Non-communicable diseases (NCD)

DCP2, Beijing

Richard Peto

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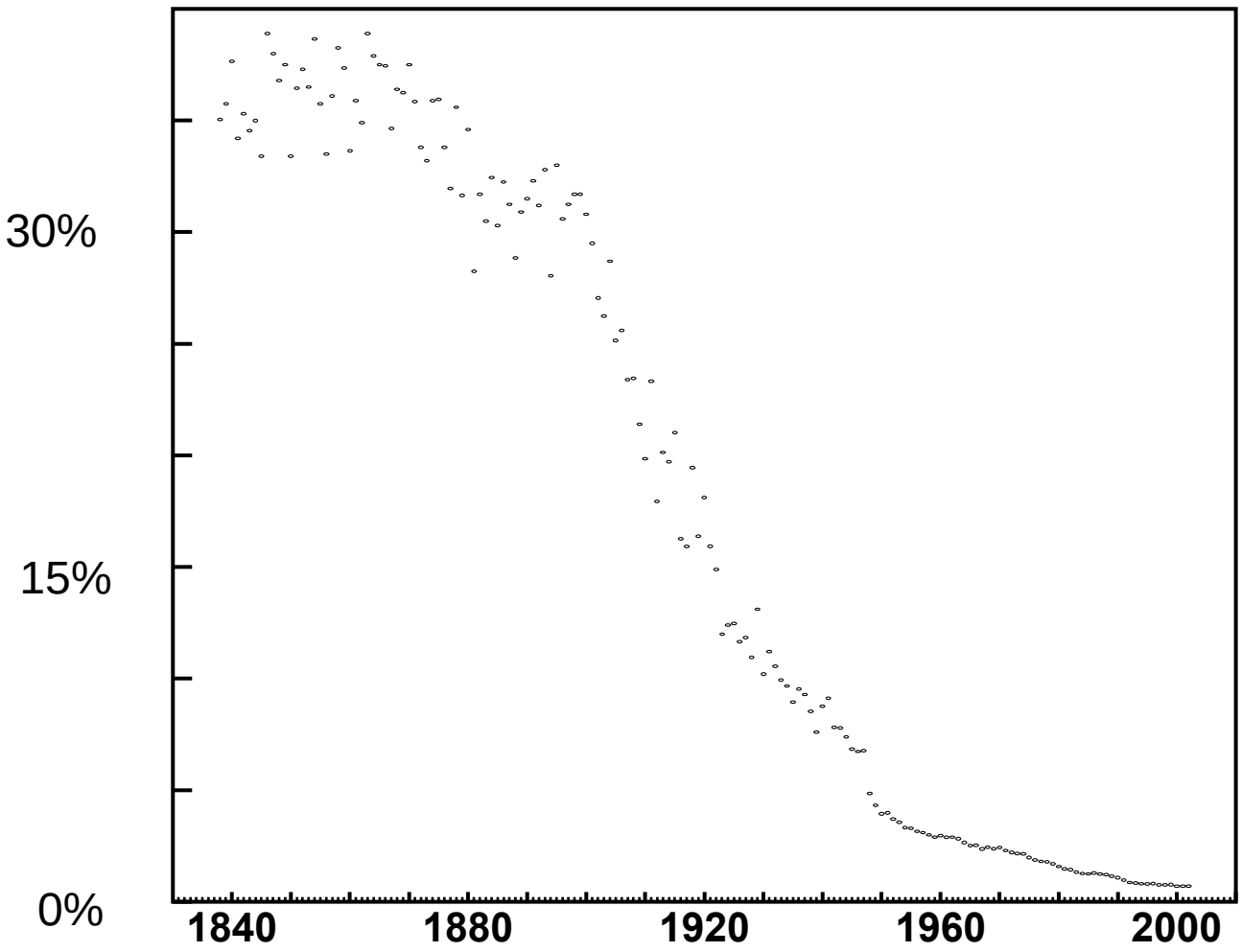
My 3 NCD priorities for China:

- Tobacco: big tax, big packet warnings (helps control smuggling), absolute ad ban (helps protect CNTC) &c.
- Push universal infant HBV vaccination even harder.
- Get blister-packed poly-pill widely available at low cost, & push 2ry prevention of vasc. disease in middle age.

Male under-5 mortality in England, 1838-2002



Source: Gary Whitlock, CTSU, from the reports of the Registrars-General for England & Wales

Worldwide childhood mortality decreasing, 1950-2000

Year of birth	Under-5 mortality
1950-4	23%
1970-4	14%
1990-4	9%
2000-4	8% (~10M / 130M)

Source: AD Lopez

Year 2000 under-5 mortality: ~10M deaths / 130M births

- It would be ~1M deaths
  at year 2000 W. European death rates

- But, it would be ~30M deaths
  at year 1900 W. European death rates

WORLDWIDE DEATHS
(dying early 21st century)

Age range	**Annual deaths**
0-34	**~20M***
35-69	**~20M**
70+	**~20M**
All ages	**~60M**

* Only ~17M / 56M in 2001,
but nos. from HIV increasing

Probability, at current death rates, of an infant surviving to age 35 but dying at 35-69

Developed countries	**1 / 6 ***
Developing countries	**1 / 3 ***

*** Mostly NCD**

Future deaths among the 130M born in the year 2000

Age range	Deaths	Years lost / death
0-34	~20M	40-60
35-69	~40M*	20-30
70+	~70M	5-10

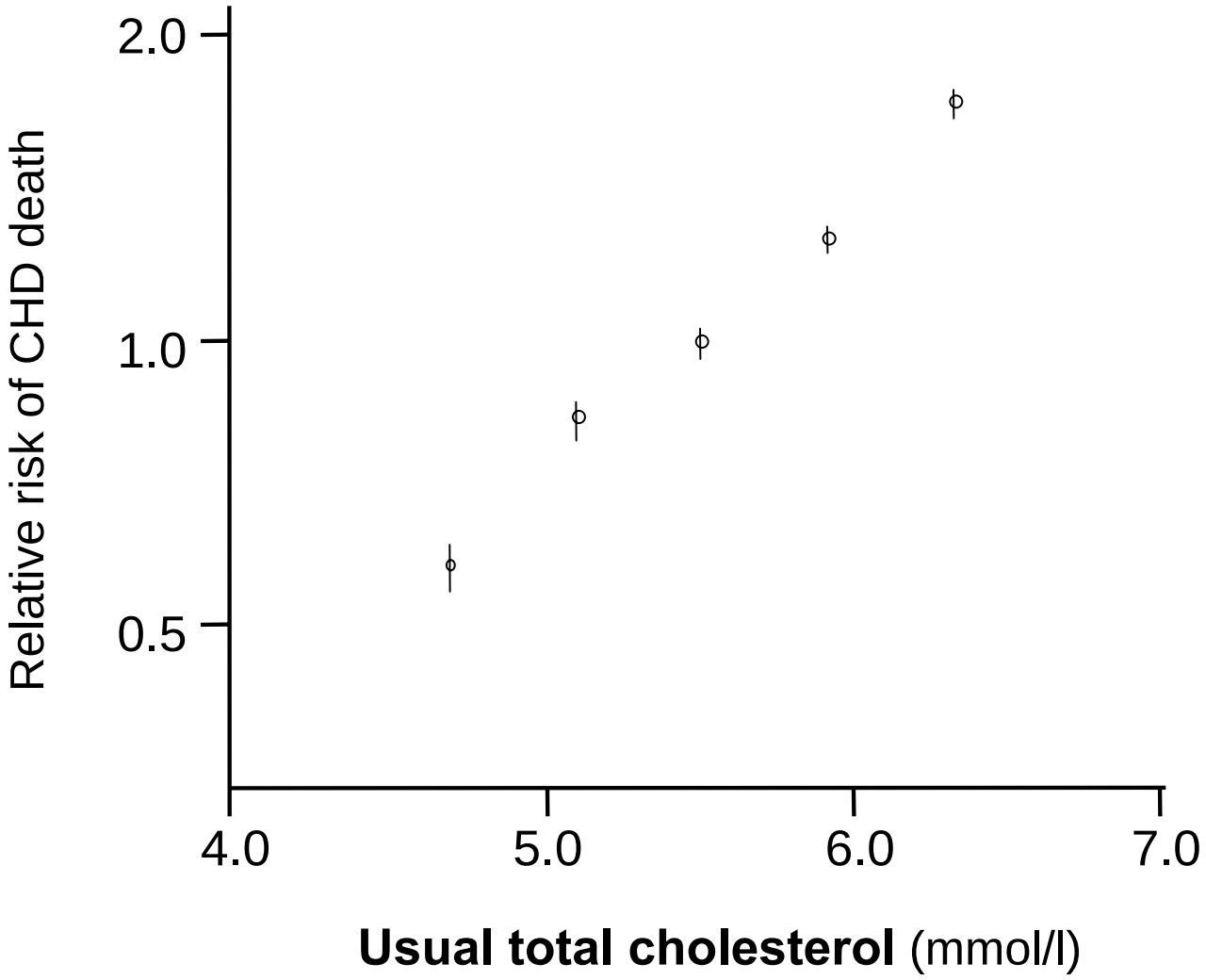
*** Deaths at ages 35-69 in 2035-2069, most from non-communicable disease: vascular, neoplastic, respiratory &c**

Halving vascular mortality in middle age (35-69)

Treatment & prevention:

blood lipids,
blood pressure,
obesity,
tobacco.

CHD mortality vs usual total cholesterol: MRFIT prospective study of 350,000 US males

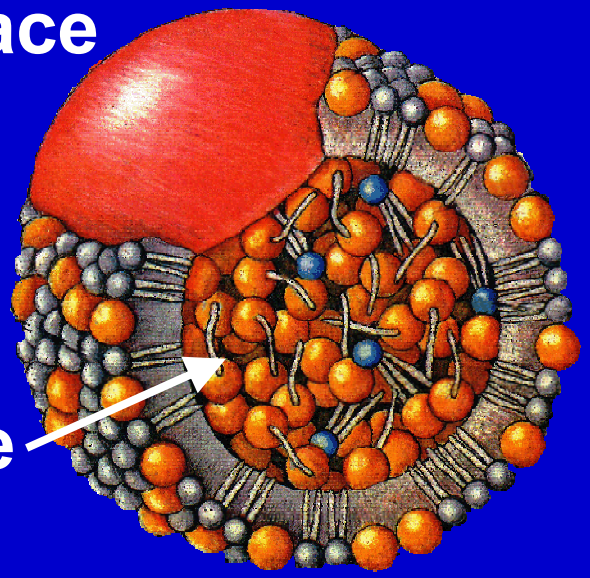


LDL and HDL particles carry most of the cholesterol (C) in the blood

apo B on surface

Bad (B): some or all types of LDL particle

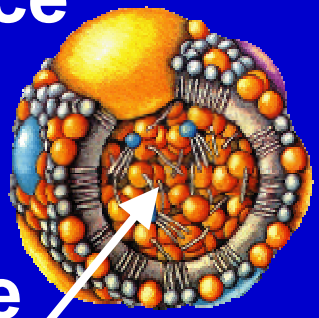
LDL-C inside



apo A_1 on surface

All right (A1): some types of HDL particle

HDL-C inside

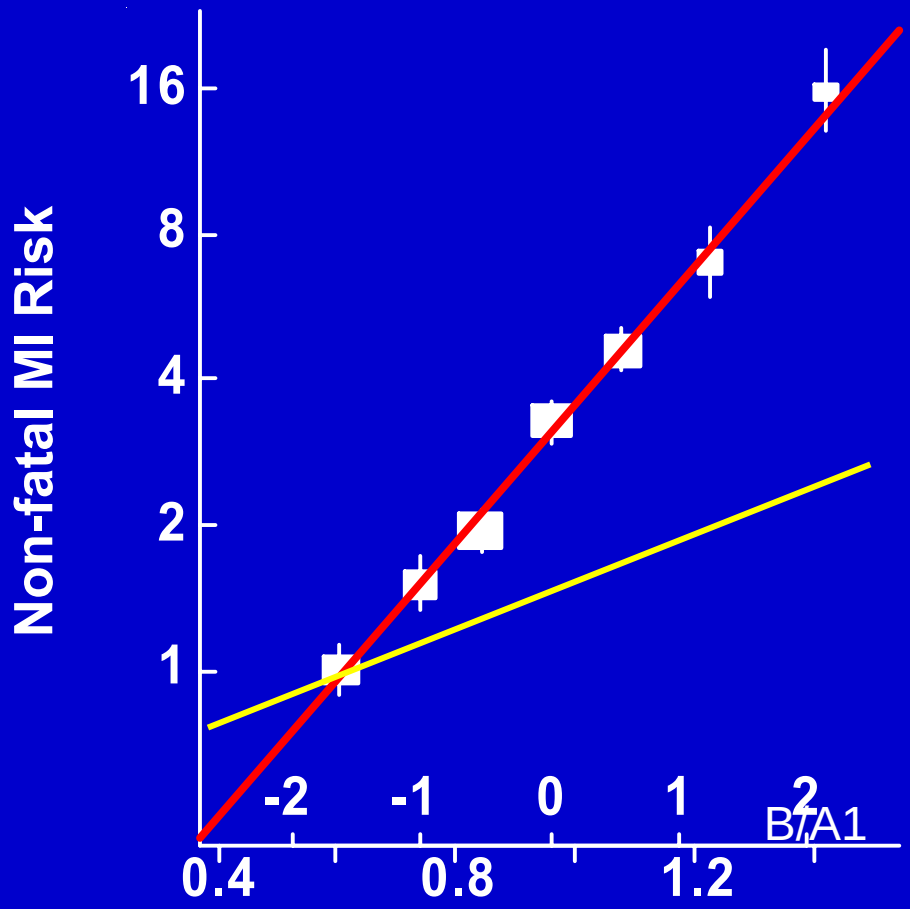


ISIS MI case - control study (UK, early 1990s)

9181 with acute myocardial infarction &

6949 controls

UK ISIS MI case-control study: relative risk *vs* apoB / apoA1 ratio (& *vs* total cholesterol)



	RR per 2SD
apo B / apo A_1	4.16
Total cholesterol	1.63

How important is blood pressure to vascular death?

10 mmHg lower systolic BP means ~1/3 less vascular death at 35-69

Prospective Studies Collaboration
Lancet 2002; 360: 1903

Long-term treatment for many years after a non-fatal stroke or heart attack ("secondary prevention"): trial results

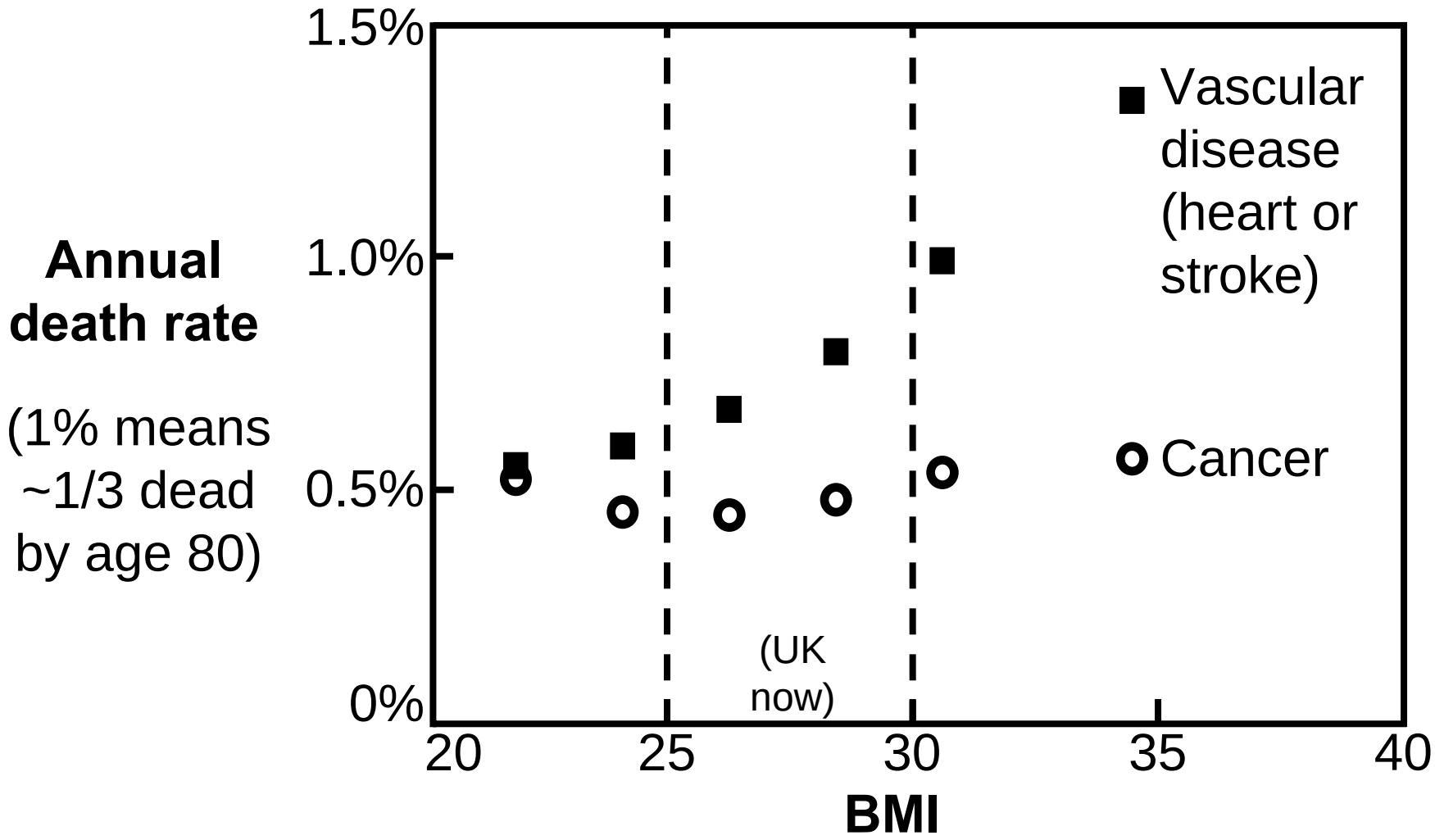
	Annual risk of recurrence
Aspirin vs. nothing	**5% vs. 7%**
Aspirin + BP↓ (diuretic & ACEI) vs. Aspirin alone	**3% vs. 5%**
Aspirin + BP↓ + statin (chol. lowering) vs. Aspirin + BP↓ alone	**2% vs. 3%**

Daily use of 3 or 4 generic drugs could prevent 2/3 of the risk of stroke or heart attack recurrence, at least for several years.

Combination pills for secondary prevention of vascular disease

- With low-cost combination pills, a main strategy of 2ry prevention could work globally, wherever diagnosis of MI or occlusive stroke can happen.
- Ten-year recurrence risk would be reduced from about 1/2 without treatment down to about 1/6.

Obesity: BMI and mortality at ages 40-79
~5 times steeper for vascular than for cancer



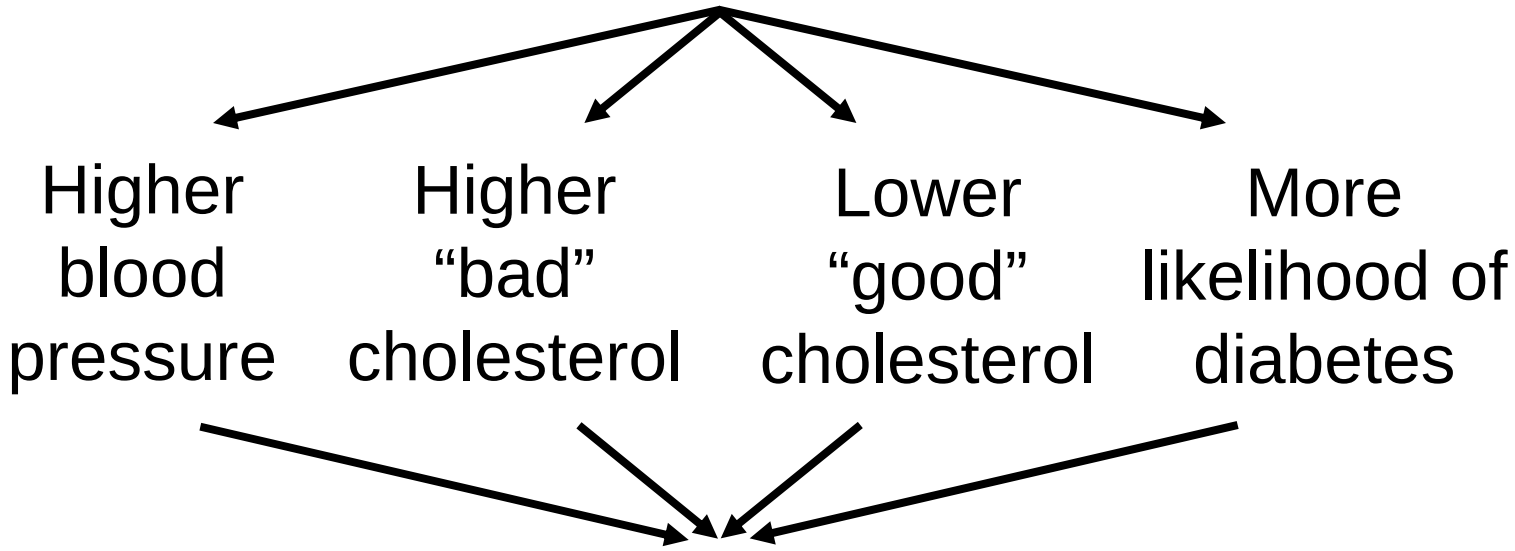
Average of rates at 40-9, 50-9, 60-9, 70-9 (standardised for age, sex, smoking etc)

Prospective Studies Collaboration, excl. 1st decade of follow-up; 800 000 adults studied

BMI and vascular disease: main mechanisms known, and largely reversible

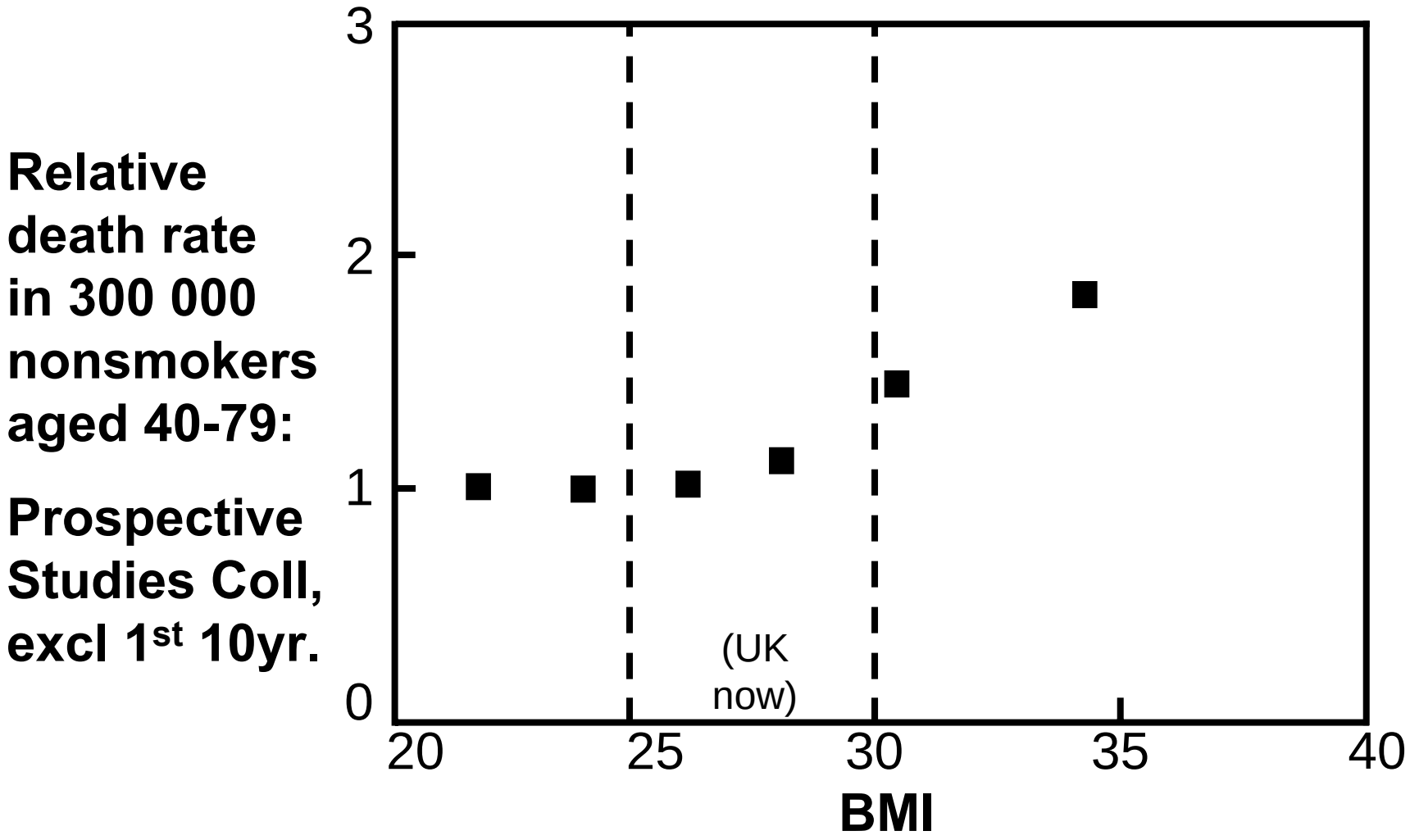
Hazards largely or wholly accounted for by blood pressure, cholesterol and diabetes

More body fat causes:

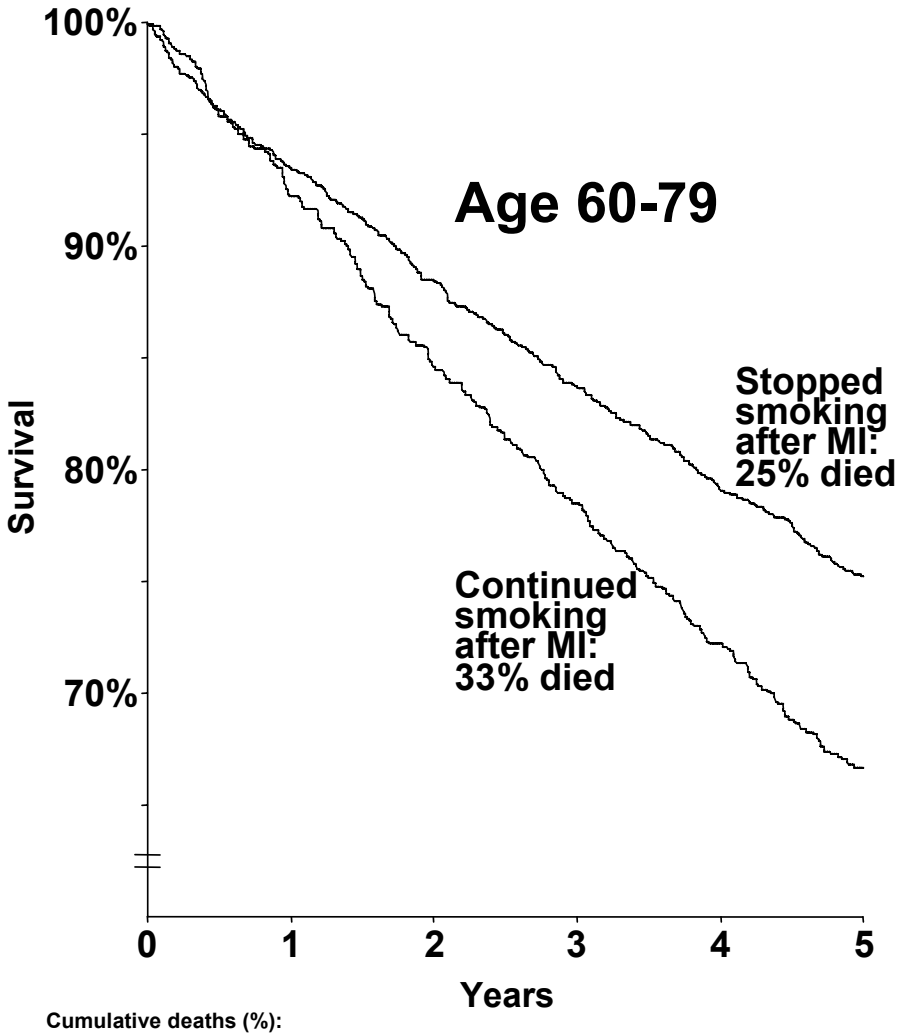


Each makes vascular death more likely

BMI and overall mortality rate in non-smokers: BMI > 35 doubles the death rate (but, smoking triples it: Doll & Peto, BMJ 328:1519)



Benefits of stopping smoking even after an acute heart attack: 5-year mortality after answering questions (a few months post-MI)

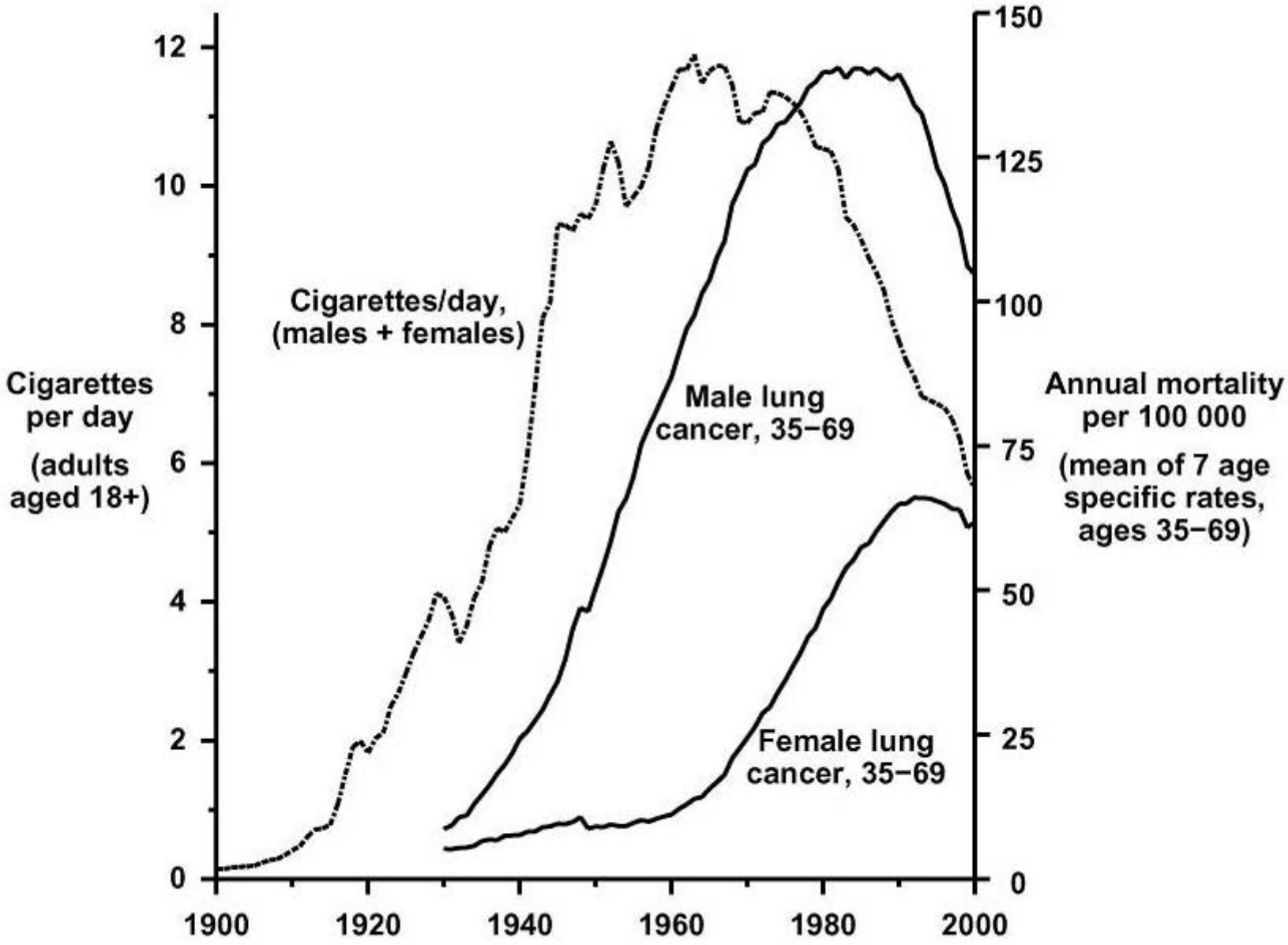


Cumulative deaths (%):					
Yes	70(7.8%)	138(15.4%)	192(21.5%)	248(27.8%)	297(33.3%)
No	123(6.6%)	216(11.6%)	302(16.3%)	387(20.9%)	459(24.8%)

Halving cancer mortality in middle age (35-69)

Predominance of tobacco hazards

US trends in cigarette consumption & lung cancer mortality



Source: US Mortality Public Use Data Tapes 1960–2000, US Mortality Volumes 1930–1959, National Center for Health Statistics, Centers for Disease Control and Prevention, 2003.

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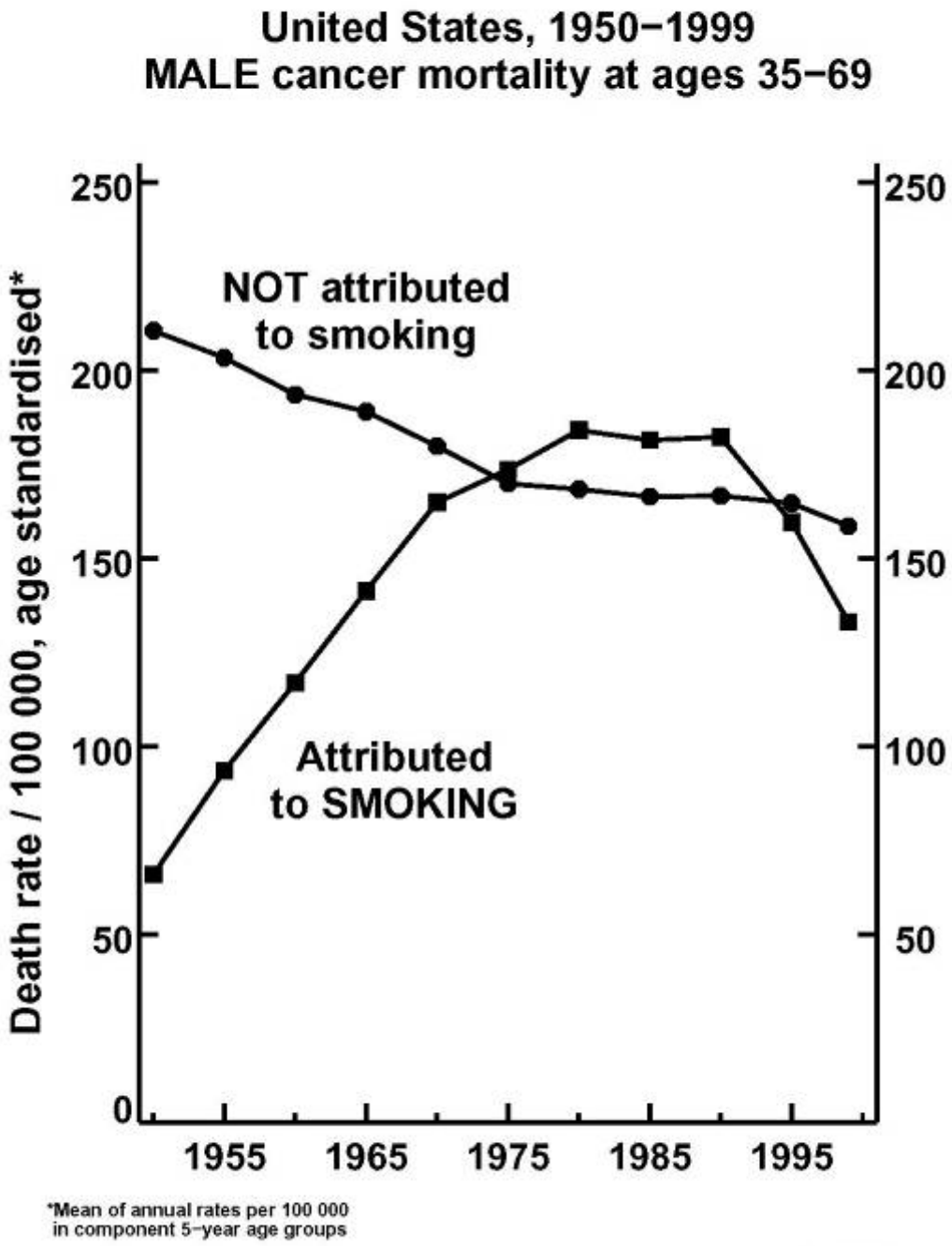
United States, 1950−1999
MALE cancer mortality at ages 35−69
Death rate / 100 000, age standardised*
250
200
150
100
50
0
NOT attributed to smoking
Attributed to SMOKING
1955
1965
1975
1985
1995
*Mean of annual rates per 100 000 in component 5−year age groups
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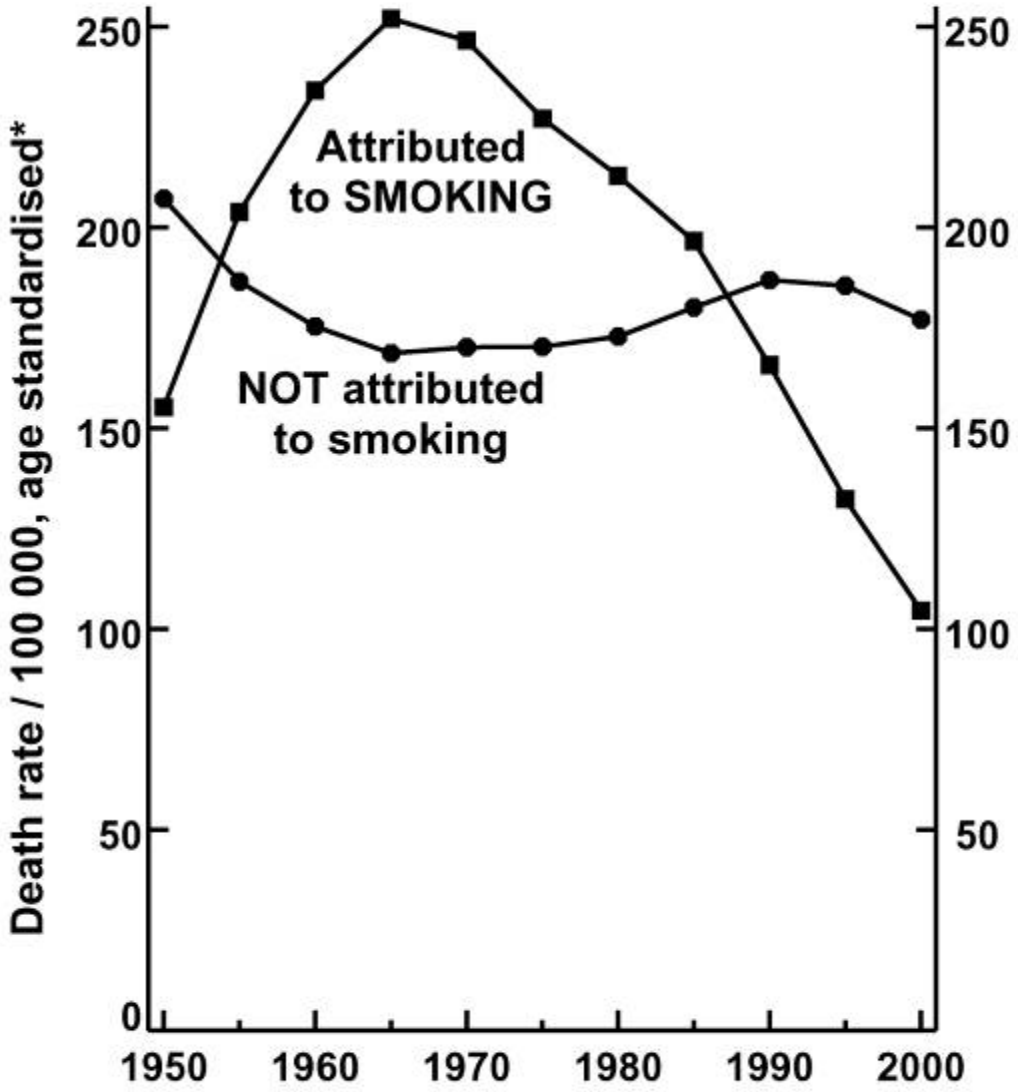
United Kingdom, 1950–2000
MALE cancer mortality at ages 35–69



*Mean of annual rates per 100 000 in component 5–year age groups

Source: WHO mortality & UN population estimates

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Mortality from smoking in developed countries, 1950-2000

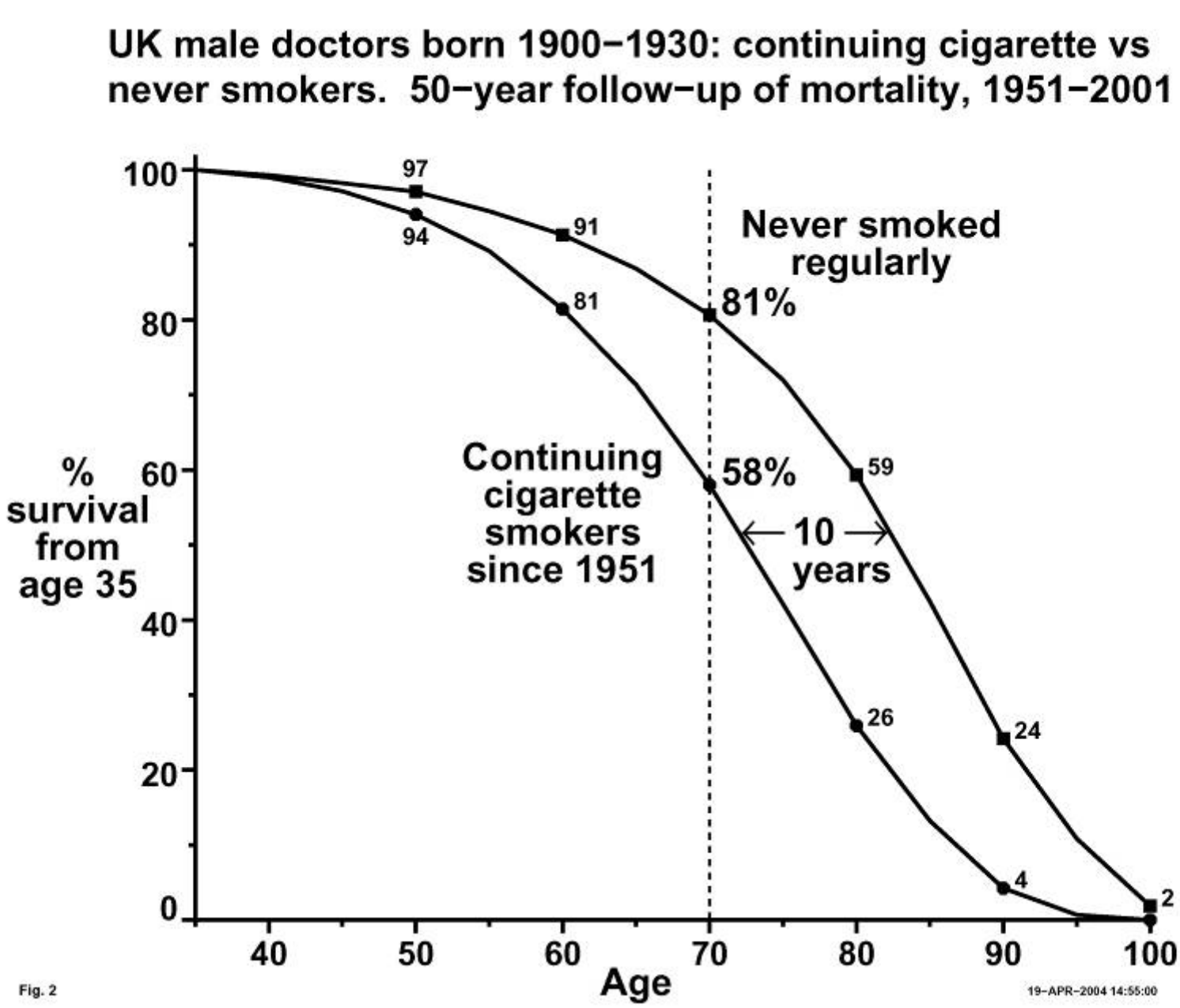
Peto, Lopez et al. (2nd edition, 2006)

Graphs of tobacco mortality for each major developed country are provided on the CTSU website

www.ctsu.ox.ac.uk

Three main messages for the individual smoker:

1. Risk is BIG: half are killed
2. 1/4 are killed in MIDDLE age (35-69), losing many years
3. STOPPING smoking works


UK male doctors born 1900−1930: continuing cigarette vs never smokers. 50−year follow−up of mortality, 1951−2001
% survival from age 35
100
80
60
40
20
0
97
94
91
81
59
26
4
24
2
Never smoked regularly
81%
Continuing cigarette smokers since 1951
58%
10 years
40
50
60
70
80
90
100
Age
Fig. 2
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Effect of stopping smoking at age ~40 on survival from age 40

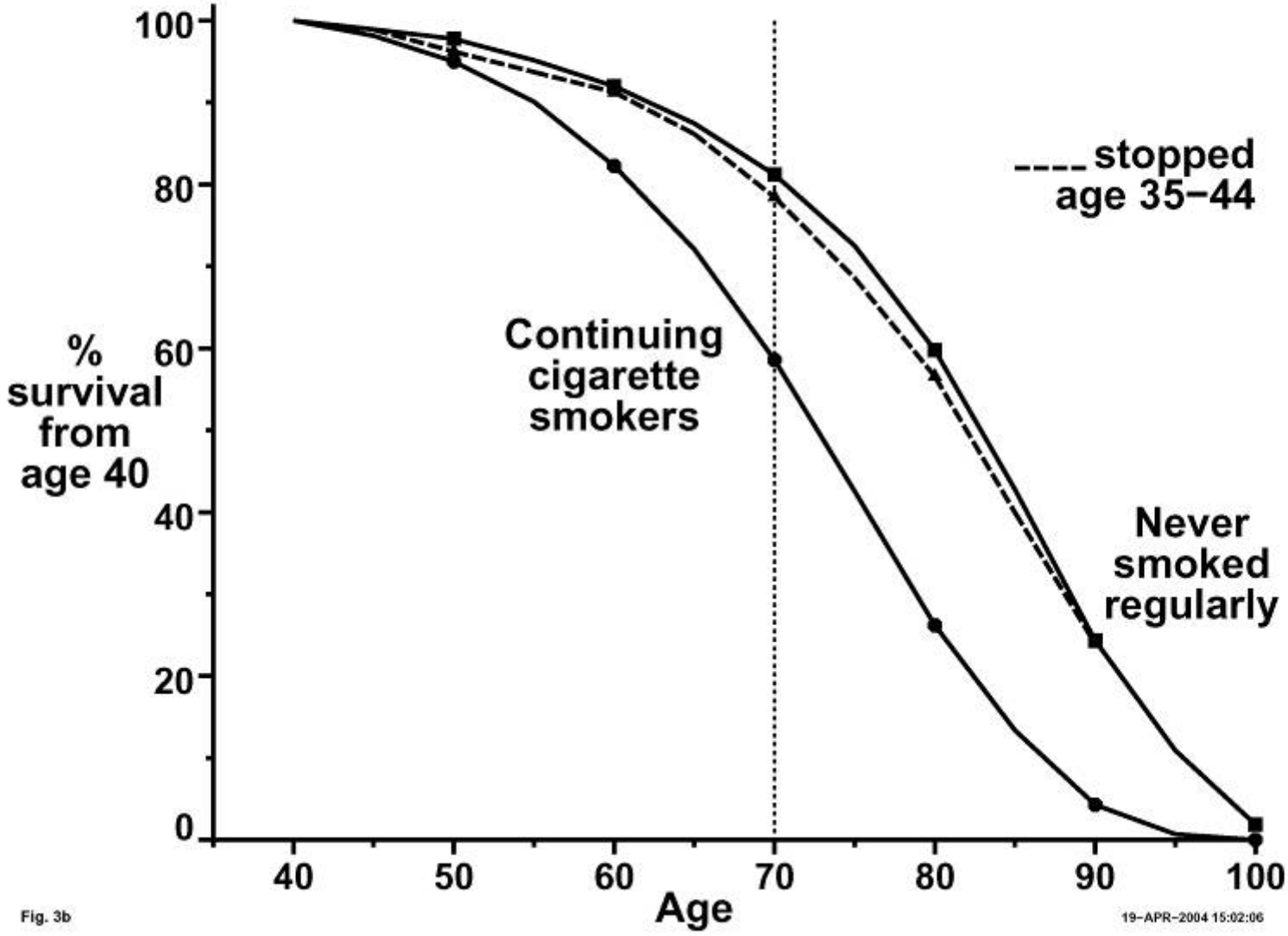

Fig. 3b

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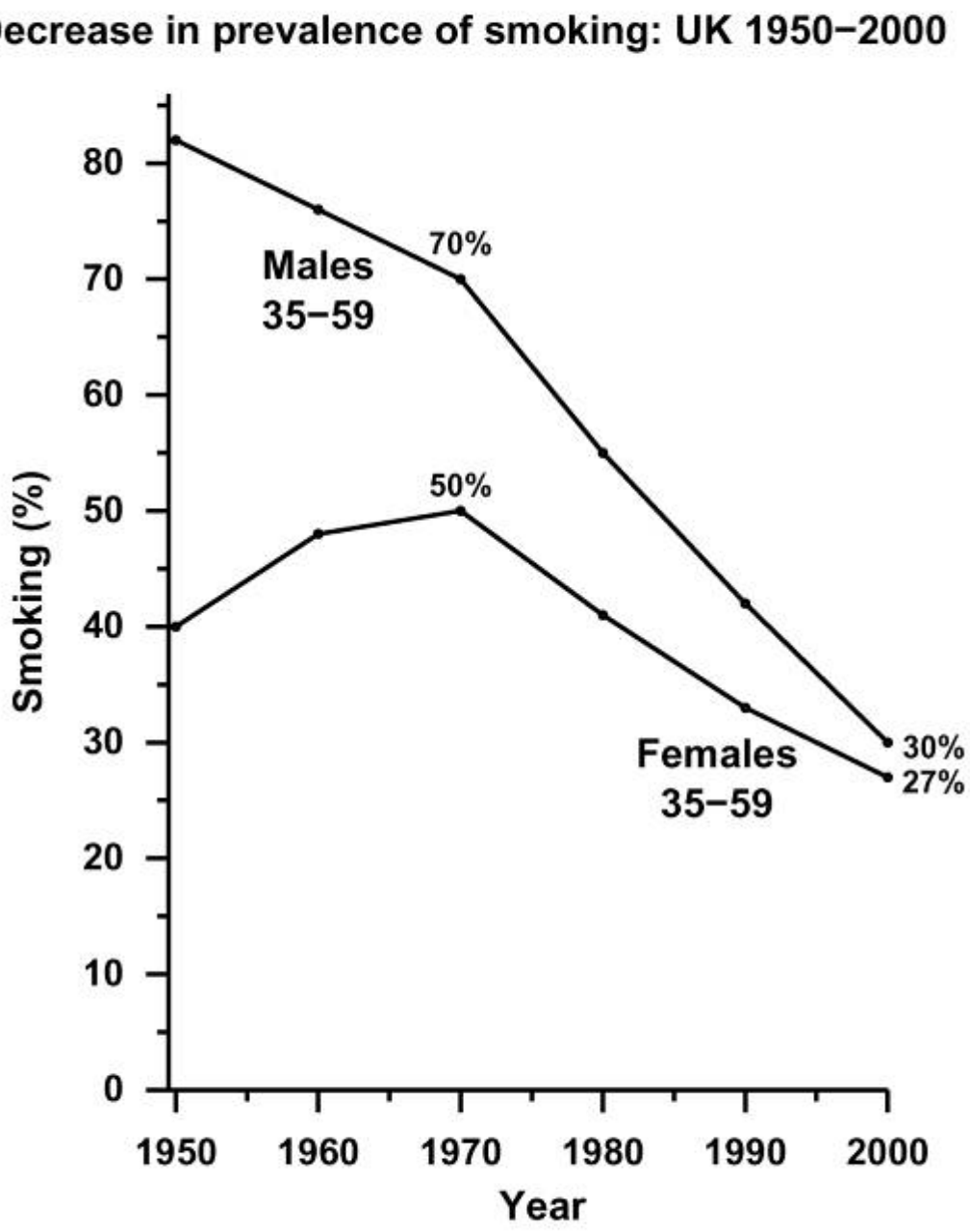
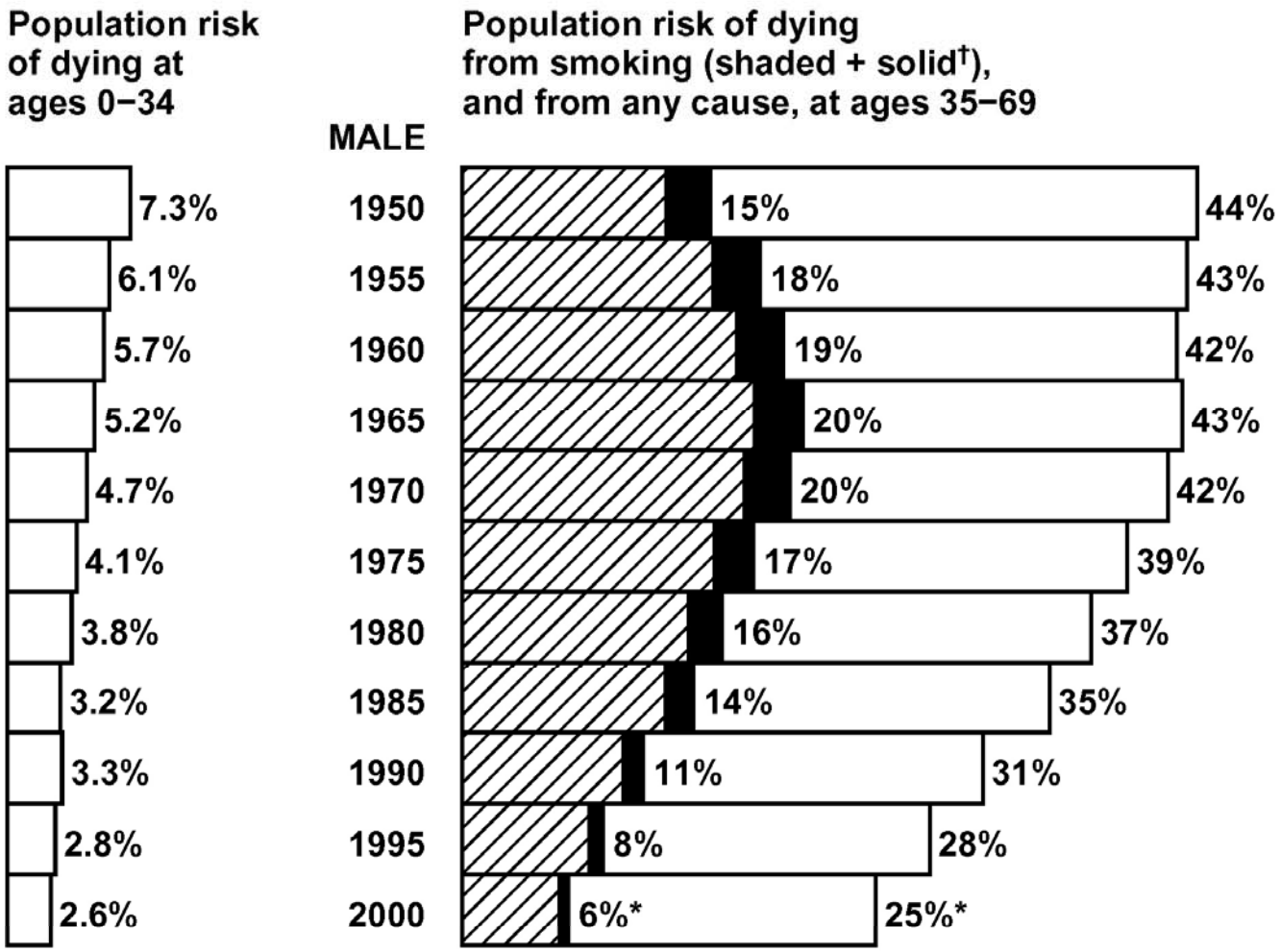
Effects of cessation at various ages

- On average, for men born 1900-1930, cigarette smokers lost about 10 years.
  .
- But, cessation at ages 60, 50, 40 or 30 gained about 3, 6, 9 or the full 10 years


Decrease in prevalence of smoking: UK 1950−2000
Smoking (%)
80
70
60
50
40
30
20
10
0
1950
1960
1970
1980
1990
2000
Year
Males
35−59
70%
50%
Females
35−59
30%
27%

1950-2000: UNITED KINGDOM



***At year 2000 male death rates, out of 100 men aged 35, 25 would die before age 70 (with 6 of these deaths attributed to smoking)**

†Most of those killed by smoking (shaded area) would otherwise have survived to age 70, but a minority (solid black area) would not

Chinese cigarette increase 40 years after US increase

US,1910-1950		China (men),1950-1990	
Year	Cigarettes per day	Year	Cigarettes per day
1910	1	1952	1
1930	4	1972	4
1950	10	1992	10

Delayed hazard: proportion of all deaths at ages 35-69 due to tobacco

US, all adults		China (men)	
1950	12%	1990	12%
1990	33%	2030	33%

Chinese cigarette increase 40 years after US increase

US,1910-1950		China (men),1950-1990	
Year	Cigarettes per day	Year	Cigarettes per day
1910	1	1952	1
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1950	10	1992	10

Delayed hazard: proportion of all deaths at ages 35-69 due to tobacco

US:	all adults
1950	12%
1990	33%

China:	men	women
1990	12%	3%
2030	~33%	1%

World: ~30 million new smokers per year (50% of young men, 10% of young women).

If this continues, & most don't stop, world tobacco deaths eventually >10 million/year (100 million/decade)

World tobacco deaths, if current smoking patterns continue

2000-2025	**~150M**
2025-2050	**~300M**
2050-2100	**>500M**
TOTAL for the 21st century	**~1000M (1 billion)**
Compare with 20th century total	~100M (0.1 billion)

Prevention of a substantial proportion of the 450 million tobacco deaths **before** 2050 requires **adult cessation**

Continuing to reduce the % children starting smoking prevents many deaths,

but its main effect will be on mortality in **~2050 & later**

HALVING PREMATURE DEATH

Child survival (improving)

HIV (worsening, despite better treatment)

Malaria (maybe worsening)

Unrelated infectious & parasitic (improving: vaccination, TB control, IMCI & better drugs)

Vascular and neoplastic death

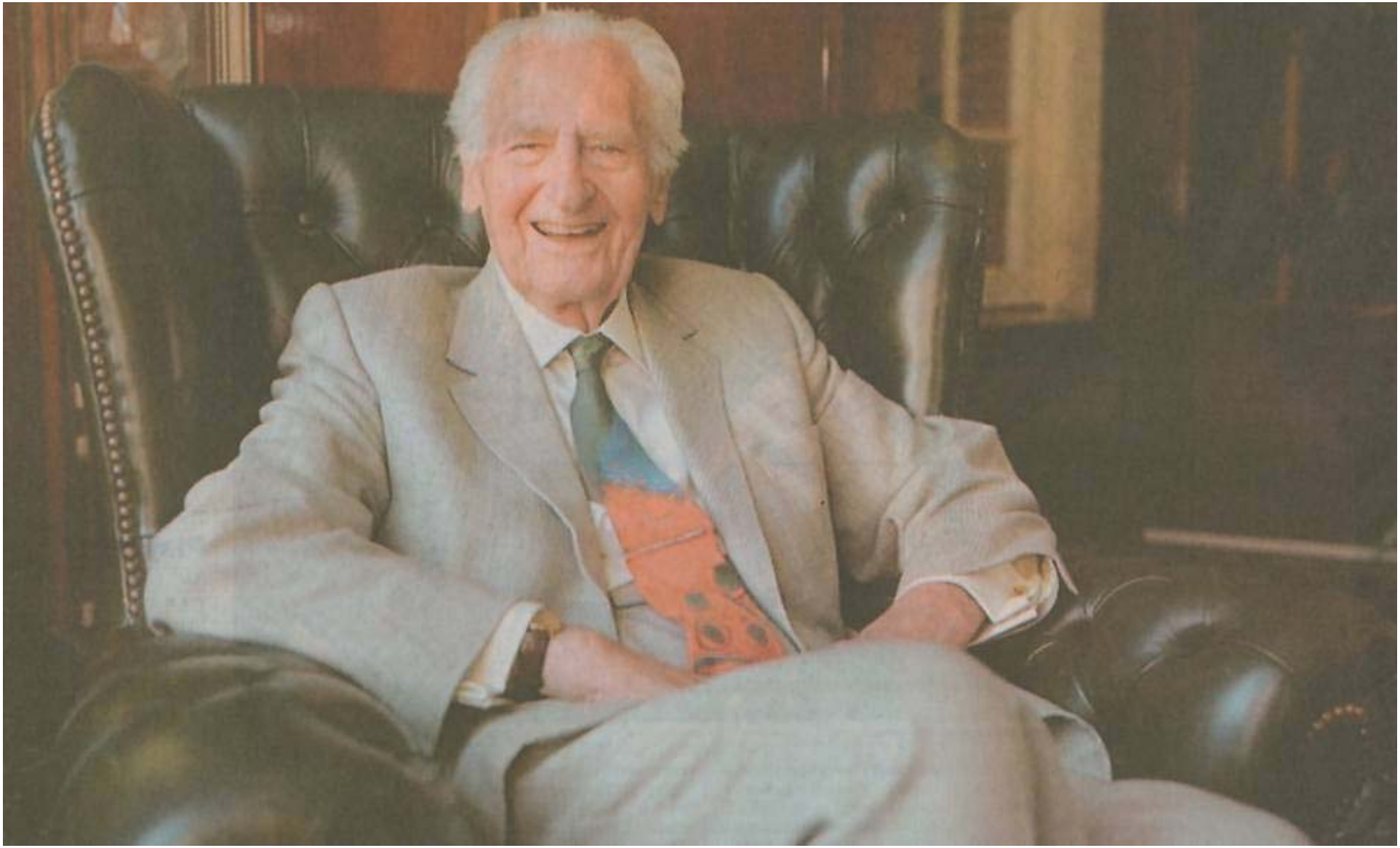
Attention to statistical detail has greatly increased the known importance of “classical” risk factors such as blood lipids, blood pressure & tobacco, and of many widely practicable treatments.

Halving premature death: get the BIG numbers right

- Avoid catastrophic war, famine, pestilence, social collapse and despair – the world could well get much worse than it is now.

  .
- Make effective treatments progressively more widely accessible worldwide – don't wait for millennial social improvements first.

  .
- Better a moderate reduction in a big cause than a big reduction in a small one - don't confuse the few big with the many smaller causes.



"Richard Doll was both a great doctor and the greatest epidemiologist of our time." Guardian obituary, 2005

(Photo at BMJ press conference on 50-year results, 2004)