Health: The Treasure we All Forget

Current Global Macro Perspectives

Spring 2020 – Greg Siourounis

Why Health Matters? Theory Check:

$$Y_t = H_t^\alpha (A_t X)^{1-\alpha}$$

- H_t $\equiv$ efficiency units of labor
- $A_t \equiv$ technological level
- X $\equiv$ land

Output per efficient worker! Not just L!

- Output per worker produced at time t

$$y_t = h_t^{\alpha} x_t^{1-\alpha}$$

  - $h_t \equiv H_t / L_t \equiv$ efficiency units per-worker

Utility Function

- The utility function of individual t (adult at time t)

$$u^t = (1 - \gamma) \ln(c_t) + \gamma \ln(n_t h_{t+1})$$

- $c_t \equiv$ consumption of individual t

- $n_t \equiv$ number of children of individual t

- $h_{t+1} \equiv$ level of human capital of each child

Remember the budget Constraint!

$$z_t n_t (\tau + e_{t+1}) + c_t \leq z_t$$

- $z_t \equiv$ potential income of individual t
- $\tau \equiv$ time required to raise a child, regardless of quality
- $\tau + e_{t+1} \equiv$ time needed to raise a child with education e_{t+1}
- $z_t (\tau + e_{t+1}) \equiv$ opportunity cost of raising 1 child with education e_{t+1}

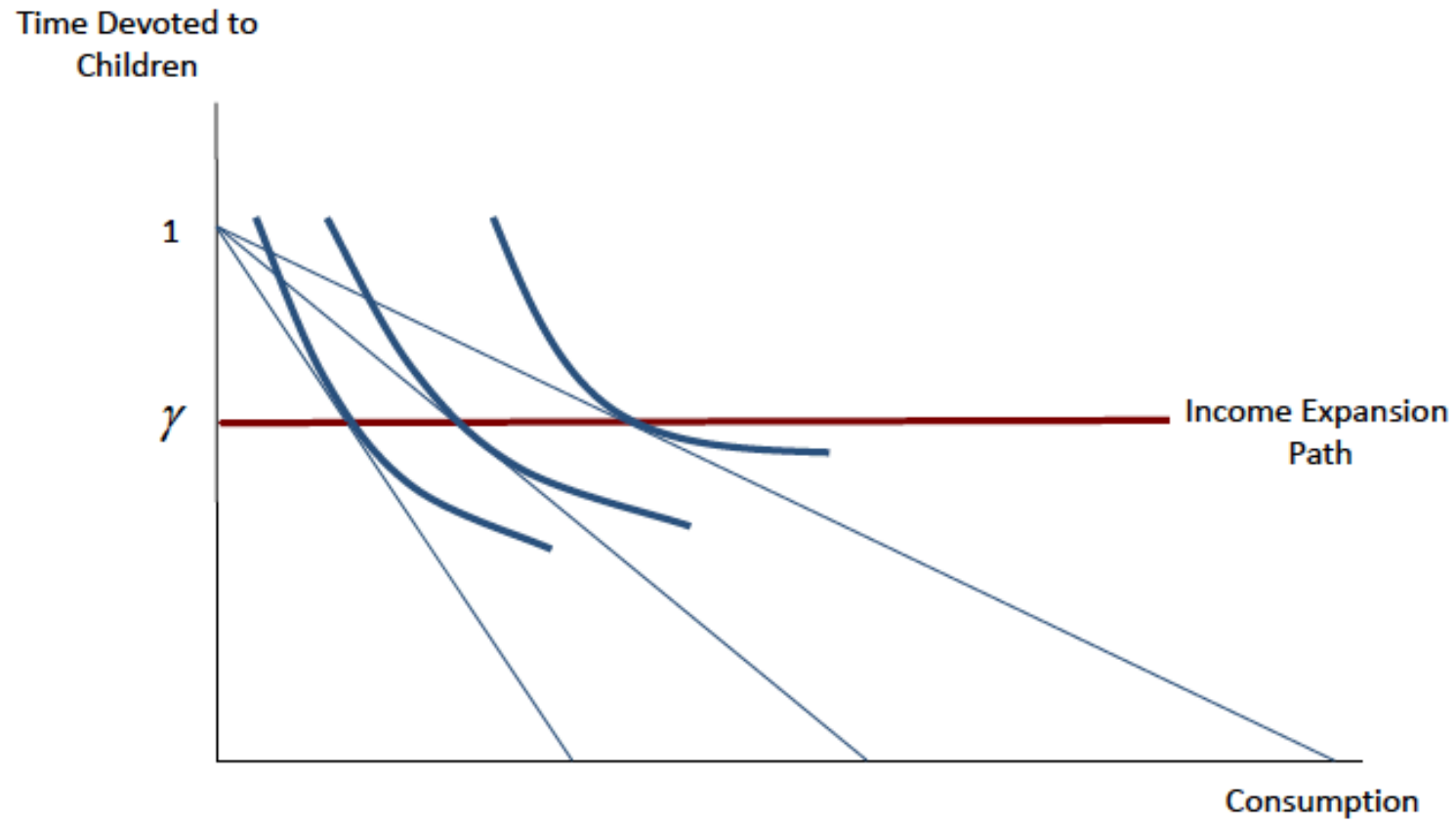$$z_t \equiv y_t = h_t^{\alpha} x_t^{1-\alpha}$$

So output is a function of education, technological progress and resources

$$z_t \equiv y_t = h_t^\alpha x_t^{1-\alpha} = h(e_t, g_t)^\alpha x_t^{1-\alpha} = z(e_t, g_t, x_t)$$

Theory Check: Subsistence Level
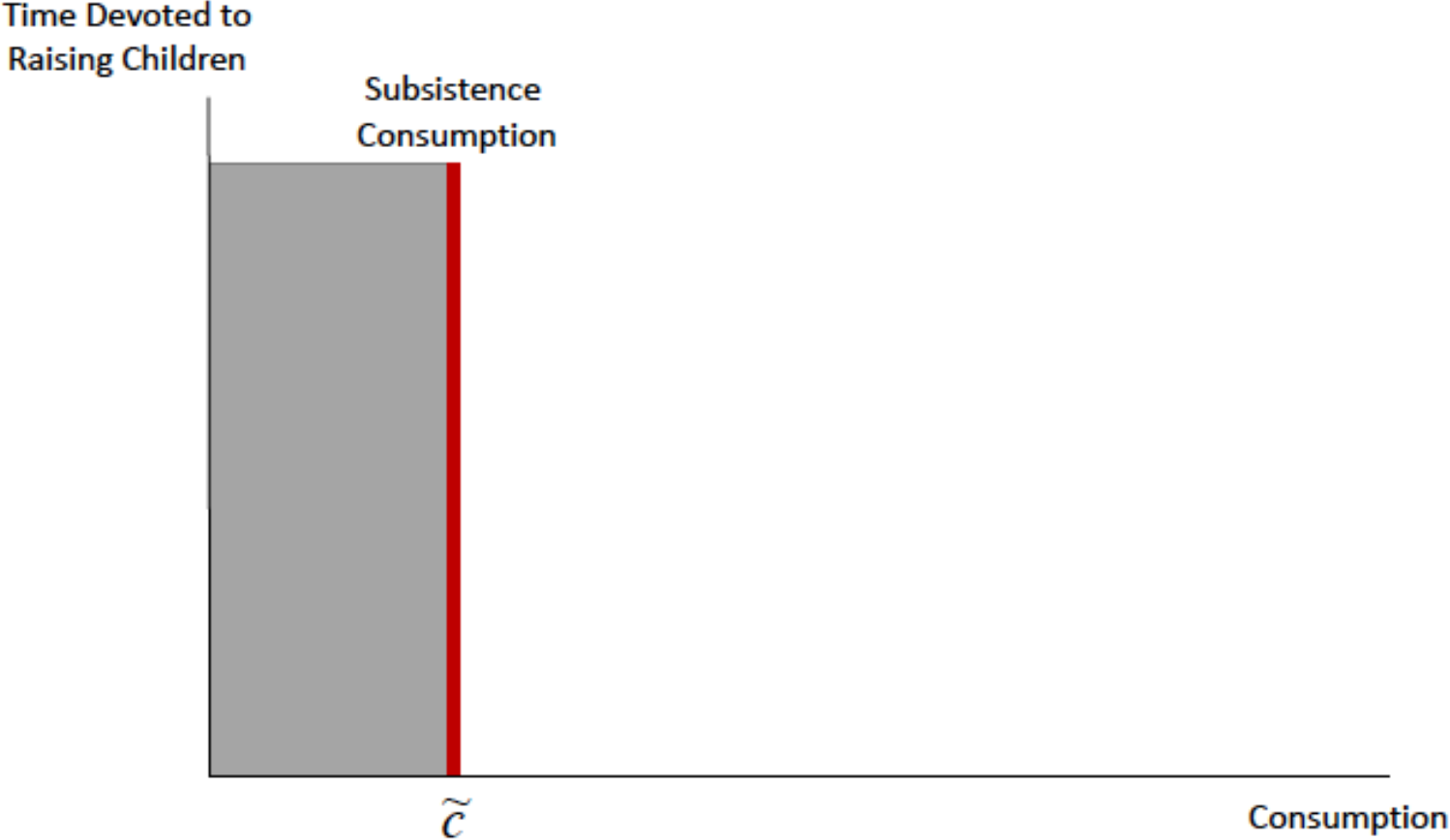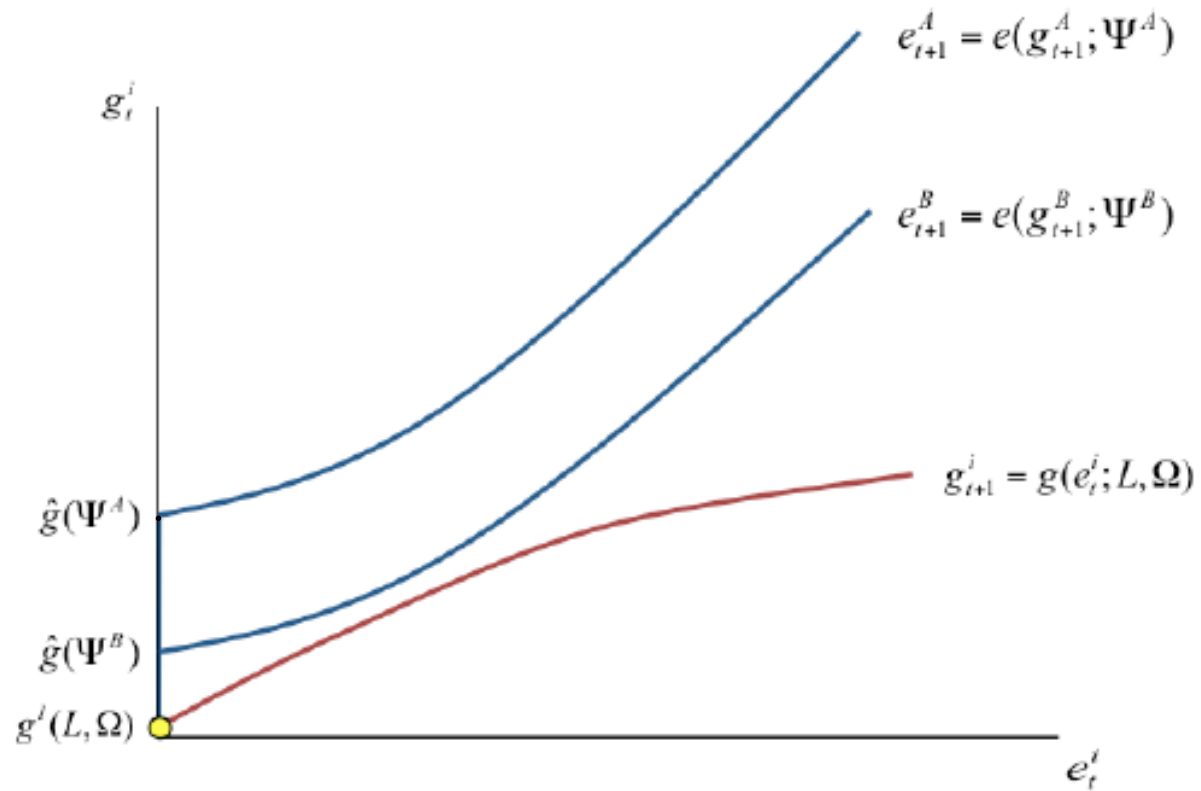
Once you escape subsistence

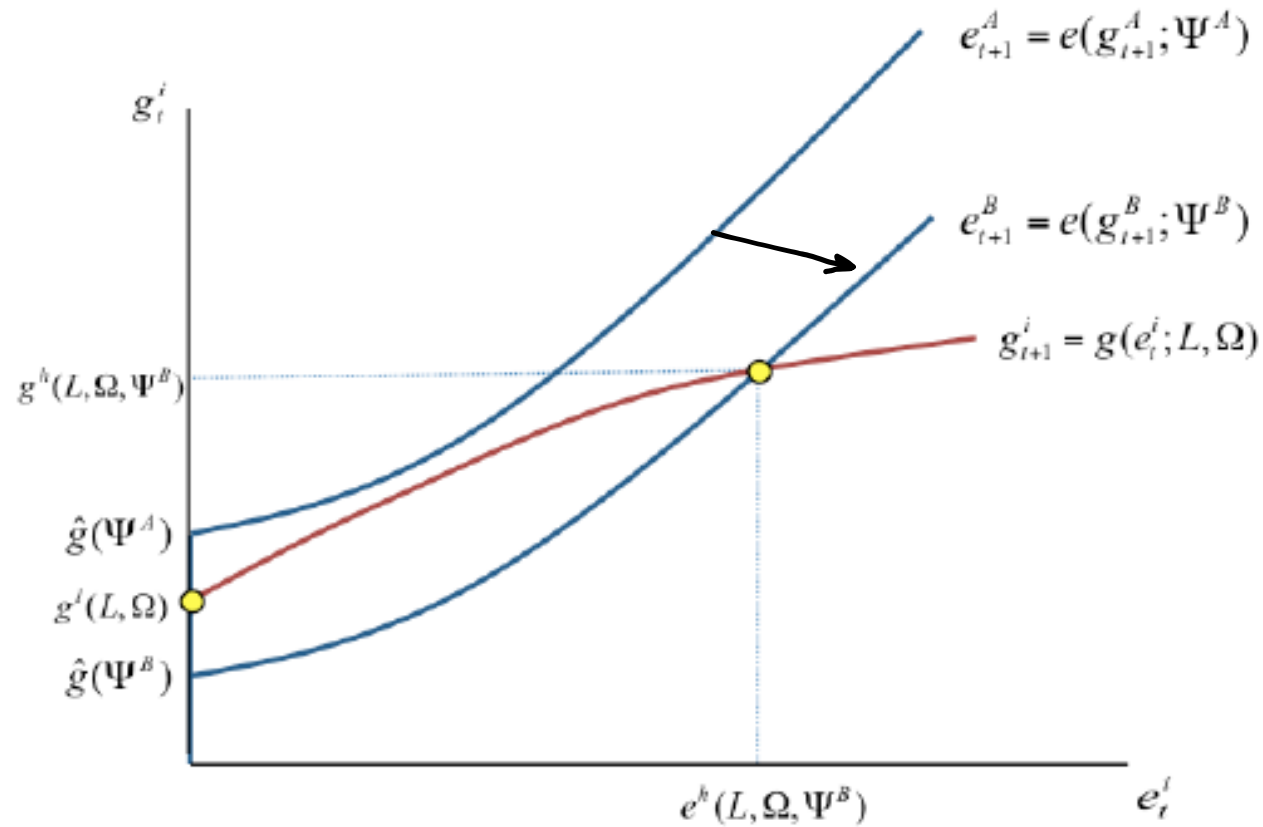# Theory Check: Improving the Education Path means More Educated Poople are Healthier!

- For country-specific characteristics Ψ_t^i

$$e_{t+1}^i = e(g_{t+1}^i; \Psi_t^i) \begin{cases} = 0 & if \quad g_{t+1}^i \leq \hat{g}(\Psi_t^i), \\ > 0 & if \quad g_{t+1}^i > \hat{g}(\Psi_t^i) \end{cases}$$

Moving from no impact

Duflo et al (2015):Education does improve health attitudes but not in all dimensions...

Philoshoplhy trip of the day: Hypocrates, the father of medicine.

- https://www.youtube.com/watch?v=Xi7ma8SJ5tg

- BETTER

- https://www.youtube.com/watch?v=FNR7qNxUBos

Maternal mortality ratio, 2015

Maternal mortality ratio is the number of women who die from pregnancy-related causes while pregnant or within 42 days of pregnancy termination per 100,000 live births. SDG Target 3.1 is to reduce global maternal deaths to less than 70 per 100,000 live births and all countries less than 140 per 100,000 live births.

No data   Global target reached   210   350

Minimum target reached   280   >420
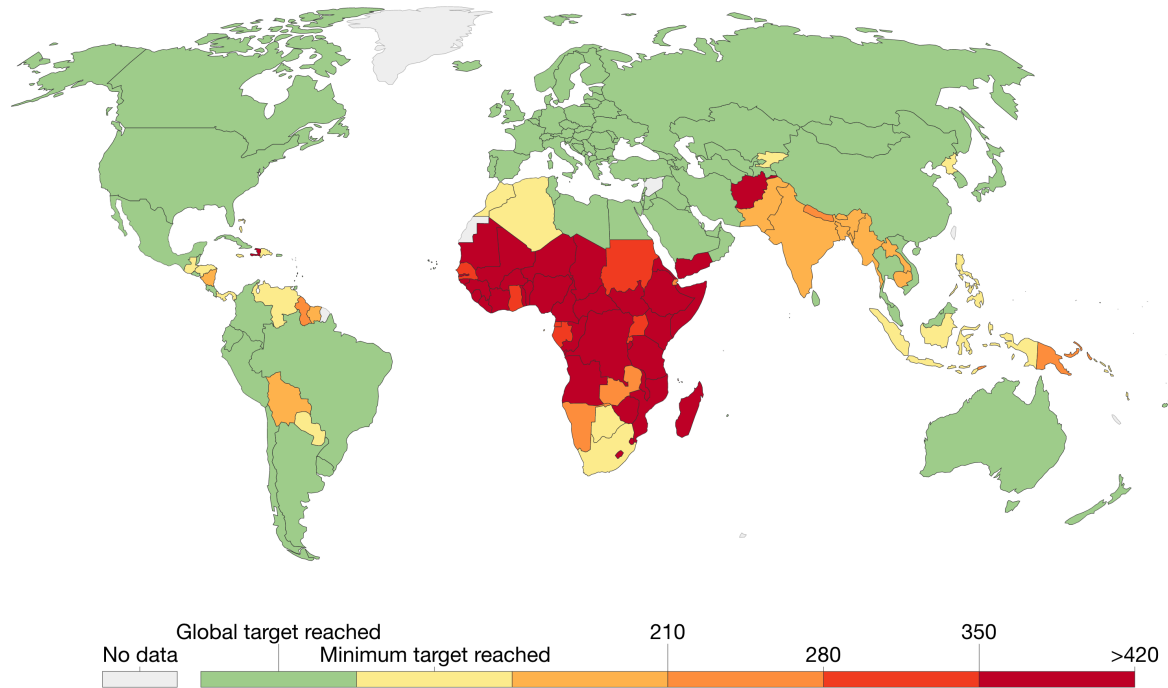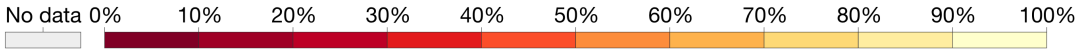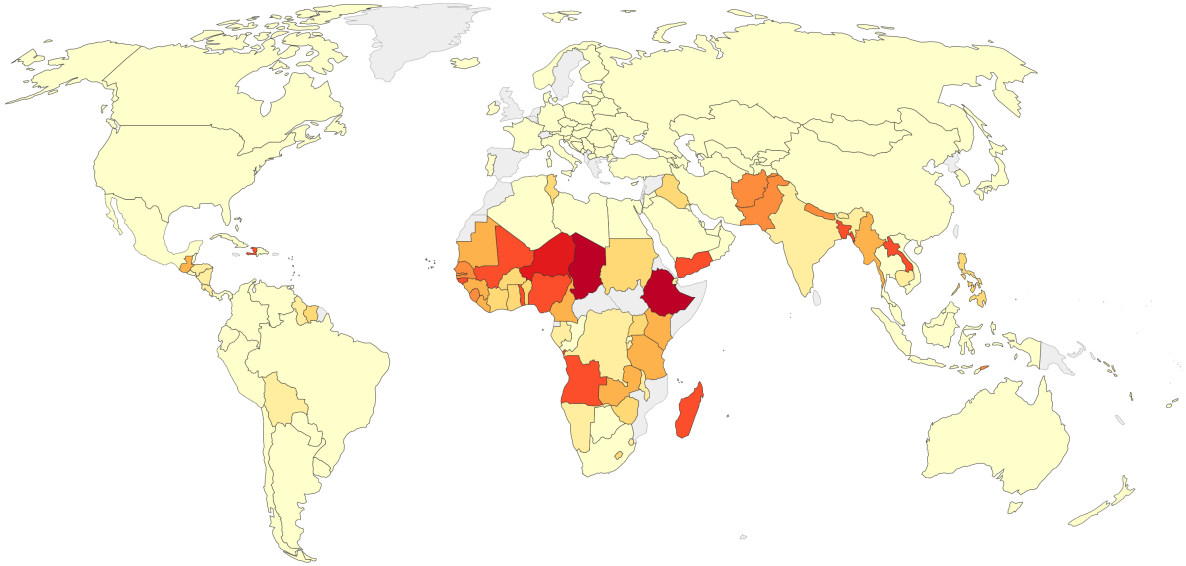
Share of births attended by skilled health staff, 2017

Percentage of births attended by personnel trained to give the necessary supervision, care, and advice to women during pregnancy, labor, and the postpartum period; to conduct deliveries on their own; and to care for newborns.

No data 0%   10%   20%   30%   40%   50%   60%   70%   80%   90%   100%

Child mortality rate

Under-five mortality rate is the probability per 1,000 that a newborn baby will die before reaching age five, if subject to age-specific mortality rates of the specified year. SDG Target 3.2 is to reduce child mortality to at least as low as 25 per 1,000 live births by 2030.
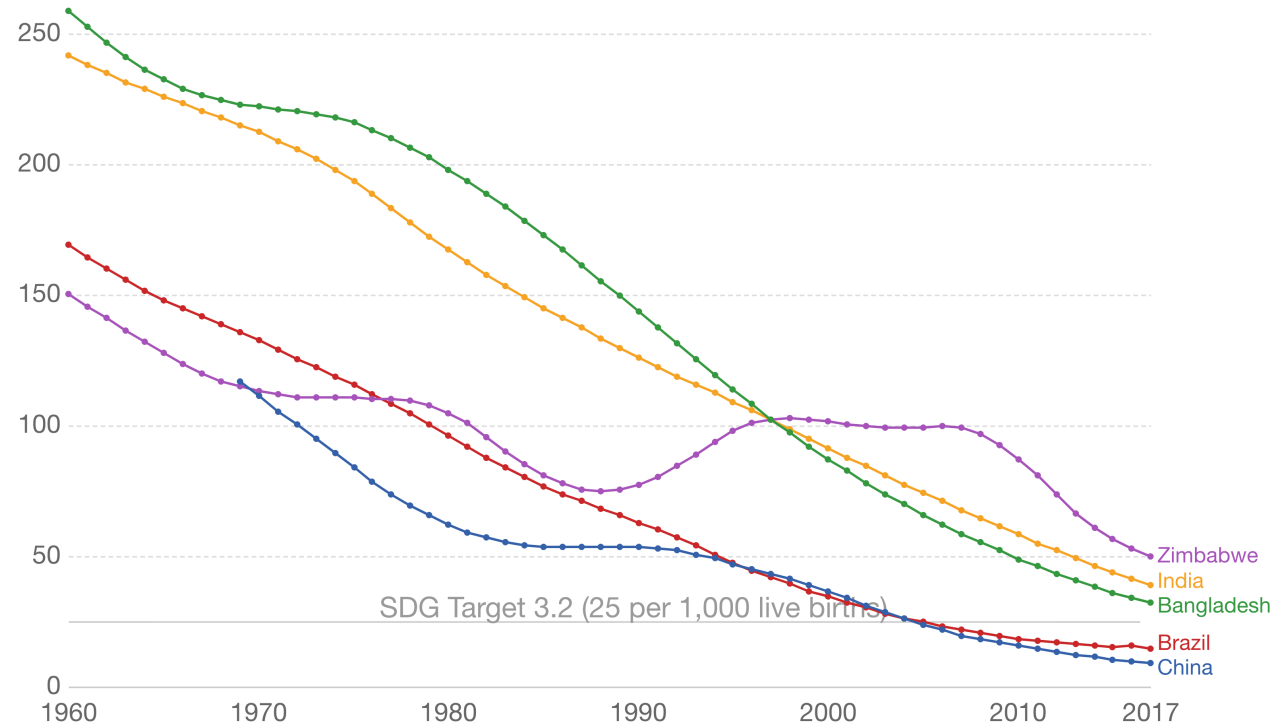
SDG Target 3.2 (25 per 1,000 live births)

- Zimbabwe
- India
- Bangladesh
- Brazil
- China

250
200
150
100
50
0

1960　1970　1980　1990　2000　2010　2017

Neonatal mortality rate, 2017

Neonatal mortality rate is the number of neonates dying before reaching 28 days of age, per 1,000 live births in a given year. SDG Target 3.2 is to reduce neonatal mortality rates to at least as low as 12 per 1,000 live births by 2030.

| No data | Target reached | | 15 | 20 | 30 | 40 | >50 |
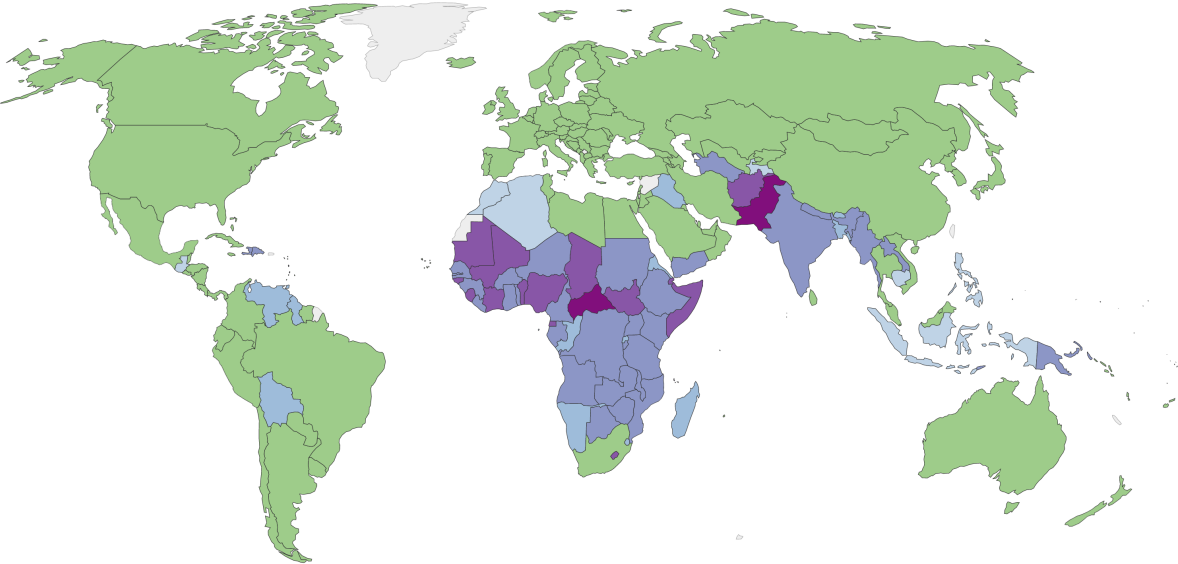
Source: World Bank

Incidence of HIV per 1,000 uninfected adults, 2017

Number of new HIV infections among uninfected populations ages 15-49 expressed per 1,000 uninfected
population in the year before the period.

No data   0   0.02   0.1   0.5   1   2.5   5   10   >15
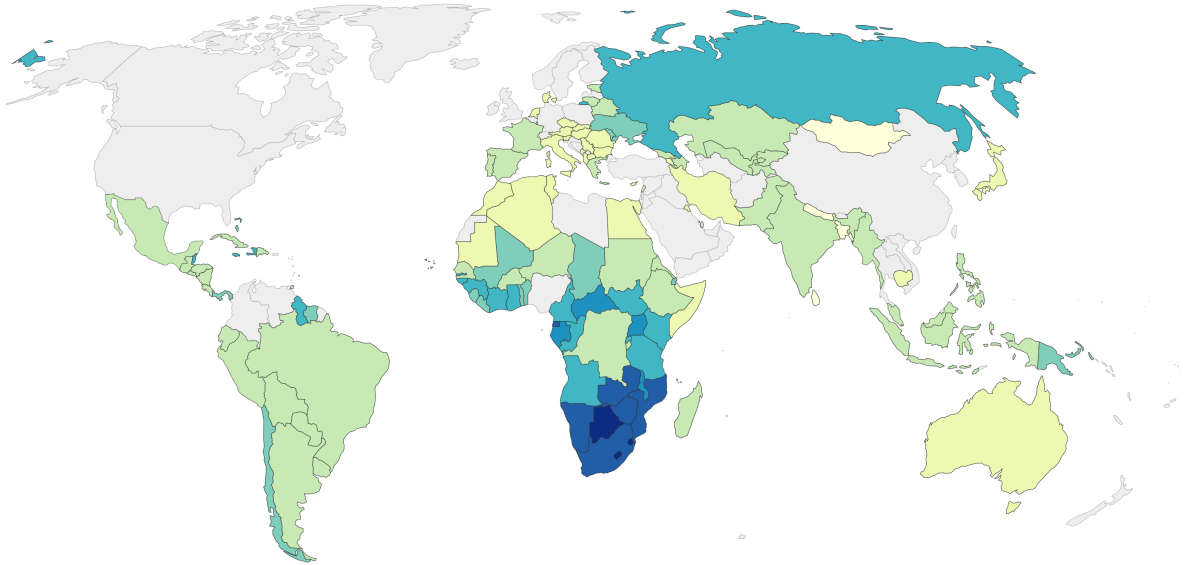
Tuberculosis incidence (per 100,000 people), 2016

Incidence of tuberculosis is the estimated number of new and relapse tuberculosis cases arising in a given year, expressed as the rate per 100,000 population. All forms of TB are included, including cases in people living with HIV.

No data | 0 | 20 | 25 | 50 | 100 | 250 | 500 | >750
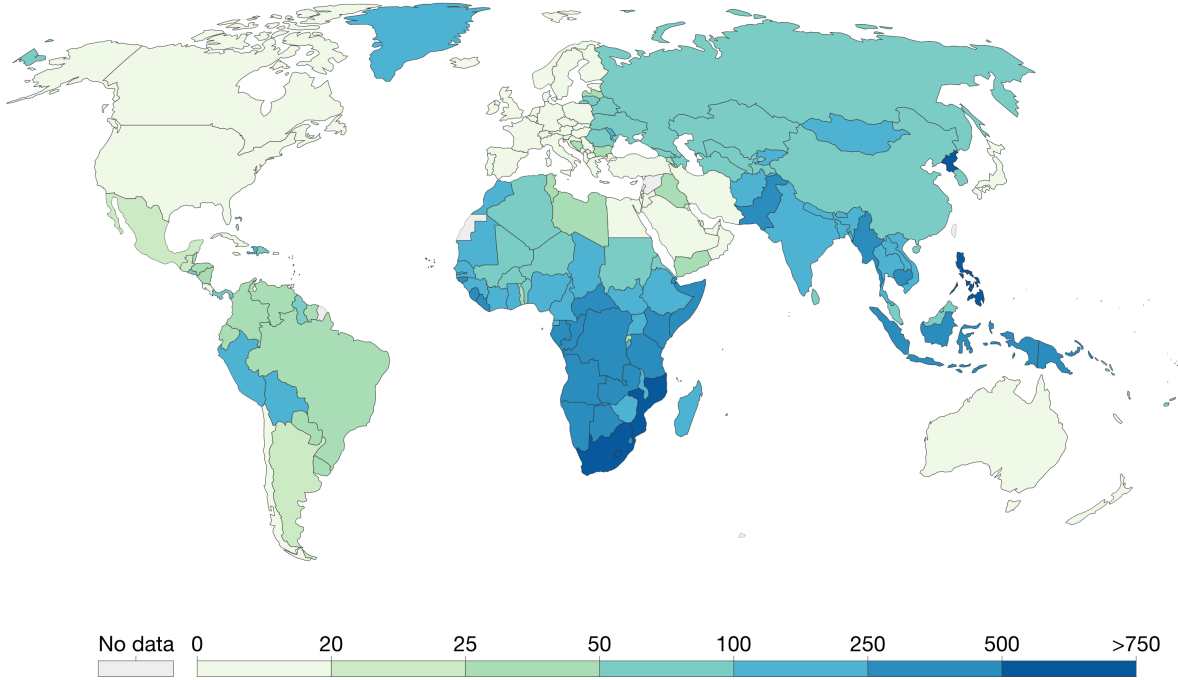
Malaria incidence (per 1,000 population at risk), 2015

Incidence of malaria is the number of new cases of malaria in a year per 1,000 population at risk. SDG Target 3.3 is to end the epidemic of malaria.

| No data | 0 | 9 | 25 | 50 | 100 | 250 | >500 |
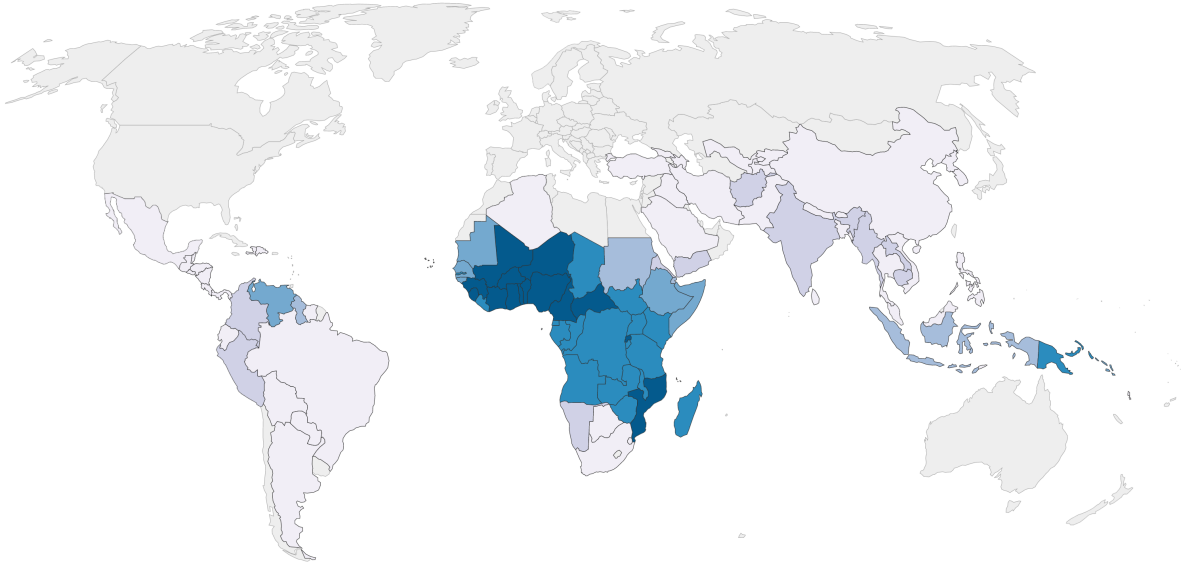
Hepatitis B incidence per 100,000 population

Hepatitis B incidence rate, 2017

Incidence of hepatitis B, measured as the number of new cases of hepatitis B per 100,000 individuals in a given population. SDG Target 3.3 is to combat heptatitis by 2030.

Our World in Data

No data   0   100   250   500   1,000   2,000   3,000   4,000   >5,000
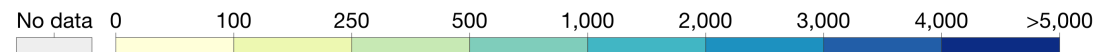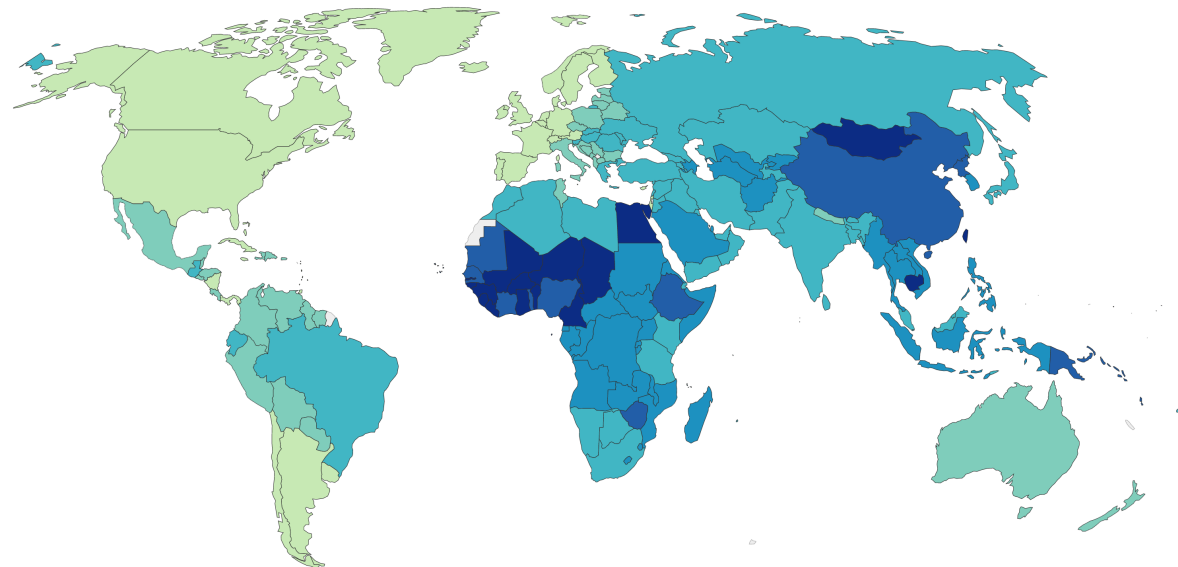
Source: IHME, Global Burden of Disease

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Mortality rate from unsafe water, sanitation, hygiene (WASH)

Mortality rate attributable to unsafe water, sanitation, and hygiene (WASH), 2016

Age-standardized death rate attributed to unsafe water, sanitation or lack of hygiene (WASH), measured as the number of deaths per 100,000 people of a given population.

Our World in Data

No data   0   20   40   80   120   160   >200
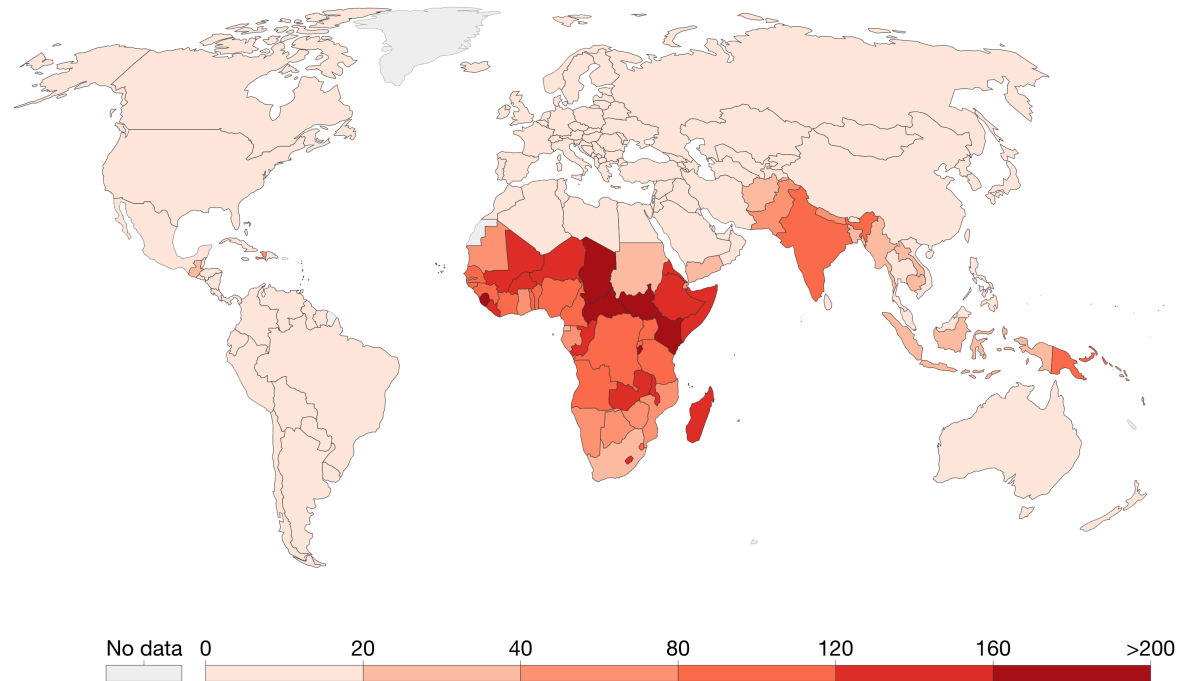
Source: IHME, Global Burden of Disease

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Number of people requiring interventions against neglected tropical diseases

Number of people requiring interventions against neglected tropical diseases (NTDs), 2015

People requiring interventions against neglected tropical diseases (NTDs). SDG Target 3.3 is to end neglected tropical diseases NTDs by 2030.

No data · 0 · 500,000 · 1 million · 10 million · 25 million · 50 million · 100 million · >250 million
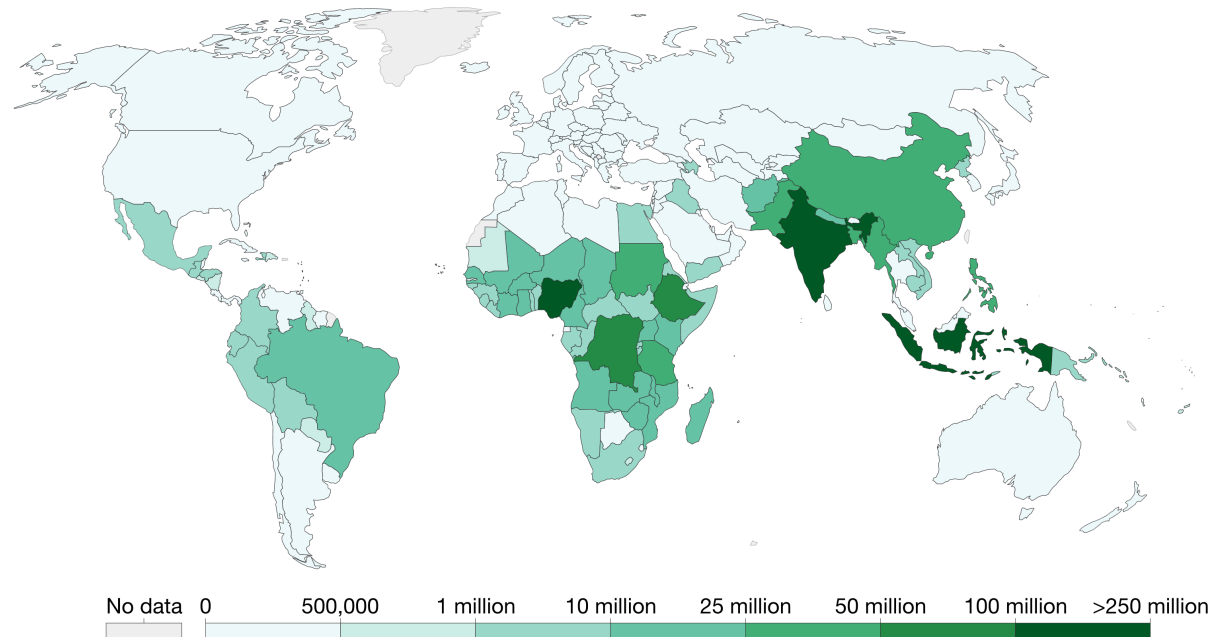
Source: WHO, Global Health Observatory
Note: 15 NTDs identified by the WHO NTD Roadmap are: Buruli ulcer, Chagas disease, Dengue and Chikungunya, Dracunculiasis (guinea-worm disease), Echinococcosis, Foodborne trematodiases, Human African trypanosomiasis (sleeping sickness), Leishmaniasis, Leprosy (Hansen's disease), Lymphatic filariasis, Mycetoma, chromoblastomycosis and other deep mycoses, Onchocerciasis (river blindness), Rabies, Scabies, Schistosomiasis, Soil-transmitted helminthiases, Snakebite envenoming, Taeniasis/Cysticercosis, Trachoma, Yaws.

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Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease

Mortality from non-communicable diseases, 2016

Mortality from CVD, cancer, diabetes or CRD is the percent of 30-year-old-people who would die before their 70th birthday from any of cardiovascular disease, cancer, diabetes, or chronic respiratory disease, assuming that s/he would experience current mortality rates at every age and s/he would not die from any other cause of death (e.g., injuries or HIV/AIDS).

Our World in Data

No data 0%   5%   10%   15%   20%   30%   40%   50%
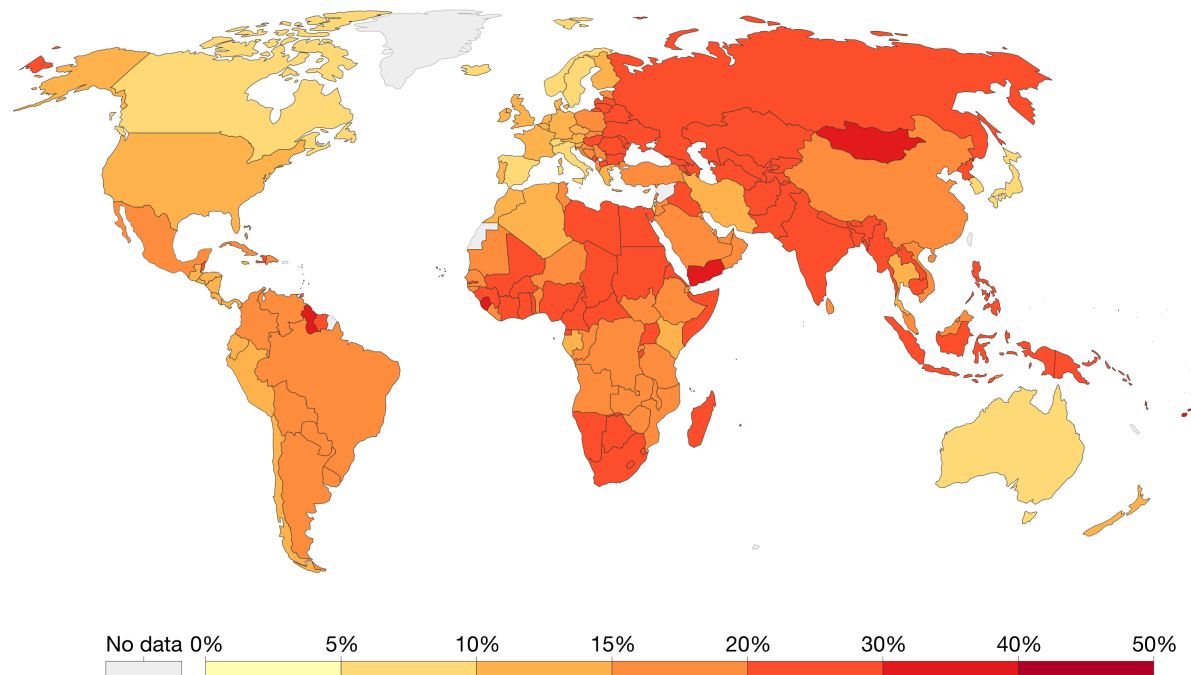
Suicide mortality rate

Suicide death rates, 2016
Suicide mortality rate is the number of suicide deaths in a year per 100,000 population.

No data | 0 | 2.5 | 5 | 7.5 | 10 | 15 | 20 | 25 | 35 | 45 | 55
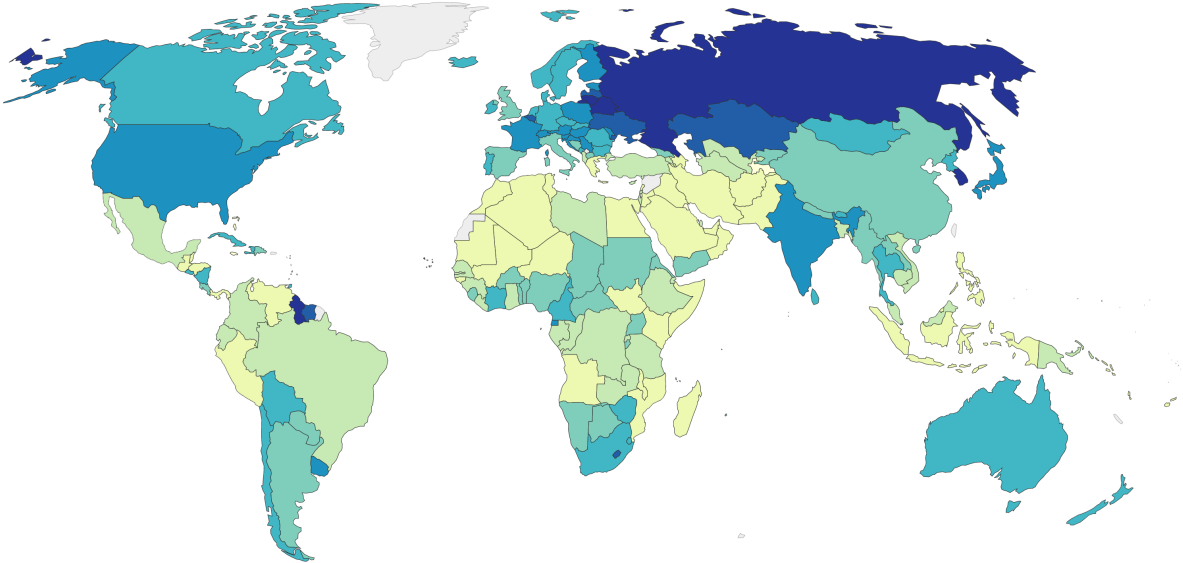
Source: World Bank

OurWorldInData.org/suicide/ • CC BY

Alcohol consumption per capita

Alcohol consumption per person, 2016

Consumption of alcohol is measured in liters of pure alcohol per person aged 15 or older.

No data   0 liters   2 liters   4 liters   6 liters   8 liters   10 liters   12 liters   14 liters   16 liters
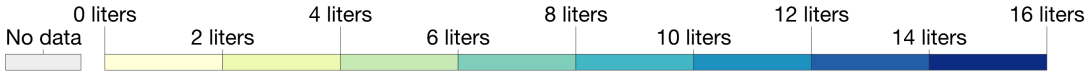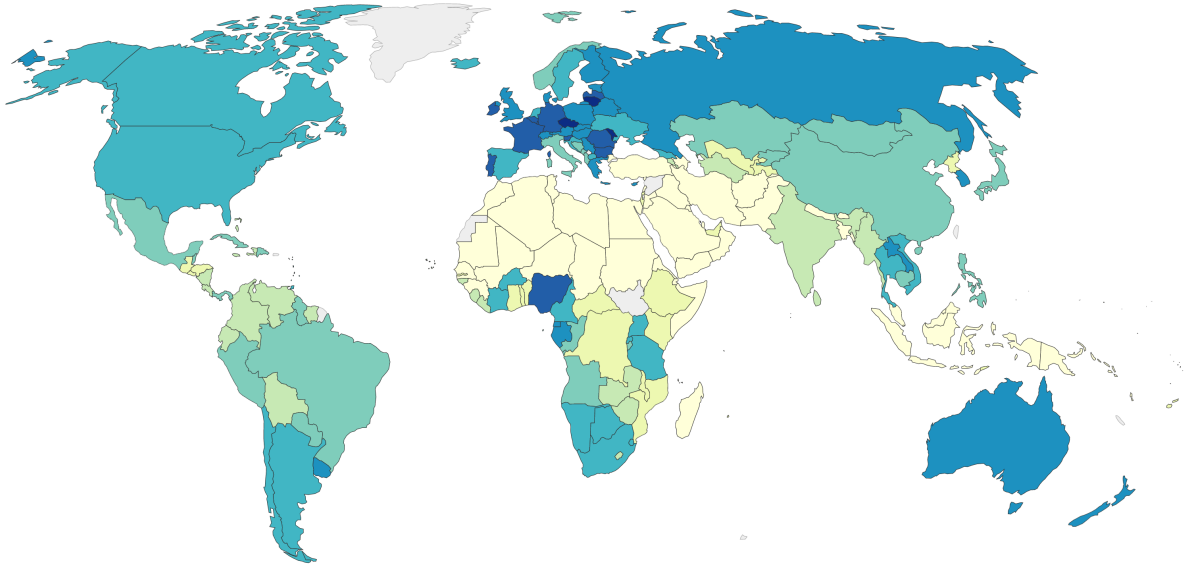
Source: World Bank

OurWorldInData.org/alcohol-consumption • CC BY

Halve the number of road traffic deaths

Road traffic deaths

Total number of deaths from road traffic incidents, including vehicle drivers or passengers, motorcyclists, cyclists and pedestrians. SDG Target 3.6 is to halve the global number of deaths from road incidents by 2020 (from 2010 levels).

Our World in Data

60,000

50,000

United States

40,000

30,000

Western Europe

20,000

10,000

Turkey

0

Greece

1990   1995   2000   2005   2010   2015 2017
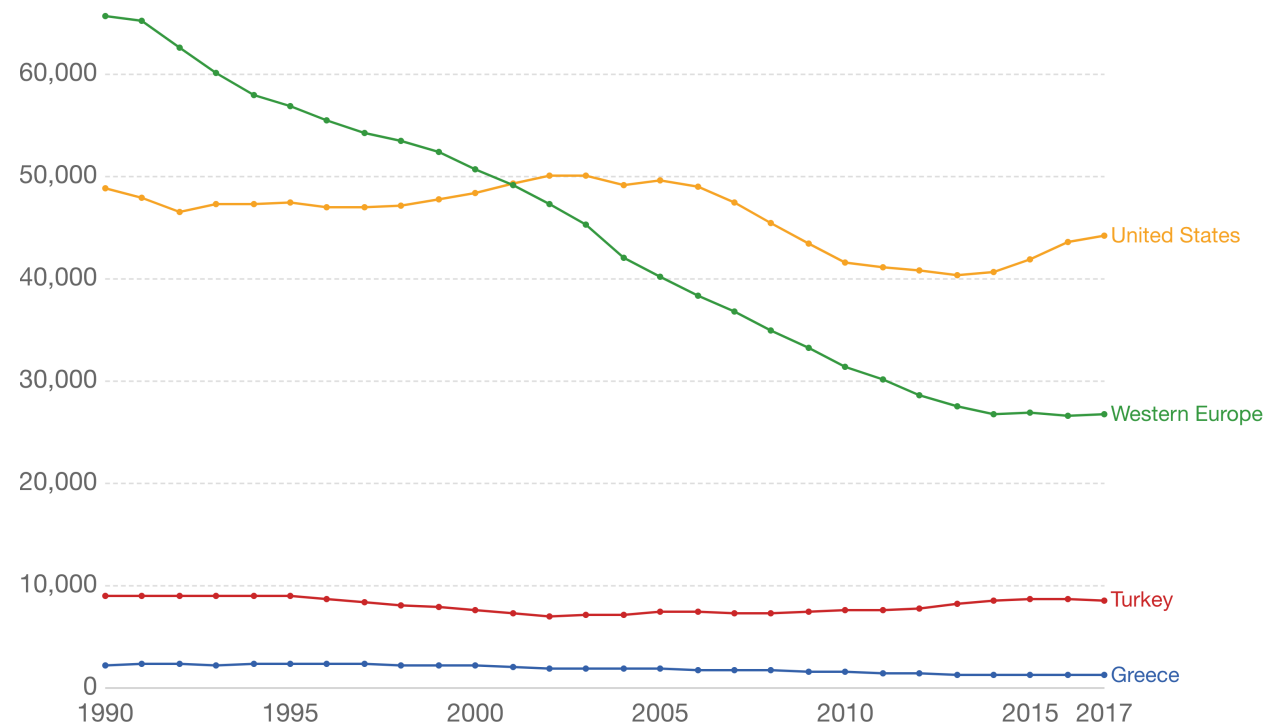
Death rate from road accidents, 2017

The annual number of deaths from road accidents per 100,000 people.
Deaths include those from drivers and passengers, motorcyclists, cyclists and pedestrians.
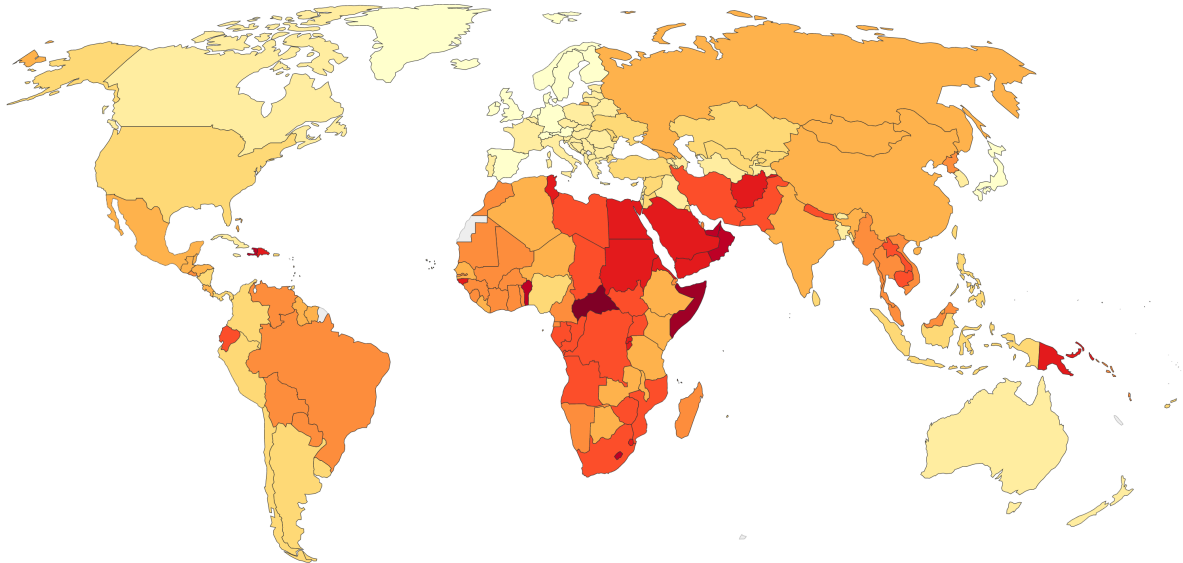
No data   0   5   10   15   20   25   30   40   50   60   >70

Our World
in Data

Coverage of essential health services

Healthcare Access and Quality Index, 2015

The Healthcare Access and Quality (HAQ) Index is measured on a scale from 0 (worst) to 100 (best) based on death rates from 32 causes of death that could be avoided by timely and effective medical care (also known as 'amenable mortality').

Our World in Data
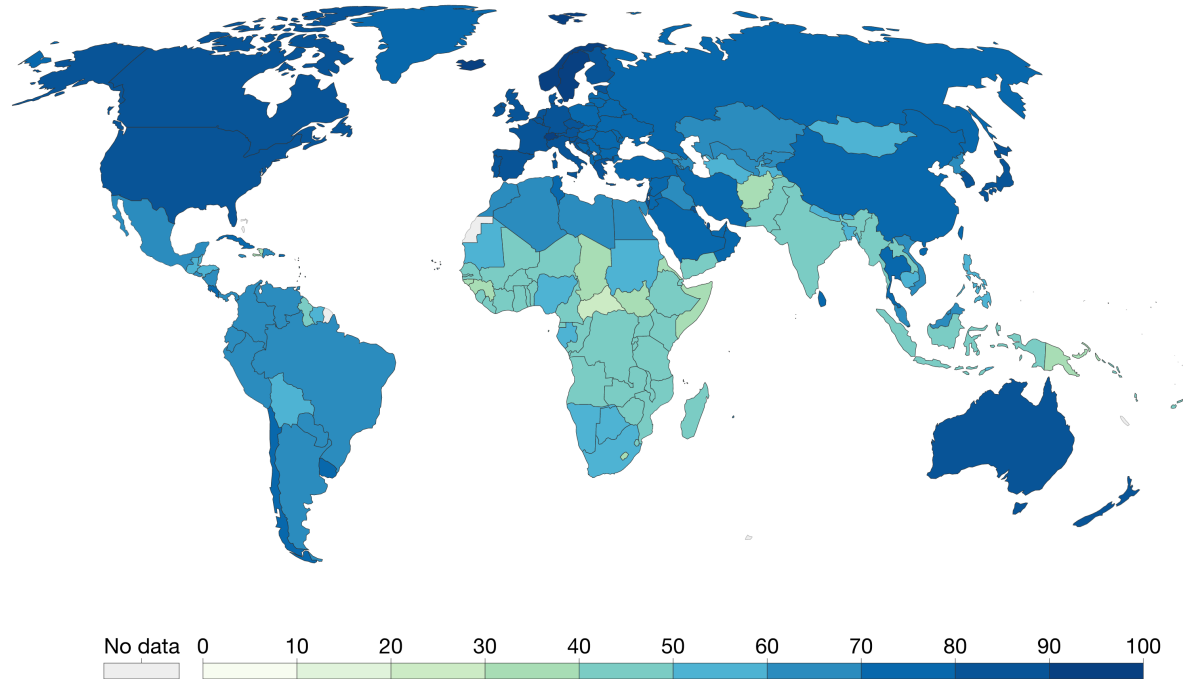
No data 0 10 20 30 40 50 60 70 80 90 100

Household expenditures on health

Share of population with large household expenditures on health, 2015
The share of the population that spend more than 25% of total household expenditure or income on health.

Our World in Data

No data   0%   1%   2%   3%   4%   >5%
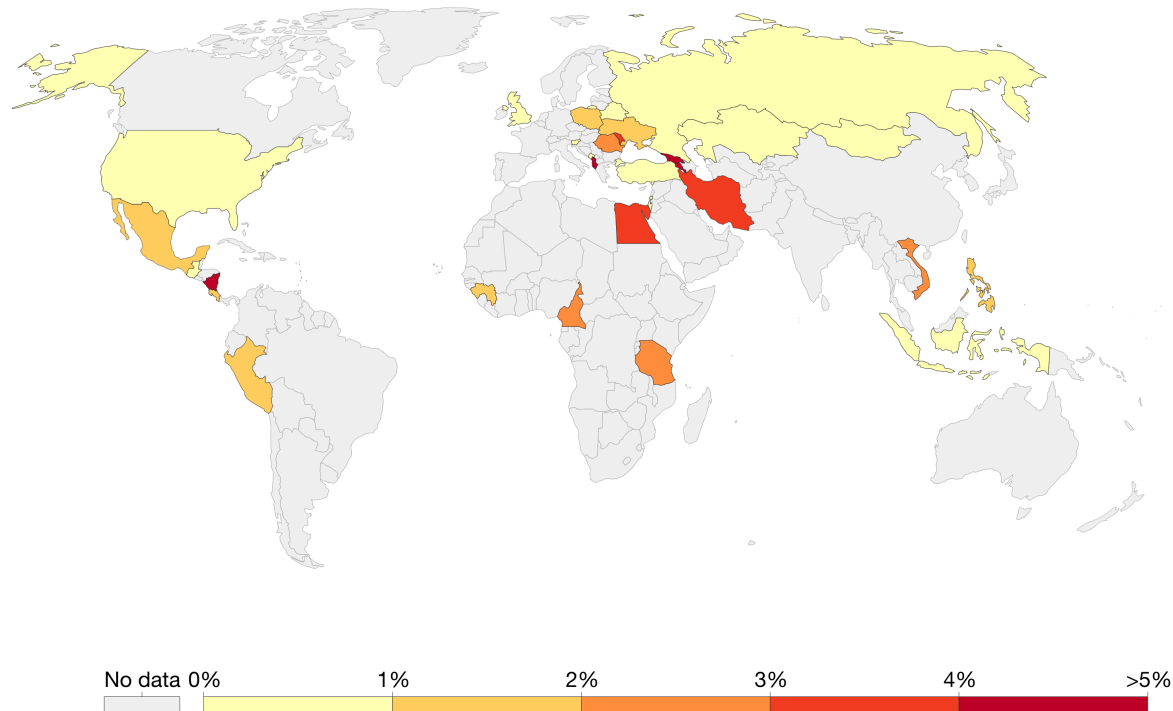
Mortality rate from air pollution

Death rates from air pollution, World
Age-standardized death rates from outdoor ozone, particulates, and indoor fuel pollution per 100,000 individuals.

Our World in Data

Outdoor ozone pollution

Outdoor particulate pollution

Household pollution
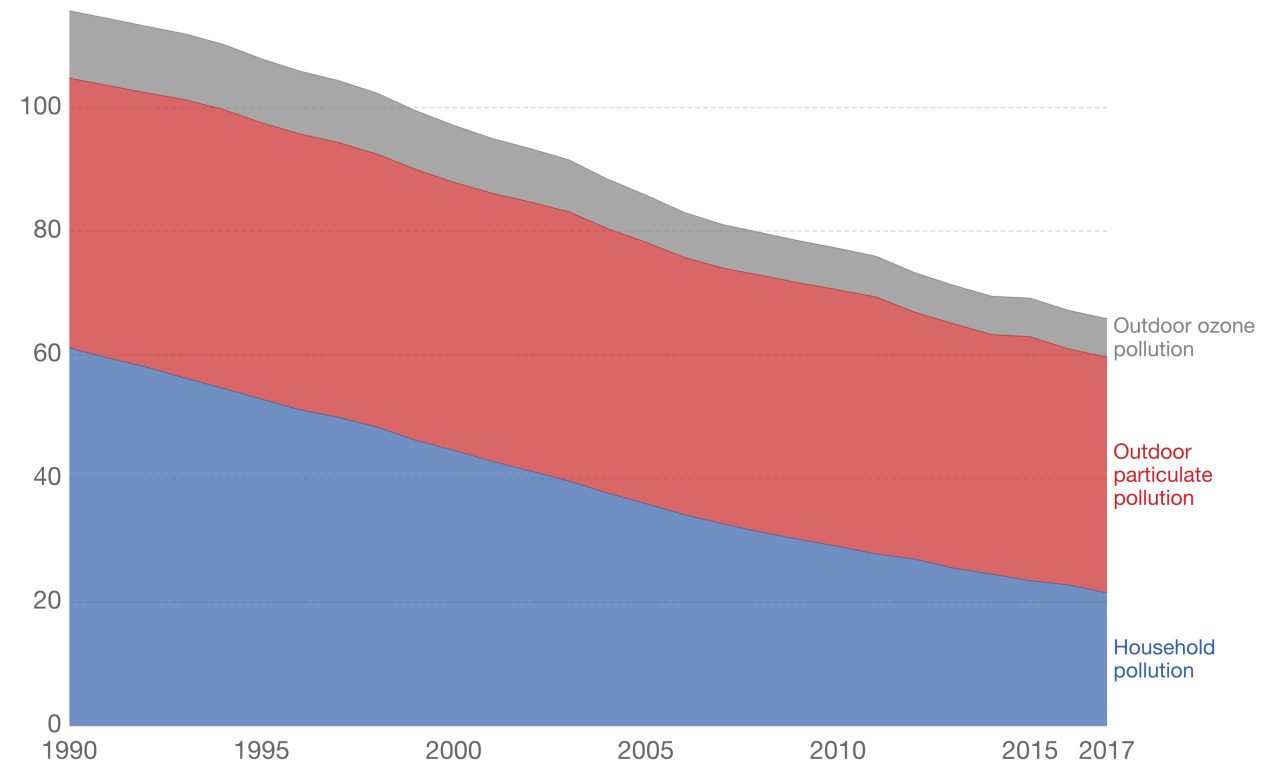
Source: IHME, Global Burden of Disease

OurWorldInData.org/air-pollution/ • CC BY

Prevalence of tobacco use

Prevalence of tobacco use among adults, 2016
Share of the population aged 15 years or older who smoke tobacco daily.
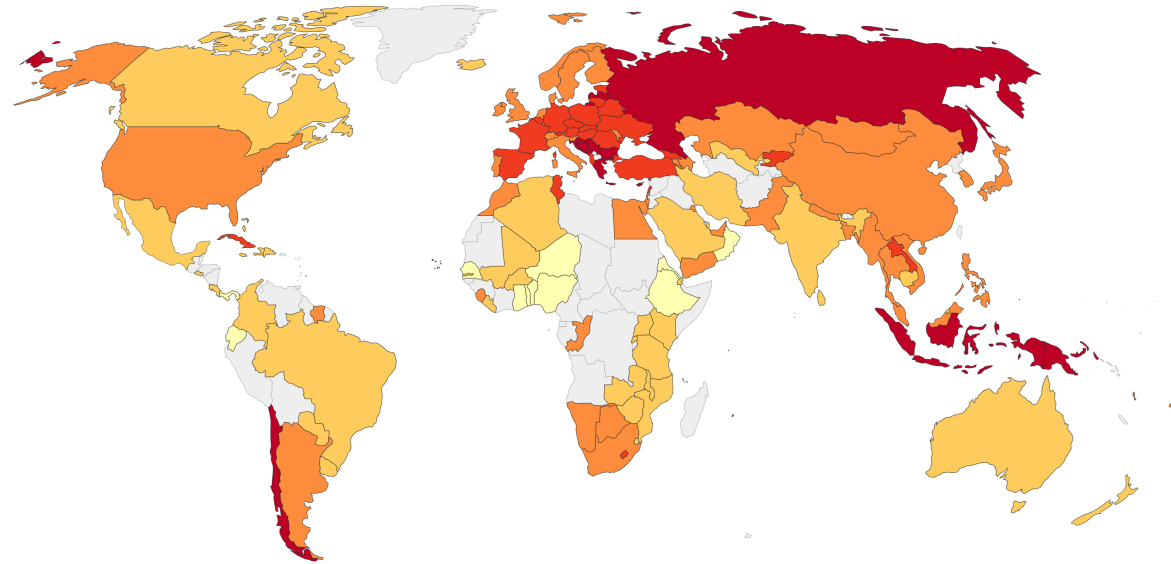
Source: United Nations Statistics Division

Vaccine coverage

Share of children who receive key vaccines in target populations, 2016

Share of children of the relevant age category who receive the seven key vaccines, conditional on inclusion in national vaccine schedules. The eight vaccines include DPT3, measles, polio, Hep3B, Haemophilus influenzae type b, pneumococcal conjugate vaccine, and rotavirus vaccine.

Our World in Data

No data 0%   20%   40%   50%   60%   70%   80%   90%   100%
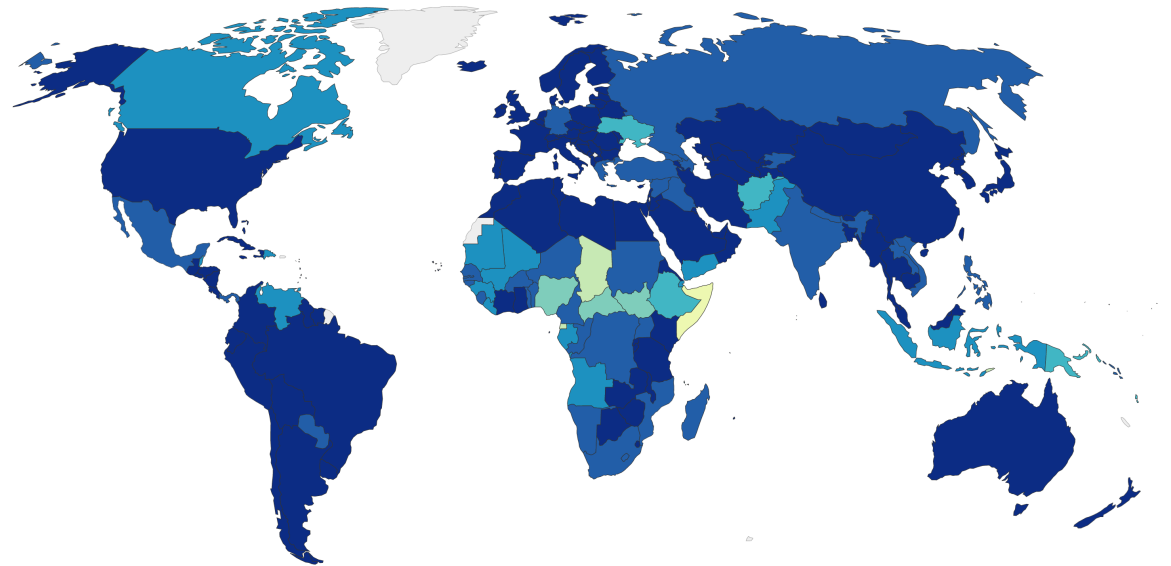
Development assistance to medical research & basic healthcare

Gross official development assistance (ODA) for medical research and
basic heath sectors, 2015

Gross disbursements of total Official Development Assistance (ODA) from all donors to medical research and basic health
sectors, measured in constant 2015 US$.
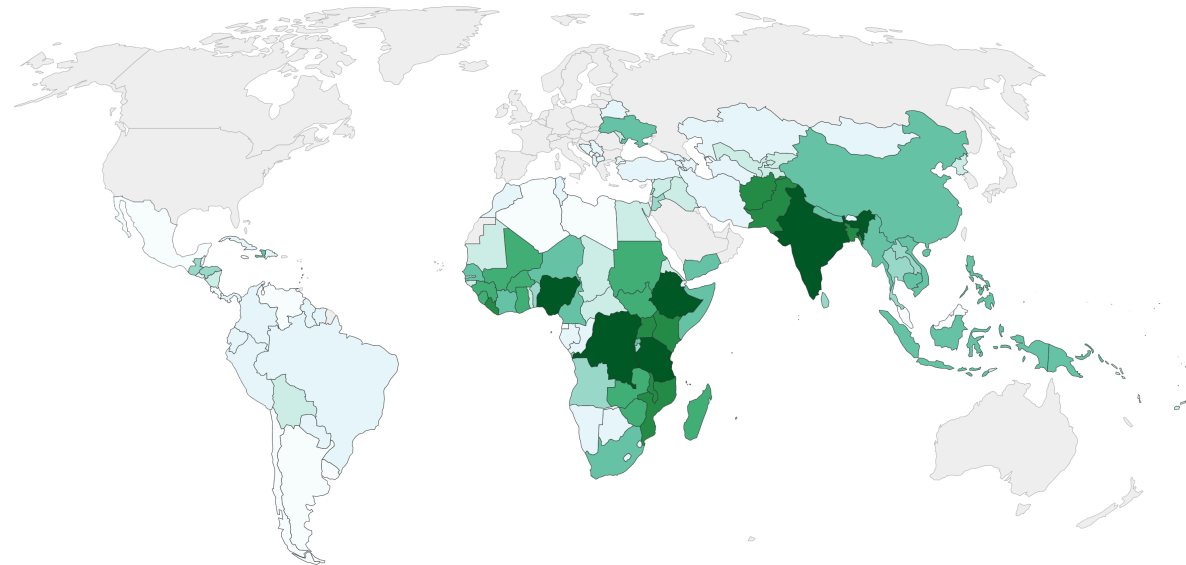
Our World
in Data

No data $0 $10 billion $50 billion $150 billion   >$600 billion
              $1 billion $25 billion $100 billion $300 billion

Doctors density

Medical doctors per 1,000 people, 2016

Medical doctors include generalist physicians and specialist medical practitioners.

No data   0   0.5   1   2   3   4   5   >6
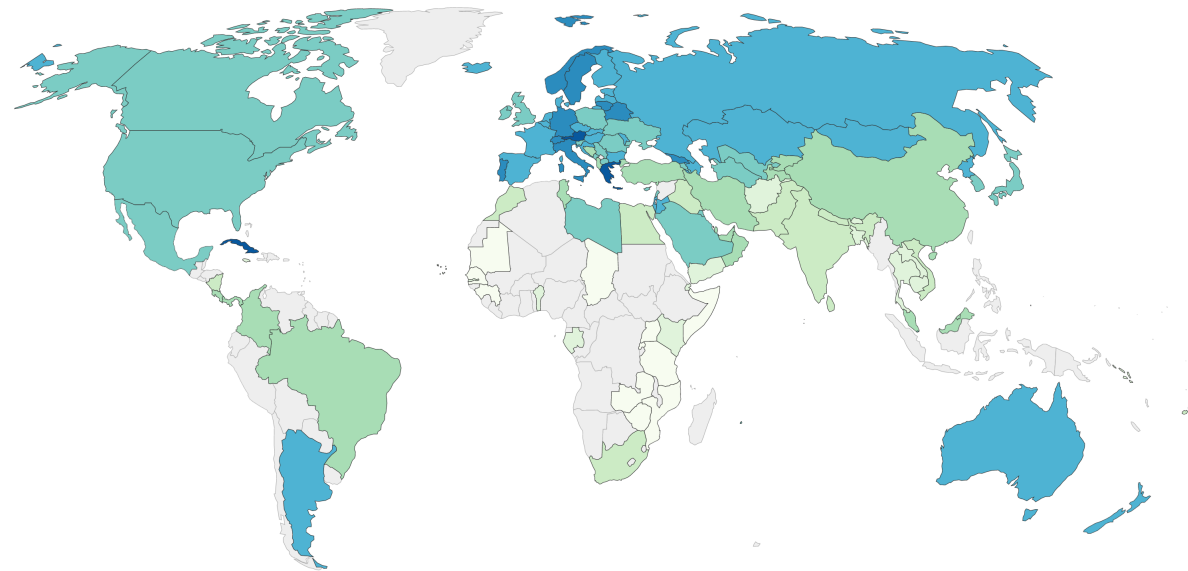
Surgical Doctors Density

Specialist surgical workforce (per 100,000 population)

Specialist surgical workforce is the number of specialist surgical, anaesthetic, and obstetric (SAO) providers who are working in each country per 100,000 population.

Our World in Data

No data   0   10   20   30   40   50   60   70   80   90   100   125   >150
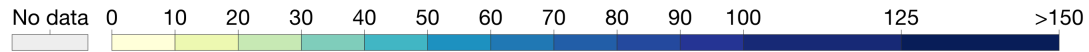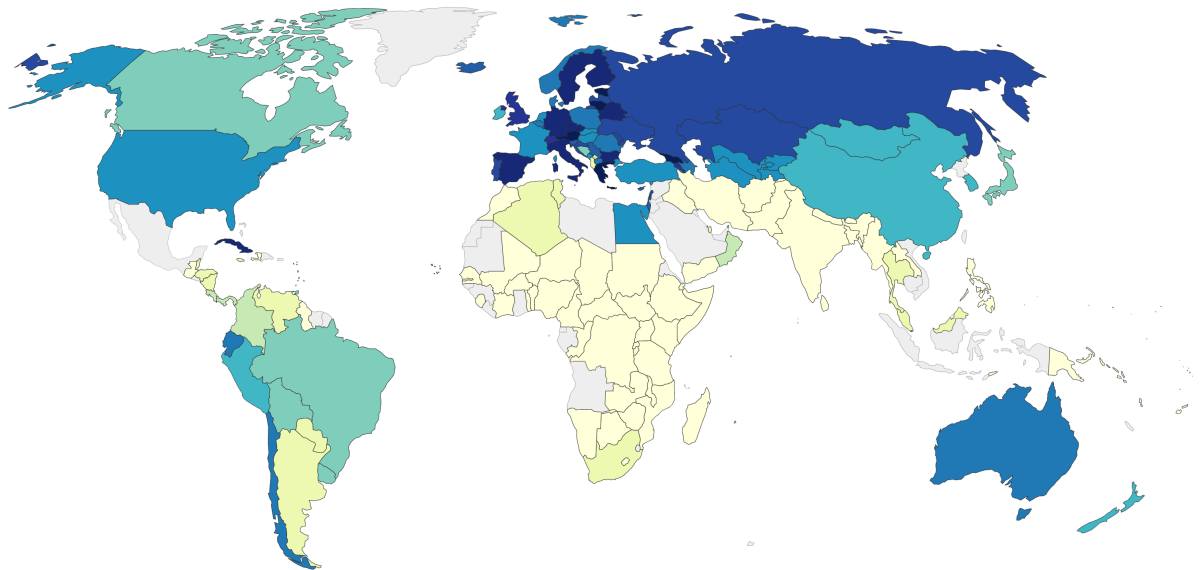
Precaution is better than treatment!

International Health Regulations (IHR) core capacity index, World, 2018

Percentage of attributes of core capacities that have been attained at a specific point in time.

Our World in Data

Category	Value
IHR Coordination and National IHR Focal Point Functions	67%
Human resources	63%
Zoonotic events and the human–animal interface	63%
Legislation and Financing	62%
Food safety	60%
Health Service Provision	59%
National Health Emergency Framework	59%
Risk Communication	57%
Points of entry	52%
Radiation emergencies	52%
Chemical events	50%

0% 10% 20% 30% 40% 50% 60%

And all those affect returns on lifetime education and output!!

Life expectancy, 2019
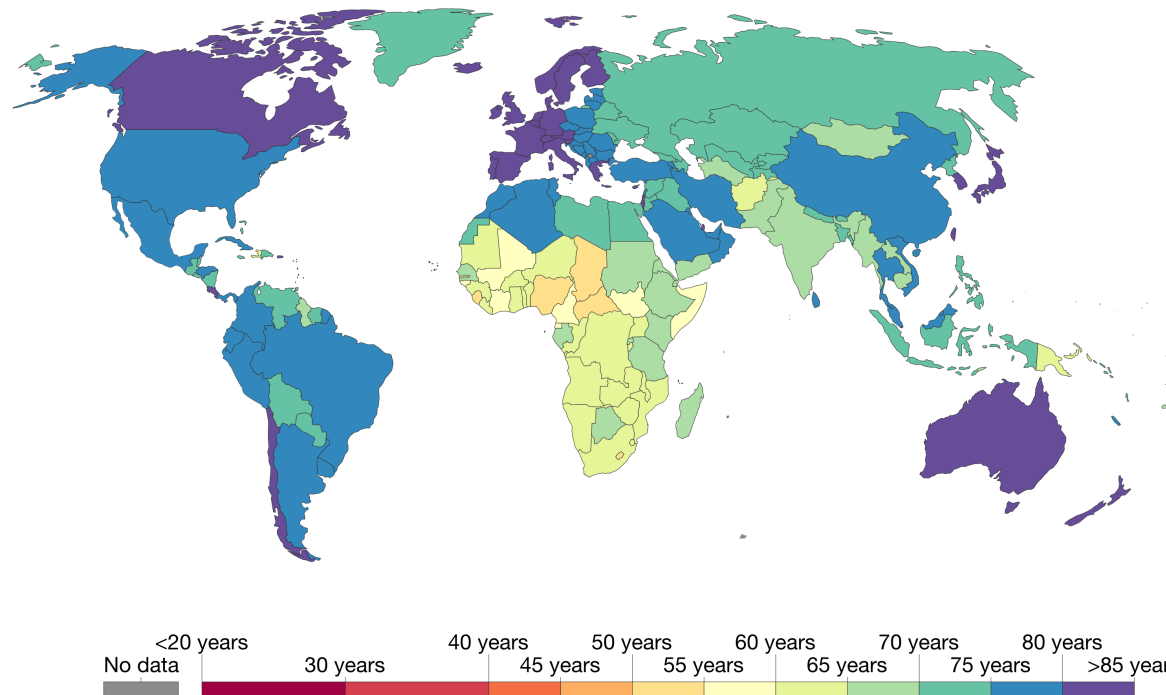
Life expectancy vs. healthcare expenditure, 1995 to 2014

Total healthcare expenditure per capita is adjusted for price differences between countries and for inflation and measured in international-$.

Legend:
- Africa
- Asia
- Europe
- North America
- Oceania
- South America

1995 ➝ 2014

Axis labels:
- Y-axis: Life expectancy at birth (40 years, 50 years, 60 years, 70 years, 80 years)
- X-axis: Healthcare Expenditure per capita (int.-$) ($100, $1,000)

Country labels: Japan, South Korea, Germany, Lebanon, Chile, Cuba, North America, Albania, United Arab Emirates, Dominica, Vietnam, China, Mexico, Brazil, Hungary, Saudi Arabia, Bangladesh, Tonga, Guatemala, Latvia, World, Nepal, Kyrgyzstan, Egypt, Trinidad and Tobago, Timor, India, Bolivia, Iraq, Laos, Pakistan, Guyana, Palau, Eritrea, Ethiopia, Tanzania, Sudan, Gabon, Botswana, Malawi, Ghana, Namibia, Benin, Angola, Democratic Republic of Congo, Pre-demographic dividend, South Africa, Mozambique, Equatorial Guinea, South Sudan, Swaziland, Chad, Nigeria, Sierra Leone

Source: World Bank

Life expectancy of women vs life expectancy of men, 2015

In countries that lie above the grey line the life expectancy of women is higher than for men.

Our World in Data

Life expectancy of women

- Africa
- Asia
- Europe
- North America
- Oceania
- South America

Countries labeled: South Korea, Japan, Germany, United States, Albania, China, Vietnam, Poland, Lithuania, Brazil, Aruba, Bahrain, Belarus, Colombia, Iran, Saudi Arabia, Syria, Russia, Moldova, Guatemala, Paraguay, Kazakhstan, Libya, Bangladesh, Egypt, Philippines, Solomon Islands, India, Bhutan, Myanmar, Pakistan, Ethiopia, Sudan, South Africa, Afghanistan, Angola, Ghana, Gambia, Uganda, Democratic Republic of Congo, Mozambique, Guinea, Cameroon, Somalia, Lesotho, Nigeria, Central African Republic, Sierra Leone

Life expectancy of men

Source: UN Population Division (2017 Revision)
Note: Shown is the period life expectancy at birth measured in years.

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Life satisfaction vs Life expectancy, 2015

The vertical axis shows life expectancy at birth. The horizontal axis shows self-reported life satisfaction in the Cantril Ladder (0-10 point scale with higher values representing higher life satisfaction).
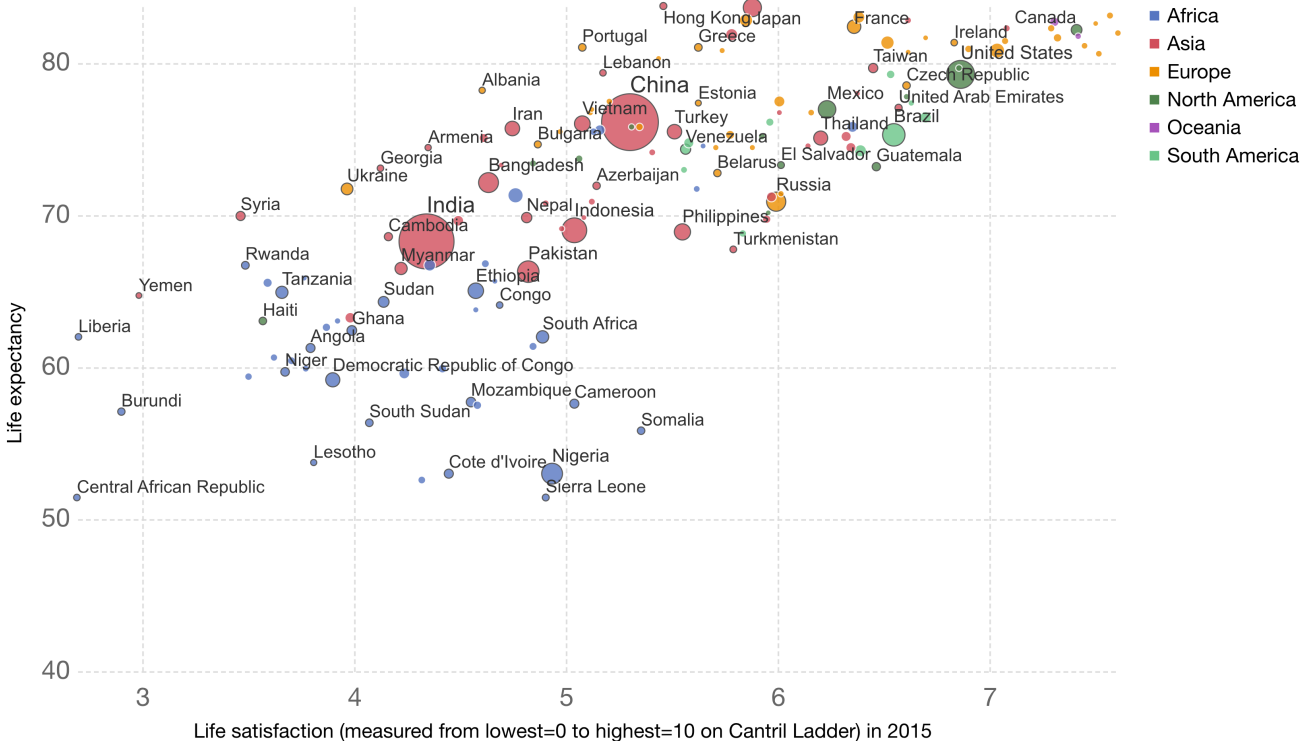
Legend:
- Africa
- Asia
- Europe
- North America
- Oceania
- South America

Food supply vs life expectancy, 2013

Our World in Data

Life expectancy at birth (y-axis)

Food supply per capita (in kcal) (x-axis)

x-axis labels: 1,879 kcal, 2,200 kcal, 2,600 kcal, 3,000 kcal, 3,600 kcal

y-axis labels: 30, 40, 50, 60, 70, 80

Legend:
- Africa
- Asia
- Europe
- North America
- Oceania
- South America

Country labels: Japan, Cyprus, Spain, Australia, France, Israel, Malta, United States, Taiwan, China, Poland, Estonia, Morocco, Turkey, Ecuador, Vietnam, Slovakia, Brazil, Iran, Belarus, Russia, Venezuela, Colombia, Samoa, Jordan, Kazakhstan, Egypt, North Korea, Bangladesh, Uzbekistan, Ukraine, India, Philippines, Indonesia, Fiji, Timor, Bolivia, Myanmar, Turkmenistan, Kiribati, Pakistan, Kenya, Sudan, Gabon, Ethiopia, Afghanistan, Liberia, Malawi, Angola, Gambia, Burkina Faso, Ghana, Zambia, Uganda, Niger, South Africa, Mozambique, Cameroon, Mali, Swaziland, Chad, Lesotho, Nigeria, Central African Republic, Sierra Leone

Poverty vs. Life expectancy, 2014

Poverty is measured as the share of the population living on less than 3.10$ international dollars per day.

Legend:
- ■ Africa
- ■ Asia
- ■ Europe
- ■ North America
- ■ Oceania
- ■ South America

Life expectancy at birth (y-axis): 55 years, 60 years, 65 years, 70 years, 75 years, 80 years

Share of population living below $3.10 per day (x-axis): 0%, 20%, 40%, 60%, 80%

Country labels: Slovenia, Chile, Poland, Slovakia, Iran, China, Vietnam, Maldives, Brazil, Lithuania, Peru, Sri Lanka, Belarus, Colombia, Paraguay, Russia, Guatemala, Bangladesh, Mongolia, Bhutan, Middle income, Vanuatu, Tajikistan, Kyrgyzstan, Bolivia, Nepal, India, Cambodia, Indonesia, South Asia, Lower middle income, Pakistan, Laos, Senegal, Rwanda, Sudan, Madagascar, Mauritania, Congo, Ethiopia, Namibia, Haiti, Djibouti, Malawi, IDA blend, South Africa, Zambia, Zimbabwe, Democratic Republic of Congo, Cameroon, Mali, South Sudan, Chad, Nigeria, Sierra Leone

Source: World Bank

OurWorldInData.org/extreme-poverty/ • CC BY

Extreme poverty (headcount ratio) vs Life expectancy at birth, 2016

The horizontal axis shows life expectancy at birth for each country (i.e. the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life). The vert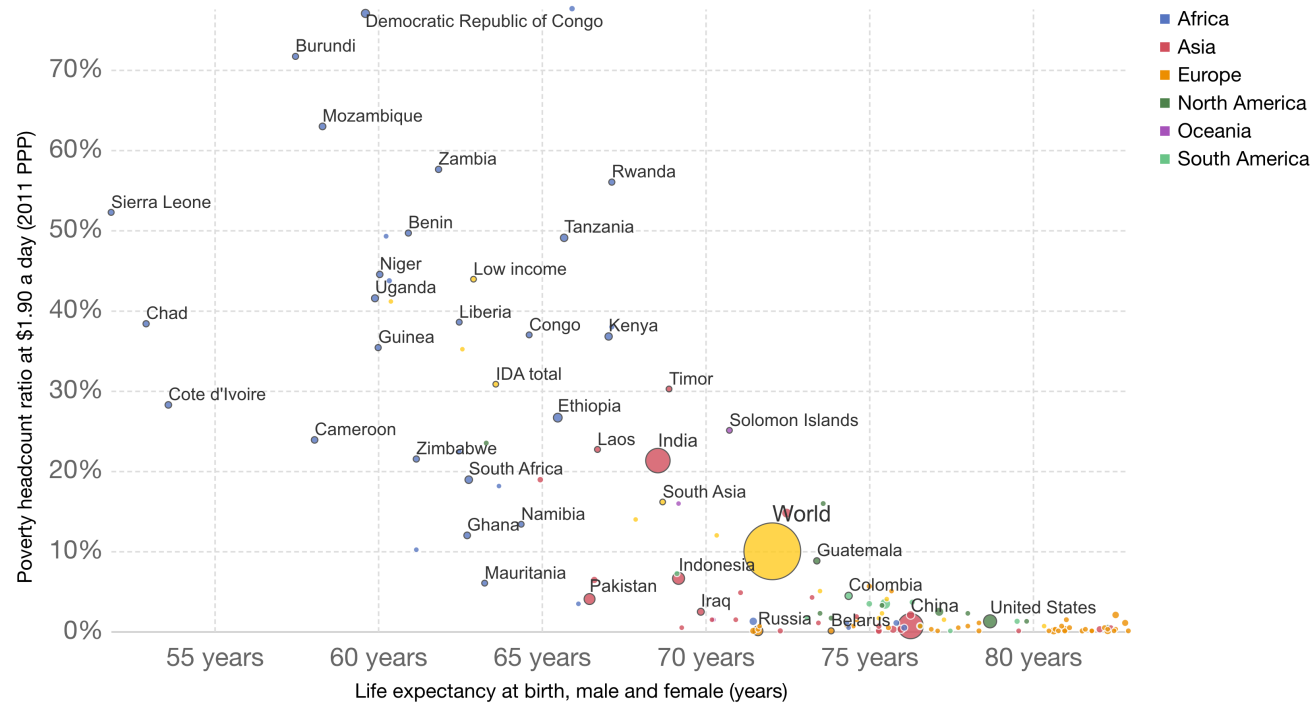ical axis shows the poverty headcount ratio at $1.90 international dollars (i.e. after adjusting for inflation and cross-country price differences).

- ■ Africa
- ■ Asia
- ■ Europe
- ■ North America
- ■ Oceania
- ■ South America

Poverty headcount ratio at $1.90 a day (2011 PPP)

Life expectancy at birth, male and female (years)

Democratic Republic of Congo
Burundi
Mozambique
Zambia
Rwanda
Sierra Leone
Benin
Tanzania
Niger
Low income
Uganda
Chad
Liberia
Congo
Kenya
Guinea
IDA total
Timor
Cote d'Ivoire
Ethiopia
Solomon Islands
Cameroon
Laos
India
Zimbabwe
South Africa
South Asia
Namibia
World
Ghana
Guatemala
Indonesia
Colombia
Mauritania
Pakistan
Iraq
China
United States
Russia
Belarus

70%
60%
50%
40%
30%
20%
10%
0%

55 years
60 years
65 years
70 years
75 years
80 years

What about education and health? What economics have to say about this?

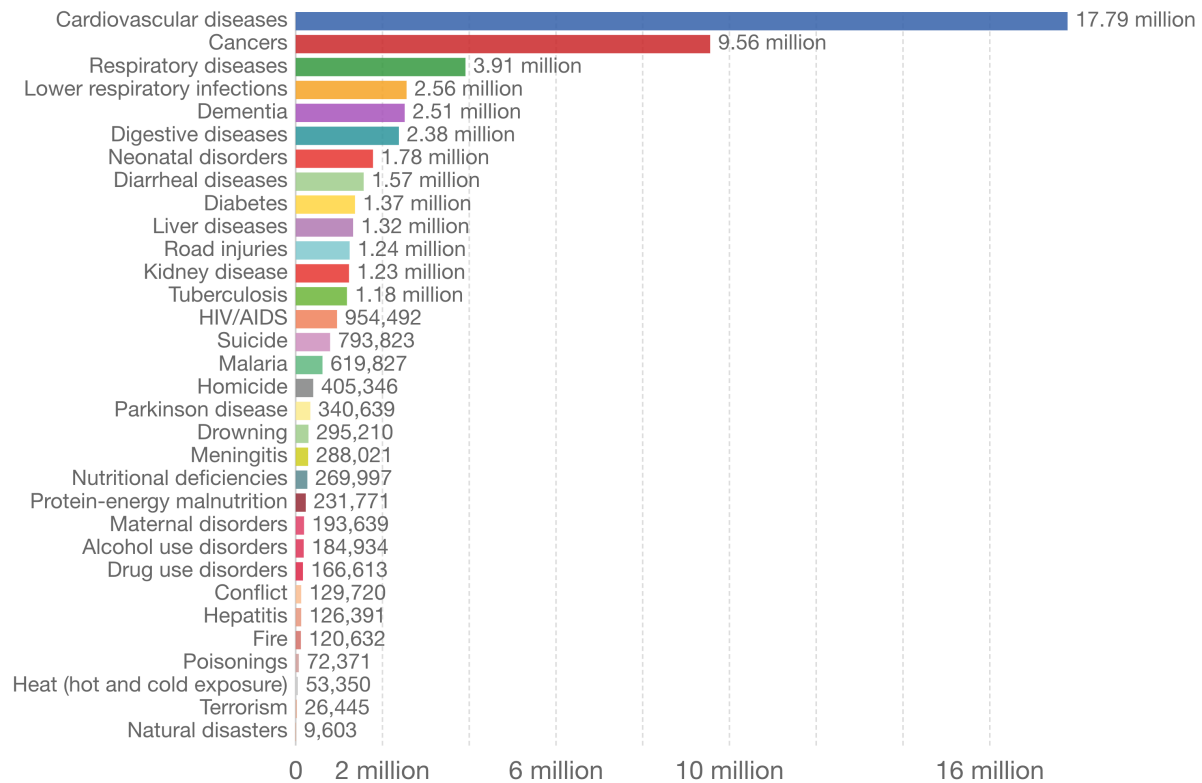**Education, HIV and Early Fertility: Experimental Evidence from Kenya**
American Economic Review Vol. 105(9), pp. 2257-97, September 2015
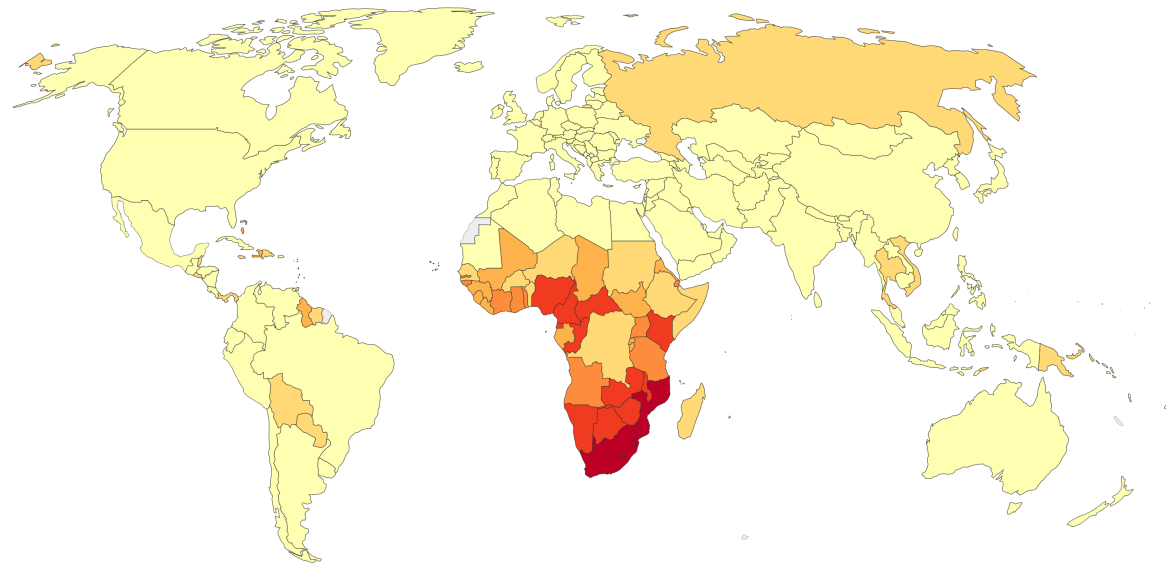with Pascaline Dupas, Michael Kremer

2019 Nobel Laurette in Economics

Number of deaths by cause, World, 2017

Cause	Deaths
Cardiovascular diseases	17.79 million
Cancers	9.56 million
Respiratory diseases	3.91 million
Lower respiratory infections	2.56 million
Dementia	2.51 million
Digestive diseases	2.38 million
Neonatal disorders	1.78 million
Diarrheal diseases	1.57 million
Diabetes	1.37 million
Liver diseases	1.32 million
Road injuries	1.24 million
Kidney disease	1.23 million
Tuberculosis	1.18 million
HIV/AIDS	954,492
Suicide	793,823
Malaria	619,827
Homicide	405,346
Parkinson disease	340,639
Drowning	295,210
Meningitis	288,021
Nutritional deficiencies	269,997
Protein-energy malnutrition	231,771
Maternal disorders	193,639
Alcohol use disorders	184,934
Drug use disorders	166,613
Conflict	129,720
Hepatitis	126,391
Fire	120,632
Poisonings	72,371
Heat (hot and cold exposure)	53,350
Terrorism	26,445
Natural disasters	9,603

0   2 million   6 million   10 million   16 million

Death rate from HIV/AIDS, 2017

The annual number of deaths from HIV/AIDS per 100,000 people.

No data   0   10   25   50   100   200   >250

Prevalence, new cases and deaths from HIV/AIDS, World

To fit all three measures on the same visualization the total number of people living with HIV has been divided by ten (i.e. in 2017 there were 37 million people living with HIV).
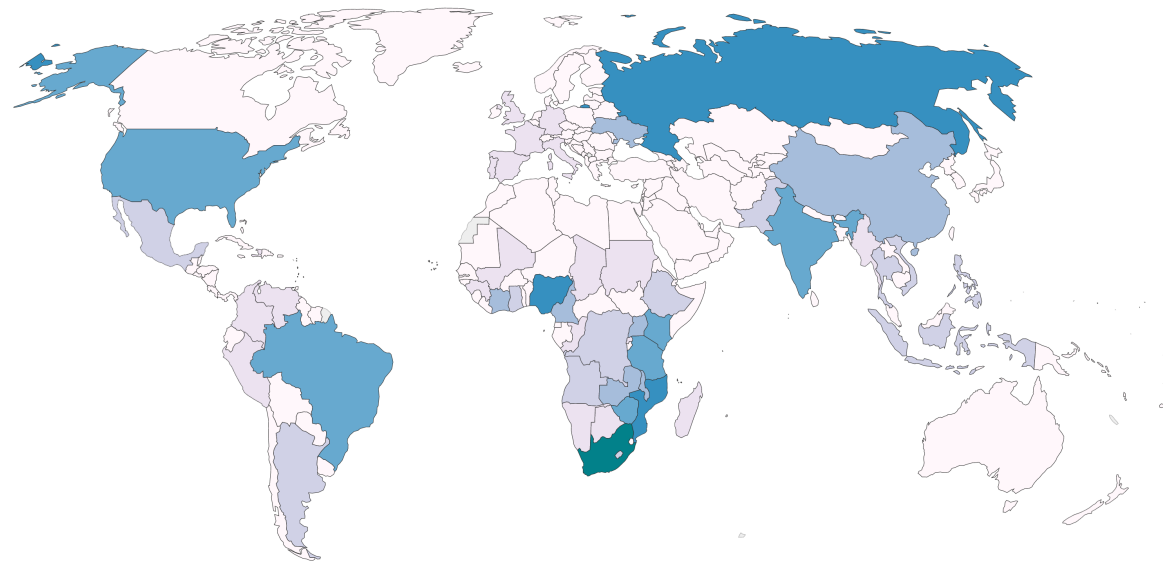
Number of people living with HIV (x10)

New infections of HIV/AIDS

Deaths from HIV/AIDS

3.5 million
3 million
2.5 million
2 million
1.5 million
1 million
500,000
0

1990   1995   2000   2005   2010   2017
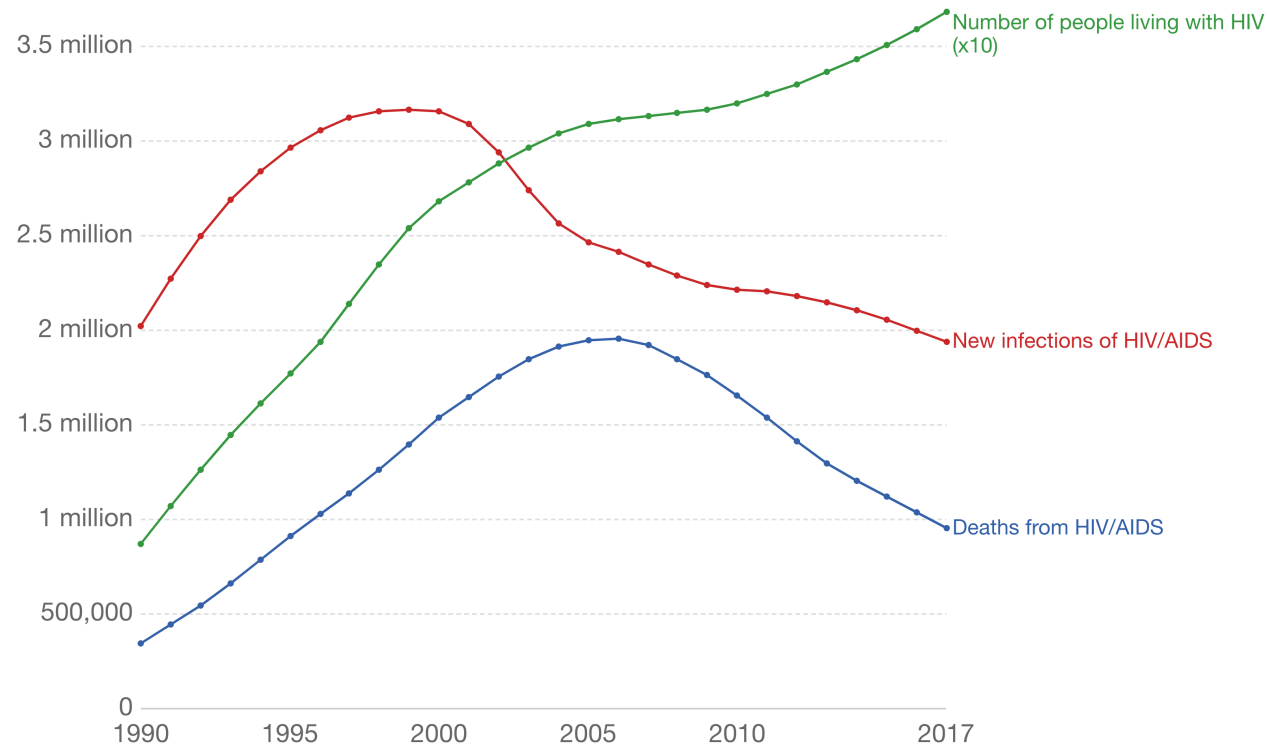
Number of new cases of HIV, 2017

No data   0   5,000   10,000   25,000   50,000   100,000   250,000   500,000   1 million

Number of children annually orphaned from AIDS deaths

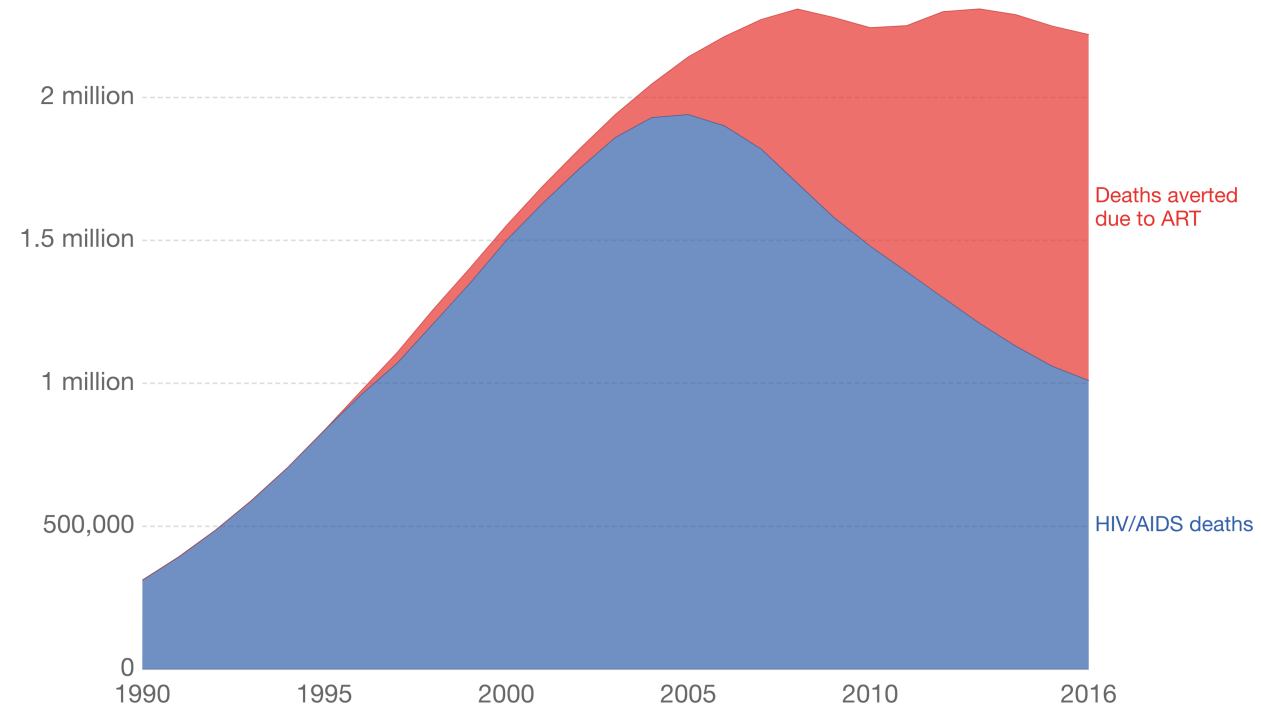Number of children, aged 17 and under, annually orphaned through the death of one or both parents from AIDS.

World

15 million

10 million

5 million

0

1990   1995   2000   2005   2010   2016

South Africa
Mozambique
Tanzania
Democratic Republic of Congo
Zambia
Botswana
Namibia
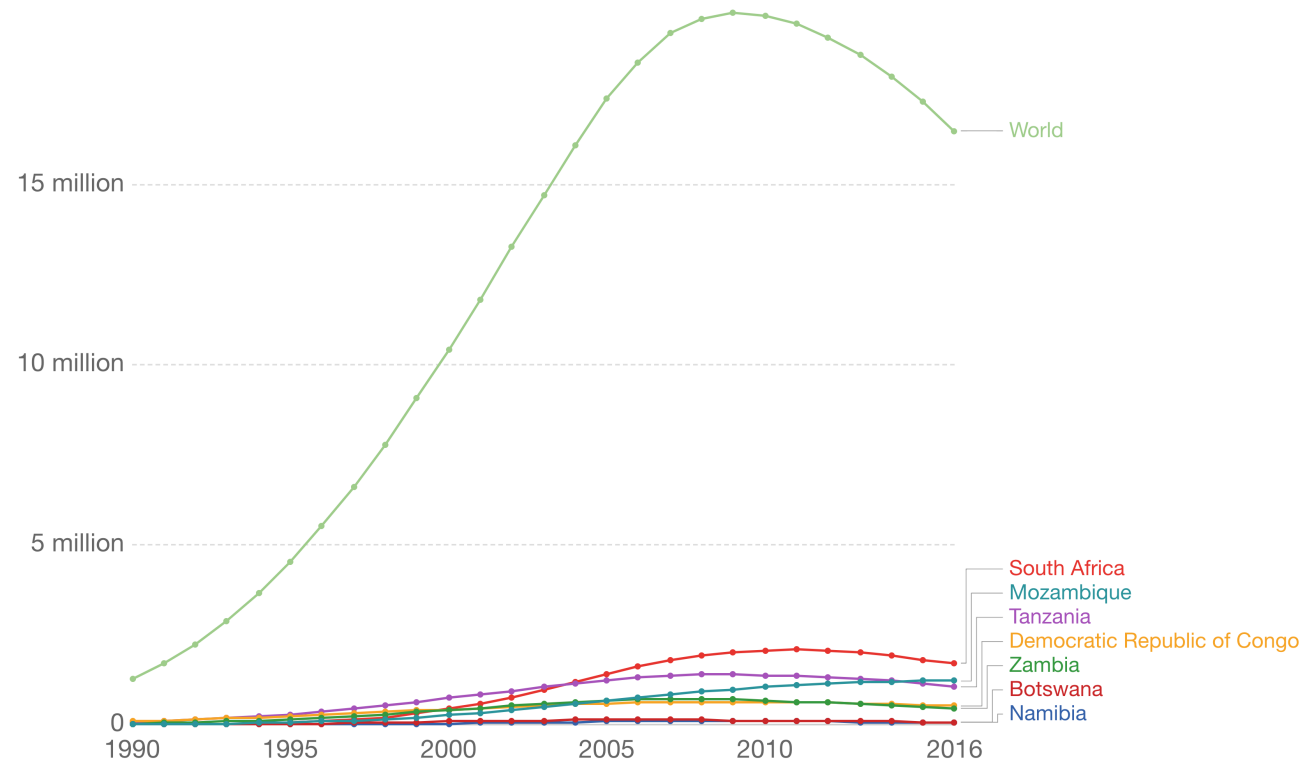
HIV/AIDS deaths and deaths averted due to antiretroviral therapy (ART), World

Annual number of deaths from HIV/AIDS and the estimated number which have been averted as a result of antiretroviral therapy (ART).

Deaths averted due to ART

HIV/AIDS deaths

2 million

1.5 million

1 million

500,000

0

1990   1995   2000   2005   2010   2016

Share of people with HIV who receive antiretroviral therapy, 2017

Percentage of people living with HIV, who are receiving antiretroviral therapy. This therapy is a combination of several antiretroviral medicines, used to slow the rate at which HIV multiplies inside the body.
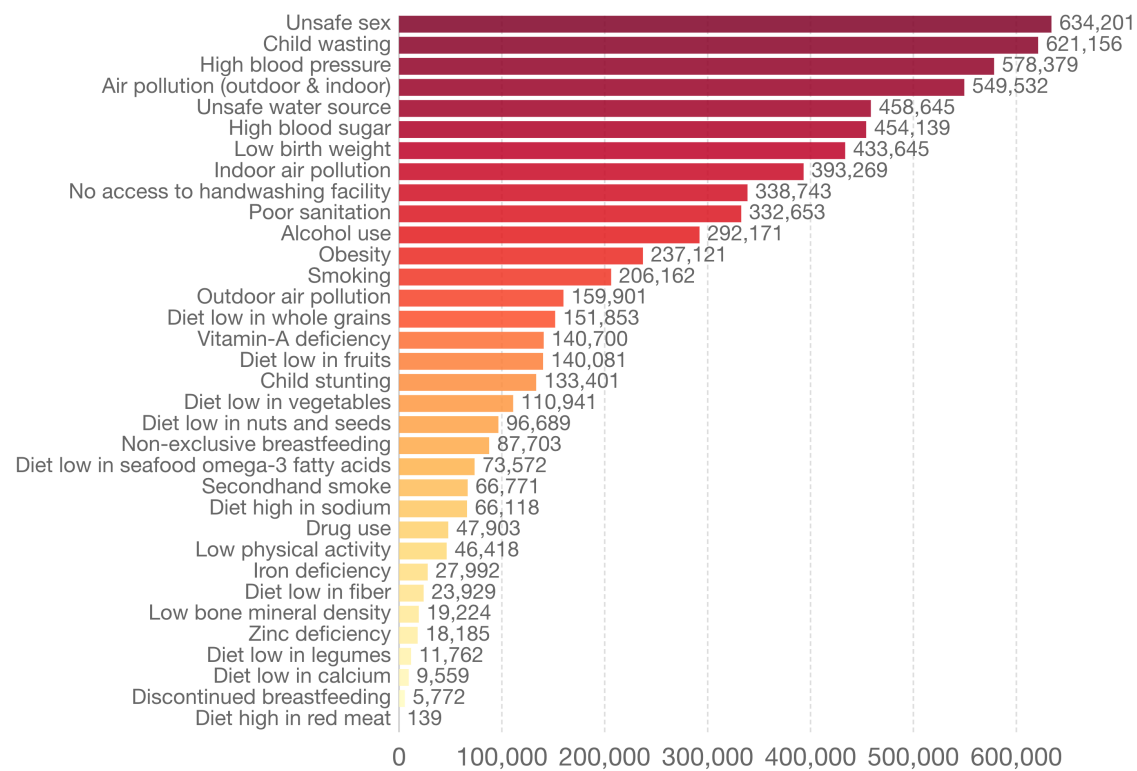
Our World in Data

No data 0%   20%   40%   60%   80%   100%
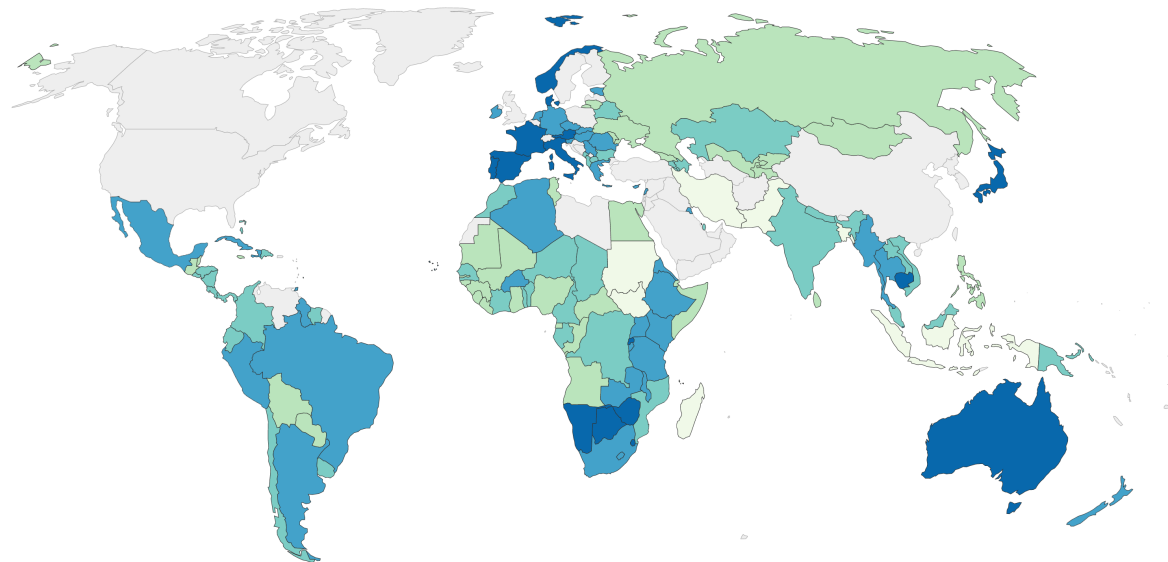
Number of deaths by risk factor, Sub-Saharan Africa, 2017

Total annual number of deaths by risk factor, measured across all age groups and both sexes.

| Risk factor	Deaths
Unsafe sex	634,201
Child wasting	621,156
High blood pressure	578,379
Air pollution (outdoor & indoor)	549,532
Unsafe water source	458,645
High blood sugar	454,139
Low birth weight	433,645
Indoor air pollution	393,269
No access to handwashing facility	338,743
Poor sanitation	332,653
Alcohol use	292,171
Obesity	237,121
Smoking	206,162
Outdoor air pollution	159,901
Diet low in whole grains	151,853
Vitamin-A deficiency	140,700
Diet low in fruits	140,081
Child stunting	133,401
Diet low in vegetables	110,941
Diet low in nuts and seeds	96,689
Non-exclusive breastfeeding	87,703
Diet low in seafood omega-3 fatty acids	73,572
Secondhand smoke	66,771
Diet high in sodium	66,118
Drug use	47,903
Low physical activity	46,418
Iron deficiency	27,992
Diet low in fiber	23,929
Low bone mineral density	19,224
Zinc deficiency	18,185
Diet low in legumes	11,762
Diet low in calcium	9,559
Discontinued breastfeeding	5,772
Diet high in red meat	139

Source: IHME, Global Burden of Disease (GBD)

Share of population with drug use disorders, 2017

Drug dependence is defined by the International Classification of Diseases as the presence of three or more indicators of dependence for at least a month within the previous year. Drug dependency includes all illicit drugs.

No data 0%   0.3%   0.6%   0.9%   1.2%   1.5%   2%   2.5%   >3%
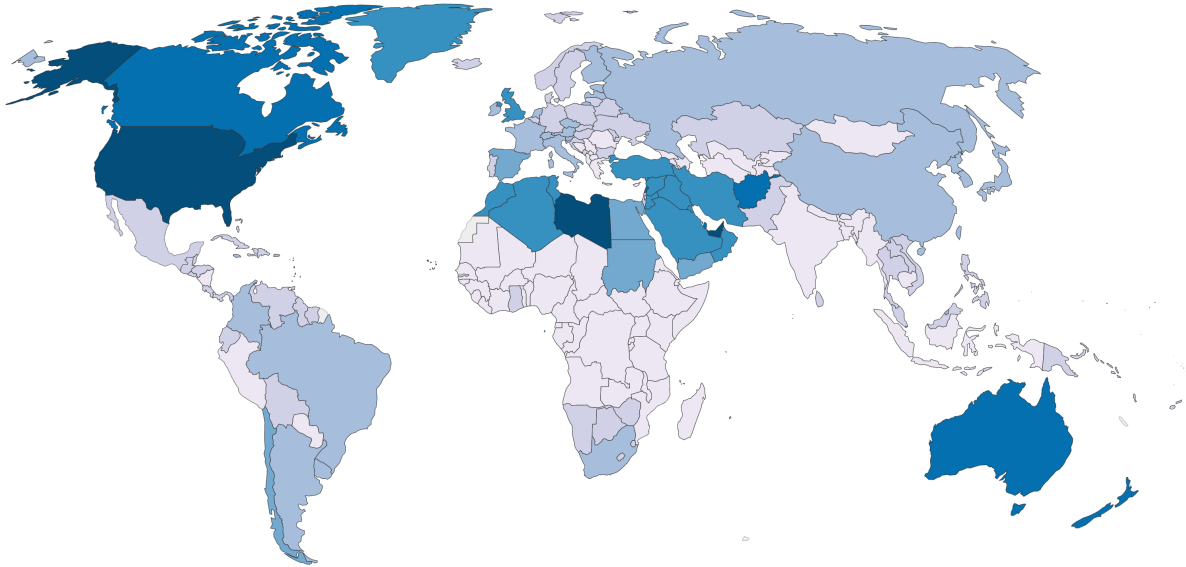
Death rates from drug use disorders, 2017

Age-standardized death rates from drug use disorders, measured per 100,000 individuals. Drug use here refers to illicit drugs including opioids, cocaine, amphetamine, and cannabis. Figures do not include indirect suicide deaths which may otherwise be related to drug use disorders.

No data   0   0.5   1   2   3   4   5   10   >15

Source: IHME, Global Burden of Disease

CC BY
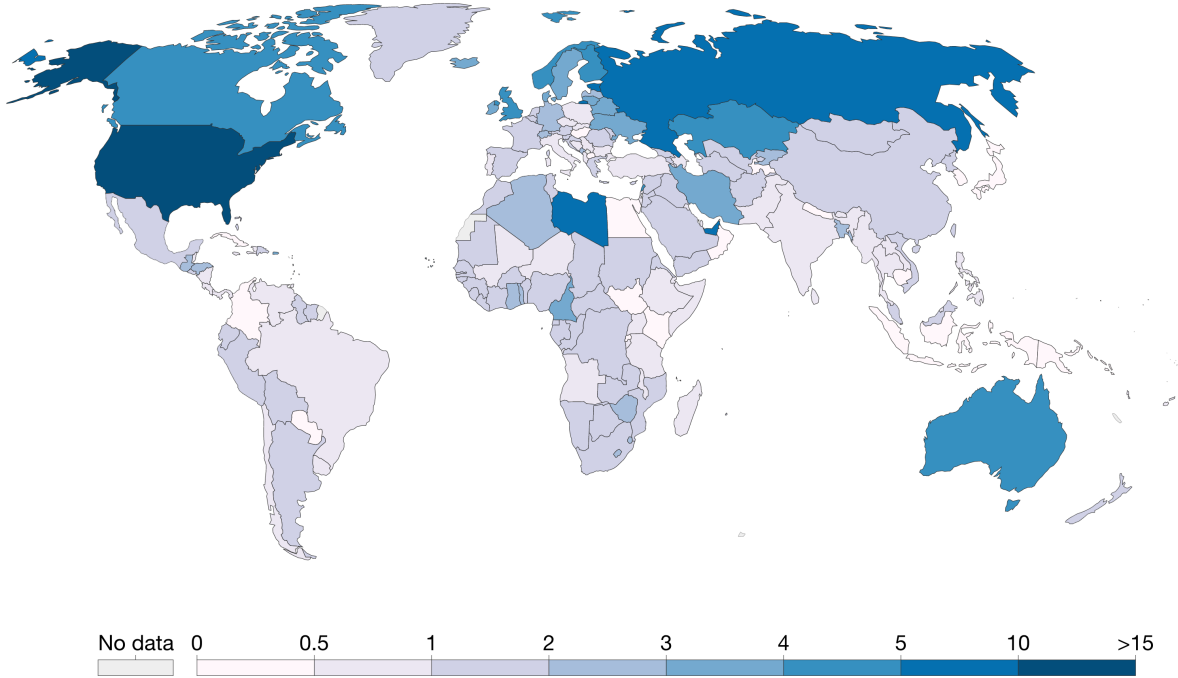
Drug use disorder DALYs, age-standardized rate, 2017

Age-standardized DALYs (Disability-Adjusted Life Years) from drug use disorders per 100,000 individuals. DALYs are used to measure total burden of disease - both from years of life lost and years lived with a disability. One DALY equals one lost year of healthy life.
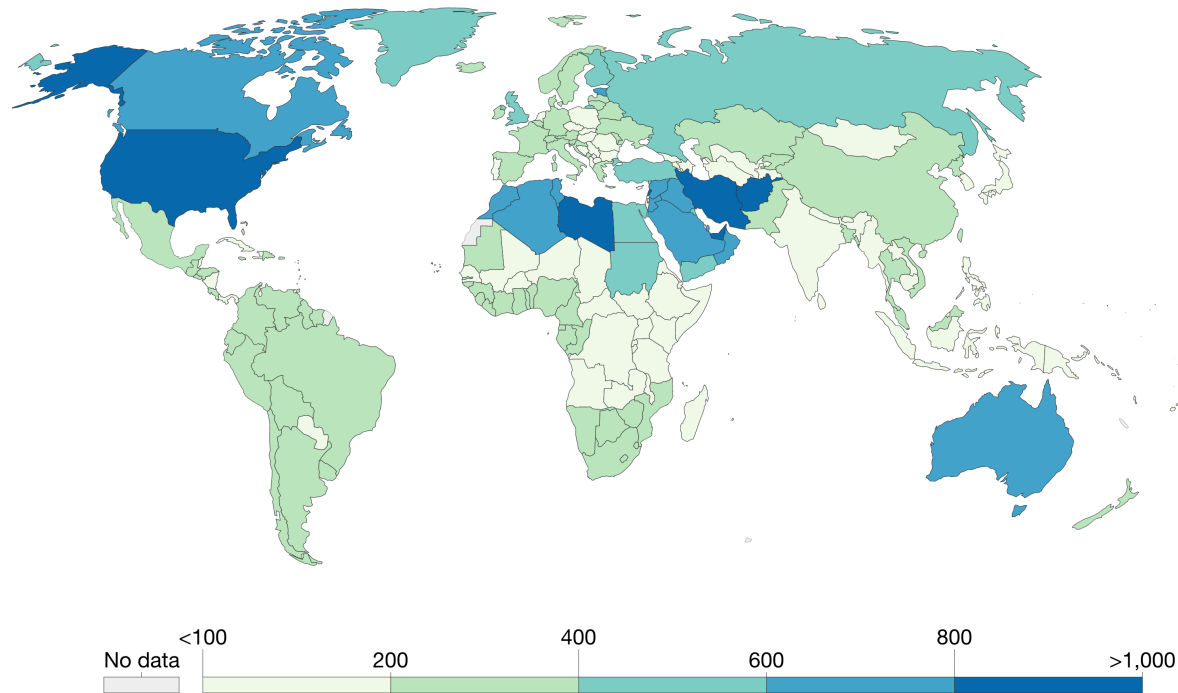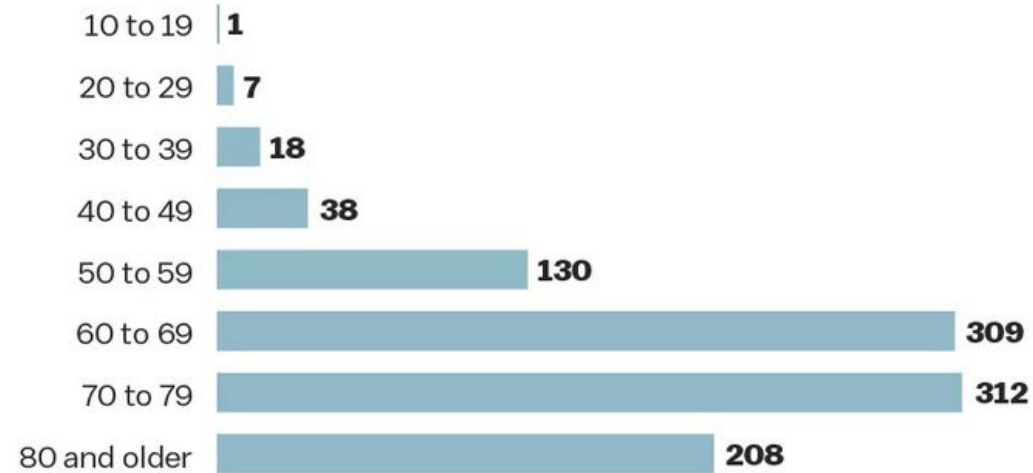
No data   <100   200   400   600   800   >1,000

Some Flu Economics

Deaths from Covid-19 in mainland China, by age group
As of February 11, 2020

Age group	Deaths
10 to 19	1
20 to 29	7
30 to 39	18
40 to 49	38
50 to 59	130
60 to 69	309
70 to 79	312
80 and older	208

Source: *The Epidemiological Characteristics of an Outbreak of 2019 Novel Coronavirus (COVID-19) – China, 2020*, China CDC
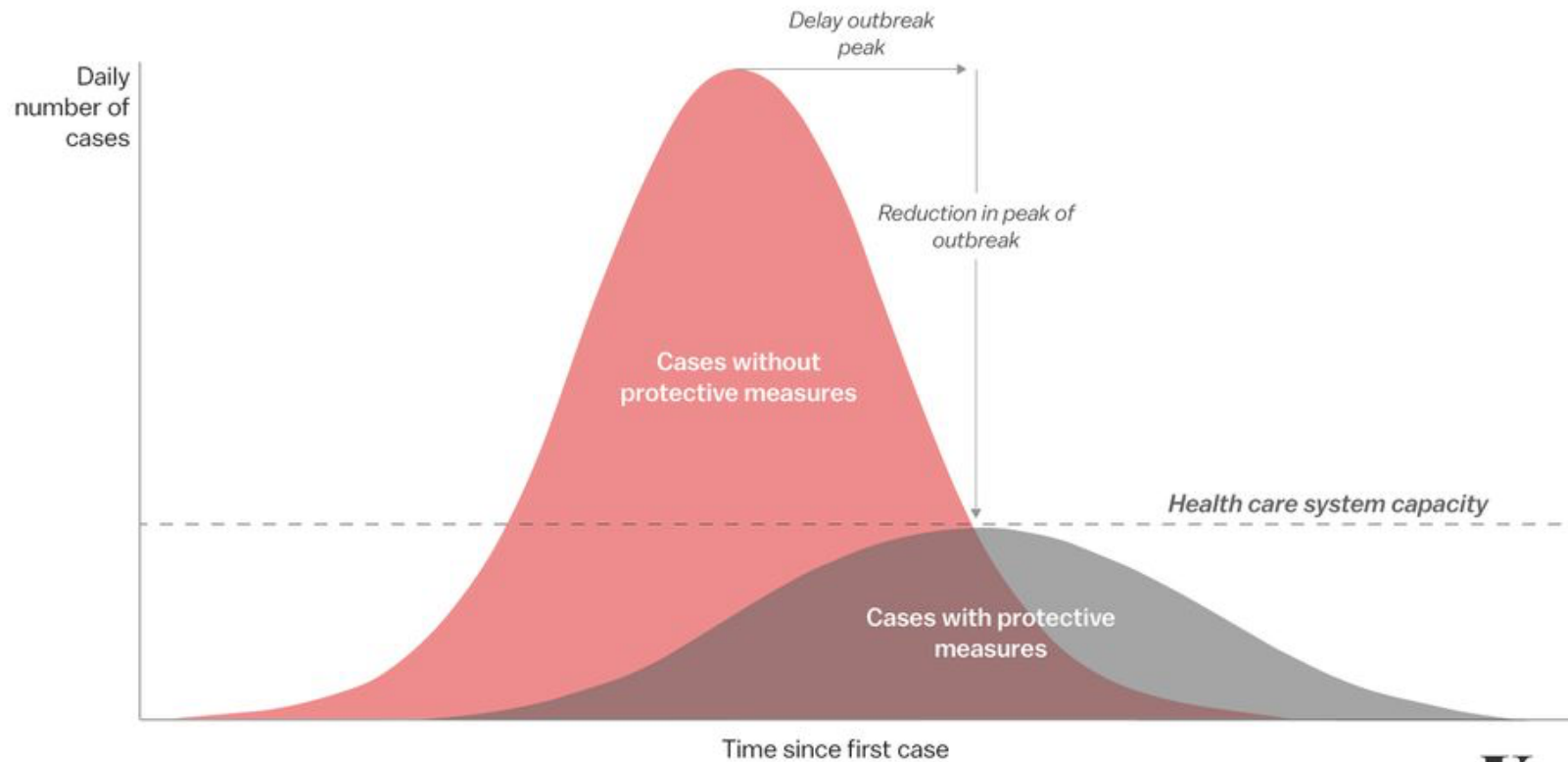
Vox

We are the leader after all!

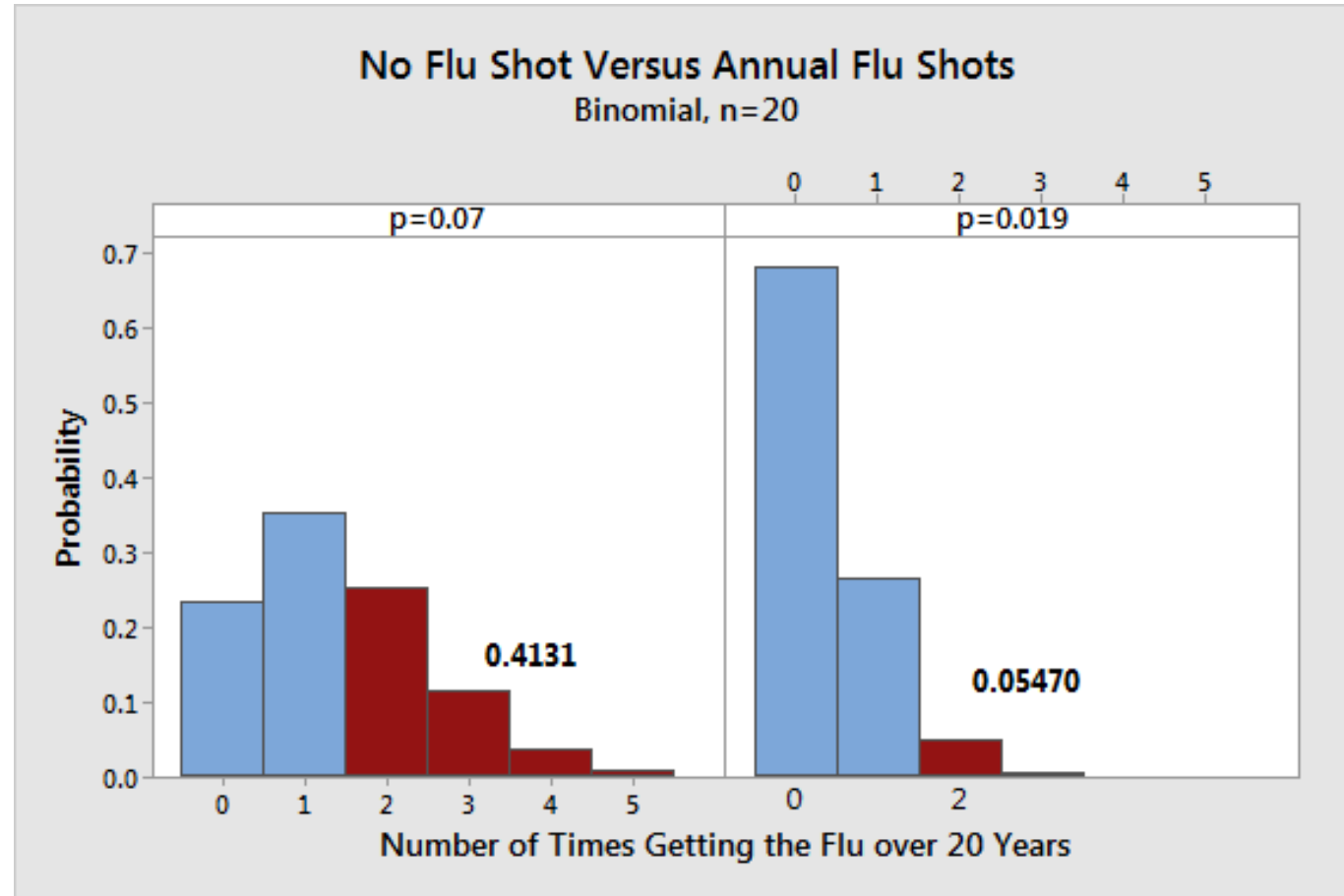# Yes we can do something! Act Proactively!!!

Flattening the curve

Don't Panic!!! You harm everybody!

Percentage of Visits for Influenza-like Illness (ILI) Reported by the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet), Weekly National Summary, 2017-2018 and Selected Previous Seasons
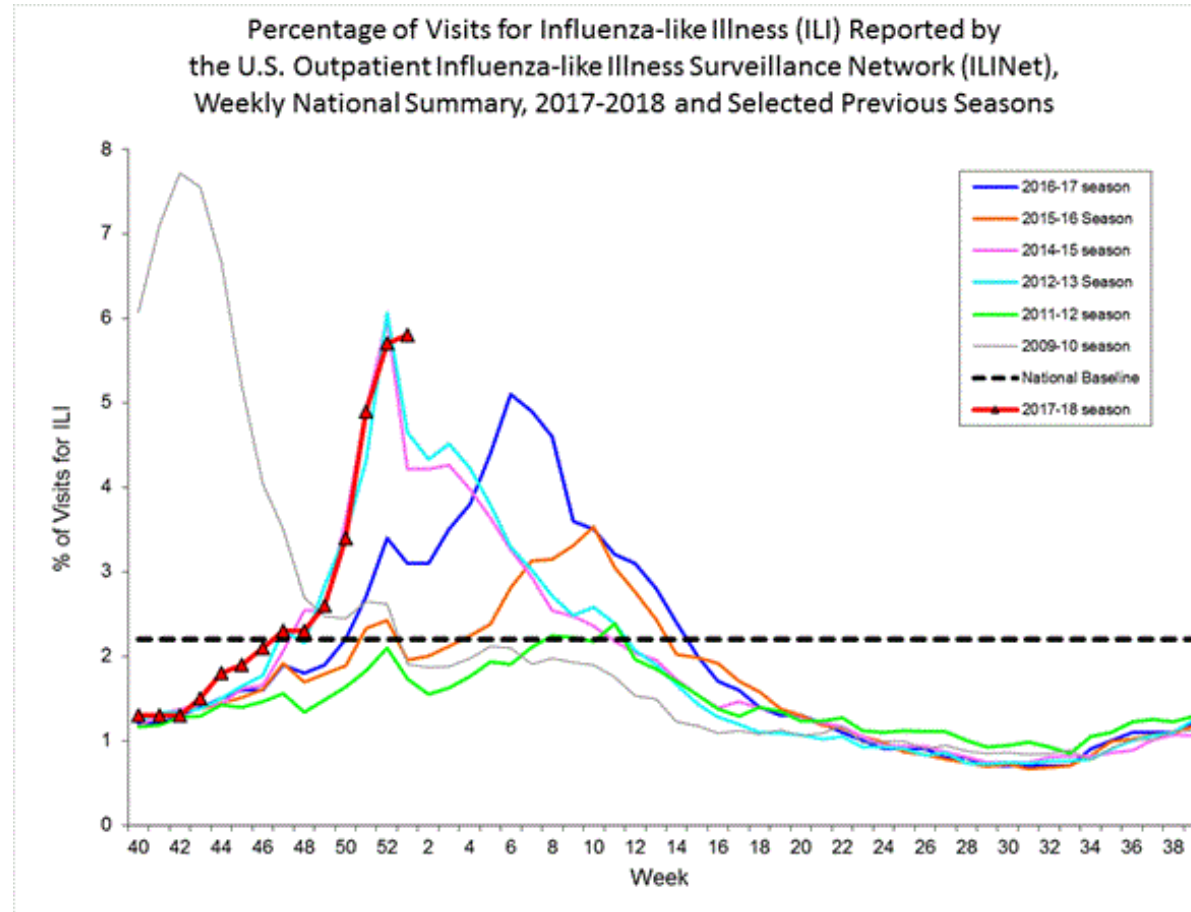
Give time to science! In Science we trust!
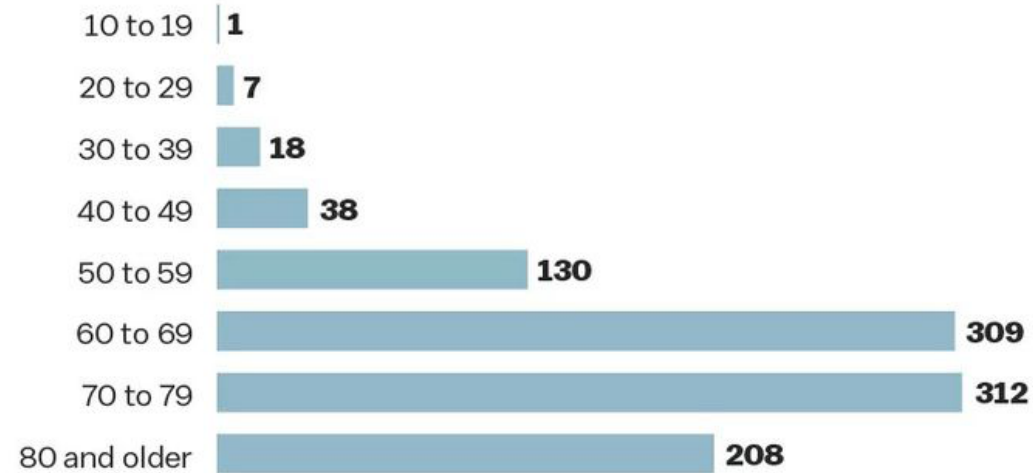
Keep safe and healthy!

Some Flu Economics

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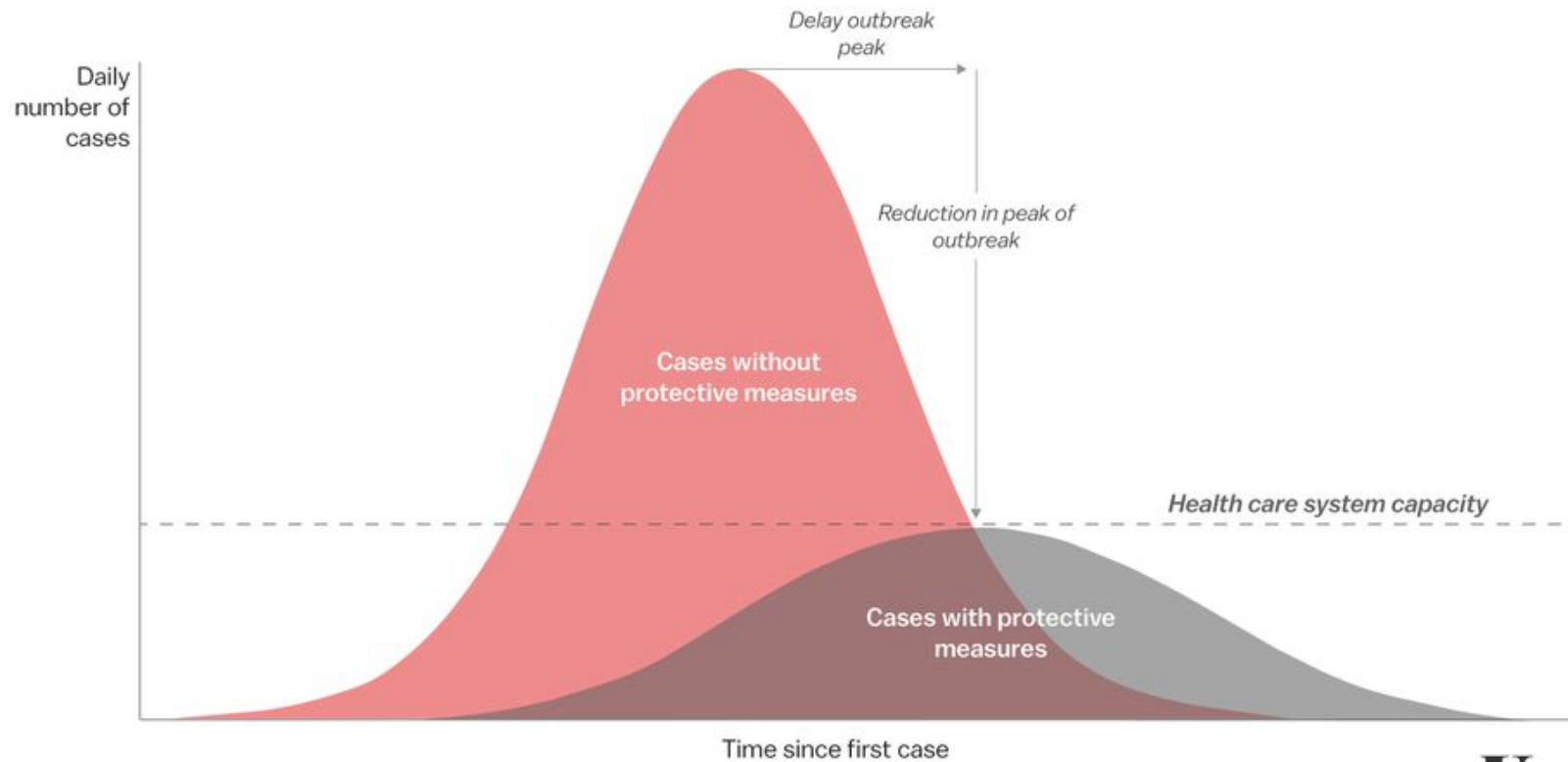# We are the leader after all!
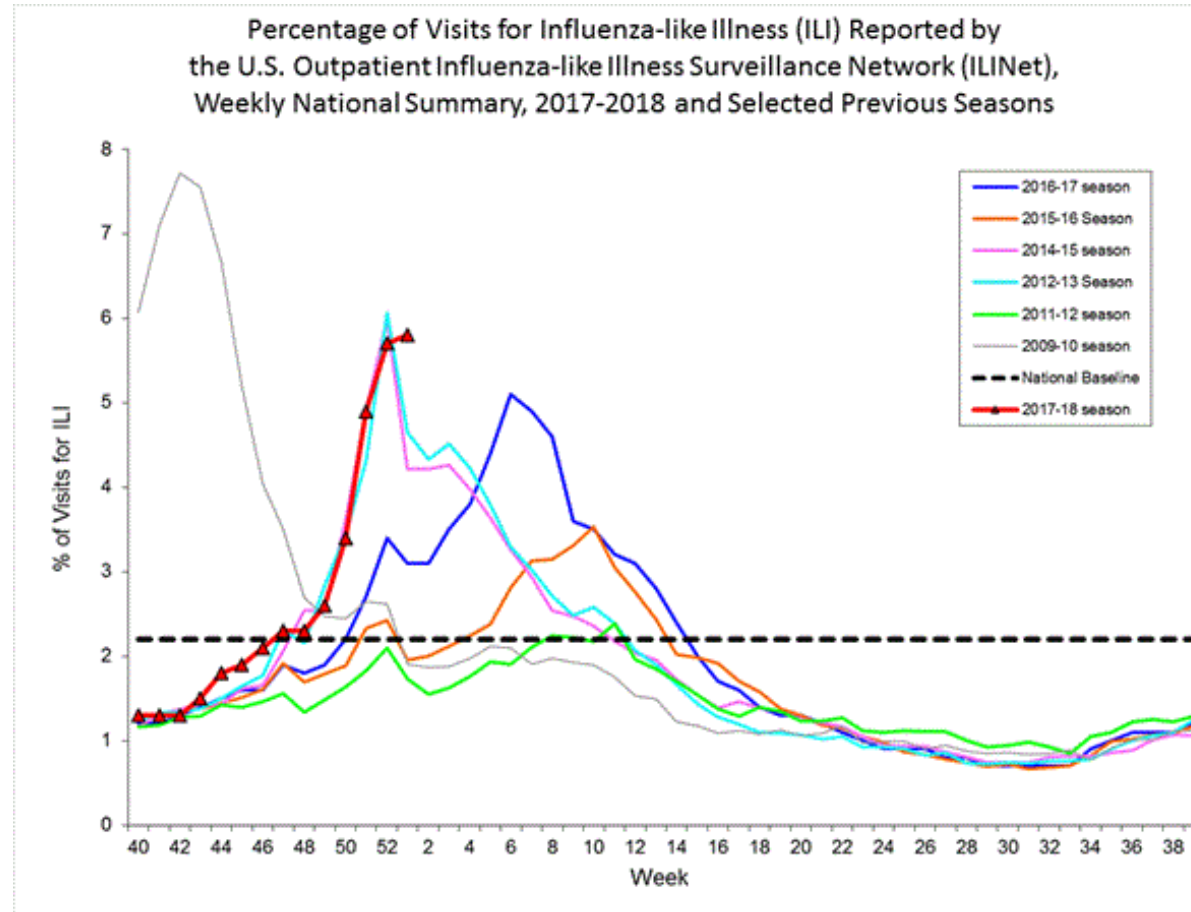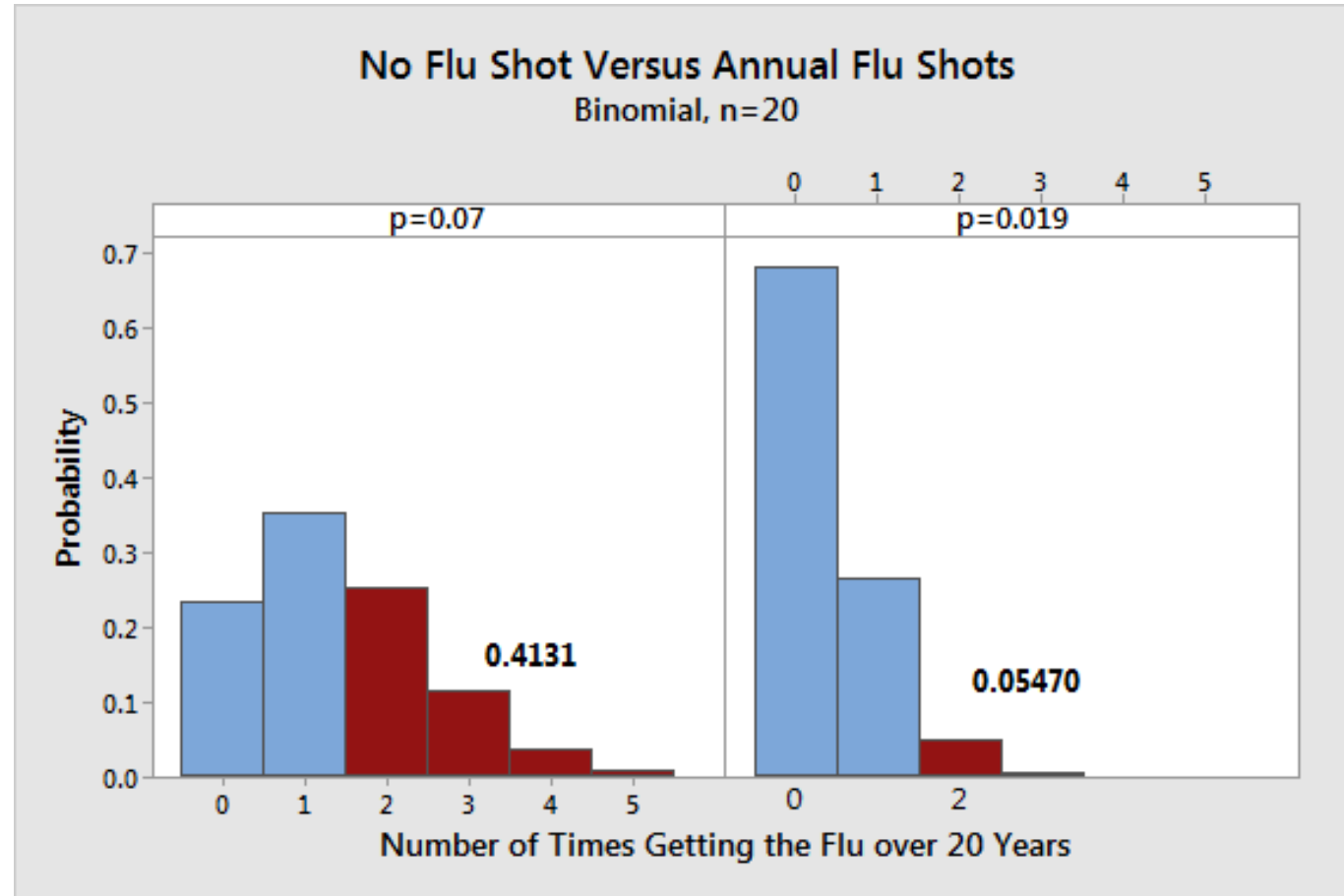
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