

Momentum 2010  
Philip Bundy, Swiss Re



## Life and the random

Risk and uncertainty from a  
pricing actuary's perspective

10 December 2010

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## Agenda

- Actuaries and risk
- Gambling with your life
  - mortality risk for an individual
- Certainty and adequacy
  - mortality risk for a life insurer
- Actuaries to the rescue!
  - applying statistical skills to the wider world

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## Actuaries and risk

- "Actuaries use **financial and statistical techniques** to solve real business problems, particularly those involving **risk management**" www.actuaries.org.uk

- "In a broad range of business and financial contexts they can **analyse the needs** of a client or employer and **identify an optimal solution**" www.actuaries.org.uk

- In a world more aware than ever of the importance of risk management, these skills are key

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## Dealing with risk

An actuary will:

1. **Recognise the risks** they face

then by interrogation and interpretation of appropriate data

2. **Quantify** the likelihood and impact of these risks

3. Develop strategies to **mitigate** and **manage** them

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Consumers' attitudes to uncertain events

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## Mortality risk



For an individual, the ultimate:

- low frequency
- high impact event

How well are the risk and consequences

{ recognised  
quantified  
mitigated

by an individual?

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## Public perceptions of mortality risk

"In this world nothing can be said to be certain, except death and taxes."

Benjamin Franklin 1789

Other well known features of mortality risk:

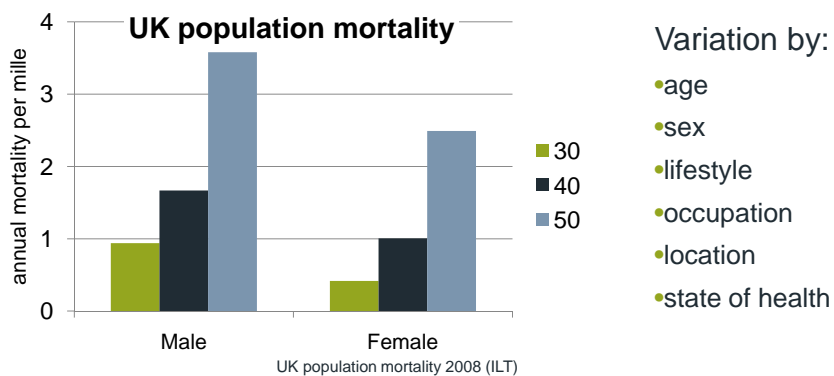
- Risk increases with age?
- Females have longer life expectancy than males?

In UK, how many 30 year old males die each year (per mille)?  
Any ideas?

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## Likelihood



- death a relatively low probability event at young ages
- great deal of data is available
- not necessarily well understood by the public

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## Impact

Death of a provider is generally a low likelihood event, but with severe consequences and additional costs, including:

- loss of income
- education costs
- mortgage/rent
- child care costs
- house work

which can add up to a significant financial loss

"Financial value of  
a mum: £32,800pa"

Value of a Mum survey – Legal & General 2009

This financial loss can be **mitigated** through life insurance

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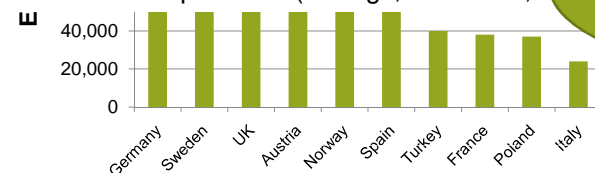
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## Mitigation

### The Protection Gap

"In the event of untimely death, the difference between

- the money needed for dependents to maintain
- the financial provision (savings, insurance, etc)



"Across Europe, consumers  
are underinsured by over  
€10,000,000,000,000"

All: European Insurance  
Report – Swiss Re 2010

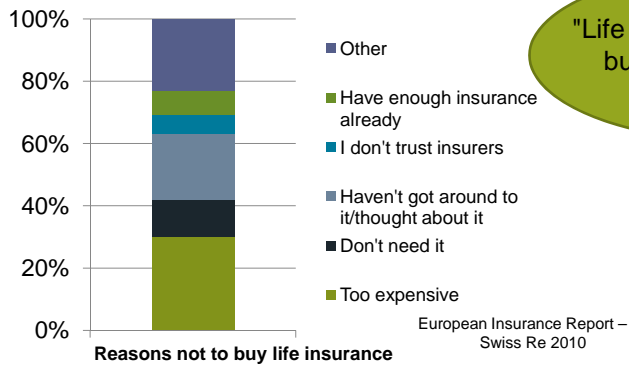
People don't buy the life protection they need - why?

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## Mitigation

### Why not buy life insurance?



"Life insurance is not a luxury, but a fundamental need"

European Insurance Report – Swiss Re 2010

- Consumers unwilling to prioritise spending on a product with only a limited likelihood of payout?

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## Do people approach risk like actuaries?

### The National Lottery

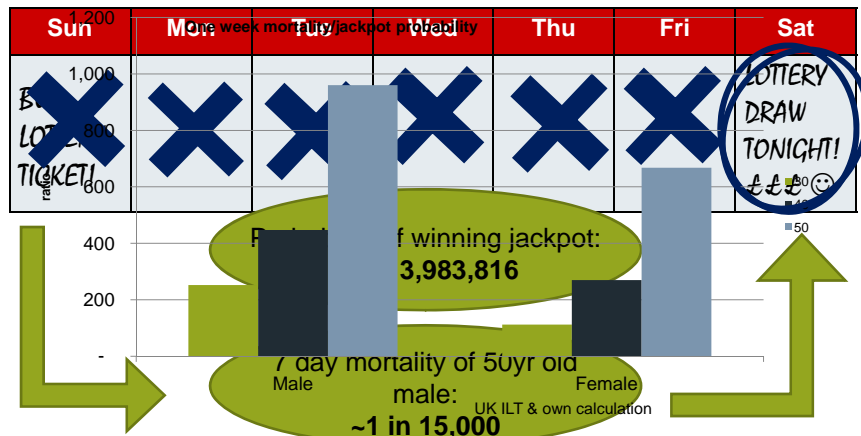
- 70% of the UK adult population play "on a regular basis"  
www.camelotgroup.co.uk (2008)
- For £1.50 a week, a man aged 30 could get over £80,000 of life cover – closing the protection gap

Which purchase is more valuable?

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## Live to enjoy it?



Individuals do not apply the same rational approach to all risks  
 than they are to win the jackpot a week later

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## Gambling your life

- Individuals do not apply the same rational approach to all risks
  - Relative probability of extreme events misunderstood
- Improved awareness of mortality risk would benefit consumers and providers
  - Closing the protection gap across Europe would result in increased premiums of over **€25bn** pa

European Insurance Report – Swiss Re 2010

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Accurate data and  
required capital

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## Mortality risk for a life actuary

Mortality seen to be relatively stable and certain

- pooling of risk
- availability of data
  - 491,000 deaths registered in England & Wales in 2009
  - mature insurance market

Instead focus on a different consequence:

- how certain are the expected cashflows under a portfolio of policies?

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## Mortality risk to a life insurer

Benefit payments differ from expected

- Leading to reduced profit or insolvency

Risk managed and reduced through

- adequate capital
- accurate assumptions using appropriate data and controls

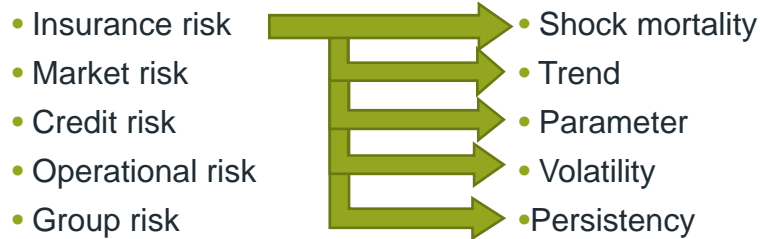
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## Life insurance risks

Actuaries **recognise** the risks they face

Risks to taken into account for life business



Necessary to manage each risk individually, but also take a holistic view

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## Accurate assumptions

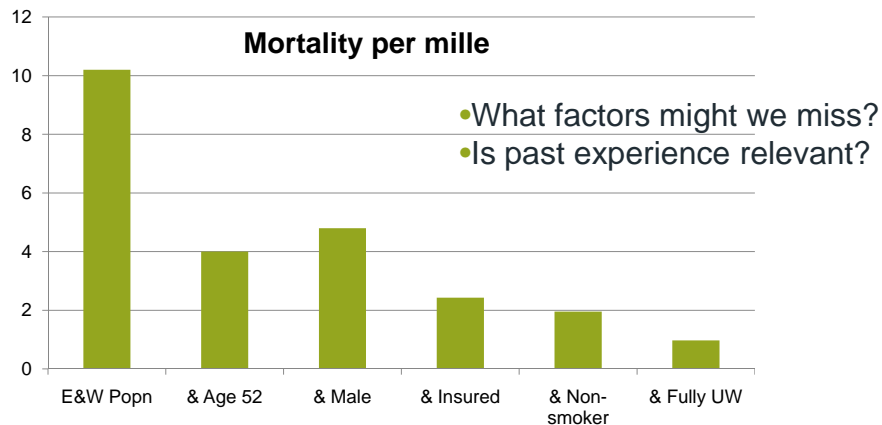
- Relevant credible experience data
- Homogeneous risks consistent with data used
  - underwriting and risk selection
- What is the expected mortality rate for a particular life in England and Wales?
  - The more we know, the more accurately we can predict, but the less credible the data

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## Accurate assumptions

- Consider a fully underwritten, 52 year old male non-smoker in E&W



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ONS – Report DH1 2001 &  
CMI – T00 mortality tables

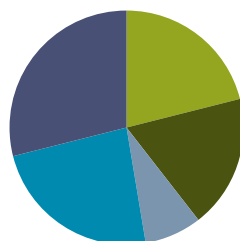
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## Accurate assumptions

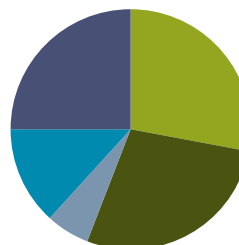
- Numbers and causes of deaths changing over time

Cause of death – male (60-89) in England & Wales

2005



1968



■ Heart  
■ Other circulatory  
■ lung cancer  
■ other cancers  
■ all other

What about the next 20 years?

Age-standardised mortality rates for males in  
England & Wales aged 60-89, by constituent  
cause (smoothed) – based on CMI WP38

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## Claims cost

A huge number of factors influence the final benefit payments

Where possible, risk can be reduced with thorough interrogation of appropriate relevant data, although necessary to treat with care

Residual risk requires adequate capital to be held

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## Life insurance risks

Risks to taken into account for life business

- Insurance risk
- Market risk
- Credit risk
- Operational risk
- Group risk
- So, how much capital?
  - Sufficient to maintain solvency up to a 1 in 200 year event

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## What does a 1 in 200 event look like?

- A dynamic combination of factors above
  - depends on underlying probability distributions applied to assumptions
- An extremely rare catastrophe
  - e.g. a pandemic event with insured mortality of 1-1.5 per mille\*
 

\*\*Influenza pandemics – time for a reality check?" - Swiss Re 2007
- Tossing a fair coin and getting 8 heads in a row

Consider the financial impact of such an event and develop capital strategy accordingly

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## Actuarial advice

Actuaries assess the uncertain events and determine the required protection for the range of uncertain outcomes

Strategic decisions to mitigate risk and optimise allocation of resources rely on actuarial expertise

Holistic risk management and data analysis skills of actuaries crucial to perform this role

Can these skills create value elsewhere?

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The importance of  
understanding the full  
picture

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## So...

Actuaries are experts at:

- understanding and managing future uncertainty
- interpreting data to inform decisions
- *"making financial sense of the future"*

Where else can we use these skills?

Could more pro-active use of our expertise benefit

- the public?
- government?
- the media?!

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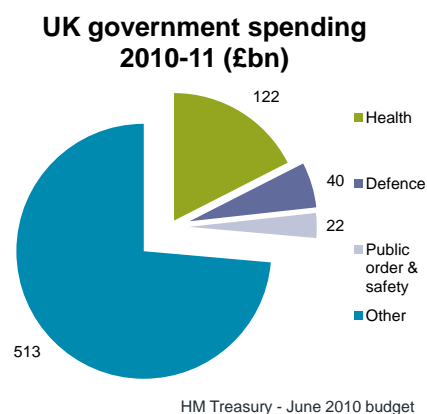
## Healthcare

Healthcare represents 18% of UK government spending

Critical that maximum return is achieved on limited resources

Are we prioritising in the most efficient way?

Could the Profession help?



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## Treating cancer

### CANCER SURVIVAL RATES IN BRITAIN AMONGST THE WORST IN EUROPE

Daily Mail - March 2009

"The UK spends twice as much per head of population on cancer as countries which are higher on the survival league table, such as Portugal, and three times as much as countries such as Slovenia"

#### % of patients who survived these cancers after 5 years

Lung		Prostate	
England	8.4%	England	69.7%
Euro average	12.2%	Euro average	77.7%
Bowel		Breast	
England	49.9%	England	77.3%
Euro average	54.3%	Euro average	81.6%

EUROCORE - 4

Is UK cancer expenditure ineffective?

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## Another statistic

Over the last 20 years, decline in UK breast cancer mortality rates greater in the UK than any other large European country

BMJ August 2010

Headlines only tell half the story

- incomplete diagnosis data
- late registrations
- under-reporting of non-fatal cancers

UK recording process differs from many other EU countries, so results are incomparable

Applying actuarial skills can help avoid knee-jerk reactions?

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## Improving mortality

### BRITISH DEATH RATES AT RECORD LOW 'DUE TO RISE IN STATINS USE'

The Telegraph – Oct 2010

"Age-standardised deaths mortality rates ~~had not~~ been so low since 1952 when the population was smaller and relatively healthy"

"Experts said the introduction of statins, which combat cardiovascular diseases, had contributed to the dramatic fall in deaths"



Risk that positive decisions are discredited by misunderstanding statistics?

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## Safety

A primary aim of government is to protect its citizens

- Significant proportion of budget spent on security, defence

Critical for government to achieve maximum return on limited resources.

- Are we prioritising resources in the most efficient way?

Do decisions fully take into account the information available and the expected consequences?

- Could the Profession use its skills to help?

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## Preventable causes of mortality – Road deaths

In the USA in 2001, c3,000 people died in road accidents **every 4 weeks**

This resulted in:

- ~~public outrage?~~
- ~~significant increase in vehicle safety measures?~~
- military action
- significant government expenditure

Individuals in developed nations estimated **390** times more likely to die in a road accident than terrorist attack (1994-2003)

Government action to try to prevent such **deaths in the future**

Deaths from international terrorism compared with road deaths in EU countries - BMU

Where should resources be allocated to maximise lives saved?

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## Preventable causes of mortality

Actuarial rigour also requires consideration of all other relevant factors:

- economic cost of safety
  - value of time – security queues, reducing speed limits
  - what value a human life?
- deaths prevented by intervention
- opportunity costs
- Allocation of resources amid conflicting demands, to manage and mitigate risk and decide on the optimal strategy

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## Just the start

Many other areas to explore, such as:

- Tobacco and alcohol - policy and taxation
- Pandemic
- The value of a life
- Infrastructure investment and the value of time
- Demographic challenges
- NICE spending

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## Summary

- The first step to dealing with a risk is to understand it, however unlikely it may be
- With its statistical and risk management skills, the Profession could play an invaluable role outside of our traditional fields
  - Could better decisions be made by individuals and policymakers?
- Suggestions here are just the start!

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## Questions or comments?

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Expressions of individual views by members of The Actuarial Profession and its staff are encouraged.

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