

Global Burden Of Disease Today

Christopher Murray

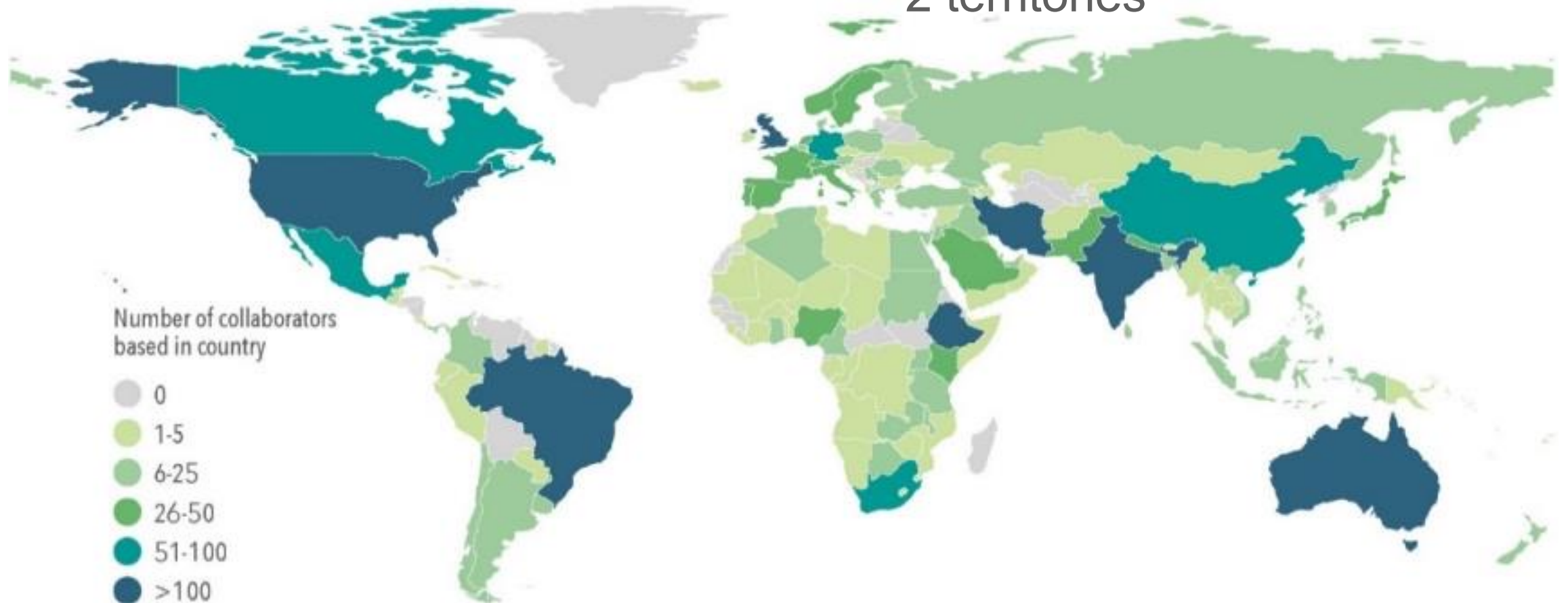


Global Burden of Disease today

- A **systematic, scientific** effort to quantify the comparative magnitude of **health loss** from all major diseases, injuries, and risk factors by age, sex, and population and over time.
- Covers 195 countries and territories from 1990 to present. Sub-national assessments for some countries.
- 359 diseases and injuries, 3,228 sequelae, 84 risk factors or clusters of risk factors.
- Time series from 1990 to most recent year updated annually
- Findings published in major medical journals, policy reports, and online data visualizations.

GBD Collaboration

3,641 collaborators
143 countries
2 territories



GBD: standardized solution to global health measurement challenges

Challenges:

1. Inconsistent coding and case definitions
2. No data
3. Conflicting data
4. Sampling and non-sampling measurement error
5. Excluded groups

GBD solutions:

1. Quality review of all sources and corrections for garbage coding
2. Cross-walking different case definitions, diagnostic technologies, recall periods, etc., using statistical methods
3. Statistical methods to deal with missing data, inconsistent data, excluded groups and measurement error

Multiple metrics for health

- 1) **Traditional metrics:** Disease and injury prevalence and incidence, death numbers and rates.
- 2) **Years of life lost** due to premature mortality (YLLs) – count the number of years lost at each age compared to a reference life expectancy of 86 at birth.
- 3) **Years lived with disability** (YLDs) for a cause in an age-sex group equals the prevalence of the condition times the disability weight for that condition.
- 4) **Disability-adjusted life years (DALYs)** are the sum of YLLs and YLDs and are an overall metric of the burden of disease.
- 5) **Healthy life expectancy (HALE)** is a positive summary measure counting the expected years of life in full health.

All data sources in the GBD indexes in on-line catalog with metadata on 100,000+ GBD sources, all code in GitHub

The screenshot shows the GHDx website with a green header bar containing 'IHME | GHDx | GBD Compare', a search bar, and a 'Login' button. Below the header is a dark navigation bar with links: 'Home', 'Country Profiles', 'Series and Systems', 'Organizations', 'Keywords', 'IHME Data', 'About the GHDx', and 'Help'. The main content area features the 'Global Health Data Exchange' title and a welcome message. It includes a list of links: 'GBD 2013 data downloads', 'GBD 2013 MDG data downloads', and 'All IHME data'. A 'Search Data' box with an 'Advanced search >>>' link and a 'Country Profile' box with 'Afghanistan' selected are present. A 'Recent' tab shows a list of datasets: 'Palestine Nutrition Survey 2002', 'World Taxation and Price Guide 1994', 'Brazil Medical Sanitary Assistance Survey 2009', 'Kuwait World Health Survey 2008-2010', 'Sri Lanka Demographic and Health Survey 2000', and 'Australia National Children's Nutrition and Physical Activity Survey 2007'. A 'Resources' section lists 'Contact Us', 'Data Sites We Love', and 'IHME Data Visualizations'. The footer contains the IHME logo, the University of Washington logo, and contact information: 'Institute for Health Metrics and Evaluation, 2301 Fifth Ave., Suite 600, Seattle, WA 98121, USA, Tel: +1.206.697.2800 Fax: +1.206.697.2899, © 2015 University of Washington IP'.

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The Global Burden of Disease Study 2015



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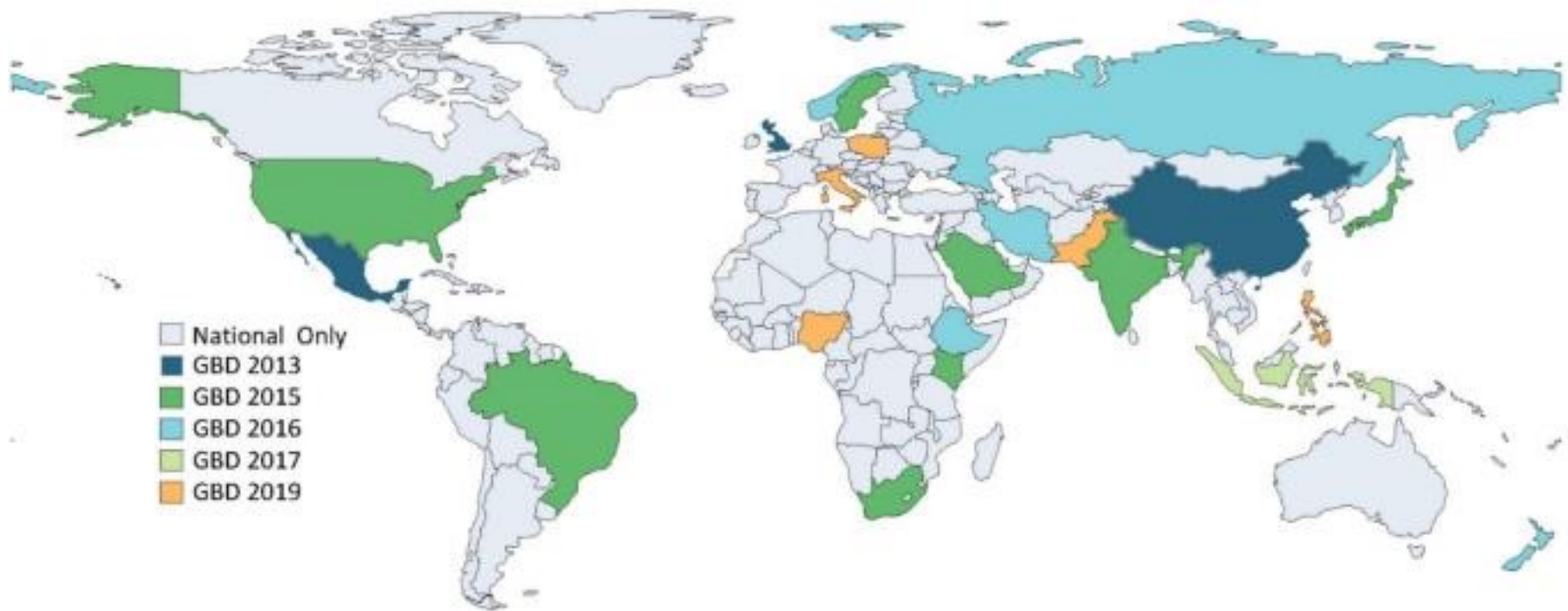
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Subnational burden by GBD by round of estimation



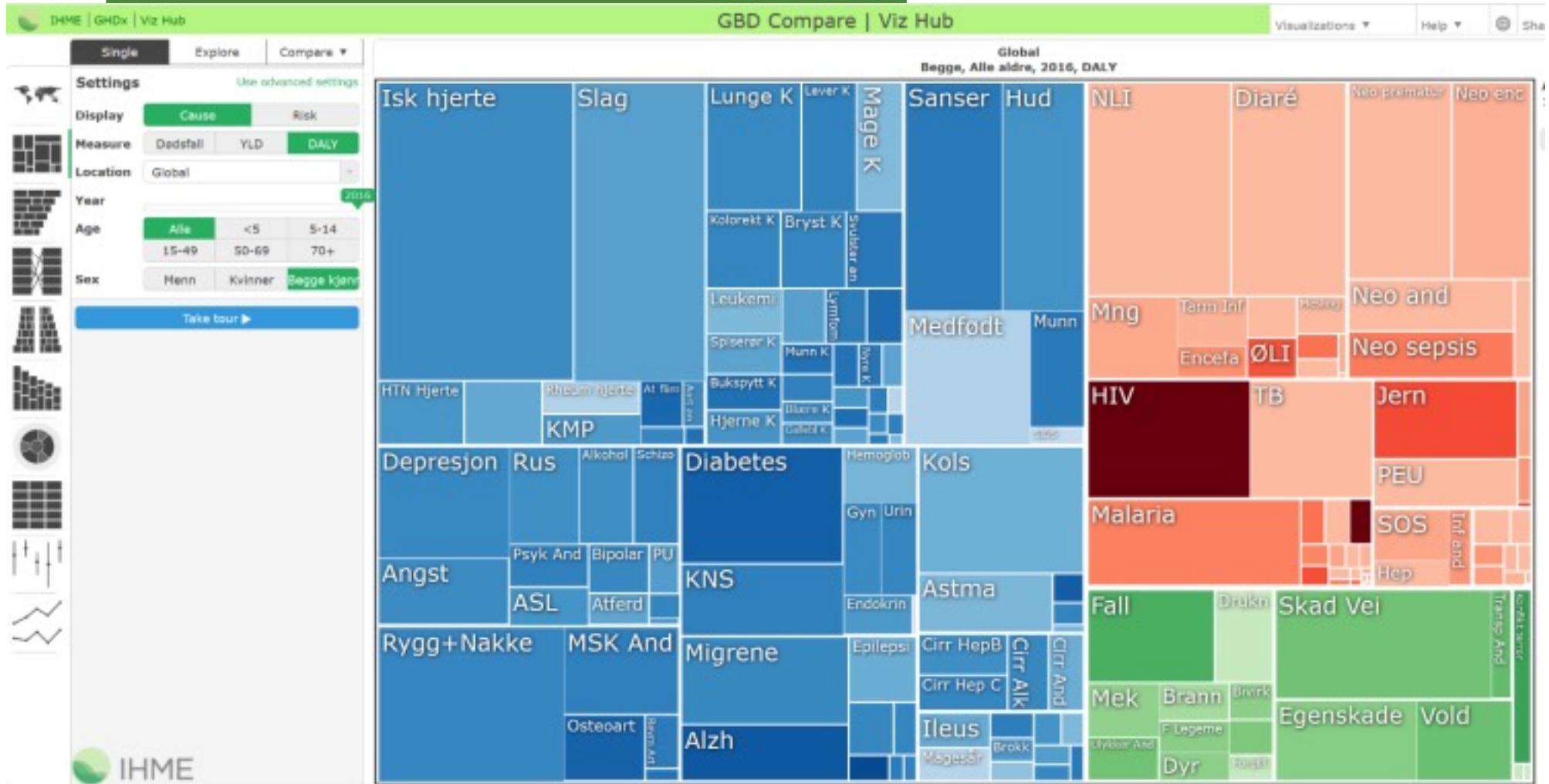
GBD 2013	China Mexico United Kingdom
GBD 2015	Brazil India Japan Kenya Saudi Arabia South Africa Sweden United States
GBD 2016	Indonesia United Kingdom
GBD 2017	Ethiopia Iran New Zealand Norway Russia
GBD 2019	Italy Nigeria Pakistan Philippines Poland

IHME and WHO sign a memorandum of understanding



May 22 2018: WHO and IHME formally agree to collaborate in improving the accuracy, timeliness, and policy-relevance of health data. The MOU signed will result in increased awareness and understanding of health problems globally, as well as the evaluation of strategies to address them.

www.healthdata.org



GBD future health scenarios

- 1) GBD forecasts and alternative scenarios for 195 countries to 2040 published Lancet October 17, 2018.
- 2) Model is a causal model (79 independent drivers) with good out-of-time predictive validity.
- 3) Three components:
 - a) Outcomes explained by risk factors/interventions based on exposure and relative risk for each risk factor/intervention as assessed in the GBD
 - b) Risk/intervention deleted outcomes modeled on GDP per capita, educational attainment, total fertility rate, year (global secular trend)
 - c) Hierarchical auto-regressive model for variation in outcomes not explained by components 1 and 2

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

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Summary

Background Understanding potential trajectories in health and drivers of health is crucial to guiding long-term investments and policy implementation. Past work on forecasting has provided an incomplete landscape of future health scenarios, highlighting a need for a more robust modelling platform from which policy options and potential health trajectories can be assessed. This study provides a novel approach to modelling life expectancy, all-cause mortality and cause of death forecasts—and alternative future scenarios—for 250 causes of death from 2016 to 2040 in 195 countries and territories.

Methods We modelled 250 causes and cause groups organised by the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) hierarchical cause structure, using GBD 2016 estimates from 1990–2016, to generate predictions for 2017–40. Our modelling framework used data from the GBD 2016 study to systematically account for the relationships between risk factors and health outcomes for 79 independent drivers of health. We developed a three-component model of cause-specific mortality: a component due to changes in risk factors and select interventions; the underlying mortality rate for each cause that is a function of income per capita, educational attainment, and total fertility rate under 25 years and time; and an autoregressive integrated moving average model for unexplained changes correlated with time. We assessed the performance by fitting models with data from 1990–2006 and using these to forecast for 2007–16. Our final model used for generating forecasts and alternative scenarios was fitted to data from 1990–2016. We used this model for 195 countries and territories to generate a reference scenario or forecast through 2040 for each measure by location. Additionally, we generated better health and worse health scenarios based on the 85th and 15th percentiles, respectively, of annualised rates of change across location-years for all the GBD risk factors, income per person, educational attainment, select intervention coverage, and total fertility rate under 25 years in the past. We used the model to generate all-cause age-specific mortality, life expectancy, and years of life lost (YLLs) for 250 causes. Scenarios for fertility were also generated and used in a cohort component model to generate population scenarios. For each reference forecast, better health, and worse health scenarios, we generated estimates of mortality and YLLs attributable to each risk factor in the future.

Findings Globally, most independent drivers of health were forecast to improve by 2040, but 36 were forecast to worsen. As shown by the better health scenarios, greater progress might be possible, yet for some drivers such as high body-mass index (BMI), their toll will rise in the absence of intervention. We forecasted global life expectancy to increase by 4.4 years (95% UI 2.2 to 6.4) for men and 4.4 years (2.1 to 6.4) for women by 2040, but based on better and worse health scenarios, trajectories could range from a gain of 7.8 years (5.9 to 9.8) to a non-significant loss of 0.4 years (–2.8 to 2.2) for men; and an increase of 7.2 years (5.3 to 9.1) to essentially no change (0.1 years [–2.7 to 2.5]) for women. In 2040, Japan, Singapore, Spain, and Switzerland had a forecasted life expectancy exceeding 85 years for both sexes, and 59 countries including China were projected to surpass a life expectancy of 80 years by 2040. At the same time, Central African Republic, Lesotho, Somalia, and Zimbabwe had projected life expectancies below 65 years in 2040, indicating global disparities in survival are likely to persist if current trends hold. Forecasted YLLs showed a rising toll from several non-communicable diseases (NCDs), partly driven by population growth and ageing. Differences between the reference forecast and alternative scenarios were most striking for HIV/AIDS, for which a potential increase of 120–2% (95% UI 67.2–190.3) in YLLs (nearly 118 million) was projected globally from 2016–40 under the worse health scenario. Compared with 2016, NCDs were forecast to account for a greater proportion of YLLs in all GBD regions by 2040 (67.3% of YLLs [95% UI 61.9–72.3] globally); nonetheless, in many lower-income countries, communicable, maternal, neonatal, and nutritional (CMNN) diseases still accounted for a large share of YLLs in 2040 (eg, 53.5% of YLLs [95% UI 48.3–58.5] in Sub-Saharan Africa). There were large gaps for many health risks between the reference

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Global distribution of population in 2016 and 2040 reference forecasts, 2040 better health scenario, and 2040 worse health scenarios

