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Findings from the
**Global Burden
of Disease Study**
2017

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GBD 2017:

Joint Introduction by Dr. Tedros and Dr. Murray

A quarter century ago, the World Bank revealed the first glimpse of the Global Burden of Disease Study (GBD). The study was met by many in the international health metrics sciences community with curiosity and skepticism. No one had ever attempted to quantify 107 diseases and injuries in every region of the world.

Twenty-five years later, the GBD has evolved into a broad resource of what injures, disables, and kills people across countries, as well as by time, age, and sex. The 2017 study comprises seven papers and a complete edition of the international medical journal *The Lancet*. In addition, for the first time, the GBD seeks to quantify population and levels of fertility in every nation. The number of collaborators totaled 3,676 from 146 countries and territories; it includes 38 billion estimates of 359 diseases and injuries and 84 risk factors in 195 countries and territories.

Comprehensive data is essential for informing policy dialogue and measuring progress in health and development. The World Health Organization (WHO) works closely with countries to produce internationally comparable statistics. Currently only 49 countries report high-quality cause-of-death data to WHO, and almost all of these are in Europe and the Americas.

WHO is committed to supporting countries to improve their systems for gathering robust health data. The GBD is an important independent resource that helps fill large gaps in existing health data through innovative statistical modelling. In May of this year, WHO and the Institute for Health Metrics and Evaluation (IHME), which coordinates the study, agreed to establish a broad collaboration, including on the GBD. Our organizations – and both of us personally – are committed to improving the accuracy, timeliness, and policy-relevance of health data and information. The memorandum of understanding we signed will result in increased awareness and understanding of health problems globally, as well as the evaluation of strategies to address them. Moreover, this agreement highlights our shared commitment to ensure that health policy is based on the most accurate and up-to-date data available.

IHME's GBD is an important tool to support health evidence worldwide, and facilitates bringing together global experts and scholars in the field to help improve health systems.

We encourage elected and appointed health officials, researchers, policy-makers, and others to explore the 2017 study.

TEDROS ADHANOM GHEBREYESUS
Director-General
The World Health Organization

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Director
Institute for Health Metrics
and Evaluation

Geneva, December 2018

Acronyms

CKD	Chronic kidney disease
COPD	Chronic obstructive pulmonary disease
DALYs	Disability-adjusted life years
GBD	Global Burden of Diseases, Injuries, and Risk Factors Study
HALE	Healthy life expectancy
NCDs	Non-communicable diseases
NTDs	Neglected tropical diseases
SDGs	Sustainable Development Goals
SDI	Socio-demographic Index
STIs	Sexually transmitted infections
TB	Tuberculosis
YLDs	Years lived with disability
YLLs	Years of life lost

Glossary of terms

Disability-adjusted life years (DALYs)	Years of healthy life lost to premature death and disability. DALYs are the sum of years of life lost (YLLs) and years lived with disability (YLDs).
Expected (value)	Predicted indicator value based on the country's per capita income, educational attainment, and total fertility rate.
Healthy 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.
Life expectancy	Number of years a person is expected to live based on their present age. For GBD, the life expectancy for an age group (e.g., 50- to 54-year-olds), is determined from the first year in the age range.
Maternal mortality ratio	The number of maternal deaths per 100,000 live births. GBD defines maternal deaths as any death of a woman while pregnant or within one year of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes. Ages included range from 10 to 54 years.
Replacement rate	The total fertility rate at which a population replaces itself from generation to generation, assuming no migration, or approximately 2.05 live births per woman.
Risk factors	Potentially modifiable causes of disease and injury.
SDG index	A composite measure, ranging from 0 to 100, of overall progress toward meeting the SDGs. It takes into account 40 of the 41 performance indicators for the health-related SDGs.
Socio-demographic Index (SDI)	A summary measure that identifies where countries or other geographic areas sit on the spectrum of development. Expressed on a scale of 0 to 1, SDI is a composite average of the rankings of the incomes per capita, average educational attainment, and fertility rates of all areas in the GBD study.
Super-regions	Seven world regions whose constituent countries are grouped on the basis of cause of death patterns: Central Europe, Eastern Europe, and Central Asia High-income Latin America and Caribbean North Africa and Middle East South Asia Southeast Asia, East Asia, and Oceania Sub-Saharan Africa
Total fertility rate	The average number of children a woman would bear if she survived through the end of the reproductive age span (age 10 to 54 years) and experienced at each age a particular set of age-specific fertility rates observed in the year of interest.
Under-5 mortality	The probability (expressed as the rate per 1,000 live births) that children born alive will die before reaching the age of 5 years.
Years lived with disability (YLDs)	Years of life lived with any short-term or long-term health loss.
Years of life lost (YLLs)	Years of life lost due to premature mortality.

Global trends in mortality and life expectancy

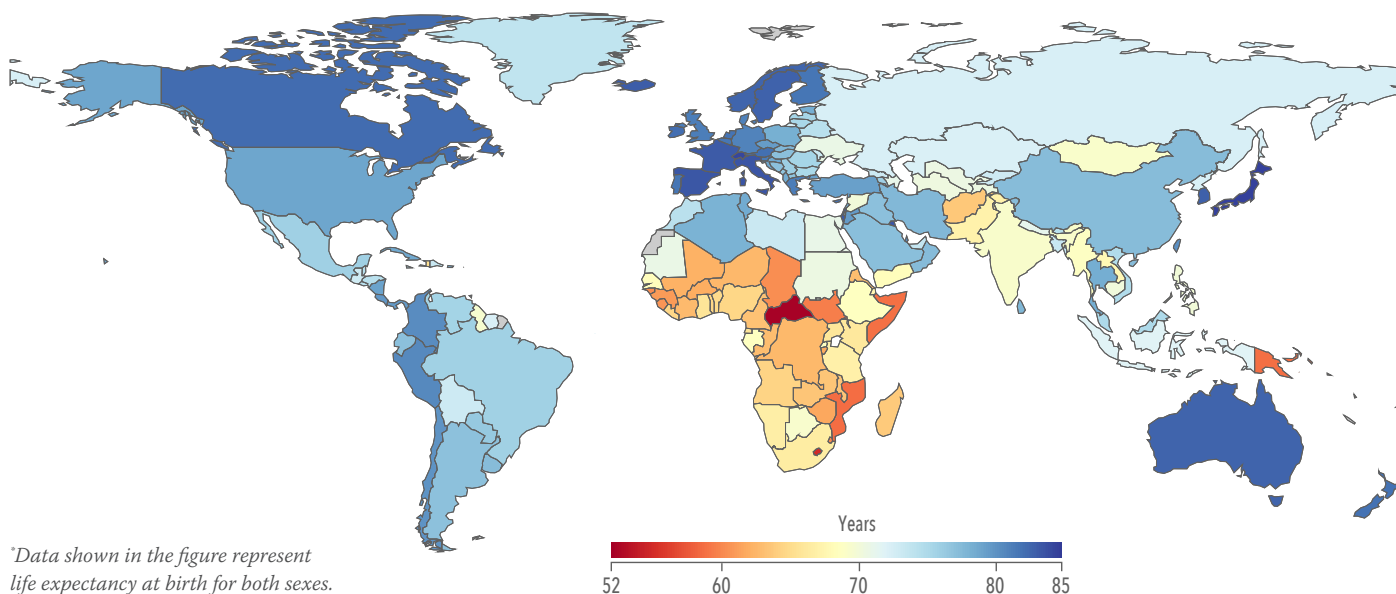
Highlights

- » There was rapid progress in life expectancy from 1950 to 2017:
 - » Males, up from 48 years in 1950 to 71 years in 2017
 - » Females, up from 53 years in 1950 to 76 years in 2017
- » Among age groups, the under-5 age group experienced huge reductions in mortality between 1950 and 2017, while adults have made much less progress, particularly adult males.
- » While females tend to live longer than males, the gap in life expectancy between them varies substantially by level of socioeconomic development.

What's new in this study

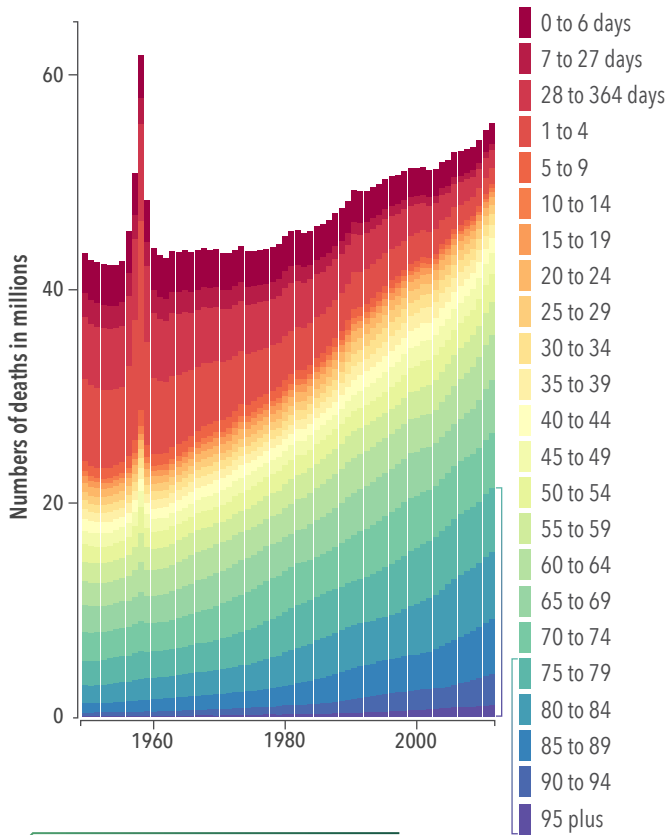
“Global, regional, and national age-sex-specific mortality and life expectancy, 1950–2017: a systematic analysis for the Global Burden of Disease Study 2017” is based on more data than ever before and includes 622 new data sources, for a total of 8,259 data sources. The 2017 study produced and used a new set of population estimates, which has led to substantial changes in mortality estimates in many countries. The analysis has been extended in time by two decades to start in 1950, and the statistical methods have been improved.

Life expectancy, 2017*



Total number of global deaths, 1950–2017

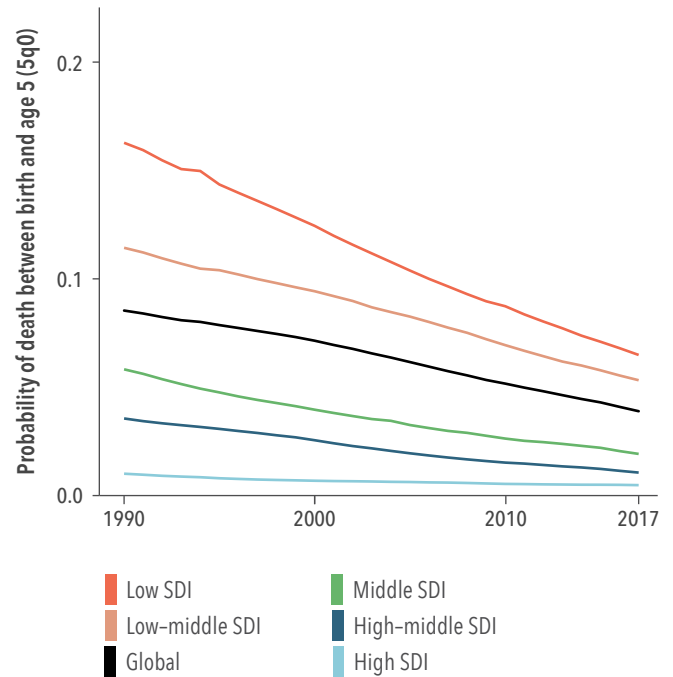
The proportion of deaths in those over age 75 increased from 12% of total deaths in 1950 to 39% in 2017.



There have been dramatic declines in under-5 mortality, but there were still 5.4 million deaths among children under 5 worldwide in 2017.

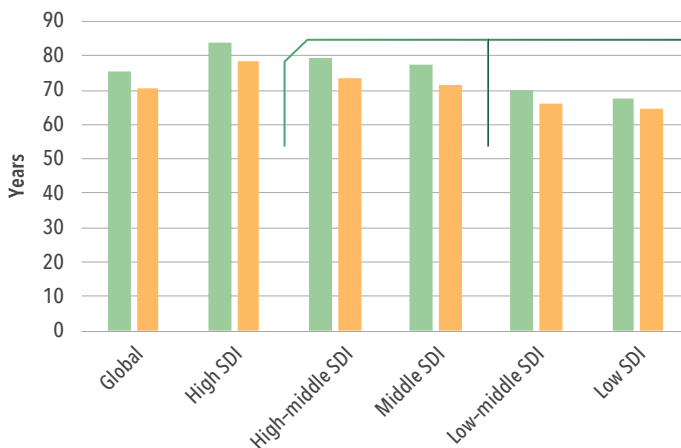
Under-5 mortality by level of socioeconomic development, 1990–2017

Declines in under-5 mortality were fastest among countries at the lowest level of Socio-demographic Index (SDI)**



**SDI captures three different aspects of development: income, education, and fertility.

Life expectancy[†] by sex globally, and by level of socioeconomic development, 2017



Disparities in life expectancy between males and females were greatest in countries at the high-middle and middle levels of development.

[†]Data shown in the figure represent life expectancy at birth.

Global trends in causes of death

Highlights

- » Between 1990 and 2017, early death from enteric infections*, respiratory infections and tuberculosis, and maternal and neonatal disorders dropped, with the greatest declines in the least developed countries.
- » Progress in reducing mortality from some common diseases has stalled or reversed, primarily for non-communicable diseases such as cardiovascular diseases and cancers.
- » An unintended consequence of greater access to health care globally is increases in mortality from diseases and disorders linked to antibiotic resistance.

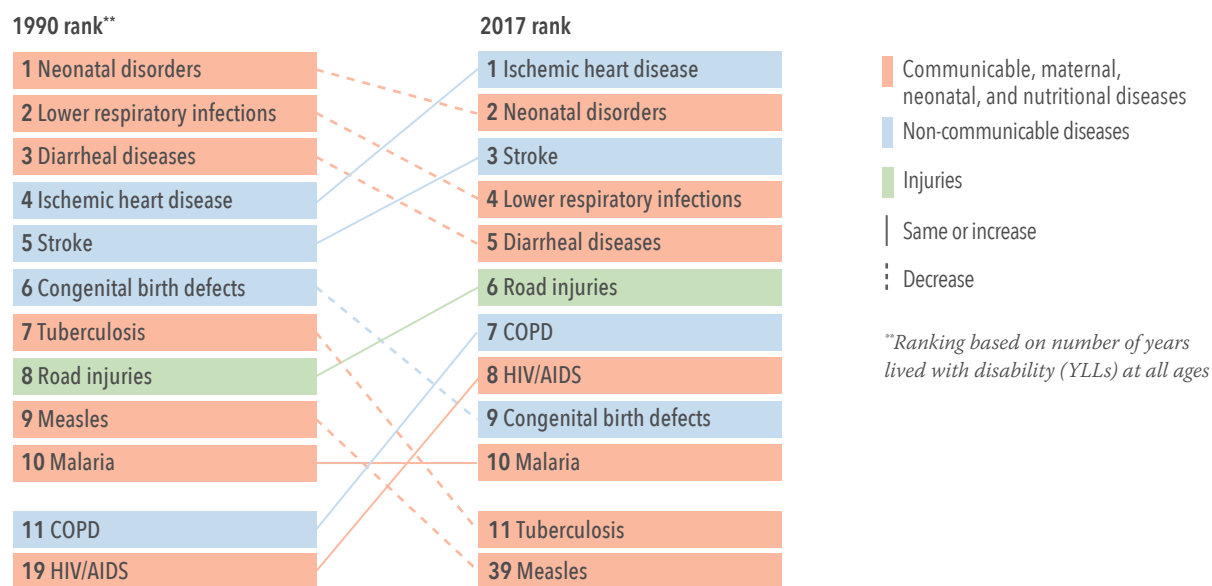
What's new in this study

“Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980–2017: a systematic analysis for the Global Burden of Disease Study 2017” estimated mortality for 282 causes of death in 195 countries from 1980 to 2017, adding 18 causes to its estimates compared to GBD 2016. In 2017, the GBD study added numerous data sources, including 127 country-years of vital registration data and 502 country-years of cancer registry data.

*Enteric infections include diseases such as diarrhea, typhoid and paratyphoid fevers, and other intestinal infections.

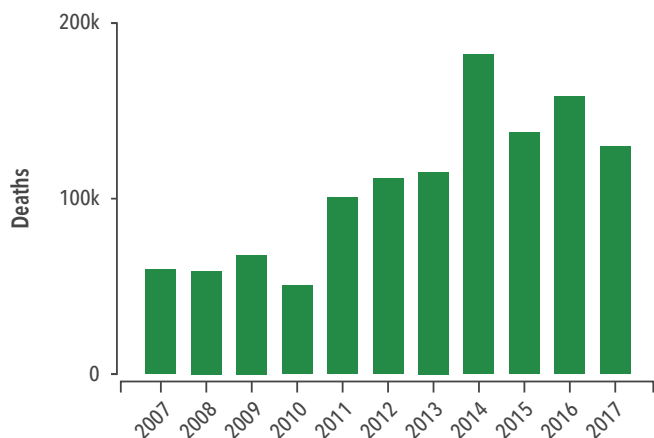
Leading causes of early death, 1990 and 2017

Ischemic heart disease, neonatal disorders, stroke, lower respiratory infections, diarrhea, road injuries, and chronic obstructive pulmonary disease (COPD) accounted for more than 1 million deaths each worldwide in 2017.



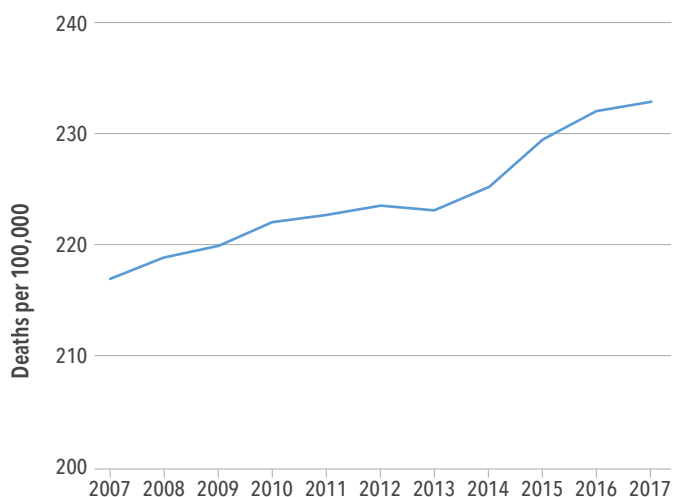
Deaths from armed conflict and terrorism, 2007–2017

Deaths from armed conflict and terrorism increased rapidly, rising by 118% from 2007 to 2017



Global mortality[†] from cardiovascular diseases, 2007–2017

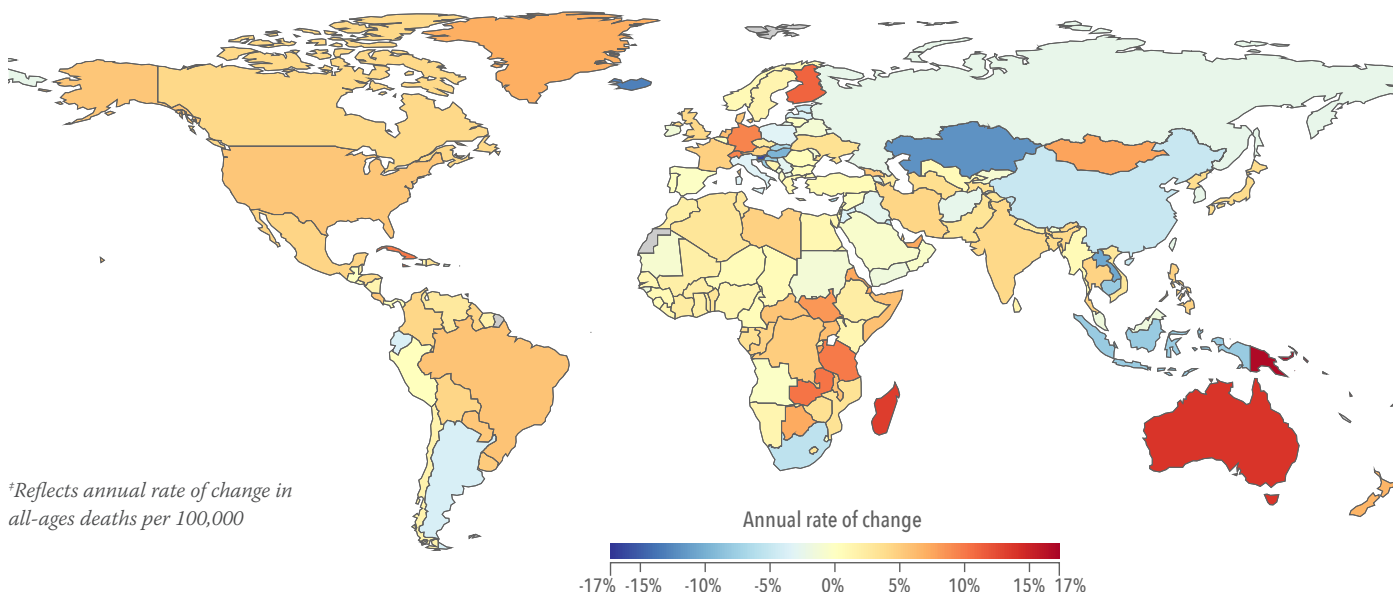
Medications that prevent deaths from cardiovascular diseases, such as those that lower blood pressure and cholesterol, are among the most cost-effective interventions available to health systems. Despite this, mortality from cardiovascular diseases has increased since 2007 worldwide.



[†]Death rate at all ages and for both sexes

Change in mortality[‡] due to extensively drug-resistant tuberculosis, 2007–2017

Since 2007, there have been rapid increases in emerging diseases and disorders due to antibiotic use or resistance, including extensively drug-resistant tuberculosis, cellulitis, and *Clostridium difficile* diarrhea.



Global trends in disability

Highlights

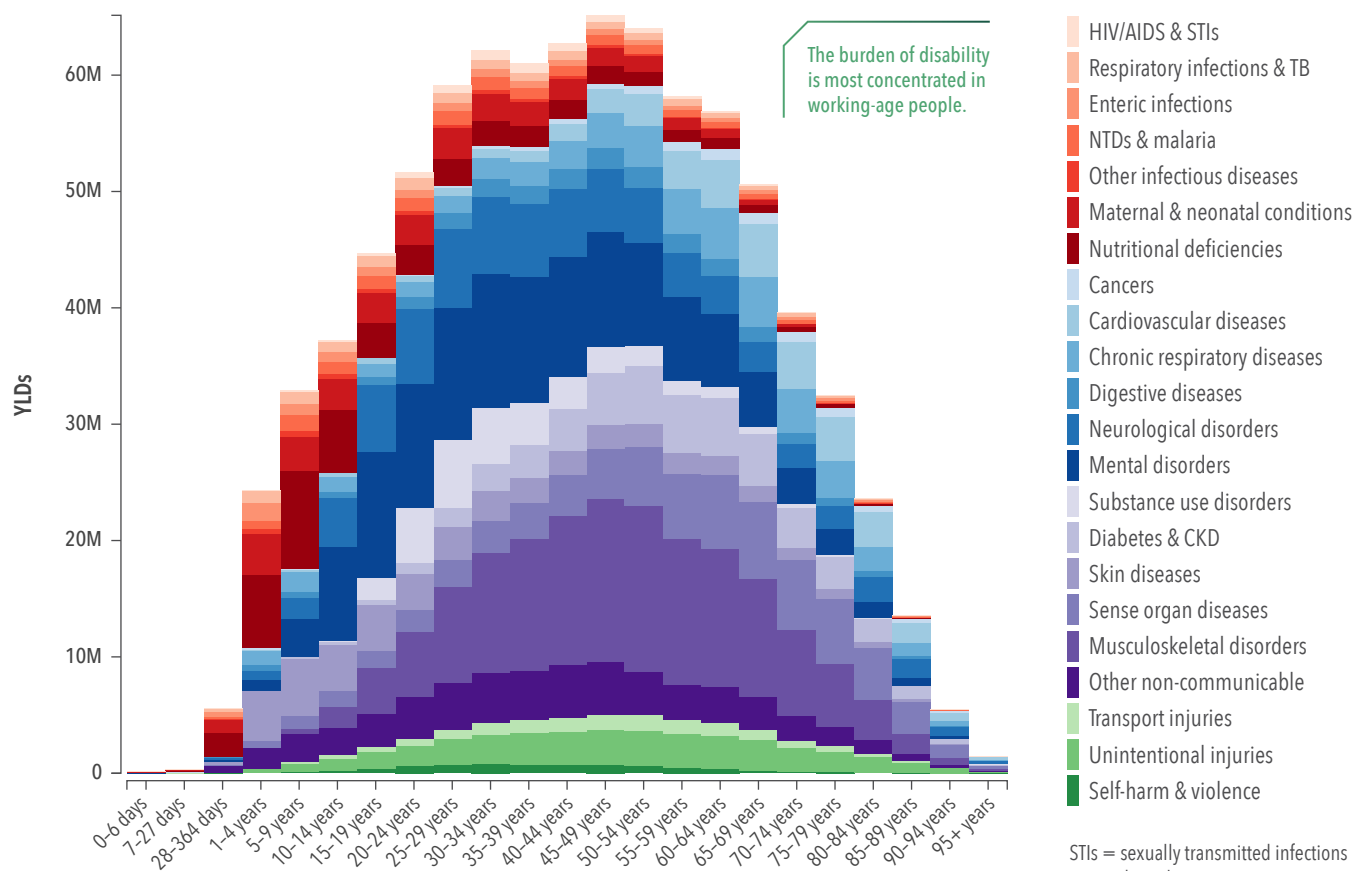
- » Globally, the total burden of disability increased by 52% between 1990 and 2017.
- » The burden of disability is driven mainly by non-communicable diseases, which caused 80% of disability in 2017.
- » Disability from metabolic conditions, such as type 2 diabetes and fatty liver disease, increased around the world and across levels of development.

What's new in this study

“Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017” is based on more data than ever before and includes 68,781 data sources used for the analysis of nonfatal causes of disease and injury. GBD 2017 added 19 new causes to its nonfatal analysis, for a total of 354 causes. The study includes a more detailed analysis of disability than previous versions of GBD.

Years lived with disability (YLDs)*, 2017

Number of total YLDs, global, both sexes, by age group and cause, 2017

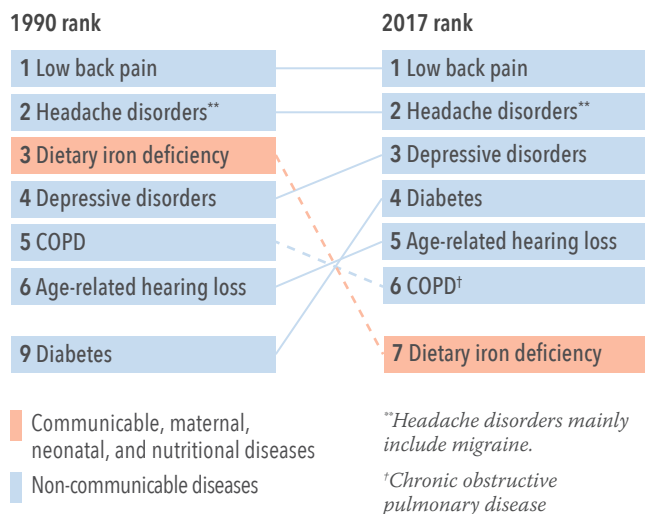


*YLDs represent time lived in less-than-ideal health. Nutritional deficiencies primarily include iron deficiency anemia; mental disorders are mainly composed of anxiety and depression; musculoskeletal disorders consist largely of back pain and neck pain; and sense organ diseases mostly include hearing loss and vision loss.

STIs = sexually transmitted infections
 TB = tuberculosis
 NTDs = neglected tropical diseases
 CKD = chronic kidney disease

Leading causes of disability, 1990 and 2017

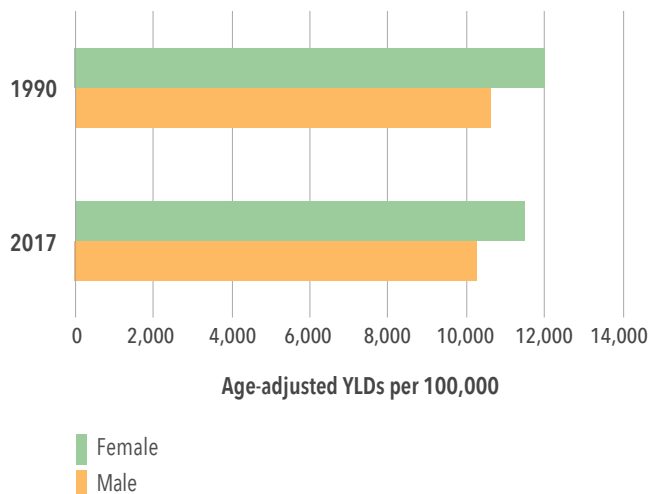
Global all-age YLDs



While diabetes emerged as the fourth-leading cause of disability globally in 2017, many of the top leading causes of disability in 1990 remain so in 2017, namely low back pain, headaches, and depression. This reflects a lack of progress in addressing these conditions.

Differences in disability by sex

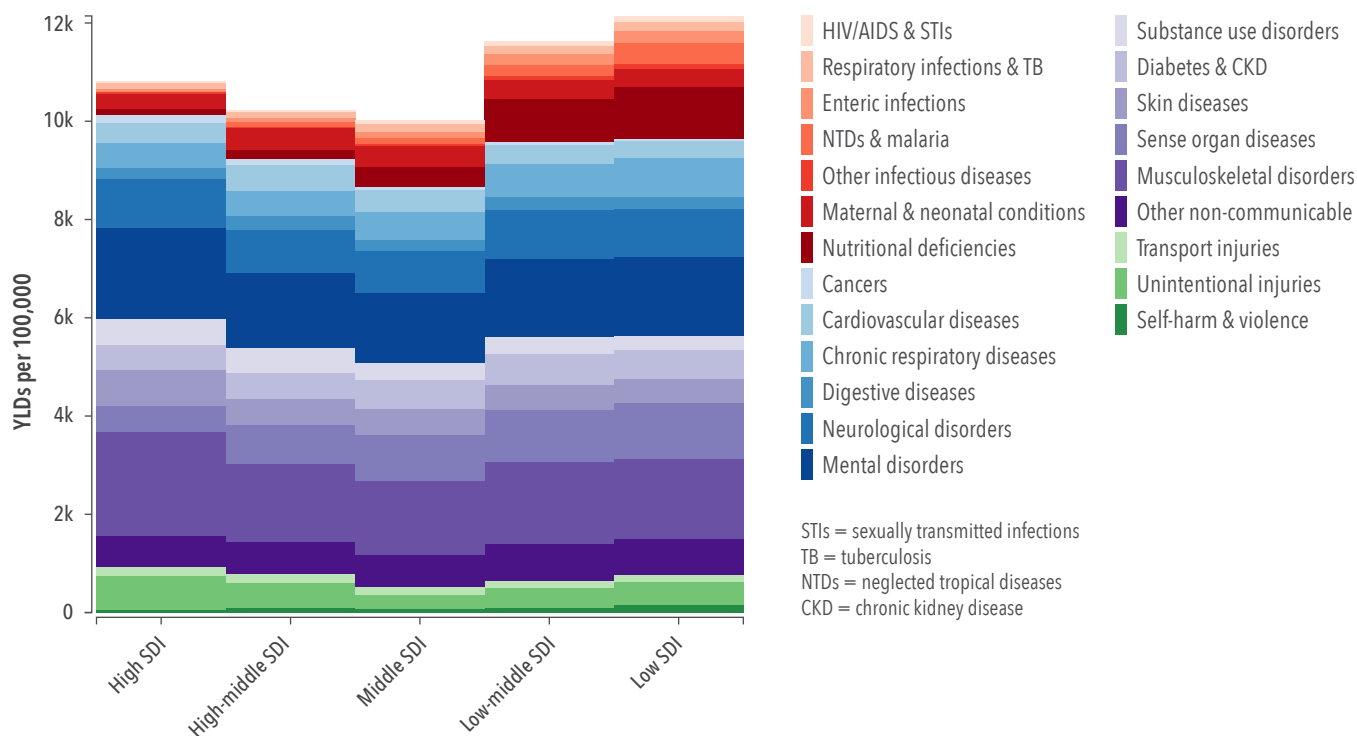
In general, females have had – and continue to experience – higher levels of disability than males.



Disability and development

Years lived with disability by Socio-demographic Index (SDI) grouping – YLDs per 100,000, age-adjusted, 2017

SDI captures three different aspects of development: income, education, and fertility.



Global trends in healthy life expectancy and early death and disability

Highlights

- » Globally, in 2017, life expectancy was 73 years, but healthy life expectancy was only 63 years. This means on average 10 years of life were spent in poor health in 2017.
- » Trends in early death and disability,* 1990–2017:
 - » 41% decrease in communicable diseases and neonatal disorders
 - » 40% increase in non-communicable diseases
 - » Large disparities persist in health and disease burden by sex and level of development

What’s new in this study

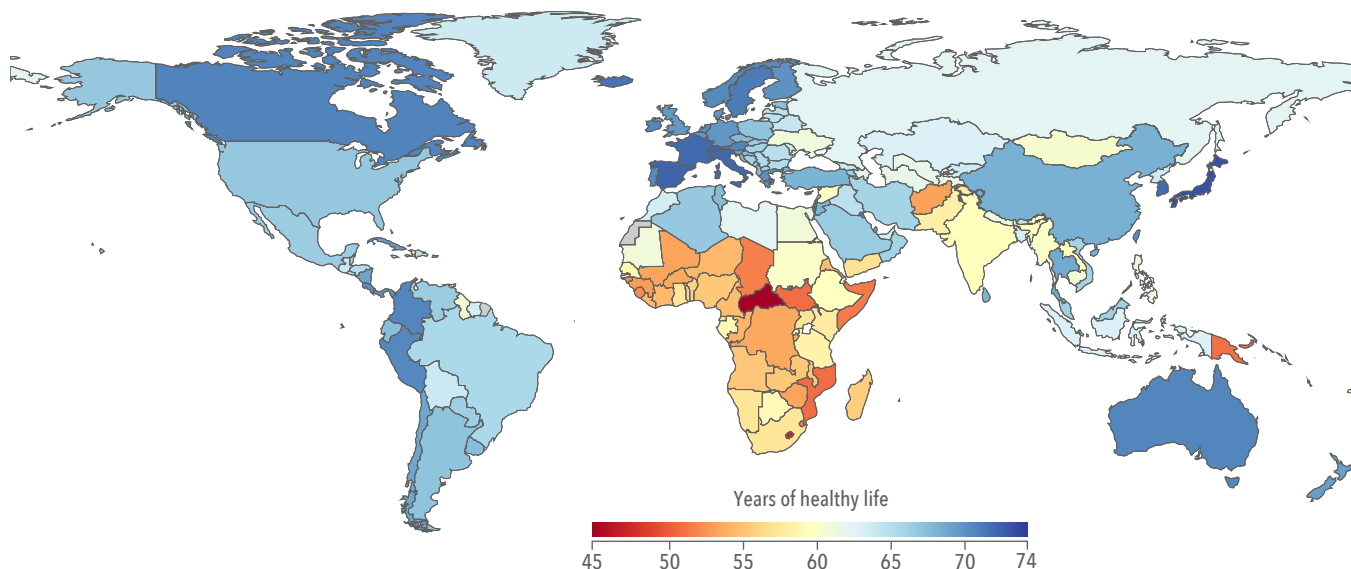
“Global, regional, and national disability-adjusted life-years (DALYs) for 359 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017” is based on more data than ever before. Nineteen new causes were added for a total of 359 causes. The study also includes a more detailed analysis of healthy life expectancy.

**Early death and disability is measured in terms of number of all-ages disability-adjusted life years (DALYs).*

Years someone can expect to live in full health in 2017

There are large inequalities across countries in healthy life expectancy, which is the number of years a person can expect to live in full health.

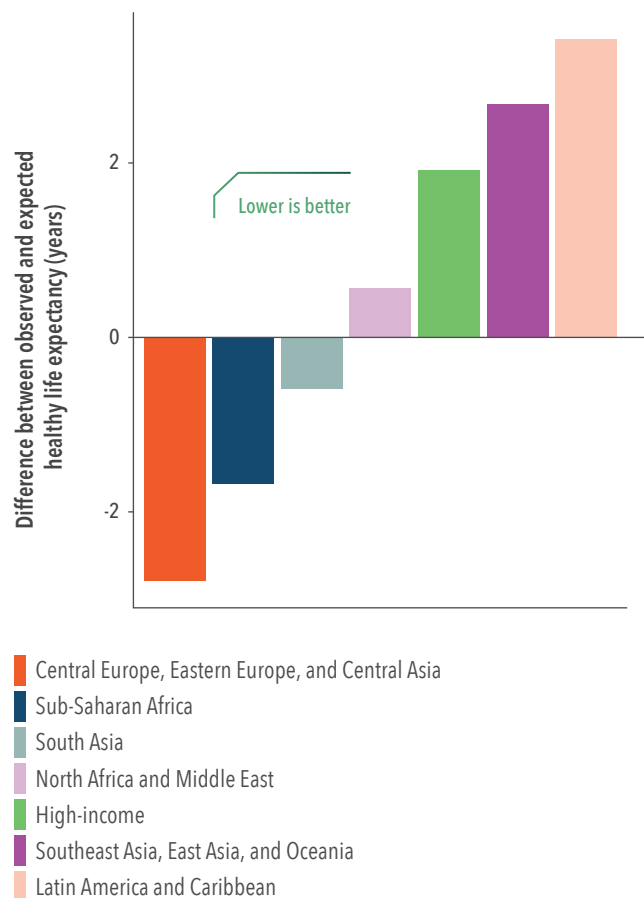
Healthy life expectancy** at birth, both sexes, 2017



**Healthy life expectancy is the number of years that a person at a given age can expect to live in full health, taking into account mortality and disability.

Performance in healthy life expectancy across regions

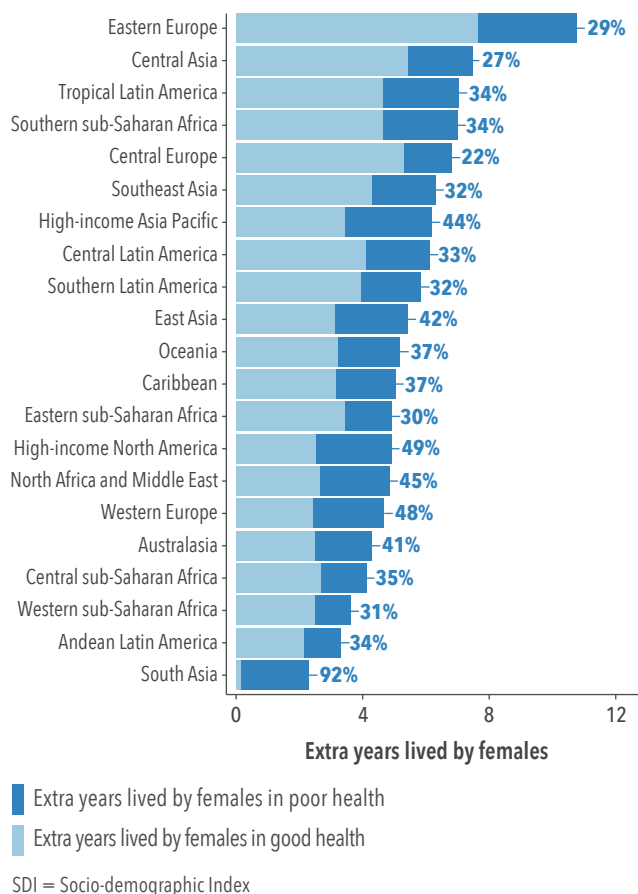
Healthy life expectancy above or below expected*** amount, GBD super-regions, 2017



***Based on level of socioeconomic development

While females tend to live longer than males, many of these extra years are spent in poor health

Extra years† lived by females compared to males in good health versus poor health, 2017



†Extra years of life expected at birth

Leading causes of early death and disability† at lowest and highest levels of development, 2017

Low Socio-demographic Index (SDI)[§] countries

High SDI countries

- 1 Neonatal disorders
- 2 Lower respiratory infections
- 3 Diarrheal diseases
- 4 Malaria
- 5 Congenital defects

- 1 Ischemic heart disease
- 2 Low back pain
- 3 Stroke
- 4 Lung cancer
- 5 COPD

- Communicable, maternal, neonatal, and nutritional diseases
- Non-communicable diseases

†Ranking based on number of all-ages DALYs

§SDI captures three different aspects of development: income, education, and fertility. COPD = chronic obstructive pulmonary disease.

Global trends in risk factors leading to early death and disability

Highlights

- » The amount of early death and disability linked to risk factors declined between 2007 and 2017.
- » Leading risk factors changed considerably between 1990 and 2017. In 1990, the leading risk factors for early death and disability (number of all-ages DALYs) were child wasting, short gestation for birth weight, and low birth weight for gestation. In 2017, they were high blood pressure, smoking, and high blood sugar.

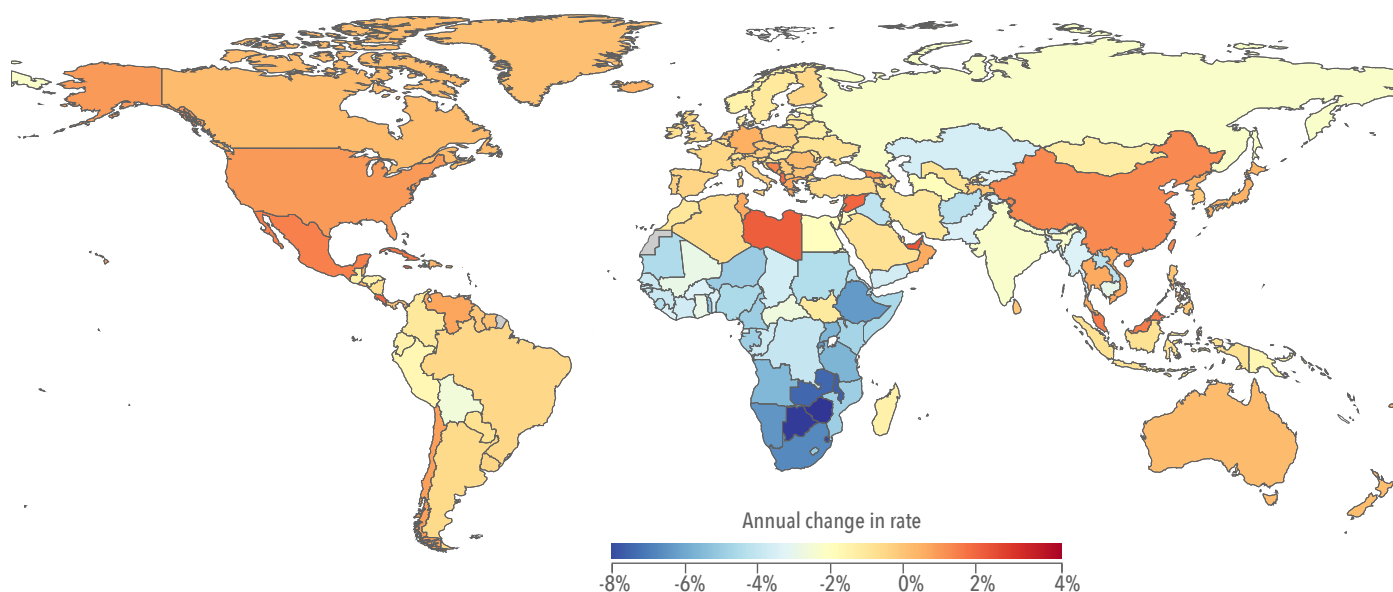
What's new in this study

“Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017” is based on more data than ever before and includes 46,749 sources used for the analysis of risk factors affecting health. GBD 2017 added one new risk factor (bullying victimization) to the analysis. The study also examines how risks change according to level of development and includes a more accurate method of estimating smoking risk.

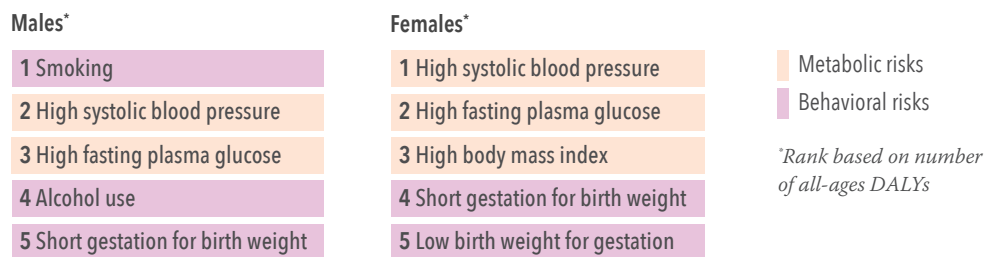
Changes in early death and disability linked to risk factors

Annual change in rate of disability-adjusted life years (DALYs) attributable to risk factors, both sexes, age-adjusted, 2000–2017

In sub-Saharan Africa, decreases in early death and disability linked to risk factors were especially pronounced.



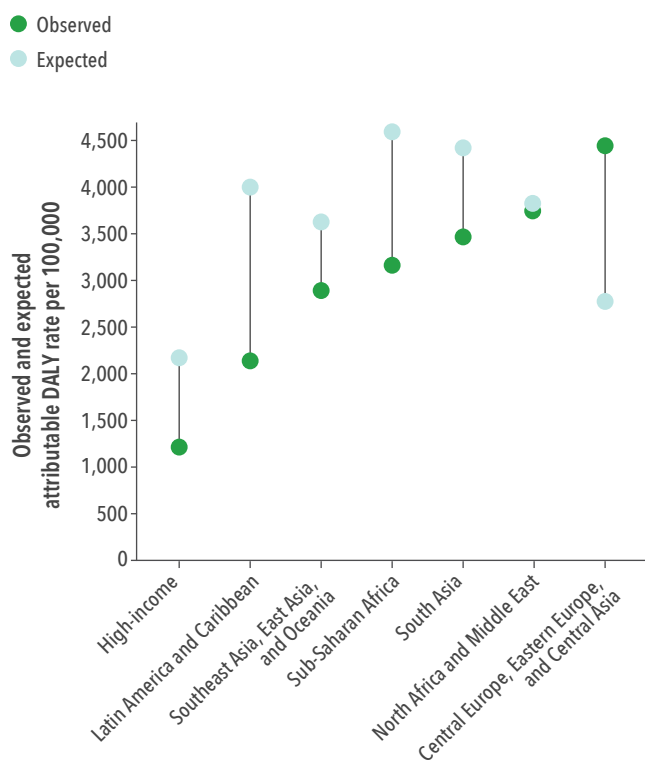
Leading risk factors causing early death and disability, by sex, 2017



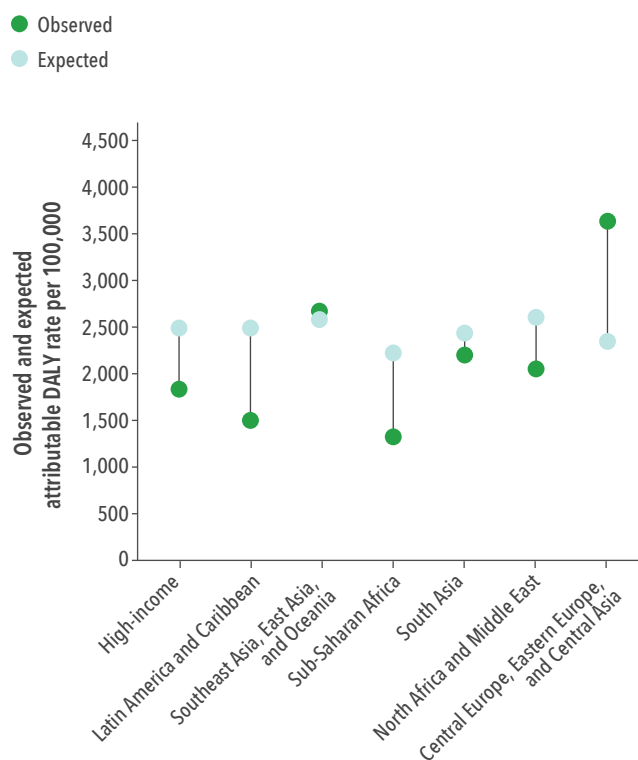
Performance in high blood pressure and smoking among GBD super-regions

As of 2017, the leading global risk factors causing early death and disability for all ages combined were high blood pressure and smoking. The disease burden caused by these two risk factors, compared to the burden expected based on the level of socioeconomic development, varied considerably by region.

Age-adjusted DALY rates from high blood pressure, both sexes, observed compared to expected, 2017



Age-adjusted DALY rates from smoking, both sexes, observed compared to expected, 2017



Global trends in population and fertility

This update to the Global Burden of Diseases, Injuries, and Risk Factors study (GBD) includes an important new feature: for the first time, population and fertility estimates were produced by the GBD collaborators. Those estimates confirm and extend our understanding of key population trends, including those related to health.

What's unique about the GBD population and fertility estimates?

The new GBD estimates improve upon previously available estimates in three key ways:

Precision. GBD estimates improve upon the current standard for population estimation. The current standard uses five-year age estimates (for example, number of 5- to 9-year-olds in a population) that are then converted into single-year age groupings (for example, number of 6-year-olds in a population). This conversion requires mathematical steps

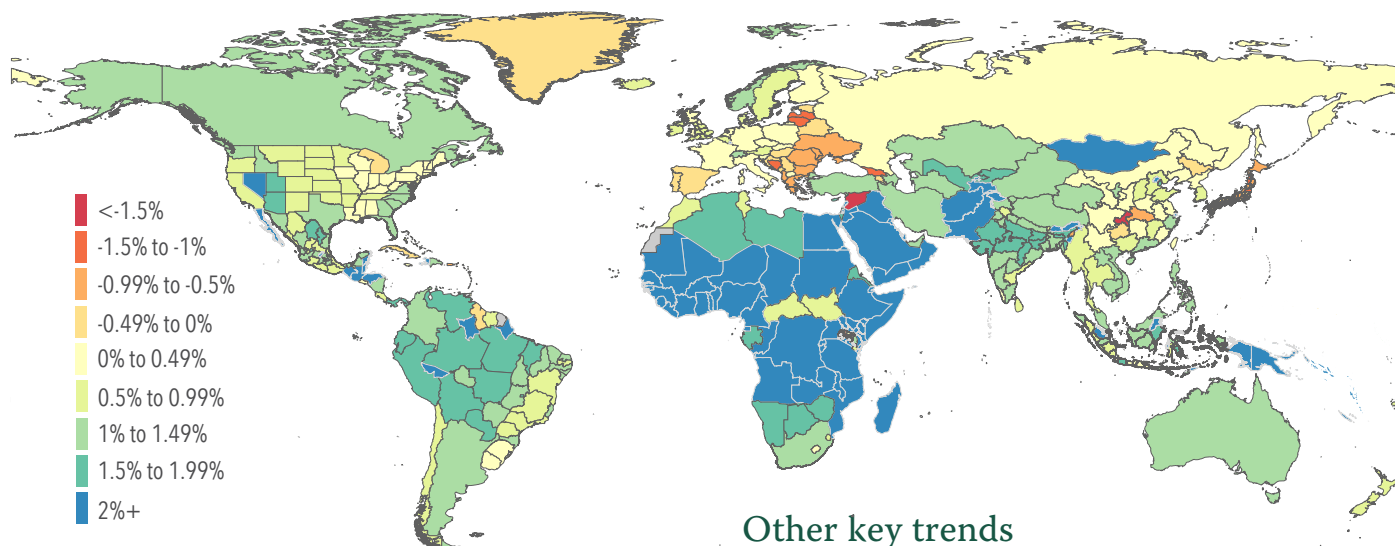
that can introduce errors and uncertainty. Instead, GBD produces single-year age estimates in every calendar year from 1950 through 2017. This approach is more accurate.

Standardization. GBD uses the same methodology to estimate population for every location and year. That ensures valid comparisons between different places and times.

Transparency. All data sources and methods used are published and publicly accessible free of charge.

Recent population growth has been highest in Africa, Asia, and Latin America

Population growth rate, 2010-2017

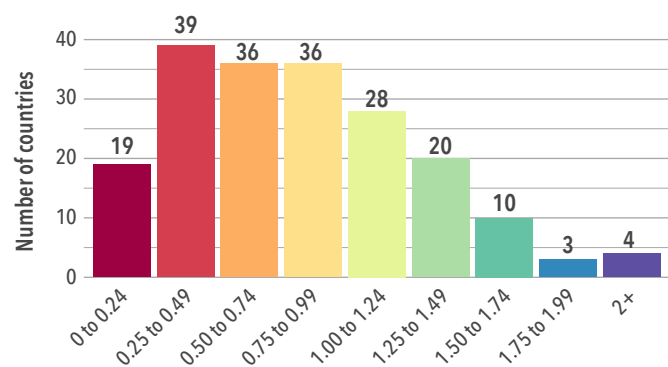


Other key trends

- » The global population increased from 2.6 billion in 1950 to 7.6 billion in 2017.
- » Despite this growth, roughly half of 195 countries recorded total fertility rates below the replacement rate of approximately 2.05 in 2017.

Fertility in females under 25 varies widely by country

Fertility rates for females under 25, by number of countries, 2017

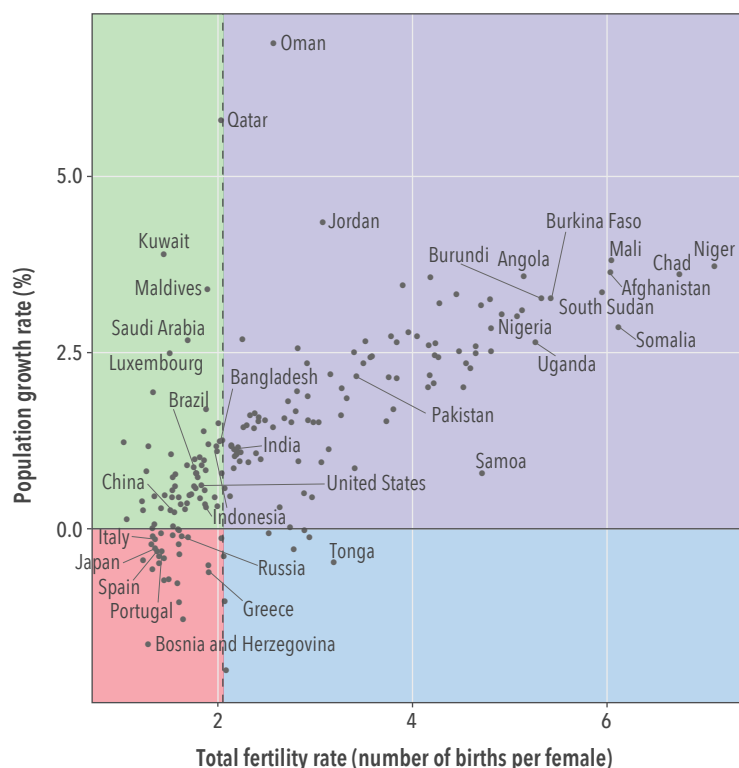


- » Among countries, total fertility under age 25 ranged from a low of 0.08 births to a high of 2.4 births.
- » Since 1990, countries have achieved nearly universal declines in fertility under age 25, which is a key indicator for Sustainable Development Goal 3.
- » Still, in 50 countries, total fertility was higher in females younger than 25 than in those 30 or older.

The relationship between total fertility rate and population growth in 2017

Countries may continue growing in population even if their total fertility rates are below the replacement rate of 2.05 births (marked in the figure below with a dashed line). This is due to population momentum, in which past growth of birth cohorts leads to more females of childbearing age, which leads to birth rates that, for a time, remain high relative to deaths in the population.

Countries plotted by total fertility rate and population growth rate, 2017



- Countries with:**
- Total fertility rate above the replacement rate and increasing population
 - Total fertility rate above the replacement rate and decreasing population
 - Total fertility rate below the replacement rate and decreasing population
 - Total fertility rate below the replacement rate and increasing population
- ↓ Replacement fertility rate of 2.05 births per woman

Immigration can also drive increases in population despite total fertility rates below replacement level. This is the case in several countries in the Middle East (see top-left quadrant of figure).

Of the 60 countries with a total fertility rate of 3.0 or greater in 2017, most are in sub-Saharan Africa, where the proportion of women whose contraceptive needs are being met is 46.5%.

Future health trends: findings from the GBD 2016 study

Highlights

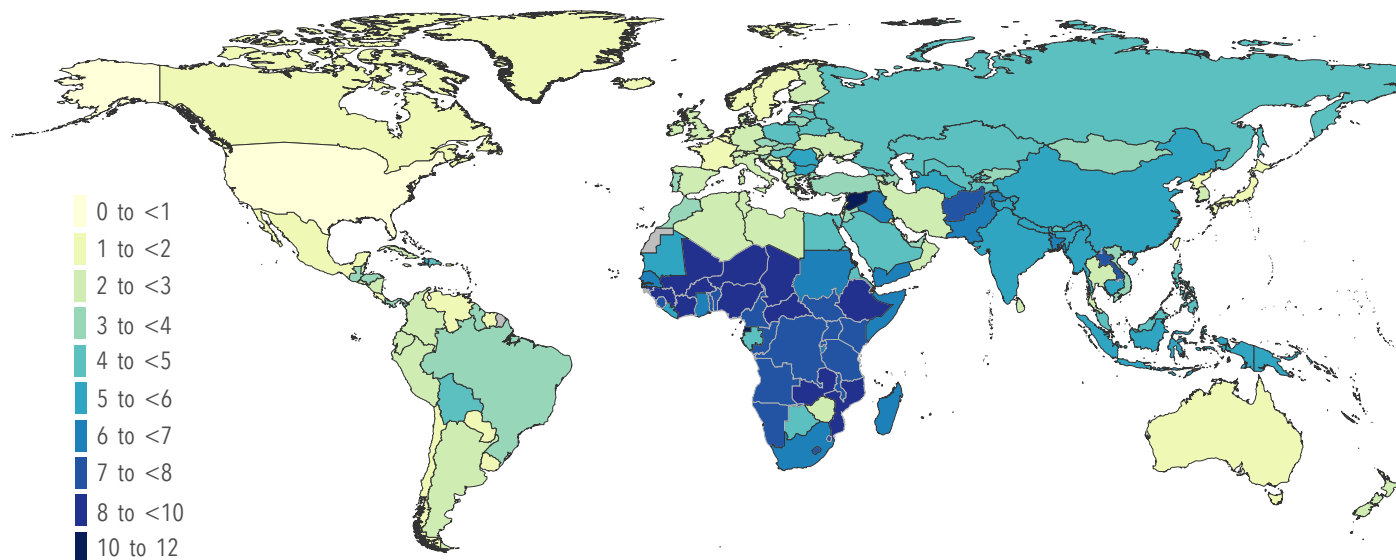
- » Globally, life expectancy overall is expected to increase by 4.4 years between 2016 and 2040. But if less progress is made, life expectancy could decrease by 0.4 years for males and stagnate for females; if more progress is made, it could increase by 7.8 years for males and 7.2 years for females.
- » There is significant risk that the progress made in slowing the HIV epidemic could be reversed without a continued robust investment in health. This could, in turn, threaten recent gains in life expectancy in eastern and southern Africa.
- » The future is not pre-ordained; the potential is large, in all countries, to alter the trajectory of health through reducing exposure to key risk factors and increasing educational attainment and income per person.

The added value of this study

The study, “Forecasting life expectancy, years of life lost, and all-cause and cause-specific mortality for 250 causes of death: reference and alternative scenarios for 2016–40 for 195 countries and territories using data from the Global Burden of Disease Study 2016,” is unprecedented, tracking 250 causes of death and 79 risks in an integrated and comprehensive way. Health forecasts and alternative future scenarios can influence long-term planning and investments. The study shows that people’s health can improve, but such improvement demands attention, resources, action, and continued prioritization of these drivers of health.

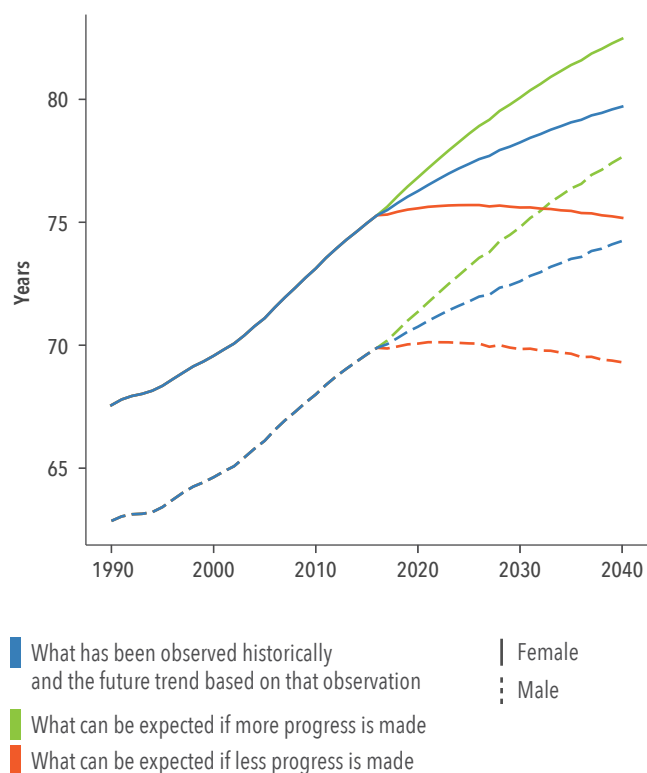
Change in life expectancy,* 2016–2040, both sexes

All countries are likely to experience at least a slight increase in life expectancy by 2040

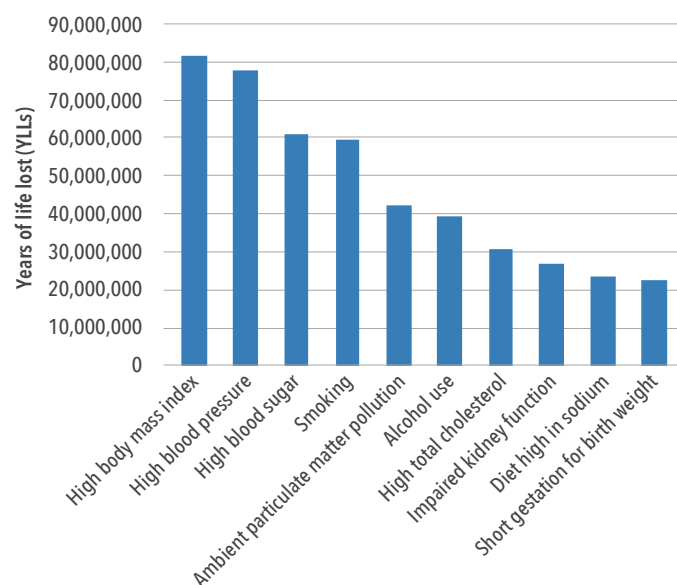


*Differences in life expectancy shown are based on what has been observed historically and the future trend based on that observation.

Life expectancy, 1990–2040

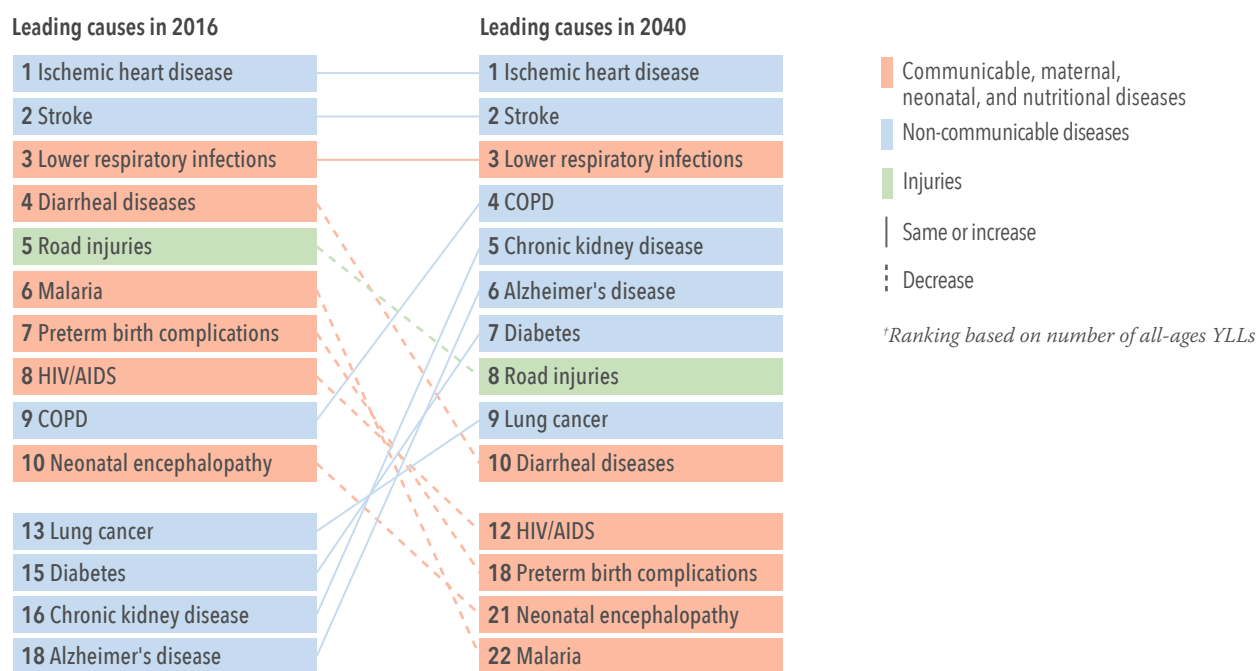


Potential loss of life** averted through reduction of exposure to key risk factors, 2040



**Measured as the difference between the 2040 "reference" (the future trend based on what has been observed historically) and 2040 "better" (what can be expected if more progress is made) scenarios in terms of YLLs attributable to risk factors

Leading causes of early death, 2016 and 2040†



Progress and challenges in pursuing the health-related Sustainable Development Goals

Highlights

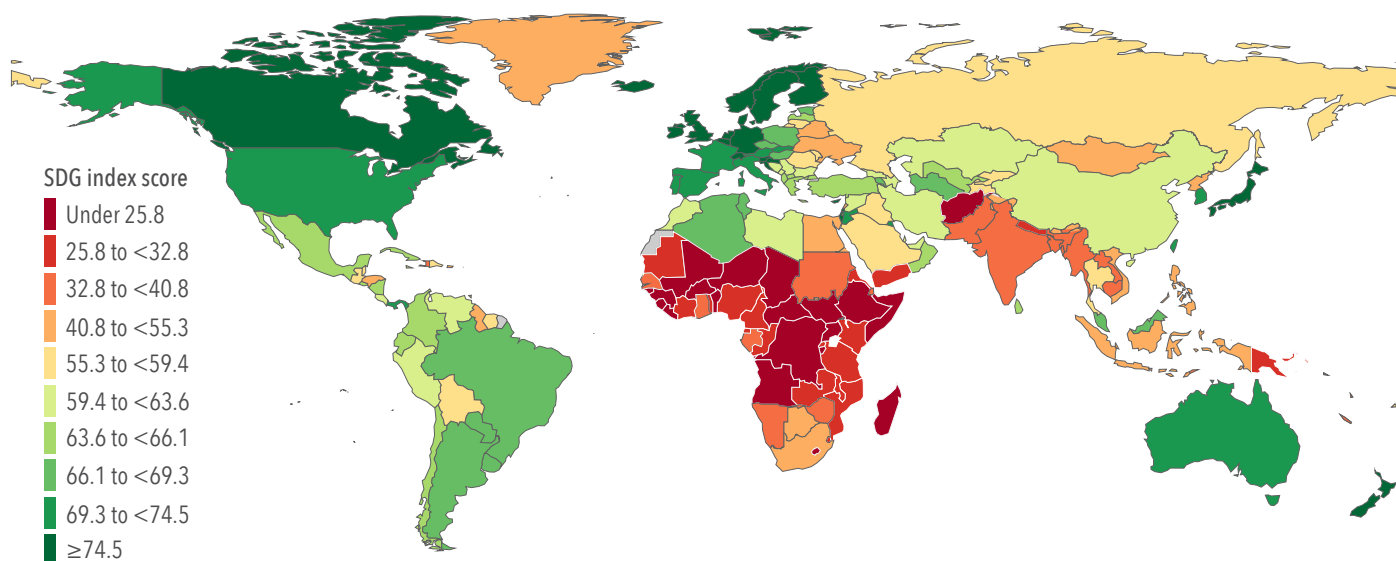
- » Based on past trends, most countries' Sustainable Development Goals (SDG) index^{*} scores are projected to rise between 2017 and 2030.
- » By 2030, the under-5 mortality, neonatal mortality, maternal mortality ratio, and malaria indicators had the most countries likely to attain their targets.

Global average SDG index score, 2017:
59.4 out of 100

What's new in this study

"Measuring progress from 1990 to 2017 and projecting attainment to 2030 of the health-related Sustainable Development Goals for 195 countries and territories: a systematic analysis for the Global Burden of Disease Study 2017" includes an updated and improved analysis of progress toward the SDGs. It produces estimates for 41 of the 52 health-related SDG indicators, including estimation of four additional indicators compared to the GBD 2016 study. It also includes subnational analyses of SDG progress for a subset of countries and analysis of trends by sex for select indicators. The study also uses revised methods to project progress between 2017 and 2030.

SDG index^{*} score, 2017



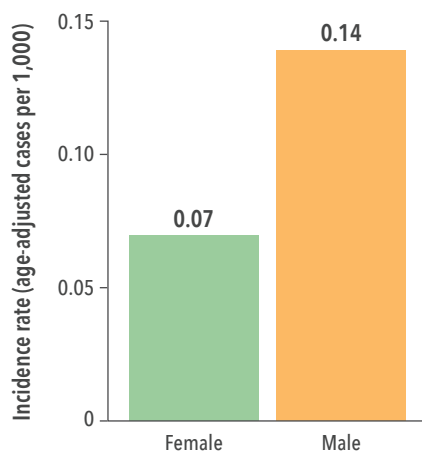
**The SDG index is a composite measure, ranging from 0 to 100, of overall progress toward meeting the SDGs. It takes into account 40 of the 41 performance indicators for the health-related SDGs.*

Note: Population census coverage is not included because of its binary status and because it does not have forecasts.

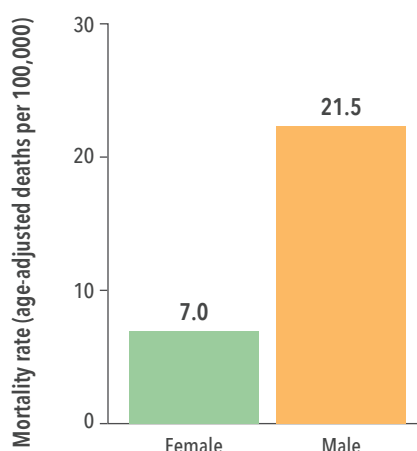
Differences by sex in 2017

The analysis broke down several SDG indicators by sex. Here, we highlight three indicators: rate of new HIV cases, deaths due to road injuries, and prevalence of alcohol use. As shown below, males had worse outcomes for most indicators.

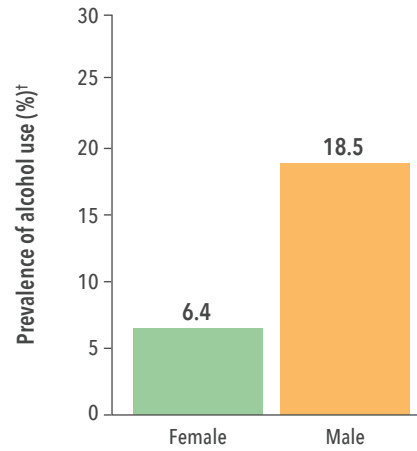
Global rate of new cases of HIV, 2017**



Global deaths due to road injuries, 2017**



Global prevalence of alcohol use, 2017**



**Median estimates

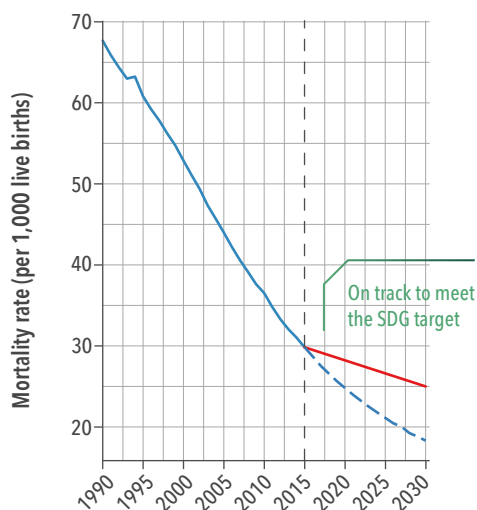
†Heavier drinking was weighted more than light drinking.

Looking ahead to 2030

Despite the progress made so far, achievement of many SDGs by 2030 is in doubt. In order to meet the SDGs, the pace of progress on many health-related indicators will need to accelerate substantially between 2017 and 2030.

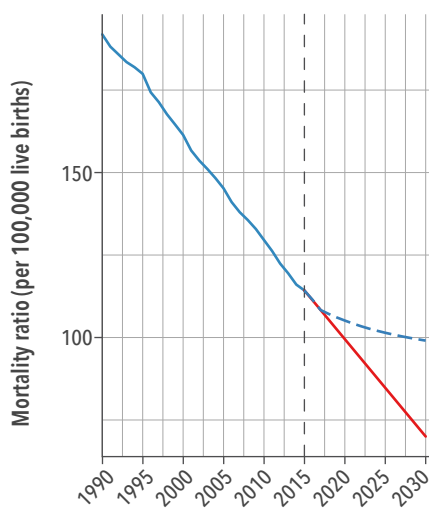
- █ Past trend
- - - Anticipated future trend
- █ Future trend needed to meet SDG target

Global under-5 mortality rate, 1990–2030



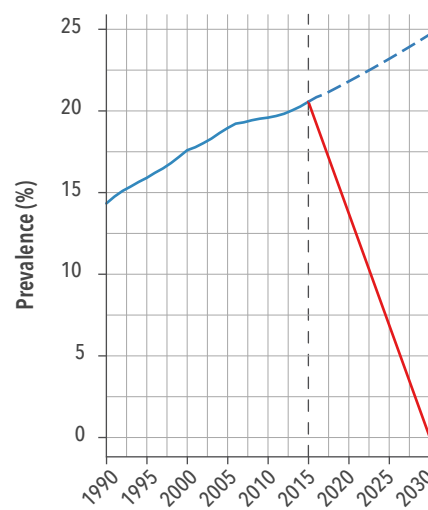
SDG target: Reduce under-5 mortality to 25 per 1,000 live births or below by 2030

Global maternal mortality ratio, 1990–2030



SDG target: Reduce maternal mortality ratio to 70 per 100,000 live births or below by 2030

Global prevalence of overweight in children aged 2 to 4, 1990–2030



SDG target: Eliminate child overweight by 2030

Downloadable GBD 2017 study data

Results data

GBD Compare data visualization:

<http://vizhub.healthdata.org/gbd-compare>

GBD Results Tool:

<http://ghdx.healthdata.org/gbd-results-tool>

GHDx:

<http://ghdx.healthdata.org/gbd-2017>

Includes population and fertility data, covariates, and other datasets not available via visualization tools.

Input data

Causes of Death (COD) Visualization:

<https://vizhub.healthdata.org/cod/>

Data Input Sources Tool (*input data sources and relevant metadata*):

<http://ghdx.healthdata.org/gbd-2017/data-input-sources>

Code

Statistical, analytical, processing, and estimation code used to generate the GBD results:

<http://ghdx.healthdata.org/gbd-2017/code>

GBD 2017 Online Tools Overview

A basic guide to the suite of web-based tools for the GBD study:

http://www.healthdata.org/sites/default/files/files/Data_viz/GBD_2017_Tools_Overview.pdf

Downloadable GBD 2016 Forecasting study data

GBD Foresight data visualization:

<https://vizhub.healthdata.org/gbd-foresight>



DOWNLOAD RESULTS AND OTHER GBD DATA:

<http://ghdx.healthdata.org/gbd-2017>