

CMI Critical Illness Investigation

Current Issues in Healthcare
12 December 2007, Staple Inn

David Heeney, Chairman, CMI Critical Illness Committee
and
Dave Grimshaw, Secretary, CMI Critical Illness Committee

Agenda

- **CI Investigation Objectives and Progress**
- **Key Challenges**
- **Recent Progress**
- **Next Steps**

Where are we going?

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Dist
17	0.000193	0.000251	0.000294	0.000337	0.0
18	0.000194	0.000251	0.000295	0.000338	0.0
19	0.000195	0.000253	0.000297	0.000340	0.0
20	0.000196	0.000254	0.000298	0.000342	0.0
21	0.000197	0.000256	0.000300	0.000344	0.0
22	0.000199	0.000258	0.000302	0.000347	0.0
23	0.000200	0.000260	0.000305	0.000350	0.0
24	0.000202	0.000263	0.000308	0.000353	0.0
25	0.000204	0.000265	0.000311	0.000357	0.0
26	0.000207	0.000269	0.000316	0.000362	0.0
27	0.000211	0.000274	0.000321	0.000368	0.0
28	0.000214	0.000278	0.000326	0.000374	0.0
29	0.000220	0.000285	0.000334	0.000383	0.0
30	0.000227	0.000294	0.000344	0.000394	0.0
31	0.000237	0.000306	0.000357	0.000409	0.0
32	0.000250	0.000320	0.000373	0.000426	0.0
33	0.000264	0.000337	0.000391	0.000446	0.0
34	0.000280	0.000355	0.000412	0.000469	0.0
35	0.000297	0.000376	0.000435	0.000494	0.0
36	0.000315	0.000398	0.000459	0.000521	0.0

How do we get there?

Age x	Duration 0	Duration 1	Duration 2	Duration 3	Dir
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Raw experience

Grossing-Up Factors

Progress to date (1)

- Results for 1999, 2000, 2001, 2002 & quad released in May 2005
- Working Paper 14:
 - Detailed methodology underlying 1999-2002 results
 - Estimate of overall grossing-up factor
- Working Paper 18:
 - Responses to feedback on WP14
 - Reasons for not graduating (yet)
- 1999-2002 data available to CMI members
- Working Paper 19: "Per-Policy" data submission

Progress to date (2)

- 2003 Results released in April 2006:
 - Covered "quad offices"
 - data from several "new" offices not included
- Health Claims Forum guidelines published in November 2006
- Error in 2003 data from one office
 - highlighted in 2004 submission
 - Error corrected and new offices added
 - "2003 revised" results released in April 2007
- 2004 results released in April 2007:
 - Same offices as in "2003 revised"
- Working Paper 28 published in July 2007

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Key Challenges

- claim date definitions
- claim development
- business growth

The key challenge facing the CI investigation is that we collect settled claims, but want to measure experience in terms of diagnosed claims

Health Claims Forum consultation

Definition:

The date of diagnosis is **the date at which the critical illness definition was fulfilled**

Key Points:

- Interpretation specified for April 2006 ABI definitions
- Companies asked to adapt these for older and non-ABI definitions -
 - Where there is a clear event date – use that (e.g. Heart Attack)
 - Where it is a degenerative disease then allow for permanence to be established
- Adoption date: 1st January 2007

Health Claims Forum Consultation – the future

- Adoption of HCF guidelines will:
 - improve consistency between offices
 - improve consistency over time with offices
 - increase recording of 'Date of Diagnosis'



Lower risk of error due to estimating diagnosis dates from settled claims

Claims typically take 6 months to settle

- Approx. observed intervals between claim dates:
 - Date of Diagnosis
 - Date of Notification
 - Date of Admittance
 - Date of Settlement

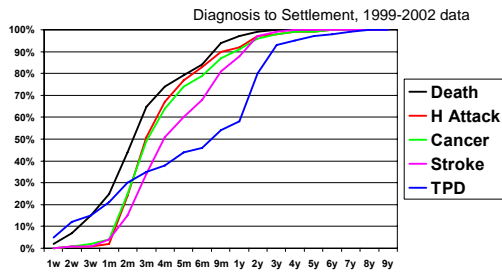
114 days

55 days

7 days

1999-2002 data

But development patterns vary by cause

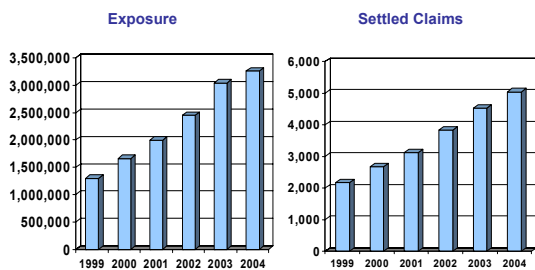


And often we only have settlement date

- Date of diagnosis is estimated where not known
- The date of diagnosis is used to correctly calculate the age and duration but not to re-allocate claims in or out of the analysis
- This would not be a major issue with a stable portfolio
- BUT VOLUMES HAVE INCREASED RAPIDLY
- The effect of this is that 1999-2002 results are under-stated by a factor of the order of 15%
- This factor will vary between offices according to the growth rate in their claims portfolio

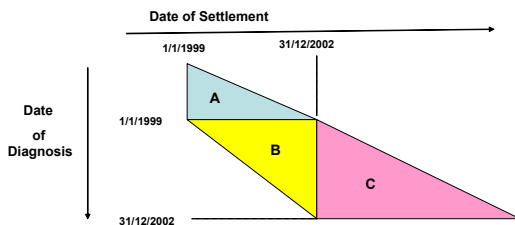
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Growing Exposure 1999-2004



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Date of Diagnosis v Date of Settlement



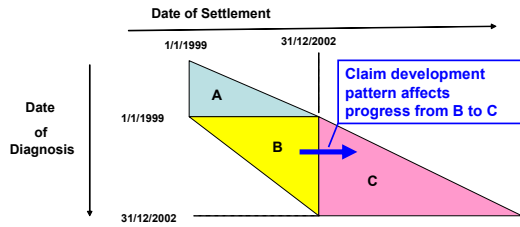
j2

The title has changed to 1999-2004 rather than 1999-2003.

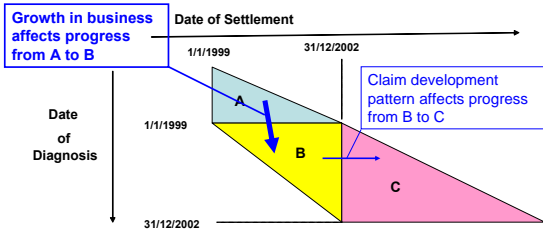
The graphs have been revised in respect of 2003 and 2004 numbers have been added.

jxb, 03/04/2007

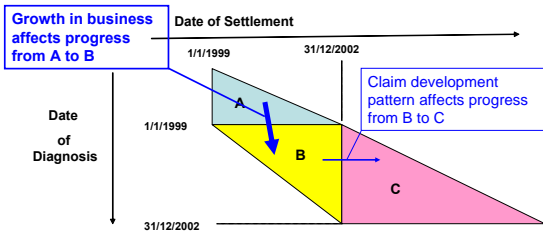
Date of Diagnosis v Date of Settlement



Date of Diagnosis v Date of Settlement



Date of Diagnosis v Date of Settlement



$$(A + B) \times (1 + \text{grossing-up factor}) = (B + C)$$

Impact of growth in exposure on Grossing-Up Factors

- Guidelines provided in Working Paper 14:

Annual rate of growth in expected claims	Approximate grossing-up factor
Nil	100%
10%	107%
20%	112%
30%	117%
50%	124%
75%	132%
100%	139%

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Estimation of Grossing-Up Factors

- Using development patterns derived from data from 1999-2003, overall GUF for 1999-2002 estimated to be **15.9%**¹
- But, using development patterns derived from data from 1999-2002, overall GUF for 1999-2002 estimated to be **17.8%**
- Overall GUF for 2003 estimated using this approach and development patterns derived from data from 1999-2003 is **14.3%**
- Corresponding GUF for 2004 is just **1.9%** due to significant downturn in business volumes
- Are GUFs too unstable?*
- Is there a better way?*

¹15.9% for 1999-2002 is new estimate following correction of the 2003 data error. Previous estimate was 14.8% (quoted at Staple Inn Seminar, Dec 2006)

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New Methodology

The key challenge facing the CI investigation is that we collect settled claims, but want to measure experience in terms of diagnosed claims

- Grossing-up factors attempted to allow for this, but ...
 - Difficult to interpret, as mix growth in business and claim development,
 - Difficult to apply to subsets of the data, and
 - The new approach makes better use of the data we have

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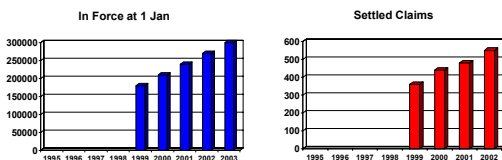
New Methodology

- The approach starts with estimating prior years' in force data and hence exposure
- ... from which we estimate diagnosed claims in each year (at each age and duration) using an initial set of claim rates
- ... we then apply a claim development distribution to estimate settled claims in each year
- ... these can be compared to known settled claims to release more accurate results
- ... and equating estimated settled claims with known settled claims will generate a set of diagnosed claim rates

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New Methodology

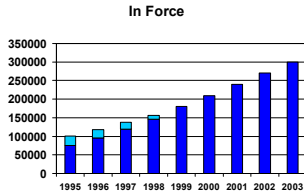
- The approach starts with:
 - the known in force data (1/1/1999 to 1/1/2003) and
 - the known settled claims (1999 to 2002)



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New Methodology

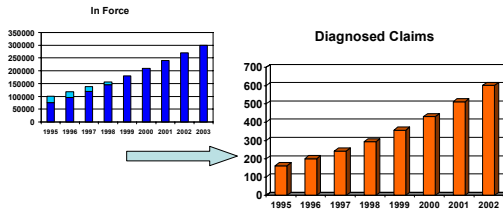
- From the known in force, we estimate prior years' in force data:
 - Part of this is a roll-back of known data (*including adjusted age and duration*)
 - And part is an estimate of the business that went off before data submitted to CMI
- Hence exposure in each year



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New Methodology

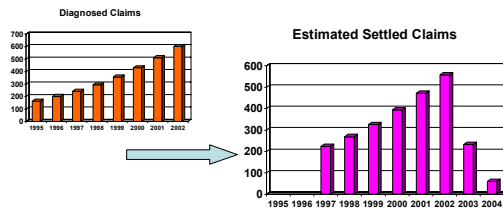
- From the estimated exposure in each year we estimate diagnosed claims in each year (at each age and duration) using an initial set of claim rates



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New Methodology

- From the estimated diagnosed claims in each year we can estimate settled claims in each year (at each age and duration) using an assumed claim development distribution

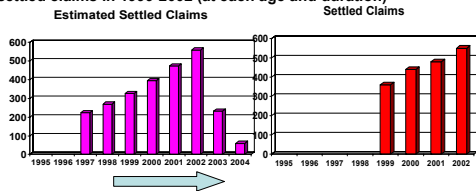


NB Max interval from diagnosis to settlement
= 2 years in this illustration

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New Methodology

- We then compare estimated settled claims in 1999-2002 with known settled claims in 1999-2002 (at each age and duration)



- This can be used to present the results (for a given base table and claim development distribution)
- Or we can amend our assumption regarding claim rates to get the best fit and a set of diagnosed claim rates

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New Methodology

Working Paper 28:

- Explanation of new methodology
- Example of an initial application
 - Focus on the roll-back of in force
 - Results only - didn't go as far as claim rates
- Demonstration that results are not overly sensitive to the assumptions (especially off rates)

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New Methodology

Subsequently:

- Limited feedback on Working Paper 28
- “System” developed to allow a full implementation
 - WP28 used simplistic spreadsheet application
 - More accurate calculation of exposure, using actual dates of commencement, affects duration 0 results (in particular)
- Claim development distribution
 - WP28 used a single distribution (from WP14)
 - GLM analysis suggests cause of claim and office are significant but need to assess for other factors
 - Parametric model

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New Method: Claim development distribution

- Features of a parametric model:
 - Smooth fit
 - Probability of settlement for every delay
 - Entire distribution can be easily summarised
 - Provides mean, variance, etc
 - Goodness of fit can be tested
 - Fit can be obtained from limited data
 - Predictive power (?)

New Method: Claim development distribution

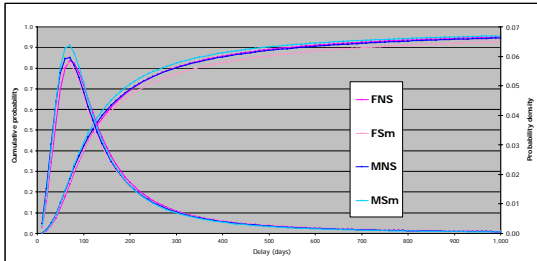
- Parametric modelling focused on distribution between diagnosis and settlement
- Calculation complicated by:
 - Left censoring because diagnosed in prior year and “exposed to settlement” before investigation period
 - Right censoring because diagnosed in investigation period and “exposed to settlement” in subsequent years
 - Investigation period varies between offices
 - Increasing % of dates of diagnosis recorded over time

New Method: Claim development distribution

- Initial findings from parametric modelling:
 - Burr distribution provides reasonable fit
 - Probability density function:
$$f(x) = \frac{\alpha\gamma\lambda^\gamma x^{\gamma-1}}{(\lambda + x^\gamma)^{\gamma+1}}$$
 - 3 parameters give reasonable flexibility over:
 - Peak rate of settlement (α)
 - When peak rate occurs (λ), and
 - Thickness of tail (γ)

New Method: Claim development distribution

- Initial findings from parametric modelling:

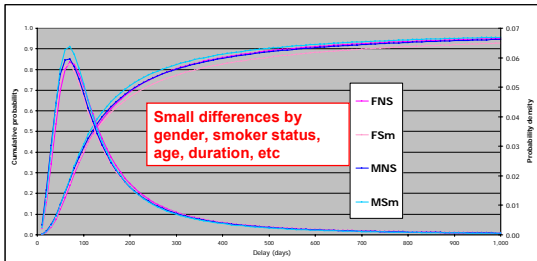


1999-2004 data; accelerated business only

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New Method: Claim development distribution

- Initial findings from parametric modelling:

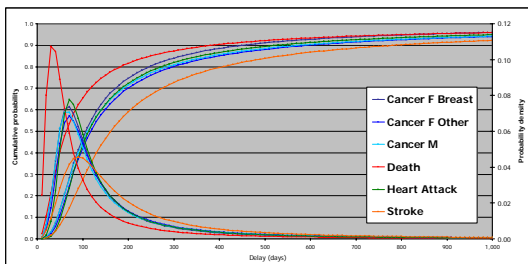


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New Method: Claim development distribution

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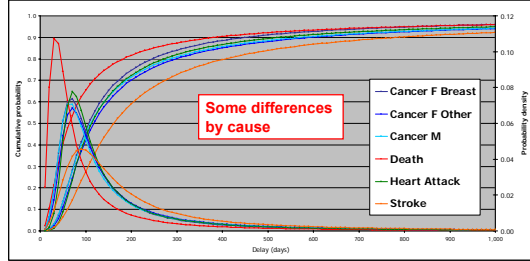


1999-2004 data; accelerated business only

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New Method: Claim development distribution

- Initial findings from parametric modelling:



1999-2004 data; accelerated business only

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New Method: Claim development distribution

- Initial findings from parametric modelling:
- Little variation by most risk factors
 - May mean we can legitimately use a single claim development distribution within the new methodology at an "All Causes" level
- Significant variation by cause:
 - Death shorter, stroke longer
 - Can also apply the new methodology at a "Cause Specific" level and derive cause-specific claim rates
 - Cause-specific should of course sum to all causes....

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Next Steps (1)

- **Claim Delay distribution**
 - Complete work on parametric model
 - Document with other analyses of data
 - Working Paper – March/April 2008?
- **Full implementation**
 - More robust application using monthly time intervals for a more accurate calculation of exposure
 - Need to reconcile with spreadsheet approach in WP28
 - Single development distribution to produce more accurate “All Causes” results for all years to date
 - Issue to member offices – March/April 2008?
 - All Causes & Cause-specific claim rates to follow

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Next Steps (2)

- **Assumptions in current work:**
 - Further analysis of ‘off’ rates?
 - “Backward” application of claim development distribution? (see 7.17 of WP28)
- **Further analysis:**
 - Amounts experience
 - Other factors: sales channel, product type, benefit amount, commencement year, office, ...
 - Stand-alone business
- **Releasing 2005 results**

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