

Mortality Projections “By Cause” Research Group

Initial feedback on work on projections by cause

Introduction

Mortality Projection by Cause Research Group Members

Adrian Pinington



Harry Palmes



Niel Daniels



Garth Lane



Richard Morris



Input for others:
Medical Profession
planned

Scott Reid



Agenda

- Terms of reference
- Why project by cause
- Why use Sigmoid curves
- Some results for key causes of death
- Conclusions
- Where next

Introduction

Mortality Projections “By Cause” Research Group Terms of Reference – Our Aims

- To examine underlying trends in the factors influencing UK population mortality rates, and from these, to assess:
 - Historical overview of mortality by cause in the UK
 - Review of literature on the key drivers of recent changes in mortality by cause in the UK, including research done by other professions
 - Investigate and review data sources available
 - Investigate and model past and future mortality improvements by cause.
 - Investigate and model past and future mortality improvements by cause to sub-populations – smoker status, socio-economic categories and immigration patterns (with associated genetic and socio-cultural mortality differences)
 - Investigate and model the potential for mortality “shocks”, either short-term or via the advent of new diseases, by way of example, reduction in the incidence of heart attack due to the introduction of a smoking ban or obesity.
- Formed in December 2007

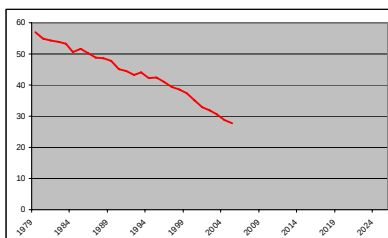
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Why project by cause ?

- Take ONS death data from 1979-2005/6
- As an example, focus on males, age 70-74
- Using simple geometric projections
 - Project total death rate
 - Project death rate by top 10 causes (+ other)
 - Compare the two approaches

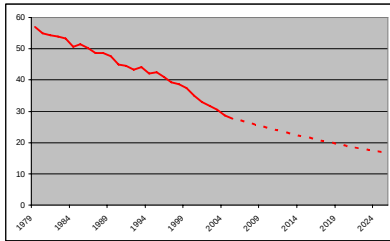
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Why project by cause ?



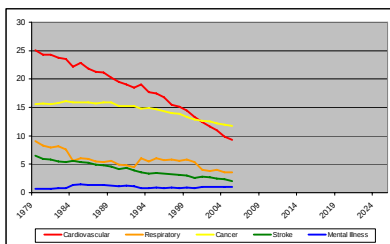
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Why project by cause ?



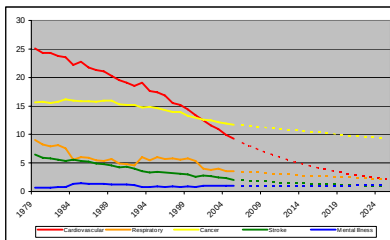
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Why project by cause ?



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Why project by cause ?



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Why project by cause ?

- Clearly Cardiovascular causes of death have been the key cause of improvements over the last 30 years
- These improvements may well continue for Cardiovascular
- But, Cardiovascular is a much smaller cause of death now

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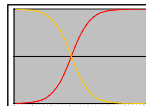
Why project by cause ?

- Using trend based on

	Improvement p.a.
▪ Total mortality	2.4%
▪ Mortality split into high level causes	2.0%
- That could be 2 – 3% on the cost of an annuity

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Why Sigmoid ?



- Sigmoid curves are used in many of the life sciences
- Each Sigmoid curve can be broken down into
 - a base phase
 - a building/introduction phase
 - a growth phase
 - a maturing phase
 - a declining phase
- Sigmoid curves explain a wide range of aspects of the natural world eg the life-story of flowers, red blood cells, trees & humans (but also of empires, products & corporations)

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Why Sigmoid ?

- The Sigmoid curve has the formula

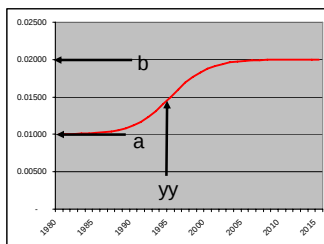
- $a + \frac{(b-a)}{1+e^{-k(t-yy)}}$

- Parameters have meaning

- a is the initial state of equilibrium
 - b is the new state of equilibrium
 - k is the rate of change over time
 - yy is the "inflexion year" (the mid point of the change)

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Why Sigmoid ?



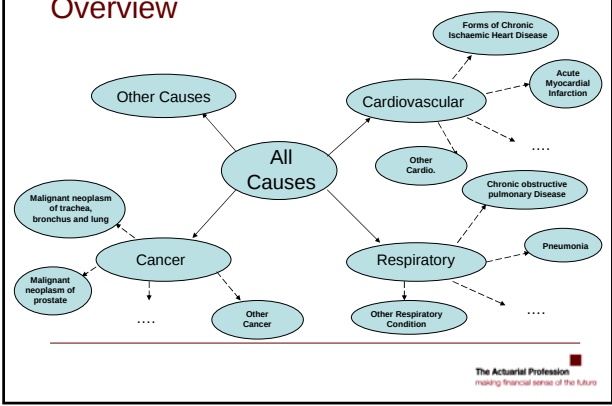
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Mortality Projections by Cause

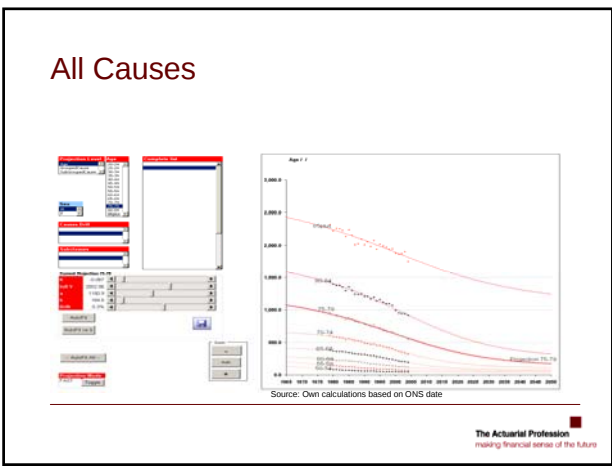
- Overview
- All causes
- Cardiovascular
 - Aggregate
 - Acute Myocardial Infarction
 - Top 3 Cardiovascular plus other sub-causes
- Cancer
 - Aggregate
 - Top 3 Cancer types plus other sub-causes
- Respiratory
- Other causes

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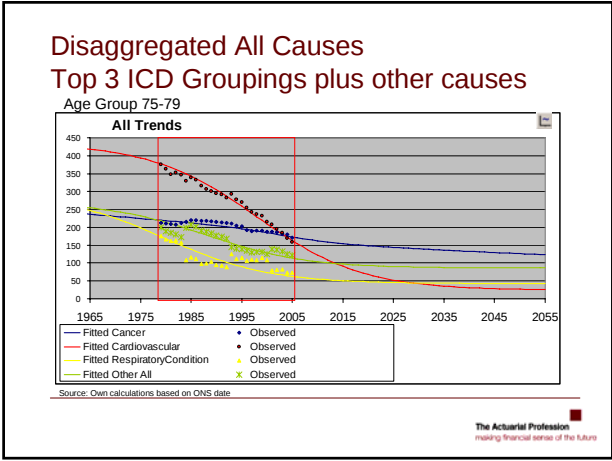
Overview



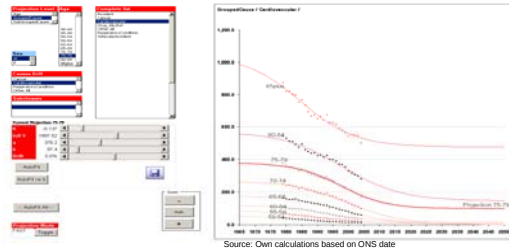
All Causes



Disaggregated All Causes Top 3 ICD Groupings plus other causes

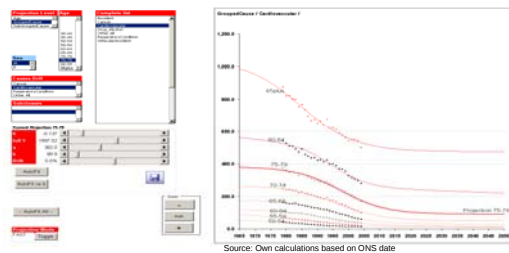


Cardiovascular - Aggregate



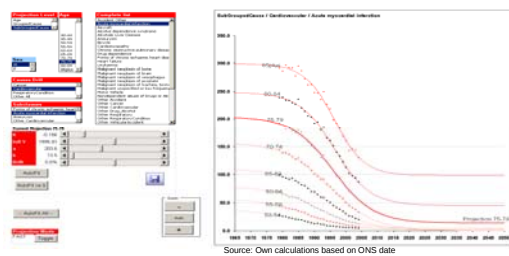
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Cardiovascular - Aggregate



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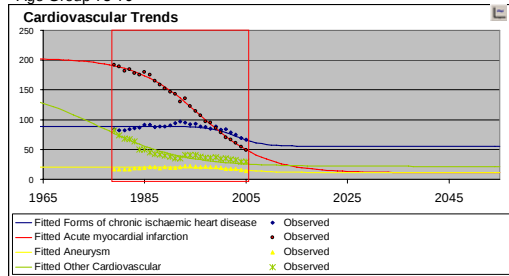
Cardiovascular Acute Myocardial infarction



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Cardiovascular Top 3 Cardiovascular plus other sub-causes

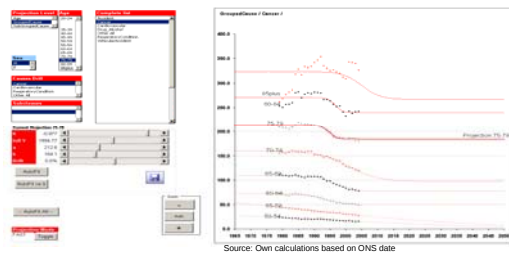
Age Group 75-79



Source: Own calculations based on ONS data

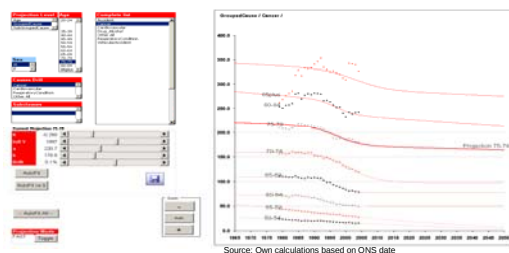
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Cancer - Aggregate



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Cancer - Aggregate

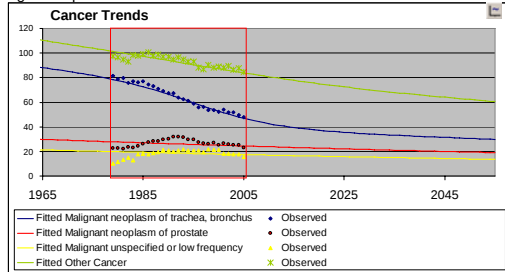


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Cancer

Top 3 Cancer types plus other sub-causes

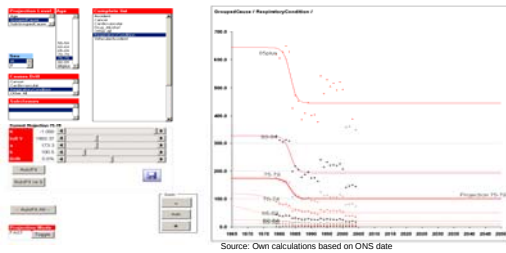
Age Group 75-79



Source: Own calculations based on ONS data

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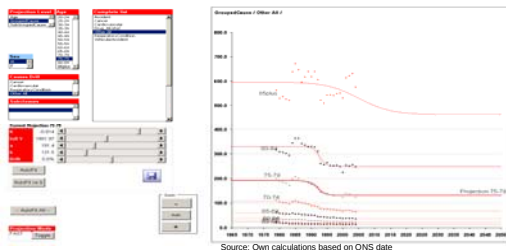
Respiratory - Aggregate



Source: Own calculations based on ONS data

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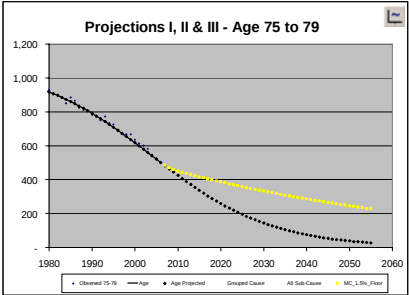
Other causes - Aggregate



Source: Own calculations based on ONS data

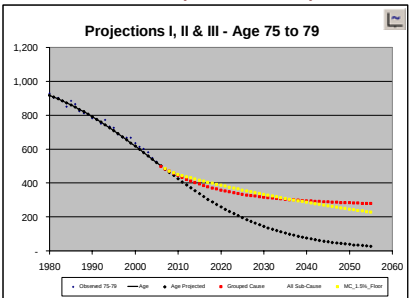
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Pulling Matters Together - Aggregate for Age vs Medium Cohort (1.5% floor)



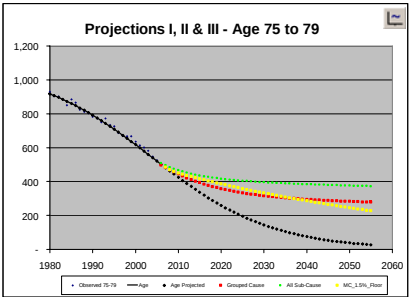
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Aggregate for Age + Grouped Causes vs Medium Cohort (1.5% floor)



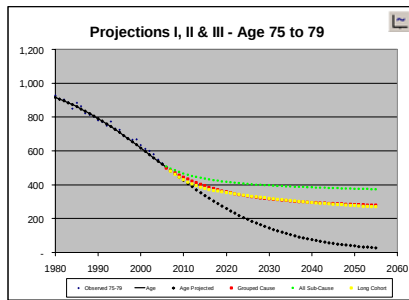
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Aggregate for Age + Grouped + Sub-Causes vs Medium Cohort (1.5% floor)



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Aggregate for Age + Grouped + Sub-Causes vs Long Cohort (No floor)



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Conclusions

- Splitting mortality by cause offers many advantages
 - It removes heterogeneity in fitting curves to past data
 - It allows practitioners to overlay subjective views on trends for each cause
- Historically dominant “causes of improvement” are given a more correct “dynamic” weight into the future.

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Where next

- Continue to refine past projections
- Seek opinions from relevant medics on future trends by cause
- Present to Life Conference
- SIAS / sessional paper
- Any feedback gratefully received !

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