Blood pressure, cholesterol and 55,000 vascular deaths among one million adults

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for the PSC
(Prospective Studies Collaboration)

Lancet 2002; **360:** 1903 & 2007; **370:** 182 9

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Steering Committee — S Lewington (coordinator and statistician), S MacMahon (chair), R Peto (statistician), A Aromaa, C Baigent, J Carstensen, Z Chen, R Clarke, R Collins, S Duffy, D Kromhout, J Neaton, N Qizilbash, A Rodgers, S Tominaga, S Törnberg, H Tunstall-Pedoe, G Whitlock.

http://www.ctsu.ox.ac.uk/projects/psc/

Prospective Studies Collaboration

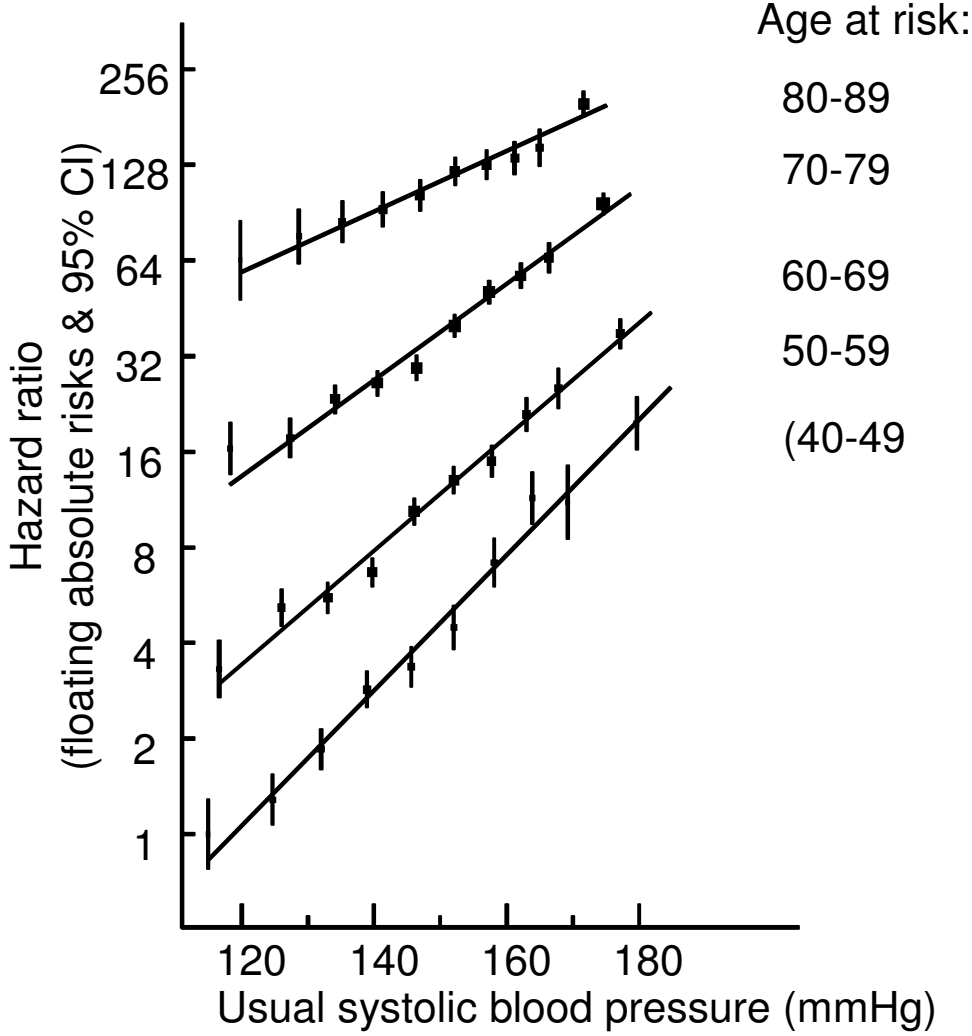
Established chiefly to investigate associations of blood pressure and blood cholesterol with cause-specific mortality

Individual data on 1 M participants without any previous history of vascular disease from 61 prospective cohort studies

120 000 deaths (55 000 vascular, 26 000 cancers), half during and half after first decade of follow-up

Stroke mortality in each decade of age versus usual SBP at the start of that decade

11 274 deaths at ages 50 - 89



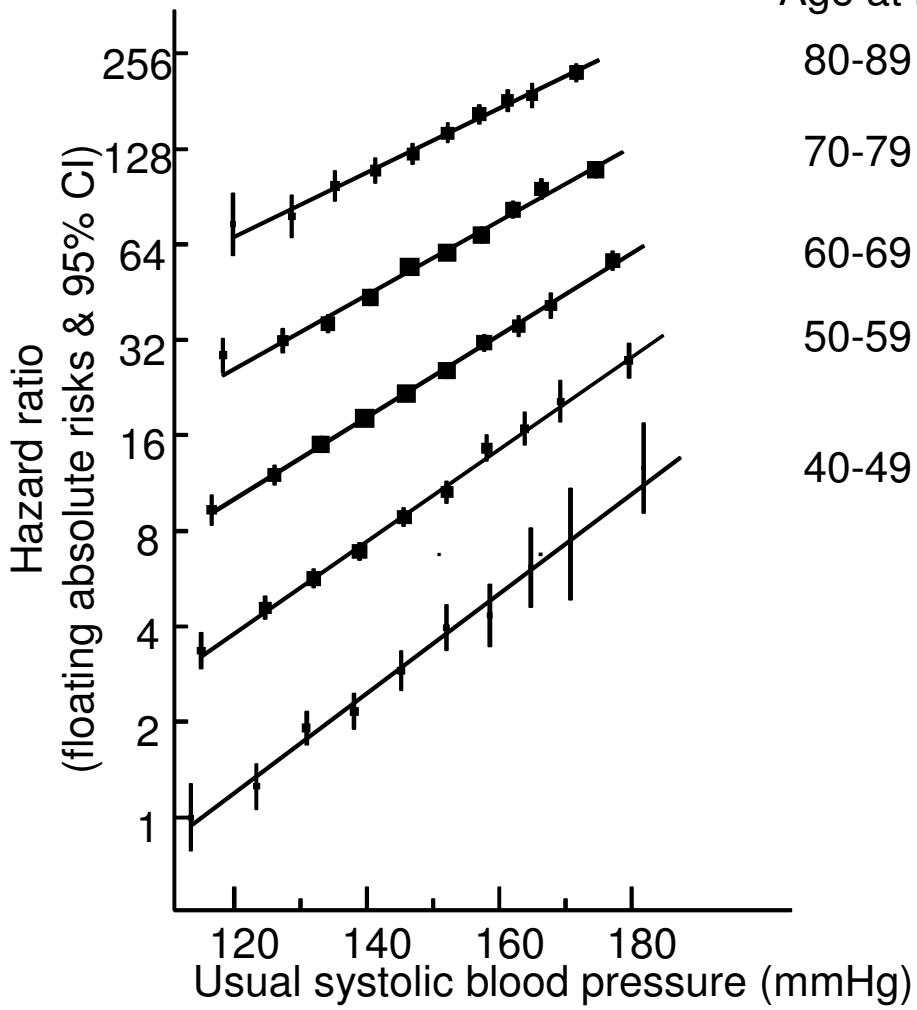
Age at risk:	20 mmHg ↓ SBP
80-89	33% ↓ risk
70-79	50% ↓ risk
60-69	57% ↓ risk
50-59	62% ↓ risk
(40-49	64% ↓ risk)

Lancet 2002; 360:1903-13

PSC

CHD mortality in each decade of age versus usual SBP at the start of that decade

33 867 deaths at ages 40 - 89

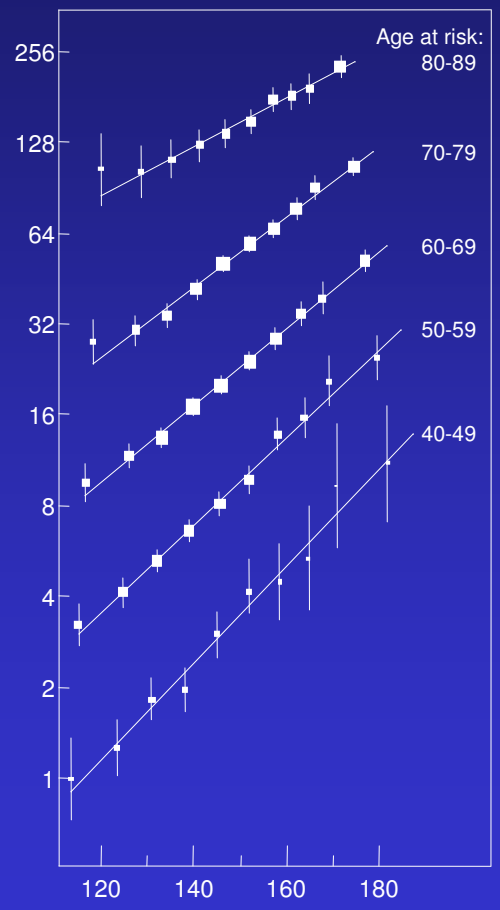


Age at risk	20 mmHg ↓ SBP
80-89	31% ↓ risk
70-79	40% ↓ risk
60-69	46% ↓ risk
50-59	50% ↓ risk
40-49	51% ↓ risk

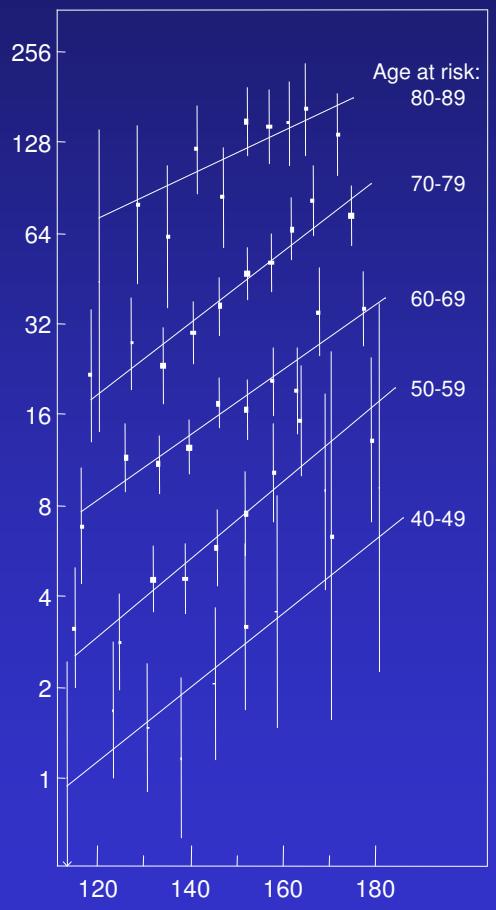
Lancet 2002; 360:1903-13

Sample size matters: CHD vs SBP by age in random samples of 0.5M, 50K, or 5K people from PSC data

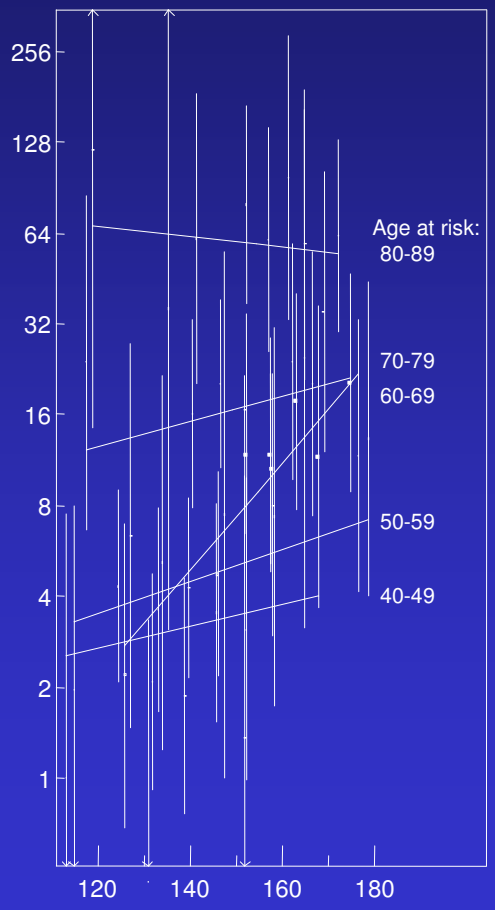
500,000 people



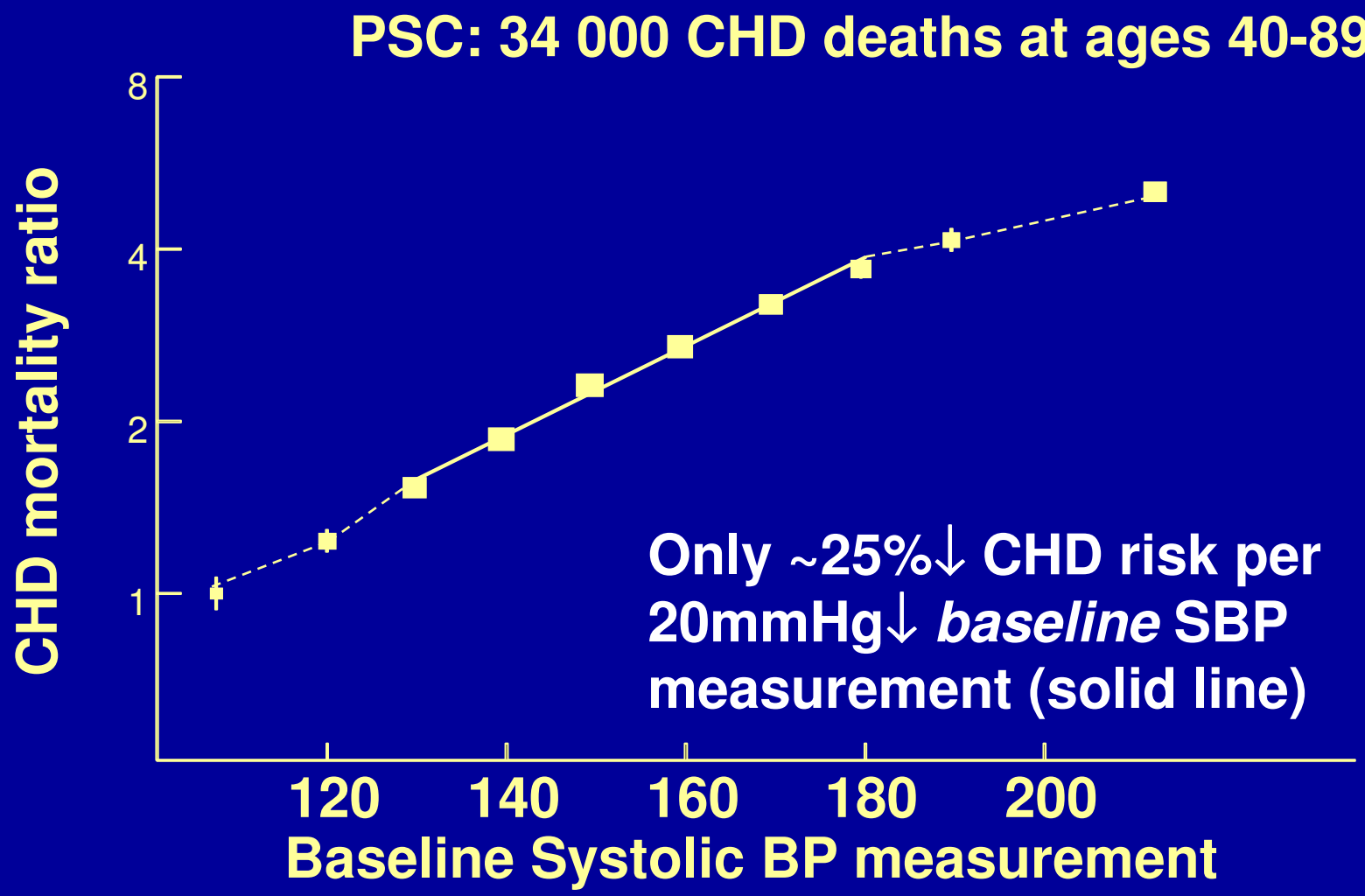
50,000 people



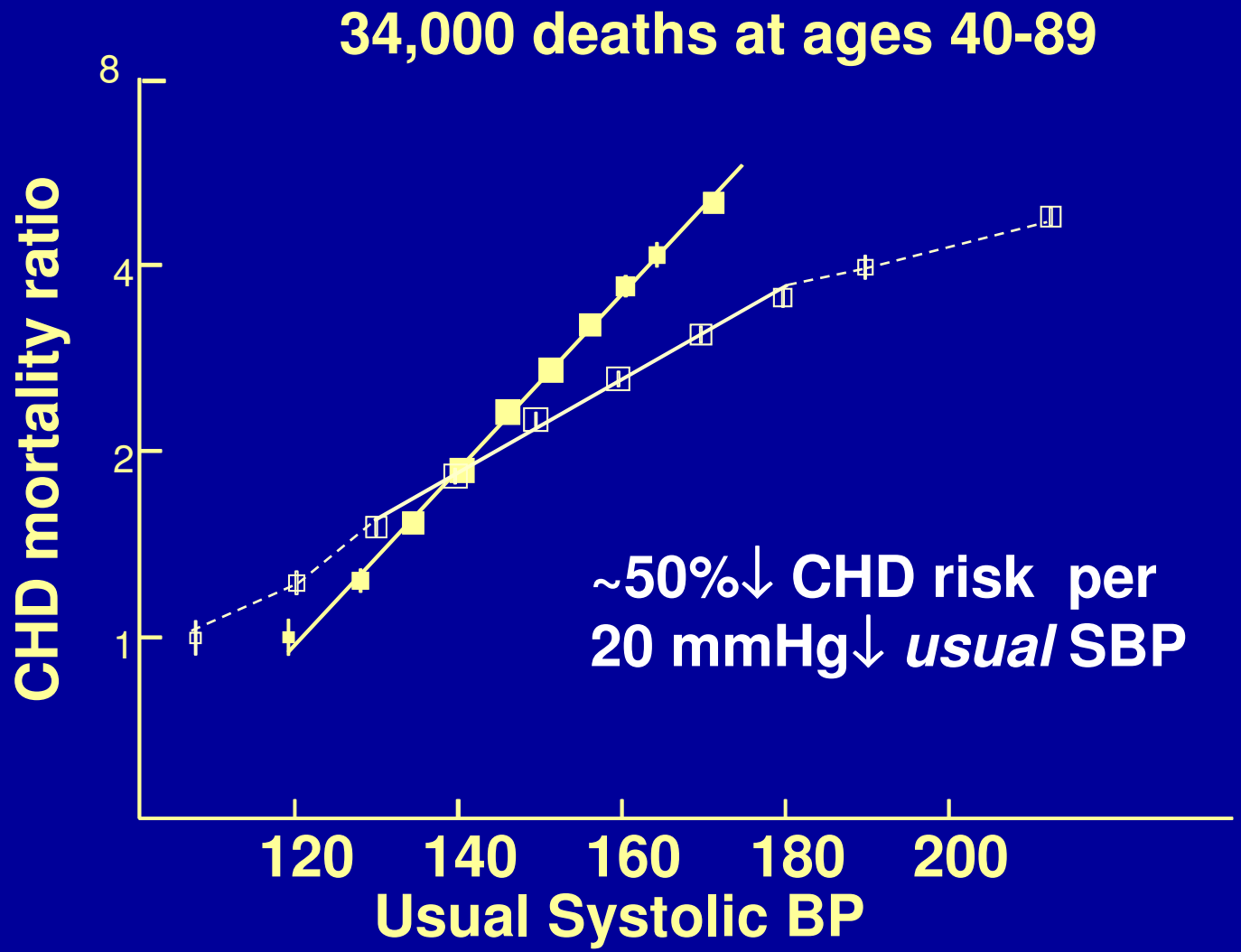
5000 people



Prospective Studies Collaboration, uncorrected: CHD mortality vs baseline systolic BP measurement



PSC, corrected for regression dilution: CHD mortality versus usual SBP



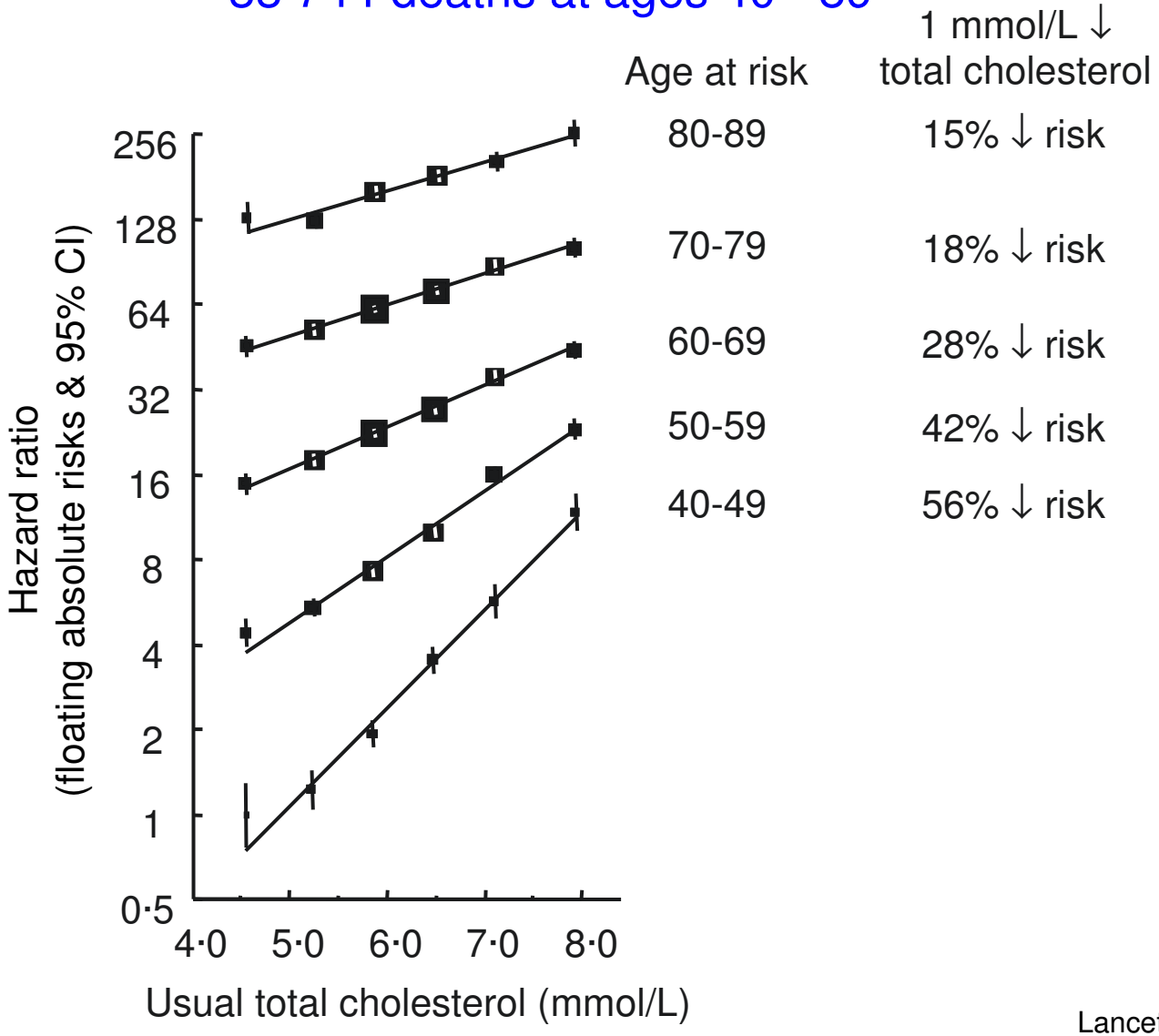
Comparison of different BP indices

If just one single measurement of BP is used to predict risk then:

- the measured systolic BP is slightly more informative than the measured diastolic BP
- their average is slightly more informative than either alone
- their difference (i.e. pulse pressure) is much less informative

CHD mortality in each decade of age versus usual total cholesterol at the start of that decade

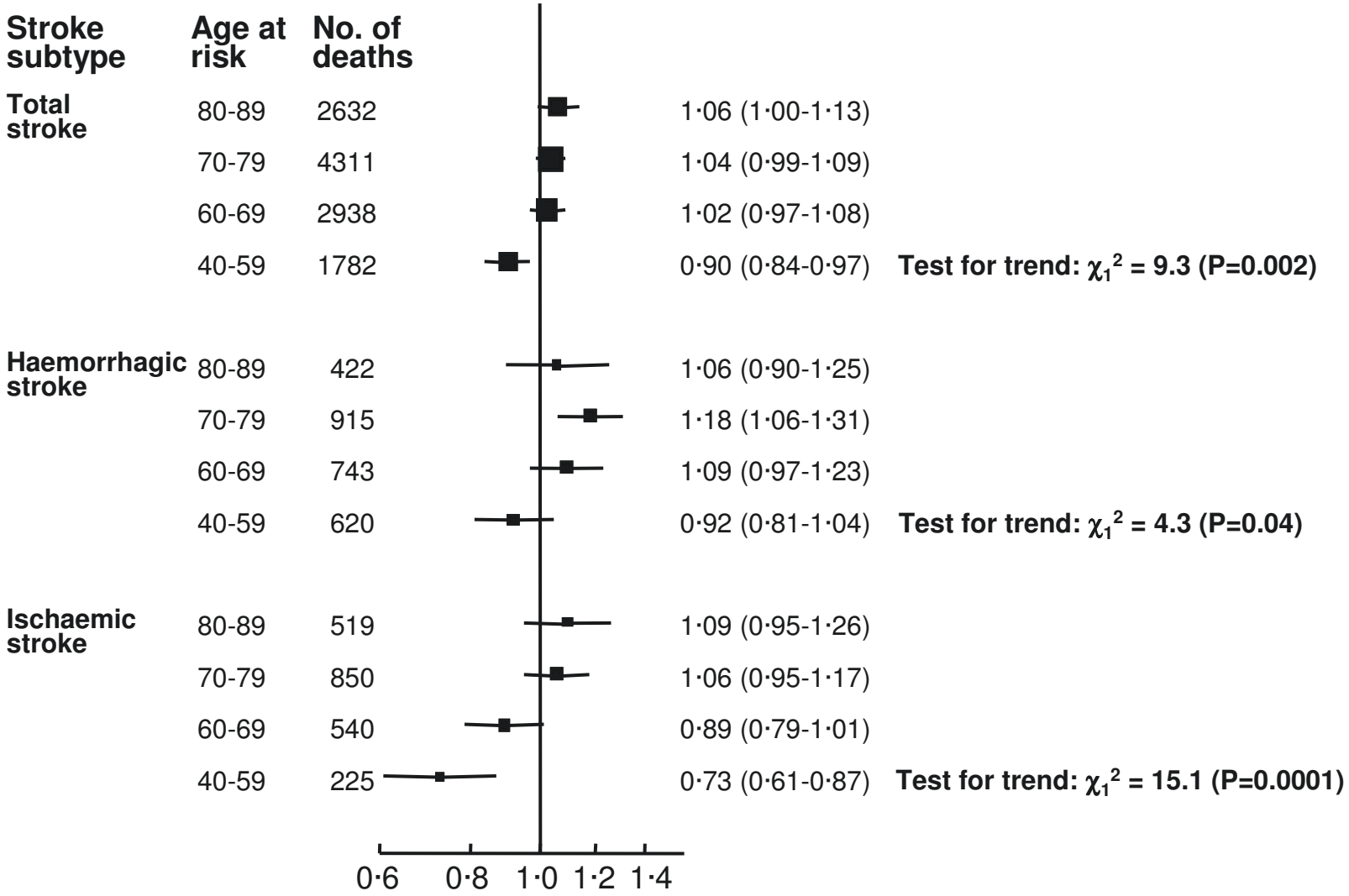
33 744 deaths at ages 40 - 89



Lancet 2007; 370:1829-39

Stroke mortality versus usual total cholesterol by type and age

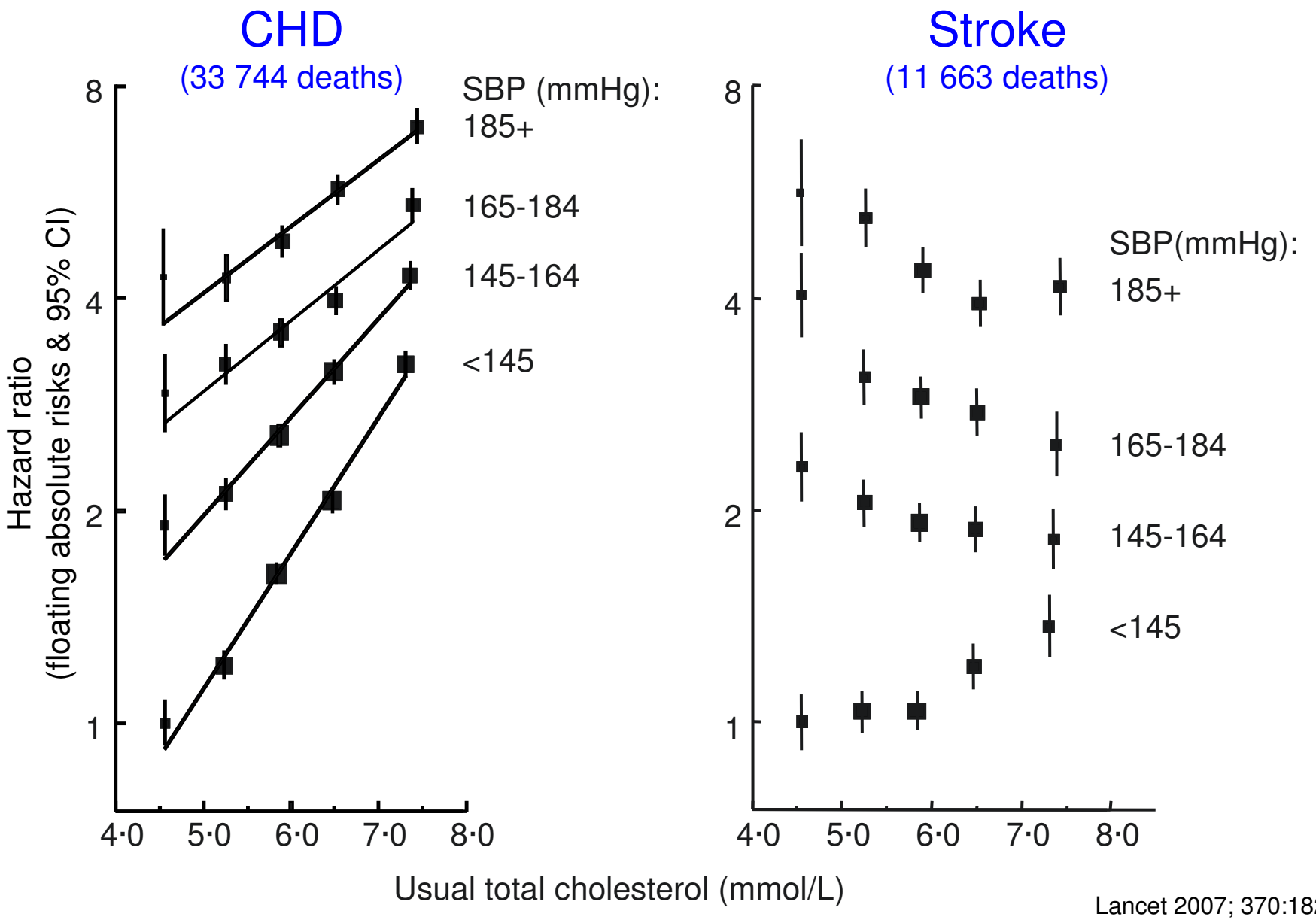
11 663 deaths at ages 40 - 89



Lancet 2007; 370:1829-39

PSC

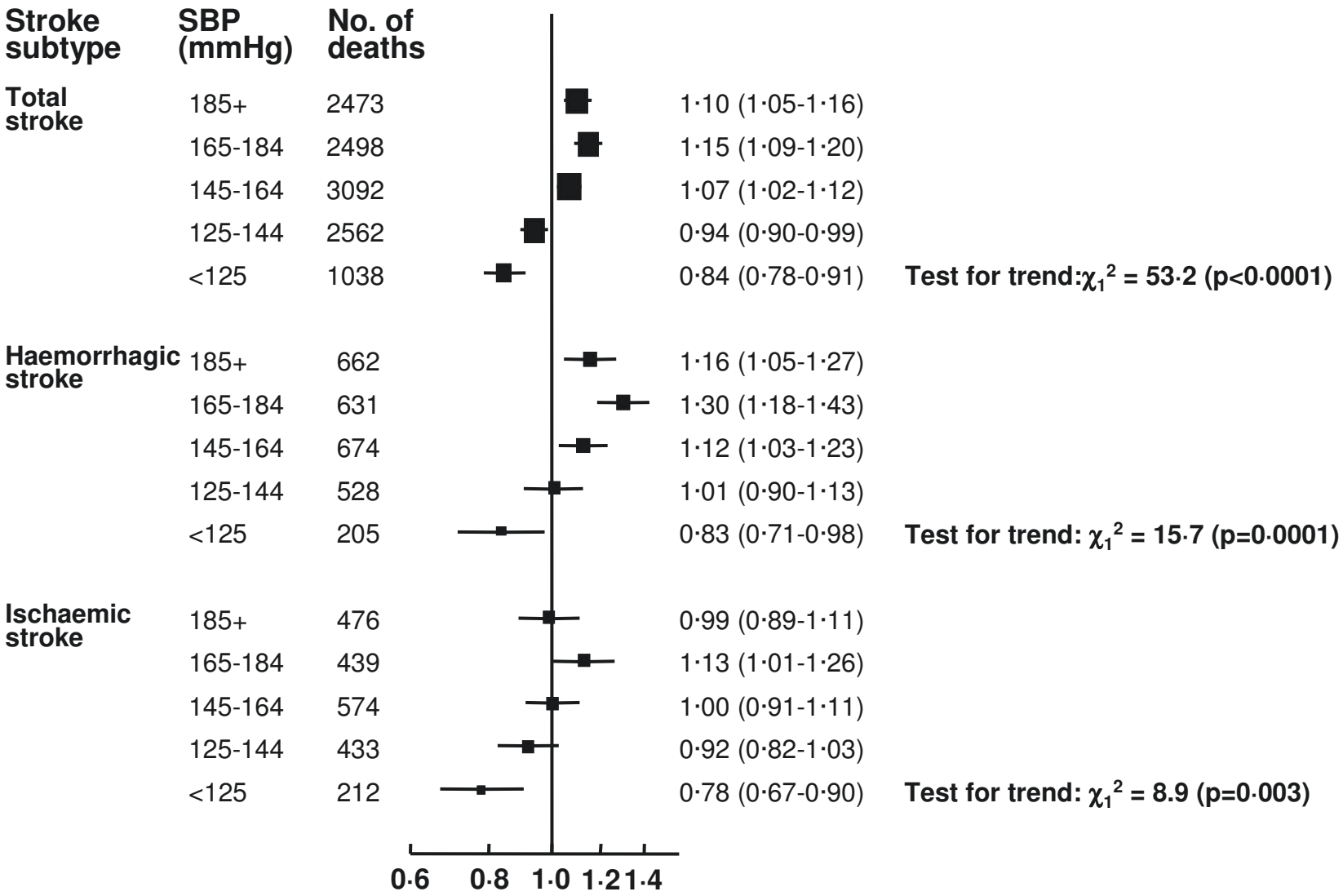
PSC: CHD and stroke mortality versus usual total cholesterol by baseline blood pressure



Lancet 2007; 370:1829-39

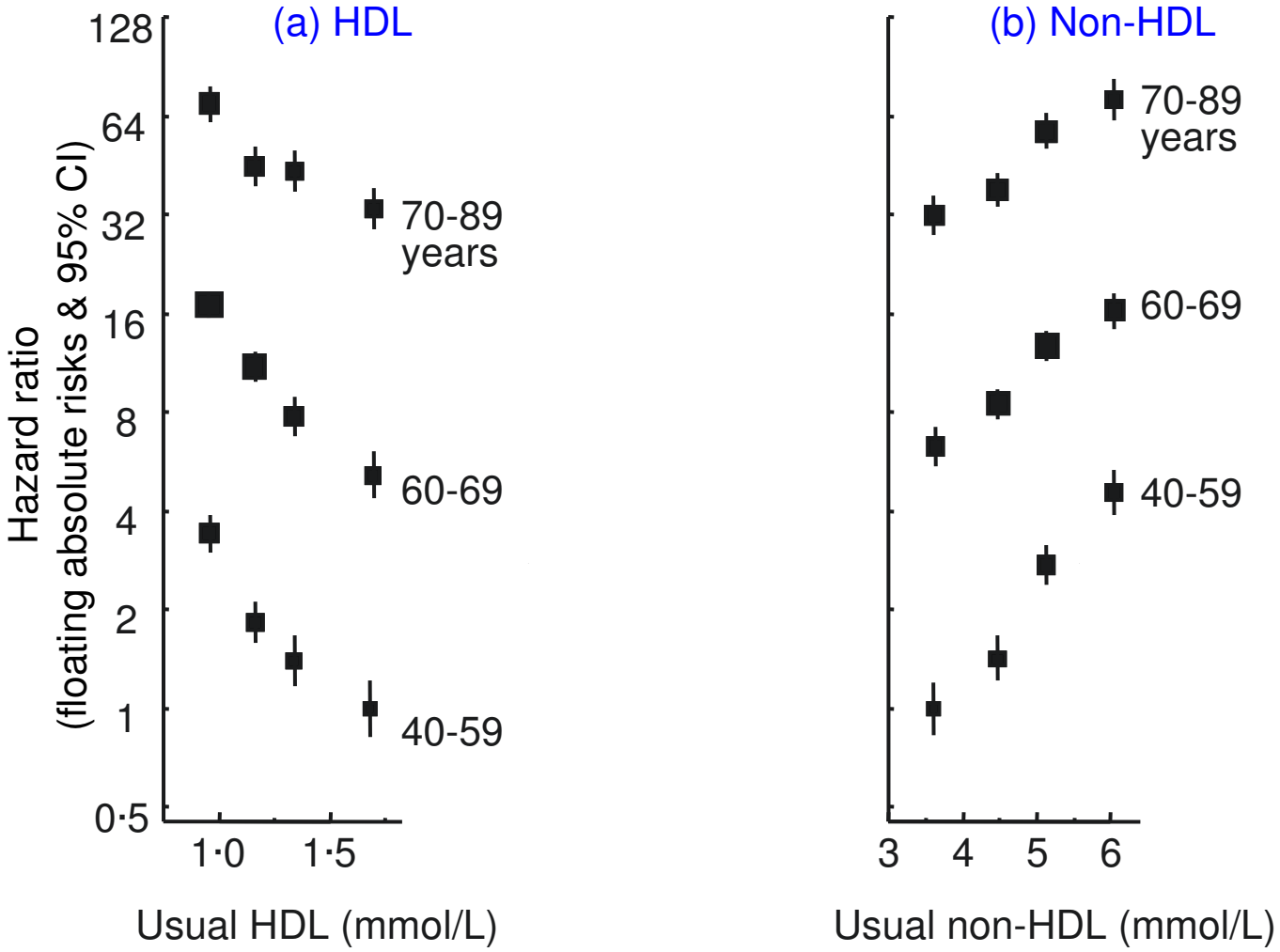
Stroke mortality versus usual total cholesterol by baseline SBP

11 663 deaths at ages 40 - 89



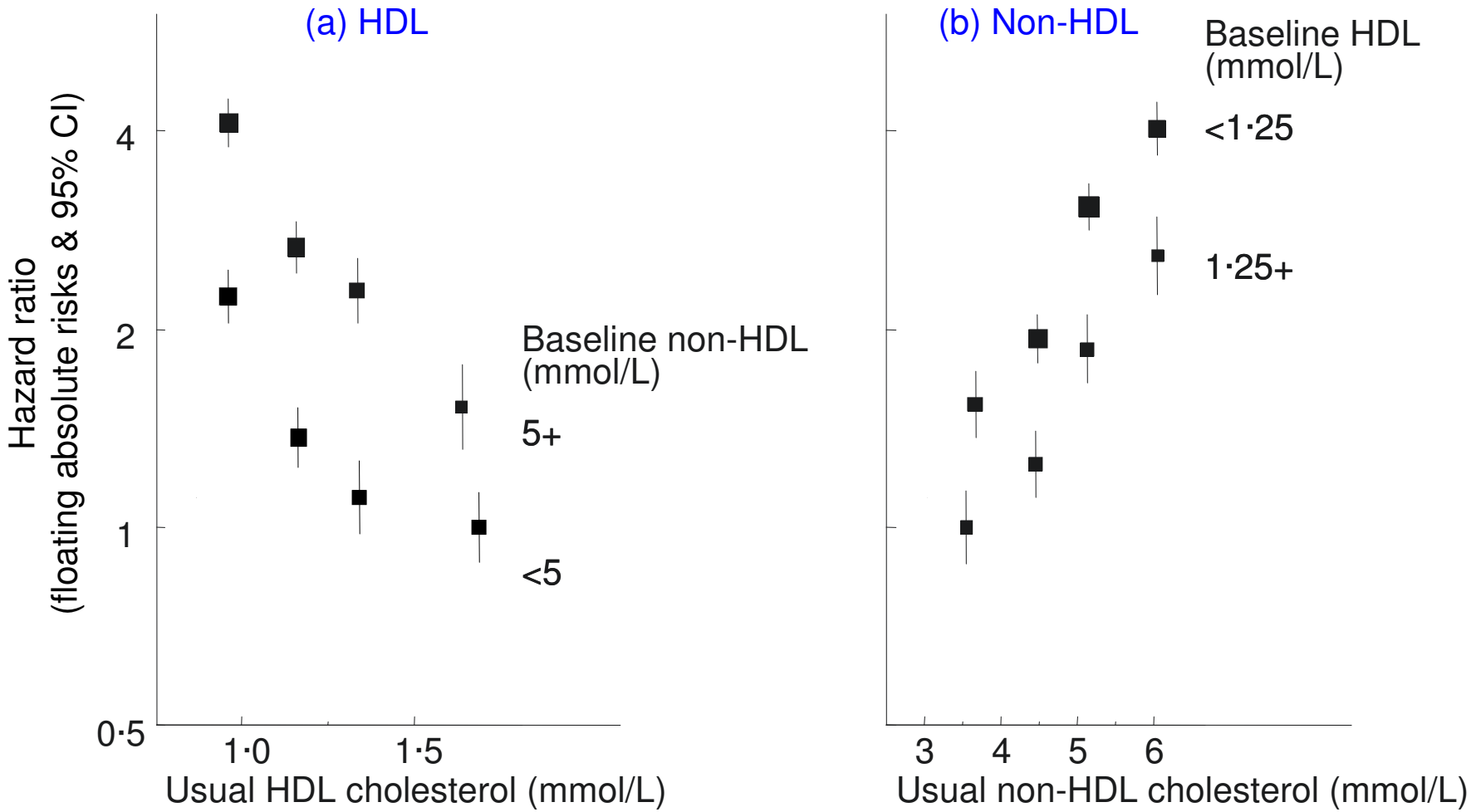
Lancet 2007; 370:1829-39

CHD mortality (3020 deaths at ages 40-89) versus usual (a) HDL cholesterol; (b) non-HDL cholesterol by age at risk



Lancet 2007; 370:1829-39

CHD mortality (3020 deaths at ages 40-89) versus:
(a) usual HDL cholesterol by baseline non-HDL cholesterol
(b) usual non-HDL cholesterol by baseline HDL cholesterol



Lancet 2007; 370:1829-39

Conclusions:
Blood pressure, cholesterol & vascular mortality

- 20 mmHg SBP (10 mmHg DBP) was associated with ~2-fold difference in vascular mortality risk (slightly less in old age & stronger for stroke)
- Total cholesterol is a major risk factor for CHD mortality both in middle and in old age. The joint relative effects of total cholesterol and blood pressure are approximately additive (rather than multiplicative)
- The joint relative effects of HDL and non-HDL cholesterol are approximately independent and additive, and the ratio total/HDL is statistically twice as informative as total cholesterol alone
- A positive relationship with ischaemic and total stroke mortality was seen only in middle age and only in those with below-average blood pressure. The contrast between these statistically reliable observational epidemiological results and the statistically reliable randomised trial results is substantial and invites further research

Lancet 2007; 370:1829-39