of GBD will be enriched by widening the network of collaborators.**

GBD 2010 found that non-communicable diseases and disability caused a greater share of health loss in 2010 compared to 1990 in most regions of the world. At the same time, the study revealed that the leading causes of DALYs in sub-Saharan Africa have changed little over the past 20 years. Still, GBD 2010 provides evidence of encouraging progress in this region, such as reductions in mortality from malaria, HIV/AIDS, and maternal conditions.

While GBD 2010 provides key information about health trends at global and regional levels, its tools also allow users to view data specific to 187 countries. Similar to the ways in which governments use financial data to monitor economic trends and make necessary adjustments to ensure continued growth, decision-makers can use GBD data to inform health policy. Continual updates of GBD will incorporate the most recent data on disease patterns as well as the latest science about the effects of different risk factors on health.

Future updates of GBD will be enriched by widening the network of collaborators. Expanded collaboration between researchers, staff of ministries of health, and IHME on national and subnational burden-of-disease studies will ensure that GBD tools are used to understand causes of premature death and disability at the community level. Despite similarities of epidemiological trends in most regions, GBD illustrates the unique patterns of diseases, injuries, and risk factors that exist in different countries. Local epidemiological assessment is crucial for informing local priorities. The GBD approach to health measurement can help guide the design of public health interventions to ensure they are tailored to countries' specific needs.

IHME is seeking partners interested in conducting in-depth studies of the burden of disease in countries. Through such partnerships, IHME is helping governments and donors gain insights into localized health trends to inform planning and policymaking. IHME is committed to building capacity for GBD analysis in countries around the world, and will be conducting a variety of training workshops. Information on these trainings can be found at http://www.healthmetricsandevaluation.org/gbd/training

GBD data visualization tools can display regional and national data from burden-of-disease studies. These user-friendly tools are helpful for planning, presentations, and educational purposes. Also, IHME has designed a variety of data visualization tools to compare trends between various raw data sources at the national level. By visualizing all available data, ministry of health officials and researchers can quickly identify unexpected trends in the data that they may wish to flag for further investigation.

Currently, IHME is working to expand GBD to track expenditure for particular diseases and injuries. Also, IHME is estimating utilization of outpatient and inpatient facilities and other health services for specific diseases and injuries. Side-to-side comparisons of these estimates to the number of DALYs from myriad causes will allow decision-makers to evaluate health system priorities. Data on disease-specific expenditure and disease burden are essential for policymakers facing difficult decisions about how to allocate limited resources.

ANNEX

GLOBAL DISABILITY-ADJUSTED LIFE YEARS, 291 CAUSES, ALL AGES, BOTH SEXES, 1990 TO 2010, REPORTED IN THOUSANDS, PER 100,000, AND PERCENT CHANGE

	All ages DALYs (thousands)			DALYs (per 100 000)		
	1990	2010	% change	1990	2010	% change
All causes	2,502,601 (2,389,053–2,639,606)	2,490,385 (2,349,250–2,637,538)	-0·5	47,205 (45,063–49,789)	36,145 (34,097–38,281)	-23·4
Communicable, maternal, neonatal, and nutritional disorders	1,181,610 (1,113,122–1,268,900)	868,024 (818,934–921,489)	-26·5	22,288 (20,996–23,934)	12,598 (11,886–13,374)	-43·5
HIV/AIDS and tuberculosis	79,368 (72,264–90,448)	130,944 (119,310–141,121)	65·0	1,497 (1,363–1,706)	1,900 (1,732–2,048)	26·9
Tuberculosis	61,250 (55,443–71,077)	49,396 (40,065–56,071)	-19·4	1,155 (1,046–1,341)	717 (581–814)	-37·9
HIV/AIDS	18,117 (15,012–22,260)	81,547 (75,003–88,367)	350·1	342 (283–420)	1,184 (1,089–1,283)	246·3
HIV disease resulting in mycobacterial infection	3,281 (2,658–4,135)	14,948 (13,589–16,410)	355·5	62 (50–78)	217 (197–238)	250·5
HIV disease resulting in other specified or unspecified diseases	14,836 (12,246–18,359)	66,600 (60,517–72,845)	348·9	280 (231–346)	967 (878–1,057)	245·4
Diarrhea, lower respiratory infections, meningitis, and other common infectious diseases	543,168 (491,308–624,755)	282,982 (254,312–317,466)	-47·9	10,245 (9,267–11,784)	4,107 (3,691–4,608)	-59·9
Diarrheal diseases	183,538 (168,790–198,052)	89,513 (77,572–98,906)	-51·2	3,462 (3,184–3,736)	1,299 (1,126–1,436)	-62·5
Cholera	9,802 (7,834–12,198)	4,463 (3,344–5,787)	-54·5	185 (148–230)	65 (49–84)	-65·0
Other salmonella infections	9,550 (7,690–11,625)	4,847 (3,819–5,949)	-49·2	180 (145–219)	70 (55–86)	-60·9
Shigellosis	13,575 (11,325–16,120)	7,052 (5,676–8,466)	-48·1	256 (214–304)	102 (82–123)	-60·0
Enteropathogenic E coli infection	17,808 (14,243–21,647)	7,542 (5,686–9,524)	-57·6	336 (269–408)	109 (83–138)	-67·4
Enterotoxigenic E coli infection	12,629 (10,768–14,968)	6,894 (5,619–8,286)	-45·4	238 (203–282)	100 (82–120)	-58·0
Campylobacter enteritis	16,611 (13,558–19,924)	7,541 (5,687–9,374)	-54·6	313 (256–376)	109 (83–136)	-65·1
Amoebiasis	3,577 (2,861–4,389)	2,237 (1,728–2,832)	-37·5	67 (54–83)	32 (25–41)	-51·9
Cryptosporidiosis	18,897 (15,579–22,426)	8,372 (6,473–10,401)	-55·7	356 (294–423)	122 (94–151)	-65·9
Rotaviral enteritis	42,224 (35,313–48,745)	18,650 (14,431–22,746)	-55·8	796 (666–919)	271 (209–330)	-66·0
Other diarrheal diseases	38,865 (28,644–51,813)	21,916 (16,031–28,760)	-43·6	733 (540–977)	318 (233–417)	-56·6
Typhoid and paratyphoid fevers	9,256 (1,281–17,123)	12,239 (1,702–23,043)	32·2	175 (24–323)	178 (25–334)	1·7
Lower respiratory infections	206,460 (183,340–222,982)	115,227 (102,282–126,985)	-44·2	3,894 (3,458–4,206)	1,672 (1,485–1,843)	-57·1
Influenza	32,428 (28,369–36,097)	19,244 (16,906–21,451)	-40·7	612 (535–681)	279 (245–311)	-54·3
Pneumococcal pneumonia	43,371 (38,585–47,618)	26,906 (23,723–29,865)	-38·0	818 (728–898)	391 (344–433)	-52·3
H influenzae type B pneumonia	43,895 (38,426–48,914)	21,315 (18,581–24,305)	-51·4	828 (725–923)	309 (270–353)	-62·6
Respiratory syncytial virus pneumonia	44,970 (38,833–51,176)	20,472 (17,193–24,136)	-54·5	848 (732–965)	297 (250–350)	-65·0
Other lower respiratory infections	41,796 (36,198–47,564)	27,289 (23,757–30,811)	-34·7	788 (683–897)	396 (345–447)	-49·8
Upper respiratory infections	1,695 (1,007–2,797)	1,866 (1,049–3,189)	10·1	32 (19–53)	27 (15–46)	-15·3
Otitis media	4,171 (2,521–8,188)	4,680 (2,946–7,589)	12·2	79 (48–154)	68 (43–110)	-13·7
Meningitis	37,815 (33,840–45,081)	29,399 (25,584–33,328)	-22·3	713 (638–850)	427 (371–484)	-40·2
Pneumococcal meningitis	9,442 (8,322–11,429)	8,024 (6,946–9,065)	-15·0	178 (157–216)	116 (101–132)	-34·6
H influenzae type B meningitis	10,142 (8,793–12,574)	6,611 (5,661–7,851)	-34·8	191 (166–237)	96 (82–114)	-49·8
Meningococcal infection	5,796 (5,126–7,055)	5,163 (4,397–5,890)	-10·9	109 (97–133)	75 (64–85)	-31·4
Other meningitis	12,401 (11,069–14,632)	9,563 (8,108–10,858)	-22·9	234 (209–276)	139 (118–158)	-40·7
Encephalitis	10,157 (8,828–12,143)	7,141 (6,148–8,274)	-29·7	192 (167–229)	104 (89–120)	-45·9
Diphtheria	514 (0–4,351)	236 (0–2,016)	-54·1	10 (0–82)	3 (0–29)	-64·7
Whooping cough	14,331 (236–69,476)	7,018 (149–33,926)	-51·0	270 (4–1,310)	102 (2–492)	-62·3
Tetanus	21,815 (13,557–34,348)	4,663 (2,569–7,589)	-78·6	411 (256–648)	68 (37–110)	-83·6
Measles	52,570 (15,757–124,079)	10,420 (3,453–24,535)	-80·2	992 (297–2,340)	151 (50–356)	-84·7
Varicella	847 (106–4,875)	581 (145–2,773)	-31·4	16 (2–92)	8 (2–40)	-47·2
Neglected tropical diseases and malaria	103,808 (86,028–123,663)	108,739 (87,846–137,588)	4·7	1,958 (1,623–2,333)	1,578 (1,275–1,997)	-19·4
Malaria	69,138 (54,532–85,576)	82,685 (63,426–109,836)	19·6	1,304 (1,029–1,614)	1,200 (921–1,594)	-8·0
Chagas disease	584 (322–966)	546 (271–1,054)	-6·5	11 (6–18)	8 (4–15)	-28·1
Leishmaniasis	5,877 (3,416–9,458)	3,317 (2,180–4,890)	-43·6	111 (64–179)	48 (32–71)	-56·6
African trypanosomiasis	2,034 (630–4,370)	560 (76–1,766)	-72·5	38 (12–82)	8 (1–26)	-78·8
Schistosomiasis	2,125 (1,052–4,230)	3,309 (1,705–6,260)	55·7	40 (20–80)	48 (25–91)	19·8
Cysticercosis	514 (398–650)	503 (379–663)	-2·1	10 (8–12)	7 (5–10)	-24·7
Echinococcosis	152 (60–359)	144 (69–286)	-5·1	3 (1–7)	2 (1–4)	-27·0
Lymphatic filariasis	2,368 (1,551–3,399)	2,775 (1,807–4,000)	17·2	45 (29–64)	40 (26–58)	-9·9
Onchocerciasis	512 (361–687)	494 (360–656)	-3·5	10 (7–13)	7 (5–10)	-25·7

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	All ages DALYs (thousands)			DALYs (per 100 000)		
	1990	2010	% change	1990	2010	% change
Trachoma	144 (104–189)	334 (243–438)	132·5	3 (2–4)	5 (4–6)	78·9
Dengue	712 (226–1,513)	825 (344–1,412)	15·9	13 (4–29)	12 (5–20)	-10·8
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	3,234 (1,866–6,509)	1,462 (852–2,659)	-54·8	61 (35–123)	21 (12–39)	-65·2
Intestinal nematode infections	9,008 (4,993–15,391)	5,184 (2,979–8,811)	-42·5	170 (94–290)	75 (43–128)	-55·7
Ascariasis	4,217 (2,291–7,148)	1,315 (713–2,349)	-68·8	80 (43–135)	19 (10–34)	-76·0
Trichuriasis	857 (465–1,420)	638 (349–1,061)	-25·5	16 (9–27)	9 (5–15)	-42·7
Hookworm disease	3,934 (2,056–6,983)	3,231 (1,695–5,732)	-17·9	74 (39–132)	47 (25–83)	-36·8
Food-borne trematodiases	2,394 (635–8,501)	1,875 (708–4,837)	-21·7	45 (12–160)	27 (10–70)	-39·7
Other neglected tropical diseases	5,012 (3,656–7,226)	4,724 (3,525–6,351)	-5·7	95 (69–136)	69 (51–92)	-27·5
Maternal disorders	21,582 (18,000–25,720)	16,104 (12,972–18,912)	-25·4	407 (340–485)	234 (188–274)	-42·6
Maternal hemorrhage	4,784 (3,923–5,713)	3,289 (2,619–3,860)	-31·2	90 (74–108)	48 (38–56)	-47·1
Maternal sepsis	2,043 (1,701–2,508)	1,309 (1,059–1,585)	-35·9	39 (32–47)	19 (15–23)	-50·7
Hypertensive disorders of pregnancy	4,108 (3,406–4,986)	2,797 (2,254–3,357)	-31·9	77 (64–94)	41 (33–49)	-47·6
Obstructed labor	1,891 (1,451–2,625)	1,792 (1,249–2,806)	-5·2	36 (27–50)	26 (18–41)	-27·1
Abortion	3,218 (2,668–3,945)	2,138 (1,731–2,592)	-33·6	61 (50–74)	31 (25–38)	-48·9
Other maternal disorders	5,538 (4,576–6,538)	4,778 (3,819–5,512)	-13·7	104 (86–123)	69 (55–80)	-33·6
Neonatal disorders	273,711 (239,733–300,723)	201,959 (182,138–221,901)	-26·2	5,163 (4,522–5,672)	2,931 (2,644–3,221)	-43·2
Preterm birth complications	105,969 (88,149–120,926)	76,982 (66,233–88,295)	-27·4	1,999 (1,663–2,281)	1,117 (961–1,282)	-44·1
Neonatal encephalopathy (birth asphyxia and birth trauma)	60,592 (50,207–75,034)	50,150 (40,521–59,841)	-17·2	1,143 (947–1,415)	728 (588–869)	-36·3
Sepsis and other infectious disorders of the newborn baby	46,029 (25,147–70,357)	44,236 (27,349–72,418)	-3·9	868 (474–1,327)	642 (397–1,051)	-26·1
Other neonatal disorders	61,121 (46,110–74,451)	30,591 (25,603–37,360)	-50·0	1,153 (870–1,404)	444 (372–542)	-61·5
Nutritional deficiencies	111,787 (94,423–134,793)	85,341 (68,823–106,945)	-23·7	2,109 (1,781–2,543)	1,239 (999–1,552)	-41·3
Protein-energy malnutrition	60,543 (50,360–71,685)	34,874 (27,975–41,628)	-42·4	1,142 (950–1,352)	506 (406–604)	-55·7
Iodine deficiency	3,273 (2,143–5,008)	4,027 (2,594–6,279)	23·0	62 (40–94)	58 (38–91)	-5·3
Vitamin A deficiency	740 (565–941)	806 (612–1,037)	9·0	14 (11–18)	12 (9–15)	-16·1
Iron-deficiency anemia	46,792 (32,598–66,122)	45,338 (30,977–64,551)	-3·1	883 (615–1,247)	658 (450–937)	-25·4
Other nutritional deficiencies	439 (384–552)	295 (218–327)	-32·8	8 (7–10)	4 (3–5)	-48·3
Other communicable, maternal, neonatal, and nutritional disorders	48,186 (39,071–58,574)	41,957 (36,061–49,095)	-12·9	909 (737–1,105)	609 (523–713)	-33·0
Sexually transmitted diseases excluding HIV	18,314 (11,399–28,213)	10,978 (6,821–16,989)	-40·1	345 (215–532)	159 (99–247)	-53·9
Syphilis	17,014 (10,026–26,765)	9,578 (5,650–15,409)	-43·7	321 (189–505)	139 (82–224)	-56·7
Sexually transmitted chlamydial diseases	621 (332–1,085)	714 (369–1,271)	15·0	12 (6–20)	10 (5–18)	-11·5
Gonococcal infection	230 (137–381)	282 (156–481)	22·8	4 (3–7)	4 (2–7)	-5·5
Trichomoniasis	182 (0–493)	167 (0–493)	-8·4	3 (0–10)	2 (0–7)	-29·5
Other sexually transmitted diseases	267 (181–351)	236 (177–339)	-11·5	5 (3–7)	3 (3–5)	-31·9
Hepatitis	10,447 (9,780–11,134)	13,258 (11,364–15,855)	26·9	197 (184–210)	192 (165–230)	-2·4
Acute hepatitis A	4,945 (2,942–7,350)	4,351 (2,412–9,026)	-12·0	93 (55–139)	63 (35–131)	-32·3
Acute hepatitis B	2,877 (1,910–3,596)	4,674 (3,189–6,052)	62·5	54 (36–68)	68 (46–88)	25·0
Acute hepatitis C	276 (169–394)	518 (378–713)	87·7	5 (3–7)	8 (5–10)	44·4
Acute hepatitis E	2,349 (1,339–3,675)	3,715 (1,552–7,470)	58·1	44 (25–69)	54 (23–108)	21·7
Leprosy	26 (12–48)	6 (3–11)	-76·6	<0·5 (0–1)	<0·5 (0–0·5)	-82·0
Other infectious diseases	19,399 (13,847–23,286)	17,715 (13,382–21,539)	-8·7	366 (261–439)	257 (194–313)	-29·7
Non-communicable diseases	1,075,297 (1,001,607–1,159,673)	1,343,696 (1,239,973–1,456,773)	25·0	20,283 (18,893–21,874)	19,502 (17,997–21,143)	-3·8
Neoplasms	148,078 (136,775–158,256)	188,487 (174,452–199,037)	27·3	2,793 (2,580–2,985)	2,736 (2,532–2,889)	-2·1
Esophageal cancer	8,139 (6,608–10,115)	8,943 (6,698–10,822)	9·9	154 (125–191)	130 (97–157)	-15·5
Stomach cancer	18,453 (14,113–24,068)	16,413 (12,290–21,537)	-11·1	348 (266–454)	238 (178–313)	-31·6
Liver cancer	13,187 (10,746–15,056)	19,111 (16,655–22,911)	44·9	249 (203–284)	277 (242–333)	11·5
Liver cancer secondary to hepatitis B	6,152 (5,031–6,999)	8,938 (7,729–10,877)	45·3	116 (95–132)	130 (112–158)	11·8
Liver cancer secondary to hepatitis C	2,628 (2,194–2,937)	4,141 (3,542–4,859)	57·6	50 (41–55)	60 (51–71)	21·3
Liver cancer secondary to alcohol use	2,645 (2,167–2,999)	3,782 (3,349–4,488)	42·9	50 (41–57)	55 (48–65)	10·0
Other liver cancer	1,762 (1,430–2,003)	2,250 (1,964–2,687)	27·7	33 (27–38)	33 (29–39)	-1·7
Larynx cancer	2,055 (1,101–3,338)	2,367 (1,281–3,818)	15·1	39 (21–63)	34 (19–55)	-11·4
Trachea, bronchus, and lung cancers	23,850 (18,835–29,845)	32,405 (24,400–38,334)	35·9	450 (355–563)	470 (354–556)	4·5
Breast cancer	8,845 (8,571–9,295)	12,018 (11,514–12,704)	35·9	167 (162–175)	174 (167–184)	4·5
Cervical cancer	5,570 (3,570–7,639)	6,440 (4,111–8,758)	15·6	105 (67–144)	93 (60–127)	-11·0
Uterine cancer	1,016 (588–1,744)	1,272 (630–1,825)	25·2	19 (11–33)	18 (9–26)	-3·7
Prostate cancer	2,352 (1,438–3,486)	3,787 (2,189–5,623)	61·0	44 (27–66)	55 (32–82)	23·9
Colon and rectum cancers	10,640 (8,967–11,798)	14,422 (12,774–16,571)	35·5	201 (169–223)	209 (185–241)	4·3
Mouth cancer	2,224 (1,859–2,401)	3,228 (2,718–3,538)	45·1	42 (35–45)	47 (39–51)	11·7
Nasopharynx cancer	1,486 (980–1,925)	2,007 (1,311–2,611)	35·1	28 (18–36)	29 (19–38)	3·9
Cancer of other part of pharynx and oropharynx	2,094 (1,211–2,579)	2,742 (1,577–3,413)	30·9	39 (23–49)	40 (23–50)	0·8
Gallbladder and biliary tract cancer	2,046 (1,374–2,812)	3,034 (1,966–4,061)	48·3	39 (26–53)	44 (29–59)	14·1

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(Continued from previous page)	All ages DALYs (thousands)			DALYs (per 100 000)		
	1990	2010	% change	1990	2010	% change
Pancreatic cancer	4,188 (3,186–5,376)	6,161 (4,644–7,694)	47·1	79 (60–101)	89 (67–112)	13·2
Malignant melanoma of skin	841 (539–1,231)	1,169 (744–1,694)	39·1	16 (10–23)	17 (11–25)	7·0
Non-melanoma skin cancer	515 (350–746)	798 (557–1,068)	54·9	10 (7–14)	12 (8–16)	19·2
Ovarian cancer	2,987 (2,146–3,606)	4,118 (2,930–5,115)	37·9	56 (40–68)	60 (43–74)	6·1
Testicular cancer	282 (172–364)	313 (202–405)	11·2	5 (3–7)	5 (3–6)	-14·4
Kidney and other urinary organ cancers	2,132 (1,554–2,806)	3,676 (2,857–4,922)	72·5	40 (29–53)	53 (41–71)	32·7
Bladder cancer	2,388 (1,904–2,858)	3,015 (2,336–3,563)	26·2	45 (36–54)	44 (34–52)	-2·9
Brain and nervous system cancers	4,602 (3,053–6,493)	6,060 (3,669–7,455)	31·7	87 (58–122)	88 (53–108)	1·3
Thyroid cancer	579 (446–714)	836 (625–997)	44·4	11 (8–13)	12 (9–14)	11·1
Hodgkin's disease	751 (474–1,035)	647 (430–920)	-13·8	14 (9–20)	9 (6–13)	-33·7
Non-Hodgkin lymphoma	4,509 (3,577–5,210)	5,860 (4,610–6,450)	30·0	85 (67–98)	85 (67–94)	0·0
Multiple myeloma	1,029 (724–1,452)	1,475 (969–2,002)	43·3	19 (14–27)	21 (14–29)	10·2
Leukemia	8,950 (7,078–11,042)	9,556 (7,662–11,232)	6·8	169 (134–208)	139 (111–163)	-17·8
Other neoplasms	12,366 (9,438–15,506)	16,615 (11,928–19,888)	34·4	233 (178–292)	241 (173–289)	3·4
Cardiovascular and circulatory diseases	240,667 (227,084–257,718)	295,036 (273,061–309,562)	22·6	4,540 (4,283–4,861)	4,282 (3,963–4,493)	-5·7
Rheumatic heart disease	14,418 (13,170–16,236)	10,150 (9,058–11,308)	-29·6	272 (248–306)	147 (131–164)	-45·8
Ischemic heart disease	100,473 (96,503–108,966)	129,820 (119,174–138,044)	29·2	1,895 (1,820–2,055)	1,884 (1,730–2,004)	-0·6
Cerebrovascular disease	86,010 (81,022–94,811)	102,232 (90,428–107,989)	18·9	1,622 (1,528–1,788)	1,484 (1,312–1,567)	-8·5
Ischemic stroke	32,128 (29,567–36,615)	39,389 (36,906–45,504)	22·6	606 (558–691)	572 (536–660)	-5·7
Hemorrhagic and other non-ischemic stroke	53,882 (45,237–63,351)	62,843 (54,386–72,540)	16·6	1,016 (853–1,195)	912 (789–1,053)	-10·3
Hypertensive heart disease	11,152 (9,216–13,691)	15,324 (12,835–18,433)	37·4	210 (174–258)	222 (186–268)	5·7
Cardiomyopathy and myocarditis	9,148 (7,463–10,970)	11,151 (9,759–12,882)	21·9	173 (141–207)	162 (142–187)	-6·2
Atrial fibrillation and flutter	1,854 (1,377–2,429)	3,598 (2,756–4,578)	94·1	35 (26–46)	52 (40–66)	49·3
Aortic aneurysm	2,349 (1,629–3,220)	3,163 (2,280–4,235)	34·6	44 (31–61)	46 (33–61)	3·6
Peripheral vascular disease	505 (342–748)	995 (703–1,445)	97·1	10 (6–14)	14 (10–21)	51·7
Endocarditis	1,489 (1,215–1,828)	1,582 (1,245–1,839)	6·2	28 (23–34)	23 (18–27)	-18·3
Other cardiovascular and circulatory diseases	13,266 (11,425–15,212)	17,021 (15,191–19,188)	28·3	250 (216–287)	247 (220–278)	-1·3
Chronic respiratory diseases	119,153 (107,917–132,391)	117,945 (102,924–135,608)	-1·0	2,248 (2,036–2,497)	1,712 (1,494–1,968)	-23·8
Chronic obstructive pulmonary disease	78,283 (70,391–87,044)	76,731 (65,654–90,111)	-2·0	1,477 (1,328–1,642)	1,114 (953–1,308)	-24·6
Pneumoconiosis	3,503 (1,799–6,097)	2,582 (1,667–4,295)	-26·3	66 (34–115)	37 (24–62)	-43·3
Asthma	21,469 (16,117–28,161)	22,459 (17,184–29,189)	4·6	405 (304–531)	326 (249–424)	-19·5
Interstitial lung disease and pulmonary sarcoidosis	1,547 (1,043–2,156)	2,233 (1,547–2,978)	44·4	29 (20–41)	32 (22–43)	11·1
Other chronic respiratory diseases	14,352 (10,700–19,695)	13,940 (11,167–17,190)	-2·9	271 (202–371)	202 (162–249)	-25·3
Cirrhosis of the liver	24,327 (20,693–27,179)	31,027 (25,965–34,663)	27·5	459 (390–513)	450 (377–503)	-1·9
Cirrhosis of the liver secondary to hepatitis B	7,088 (5,842–7,961)	8,990 (7,728–10,912)	26·8	134 (110–150)	130 (112–158)	-2·4
Cirrhosis of the liver secondary to hepatitis C	5,629 (4,813–6,421)	7,452 (6,370–8,553)	32·4	106 (91–121)	108 (92–124)	1·9
Cirrhosis of the liver secondary to alcohol use	6,350 (5,128–7,602)	8,575 (6,840–10,177)	35·0	120 (97–143)	124 (99–148)	3·9
Other cirrhosis of the liver	5,260 (4,556–6,111)	6,011 (5,172–7,117)	14·3	99 (86–115)	87 (75–103)	-12·1
Digestive diseases (except cirrhosis)	33,564 (30,273–36,733)	32,691 (29,153–35,898)	-2·6	633 (571–693)	474 (423–521)	-25·1
Peptic ulcer disease	9,940 (8,233–10,669)	6,718 (5,718–7,752)	-32·4	187 (155–201)	98 (83–113)	-48·0
Gastritis and duodenitis	1,277 (926–1,717)	1,197 (860–1,717)	-6·3	24 (17–32)	17 (12–25)	-27·9
Appendicitis	1,902 (1,306–2,933)	1,483 (993–2,096)	-22·0	36 (25–55)	22 (14–30)	-40·0
Paralytic ileus and intestinal obstruction without hernia	3,860 (2,243–4,940)	3,729 (2,785–5,009)	-3·4	73 (42–93)	54 (40–73)	-25·7
Inguinal or femoral hernia	999 (808–1,358)	792 (539–1,208)	-20·7	19 (15–26)	11 (8–18)	-39·0
Non-infective inflammatory bowel disease	2,830 (1,928–3,648)	2,875 (2,190–3,629)	1·6	53 (36–69)	42 (32–53)	-21·8
Vascular disorders of intestine	880 (449–1,903)	1,100 (566–2,399)	25·1	17 (8–36)	16 (8–35)	-3·7
Gall bladder and bile duct disease	2,179 (1,836–2,743)	2,245 (1,933–2,598)	3·0	41 (35–52)	33 (28–38)	-20·7
Pancreatitis	1,695 (1,240–2,121)	2,354 (1,811–2,989)	38·9	32 (23–40)	34 (26–43)	6·9
Other digestive diseases	8,003 (6,261–9,544)	10,197 (8,318–13,168)	27·4	151 (118–180)	148 (121–191)	-2·0
Neurological disorders	48,663 (41,117–56,947)	73,781 (62,753–84,299)	51·6	918 (776–1,074)	1,071 (911–1,224)	16·7
Alzheimer's disease and other dementias	5,695 (4,516–6,982)	11,349 (9,147–13,741)	99·3	107 (85–132)	165 (133–199)	53·3
Parkinson's disease	1,094 (880–1,374)	1,918 (1,529–2,387)	75·3	21 (17–26)	28 (22–35)	34·9
Epilepsy	13,386 (10,681–16,667)	17,429 (14,129–21,202)	30·2	252 (201–314)	253 (205–308)	0·2
Multiple sclerosis	875 (700–1,033)	1,075 (893–1,251)	22·9	17 (13–19)	16 (13–18)	-5·5
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	1,266 (754–2,016)	1,779 (1,056–2,822)	40·5	24 (14–38)	26 (15–41)	8·1
Other neurological disorders	10,419 (6,837–14,567)	17,869 (12,788–24,723)	71·5	197 (129–275)	259 (186–359)	32·0
Mental and behavioral disorders	134,598 (112,138–159,316)	185,190 (154,647–218,496)	37·6	2,539 (2,115–3,005)	2,688 (2,245–3,171)	5·9
Schizophrenia	10,444 (6,935–14,099)	14,999 (9,766–20,399)	43·6	197 (131–266)	218 (142–296)	10·5
Alcohol use disorders	13,133 (9,516–17,511)	17,644 (12,928–23,273)	34·3	248 (179–330)	256 (188–338)	3·4
Drug use disorders	13,143 (9,721–17,259)	19,994 (15,254–25,366)	52·1	248 (183–326)	290 (221–368)	17·1
Opioid use disorders	5,278 (3,766–6,850)	9,152 (7,066–11,443)	73·4	100 (71–129)	133 (103–166)	33·4
Cocaine use disorders	862 (529–1,321)	1,110 (645–1,727)	28·8	16 (10–25)	16 (9–25)	-0·9
Amphetamine use disorders	1,911 (1,080–2,984)	2,617 (1,470–4,109)	36·9	36 (20–56)	38 (21–60)	5·4

(Continued from previous page)	All ages DALYs (thousands)			DALYs (per 100 000)		
	1990	2010	% change	1990	2010	% change
Cannabis use disorders	1,693 (1,105–2,418)	2,057 (1,348–2,929)	21·5	32 (21–46)	30 (20–43)	-6·5
Other drug use disorders	3,399 (2,335–4,932)	5,059 (3,555–7,042)	48·8	64 (44–93)	73 (52–102)	14·5
Unipolar depressive disorders	54,010 (40,381–68,450)	74,264 (55,670–94,240)	37·5	1,019 (762–1,291)	1,078 (808–1,368)	5·8
Major depressive disorder	46,139 (34,517–58,427)	63,179 (47,779–80,891)	36·9	870 (651–1,102)	917 (693–1,174)	5·4
Dysthymia	7,871 (5,266–10,858)	11,084 (7,297–15,447)	40·8	148 (99–205)	161 (106–224)	8·4
Bipolar affective disorder	9,129 (5,757–13,169)	12,867 (8,084–18,654)	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	1,304 (934–1,770)	2,161 (1,519–2,949)	65·7	25 (18–33)	31 (22–43)	27·5
Pervasive development disorders	5,918 (4,133–8,130)	7,666 (5,355–10,565)	29·5	112 (78–153)	111 (78–153)	-0·3
Autism	3,088 (2,119–4,260)	4,007 (2,752–5,563)	29·8	58 (40–80)	58 (40–81)	-0·2
Asperger's syndrome	2,830 (1,917–4,016)	3,659 (2,463–5,150)	29·3	53 (36–76)	53 (36–75)	-0·5
Childhood behavioral disorders	5,472 (3,277–8,359)	6,245 (3,785–9,347)	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	5,047 (2,960–7,840)	5,753 (3,428–8,748)	14·0	95 (56–148)	84 (50–127)	-12·3
Idiopathic intellectual disability	1,247 (746–1,924)	1,043 (572–1,687)	-16·4	24 (14–36)	15 (8–24)	-35·7
Other mental and behavioral disorders	1,135 (721–1,675)	1,482 (990–2,152)	30·6	21 (14–32)	22 (14–31)	0·5
Diabetes, urogenital, blood, and endocrine diseases	85,084 (73,638–102,489)	122,437 (107,437–143,387)	43·9	1,605 (1,389–1,933)	1,777 (1,559–2,081)	10·7
Diabetes mellitus	27,706 (23,696–32,894)	46,823 (40,085–55,215)	69·0	523 (447–620)	680 (582–801)	30·0
Acute glomerulonephritis	6,774 (2,754–17,979)	3,684 (1,746–8,386)	-45·6	128 (52–339)	53 (25–122)	-58·1
Chronic kidney diseases	13,946 (12,194–15,480)	21,151 (18,147–23,223)	51·7	263 (230–292)	307 (263–337)	16·7
Chronic kidney disease due to diabetes mellitus	2,642 (2,371–3,018)	4,675 (4,030–5,182)	76·9	50 (45–57)	68 (58–75)	36·1
Chronic kidney disease due to hypertension	2,850 (2,524–3,183)	4,599 (3,982–5,057)	61·4	54 (48–60)	67 (58–73)	24·2
Chronic kidney disease unspecified	8,453 (7,291–9,375)	11,877 (10,193–13,047)	40·5	159 (138–177)	172 (148–189)	8·1
Urinary diseases and male infertility	8,116 (6,179–10,673)	13,523 (10,484–17,718)	66·6	153 (117–201)	196 (152–257)	28·2
Tubulointerstitial nephritis, pyelonephritis, and urinary tract infections	2,060 (1,421–2,638)	3,108 (2,196–3,766)	50·8	39 (27–50)	45 (32–55)	16·1
Urolithiasis	897 (659–1,331)	1,113 (785–1,834)	24·1	17 (12–25)	16 (11–27)	-4·5
Benign prostatic hyperplasia	3,726 (2,392–5,645)	6,834 (4,377–10,179)	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	1,307 (829–1,844)	2,296 (1,681–3,068)	75·7	25 (16–35)	33 (24–45)	35·2
Gynecological diseases	7,858 (5,064–11,911)	10,258 (6,438–15,837)	30·5	148 (96–225)	149 (93–230)	0·4
Uterine fibroids	2,355 (1,584–3,354)	3,062 (1,990–4,573)	30·0	44 (30–63)	44 (29–66)	0·0
Polycystic ovarian syndrome	2,027 (971–3,786)	2,756 (1,312–5,212)	35·9	38 (18–71)	40 (19–76)	4·6
Female infertility	91 (36–189)	125 (50–259)	37·6	2 (1–4)	2 (1–4)	5·9
Endometriosis	405 (143–739)	545 (188–1,008)	34·6	8 (3–14)	8 (3–15)	3·6
Genital prolapse	1,343 (548–2,690)	1,817 (746–3,654)	35·3	25 (10–51)	26 (11–53)	4·1
Premenstrual syndrome	983 (49–2,592)	1,249 (63–3,337)	27·0	19 (1–49)	18 (1–48)	-2·3
Other gynecological diseases	654 (497–954)	705 (527–954)	7·7	12 (9–16)	10 (8–14)	-17·1
Hemoglobinopathies and hemolytic anemias	14,293 (10,785–18,552)	15,640 (12,225–19,722)	9·4	270 (203–350)	227 (177–286)	-15·8
Thalassemias	5,397 (4,084–7,018)	5,717 (4,170–7,728)	5·9	102 (77–132)	83 (61–112)	-18·5
Sickle cell disorders	4,333 (3,288–5,576)	5,641 (4,244–7,467)	30·2	82 (62–105)	82 (62–105)	0·2
G6PD deficiency	325 (254–414)	303 (244–372)	-6·8	6 (5–8)	4 (4–5)	-28·3
Other hemoglobinopathies and hemolytic anemias	4,238 (2,950–6,223)	3,979 (2,887–5,400)	-6·1	80 (56–117)	58 (42–78)	-27·7
Other endocrine, nutritional, blood, and immune disorders	6,392 (4,349–8,434)	11,358 (8,204–17,019)	77·7	121 (82–159)	165 (119–247)	36·7
Musculoskeletal disorders	116,554 (88,684–147,285)	169,624 (129,771–212,734)	45·5	2,198 (1,673–2,778)	2,462 (1,883–3,088)	12·0
Rheumatoid arthritis	3,335 (2,573–4,192)	4,815 (3,705–6,056)	44·4	63 (49–79)	70 (54–88)	11·1
Osteoarthritis	10,449 (7,100–14,788)	17,135 (11,884–24,256)	64·0	197 (134–279)	249 (172–352)	26·2
Low back and neck pain	82,111 (56,962–110,433)	116,704 (80,615–156,527)	42·1	1,549 (1,074–2,083)	1,694 (1,170–2,272)	9·4
Low back pain	58,245 (39,934–78,139)	83,063 (56,632–111,880)	42·6	1,099 (753–1,474)	1,206 (822–1,624)	9·7
Neck pain	23,866 (16,535–33,105)	33,640 (23,469–46,176)	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	20,583 (17,019–23,254)	30,856 (25,815–34,583)	49·9	388 (321–439)	448 (375–502)	15·4
Other non-communicable diseases	124,608 (101,248–157,225)	127,477 (99,171–169,616)	2·3	2,350 (1,910–2,966)	1,850 (1,439–2,462)	-21·3
Congenital anomalies	54,242 (45,567–69,009)	38,887 (31,850–45,719)	-28·3	1,023 (860–1,302)	564 (462–664)	-44·8
Neural tube defects	10,291 (6,276–14,848)	6,372 (3,884–9,096)	-38·1	194 (118–280)	92 (56–132)	-52·4
Congenital heart anomalies	21,786 (18,241–28,667)	15,457 (13,675–17,754)	-29·0	411 (344–541)	224 (198–258)	-45·4
Cleft lip and cleft palate	982 (543–1,688)	571 (408–747)	-41·9	19 (10–32)	8 (6–11)	-55·3
Down's syndrome	2,120 (1,087–3,380)	1,775 (1,227–2,463)	-16·3	40 (21–64)	26 (18–36)	-35·6
Other chromosomal abnormalities	3,051 (1,759–6,843)	1,761 (1,017–2,972)	-42·3	58 (22–129)	26 (15–43)	-55·6
Other congenital anomalies	16,012 (9,010–24,351)	12,951 (8,408–17,169)	-19·1	302 (170–459)	188 (122–249)	-37·8
Skin and subcutaneous diseases	30,197 (20,885–44,452)	36,948 (24,800–55,671)	22·4	570 (394–838)	536 (360–808)	-5·8
Eczema	6,890 (3,508–10,872)	8,897 (4,518–14,049)	29·1	130 (66–205)	129 (66–204)	-0·6
Psoriasis	742 (371–1,179)	1,059 (528–1,690)	42·8	14 (7–22)	15 (8–25)	9·8

(Continued from previous page)	All ages DALYs (thousands)			DALYs (per 100 000)		
	1990	2010	% change	1990	2010	% change
Cellulitis	1,428 (1,069–1,863)	1,292 (1,000–1,770)	-9·6	27 (20–35)	19 (15–26)	-30·4
Abscess, impetigo, and other bacterial skin diseases	3,166 (2,295–4,355)	2,869 (2,099–4,175)	-9·4	60 (43–82)	42 (30–61)	-30·3
Scabies	1,881 (956–3,384)	1,580 (807–2,792)	-16·0	35 (18–64)	23 (12–41)	-35·4
Fungal skin diseases	1,618 (532–3,754)	2,303 (740–5,435)	42·3	31 (10–71)	33 (11–79)	9·5
Viral skin diseases	2,354 (1,058–4,369)	2,731 (1,203–4,941)	16·0	44 (20–82)	40 (17–72)	-10·7
Acne vulgaris	3,281 (1,545–6,205)	4,002 (1,869–7,575)	22·0	62 (29–117)	58 (27–110)	-6·2
Alopecia areata	1,002 (313–1,906)	1,352 (424–2,567)	35·0	19 (6–36)	20 (6–37)	3·9
Pruritus	1,433 (682–2,676)	2,086 (1,004–3,951)	45·6	27 (13–50)	30 (15–57)	12·1
Urticaria	1,968 (757–3,431)	2,600 (980–4,441)	32·1	37 (14–65)	38 (14–64)	1·6
Decubitus ulcer	975 (764–1,232)	1,206 (914–1,539)	23·6	18 (14–23)	17 (13–22)	-4·9
Other skin and subcutaneous diseases	3,459 (1,642–6,475)	4,973 (2,328–9,311)	43·7	65 (31–122)	72 (34–135)	10·6
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 (725–1,178)	112·7	8 (6–11)	14 (11–17)	63·7
Cataracts	4,225 (3,283–5,364)	4,732 (3,647–6,010)	12·0	80 (62–101)	69 (53–87)	-13·8
Macular degeneration	513 (388–647)	1,329 (1,026–1,668)	158·9	10 (7–12)	19 (15–24)	99·2
Refraction and accommodation disorders	3,608 (2,688–4,762)	5,593 (4,117–7,468)	55·0	68 (51–90)	81 (60–108)	19·3
Other hearing loss	12,211 (7,258–19,495)	15,761 (9,455–25,210)	29·1	230 (137–368)	229 (137–366)	-0·7
Other vision loss	4,069 (2,171–7,180)	6,240 (3,260–11,208)	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 (6,824–20,984)	15,015 (7,795–26,482)	20·9	234 (129–396)	218 (113–384)	-7·0
Dental caries	3,704 (1,523–7,150)	4,984 (2,086–9,356)	34·5	70 (29–135)	72 (30–136)	3·5
Periodontal disease	3,440 (1,310–7,305)	5,410 (2,051–11,286)	57·3	65 (25–138)	79 (30–164)	21·0
Edentulism	5,273 (3,100–8,127)	4,621 (2,678–7,296)	-12·4	99 (58–153)	67 (39–106)	-32·6
Sudden infant death syndrome	2,583 (1,321–4,884)	1,893 (1,127–3,139)	-26·7	49 (25–92)	27 (16–46)	-43·6
Injuries	245,694 (228,373–268,325)	278,665 (253,532–305,786)	13·4	4,634 (4,308–5,061)	4,044 (3,680–4,438)	-12·7
Transport injuries	61,026 (51,613–72,674)	81,577 (67,477–103,465)	33·7	1,151 (974–1,371)	1,184 (979–1,502)	2·9
Road injury	56,655 (49,607–68,078)	75,482 (61,556–94,783)	33·2	1,069 (936–1,284)	1,096 (893–1,376)	2·5
Pedestrian injury by road vehicle	17,477 (13,682–20,572)	25,636 (20,291–33,329)	46·7	330 (258–388)	372 (295–484)	12·9
Pedal cycle vehicle	3,362 (2,601–4,070)	4,645 (3,643–5,496)	38·2	63 (49–77)	67 (53–80)	6·3
Motorized vehicle with two wheels	8,631 (6,913–10,361)	12,266 (9,979–13,897)	42·1	163 (130–195)	178 (145–202)	9·4
Motorized vehicle with three or more wheels	21,448 (17,644–25,904)	28,233 (23,657–33,474)	31·6	405 (333–489)	410 (343–486)	1·3
Road injury other	6,565 (3,845–10,481)	5,974 (3,593–10,091)	-9·0	124 (73–198)	87 (52–146)	-30·0
Other transport injury	4,370 (3,623–5,384)	6,096 (5,032–7,458)	39·5	82 (68–102)	88 (73–108)	7·3
Unintentional injuries other than transport injuries	129,188 (118,487–143,697)	120,546 (107,276–133,408)	-6·7	2,437 (2,235–2,710)	1,750 (1,557–1,936)	-28·2
Falls	25,891 (21,284–31,651)	35,385 (28,479–44,049)	36·7	488 (401–597)	514 (413–639)	5·2
Drowning	28,724 (22,511–34,347)	19,742 (16,948–24,802)	-31·3	542 (425–648)	287 (246–360)	-47·1
Fire, heat and hot substances	17,128 (13,849–20,276)	19,010 (13,290–24,139)	11·0	323 (261–382)	276 (193–350)	-14·6
Poisonings	11,151 (8,403–17,607)	8,934 (6,647–11,850)	-19·9	210 (158–332)	130 (96–172)	-38·4
Exposure to mechanical forces	15,793 (11,470–23,763)	11,367 (8,668–13,493)	-28·0	298 (216–448)	165 (126–196)	-44·6
Mechanical forces (firearm)	7,603 (4,721–11,573)	4,624 (3,125–6,872)	-39·2	143 (89–218)	67 (45–100)	-53·2
Mechanical forces (other)	8,504 (5,674–11,561)	7,097 (4,686–8,517)	-16·5	160 (107–218)	103 (68–124)	-35·8
Adverse effects of medical treatment	2,483 (1,901–3,006)	4,082 (3,333–4,730)	64·4	47 (36–57)	59 (48–69)	26·5
Animal contact	4,743 (3,217–6,151)	3,659 (2,366–5,049)	-22·9	89 (61–116)	53 (34–73)	-40·6
Animal contact (venomous)	3,531 (2,110–5,519)	2,729 (1,545–4,806)	-22·7	67 (40–104)	40 (22–70)	-40·5
Animal contact (non-venomous)	1,212 (625–1,952)	929 (558–1,281)	-23·3	23 (12–37)	13 (8–19)	-41·0
Unintentional injuries not classified elsewhere	23,275 (20,000–25,649)	18,369 (16,254–20,786)	-21·1	439 (377–484)	267 (236–302)	-39·3
Self-harm and interpersonal violence	49,198 (41,304–56,869)	62,195 (51,859–73,023)	26·4	928 (779–1,073)	903 (753–1,060)	-2·7
Self-harm	29,605 (23,033–37,329)	36,654 (26,890–44,649)	23·8	558 (434–704)	532 (390–648)	-4·7
Interpersonal violence	19,593 (14,501–23,503)	25,541 (20,030–32,921)	30·4	370 (274–443)	371 (291–478)	0·3
Assault by firearm	8,239 (6,325–10,094)	11,146 (8,769–13,161)	35·3	155 (119–190)	162 (127–191)	4·1
Assault by sharp object	4,776 (3,319–6,698)	7,095 (4,828–10,148)	48·6	90 (63–126)	103 (70–147)	14·3
Assault by other means	6,729 (5,182–7,705)	7,526 (6,274–8,920)	11·8	127 (98–145)	109 (91–129)	-13·9
Forces of nature, war, and legal intervention	6,282 (4,786–9,222)	14,347 (8,969–27,860)	128·4	118 (90–174)	208 (130–404)	75·7
Exposure to forces of nature	1,674 (1,091–2,917)	13,387 (8,177–26,226)	699·9	32 (21–55)	194 (119–381)	515·5
Collective violence and legal intervention	4,608 (3,538–6,516)	960 (708–1,480)	-79·2	87 (67–123)	14 (10–21)	-84·0

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