The Actuarial Profession
making financial sense of the future

Health and care conference 2010
Dave Heeney and Dave Grimshaw, CMI Critical Illness Committee

Critical Illness
Learning from experience

14 May 2010

Critical Illness: Learning from experience

Agenda

- Summary of past work
- 1999-2004 Diagnosis rates
- 2003-2006 results and Diagnosis rates
- Future Work

CMI Critical Illness – Outputs

- May 05: Results for 1999, 2000, 2001, 2002
- May 05: **WP14 – Initial methodology (Grossing-up factors)**
- Dec 05: WP18 – Feedback on WP14 & future work
- Apr 07: 2003 (Revised) and 2004 (Unadjusted) Results
- Jul 07: **WP28 – Towards improved methodology**
- Jul 08: **WP33 – A new methodology (Adjusted Results)**
- Jul 08: 1999-2004 Adjusted Results
- Oct 08: 2005 Unadjusted and Adjusted Results
- Oct 09: 2006 Unadjusted and Adjusted Results
- Dec 09: 2003-2006 Unadjusted Results
- Feb 10: **WP43 – Diagnosis Rates (Accelerated 1999-2004)**

CMI Critical Illness – Methodology

- 'Unadjusted Results' / WP14 methodology
  - Actual Settled Claims v Expected Diagnosed Claims
  - Mismatch ... 'Grossing-up factors'
- 'Adjusted Results' / WP33 methodology
  - Actual Settled Claims v Expected Settled Claims
  - Match A & E, but presented using settlement timing
- Diagnosis Rates / WP43 methodology
  - Derive from 'Adjusted Results' / WP33 methodology
  - Smoothed, fitted diagnosis rates for claims settled in 99-04

CMI Critical Illness – WP33 Methodology

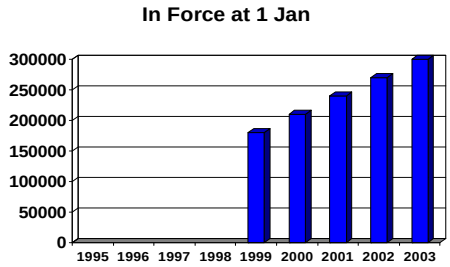
- The approach starts with estimating prior years' in force data and hence exposure
- … from which we estimate diagnosed claims in each year (at each age and duration) using an initial set of claim rates
- … we then apply a claim development distribution (CDD) to estimate settled claims in each year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

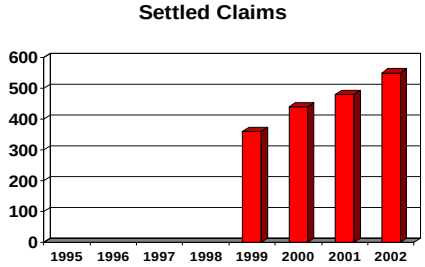
WP43:

- *… and equating estimated settled claims with known settled claims will generate a set of diagnosed claim rates*

CMI Critical Illness - WP33 Methodology

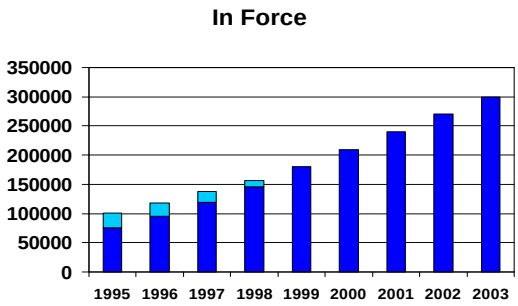
- CMI CI data / analysis problem:
  - Claims collected by year of settlement; diagnosis date often unknown; material lag from diagnosis to settlement
- Start with the known in-force and settled claims





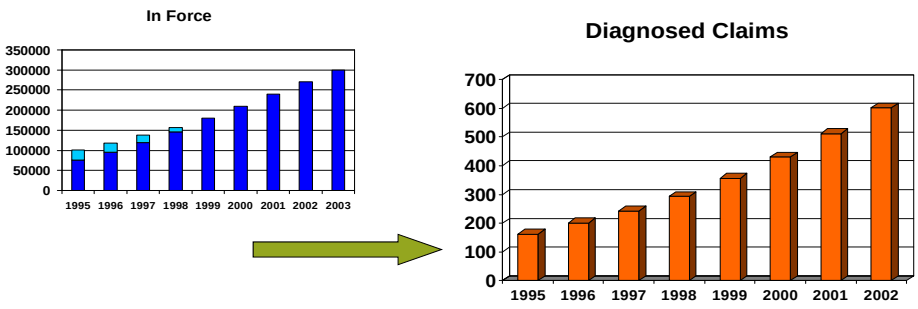
CMI Critical Illness - **WP33** Methodology

- From known in-force, estimate prior years in-force
  - Roll back known data (over time, age and duration)
  - Add back an estimate of business exiting before start date



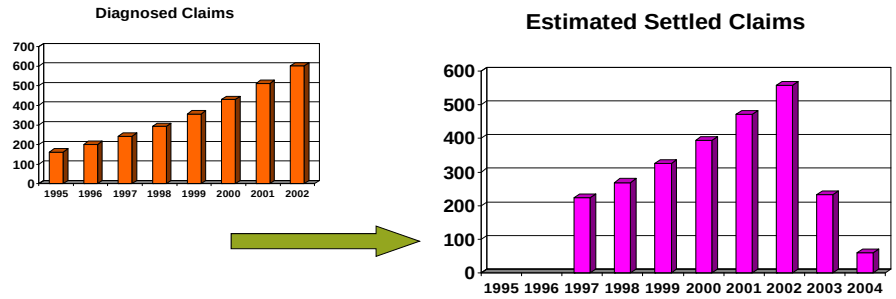
CMI Critical Illness - WP33 Methodology

- From the in-force, estimate exposure in each year, then estimate diagnosed claims by year (at each age & duration) using an initial set of claim rates



CMI Critical Illness - WP33 Methodology

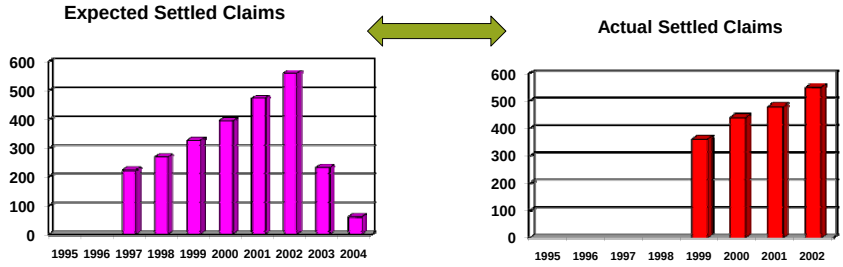
- From estimated diagnosed claims by year, estimate settled claims by year (by age & duration) using an assumed claim development distribution (CDD)



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

CMI Critical Illness - WP33 Methodology

- Compare estimate of expected settled claims in investigation period with known settled claims by year, age and duration



- Produces 'adjusted' results (Actual Settled Claims/Expected Settled Claims), for a given base table and CDD
- WP43 – Used to derive a set of 'best fit' CI claim diagnosis rates

Critical Illness: Learning from experience

Agenda

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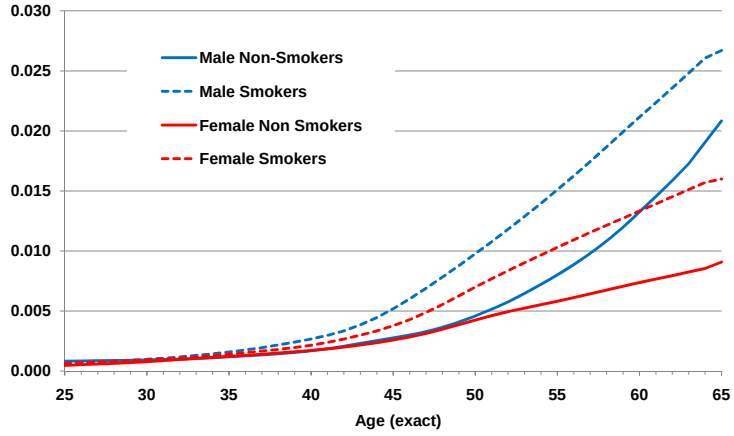
Working Paper 43 – Diagnosis Rates

- Extension of WP33 methodology
- Pragmatic approach (not mathematical model)
- Claim Development Distribution derived for all genders/smokers
- Judgement required on many aspects:
  - selection / application of constraints (prior beliefs)
  - smoothness versus goodness-of-fit
  - identifying viable age range
  - identifying variations in rates by duration
  - analysis of subsets (gender, smoker status, cause, ...)
  - derivation of CDD(s)

Working Paper 43 – All-causes Diagnosis Rates

Smoothed Annualised CI Diagnosis Rates by Gender and Smoker Status; Accelerated CI; Ultimate; 1999-2004



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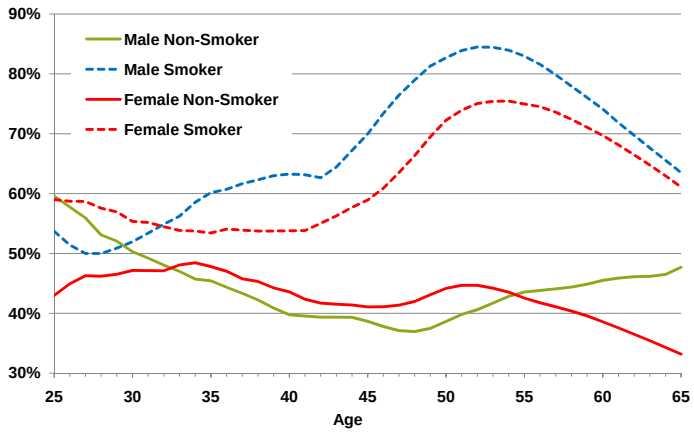

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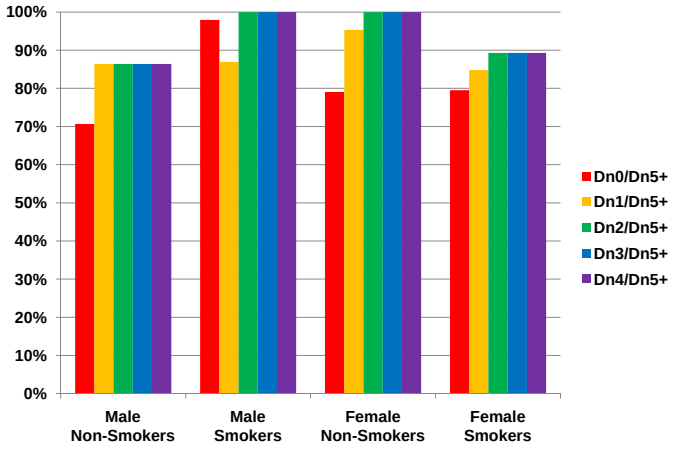
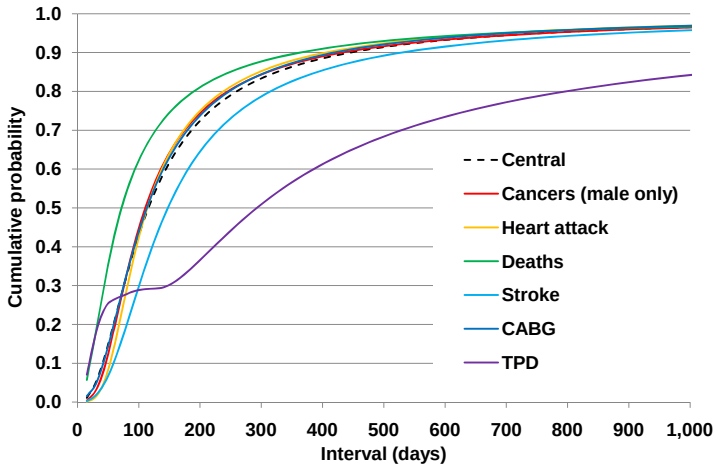
Durational pattern in Smoothed Annualised CI Diagnosis Rates
Accelerated CI; 1999-2004



Working Paper 43 – Cause-specific CDDs



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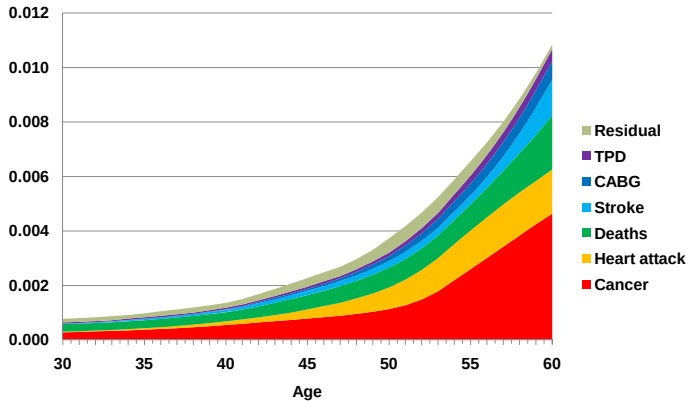
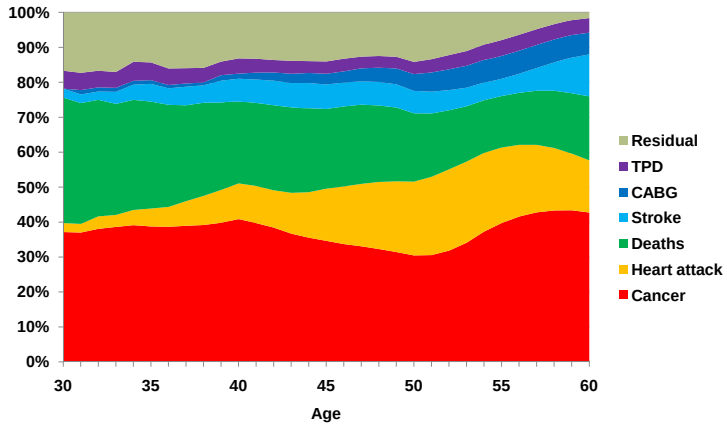
Working Paper 43 – Cause-specific Diagnosis Rates

Smoothed Annualised CI Diagnosis Rates by Cause
Accelerated CI; Males; Non-Smokers; Durations 1-4; 1999-2004



Working Paper 43 – Cause-specific Diagnosis Rates

CI Diagnosis Rates by Cause as % of All-causes Rates
Accelerated CI; Males; Non-Smokers; Durations 1-4; 1999-2004



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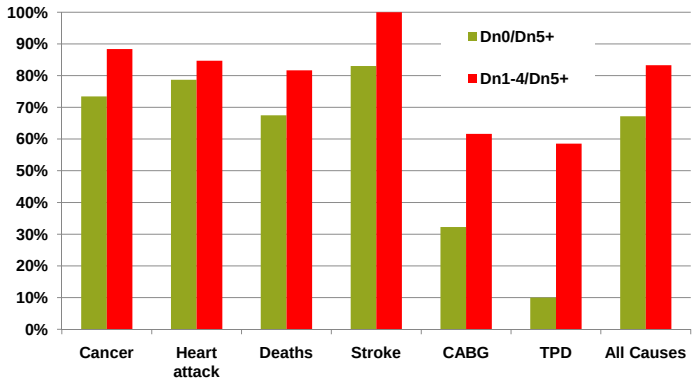

Key Features of WP43 work

- Rates fitted by age only and by duration only, to broadly fit the expected settled claims to the actual settled claims; each gender/smoker dataset considered independently.
- Different selection patterns:
  - Male Non-smoker 0, 1-4, 5+
  - Male Smoker 0, 1, 2+
  - Female Non-smoker 0, 1, 2+
  - Female Smoker 0, 1, 2-4, 5+
- Shapes of rates by age differ significantly from current tables
- Shape of rates by age and duration may be distorted by market changes.

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Benefits of moving to 2003-2006 dataset

- More up-to-date
- Experience in 1999-2004 appears to have reduced in period
- Less affected by changes in the critical illness market?
- Shorter period (4 years v 6 years) ... But similar number of settled claims
- Higher % of claims with date of diagnosis ⇒ CDD more reliable
- Reduced dependency on off rates
- More stable contributing offices
- Analysis of two periods may show “real” features.

Questions from WP43

- Prioritisation of various 2003-2006 rates?
- The need for a full age-range table?
- The appropriateness of the constraints, particularly by duration?
- Other constraints, e.g. between non-smoker and smoker rates?
- Derive all-causes rates directly or sum of cause-specific rates?
- Anti-selection in male smoker rates?
- Increased selection at ages 46-55 in male non-smoker rates?
- All-causes rates including or excluding TPD?

Critical Illness: Learning from experience

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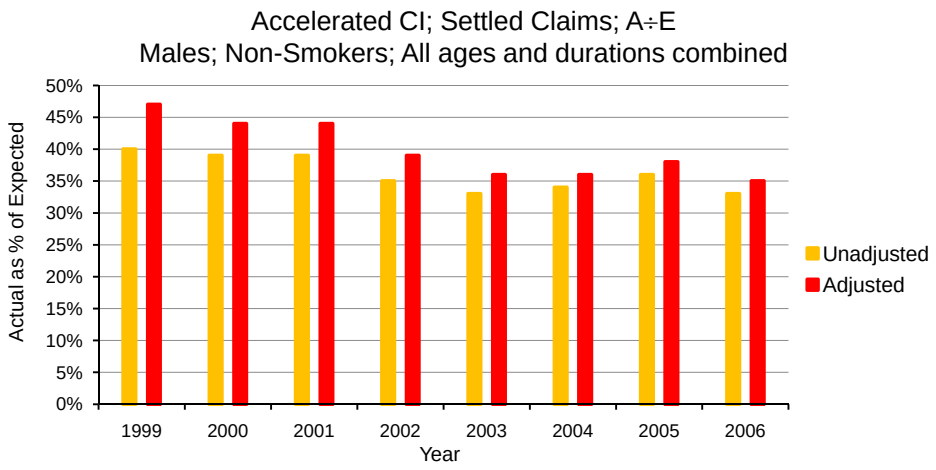
- Summary of past work
- 1999-2004 Diagnosis rates
- DRAFT 2003-2006 results and PROVISIONAL Diagnosis rates
- Future Work

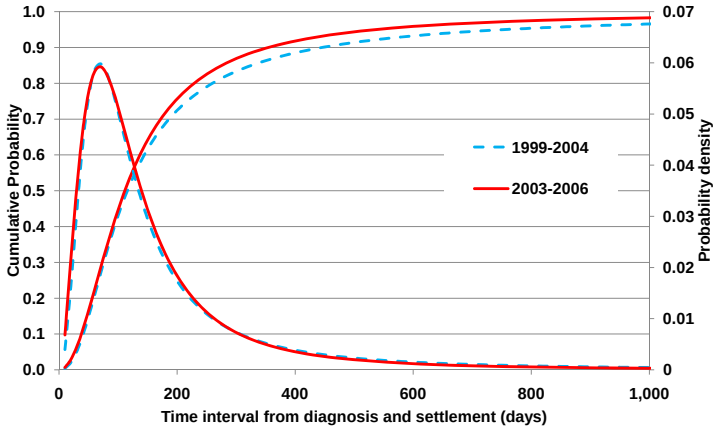
CI Experience Summary - by Year



Annual results issued to member offices: Expected based on CIBT93 and 1999-2004 Central CDD for 'adjusted' results

2003-2006 Claim Development Distribution (CDD)

Comparison of 2003-2006 CDD with the 1999-2004 CDD:



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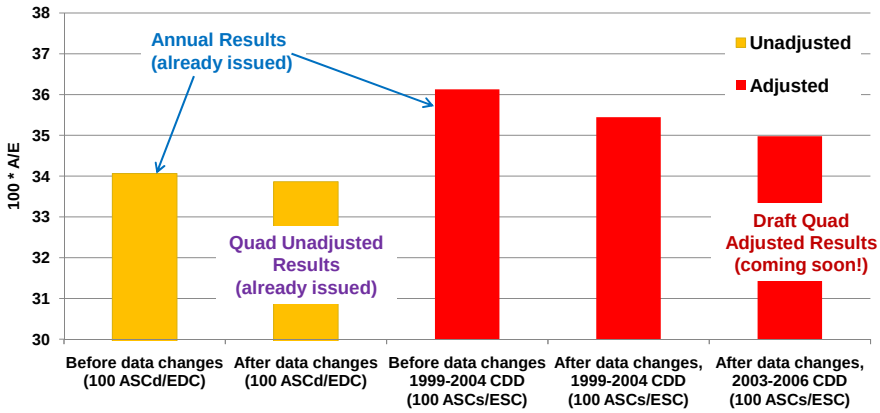
CI Experience Summary 2003-2006
Impact of data changes and revised CDD

Accelerated CI; Settled Claims; A÷E (E=CIBT93)
Males; Non-Smokers; All ages and durations combined



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Draft CI Experience Summary 2003-2006 By Year

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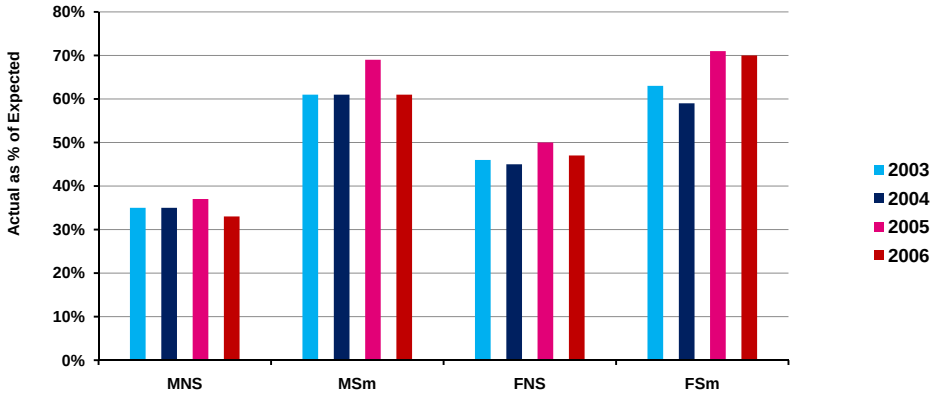

Expected based on CIBT93 and 2003-2006 CDD

2003-2006 Provisional Diagnosis Rates

- Initial phase of work is to "repeat" the work on 1999-2004 (WP43 methodology, 2003-2006 CDD, by cause for MNS only)
- Seeking to assess how the rates compare:
  - Do the selection patterns inferred from the data differ?
  - How do the "selection discounts" compare? (Is there still evidence of anti-selection for male smokers?)
  - Is the fit still poor for male non-smokers at ages 36-55?
  - How do the cause-specific rates (for male non-smokers) compare?
- PROVISIONAL FINDINGS AT THIS STAGE

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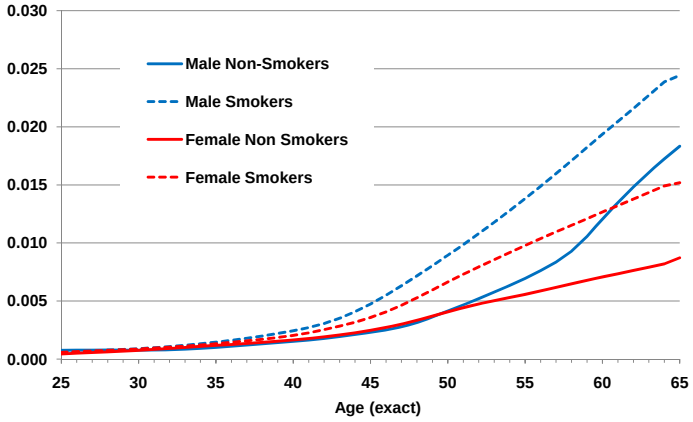
2003-2006 Provisional All-causes Diagnosis Rates

Smoothed Annualised CI Diagnosis Rates by Gender and Smoker Status; Accelerated CI; Ultimate; 2003-2006



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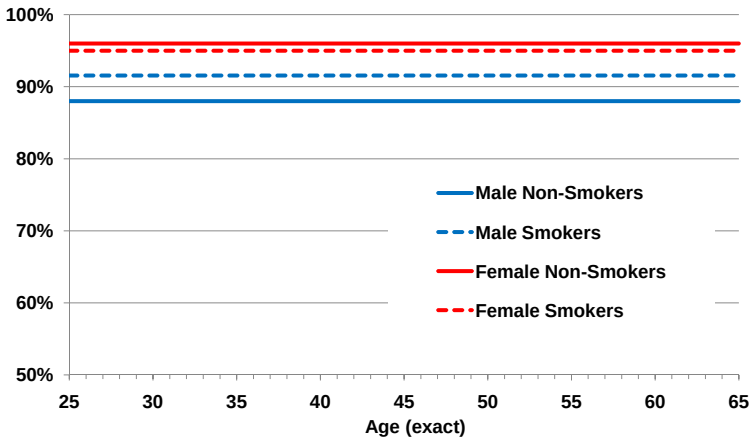
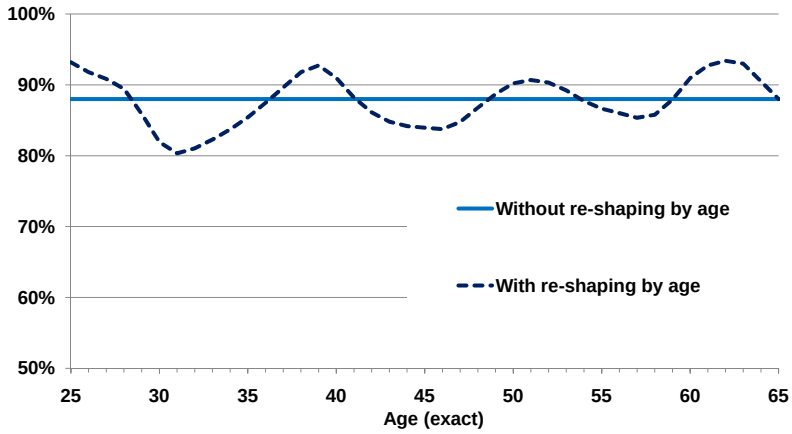


2003-2006 Provisional All-causes Diagnosis Rates

Smoothed Annualised CI Diagnosis Rates Male Non-Smoker only;
Accelerated CI; Ultimate; 2003-2006 as % of 1999-2004



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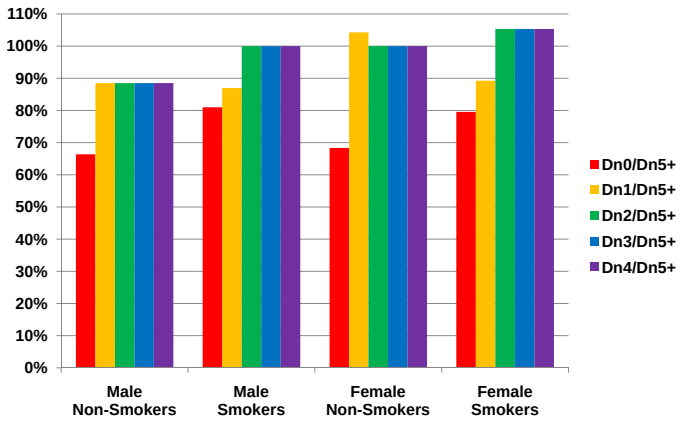
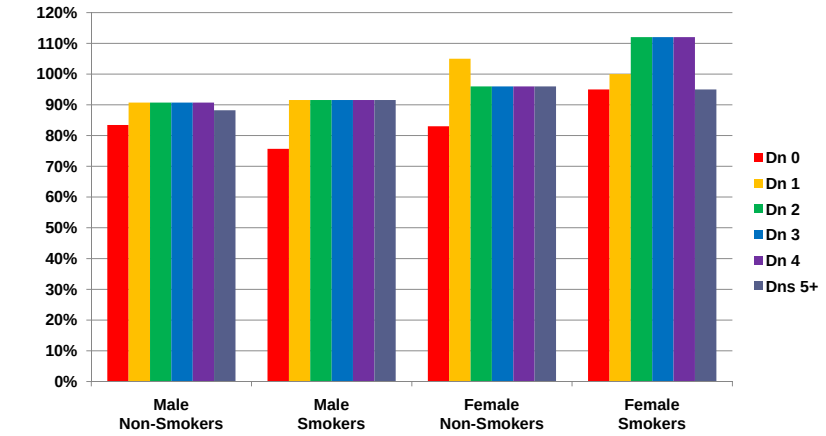
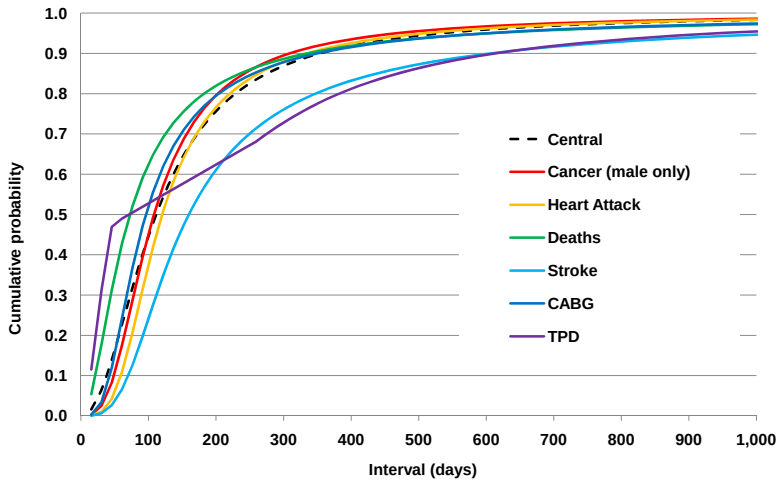


2003-2006 Provisional All-causes Diagnosis Rates

Annualised CI Diagnosis Rates by Gender and Smoker Status;
Accelerated CI; by Duration; unsmoothed 2003-2006 as % of 1999-2004



2003-2006 Provisional Cause-specific CDDs



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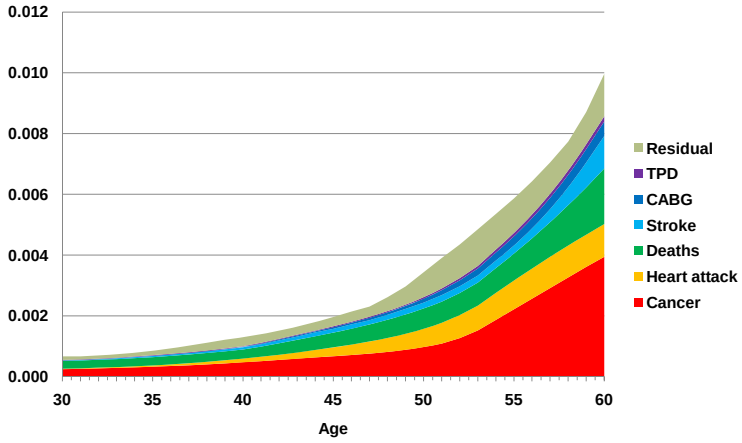

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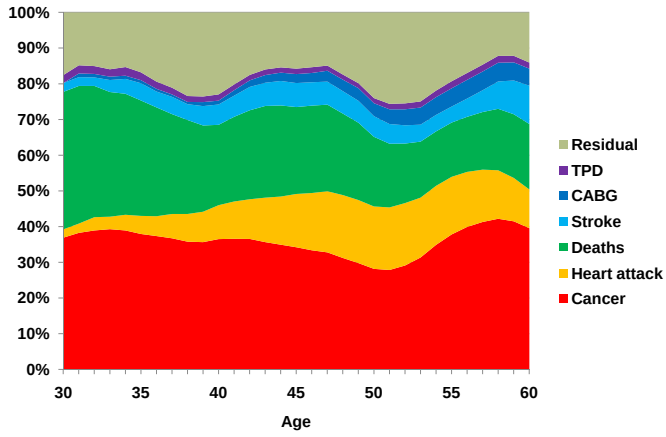

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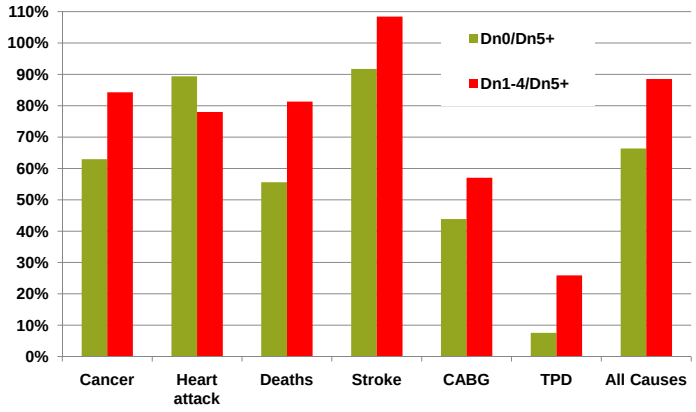

2003-2006 results and Diagnosis rates: Preliminary findings

- Experience appears to have improved between 1999 and 2002
- 2003-2006 results appear more stable
- (Female) selection patterns differ – may be random effects?
- "Selection discounts" comparable but no apparent anti-selection for male smokers in 2003-2006
- Fit for male non-smokers at ages 36-55 is still poor ... May need to vary selection discounts by age
- Cause-specific rates (for male non-smokers) comparable ... But issue for 2003-2006 given increase in unspecified types of claim

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Critical Illness: Learning from experience

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- Summary of past work
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CMI Critical Illness: Probable Future Outputs

- 2003-06 Adjusted Quad Results (to member offices)
- Provisional 2003-06 diagnosis rates (to member offices) ...
- ... As additional call for feedback!
- Working Paper with derived CI diagnosis rates for 2003-06
- 2007 Results (to member offices)

CMI Critical Illness: A Plea for Help!!!

Direct insurers:

- Do you contribute data?
- Are you up-to-date (soon asking for 2009!!)
- Do you record Dates of Diagnosis consistent with Health Claims Forum guidance?
- Do you provide Dates of Diagnosis to the CMI?!
- Do you record and provide Cause of Claim?

Reinsurers

- Are you asking your (potential) clients these questions?!