The Actuarial Profession
making financial sense of the future

Future mortality improvement: an actuary's perspective

Richard Willets, Paternoster

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A summary of recent trends

Key actuarial themes

Differing views on future change

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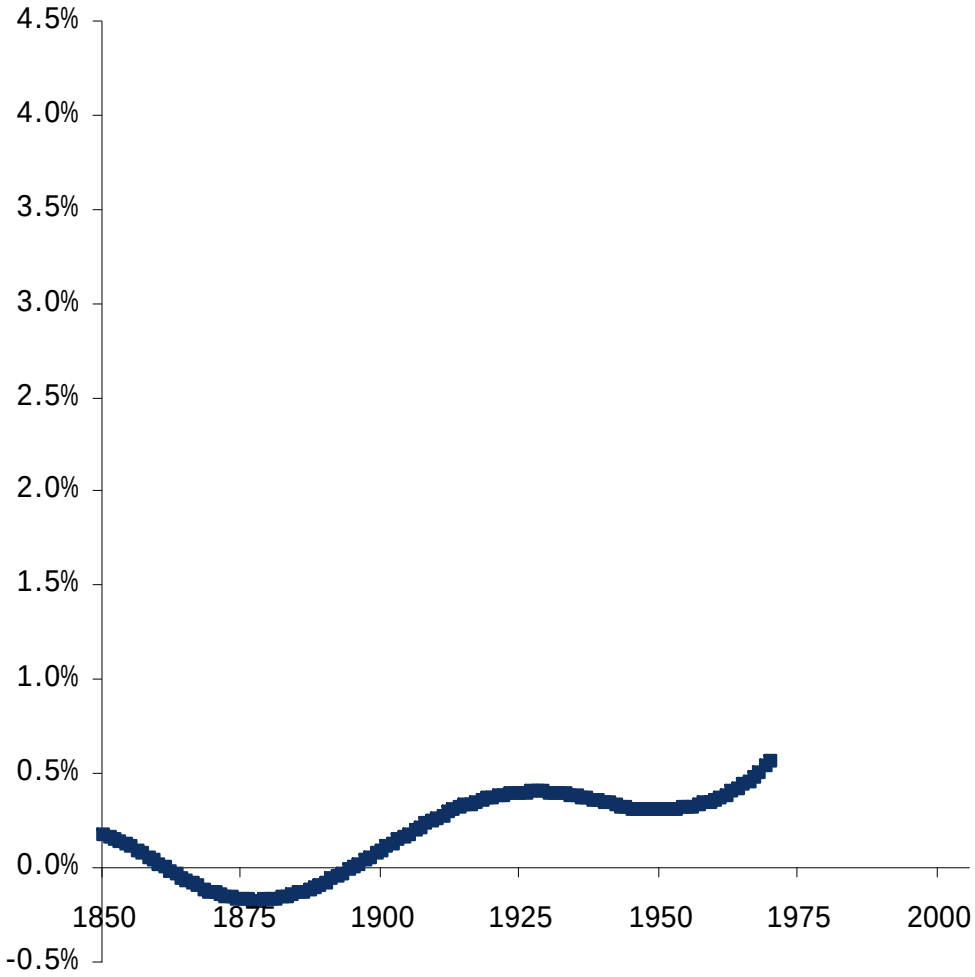
Why have actuaries become increasingly interested in longevity trends?



Smoothed annual rate of mortality improvement, males, England & Wales, aged 70-79

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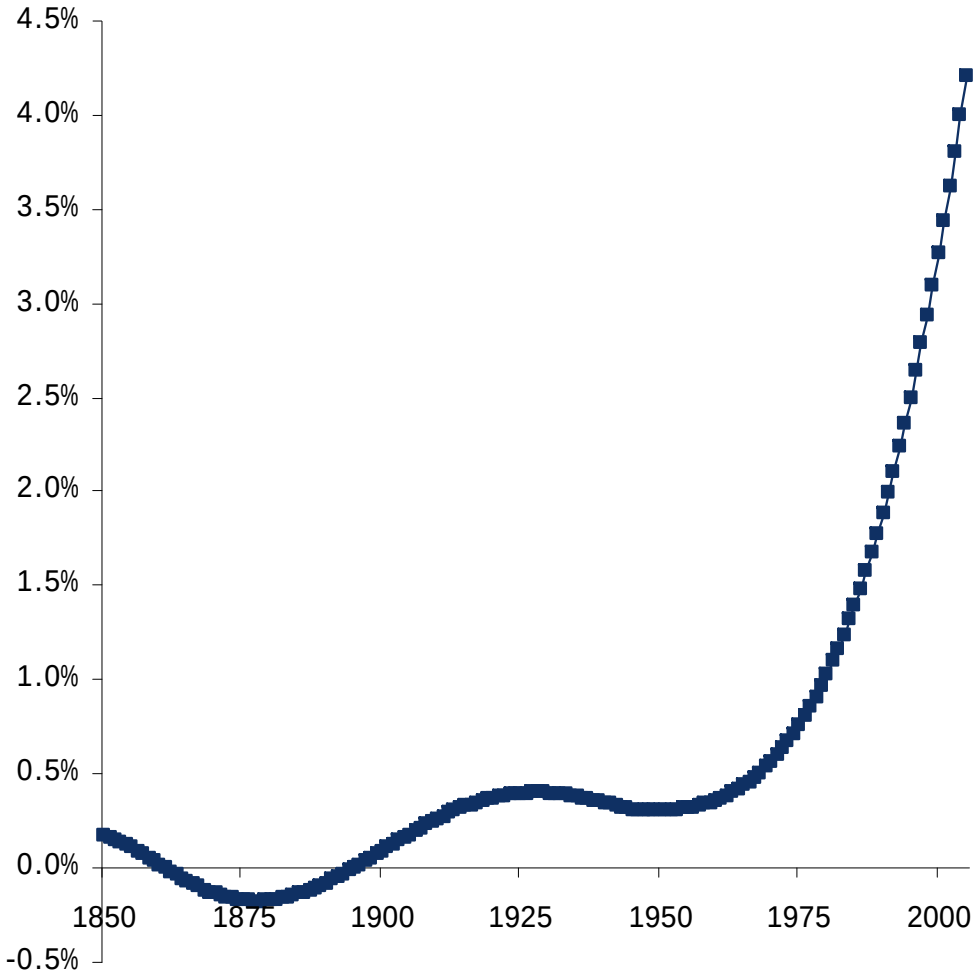


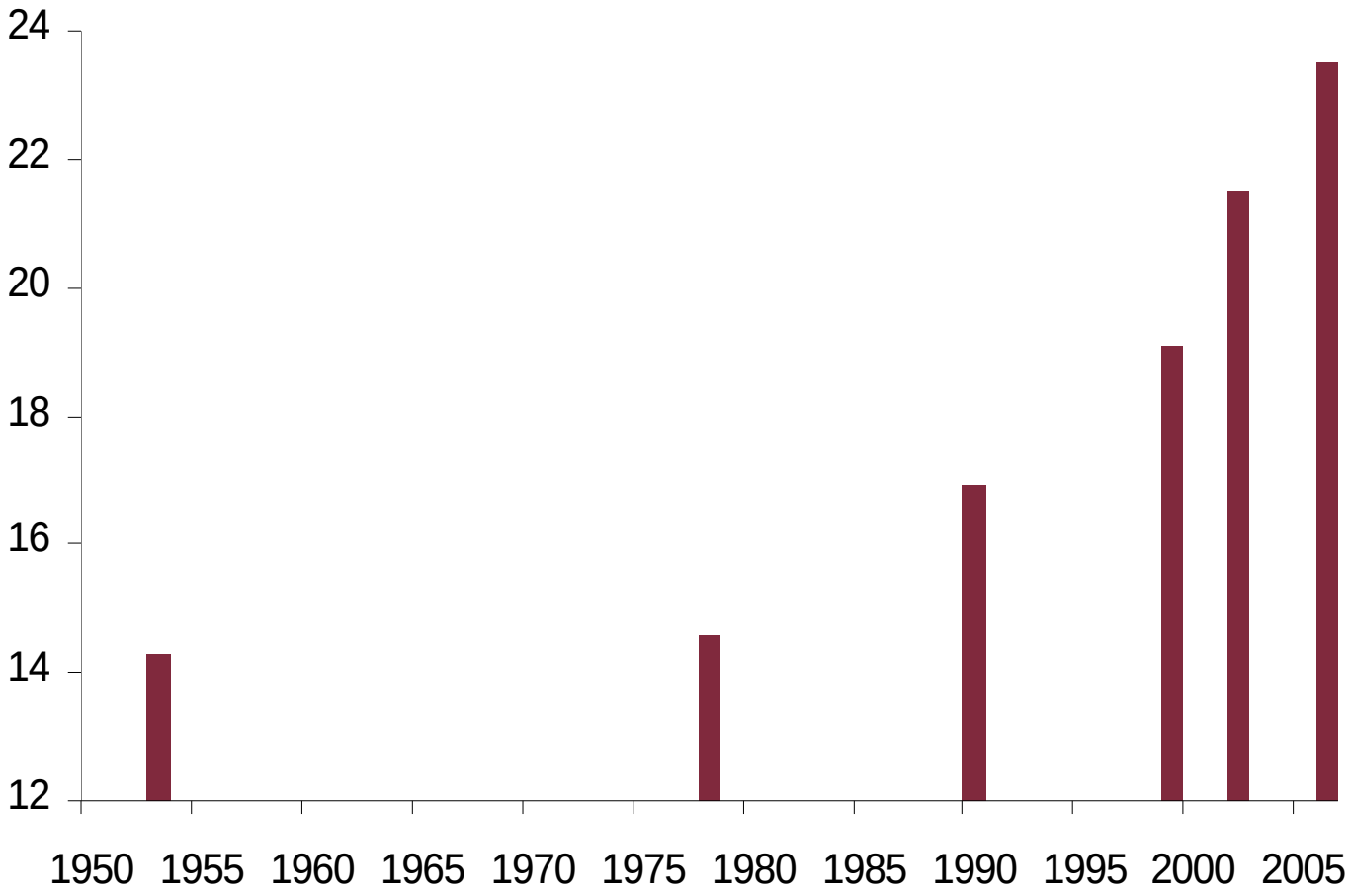
Smoothed annual rate of mortality improvement, males, England & Wales, aged 70-79

We are seeing unprecedented change

In the UK actuaries' estimates of male life expectancy at retirement have probably changed more in the past **10 years** than in the previous **100 years**

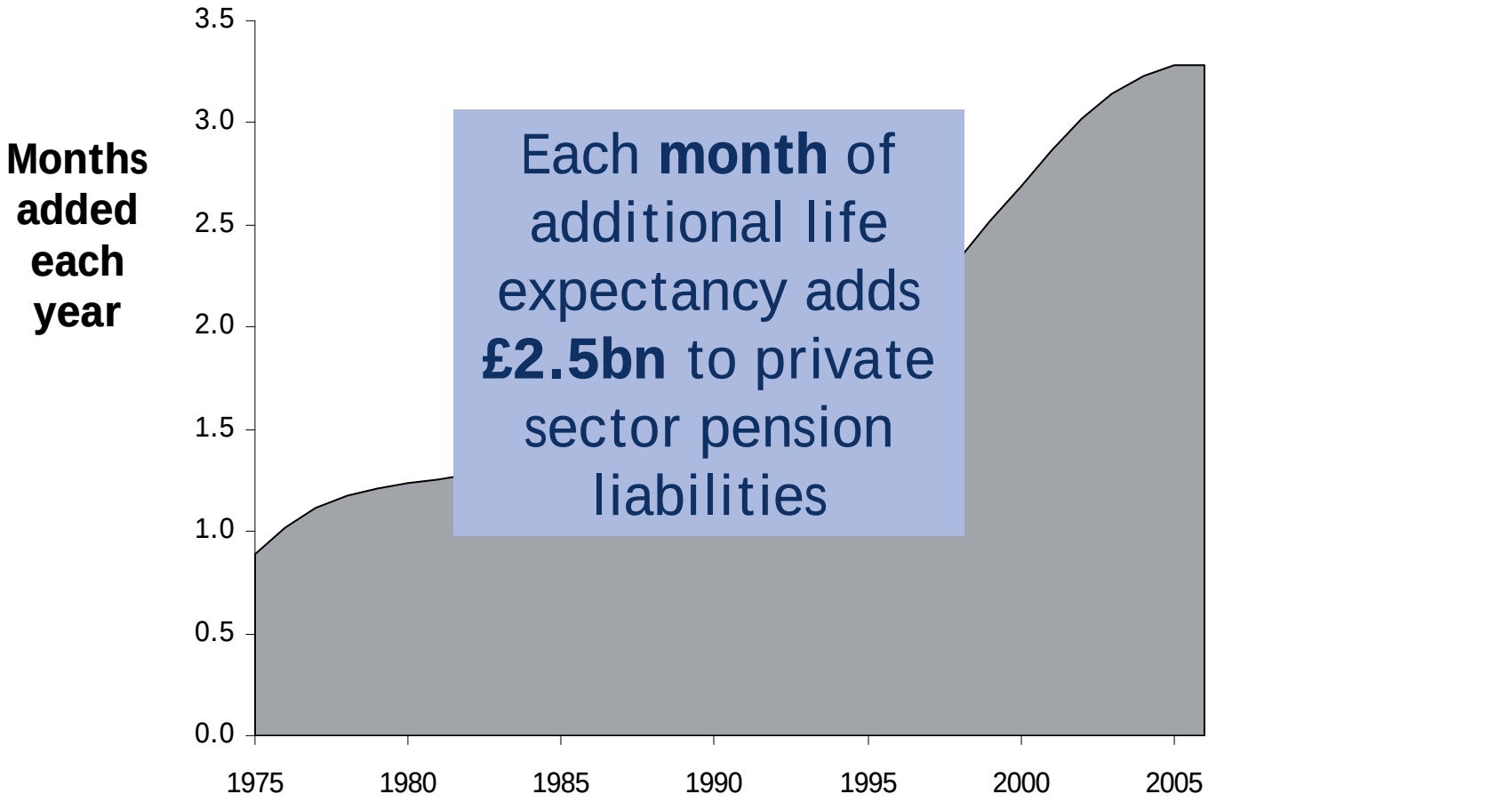
We are seeing unprecedented change

Projected life expectancy for male pensioners aged 65 based on published actuarial tables and projections



The pace of change has accelerated

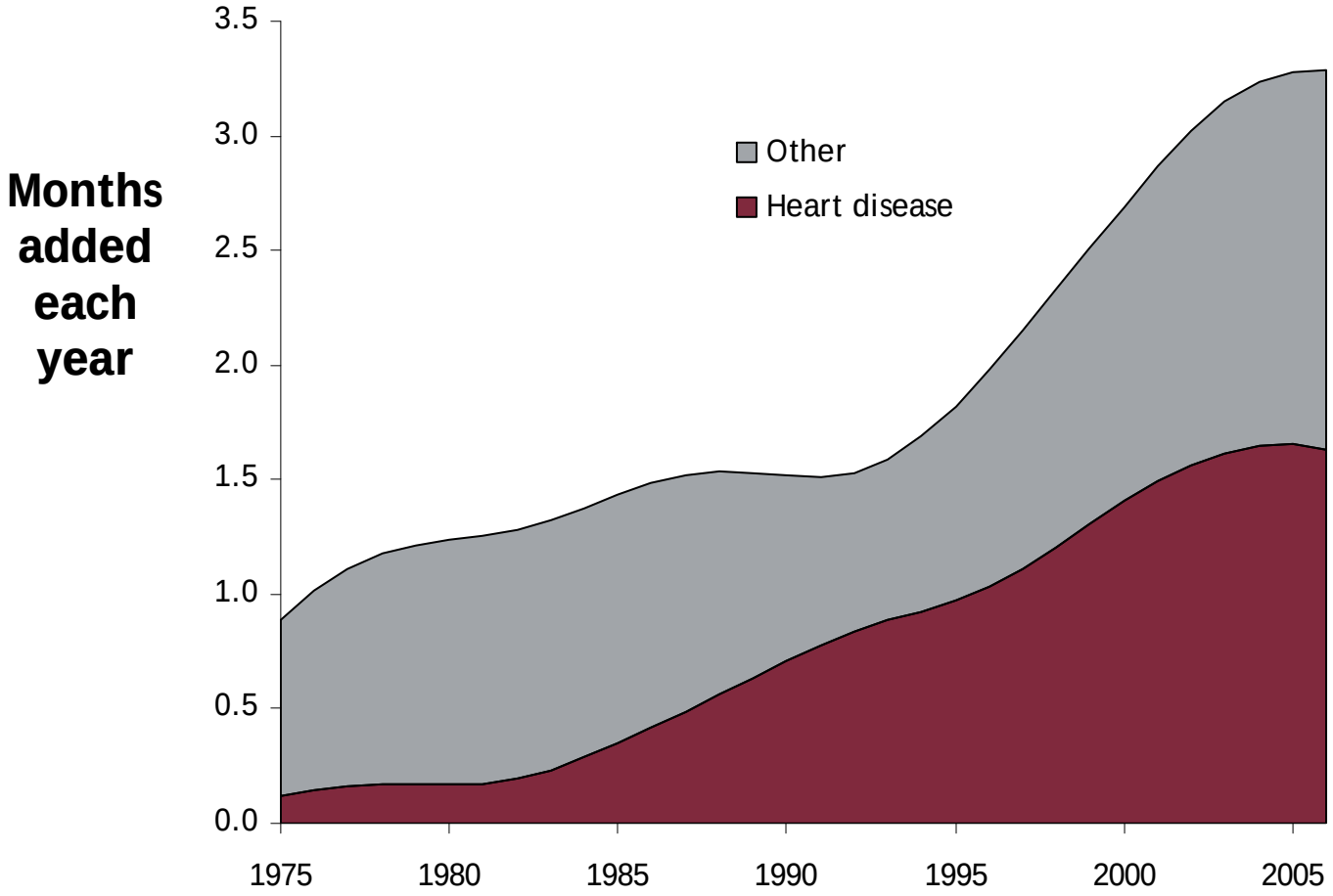
Gain in life expectancy (at age 65) p.a., males, Eng & Wales population



Source: own calculations using ONS data

Gains split by cause of death

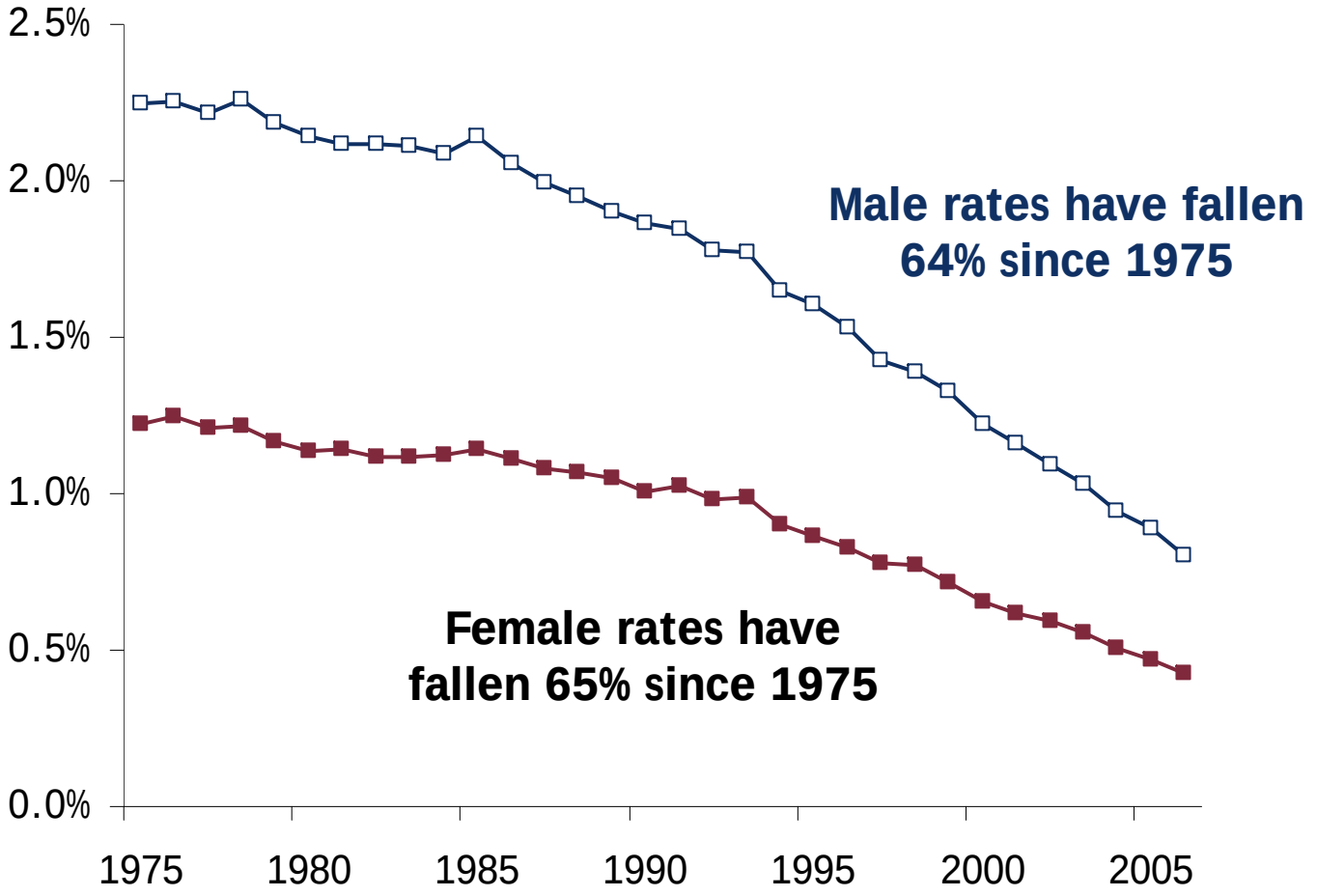
Gain in life expectancy (at age 65) p.a., males, Eng & Wales population



Source: own calculations using ONS data and a variant of the p-spline model developed by Paternoster to model mortality by cause of death

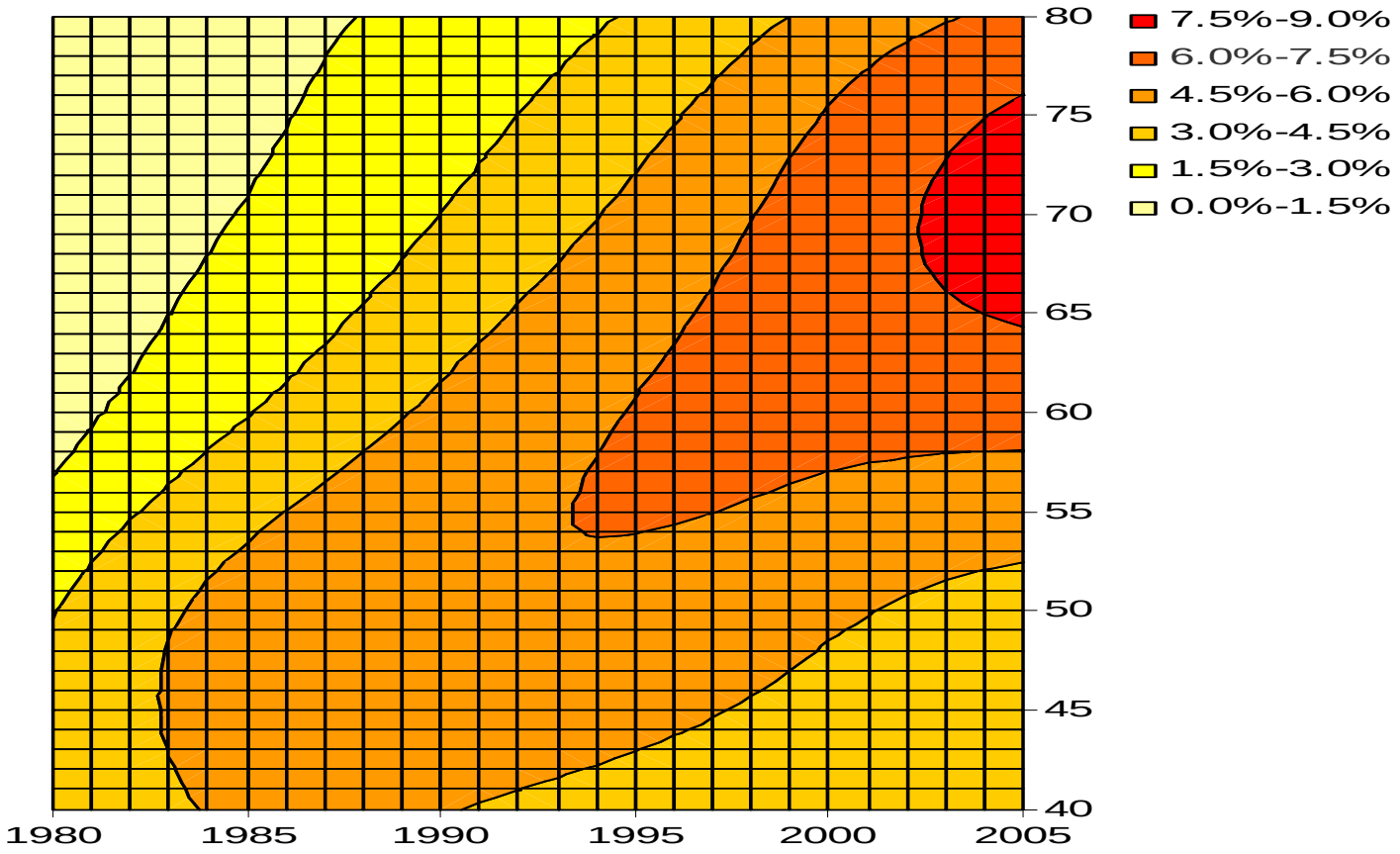
Heart disease mortality rates have fallen sharply…

Mortality rates from CHD, England & Wales, ages 65-84, by gender



The pace of change has varied by year of birth

Annual rate of improvement in heart disease mortality, males, Eng & Wales population, by age and calendar year



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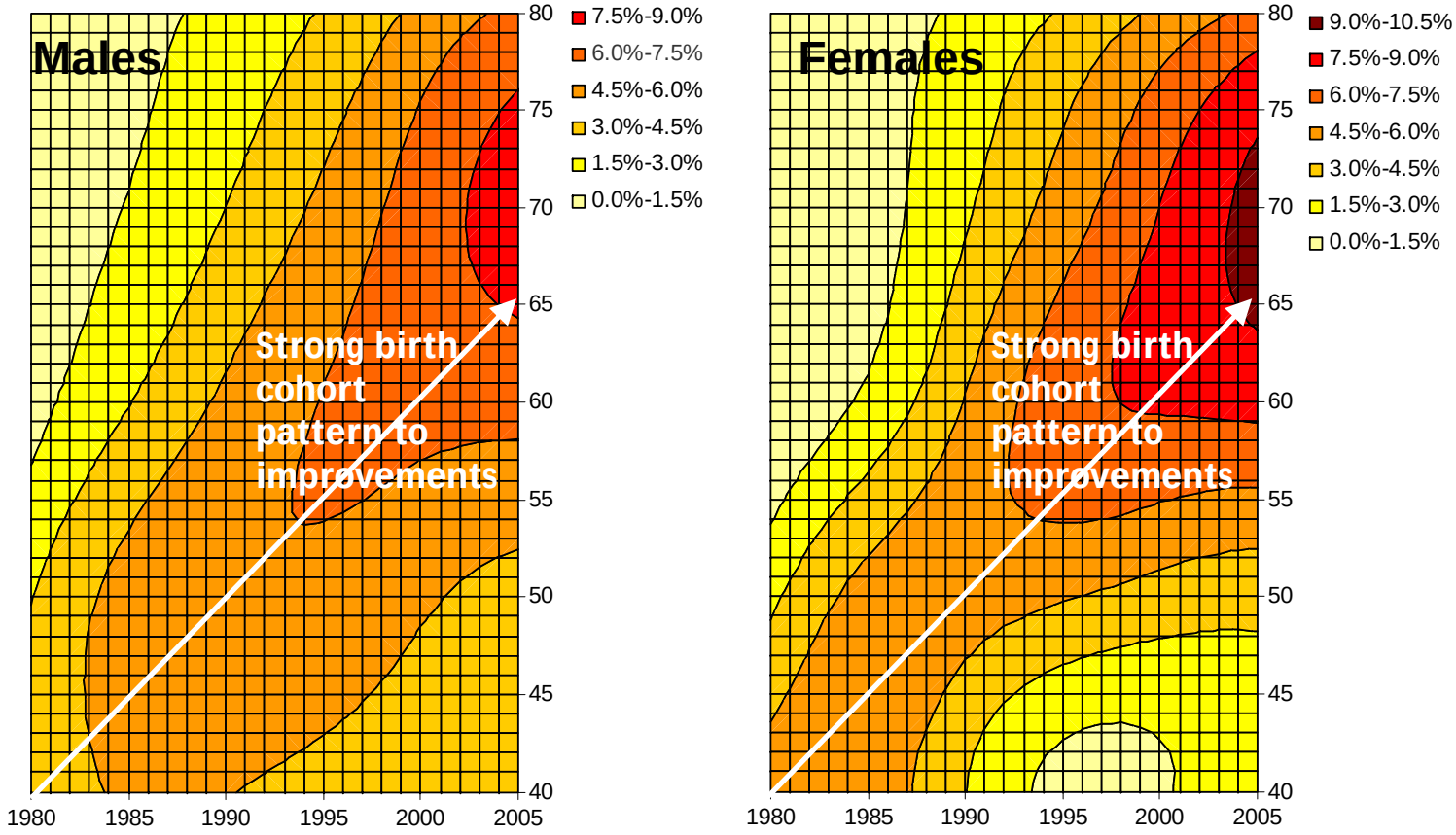
The pace of change has varied by year of birth

Annual rate of improvement in heart disease mortality, Eng & Wales population, by age, calendar year & gender



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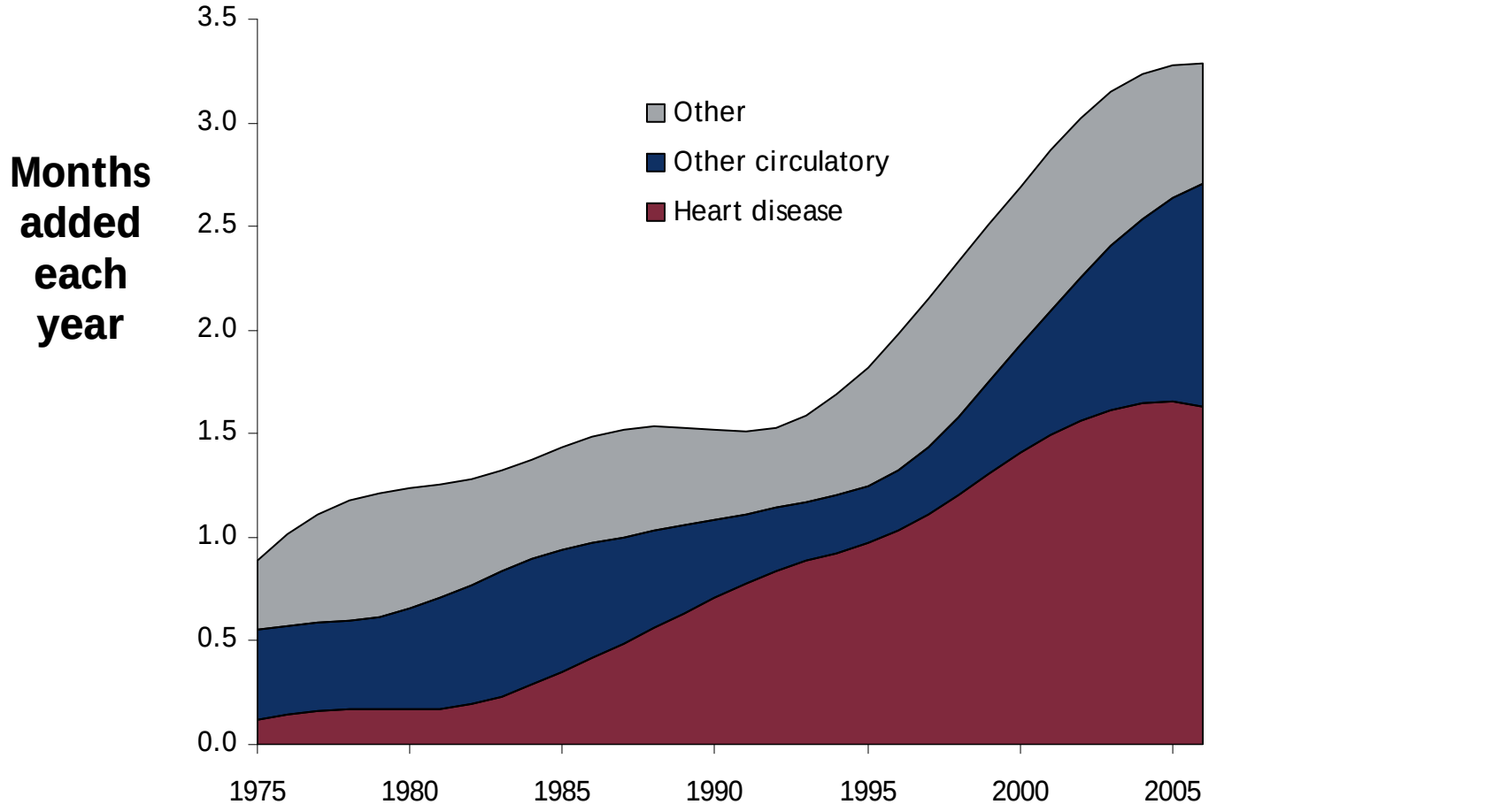
Life expectancy gains split by cause

Gain in life expectancy (at age 65) p.a., males, Eng & Wales population



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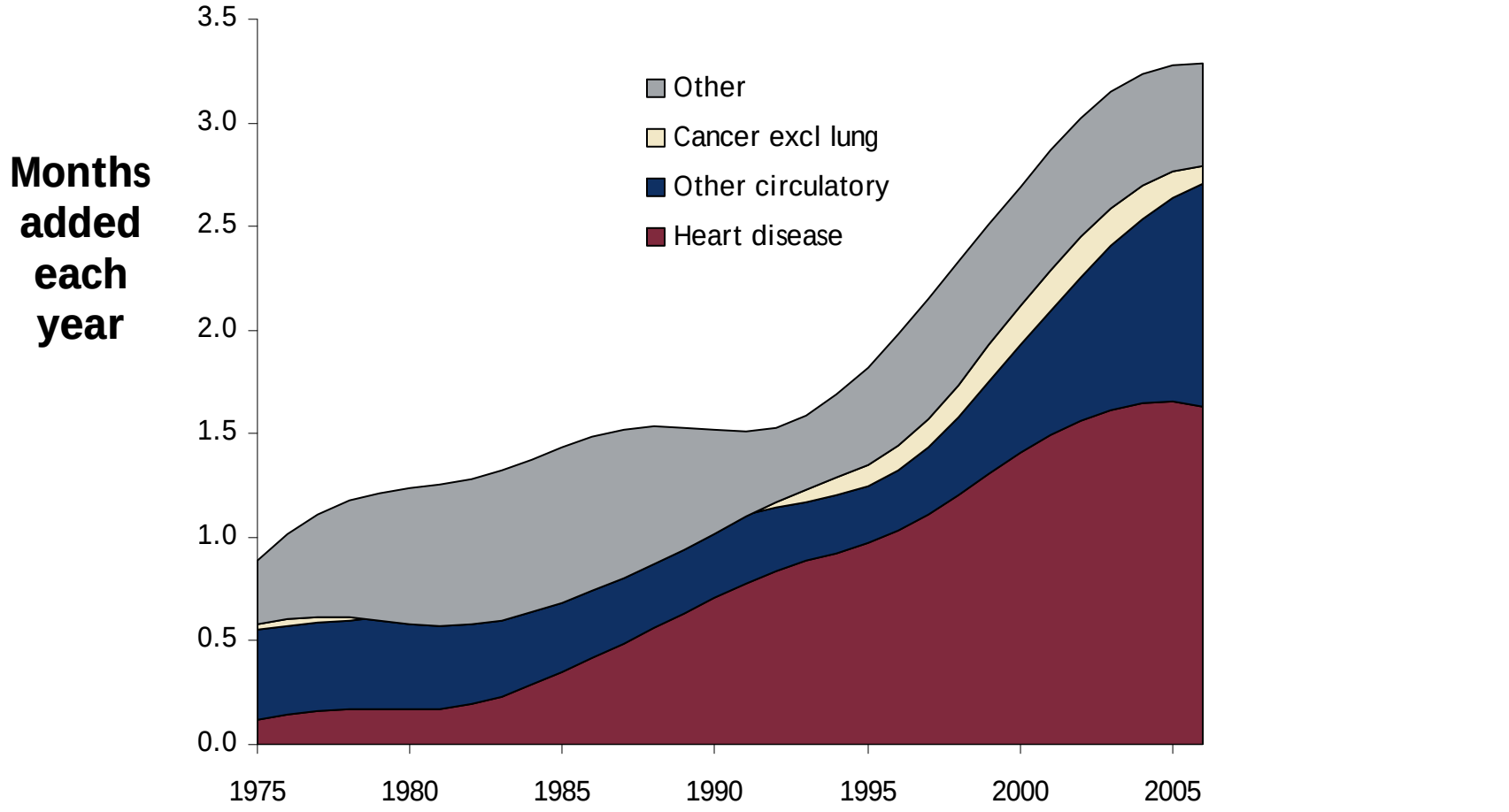
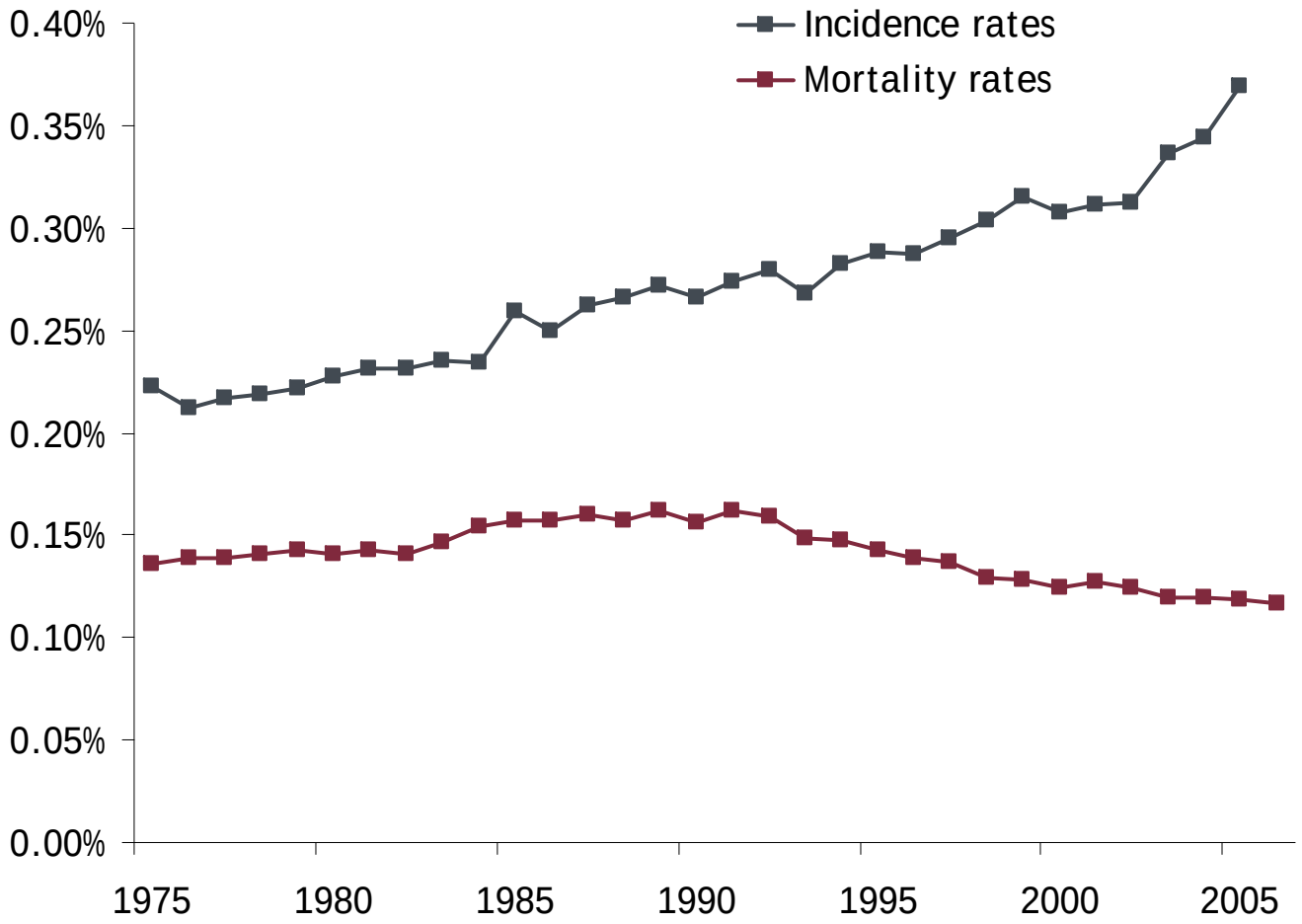


Source: own calculations using ONS data and a variant of the p-spline model developed by Paternoster to model mortality by cause of death

Breast cancer incidence rates are rising, while mortality rates are falling…

Incidence and mortality rates from female breast cancer, England & Wales, ages 65-84



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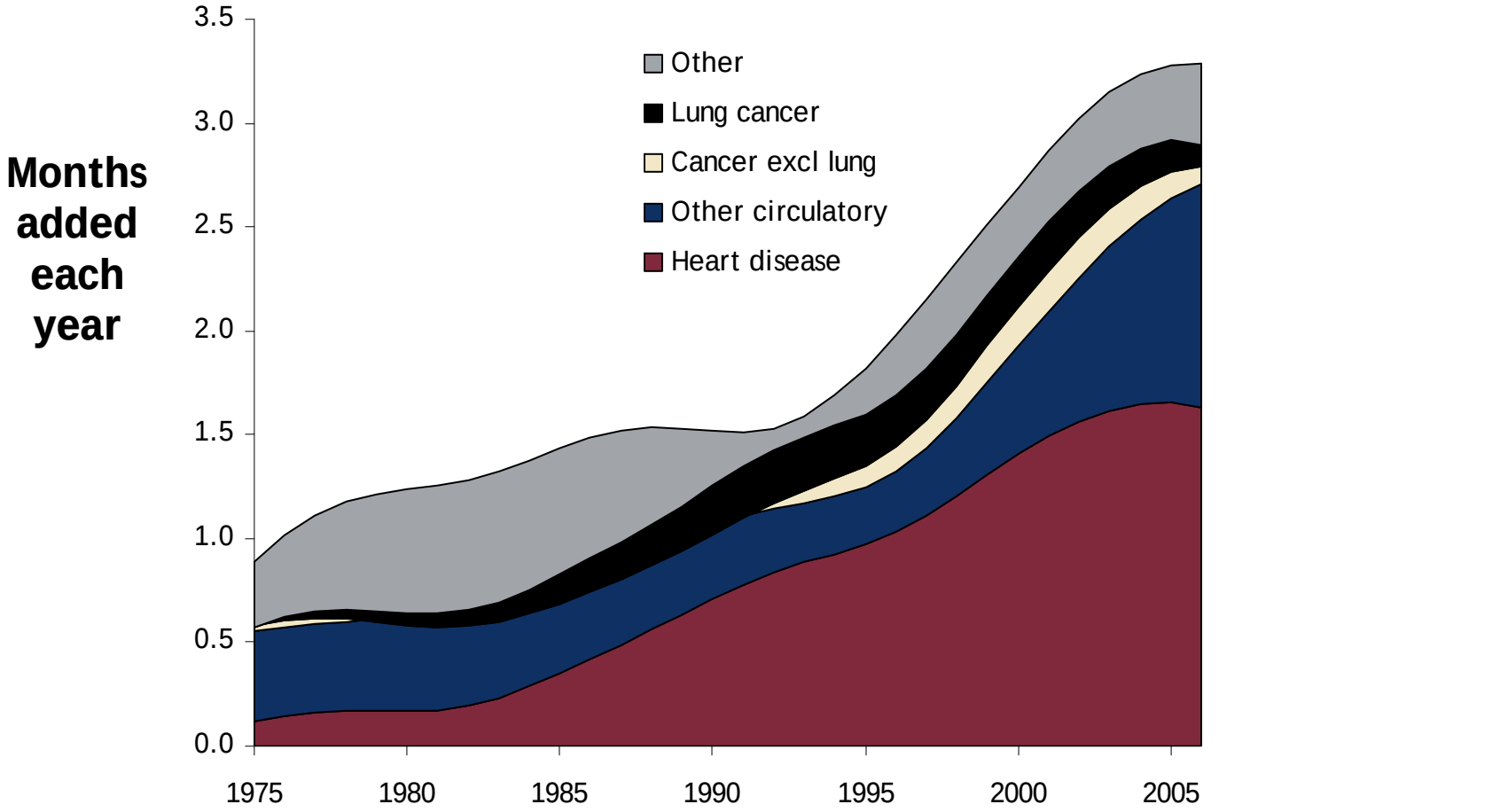

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Advances in statistical/stochastic modelling

- **P-spline**
- **Lee Carter variants**
- **Age-period-cohort models**
- **Cairns-Blake-Dowd models**

Focus on understanding the drivers of change

- **Drivers of the 'cohort effect', cigarette smoking, etc…**
- **Cause-of-death / risk factor models**

Development of the 'secondary market'

- **Customised cashflow swaps [insurers, reinsurers & capital markets]**
- **Standardised index hedges [e.g. 'q-forwards']**

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Differences in modelling approach

- **Use output from a statistical model fitted to population data**
- **Use an 'ONS-style' model, in which current rates of improvement tend towards long-term assumptions**
- **Use a scenario-driven approach utilising data on underlying causes or risk factors**

Different views on the forces shaping mortality change and the implications for likely future improvements

- **A 'best-estimate' rate of improvement for a male aged 75 in 2030 varies from 1.0% to 3.0% p.a.**

Arguments for further acceleration

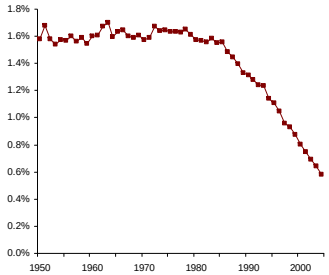
Medical advances are occurring at a faster and faster rate

Further reductions in key risk factors are likely – e.g. smoking, blood pressure & cholesterol levels

Increasing focus on healthy diets

Arguments for deceleration

Current high rates of improvement are due to big falls in deaths from circulatory causes



Increasing levels of obesity and type II diabetes

Impact of excess alcohol consumption, increasing drug use, stress, longer-working hours and more sedentary lifestyles

In future years…

We are unlikely to reach a consensus on the ‘best’ approach to use for mortality projections

However, it will become easier to determine the ‘market price’ for future improvements

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