Newcastle University

Institute for Ageing

Population ageing: are we living longer healthier lives?

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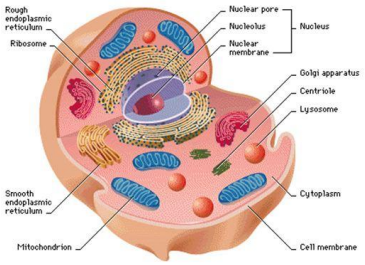
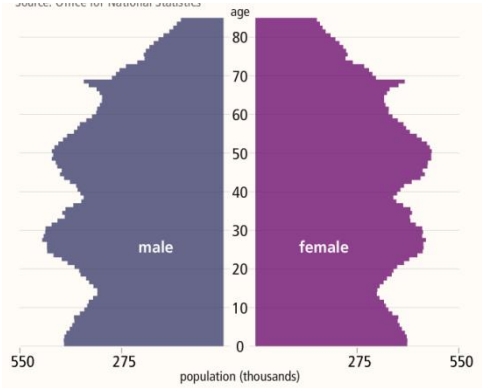
Outline

- Ageing, health and longevity
  - Health expectancy
  - Methodology
- Case study 1
  - Burden of disease on disability-free life expectancy
- Case study 2
  - Modelling future disability-free life expectancy

Ageing – from cells to population





- How can we make the extra years of life healthy ones?
- Assessing health alongside longevity – quality as well as quantity
- **Health expectancy**: expected number of remaining years lived from a particular age spent in a healthy state

Terminology

Health Expectancy

Healthy LE
(self rated health)
HLE

Disability free LE
DFLE

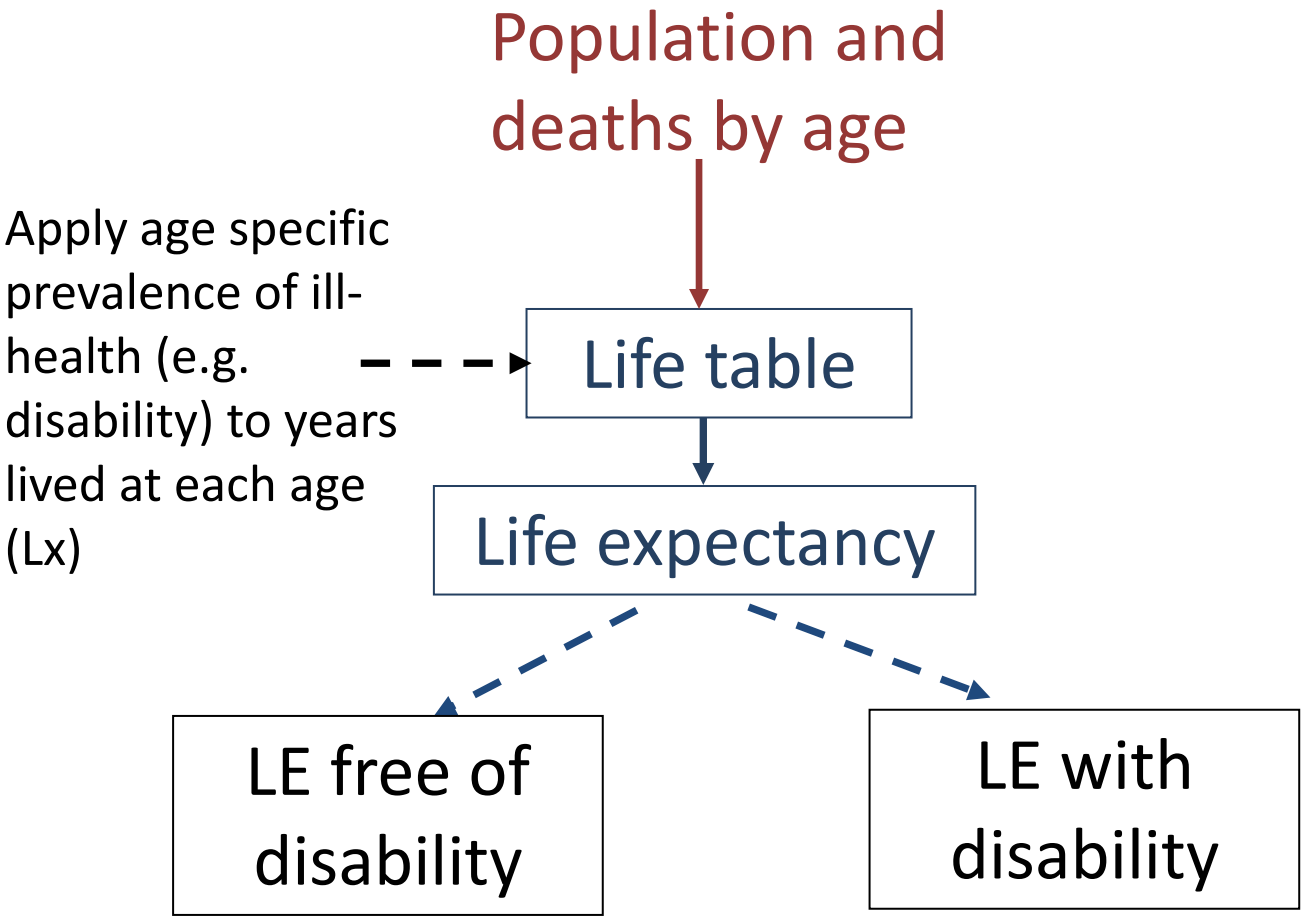
Dementia free LE
DemFLE

Limiting longstanding illness
HLY

IADL/ADL
Active LE

Many measures of health = many health expectancies!

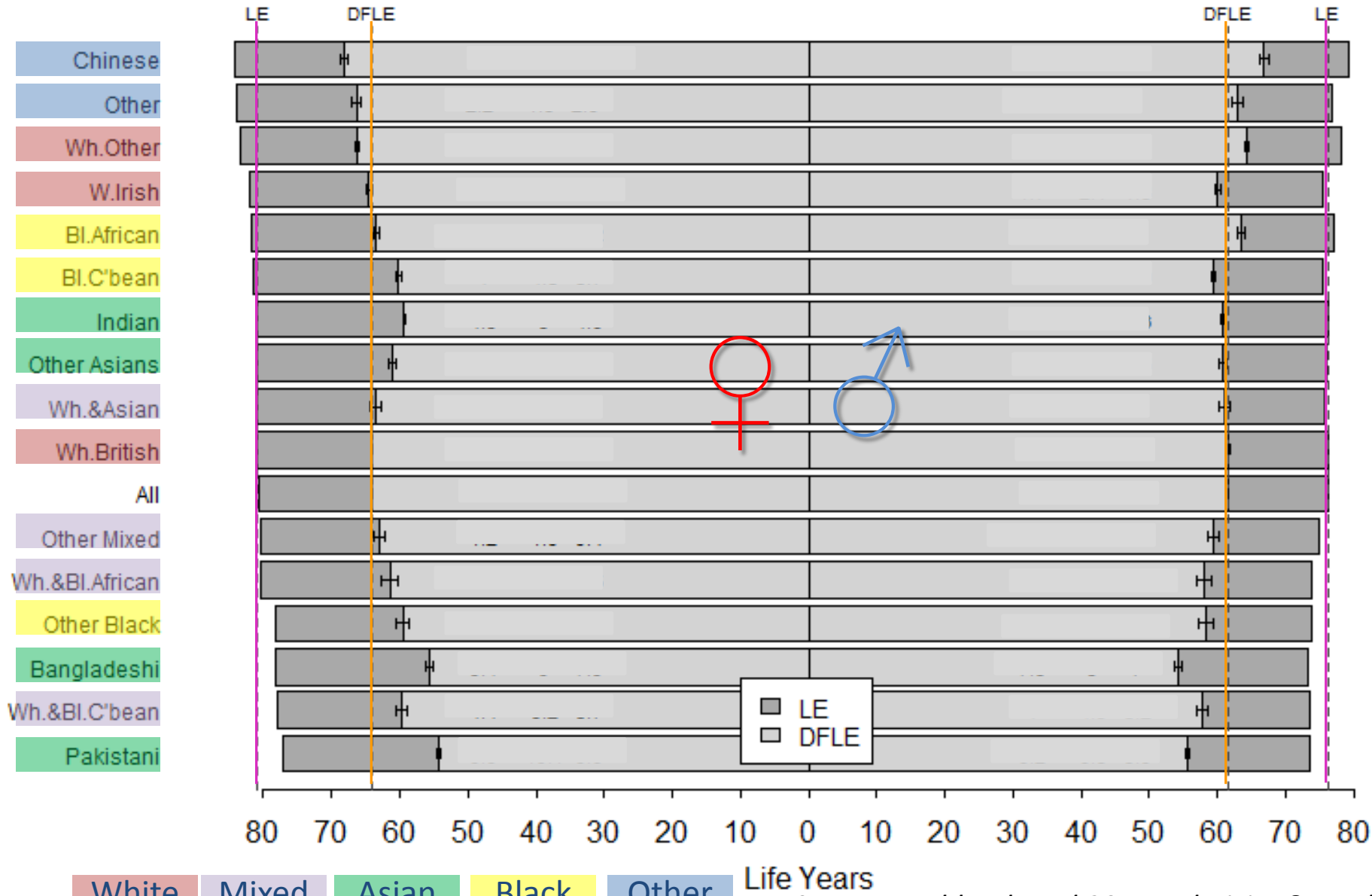
HE methods - cross-sectional data



Research issues

- Good for trends
- How do different ethnic groups compare on DFLE – no life tables by ethnic group
- What accounts for inequalities in HE between local areas – meta-regression

DFLE at birth for ethnic groups, 2001



Source: Wohland et al 2014, Ethnicity & Health

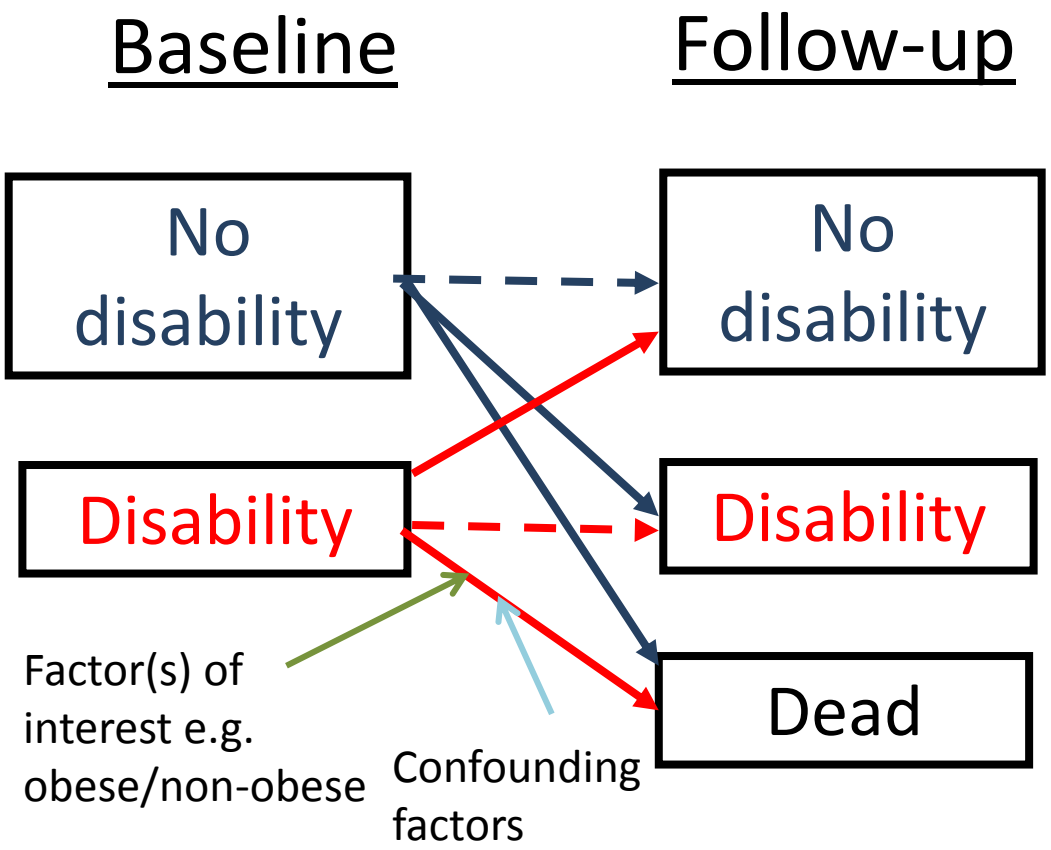
Understanding inequalities: meta-regression

		DFLE at birth (local areas E&W)			
		1991		2001	
		β (SE)	p	β (SE)	p
Women	Social Class IV and V (%)	-0.16 (0.03)	<0.001	-0.35 (0.03)	<0.001
	Unemployment rate (%)	-0.53 (0.05)	<0.001	-0.67 (0.08)	<0.001
	Retirement migration	0.42 (0.11)	<0.001	1.42 (0.15)	<0.001
	Population density	0.02 (0.01)	0.005	-0.01 (0.01)	0.337
	Non-white population (%)	0.03 (0.02)	0.063	0.05 (0.01)	<0.001
	r^2	0.70		0.81	

Source: Wohland et al (2014) Drivers of inequality in disability-free expectancy at birth and age 85 across space and time in Great Britain. J Epidemiol Community Health 68(9): 826-833.

HE methods - longitudinal data

Multi-state life table



Research issues

- Explicitly estimates incidence and recovery providing better future forecasts

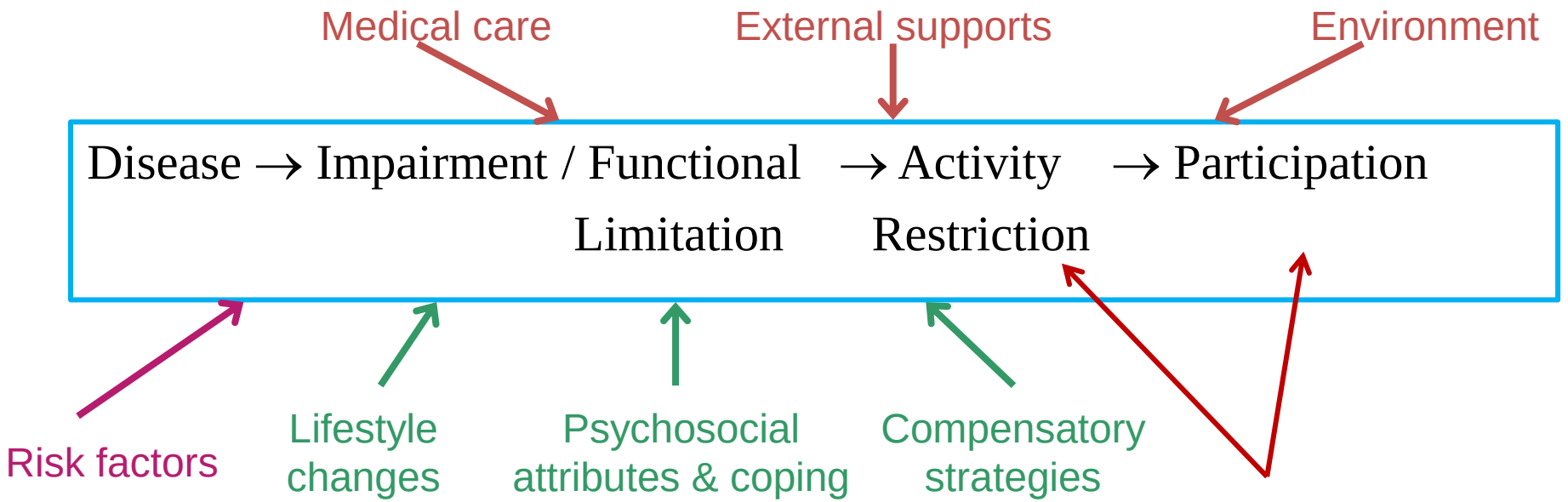
- Non-recoverable states (e.g. dementia)
- More than two health states (e.g. none/mild/severe disability)
- Unequal observations
- Adjustment for confounders

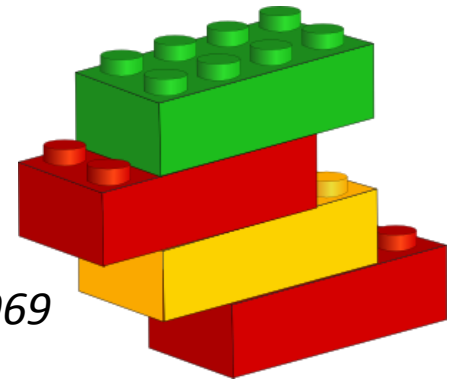
Inequalities in InHALE Healthy Active Life Expectancy

http://research.ncl.ac.uk/InHALE/index.html

BURDEN OF DISEASES ON DISABILITY-FREE LIFE EXPECTANCY

Disablement model





IADLs

- Shopping
- Laundry
- Cooking a hot meal

ADLs

- Getting in/ out of bed
- Toiletting
- Feeding

Sources: Katz 1963, Lawton & Brody 1969

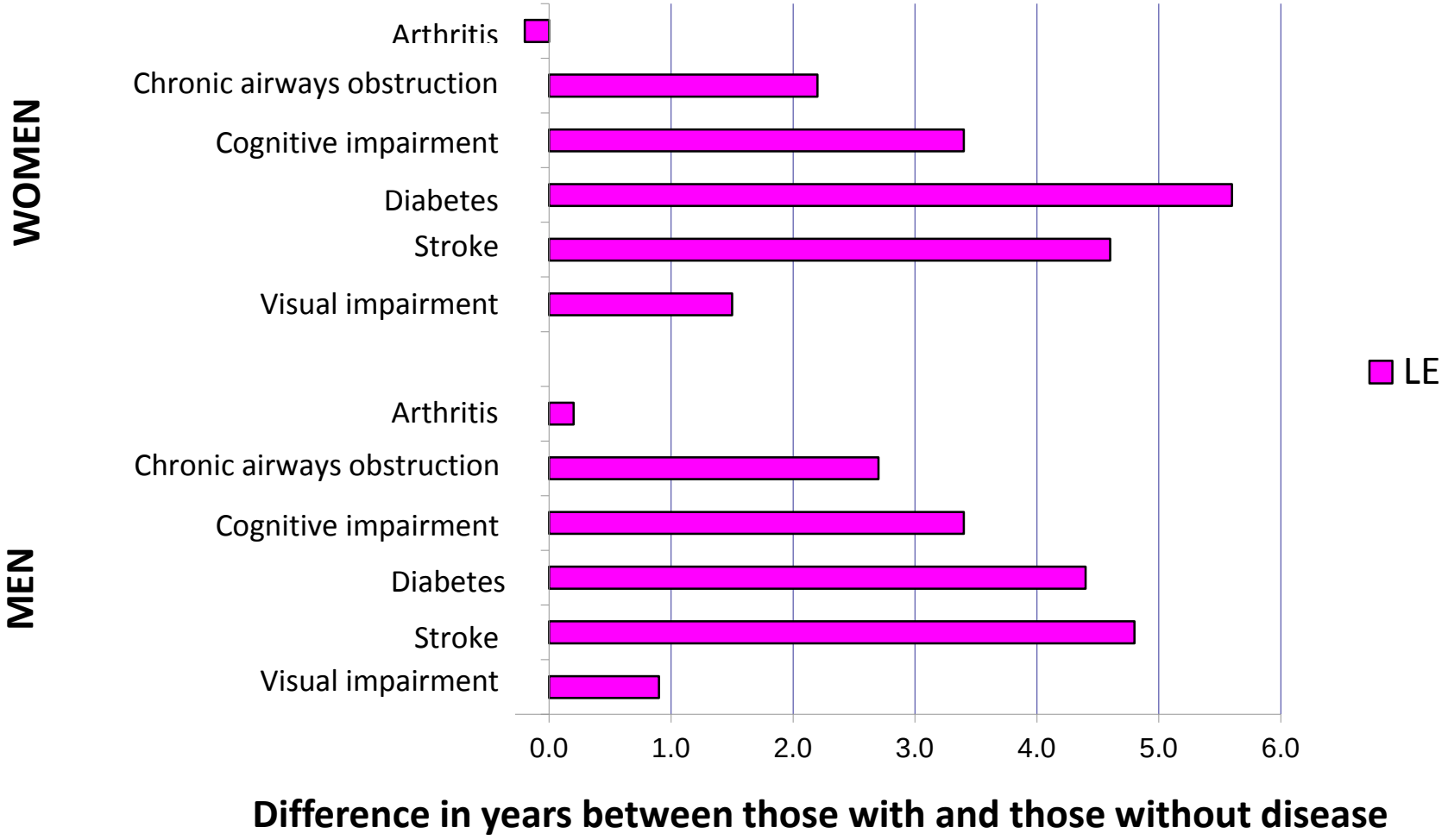
Reduction of disease and gains in DFLE

- Targets for disease usually focus on mortality but many age-related diseases are disabling and/or fatal
- Estimating the gains in DFLE through the (hypothetical) elimination of diseases is one way of capturing both
- Previous work used prevalence data and cause-deleted life tables but
  - Depends on death certificate data
  - Can't assess non-fatal diseases
  - Some diseases under-reported (dementia)
- Could estimate TLE, DFLE and DLE in those with and without baseline disease

MRC Cognitive Function and Ageing Study (MRC CFAS)

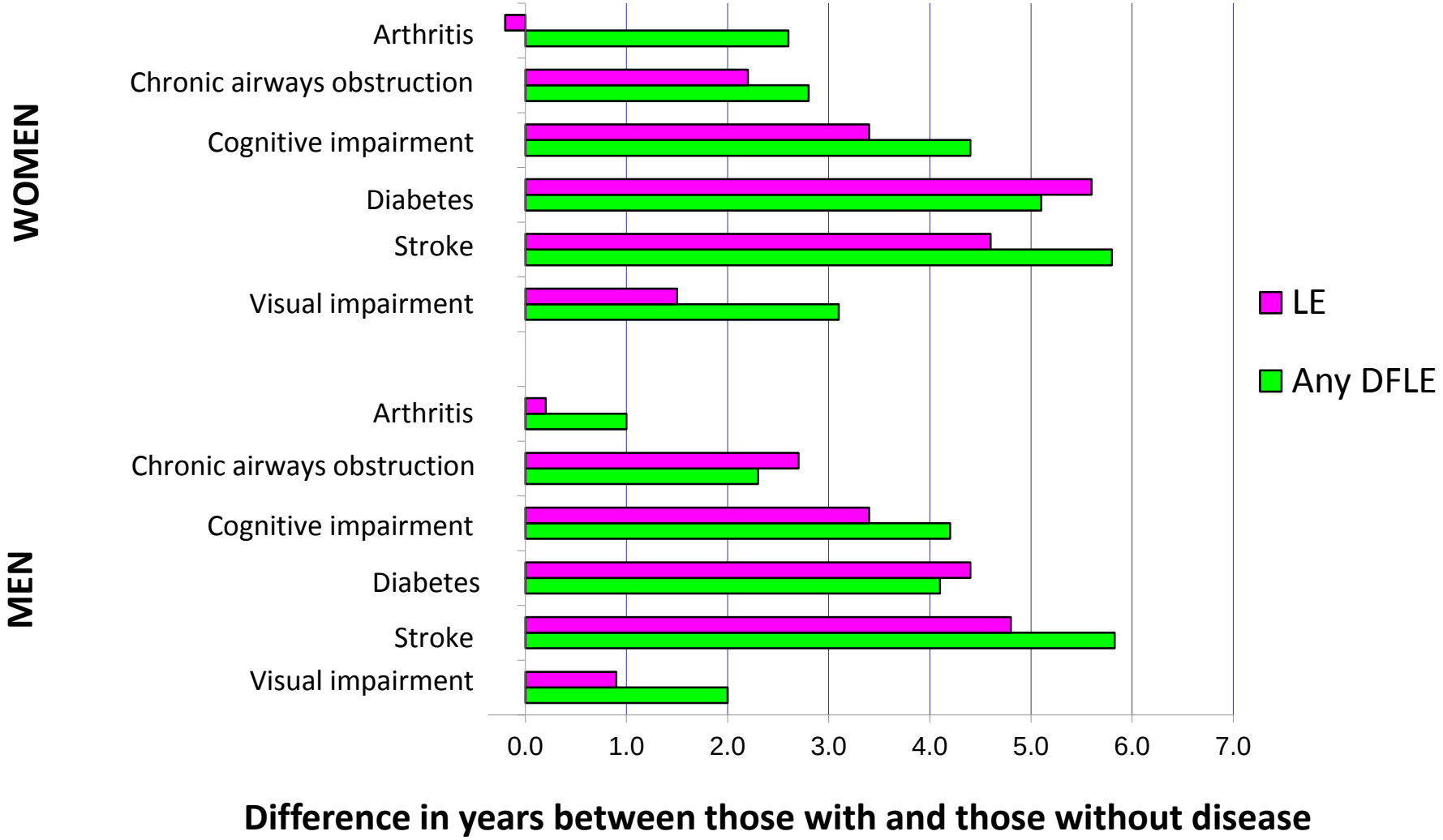
- Five centres
- stratified random sample aged 65+
- includes those in institutions
- N=13004 at baseline (1991)
- 2,6 and 10 yr follow-up
- death information from National Death Registry

Change in LE at age 65



Source: Jagger et al (2007) the burden of diseases on disability-free life expectancy in later life. J Gerontol 62(4) 408-414

Change in LE and DFLE at age 65



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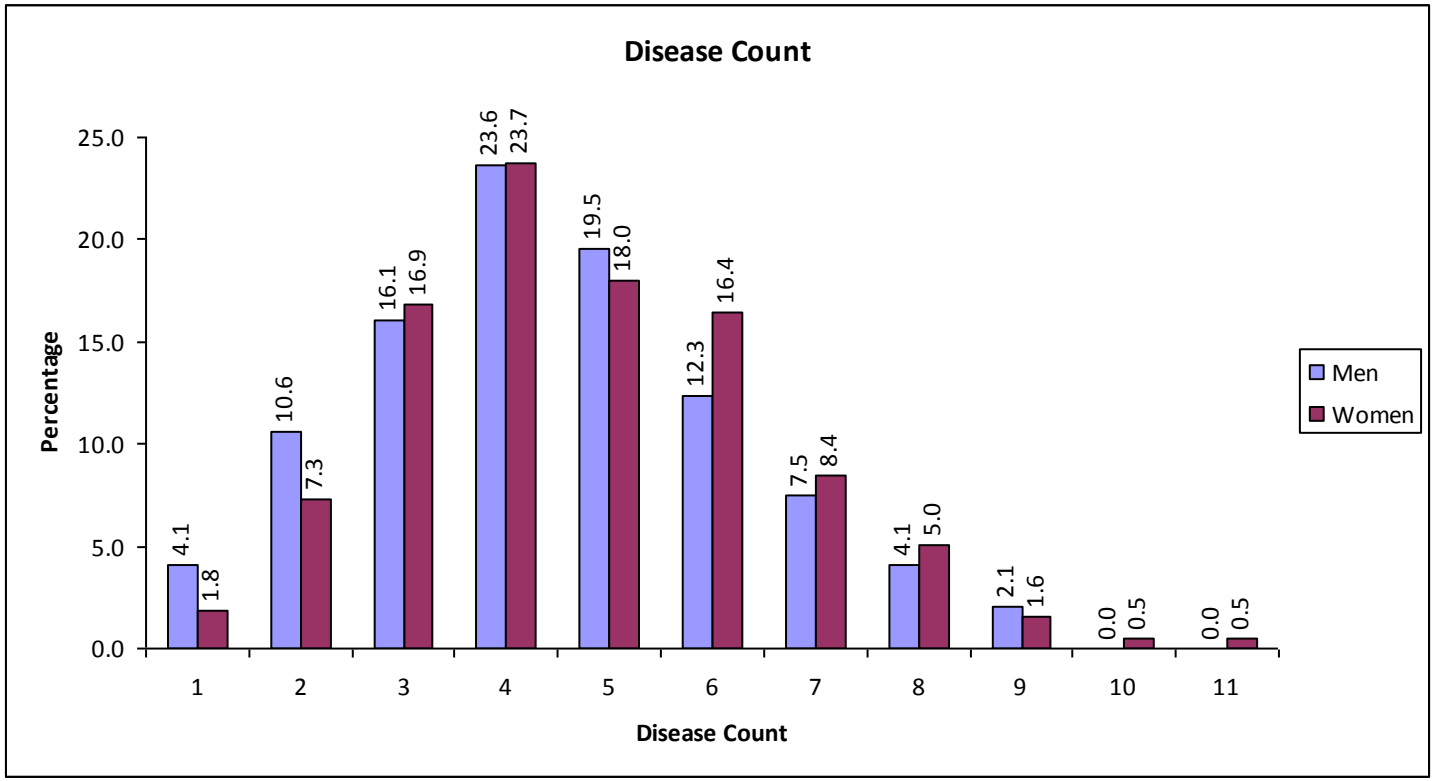
Number of diseases in 85 yr olds



Median count:
Men = 4
Women = 5

28% (men) and 32% (women) had 6+ diseases

Multimorbidity is the norm for very old people – contrary to single disease-based healthcare delivery

Source: Newcastle 85+ Study

MODELLING FUTURE DISABILITY-FREE LIFE EXPECTANCY

SIMPOP Projection model

- Macrosimulation model developed as part of the Modelling Ageing Population to 2030 (MAP2030) project
- Based on two-year transitions to and from disability and to death from large longitudinal ageing study (MRC CFAS)
- Produces projections of numbers of older people with disability and disability-free life expectancy (DFLE) **under different health/disease scenarios**
- Improves on single disease models since
  - old age is characterised by multi-morbidity
  - risk factors and treatments may affect more than one disease e.g. better control of vascular risk factors

Projections used in:

1. House of Lords report 'Ready for Ageing'
2. UK Government Commission on the Funding of Care and Support (Dilnot Commission)

Source: Jagger et al. (2009) Age and Ageing 38:319–25

Model disease scenarios

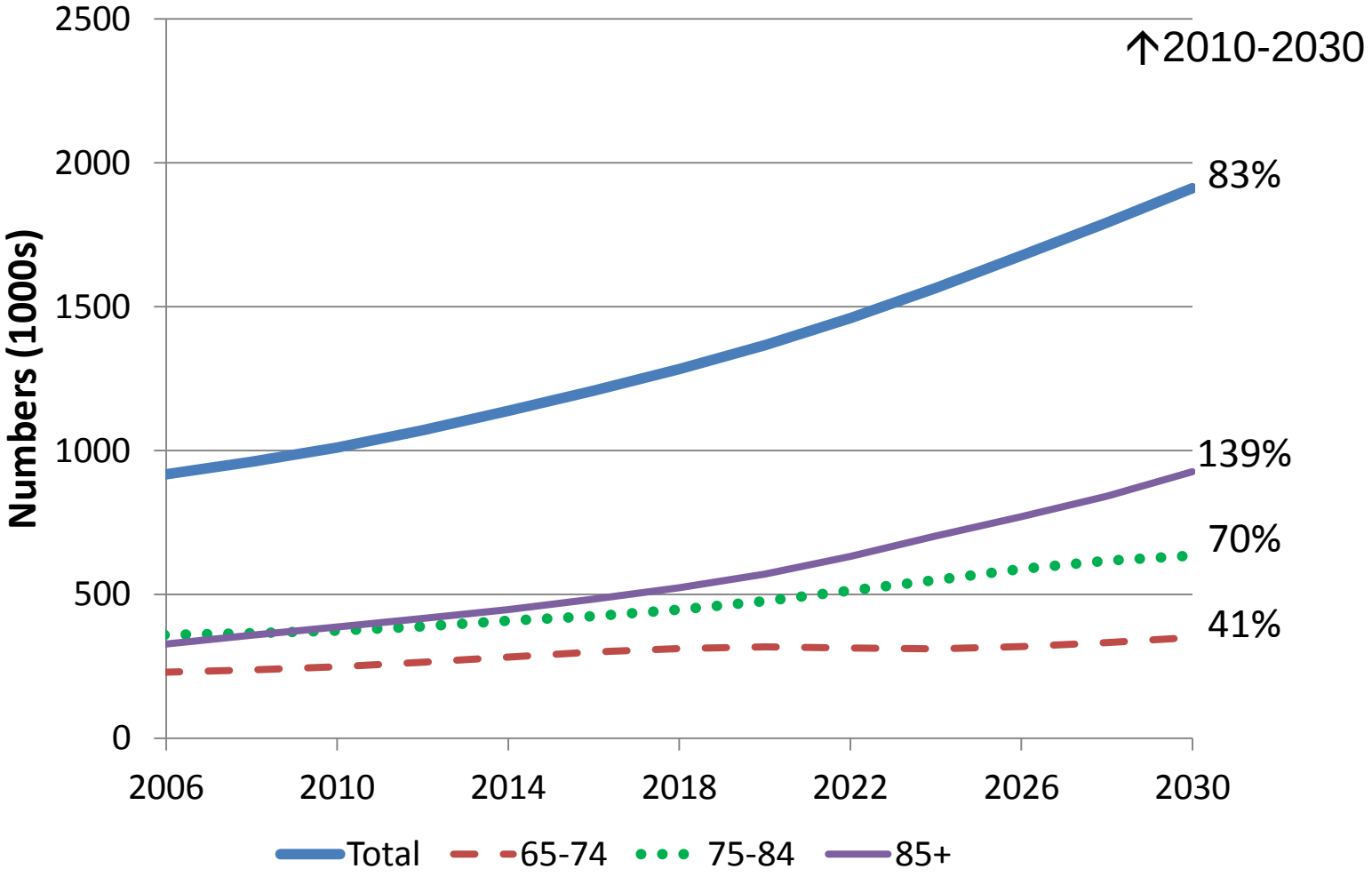
- 3 parameters can be altered to simulate time trends in each disease or their treatments and risk factors
- *Prevalence of disease* – to reflect changes in cohorts or risk factors
- *Disabling effect of disease* – to reflect changes in treatments or severity of disease
- *Mortality from disease* - to reflect changes in treatments or severity of disease

Scenario 1: Population ageing alone (constant illness prevalence)

- Age-specific prevalence of diseases, incidence & recovery rates remain the same.
- Mortality rates continue to fall according to levels set by GAD principal projection

Numbers with disability by age

Constant illness prevalence



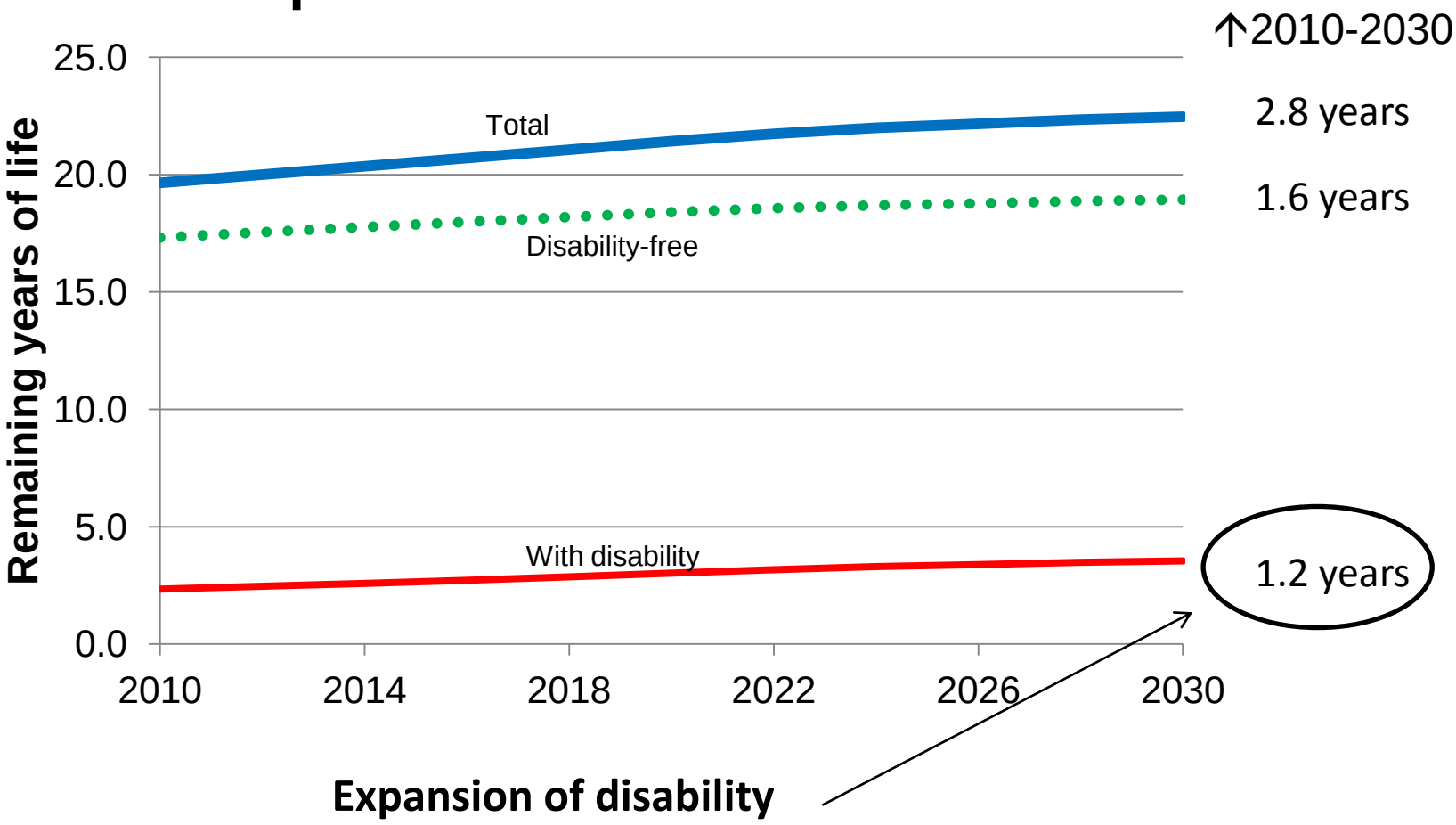
Prevalence of disability 2010-2030

Constant illness prevalence

Age group	Disability prevalence 2010	Disability prevalence 2030	Change in disability prevalence
65-69	4.2	4.3	0.1
70-74	6.4	6.7	0.3
75-79	9.1	10.0	0.9
80-84	15.6	17.4	1.8
85+	31.1	37.9	6.8

Women's LE, DFLE and DLE at age 65

Constant illness prevalence



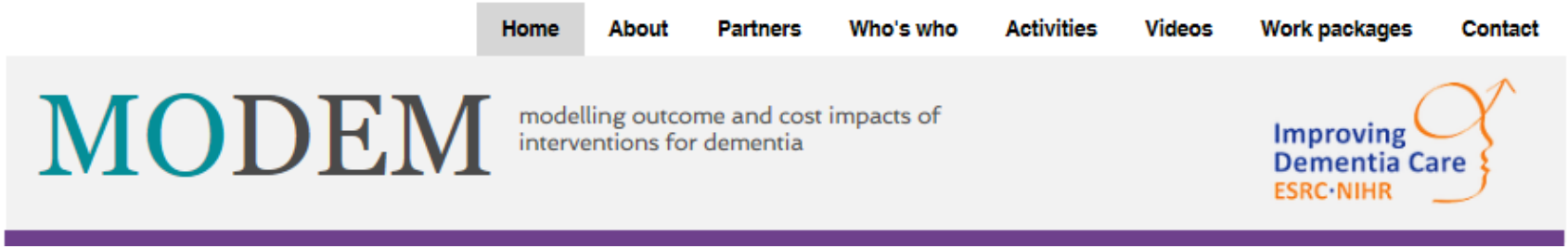
Reductions in disabling effects of diseases*

REDUCTION in disabling effect	MEN				WOMEN			
	Increase from 2010 to 2030 in				Increase from 2010 to 2030 in			
	LE	DFLE	DLE	%DFLE/LE	LE	DFLE	DLE	%DFLE/LE
At age 65								
10%	3.2	2.2	1.0	-3.1	3.0	1.9	1.2	-3.4
20%	3.1	2.1	1.1	-2.9	3.1	2.0	1.1	-3.2
50%	3.1	3.4	-0.4	2.4	3.4	2.7	0.8	-1.4
At age 85								
10%	2.1	1.1	1.0	-4.4	2.0	1.0	1.1	-5.6
20%	2.1	1.1	1.0	-4.3	2.0	0.9	1.1	-5.3
50%	2.0	2.3	-0.3	5.9	2.3	1.6	0.8	-0.3

*Vascular diseases (stroke, CHD, dementia, diabetes, hypertension, PVD) + arthritis

Strengths and limitations

- Limitations:
  - Evidence of effect of treatments on disability is lacking therefore ‘guestimates’
  - Transitions based on 1991/2 older people – need new cohort but must include institutional population
  - Although incorporates multimorbidity can’t estimate changes in this
  - Complex to update with new GAD projections
  - Deterministic – no measures of uncertainty around estimates
- Strengths:
  - Very large cohort so can estimate low prevalence diseases
  - Includes multiple diseases
  - Can simulate effect of joint risk factors eg obesity, and interventions that affect multiple diseases eg better vascular control
  - **First projections of DFLE that link back explicitly to diseases**



- MODEM will include development of a microsimulation model MicSIMPOP to model:
  - the health and associated care needs of the English population from 2008 for the coming decades;
  - the impact of interventions for risk factor reduction, disease prevention and treatments that slow down progression to disease and disability.
- Builds on SIMPOP and a similar Australian microsimulation model DynoptaSim
- Outputs:
  - Numbers with disability x age x gender x dementia +/- other diseases
  - Years lived with different levels of disability/care needs to explore compression of morbidity
- Will provide distribution of outcomes (disability, DFLE) and therefore measures of uncertainty

http://www.modem-dementia.org.uk/

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