



**The Actuarial Profession**

making financial sense of the future

# Healthcare Conference 2005

## Using our Resources Wisely

24-26 April 2005

Scarman House, University of Warwick



**The Actuarial Profession**

making financial sense of the future

# Past and Future Trends in Contraction and Diagnosis of Serious Illnesses

Neil Robjohns

Munich Re UK Life Branch

Dr Philip Smalley

RGA International Corporation



**The Actuarial Profession**

making financial sense of the future

# A Brief Summary of the Past

Neil Robjohns

Head of Pricing, Munich Re UK Life Branch

Chairman of Critical Illness Trends Research Group

# Outline

- The CI Trends Research Group
- Some Detail on Trends
  - Cancer
  - Heart Attack
  - Stroke
- Summary of Trends - The Big Picture
  - Variations over time, by sex, by smoker status, by socio-economic group
  - Focussing on the age group 40 – 60
- Mapping a range of possible future outcomes for CI risk costs

# Outline



- The CI Trends Research Group
- Some Detail on Trends
  - Cancer
  - Heart Attack
  - Stroke
- Summary of Trends - The Big Picture
  - Variations over time, by sex, by smoker status, by socio-economic group
  - Focussing on the age group 40 – 60
- Mapping a range of possible future outcomes for CI risk costs

# Critical Illness Trends Research Group

- Our Aims :  
To examine underlying trends in the factors influencing UK Insured Critical Illness claim rates, and from these, to assess :
  - The historic trend in incidence and death rates for the major CI's
  - Any pointers for future trends in Standalone CI, Mortality and hence Accelerated CI.
- Formed in March 2001

# Critical Illness Trends Research Group

## Population Data versus Insured Data

- Insured Data  CMI CI experience study
  - Relevant, but ...
  - Limited in volume, age range and depth
  - Short time series and trends drowned out by noise
  
- Population Data  CI Trends Research Group
  - Need to distil proxy for insured subset, but ...
  - Large volume, full age range, and lots of depth
  - Long time series
  - Combine with knowledge of medical developments to give a platform for projection of a range of future outcomes

# Critical Illness Trends Research Group

## Group Members and our Current Focus

<u>Cancer</u>	<u>Heart Attack &amp; Stroke</u>	<u>Non-CI Mort<sup>y</sup> &amp; Overall Proj<sup>n</sup></u>
■ Actuaries		
Richard Morris Neil Robjohns	Scott Reid Joanne Wells	Hamish Galloway Martin Gilbert
■ Medical Experts		
Professor Rubens Consultant Oncologist	Dr Richard Croxson Consultant Cardiologist	
■ Former members include Azim Dinani, Sue Elliott and Daniel Ryan		



# Critical Illness Trends Research Group

## Focus of Work

- 2001
    - UK Trends in Cancer (30 years), Heart Attack & Stroke (10 years)
  - 2002
    - Further analysis of UK trends, including by deprivation category
    - International comparisons
    - Initial look at MS and TPD
  - 2003
    - Modelling lung cancer and cancer screening programmes
    - Trends in Non-CI mortality
    - Interaction of trends in Heart Attack, CABG and angioplasty
  - 2004
    - Mapping a range of possible future outcomes
  - 2005
    - Update and consolidate analysis to publish paper (and data ?)
-

# Critical Illness Trends Research Group

## The complete published works ... so far

### Presentations :

- Healthcare Conference 2001 (workshop B1)
- Healthcare Conference 2002 (plenary, workshops A1, B1, C3)
- Healthcare Conference 2003 (workshop A1)
- CI Seminar at Staple Inn, 23 May 2003
- Healthcare Conference 2004 (workshop B1/D3)
- Life Convention 2004 (concurrent session D09)
- CI Seminar at Staple Inn, 02 December 2004

### Articles :

- The Actuary, May 2003 and June 2003

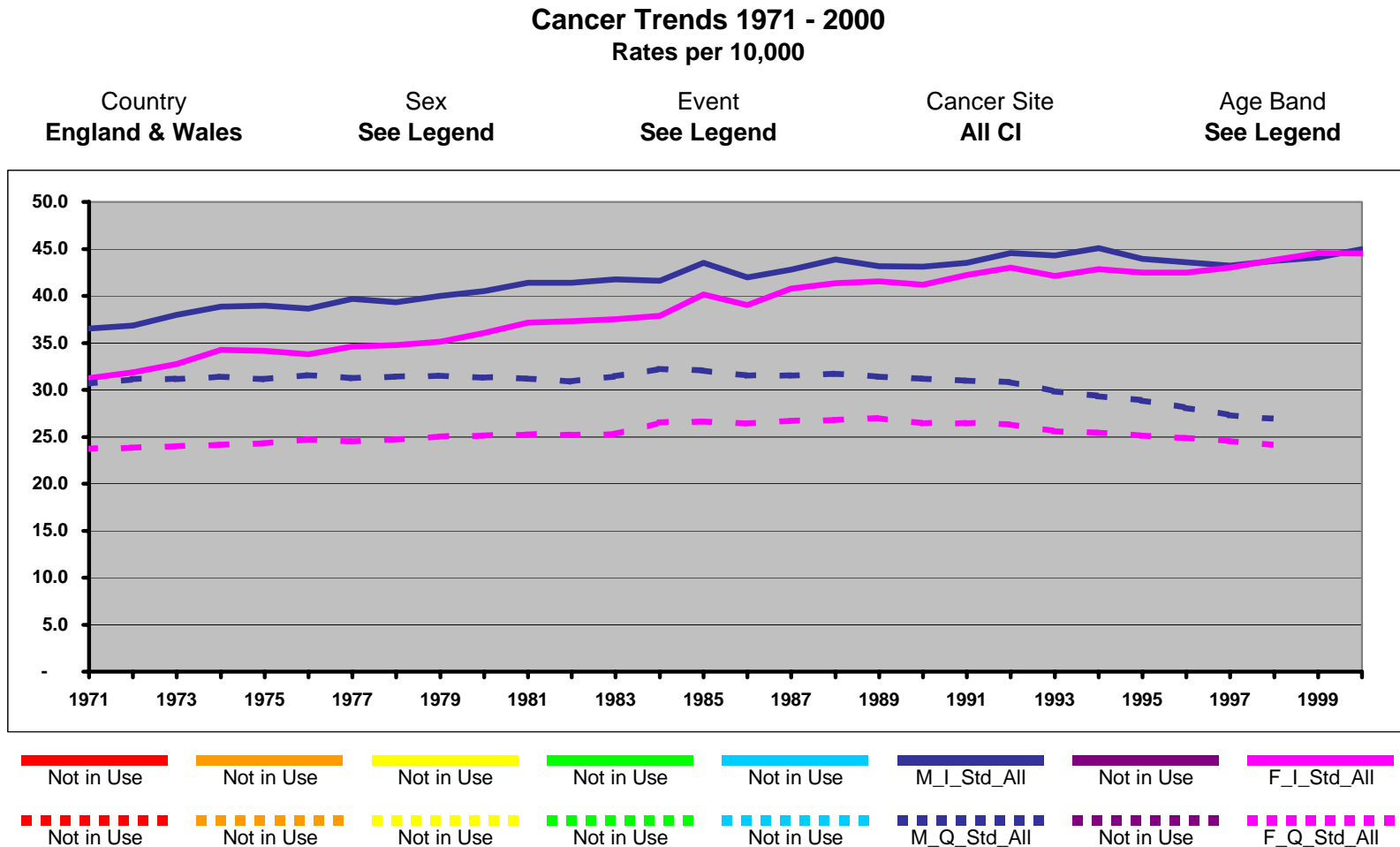
All available via [www.actuaries.org.uk](http://www.actuaries.org.uk)

# Outline

- The CI Trends Research Group
- Some Detail on Trends
  - Cancer
  - Heart Attack
  - Stroke
- Summary of Trends - The Big Picture
  - Variations over time, by sex, by smoker status, by socio-economic group
  - Focussing on the age group 40 – 60
- Mapping a range of possible future outcomes for CI risk costs

# Cancer Incidence and Mortality Rates, 1971 - 2000

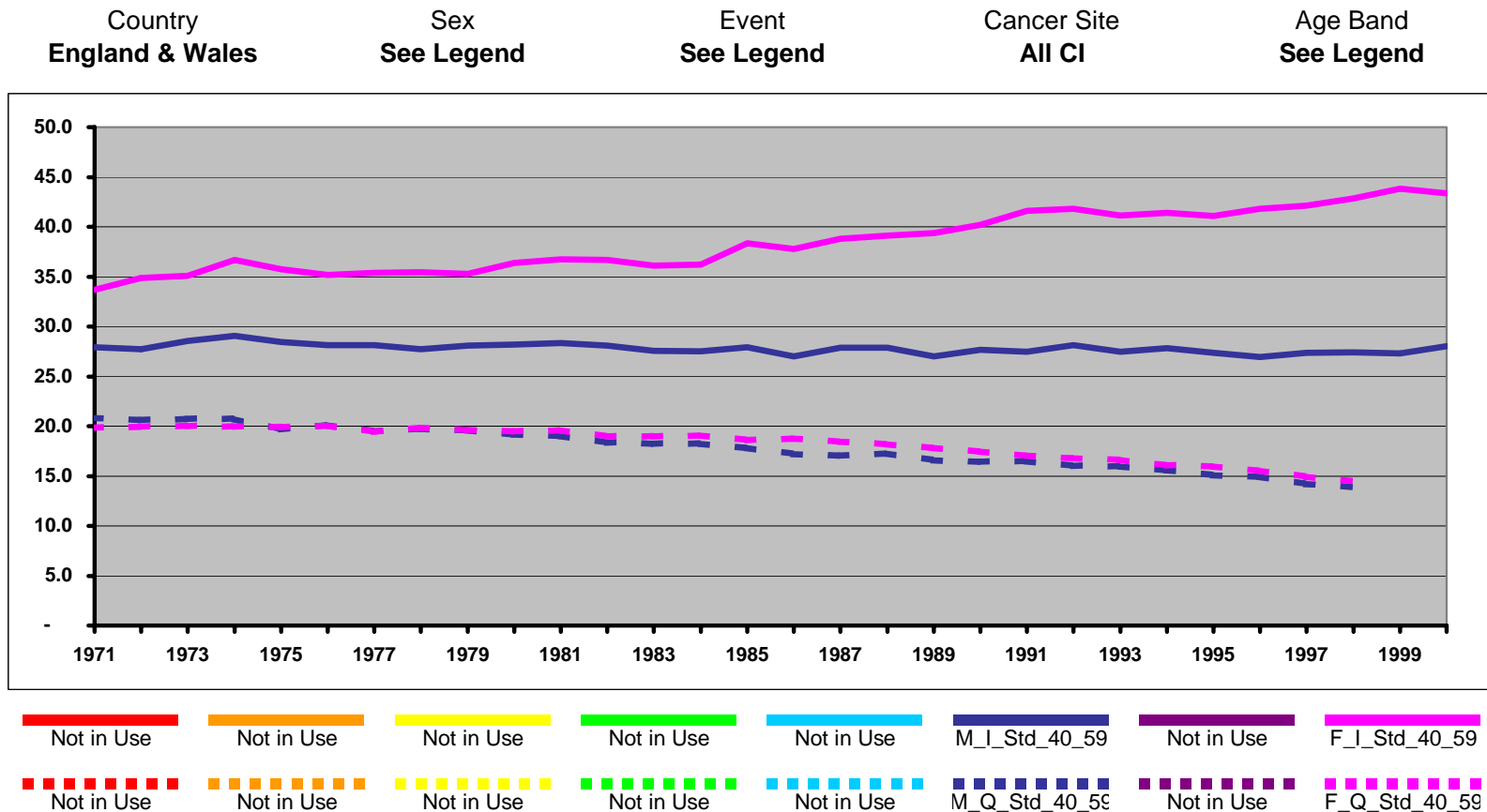
## All Ages (standardised), England & Wales



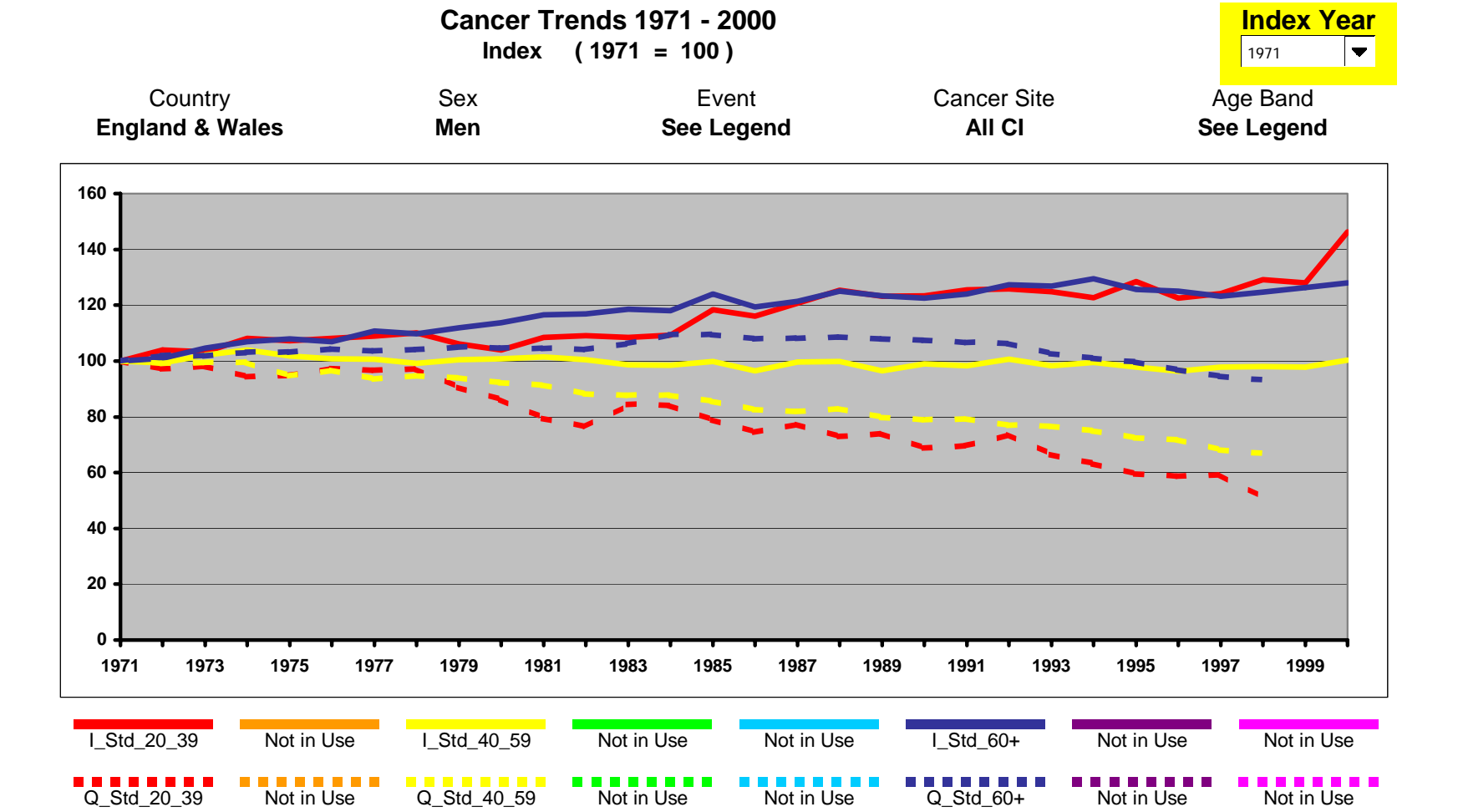
# Cancer Incidence and Mortality Rates, 1971 - 2000

## Ages 40 – 59 (standardised), England & Wales

Cancer Trends 1971 - 2000  
Rates per 10,000



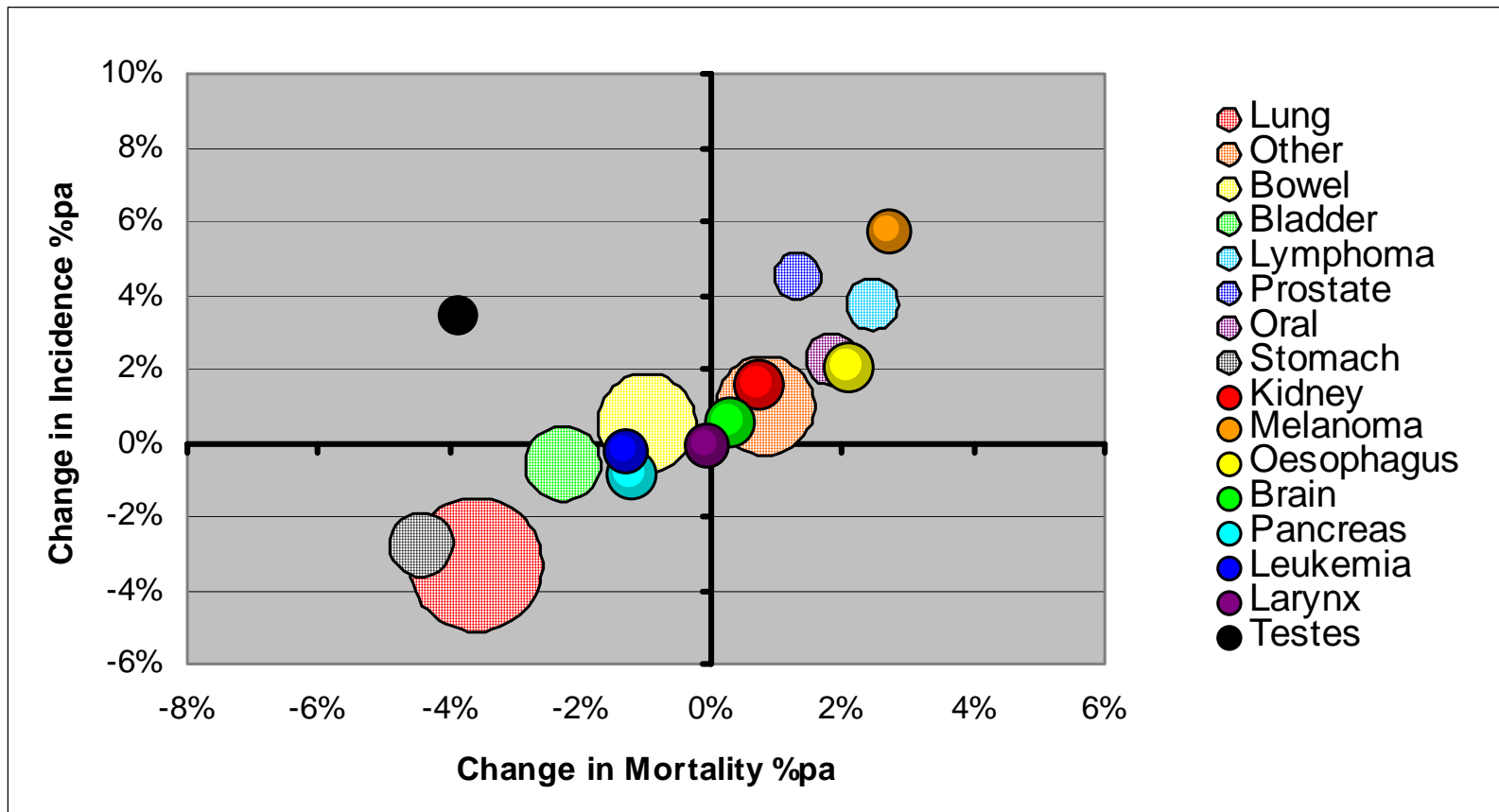
# Trend in Cancer Incidence and Mortality Rates 1971 – 2000, Index 1971 = 100, England & Wales, Men



# Summary of Trends in Cancer Incidence and Mortality

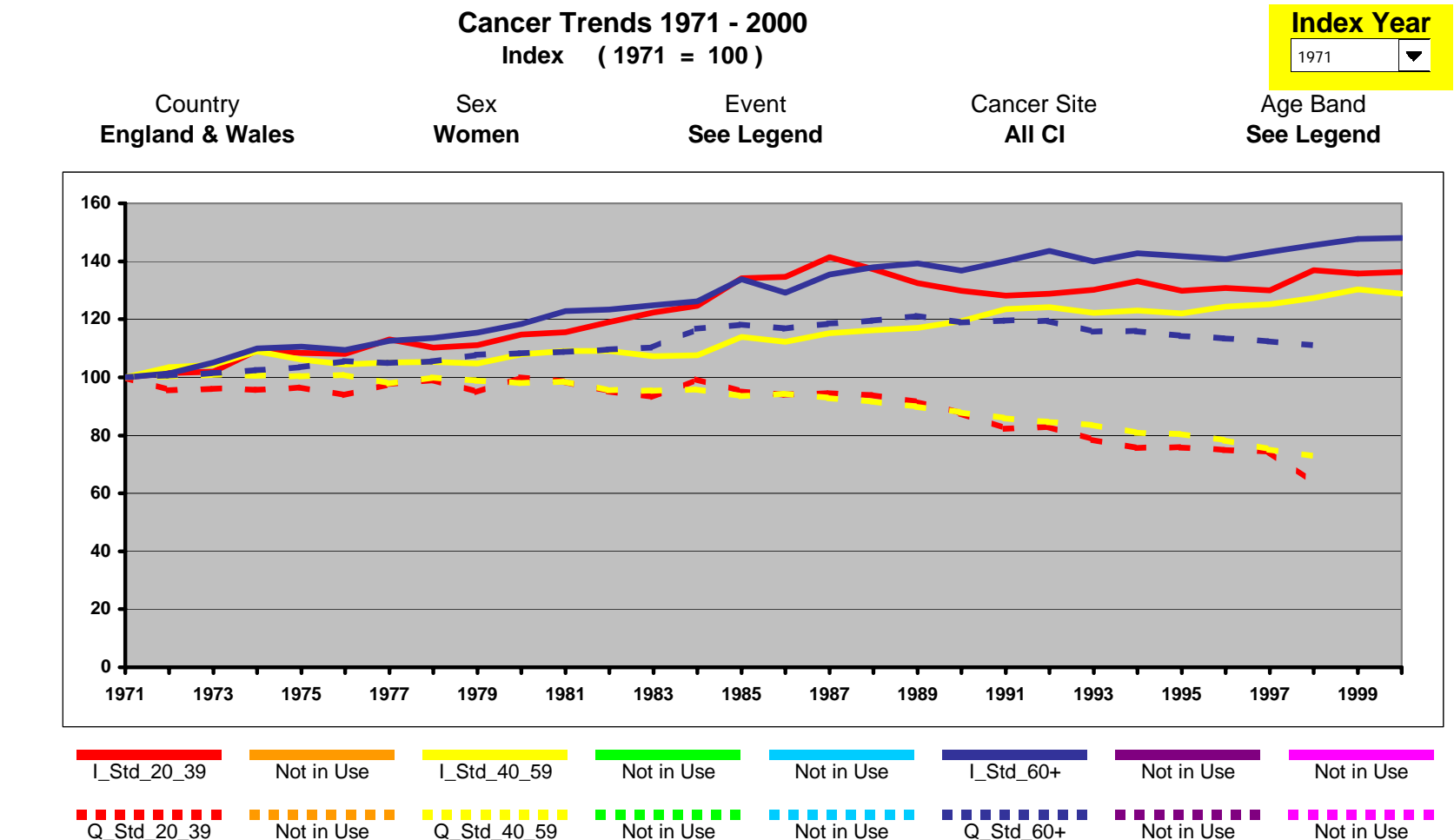
## Average Change % pa, England & Wales, by cancer site

### Men, aged 40 - 59, 1971-2000



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

# Trend in Cancer Incidence and Mortality Rates 1971–2000, Index 1971 = 100, England & Wales, Women

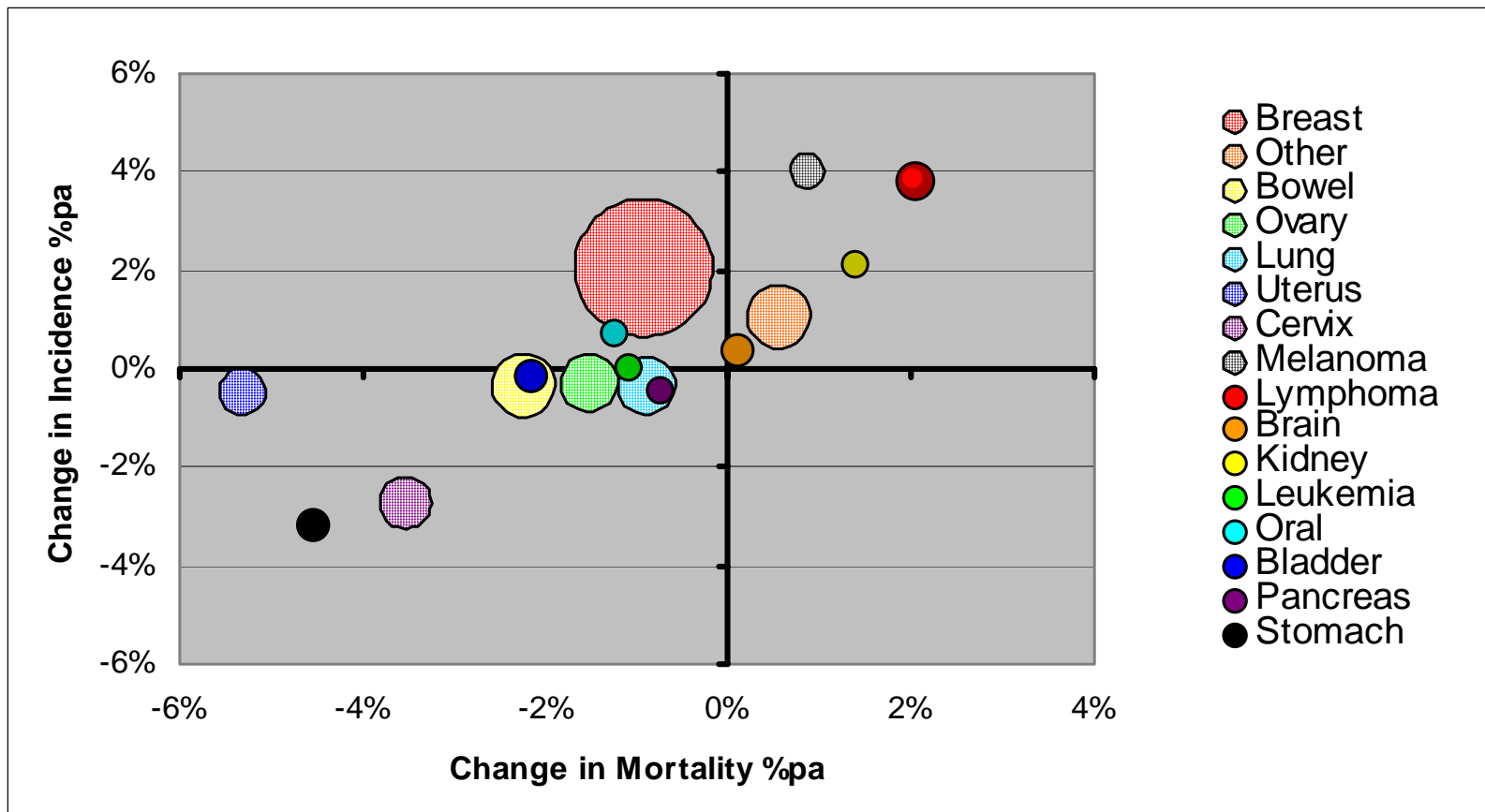




# Summary of Trends in Cancer Incidence and Mortality

## Average Change % pa, England & Wales, by cancer site

### Women, aged 40 - 59, 1971-2000

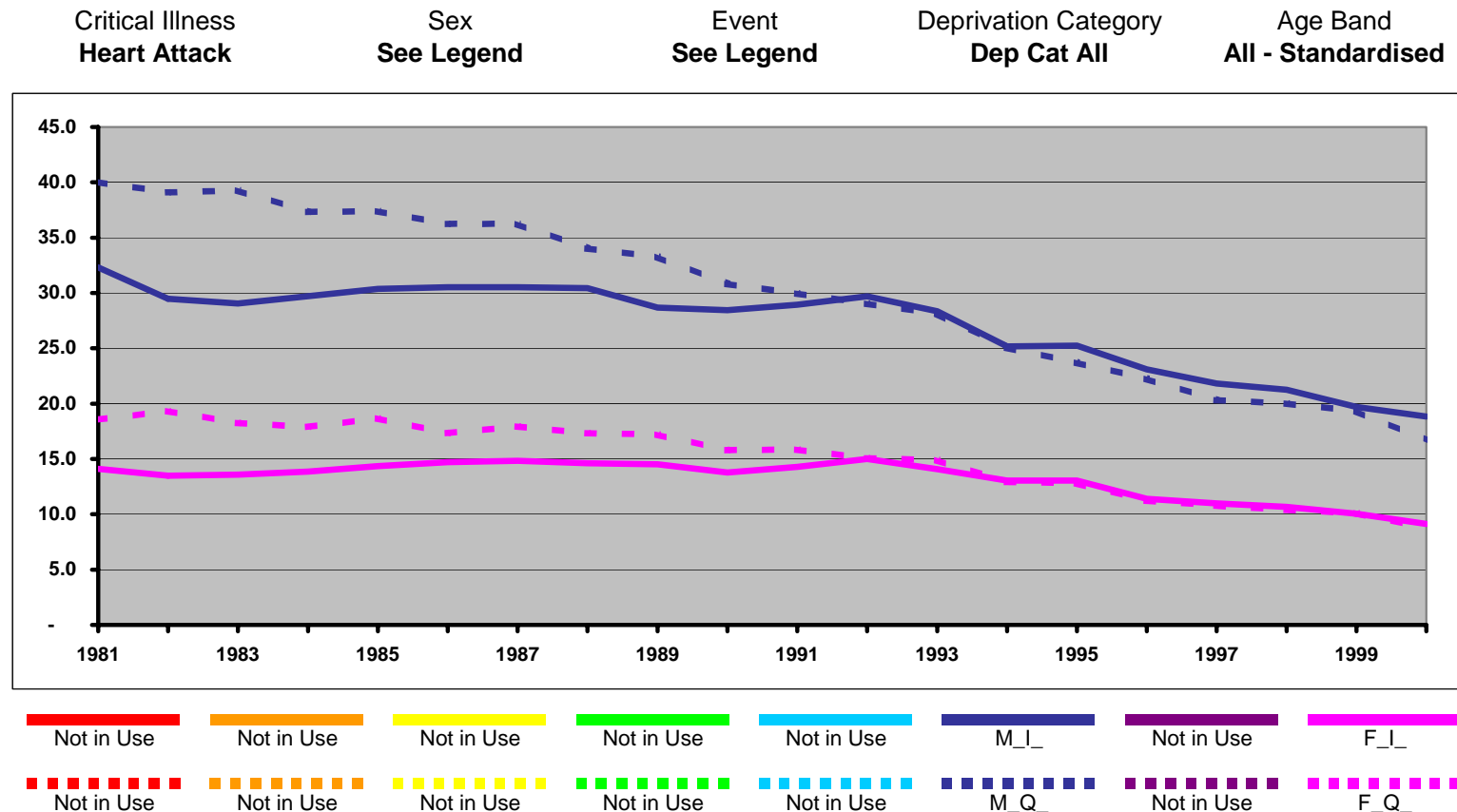


Size of balls represents relative importance of cancer site measured by incidence rates

# Heart Attack Incidence and Mortality Rates

## 1981 – 2000, All Ages (standardised), Scotland, All Deprivation Cat

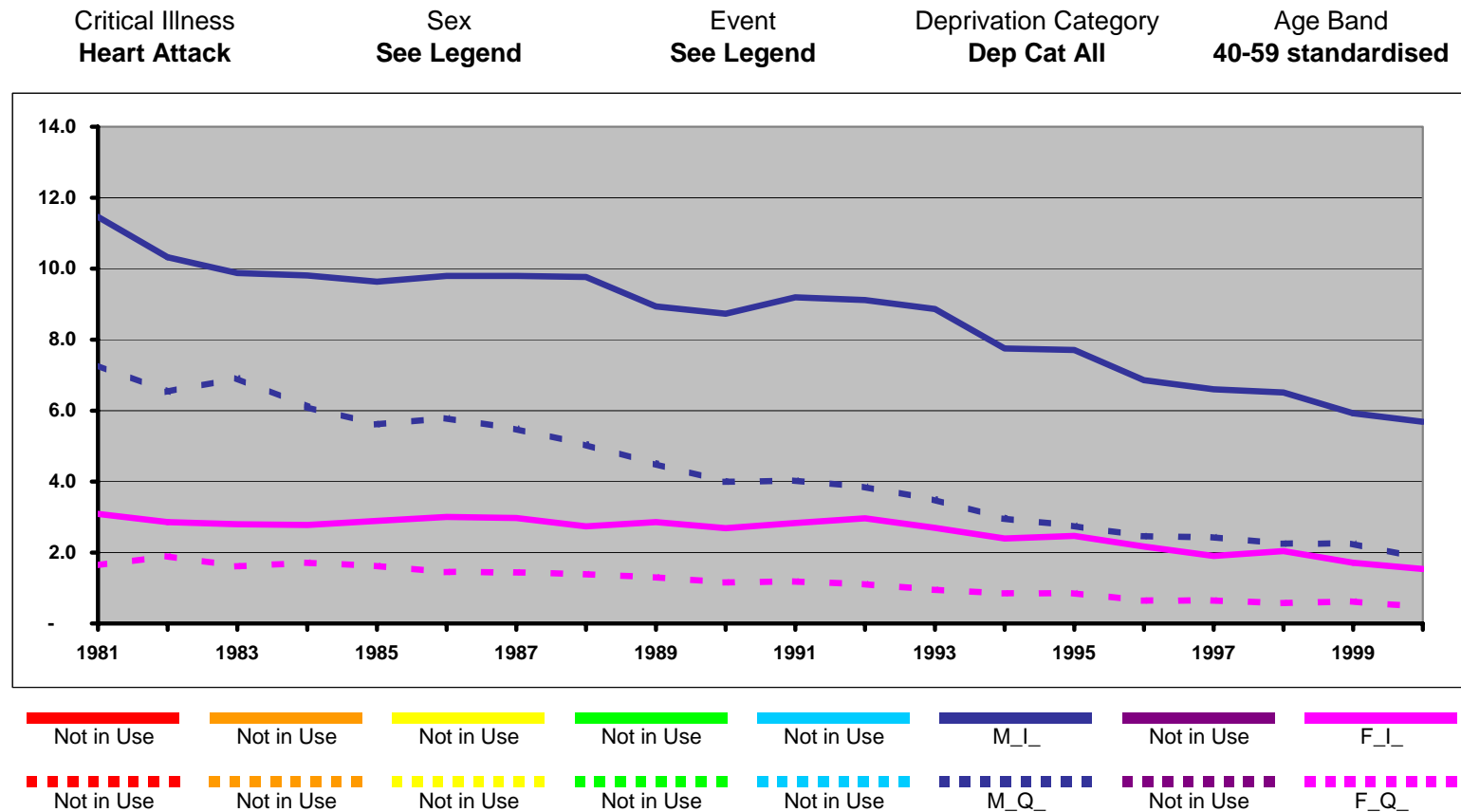
Scottish Population Data : Trends by Deprivation Category, 1981 - 2000  
Rates per 10,000



# Heart Attack Incidence and Mortality Rates

## 1981 – 2000, Ages 40 – 59 (standardised), Scotland, All Dep Cat

Scottish Population Data : Trends by Deprivation Category, 1981 - 2000  
Rates per 10,000



# Trend in Heart Attack Incidence and Mortality Rates 1981 – 2000, Index 1981 = 100, Scotland, Men, All Deprivation Cat

Scottish Population Data : Trends by Deprivation Category, 1981 - 2000  
Index (1981 = 100)

Index Year

1981 ▼

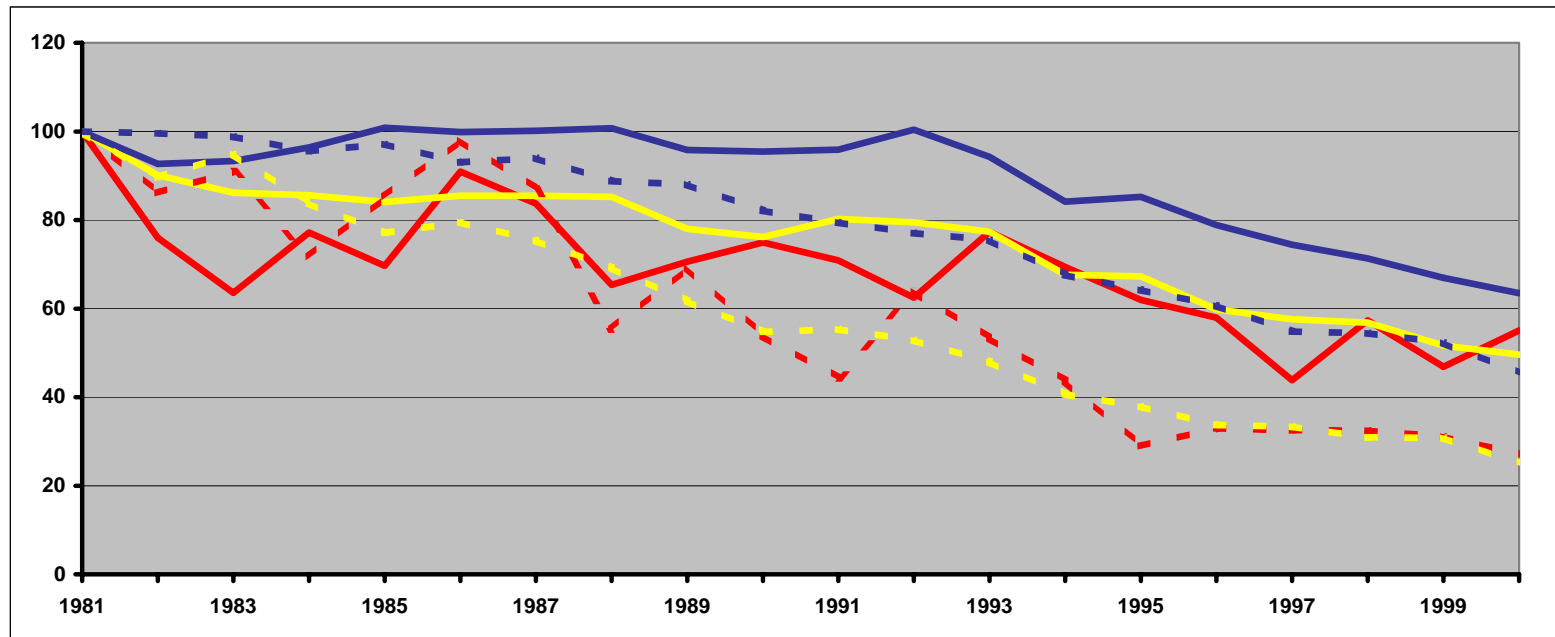
Critical Illness  
Heart Attack

Sex  
Men

Event  
See Legend

Deprivation Category  
Dep Cat All

Age Band  
See Legend



I\_Std\_20\_39

Not in Use

I\_Std\_40\_59

Not in Use

Not in Use

I\_Std\_60+

Not in Use

Not in Use

Q\_Std\_20\_39

Not in Use

Q\_Std\_40\_59

Not in Use

Not in Use

Q\_Std\_60+

Not in Use

Not in Use

# Trend in Heart Attack Incidence and Mortality Rates 1981 – 2000, Index 1981 = 100, Scotland, Women, All Dep Cat

Scottish Population Data : Trends by Deprivation Category, 1981 - 2000  
Index ( 1981 = 100 )

Index Year

1981



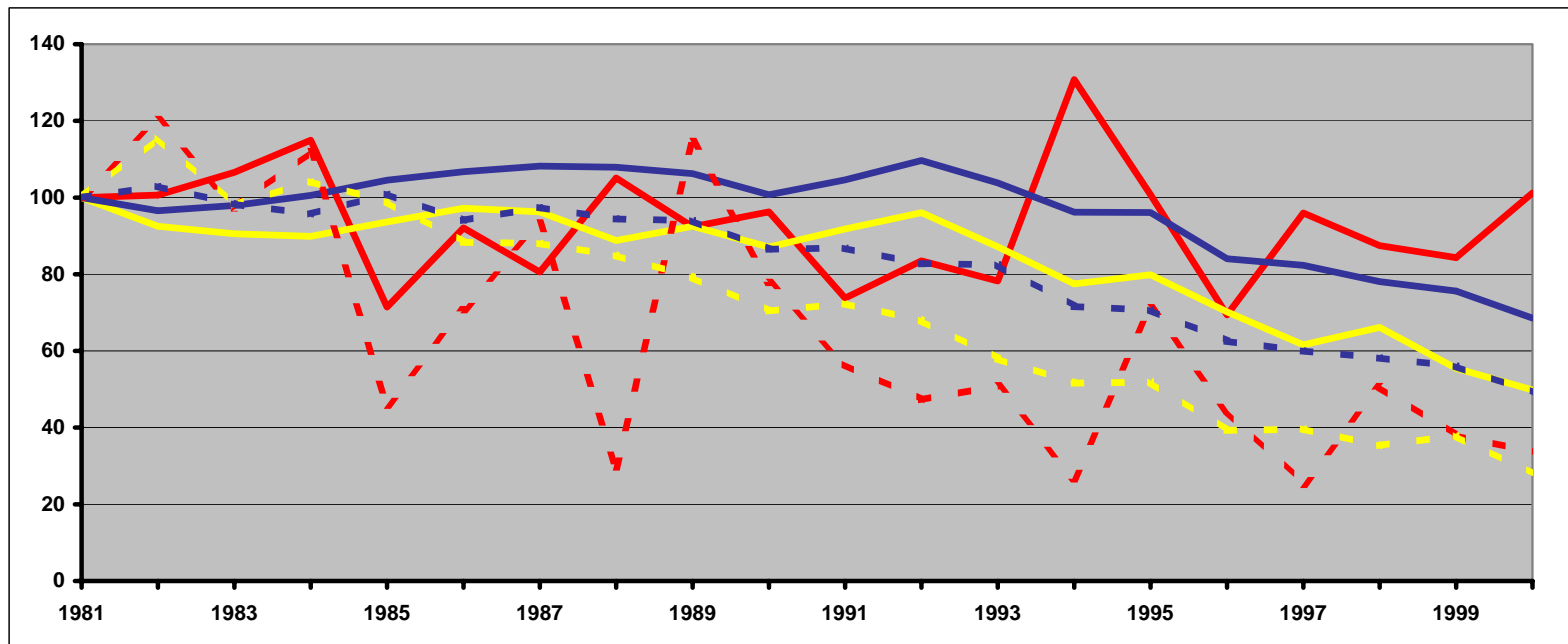
Critical Illness  
Heart Attack

Sex  
Women

Event  
See Legend

Deprivation Category  
Dep Cat All

Age Band  
See Legend



I\_Std\_20\_39

Not in Use

I\_Std\_40\_59

Not in Use

Not in Use

I\_Std\_60+

Not in Use

Not in Use

Q\_Std\_20\_39

Not in Use

Q\_Std\_40\_59

Not in Use

Not in Use

Q\_Std\_60+

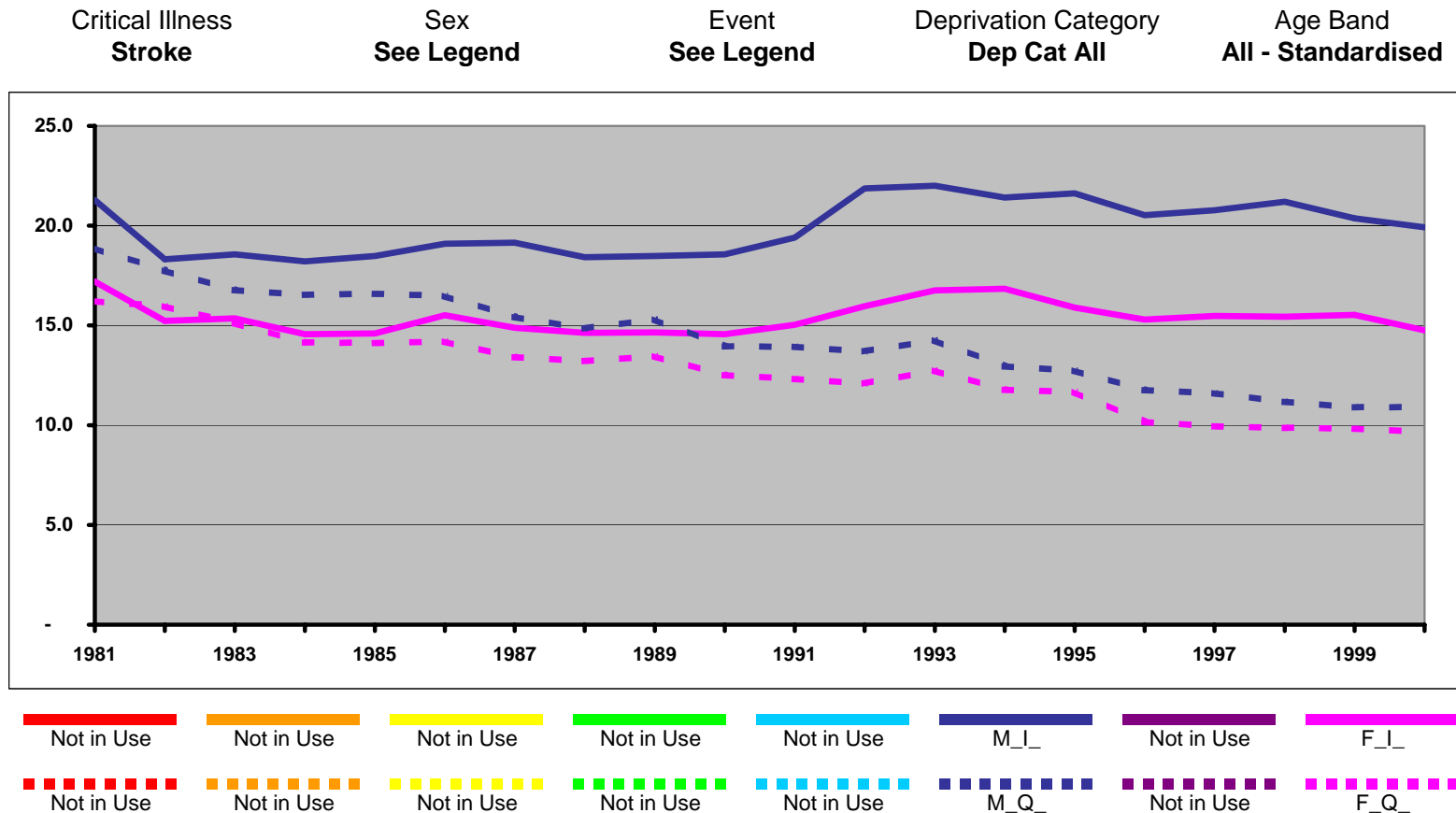
Not in Use

Not in Use

# Stroke Incidence and Mortality Rates

1981 – 2000, All Ages (standardised), Scotland, All Deprivation Cat

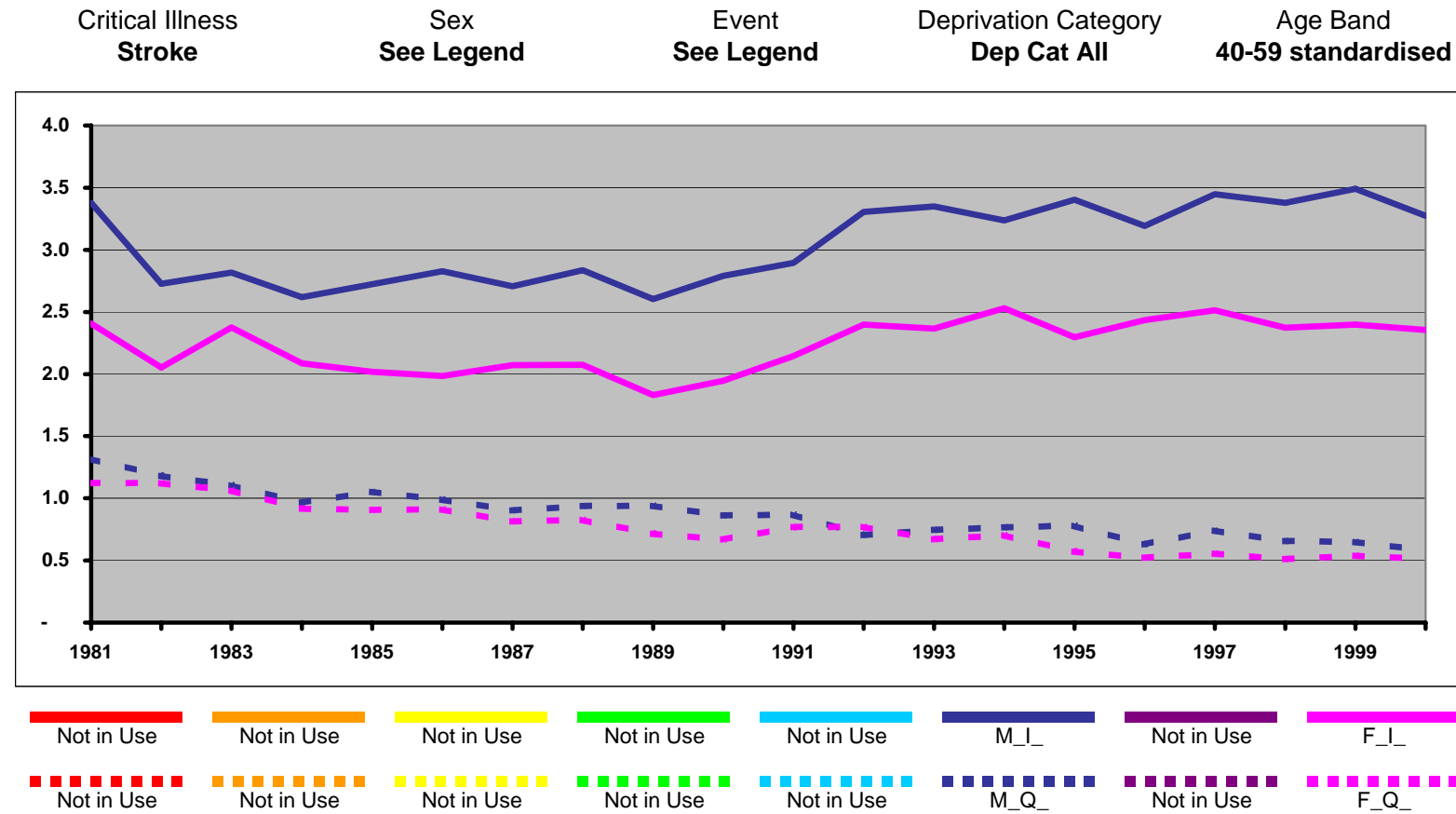
Scottish Population Data : Trends by Deprivation Category, 1981 - 2000  
Rates per 10,000



# Stroke Incidence and Mortality Rates

1981 – 2000, Ages 40 – 59 (standardised), Scotland, All Dep Cat

Scottish Population Data : Trends by Deprivation Category, 1981 - 2000  
Rates per 10,000



# Trend in Stroke Incidence and Mortality Rates 1981 – 2000, Index 1982 = 100, Scotland, Men, All Deprivation Cat

Scottish Population Data : Trends by Deprivation Category, 1981 - 2000  
Index ( 1982 = 100 )

Index Year

1982

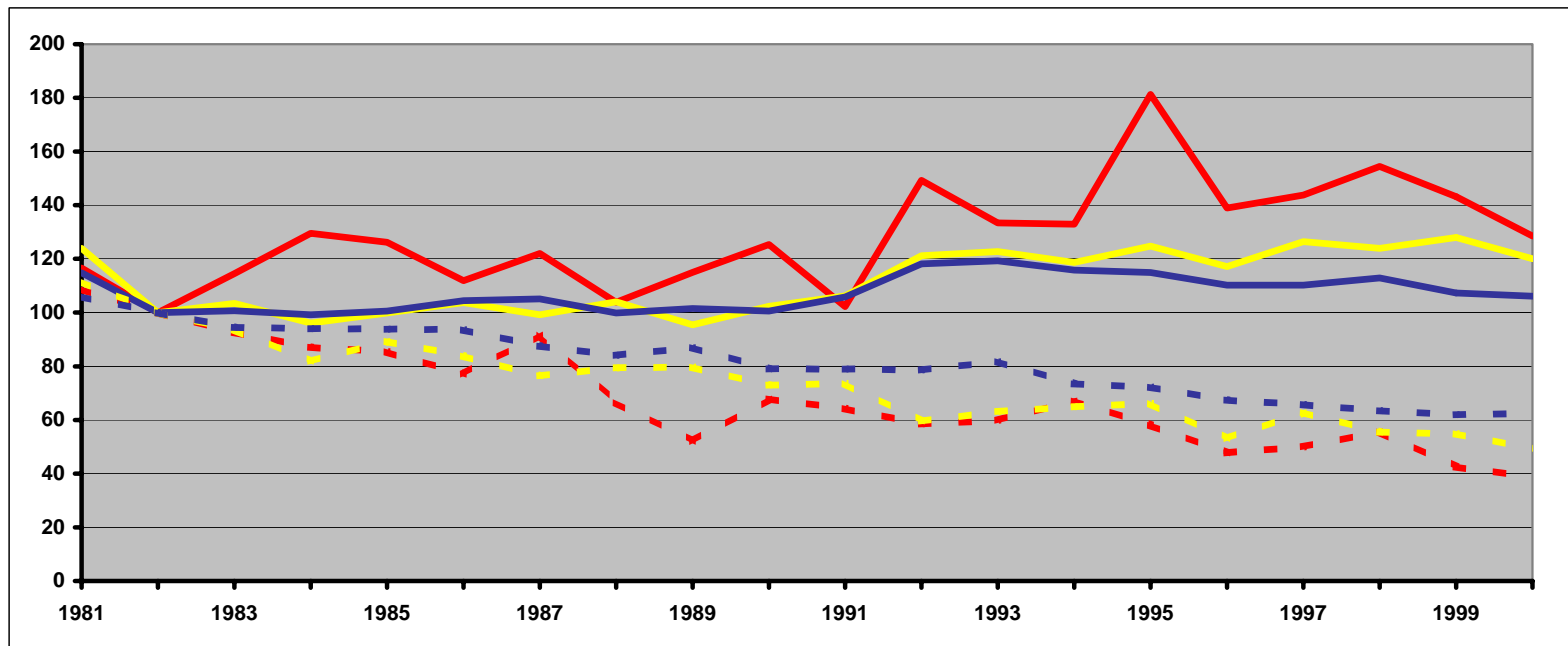
Critical Illness  
Stroke

Sex  
Men

Event  
See Legend

Deprivation Category  
Dep Cat All

Age Band  
See Legend



I\_Std\_20\_39

Not in Use

I\_Std\_40\_59

Not in Use

Not in Use

I\_Std\_60+

Not in Use

Not in Use

Q\_Std\_20\_39

Not in Use

Q\_Std\_40\_59

Not in Use

Not in Use

Q\_Std\_60+

Not in Use

Not in Use



# Trend in Stroke Incidence and Mortality Rates 1981 – 2000, Index 1982 = 100, Scotland, Women, All Dep Cat

Scottish Population Data : Trends by Deprivation Category, 1981 - 2000  
Index ( 1982 = 100 )

Index Year

1982

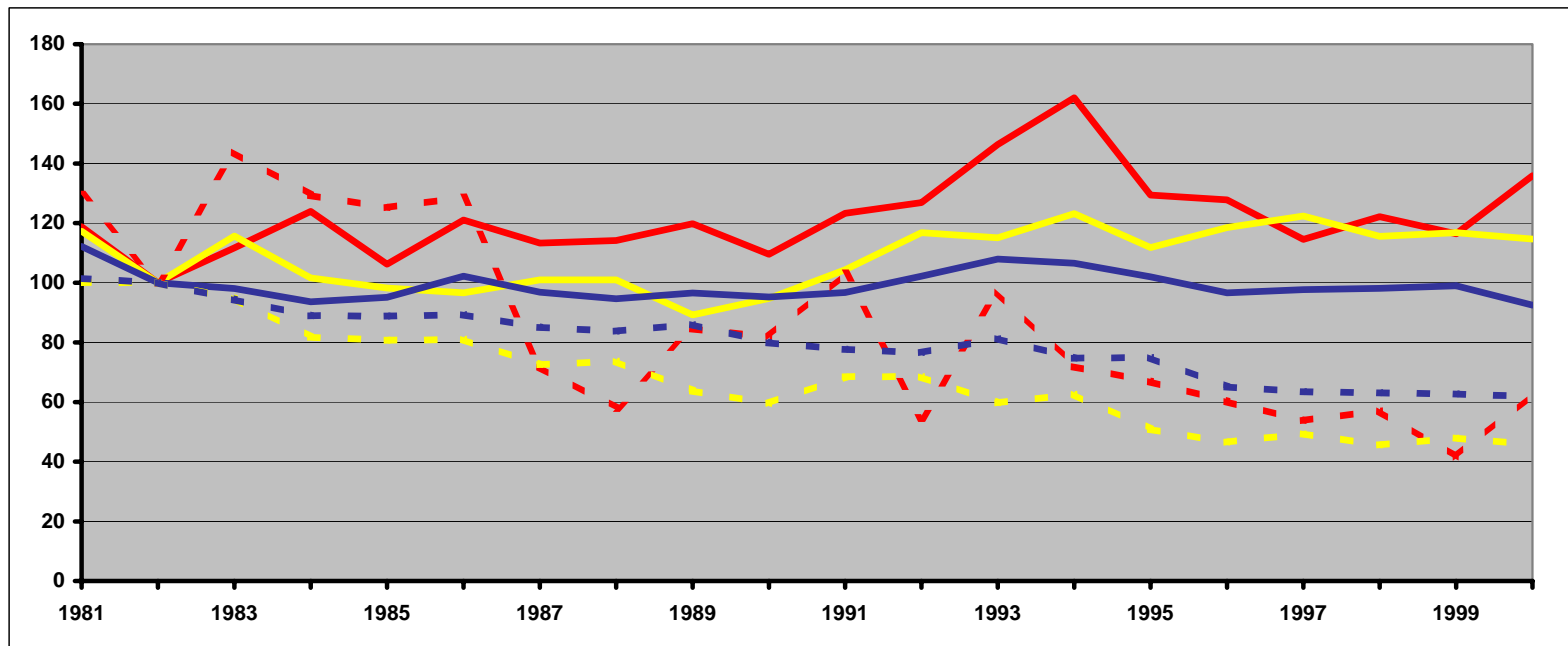
Critical Illness  
Stroke

Sex  
Women

Event  
See Legend

Deprivation Category  
Dep Cat All

Age Band  
See Legend



I\_Std\_20\_39

Not in Use

I\_Std\_40\_59

Not in Use

Not in Use

I\_Std\_60+

Not in Use

Not in Use

Q\_Std\_20\_39

Not in Use

Q\_Std\_40\_59

Not in Use

Not in Use

Q\_Std\_60+

Not in Use

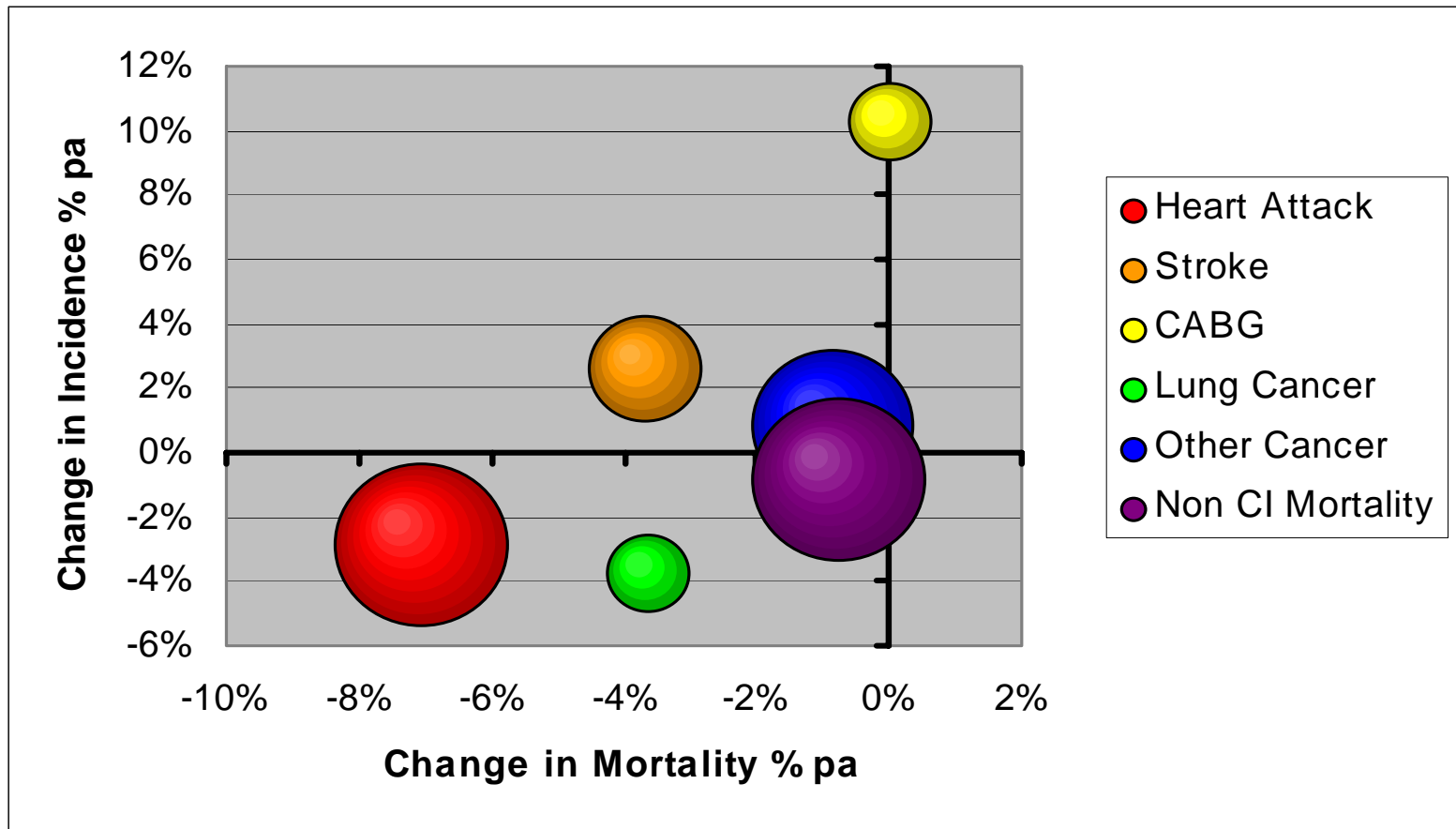
Not in Use

# Outline

- The CI Trends Research Group
- Some Detail on Trends
  - Cancer
  - Heart Attack
  - Stroke
- Summary of Trends - The Big Picture
  - Variations over time, by sex, by smoker status, by socio-economic group
  - Focussing on the age group 40 – 60
- Mapping a range of possible future outcomes for CI risk costs

# Summary of Trends in CI Incidence and Mortality

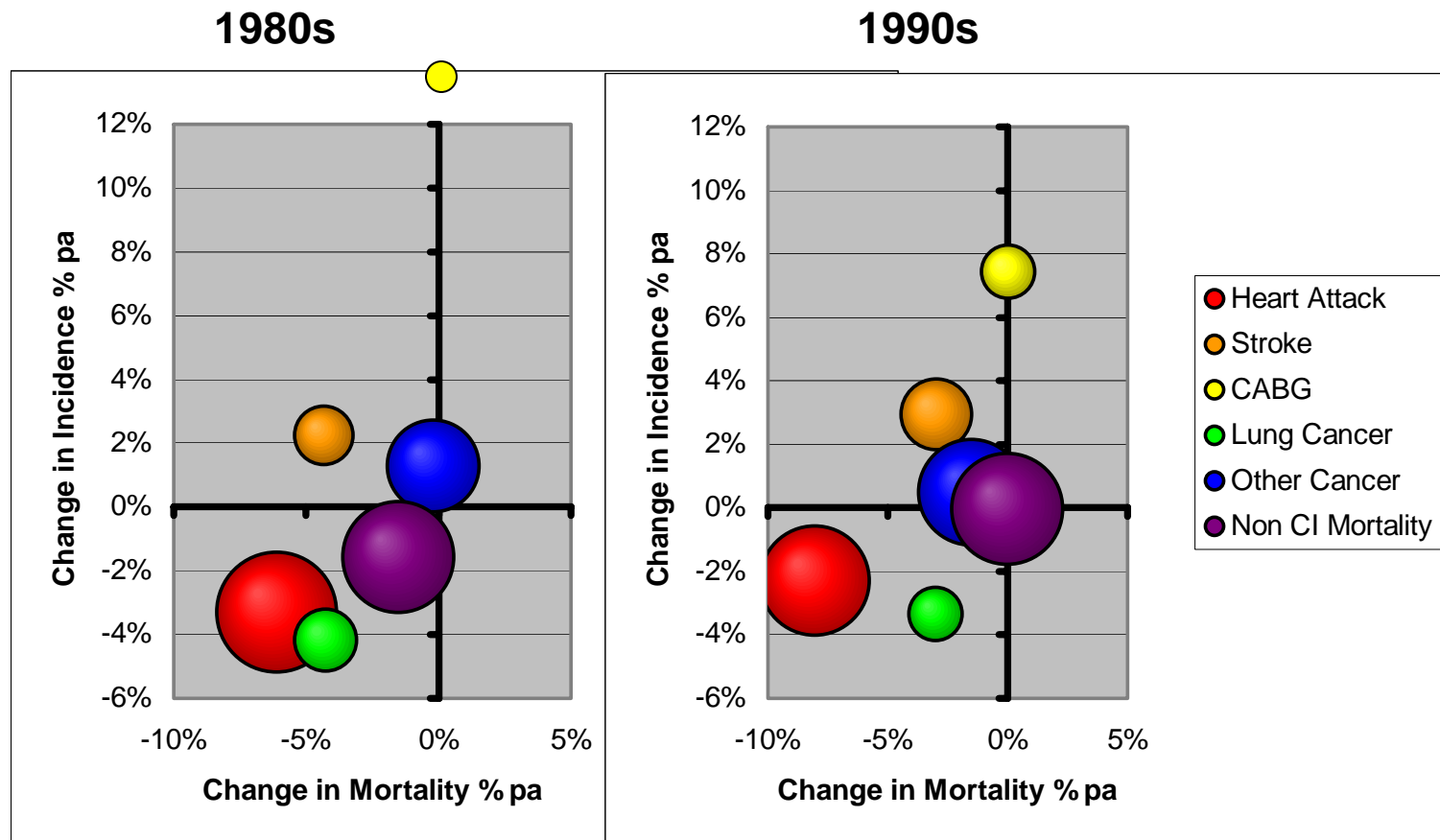
Best Estimate Avg Change % pa, England & Wales, 1980-2000  
Men, aged 40 - 60



Size of Balls Indicates Relative Importance of CI Measured by Incidence Rate.

# Summary of Trends in CI Incidence and Mortality

Best Estimate Avg Change % pa, England & Wales, 1980-2000  
Men, aged 40 - 60

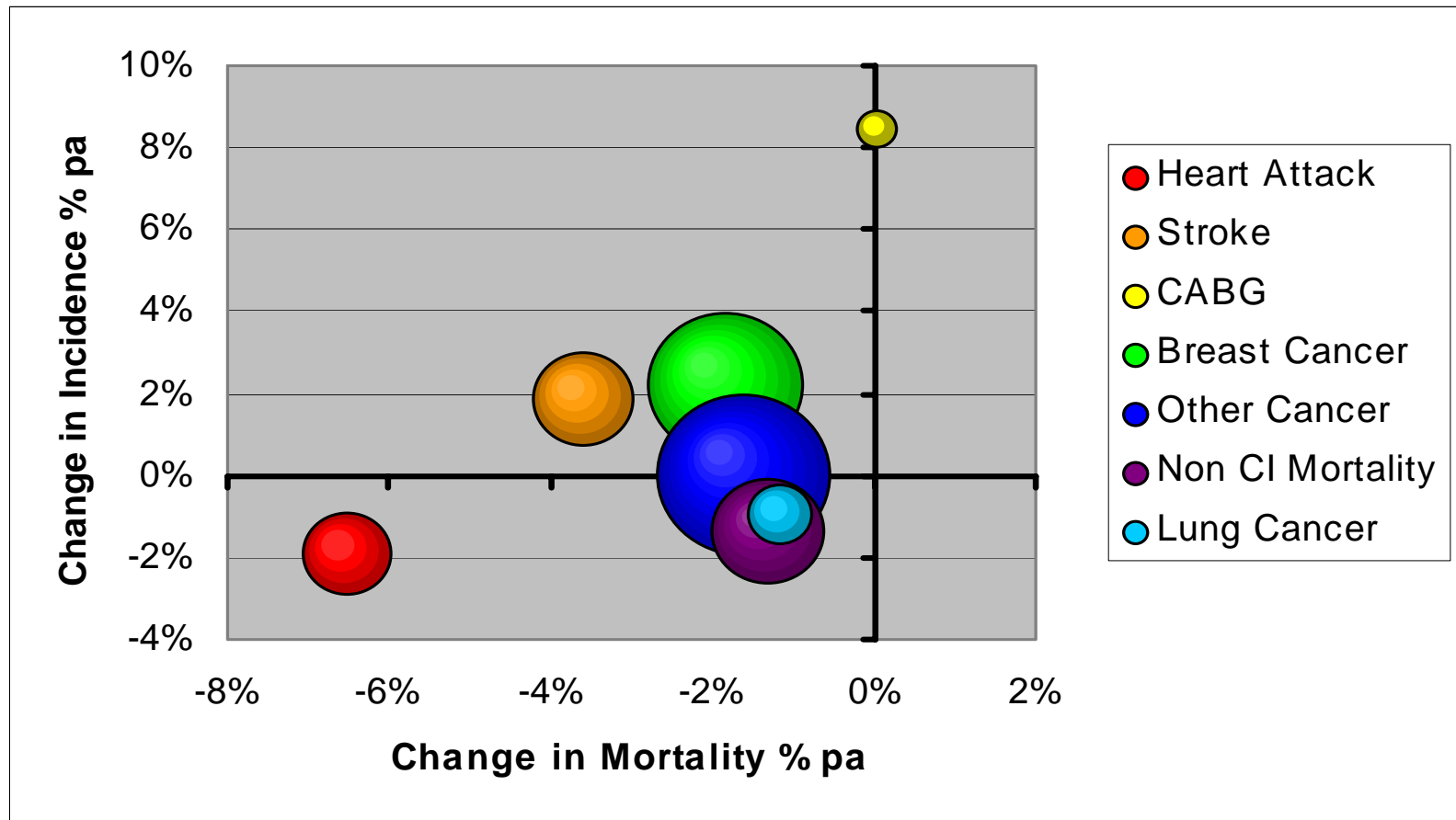


Size of Balls Indicates Relative Importance of CI Measured by Incidence Rate.

# Summary of Trends in CI Incidence and Mortality

Best Estimate Avg Change % pa, England & Wales, 1980-2000

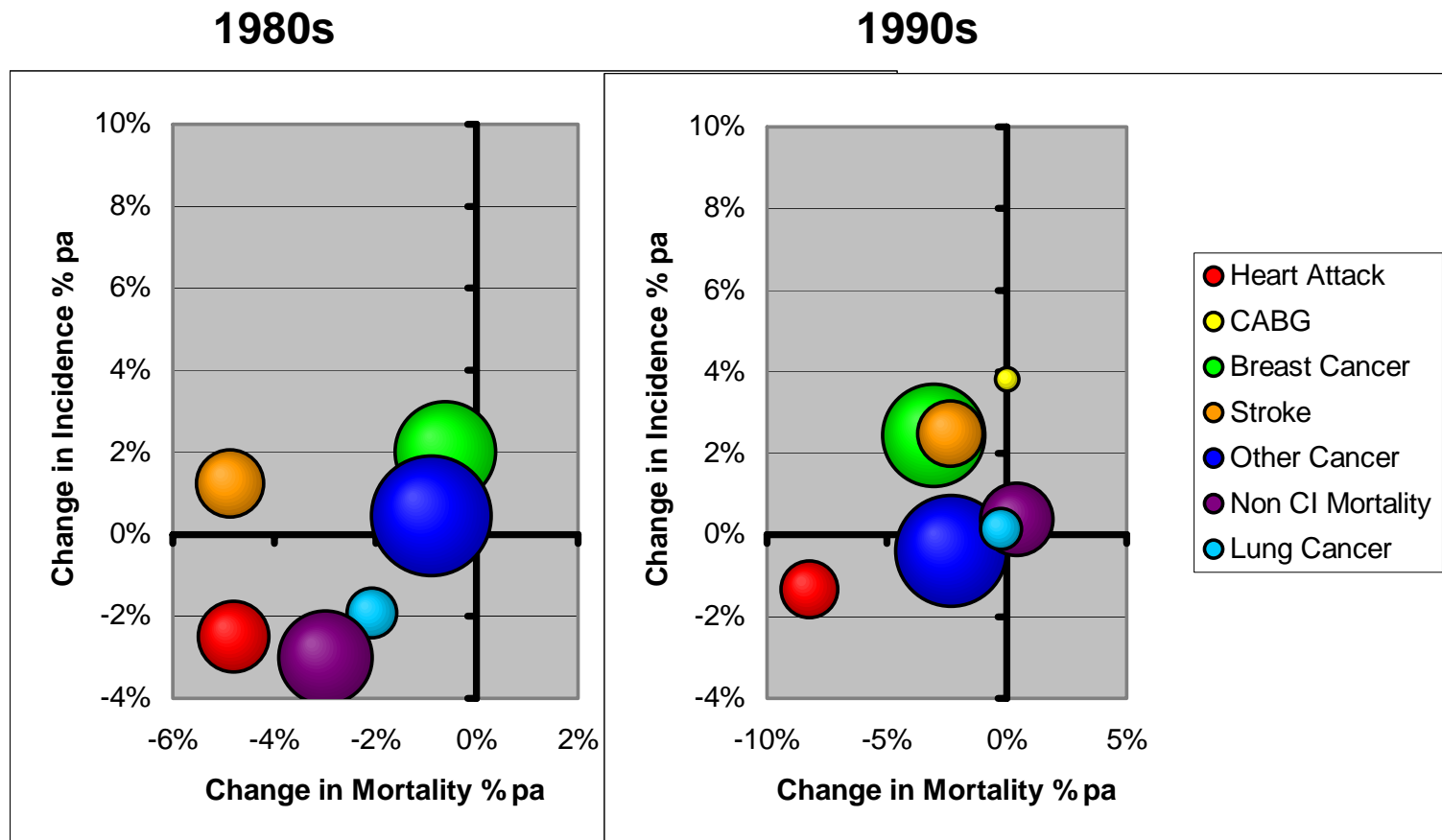
Women, aged 40 - 60



Size of Balls Indicates Relative Importance of CI Measured by Incidence Rate.

# Summary of Trends in CI Incidence and Mortality

Best Estimate Avg Change % pa, England & Wales, 1980-2000  
Women, aged 40 - 60



Size of Balls Indicates Relative Importance of CI Measured by Incidence Rate.

# Summary of Trends in CI Incidence and Mortality

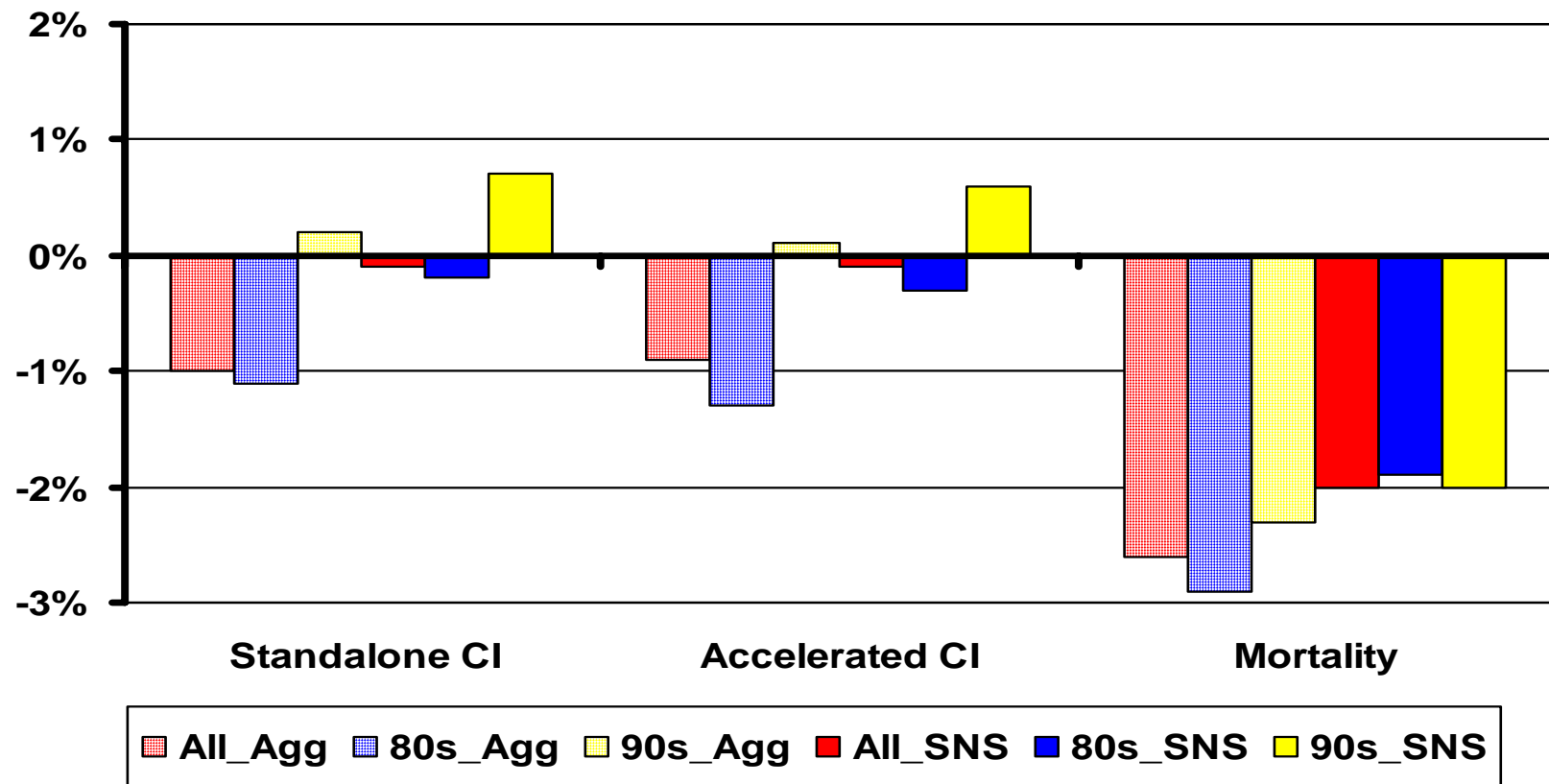
## Impact of Changes in Smoking Prevalence

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

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

# Summary of Trends in CI Incidence and Mortality

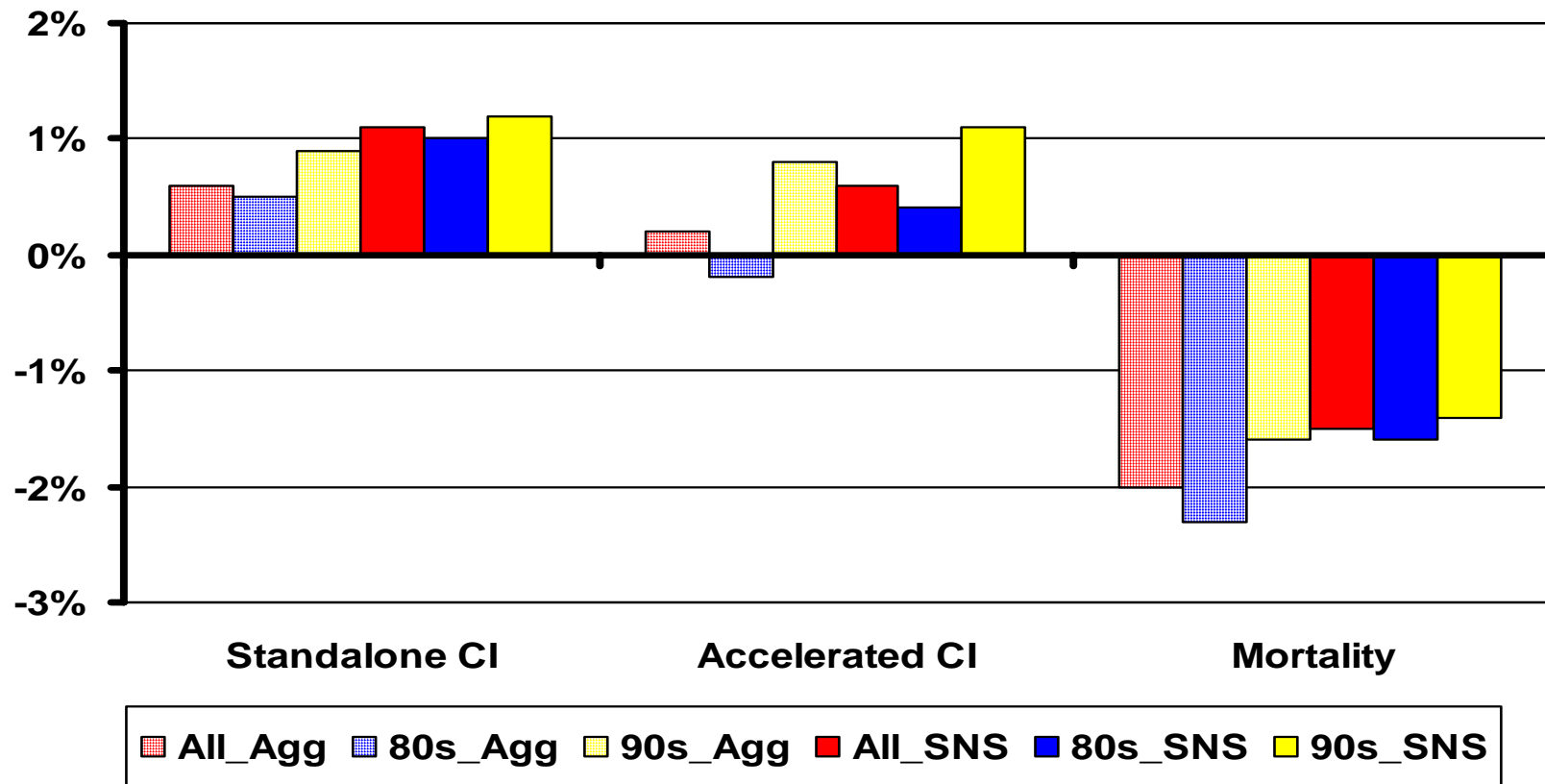
Rough Estimate Avg Change % pa, England & Wales, 1980-2000  
Men, aged 40 - 60



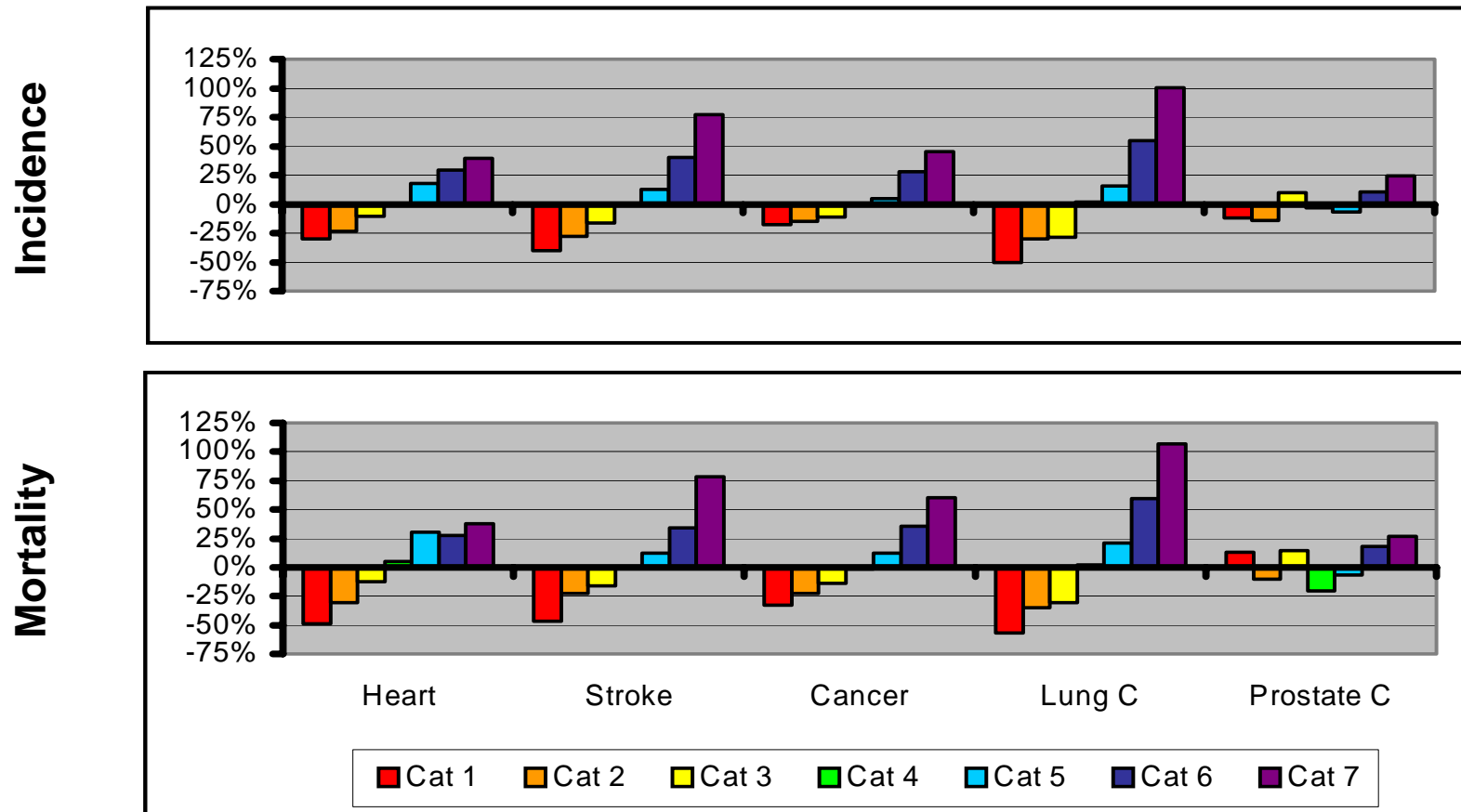


# Summary of Trends in CI Incidence and Mortality

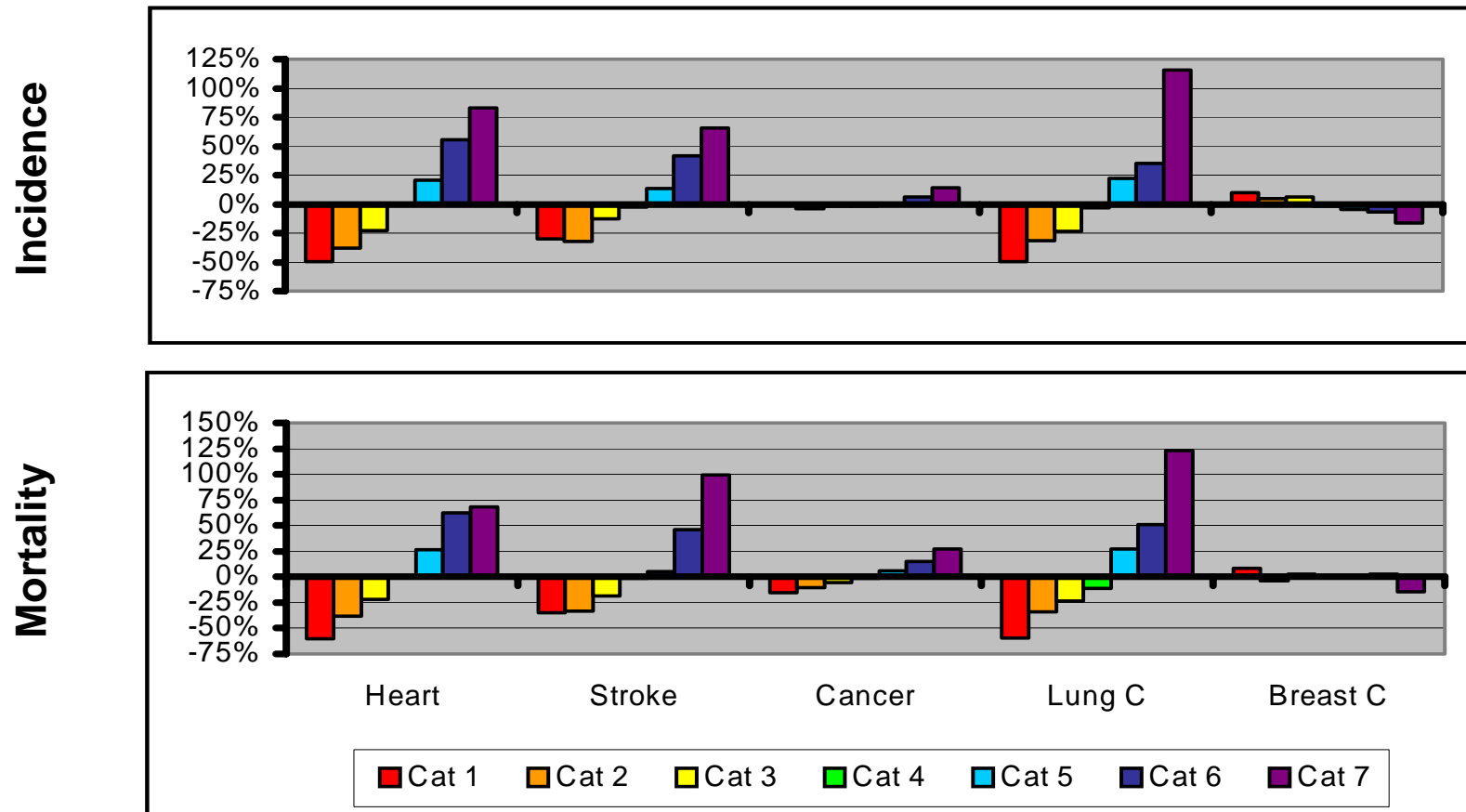
Rough Estimate Avg Change % pa, England & Wales, 1980-2000  
Women, aged 40 - 60



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



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



# 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**  $2\frac{1}{2}\%$ pa for men, **2%**pa for women.
- **CI** incidence **fell**  $1\%$ pa for men, but has **risen**  $\frac{1}{2}\%$ pa for women.

But :

- Trends for the **1990's** were **worse than** for the **1980's**.
- **Changes in smoking** prevalence account for **falls** of a little under  $1\%$ pa for men and  $\frac{1}{2}\%$ pa for women, but are waning.
- Cancer is a larger part of total cost for insured lives than population.

So, for smoker-segregated rates in the 1990's the picture looks far worse :

- **CI** incidence **rose** by  $\frac{1}{2}$  to **1%**pa for **men**
- **CI** incidence **rose** by **1** to  **$1\frac{1}{2}\%$** pa for **women**

# Outline

- The CI Trends Research Group
- Some Detail on Trends
  - Cancer
  - Heart Attack
  - Stroke
- Summary of Trends - The Big Picture
  - Variations over time, by sex, by smoker status, by socio-economic group
  - Focussing on the age group 40 – 60
- Mapping a range of possible future outcomes for CI risk costs

# Mapping a range of possible future outcomes for CI risk costs

- Summarize and compare a selection of scenarios we have evaluated
- Cautions :
  - Illustrative, but very rough, estimates
  - Still “work in progress”
  - Focus on cancer, heart attack, CABG and stroke only
  - Far from exhaustive, even for the CIs partially covered
  - Mix of high and low likelihood
  - Many overlaps and lots of gaps
  - Modelled individually - how might the scenarios combine ?

# Mapping a range of possible future outcomes for CI risk costs

## Key - Part 2

### Mapping a range of possible future outcomes for CI risk costs Key - Part 1

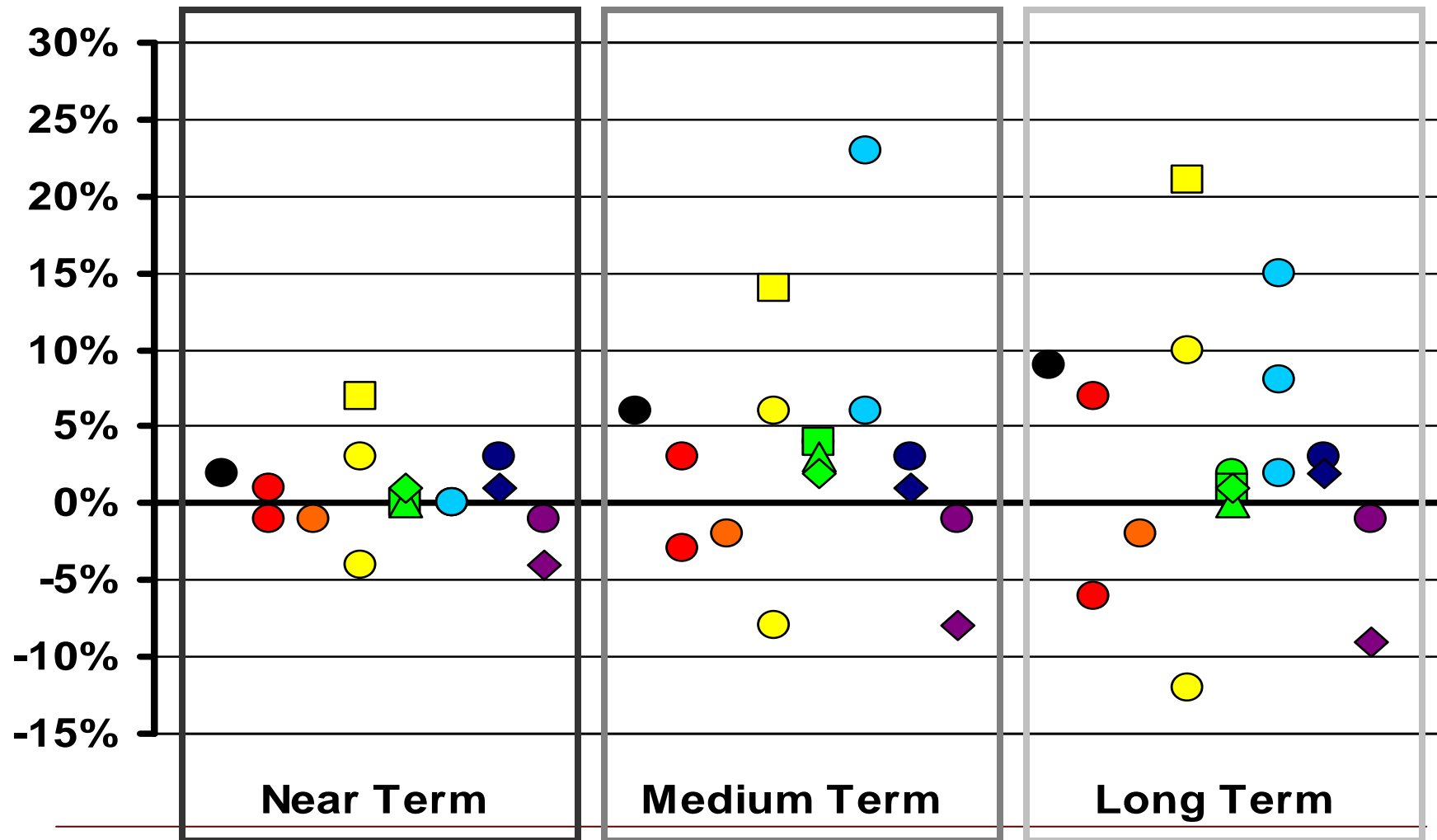
- Extrapolation of trends from the 1990's
- Obesity - "optimistic" and "pessimistic" scenarios
- Smoking - continuation of recent trends in smoking habits
- Convergence to USA CI incidence rates
- Convergence to EU CI incidence rates - "best" and "worst"
- Cancer Screening - Breast (extended down to age 40)
- Cancer Screening - Bowel Cancer - No polyps detected
- ▲ Cancer Screening - Bowel Cancer - 10% polyps detected
- ◆ Cancer Screening - Prostate (similar to USA experience)

### Mapping a range of possible future outcomes for CI risk costs Key - Part 2

- Cancer Screening - "1 year" advancement in detection
- Cancer Screening - "3 year" advancement in detection
- Cancer Screening - "5 year" advancement in detection
- Impact of Troponin on heart attack diagnoses
- ◆ Definition drift on Strokes / TIAs
- Impact of Statins on heart attack rates
- ◆ Blue sky - polypills and cancer vaccinations

# Scenario Impact on Over CI Risk Rates for Insured

## % Change in Overall CI risk Rate





# Mapping a range of possible future outcomes for CI risk costs - Key Observations

- **Caution : Work-in-progress and incomplete !**
- Many of the illustrated scenarios have relatively small impact - +/- 5% ...
- ... but we can readily envisage more dramatic scenarios
- Balance or imbalance of competing forces is critical
- Of the work so far, convergence with international rates perhaps gives the best indication of possible future ranges
- Typically, shifting from a population to an insured portfolio view magnifies the impact of any cancer-related scenarios

# Mapping a range of possible future outcomes for CI risk costs - Key Issues

- Difficult to model the whole picture ('top down')
- We can more easily answer "What If ?" questions
  - 'Bottom Up'
  - Start building up the jigsaw
  - But the puzzle may have very many pieces !
- Key difficulty is assessing likelihood
- Stress need to work with other professions to help us understand the rest of the jigsaw



**The Actuarial Profession**

making financial sense of the future

# A Brief Summary of the Past

Neil Robjohns

Head of Pricing, Munich Re UK Life Branch

Chairman of Critical Illness Trends Research Group