



Recent trends in cardiovascular epidemiology in Europe

EuroHeart conference, Brussels, Sept 2009

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With acknowledgements to Simon Capewell, Professor of Clinical Epidemiology, University of Liverpool, UK and the WHO EURO office



Cardiovascular disease in Europe

- **Each year CVD causes over 4.3 million deaths in Europe**
- **CVD causes nearly half of all deaths in Europe and is the main cause of the disease burden**

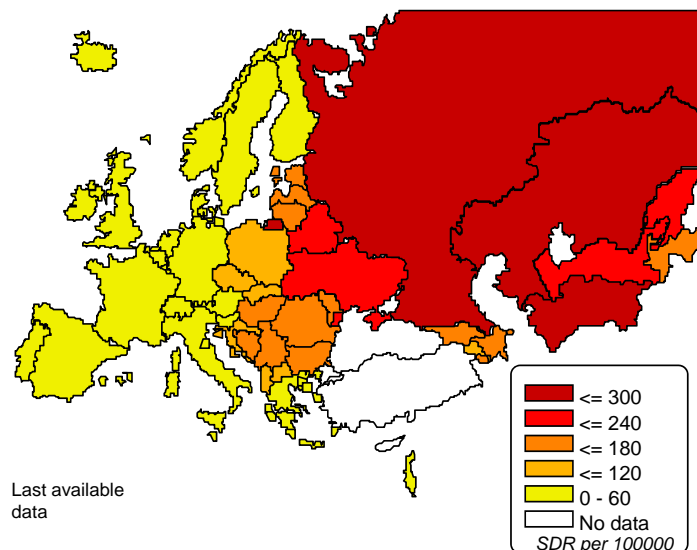
European Cardiovascular Disease Statistics 2008,
European Heart Network

Leading conditions in Europe

Disease	Disease burden (DALYs)	Deaths
Cardiovascular diseases	23%	52%
Neuropsychiatric disorders	20%	3%
Cancer	11%	19%
Digestive diseases	5%	4%
Respiratory diseases	4%	4%
Diabetes mellitus	1%	1%
Musculoskeletal diseases	4%	0%
Sense organ disorders	4%	0%
Other NCDs	5%	2%
Total	77%	86%

CVD causes more >50% of all deaths in Europe

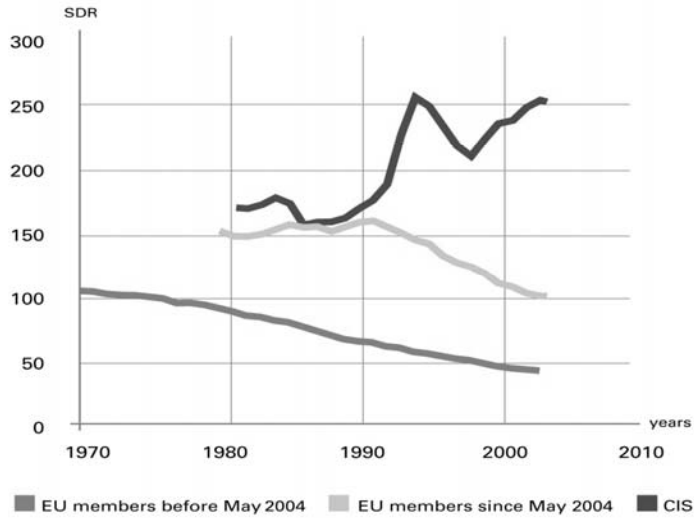
Cardiovascular mortality (up to 65 years) in the WHO European Region



....and is a main contributor to the almost 20 year difference in life expectancy across Europe

Widening gaps between & within countries

Trends in premature mortality from cardiovascular disease in the WHO European Region (SDR, <65 years per 1000000)

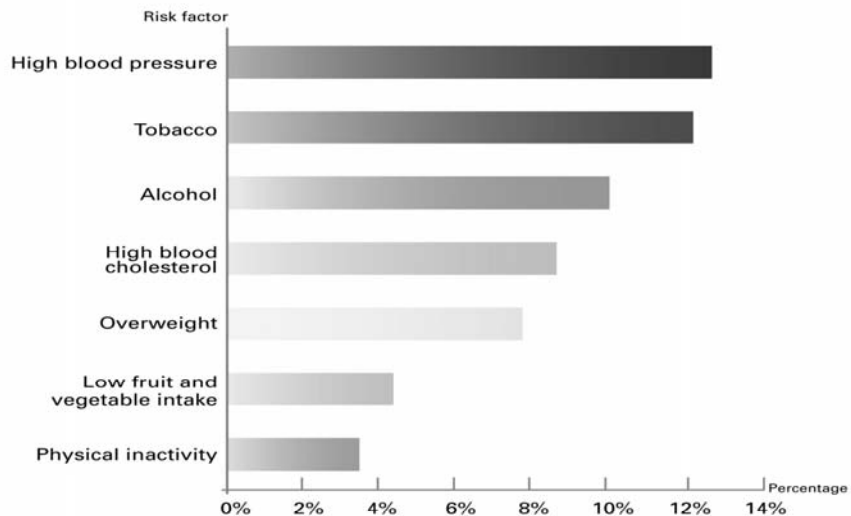


Source: WHO HFA database 2006, latest available data

The main causes are known

RC56

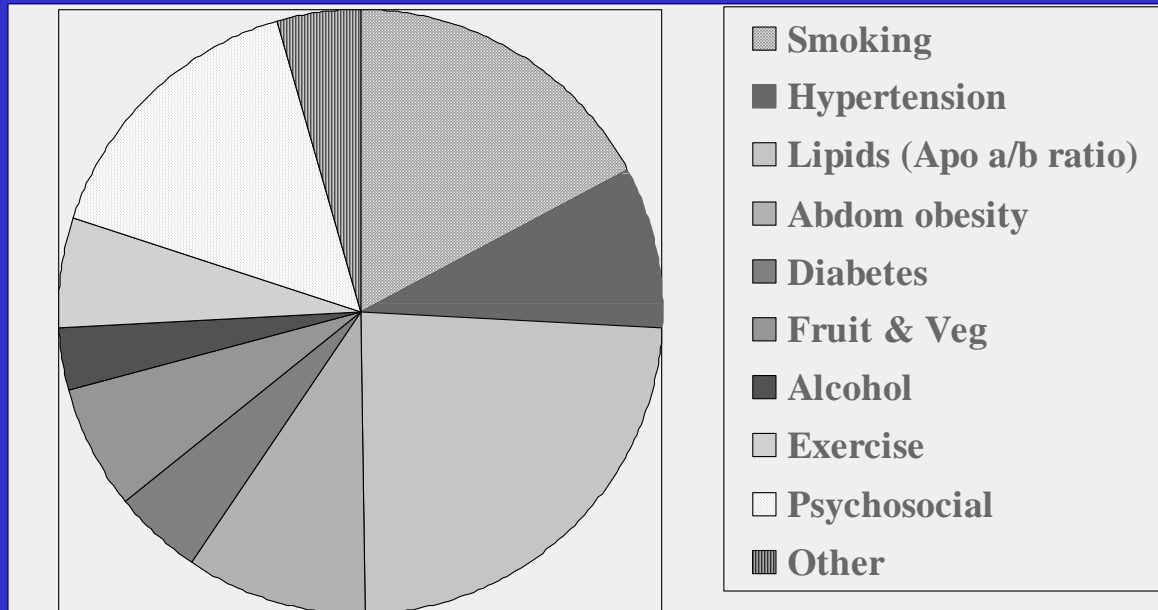
Proportion of total disease burden (DALYs) attributable to seven leading risk factors in the WHO European Region, 2000



Source: The world health report 2002 - Reducing risks, promoting healthy life

INTERHEART Study

"nine potentially modifiable risk factors account for over 90% of the risk of an initial acute myocardial infarction" *Population attributable risk fractions*



Salim Yusuf et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study). *Lancet* 364 9437 11 Sept 2004



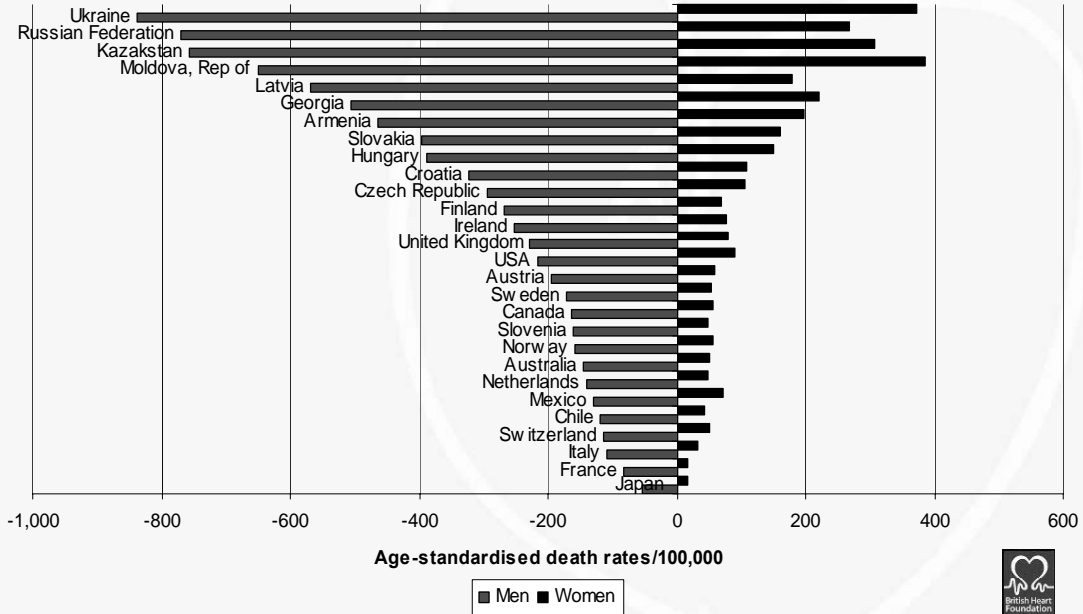
Big falls in Coronary heart disease (CHD) mortality [& in CVD mortality] in UK & elsewhere

Hypotheses:

- Risk Factors more powerful than treatments?
- Tobacco control and diet are crucial
- ↓ Risk factors reflect secular changes more than tablets?
- CVD prevention has large potential to reduce future deaths?



International comparisons CHD death rates in 2004, men & women aged 35-74

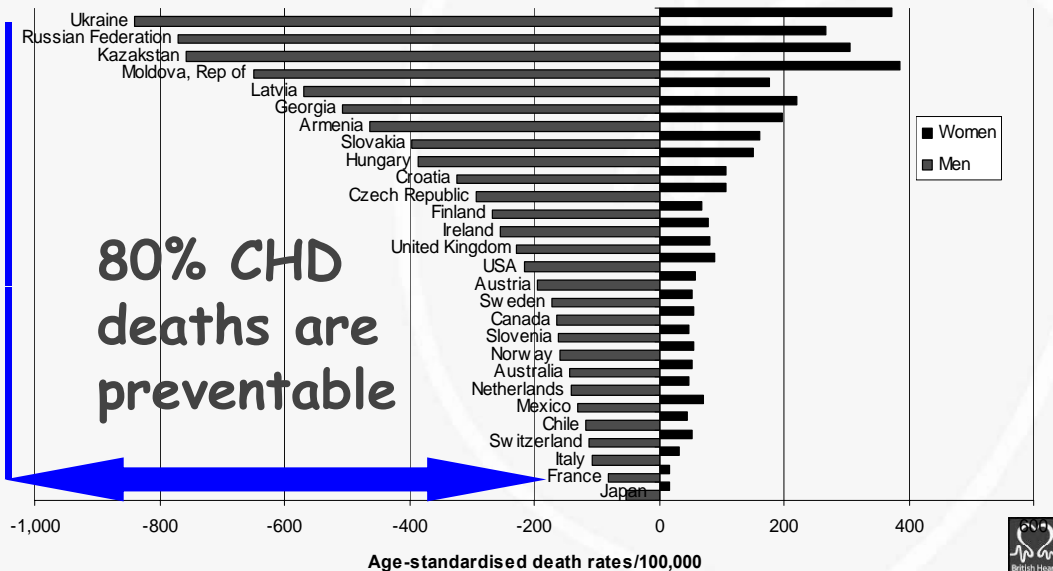


World Health Organization (2004)

www.heartstats.org



International comparisons CHD death rates in 2004, men & women aged 35-74

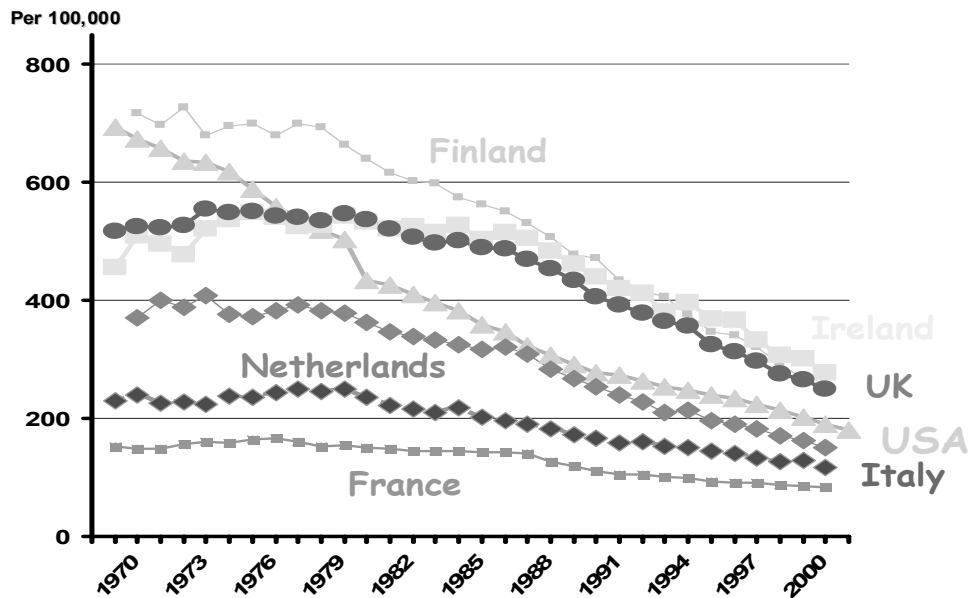


80% CHD deaths are preventable

World Health Organization (2004)

www.heartstats.org

International CHD mortality trends in men, 1968-2003



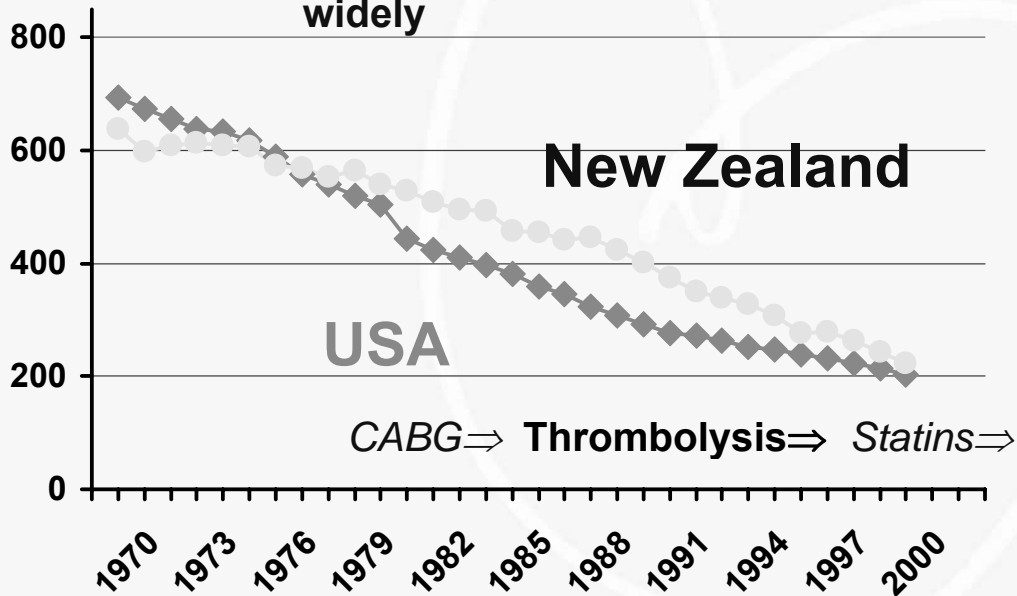
Source: WHO statistics 2005 Men aged 35 - 74, Standardised

WHY have CHD death rates halved since the 1980s?

- CHD treatments?
- Risk factor reductions?



CHD mortality rates started falling long before effective treatments used widely



Source: WHO statistics 2005 Men aged 35 - 74, Standardised

Goldman & Cook 1984 Annals Int Med 1984 101 825)

Beaglehole 1986 BMJ 1986 292 33



Addressing prevention & policy issues

How can we

- *Explain* falls in CHD mortality?
- *Integrate* treatment trends & risk factor trends?
- *Simultaneously consider* vast amounts of data?
- *Quantify* benefits from treatments & risk factors?



Addressing prevention & policy issues

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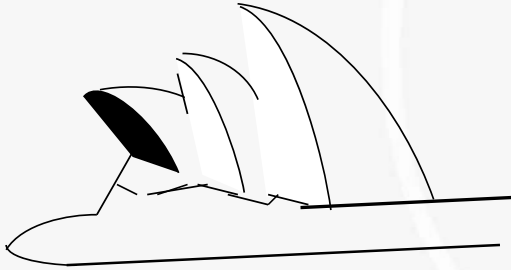
Build a model...!



What is modelling?



What is modelling? a simplification of reality



What is modelling? a simplification of reality





IMPACT CHD Policy Model

Original Aims

To explain falls in CHD mortality
in recent decades in
Scotland / England & Wales / Ireland
New Zealand / Finland /USA & rises in China

Subsequent Aims

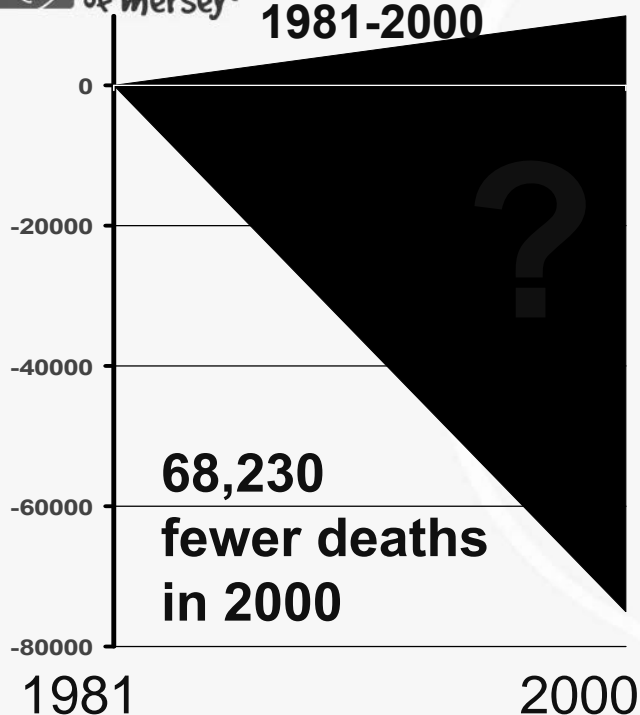
To predict future trends in CVD mortality
To compare policy options for reducing CVD



NEJM 2007; 356: 2388.



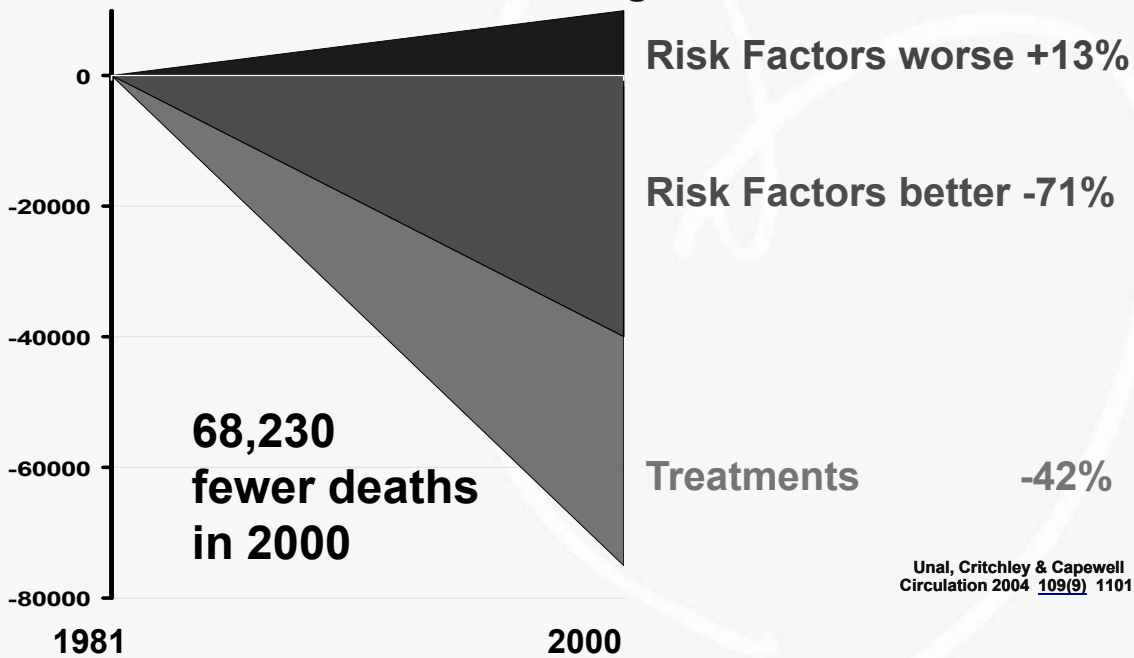
Explaining the fall in coronary heart disease deaths in England & Wales 1981-2000



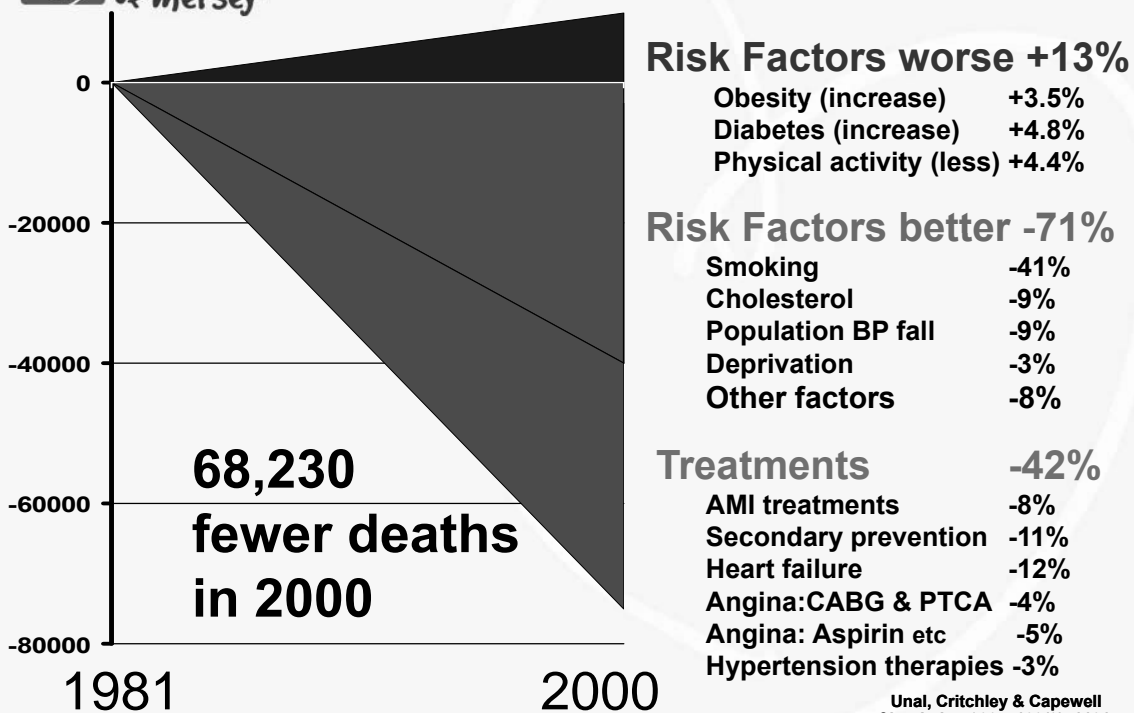
Unal, Critchley & Capewell
Circulation 2004 109(9) 1101



Explaining the fall in coronary heart disease deaths in England & Wales 1981-2000



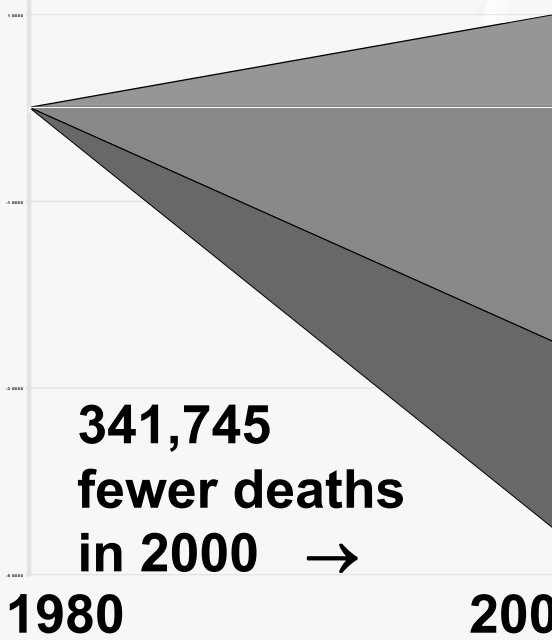
Explaining the fall in coronary heart disease deaths in England & Wales 1981-2000





Explaining the fall in CHD deaths in USA 1980-2000 : RESULTS

NEJM 2007; 356: 2388.



Risk Factors worse +17%

- Obesity (increase) +7%
- Diabetes (increase) +10%

Risk Factors better -65%

- Population BP fall -20%
- Smoking -12%
- Cholesterol (diet) -24%
- Physical activity -5%

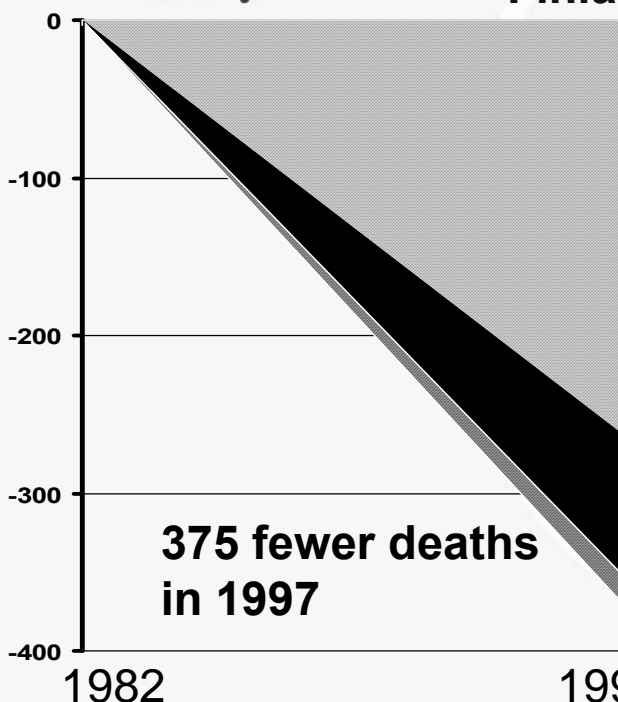
Treatments -47%

- AMI treatments -10%
- Secondary prevention -11%
- Heart failure -9%
- Angina: CABG & PTCA -5%
- Hypertension therapies -7%
- Statins (primary prevention) -5%

Unexplained -9%



IMPACT model: CHD mortality fall in Finland 1982 – 1997



Risk Factors -71%

- Cholesterol - 53%**
- Smoking - 11%
- Blood pressure - 7%

Treatments -24%

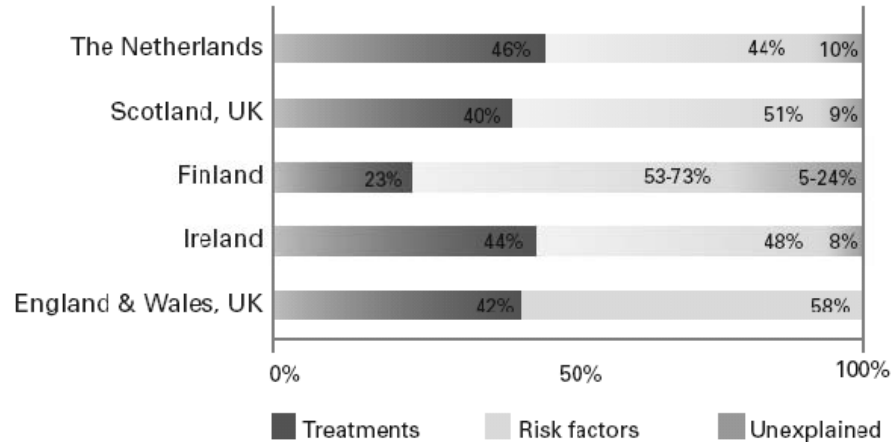
- AMI treatments - 4%
- Secondary prevention - 8%
- Heart failure - 2%
- Angina: CABG & PTCA - 8%
- Angina: Aspirin etc - 2%

Other Factors -5%

Laatikainen et al Am J Epid 2005 162 764

Effective interventions are known - summary

Reductions in deaths from coronary heart disease in
selected European countries: % attributed to interventions



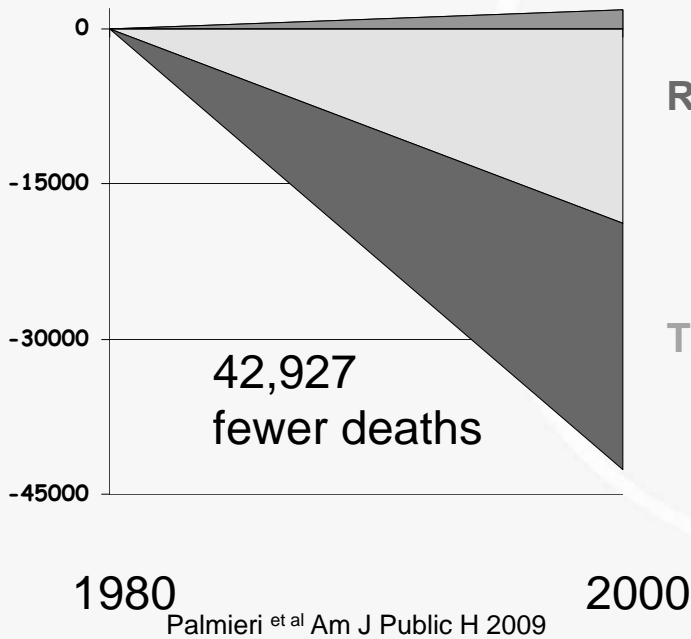
Source: Bots 1996; Capewell 1999; Laatkainen 2005; Bennett 2006; Unal 2004



What about
CHD trends in
LOW incidence populations?



Explaining the fall in coronary heart disease in Italy 1980-2000



Risk Factors worse +4 %

Obesity (increase)	+ 2%
Diabetes (increase)	+ 2.5%

Risk Factors better -44 %

Cholesterol -25 %

Smoking	- 9%
Population BP fall	- 4 %
Physical activity (incr.)	- 6 %

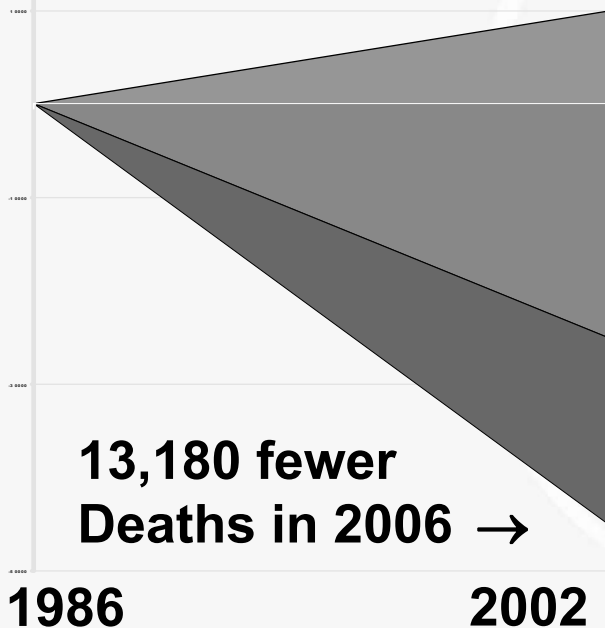
Treatments -55 %

AMI treatments	- 4 %
Secondary prevention	-13 %
Heart failure	-19 %
Angina	-12 %
CABG & PTCA	- 2 %
Angina: Aspirin etc	- 1 %
Hypertension therapies	- 1 %
Statins 1° prevention	- 2 %



Explaining the CHD mortality fall in Sweden 1986-2002: RESULTS

Bjorck et al Eur Heart J 2009



Risk Factors worse +11%

Obesity (increase)	+3%
Diabetes (increase)	+8%

Risk Factors better -66%

<u>Cholesterol</u> (diet)	-39%
Population BP fall	-9%
Smoking	-20%
Physical activity	-13%

Treatments -36%

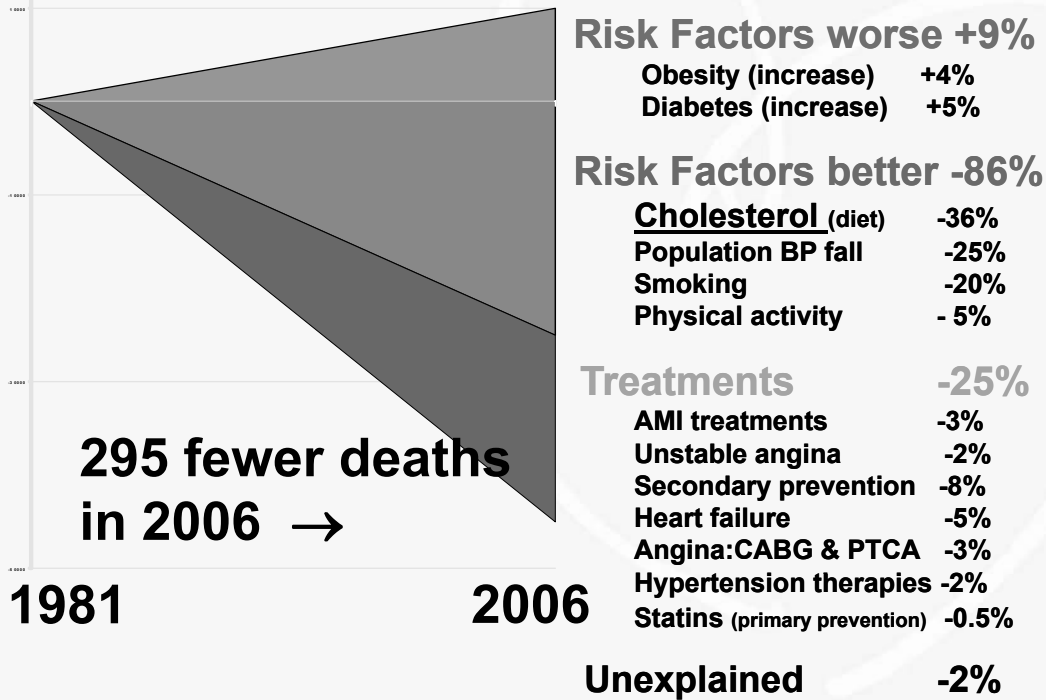
AMI treatments	-6%
Unstable angina	-2%
Secondary prevention	-12%
Heart failure	-7%
Angina: CABG & PTCA	-3%
Hypertension therapies	-4%
Statins (primary prevention)	-2%

Unexplained -9%



Explaining the 80% CHD mortality fall in Iceland 1981-2006: RESULTS

Circulation 2009 [in press]

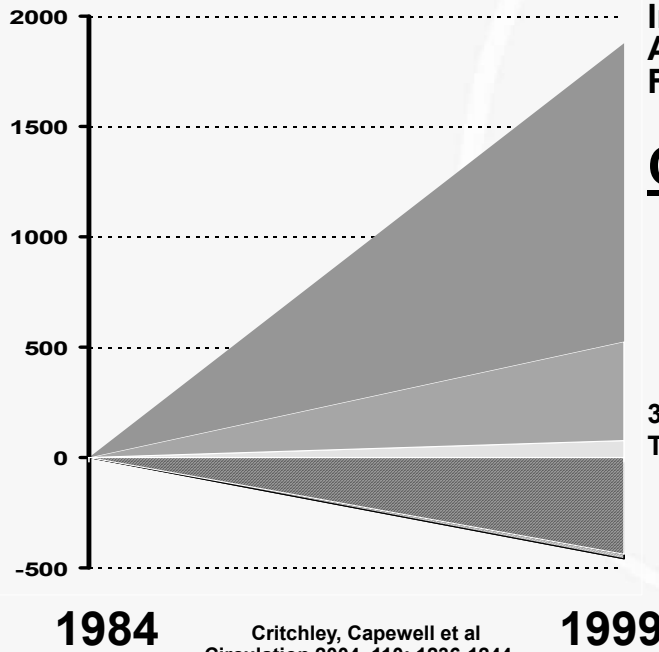


USING THE IMPACT MODEL

1. Replication in other populations
2. Populations with RISING CHD



IMPACT model: CHD mortality RISE in Beijing 1984 - 1999



In 1999: 1820 EXTRA DEATHS
ATTRIBUTABLE TO RISK
FACTOR CHANGES

Cholesterol 77%

Diabetes	19%
BMI	4%
Smoking	1%

370 FEWER DEATHS BY
TREATMENTS

AMI treatments	41%
Hypertension treatment	24%
Secondary prevention	11%
Heart failure	10%
Aspirin for Angina	10%
Angina: CABG & PTCA	2%

Critchley, Capewell et al
Circulation 2004 110: 1236-1244



Summary - falls in CHD mortality:

- Prevention more powerful than treatments
- Cholesterol, blood pressure & smoking crucial (45% -75% due to risk factor reductions)
- Risk factor falls reflect population changes more than tablets
- CVD prevention has large potential to reduce future deaths

Opportunities for interventions

β Coefficients = % fall in CHD mortality per unit decrease in risk factor

(from meta-analyses & cohorts)

Cholesterol lowering *PSC 2007*

- ↓ 0.1mmol/l population mean cholesterol \cong
- ↓ 4% reduction in CHD mortality

Blood pressure *PSC Lancet 2003*

- ↓ 1 mm Hg Systolic BP \cong ↓2% CHD deaths

Smoking *InterHEART, 2004*

- 1% ↓ Smoking prevalence \cong ↓1% CHD deaths

Obesity *Bodgers, 2007*

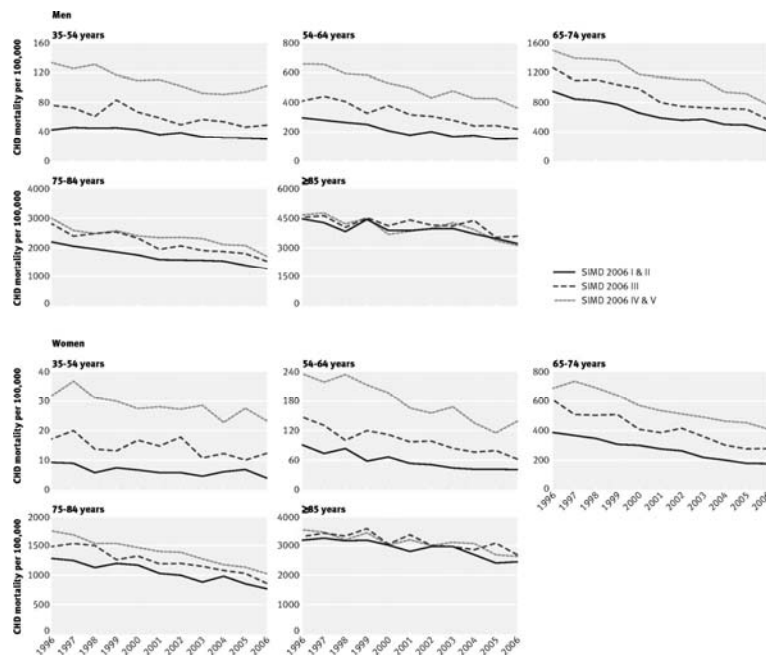
- 0.1 Kg/M² ↓ BMI \cong ↓ 0.25% CHD deaths

Are trends in CVD mortality changing?

- Smoking has been declining but the rate of decline is slowing. Women are smoking nearly as much as men and girls often smoke more than boys
- Dietary patterns are converging
- Levels of physical inactivity are high

European Cardiovascular Disease Statistics 2008,
European Heart Network

Coronary heart disease mortality trends by age and deprivation in men and women (Scotland 1996-2006). SIMD=Scottish Index of Multiple Deprivation



O'Flaherty, M. et al. BMJ 2009;339:b2613



Summary

- **THE public health challenge in Europe**
- **Widening gaps within and between Member States**
- **Increasing burden on health systems, economy and society**
- **There may be a flattening decline in mortality among younger adults**
- **Significant potential for health gain**
 - **Main causes are known**
 - **Effective interventions are known**
 - **Prevention is a vital investment**
 - **Comprehensive and integrated approach is needed**



Thank you

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