



Health and care conference 2011

Dave Heeney and Dave Grimshaw, CMI Critical Illness Committee



# Critical Illness insurance AC04 diagnosis rates

20 May 2011

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# Critical Illness insurance: CMI 2003–2006 diagnosis rates

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## Agenda

- Summary of past work
- AC04 Diagnosis rates (Working Paper 50)
- 2003-2006 Cause-specific rates
- Analysis of subsets of data
- Future work

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# CMI Critical Illness – Outputs

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- 2005 Results for 1999, 2000, 2001, 2002  
**WP14 – Initial methodology (Grossing-up factors)**  
Dec 05: WP18 – Feedback on WP14 & future work
- 2007 2003 (Revised) and 2004 (Unadjusted) Results  
WP28 – Towards improved methodology
- 2008 **WP33 – A new methodology (Adjusted Results)**  
1999-2004 Adjusted Results  
2005 Unadjusted and Adjusted Results
- 2009 2006 Unadjusted and Adjusted Results  
2003-2006 Unadjusted Results
- 2010 **WP43 – Diagnosis Rates (Accelerated 1999-2004)**  
2003-2006 Adjusted Results  
Draft 2003-2006 diagnosis rates
- 2011 **WP50 – Diagnosis Rates (Accelerated 2003-2006)**

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# CMI Critical Illness – Methodology

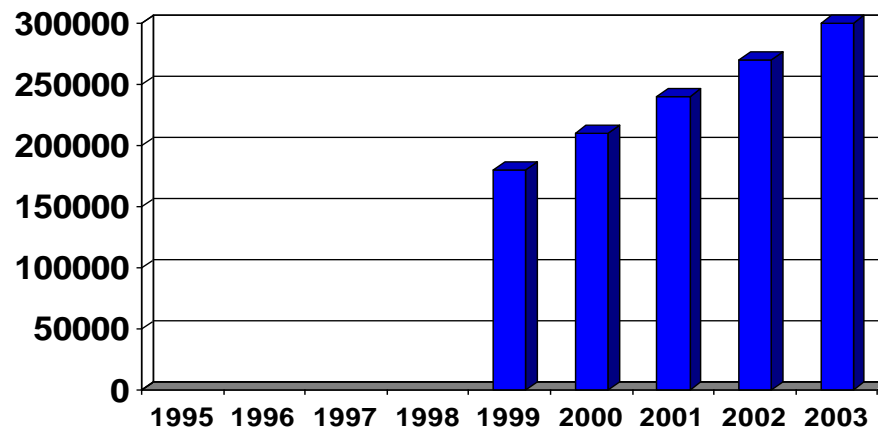
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- ‘Unadjusted Results’ / WP14 methodology
  - Actual Settled Claims v Expected Diagnosed Claims
  - Mismatch ... ‘Grossing-up factors’
- ‘Adjusted Results’ / WP33 methodology
  - Actual Settled Claims v Expected Settled Claims
  - Match A & E, but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

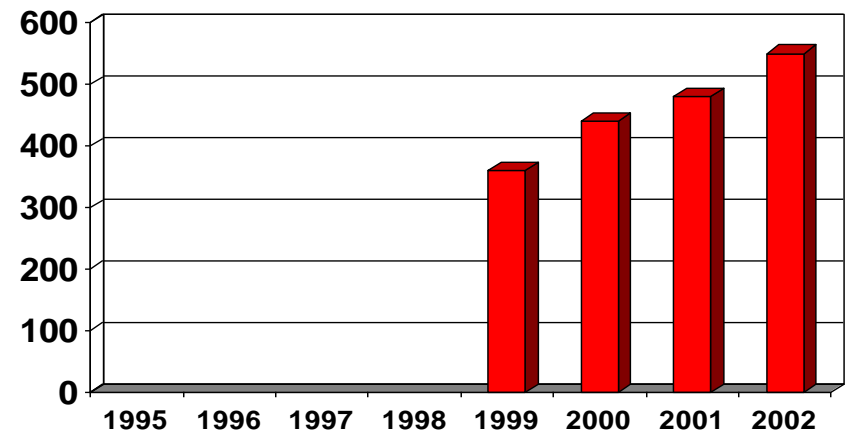
# CMI Critical Illness - WP33 Methodology

- 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

**In Force at 1 Jan**



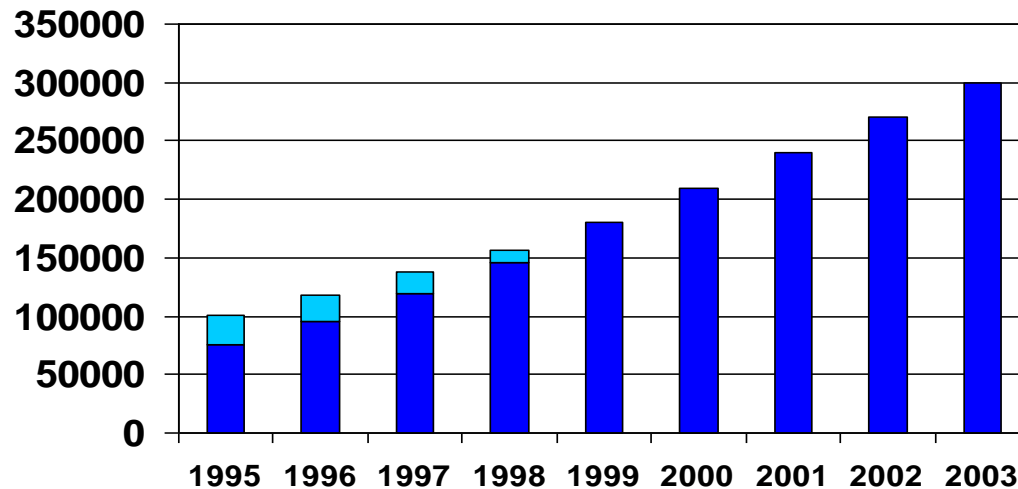
**Settled Claims**



# CMI Critical Illness - WP33 Methodology

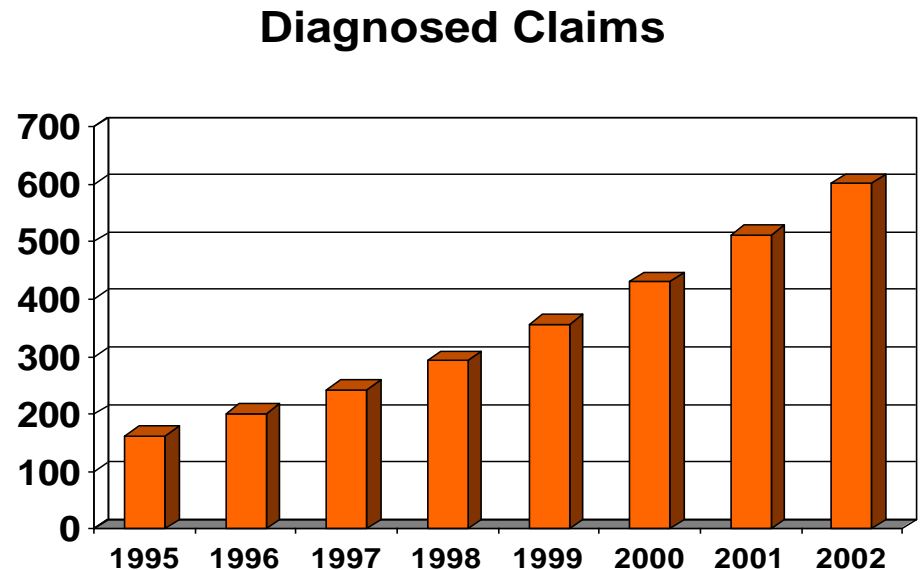
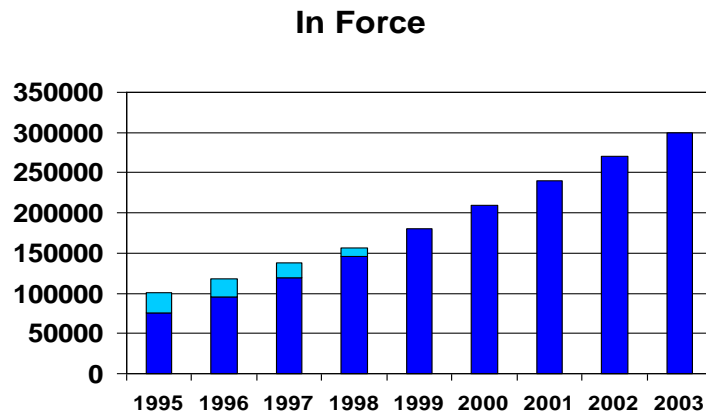
- From known in-force, estimate prior years in-force
  - Roll back known data (over time, age and duration)
  - Add back an estimate of business exiting before start date

**In Force**



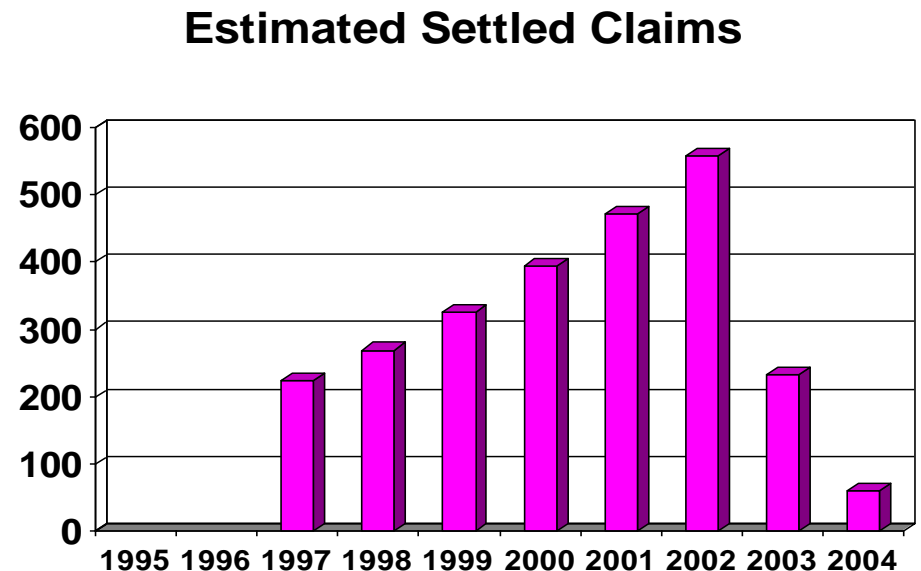
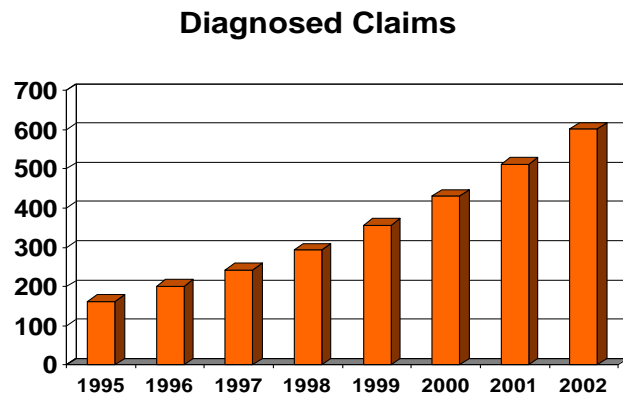
# CMI Critical Illness - WP33 Methodology

- 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)

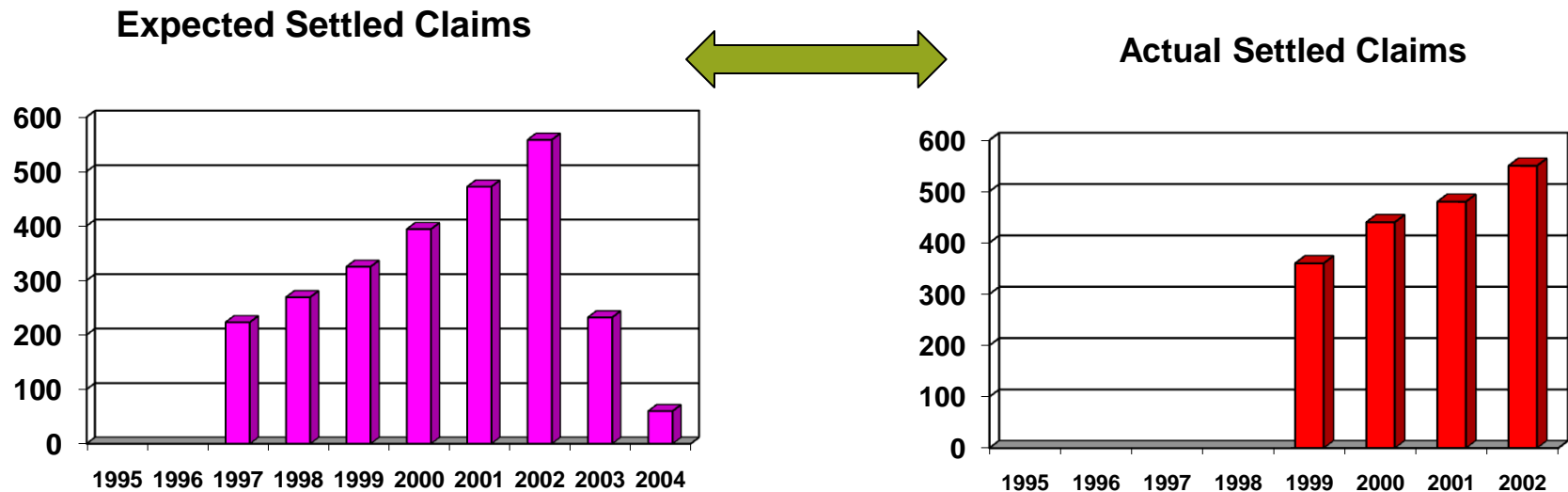


NB Max interval from diagnosis to settlement = 2 years in this illustration



# 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

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# Critical Illness insurance: CMI 2003–2006 diagnosis rates

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## Agenda

- Summary of past work
- AC04 Diagnosis rates
- 2003-2006 Cause-specific rates
- Analysis of subsets of data
- Future work

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# Benefits of moving to 2003-2006 dataset

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- 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  $\Rightarrow$  CDD more reliable
- Reduced dependency on off rates
- More stable contributing offices
- Analysis of two periods may show “real” features

# Benefits of moving to 2003-2006 dataset

CMI accelerated critical illness exposure in 2003 to 2006, by office

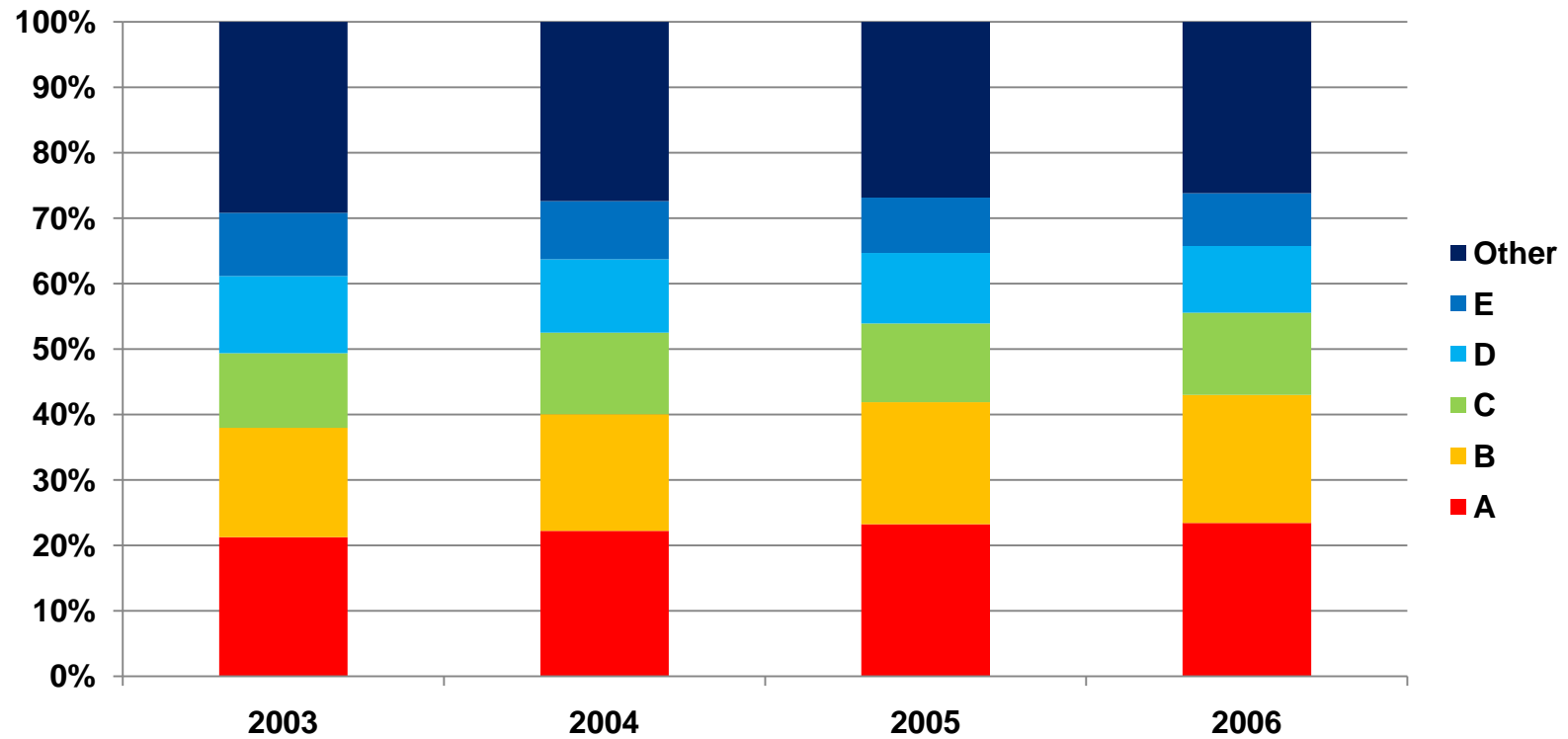
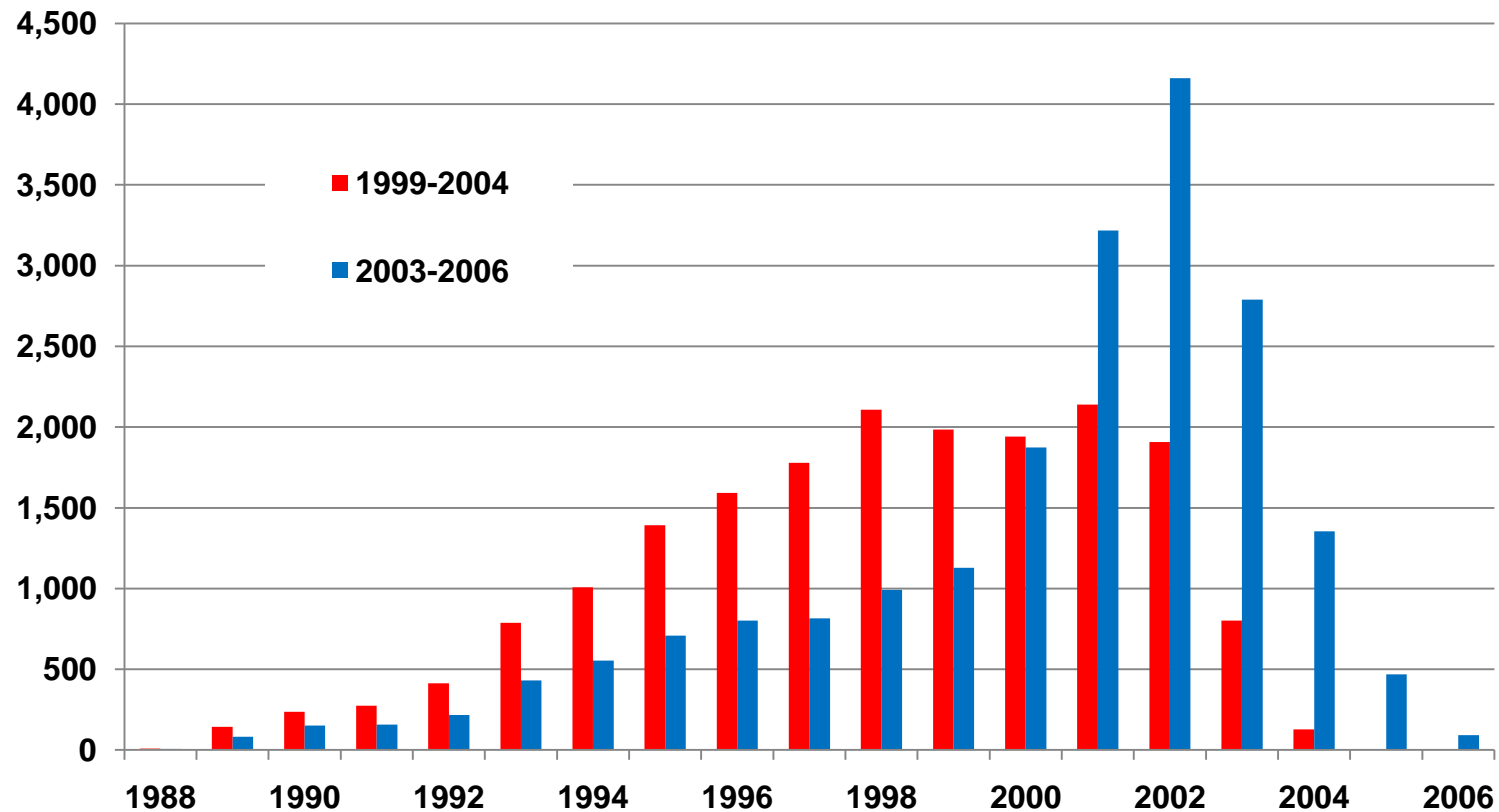


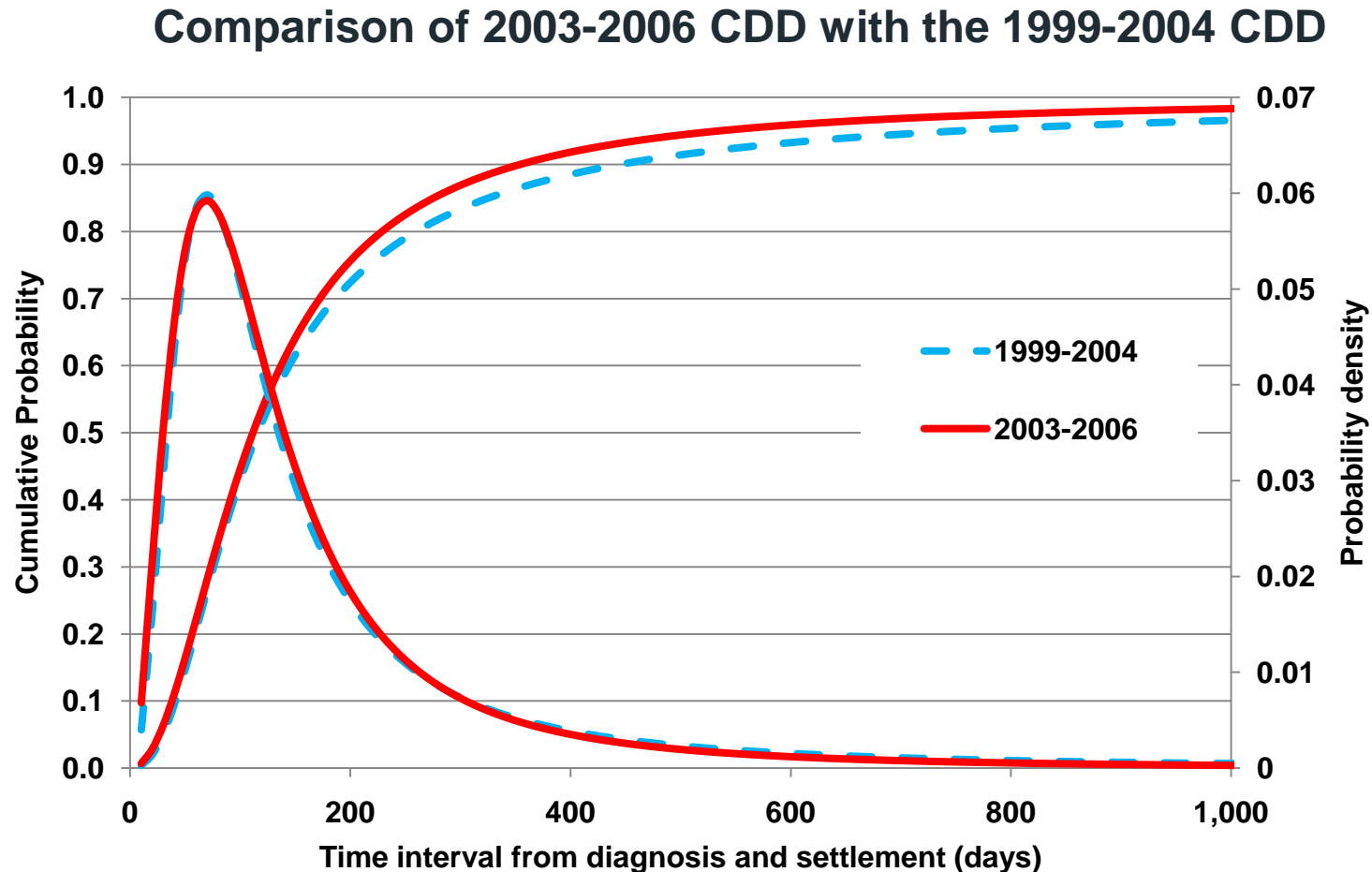
Figure 2.1 from Working Paper 50

# Vulnerability of 2003-2006 dataset to market changes

**CMI accelerated critical illness settled claims by policy commencement year**



# 2003-2006 Claim Development Distribution (CDD)



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# Older age rates

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- Need for full age-range table for the pricing, experience analysis and valuation of whole-of-life policies
- But 2003-2006 dataset contained credible volumes of data for only a limited age range
- Pragmatic approach used to extend age range
- A number of approaches to developing rates up to age 85 were investigated

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# Older age rates: Approach

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- Set target at age 85 for insured table as a percentage of population table (CIBT02) based on ratio of insured to population mortality
- Extrapolate ultimate male and female rates at aggregate level to progress smoothly from 60 to target at 85
- Derive ultimate smoker-segregated rates using:
  - assumed proportion of smokers (observed to reduce with increasing age) and
  - assumed smoker to non-smoker differential at each age (assumed to converge with increasing age)
- From age 86, project rates so that they increase at a lower rate at each age, reaching unity at 110



# Older age rates

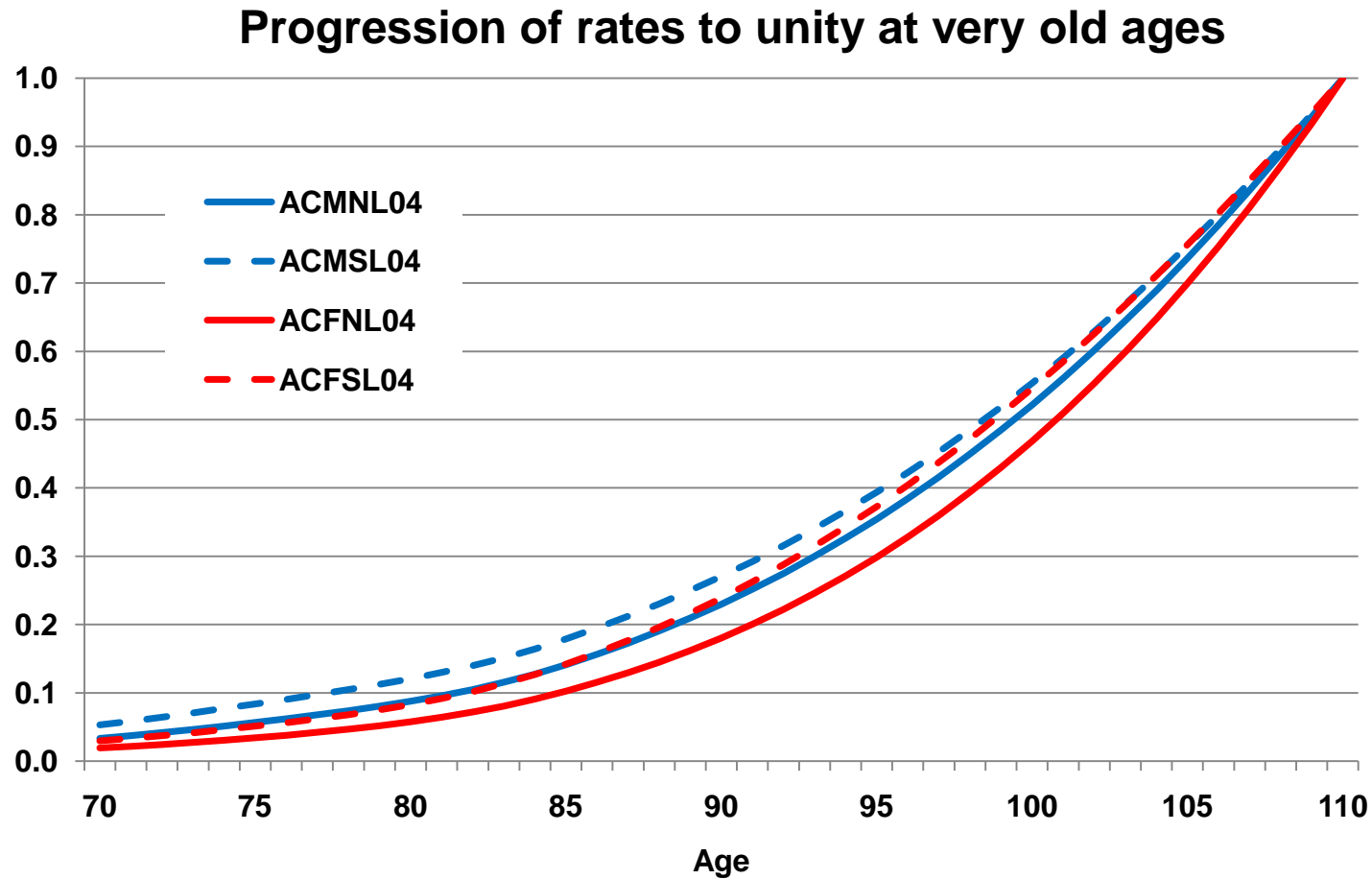


Figure C.3 from Working Paper 50

# 2003-2006 All-causes Diagnosis Rates (AC04 rates)

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

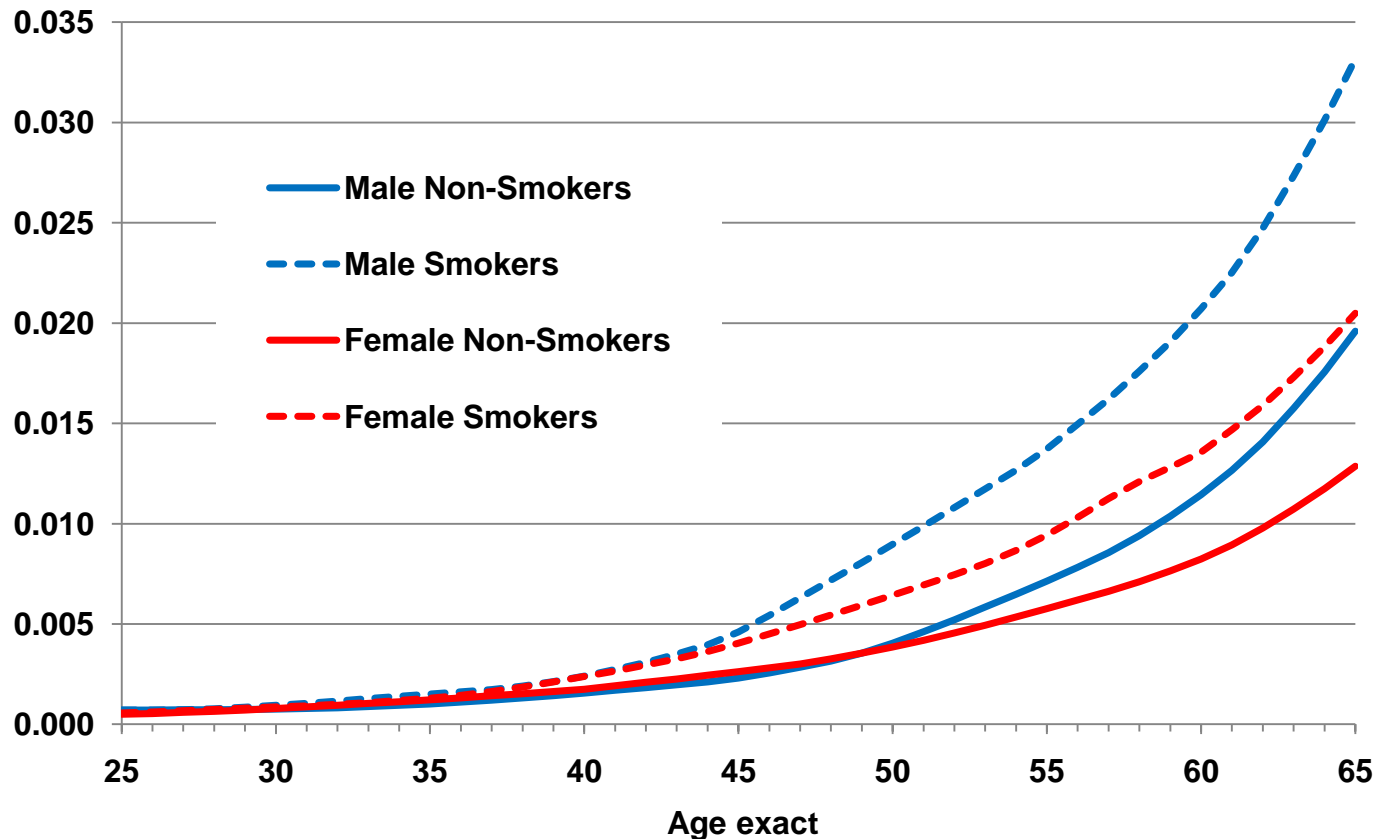


Figure 8.2 from Working Paper 50

# 2003-2006 All-causes Diagnosis Rates (AC04 rates)

Smoothed Annualised CI Diagnosis Rates by Gender and Smoker Status; Accelerated CI; Ultimate; 2003-2006 as % of CIBT02

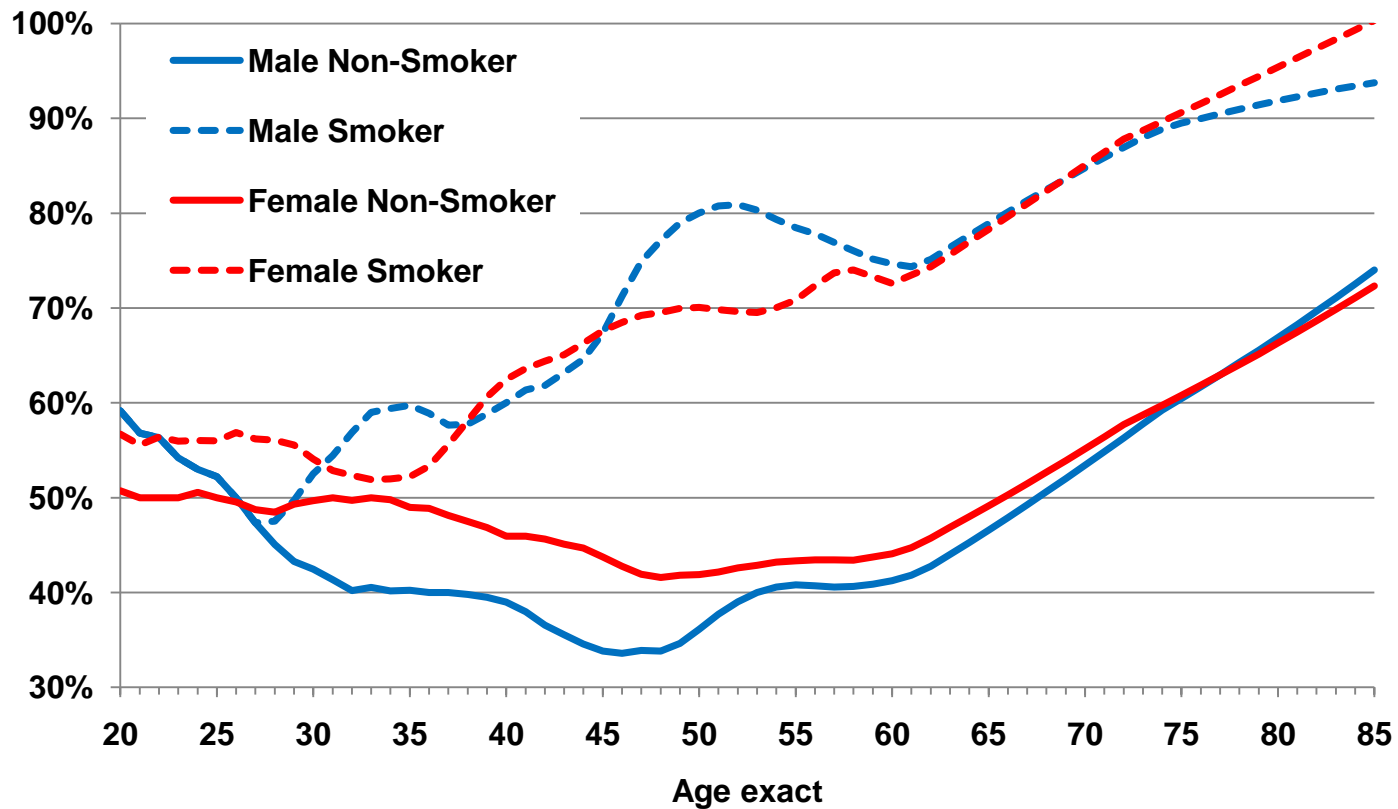


Figure 8.5 from Working Paper 50

# 2003-2006 All-causes Diagnosis Rates (AC04 rates)

## Durational pattern in Smoothed Annualised CI Diagnosis Rates Accelerated CI; 2003-2006

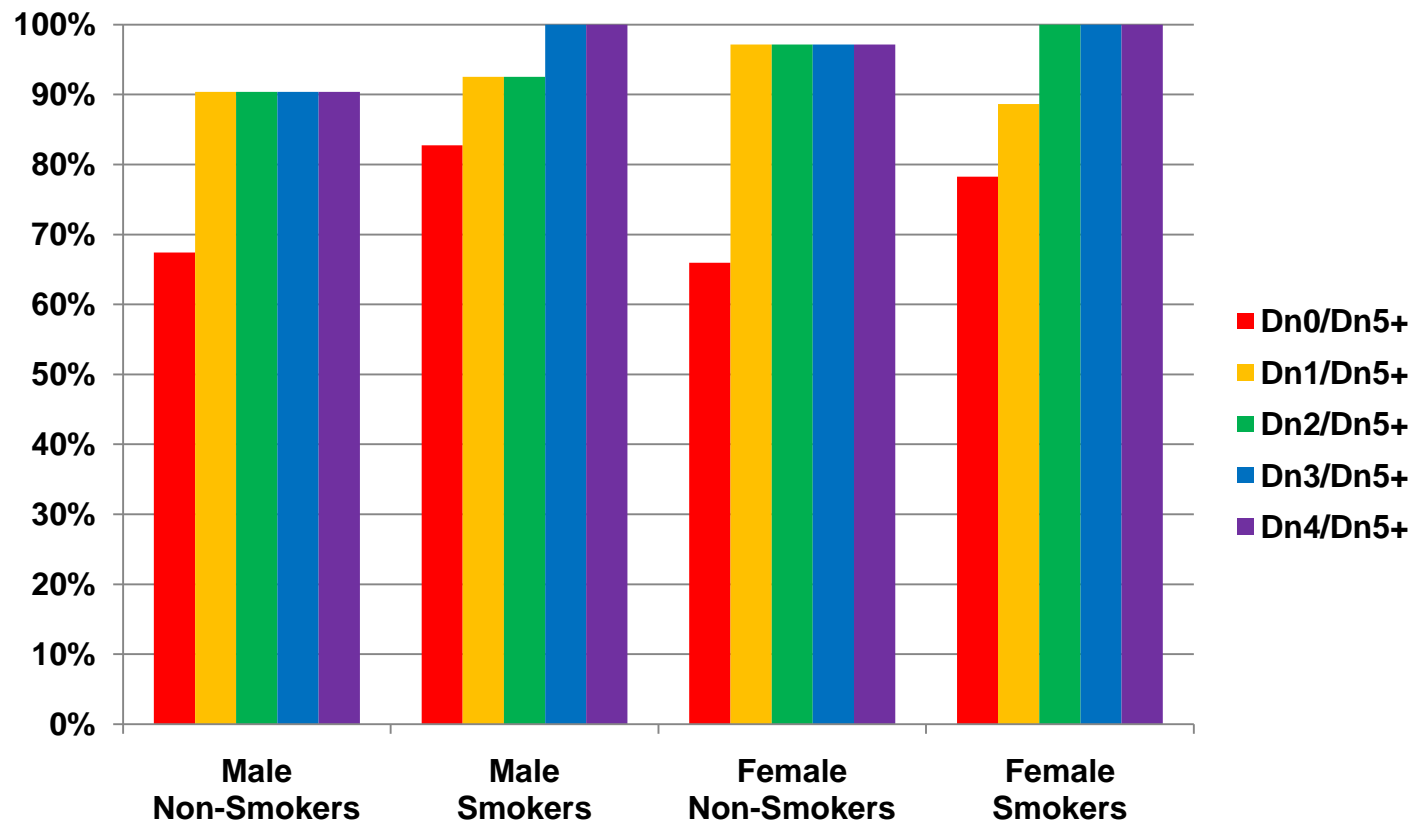


Figure 8.4 from Working Paper 50

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# Key features of WP50 work

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- Single CDD, based on data across 4 gender/smoker datasets
- Rates fitted by age only and by duration only, to broadly fit the ESC's to the ASC's; each gender /smoker dataset is considered independently
- Different selection patterns;
  - Male Non-smoker      0, 1-4, 5+
  - Male Smoker            0, 1-2, 3+
  - Female Non-smoker    0, 1-4, 5+
  - Female Smoker         0, 1, 2+
- Rates have been extended outside the age range where there is credible volumes of data

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# CMI Critical Illness: Scope of AC04 rates

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- All-causes accelerated critical illness; Lives table only
- Based on claims settled in 2003-2006
- Four tables:
  - ACMNL04
  - ACMSL04
  - ACFNL04 and
  - ACFSL04.
- Durations 0,1,2,3,4 and 5+ for ages 18 to 65; ultimate only for ages 66+
- Age exact basis

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# Critical Illness insurance: CMI 2003–2006 diagnosis rates

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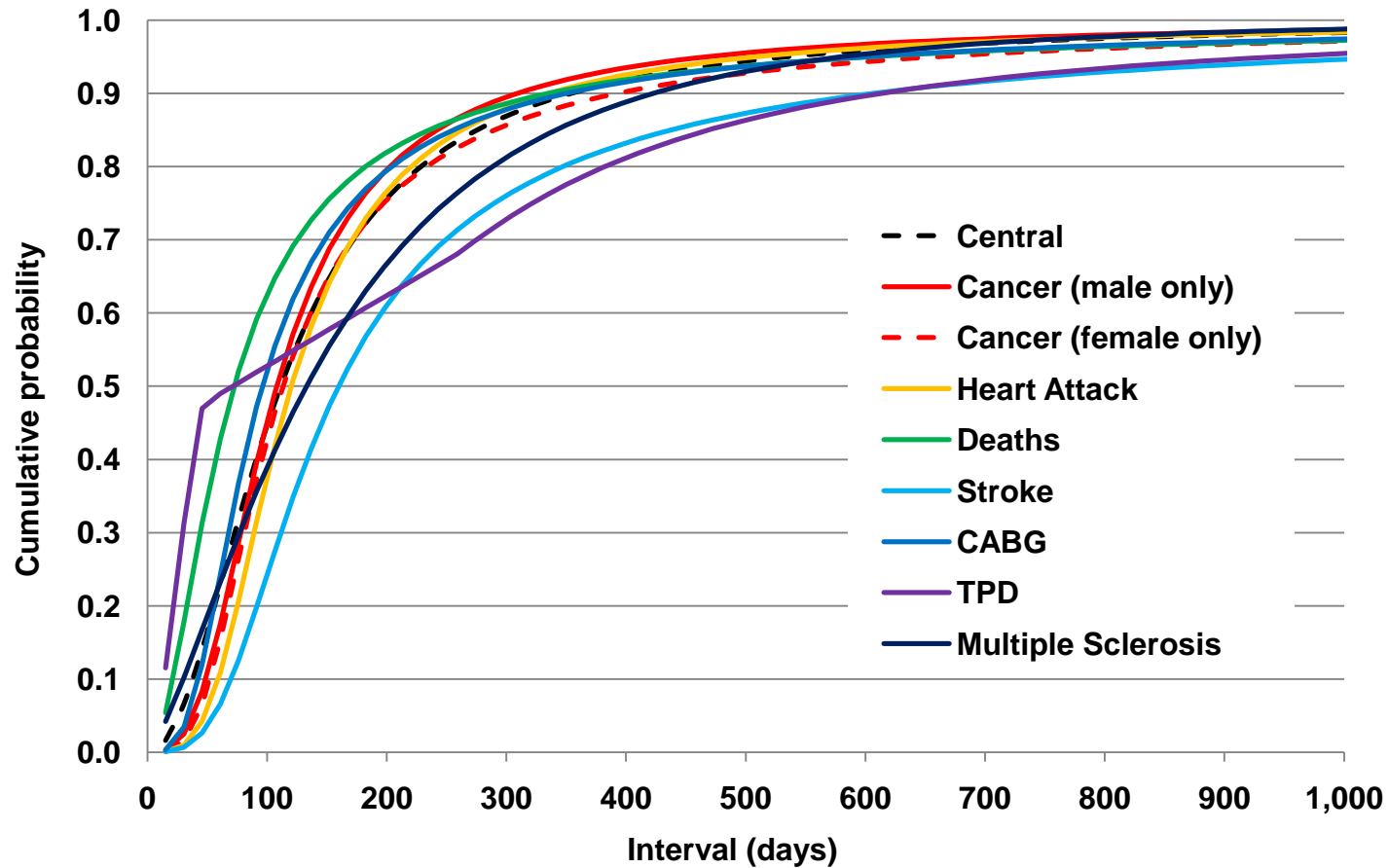
# 2003-2006 Cause-specific rates: Scope

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- Restricted dataset
- Main causes only (200+ claims):
  - M Non-Smoker      Cancer, HA, Death, Stroke, CABG, TPD
  - M Smoker            Cancer, HA, Death
  - F Non-Smoker      Cancer, Death, Stroke, MS
  - F Smoker            Cancer, Death
- Cause-specific CDDs again combine data across 4 gender/smoker datasets (except Cancer)



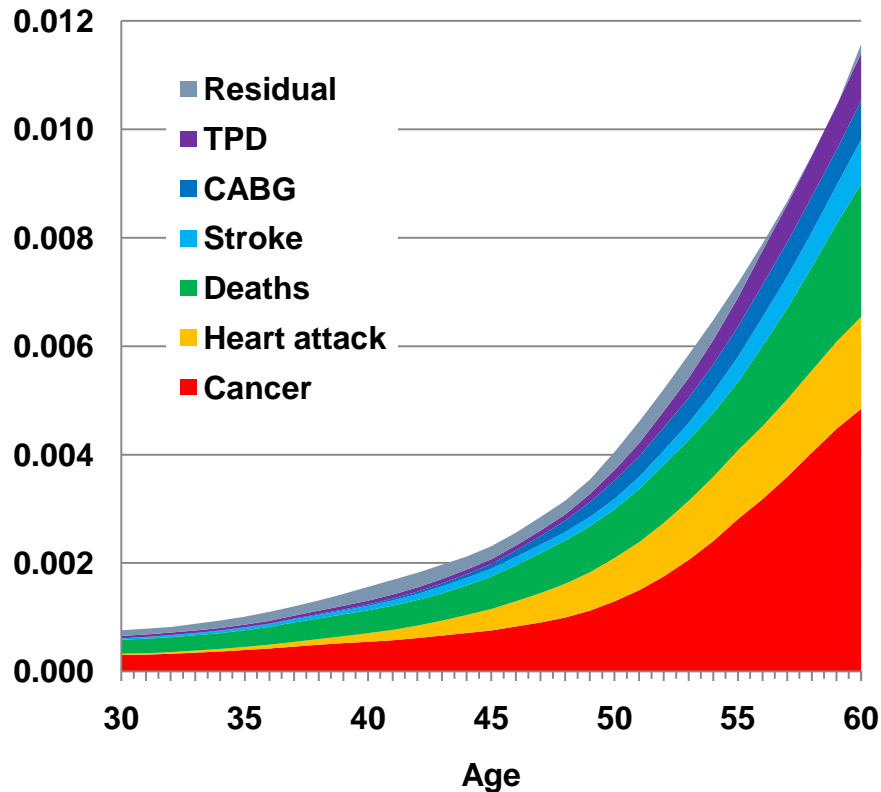
# 2003-2006 Cause-specific CDDs



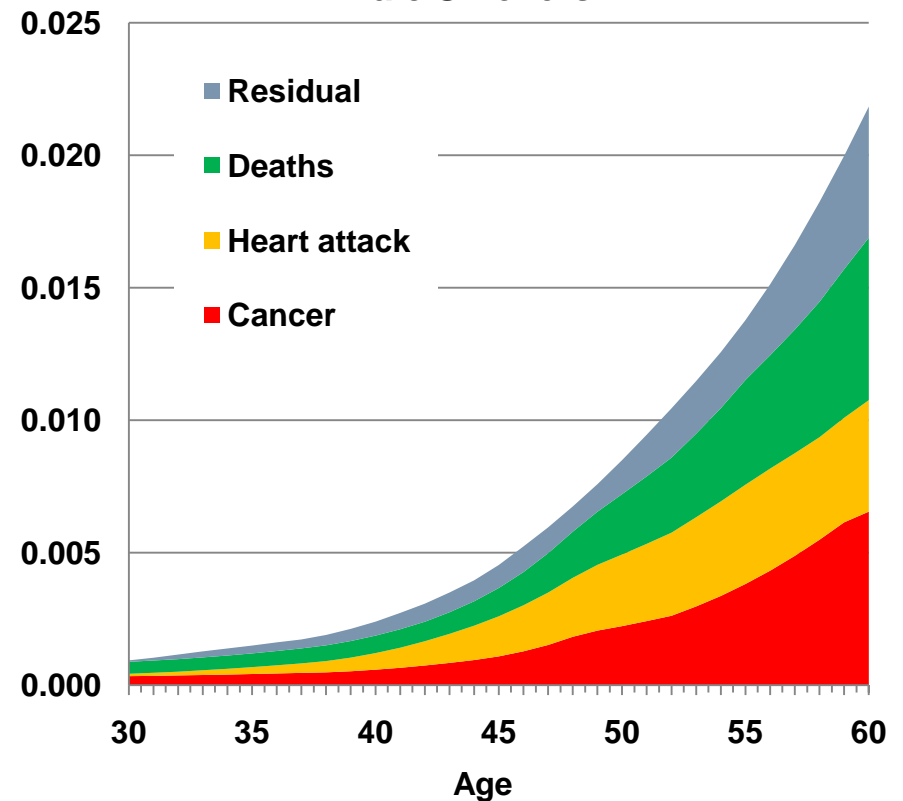
# 2003-2006 DRAFT Cause-specific Diagnosis Rates

## Smoothed Annualised CI Diagnosis Rates by Cause Accelerated CI; Durations 5+; 2003-2006

Male Non-Smokers

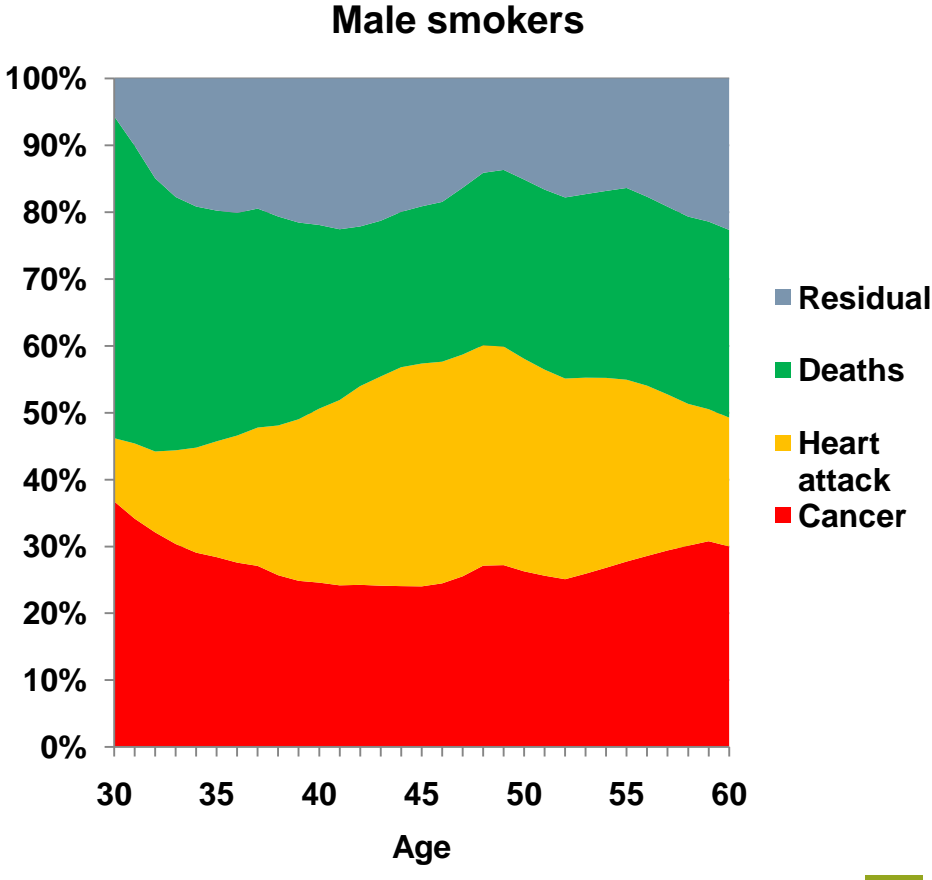
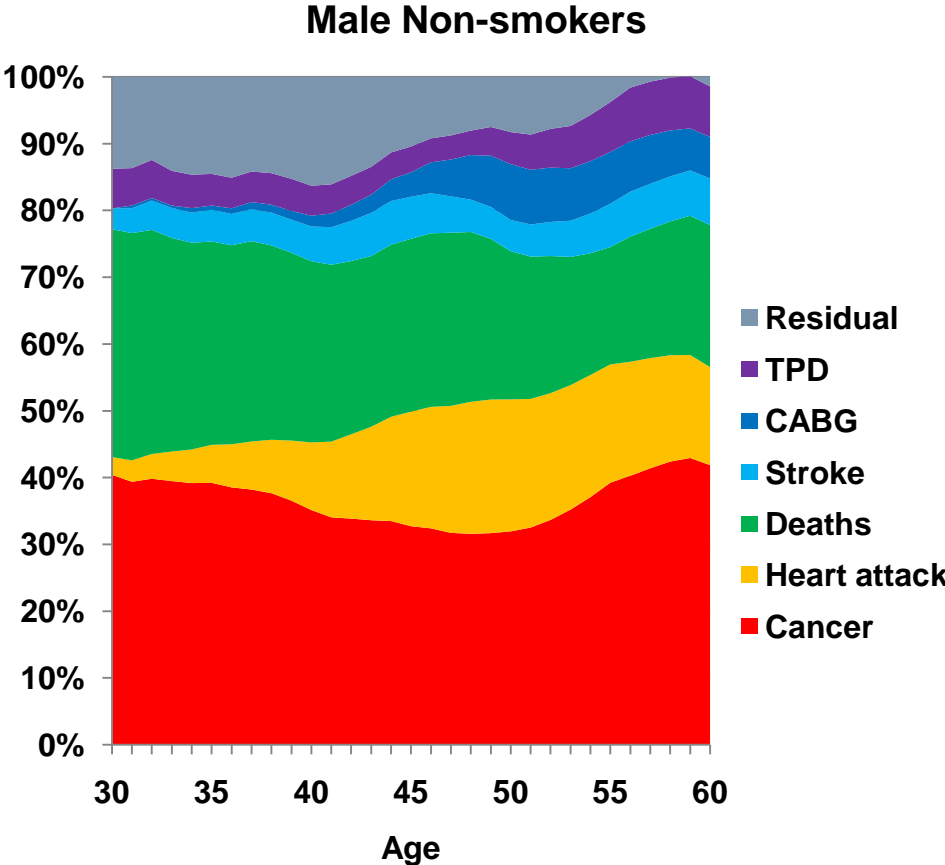


Male Smokers



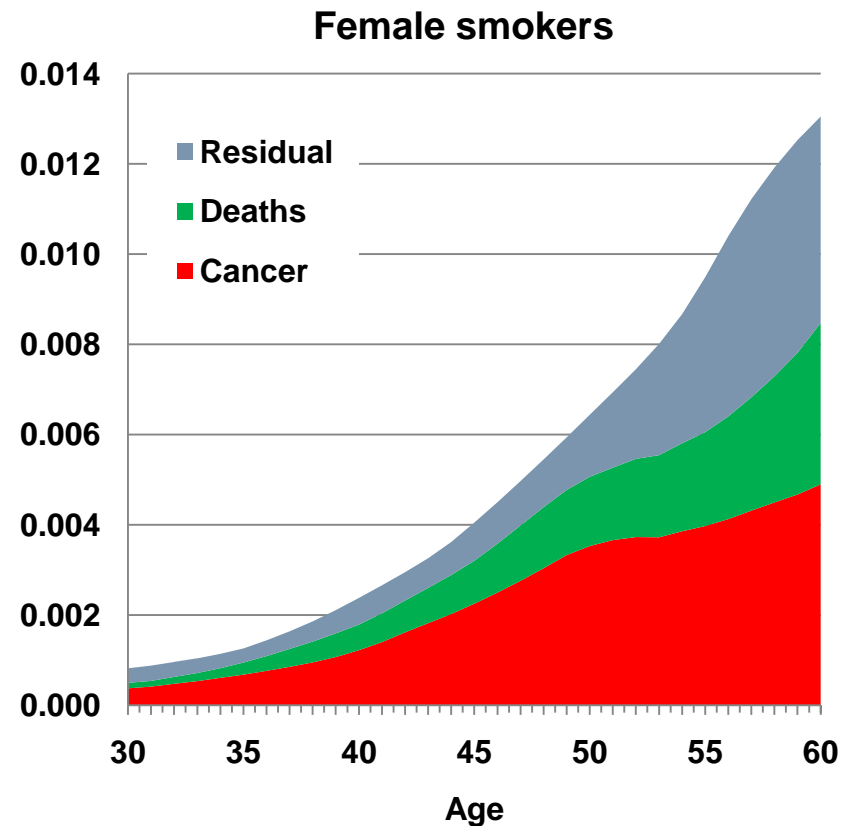
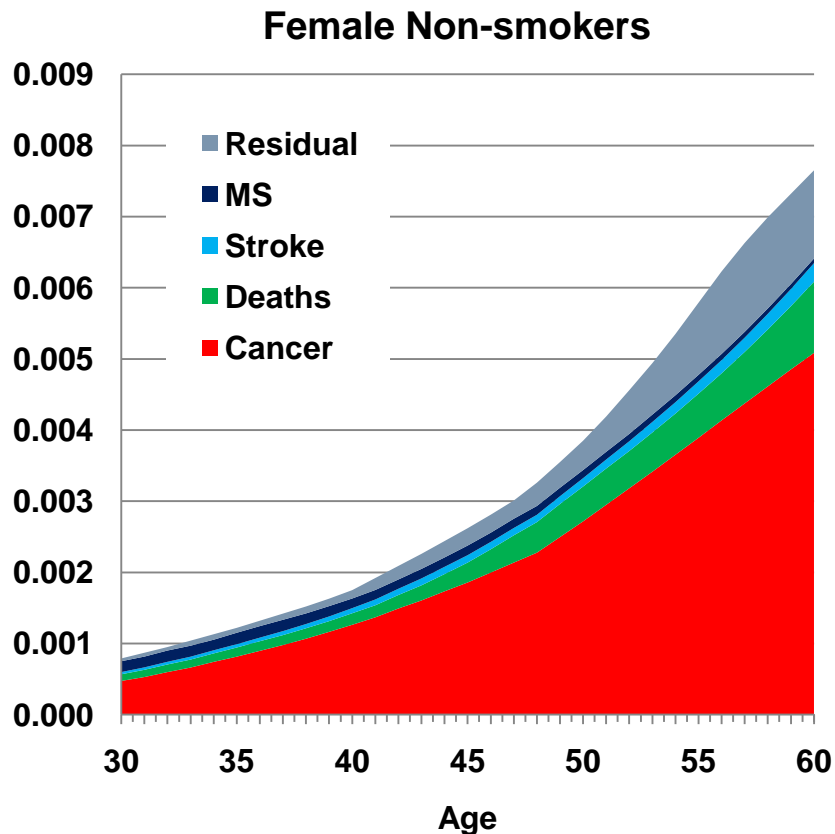
# 2003-2006 DRAFT Cause-specific Diagnosis Rates

CI Diagnosis Rates by Cause as % of All-causes Rates  
Accelerated CI; Durations 5+; 2003-2006



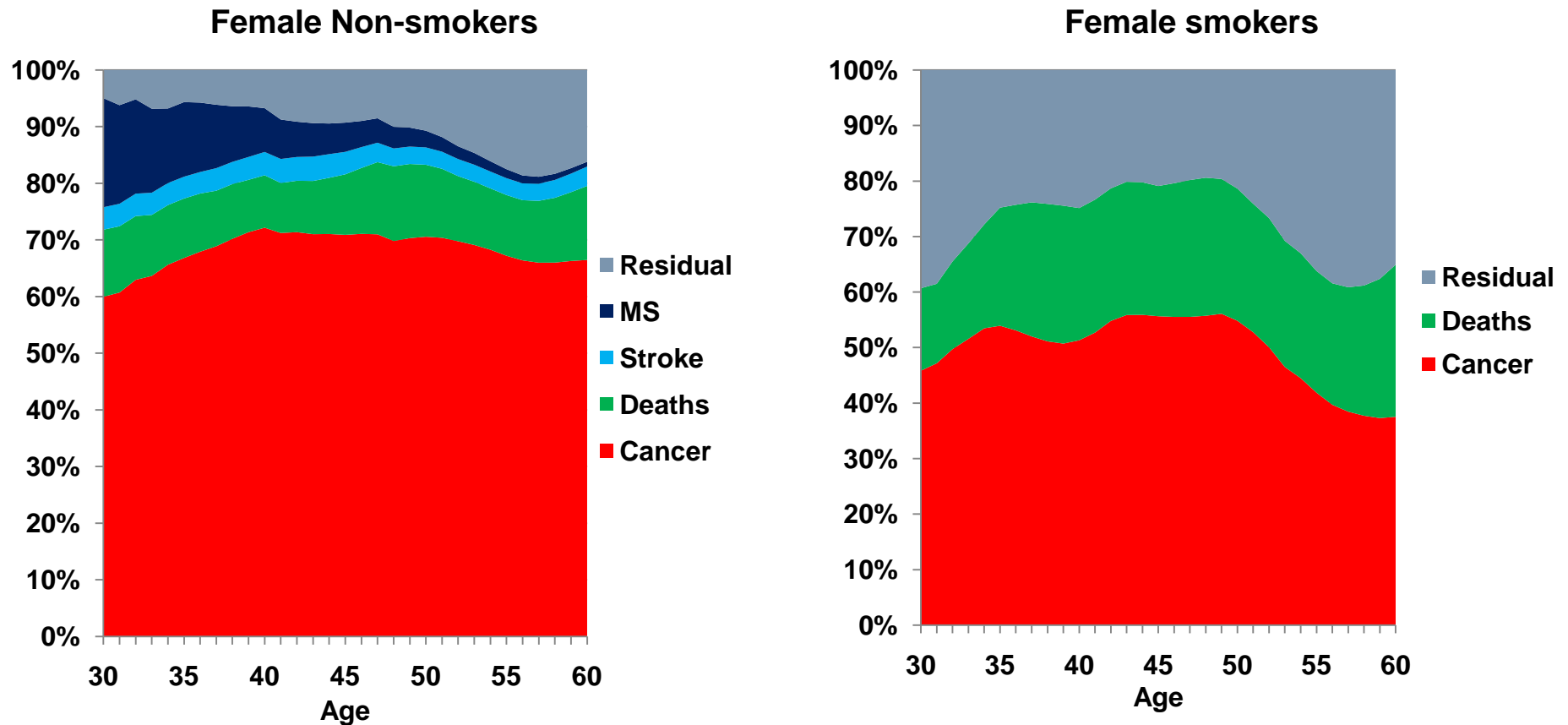
# 2003-2006 DRAFT Cause-specific Diagnosis Rates

## Smoothed Annualised CI Diagnosis Rates by Cause Accelerated CI; Durations 5+; 2003-2006



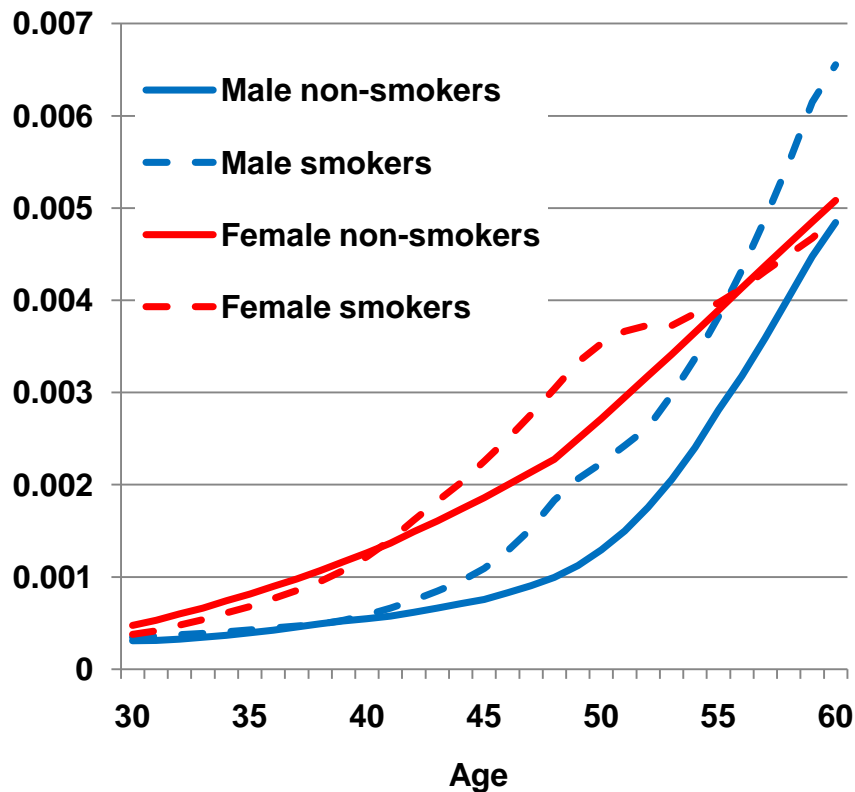
# 2003-2006 DRAFT Cause-specific Diagnosis Rates

## CI Diagnosis Rates by Cause as % of All-causes Rates Accelerated CI; Durations 5+; 2003-2006

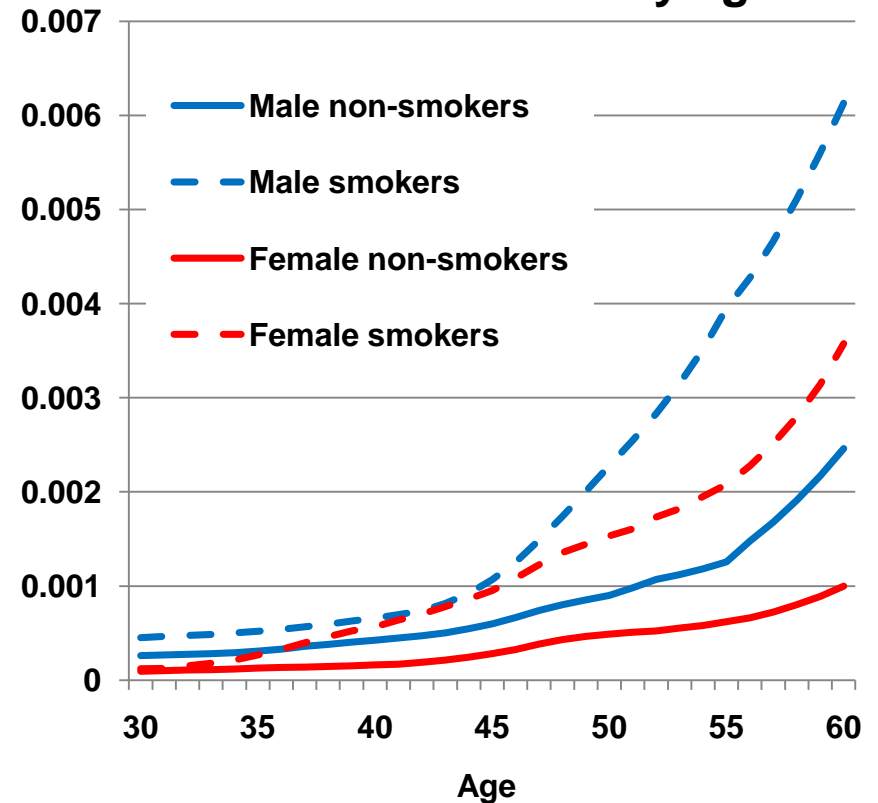


# Comparison of DRAFT cause-specific rates

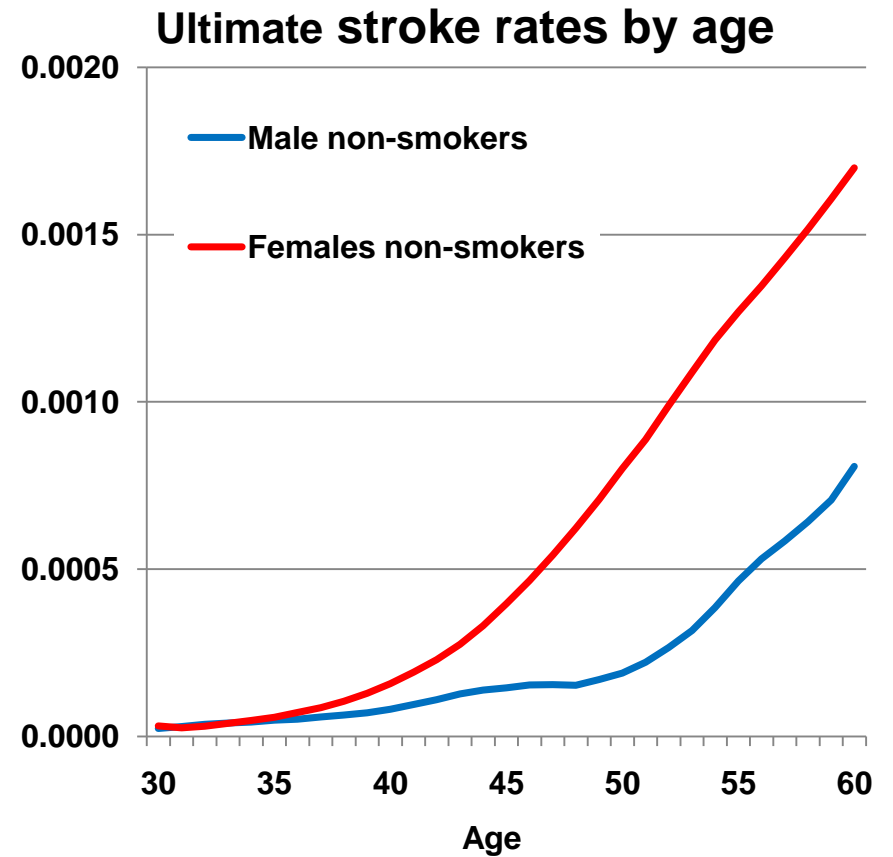
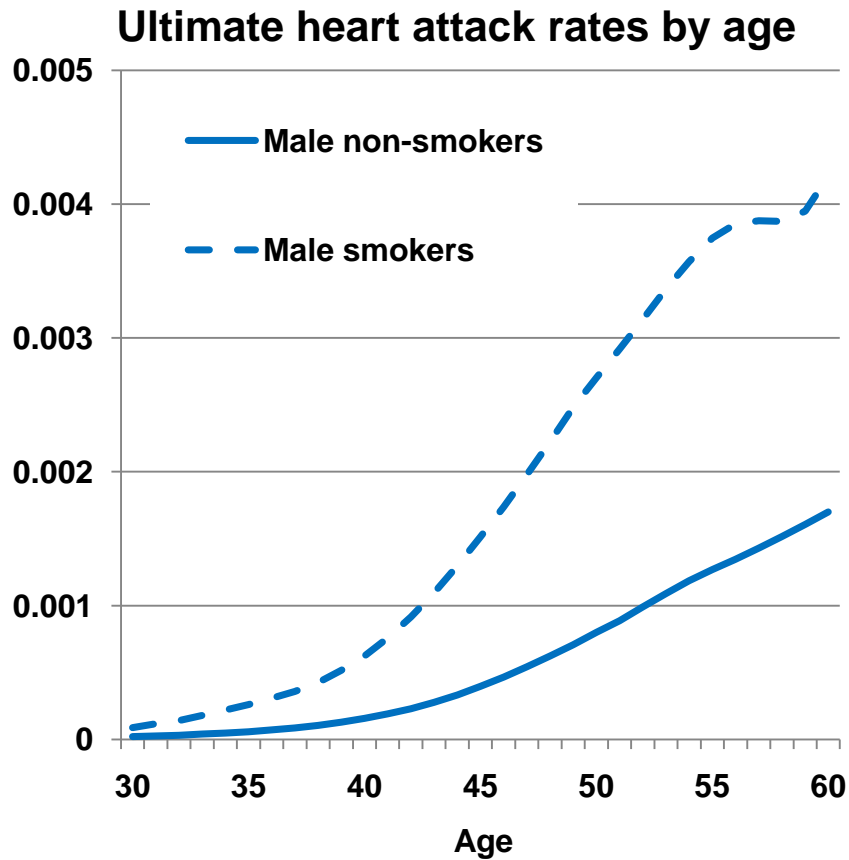
## Ultimate cancer rates by age



## Ultimate death rates by age

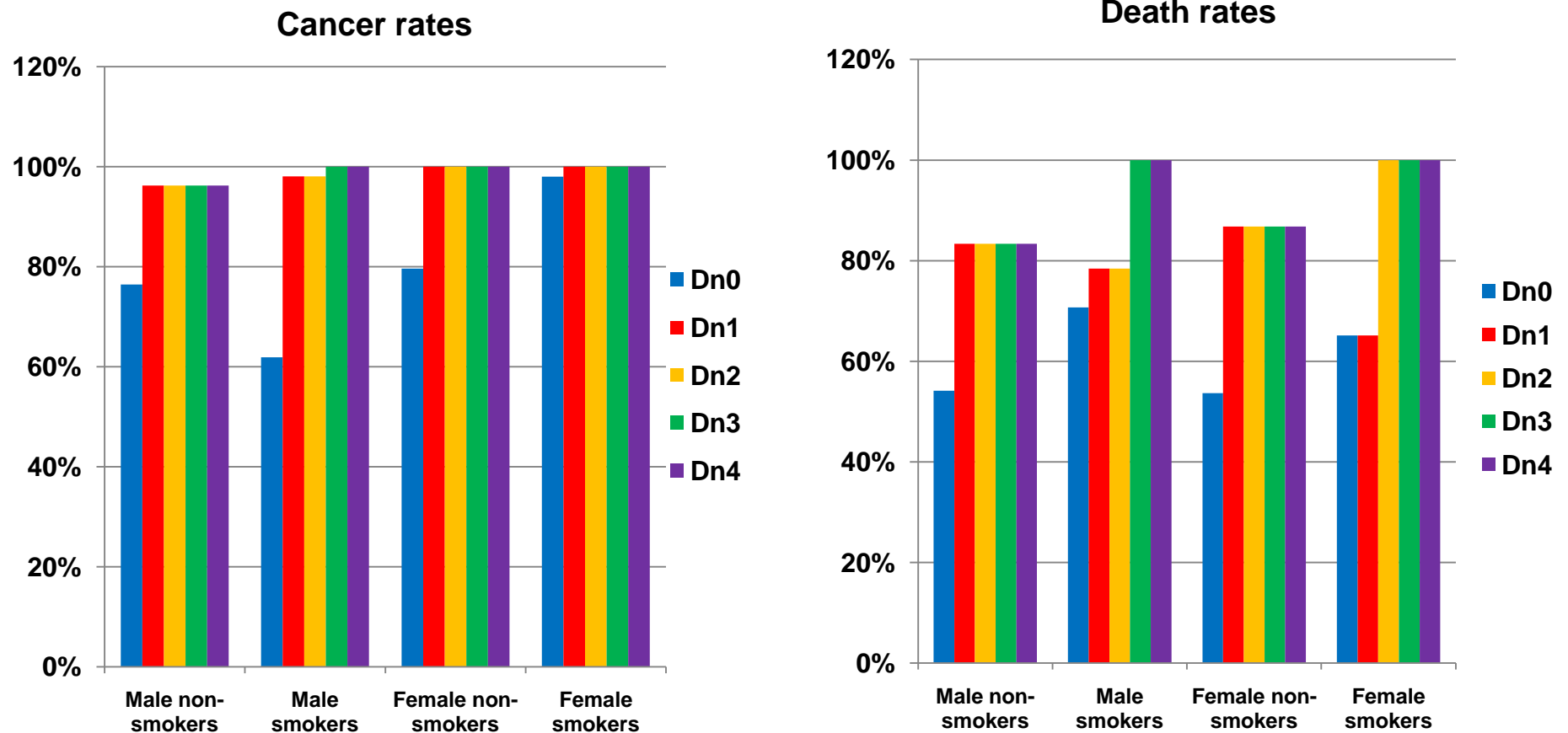


# Comparison of DRAFT cause-specific rates



# 2003-2006 DRAFT Cause-specific Diagnosis Rates

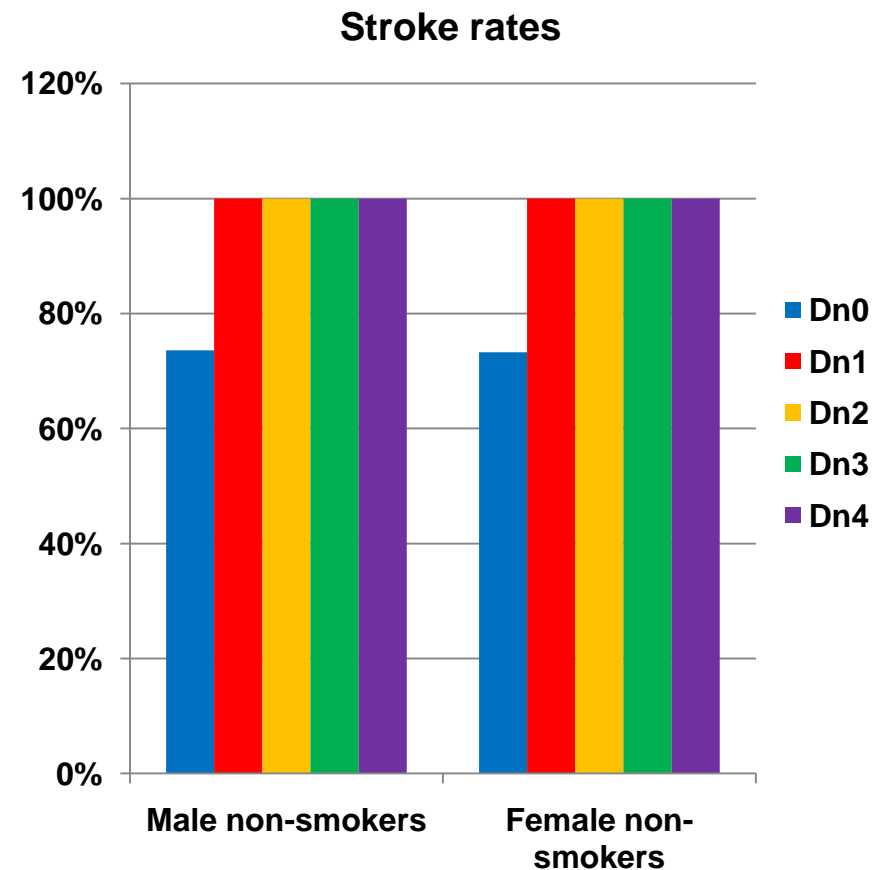
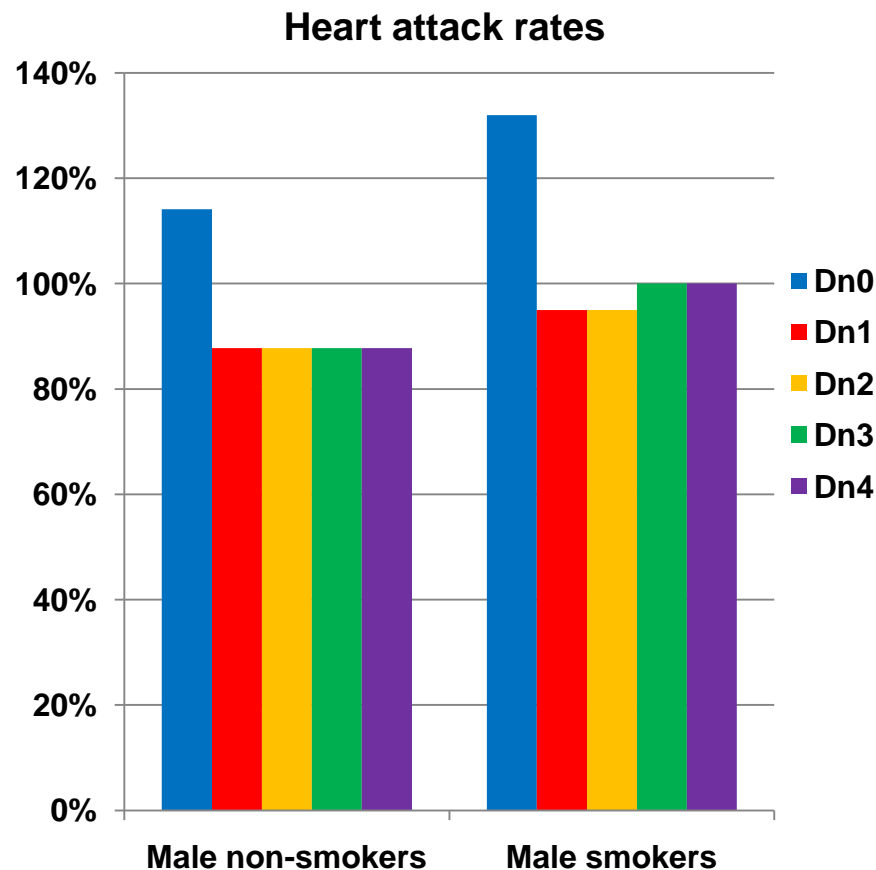
Durational **pattern** in CI Diagnosis Rates at durations 0,1,2,3 and 4 as a percentage of duration 5+ rates; 2003-2006





# 2003-2006 DRAFT Cause-specific Diagnosis Rates

Durational **pattern** in CI Diagnosis Rates at durations 0,1,2,3 and 4 as a percentage of duration 5+ rates; 2003-2006



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# Critical Illness insurance: CMI 2003–2006 diagnosis rates

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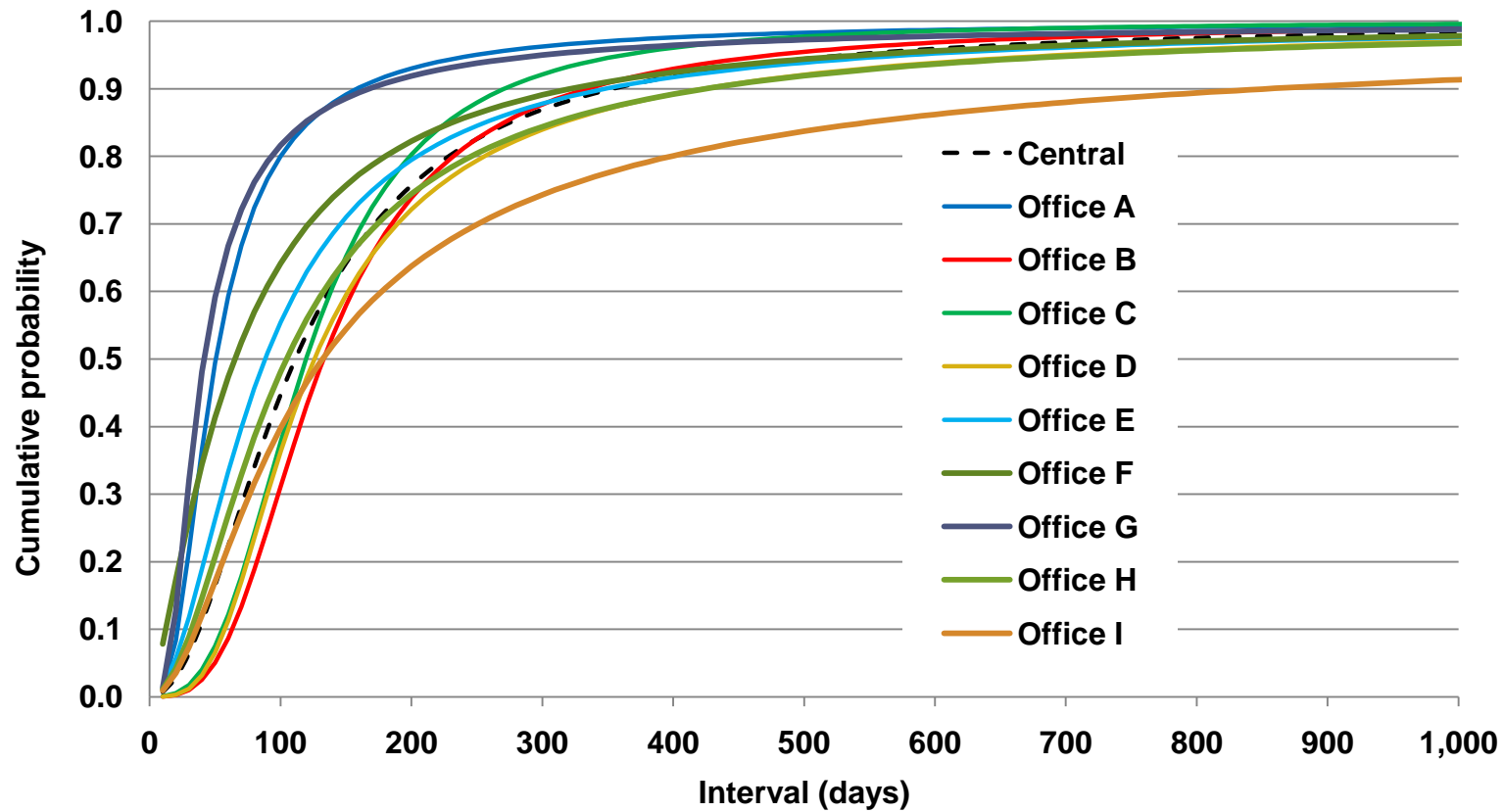
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# CMI Critical Illness: Scope of other analyses

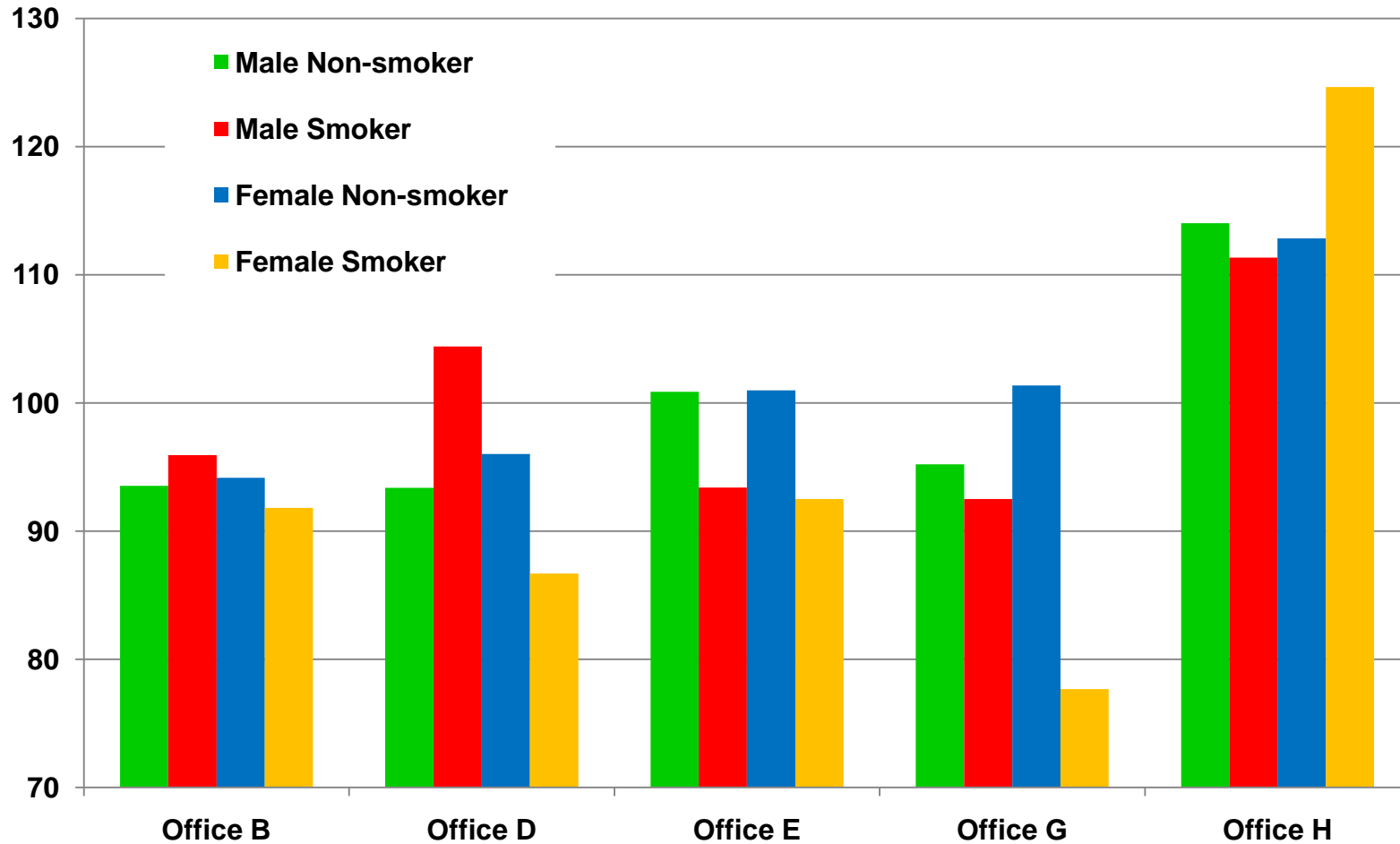
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- Experience split by
  - Office
  - Sum assured band
  - Distribution channel
  - Year of commencement
- Central CDD used except for analysis by office
- Published in Working Paper in 2011

# 2003-2006 Office-specific CDDs

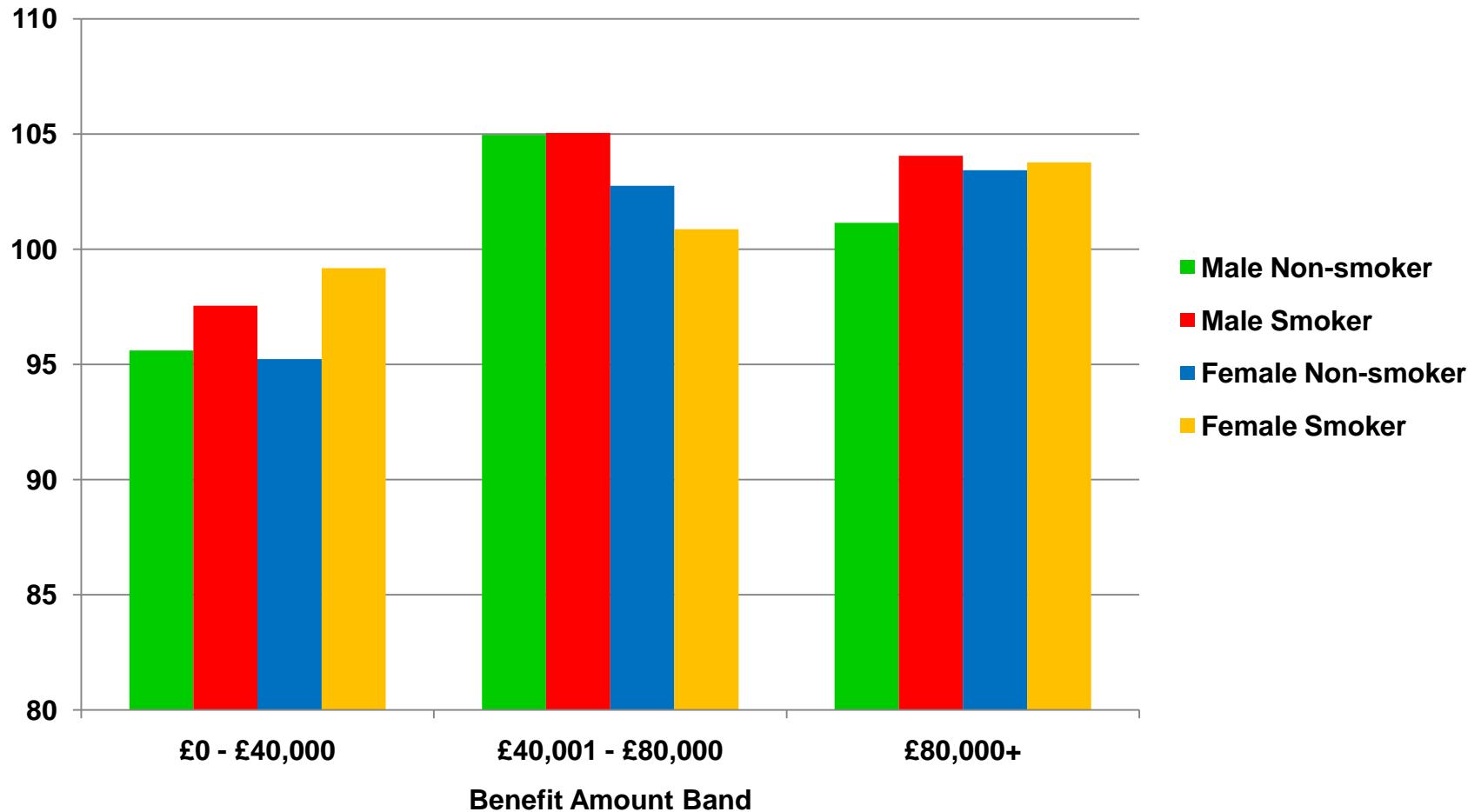


# Experience for 5 selected offices



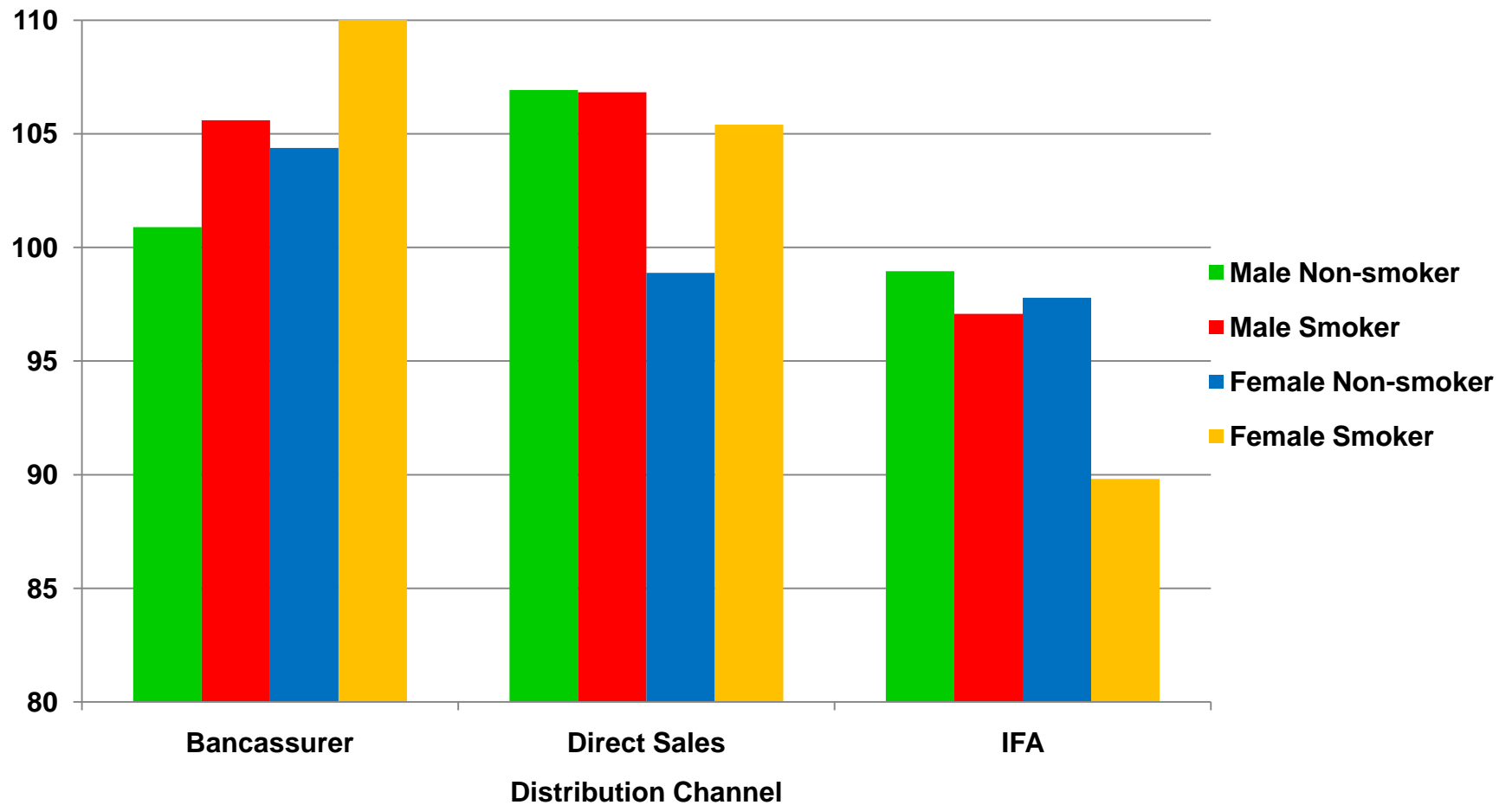
Results are expressed as a percentage of the AC04 diagnosis rates

# Experience by sum assured



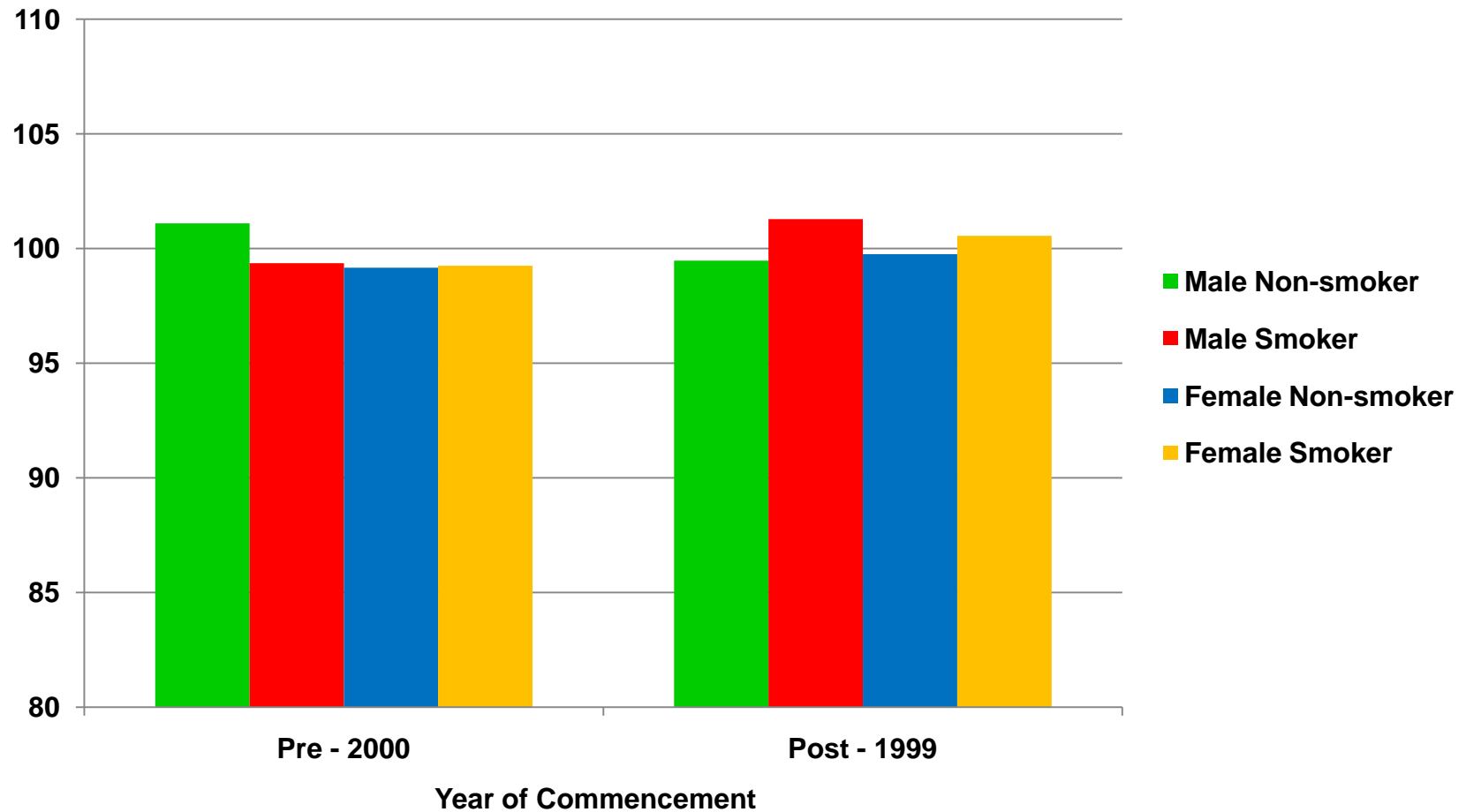
Results are expressed as a percentage of the AC04 diagnosis rates

# Experience by distribution channel



Results are expressed as a percentage of the AC04 diagnosis rates

# Experience by year of commencement



Results are expressed as a percentage of the AC04 diagnosis rates



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# Critical Illness insurance: CMI 2003–2006 diagnosis rates

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# CMI Critical Illness: Future work

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- Cause-specific rates (expected to be published ~~May~~ **June** 2011)
- Analysis by benefit amount, distribution channel, year of commencement, office and product type
- Sensitivity of final rates, e.g. to CDD
- Imputed stand-alone rates + comparison of experience
- Published in separate Working Paper later in 2011

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# Critical Illness: Learning from experience

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## Questions??

Slides on website next week:

[www.actuaries.org.uk/research-and-resources](http://www.actuaries.org.uk/research-and-resources)

Any queries to [ci@cmib.org.uk](mailto:ci@cmib.org.uk)