Mortality of a disease

Dose

-number of organisms infecting.

-determines likelihood of symptomatic disease.

-different dose responses.

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Dose

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-determines likelihood of symptomatic disease.

-different dose responses.

Reproductive capacity

-some reproduce within humans.

-increases # of pathogenic organisms.

Innate pathogenicity.

-some disease-causing organisms cause more damage than others.

-type of tissue(s) affected.

-metastasis to other tissues.

-toxic metabolic products.

-immuno-depressers.

-this determines an individual human's likelihood of dying.

Mortality of a disease

Ease of transmission.

-easily-transmitted disease-causing organisms infect more people.

-this determines the population-level mortality risk.

Mortality of a disease

- Ease of transmission.
  - -easily-transmitted disease-causing organisms infect more people.
  - -this determines the population-level mortality risk.
- Other factors.
  - Risk of secondary infection.
  - Individual-level: nutrition, immunocompetency, other diseases, sex, age, behavior.
  - Population-level: density, hygienic facilities, geography, treatment availability, group-level behaviors.

Geography of a disease

Humans are everywhere; thus, the geography of a disease is usually linked to:

-historical factors (where diseases have always been).

e.g., some hemorrhagic fevers.

-current biological limitations on disease spread.

e.g., African Trypanosomiasis.

-historical and contemporary eradication and control.

e.g., malaria gone from the temperate zone.

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-historical and contemporary eradication and control.

e.g., malaria in the temperate zone.

Disease transmission mode.

-Directly transmitted: usually more cosmopolitan.

e.g., amebiasis, ascariasis, influenza, cholera.

-Vector or intermediate host mediated: usually more restricted.

e.g., trypanosomiasis, schistosomiasis.

Geography of morbidity and mortality.

Endemic levels of disease: those levels of morbidity and mortality that are relatively unchanged over long periods of time.

-e.g., syphilis in the U.S. (~ 3,000-4,000 new cases per month).

-these are background diseases and part of the normal health care of most countries.

Geography of morbidity and mortality.

Endemic levels of disease: those levels of morbidity and mortality that are relatively unchanged over long periods of time.

Epidemic levels of disease: a spike in morbidity and mortality beyond the normal endemic upper range.

-e.g., African trypanosomiasis in Uganda (250,000 dead in 20 years).

-these place huge burdens on health care.

Geography of morbidity and mortality.

Endemic levels of disease: those levels of morbidity and mortality that are relatively unchanged over long periods of time.

Epidemic levels of disease: a spike in morbidity and mortality beyond the normal endemic upper range.

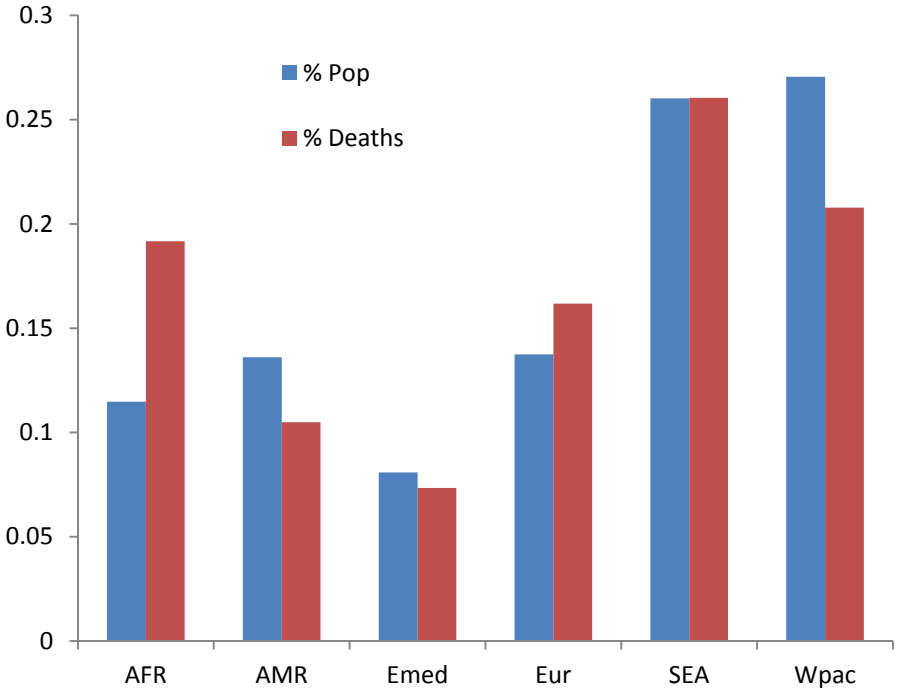
Pandemic levels of disease: a global, or nearly global, spike in morbidity and mortality beyond the normal endemic upper range.

-e.g., 1918-1919 influenza pandemic killed 50 million or more.

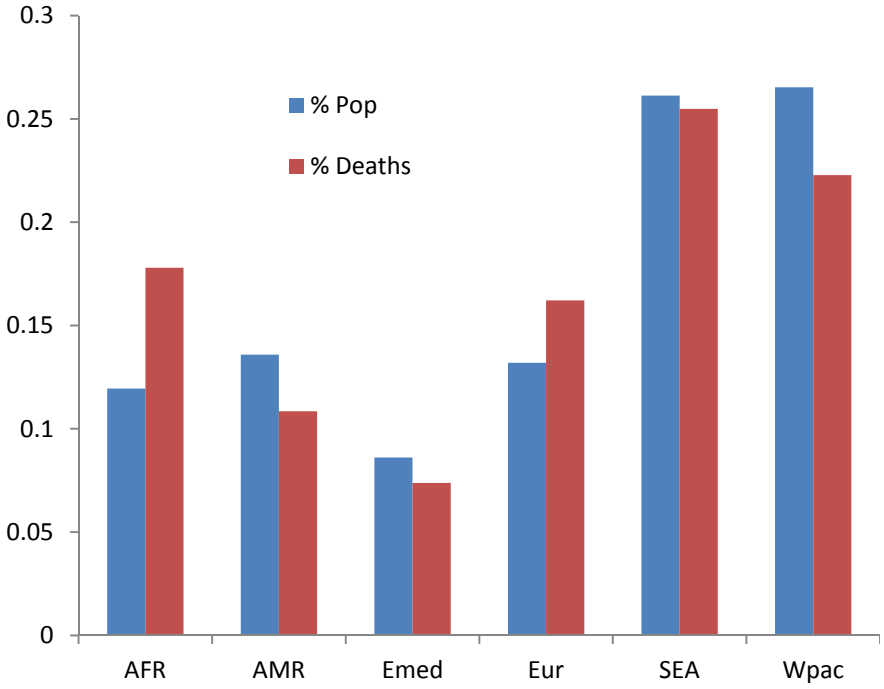
-these are out of control and usually run their course.

Regional % of global population and annual deaths

2004

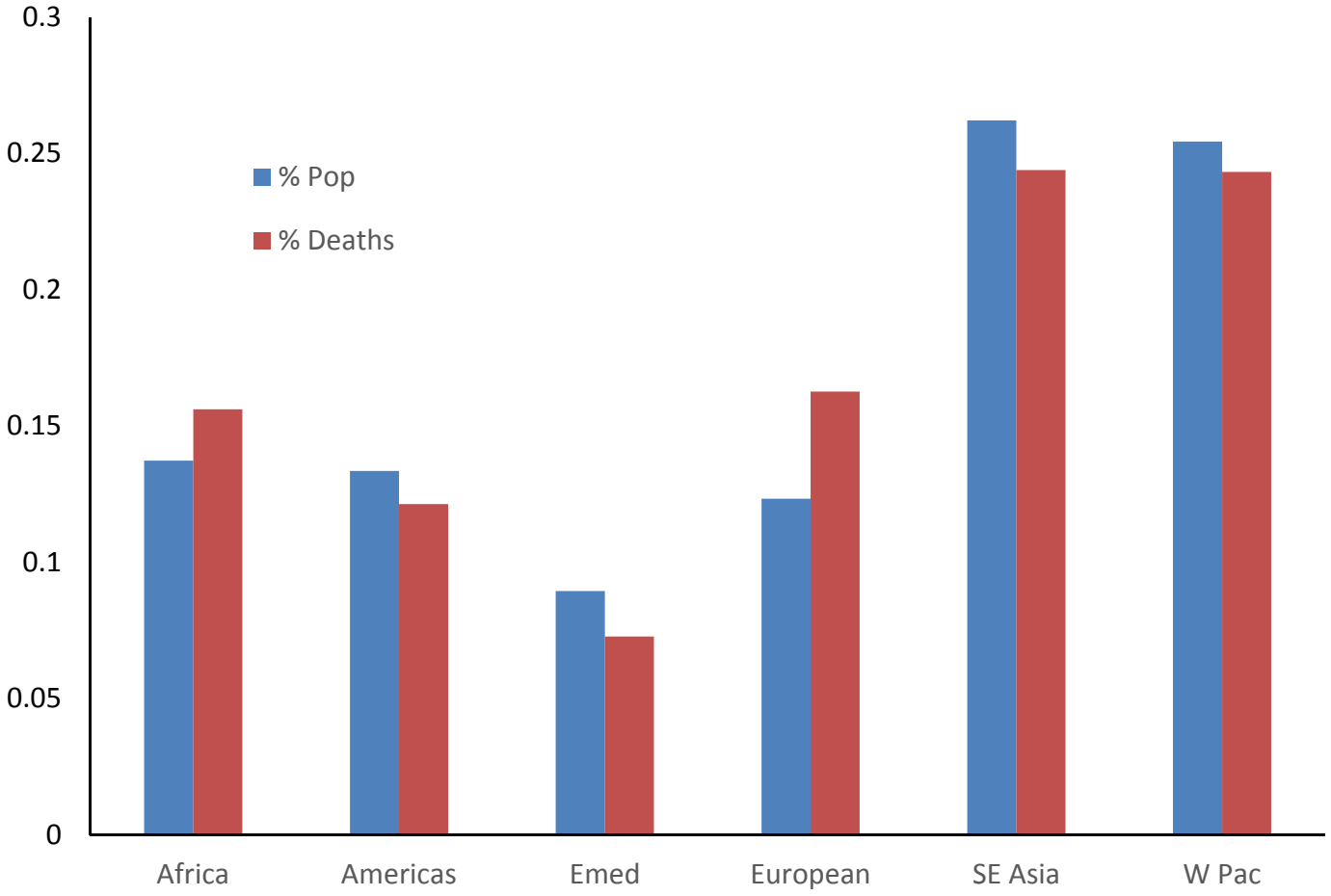


2008



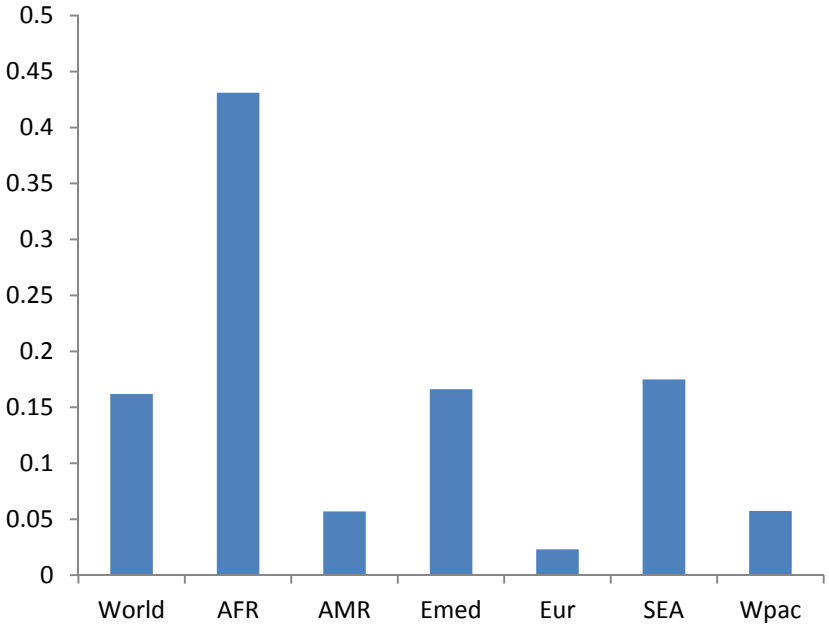
Regional % of global population and annual deaths

2016

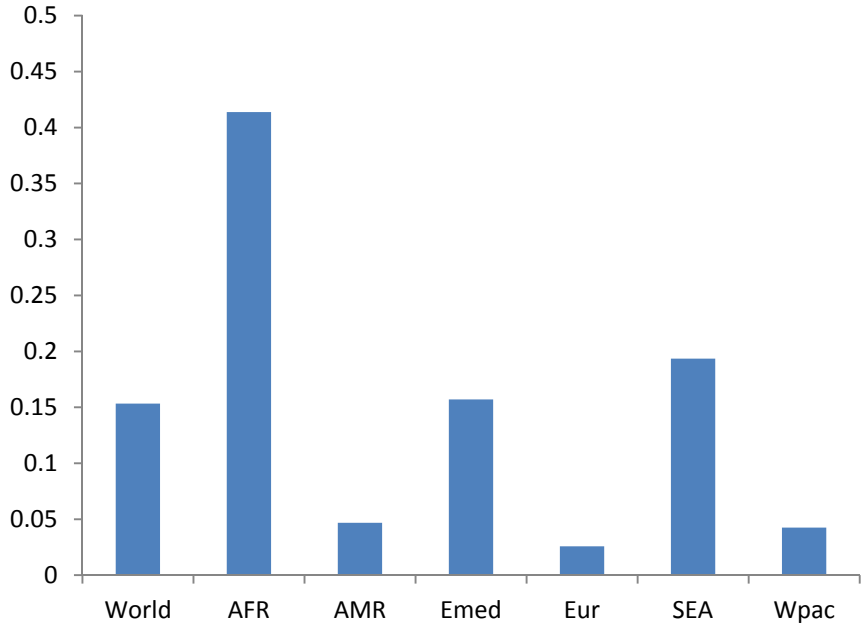


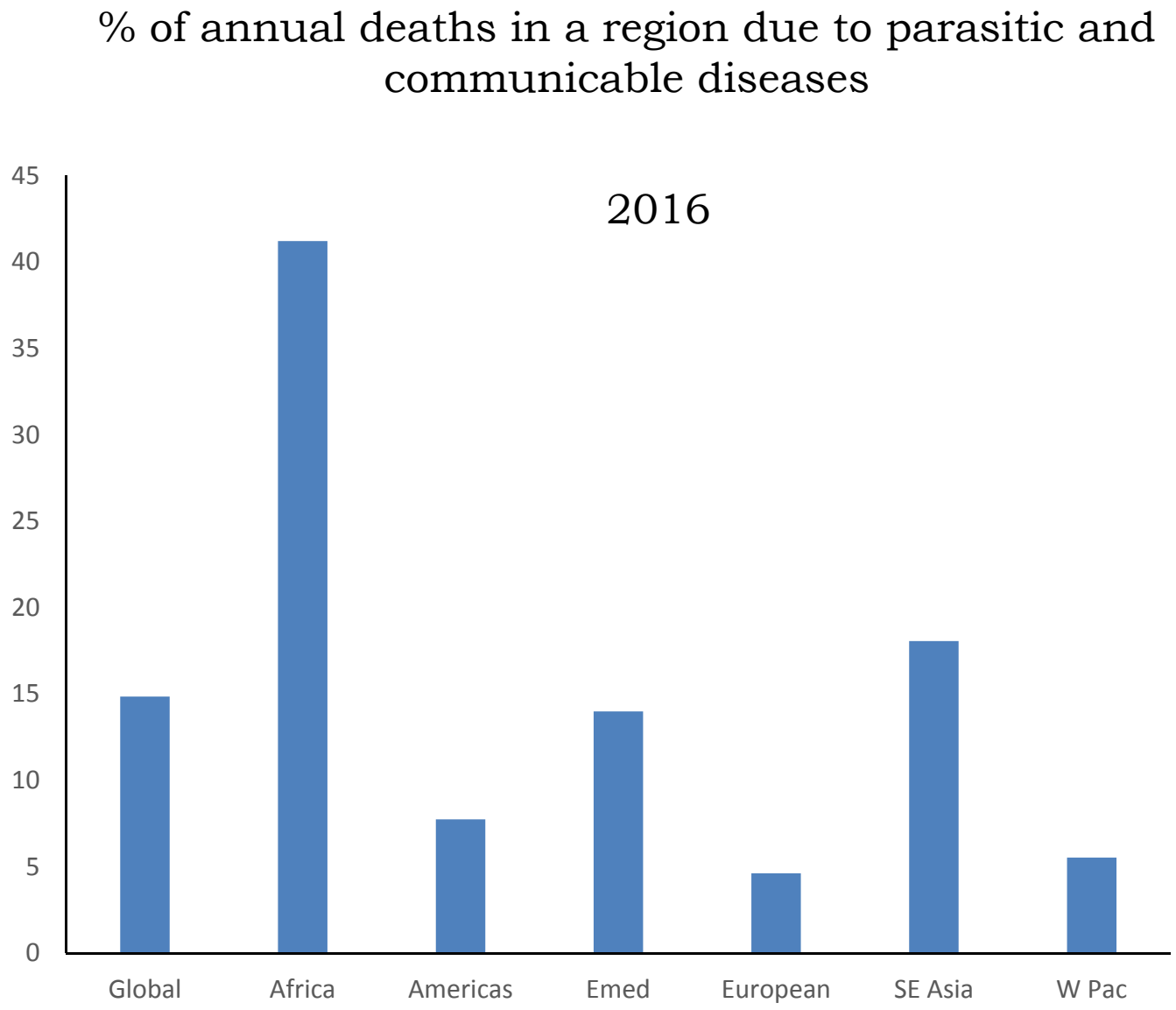
% of annual deaths in a region due to parasitic and communicable diseases

2004



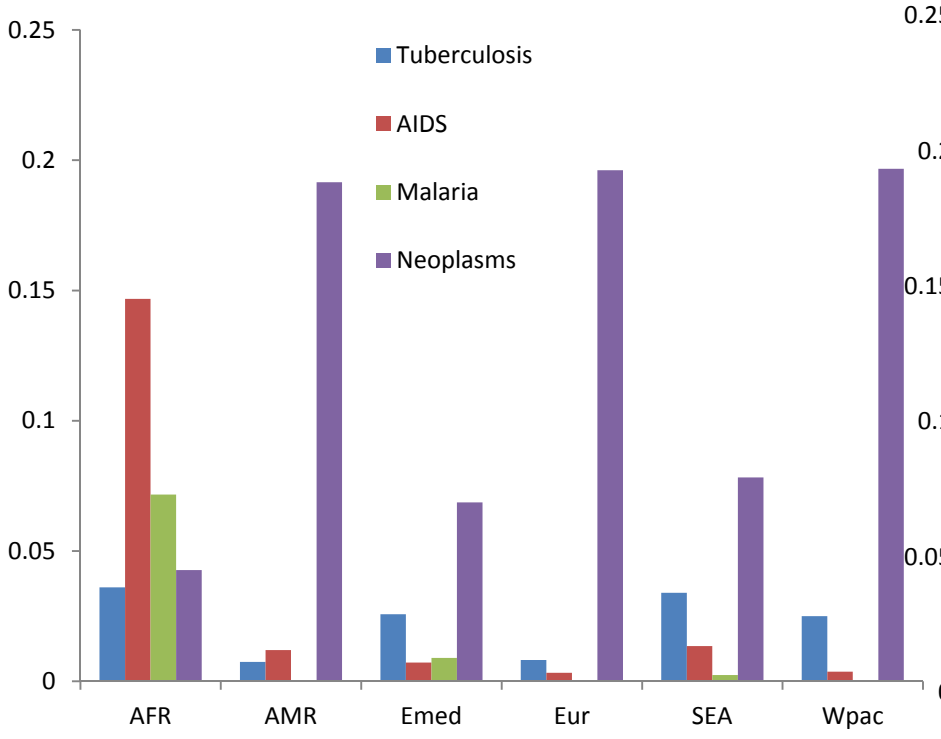
2008



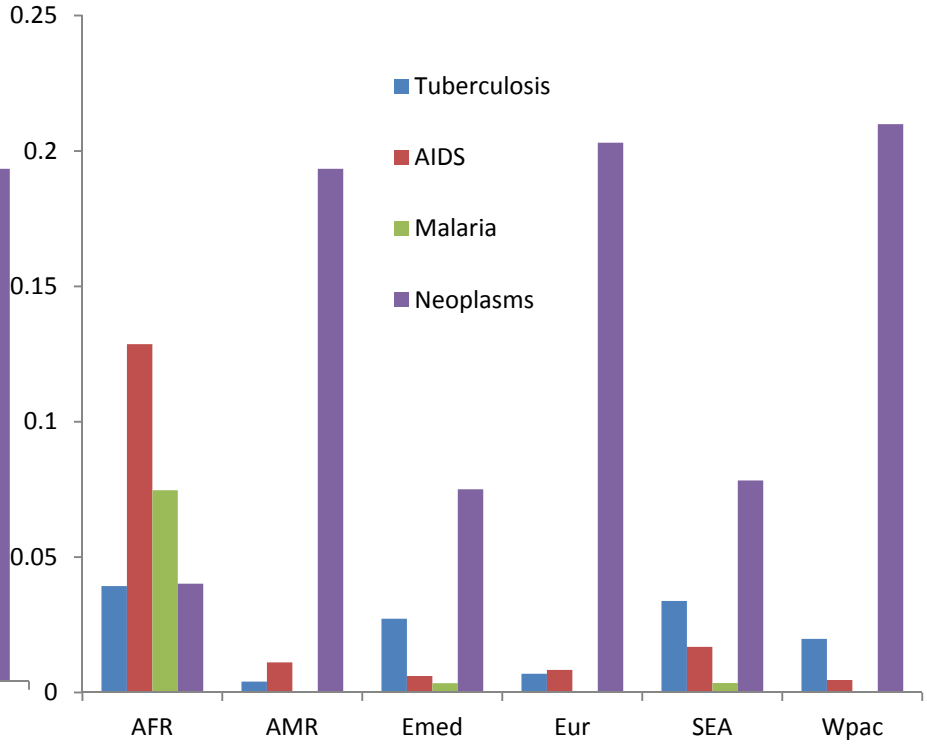

% of annual deaths in a region due to parasitic and communicable diseases
2016
45
40
35
30
25
20
15
10
5
0
Global
Africa
Americas
Emed
European
SE Asia
W Pac

% of annual deaths in a region due to tuberculosis, AIDS, malaria, and cancers

2004

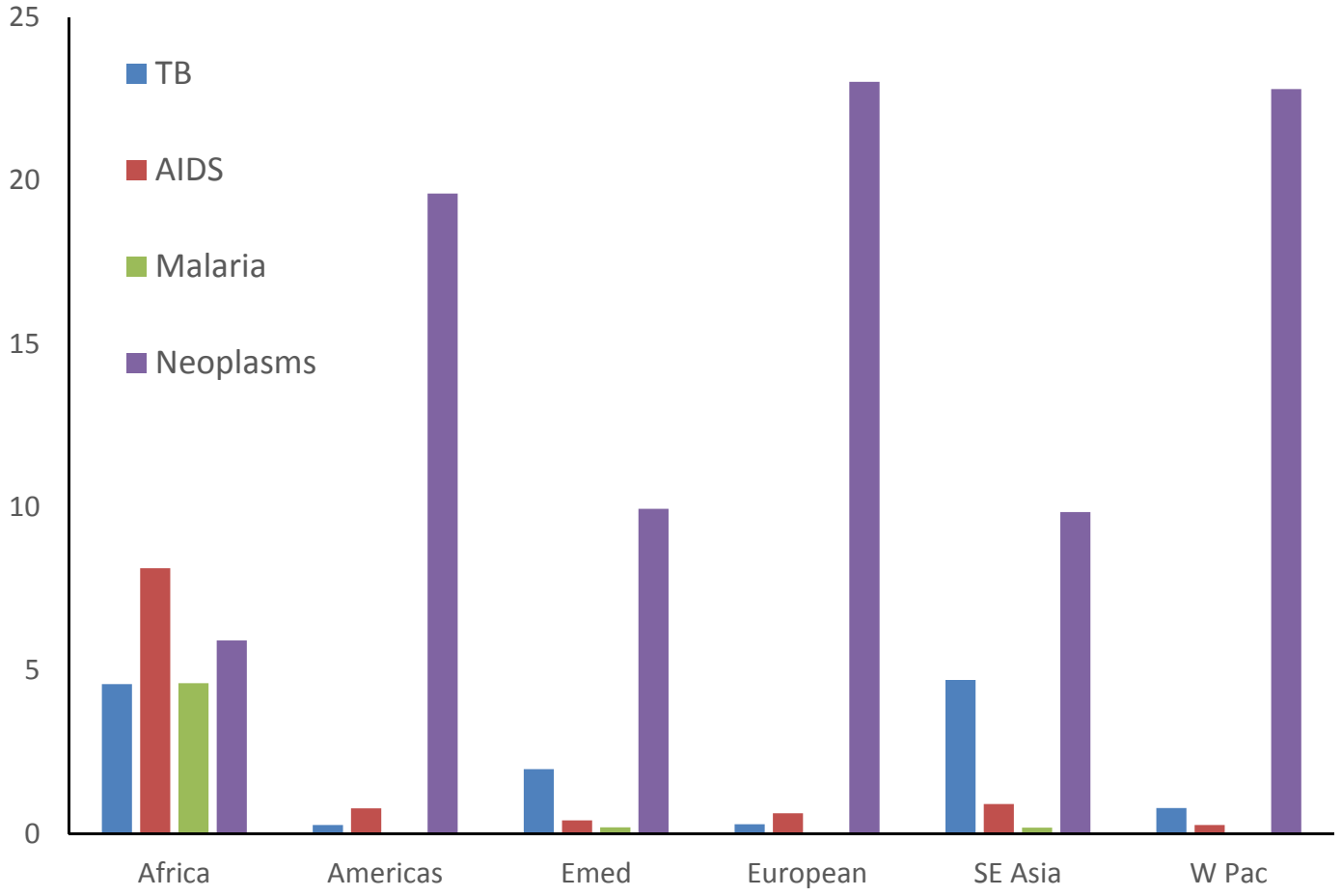


2008



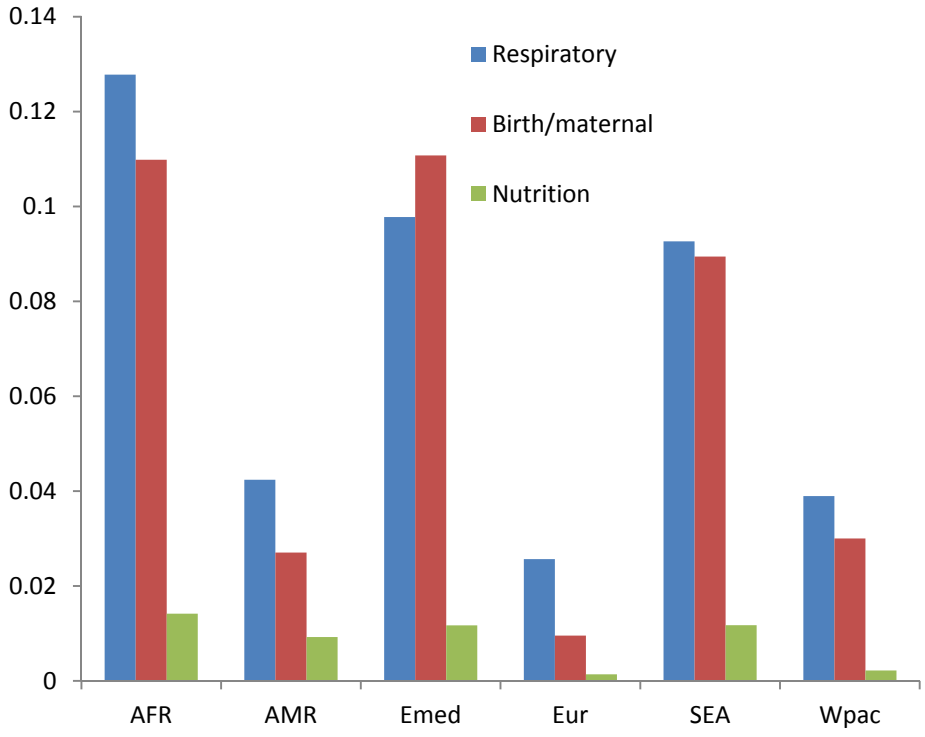
% of annual deaths in a region due to tuberculosis, AIDS, malaria, and cancers

2016

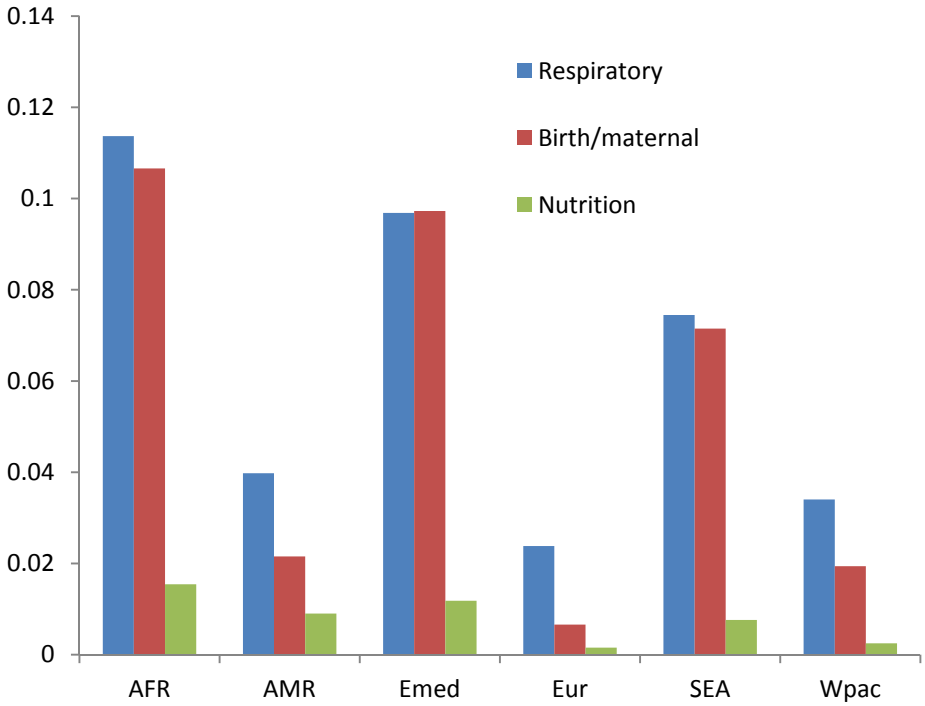


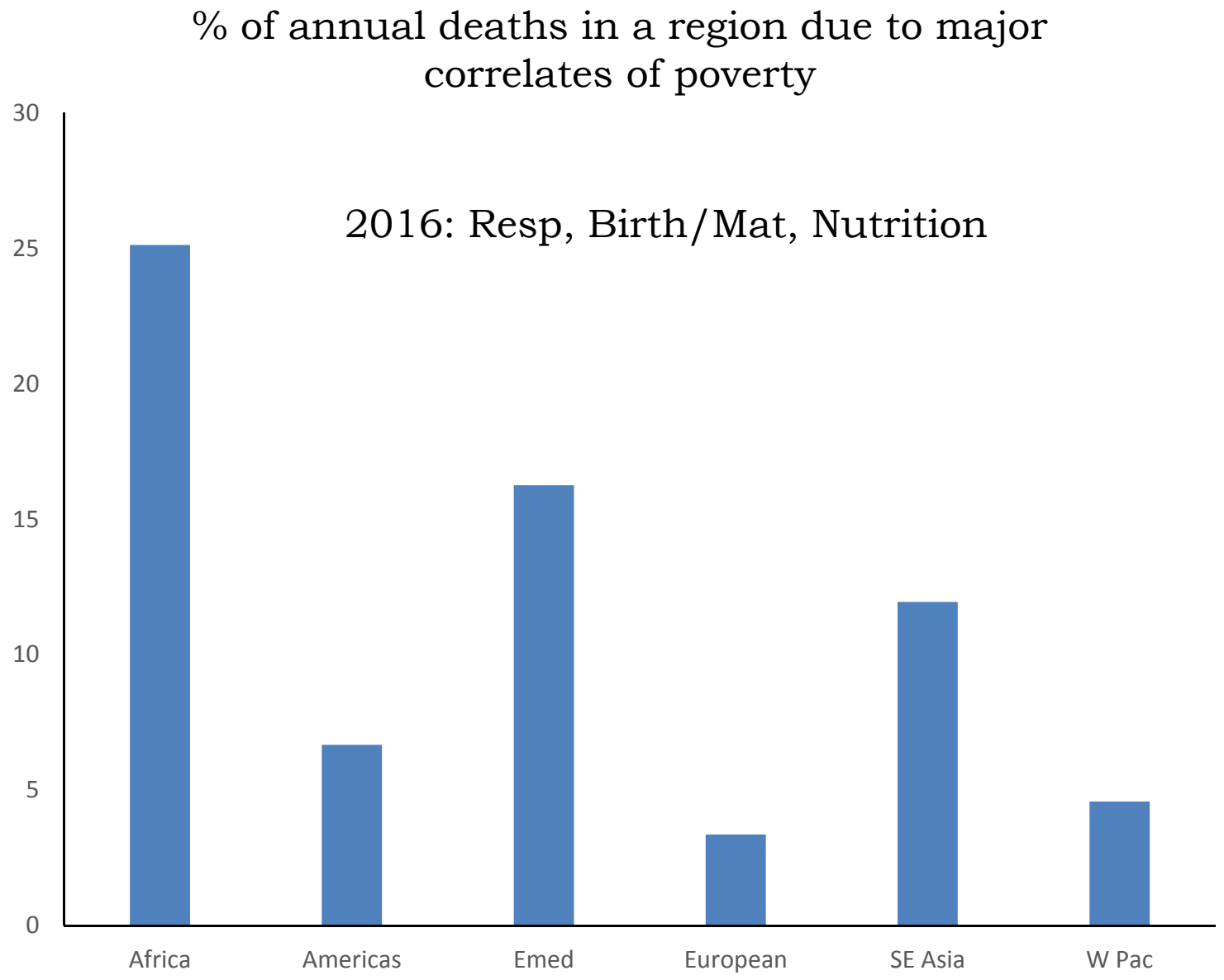
% of annual deaths in a region due to major correlates of poverty

2004

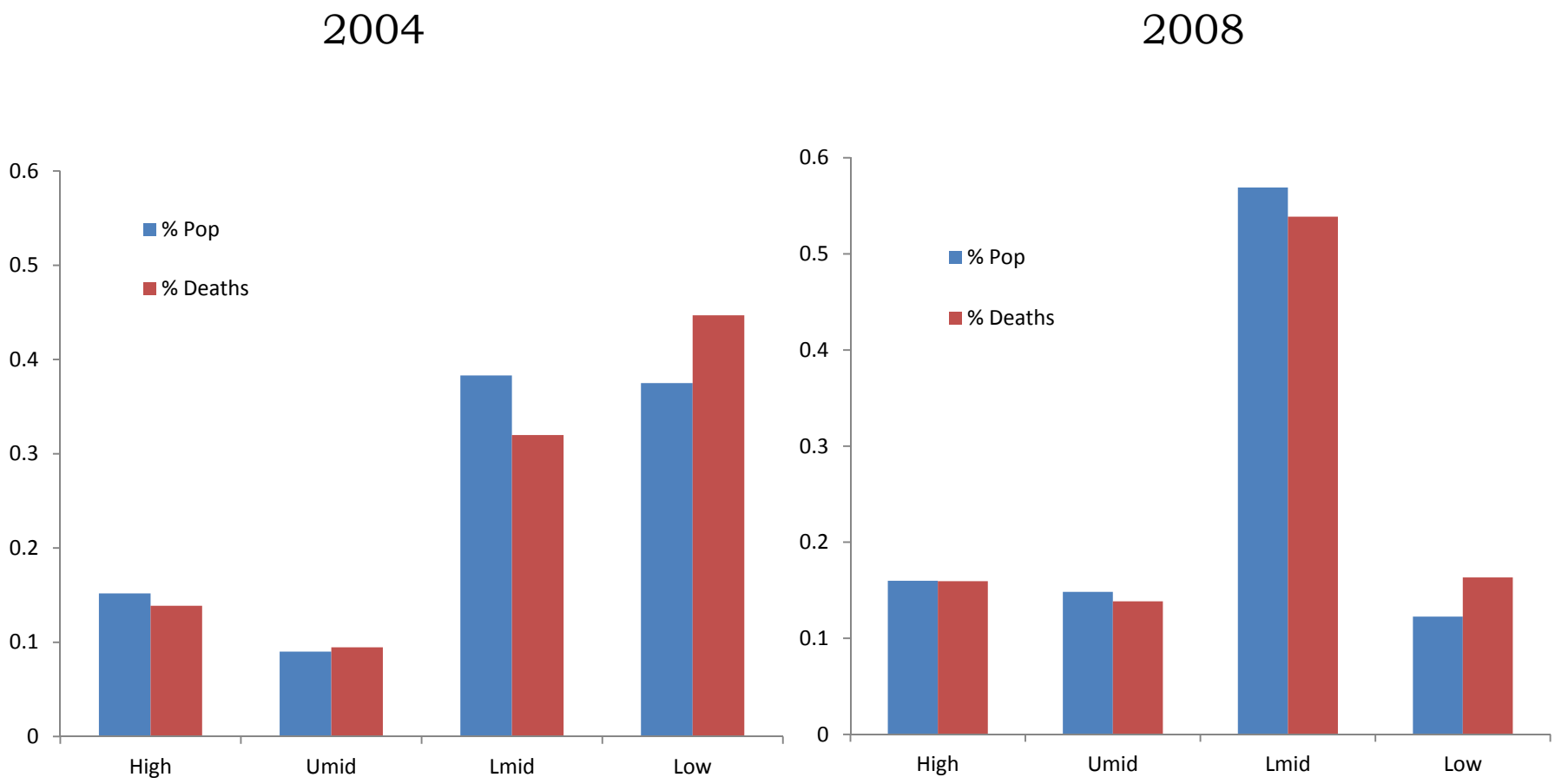


2008



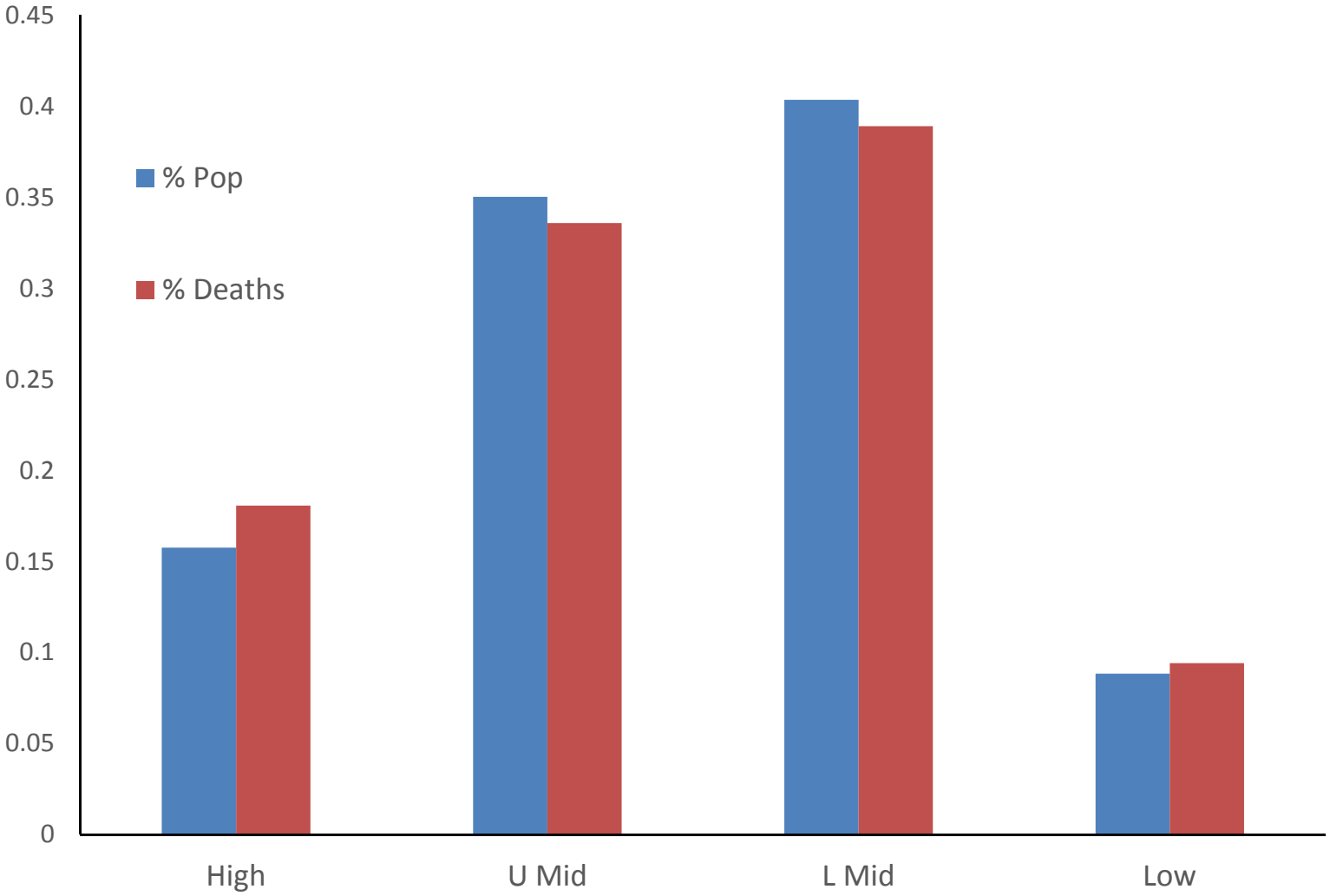

% of annual deaths in a region due to major correlates of poverty
2016: Resp, Birth/Mat, Nutrition
30
25
20
15
10
5
0
Africa
Americas
Emed
European
SE Asia
W Pac

% of global population and annual deaths by national wealth

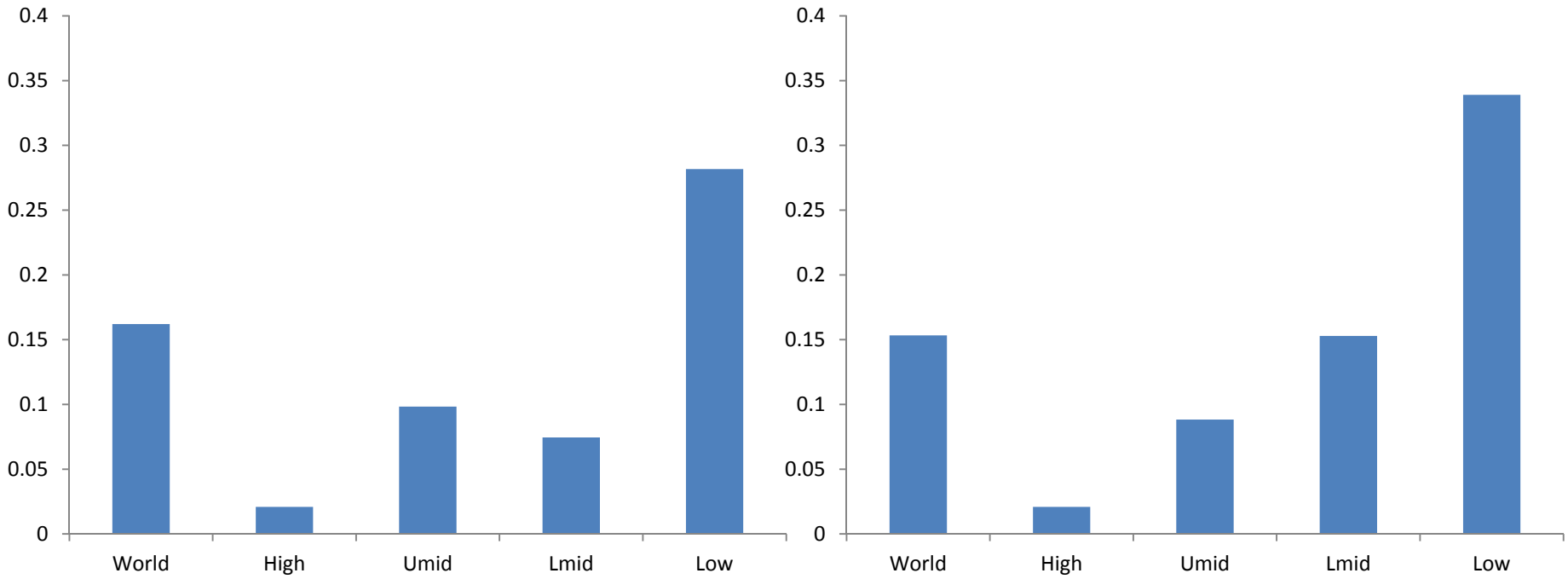


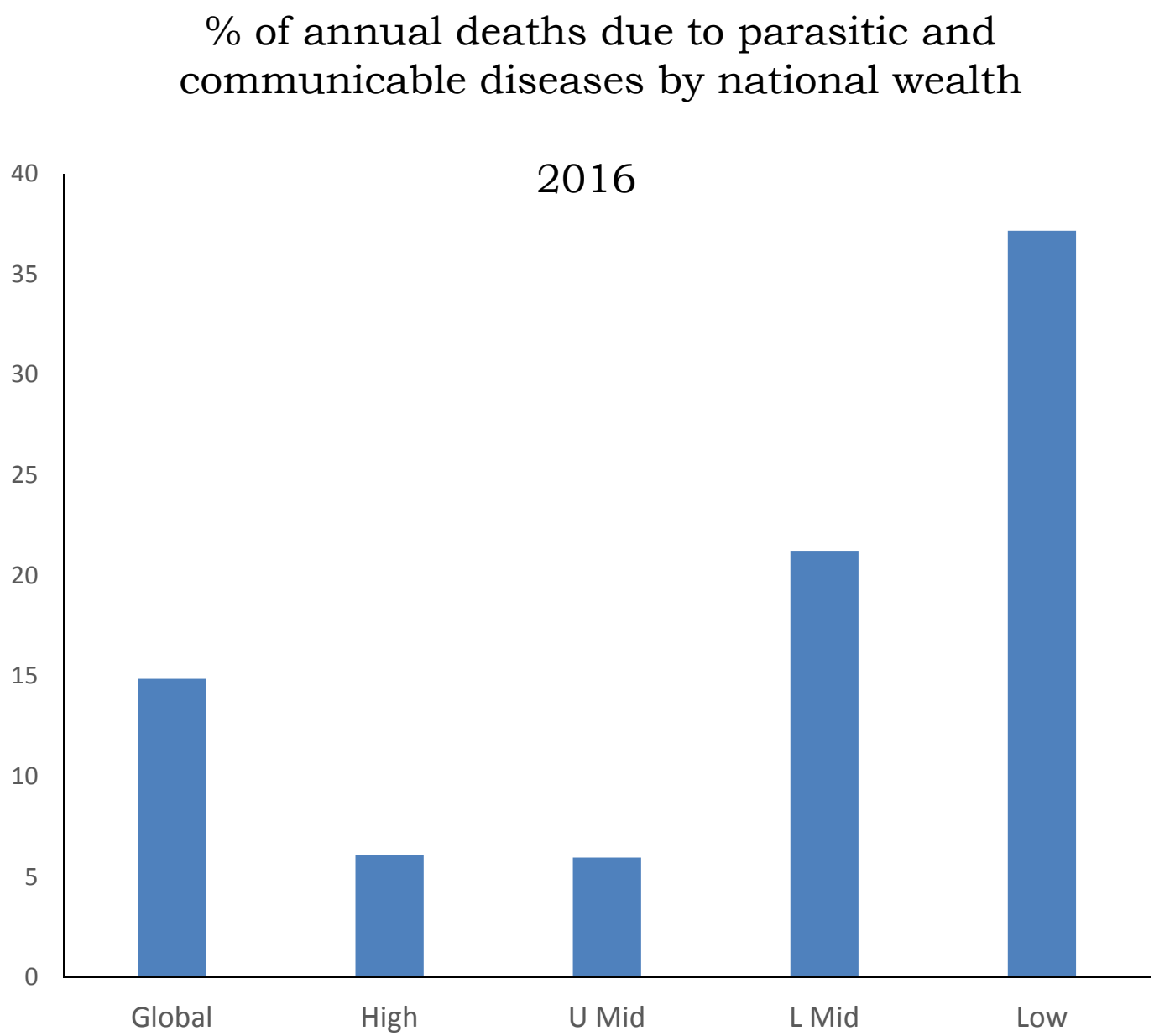
% of global population and annual deaths by national wealth

2016



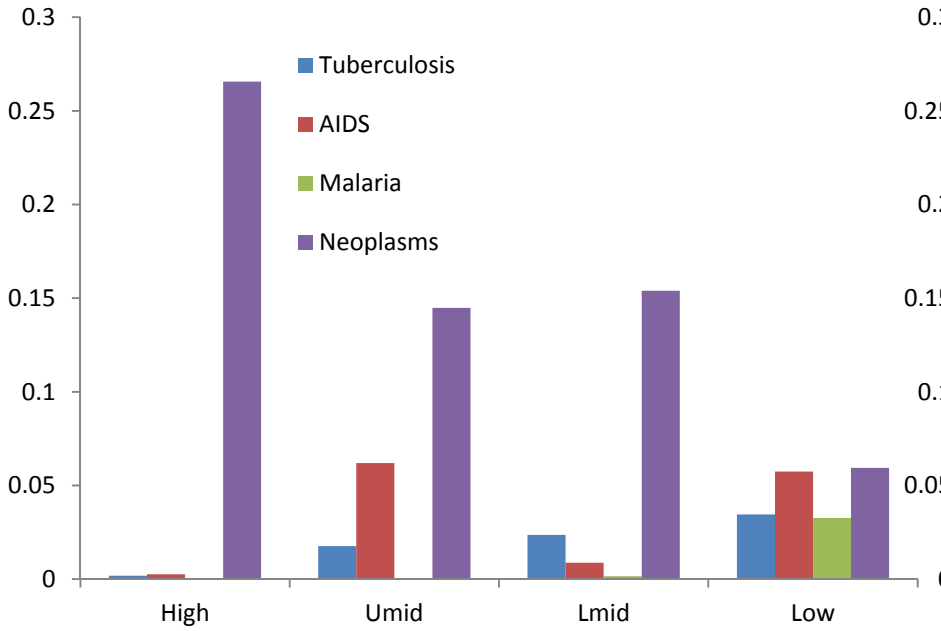
% of annual deaths due to parasitic and communicable diseases by national wealth



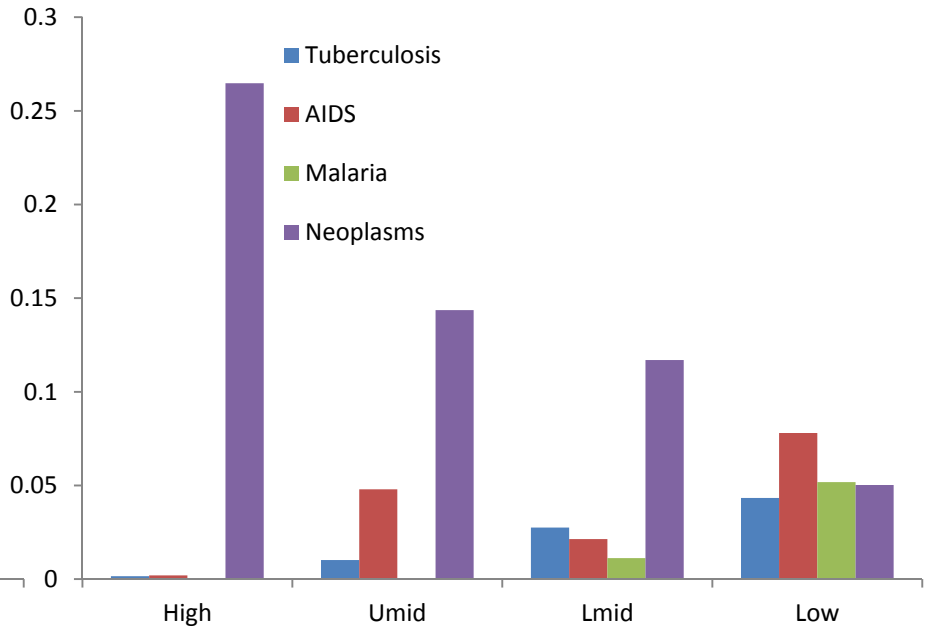

% of annual deaths due to parasitic and communicable diseases by national wealth
2016
40
35
30
25
20
15
10
5
0
Global
High
U Mid
L Mid
Low

% of annual deaths due to tuberculosis, AIDS, malaria, and cancers by national wealth

2004

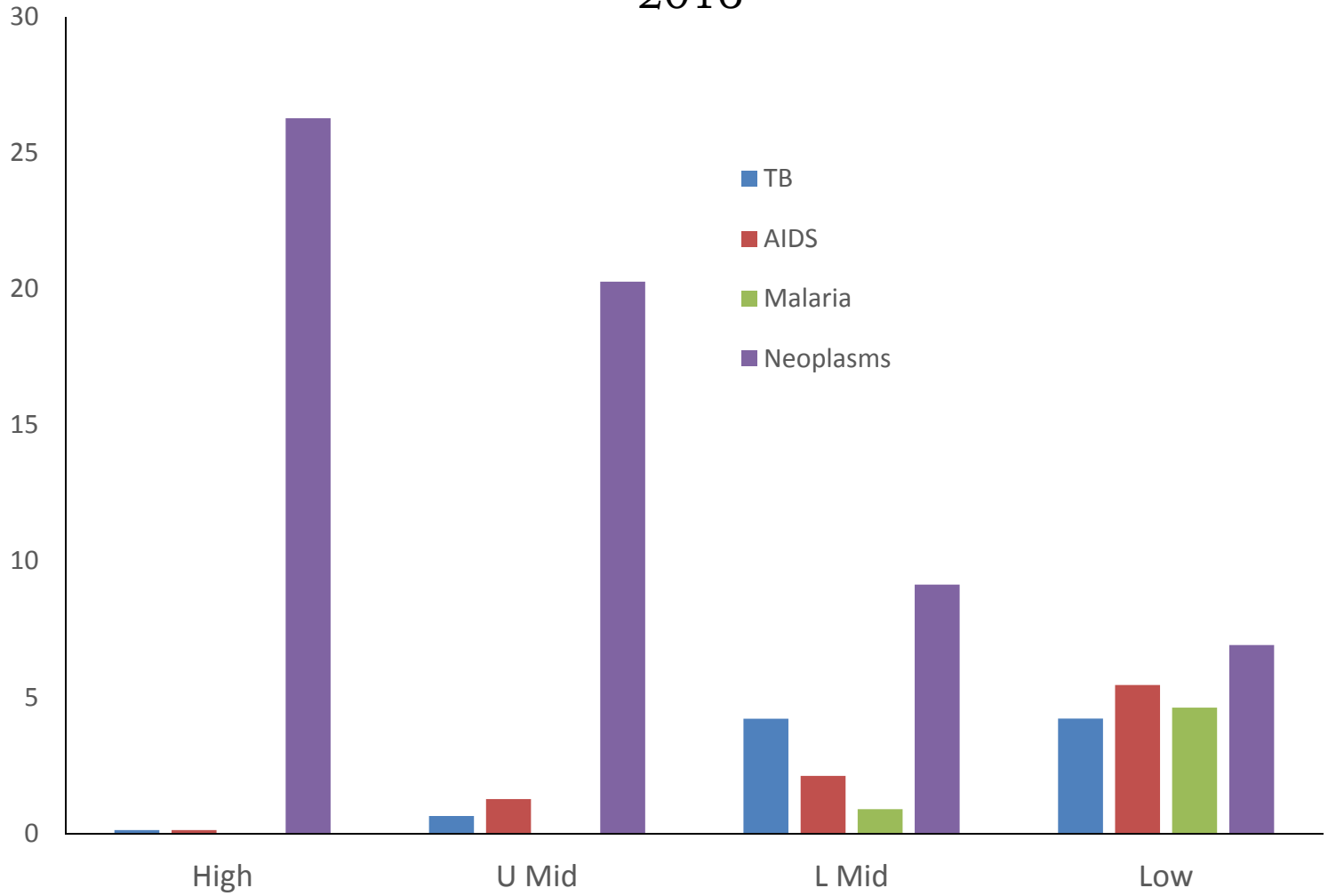


2008

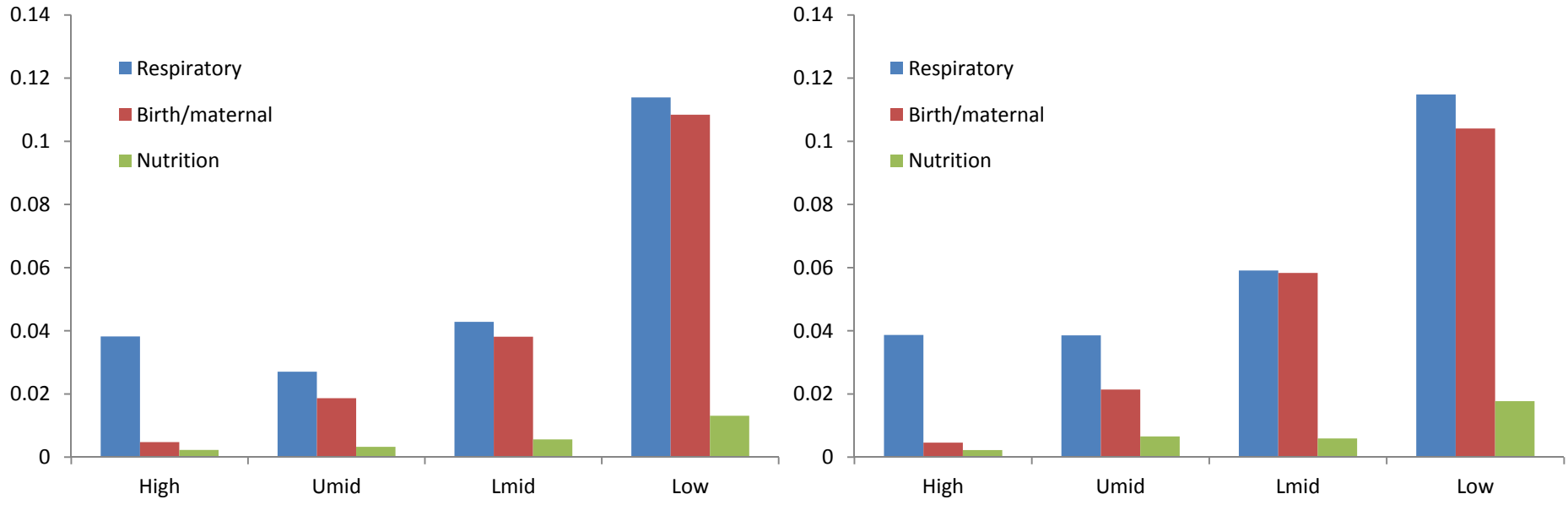


% of annual deaths due to tuberculosis, AIDS, malaria, and cancers by national wealth

2016

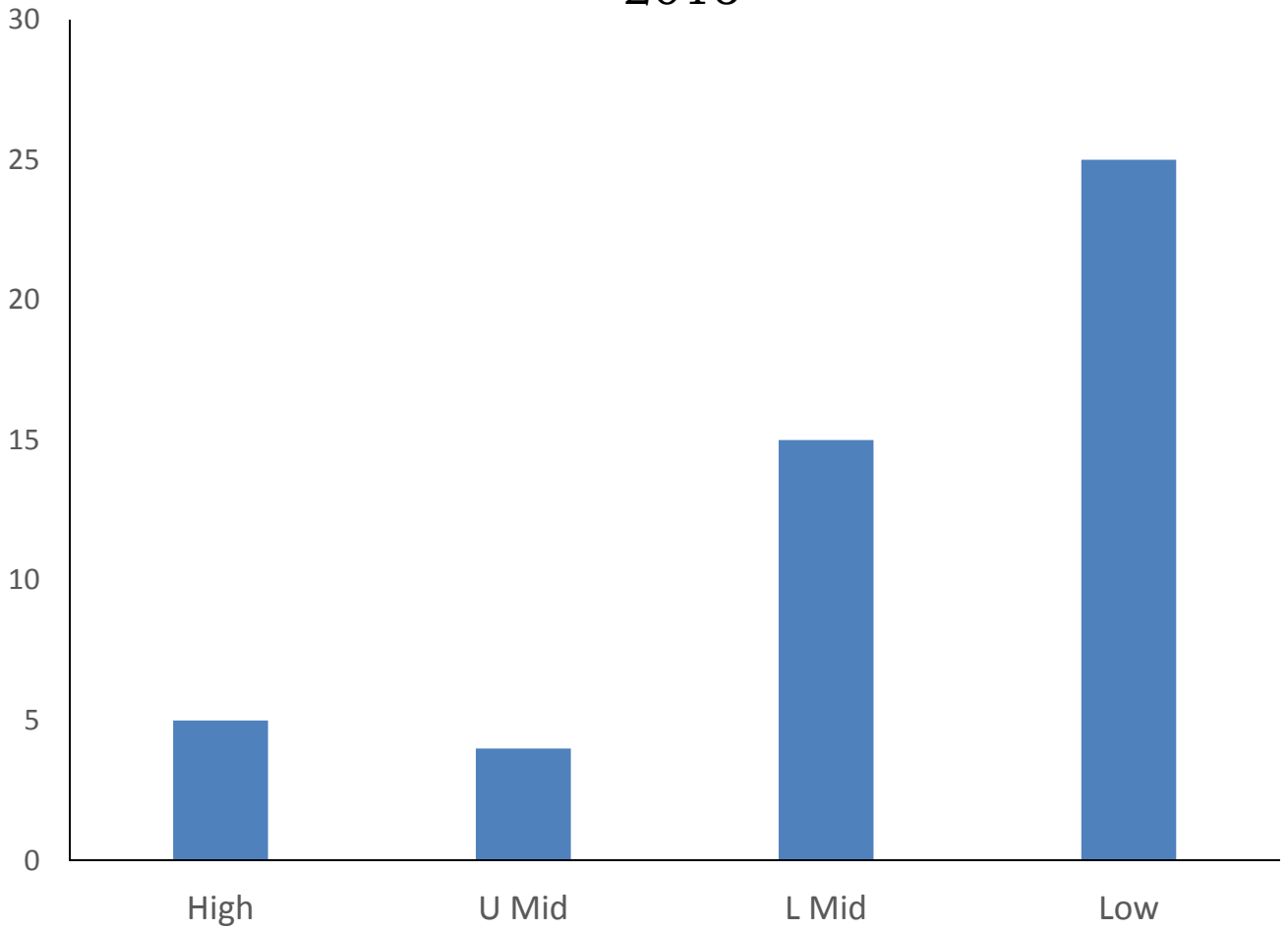


% of annual deaths due to major correlates of poverty by national wealth



% of annual deaths due to major correlates of poverty by national wealth

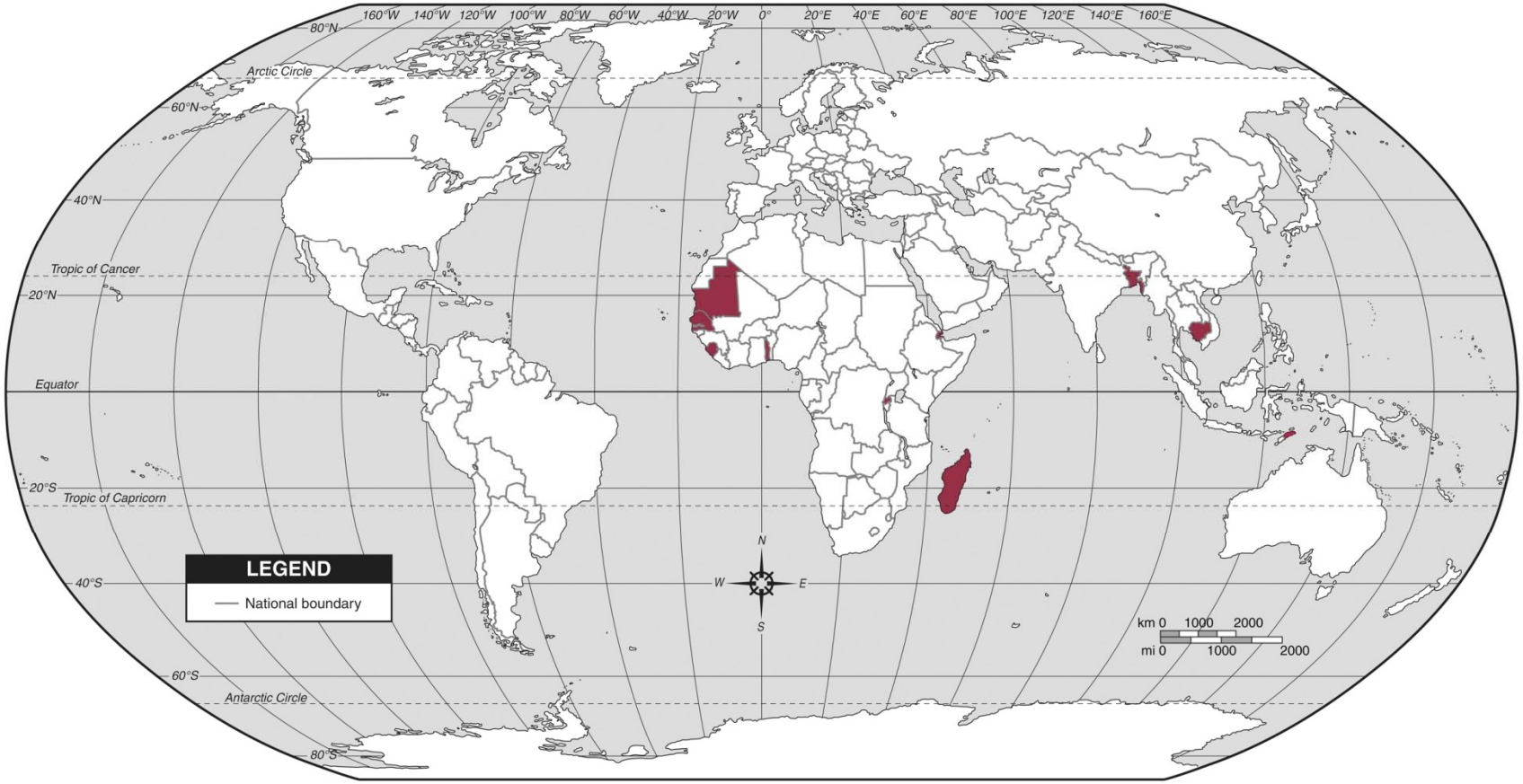
2016



Top 10 countries for tuberculosis deaths (2008)

Timor: 12.7%

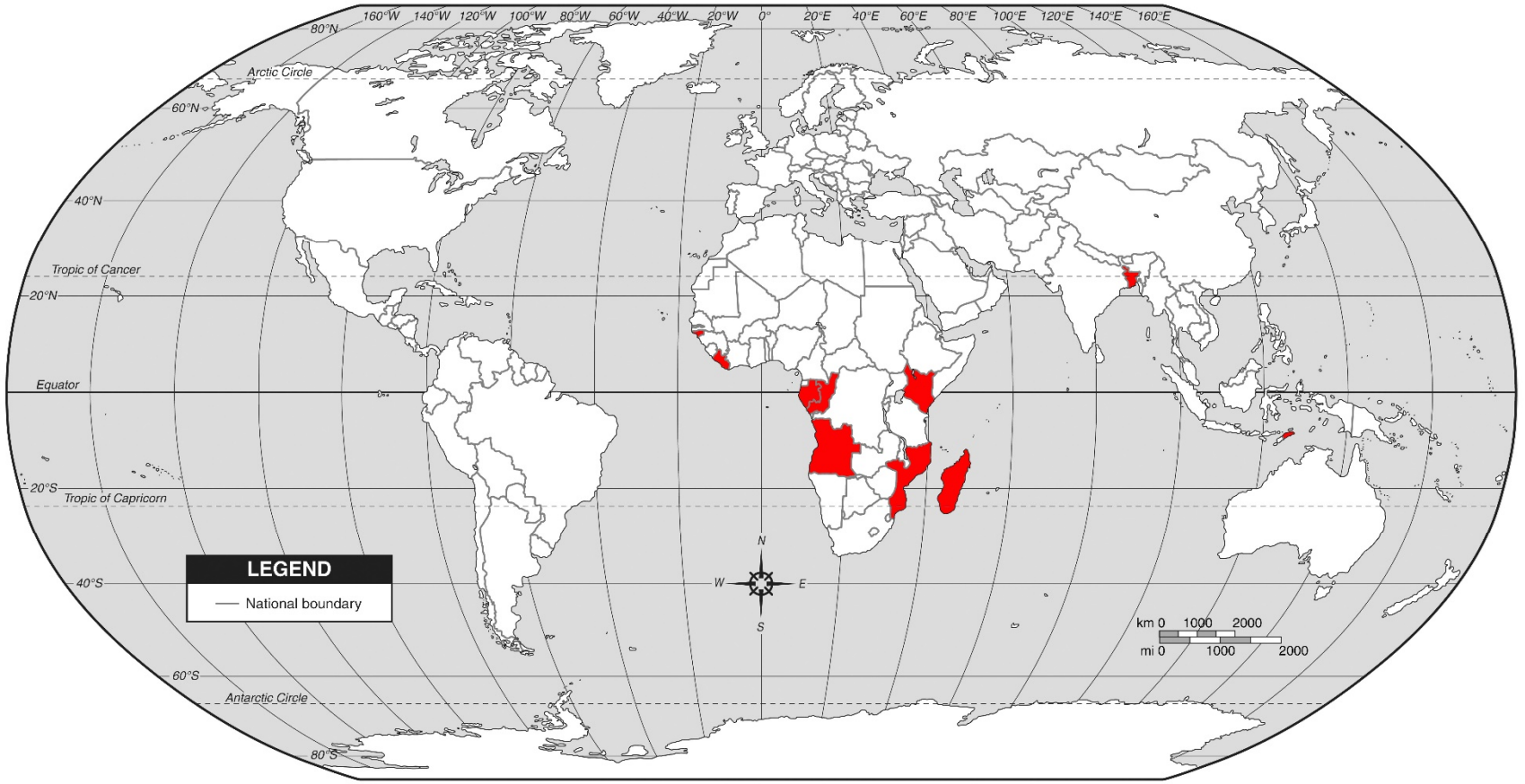
Bangladesh: 7.1%



Top 10 countries for tuberculosis deaths (2016)

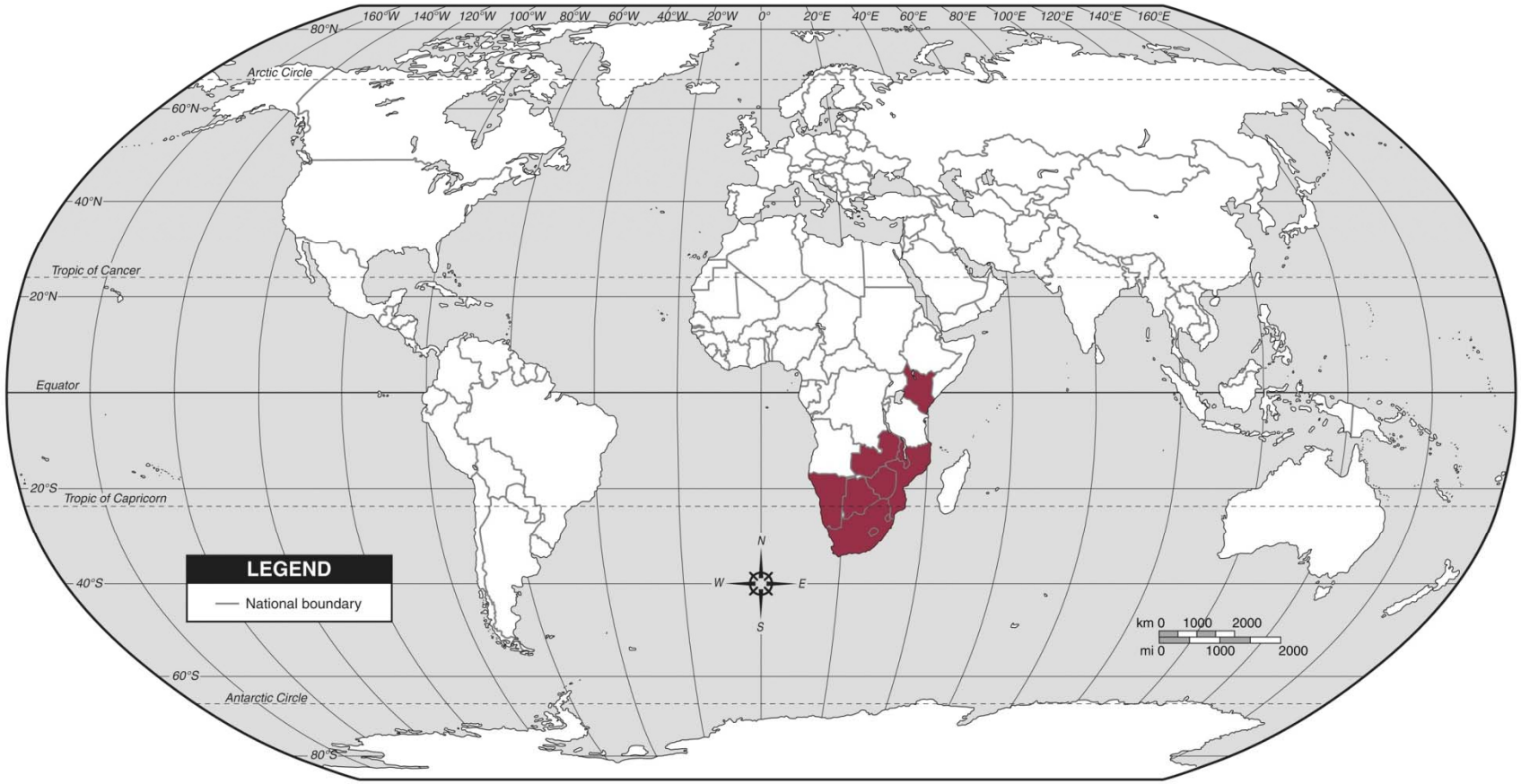
Timor: 16.7%

Mozambique: 7.1%



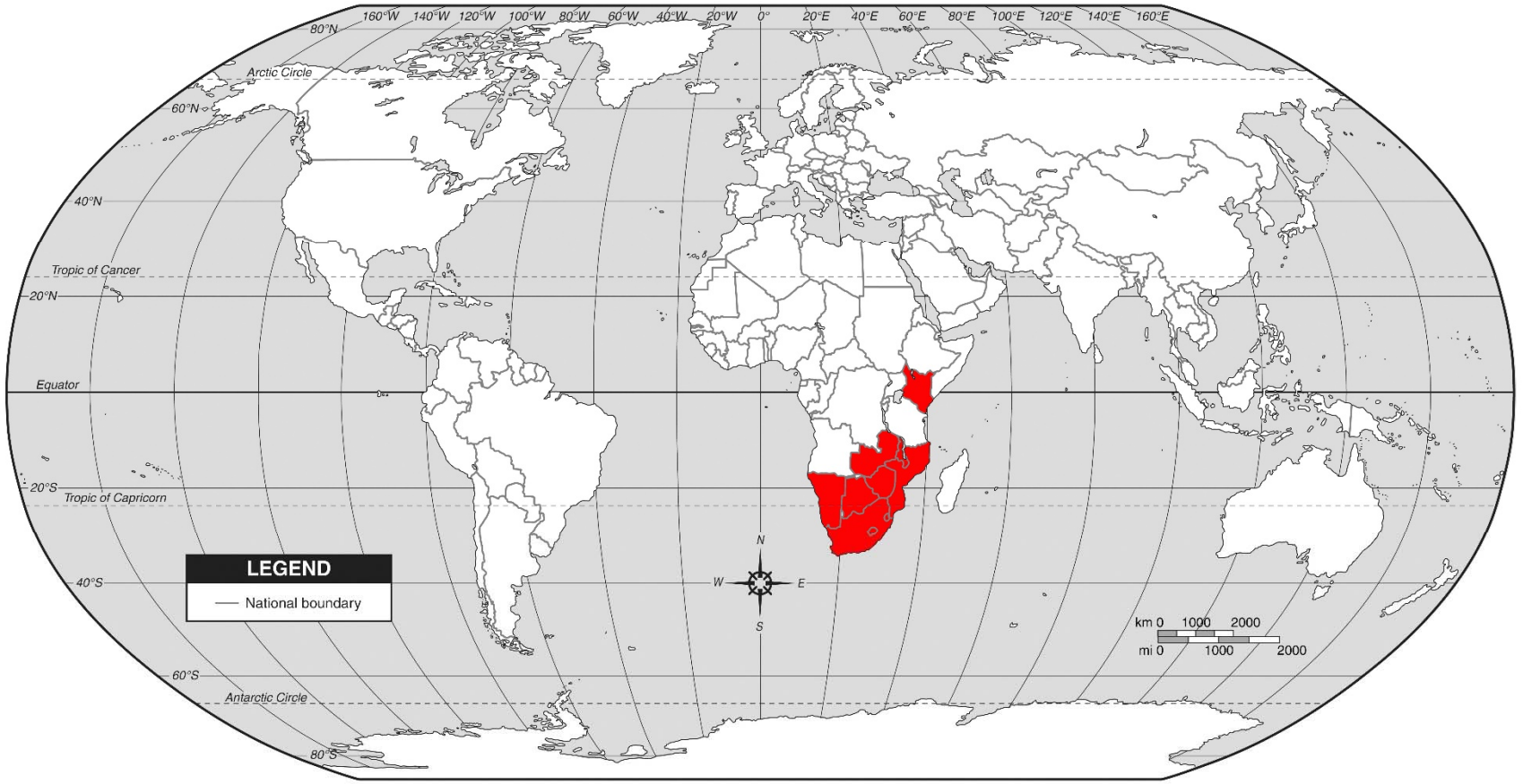
Top 10 countries for AIDs deaths (2008)

Zimbabwe: 50.5%
Mozambique: 20.6%



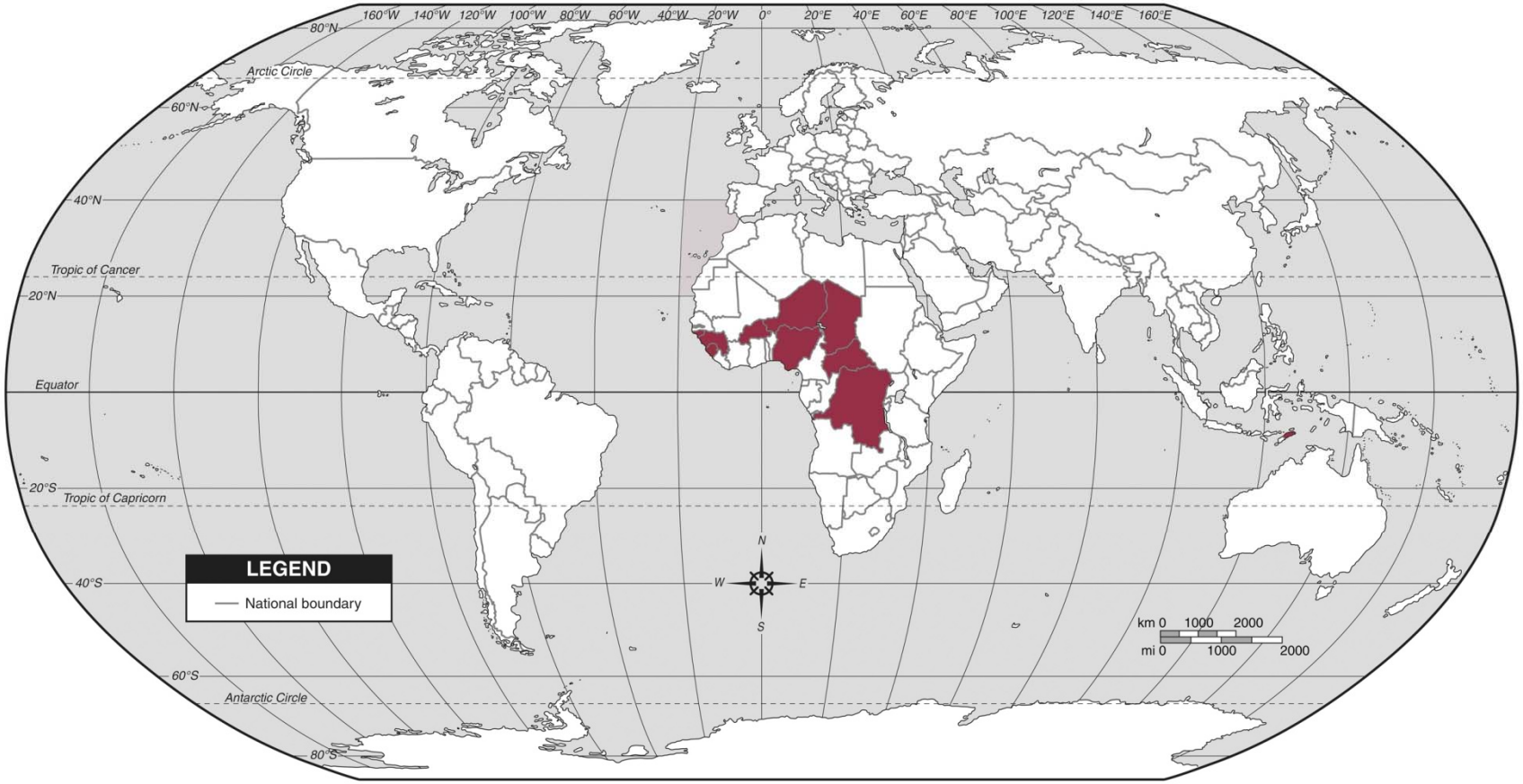
Top 10 countries for AIDS deaths (2016)

Lesotho	33.2%
Kenya	12.6%



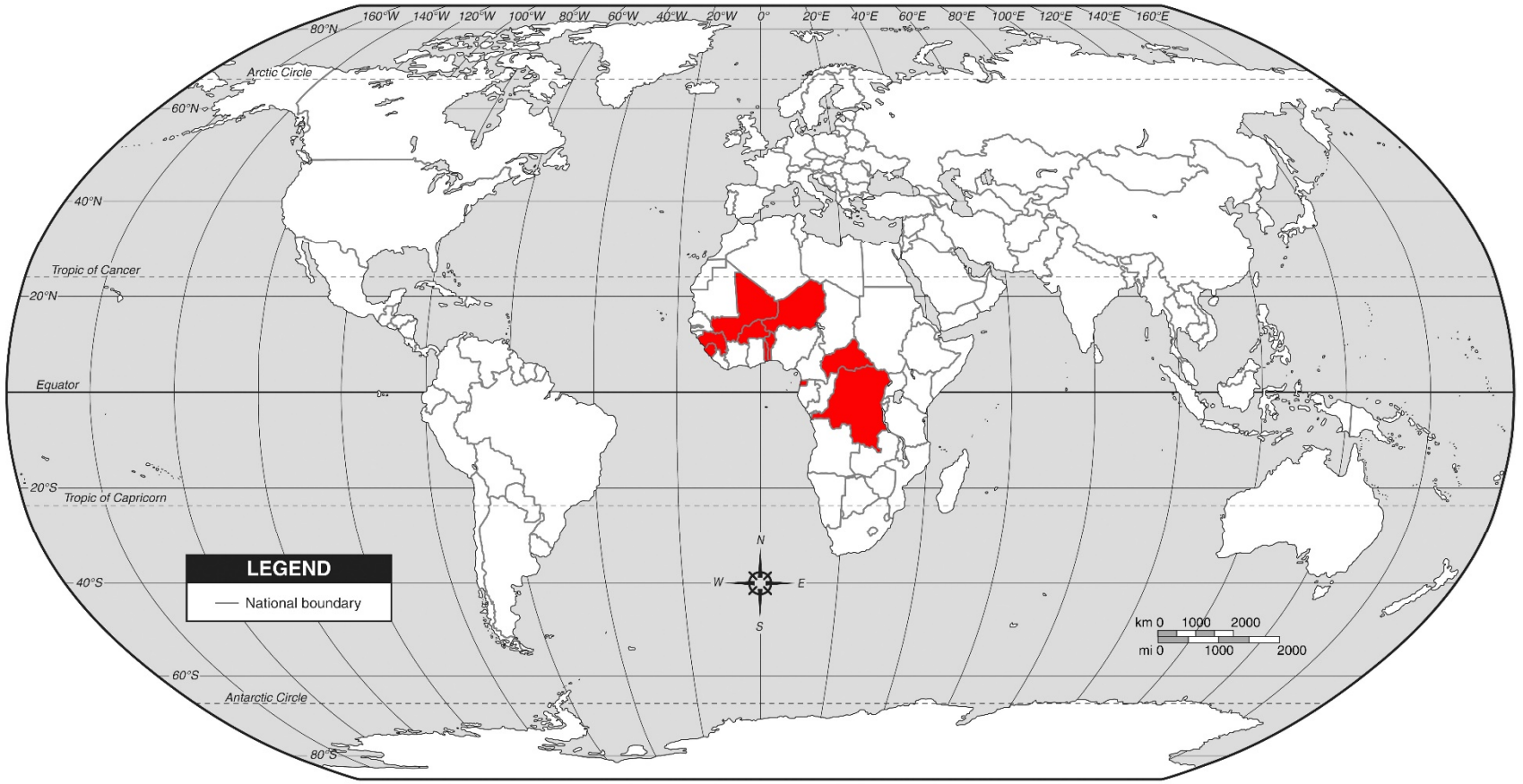
Top 10 countries for malaria deaths (2008)

Burkina Faso: 16.1%
Nigeria: 11.1%



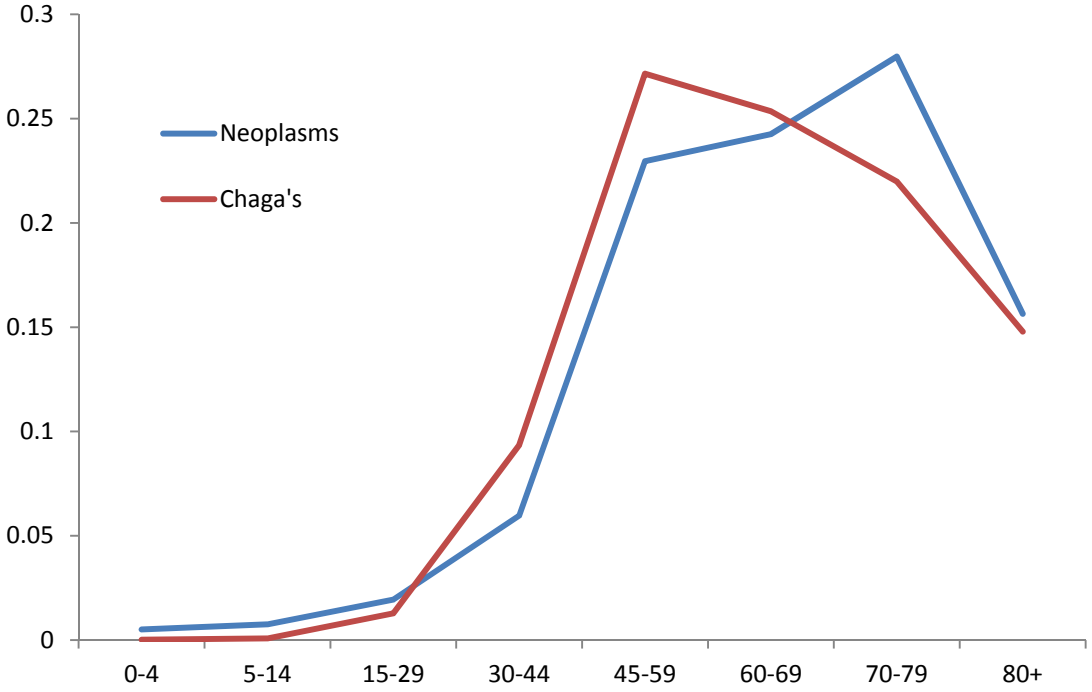
Top 10 countries for malaria deaths (2016)

Burkina Faso	13.4%
C. Afr. Rep	6.2%



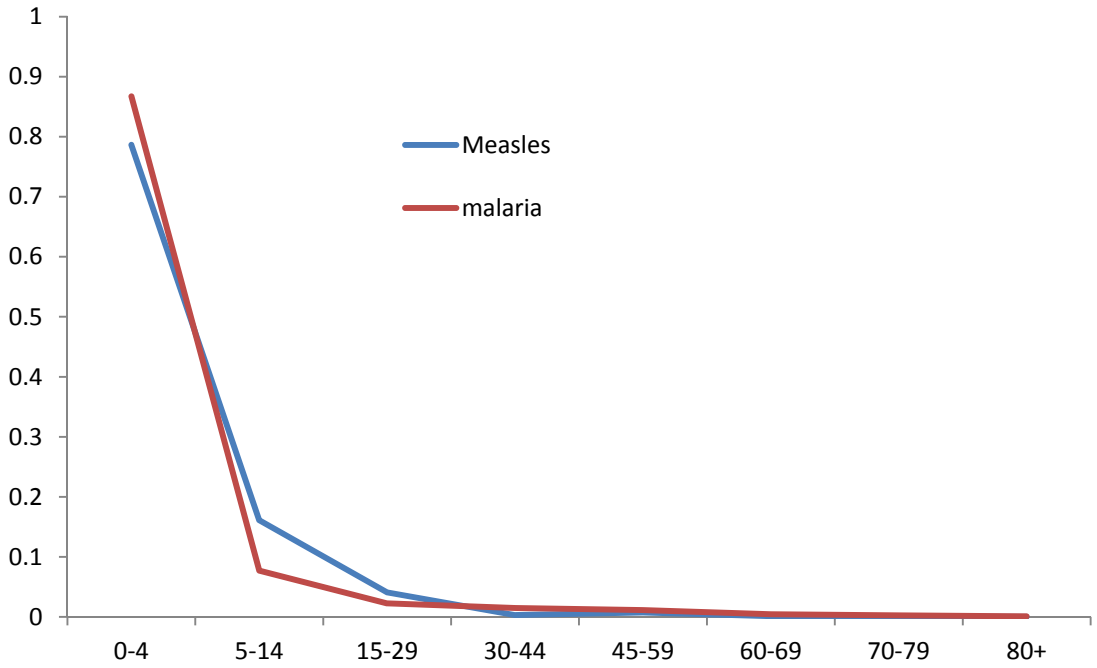
% of deaths caused by a disease occurring in different age classes

Increase with age



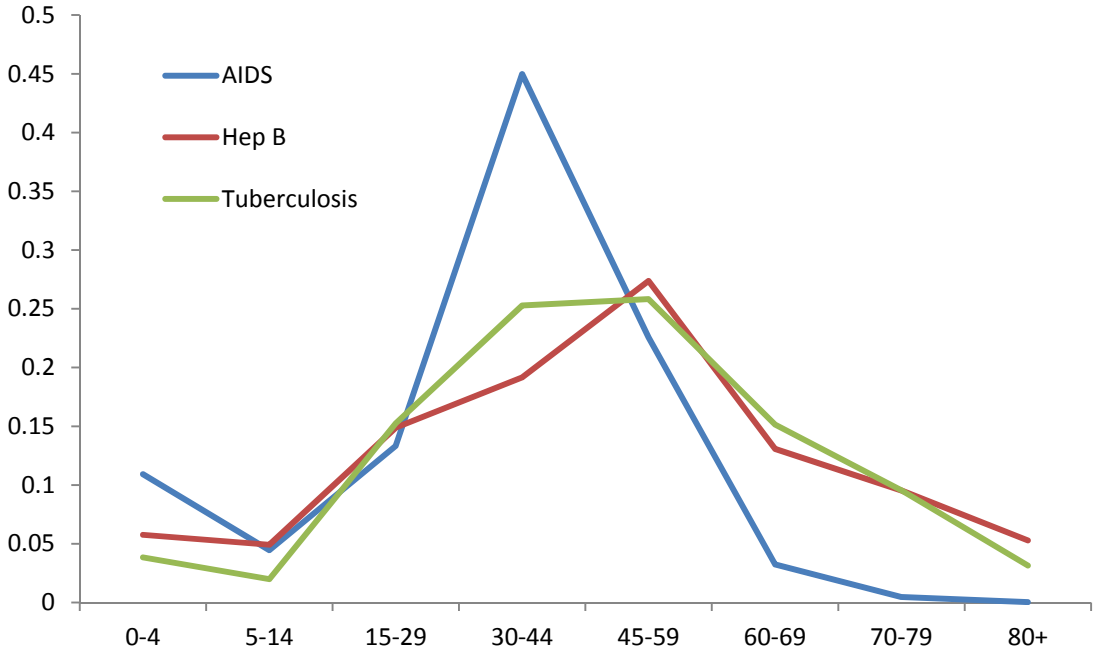
% of deaths caused by a disease occurring in different age classes

Decrease with age



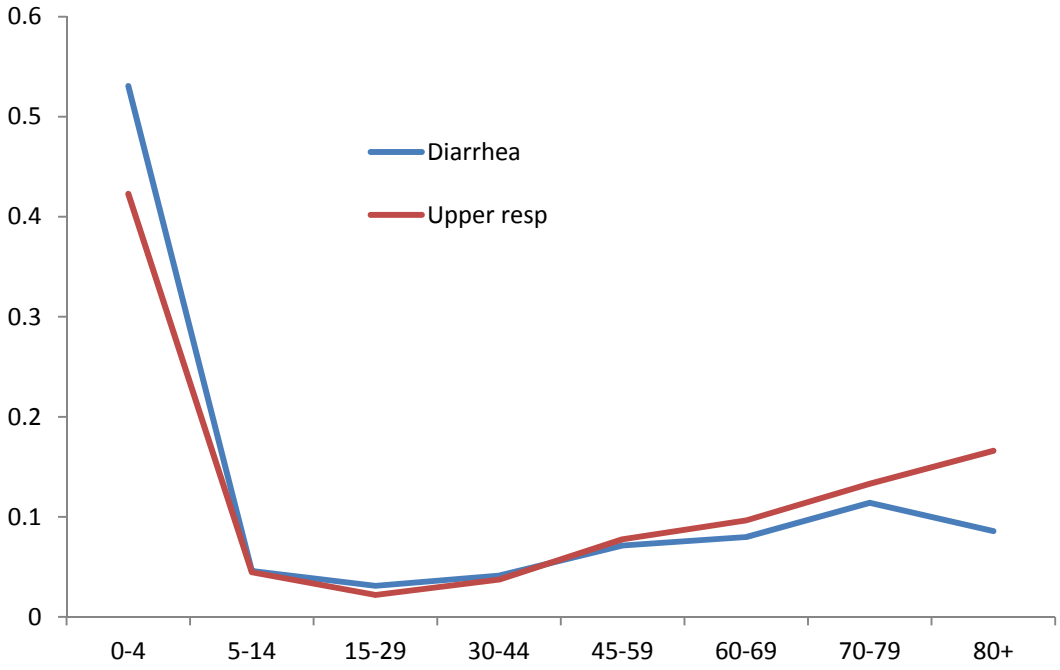
% of deaths caused by a disease occurring in different age classes

High in mid ages



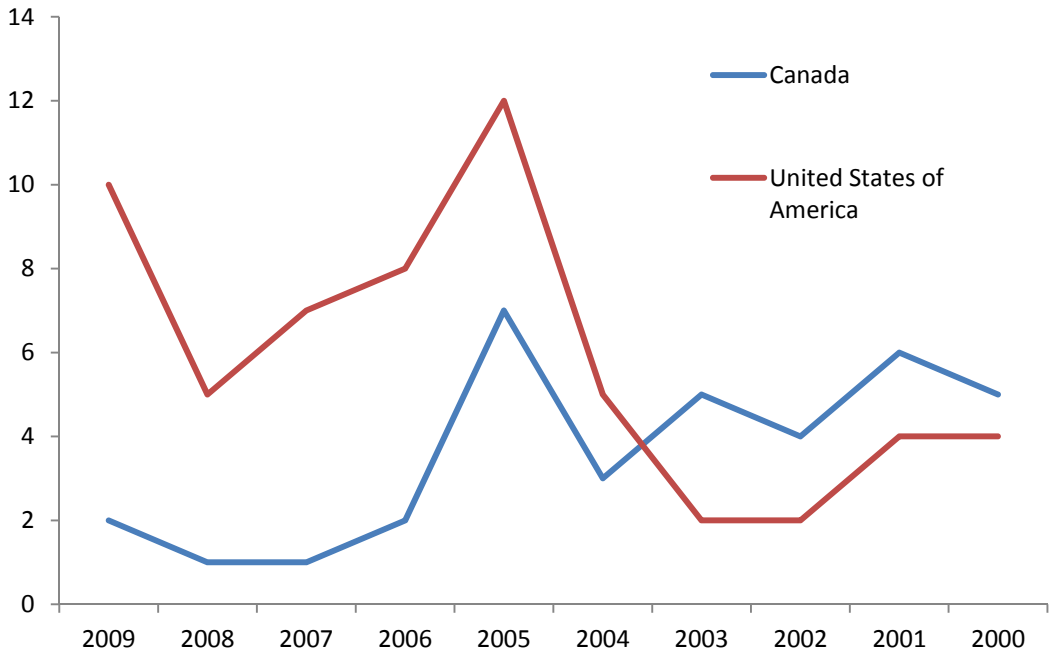
% of deaths caused by a disease occurring in different age classes

Low in mid ages



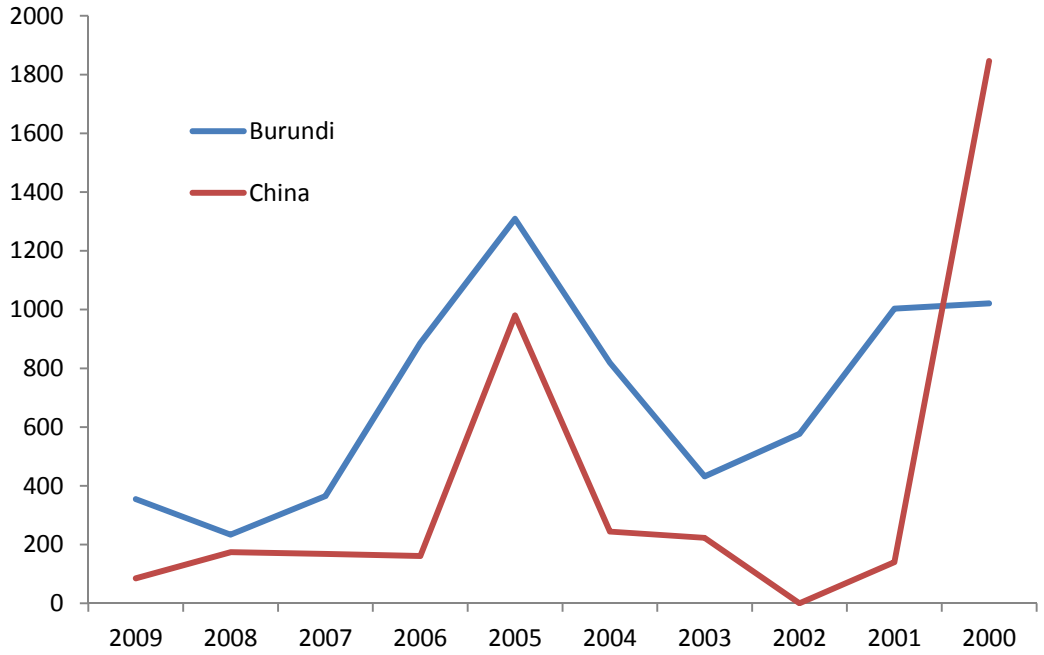
of new cases of cholera by country

Low and imported



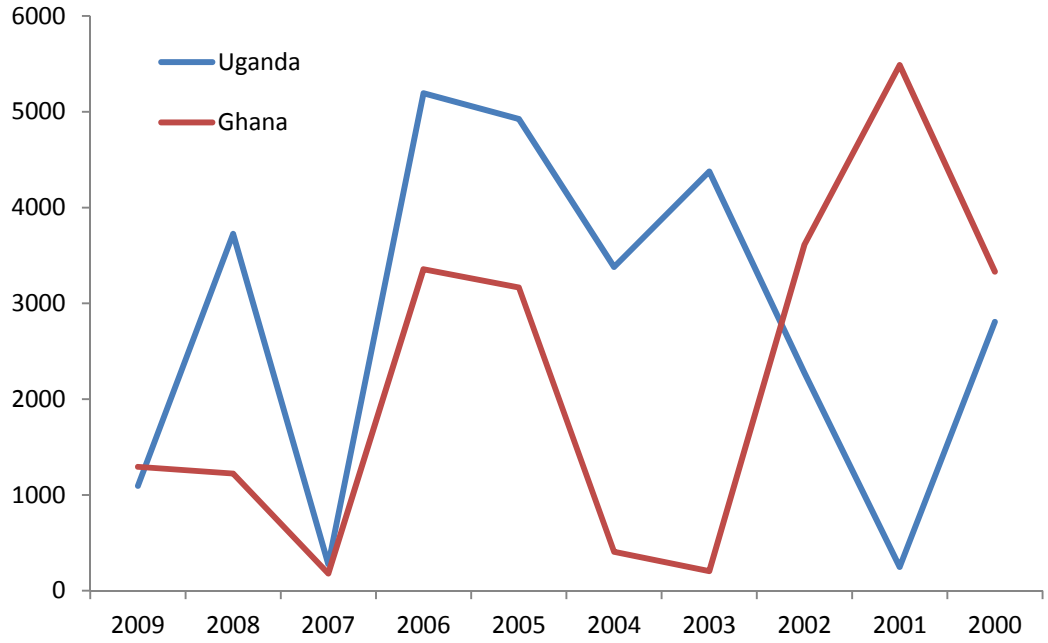
of new cases of cholera by country

Low and endemic



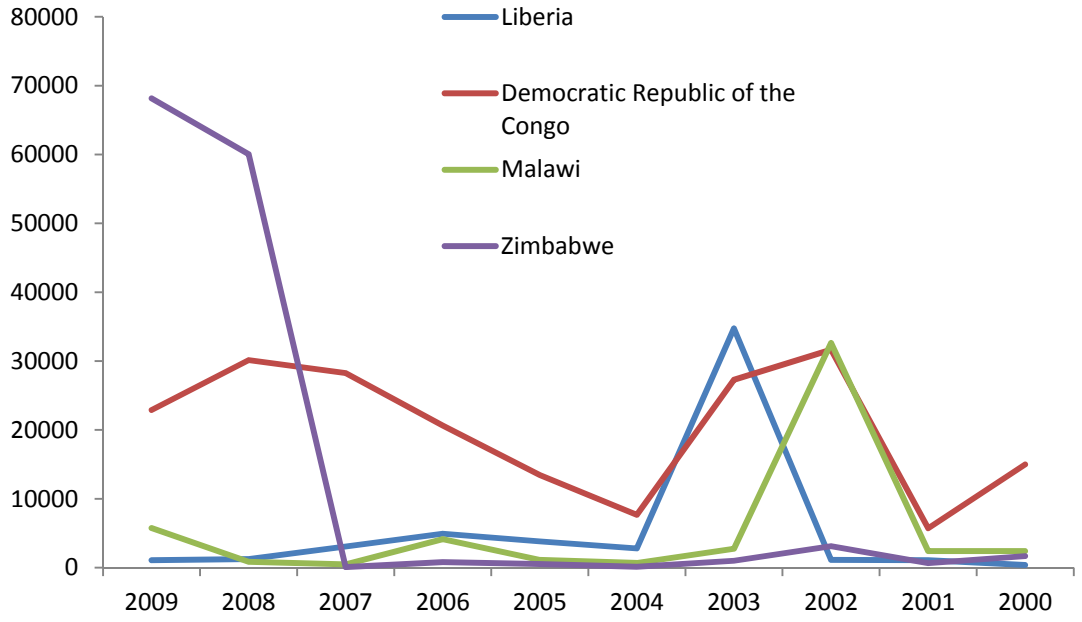
of new cases of cholera by country

High and endemic



of new cases of cholera by country

Epidemic



Life expectancy at birth

Zimbabwe

1990:	60.8
2009:	49.0

Lesotho

1990:	60.1
2009:	48.2

Canada

1990:	77.1
2009:	81.2

United States

1990:	75.3
2009:	78.5

Disease Name	**Etiological Agent**	**Mode of Transmission to Humans**	**Life Cycle**	**Geographical Distribution**	**Pathology and Mortality**
Yellow Fever	RNA virus	Bite of mosquito	Coincident with mosquito vector; can be epidemic	Tropical and subtropical Africa and South America	Liver damage and bleeding
Smallpox	*Variola* spp. (virus)	Airborne and fluid-borne	N/A	Worldwide	Skin lesions; invasion of visceral organs
Influenza	Influenza viruses	Airborne and fluid-borne	Seasonal outbreaks, usually most intense in winter	Worldwide	Cellular destruction in respiratory tract
AIDS	Human immunodeficiency Virus	Sexual intercourse; exchange of fluids	N/A	Worldwide	Destruction of T-cells of immune system leading to immunodeficiency
Plague	*Yersinia pestis* (bacterium)	Bite of flea associated with plague-infested rodents	Coincident with rodent-human interactions; can be epidemic	Worldwide	Destruction of cells of lymph and other areas
Cholera	*Vibrio cholerae* (bacterium)	Ingestion of bacteria in contaminated water or food	Seasonal epidemics, with semi-global pandemics yearly	Worldwide	Destruction of intestinal lining.
Tuberculosis	*Mycobacterium tuberculosis* (bacterium)	Airborne and fluid-borne	N/A	Worldwide, with epidemics in poor countries, especially in Africa and Asia	Destruction of lung tissue; tubercle formation; blood involvement
Leprosy	*Mycobacterium leprae* (bacterium)	Airborne in droplets of fluid	N/A	Worldwide, with epidemics in Africa, Asia, and S. America	Destruction of nerve cells and surrounding tissues
Syphilis	*Treponema pallidum* (bacterium)	Sexual intercourse	N/A	Worldwide	Chancres and sores externally; neurological damage

Disease Name	**Etiological Agent**	**Mode of Transmission to Humans**	**Life Cycle**	**Geographical Distribution**	**Pathology and Mortality**
Malaria	*Plasmodium* species (protozoa)	Bite of female anopheline mosquito infected with *Plasmodium* spp.	Coincident with life cycle of local mosquitoes; can be epidemic	Mostly tropical and subtropical Africa, S. America, Asia, and Atl./Pac. Islands	RBC destruction (anemia); neurological damage; kidney damage
Kala azar	*Leishmania donovoni* (protozoa)	Bite of sandfly, *Phlebotomus*	Coincident with life cycle of local sandflies; can be epidemic	Mostly tropical and substropical, esp. India, S. America, and Middle East	Destruction of cells in liver and spleen causing eventual rupture of these organs
African Sleeping Sickness	*Trypanosoma* species (protozoa)	Bite of tsetse fly, *Glossina*	Coincident with life cycle of tsetse flies; can be epidemic	Limited to African continent by range of tsetse fly vectors	Destruction of neurological and lymph tissues
Schistosomiasis	*Schistosoma* species (trematodes)	Invasion of skin by cercariae shed from snail	Eggs passed via feces/urine; snail infected; cercariae released from snail	Mostly tropical and subtropical, with foci in Africa, S. America, and SE Asia	Destruction of intestinal and urinary tissues; other tissues may be destroyed
Hookworm disease	*Necator americanus* or *Ancylostoma duodenale* (nematode)	Invasion of skin by larvae in soil	Eggs passed via feces in soil; juveniles develop in soil	Worldwide, but abundant only in warm, moist areas	Anemia due to ingestion of blood; tissue damage of intestine