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Decomposition method to disentangle changes in disease life-expectancy

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Background

Life expectancy represents the expected number of years to be lived and is computed by using death and population counts

It does not indicate whether people live in good or bad health (e.g. the same number of years can be lived with or without diseases)

Using measures of disease prevalence, the number of years to be lived can be partitioned in years into with and without diseases

Years of life with 'disability' in England

Years	MALES, birth			FEMALES, birth		
	Life expectancy (LE)	LE without limiting long term illness	LE with limiting long term illness	Life expectancy (LE)	LE without limiting long term illness	LE with limiting long term illness
1991	73.4	59.4	13.9	78.9	61.8	17.0
1992	73.6	59.7	13.9	79.0	61.9	17.1
1993	73.9	59.4	14.5	79.2	61.7	17.5
1994	74.1	59.4	14.6	79.3	61.7	17.6
1995	74.3	59.2	15.1	79.5	61.6	17.9
1996	74.5	…	…	79.6	…	…
1997	74.8	59.1	15.6	79.8	60.8	19.0
1998	75.0	…	…	79.9	…	…
1999	75.3	60.6	14.7	80.1	62.6	17.5
2000	75.6	…	…	80.3	…	…
2001	76.0	60.8	15.1	80.6	62.9	17.7

Source: ONS

Years of life with 'disability' in England (indexed values)

Years	MALES, birth - Index number (base=1991)			FEMALES, birth - Index number (base=1991)		
	Life expectancy (LE)	LE without limiting long term illness	LE with limiting long term illness	Life expectancy (LE)	LE without limiting long term illness	LE with limiting long term illness
1991	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
1992	100.3	100.4	99.9	100.1	100.1	100.4
1993	100.7	100.0	103.9	100.4	99.8	102.9
1994	100.9	100.0	104.9	100.5	99.8	103.1
1995	101.3	99.6	108.6	100.8	99.5	105.3
1996	101.5	…	…	100.9	…	…
1997	101.9	99.5	112.2	101.1	98.3	111.3
1998	102.2	…	…	101.3	…	…
1999	102.6	101.9	105.6	101.5	101.2	102.8
2000	103.1	…	…	101.9	…	…
2001	103.5	102.4	108.5	102.2	101.6	104.1

Source: Analysis of ONS data

Policy issues arising

The burden on the health system might be underestimated if only 'long term limiting illness (e.g. disability) ' is considered

People may have a long term illness but not consider it 'limiting' but they still may:

- take medicine regularly
- require hospitalisation
- require hospital visits

a) Can we circumvent this by using a more general definition of illness?
b) Can we break the years in ill health down into different conditions e.g. in order to estimate economic cost?
c) People might have more than one disease so need to be able to deal with co-morbidity

Objectives

Decompose the differences over time and between the sexes in the life expectancy with disease by applying the Nussleder & Looman method (2004)

Include co-morbidity in the analysis

Methodology

The diseases affecting a change in life expectancy with disease can be identified using decomposition methods (e.g. Nussleder & Looman 2004)

Life expectancy with disease is computed by using mortality and disease rates (Sullivan 1971)

Changes over time can be decomposed by separating mortality and disease effects

Decomposition

(Arriaga 1989, Nussleder & Looman 2004)

Let us suppose that life expectancy with disease has changed between time *t* and time *t+n*

The change is attributable to a change in the number of person-years with disease (L_{dis}) which can be decomposed as follows

$$\Delta L_{Dis} = \left(\frac{L_{life}^{t+n} + L_{life}^{t}}{2} \right) * \left(\pi_{Dis}^{t+n} - \pi_{Dis}^{t} \right) + \left(\frac{\pi_{Dis}^{t+n} + \pi_{Dis}^{t}}{2} \right) * \left(L_{Life}^{t+n} - L_{Life}^{t} \right)$$

Where the difference between the π_{Dis} depends on the change of the prevalence of each cause of disease, and the difference between the L_{Life} depends on the change of each cause of death

Data used

ONS (death and population counts)

Health Survey for England (disease prevalence)

Analysis performed on the most complete data series available from ONS and the Health Survey for England:

- 1991 - 2005

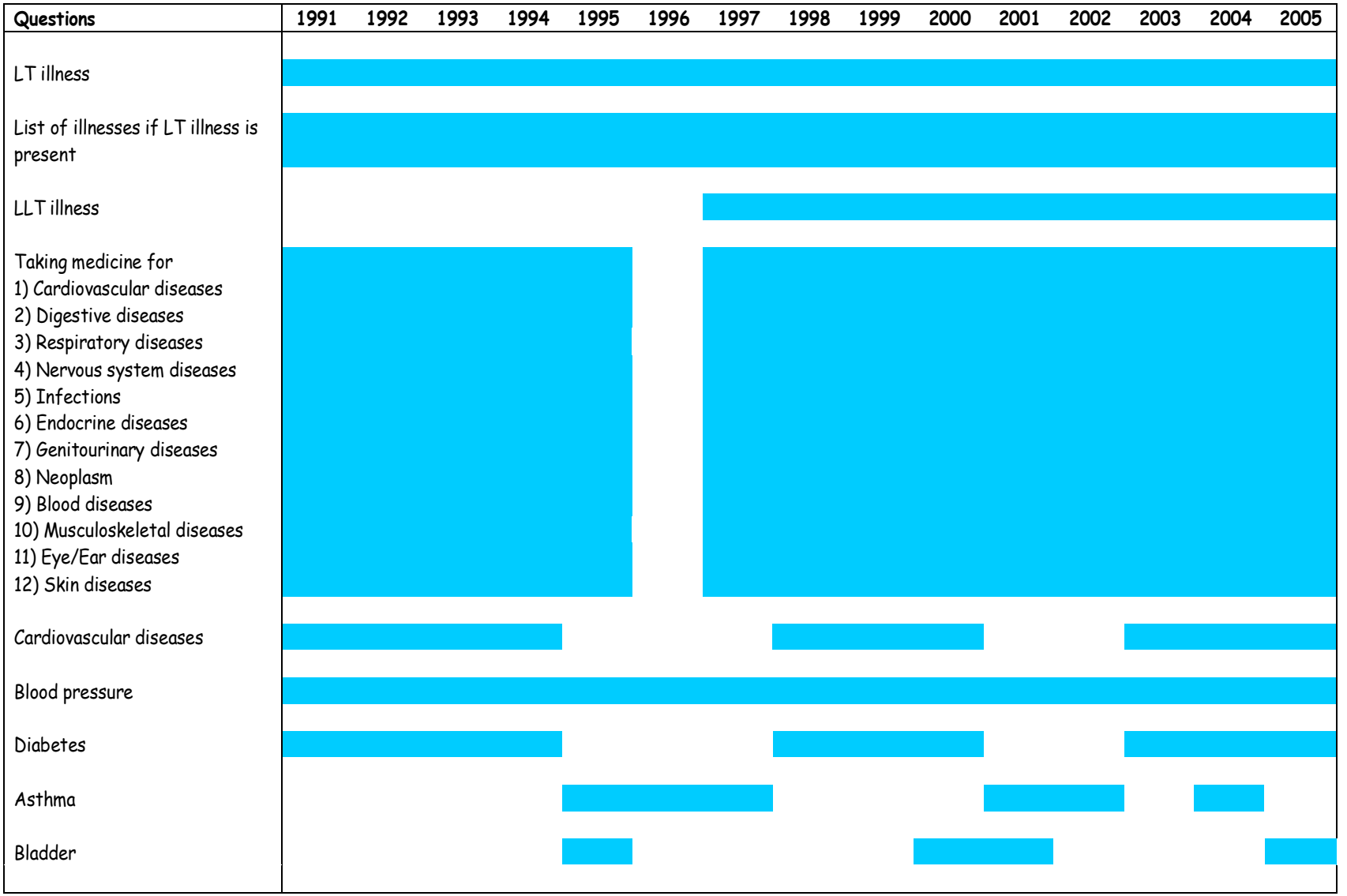
The Health Survey for England has included from 1991 people aged 16 and above:

- All the analysis performed on people 16+

Classification of causes of disease/death

Causes of death		Groups	Label of the group
1	Infectious & parasitic diseases	1	Infectious disease
2	Accidents	2	Accidents & Injuries
3	Suicides	2	Accidents & Injuries
4	Neoplasms	3	Cancers
5	Endocrine & immunity disorders	6	Other chronic diseases
6	Blood diseases	6	Other chronic diseases
7	Mental disorders	5	Respiratory & Other
8	Nervous system	6	Other chronic diseases
9	Circulatory system	4	Circulatory system
10	Respiratory system	5	Respiratory & Other
11	Digestive system	5	Respiratory & Other
12	Genitourinary system	6	Other chronic diseases
13	Pregnancy complications	6	Other chronic diseases
14	Skin diseases	6	Other chronic diseases
15	Musculoskeletal diseases	5	Respiratory & Other
16	Congenital anomalies	6	Other chronic diseases
17	Conditions from perinatal period	6	Other chronic diseases
18	Ill-defined conditions	6	Other chronic diseases
19	Diseases of the eye	6	Other chronic diseases
20	Diseases of the ear	6	Other chronic diseases

Information collected in different years (HSE 1991-2005)



Over-time decomposition: Males, 1992-1998

1992-98	Disease
Difference	3.6 yrs
Mortality	1.0 yrs
Morbidity	2.6 yrs
Single diseases	1.0 yrs
Comorbidity	1.6 yrs

Over-time decomposition: Females, 1992-1998

1992-98	Disease
Difference	**1.7 yrs**
Mortality	0.6 yrs
Morbidity	1.1 yrs
Single diseases	-1.0 yrs
Comorbidity	2.1 yrs

Conclusions

There has been morbidity expansion

The morbidity effect is larger than the mortality effect

Relevance of co-morbidity: lack of inclusion would cause overestimation of the single causes