



World Health
Organization

The Global Burden of Foodborne Disease: **Overview and Implications**

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Summary

- ▶ FERG: why, what, how?
- ▶ Global overview of burden of foodborne disease
- ▶ Regional differences
- ▶ Policy implications
- ▶ Conclusions

Why estimate the global burden of foodborne disease?

- ▶ Foodborne diseases are highly visible: outbreaks, contamination events
- ▶ FBD cause considerable morbidity and mortality
- ▶ Full extent of FBD not documented
- ▶ FBD not a risk factor in studies on global burden of disease
- ▶ FBD are complex: numerous hazards, numerous health outcomes, effects on different time scales
- ▶ Limited data availability
- ▶ Food is not the only transmission pathway of many food-related hazards

Objectives and structure

▶ WHO Initiative to Estimate the Global Burden of Foodborne Diseases (2006)

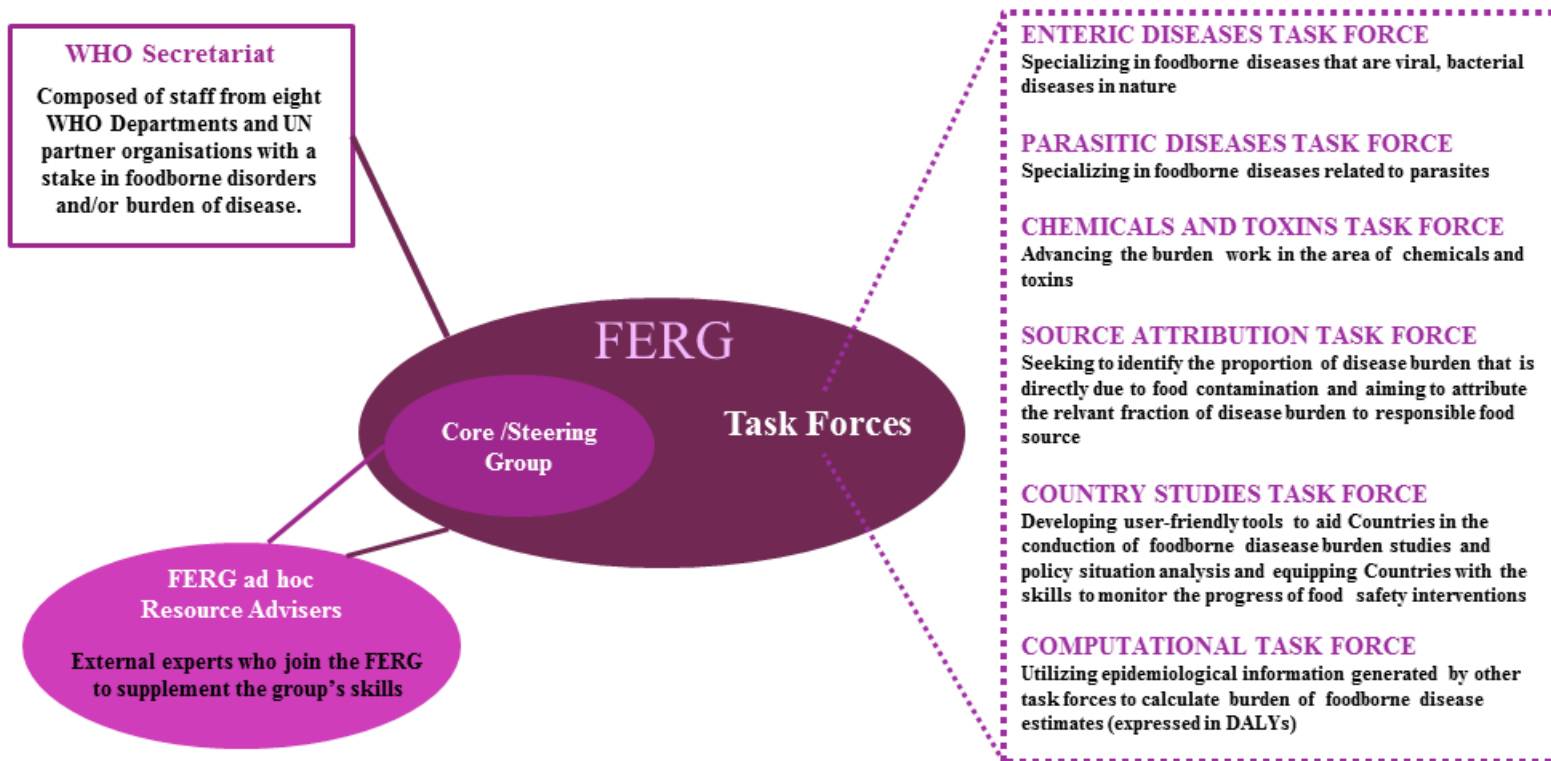
- ▶ strengthen country capacity of to assess burden of FBD
- ▶ increase number of countries who have studied burden of FBD
- ▶ estimates of global burden of FBD, according to age, sex and region
- ▶ increase awareness and commitment to implement food safety standards
- ▶ encourage to use burden of FBD to set evidence-informed policies

▶ Foodborne Disease Burden Epidemiology Reference Group (FERG) (2007)

- ▶ reviews of mortality, morbidity and disability associated with FBD
- ▶ model FBD burden where data are lacking
- ▶ source attribution models to estimate proportion of disease that is foodborne
- ▶ user-friendly tools for studies of burden of FBD at country level

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- ▶ The Global Burden of Foodborne Disease: Overview and Implications

FERG structure



FERG: methods

- ▶ Global estimates for 31 hazards
 - ▶ 11 acute diarrheal disease; 7 invasive infectious disease; 10 helminths; 3 chemical
- ▶ Estimates for high-income countries for 4 hazards
 - ▶ 4 bacterial toxins; 1 allergen
- ▶ Estimates for 5 chemicals on-going
- ▶ Full (systematic reviews) for all hazards
- ▶ Imputation and expert knowledge to fill data gaps
- ▶ Estimated incidence, mortality and DALYs for 2010
- ▶ Structured expert judgment for source attribution
- ▶ Methods compliant with WHO methodology for assessment of global burden of disease

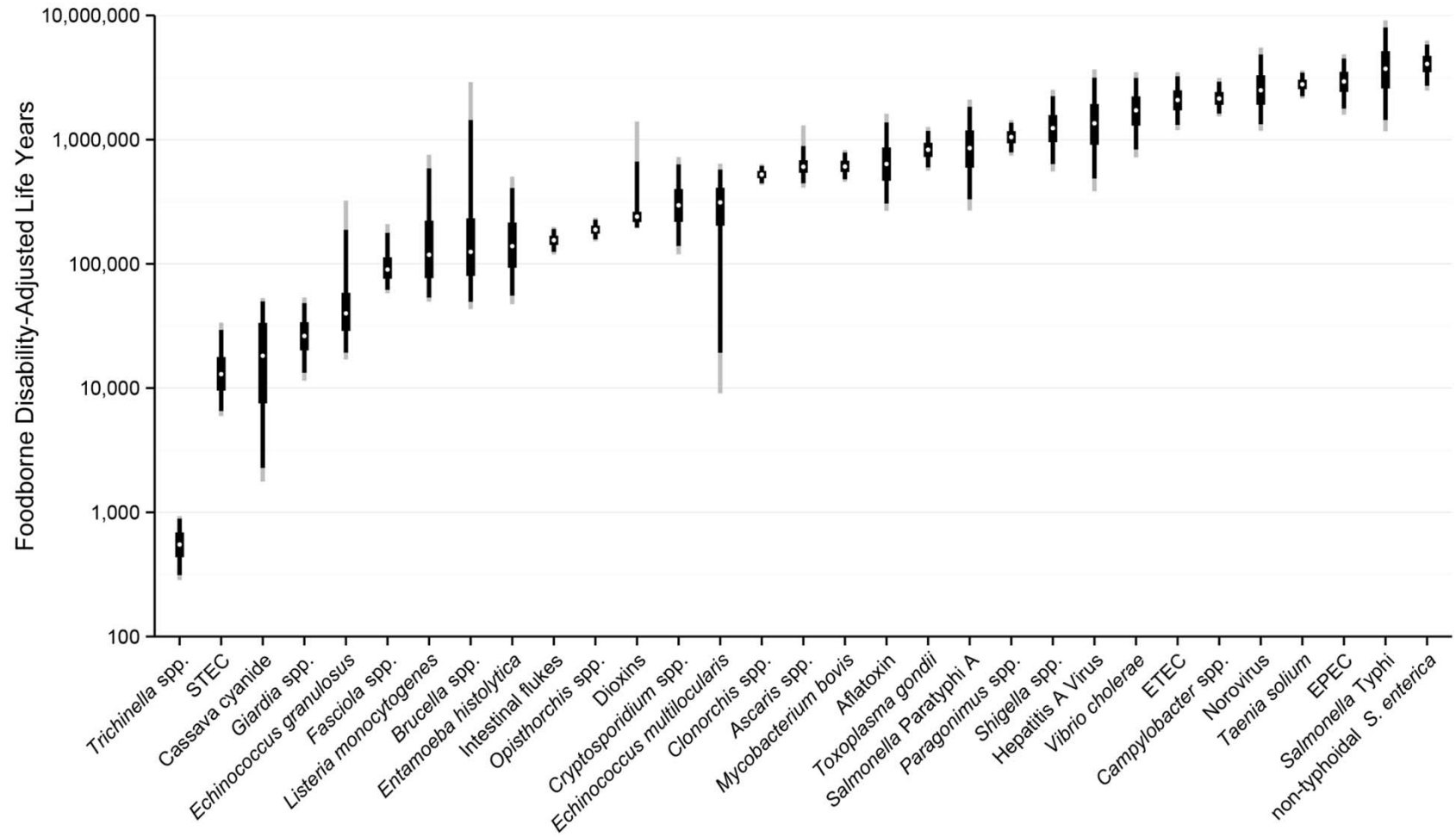
Global burden of foodborne disease

Hazard group	Foodborne illnesses (millions)	Foodborne deaths (thousands)	Foodborne DALYs (millions)
All	600	420	33
Diarrheal	549	230	18
Invasive	36	117	8
Helminths	13	45	6
Chemicals	0.2	19	0.9

Most frequent causes of global

- ▶ Foodborne illnesses: norovirus, *Campylobacter* spp.
- ▶ Foodborne deaths: non-typhoidal *Salmonella enterica*, *Salmonella* Typhi, *Taenia solium*, hepatitis A virus, aflatoxin
- ▶ Foodborne DALYs: non-typhoidal *Salmonella enterica*, enteropathogenic and enterotoxigenic *Escherichia coli*; *Taenia solium*, norovirus, *Campylobacter* spp.

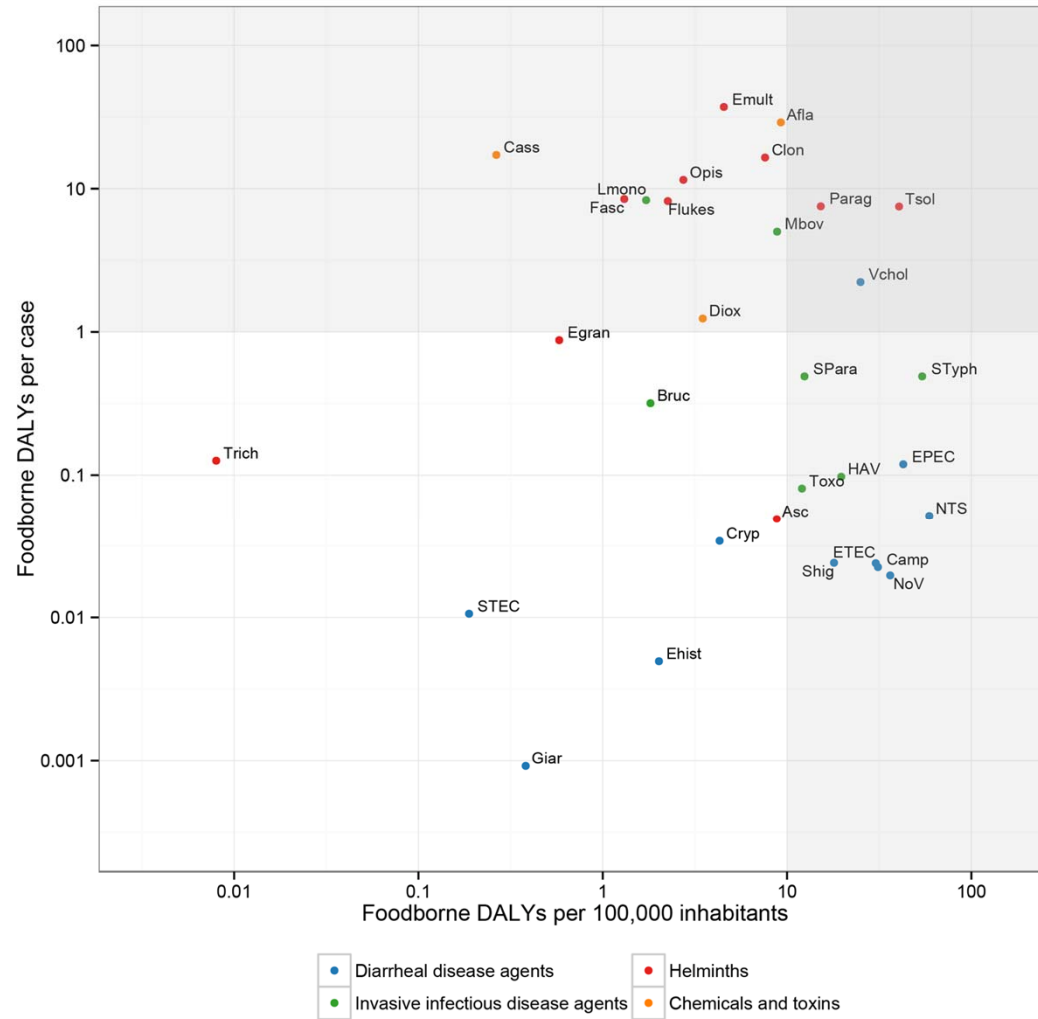
Ranking of foodborne hazards-global DALYs



Global findings

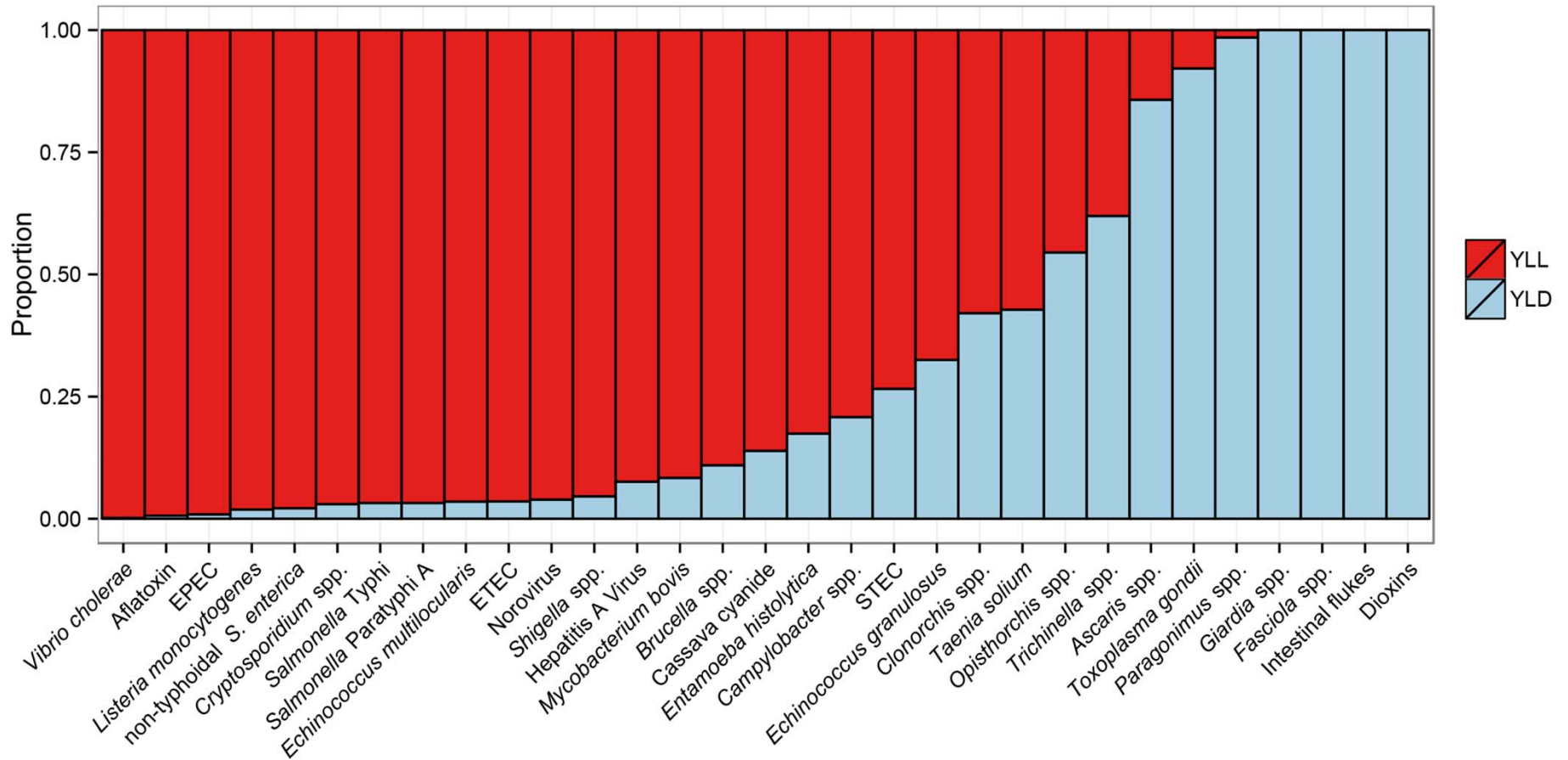
- ▶ Annually, 1 out of 10 people in the world suffer from foodborne disease
- ▶ Diarrheal diseases are most common causes of illness (550,000 cases) and death (230,000 deaths)
- ▶ Of these, non-typhoidal *Salmonella enterica* causes 60,000 deaths; this includes 22,000 deaths from invasive salmonellosis in non-HIV patients
- ▶ Diarrheal diseases cause more than half of global foodborne DALYs

Global burden at population and individual level



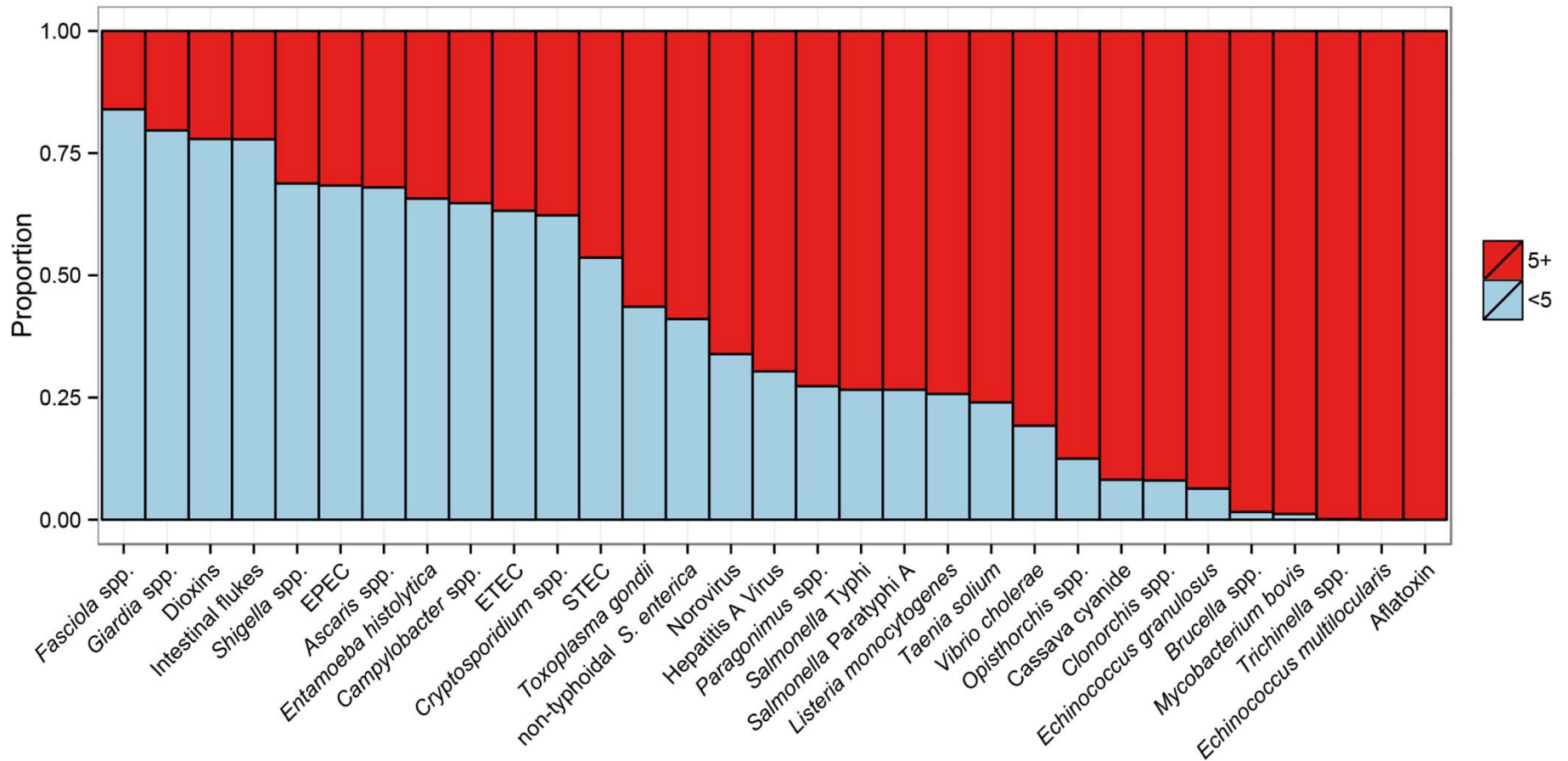
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Global DALYs – proportion of YLD and YLL



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Age distribution of global DALYs

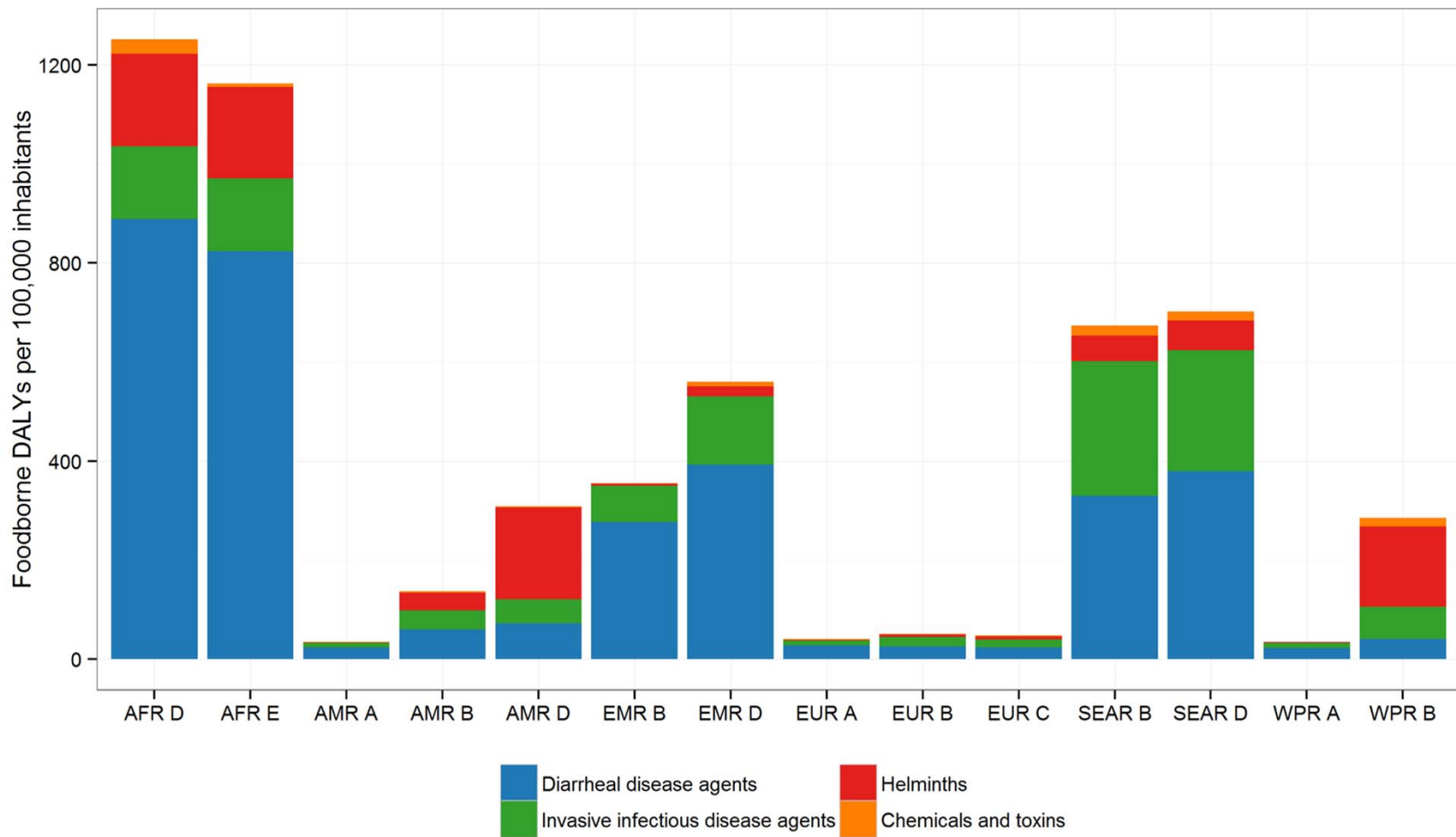


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Children under five years of age ...

- ▶ ... make up 9% of the world population
- ▶ ... suffer from 38% of all foodborne illnesses
- ▶ ... succumb to 30% of foodborne deaths
- ▶ ... bear 40% of global foodborne DALYs

Regional differences



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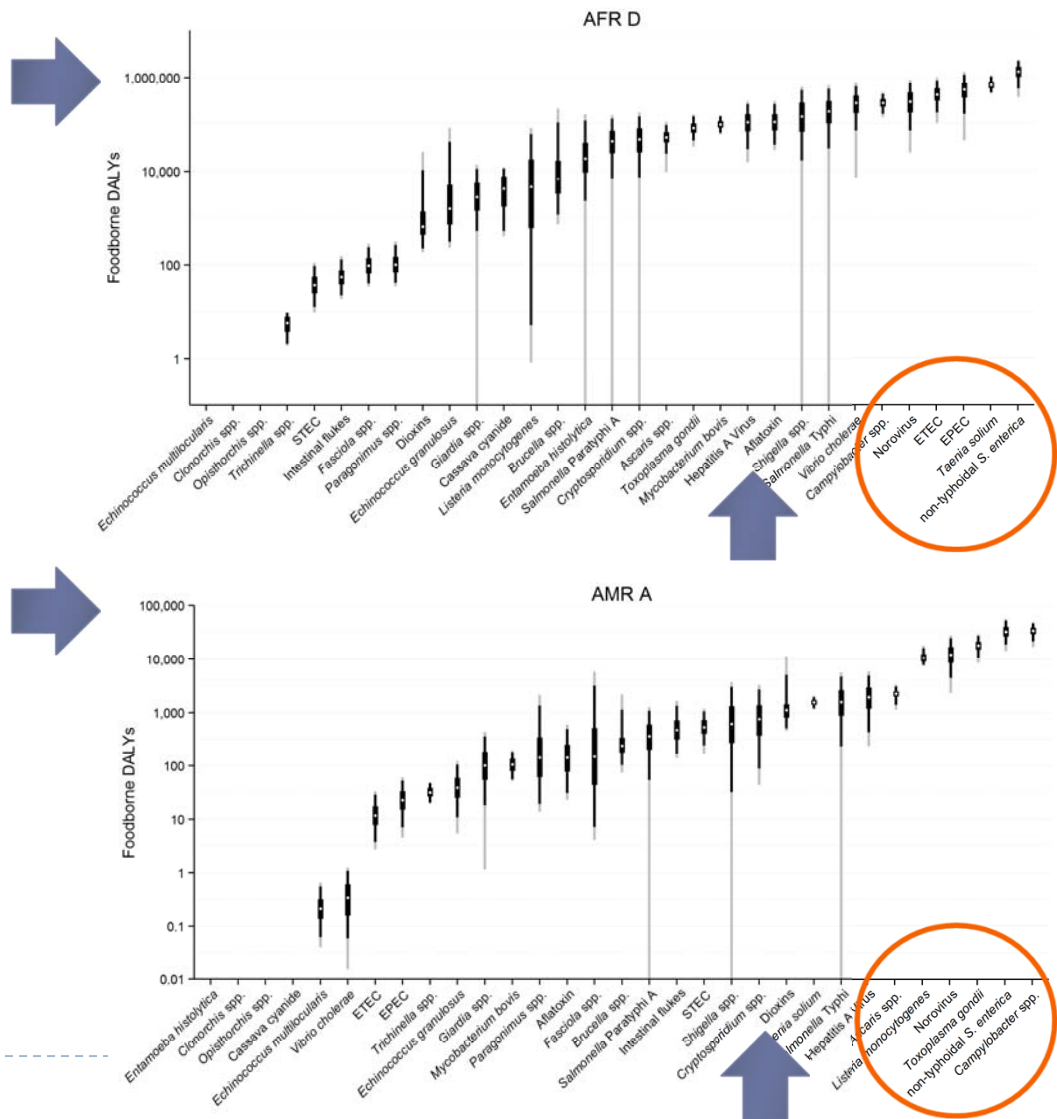
Regional differences

- ▶ Africa and South-East Asia have the highest incidence of foodborne diseases and the highest death rates among all ages, including children under five
- ▶ Lowest burden in North America, Europe and Australia, New Zealand and Japan
- ▶ Marked differences in the contribution of different agents
- ▶ Typhoid fever, foodborne cholera and diarrhea caused by pathogenic *E. coli* are much more common to low income countries
- ▶ Fish-borne parasites are of concern in Southeast Asia
- ▶ Diseases caused by non-typhoidal *S. enterica*, *Campylobacter* spp. and *Toxoplasma gondii* are a public health concern across the world

People living in the poorest areas of the world ...

- ▶ ... make up 41% of the world population
 - ▶ ... suffer from 53% of all foodborne illnesses
 - ▶ ... succumb to 75% of foodborne deaths
 - ▶ ... bear 72% of global foodborne DALYs
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- ▶ D and E subregions: high child and high – very high adult mortality

Regional differences in ranking of hazards



Comparison with other estimates

- ▶ Foodborne diseases: 33 million DALYs
- ▶ IHME Global Burden of Disease 2010
 - ▶ Dietary risk factors: 254 million DALYs
 - ▶ Unimproved water and sanitation: 211 million DALYs
 - ▶ HIV/AIDS: 82 million DALYs
 - ▶ Malaria: 82 million DALYs
 - ▶ Air pollution: 76 million DALYs
 - ▶ Tuberculosis 49 million DALYs
- ▶ WHO Global Health Observatory 2012
 - ▶ HIV/AIDS 92 million DALYs
 - ▶ Malaria: 55 million DALYs
 - ▶ Tuberculosis: 44 million DALYs
- ▶ **Methodological differences!!**

Limitations

- ▶ **Data availability and quality**
 - ▶ Particularly in low-income countries where burden is highest
 - ▶ Imputation and expert judgment
 - ▶ Presentation at regional level rather than country level
 - ▶ Large uncertainty intervals
- ▶ **Underestimation**
 - ▶ Limited number of hazards
 - ▶ Not all endpoints considered, e.g. malnutrition and stunting; irritable bowel syndrome
 - ▶ Model uncertainty, e.g. multiplicative or additive models for chemicals
 - ▶ Public health metrics do not quantify the full societal impact of foodborne diseases; economic burden
 - ▶ Indirect transmission of disease agents from food production systems – One Health

Implications for food safety policy

- ▶ Difference in burden between regions suggests that FBD are largely preventable by currently available methods
- ▶ Linked to economic development and effective food safety systems
- ▶ From reactive, repressive systems to preventive, risk-based and enabling systems
- ▶ Effective surveillance networks at country, regional and global levels
- ▶ Pathogens that also cause problems in the developed world will need novel control methods

Conclusions

- ▶ WHO has launched the most comprehensive estimates of the global burden of foodborne diseases to date
- ▶ These address the lack of data to support food safety policy making
- ▶ Despite data gaps and other limitations, the results demonstrate a considerable burden
- ▶ A large share of the burden is borne by children under five years of age and those living in low-income countries
- ▶ Priority hazards differ between regions
- ▶ Control methods do exist for many hazards, and are linked to economic development and effective food safety systems
- ▶ Hazards of global significance need novel control methods

Acknowledgements

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