

Risk Assessment

Session 4C
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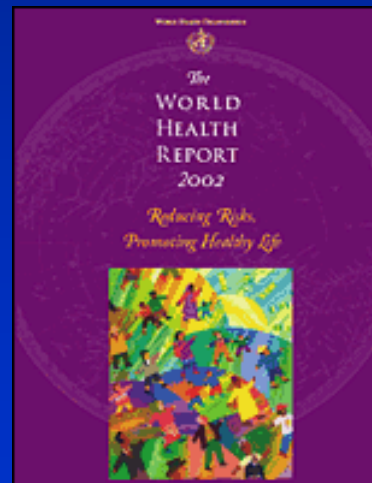


2002 World Health Report

“Reducing risks, promoting healthy life”

www.who.int/whr

www.thelancet.com



Ideal features of risk assessment

- Risks assessed irrespective of place in a causal chain or discipline
- Risks defined and studied comprehensively and with comparable counterfactuals
- “common currency” outcome measures, with impact assessed in terms of lost healthy life years
- Protective as well as hazardous factors
- Population-wide risks as well as high-risk individuals
- Full effects due to each risk factor & joint effects of risks that act together to cause disease



Attributable and avoidable burden

- Attributable burden - current burden due to past exposure
- Avoidable burden - future burden avoidable if current and future exposure levels are reduced



Basic CRA framework and goals

All by 224 age, sex and region subgroups
and by levels of poverty

Risk factor levels

- current distribution
- counterfactual distribution(s)

Risk factor-disease relationships

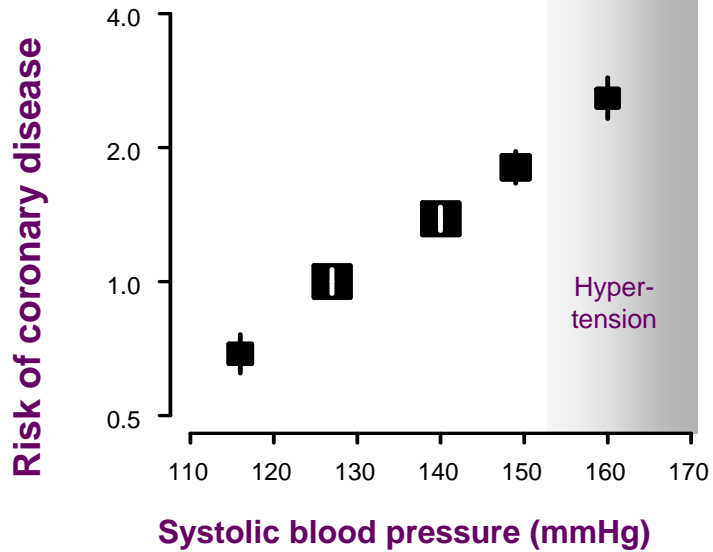
- risk accumulation
- risk reversal

Disease burden

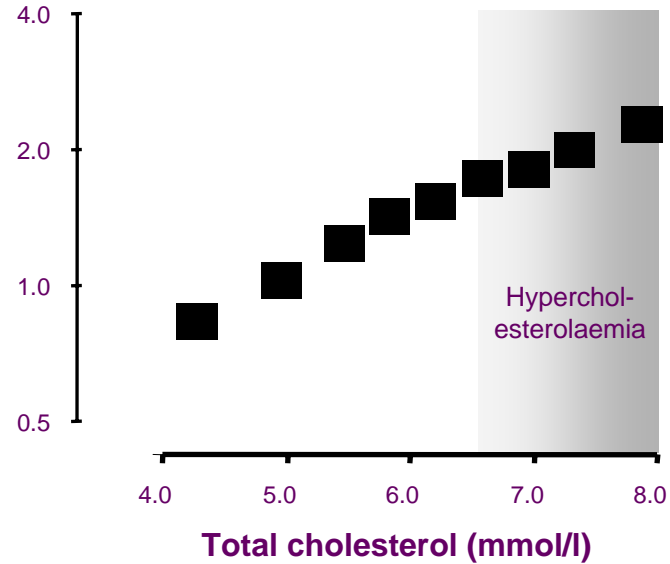
Attributable burden in 2000
Avoidable burden in 2010 & 2020

Continuous exposure and disease associations

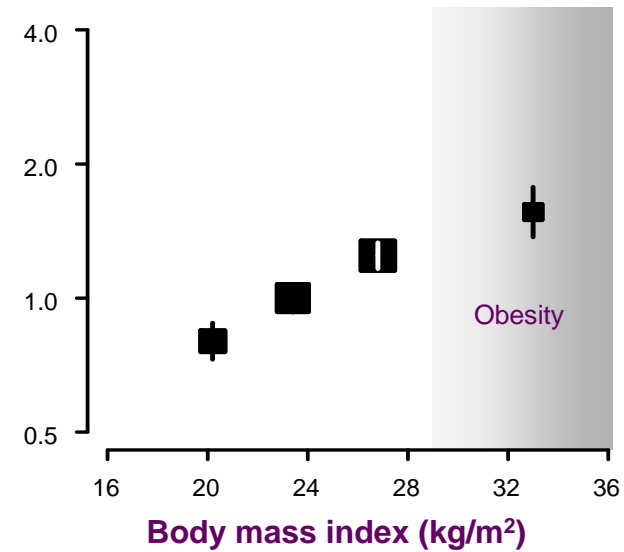
Blood pressure



Cholesterol

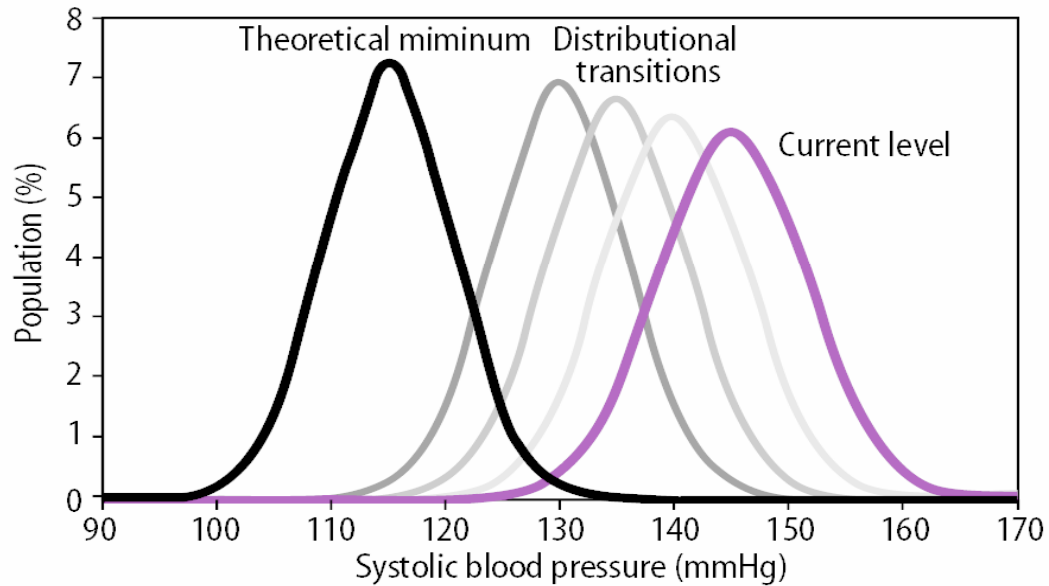


Body mass index

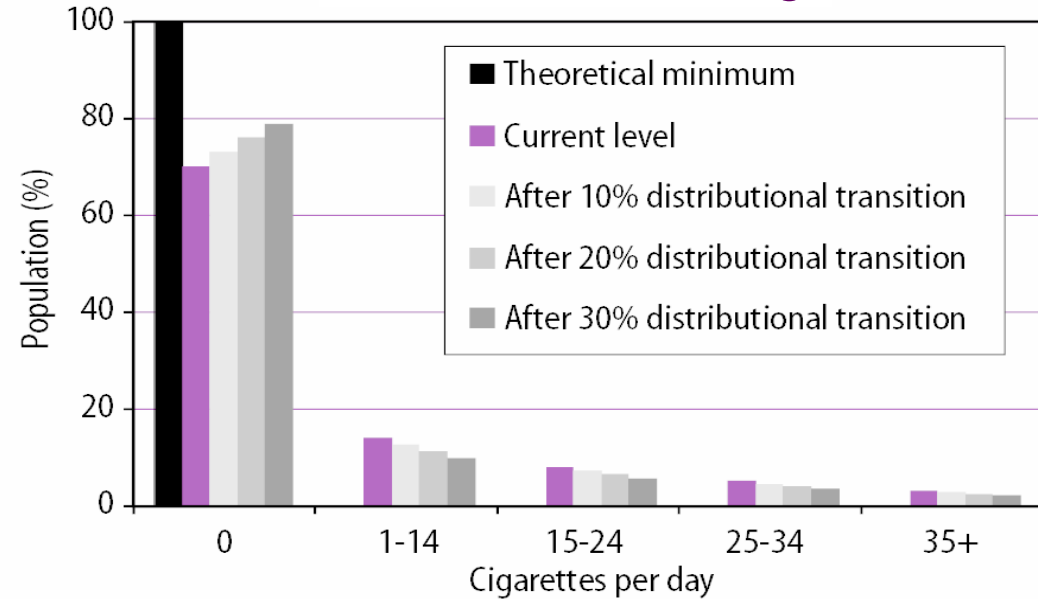


Example distributional transitions

Blood pressure



Tobacco smoking



Risks quantified in WHR2002

Child & maternal under-nutrition

Underweight

Iron deficiency

Vitamin A deficiency

Zinc deficiency

Other diet-related risks & inactivity

Blood pressure

Cholesterol

High body mass index

Inadequate fruit and vegetable intake

Physical inactivity

Sexual and reproductive health risks

Unsafe sex

Lack of contraception

Addictive substances

Smoking and oral tobacco

Alcohol

Illicit drugs

Environmental risks

Unsafe water, sanitation, and hygiene

Urban air pollution

Indoor smoke from solid fuels

Lead exposure

Climate change

Occupational risks

Risk factors for injury

Carcinogens

Airborne particulates

Ergonomic stressors

Noise

Other selected risks to health

Unsafe health care injections

Childhood sexual abuse



NCD Risks and theoretical minima in WHR2002

Other nutrition-related risk factors and physical activity

High blood pressure	115 SD 6 mmHg
High cholesterol	3.8 SD 1 mmol/l (147 SD 39 mg/dl)
High body mass index	21 SD 1 kg/m ²
Low fruit & vegetables	600g (SD 50 g) intake per day for adults
Physical inactivity	All having at least 2.5 hours per week of moderate-intensity activity or equivalent (400KJ/week)

Addictive substances

Tobacco	No tobacco use
Alcohol	No alcohol use
Illicit drugs	No illicit drug use

Selected environmental risks

Urban air pollution	7.5 µg/m ³ for PM _{2.5} , 15 µg/m ³ for PM ₁₀
Indoor smoke	No household solid fuel use
Lead	0.016 µg/dl blood lead levels

Selected occupational risks

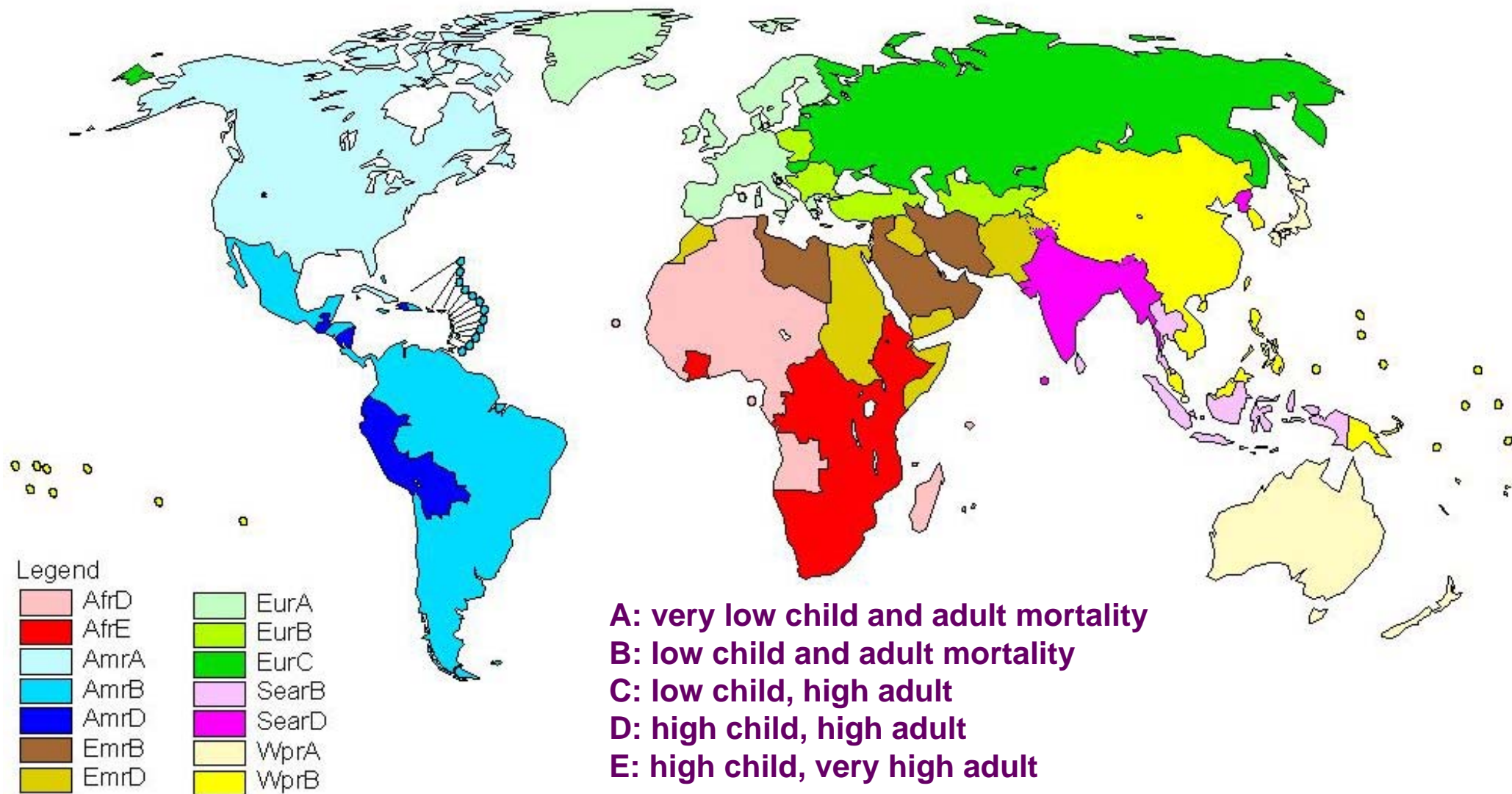
Carcinogens	No work-related exposure above background to chemical or physical agents that cause cancer
Airborne particulates	No work-related exposure above background
Ergonomic stressors	Physical workload at the level of managers and professionals (low)
Occupational noise	Less than 85 dBA on average over eight working hours

Other selected risks

Childhood sexual abuse	No abuse
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14 WHO mortality subregions



Leading 10 selected risk factors and diseases or injuries

Developing high mortality (AfrD, AfrE, AmrD, EmrD, SearD)

Risk factor	% DALYs	Disease or injury	% DALYs
Underweight	14.9%	HIV/AIDS	9.0%
Unsafe sex	10.2%	Lower respiratory infections	8.2%
Unsafe water, S&H	5.5%	Diarrhoeal diseases	6.3%
Indoor smoke	3.7%	Childhood cluster diseases	5.5%
Zinc deficiency	3.2%	Low birth weight	5.0%
Iron deficiency	3.1%	Malaria	4.9%
Vitamin A deficiency	3.0%	Unipolar depressive disorders	3.1%
Blood pressure	2.5%	Ischaemic heart disease	3.0%
Tobacco	2.0%	Tuberculosis	2.9%
Cholesterol	1.9%	Road traffic injury	2.0%

Leading 10 selected risk factors and diseases or injuries

Developing lower mortality (Amr B, EmrB, SearB, WprB)

Risk factor	% DALYs	Disease or injury	% DALYs
Alcohol	6.2%	Unipolar depressive disorders	5.9%
Blood pressure	5.0%	Cerebrovascular disease	4.7%
Tobacco	4.0%	Lower respiratory infections	4.1%
Underweight	3.1%	Road traffic injury	4.1%
Overweight/obesity	2.7%	COPD	3.8%
Cholesterol	2.1%	Ischaemic heart disease	3.2%
Low fruit & vegetables	1.9%	Birth asphyxia/trauma	2.6%
Indoor smoke from solid fuels	1.9%	Tuberculosis	2.4%
Iron deficiency	1.8%	Alcohol use disorders	2.3%
Unsafe water, S&H	1.7%	Deafness	2.2%

Leading 10 selected risk factors and diseases or injuries

Developed (Amr A, Eur A, Eur B, Eur C, WprA)

Risk factor	% DALYs	Disease or injury	% DALYs
Tobacco	12.2%	Ischaemic heart disease	9.4%
Blood pressure	10.9%	Unipolar depressive disorders	7.2%
Alcohol	9.2%	Cerebrovascular disease	6.0%
Cholesterol	7.6%	Alcohol use disorders	3.5%
Overweight/obesity	7.4%	Dementia & other CNS disorders	3.0%
Low fruit & vegetables	3.9%	Deafness	2.8%
Physical inactivity	3.3%	COPD	2.6%
Illicit drugs	1.8%	Road traffic injury	2.5%
Unsafe sex	0.8%	Osteoarthritis	2.5%
Iron deficiency	0.7%	Trachea bronchus & lung cancers	2.4%

Deaths and DALYs due to leading 5 global risks

	Deaths (M)		DALYs (M)	
	No.	%	No.	%
Underweight	3.7	6.7%	137.8	9.5%
Unsafe sex	2.9	5.2%	91.9	6.3%
Blood pressure	7.1	12.8%	64.3	4.4%
Tobacco	4.9	8.8%	59.1	4.1%
Alcohol	1.8	3.2%	58.3	4.0%
<i>Joint effects</i>	<i>31%</i>		<i>25%</i>	

NB – check lower for joint

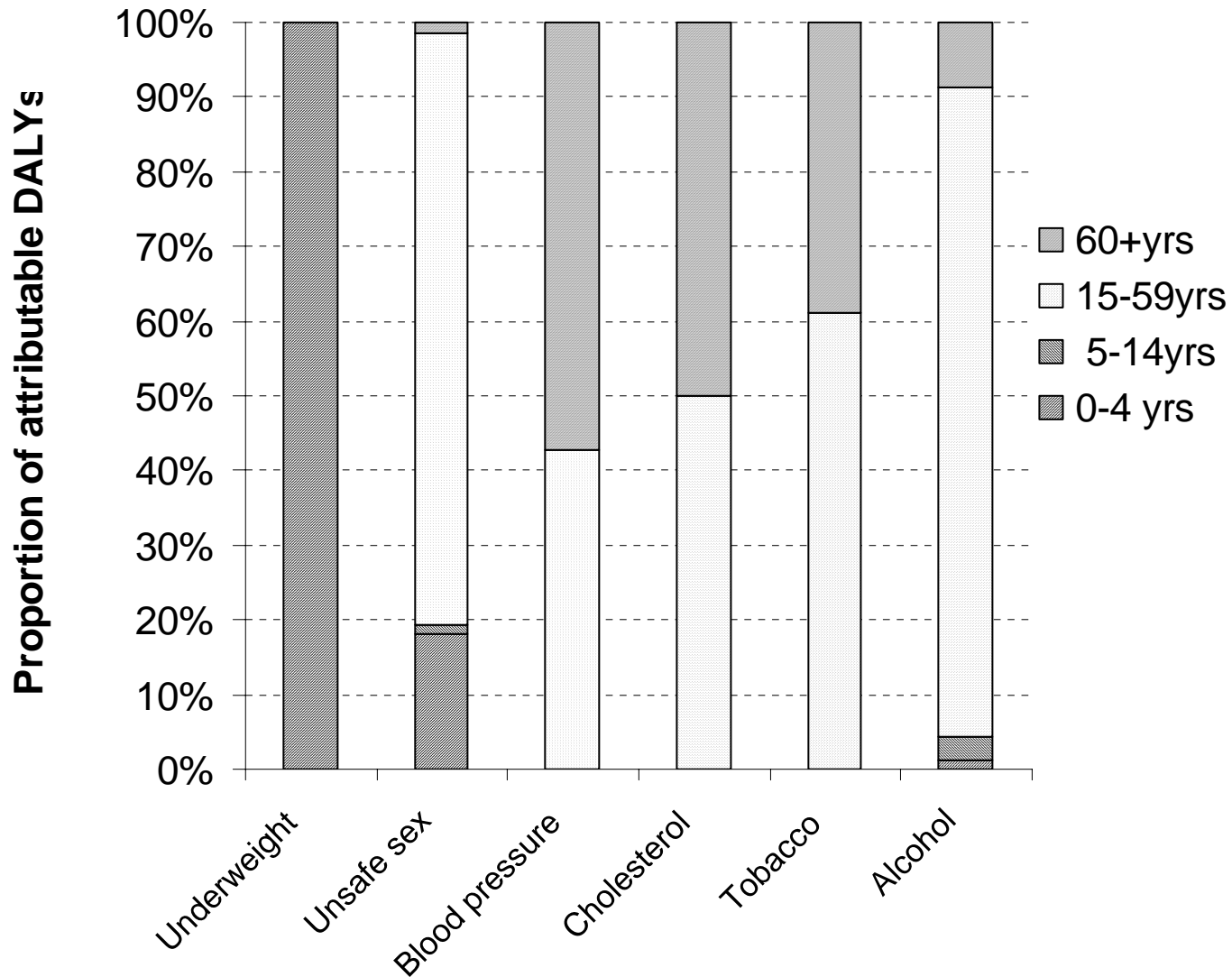


Distribution by sex of burden due to leading 5 global risks

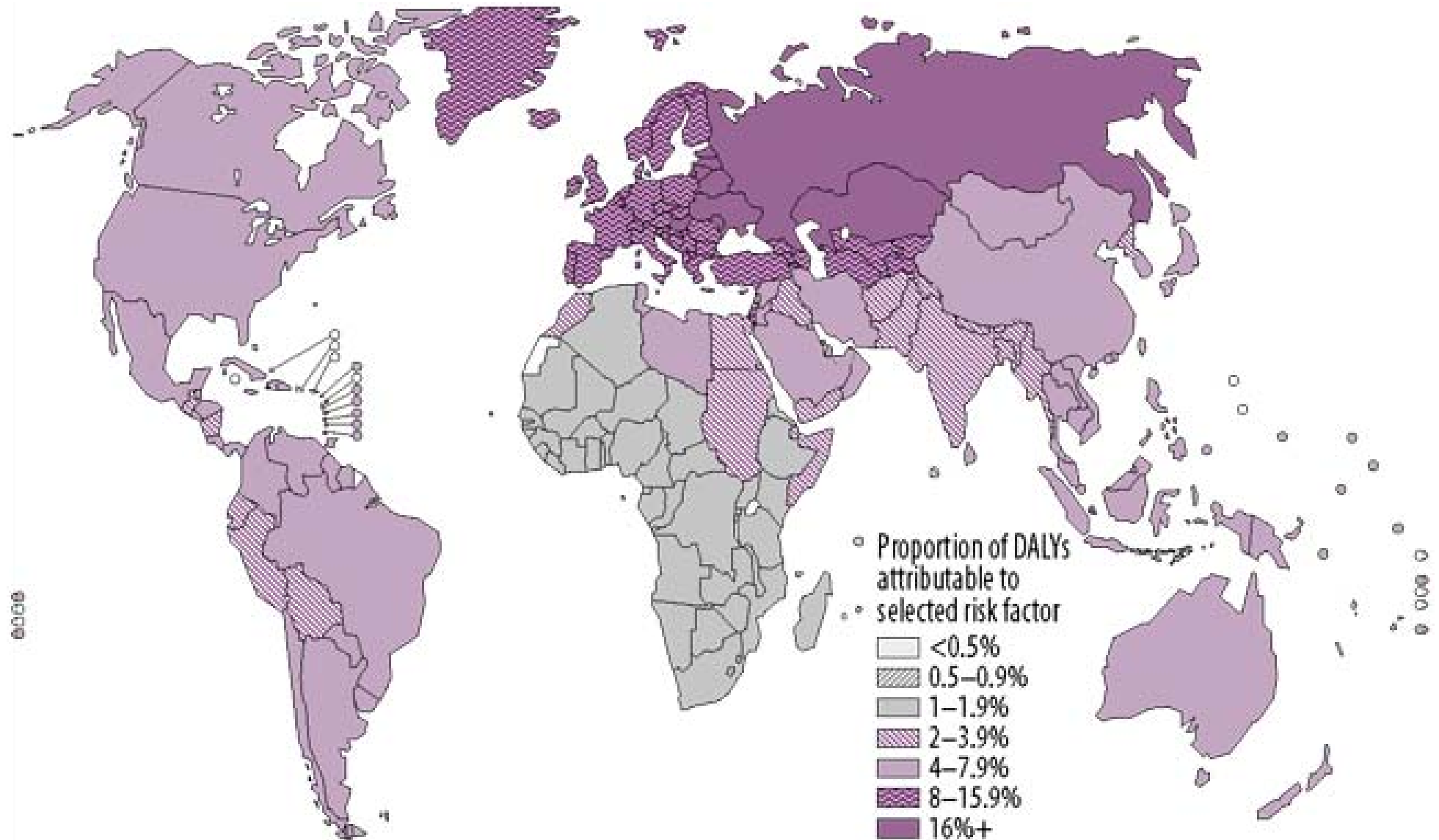
	% in women
Underweight	49%
Blood pressure	46%
Unsafe sex	54%
Tobacco	18%
Alcohol	15%



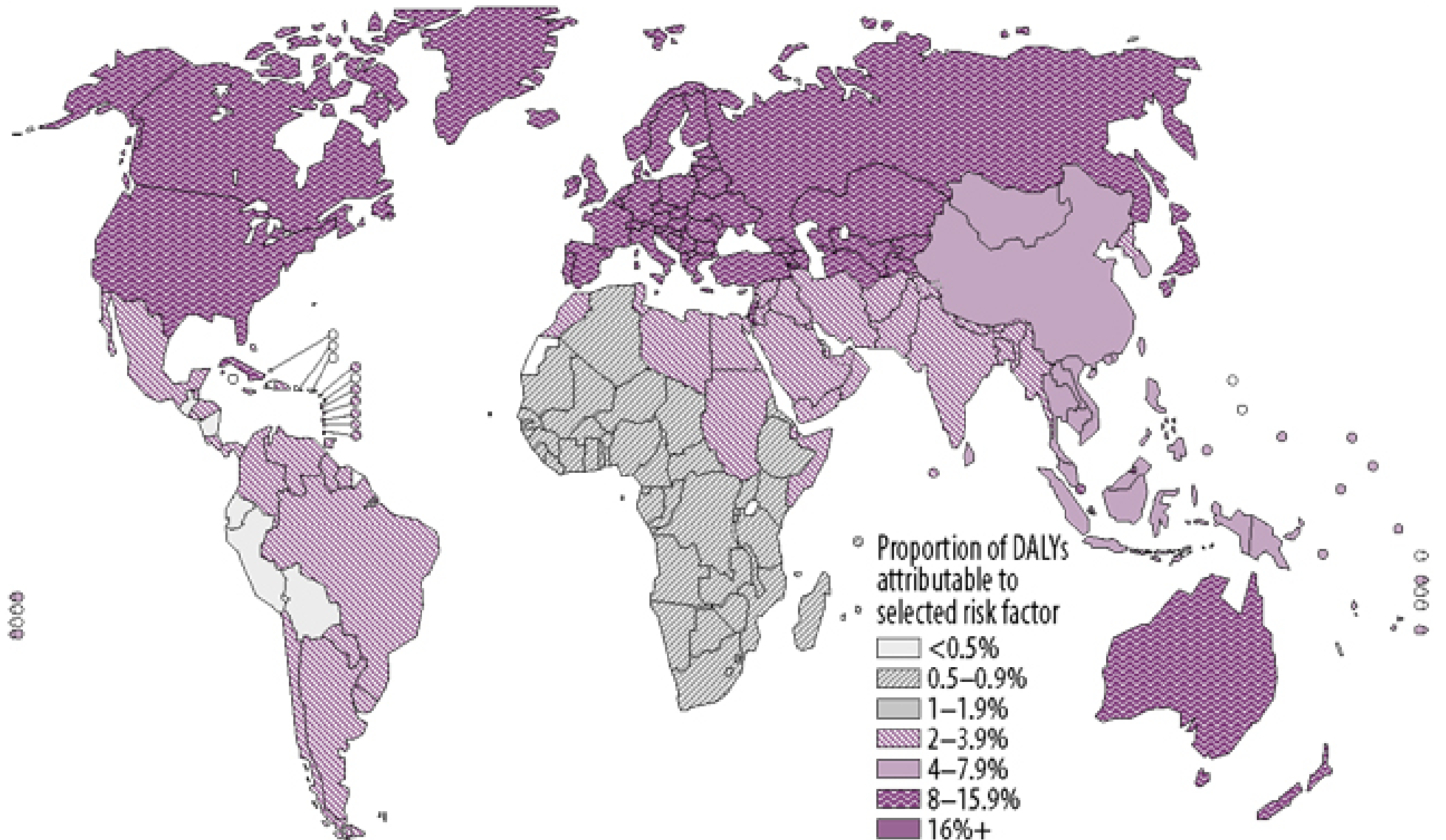
Distribution by age of burden due to leading 5 global risks



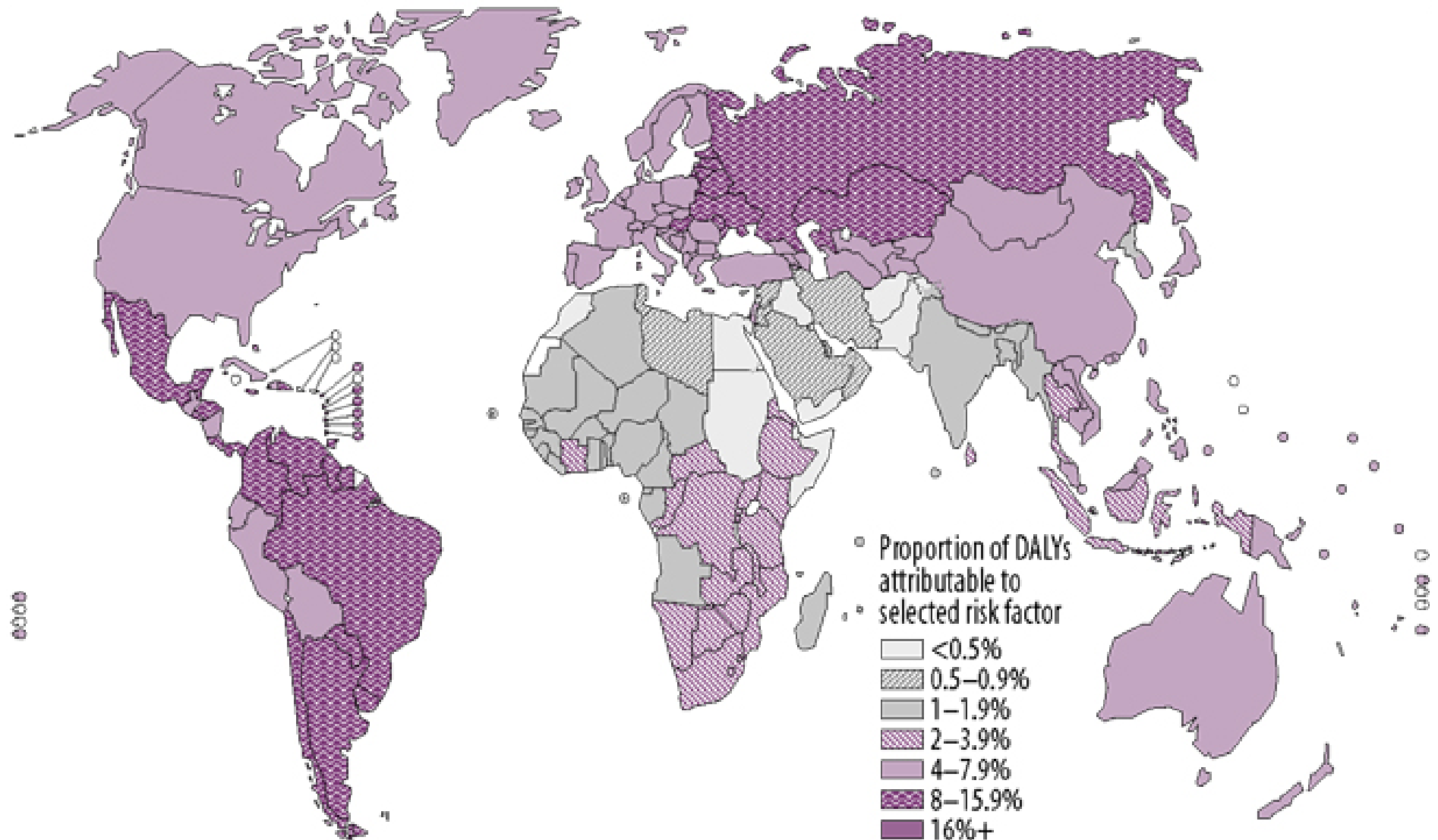
Burden of disease attributable to high blood pressure (% DALYs in each subregion)



Burden of disease attributable to tobacco (% DALYs in each subregion)



Burden of disease attributable to alcohol (% DALYs in each subregion)



Burden attributable to joint effects of risk factors

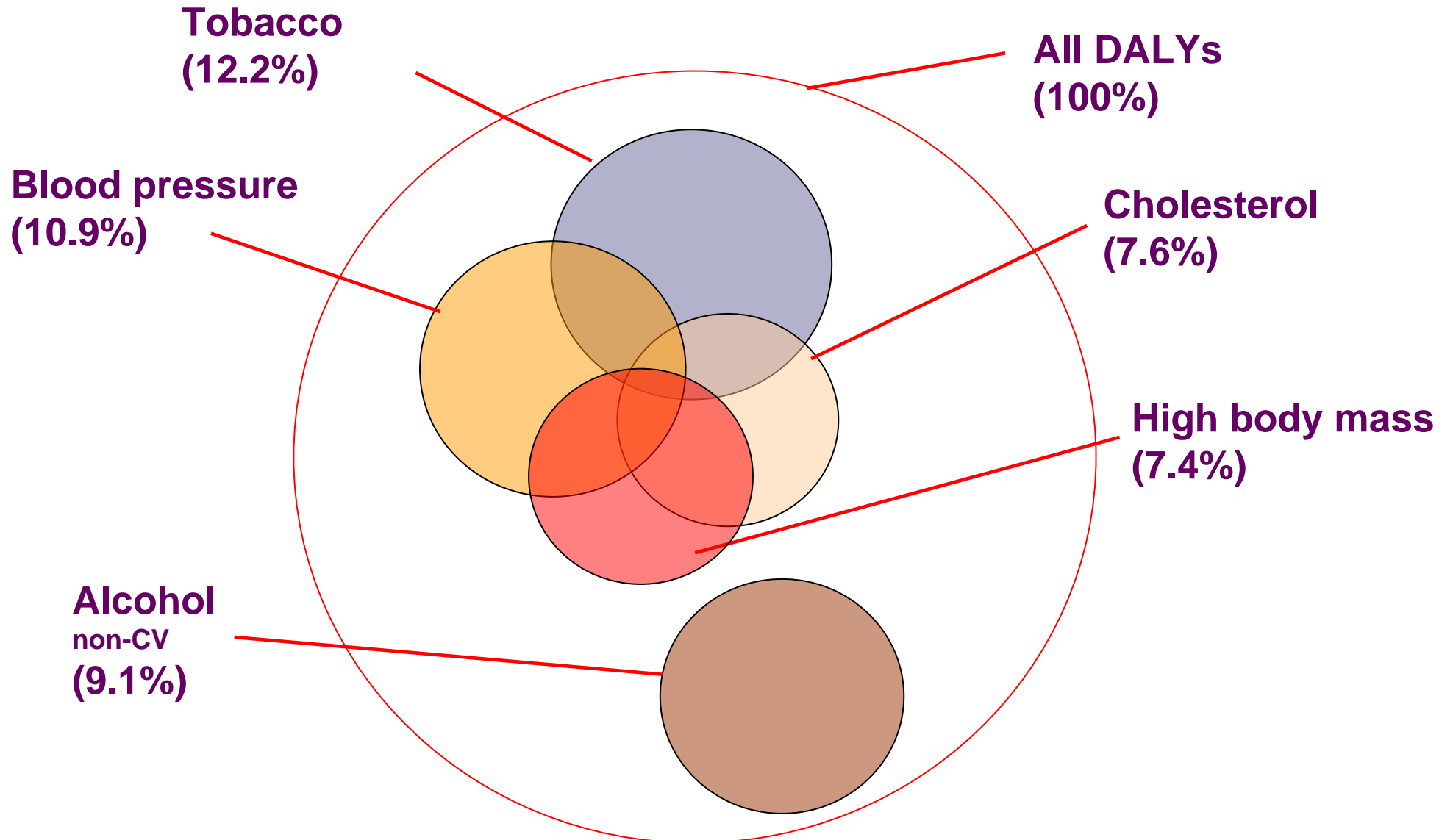


Key drivers of joint effects for two or more risk factors

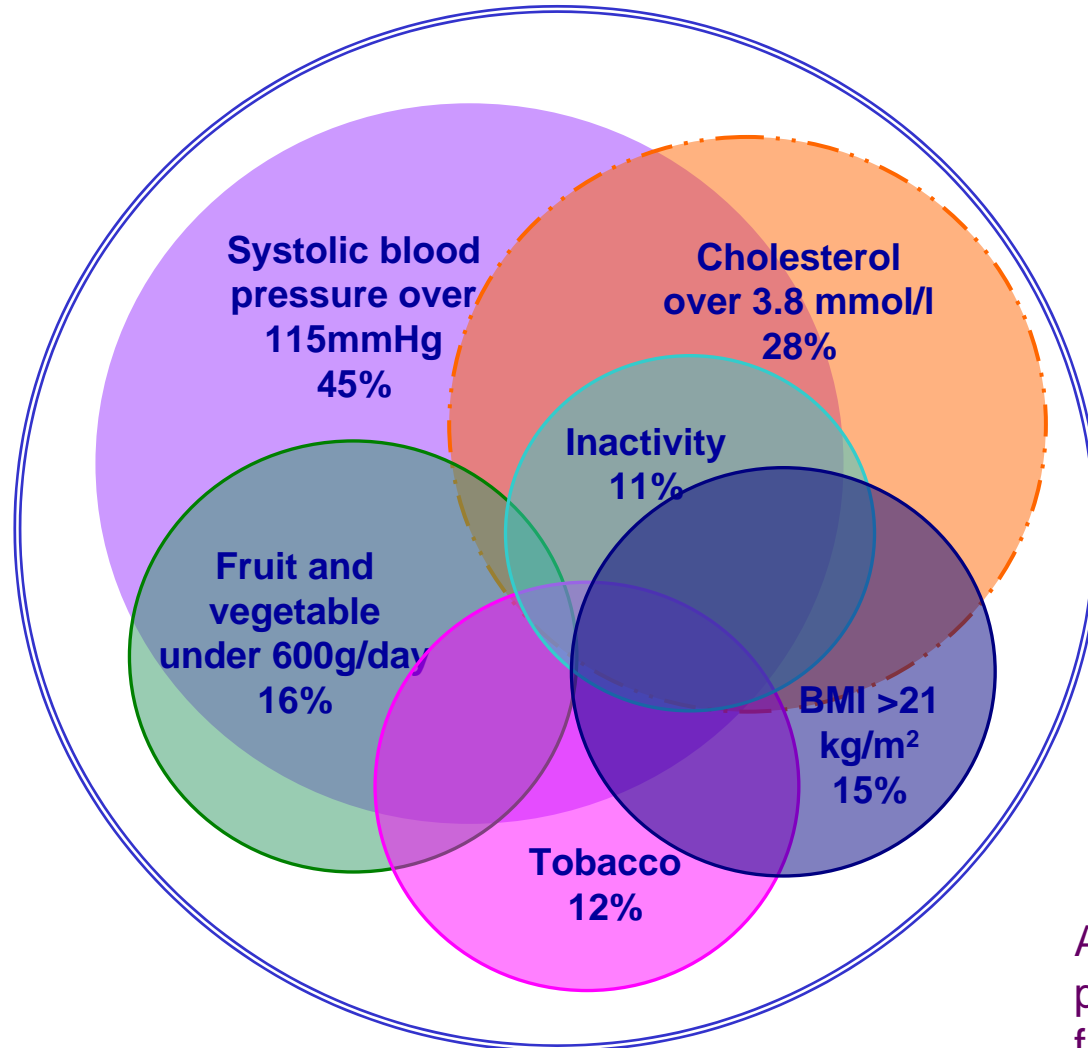
- Which outcomes are affected
- Overlap of prevalence in the population
- Biological interaction



Proportion of all lost healthy life years in developed countries



Global cardiovascular disease burden due to 6 major risk factors



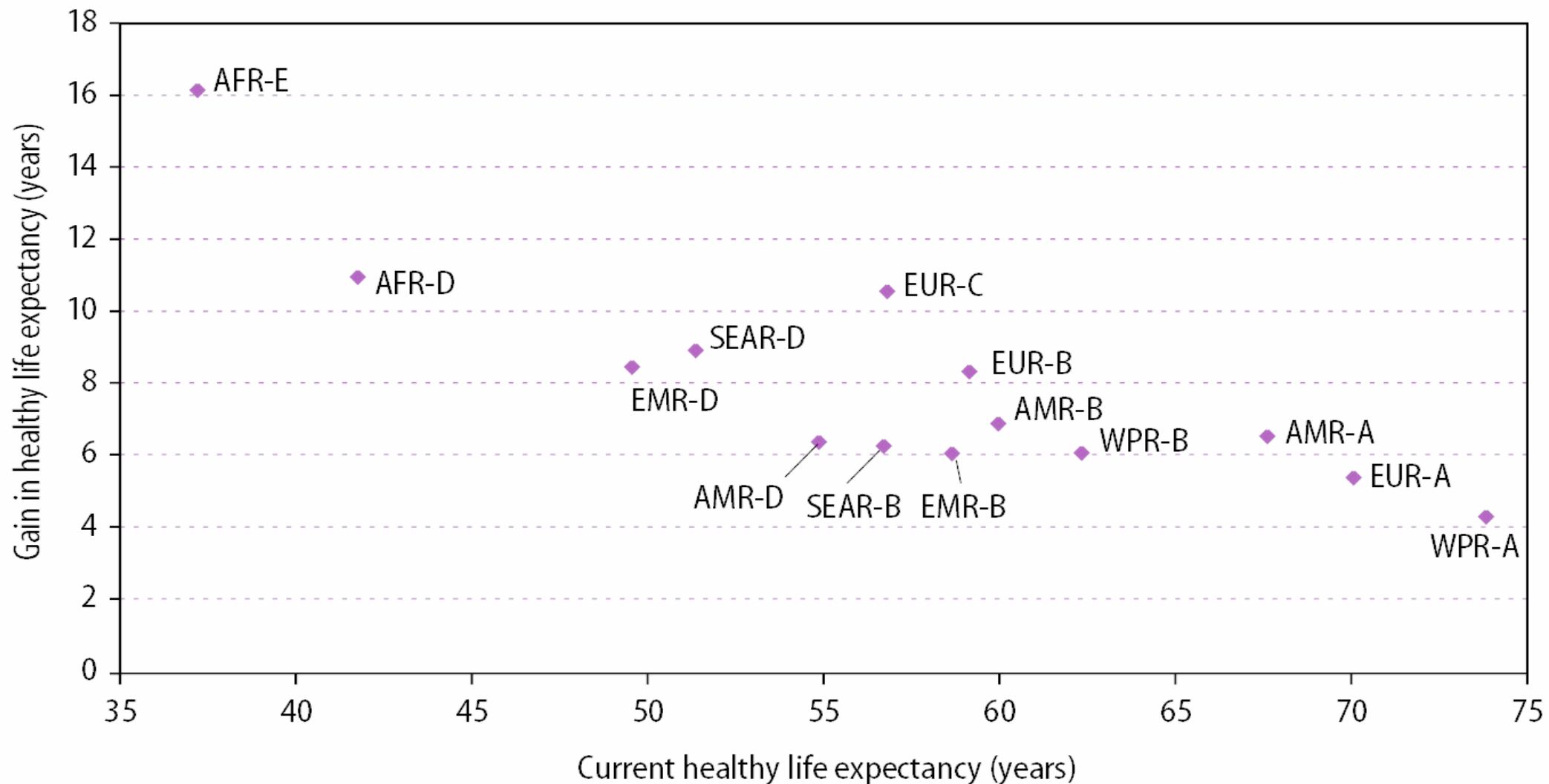
Area proportional to population attributable fraction, overlap not proportional to joint effects

Global disease burden due to leading 10 vs 20 risks

	Leading 10	Leading 20
Attributable deaths	42%	46%
Attributable DALYs	33%	39%
Attributable HALE	8.4 yrs	9.2 yrs



Estimated gain in healthy life expectancy with removal of 20 leading selected risk factors by subregion^a



Conclusions

- Role of established risk factors greater than commonly thought
- In many world regions, the leading 5 risk factors account for more than one-third of mortality and one-quarter of DALYs
- Risks are widespread – all risk factors have global impact, and the burden of many occurs almost exclusively in developing countries



Conclusions

- Cause(s) known of more than two-thirds of many major diseases eg. ischaemic heart disease, stroke, diabetes
- Research agenda driven by need to identify and implement affordable, practical interventions



Conclusions

- Large and often unrecognised potential for prevention
 - Full impact of risks often undermeasured, and hence under-appreciated
 - Risks often occur as a continuum throughout the population:
 - many more at risk eg. more than three quarters of adults would be in better health if they had lower blood pressure
 - large potential gains from shifting population distributions of exposure



Conclusions

- Substantial and rapid improvements in overall healthy life expectancy are possible if:
 - major risks are targeted
 - population-wide changes are achieved
- Need for other inputs to prioritisation – values and cost-effective interventions

