Health Modelling for Better Policy

National Burden of Disease due to diet-related risk factors

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Overview

- History of GBD
- General review of GBD methodology including:
  - Components of DALY measure
  - Attributable Burden
- National burden of disease study

History of GBD

- The World Bank's 1993 World Development Report quantified burden of 107 disease & injuries for 8 regions in 1990.
- Commencement of GBD update publications by WHO in 2000.
- Continued improvements of methods & data sources at WHO.

GBD 2005

- Funded by Bill & Melinda Gates Foundation
- Collaboration:
  - Institute of Health Metrics & Evaluation at University of Washington
  - Harvard Institute of Global Health
  - John Hopkins University
  - University of Queensland
  - WHO

GBD 2005 cont'd

- Complete update & overhaul of methods
- Systematic assessment of data
- Burden of disease & risk factor estimates for 1990 and 2005
- Final estimates due by November 2010

DALY

Disability – adjusted Life Year

Future stream of life lost due to premature mortality based on life expectancy:

Years of Life Lost (YLL)

+

Future loss of ‘health’ life arising from new cases of disabling conditions:

Years Lived with Disability (YLD)

GBD Cause Lists

- **Group 1:** communicable, maternal & perinatal
- **Group 2:** non-communicable causes
- **Group 3:** intentional and unintentional injuries

Standard Expected Years of Life Lost

Calculate total YLL for a given cause, age & sex using:

YLL =N*L

N= number of deaths

L= life expectancy at age of death on the Coale & Demeny West 26 Model Life Table.

Standard Expected Years of Life Lost

- All deaths contribute to the mortality burden estimate.

- Every death at the same age contributes equally to the mortality burden estimate.

Years lived with Disability

$$YLD = I \times DW \times L$$

I = number of incident cases in reference period

DW = disability weight (range 0 – 1)

L = average duration of condition (measured in years)

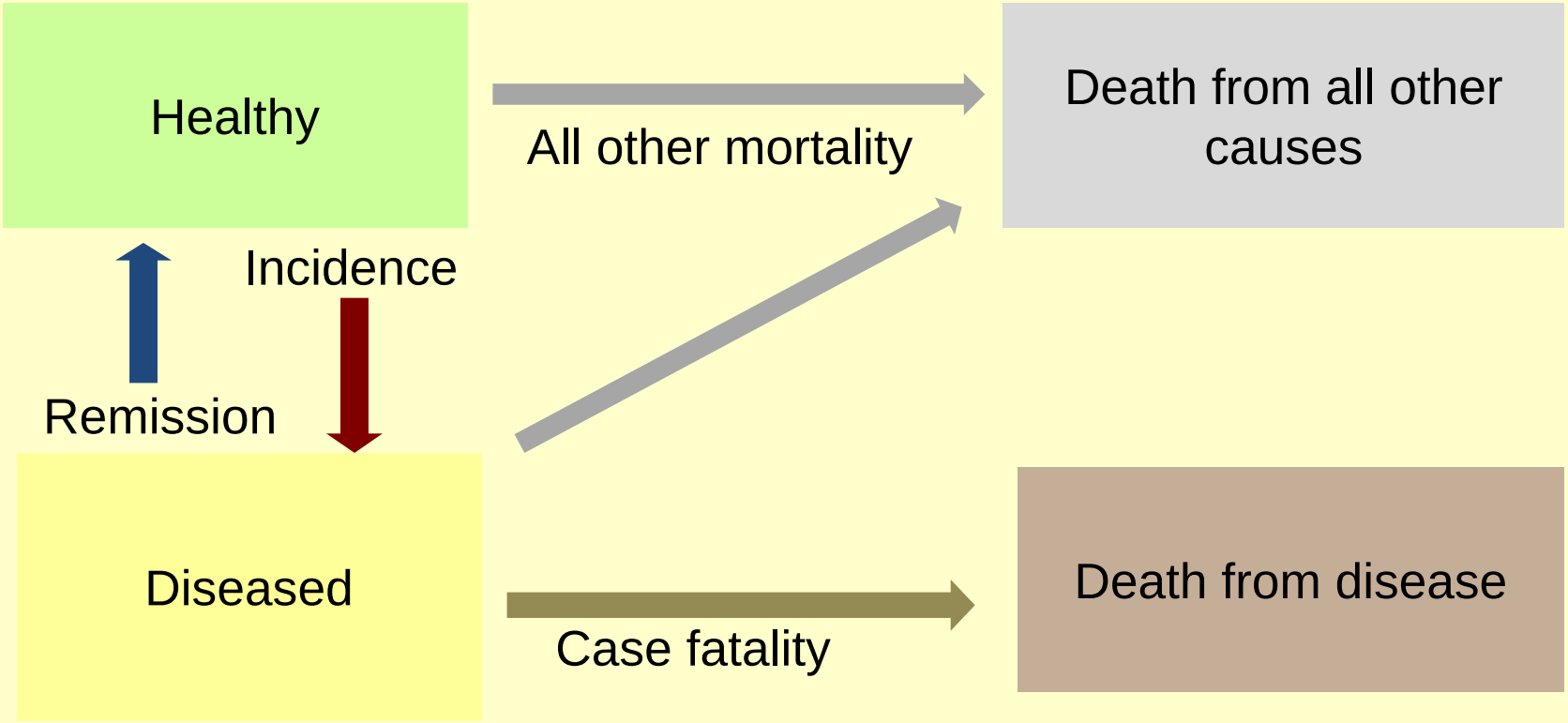
DisMod

- Disease Model
- A computer software programme
- A generic disease model
- A mathematical description of disease process

DisMod

- Allows:
  - Calculation of missing variables from known ones
  - Supplementation of observations with expert knowledge
  - Production of internally consistent estimates of disease epidemiology

Disease Model



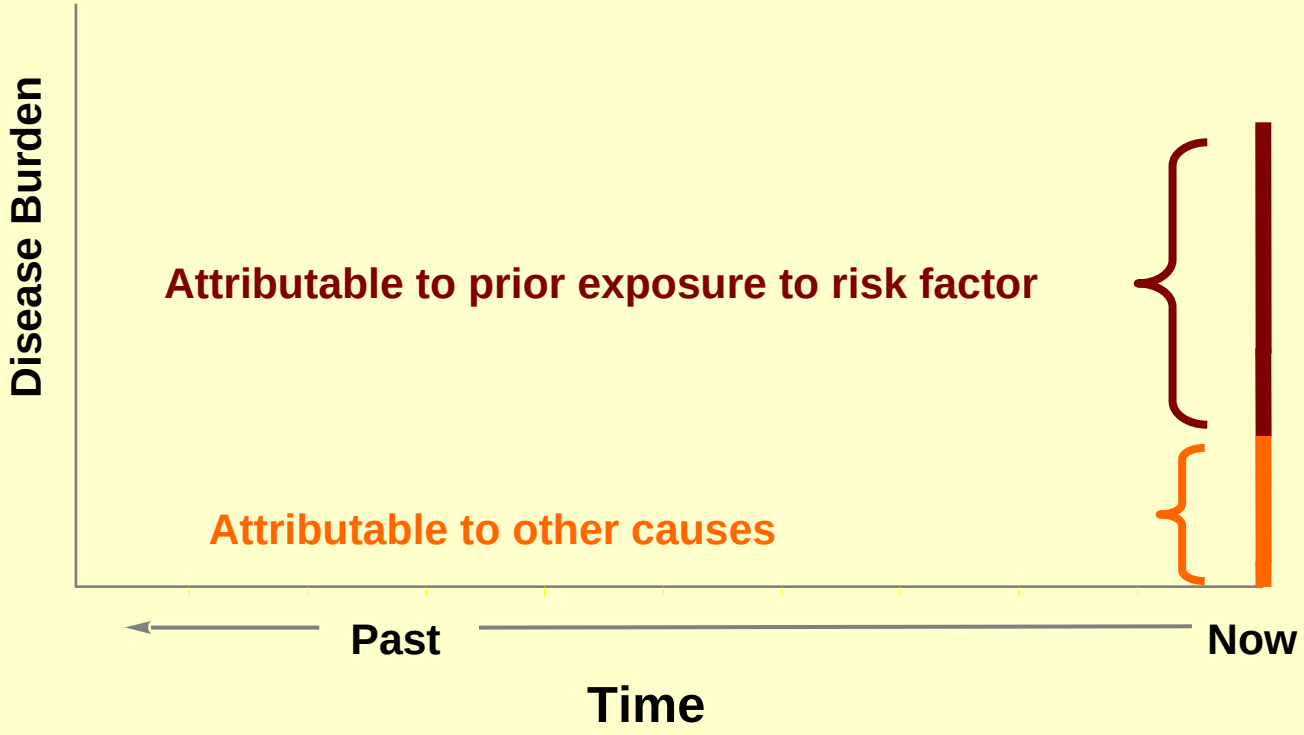
Dismod input & output variables

Data describing a single disease

- Incidence
- Prevalence
- Remission
- Case fatality
- Relative risk of Mortality
- Duration
- Mortality

Generally only 3 variables will do, but case fatality and RR mortality are equivalent

Attributable Burden of Disease



Population Attributable Fraction:

fraction of disease cases in population associated with exposure

Attributable Burden:

fraction of disease burden attributable to risk factor

Attributable Burden (AB) = PAF x B (total burden)

Potential Impact Fraction (PIF)

Measures the proportional reduction that would occur in disease burden if the population were subjected to an alternative counterfactual distribution of risk exposure.

Exposure-based approach

GBD 1990

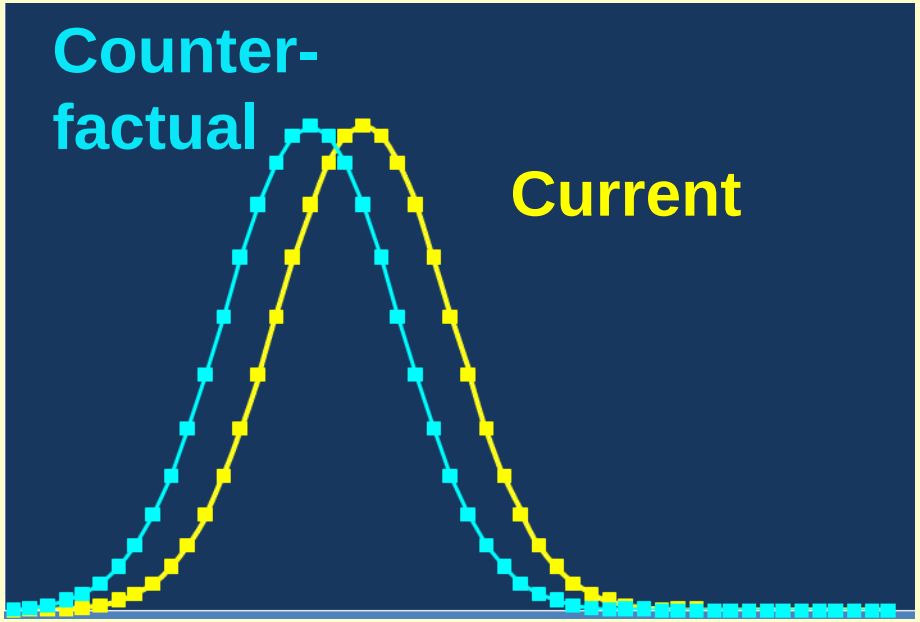
Exposure - YES or NO

Population Attributable fraction

$$PAF = \frac{P(RR-1)}{P(RR-1)+1}$$

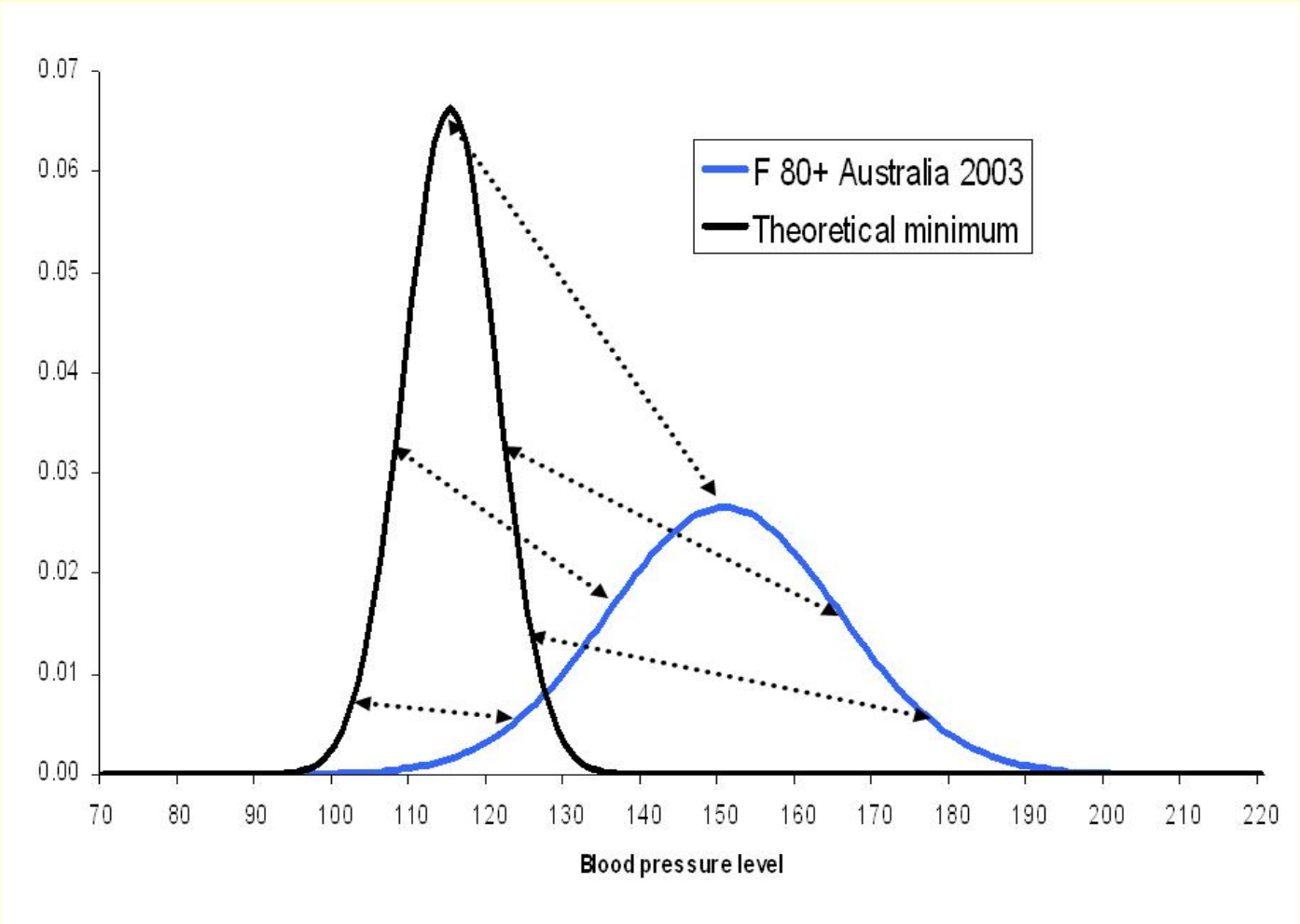
Population distribution of exposure

CRA 2000



Potential Impact Fraction (PIF):

Extension to Multiple Categories
or Continuous Exposure


0.07
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120
130
140
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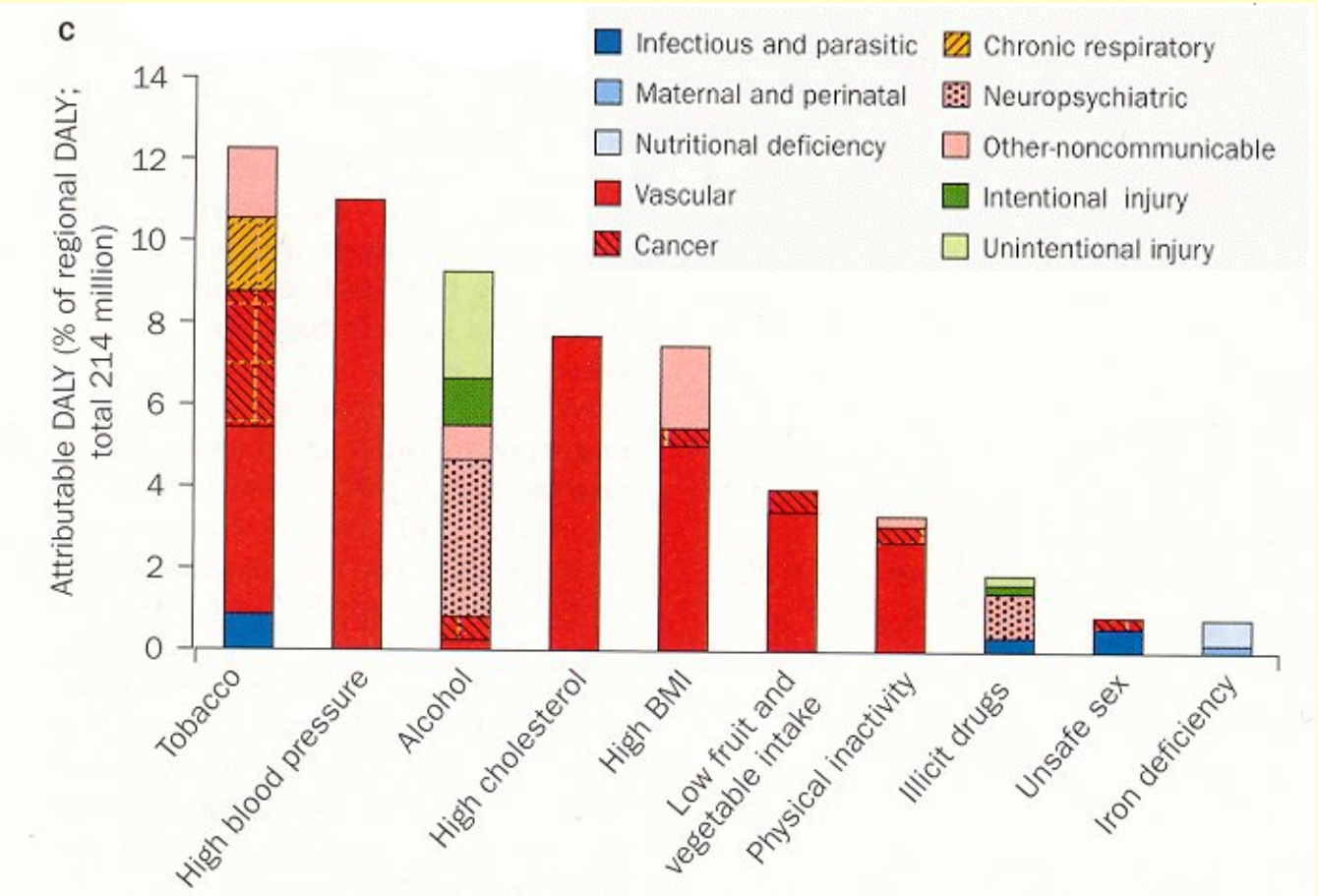
160
170
180
190
200
210
220
Blood pressure level
F 80+ Australia 2003
Theoretical minimum

Leading Health Hazards in Developed Countries



Ezzati et al, The Lancet, 2002; 360: 1347-60

National Burden of Disease Study

- HRB Centre for Health & Diet Research
- Co-supervised by UCC & Institute of Public Health
- All-Ireland study

National Burden of Disease Study

- Premature all-cause mortality
- YLDs and DALYs for:
  - Diabetes, IHD, Stroke & Nutrition-related Cancers
- Attributable Burden (YLLs, YLDs & DALYs) for the following risk factors:
  - Overweight & obesity; low fruit & vegetable intake; salt intake; and saturated fat intake

Advantages

- Systematic approach using universal methods
- Assessment of health problem magnitude using standard measurement units
- Internationally comparable outputs of disease burden
- Use of most current GBD methodology

Disadvantages

- Study is restricted to a number of nutrition-related risk factors
- Aspects of current methodology are still in development:
  - Co-morbidity in YLDs
  - Attributable fractions for multiple risk factors

Policy Benefits

- Advance evidence on the impact of unhealthy diet on Irish population
- Inform choices on resource allocation
- Support need for suitable interventions to target obesity & unhealthy diet
- Provide a foundation for cost-effectiveness analysis of interventions