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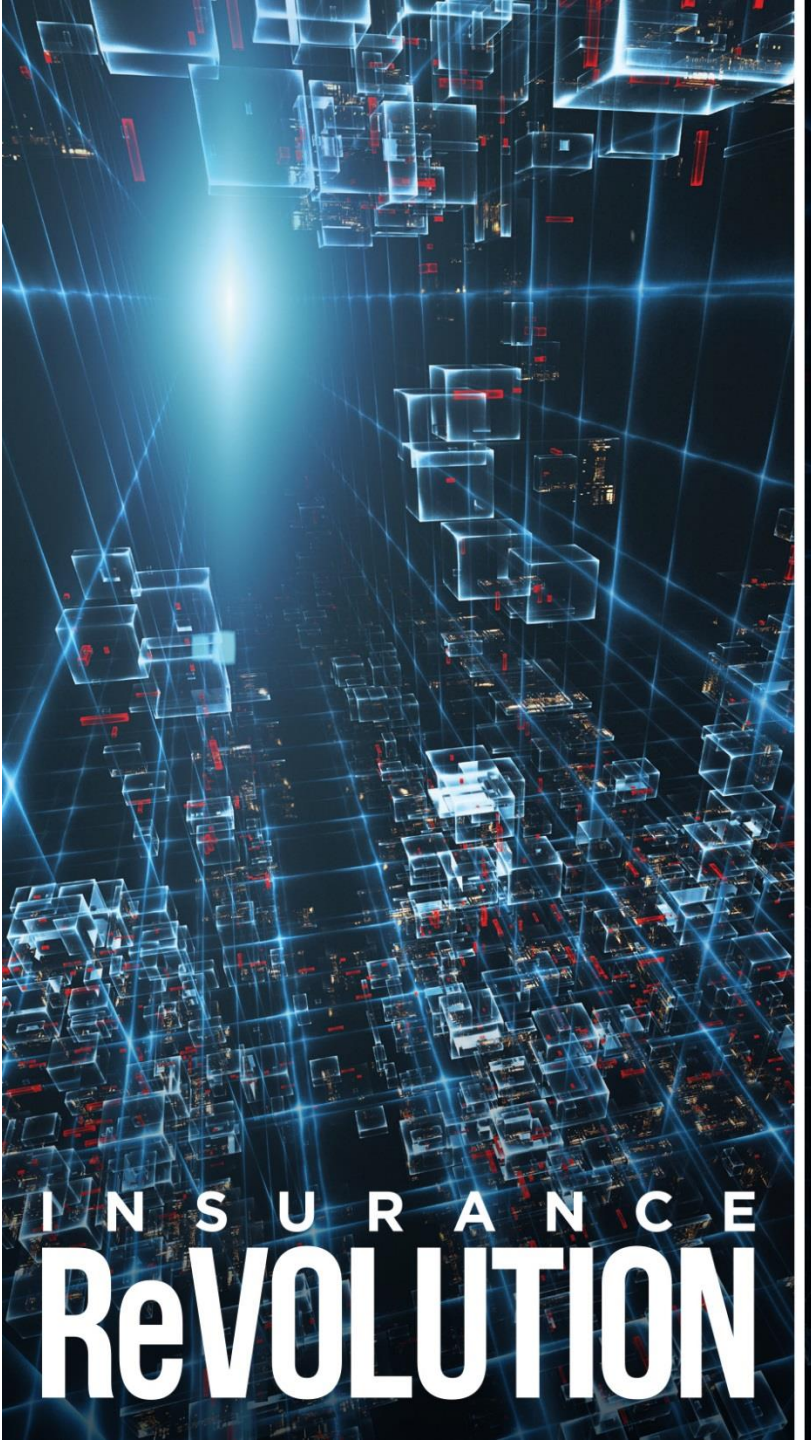

Comparison of Traditional UW Requirements and Their Impact on Mortality - Canada and Similar Countries

Colin Kearney
Damien Lapointe Nguyen

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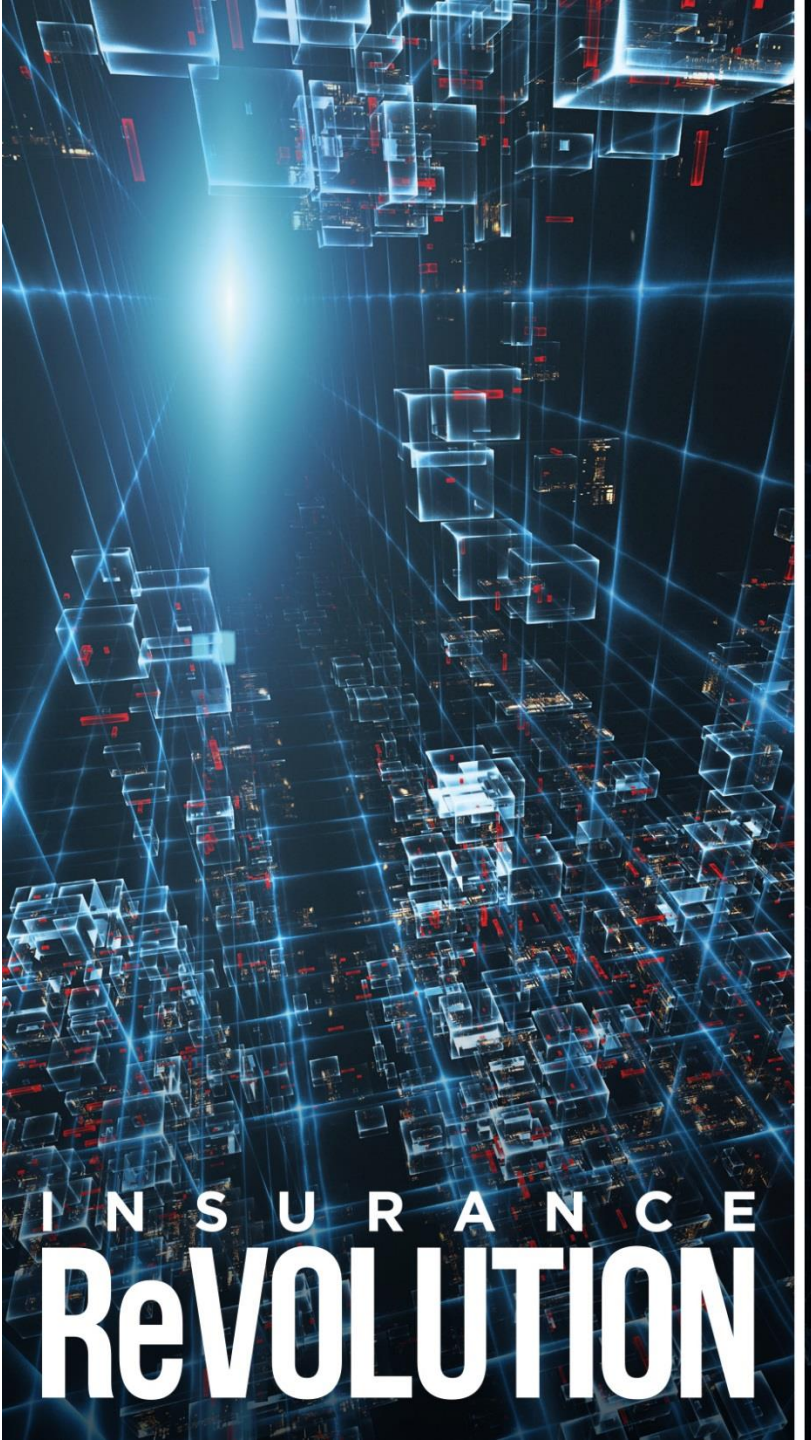
Agenda

- Key events affecting Underwriting requirements
- Age and amount UW Milestone
- International comparison of A&A requirements 
- UW innovation and future state
- Mortality table comparison for Canada, US, UK, Australia
- Analysis of 10 years of Canadian industry data



Part I: Evolution of Traditional Underwriting Requirements:

Age & Amount Tables Country Comparison and Future Trend

Colin Kearney
AVP, Chief Underwriting Officer
SCOR Global Life

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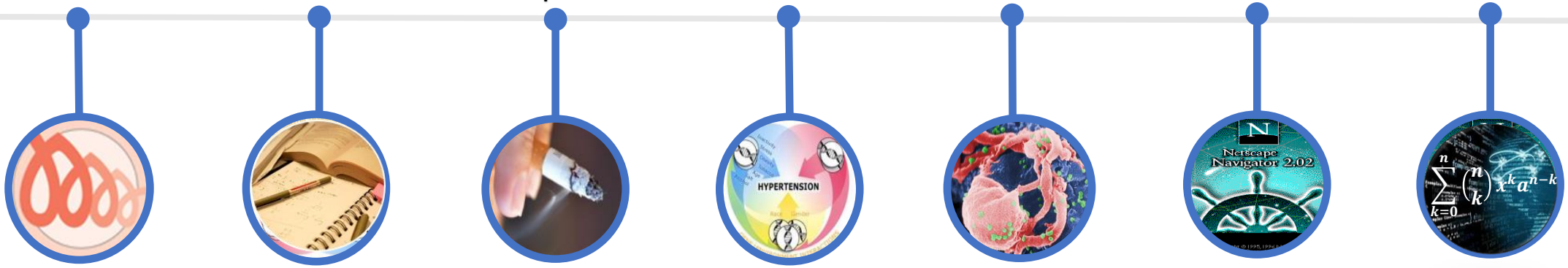
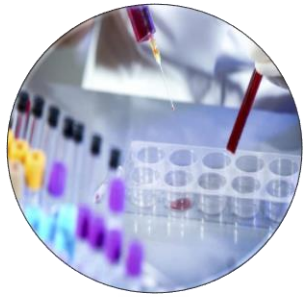
Key Events Affecting UW Requirements

UW	Cohort study on CV Disease	'Liberation' of UW standards	Birth of Smoker Class in 1980s	Emphasis on Medical Exams	Emergence of Blood Testing and Preferred UW	E-UW	Simplified / Accelerated UW
Events	1948 Framingham	1951 1st impairment study	1964 Surgeon General's Report	1979 Build and BP Study	1984 HIV virus	1996 Internet	2000s Open Information / Big Data Revolution



Canada UW Requirements Milestone :Blood Testing Triggered Introduction of Preferred Products

HIV Threat in 1980s Led to Blood Testing and Birth / Evolution of Preferred UW Class



Available UW Classes:

Pre-1990s:

- Standard non- smoker
- Standard smoker
- Substandard

1990s:

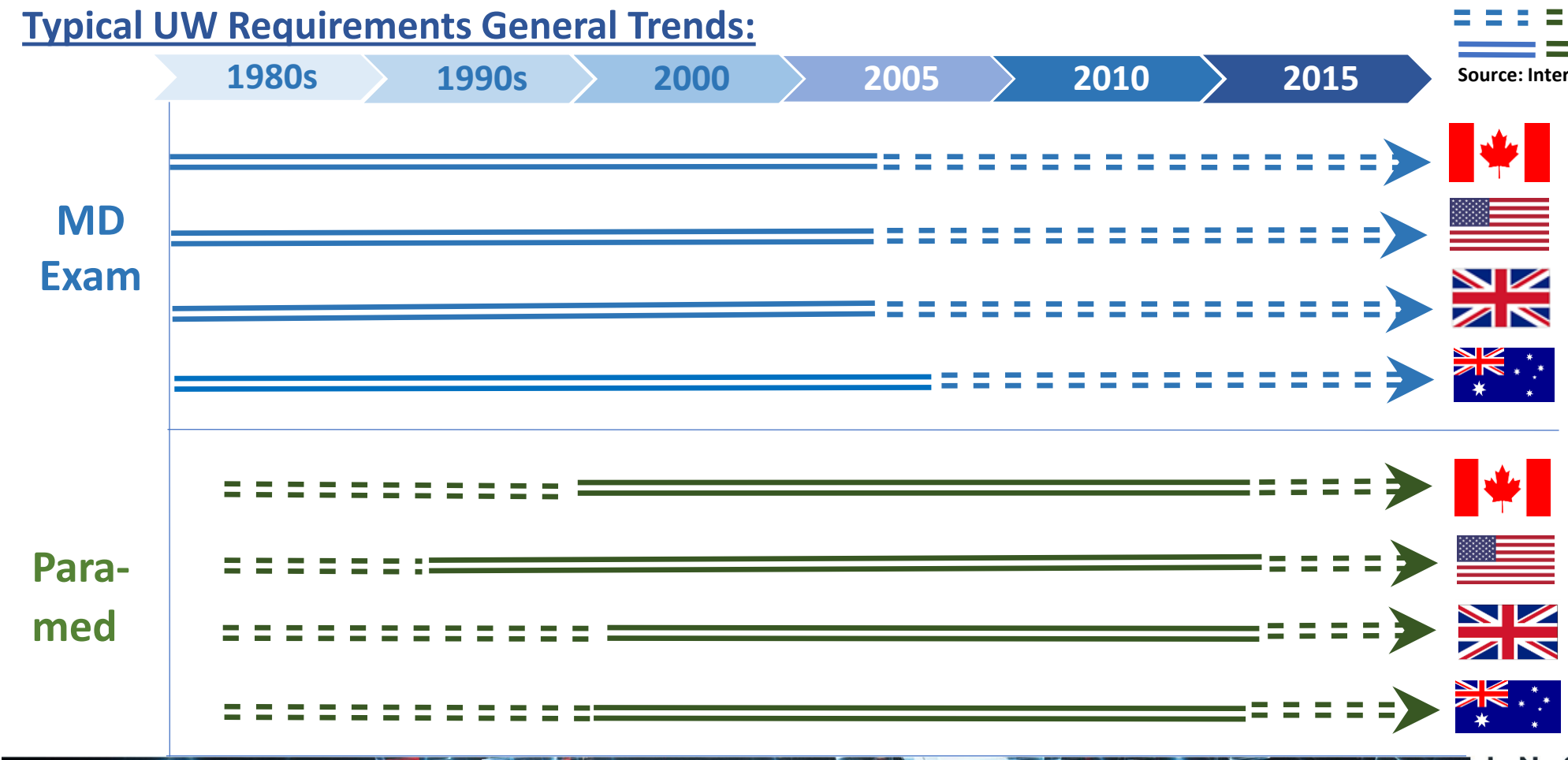
- Preferred non-smoker
- Standard non-smoker
- Standard smoker
- Substandard

Current:

- Super Preferred
- Preferred Plus
- Preferred non-smoker
- Standard non-smoker
- Preferred smoker
- Standard smoker
- Substandard

Age & Amount Requirement Changes 1980's – 2010's

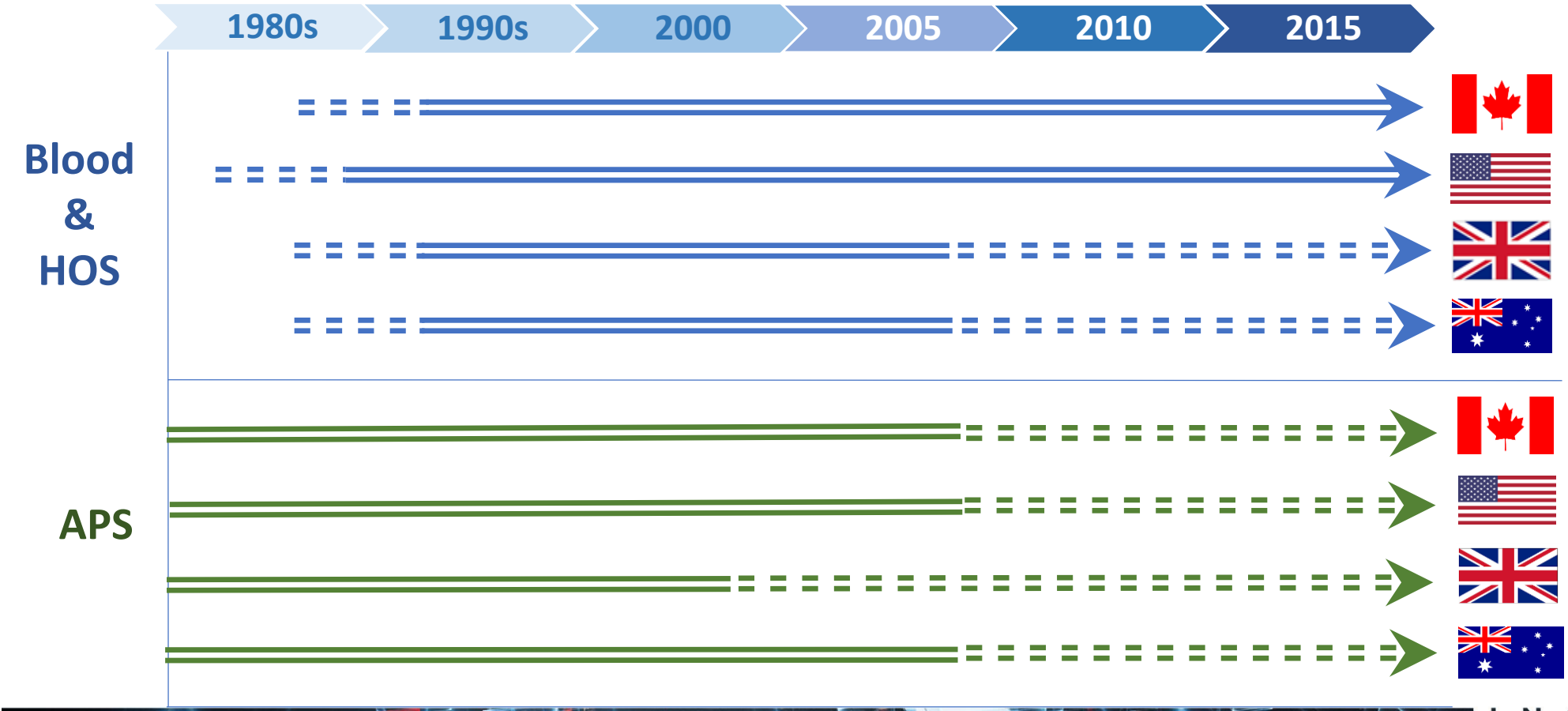
Typical UW Requirements General Trends:



- MD Exams have become less common. Now mostly used for higher face amounts.
- Parameds were originally unreliable, but became an essential requirement in all regions by mid '00s. Probable replacement by EUW/Tele UW.

Age & Amount Requirement Changes 1980's – 2010's

Typical UW Requirements General Trends :



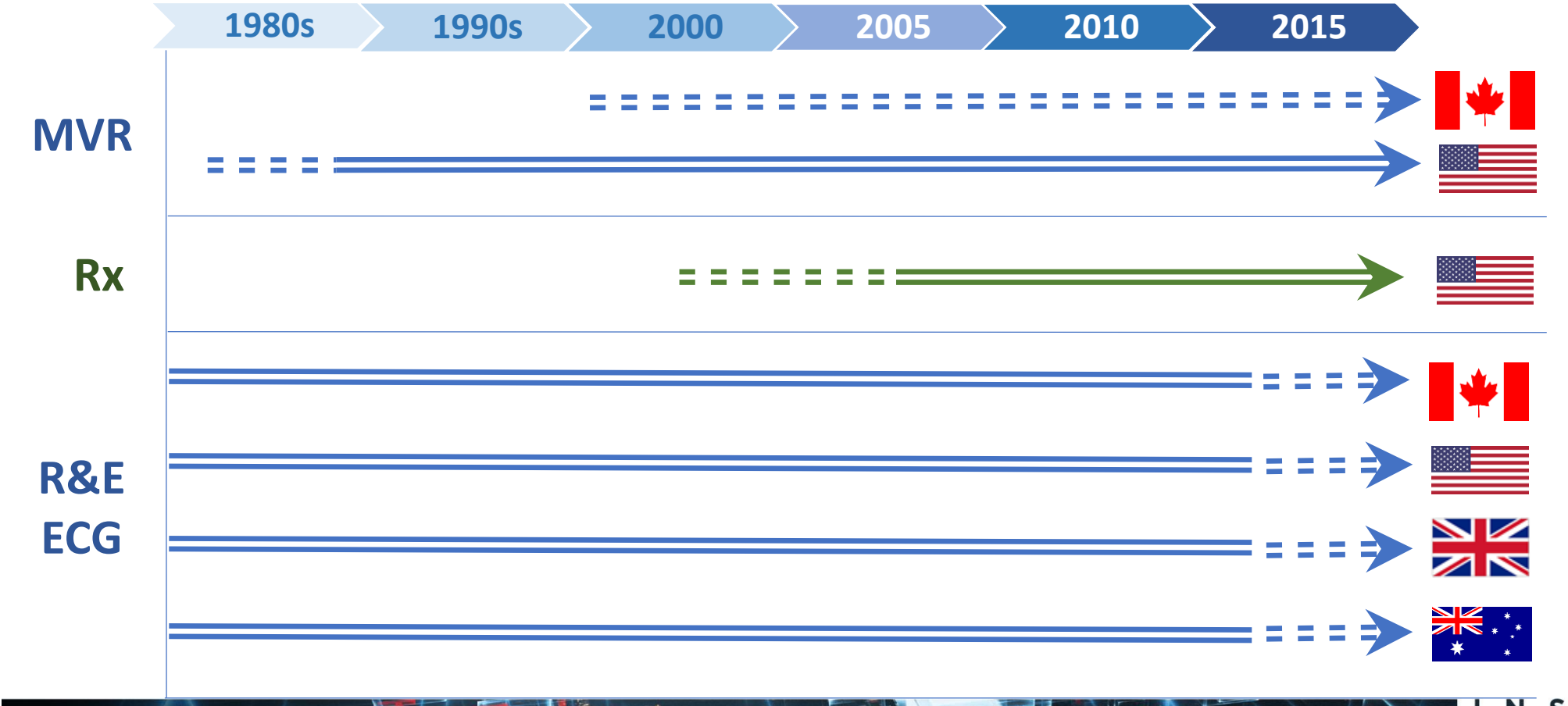
Less Commonly Used
Predominantly Used

- HIV was the main driver for starting Blood/APS testing in Mid '80s.
- More Blood/APS testing in Canada and US on lower face amounts due to preferred products.
- APS now mostly being obtained for cause/higher face amounts.

Source: Internal Survey

Age & Amount Requirement Changes 1980's – 2010's

Typical UW Requirements General Trends :

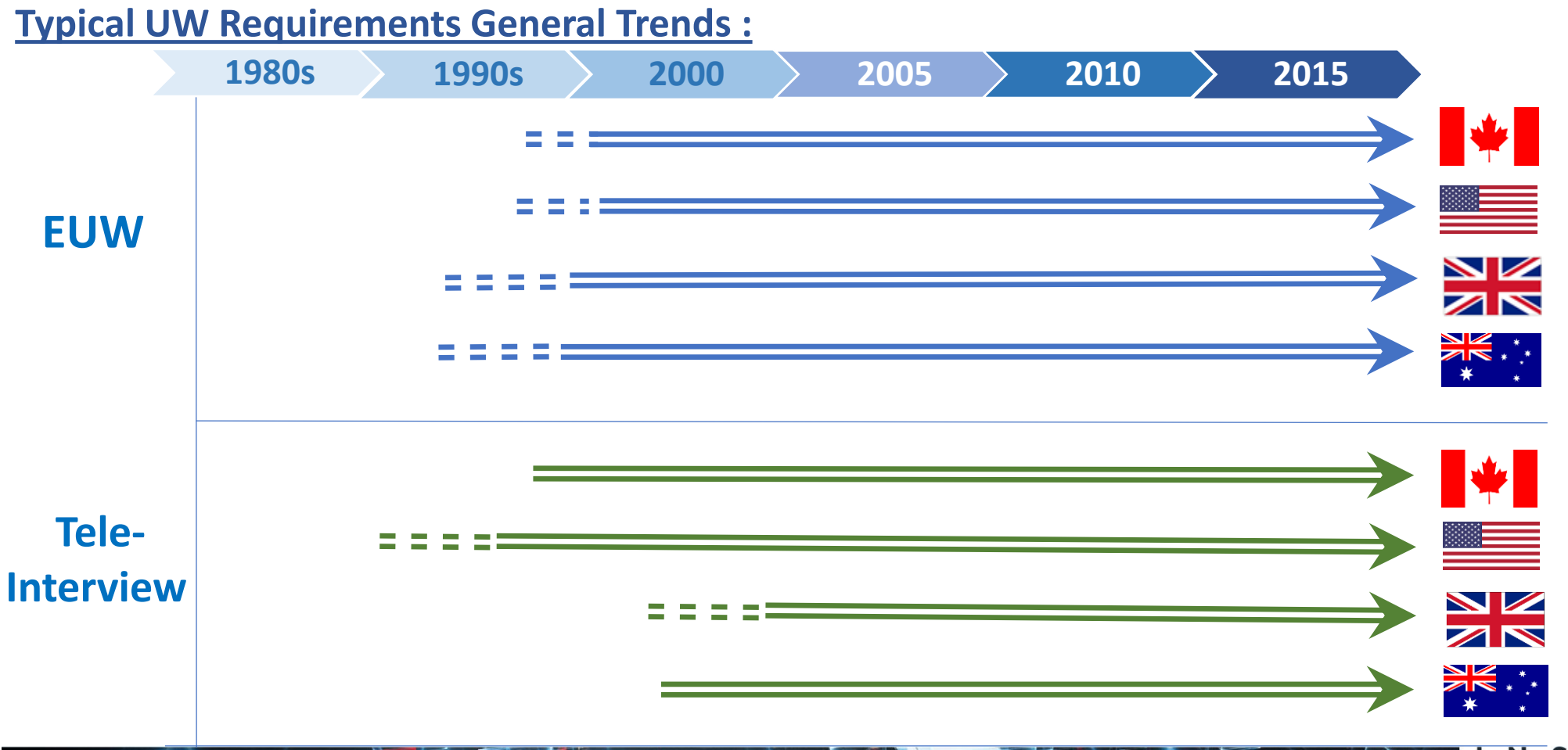


Less Commonly Used
Predominantly Used

- In U.S., MVR came into usage in 1990s.
- Minimal availability on electronic format in Canada.
- MVR not accessible in AUS and UK. Rx is only currently available in US.
- Predictive value of ECG Vs HBA1C or NT-proBNP is currently under review.

Age & Amount Requirement Changes 1980's – 2010's

Typical UW Requirements General Trends :



- EUW now established in all markets (mostly combined with UW rules engines).
- Both EUW and Tele-UW are replacing certain A&A requirements (APS, Paramed/MD Exam and certain fluids)

Source: Internal Survey

Market Competitiveness and Technology Have Driven A&A Requirements Changes in Canada

Medical Exam/R&E ECG Diminished while New Requirements (Teleinterview, EUW, etc.) Emerged

Typical Age/Amount Requirements in Canada:

In Blue: New
In Red: No longer used
In Orange: Phasing out

A&A Sample in 1997:

Amounts	Ages				
	18-40	41-50	51-60	61-70	71+
Up to 99,999	Non-medical	Non-medical	Non-medical	Non-medical	Medical Exam Blood Vitals R&E ECG
100,000 – 249,999	Non-medical	Non-medical Blood Vitals	Non-medical Blood Vitals	Non-medical Blood Vitals	Medical Exam Blood Vitals R&E ECG
250,000 – 499,999	Non-medical Blood Vitals	Non-medical Blood Vitals	Non-medical Blood Vitals R&E ECG	Non-medical Blood Vitals R&E ECG	Medical Exam Blood Vitals R&E ECG
500,000 – 1,000,000	Non-medical Blood Vitals R&E ECG	Non-medical Blood Vitals R&E ECG	Paramed Blood Vitals R&E ECG	Paramed Blood Vitals R&E ECG	Medical Exam Blood Vitals R&E ECG
1,000,001+	Paramed Blood Vitals R&E ECG	Paramed Blood Vitals R&E ECG	Paramed Blood Vitals R&E ECG	Paramed Blood Vitals R&E ECG	Medical Exam Blood Vitals R&E ECG

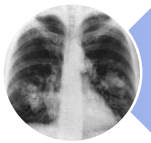
A&A Sample in 2017:

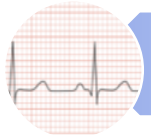
Amounts	Ages				
	18-40	41-50	51-60	61-70	71+
Up to 99,999	Non-medical	Non-medical	Non-medical	Non-medical	Tele-int./EUW Blood Vitals
100,000 – 249,999	Non-medical	Non-medical	Non-medical Blood Vitals	Non-medical Blood Vitals	Tele-int./EUW Blood Vitals Cognitive Screening
250,000 – 499,999	Non-medical	Non-medical Blood Vitals	Non-medical Blood Vitals	Non-medical Blood Vitals	Tele-int./EUW Blood Vitals R&E ECG Cognitive Screening
500,000 – 1,000,000	Non-medical Blood Vitals	Non-medical Blood Vitals	Tele-int./EUW Blood Vitals	Tele-int./EUW Blood Vitals	Tele-int./EUW Blood Vitals R&E ECG Cognitive Screening
1,000,001+	Tele-int./EUW Blood Vitals	Tele-int./EUW Blood Vitals	Tele-int./EUW Blood Vitals	Tele-int./EUW Blood Vitals	Tele-int./EUW Blood Vitals R&E ECG Cognitive Screening

Out with the Old / In with the New

Traditional Method:


MD Exams


Chest X-Rays


Treadmills


Paper Applications

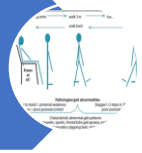

Inspection Report

New Innovation:

Auto/Electronic UW

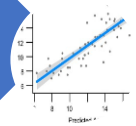
Tele-Underwriting

Wearable devises



Credit Scoring/RX/MVR

Predictive Models



Technology, data and market forces are rapidly driving A&A changes.

Future State of A&A requirements

- A&A Requirements will keep evolving, driven by technology and market force.
- Industry needs to stay in touch and adapt in order to maintain competitiveness.

Past (Pre-2010s)

Current (2010s)

Key Driver: Rules Engine

Near Future (- 2020)

Key Driver: Big Data / Predictive Modeling

?

Future (2020 -)

Key Driver: Biological Advancement? AI?

Historical UW A&A

- Medical Record
- Blood
- Para-med
- ECGs

Accelerated UW A&A

- Electronic Rules Engine
- Tele-Interview
- Rx
- Wearable Devises

Predictive UW A&A

- Big Data Evolution
- Facial Analytics
- Genetic Information

Future UW A&A

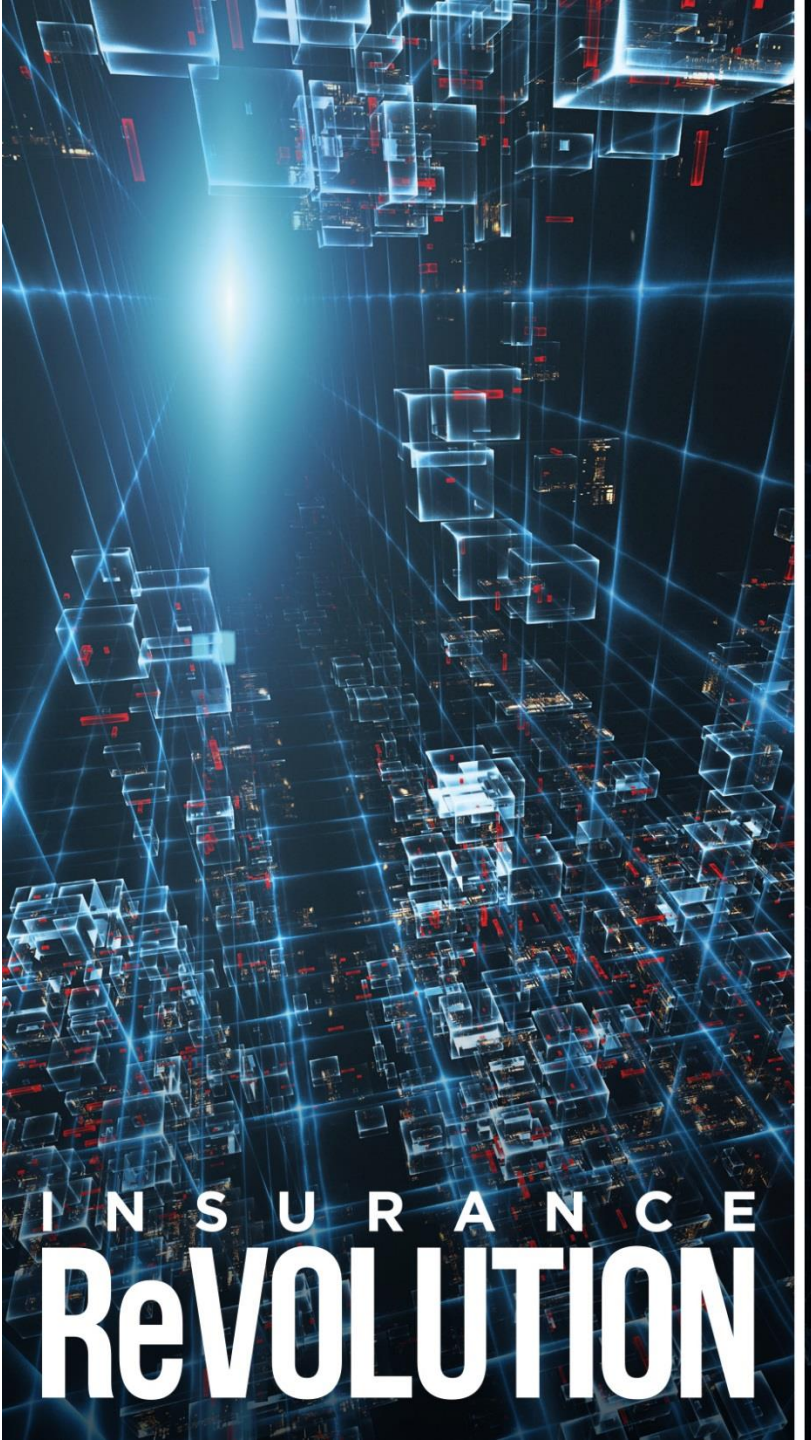
- Artificial Intelligence?
- Robo-Underwriter?
- Molecular Microbiological Prediction?

Key Points: Age / Amount Table – How Has It Changed and What Influenced It?

- **Overall, Age / Amount tables have significantly changed in the past decades in all countries, driven by major influencers including:**
  - Streamlining of evidences
  - Increasing consumer demand for less complicated and speedier processing
  - Innovation and technological advancement enabling faster and new UW approaches
  - Big data analytics improving and innovating UW quality and mortality outcome

Key Points: Age / Amount Table – How Has It Changed and What Influenced It?

- As a result, it is possible (potentially also for preferred) to **underwrite without fluids**, supplemented by additional data, to obtain mortality results similar to those from fully underwritten channels.
- **Innovation will drive further evolution of A&A requirements**, achieving more efficiency and accuracy whilst maintaining the protective value within the Industry's risk appetite.



Part II:

Impact on Mortality for Canada and Similar Countries

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Introduction

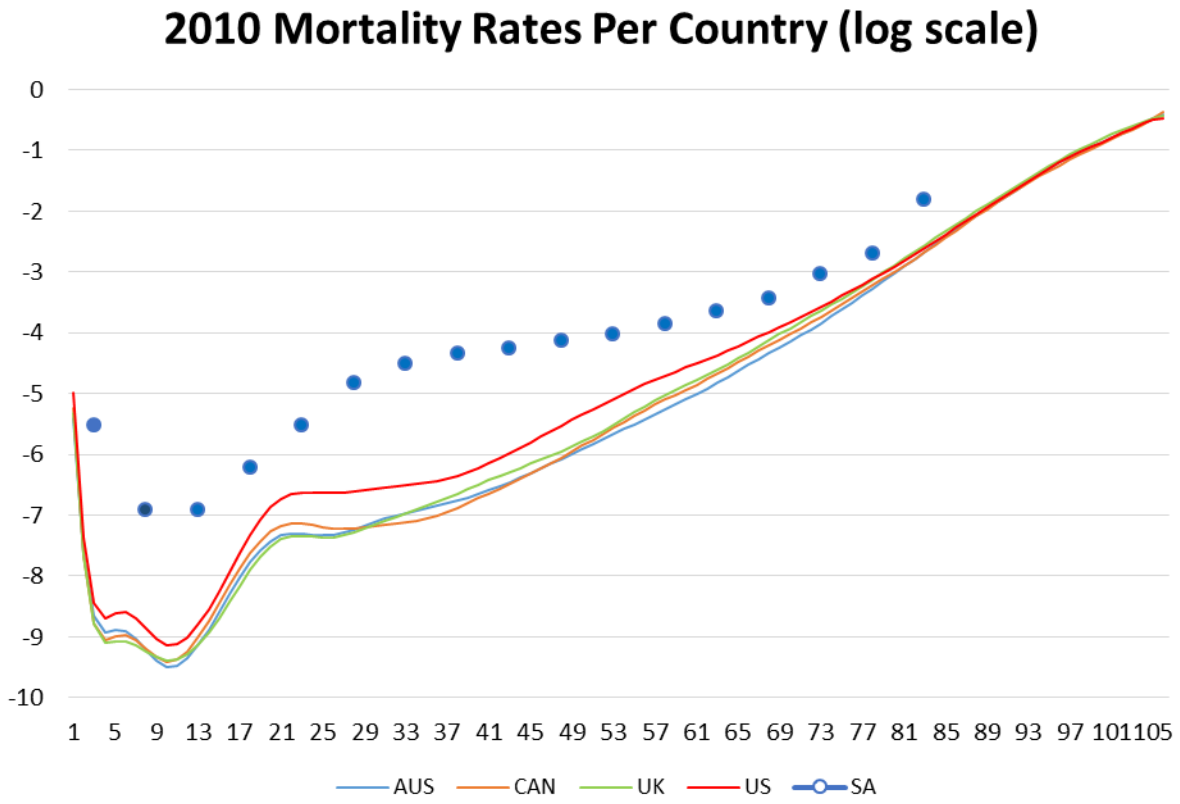
- Most protective studies today are proprietary
- Anti-selection and sentinel effects are difficult to quantify
- An attempt to understand protective value is made using public data:
  - By comparing mortality tables between Canada and “similar” countries (US, UK, AUS)
  - By looking at 10 years of individual life experience from the Canadian Institute of Actuaries

Industry Tables Comparison

- Latest industry tables from US, UK, Australia were compared to the Canadian table
- When available, historic tables were compared to the newest one to try to quantify the effect of underwriting changes
- Tables are expressed as a **ratio of population mortality** at the time the table was built to ensure comparability
- For simplicity and better credibility, only male non-smoker tables will be shown

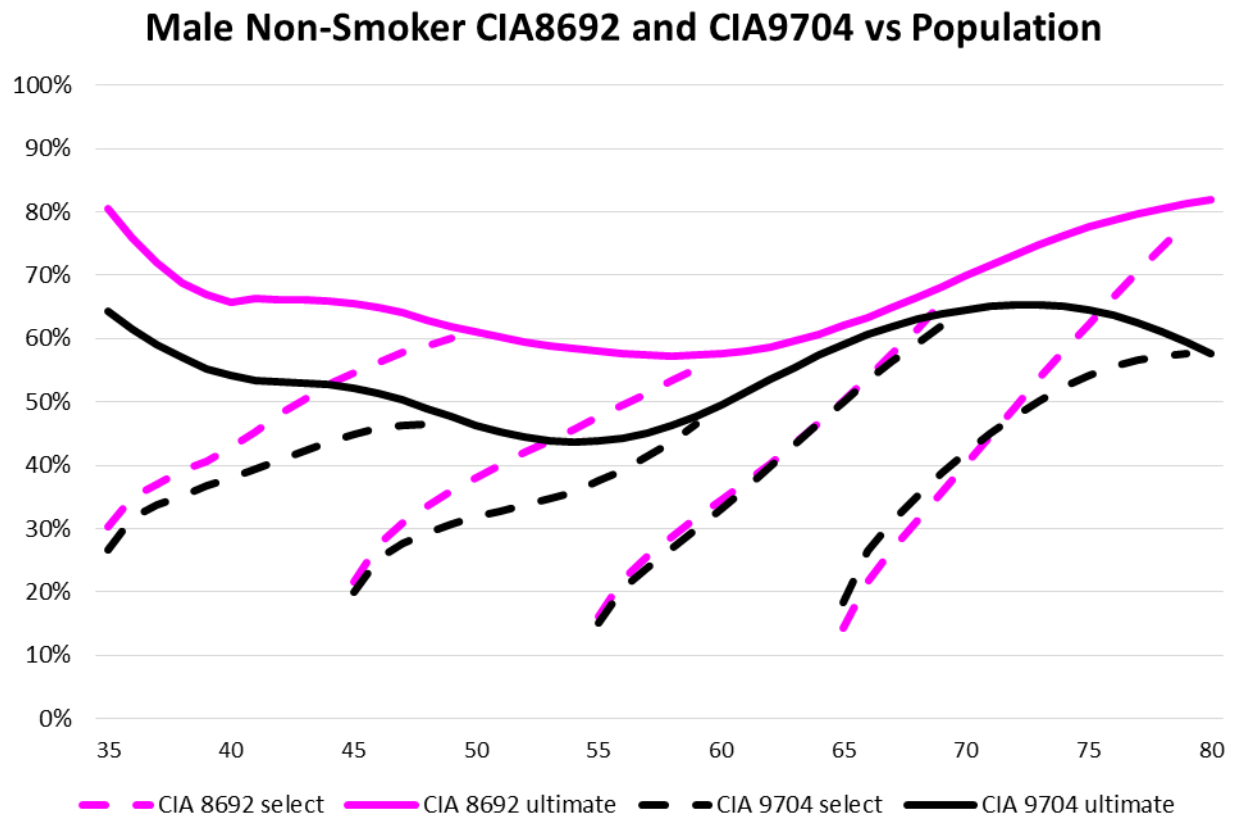
Population Mortality

- Data comes from Human Mortality Database (HMD)
- Canada, UK and Australia mortality rates are similar. US mortality is slightly higher.
- South Africa is much higher which is why it was excluded from the following analysis



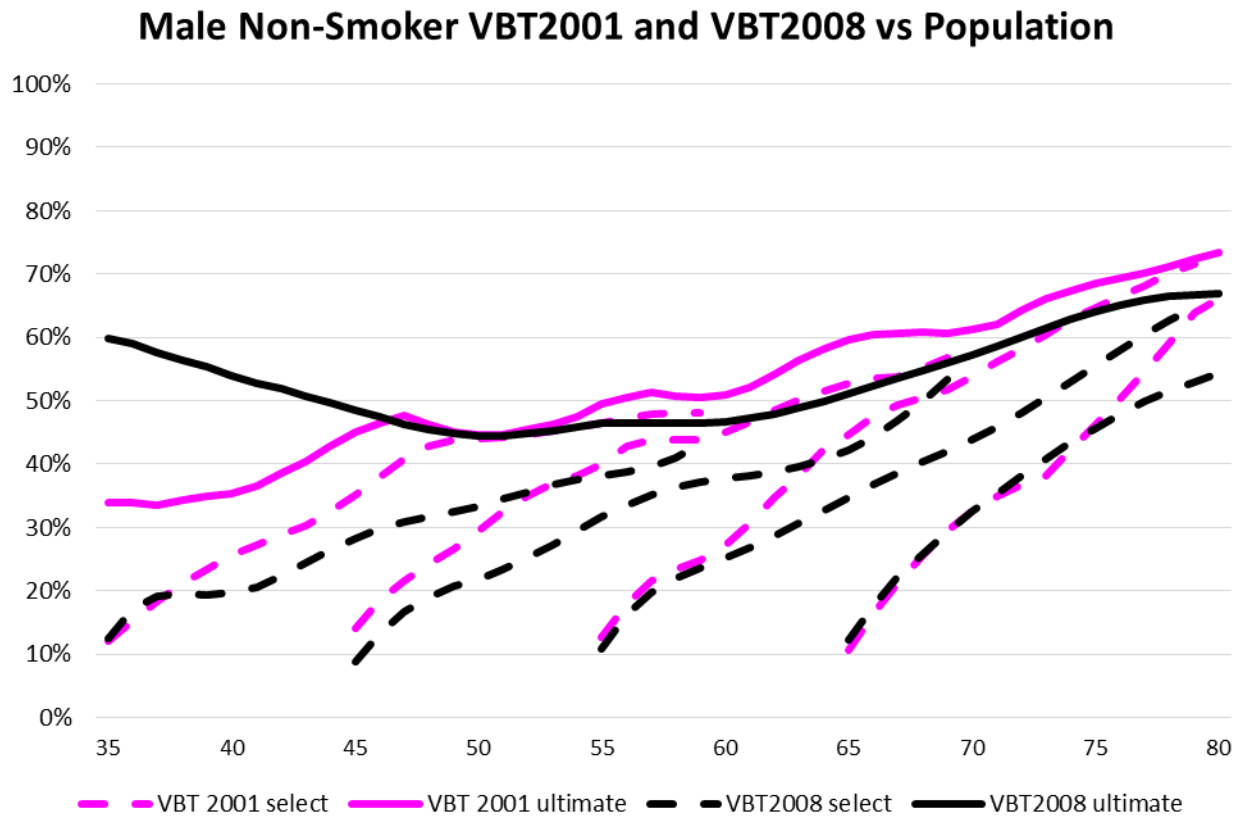
Canada – CIA8692 vs CIA9704

- Both tables have select periods of 15 years
- CIA8692 was too early to reflect blood underwriting in the experience
- CIA9704 will reflect blood underwriting in the select period: convergence from select to ultimate seems to flatten



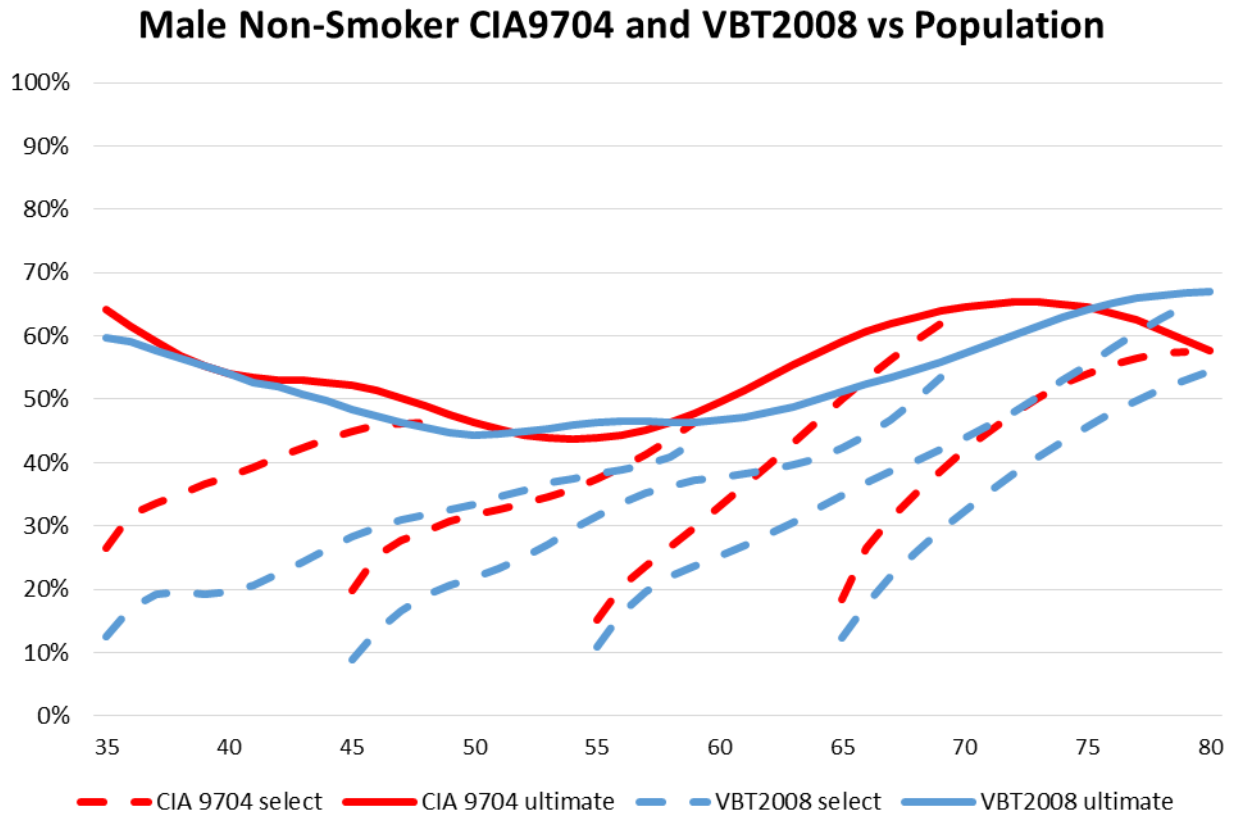
US – VBT2001 vs VBT2008

- The select period in the US tables is 25 years
- VBT2001 was built with data from 1990-1995 and did not have preferred components
- VBT2008 was built to reflect preferred products
- Convergence from select to ultimate rates is much slower on the new table



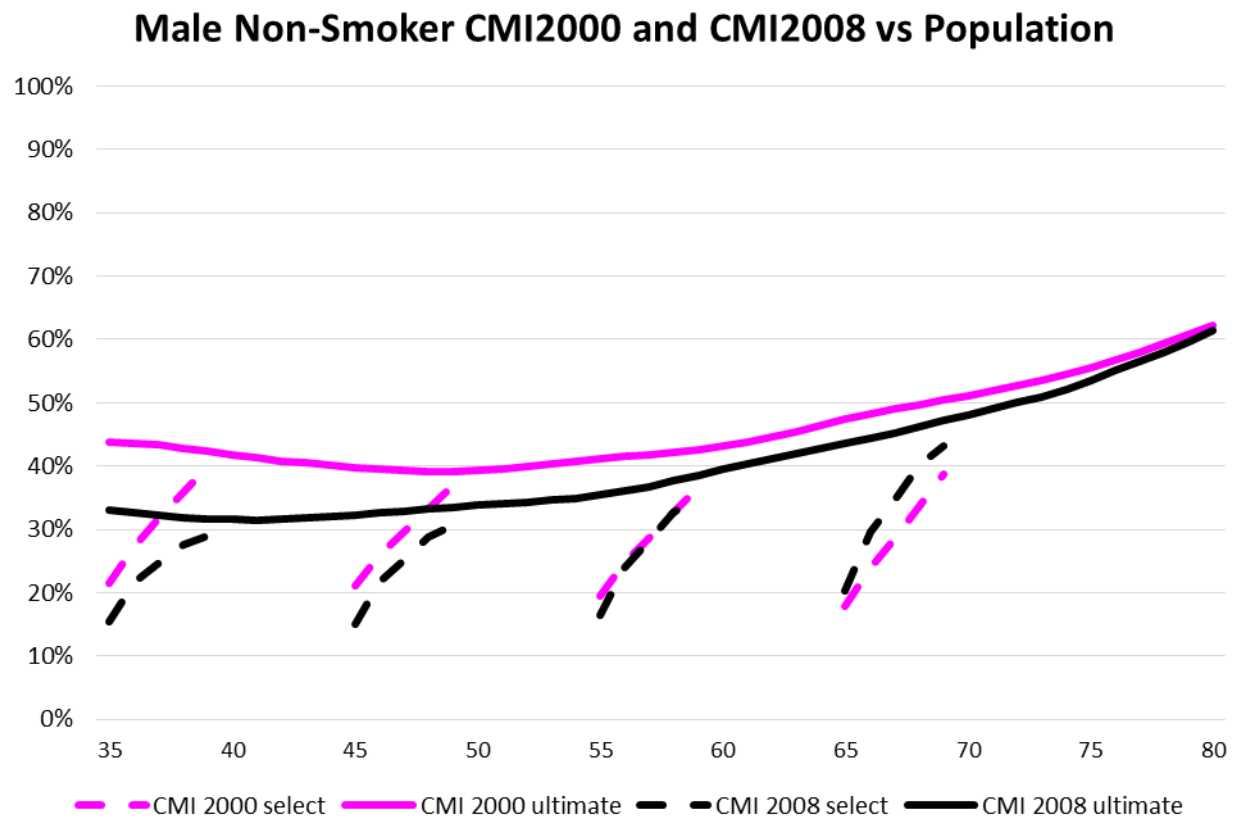
Canada vs US

- The select period is shorter in Canada leading to steeper mortality rates on the first durations
- US is selecting at much lower rates
  - Is this due to higher population mortality?
- The ultimate rates are very similar at 45-60% of population mortality



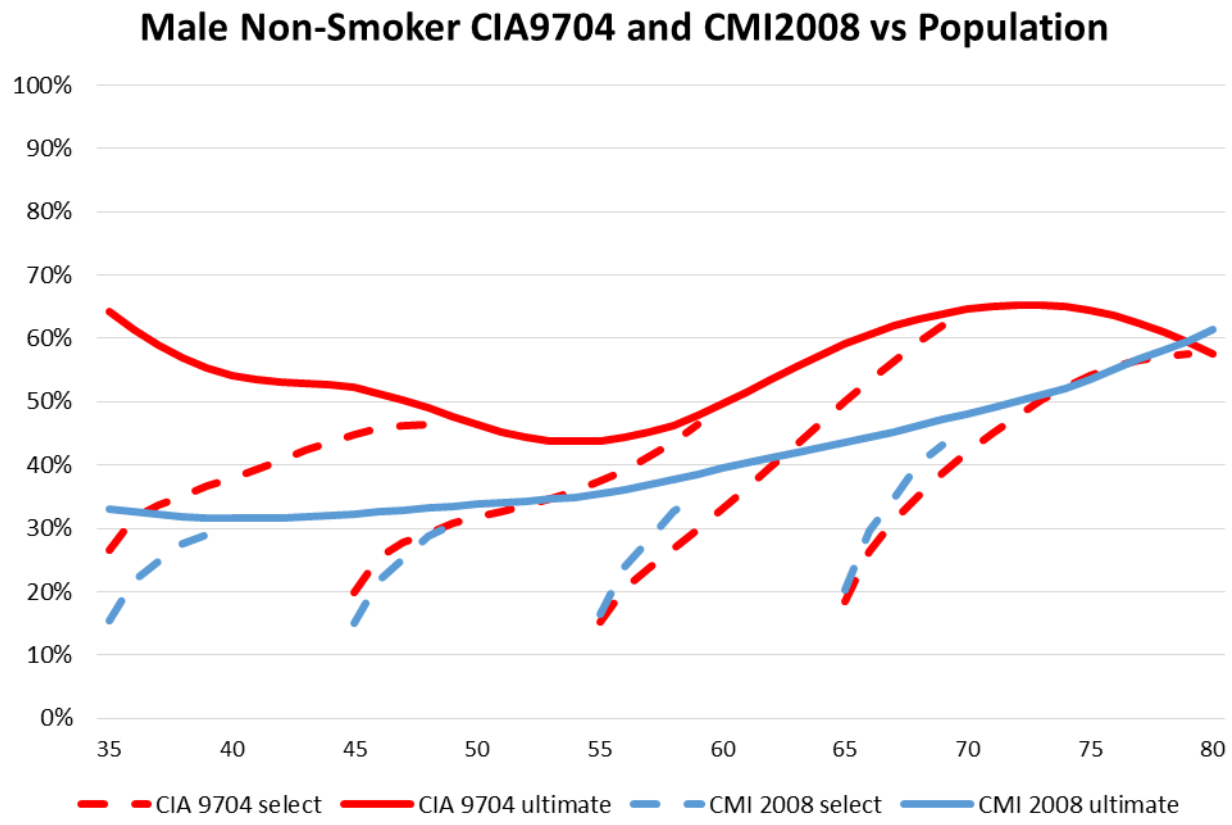
UK – CMI2000 vs CMI2008

- The select period in the UK is 5 years.
- Since the early 2000's, the underwriting standards have become much more strict
- Mortality rates have improved especially on ultimate rates



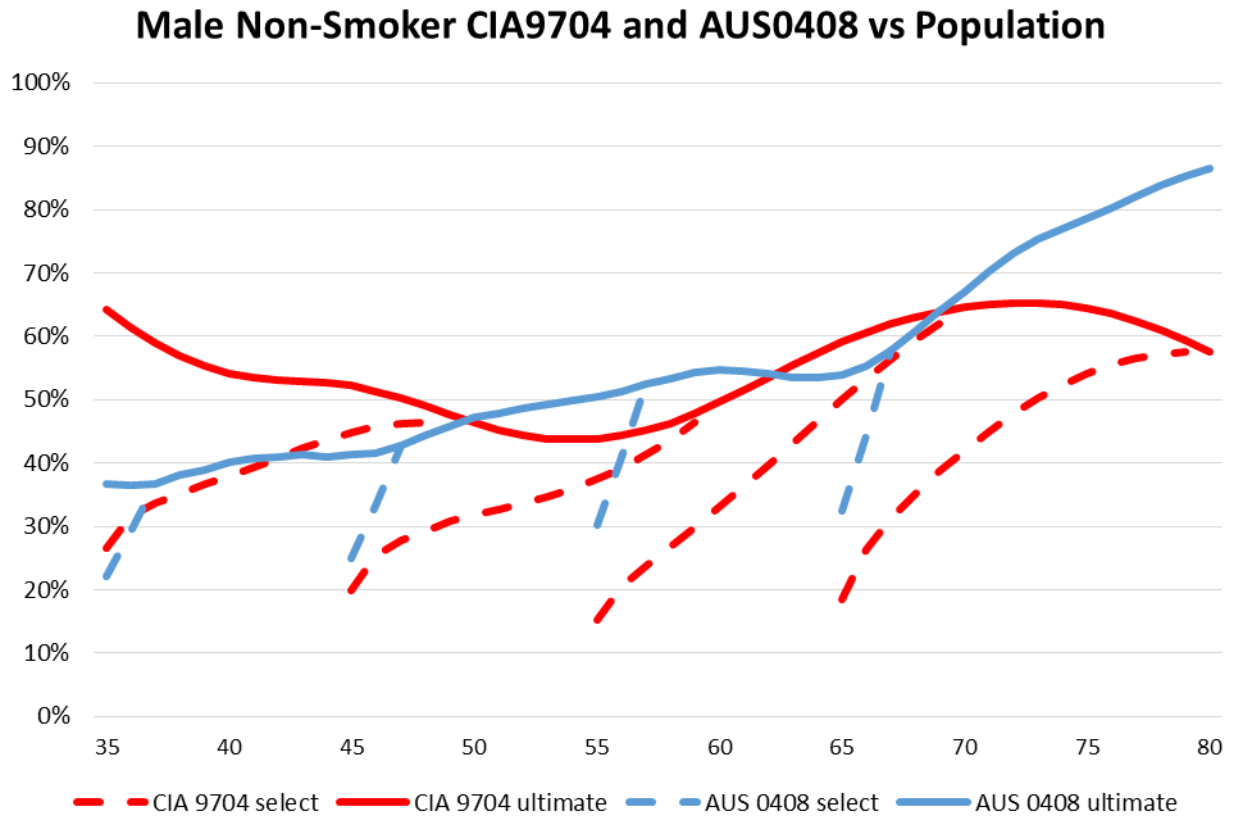
Canada vs UK

- Select rates are similar for ages 45+. UK is better at selecting ages below 45.
- Comparison is difficult for the ultimate rate because of the difference in select period (15 vs 5 years)
- UK appears to do very well considering no blood is requested
  - How does distribution impact this?



Canada vs Australia

- Australia's select period on mortality is only 2 years with early durations higher than Canada for ages 45+
- The ultimate rates for ages 45 to 70 are similar even if Canada's select period is 15 years
- Australia does not request blood and is struggling with mortality
  - How does product design impact this?



10 Years of CIA Data

- Every year, the Canadian Institute of Actuaries publishes a mortality study
- Data supporting the study has been uploaded and made available back to 2005 (2005-2014)
- Included in the data:
  - Post-renewal
  - Conversions
- Excluded from the data:
  - Substandard policies
  - Joint lives
  - Simplified and guaranteed issues (recently)

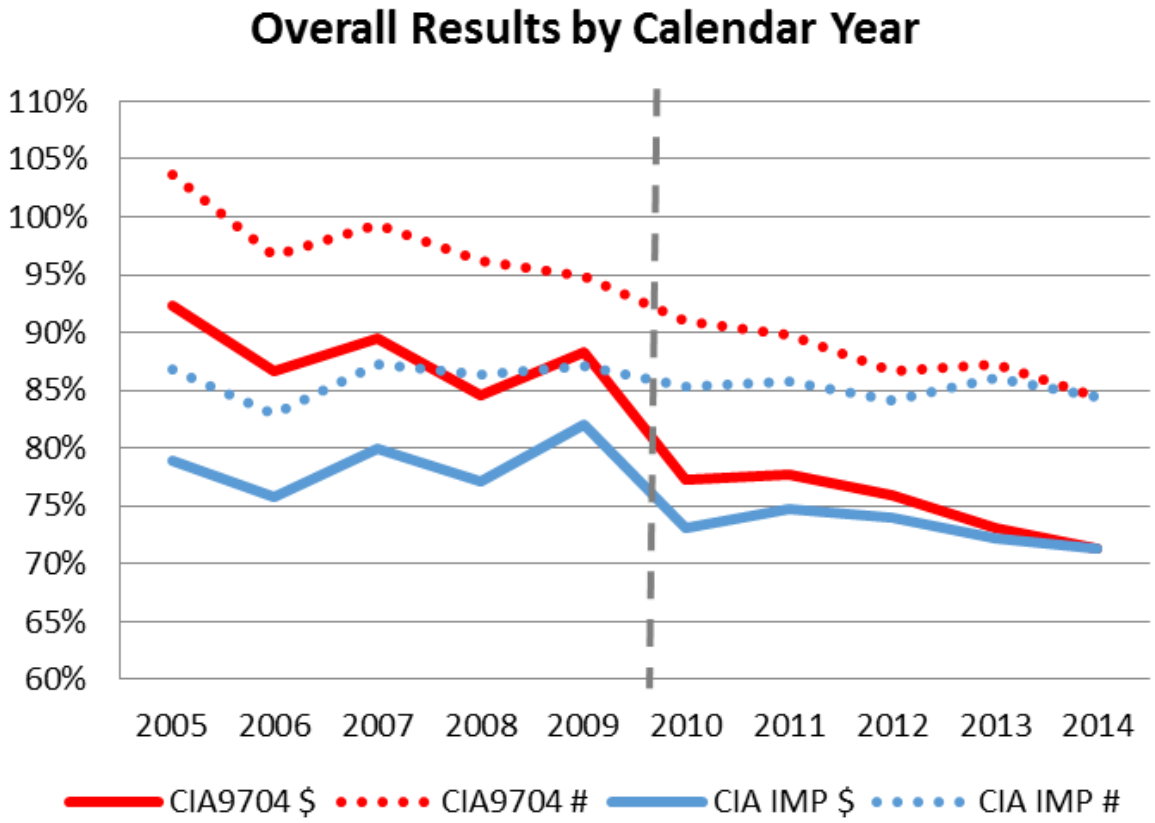
10 Years of CIA Data

- Three different bases will be used:
  - CIA9704 select ultimate mortality table
  - Improved CIA9704 (using smoothed population improvement)
  - Population mortality (Human Mortality Database and Statistics Canada)
- Weighted by:
  - Policy count
  - Face amount
- Caveats:
  - Company mixes may not be the same
  - Some exclusions were applied only later
  - Field definitions could vary by company (ex: preferred vs standard)

10 Years of CIA Data

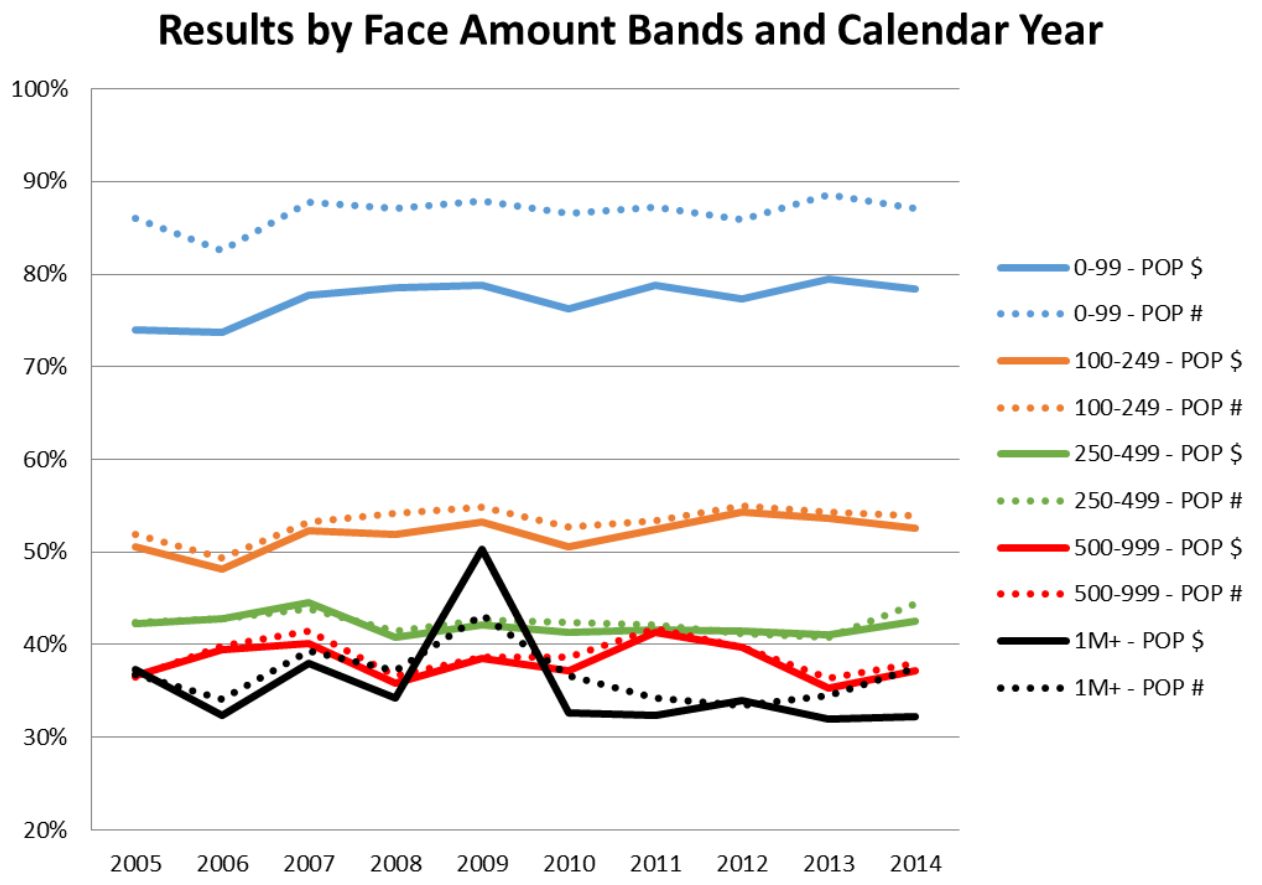
- Both by count and by amount results show improvement. However, by count results are stable while amounts are much more volatile.

- By amount results also show:
  - There is a major difference before and after 2009
  - There seems to be extra mortality improvement over population in the last 5 years



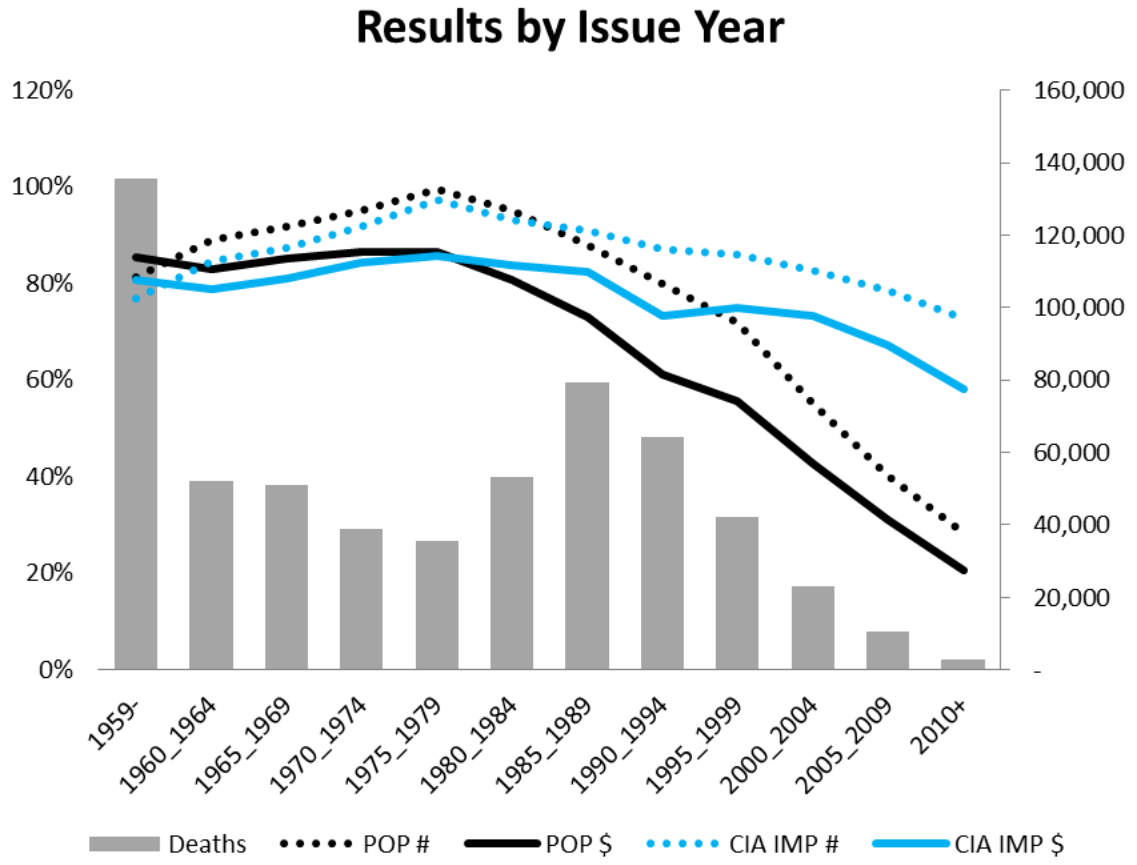
10 Years of CIA Data

- Face amounts below 100K include a lot of smokers
- Higher face amounts of 250K+ are close to 40% of population mortality
- For most amounts, there is no extra improvement over population



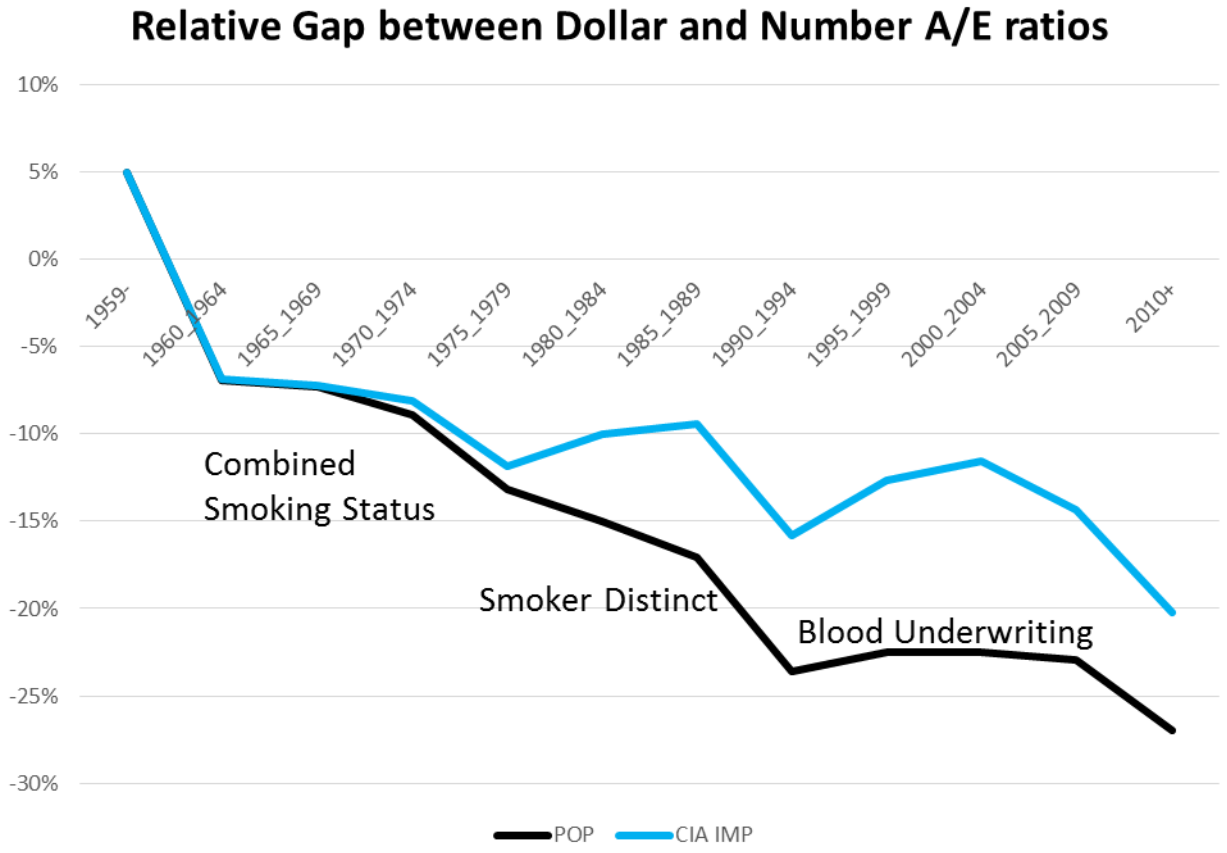
10 Years of CIA Data

- The study contains around 590K claims over 10 years
- Most claims are on policies issued before 1960
- The actual-to-expected on population basis decreases significantly as we get into the select period (1990+)



10 Years of CIA Data

- The gap between number and dollar weights widens after each underwriting generation
- The CIA9704 basis already accounts for smoking status
- For issue years 2010+, the gap between amount and count is close to 20% on a CIA basis, compared to about 8% in the UK and 10% in Australia

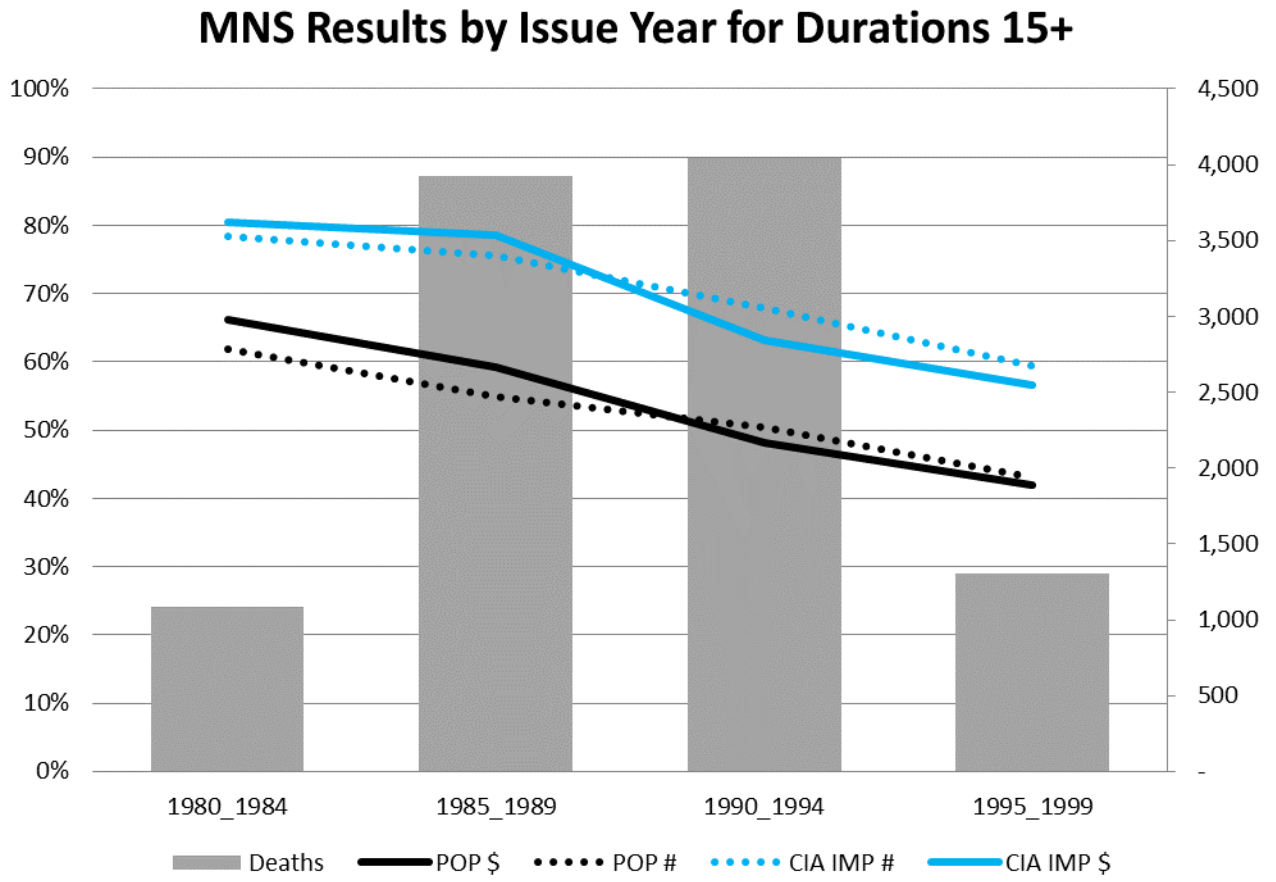


Impact of Underwriting

- To try to quantify the impact of underwriting over time, the following will be manually excluded:
  - Face amounts below 100K$
  - Combined smoker status
  - Post-renewal T10

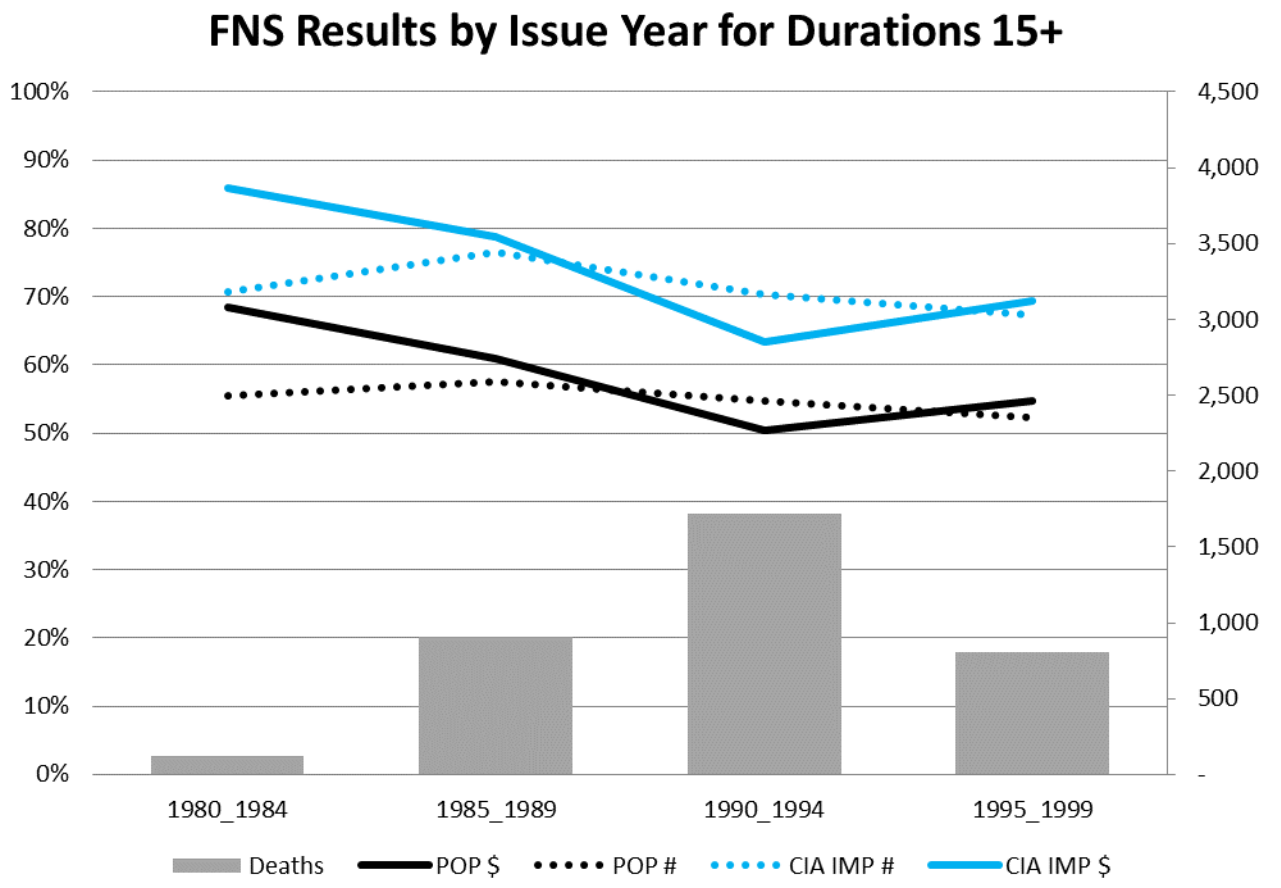
Impact of Underwriting – 1990's

- There is a significant improvement of results after 1990 for male non-smoker
- On the CIA9704 improved basis, the post 1990 experience is better by about 15% by count and 20% by amount
- Post 1995 ultimate experience is about 40% of population mortality which is close to UK experience on durations 5+



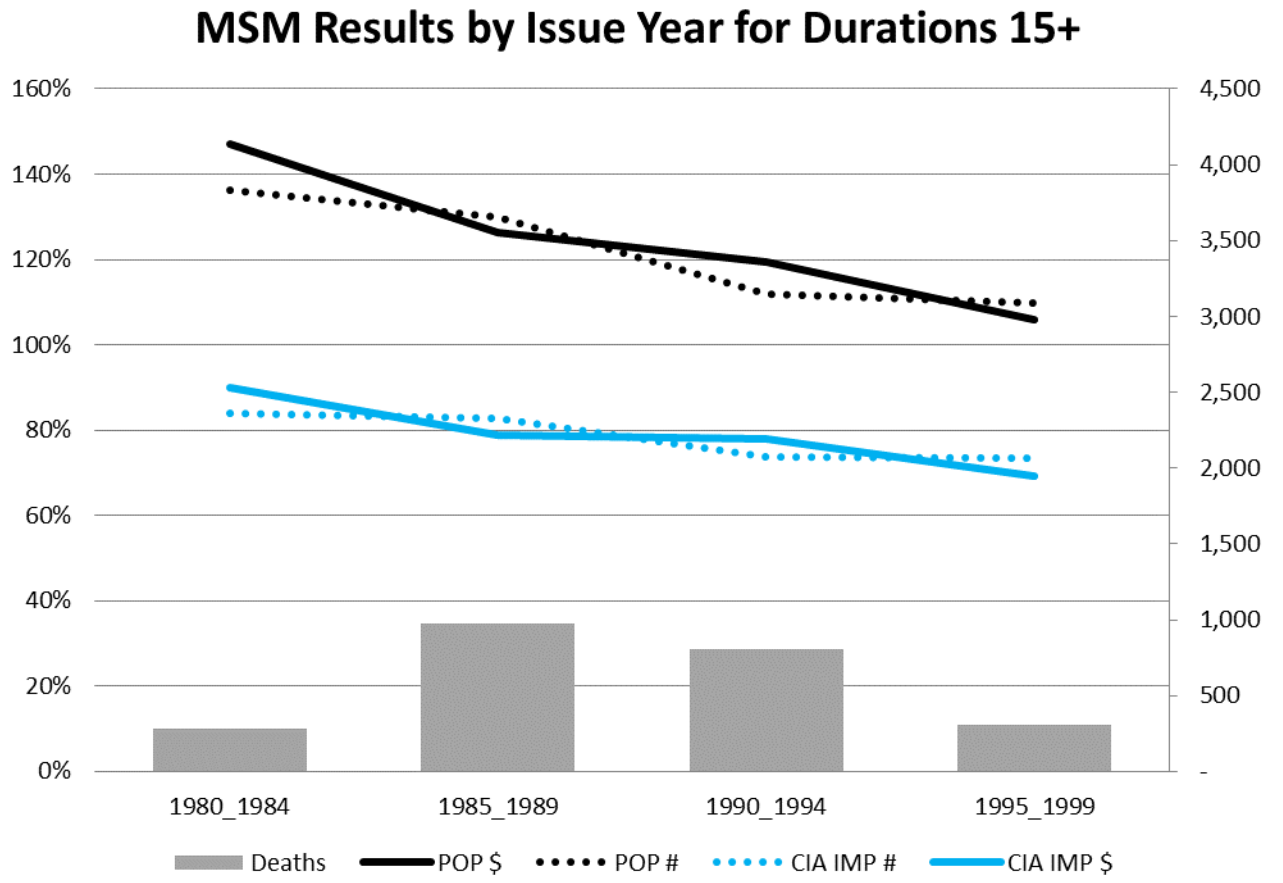
Impact of Underwriting – 1990's

- Results also improved after 1990 for female non-smoker, but not as much
- On the CIA9704 improved basis, post 1990 is better by about 10% by count and 20% by amount
- Post 1995 ultimate mortality is about 55% of population mortality



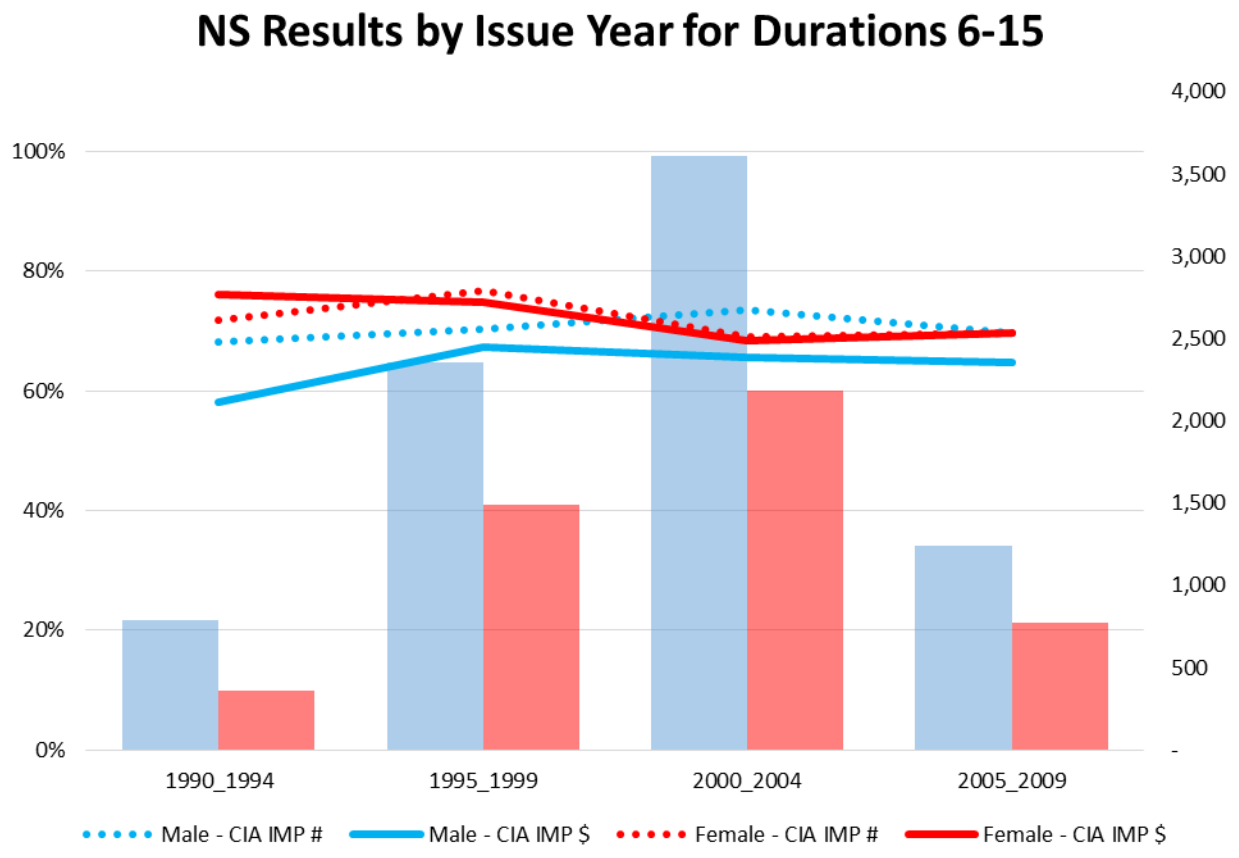
Impact of Underwriting – 1990's

- For male smoker, results improve by about 10% which is less than for non-smoker
- Female smoker is not very credible (less than 1000 claims) and currently shows no improvement after 1990
- Post 1995 ultimate mortality is about 110% of population mortality



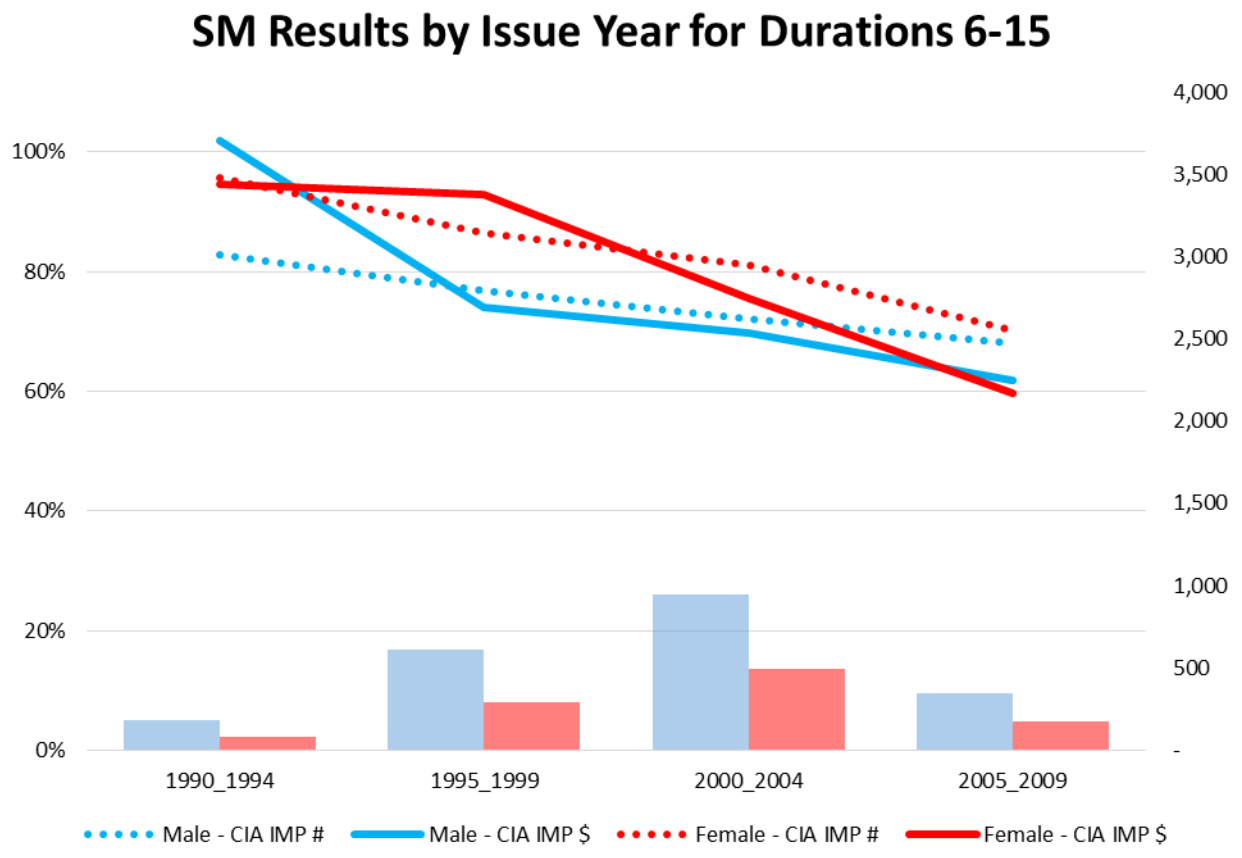
Impact of Underwriting – 2000's

- There is very small improvement for non-smokers issued in the 2000's (durations 6-15)



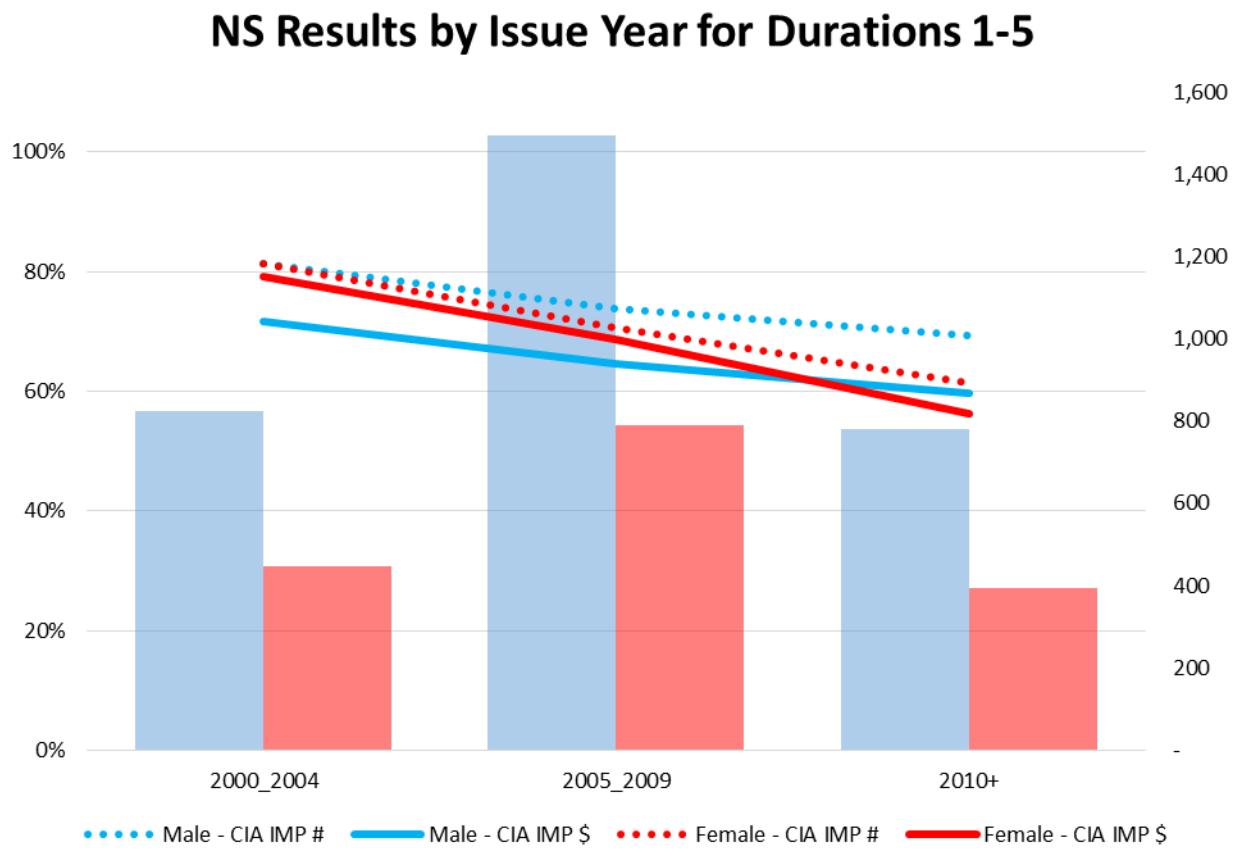
Impact of Underwriting – 2000's

- Smokers have improved a lot from 1990's to 2000's
- There is significantly more improvement by amount than by count



Impact of Underwriting – 2010's

- Over the last 15 years, there has been significant improvement in the first 5 durations for non-smokers.
- Better fraud prevention? Contestable claims management? Accidental death?
- We are currently selecting at about 15% or population mortality for NS, 30% for SM



Key Points from Historical Analysis

- Significant improvement from the 80's to 90's
  - Is blood entirely responsible for 10-20% of improvement?
  - Ultimate mortality is currently at 40% of population for MNS face amounts 100K+. It is 55% for FNS.
- The early 2000's show significant improvement for smoker insured mortality
- Mortality in early durations has improved over the last 15 years
  - Insured mortality is now 15-20% on first durations for non-smokers
- Current mortality levels are extremely low compared to population

Key Points from Country Comparison

- Canada and US exhibit similar patterns in mortality (and underwriting)
- Australia is much more liberal in underwriting and product development, resulting in a much higher overall mortality
- UK does not collect blood but maintains mortality at very low levels (ultimate rates somewhat similar to Canada)
  - Is it due to stricter/better quality underwriting and/or distribution?
  - What are the risk mitigating factors used to offset fluids protective value?

Final Remarks

- The past may not be a good predictor of the future: it can be better, or worse.
- Quantifying the impact of anti-selection and non-disclosure is very difficult. There are a wide range of opinions.
- As an industry, it is important to control and monitor our changes as well as to follow best practices around the world.
- Together, we have reaped the benefits of an improved mortality in the insured population. Let us not forgo these benefits.