



Australian Government

Australian Institute of
Health and Welfare

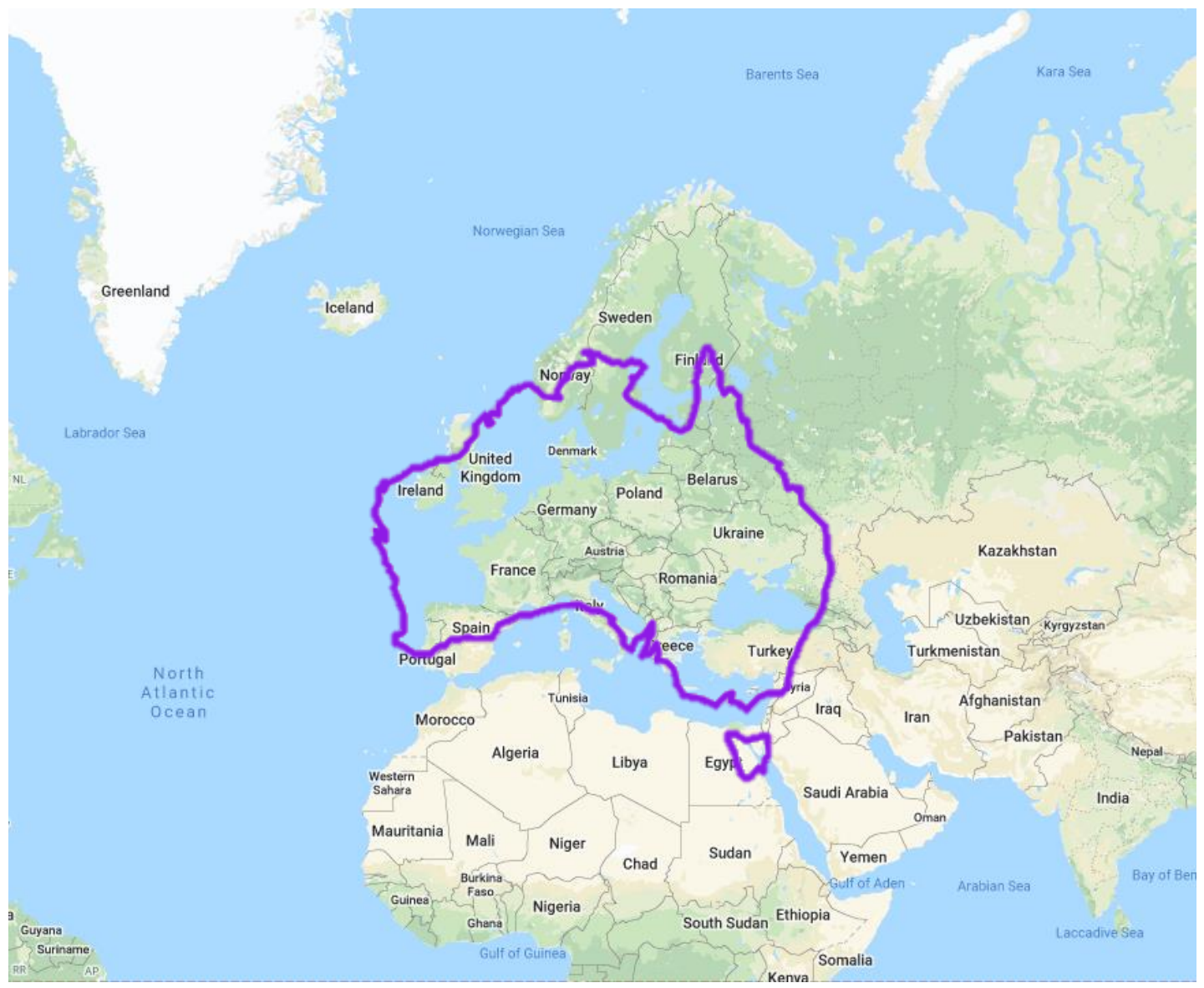
Estimation of burden of disease and recent developments in Australia

Richard Jukes

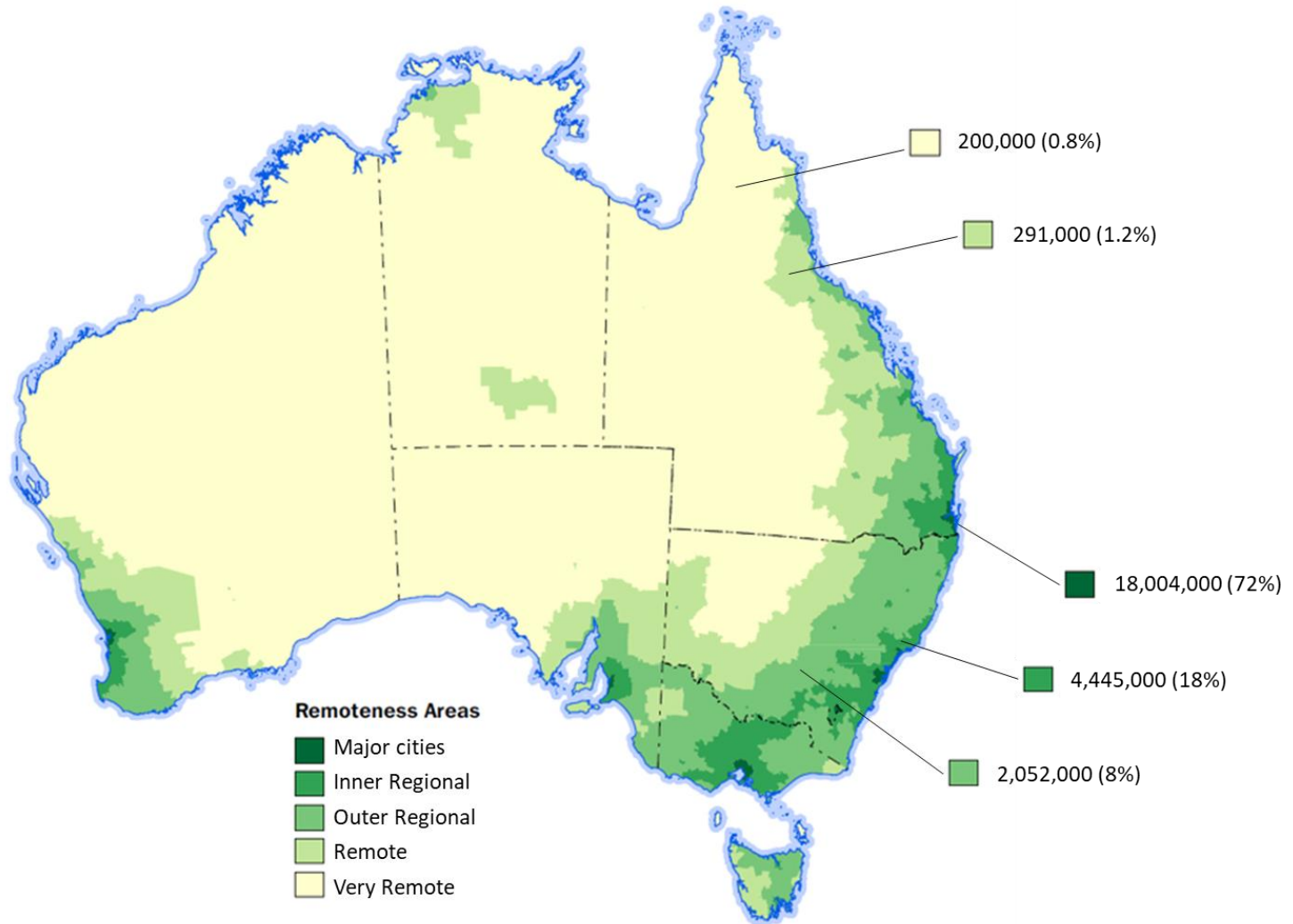
European burden of disease network WG meeting, Copenhagen

February 2020





Australia





Stronger evidence, better decisions, improved health and welfare



**Australian
Institute
of
Health
and
Welfare**

Stronger evidence, better decisions, improved health and wellbeing for all Australians

The Australian Institute of Health and Welfare (AIHW) is an independent statutory agency.

We produce authoritative and accessible information and statistics to inform and support better policy and service delivery decisions, leading to better health and wellbeing for all Australians.

We are focused on turning data into useful information and telling the broader story.



180+ customised data extracts annually for researchers, consumers, service providers, and organisations



Controlled access to Australia's most comprehensive collection of health and welfare data

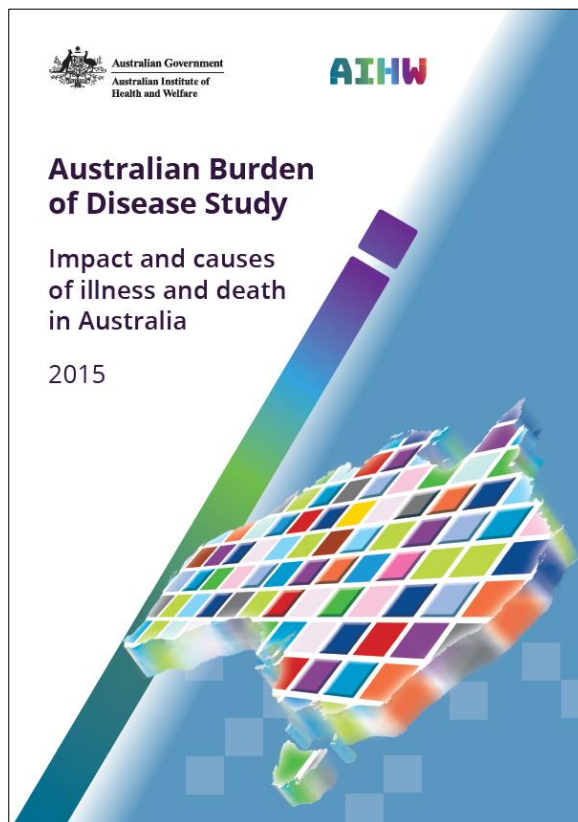
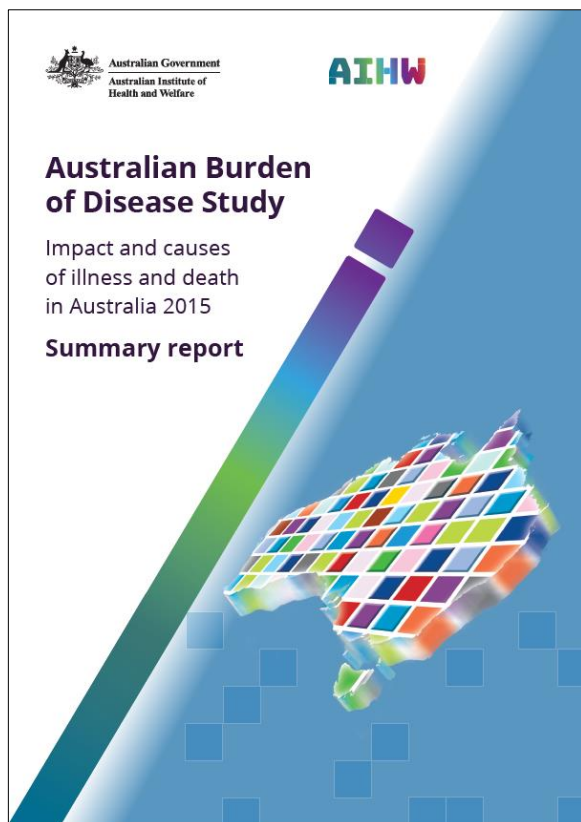


200+ publicly available reports and data releases annually covering over 75 health and welfare topics

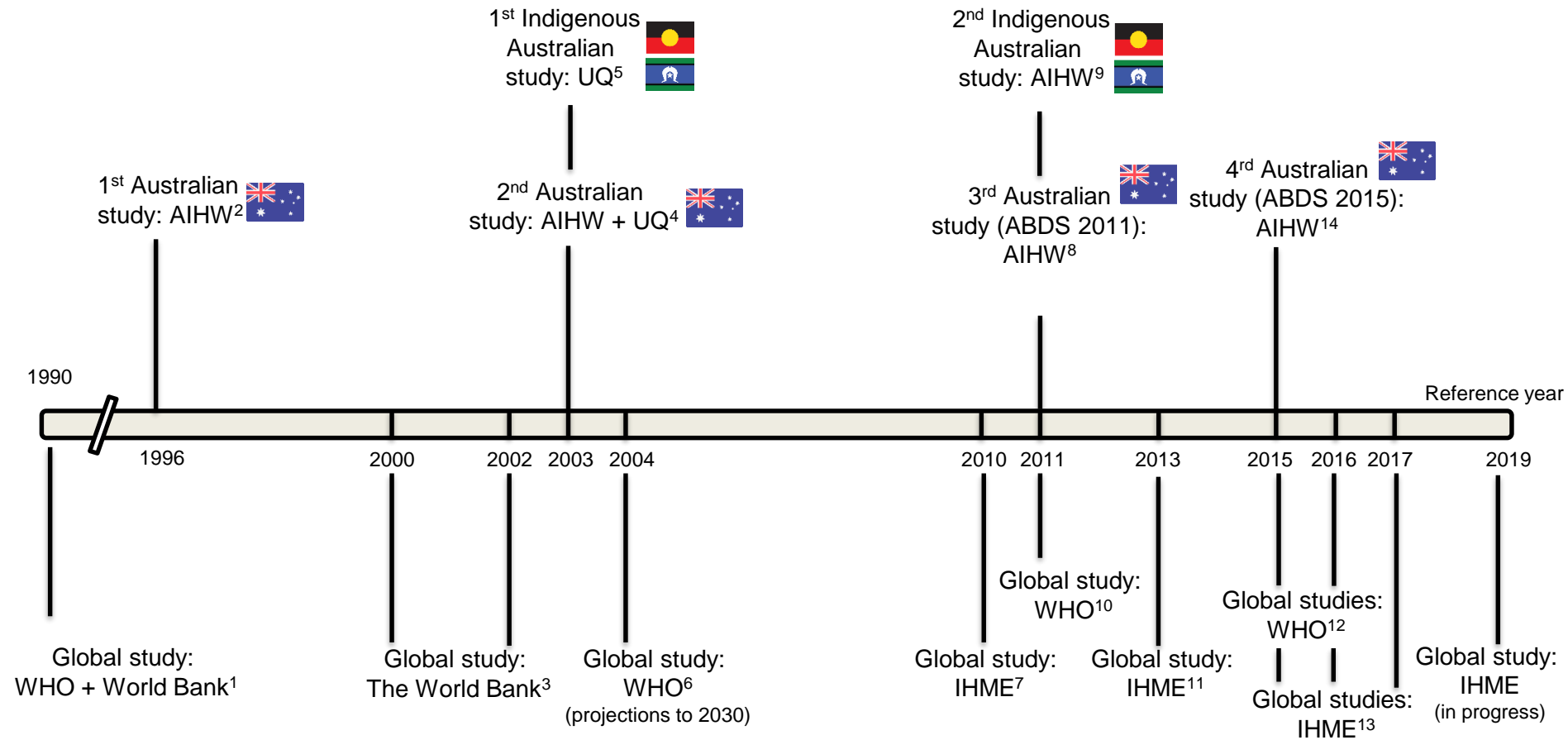


Full range of data services from requests and access, through to analysis and linkage

Australian Burden of Disease (ABDS) project



History: Australia and international



Methods

The blackboard contains a dense collection of handwritten mathematical notes and equations. Key elements include:

- Equations and Formulas:**
 - $\psi(g) = g$
 - $g = D \log f_u$
 - $M = X(E | F_\infty)$
 - $X^2 + X + 1 = 0$
 - $X^2 + X + 1 = 0 \rightarrow S_1, S_2 \rightarrow S_1^2, S_2^2$
 - $X^2 - X^2 + 1$
 - $D = (1+T) \frac{d}{dT}$
 - $\psi(f) = (1+T)$
 - $\int \chi_i d\tau = 1$
- Diagrams:**
 - A circle with a diagonal line and points labeled 'a' and 'c'.
 - A diagram of a wheel or gear with a central point and radiating lines.
 - A diagram showing a circle with a point 'a' and a line segment.
- Text and Symbols:**
 - Handwritten text such as "for some u", "SE 211@cam", and "Munich".
 - Various mathematical symbols and notations, including σ , τ , α , β , γ , δ , ϵ , ζ , η , θ , φ , χ , ψ , ω , ν , μ , λ , κ , ι , θ , φ , χ , ψ , ω , ν , μ , λ , κ , ι .



The modern era: ABDS2011 ->

- Took on developments from Global Burden of Disease Study
 - simpler DALY
 - new standard life table for YLL
 - updated disability weights
- Australian specific changes
 - YLD based more directly on data (closer to YLL approach)
 - more comprehensive list of diseases
 - new conceptual models for some diseases
 - new data sources for many diseases
 - new risk factors and linked diseases
- Establishing the ABDS “system”

(available at www.aihw.gov.au/burden-of-disease/working-papers/)



Inputs into calculations


	Fatal burden (YLL)	Non-fatal burden (YLD)	Risk factor attribution
Main data sources	<i>Number of deaths:</i> National Mortality Database	<i>Prevalence of disease:</i> Disease registers National Hospital Morbidity Database Linked hospital/deaths data Population health surveys Epidemiological studies	<i>Prevalence of risk factor:</i> Population health surveys Surveillance studies Disease registers National Hospital Morbidity Database National Mortality Database
Other inputs	Standard life table (GBD 2010)	Disability weights (GBD 2013)	Effect sizes/ relative risks and linked diseases (mostly GBD 2016)
Key choices	Redistribution method	Underlying conceptual model for each disease	Risk-outcome pairs Theoretical minimums

Levels of analysis

Level	Fatal, non-fatal	Number	Example
Disease group	Both	17	Cardiovascular diseases
Specific disease	Both	216	Coronary heart disease (CHD)
Sequela (consequence)	NF only	~320	Heart failure due to CHD
Severity	NF only	~700	Mild, moderate, severe



Results from ABDS 2015

- What is the overall status of Australia's health?
 - What are the most relevant diseases in Australia?
 - Which risk factors are the strongest contributors to disease and death?
 - How is the impact of different diseases evolving over time?
 - How does it compare between groups within Australia?
 - How does it compare with other countries?
- 

Australians lost 4.8 million years of healthy life in 2015



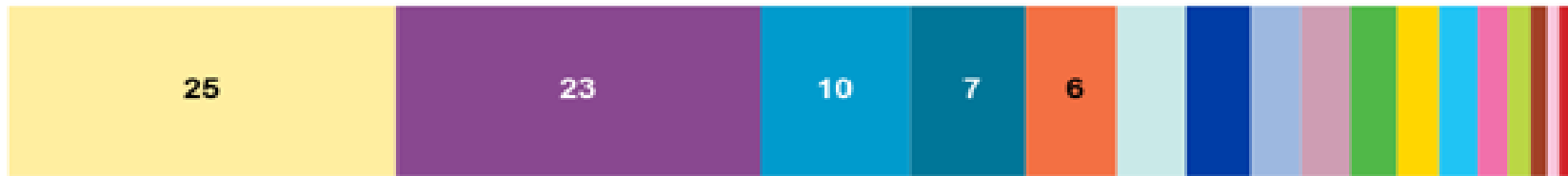
50.4% due to living with impacts of disease/injury (non-fatal burden)

49.6% due to dying prematurely (fatal burden)

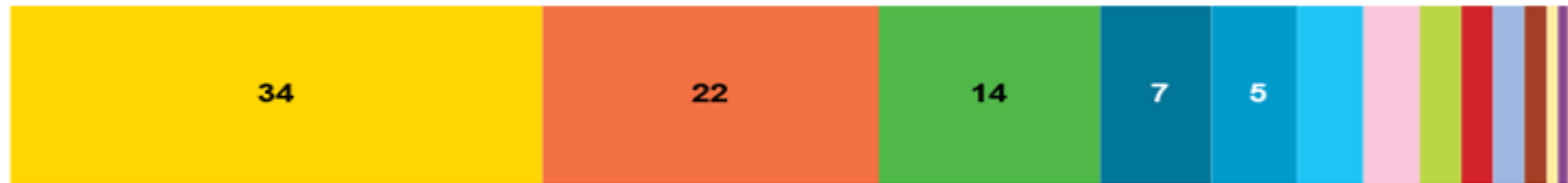


Chronic diseases and injury dominate

Non-fatal burden (YLD)



Fatal burden (YLL)



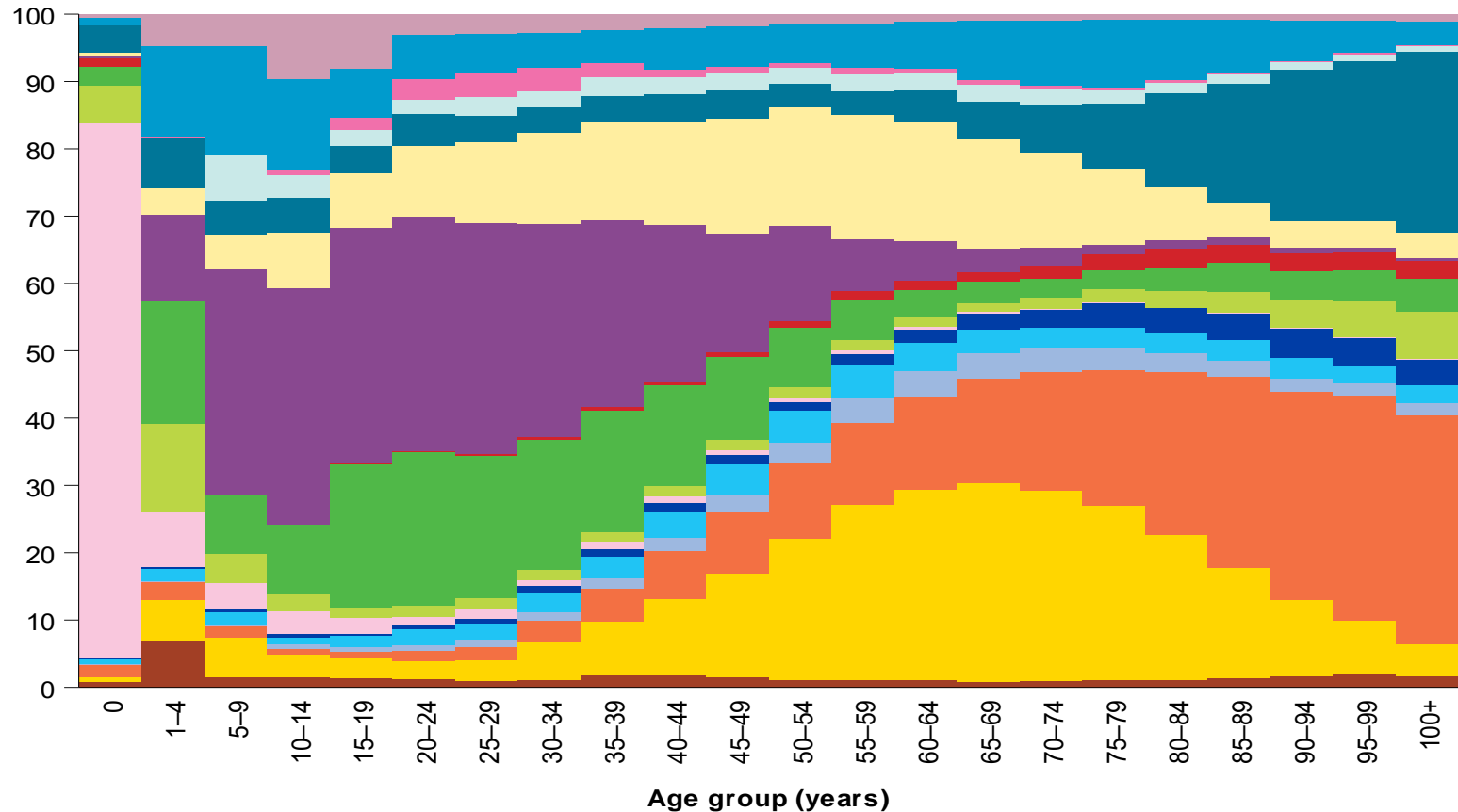
Total burden (DALY)



- | | | | |
|-----------------------|----------------|----------------|------------------|
| Cancer | Cardiovascular | Mental | Musculoskeletal |
| Injuries | Respiratory | Neurological | Gastrointestinal |
| Infant/congenital | Endocrine | Oral | Hearing/vision |
| Skin | Infections | Kidney/urinary | Blood/metabolic |
| Reproductive/maternal | | | |

Patterns across the life course (DALY)

Per cent



- Blood/metabolic
- Cancer
- Cardiovascular
- Endocrine
- Gastrointestinal
- Hearing/vision
- Infant/congenital
- Infections
- Injuries
- Kidney/urinary
- Mental
- Musculoskeletal
- Neurological
- Oral
- Reproductive/maternal
- Respiratory
- Skin

Leading specific causes of burden: mainly chronic

Rank		% DALY
1	CHD	6.9
2	Back pain	4.1
3	COPD	3.9
4	Dementia	3.8
5	Lung cancer	3.3
6	Anxiety	3.2
7	Depression	2.9
8	Suicide/self-inflicted injury	2.8
9	Stroke	2.7
10	Asthma	2.5

Rank		% DALY
11	Osteoarthritis	2.4
12	Type 2 diabetes	2.2
13	Bowel cancer	2.0
14	Rheumatoid arthritis	2.0
15	Hearing loss	1.5
16	Breast cancer	1.5
17	Alcohol use dis.	1.4
18	Falls	1.4
19	Poisoning	1.3
20	Chronic liver disease	1.2

Australians getting healthier (or at least dying less)

There were **substantial improvements** in population health between 2003 and 2015 with:



Biggest **absolute reduction** in burden (DALY rate) came from:

- Cardiovascular diseases
- Cancer
- Musculoskeletal conditions
- Infant and congenital conditions

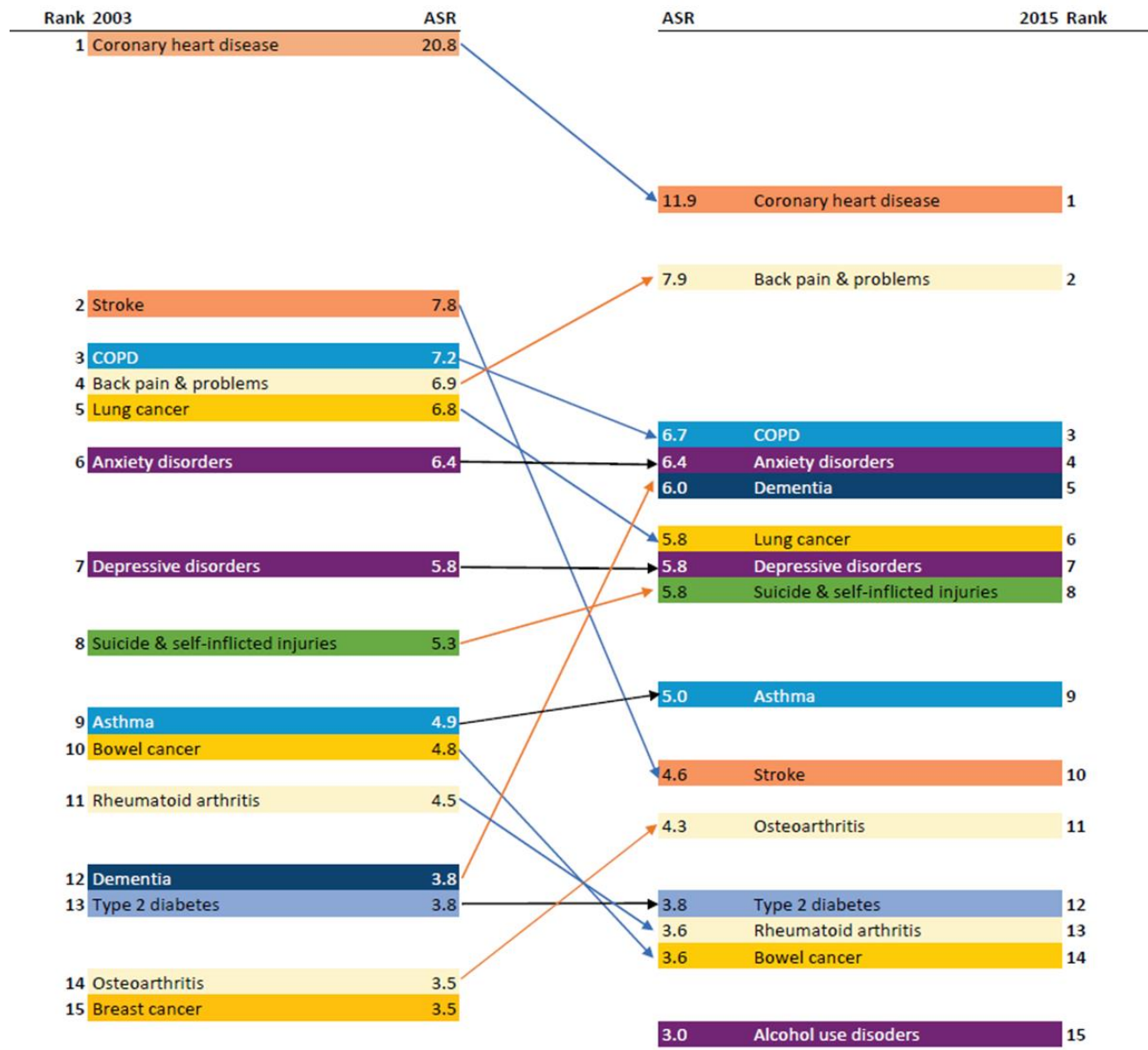


Biggest **absolute increase** in burden (DALY rate) came from:

- Neurological conditions



Change in ranking and DALY rate



Differences across population groups

Burden (DALY rate) in:

Northern Territory is



1.4x

National average



Remote and very remote areas is



1.4x

Major cities



Lowest socioeconomic group is



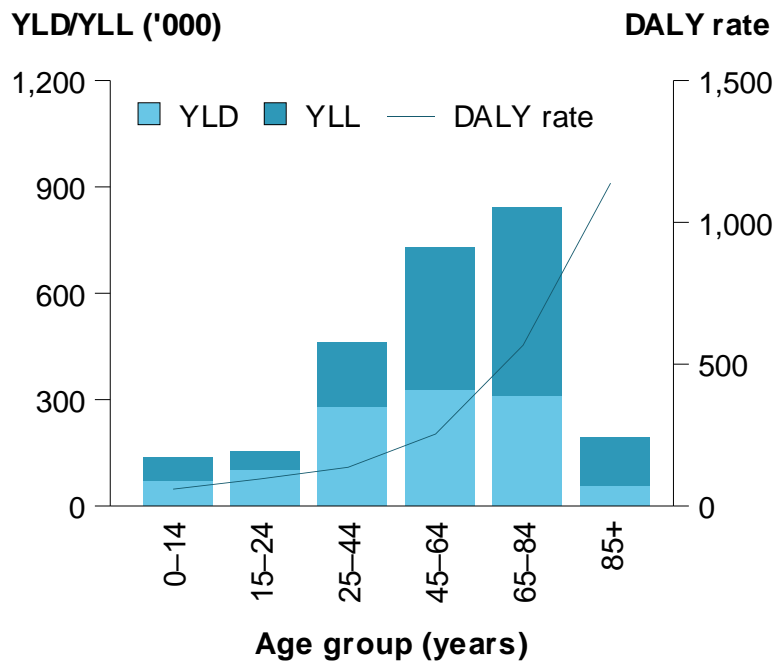
1.5x

Highest socioeconomic group

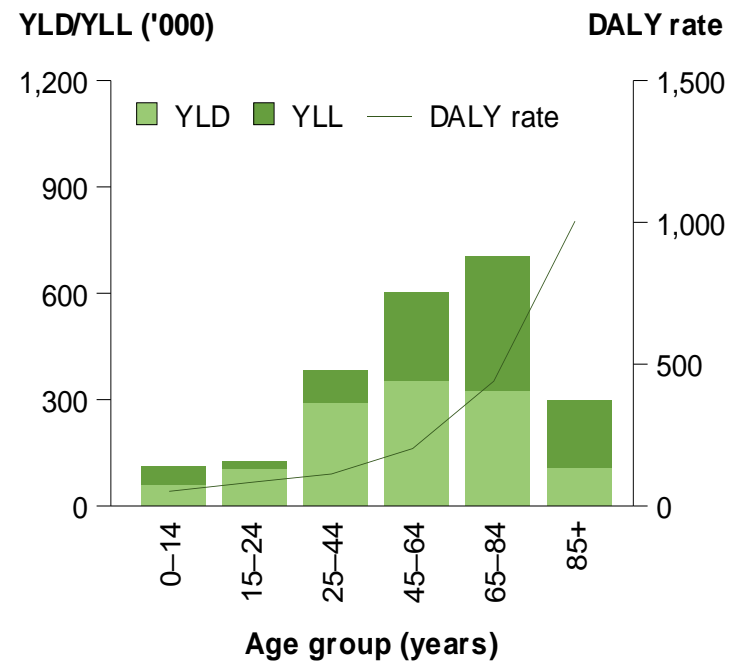


Burden of ill health increases with age

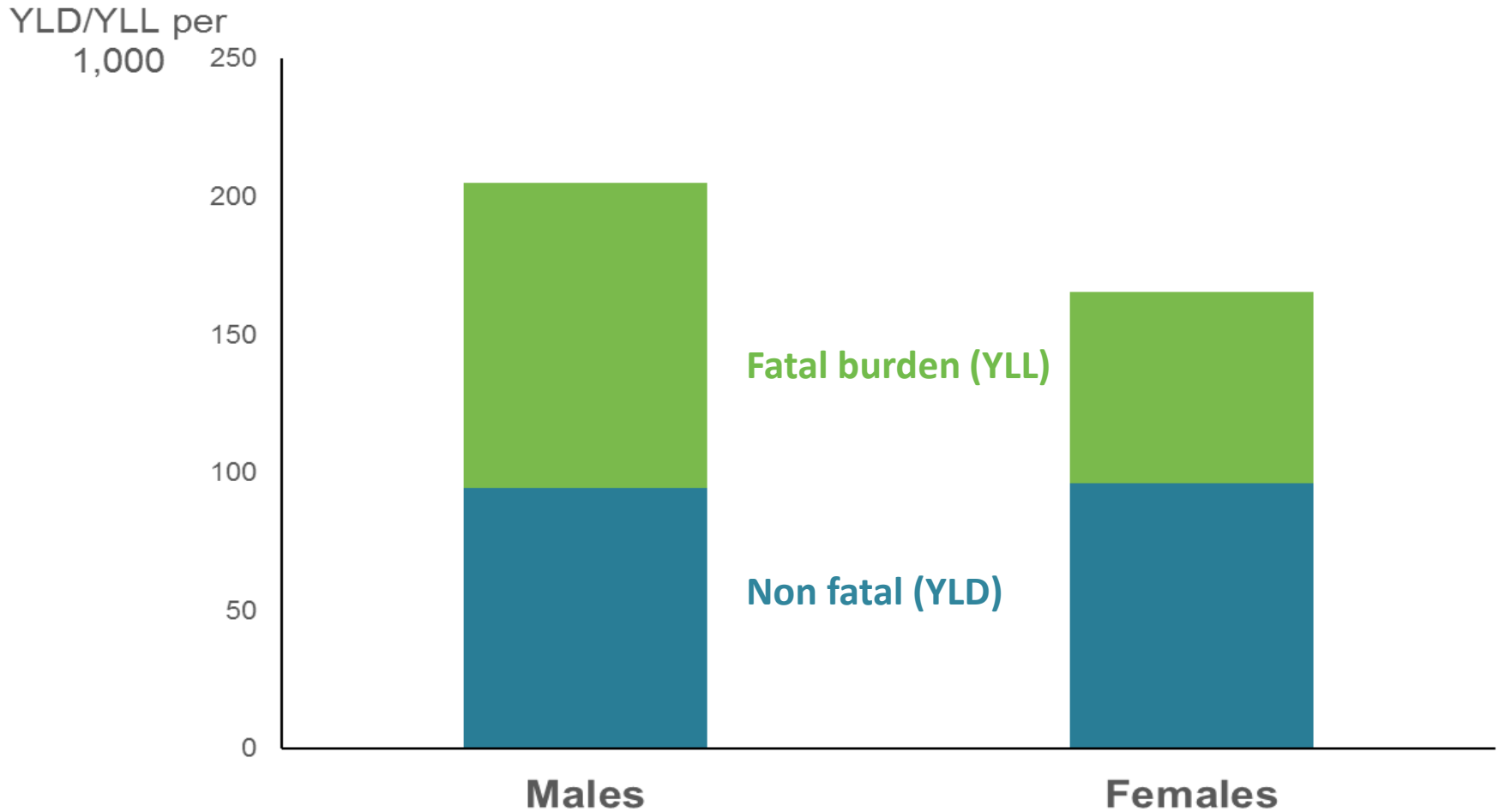
Males



Females

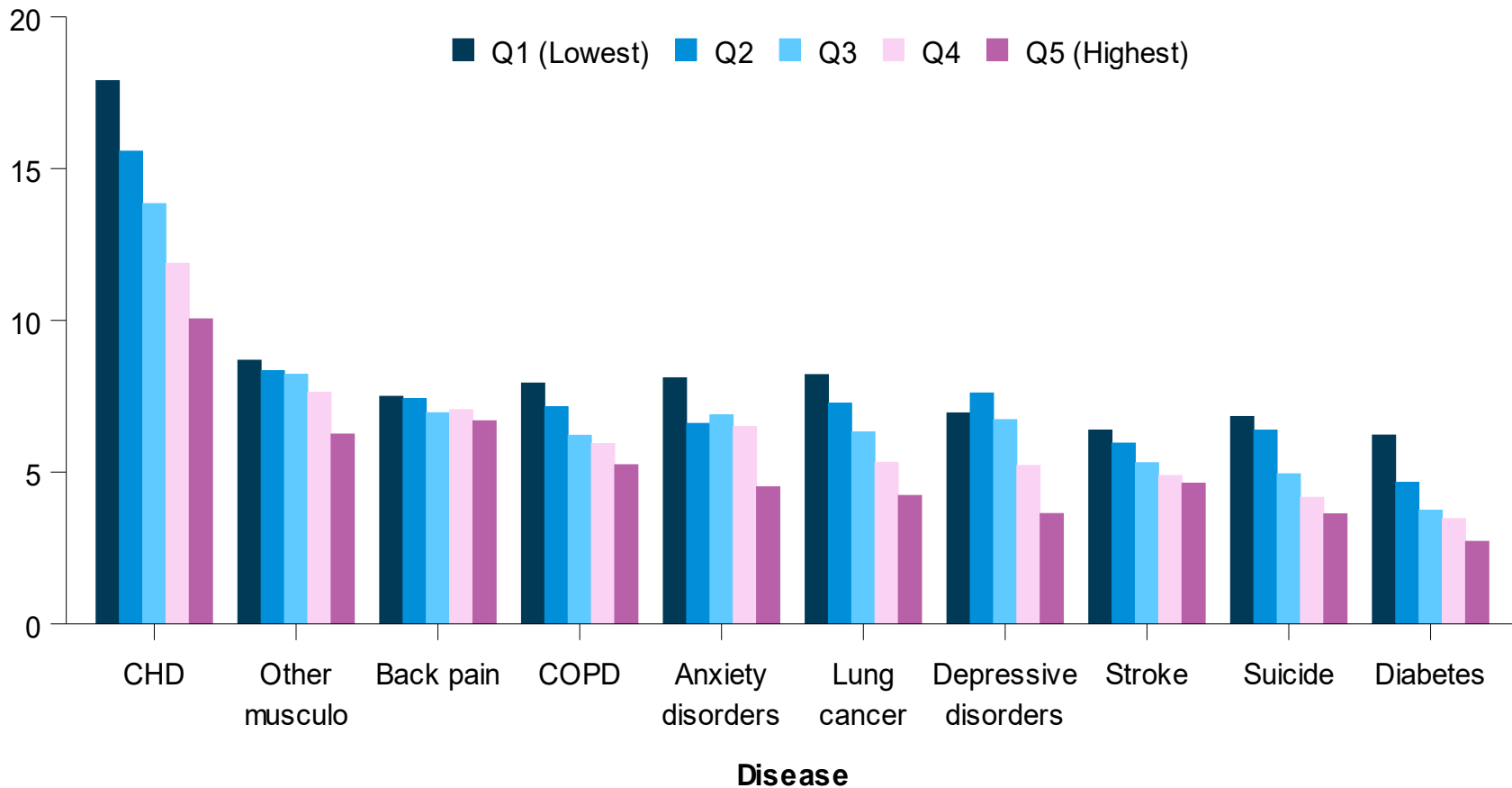


Fatal burden 60% higher for males

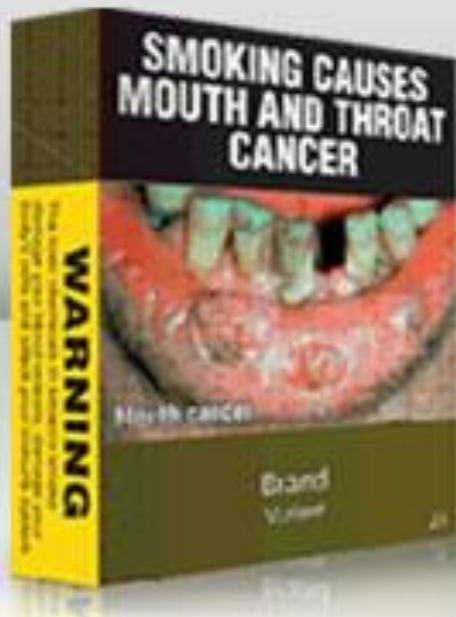


Clear gradient in burden rates by SE group






DALY ASR (per 1,000 people)



Risk Factors

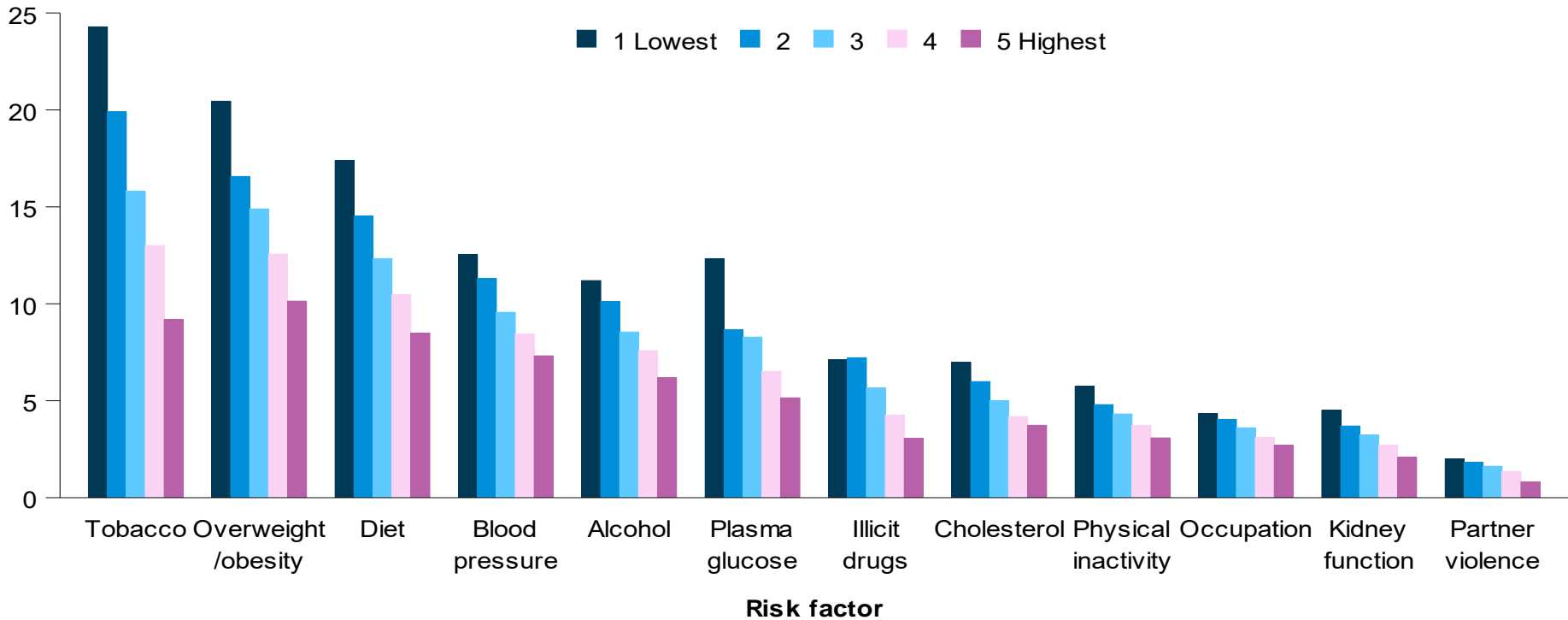


38% of burden due to potentially modifiable risk factors

					
Disease group	Tobacco use	Overweight & obesity	Dietary risks	High blood pressure	High blood plasma glucose
<i>Proportion of total burden</i>					
All diseases	9.3	8.4	7.3	5.8	4.7
<i>Proportion of disease group burden</i>					
Cancer	22.1	7.8	4.2	..	2.9
Cardiovascular	11.5	19.3	40.2	38.0	4.9
Neurological	1.5	9.0	0.2	1.8	2.9
Respiratory	41.0	8.0	0.3
Endocrine	3.7	44.6	34.2	..	98.0
Kidney/urinary	..	35.6	7.7	34.1	53.7

Risk factor impact by socio-economic group

DALY rate



International comparisons



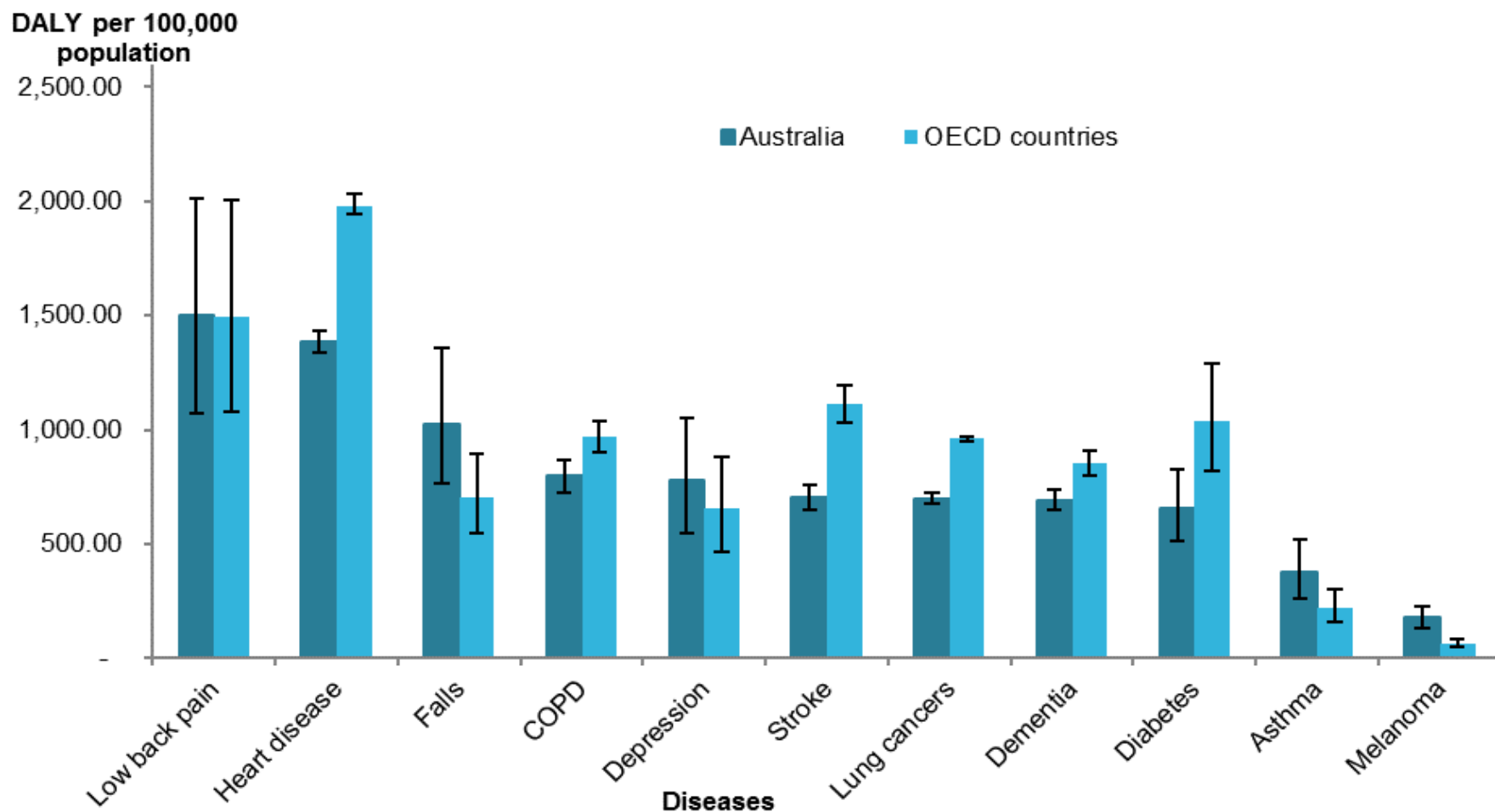


Australian vs. international estimates

- *International comparisons?*
Use international data (GBD, WHO)
- *Australian-specific analyses?*
Use the Australian Burden of Disease Study
 - uses detailed Australian data
 - less modelling required
 - based on assumptions relevant for Australia
 - includes Indigenous and subnational estimates
 - high level of transparency
 - access to detail behind the published estimates



Australia vs OECD average: GBD data



Comparison of methods

		ABDS 2015	GBD 2017	WHO 2012
Cause list and ICD codes	F/ NF	Aus specific	GBD specific	WHO specific
Data sources	F	Aus National Mortality Database	Mostly Aus data, some modelled from various sources	WHO mortality database
	NF	Aus recognised best source	Modelled from various sources	Modelled from various sources
Key inputs	F	GBD 2010 standard reference life table (LE=86)	GBD 2017 Theoretical Minimum Risk Reference Life Table (LE=88)	WHO 2012 standard life table (LE=92)
	NF	GBD 2013 disability weights	GBD 2013 disability weights	GBD 2010 disability weights with some adjustments
Key choices	F	Aus redistribution	GBD redistribution	WHO redistribution
	NF	Aus disease conceptual models	GBD disease conceptual models	WHO disease conceptual models

Comparison of ABDS and GBD/WHO results

Fatal burden

- deaths Aus=157,162 GBD=160,006 WHO=143,500
- YLL Aus=2.36m GBD=2.53m WHO=2.75m
- redistributed Aus=10% GBD=18% WHO=5-6%

- top 5 specific diseases (disease, YLL '000):

Aus 2015	GBD 2017 (2015 estimates)	WHO 2012
CHD (262)	CHD (304)	CHD (317)
Lung cancer (154)	Lung cancer (160)	Lung cancer (174)
Suicide (134)	Suicide (128)	Stroke (141)
Stroke (110)	Dementia (127)	Suicide (127)
Dementia (100)	Stroke (121)	Dementia (112)

Comparison of ABDS and GBD/WHO results

Non-fatal burden

- YLD Aus=2.4m GBD=3.1m WHO=2.5m
- YLL:YLD Aus 49.6:50.4 GBD=44:55 WHO=53:47
- top 5 specific diseases (disease, YLD '000):

Aus 2015	GBD 2017 (2015 estimates)	WHO 2012
Back pain & problems (195)	Low back pain (349)	Back & neck pain (236)
Anxiety (150)	Falls (205)	Depression (190)
Depression (136)	Depression (182)	Falls (135)
Osteoarthritis (115)	Migraine (150)	Anxiety (120)
Asthma (113)	Anxiety (135)	Asthma (112)

Comparison of ABDS and GBD/WHO results

Risk factors

- Total % DALY Aus=37.5% GBD= 38.5%

Top 5 risk factors (risk factor, % of DALY):

Aus 2015	GBD 2017 (2015 estimates)	WHO 2012 (not included)
Tobacco (9.3)	Tobacco (9.7)	
Overweight/obesity (8.4)	High body mass (8.5)	
Dietary risks (7.3%)	Dietary risks (7.0)	
High blood pressure (5.8%)	High blood pressure (6.4)	
High plasma glucose (4.7%)	High plasma glucose (6.3)	

Justifying a national study vs international studies



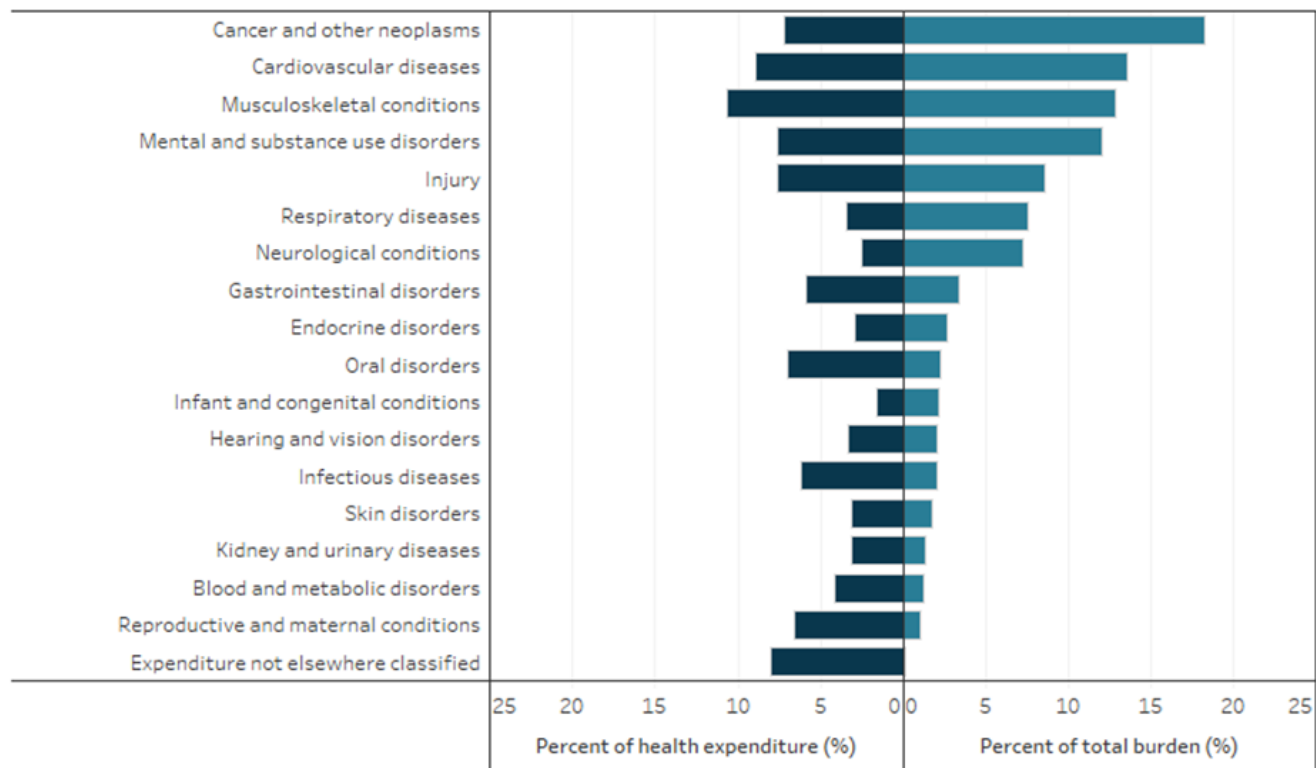


Extras



Human cost and financial cost

Figure 7: Proportions of total burden and health expenditure, by disease group, 2015



Note: Expenditure not elsewhere classified includes: Examination and observation NEC (not elsewhere classified), Physical, behavioural and social problems NEC, Interventions NEC and Symptoms NEC.

Sources: AIHW 2019a, 2019d.

<http://www.aihw.gov.au/>

Summary of quality index assessment, ABDS 2015

	% of diseases	% of risk factors
Dimension 1 - data		
A - Highly accurate	37.6	16.7
B - Relevant	23.2	55.6
C – Moderately relevant	23.2	16.7
D - Somewhat relevant	14.9	5.6
E - Questionable relevance—use with caution	1.0	5.6
Total	100.0	100.0
Dimension 2 - methods		
A - Highly accurate	28.9	11.1
B - Accurate	19.6	38.9
C - Moderately accurate	31.4	33.3
D - Somewhat accurate	18.0	5.6
E - Questionable accuracy—use with caution	2.1	0.0
Unable to be assigned	0.0	11.1
Total	100.0	100.0



Want to find out more?

More information on the ABDS 2015 results can be found on the AIHW website:

[<http://www.aihw.gov.au/burden-of-disease/>](http://www.aihw.gov.au/burden-of-disease/).

Contact us via email: burdenofdisease@aihw.gov.au

