New Zealand Burden of Disease Study 2006 - 2016

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The Global Burden of Disease Study 2010 (GBD 2010)

- Led by University of Washington (principal investigator Chris Murray)
- Estimated health loss (burden) globally and for 187 countries (including NZ)
- NZBD independent but designed to be compatible (same standards and methods)
- So why do our own study?
  - Access to much more empirical data for NZ (less dependent on modelling)
  - Validation
- Advantages of having both GBD country estimate for NZ and NZBD:
  - Greater credibility
  - Ownership
  - Can use GBD for international benchmarking (provided good concordance)
  - Can use GBD historical trends to improve projections (provided good concordance)

Objectives of the NZBDS 2006-2016

- Generate an *internally consistent* set of epidemiological estimates for a *comprehensive* set of 220 diseases and injuries in 18 condition groups and 31 risk factors in 10 risk factor clusters

- [Epidemiological estimates = incidence, prevalence, severity distribution, survival and mortality for each condition – all by 20 age groups, both sexes, and Maori – nonMaori ethnic groups]

- Using this database, estimate the burden of disease and injury (ie *health loss*, in DALYs) and summarise this information in terms of *health expectancy* (HALE)

BD concepts

- **Years of life lost (YLLs)** for a cause is the number of deaths from the cause at age x multiplied by the standard life expectancy at age x.

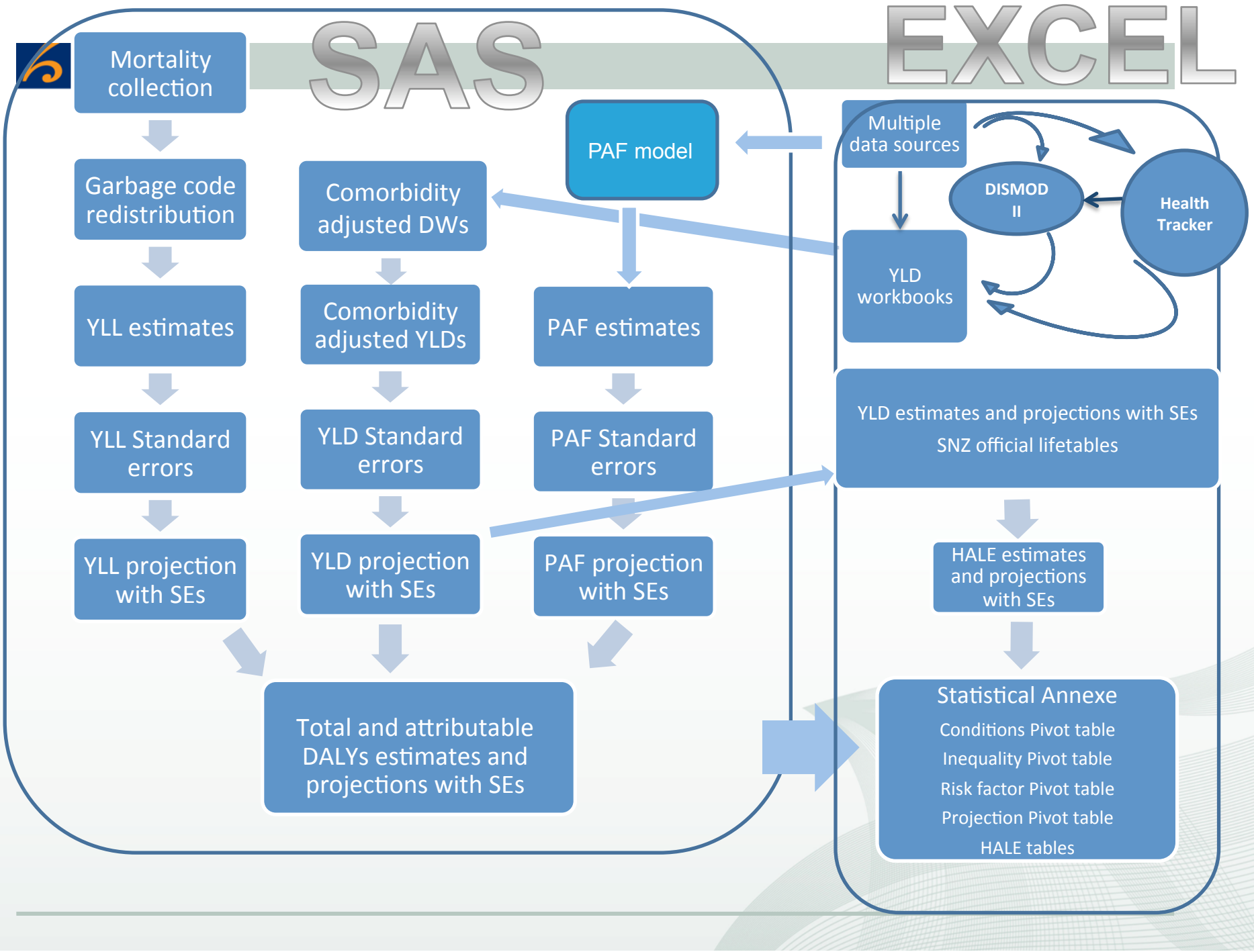
- **Years lived with disability (YLDs)** for a cause in an age-sex group is the prevalence of each sequela of that cause multiplied by the disability weight for that sequela, summed across all sequelae.

- **Sequela** or health state is any stage, phase or complication of disease or injury.

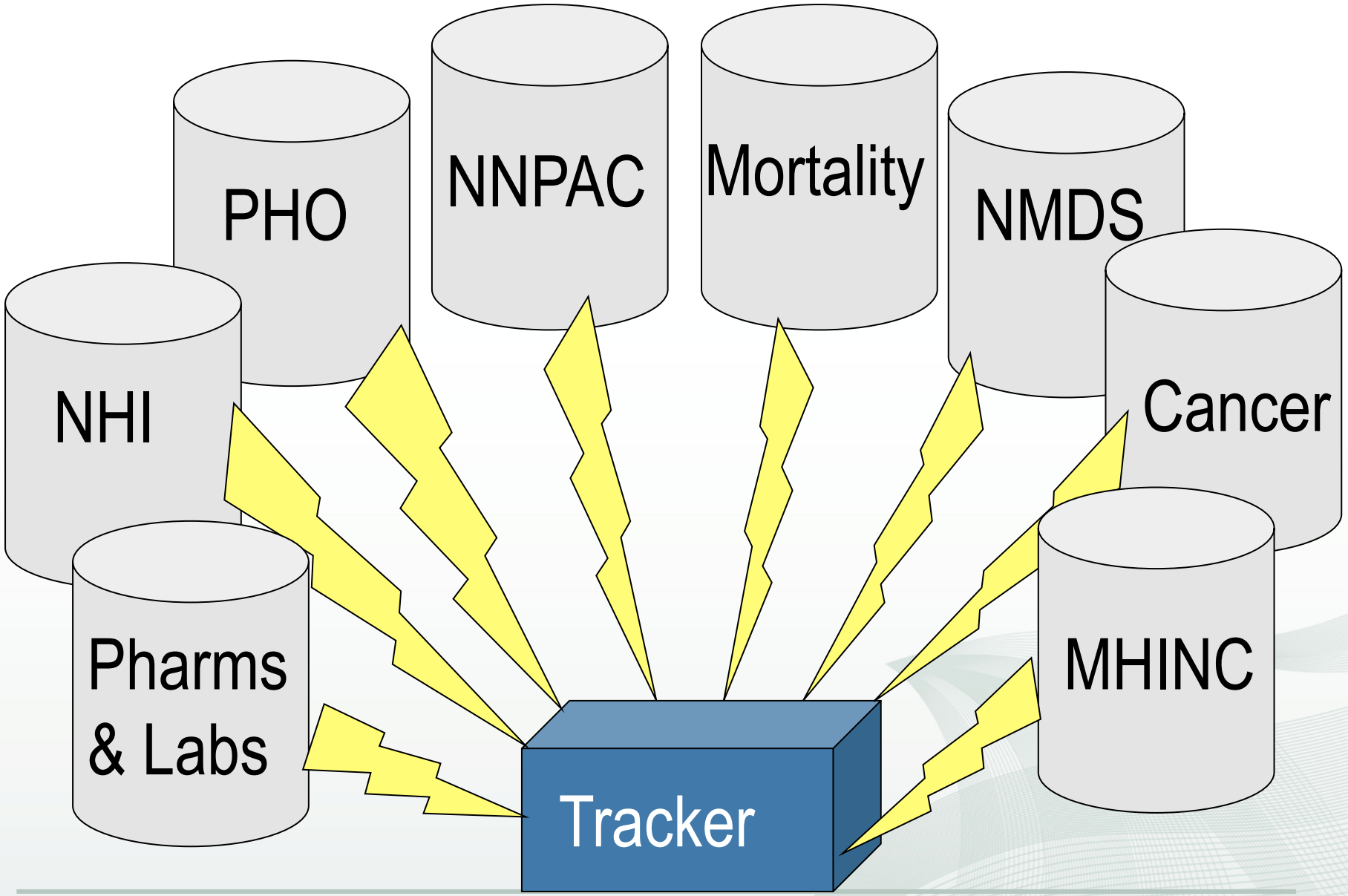
- **Disability weights** are assessments of relative severity of different health states, on a 0 – 1 scale. 'Severity' or 'disability' refers to any short-term or long-term nonfatal health loss (impairment, functional limitation, dysphoric affective state or symptom).

- **Disability adjusted life-years (DALYs)** for a cause in an age-sex group is the sum of YLLs and YLDs for that cause. So **1 DALY = 1 year of healthy life lost**

- **Health expectancy (HALE)** is a generalisation of life expectancy to incorporate time lived in different health states (operationalised as all-cause YLD rate)


SAS
EXCEL
Mortality collection
Garbage code redistribution
YLL estimates
YLL Standard errors
YLL projection with SEs
Comorbidity adjusted DWs
Comorbidity adjusted YLDs
YLD Standard errors
YLD projection with SEs
PAF model
PAF estimates
PAF Standard errors
PAF projection with SEs
Total and attributable DALYs estimates and projections with SEs
Multiple data sources
DISMOD II
Health Tracker
YLD workbooks
YLD estimates and projections with SEs
SNZ official lifetables
HALE estimates and projections with SEs
Statistical Annexe
Conditions Pivot table
Inequality Pivot table
Risk factor Pivot table
Projection Pivot table
HALE tables

New Zealand Health Tracker

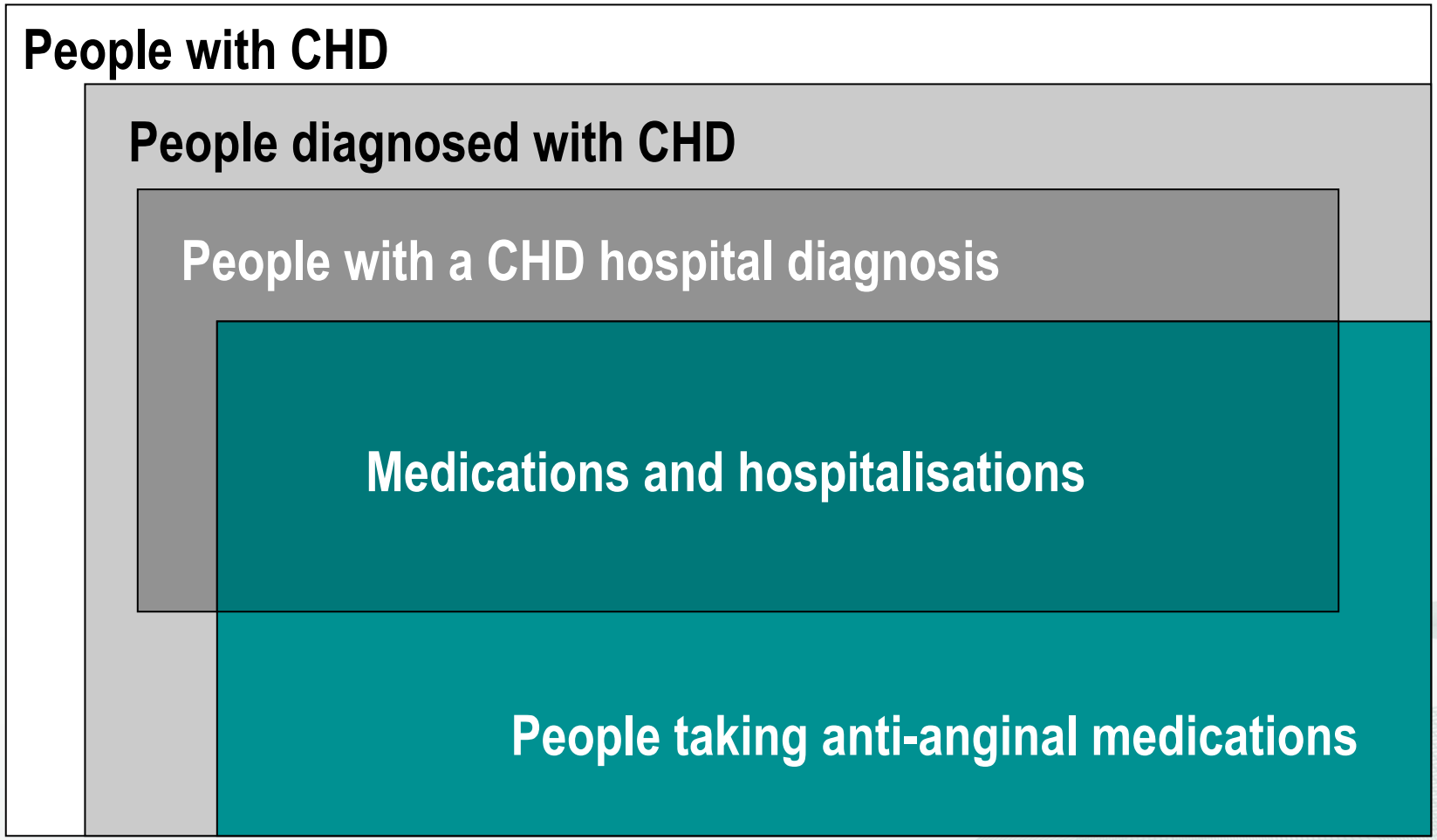


New Zealand Health Tracker: Indicators

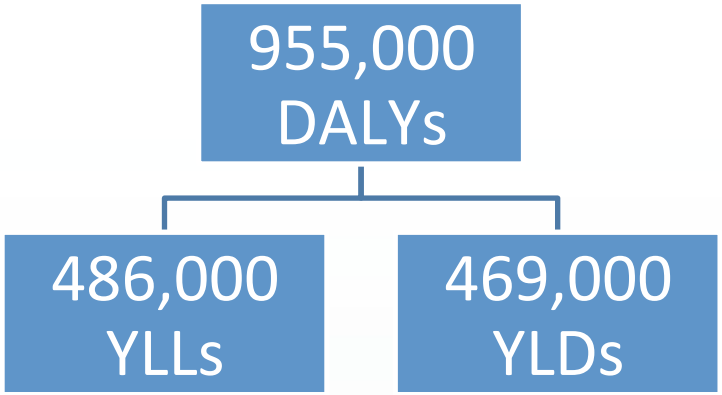
- Prevalence (example: Gout)
  - EITHER received a discharge diagnosis of gout (ICD9 274 or ICD10 M10) from a public hospital any time from 1988 to 2009
  - OR been dispensed allopurinol or colchicine from a community pharmacy any time from 2001 to 2009 AND did not have a diagnosis of a haematological malignancy in the 24 months preceding the first dispensing of allopurinol
  - AND were alive and still living in NZ as at last quarter 2009 as evidenced by any recorded health care contact during 2008-9 (including being enrolled in a PHO)
- Incidence
  - Similar to prevalence
  - Main difference is need to accurately identify *first ever* events
  - Retrograde survival model used to derive correction factor for over-ascertainment of first-ever events according to the number of years of linked data on which estimate is based

NZ Health Tracker : Capture - Recapture

Example: Coronary heart disease (CHD)

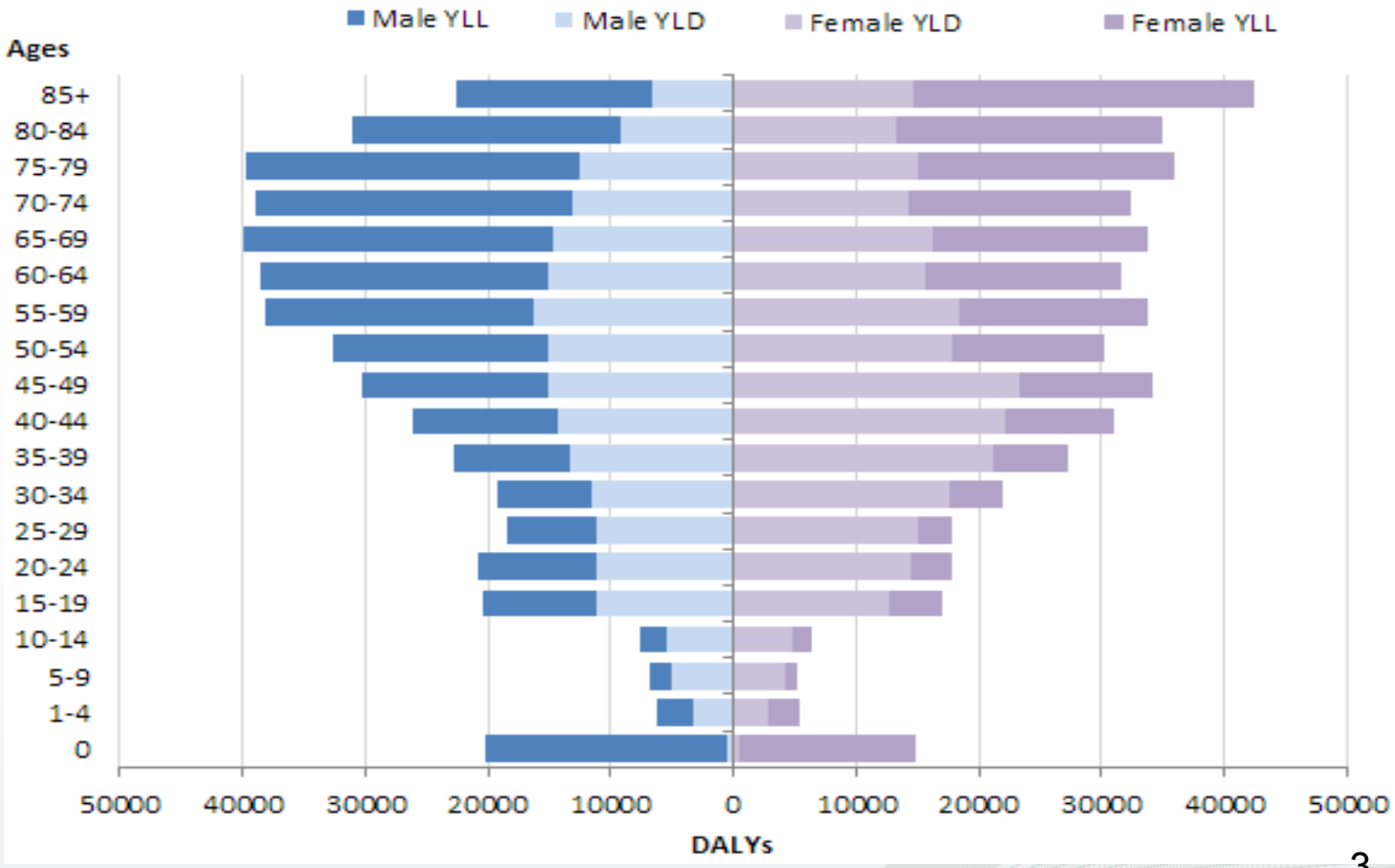


New Zealanders sustained health losses totalling almost one million DALYs in 2006

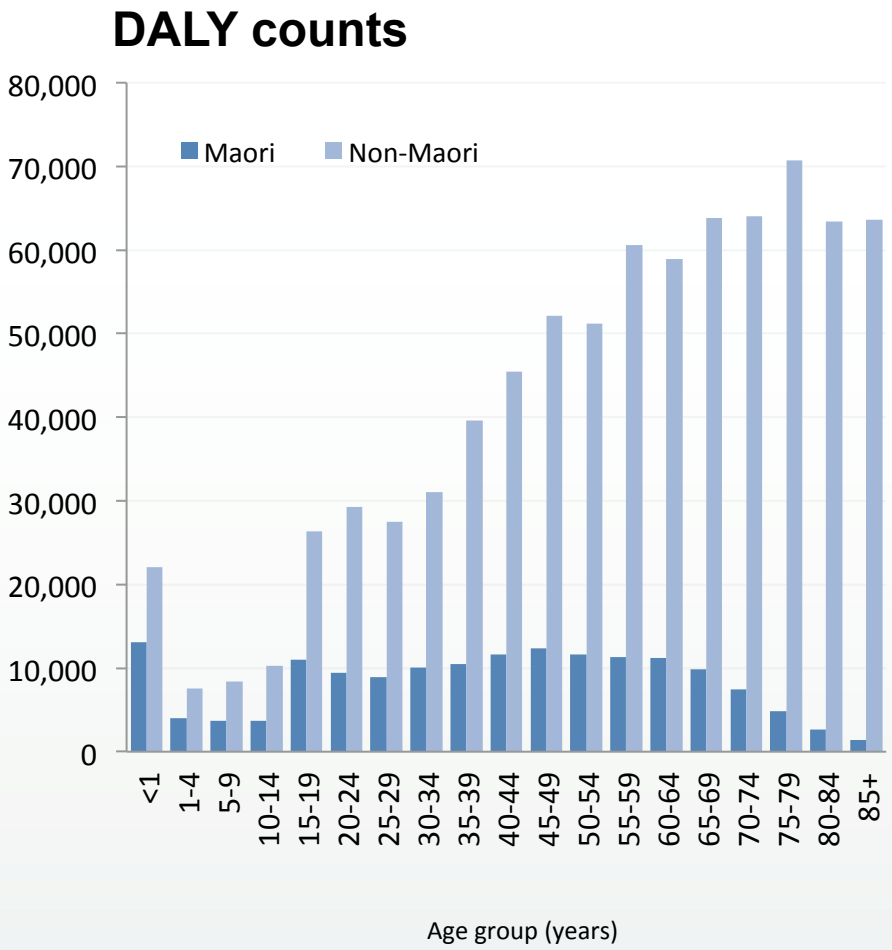


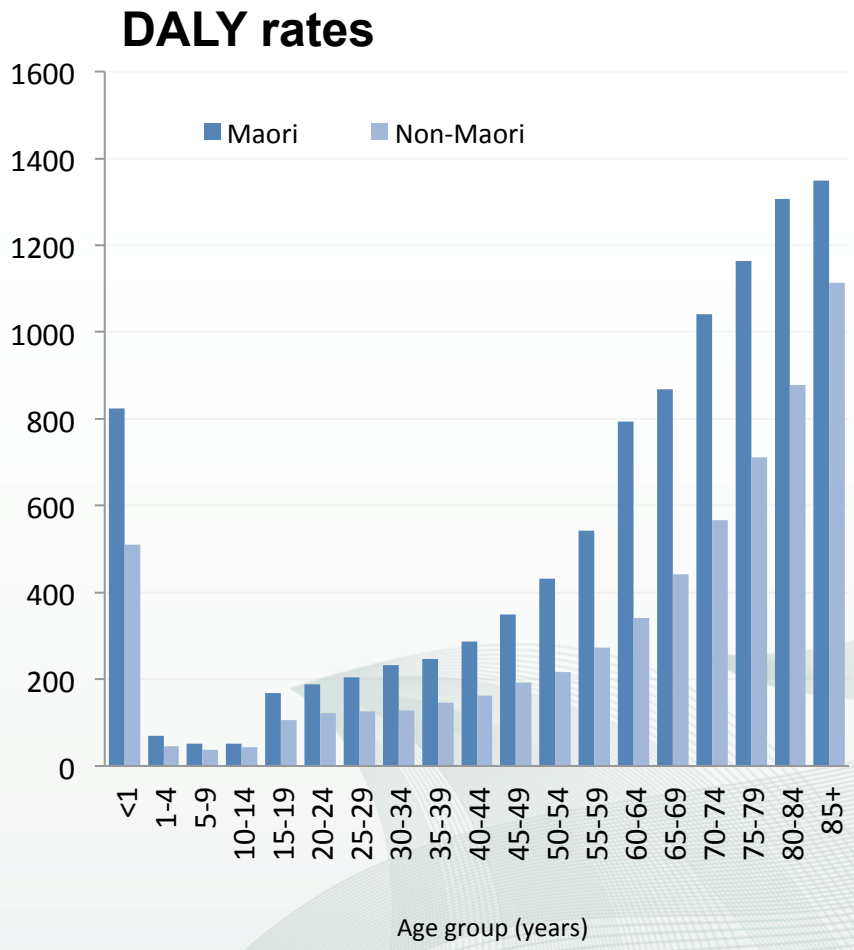
- Male : Female age standardised DALY rate ratio 1.14
- Maori : non-Maori age standardised DALY rate ratio 1.76

All-cause DALY age pyramid

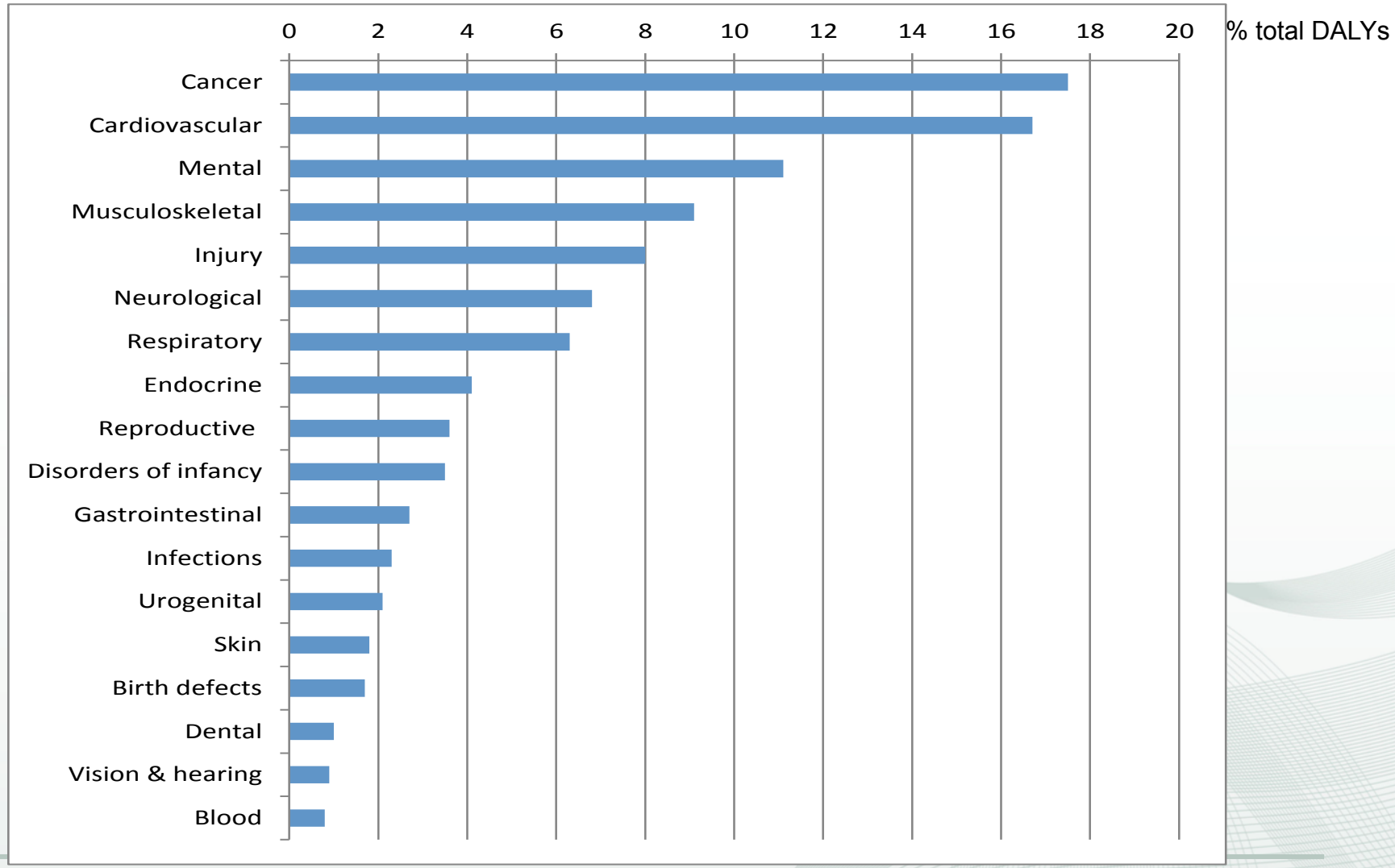


Maori experience relatively larger and earlier health losses

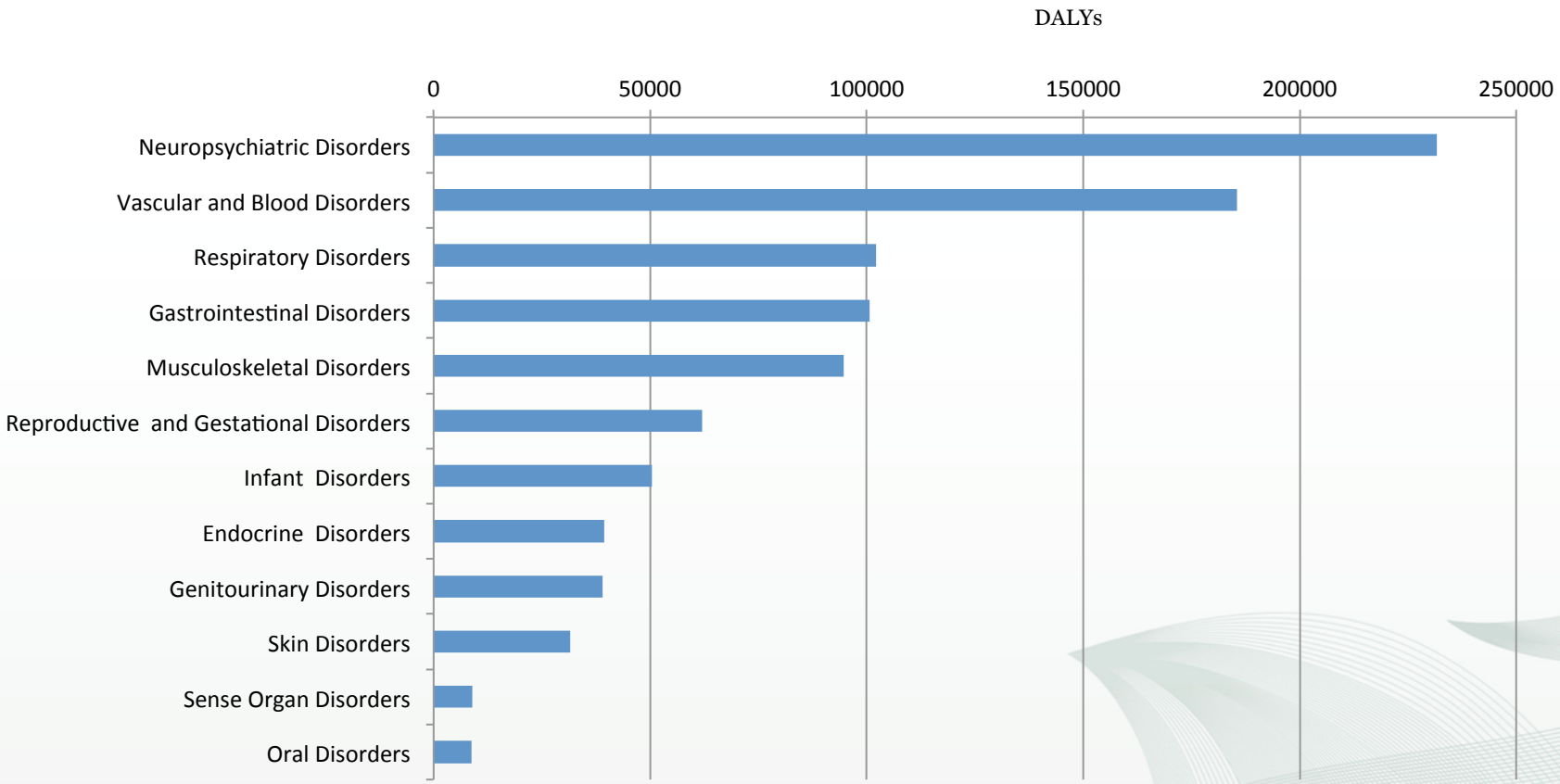




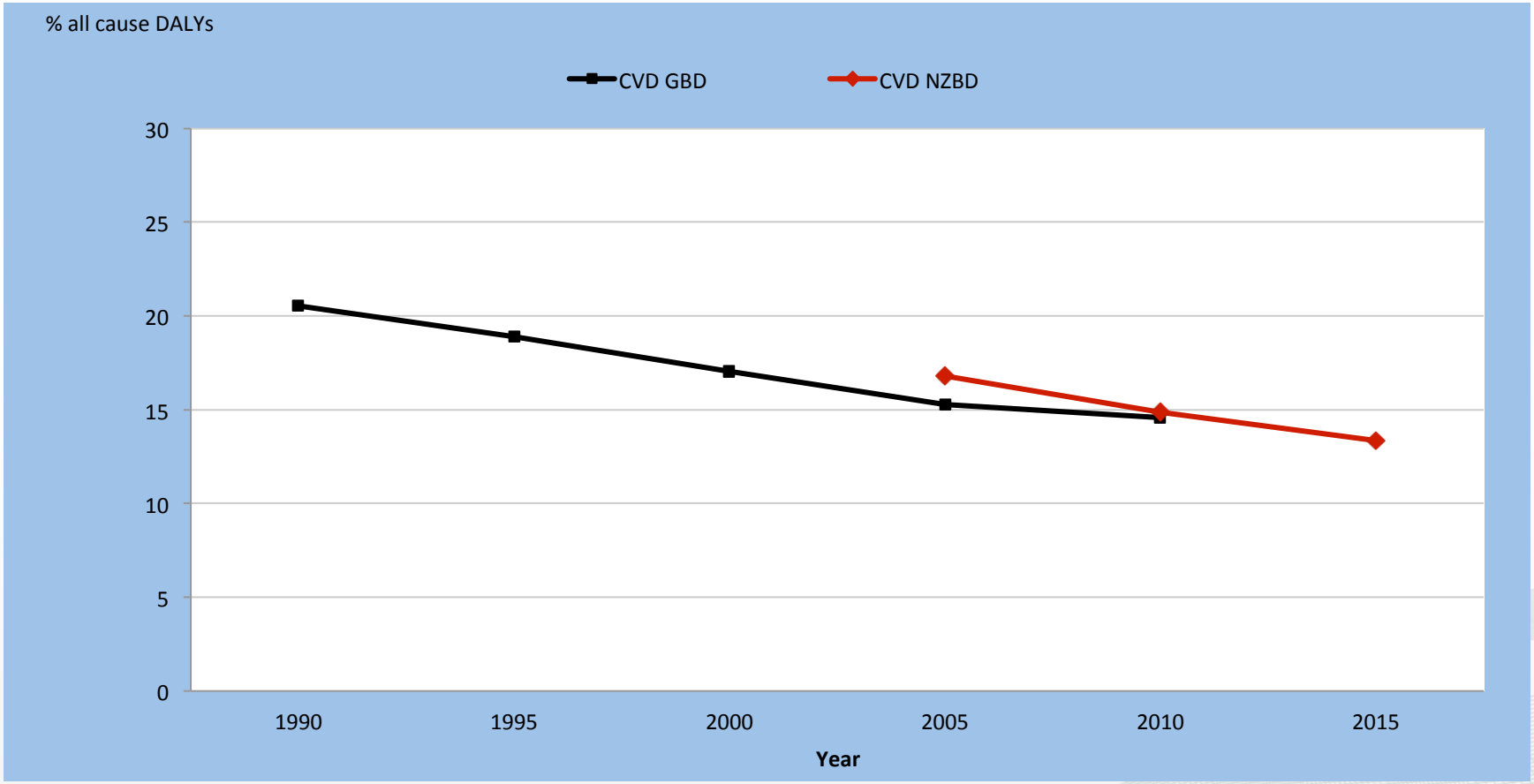
Seven condition groups account for three quarters of all health lost



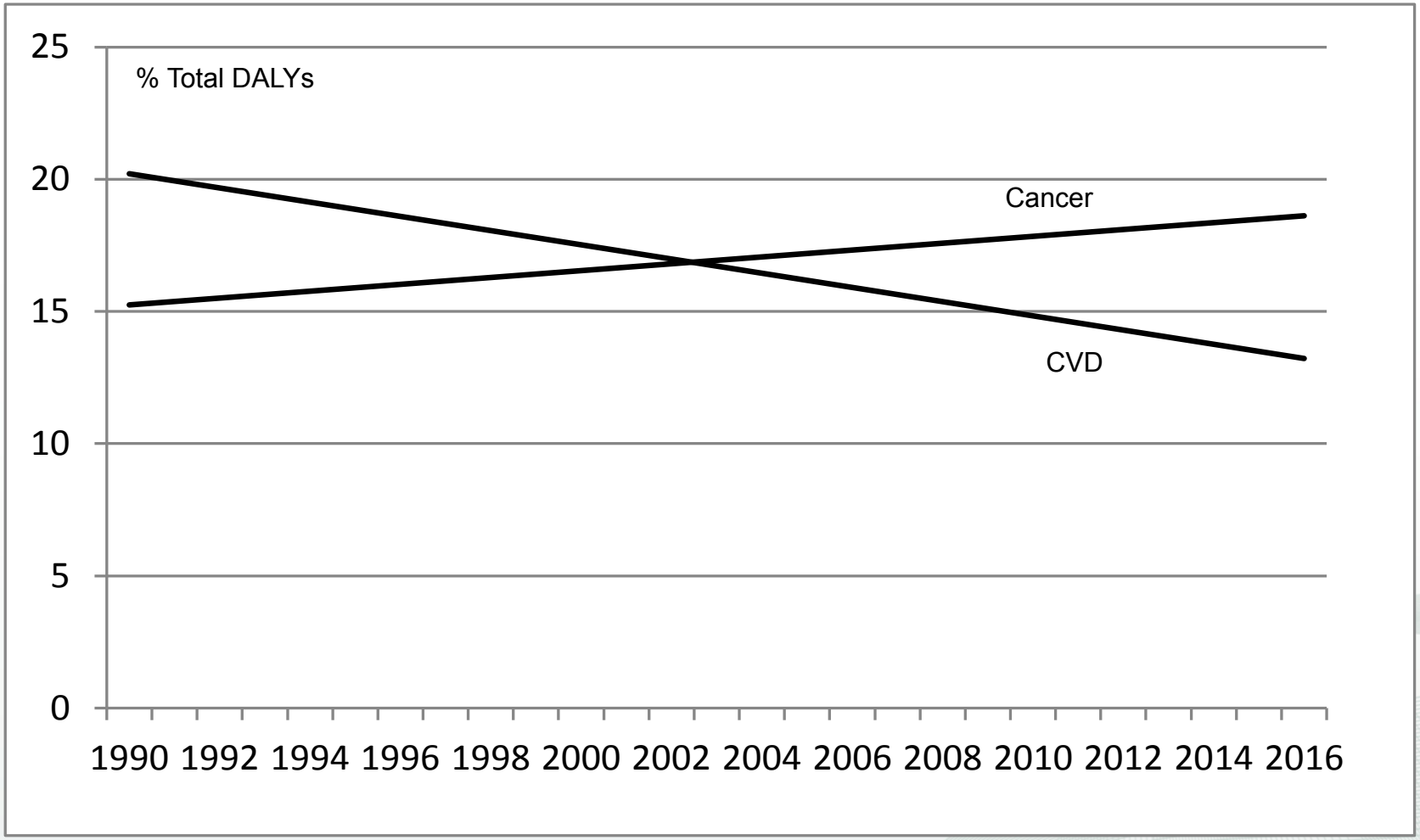
Alternative classification: body system



Trends in the cardiovascular burden



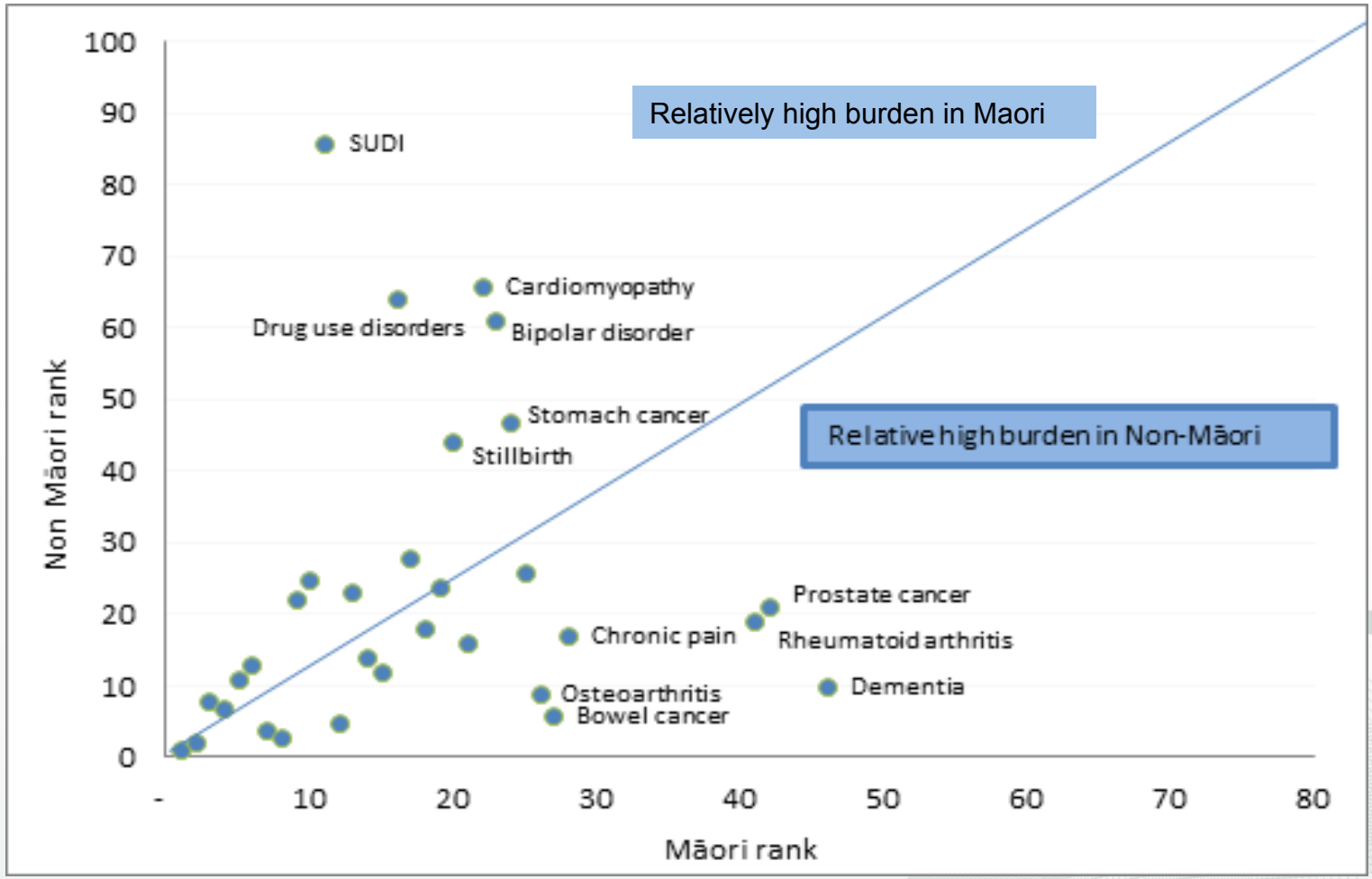
Trends in the cancer and cardiovascular burdens



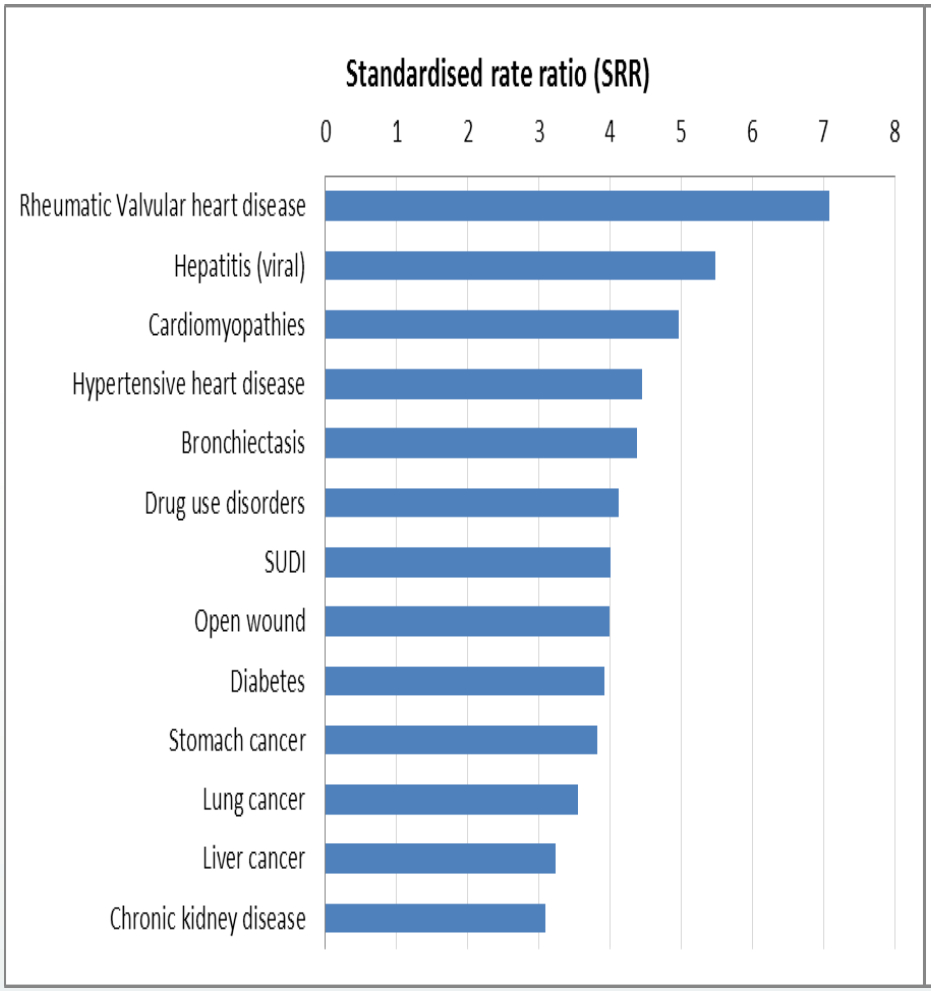
Twenty five specific causes each account for >1% DALYs

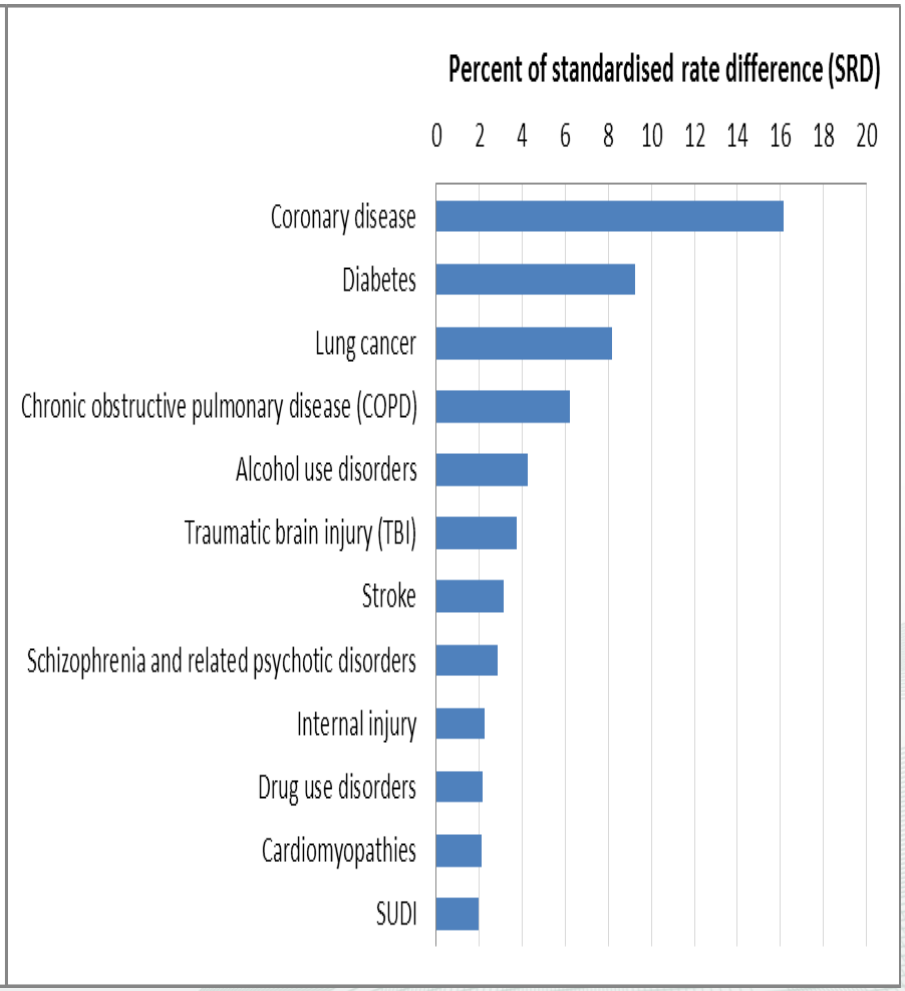
Rank	Specific Conditions	DALYs	% Total
1	Coronary disease	89,159	9.3%
2	Anxiety / depression	50,954	5.3%
3	Stroke	37,688	3.9%
4	COPD	35,339	3.7%
5	Diabetes	28,808	3.0%
6	Lung cancer	28,570	3.0%
7	Back disorders	27,112	2.8%
8	Bowel cancer	24,012	2.5%
9	Traumatic brain injury	21,728	2.3%
10	Osteoarthritis	20,738	2.2%
11	Alcohol use disorder	19,706	2.1%
12	Breast cancer	17,870	1.9%
13	Dementia	16,949	1.8%
14	Asthma	15,084	1.6%
15	Migraine	13,094	1.4%
16	Insomnia	12,772	1.3%
17	Schizophrenia	12,328	1.3%
18	Chronic pain syndromes	12,202	1.3%
19	Premature birth	11,640	1.2%
20	Internal injury	11,572	1.2%
21	Rheumatoid arthritis	10,320	1.1%
22	Poisoning (toxic injury)	10,197	1.1%
23	Prostate cancer	9,786	1.0%
24	Eczema / dermatitis	9,479	1.0%
25	Menstrual disorders	9,362	1.0%

Comparative rankings: specific causes by ethnicity

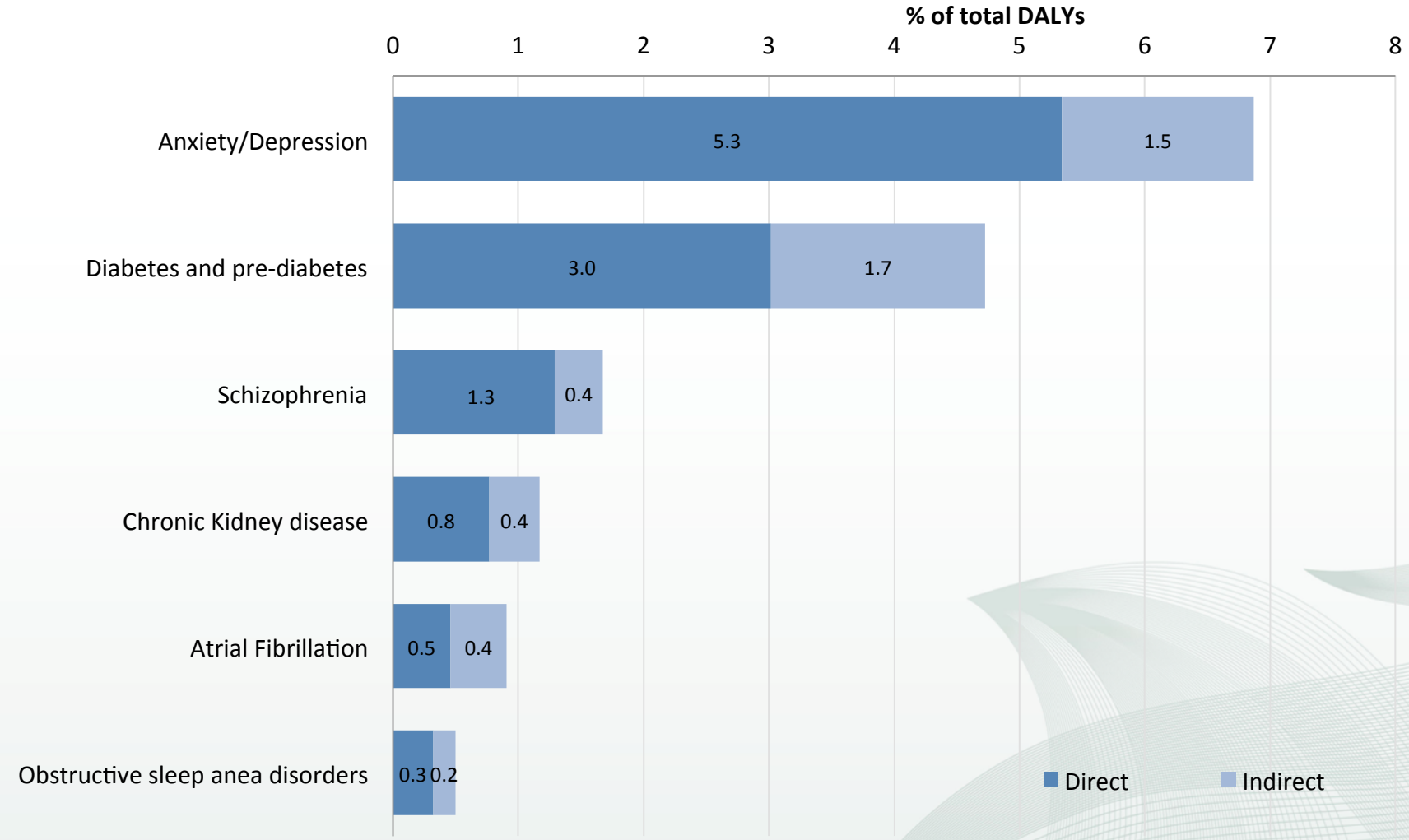


Some specific causes are very unequally distributed, but don't necessarily contribute much to inequality

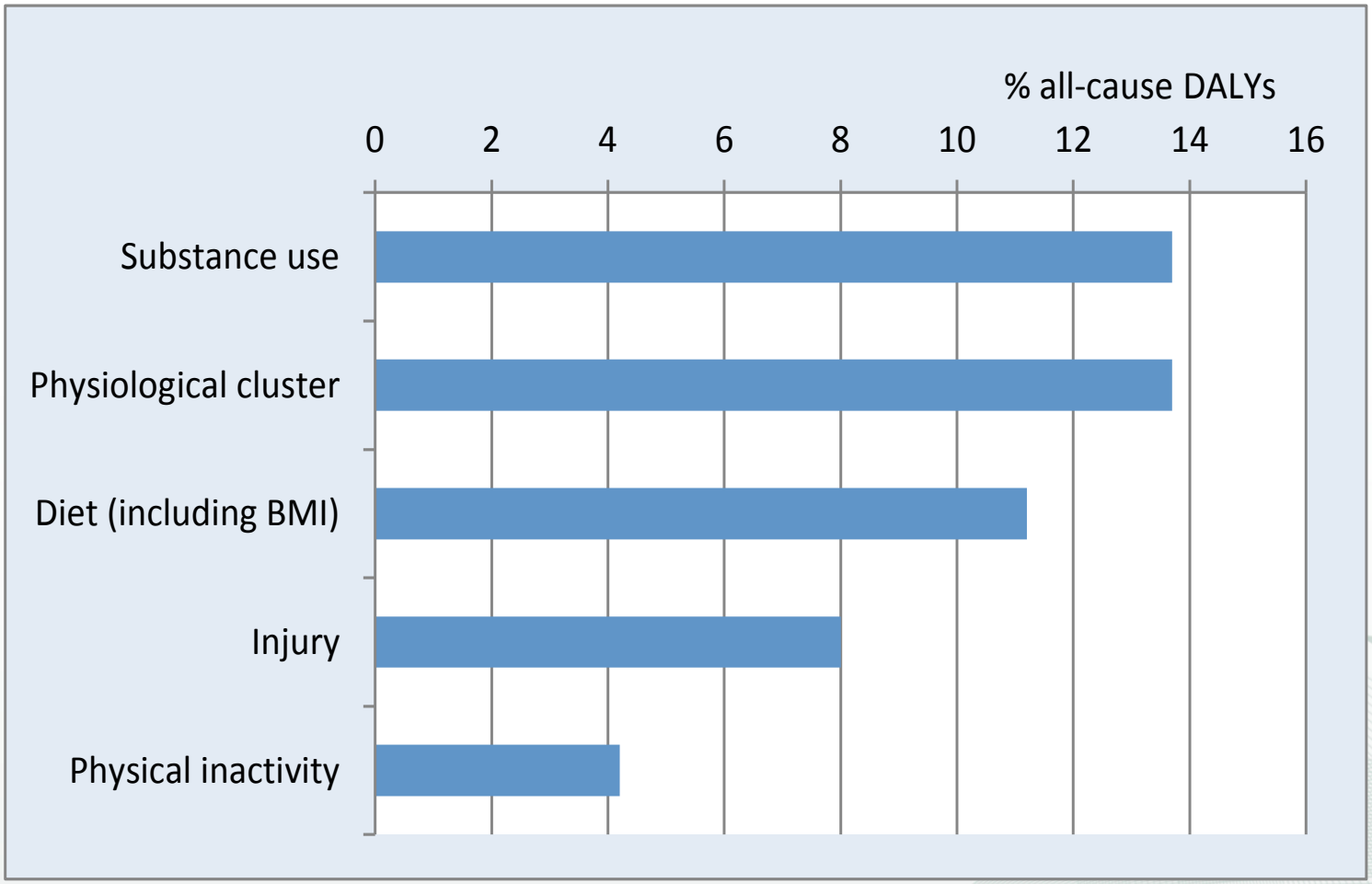




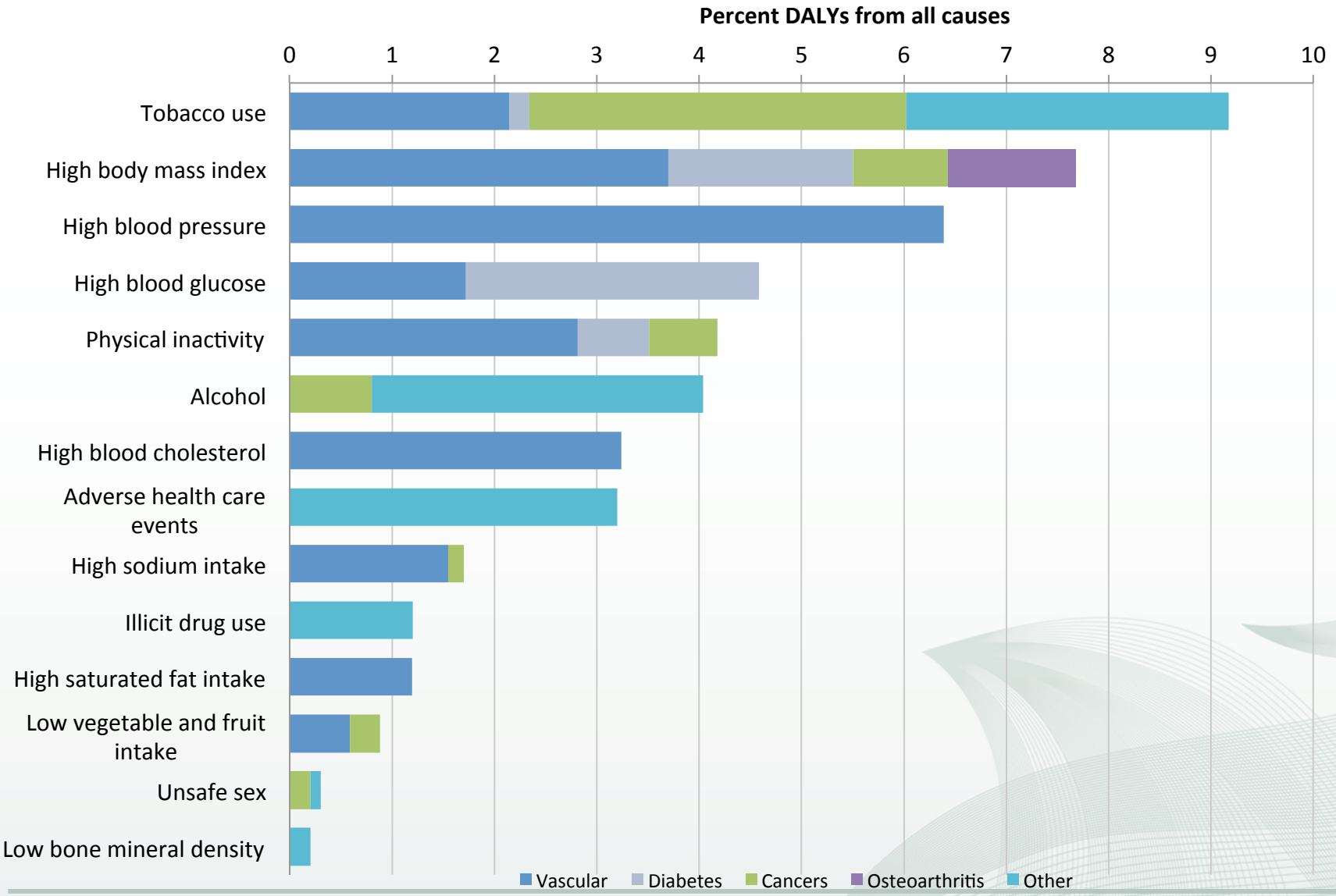
Some diseases are risk factors for other diseases



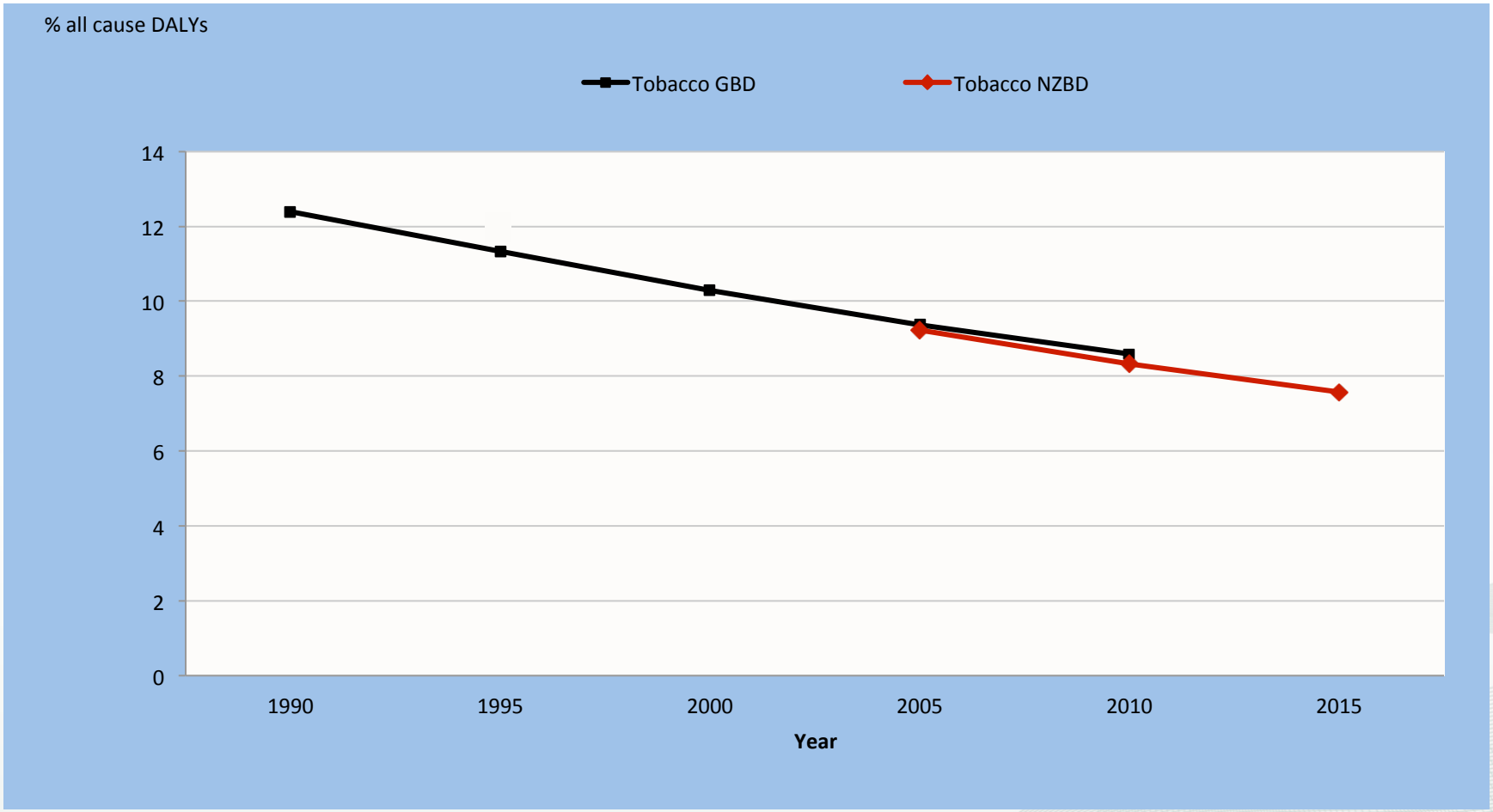
Risks to health: risk factor clusters



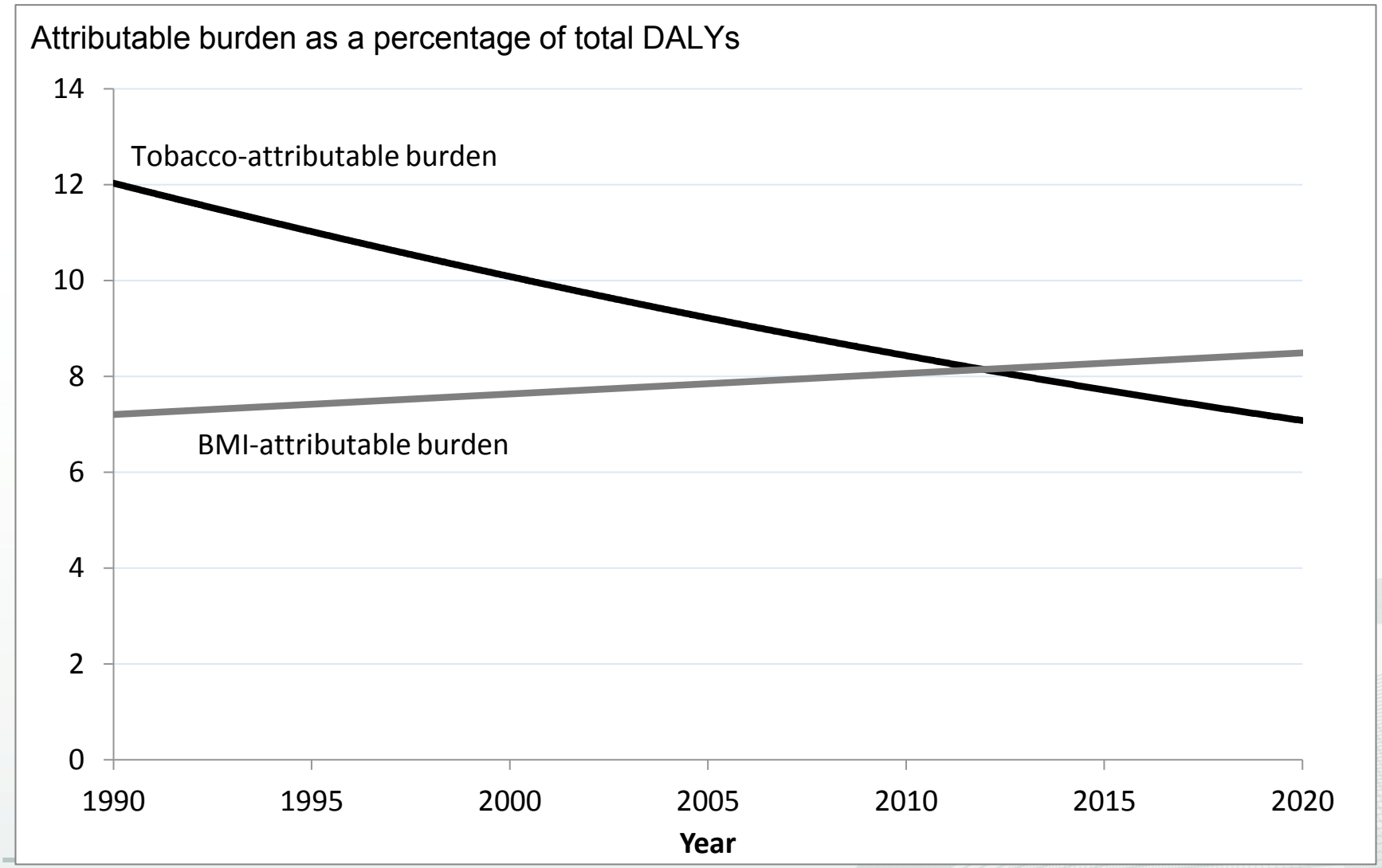
Risks to health: specific risk factors



Trends in the tobacco burden

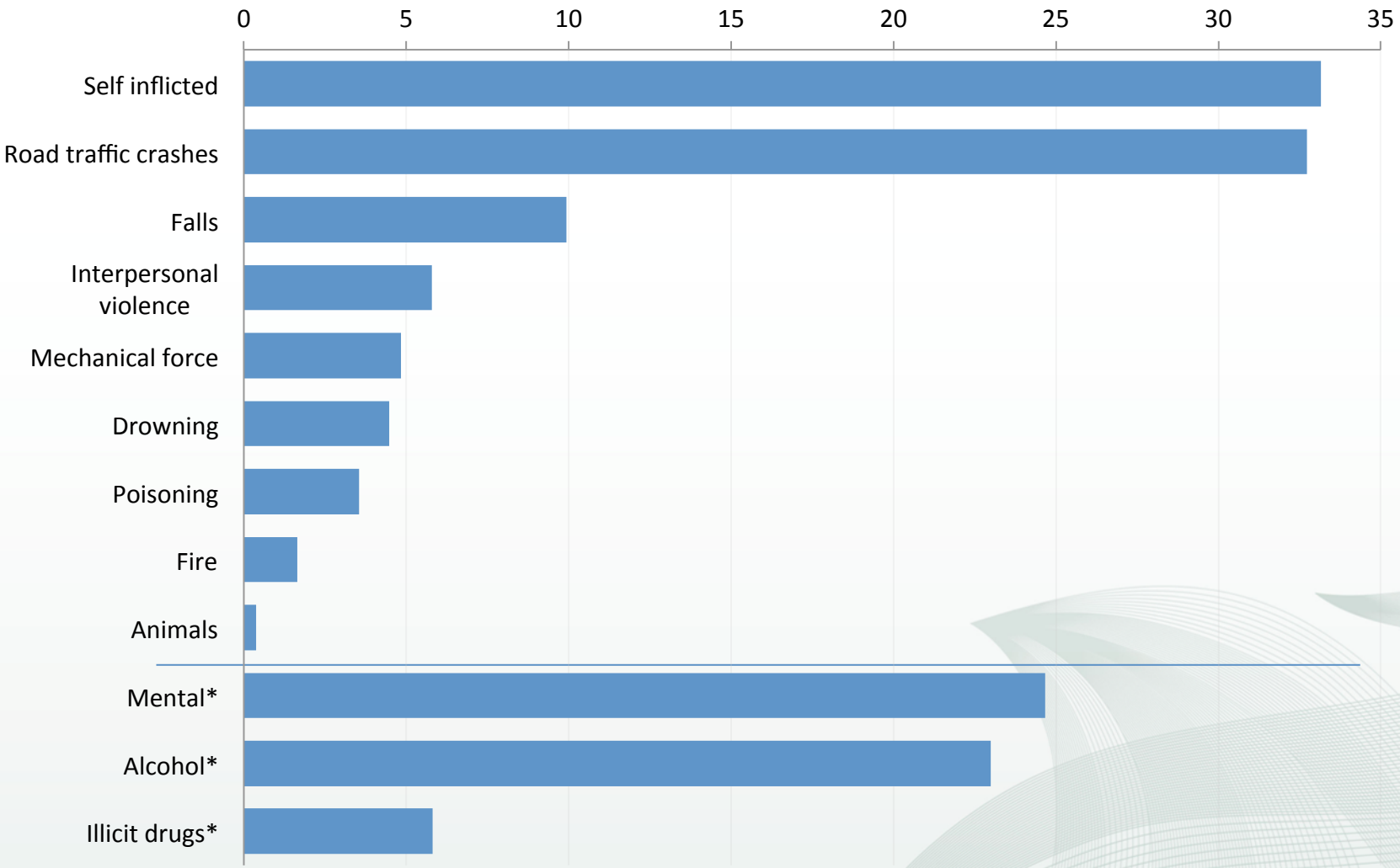


Trends in the Tobacco and BMI burdens



Risks for injury

Percentage of total injury DALYs attributable to selected external causes, NZ 2006



Injury matrix, 2006

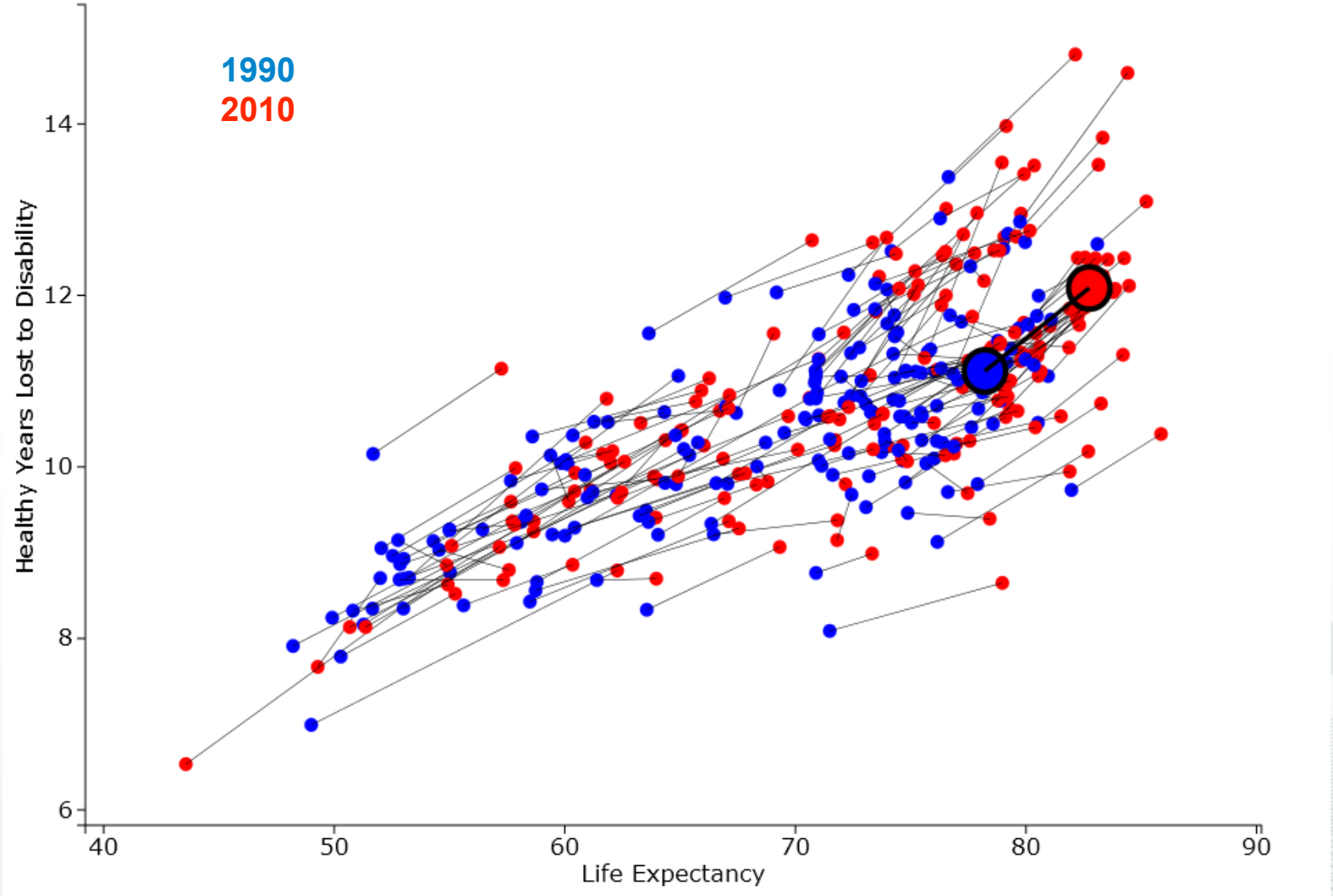
DALYs

	TBI	Other Injury	Internal	Toxic effects	Immersion	Fracture & disloc	Open wound	Burn	Amputation	Total
Transportation	15097	308	7936	136	571	488	197	169	57	24959
Falls	4092	243	803	6	11	2295	199	17	8	7673
Fire	12	12	0	355	0	0	0	1000	1	1381
Drowning	74	16	33	16	3287	7	0	0	0	3432
Poisoning	27	2	0	2591	4	5	0	63	0	2692
Animal related	78	26	85	28	0	37	13	0	2	268
Mechanical force	1035	916	494	0	12	173	219	95	623	3567
Other unintentional	304	1861	215	50	79	129	32	31	6	2707
Self-inflicted	1902	13854	1447	6660	500	143	402	195	0	25103
Interperonal violence	2022	404	890	51	85	323	642	61	7	4486
Total	24642	17640	11904	9893	4548	3601	1703	1632	704	76267

Health expectancy estimates and projections

2006	LEo	HEo	Difference	Ratio
Māori males	70.4	60.1	10.3	0.85
Māori females	75	62.8	12.2	0.84
Non-Māori males	78.9	69.9	9	0.89
Non-Māori females	82.8	71.4	11.4	0.86
2011	**LEo**	**HEo**	**Difference**	**Ratio**
Māori males	73.3	62.6	10.7	0.85
Māori females	77.6	64.5	13.1	0.83
Non-Māori males	79.9	70.8	9.1	0.89
Non-Māori females	84.4	72.4	12	0.86
2016	**LEo**	**HEo**	**Difference**	**Ratio**
Māori males	74.9	64	10.9	0.85
Māori females	78.1	65.7	12.4	0.84
Non-Māori males	80.6	71.2	9.4	0.88
Non-Māori females	84.9	72.8	12.1	0.86

Compression or expansion of morbidity?



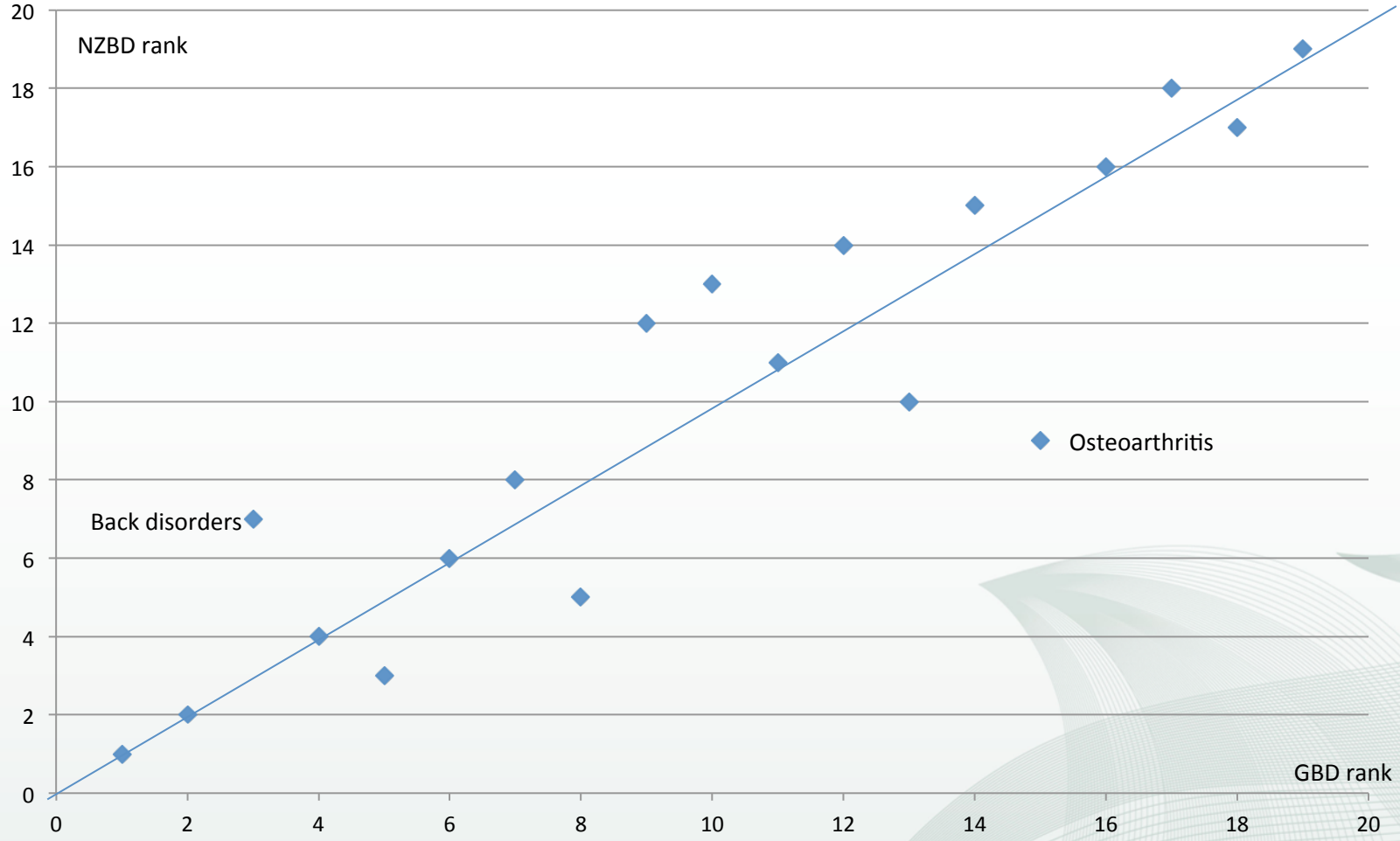
Comparison of NZBD 2006 with GBD 2010 Australasian region and New Zealand country estimates

- Very good agreement at all-cause level (especially YLL)
- Good agreement at specific condition / risk factor level, with some exceptions
- Exceptions: some musculoskeletal disorders, especially back disorders and osteoarthritis; alcohol use disorder; falls YLDs only; vegetables & fruit; some minor conditions and risk factors
- Best agreement for cancers (YLL dominated; single excellent data source; clear case definitions and disease schematics)
- Worst agreement for musculoskeletal disorders (YLD dominated; multiple poor quality data sources; unclear case definitions and severity distributions)

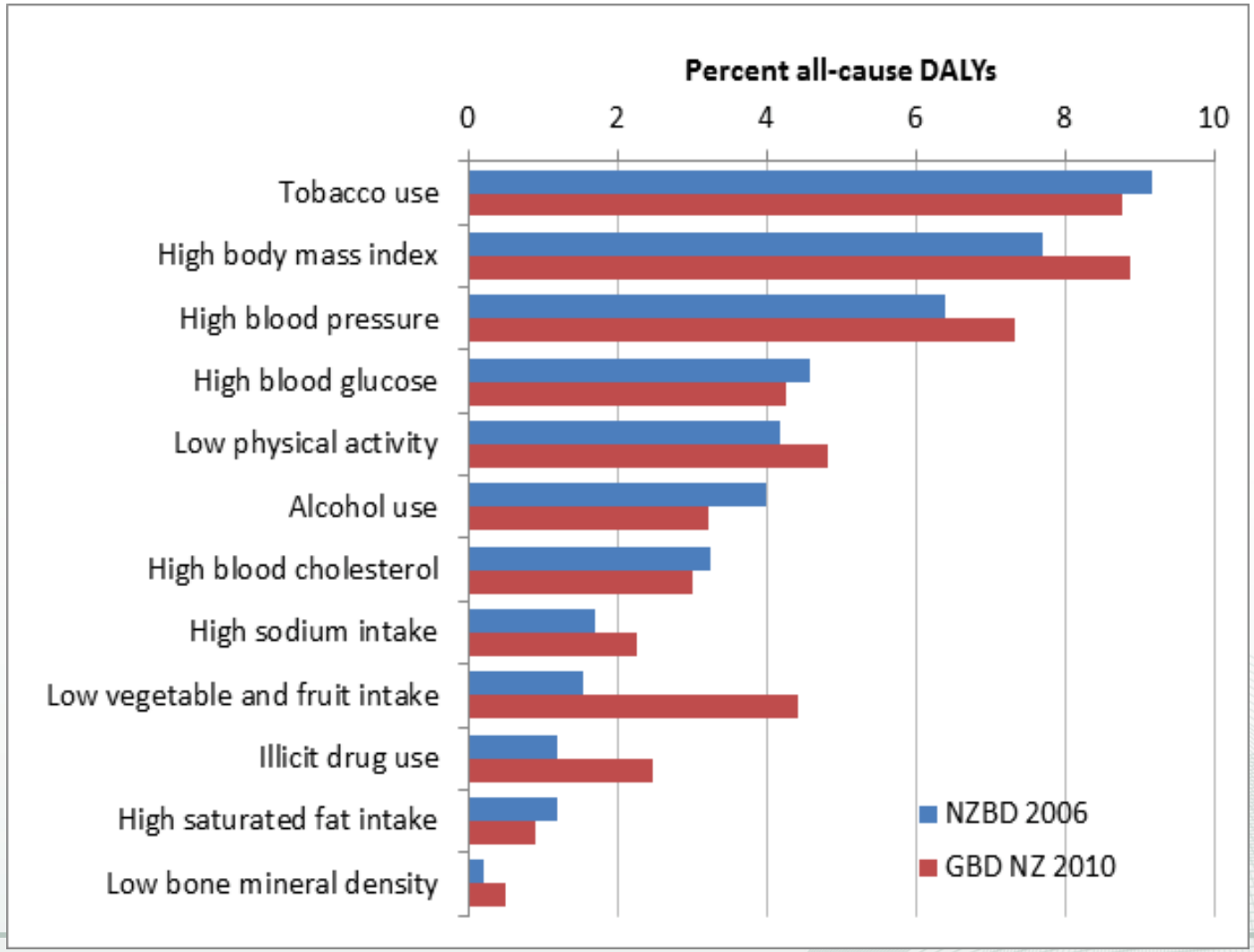
GBD 2010 – NZBD 2006 comparison: conditions

Condition	GBD 2010 Australasian region		GBD 2010 New Zealand		NZBD 2006	
	%	rank	%	rank	%	rank
Coronary heart disease	7.9	2	8.3	1	9.3	1
Anxiety and depressive disorders	5.6	3	5.5	2	5.3	2
Stroke	3.0	5	3.0	5	3.9	3
COPD	3.4	4	3.8	4	3.7	4
Diabetes	2.3	7	2.3	8	3.0	5
Lung cancer	2.8	6	2.8	6	2.9	6
Back disorders	8.0	1	7.0	3	2.8	7
Bowel cancer	2.1	10	2.4	7	2.5	8
Osteoarthritis	1.0	15	1.0	15	2.2	9
Alcohol use disorder	1.1	14	1.1	13	2.0	10
Breast cancer	1.4	12	1.6	11	1.9	11
Dementia	2.3	9	2.2	9	1.8	12
Asthma	2.3	8	2.2	10	1.6	13
Migraine	2.1	11	1.5	12	1.4	14
Schizophrenia	1.1	13	1.1	14	1.3	15
Premature birth complications	0.8	17	1.0	16	1.2	16
Rheumatoid arthritis	0.7	18	0.7	18	1.1	17
Prostate cancer	1.0	16	0.9	17	1.0	18
Eczema and dermatitis	0.6	19	0.6	19	1.0	19

Comparative rankings: GBD 2010 country vs NZBD 2006, leading specific causes



GBD 2010 – NZBD 2006 comparison: risk factors



Summary of key NZBD findings

- Two major transitions are currently in progress:
  - Cancer has overtaken cardiovascular disease as the leading cause of health loss at disease level
  - Obesity (raised BMI) is currently overtaking tobacco use as the leading cause of health loss at risk factor level.

- Poor diet is a leading cause of disease burden, particularly excess energy intake relative to expenditure, low consumption of fruits and vegetables, excessive saturated fat intake relative to unsaturated, and excessive sodium intake.

- Disabling conditions are making an increasing contribution to health loss: mental illness, musculoskeletal disorders (especially back disorders and osteoarthritis), sleep disorders, chronic pain syndromes, reproductive disorders, neurological disorders (especially dementia).

- Further expansion of morbidity (as measured by LE – HALE) is likely, unless health system can be re-focused on disabling disorders.

Possible policy uses of health loss data

- Health needs analysis
- Health impact analysis
- Health gap analysis
- Program budgeting
- Priority setting and resource allocation (input to cost effectiveness analysis - PBMA)
- Needs adjustment in population based funding formulae
- Health and health expenditure projection (MTEF)
- Health system performance assessment
- International benchmarking
- Monitoring compression vs expansion of morbidity (relevant for retirement / pensions policy, insurance industry, labour market policy)
- Beyond health system: Quality adjustment of GDP; labour markets; pensions /retirement; MSD

Acknowledgements

- NZBD team and Donald Schopflocher (University of Alberta)
- NZ Health Tracker team (Craig Wright and Anna Davies)
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