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Longevity Gap: Gender & Socio-economic Circumstances

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1 July 2013

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Longevity Science Advisory Panel (LSAP)



Dame Karen Dunnell
Former UK National Statistician



Sir John Pattison
Former Department of Health's R&D Head



Professor Klim McPherson
National Heart Forum's Chair



Professor Steve Haberman
Cass Business School's Dean



Professor Colin Blakemore
Former Medical Research Council's CEO

Publications

- Life expectancy: Past and future variations by socio-economic group in England & Wales. 2012
- Life expectancy: Past and future variations by gender in England & Wales. 2013.

Media

- Catching up: In the rich world, men are closing the longevity gap with women. Lifespan and the sexes. The Economist. Print edition. 12 Jan. 2013.



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Gender directive

- The 2004 Gender Directive made it illegal to differentiate goods or services by gender
- Article 5(2) allowed insurance contracts an opt-out of the requirement where actuarial data supports the use of gender as a rating factor
- The UK implemented this opt-out in the Equality Act 2010 and companies rely upon this to differentiate premiums on the basis of gender
- IN 2009 the Belgian consumer association "Test Achats" brought a case before the ECJ
- ECJ ruled on 1 March 2011 that opt-out was invalid
- New insurance business must be issued with gender-neutral pricing where the customer forms a "new contract" on or after 21 December 2012

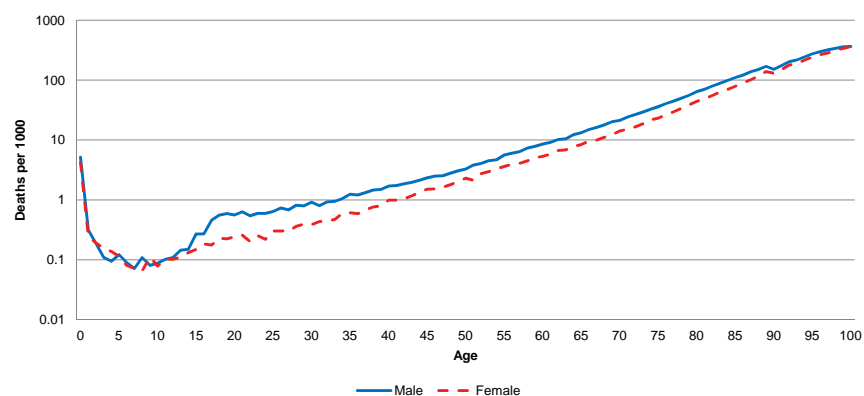
But what do stats and science say?



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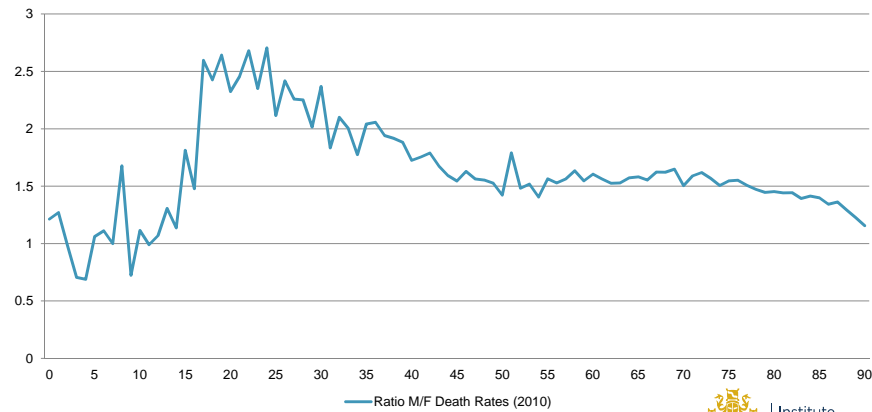
Current mortality rates across lifespan in England and Wales



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Ratio of male/female mortality



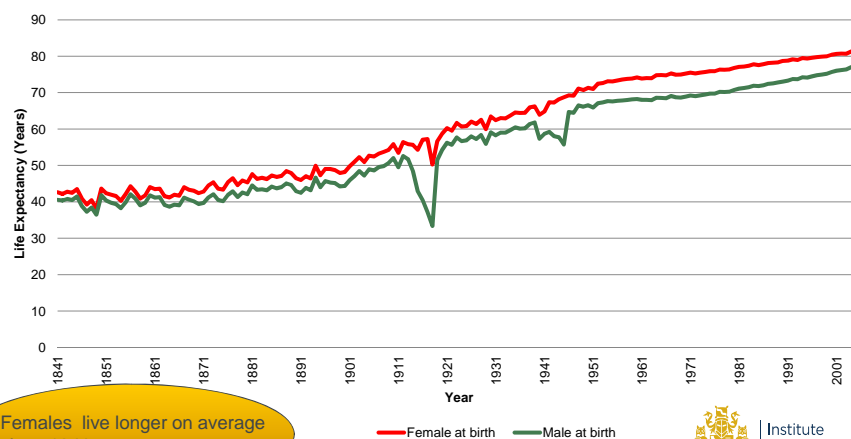
Source: Human Mortality Database (www.mortality.org)



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Male & Female Life Expectancy at Birth (E&W, 1841-2006)



Females live longer on average since 1841

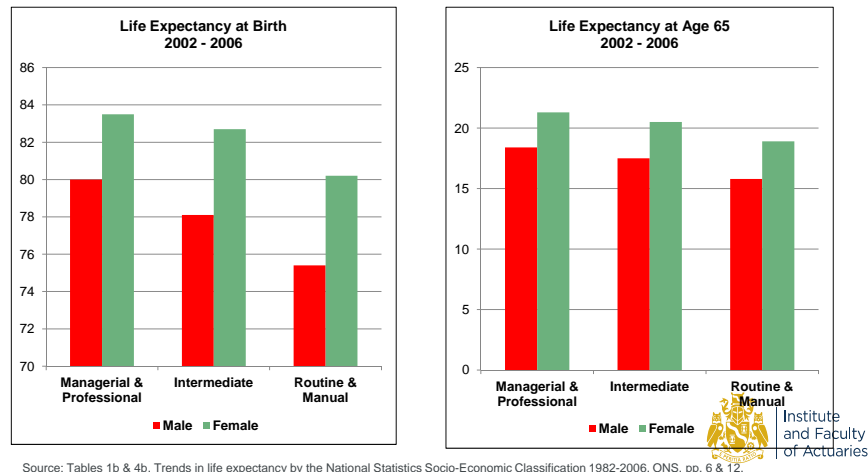
— Female at birth — Male at birth



Source: Human Mortality Database (www.mortality.org)

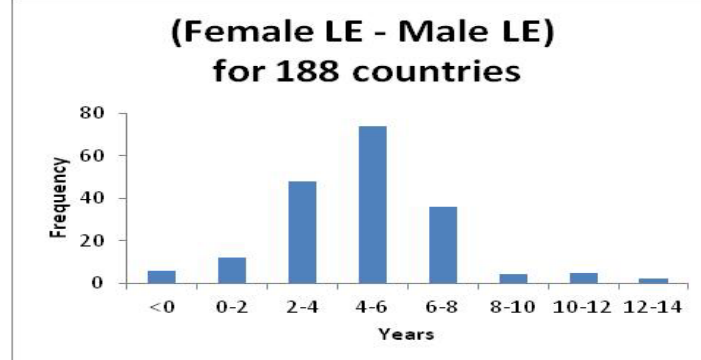
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Females live longer within sub-populations in UK (socio-economic groups)



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Females live longer internationally

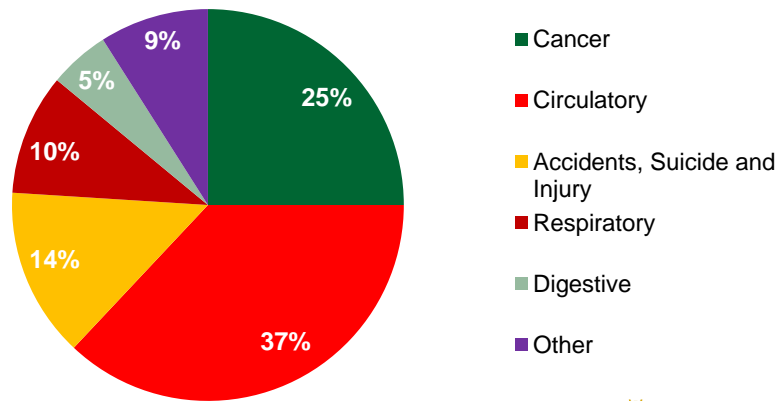


- 182 countries out of 188 where females live longer than males

•Source: Protection Business, Legal & General

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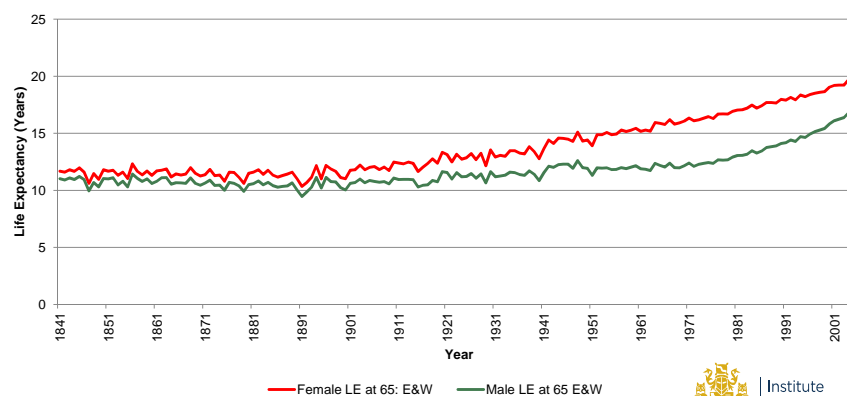
Causes of Death that Contribute to the Difference in Life Expectancy (at Birth) between Males & Females (%)



Figures provided by Ben Rickne, Oxford University

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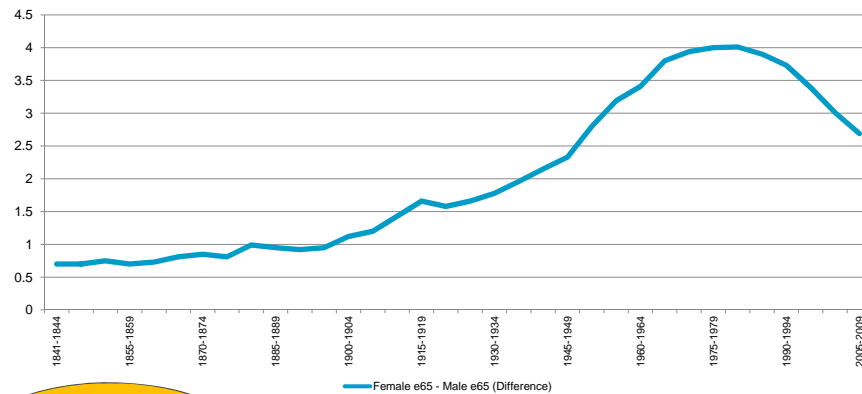
Male & Female Life Expectancy at Age 65 (E&W, 1841-2006)



Source: Human Mortality Database (www.mortality.org)

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Difference between Male & Female Life Expectancy at age 65 (E&W, 1841/44 to 2005/09)

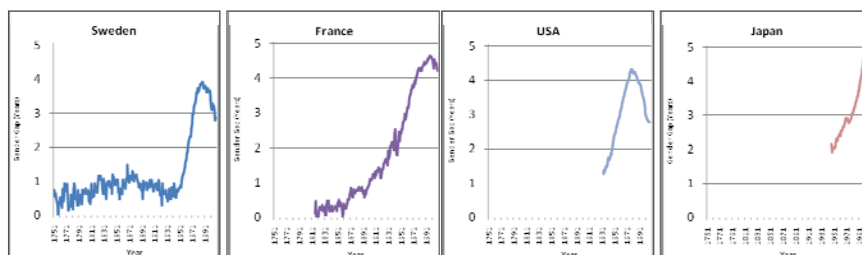


Up and down gap

Source: Human Mortality Database (www.mortality.org)

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International Comparison of Gender Differences in Period Life Expectancy at age 65

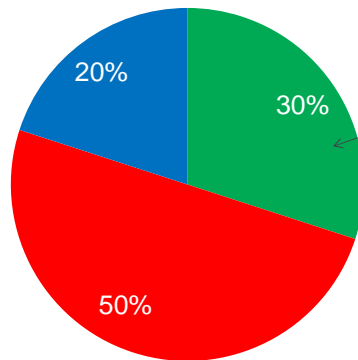


Up and down gap

Source: Human Mortality Database (www.mortality.org)

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Explanations for Differences in Gender Life Expectancy



Examples:

- Use of health care
- Behavioural – accidents, aggressiveness
- Biological

■ Other Factors ■ Smoking Related Causes ■ Alcohol Related Causes



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Note: Study of 30 European countries (2003-05). McCartney et al. 2011

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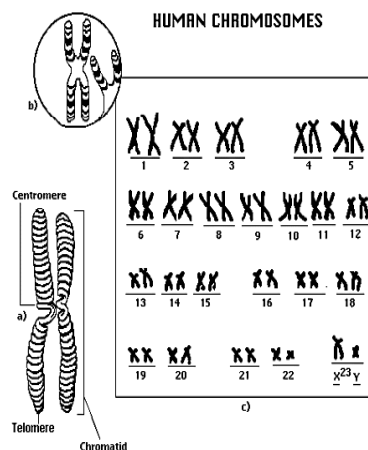
Gender Differences in Biology: Chromosomes

• Sex chromosomes (XY v XX)

- Females have 2 X chromosomes
- Able to compensate if one is damaged

• Telomeres

- Protect the ends of chromosomes from degradation¹
- Shorter telomeres means shorter lifespan²
- Males have shorter telomeres & higher rates of cellular degradation than females³



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References: 1 – Blackburn 2000; 2 – Blasco 2007; 3 - Stindl 2004.

Gender Differences in Biology: Hormones

- **Testosterone (Male)**
 - Suppresses immune system¹
 - Contributes to aggression
 - Linked to heart problems
 - Linked with oxidative stress²
- **Oestrogen (Female)**
 - Contributes to muscle strength/repair³
 - Linked with antioxidant enzymes⁴
 - Lowered risk of:
 - Metabolic syndrome/Type II Diabetes⁵
 - Cardiovascular Disease⁶



References: 1 - Hamilton JB and Mestler GE. (1969); Gilliver 2010; 2 - Alonso-Alvarez et al. 2007; 3 - Horstman et al. 2012; 4 - Vina et al. 2005; 5 - Faulds et al. 2012; 6 - Horstman 2012; Novella et al. 2012.

Conclusion

- Gender mortality differences have been robustly observed for all ages, internationally and within country's sub-populations
- Largely due to life style differences
- But, biological difference remains,
- ***So, gender mortality difference likely to remain***





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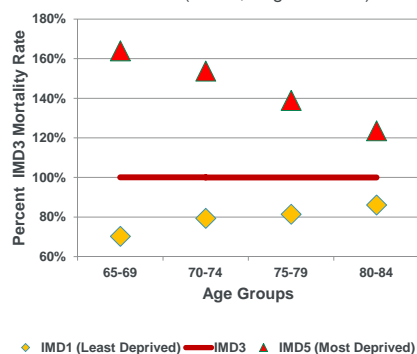
Mortality Improvement by Socio-economic Circumstances in England, 1982 to 2006

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Background

- Actuaries use socio-economic circumstances (SEC) for base mortality
 - Postcode
 - Pension Amount
 - Occupation
- Less is known about how mortality rates by SEC have changed over time
- Lack of credible data has hampered the study of mortality improvement by SEC

Comparison of Mortality Rates of People
in Different Socio-Economic
Circumstances (Males, England 2006)



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Solution – 100% Data

Advantages	Description
Larger Sample	100% population, England
Longer Period	1981 to 2007
Regularity	Yearly data
SEC Grouping	Index Multiple Deprivation (IMD) 2007
Consistency	•Deaths counts - Death Registry
Credibility	•Population figures - ONS

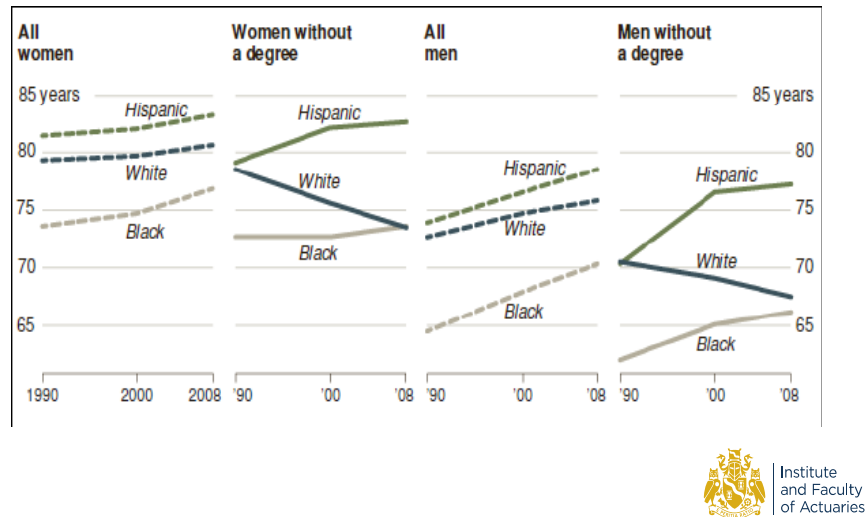


Findings: Fall in mortality rates between 1982 and 2006

- Differences in the fall in mortality rates in all quintiles (except IMD3 for most age groups) are **statistically significantly different** from that of the Total Population
- Less deprived (IMD 1 and 2) have experienced **greater fall** in mortality rates than more deprived (IMD 4 and 5)

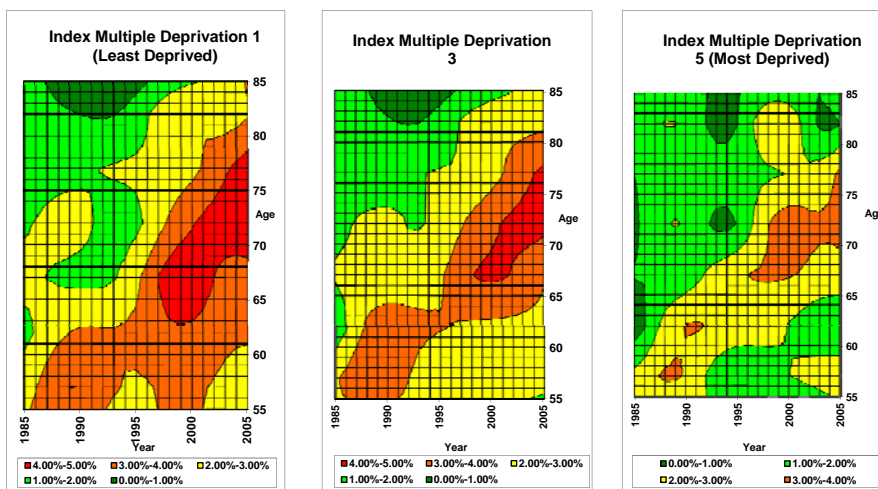
Males	Age 75-79	95% CI	Females	Age 75-79	95% CI
IMD 1	46.4%	0.5%	IMD 1	38.5%	0.4%
IMD 2	45.0%	0.4%	IMD 2	38.4%	0.4%
IMD 3	44.3%	0.4%	IMD 3	33.6%	0.4%
IMD 4	39.6%	0.5%	IMD 4	27.5%	0.4%
IMD 5	37.2%	0.5%	IMD 5	22.9%	0.4%
Total	43.7%	0.2%	Total	33.3%	0.2%

USA socio-economic differences



Source: The New York Times 2012.

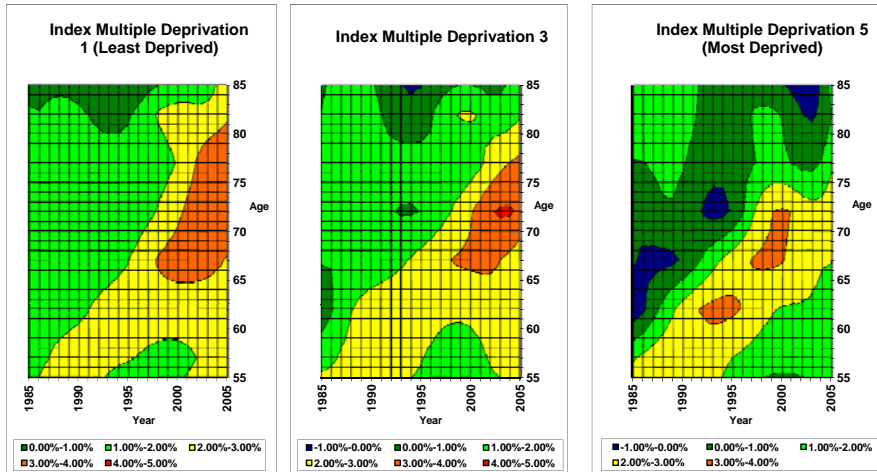
Annual Rates of Mortality Improvement Males, England 1985-2005



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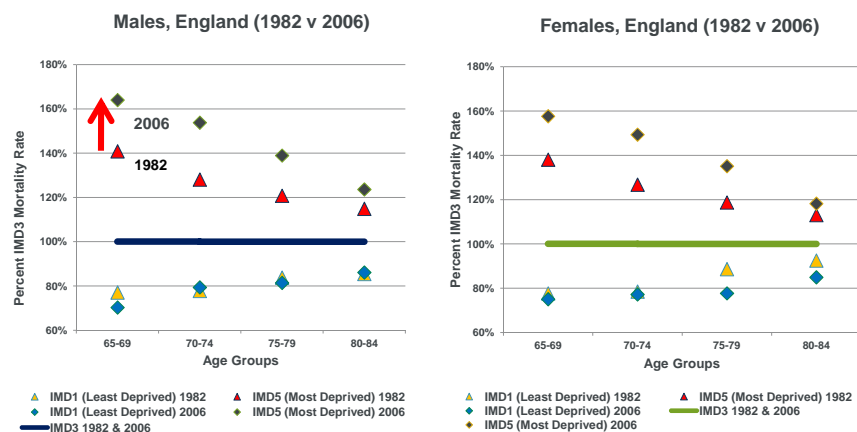
Findings

Annual Rates of Mortality Improvement Females, England 1985-2005

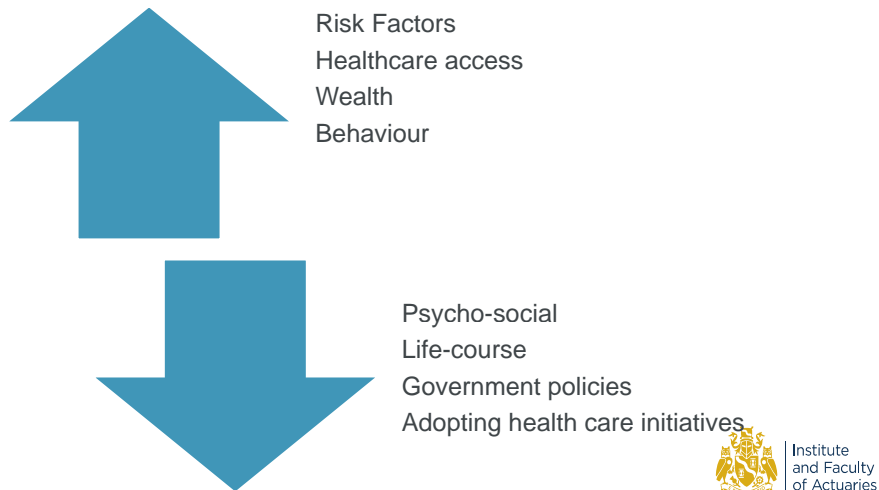


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Comparison of Mortality Rates of People in Different Socio-Economic Circumstances (England 1982 v 2006)



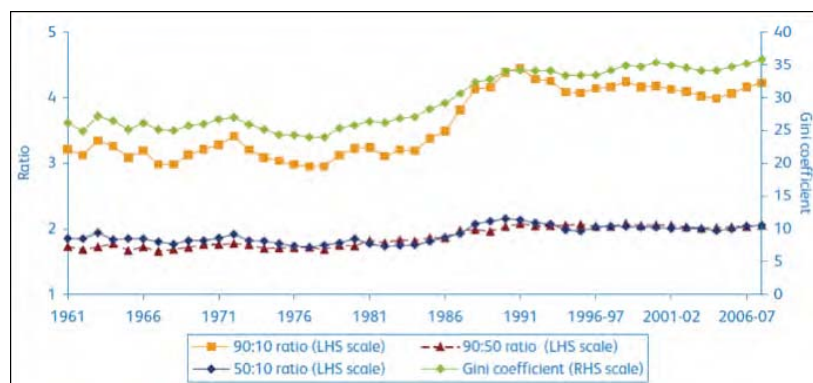
Forces separating longevity between SEC



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Widening income gap



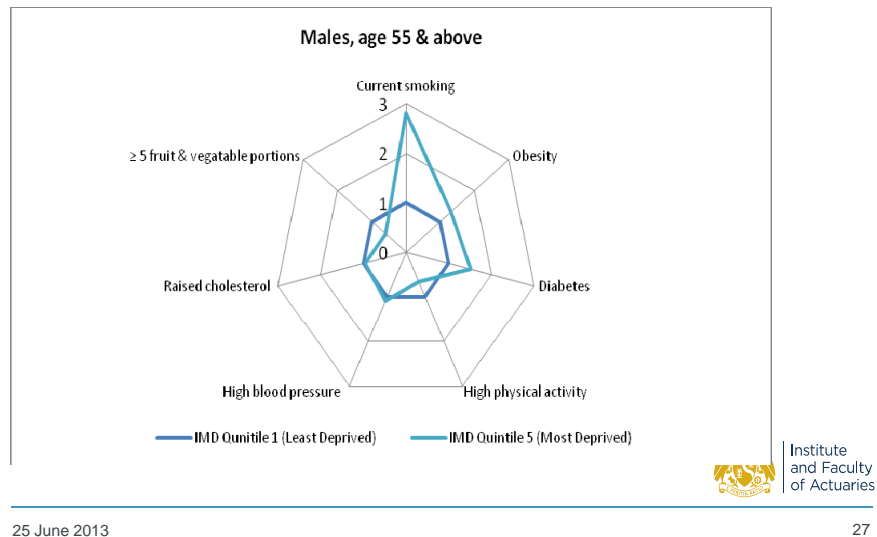
Source: Reproduced from Figure 2.13. Changes in overall income inequality measures (HBAI definition), 1961 to 2007-08. *An anatomy of economic inequality in the UK. Report of the National Equality Panel. National Equality Panel, 2010, p.39. (<http://sticerd.lse.ac.uk/dps/case/cr/CASereport60.pdf>)*

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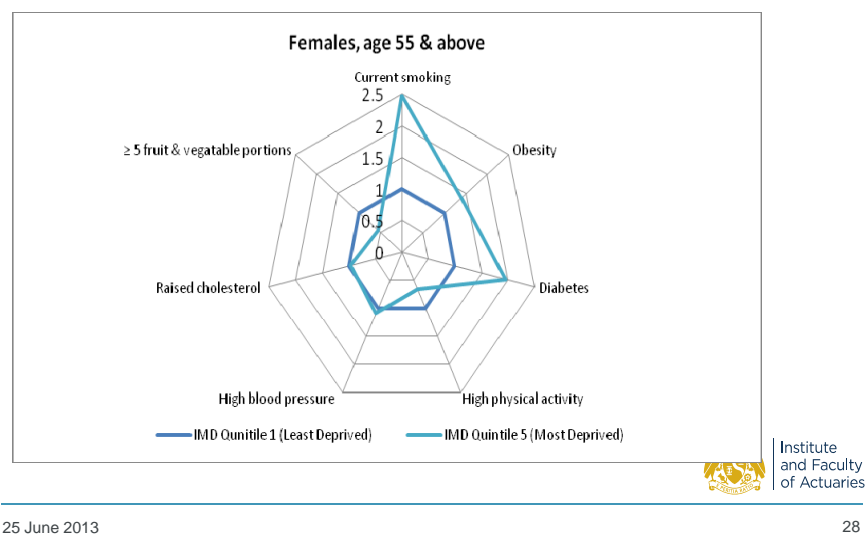
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Relative inequalities in cardiovascular risk factors (Males, England, age 55 and above)



Relative inequalities in cardiovascular risk factors (Females, England, age 55 and above)



Summary

1. Greater reduction in mortality rates in the less deprived IMD quintiles over the period 1982 and 2006 (***statistically significant***)
2. Heat maps of annual rates of improvement in mortality suggest more pronounced cohort patterns for less deprived IMD quintiles
3. Widening of differences in annual rates of improvement in mortality between people in different SECs
4. Results can inform assumption setting and decision making for pricing and valuation of longevity risks of people in different SEC
5. Basis risk could be assessed using the appropriate data and methods



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Longevity Science Advisory Paper 2

Life Expectancy: Past and future variations by gender in England & Wales

LSAP Members (2012)

- Sir John Pattison (Acting Chair)
- Klim McPherson
- Colin Blakemore
- Steven Haberman

Other Contributors

- Wun Wong
- Joseph Lu
- Madhavi Bajekal
- Benjamin Rinck
- Jennifer Regan
- Timothy Clutton-Brock

<http://www.longevitypanel.co.uk/docs/life-expectancy-by-gender.pdf>



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Mortality Improvement by Socio-economic Circumstances in England, 1982 to 2006

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Pretty Sagoo, Deutsche Bank

Richard Willets, Friends Life



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Questions

Comments

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

The views expressed in this presentation are those of the presenter.



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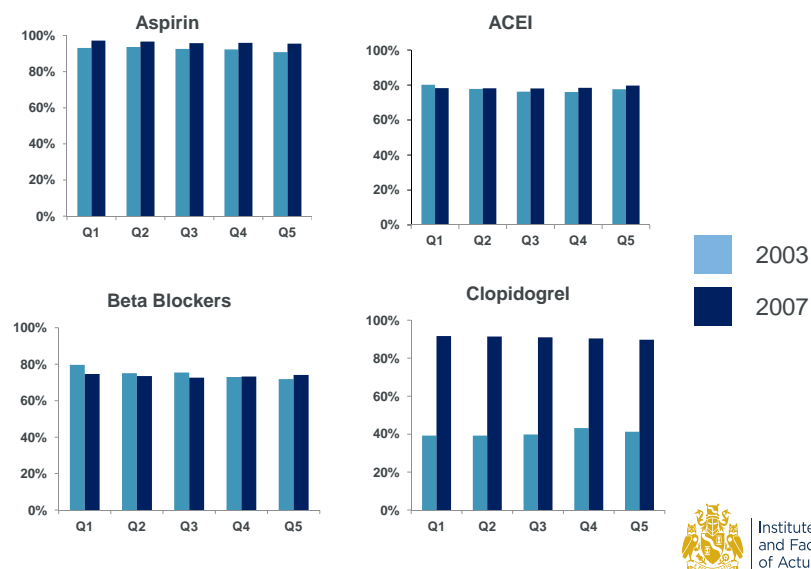
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Treatment trends 2000-2007



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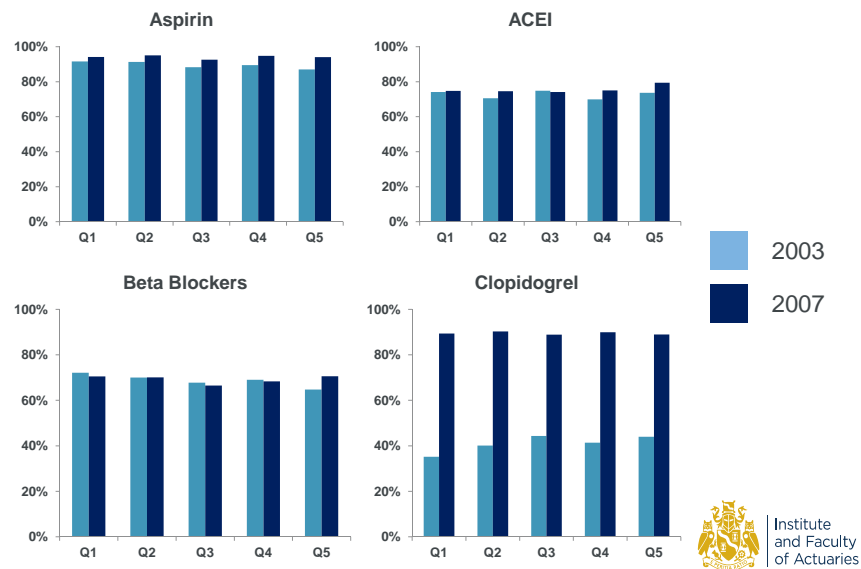
Myocardial infarction treatments (Males, ages 55-74)



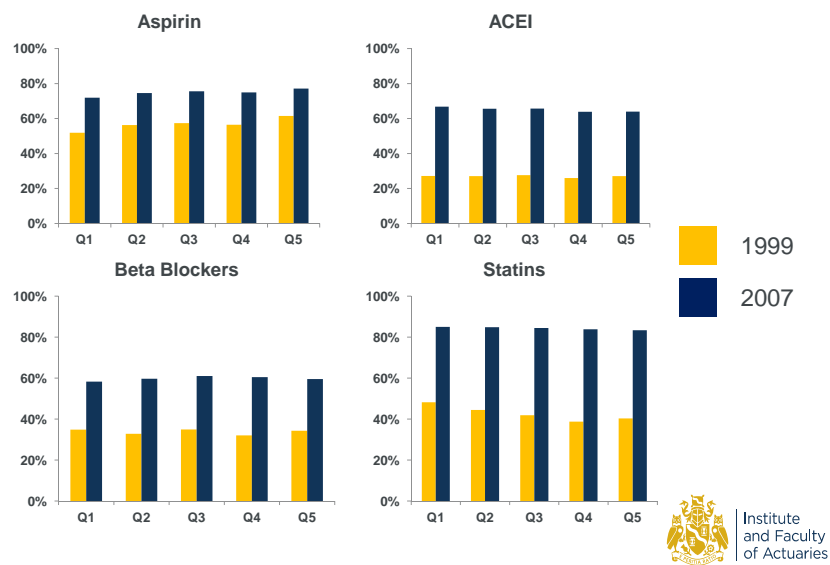
Source: Natkins et al. (2012) Epub



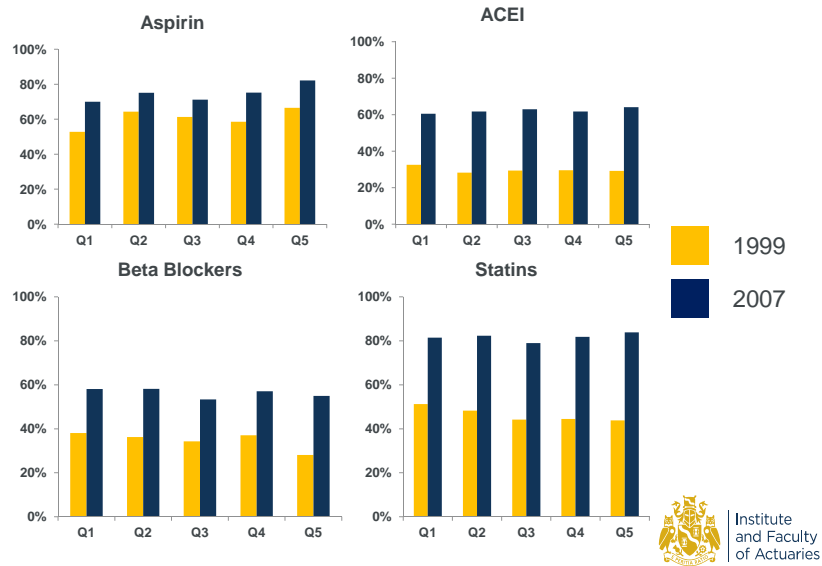
Myocardial infarction treatments (Females, ages 55-74)



Post-MI/Re-vascularisation treatments (Males, ages 55-74)

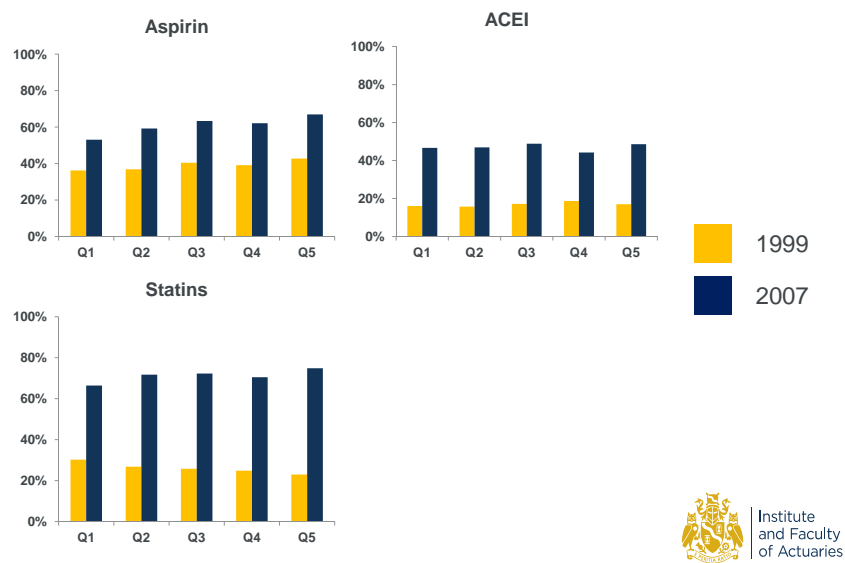


Post-MI/Re-vascularisation treatments (Females, ages 55-74)



Source: TBC

Angina treatments (Males, ages 55-74)



Source: TBC

