



The Actuarial Profession

making financial sense of the future

Healthcare Conference 2005

Using our Resources Wisely

24-26 April 2005

Scarman House, University of Warwick



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Workshop A1

How Much Capital is Needed to Support Critical Illness Business ?

Neil Robjohns

Head of Pricing, Munich Re UK Life Branch

Chairman of Critical Illness Risk Based Capital Working Party

Outline

- The CI Risk Based Capital Working Party
- Landscape
 - Capital Frameworks
 - Survey of Approaches to ICAS
 - Range of Views in the Market
- Risk Map
- Some Thoughts on CI Claims Risks
 - Past Works
 - Initial Level Estimation Risk
 - Trend Risk

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CI Risk Based Capital Working Party

- A new working party; first meeting January 2005
- Established to help address a Key Question :

How much capital is needed to support CI business ?

- Our aim is to develop information and models, and possibly formal guidance, to assist with ICAs, reserving and pricing for CI business, especially where long-term premium guarantees are given.
- This workshop is a first report on progress & plans

Critical Illness Risk Based Capital Working Party Members

- Bill Baker
 - Swiss Re
- Stehanie Harwood
 - Friends Provident
- Jon Neale
 - L&G
- Adrian Pinington
 - Revios
- Neil Robjohns (Chair)
 - Munich Re
- Rajeev Shah
 - Barnett Waddingham
- Stephen Somerville
 - Scottish Widows
- Grigory Spivak
 - Gen Re
- David Whittaker
 - Norwich Union
- Hamish Wilson
 - Abbey

Disclaimer

- The Working Party is newly formed and has much work ahead to reach adequately researched and well thought out conclusions.
- The opinions expressed in this presentation (to encourage debate) are my own and do not necessarily represent the views of the Working Party, nor those of my employer.

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Capital Frameworks

- Many differing Capital and Reporting Regimes
 - UK Statutory
 - Realistic Balance Sheets
 - ICAS
 - Internal Capital Models
 - EV, EEV, Fair Value Accounting, ...
 - EU Solvency II
- and Viewpoints :
 - Regulators - UK, other EU, Swiss, USA, ...
 - Rating Agencies
 - Shareholders
 - Policyholders

Capital Frameworks

- Common Elements
 - Reserves - Explicit and Implicit Margins
 - Solvency Buffer - %, Factors, Formulas, Scenarios, Probabilistic
 - Varying Degrees of
 - Complexity
 - Judgement
 - Ability to Manage
 - Two Key Issues
 - Security Level / Risk Tolerance
 - Time Horizon
 - Overview : Different capital answers for differing purposes
-

Survey of ICAS Practice, YE2004

Protection Products

- Calculation Approach
 - Deterministic - load claim and trend rates
 - Worst case scenarios
 - Stochastic Models
 - Mix and match
- Calibration Justification
 - Historic analysis - internal and population data
 - Opinion - in-house and external expert
- Target Ruin Probability
 - 99.5% over 1 year
 - 95% (for example) over outstanding term

Survey of ICAS Practice, YE2004

Protection Products

- Time Horizon
 - 1 year only (possibly including change in reserves at end year)
 - Outstanding term of inforce block
 - Mix and match
- Risk Correlations
 - No allowance
 - Reinsurer Credit Risk
 - Correlation Matrix based on judgement and stress tests
 - Extreme scenarios investigated
- Overview
 - Wide range of practices - no emerging consensus

Range of Views - Reserves

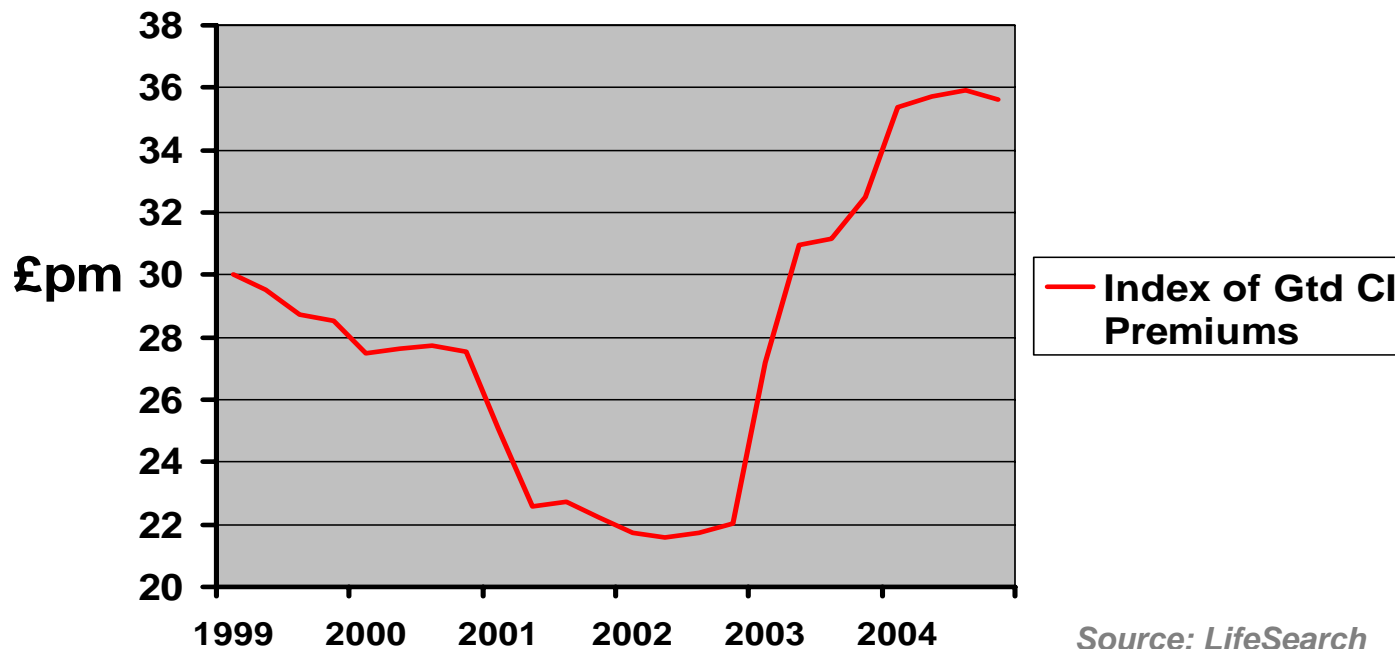
UK Statutory Valuation Bases for 8 Reinsurers

■ Source : YE2003 FSA Returns

	Level (approx % CIBT93)					Trend (% pa)	
	M NSm	M Sm	F NSm	F Sm		M	F
A	42	80	42	80		1.00	1.75
B	45	90	50	110		2.00	2.00
C	50	86	56	69		2.00	2.00
D	50	93	60	110		2.00	2.00
E	60	60	60	60		2.00	2.00
F	56	89	69	110		1.50	1.50
G	70	70	90	90		1.50	1.50
H	65	120	75	140		1.60	1.60

Range of Views – Prices and Capacity


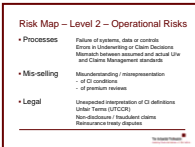
There have been major changes in market prices, capacity and composition over recent years



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Risk Map – Level 1 – All Risks

- Market Interest rates; Inflation; Equity Returns
- Credit Bond, Reinsurer or Intermediary defaults
- Insurance 
 - Claims Experience
 - Initial Level
 - One Time
 - Catastrophes: Natural disasters, terrorism, epidemics
 - Volatility: Random incidence, seasonality
 - Persistency: Too low, too high – complex risk
 - Expenses: Mis-estimation, poor control
 - Business Mix: Changes in distribution, competitor actions
- Liquidity Cashflow mgmt; Aggregation of claims
- Operational 
 - Processes: Failure of systems, data or controls; Errors in underwriting or Claims Settlements; Mismatch between assumed and actual life and Claims Management standards
 - Mis-selling: Misunderstanding / misrepresentation
 - of conditions
 - of premium reviews
 - Legal: Unintentional misapplication of (D) definitions; Under Terms (UTOCs); Non-Statutory / "Residual" claims; Reinsurance treaty disputes
- Group Interactions between entities within a Group

Risk Map – Level 2 – Insurance Risks

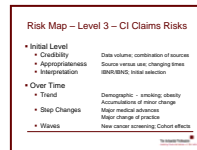
■ Claims Experience

■ Initial Level

■ Over Time

■ Catastrophes Natural disasters; terrorism; epidemics

■ Volatility Random incidence; seasonality



■ Persistency Too low; too high - complex risk

■ Expenses Mis-estimation; poor control

■ Business Mix Changes in distribution; competitor actions

Risk Map – Level 3 – CI Claims Risks

- Initial Level

- Credibility Data volume; combination of sources
- Appropriateness Source versus use; changing times
- Interpretation IBNR/IBNS; Initial selection

- Over Time

- Trend Demographic - smoking; obesity
Accumulations of minor change
- Step Changes Major medical advances
Major change of practice
- Waves New cancer screening; Cohort effects

Risk Map – Level 2 – Operational Risks

- **Processes**
 - Failure of systems, data or controls
 - Errors in Underwriting or Claim Decisions
 - Mismatch between assumed and actual U/w and Claims Management standards
- **Mis-selling**
 - Misunderstanding / misrepresentation
 - of CI conditions
 - of premium reviews
- **Legal**
 - Unexpected interpretation of CI definitions
 - Unfair Terms (UTCCR)
 - Non-disclosure / fraudulent claims
 - Reinsurance treaty disputes

Risk Map – Level 2 – Insurance Risks

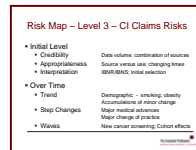
- Claims Experience

- Initial Level

- Over Time

- Catastrophes

- Volatility



Natural disasters; terrorism; epidemics

Random incidence; seasonality

- Persistency

Too low; too high - complex risk

- Expenses

Mis-estimation; poor control

- Business Mix

Changes in distribution; competitor actions

Risk Map – Level 3 – CI Claims Risks

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CI Risk Based Capital Working Party Terms of Reference (Revisited)

Recognising the Landscape, we will :

- Focus on modelling cashflows, independent of any specific capital regime
- Provide research to illuminate, evaluate and encourage debate on key elements of the Risk Map
- Focus primarily on CI Claims Risks, ...
 - using mortality as a benchmark
- ... then on other Insurance Risks and some Operational Risks with specific relevance to CI, and consider risk correlations
- Attempt to build / hope to encourage move towards a consensus

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Past Works - 1

Reserving for CI Guarantees

Society of Actuaries in Ireland Working Party

November 1994

- Benchmark table of risk rates
- Capital standard expressed in terms of valuation basis
- Level Margin - 35% to 50%
- Future Deterioration - 1%pa to 3%pa

Past Works - 2

Reserving and Pricing for Healthcare Guarantees

Second Report by Healthcare Guarantees Working Party

September 1999

- Stochastic modelling approach
- Capital standard expressed in terms of ruin probability
- Level - Credibility $N(0, 10\%)$
- Level - Appropriateness $N(0, 10\%)$
- Trend $N(1\%, 2.5\%)$ [random walk]
- Permanent shocks also explicitly modelled

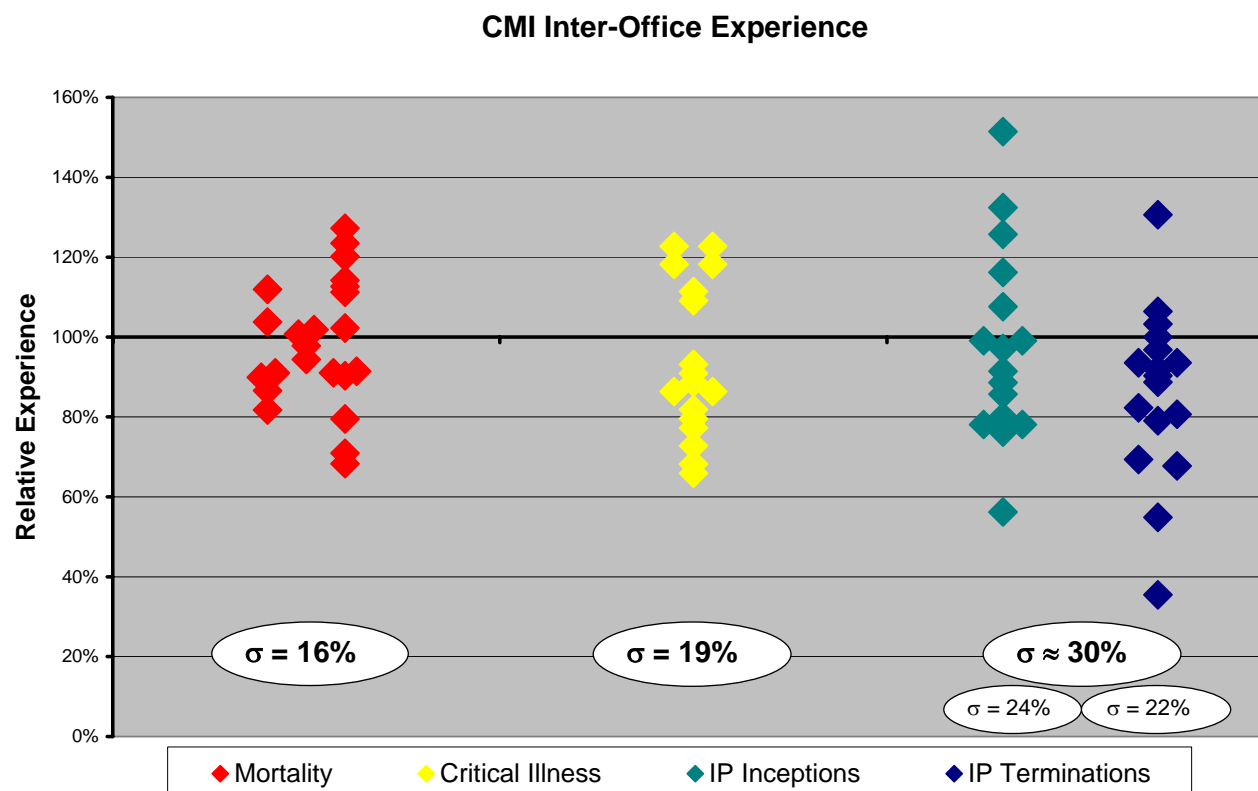
Level Risk

- Credibility
 - Data volume - CMI, Individual Offices, combination of sources
 - Splits by rating factors
 - σ by Amounts is typically $2 \times \sigma$ by Lives
- Appropriateness
 - Use of non-insurance data
 - Variation by office
 - Initial selection
 - Changing times - changing distribution, u/w, claims mgmt
 - Changing coverage and operating environment
- Interpretation
 - Long delays from diagnosis to settlement of claims - IBNR/IBNS

Level Risk - Credibility

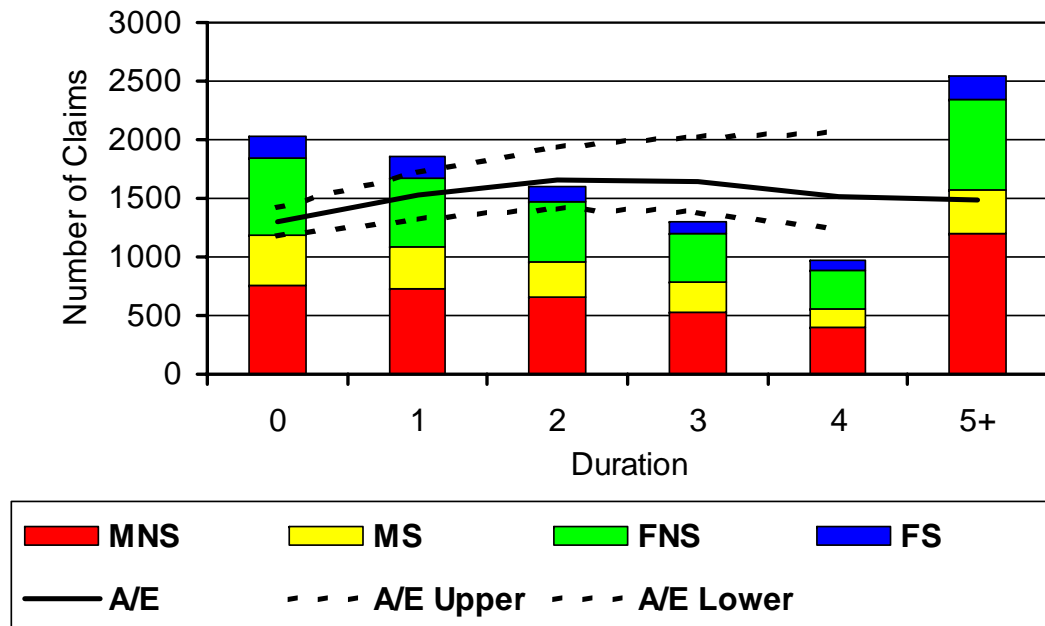
- Data Volumes
 - CMI - 11,803 claims in the 1999-2002 quadrennium
 - 95% confidence interval $\approx \pm 2\%$
 - Lower volume and bigger σ for own-office data
- Splits by rating factors
 - CMI is non-homogenous data
 - 16 offices
 - by benefit type (87% Acc ; 13% Standalone)
 - by sex (60% male ; 40% female)
 - by smoker status (74% non-smoker; 26% smoker)
 - by age, duration, single / joint Life, ...
- So real estimation error σ is far larger

Level Risk - Variation by Office



- Wide variation by office
- 'Ranking' of individual offices for CI hard to predict ?

Level Risk - Initial Select Period



- CMI / most own-office data is still heavily weighted to early durations
- We have no prior knowledge of shape of initial selection for CI
- Wide range of 'ultimate' experience still fits the data
- Particular issues around TPD and 'declined' / postponed claims

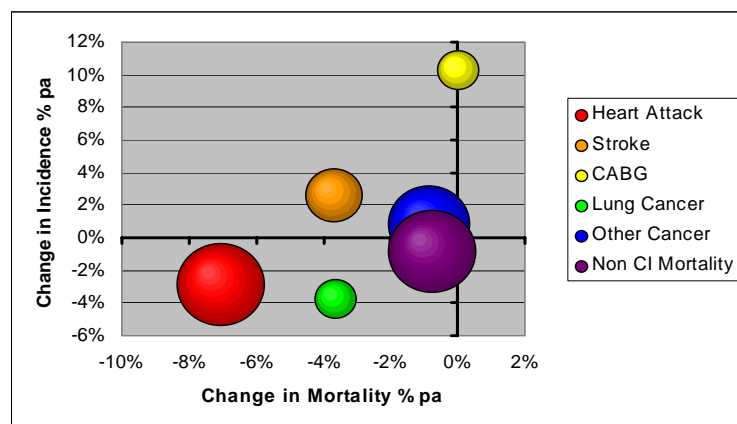
Trend Risk

- Underlying Trend
 - Demographic - smoking; obesity
 - Accumulations of minor change
 - Review past and current trends - population data
 - Compare to mortality trends and trend volatility
- Step Changes & Waves
 - Major medical advances
 - Major changes of lifestyle, law or practice
 - New screening tests / programmes
 - Cohort effects
 - Review past features - population data
 - Postulate and model potential future scenarios

Trend Risk - Review Recent Trends

Summary of Trends in CI Incidence and Mortality

Best Estimate Avg Change % pa, England & Wales, 1980-2000
Men, aged 40 - 60



Size of Balls Indicates Relative Importance of CI Measured by Incidence Rate.

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Summary of Trends in CI Incidence and Mortality

Estimates for 40 – 60 age group, England & Wales, 1980-2000

At aggregate population level :

- **Mortality** rates have **fallen** 2½%pa for men, 2%pa for women.
- **CI** incidence **fell** 1%pa for men, but has **risen** ½%pa for women.

But :

- Trends for the **1990's** were **worse than** for the **1980's**.
- **Changes in smoking** prevalence account for **falls** of a little under 1%pa for men and ½%pa for women, but are waning.
- Cancer is a larger part of total cost for insured lives than population.

So, for smoker-segregated rates in the 1990's the picture looks far worse :

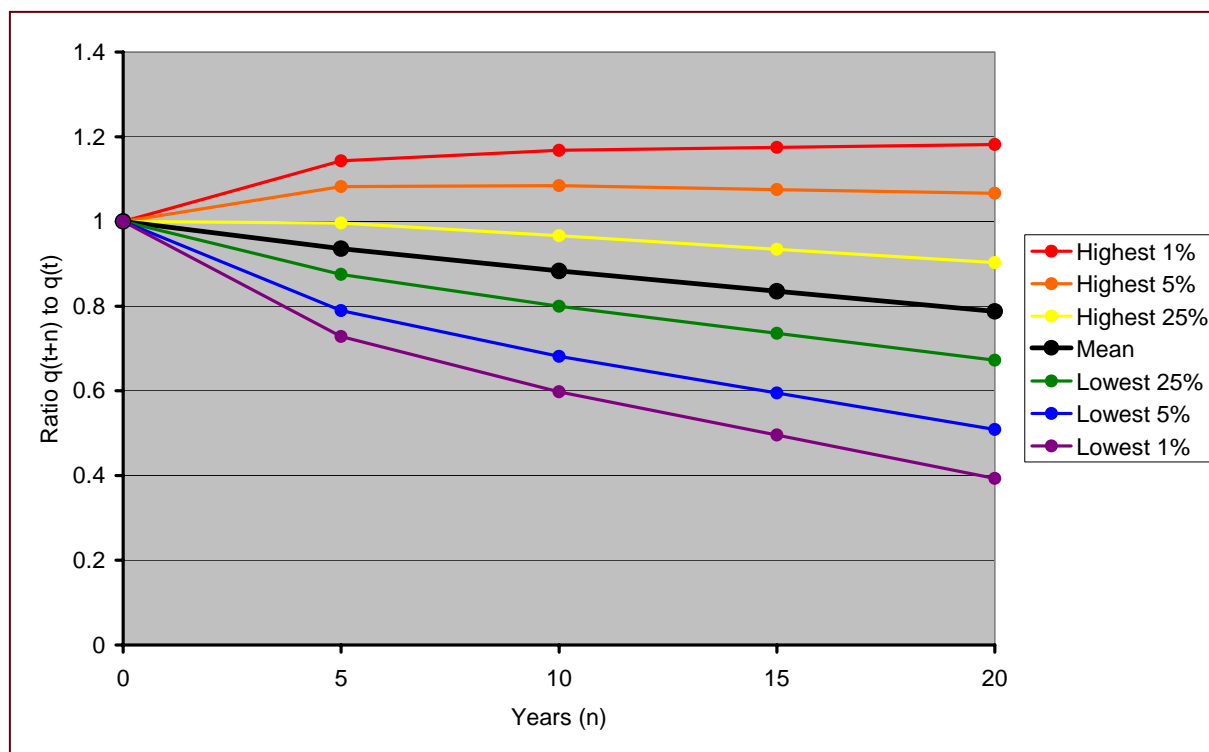
- **CI** incidence **rose** by ½ to 1%pa for **men**
- **CI** incidence **rose** by 1 to 1½%pa for **women**

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- Draw from CI Trends Research Group work
- Seek to learn from analysis of past trends and features in population data

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Trend Risk - Compare to Mortality



- Spread of Outcomes - q_{x+n} / q_x
- 5-year age bands
- England & Wales population mortality 1920 - 1998

Trend Risk - Compare to Mortality

- Derive an overall distribution for portfolio
 - Allow for correlations between ages

Time period	5 years	10 years	20 years
σ ratio	5%	8%	12%
σ Trend	1.0% pa	0.8% pa	0.6% pa

- Then consider CI risks against mortality risks
 - Past trends in incidence and mortality by CI / cause
 - Different alignment of CI and mortality against medical advances and social change
 - Additional potential for shocks on CI
 - Different shape of 'funnel of doubt' ?

Trend Risk - Scenarios

Mapping a range of possible future outcomes for CI risk costs Key - Part 2

Mapping a range of possible future outcomes for CI risk costs Key - Part 1

- Extrapolation of trends from the 1990's
- Obesity - "optimistic" and "pessimistic" scenarios
- Smoking - continuation of recent trends in smoking habits
- Convergence to USA CI incidence rates
- Convergence to EU CI incidence rates - "best" and "worst"
- Cancer Screening - Breast (extended down to age 40)
- Cancer Screening - Bowel Cancer - No polyps detected
- Cancer Screening - Bowel Cancer - 10% polyps detected
- Cancer Screening - Prostate (similar to USA experience)

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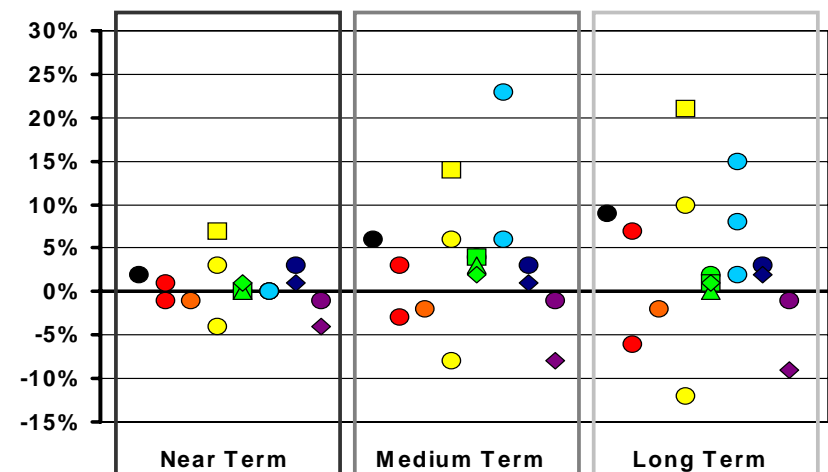
Mapping a range of possible future outcomes for CI risk costs Key - Part 2

- Cancer Screening - "1 year" advancement in detection
- Cancer Screening - "3 year" advancement in detection
- Cancer Screening - "5 year" advancement in detection
- Impact of Troponin on heart attack diagnoses
- Definition drift on Strokes / TIAs
- Impact of Statins on heart attack rates
- Blue sky - polypills and cancer vaccinations

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Scenario Impact on Over CI Risk Rates for Insured % Change in Overall CI risk Rate



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- Extend CI Trends Research Group work on scenario testing
- Key issue is assessing probability of scenarios alongside impact

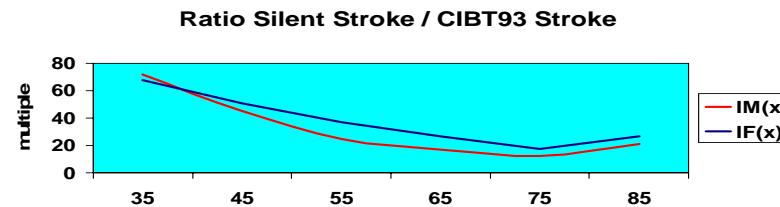
Trend Risk - Scenarios

	% CI Claims	Trend	Diagnostics	Drugs	Genetics	NHS Capacity	Screening	Surgery	Technology	Treatments	Legislative
Traffic Lights for overall risk rating											
aorta graft surgery	L	L	L	L	L	L	L	L	L	L	L
benign brain tumour	L	M	L	L	L	L	L	L	L	L	M
blindness	L	L	L	L	L	L	L	L	L	L	L
cancer	H	H	H	L	M	L	H	L	H	L	M
coma	L	L	L	L	L	L	L	L	L	L	M
coronary artery by-pass surgery	M	L	L	L	L	M	L	L	L	L	M
deafness	L	L	L	L	L	L	L	L	L	L	L
heart attack	H	M	H	L	L	L	M	M	H	L	H
heart valve replacement or repair	L	L	L	L	L	L	L	L	L	L	M
kidney failure	L	L	L	L	L	L	L	L	L	L	L
loss of limbs	L	L	L	L	L	L	L	L	L	L	L
loss of speech	L	L	L	L	L	L	L	L	L	L	L
major organ transplant	L	M	L	L	M	L	L	M	M	L	L
motor neurone disease	L	L	L	L	L	L	L	L	L	L	L
multiple sclerosis	M	L	H	L	H	L	M	L	M	L	H
paralysis/paraplegia	L	L	L	L	L	L	L	L	L	L	L
Parkinson's disease	L	L	H	L	H	L	M	L	H	L	L
stroke	M	L	H	L	L	L	H	L	M	L	M
terminal illness	L	L	L	L	L	L	L	L	L	L	M
third degree burns	L	L	L	L	L	L	L	L	L	L	M

- Draw from ABI CI Working Party work on 'Vulnerability Matrix'
- Consider each CI condition for susceptibility to shocks and waves
- Also illustrates how range of outcomes might vary by generation of cover

Trend Risk - New Diagnostics

Stroke – a cerebrovascular incident resulting in permanent neurological damage



Source: Annual Incidence of First Silent Stroke in the US: A Preliminary Estimate
Leary and Saver - April 2002

Cancer – the term cancer includes leukaemia

The harder we look, the more we find. Diagnoses of chronic lymphocytic leukemia (CLL) are becoming more common because we are looking harder. Such a finding will never have clinical effects with most people – they will die with it rather than from it.

Terry J Hamblin, M.D., New England Journal, August 2004

- It's possible to envisage extreme scenarios
- Key issue is assessing probability of alongside impact

Sample Conclusion - Personal Views!

Range of CI Claim Cost Outcomes

- Initial level
 - σ in range [15,25] and skew (more upside than downside)
- Trend

	Mean	Spread
■ At 5 years	+1% pa	$\sigma \approx 1.25$ pa
■ At 10 years	+1% pa	$\sigma \approx 1.25\%$ pa
■ At 20 years	+0.5% pa	$\sigma \approx 1.75\%$ pa
- Your turn to shoot !
- Many interesting debates ahead !

Next Steps

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Recognising the Landscape, we will :

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- Pursue research agenda and formulate views
 - Publish and invite debate ; work towards consensus
 - Broad Timescale - preliminary views by late 05 / early 06
-
- **We welcome your comments, suggestions and opinions, now and at any time**



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Workshop A1

How Much Capital is Needed to Support Critical Illness Business ?

Question / Discussion Time

Neil Robjohns

Head of Pricing, Munich Re UK Life Branch

Chairman of Critical Illness Risk Based Capital Working Party