

The 2003 Healthcare Conference

**Actuaries Adding Value**

5-7 October 2003  
Scarman House, The University of Warwick

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**Workshop Session C1 :**

**Risk Factors in Insured Lives Mortality  
and Critical Illness Experience**

- q Neil Robjohns
- q Rajeev Shah

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**Risk Factors in Insured Lives  
Mortality and Critical Illness Experience**

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A comparison of Critical Illness versus Mortality

- q Historic Trends
- q Pointers to Future Trends
- q Select Patterns
- q Causes of Claim
- q The impact of claim delays and IBNR

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**Risk Factors in Insured Lives  
Mortality and Critical Illness Experience**

A comparison of Critical Illness versus Mortality

- q **Historic Trends**
- q Pointers to Future Trends
- q Select Patterns
- q Causes of Claim
- q The impact of claim delays and IBNR

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**Historic Trends**

- q Population trends
- q Impact of falling prevalence of smoking
- q Variations by socio-economic group

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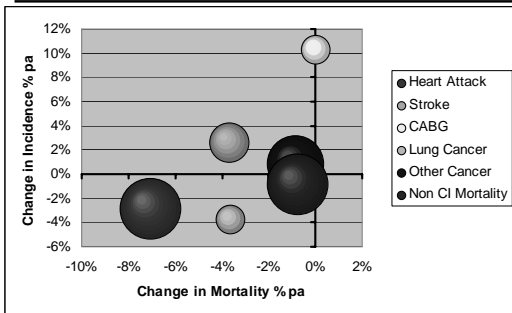
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Summary of Trends in CI Incidence and Mortality  
Best Estimate Avg Change % pa, England & Wales, 1980-2000  
Men, aged 40 - 60



Size of balls represents relative importance of CI measured by incidence rates

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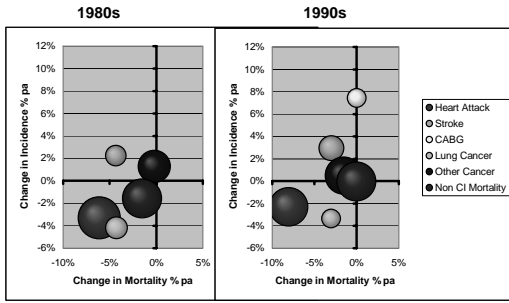
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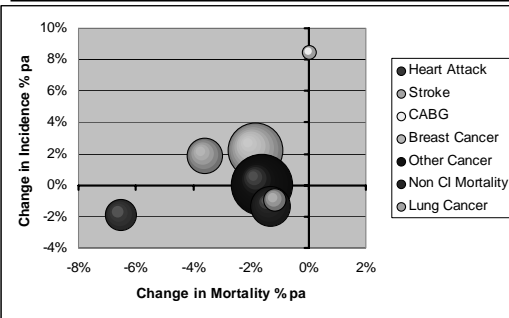
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Summary of Trends in CI Incidence and Mortality  
 Best Estimate Avg Change % pa, England & Wales, 1980-2000  
 Women, aged 40 - 60



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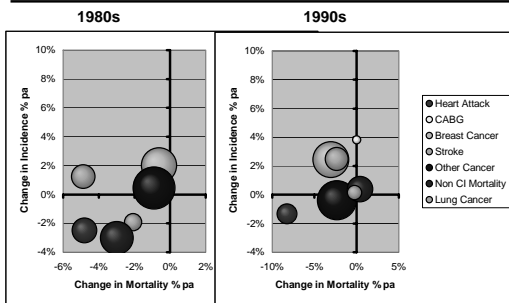
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Summary of Trends in CI Incidence and Mortality  
 Best Estimate Avg Change % pa, England & Wales, 1980-2000  
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**Overview of CI Trends research**  
Impact of Changes in Smoking Prevalence

Rough estimates of the risks faced by 'typical' smokers relative to those who have never smoked are :

- q Heart Attack risk - 2 to 3 times higher
- q Stroke risk - 2 to 4 times higher
- q Overall Cancer risk - around double
- q Lung Cancer risk - 10 to 15 times higher

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**Summary of Trends in CI Incidence and Mortality**  
 Rough Estimate Avg Change % pa, England & Wales, 1980-2000  
 Men, aged 40 - 60

	Incidence Rates			Mortality Rates		
	1980's	1990's	Overall	1980's	1990's	Overall
Heart Attack	-3.3%	-2.3%	-2.8%	-6.1%	-8.1%	-7.1%
Stroke	2.3%	3.0%	2.6%	-4.3%	-3.0%	-3.7%
CABG	13.3%	7.5%	10.4%	0%	0%	0%
Lung Cancer	-4.1%	-3.3%	-3.7%	-4.3%	-3.0%	-3.7%
Other Cancer	1.3%	0.5%	0.9%	-0.2%	-1.5%	-0.9%
<b>Non CI Mortality</b>	<b>-1.5%</b>	<b>0.0%</b>	<b>-0.8%</b>	<b>-1.5%</b>	<b>0.0%</b>	<b>-0.8%</b>
<b>Overall</b>						
Standalone	-1.1%	0.2%	-1.0%			
Accelerated	-1.3%	0.1%	-0.9%	-2.9%	-2.3%	-2.6%
<b>After Stripping out Impact of Fall in Smoking</b>						
Standalone	-0.1%	0.7%	-0.2%			
Accelerated	-0.3%	0.6%	-0.1%	-1.9%	-2.0%	-2.0%

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**Summary of Trends in CI Incidence and Mortality**  
 Rough Estimate Avg Change % pa, England & Wales, 1980-2000  
 Women, aged 40 - 60

	Incidence Rates			Mortality Rates		
	1980's	1990's	Overall	1980's	1990's	Overall
Heart Attack	-2.5%	-1.3%	-1.9%	-4.8%	-8.2%	-6.5%
Stroke	1.3%	2.5%	1.9%	-4.9%	-2.4%	-3.6%
CABG	13.3%	3.8%	8.5%	0%	0%	0%
Breast Cancer	2.0%	2.5%	2.2%	-0.6%	-3.1%	-1.9%
Lung Cancer	-1.9%	0.2%	-0.9%	-2.1%	-0.3%	-1.2%
Other Cancer	0.5%	-0.4%	0.0%	-0.9%	-2.3%	-1.6%
<b>Non CI Mortality</b>	<b>-3.0%</b>	<b>0.4%</b>	<b>-1.3%</b>	<b>-3.0%</b>	<b>0.4%</b>	<b>-1.3%</b>
<b>Overall</b>						
Standalone	0.5%	0.9%	0.6%			
Accelerated	-0.2%	0.8%	0.2%	-2.3%	-1.6%	-2.0%
<b>After Stripping out Impact of Fall in Smoking</b>						
Standalone	1.1%	1.2%	1.0%			
Accelerated	0.4%	1.1%	0.6%	-1.6%	-1.4%	-1.5%

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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 :

- **Changes in smoking** prevalence accounted for **falls** of a little over **1%pa** for men and **½%pa** for women in the 1980's.
- This effect is waning and was much smaller in the 1990's.
- Even after allowing for this smoking prevalence effect, trends for the **1990's** were **worse than** for the **1980's**.

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**.
- **Mortality** rates **fell** by **2%pa** for men, **1½%pa** for women.

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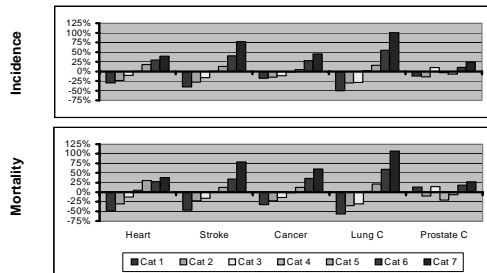
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**Relative CI Rates by Deprivation Category**  
**Scotland, 1989 – 93, Ages 40 – 59, Males**




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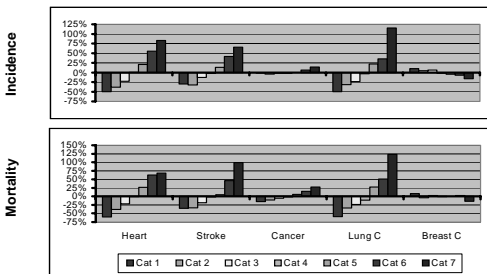
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**Relative CI Rates by Deprivation Category**  
**Scotland, 1989 – 93, Ages 40 – 59, Females**




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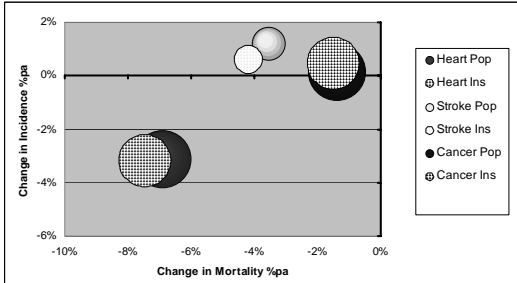
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**Summary of Trends in CI Incidence and Mortality**  
 Avg Change % pa, Scotland, Population & Insured (Dep Cat 1 - 3)  
 Men, aged 40 – 60, 1981 - 2000



Size of balls represents relative importance of CI measured by incidence rates

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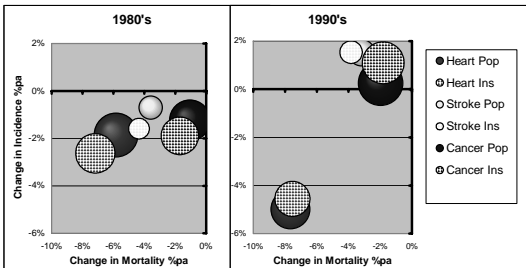
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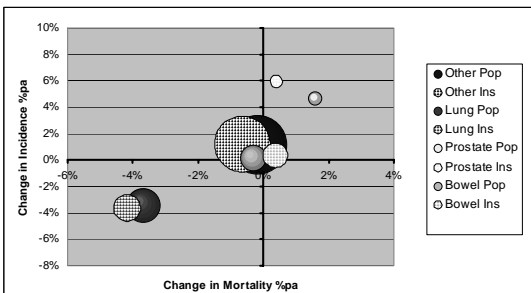
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**Summary of Trends in Cancer Incidence and Mortality**  
 Avg Change % pa, Scotland, Population & Insured (Dep Cat 1 - 3)  
 Men, aged 40 – 60, 1981 - 2000



Size of balls represents relative importance of cancer site measured by incidence rates

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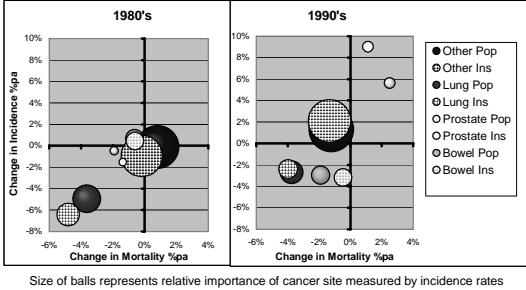
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**Summary of Trends in Cancer Incidence and Mortality**  
 Avg Change % pa, Scotland, Population & Insured (Dep Cat 1 - 3)  
 Men, aged 40 – 60, 1981 - 2000




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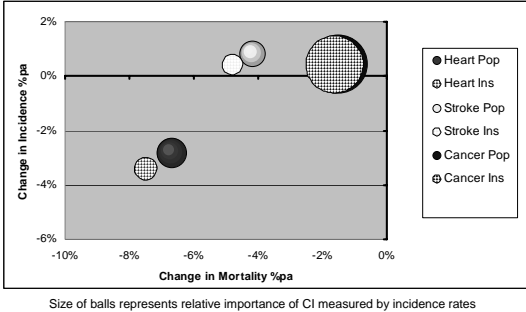
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**Summary of Trends in CI Incidence and Mortality**  
 Avg Change % pa, Scotland, Population & Insured (Dep Cat 1 - 3)  
 Women, aged 40 – 60, 1981 - 2000




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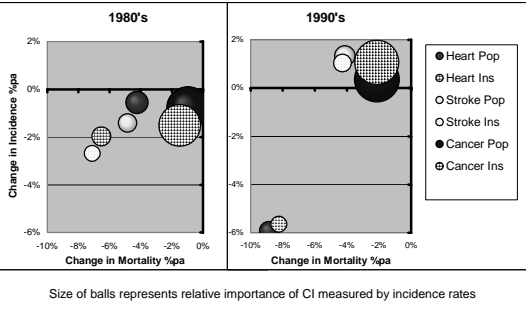
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**Summary of Trends in CI Incidence and Mortality**  
 Avg Change % pa, Scotland, Population & Insured (Dep Cat 1 - 3)  
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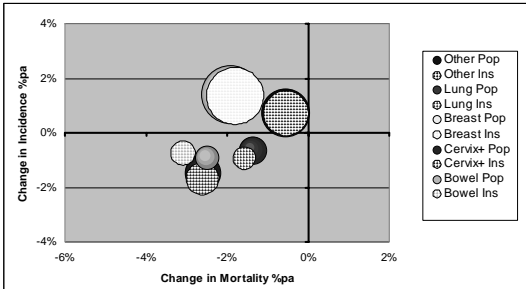
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**Summary of Trends in Cancer Incidence and Mortality**  
 Avg Change % pa, Scotland, Population & Insured (Dep Cat 1 - 3)  
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Size of balls represents relative importance of cancer site measured by incidence rates

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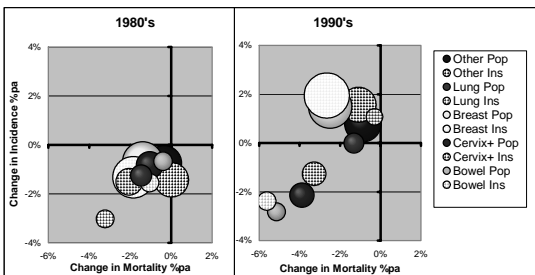
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 Avg Change % pa, Scotland, Population & Insured (Dep Cat 1 - 3)  
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**Summary of Trends in CI Incidence and Mortality**  
 Population & Insured (Dep Cat 1 - 3)  
 Estimates for 40 – 60 age group, Scotland, 1980-2000

- For the 'insured group' relative to the population :
- Rates for heart attack and stroke are around 75% to 80%.
  - Rates for lung cancer are around 65% to 70%.
  - Rates for other cancers are around 95% to 110%.

So,

- Cancer is a larger part of total cost for insured lives than population.

And for trends on each major CI, the 'insured group' :

- Fared **better** in the **1980's** (bigger falls, lesser rises).
- Fared **worse** in the **1990's**.

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**Risk Factors in Insured Lives  
Mortality and Critical Illness Experience**

A comparison of Critical Illness versus Mortality

- q Historic Trends
- q **Pointers to Future Trends**
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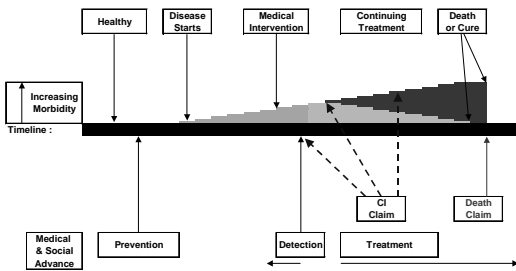
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**Simplistic Model of Disease Timeline**



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**Simplistic Model of Disease Timeline  
Prevention - Possible Outlook for Trends**

- q Generally positive for both Mortality and CI,
  - q ... but beware lifestyle changes and obesity.
- q Likely steady trend,
  - q ... but possible leaps forward (eg: Genetics, Polypill, ??).
- q Positive impact of falling prevalence of smoking will run out of steam.
- q Reduced impact on insured lives ?
- q Little impact on cancer ?
- q Strong positive impact of prevention measures on heart attack rates over last 20 years.

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**Simplistic Model of Disease Timeline  
Detection - Possible Outlook for Trends**

- q Almost all negative for CI (earlier claims, less severity),  
q But positive for mortality,
  
- q Probable step change / shocks.
  
- q Even if not developed into national screening programmes, unleashes clear scope for anti-selective behaviour by insureds.
  
- q CI definitions without a severity underpin are clearly vulnerable.

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**Simplistic Model of Disease Timeline  
Treatment - Possible Outlook for Trends**

- q Expect improvements in mortality / morbidity, but after CI claim event.
  
- q May reduce CI rates where CI definitions have a credible, effective severity underpin.
  
- q If morbidity post CI-event is reduced, benefits become nearer to "windfall" status.

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**Pointers to Future Trends**

- q Consider how our interests are aligned with medical advances and social change
  
- q Outlook for mortality remains very positive
  
- q But impact of medical advance on CI is far less clear
  - q Potential steady gains from prevention measures,
  - q But likely step-increases from disease / event detection,
  - q Possible gains from treatment mainly accrue to insureds under current definitions.

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**Risk Factors in Insured Lives  
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- q Causes of Claim
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**Select Patterns**

- q Population Comparisons
- q Male / Female Differentials
- q Initial Selection
- q Smoker Selection
- q Selection by Distribution Channel

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**Comparison against population rates for Males**

	Non Smoker		
	Mortality		Critical Illness
	Term Assurance	Acceleration	Stand Alone
D0	18%	34%	40%
D1	29%	32%	32%
D2+	36%	36%	35%
DAII	34%	35%	35%

	Smoker		
	Mortality		Critical Illness
	Term Assurance	Acceleration	Stand Alone
D0	30%	71%	72%
D1	65%	71%	43%
D2+	82%	65%	93%
DAII	75%	68%	76%

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**Comparison against population rates for Females**

<b>Non Smoker</b>			
	Mortality		Critical Illness
	Term Assurance	Acceleration	Stand Alone
D0	20%	45%	64%
D1	35%	43%	35%
D2+	42%	48%	51%
DAII	40%	46%	51%

<b>Smoker</b>			
	Mortality		Critical Illness
	Term Assurance	Acceleration	Stand Alone
D0	42%	60%	38%
D1	50%	56%	45%
D2+	82%	52%	103%
DAII	76%	55%	68%

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**Male-Female Differentials**

<b>F/M - Non Smokers</b>			
	Mortality		Critical Illness
	Term Assurance	Acceleration	Stand Alone
31-40	73%	136%	108%
41-50	117%	165%	161%
51-60	106%	124%	154%

<b>F/M - Smokers</b>			
	Mortality		Critical Illness
	Term Assurance	Acceleration	Stand Alone
31-40	101%	68%	49%
41-50	80%	92%	94%
51-60	103%	84%	219%

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**Initial Selection**

<b>Males - Non Smokers</b>			
	Mortality		Critical Illness
	Term Assurance	Acceleration	Stand Alone
D0/DAII	54%	98%	114%
D1/DAII	85%	92%	91%
D2+/DAII	107%	104%	98%

<b>Males - Smokers</b>			
	Mortality		Critical Illness
	Term Assurance	Acceleration	Stand Alone
D0/DAII	40%	105%	95%
D1/DAII	87%	104%	57%
D2+/DAII	109%	96%	122%

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**Initial Selection**

Females - Non Smokers			
	Mortality		CI
	Term Assurance	Acceleration	Stand Alone
D0/DAII	50%	97%	125%
D1/DAII	87%	93%	68%
D2+/DAII	105%	104%	101%

Females - Smokers			
	Mortality		CI
	Term Assurance	Acceleration	Stand Alone
D0/DAII	55%	110%	55%
D1/DAII	66%	102%	67%
D2+/DAII	107%	94%	151%

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**Smoker differentials**

Male				
		Mortality		Critical Illness
		Term Assurance	Acceleration	Stand Alone
S/NS	31-40	149%	180%	170%
	41-50	203%	250%	288%
	51-60	271%	196%	167%

Female				
		Mortality		Critical Illness
		Term Assurance	Acceleration	Stand Alone
S/NS	31-40	208%	90%	78%
	41-50	138%	139%	168%
	51-60	263%	133%	237%

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**100A/Es Split by Sales Channel - Males**

Non Smoker		
	Full Acceleration	Stand Alone
Bancassurer	37%	32%
Direct Sales	32%	23%
IFA	39%	50%

Smoker		
	Full Acceleration	Stand Alone
Bancassurer	75%	91%
Direct Sales	69%	28%
IFA	63%	70%

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**100A/Es Split by Sales Channel - Females**

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	Non Smoker	
	Full Acceleration	Stand Alone
Bancassurer	50%	54%
Direct Sales	48%	73%
IFA	45%	65%

	Smoker	
	Full Acceleration	Stand Alone
Bancassurer	53%	81%
Direct Sales	70%	100%
IFA	51%	59%

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**Risk Factors in Insured Lives  
Mortality and Critical Illness Experience**

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A comparison of Critical Illness versus Mortality

- q Historic Trends
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**Causes of Claim**

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- q 100 A/E
  
- q Major Causes

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### Claims by Cause - Males

	Critical Illness				Life Assurance				
	A	E	100A/E	100A/All	A	E	100A/E	100A/All	
<b>Cancer</b>	401.0	905.3	44.29	46.09	<b>Cancer</b>	17,460.0	24,832.1	70.31	36.75
<b>Heart Disease</b>	301.0	818.7	36.77	34.60	<b>Heart Disease</b>	16,803.0	28,571.2	58.81	35.37
<b>Stroke</b>	74.0	361.8	20.45	8.51	<b>Stroke</b>	3,347.0	5,446.3	61.45	7.05
<b>Kidney Failure</b>	7.0	32.1	21.81	0.80	<b>Kidney Failure</b>	724.0	1,659.0	43.64	1.52
<b>All*</b>	870.0				<b>All**</b>	47,505.0			

Critical Illness Groupings		Cause of Death Groupings	
Cancer	All neoplasms	Cancer	All neoplasms
Heart Attack	Heart Attack & CABG	Heart Attack	Acute MI, Other IHD & HD & Other Circulatory
Stroke	Stroke	Stroke	Cerebrovascular & Hypertensive
Kidney Failure	Kidney Failure	Kidney Failure	Cirrhosis of liver & Nephritis/Nephrosis
All*	The above & MS, MOT, TPD	All**	The above & other causes analysed

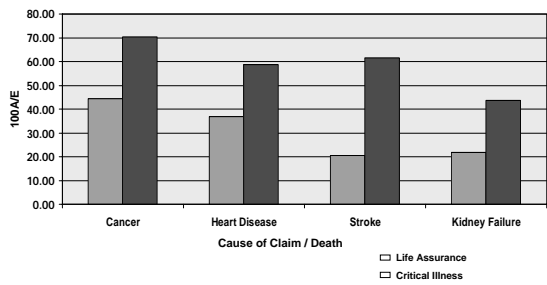
### Claims by Cause - Females

	Critical Illness				Life Assurance				
	A	E	100A/E	100A/All	A	E	100A/E	100A/All	
<b>Cancer</b>	574.0	1,123.1	51.11	76.53	<b>Cancer</b>	4,662.0	6,215.2	75.01	53.41
<b>Heart Disease</b>	27.0	105.5	25.59	3.60	<b>Heart Disease</b>	1,590.0	3,338.3	47.63	18.22
<b>Stroke</b>	42.0	247.4	16.98	5.60	<b>Stroke</b>	763.0	1,310.5	58.22	8.74
<b>Kidney Failure</b>	1.0	17.6	5.68	0.13	<b>Kidney Failure</b>	110.0	297.1	37.02	1.26
<b>All*</b>	750.0				<b>All**</b>	8,729.0			

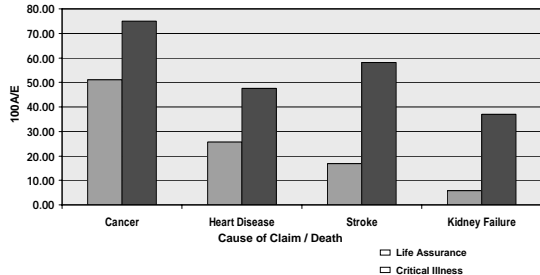
  

Critical Illness Groupings		Cause of Death Groupings	
Cancer	All neoplasms	Cancer	All neoplasms
Heart Attack	Heart Attack & CABG	Heart Attack	Acute MI, Other IHD & HD & Other Circulatory
Stroke	Stroke	Stroke	Cerebrovascular & Hypertensive
Kidney Failure	Kidney Failure	Kidney Failure	Cirrhosis of liver & Nephritis/Nephrosis
All*	The above & MS, MOT, TPD	All**	The above & other causes analysed

### 100A/Es - Critical Illness vs Life Assurance - Males



**100A/Es - Critical Illness vs Life Assurance - Females**




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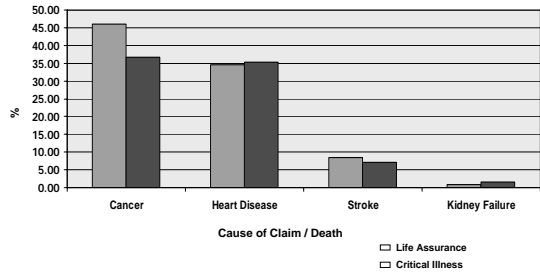
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**Claims by Cause as percentage of All Claims  
Critical Illness vs Life Assurance - Males**




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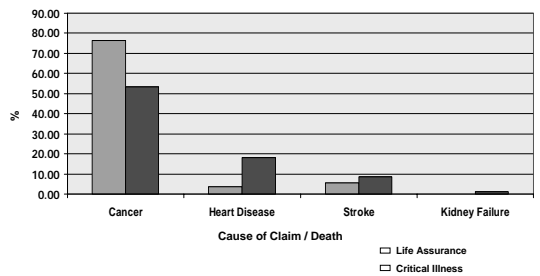
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**Claims by Cause as percentage of All Claims  
Critical Illness vs Life Assurance - Females**




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**Risk Factors in Insured Lives  
Mortality and Critical Illness Experience**

A comparison of Critical Illness versus Mortality

- q Historic Trends
- q Pointers to Future Trends
- q Select Patterns
- q Causes of Claim
- q **The impact of claim delays and IBNR**

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**IBNR**

- q Diagnosis to Notification
- q Diagnosis to Settlement
- q Diagnosis to Settlement\*

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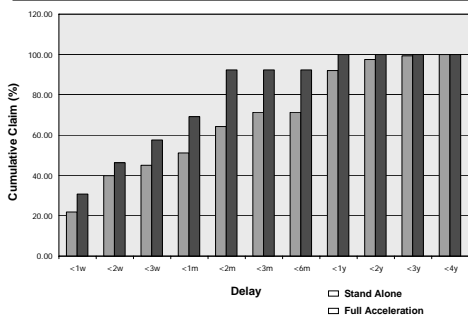
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**Diagnosis – Notification (By Benefit Type)**




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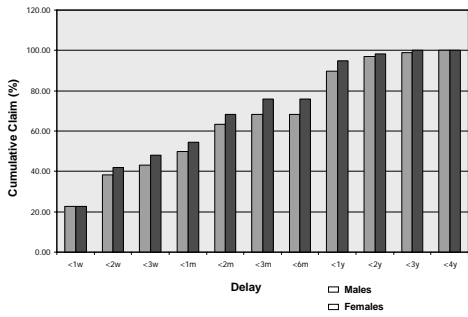
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### Diagnosis – Notification (By Sex)




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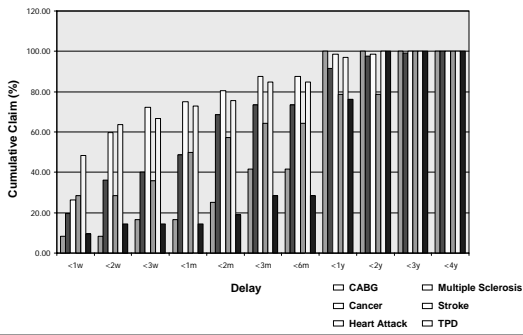
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### Diagnosis – Notification (By Cause)




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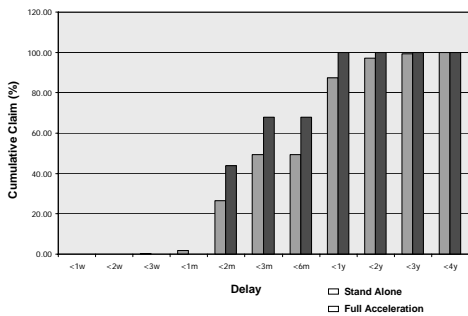
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### Diagnosis – Settlement (By Benefit Type)




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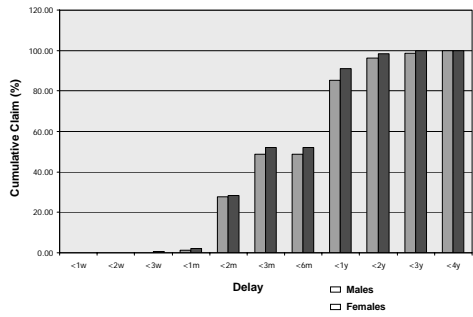
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### Diagnosis – Settlement (By Sex)




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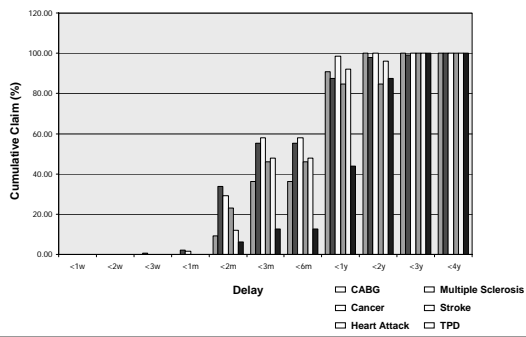
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### Diagnosis – Settlement (By Cause)




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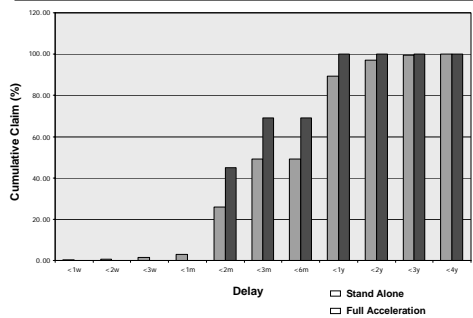
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### Diagnosis - Settlement\* (By Benefit Type)




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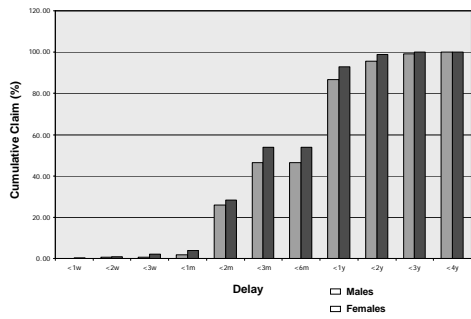
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### Diagnosis – Settlement\* (By Sex)




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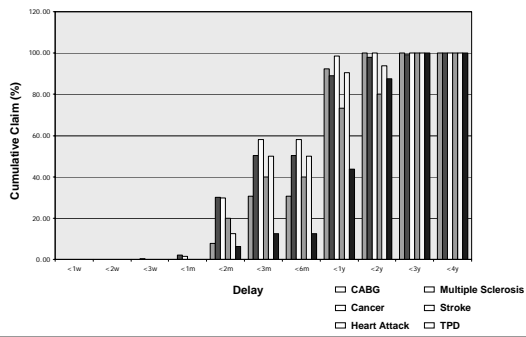
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### Diagnosis - Settlement\* (By Cause)




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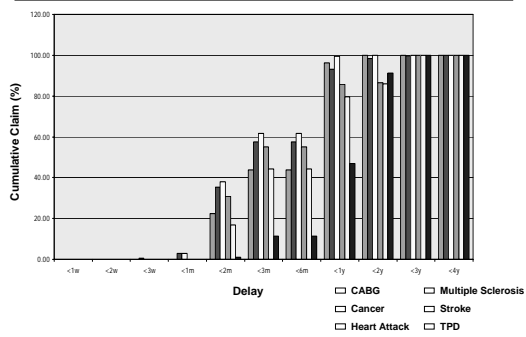
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### Diagnosis - Settlement\* (By Cause – Amounts)




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**Workshop Session C1 :**

**Risk Factors in Insured Lives Mortality  
and Critical Illness Experience**

- q Neil Robjohns
- q Rajeev Shah

q **Questions and Discussion**

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