Institute for Health Metrics and Evaluation

Global Enteric Burden of Disease: Global Burden of Disease 2010

March 2, 2013

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Outline

Global Burden of Disease

Overview of findings

Enteric diseases

Next Steps

Outline

- Global Burden of Disease
- Overview of findings
- Enteric diseases
- Next Steps

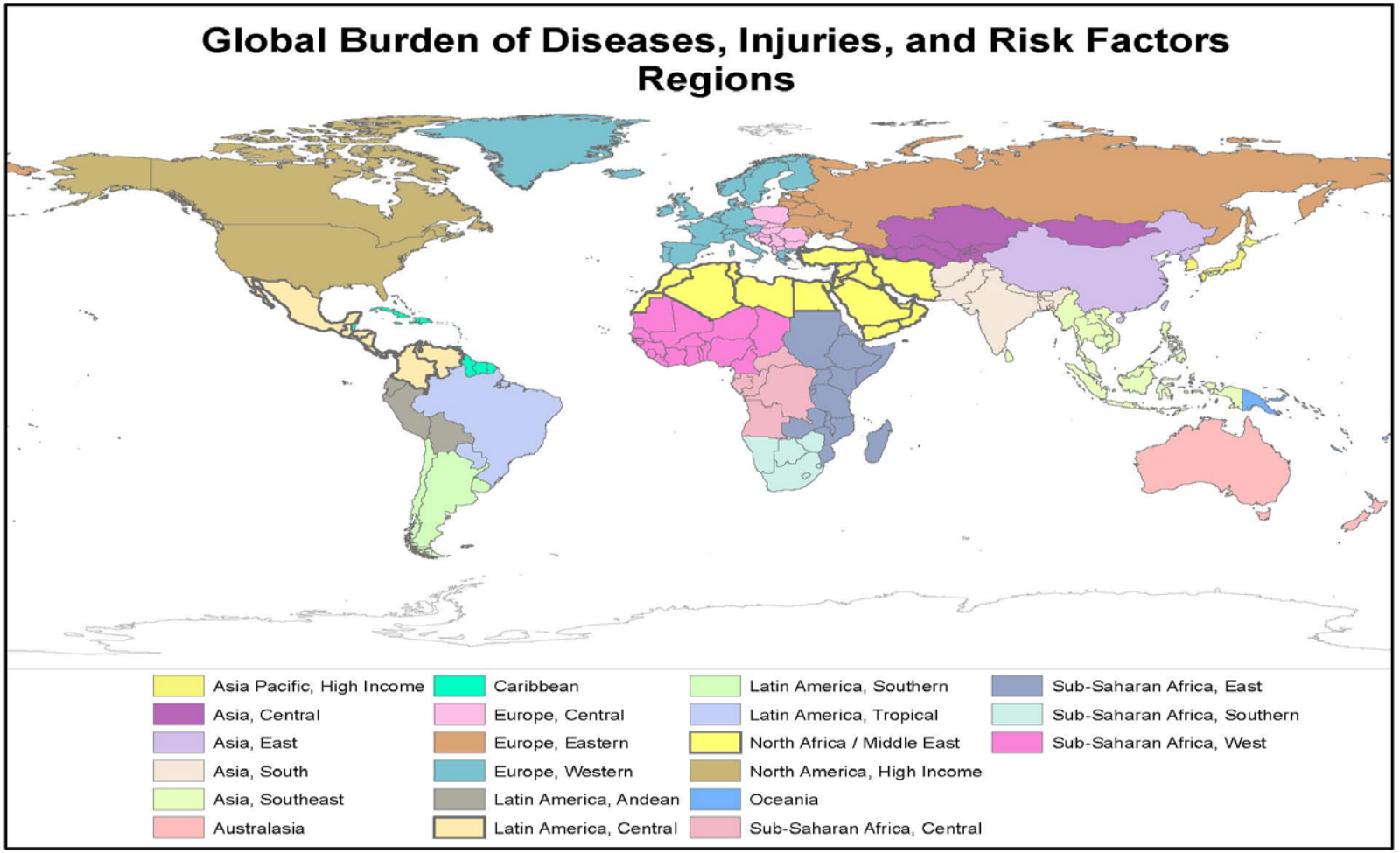
What is the burden of disease?

A ***systematic scientific*** effort to quantify the ***comparative*** magnitude of ***health loss*** due to diseases, injuries and risk factors by age, sex, geographies for specific points in time.

Global Burden of Disease 2010

1. By the numbers: 291 diseases and injuries, 1,160 sequelae of these diseases and injuries, and 67 risk factors or clusters of risk factors for 187 countries from 1990 to 2010.
2. GBD 2010 provides uncertainty intervals for all quantities of interest.

21 GBD Regions



GBD 2010 team and timeline

1. GBD 2010 study initiated in 2007 funded by Bill & Melinda Gates Foundation.
2. IHME coordinating institution: seven partner institutions University of Queensland, WHO, Harvard University, Johns Hopkins University, Imperial College London, University of Tokyo.
3. Final study with 486 authors from 50 countries.
4. Seven summary papers and an overview to be published in a dedicated triple issue of the Lancet on December 14th.
5. More than 200 detailed publications in submission or preparation.

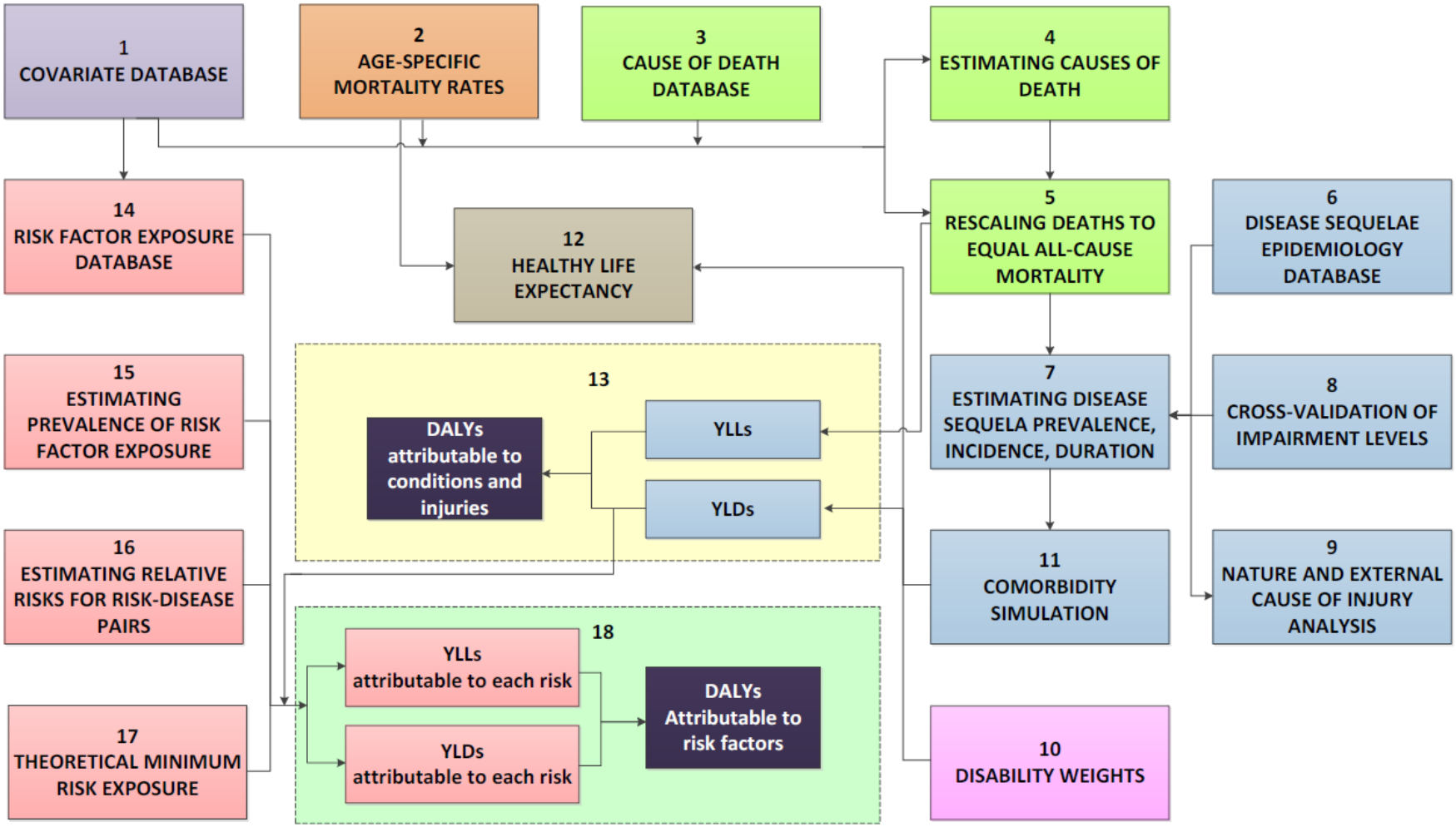
GBD terminology

1) **DALYs** = Years of life lost due to premature mortality (YLLs) and years lived with disability (YLDs).
2) **Years of life lost** due to premature mortality due to a death at age x is the standard life expectancy at age x. A death at age 5 years counts as 81.4 YLLs, while a death at age 50 counts as 27.8 YLLs.
3) **Years lived with disability** for a cause in an age-sex group equals the prevalence of the condition times the **disability weight** for that condition.
4) **Disability weights** quantify the impact from any short-term or long-term health loss.
5) In the GBD 2010, DALYs are not discounted or age-weighted.

Why measure the GBD?

1. Investment in the GBD methods development and application is predicated on the belief that systematic, scientific and comparable information on health loss by cause is an important input into health policy debates.
2. Without the broad comparative view, important health challenges may be missed or ignored and others may be over-emphasized.
3. GBD provides a roadmap of health challenges, charting past progress as an input to debate about the future.

Interconnected study with 18 components



Web Figure 3: **Eighteen components of the GBD 2010 and their inter-relationships**

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Global progress reducing mortality in all ages

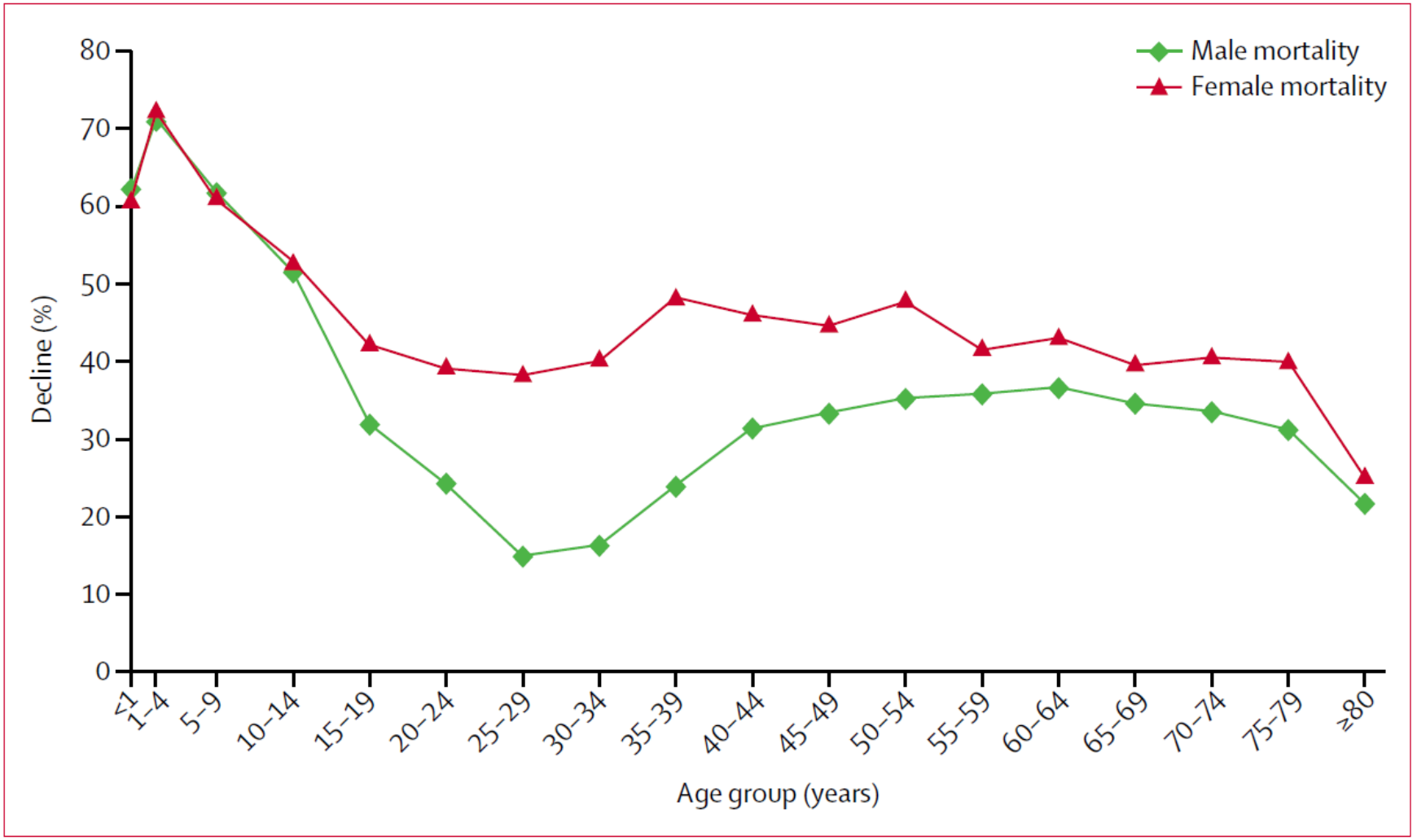
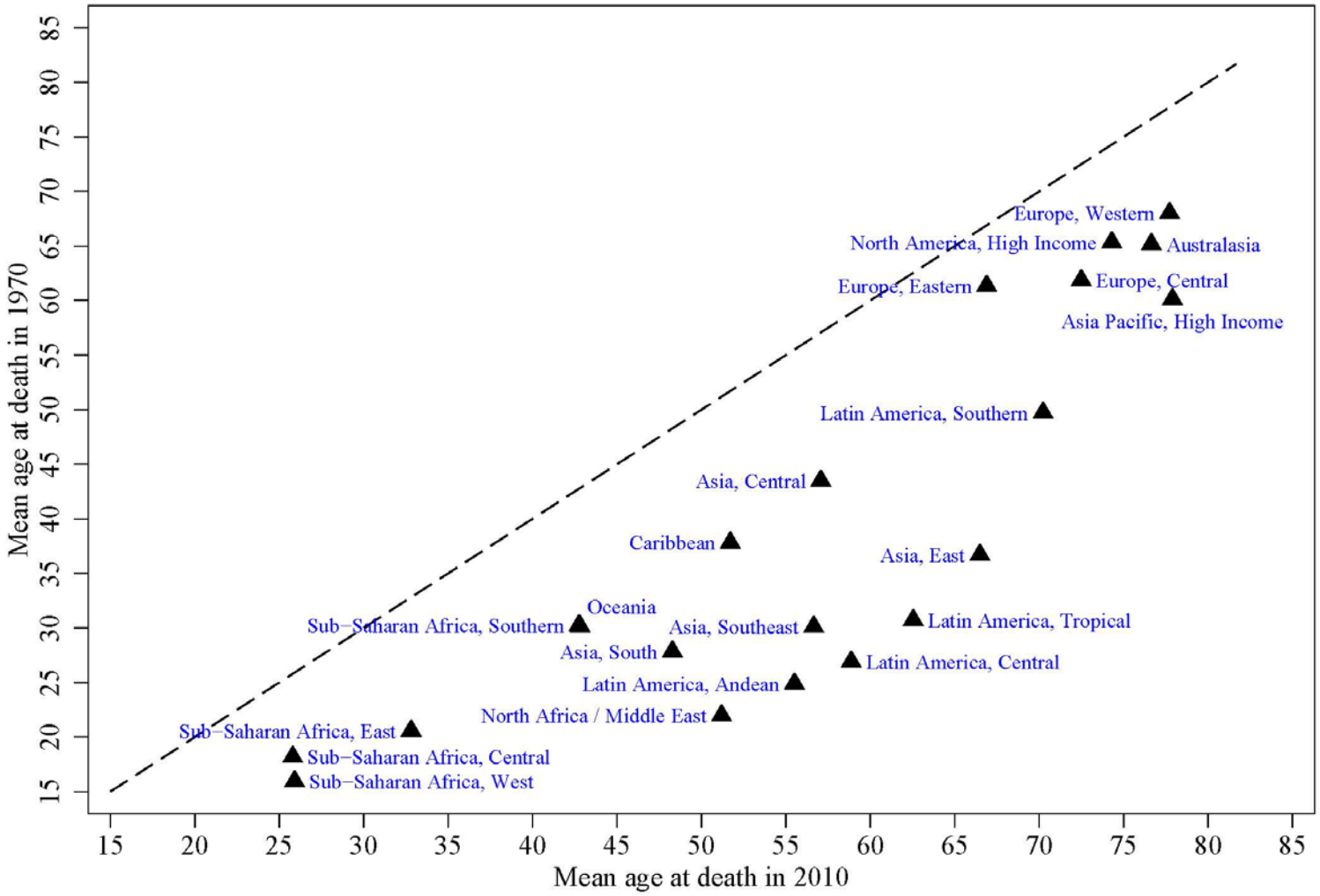
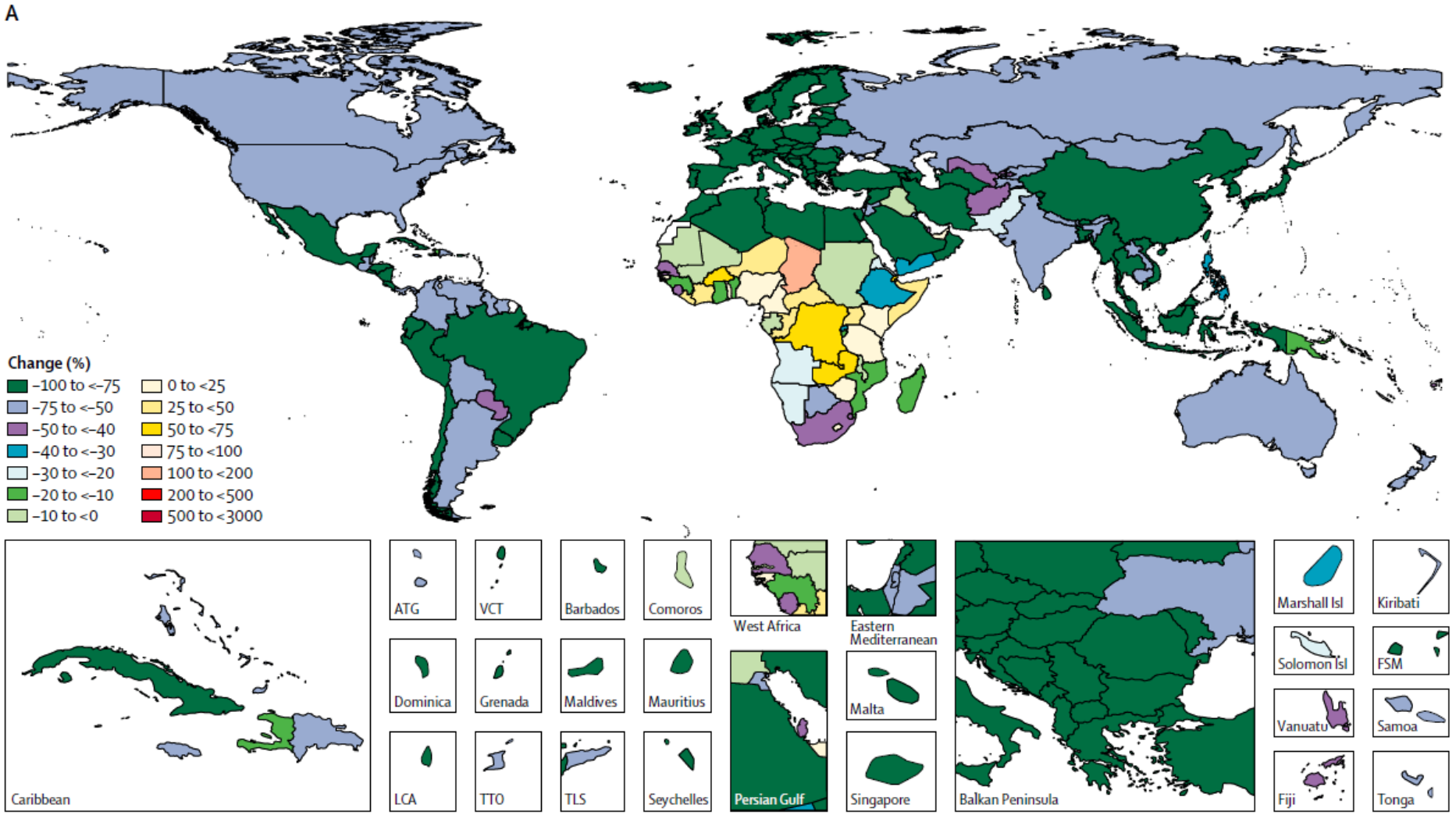


Figure 2: Decline in global age-specific mortality rate, 1970–2010

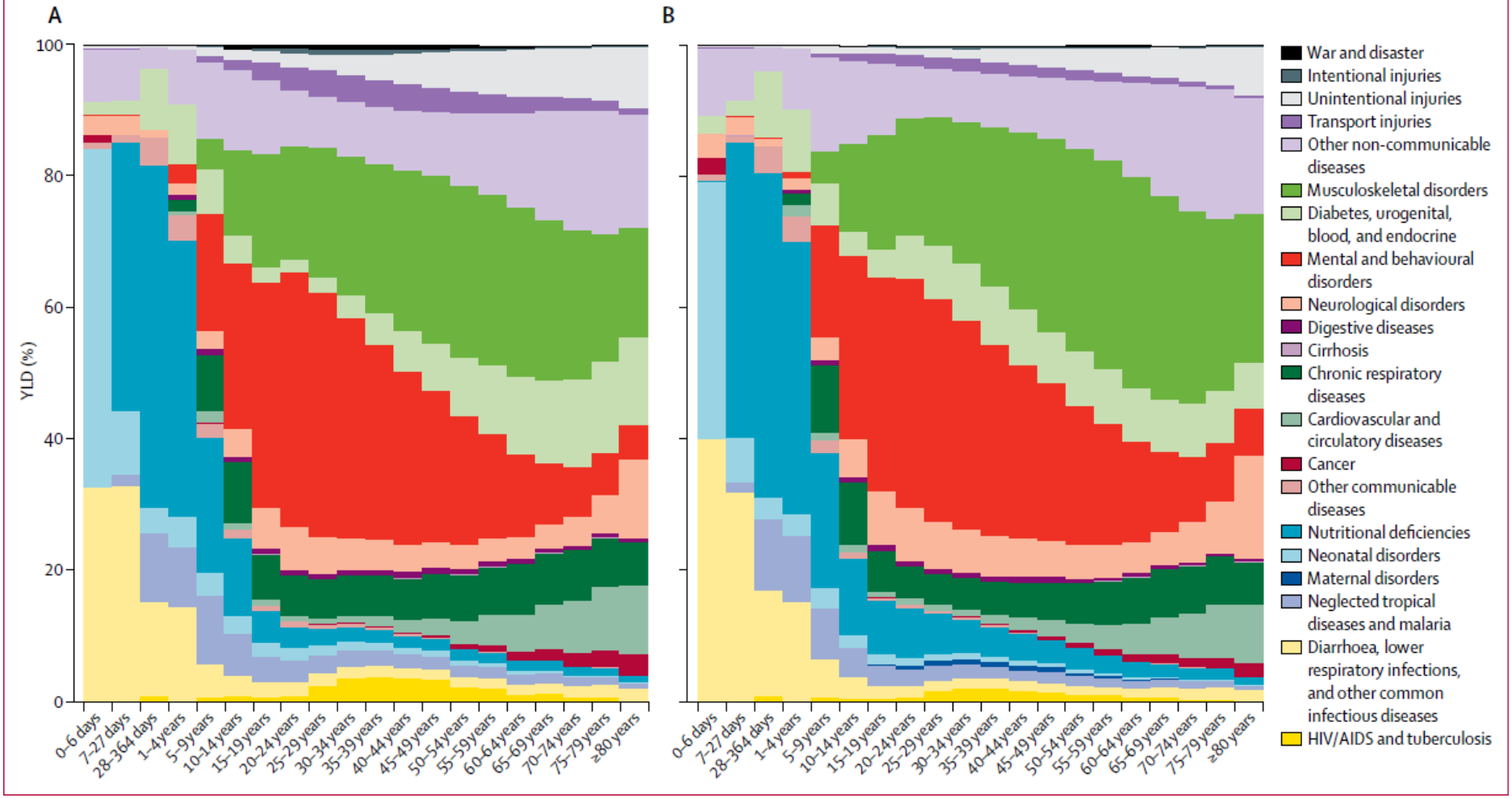
Mean Age at Death by Region, 1970-2010



Large reductions in the number of child deaths

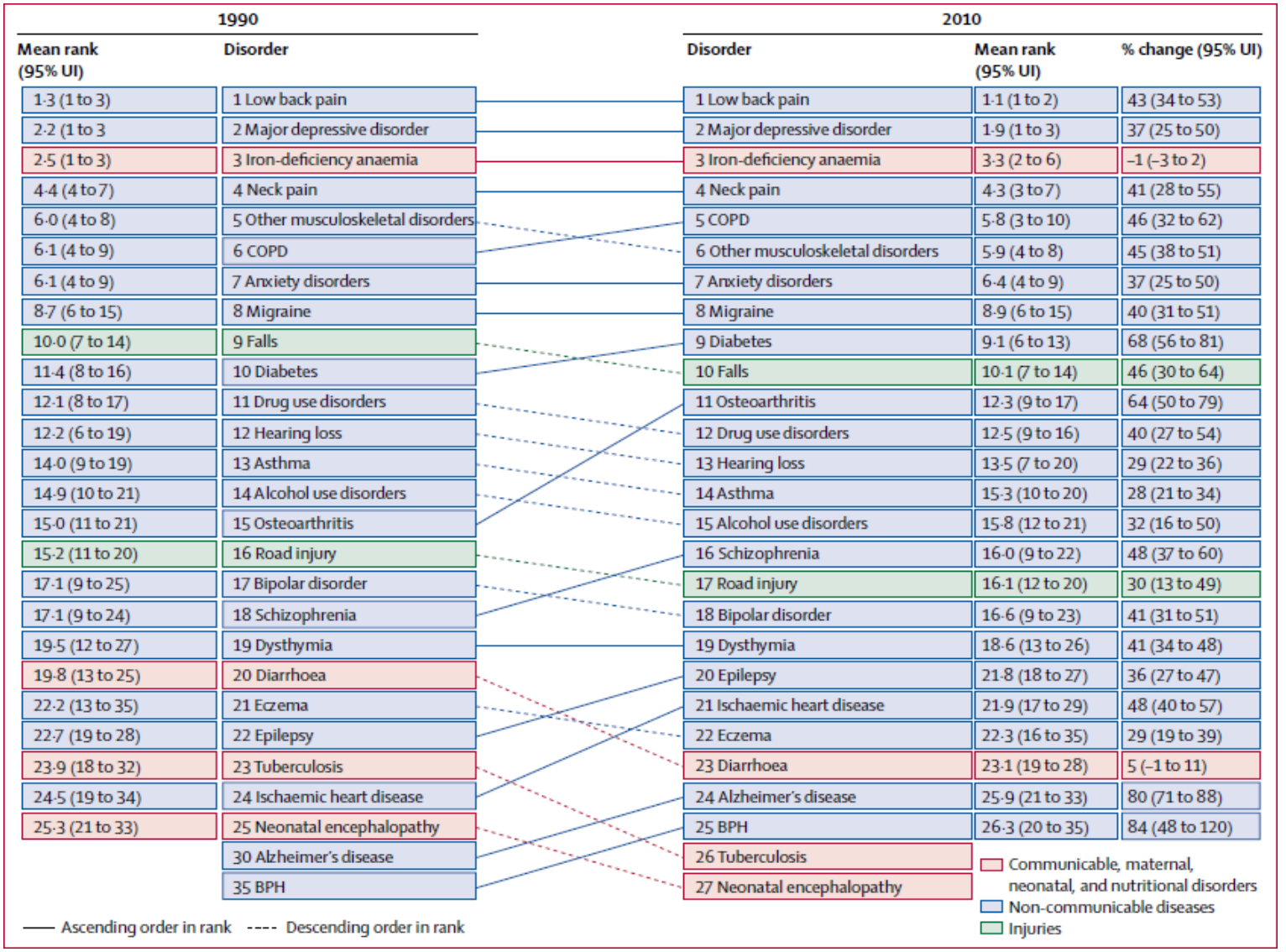


What ails you is not what kills you



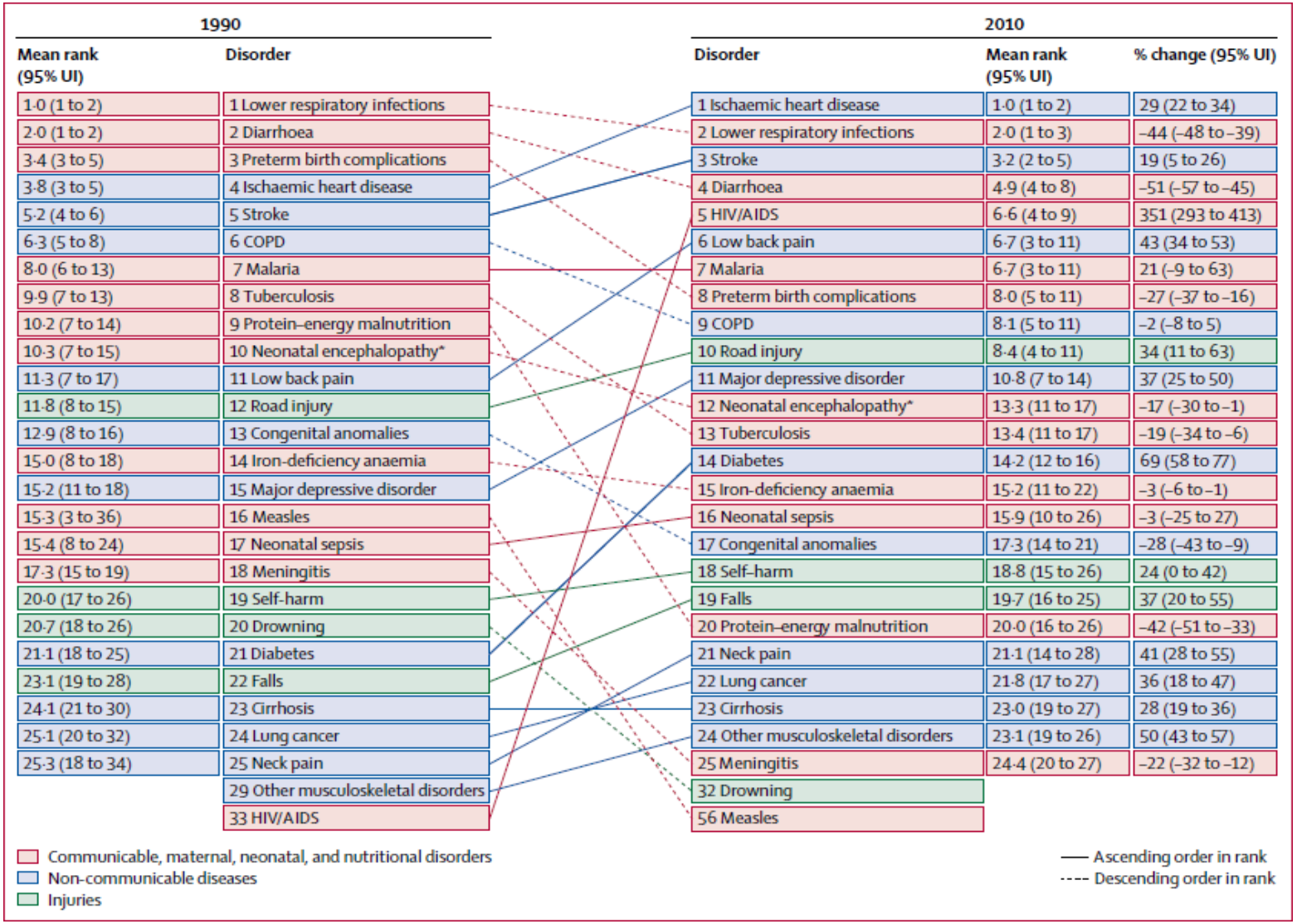
Percentage of years lived with disability (YLDs) in 2010, by cause and age

Leading global causes of disability



Global YLDs ranks for the 25 most common causes in 1990 and 2010

Leading causes of the global burden of disease



Global DALY ranks for the top 25 causes in 1990 and 2010, and the percentage change with 95% UIs between 1990 and 2010

Child and maternal risks fall, lifestyle risks rise

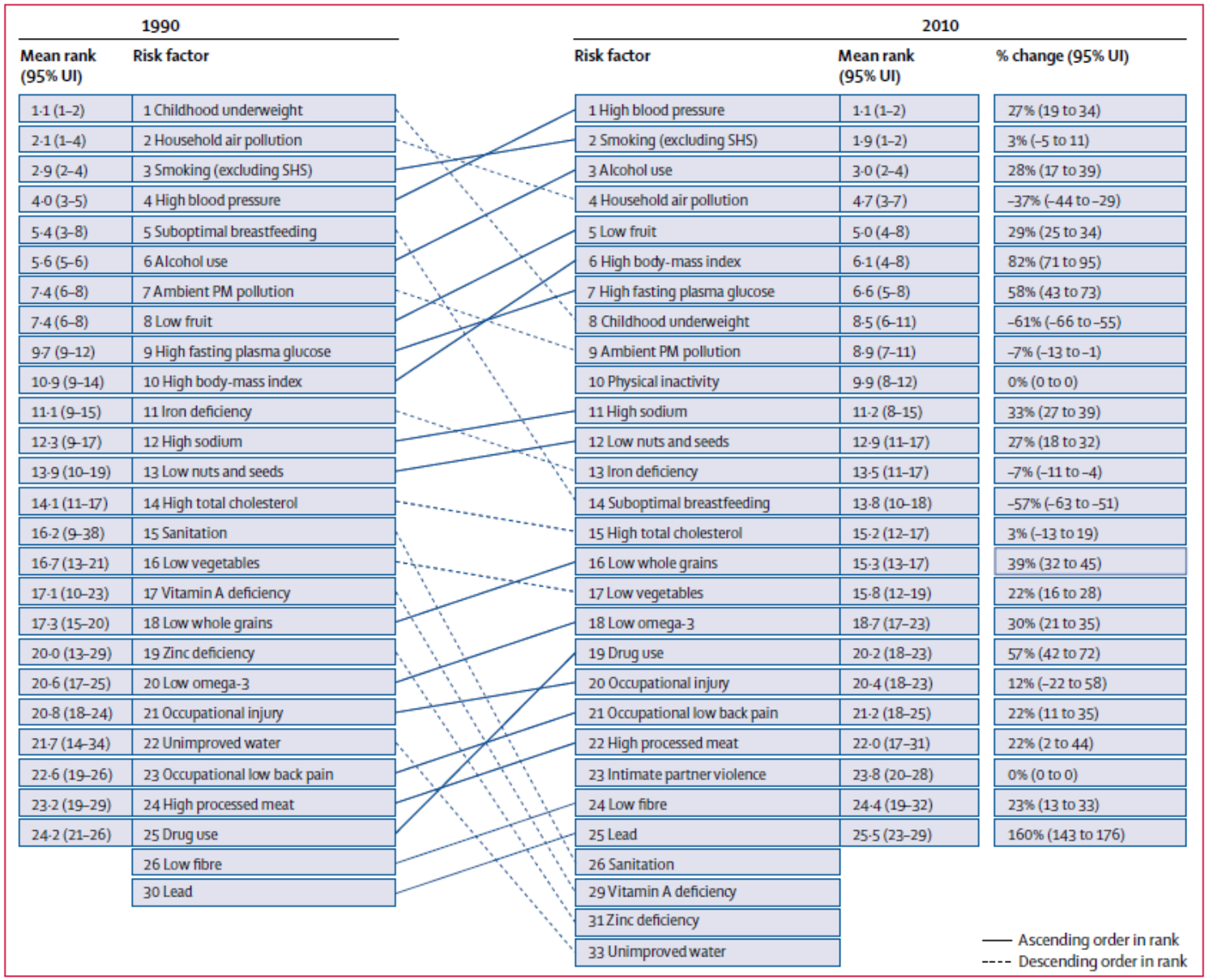


***Figure 3*: Global risk factor ranks with 95% UI for all ages and sexes combined in 1990, and 2010, and percentage change**
PM=particulate matter. UI=uncertainty interval. SHS=second-hand smoke. An interactive version of this figure is available online at http://healthmetricsandevaluation.org/gbd/visualizations/regional.

The worldwide epidemiological transition

- Large declines in child mortality and in the burden for its key risk factors, leading to larger share of disease burden from NCDs. A great deal more to be done in sub-Saharan Africa and South Asia.
- Shifting burden of smoking from high-income to low-and-middle-income countries
- Massive harms from alcohol use in Eastern Europe
- Worldwide rise in body weight and glycaemia, with rare regions where it has been stable
- Lower blood pressure in high-income countries, and increasingly those in South America; BP stable in East Asia and rising in sub-Saharan Africa and South Asia

Big Drivers of Health Trends

Negative Trends:

1. HIV Epidemic
2. Tobacco
3. Alcohol and social dysfunction in Eastern Europe and Central Asia
4. Obesity

Positive Development Trends:

5. Rising levels of income
6. Rising educational attainment, especially in women

Global Health Action

7. Expanding set of public health and medical interventions
8. Development Assistance for Health

Outline

Global Burden of Disease

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Enteric diseases

Next Steps

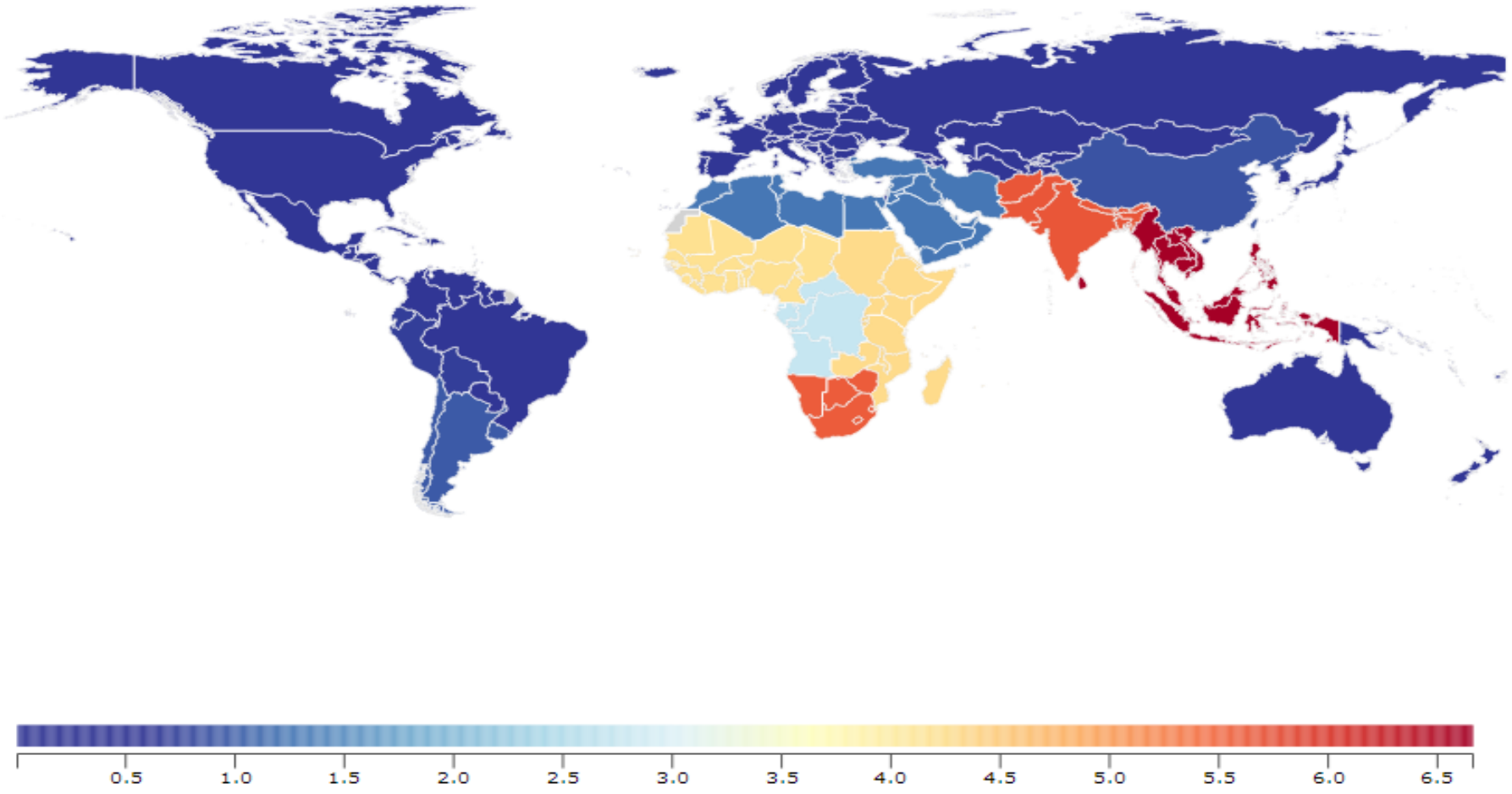
Global Burden of Enteric Disease:

- ICD 10 etiological categories
  - Cholera
  - Salmonella
  - Shigellosis
  - EPEC
  - ETEC
  - Campylobacter enteritis
  - Amoebiasis
  - Cryptosporidosis
  - Rotaviral enteritis
  - Other diarrheal disease

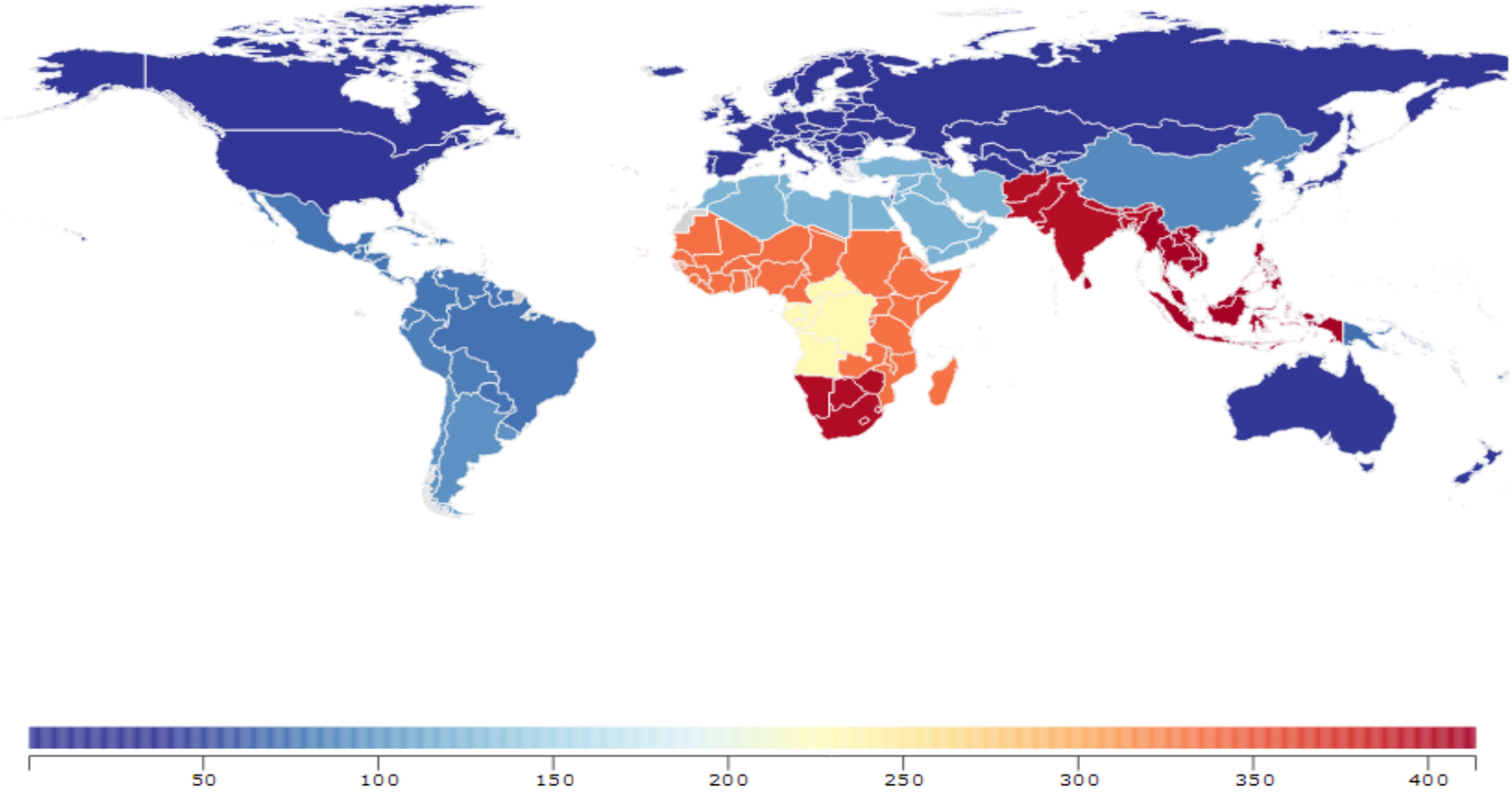
Global DALYs Rank Age Under 5 yrs

Cause	Global	Asia Pacific, Hich Income	Asia, Central	Asia, East	Asia, South	Asia, Southeast	Australasia	Caribbean	Europe, Central	Europe, Eastern	Europe, Western	Latin America, Andean	Latin America, Central	Latin America, Southern	Latin America, Tropical	North Africa / Middle East	North America, High Income	Oceania	Sub-Saharan Africa, Central	Sub-Saharan Africa, East	Sub-Saharan Africa, Southern	Sub-Saharan Africa, West
Preterm birth complications	1	2	3	2	1	1	1	2	1	2	1	2	1	1	1	1	1	3	5	4	4	5
Lower respiratory infections	2	5	1	3	2	3	8	3	3	4	8	1	3	3	5	3	9	1	3	2	2	3
Diarrheal diseases	3	3	5	7	3	2	6	4	6	7	5	5	4	7	6	4	6	2	2	3	1	2
Malaria	4	99	83	90	25	15	94	28	99	97	99	67	68	101	58	22	95	10	1	1	16	1
Neonatal encephalopathy (birth asphyxia and birth trauma)	5	4	2	4	5	4	3	6	5	3	3	3	5	5	3	6	3	4	7	6	5	7
Sepsis and other infectious disorders of the newborn baby	6	7	9	14	4	6	10	5	7	6	7	6	6	6	4	5	7	6	9	5	7	4
Congenital anomalies	7	1	4	1	6	5	2	7	2	1	2	4	2	2	2	2	2	5	6	11	6	10
Protein-energy malnutrition	8	25	12	11	7	9	30	9	12	19	23	8	8	12	9	8	31	8	4	7	9	6
Meningitis	9	20	8	13	10	8	15	11	9	11	12	11	9	9	8	9	17	7	8	9	11	8
Iron-deficiency anemia	10	80	6	5	8	7	4	8	4	5	80	7	7	4	7	7	81	9	12	12	8	11
HIV/AIDS	11	44	49	38	26	19	39	13	42	22	34	33	14	22	51	57	33	12	10	8	3	9
Syphilis	12	47	21	15	13	14	18	10	21	58	51	9	16	19	10	16	50	11	11	10	10	14
Measles	13	69	34	46	9	10	61	68	71	73	73	22	54	59	63	51	80	17	22	13	12	15
Drowning	14	12	7	6	12	12	9	21	14	9	16	12	11	10	12	15	11	26	15	17	18	21
Road injury	15	9	11	8	18	16	7	16	10	10	10	10	10	11	11	11	8	32	16	16	20	12
Fire, heat and hot substances	16	24	10	24	16	26	22	14	22	12	24	15	20	13	22	17	13	13	14	14	15	13
Tetanus	17	82	94	26	14	25	87	18	76	94	88	75	76	96	70	40	92	15	26	18	72	16
Tuberculosis	18	68	47	50	19	13	73	12	56	38	74	24	47	55	48	38	79	24	17	15	14	18
Encephalitis	19	42	16	34	11	35	74	49	37	17	55	70	58	67	28	18	59	60	33	28	39	25
Falls	20	16	15	10	21	30	25	38	20	18	21	25	26	34	25	21	25	31	27	21	44	17
Epilepsy	21	19	18	20	29	22	19	29	13	24	14	17	13	18	16	25	21	21	21	19	22	20
Typhoid and paratyphoid fevers	22	57	93	18	15	11	65	43	87	82	79	36	34	20	29	27	68	54	35	23	17	28
Sickle cell disorders	23	6	53	77	48	88	20	17	18	35	4	53	28	50	17	24	5	73	13	35	53	19
Chronic obstructive pulmonary disease	24	50	35	28	17	29	36	47	36	46	44	26	24	28	38	20	30	47	23	30	28	26
Cerebrovascular disease	25	32	43	25	32	18	47	27	27	52	36	19	21	29	33	10	20	34	18	39	38	22

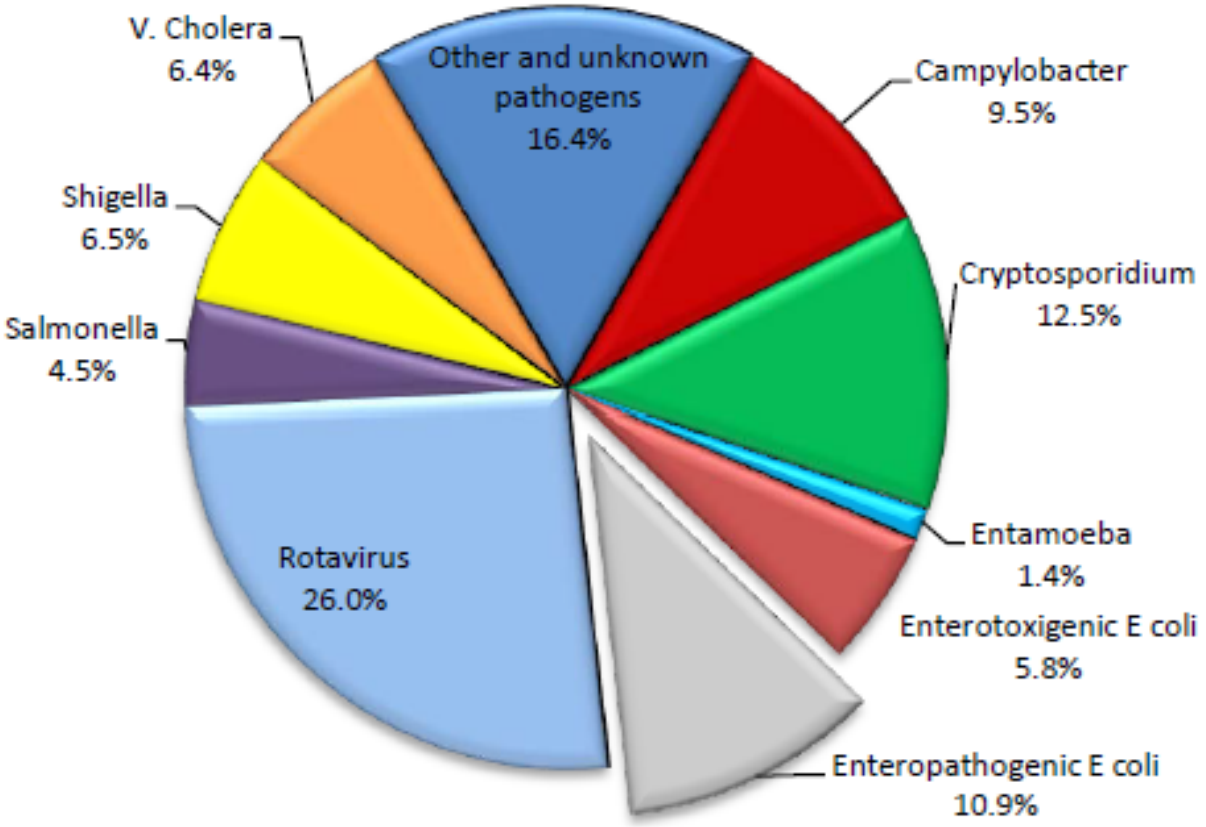
Typhoid and paratyphoid fevers
Both Sexes, All ages, 2010
Deaths per 100,000

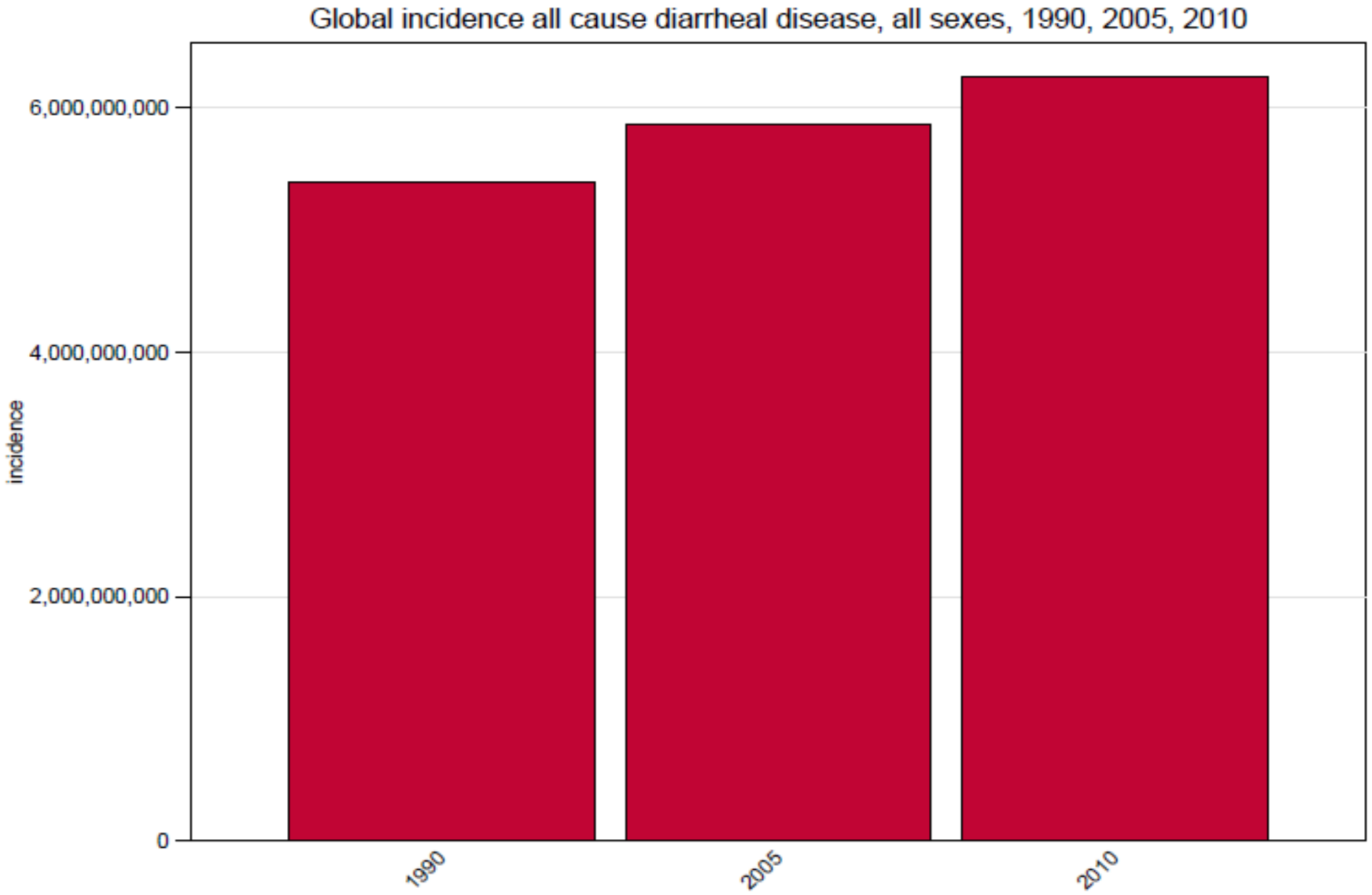


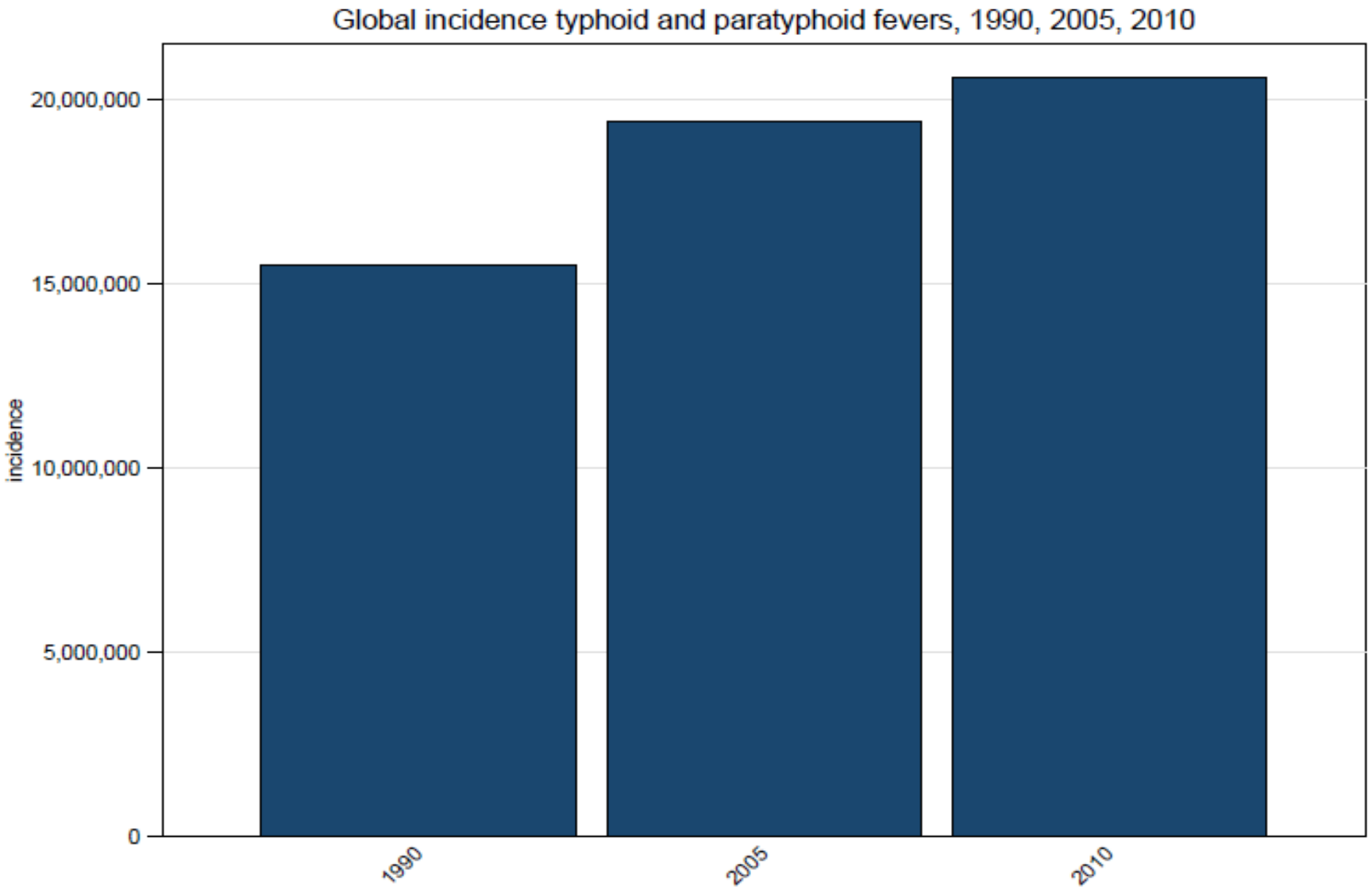
Typhoid and paratyphoid fevers
Both Sexes, All ages, 2010
DALYs per 100,000

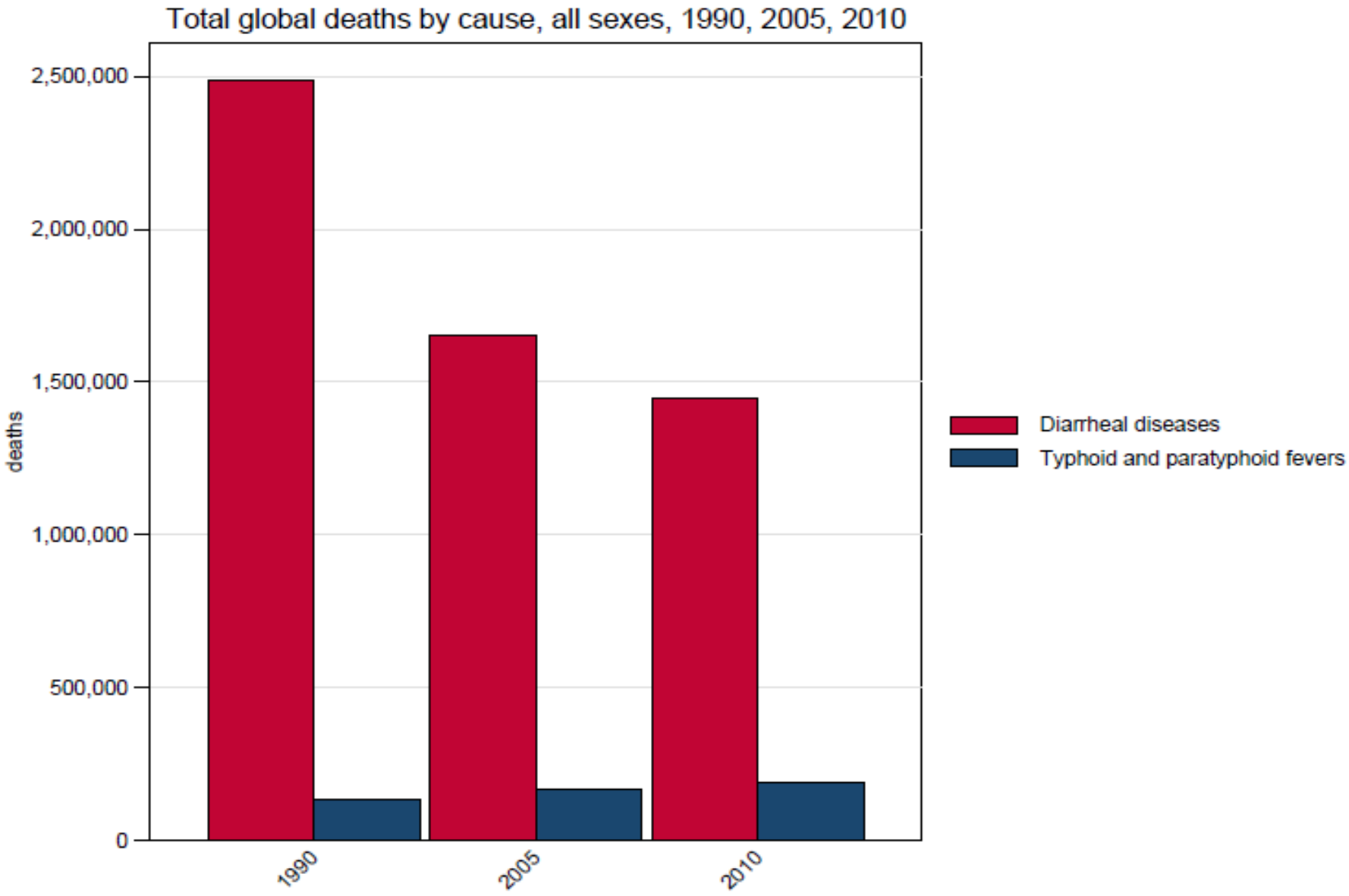


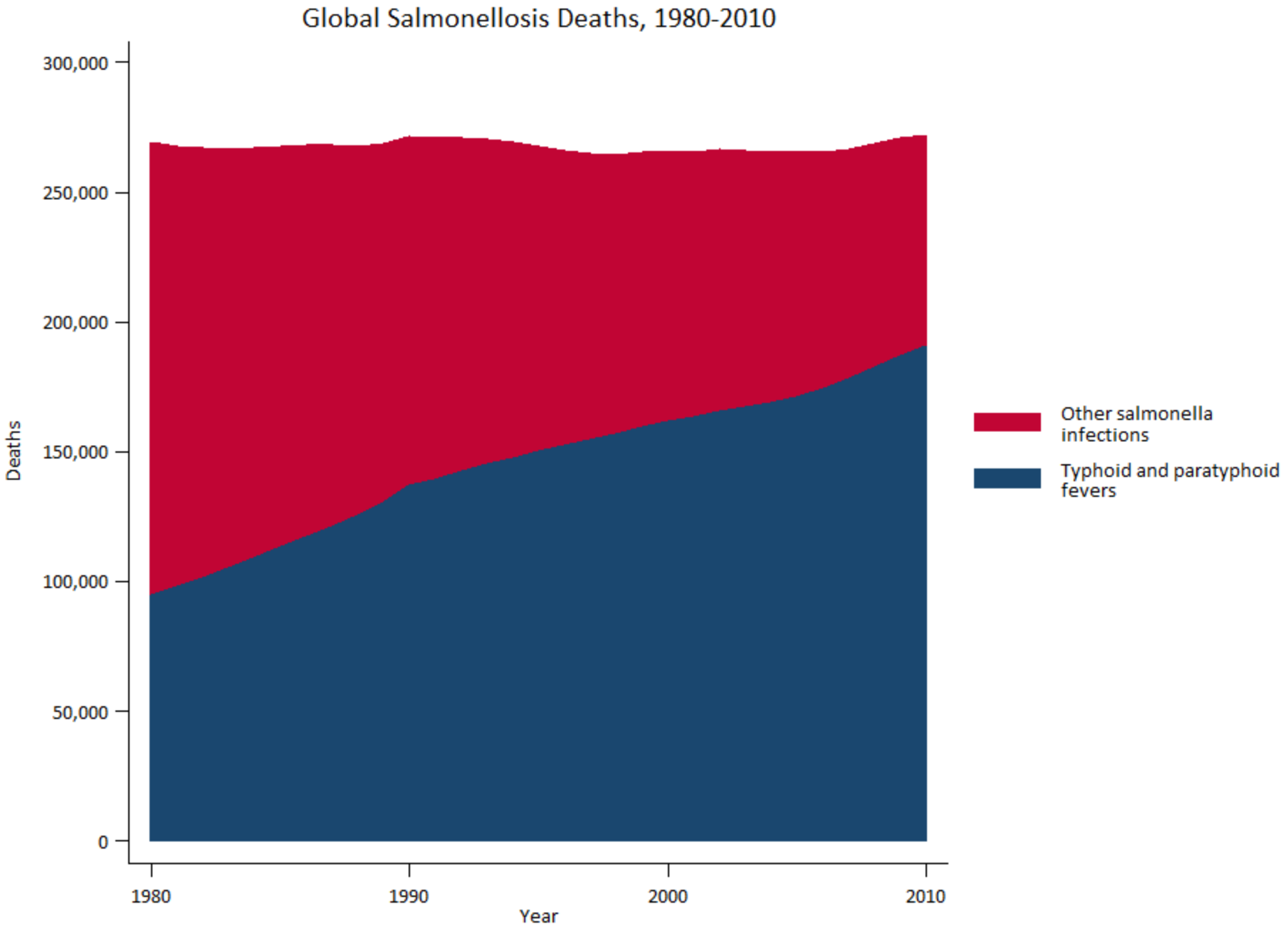
Global distribution of diarrhea death by pathogen under age 5

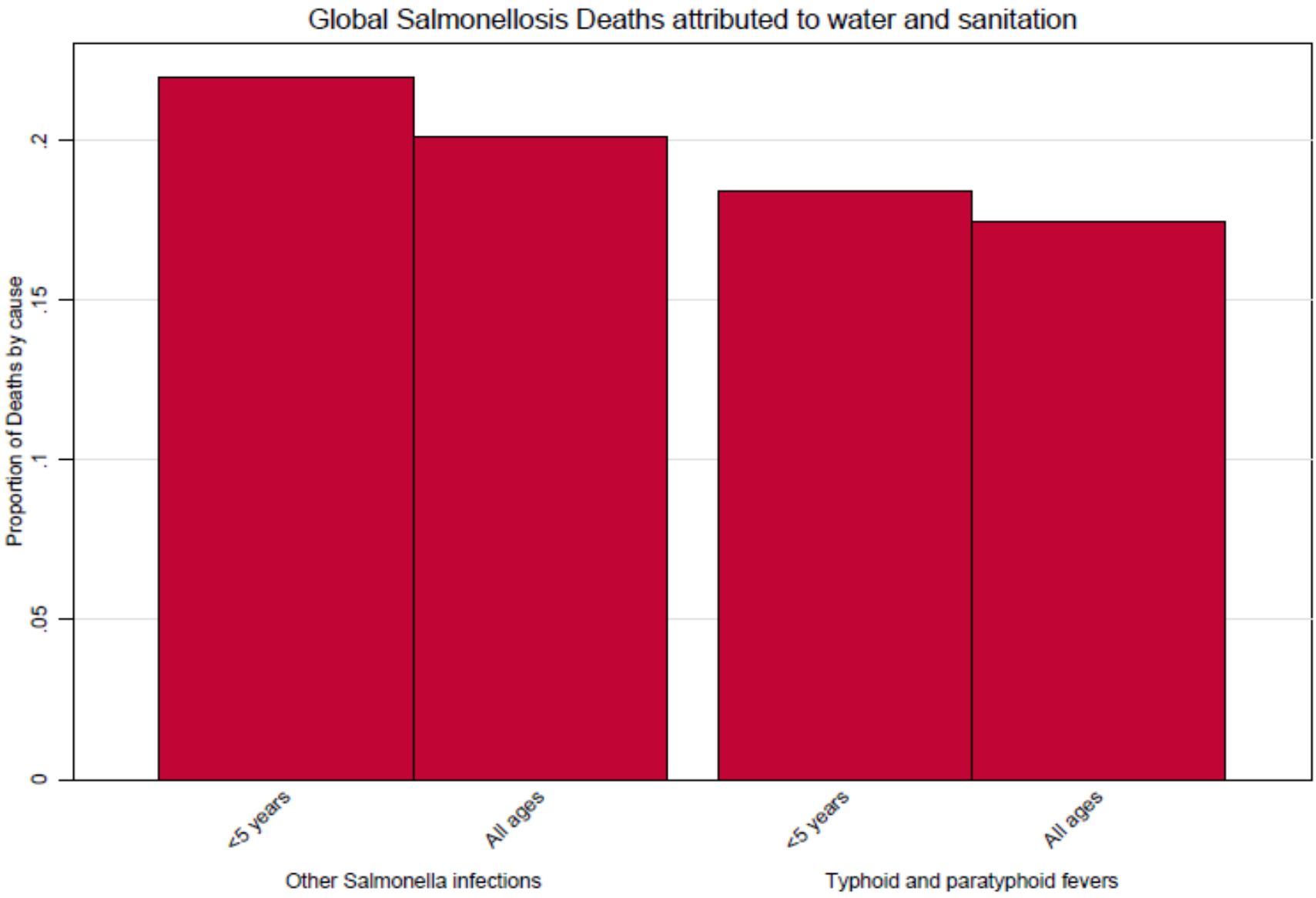


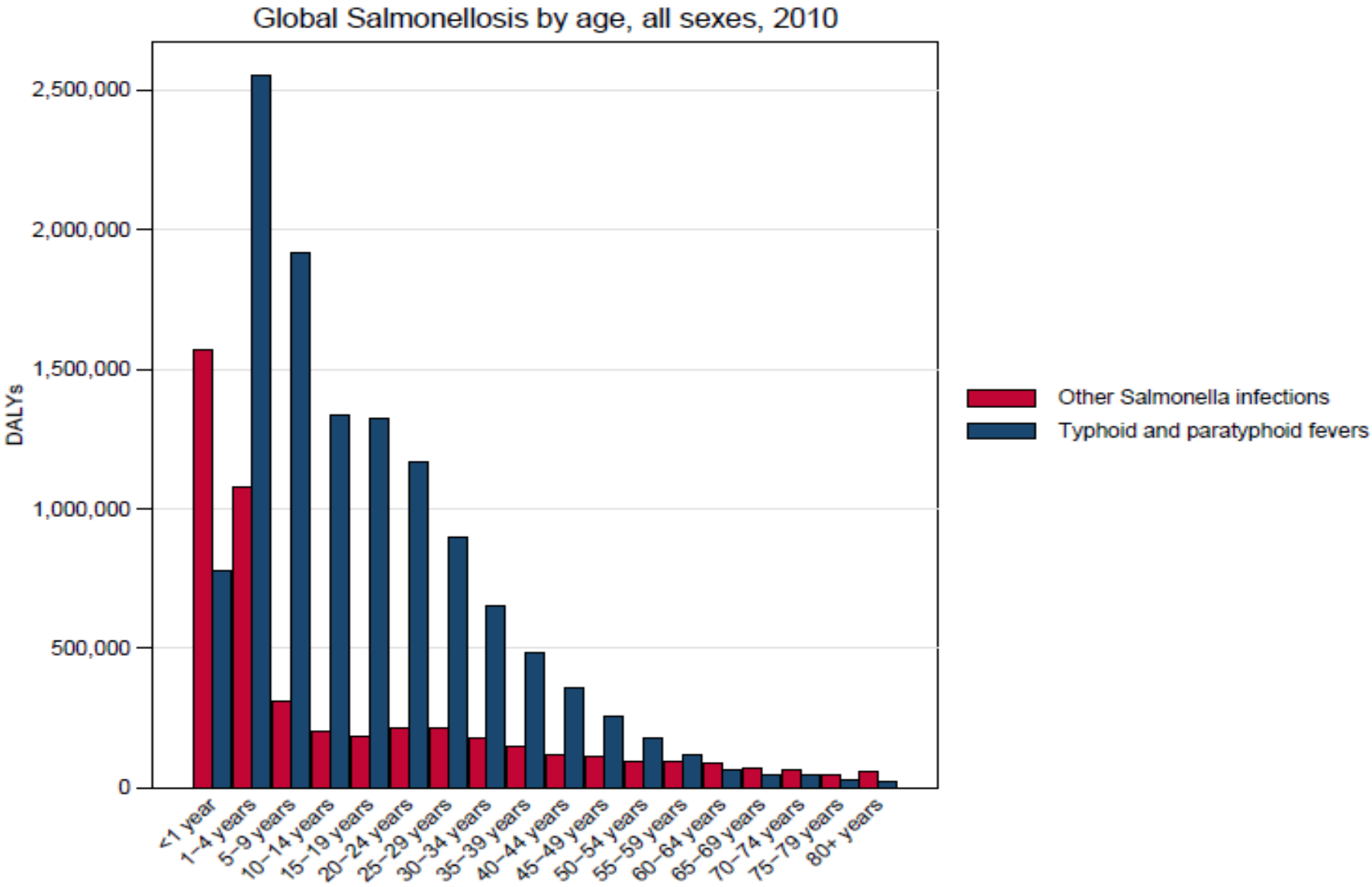

Global incidence all cause diarrheal disease, all sexes, 1990, 2005, 2010
6,000,000,000
4,000,000,000
2,000,000,000
0
incidence
1990
2005
2010

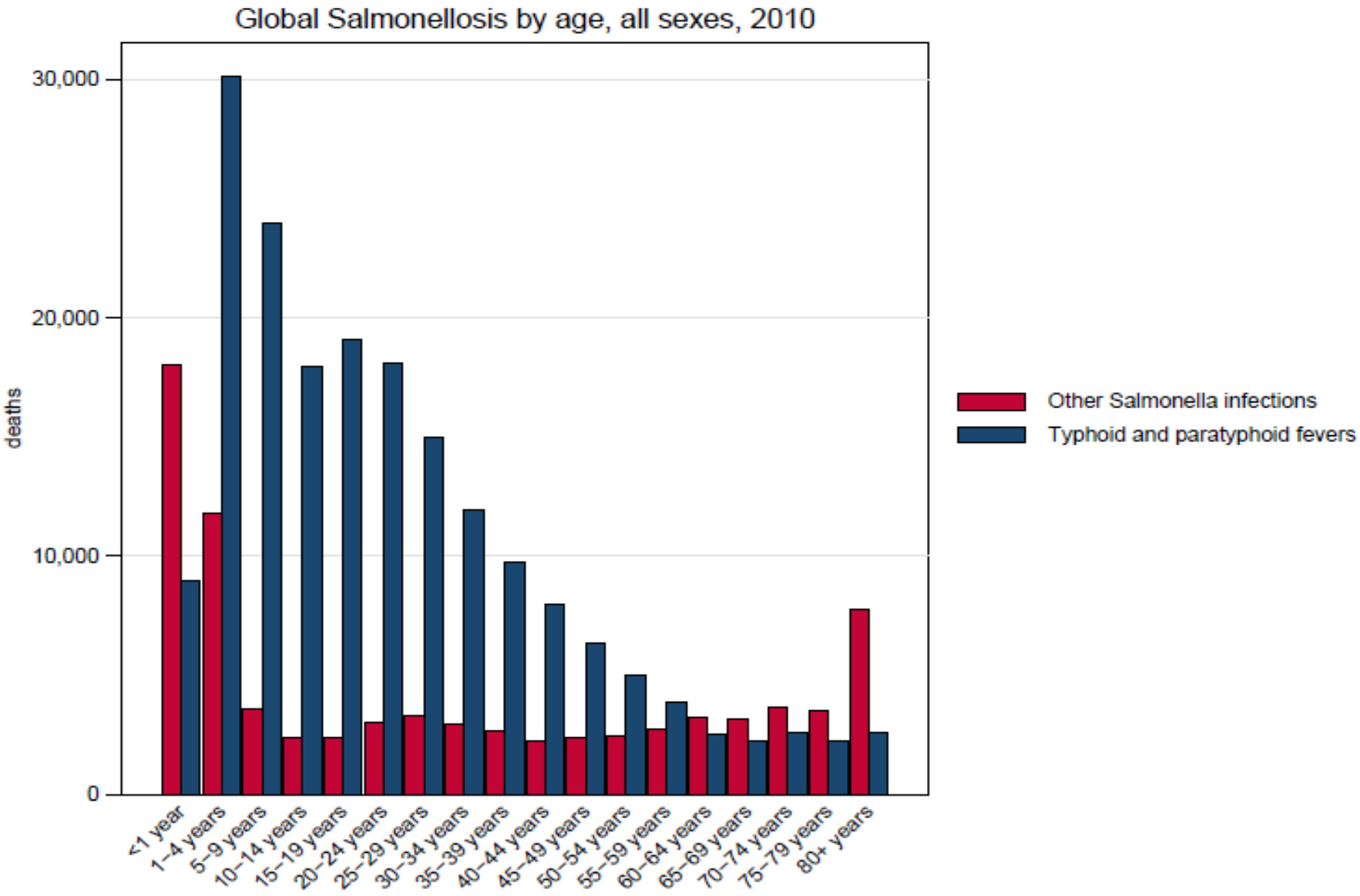

Global incidence typhoid and paratyphoid fevers, 1990, 2005, 2010
incidence
20,000,000
15,000,000
10,000,000
5,000,000
0
1990
2005
2010

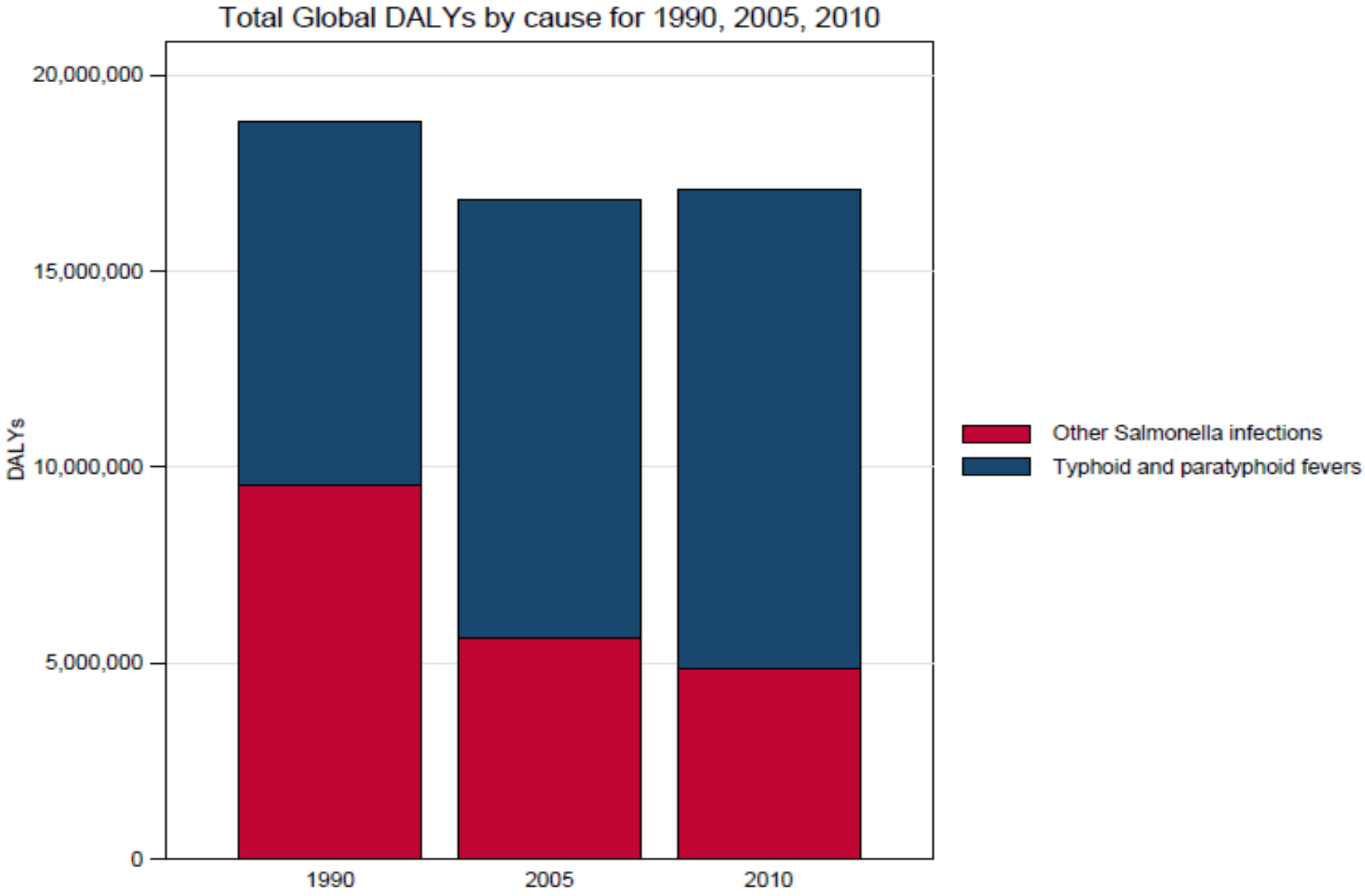

Total global deaths by cause, all sexes, 1990, 2005, 2010
deaths
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
1990
2005
2010
Diarrheal diseases
Typhoid and paratyphoid fevers

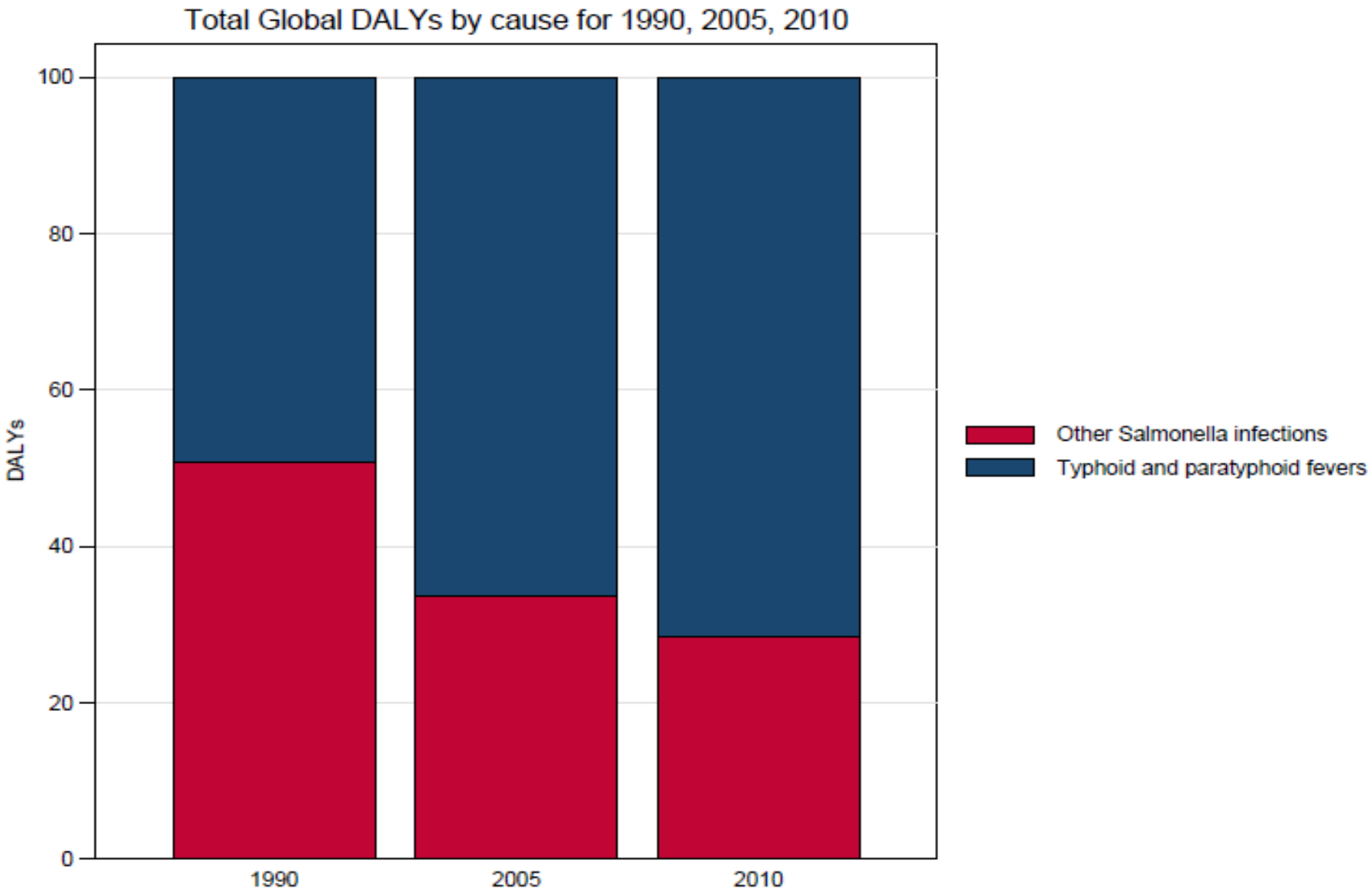

Global Salmonellosis Deaths, 1980-2010
300,000
250,000
200,000
150,000
100,000
50,000
0
Deaths
1980
1990
2000
2010
Year
Other salmonella infections
Typhoid and paratyphoid fevers


Global Salmonellosis Deaths attributed to water and sanitation
Proportion of Deaths by cause
0
.05
.1
.15
.2
<5 years
All ages
<5 years
All ages
Other Salmonella infections
Typhoid and paratyphoid fevers


Global Salmonellosis by age, all sexes, 2010
DALYs
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
<1 year
1–4 years
5–9 years
10–14 years
15–19 years
20–24 years
25–29 years
30–34 years
35–39 years
40–44 years
45–49 years
50–54 years
55–59 years
60–64 years
65–69 years
70–74 years
75–79 years
80+ years
Other Salmonella infections
Typhoid and paratyphoid fevers


Global Salmonellosis by age, all sexes, 2010
30,000
20,000
10,000
0
deaths
<1 year
1–4 years
5–9 years
10–14 years
15–19 years
20–24 years
25–29 years
30–34 years
35–39 years
40–44 years
45–49 years
50–54 years
55–59 years
60–64 years
65–69 years
70–74 years
75–79 years
80+ years
Other Salmonella infections
Typhoid and paratyphoid fevers


Total Global DALYs by cause for 1990, 2005, 2010
20,000,000
15,000,000
10,000,000
5,000,000
0
DALYs
1990
2005
2010
Other Salmonella infections
Typhoid and paratyphoid fevers


Total Global DALYs by cause for 1990, 2005, 2010
DALYs
100
80
60
40
20
0
1990
2005
2010
Other Salmonella infections
Typhoid and paratyphoid fevers

Outline

Global Burden of Disease

Overview of findings

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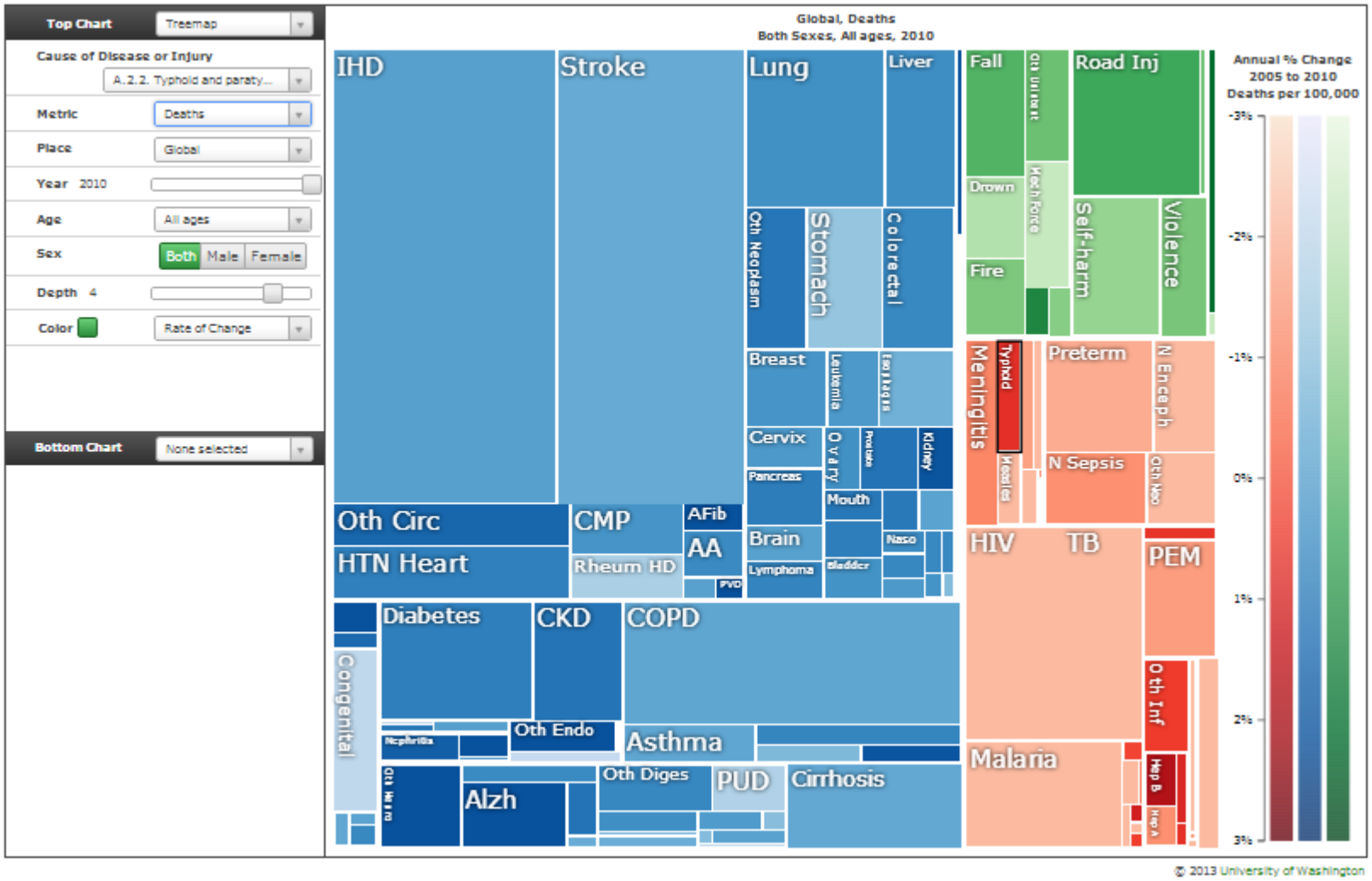
Next Steps

Next Steps for GBD

- Release of country data
- Release of visualization tools

- Announcement of GBD 2.0 yearly updates

- Update our number based on new releases


Top Chart
Treemap
Cause of Disease or Injury
A.2.2. Typhoid and paraty...
Metric
Deaths
Place
Global
Year 2010
Age
All ages
Sex
Both
Male
Female
Depth 4
Color
Rate of Change
Bottom Chart
None selected
Global, Deaths
Both Sexes, All ages, 2010
IHD
Stroke
Lung
Liver
Oth Neoplasm
Stomach
Colorectal
Breast
Leukemia
Esophagus
Cervix
Ovary
Prostate
Kidney
Pancreas
Mouth
Brain
Lymphoma
Bladder
Naso
Oth Circ
HTN Heart
CMP
Rheum HD
AFib
AA
PVD
Congenital
Diabetes
CKD
COPD
Nephritis
Oth Endo
Asthma
Oth Neuro
Alzh
Oth Diges
PUD
Cirrhosis
Fall
Oth Unintent
Road Inj
Drown
Mech Force
Self-harm
Violence
Fire
Meningitis
Typhoid
Measles
Preterm
N Enceph
N Sepsis
Oth Neo
HIV
TB
PEM
Oth Inf
Malaria
Hep B
Hep A
Annual % Change
2005 to 2010
Deaths per 100,000
-3%
-2%
-1%
0%
1%
2%
3%
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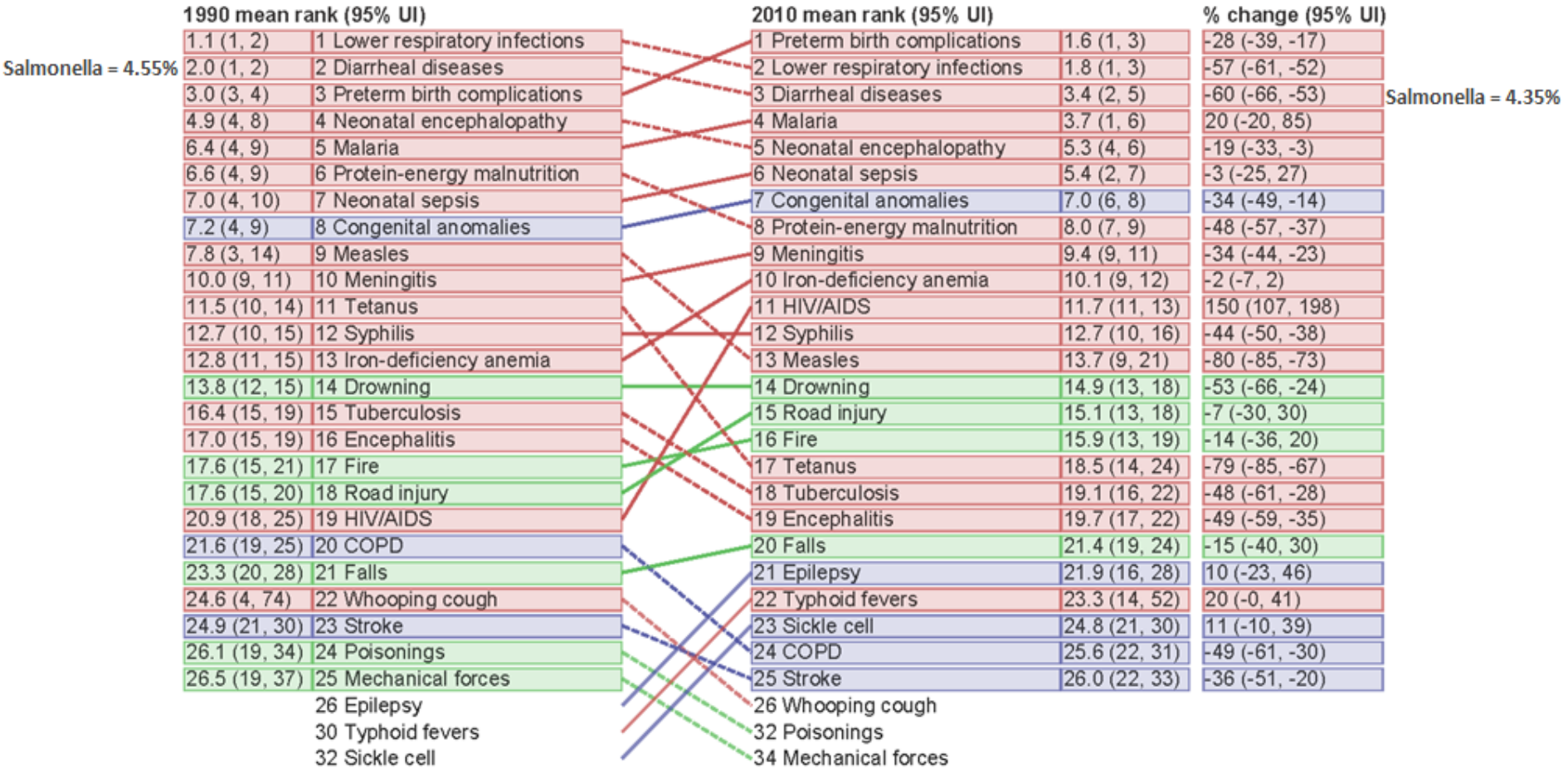
Thank you!

Global Enteric Burden of Disease: Methods

- Systematic Literature Review. In total, we included 189 studies between the years 1975 to 2010. Rotavirus had the greatest number of studies at 126, and amoebiasis had the least amount of data available with only 14 studies. We included data from inpatient, outpatient, case-control, clinical trial, and community-based studies.
- Bayesian Meta Regression
  - Estimates for inpatients = severe cases
  - Estimates for outpatient or community-based = all cases
- We separately modeled “other diarrheal diseases” in a non-DisMod environment as the pathogens included in this residual category differed by study

Global DALY Ranks for Top 25 Causes, Age Under 5 years, 1990 to 2010



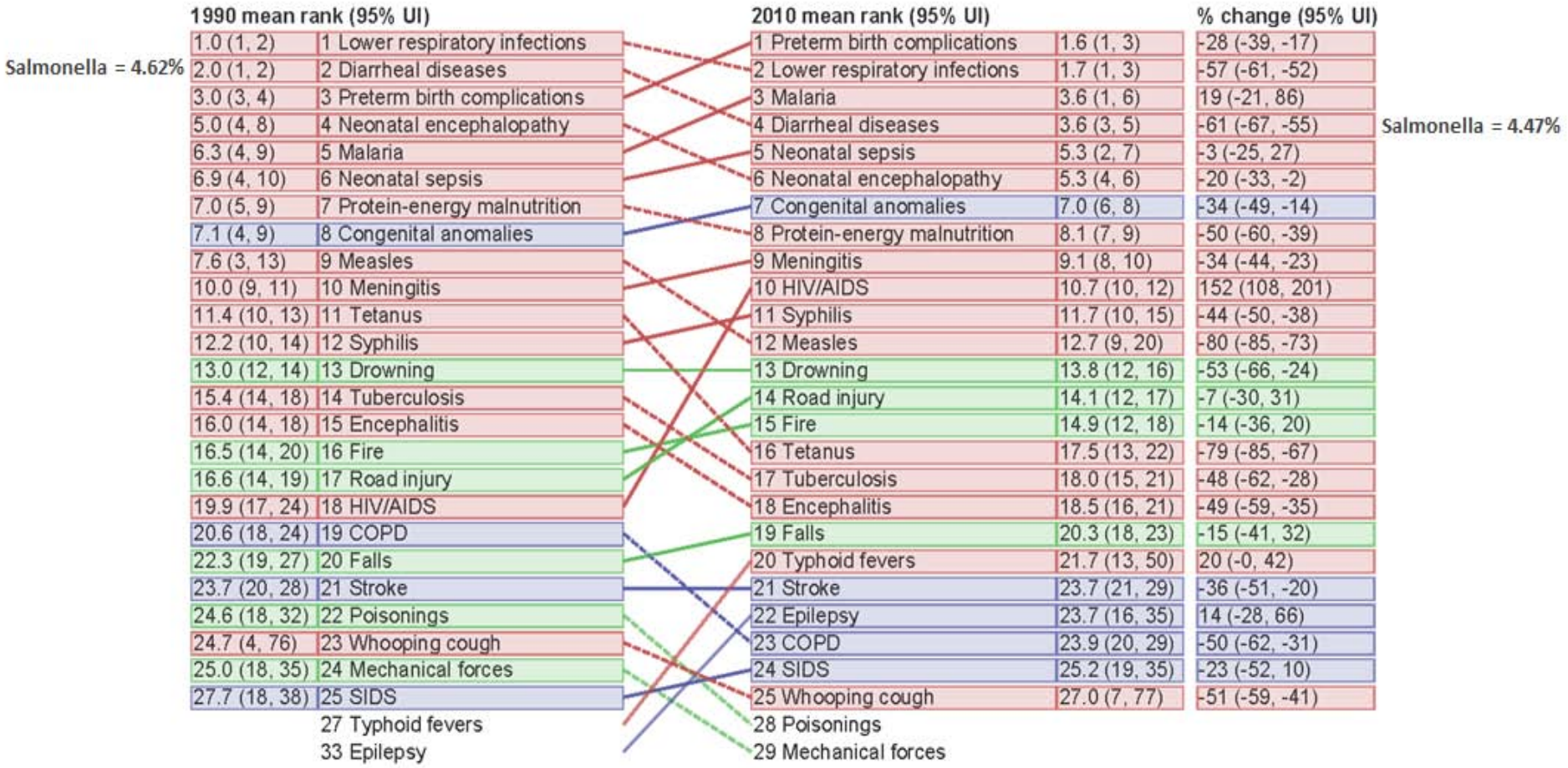
Legend

Communicable, maternal, neonatal, and nutritional

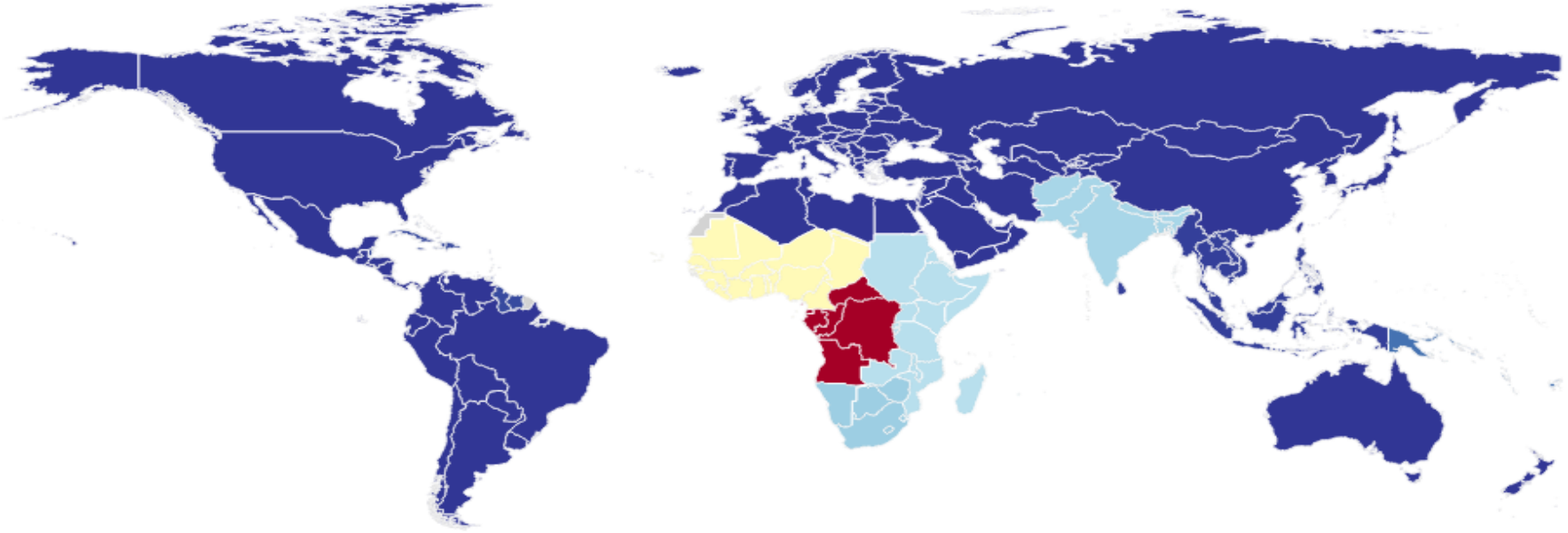
Non-communicable

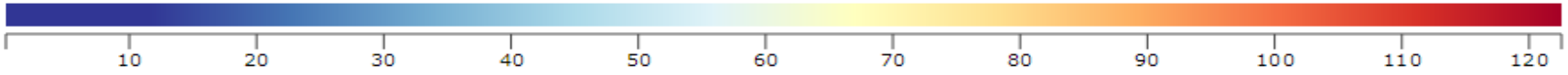
Injury

Global Death Ranks for Top 25 Causes, Age Under 5 years, 1990 to 2010



Diarrheal diseases
Both Sexes, All ages, 2010
Deaths per 100,000





Diarrheal diseases
Both Sexes, All ages, 2010
DALYs per 100,000