

Body mass index and mortality among 900 000 people in 19 countries

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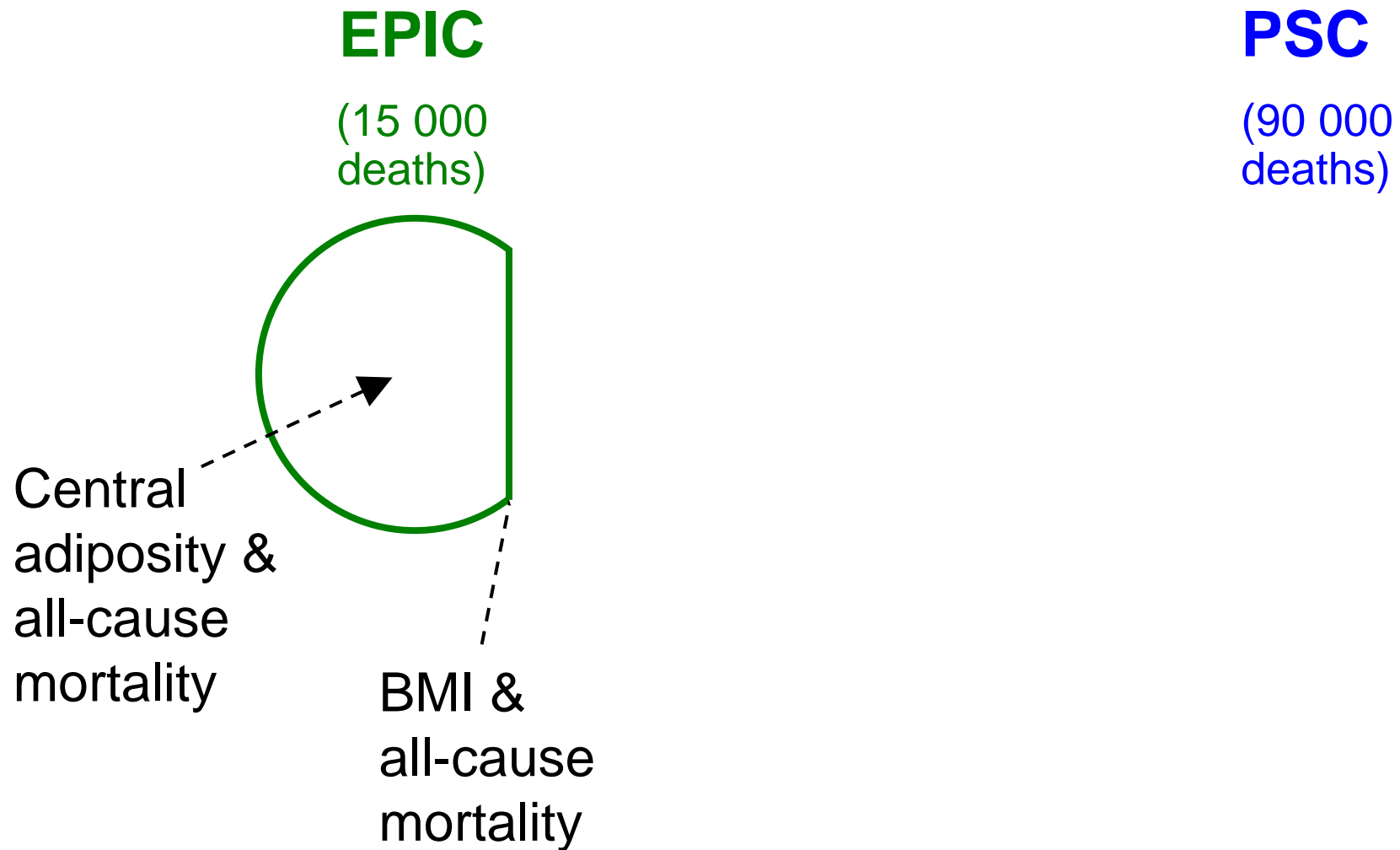
Prospective Studies Collaboration (PSC)

- Shares data on 1 million individuals in 61 studies
- Most studies in US and Europe, and includes:
 - Prospective Cardiovascular Münster Study (PROCAM): 10 000 M & 3000 F recruited in ~1980s
 - Paris Prospective Study: 8000 M recruited in ~1970
 - Investigations Preventives et Cliniques (IPC) Paris Study: 100 000 M & 80 000 F recruited in ~1980s
- 56 studies included in BMI analyses:
 - Mean follow-up 13 years
 - 90 000 deaths (36 000 vascular, 28 000 neoplastic)

>100 individual collaborators (PSC)

Atherosclerosis Risk in Communities (**ARIC**): L Chambless; Belgian Inter-university Research on Nutrition and Health (**BIRNH**): G De Backer, D De Bacquer, M Kornitzer; British Regional Heart Study (**BRHS**): P Whincup, SG Wannamethee, R Morris; British United Provident Association (**BUPA**): N Wald, J Morris, M Law; **Busselton**: M Knuiman, H Bartholomew; **Caerphilly** and **Speedwell**: G Davey Smith, P Sweetnam, P Elwood, J Yarnell; Cardiovascular Health Study (**CHS**): R Kronmal; **CB Project**: D Kromhout; **Charleston**: S Sutherland, J Keil; **Copenhagen City Heart Study**: G Jensen, P Schnohr; **Evans County**: C Hames (deceased), A Tyroler; Finnish Mobile Clinic Survey (**FMCS**): A Aromaa, P Knekt, A Reunanen; **Finrisk**: J Tuomilehto, P Jousilahti, E Vartiainen, P Puska; Flemish Study on Environment, Genes and Health (**FLEMENGHO**): T Kuznetsova, T Richart, J Staessen, L Thijs; Research Centre for Prevention and Health (**Glostrup Population Studies**): T Jorgensen, T Thomsen; **Honolulu Heart Program**: D Sharp, J D Curb; Imperial College and Oxon Clinical Epidemiology Limited: N Qizilbash; **Ikawa, Noichi and Kyowa**: H Iso, S Sato, A Kitamura, Y Naito; Centre d'Investigations Préventives et Cliniques (**IPC**), **Paris**: A Benetos, L Guize; **Israeli Ischaemic Heart Disease Study**: U Goldbourt; **Japan Railways**: M Tomita, Y Nishimoto, T Murayama; Lipid Research Clinics Follow-up Study (**LRC**): M Criqui, C Davis; **Midspan Collaborative Study**: C Hart, G Davey-Smith, D Hole, C Gillis; Minnesota Heart Health Project (**MHHP**) and Minnesota Heart Survey (**MHS**): D Jacobs, H Blackburn, R Luepker; Multiple Risk Factor Intervention Trial (**MRFIT**): J Neaton, L Eberly; First National Health and Nutrition Examination Survey Epidemiologic Follow-up Study (**NHEFS**): C Cox; **NHLBI Framingham Heart Study**: D Levy, R D'Agostino, H Silbershatz; **Norwegian Counties Study**: A Tverdal, R Selmer; Northwick Park Heart Study (**NPHS**): T Meade, K Garrow, J Cooper; **Nurses' Health Study**: F Speizer, M Stampfer; **Occupational Groups (OG)**, **Rome**: A Menotti, A Spagnolo; **Ohasama**: I Tsuji, Y Imai, T Ohkubo, S Hisamichi; **Oslo**: L Haheim, I Holme, I Hjermann, P Leren; **Paris Prospective Study**: P Ducimetiere, J Empana; **Perth**: K Jamrozik, R Broadhurst; Prospective Cardiovascular Munster Study (**PROCAM**): G Assmann, H Schulte; **Prospective Study of Women in Gothenburg**: C Bengtsson, C Björkelund, L Lissner; Puerto Rico Health Heart Program (**PRHHP**): P Sorlie, M Garcia-Palmieri; **Rancho Bernado**: E Barrett-Connor, M Criqui, R Langer; **Renfrew and Paisley study**: C Hart, G Davey Smith, D Hole; **Saitama Cohort Study**: K Nakachi, K Imai; **Seven Cities China**: X Fang, S Li; **Seven Countries (SC)** **Croatia**: R Buzina; **SC Finland**: A Nissinen; **SC Greece** (Greek Islands Study): C Aravanis, A Dontas, A Kafatos; **SC Italy**: A Menotti; **SC Japan**: H Adachi, H Toshima, T Imaizumi; **SC Netherlands**: D Kromhout; **SC Serbia**: S Nedeljkovic, M Ostojic; **Shanghai**: Z Chen; Scottish Heart Health Study (**SHHS**): H Tunstall-Pedoe; **Shibata**: T Nakayama, N Yoshiike, T Yokoyama, C Date, H Tanaka; **Tecumseh**: J Keller; **Tromso**: K Bonna, E Arnesen; United Kingdom Heart Disease Prevention Project (**UKHDPP**): H Tunstall-Pedoe; **US Health Professionals Follow-up Study**: E Rimm; **US Physicians' Health Study**: M Gaziano, J E Buring, C Hennekens; **Värmland**: S Törnberg, J Carstensen; **Whitehall**: M Shipley, D Leon, M Marmot; **Clinical Trial Service Unit (CTSU)**: J Armitage, C Baigent, Z Chen, R Clarke, R Collins, J Emberson, J Halsey, M Landray, S Lewington, A Palmer (deceased), S Parish, R Peto, P Sherliker, G Whitlock.

PSC and EPIC are *complementary*



Circle area proportional to number of deaths

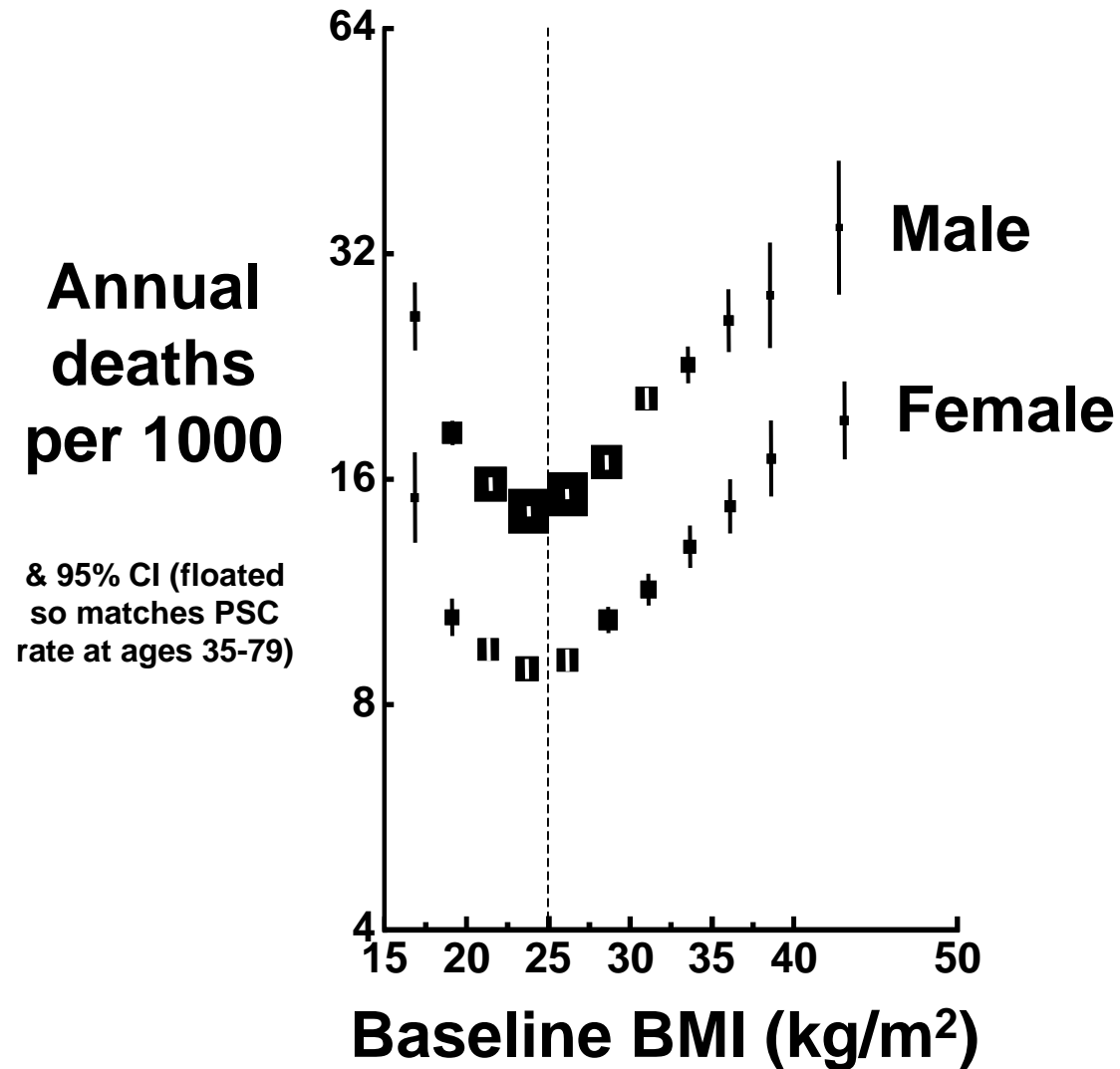
NEJM 2008;359:2105-20 and Lancet 2009;373:1083-96

BMI and waist circumference are highly correlated

	EPIC	Nurses' Health Study
Females	0.84	0.81
Males	0.85	-

(> 40 000 individuals in each analysis)

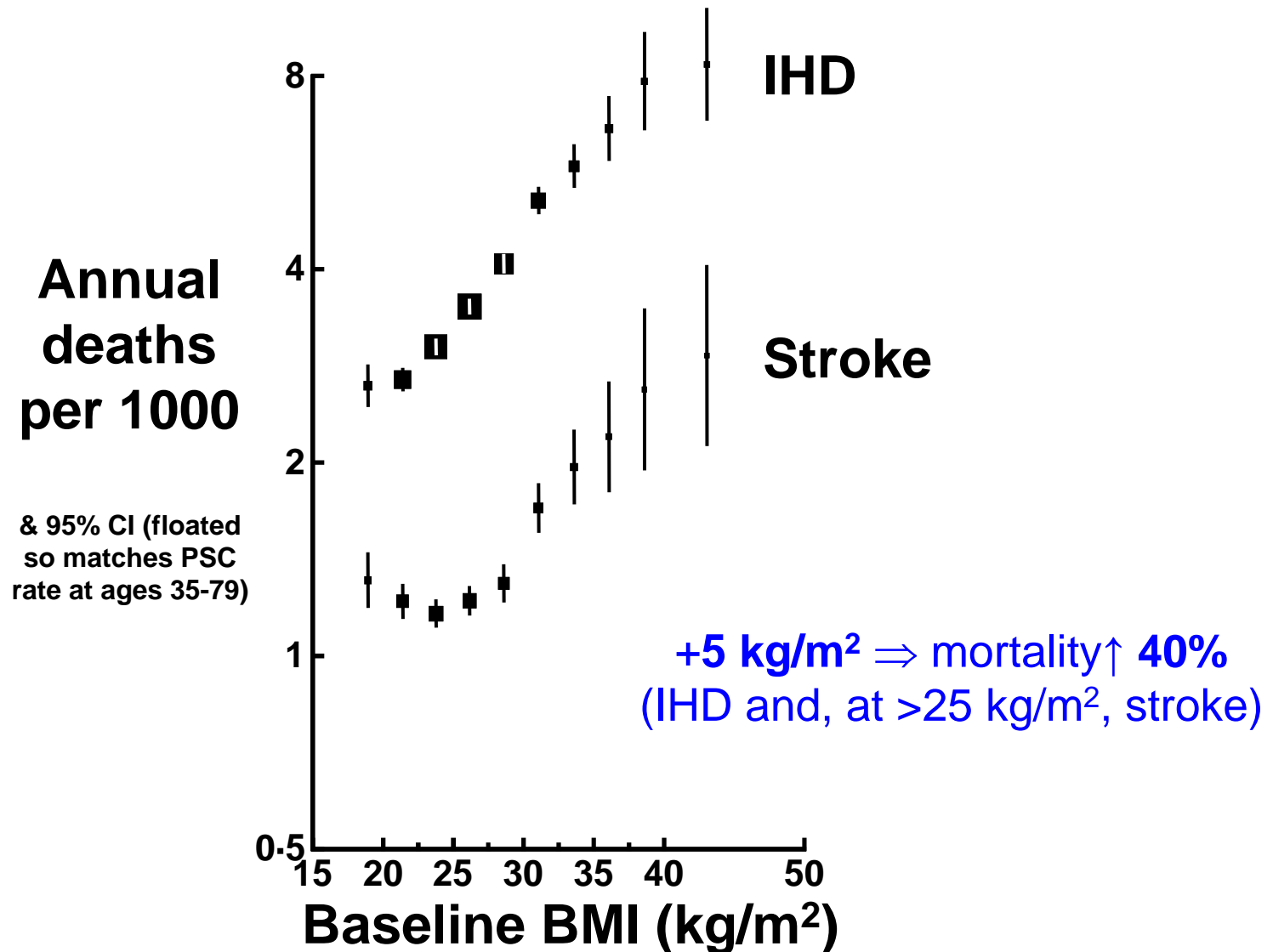
U-shaped relationship between all-cause mortality and BMI (PSC)



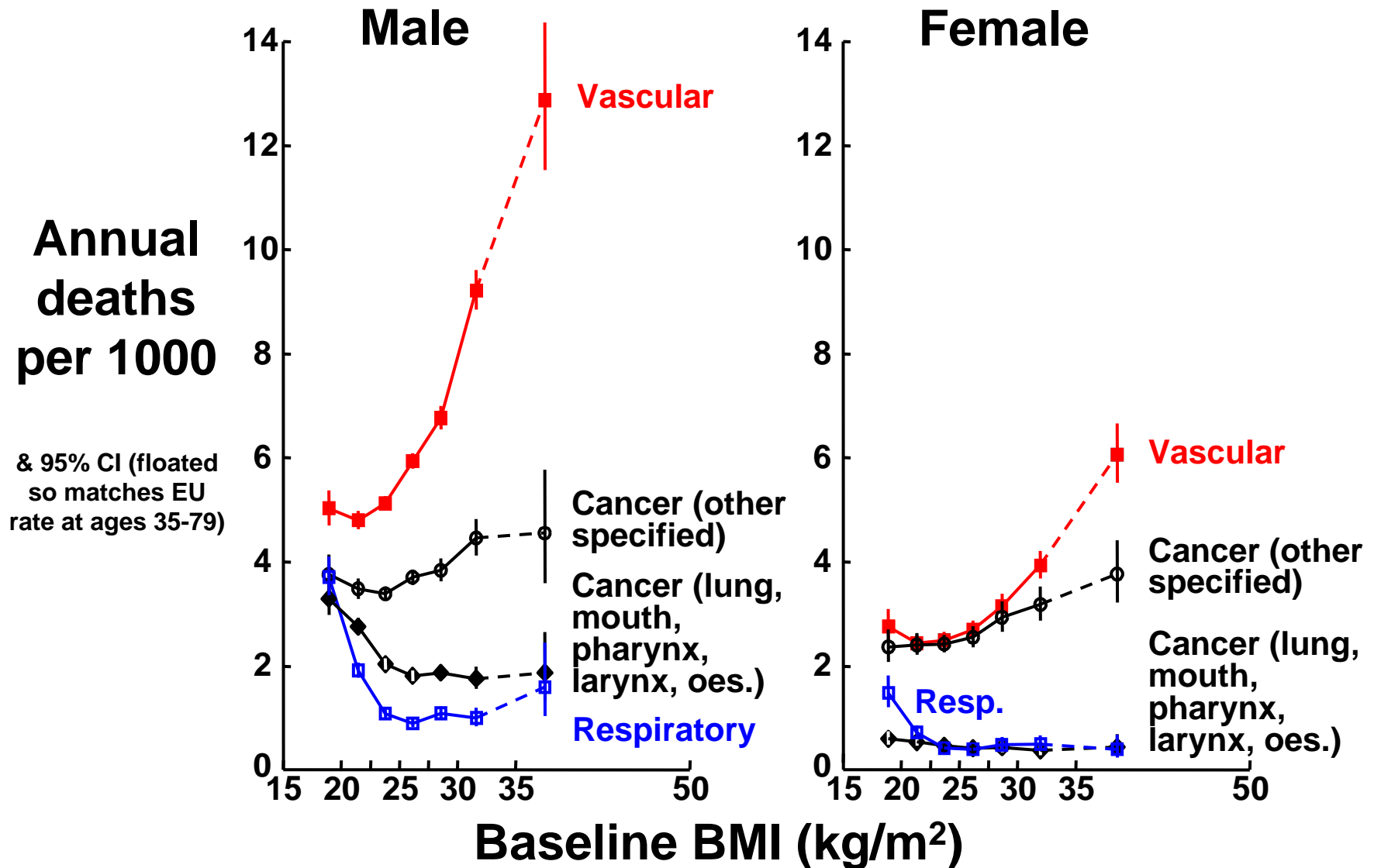
Adjusted for age, smoking and study; 1st 5 years of follow-up excluded

Fig 2, Lancet 2009; 373: 1083-96

Positive linear association for IHD, J-shaped for stroke (PSC)



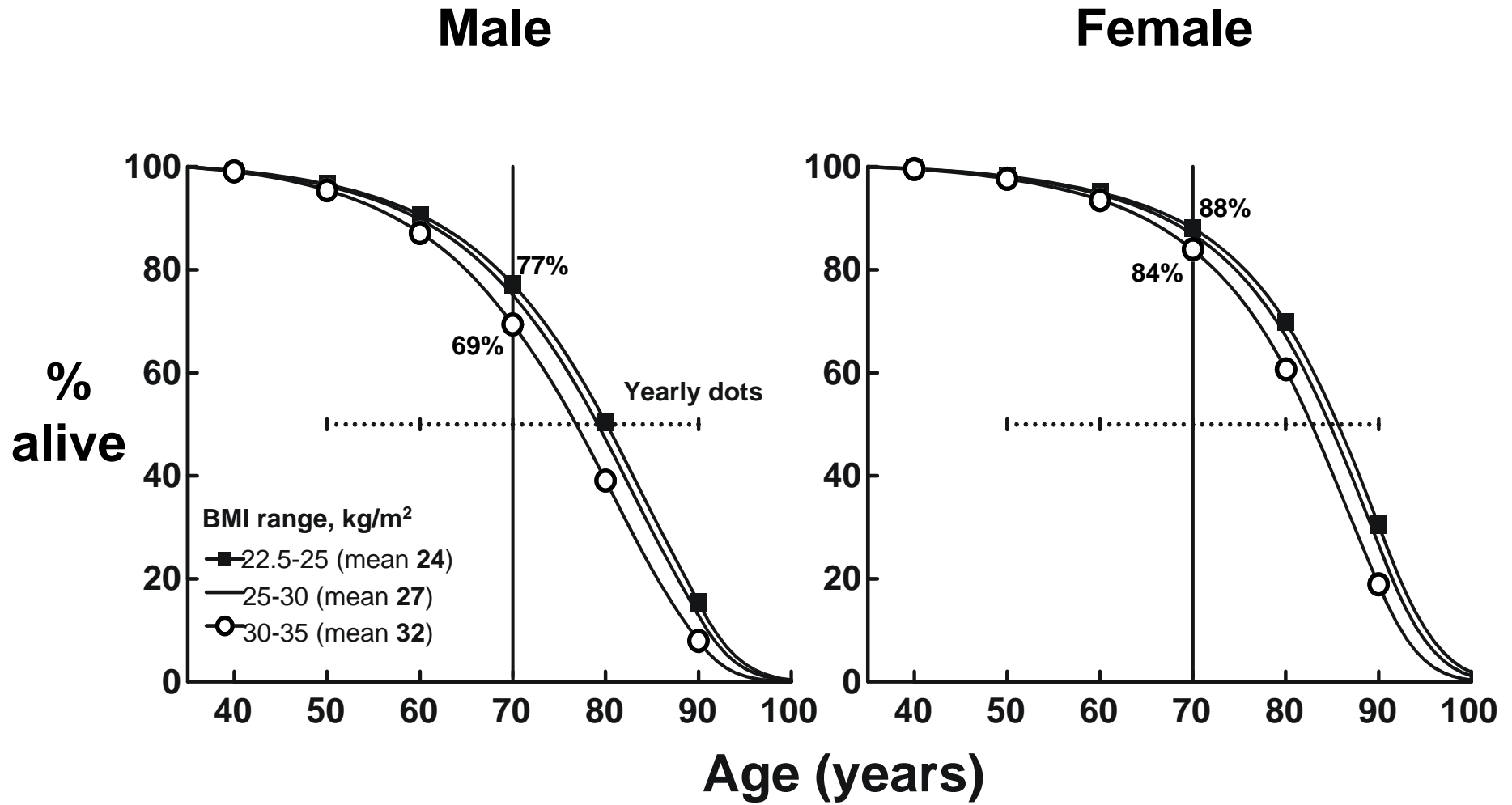
Most excess deaths at high BMI are vascular, especially for males (PSC)



Adjusted for age, smoking and study; 1st 5 years of follow-up excluded

Fig 5, Lancet 2009; 373: 1083-96

BMI 32 vs 24 shortens life by 3 years (PSC)



Moderate obesity is now common

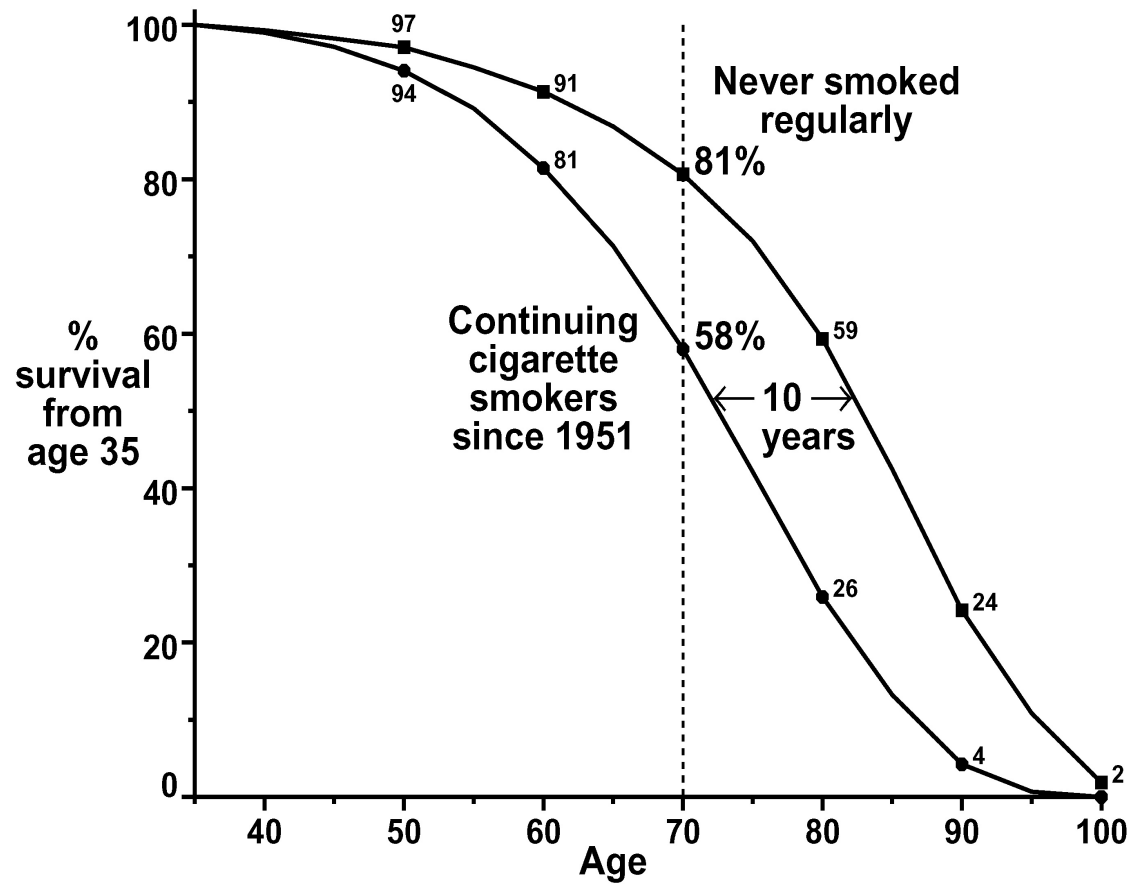
Among each **100** middle-aged people in the UK:

28 have BMI 30-35 (“moderate” obesity)

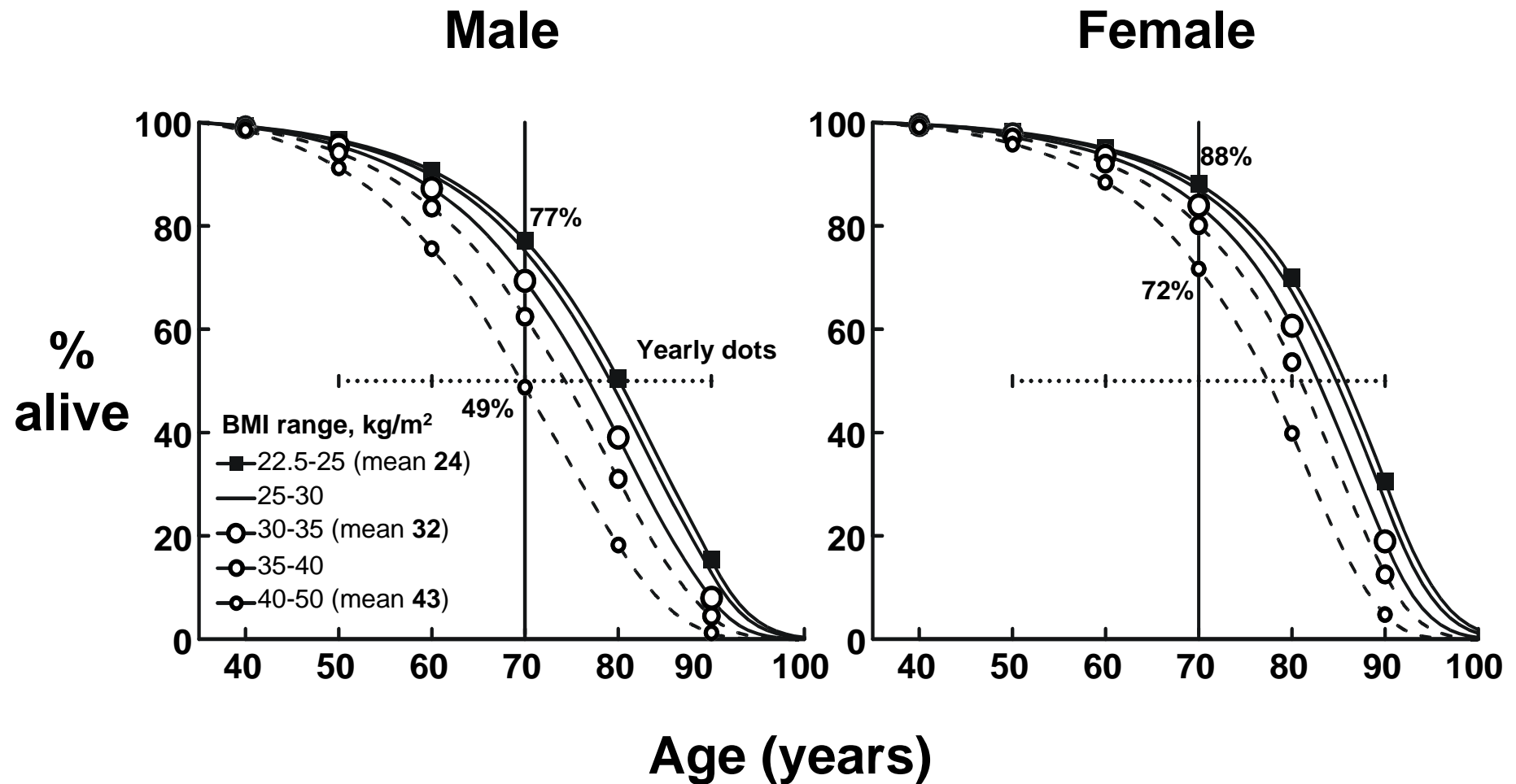
2 have BMI 40+ (“morbid” obesity)

Moderate obesity is now also quite common in
Germany and France

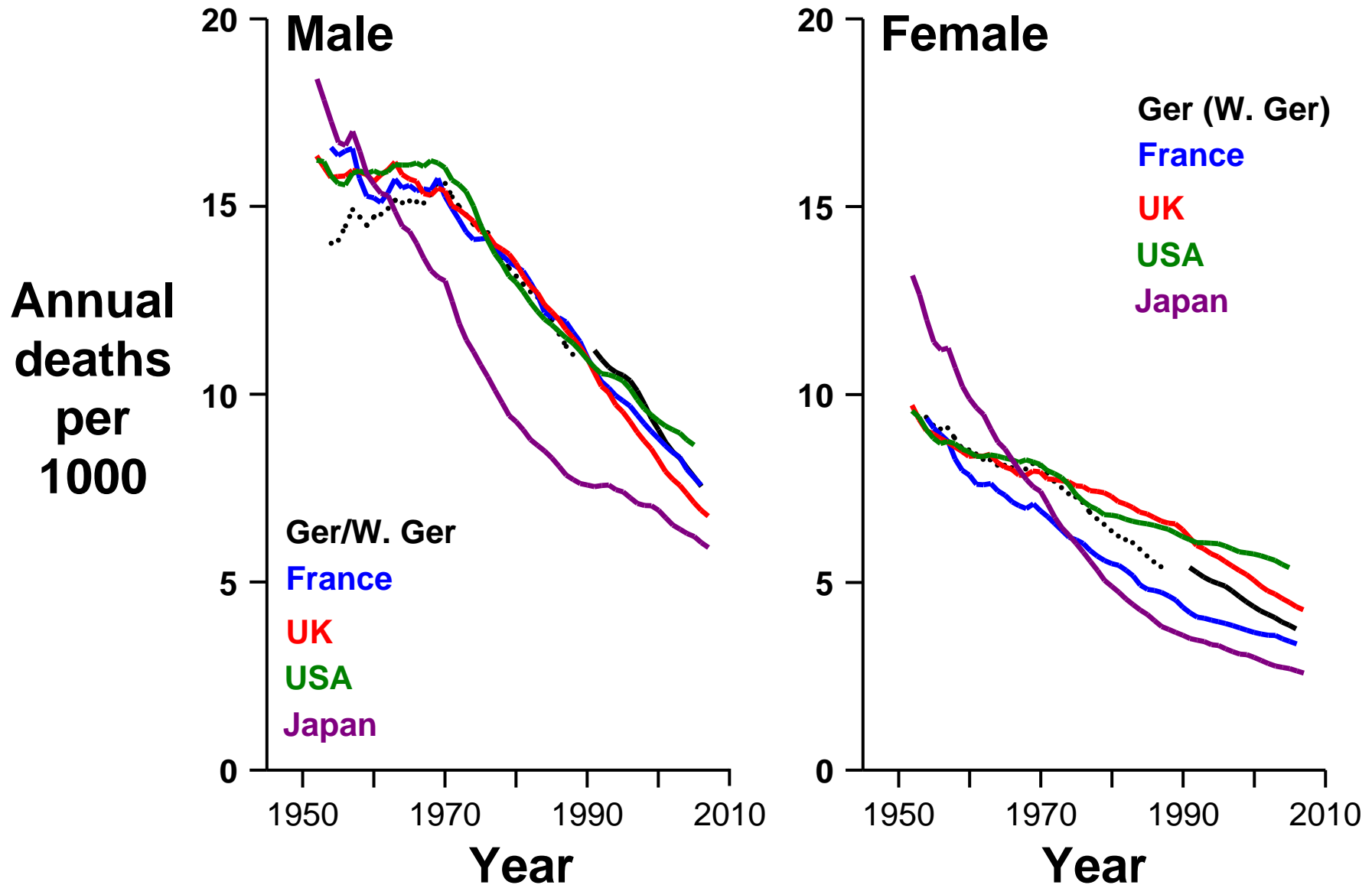
Smoking shortens life by 10 years (British Doctors' Study)



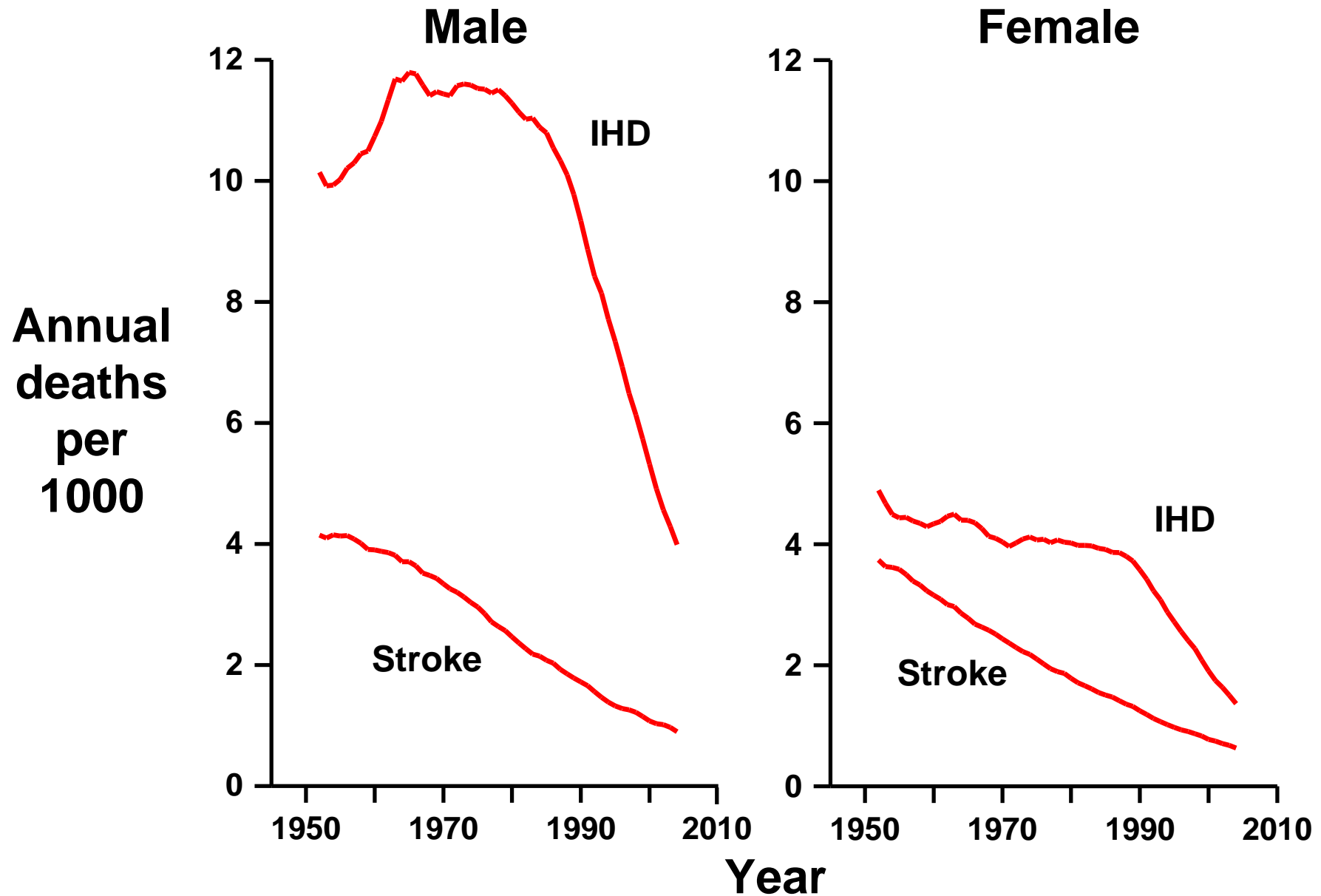
BMI 40-50 also shortens life by 10 years (PSC), but is uncommon



All-cause mortality in middle age (35-69 yrs) continues to fall fast

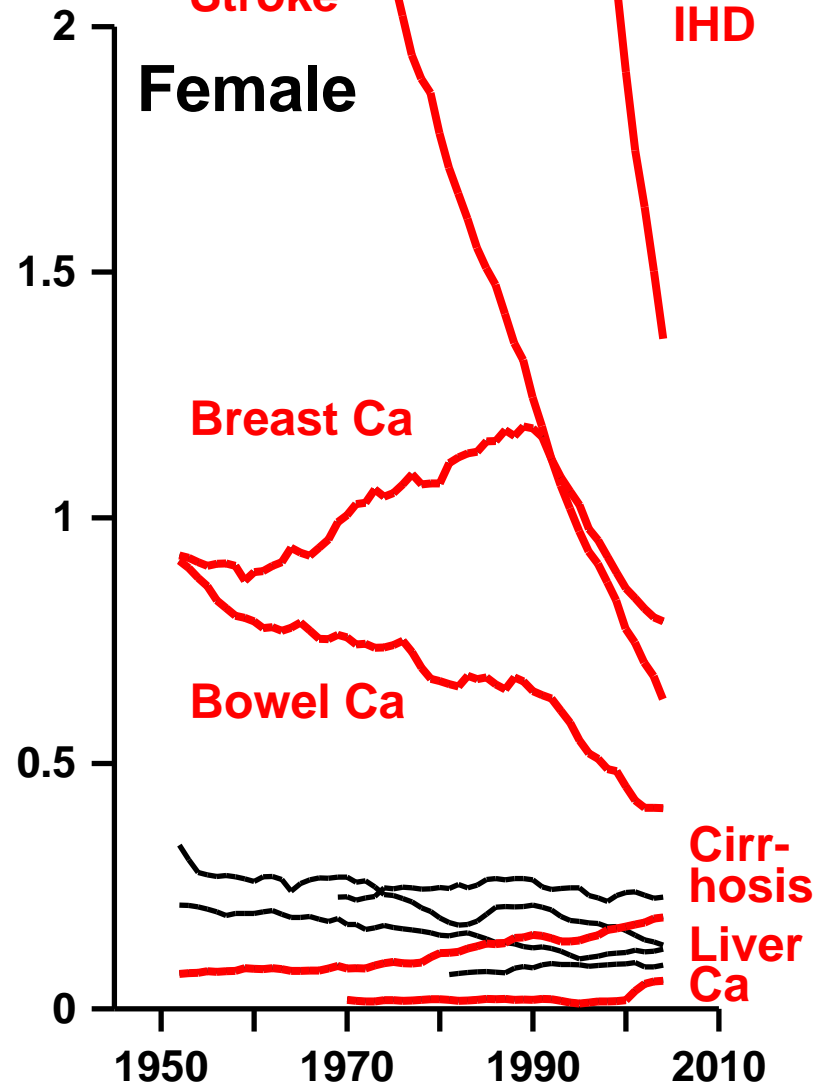
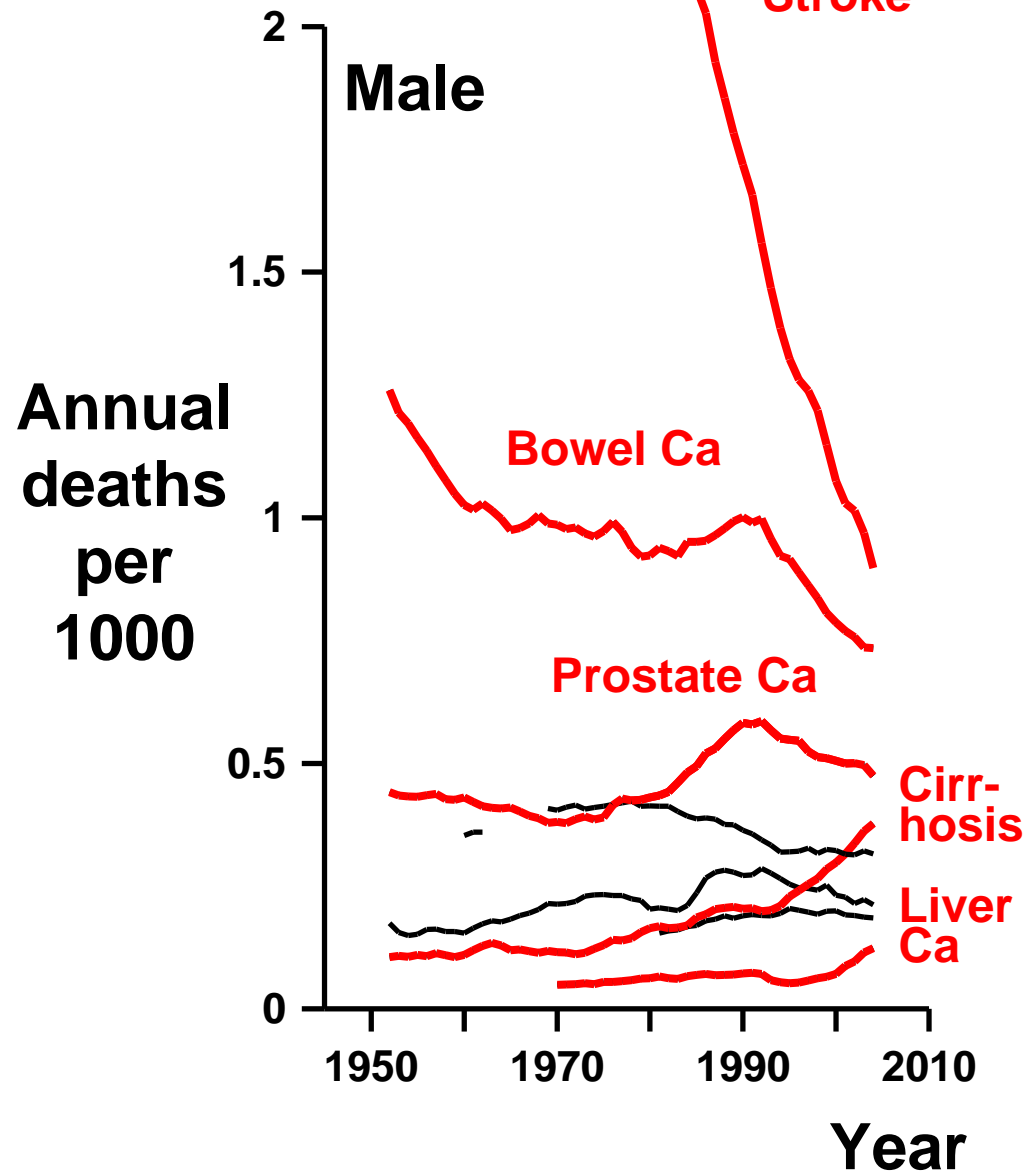


IHD and stroke mortality at age 60-69 falling in UK



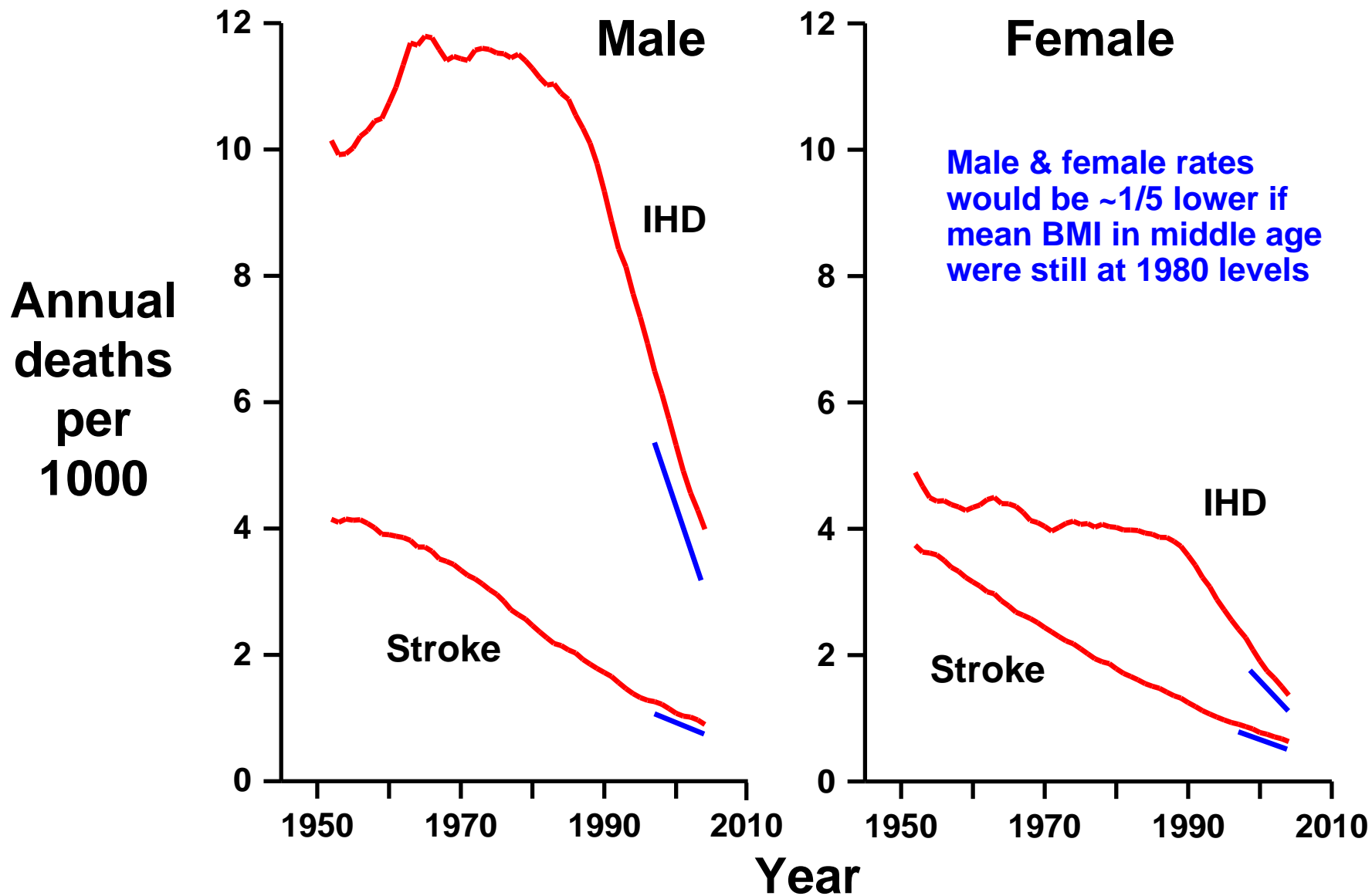
Data : WHO. Standardised for age, 3-yr moving averages

Other BMI-related mortality at age 60-69 in UK

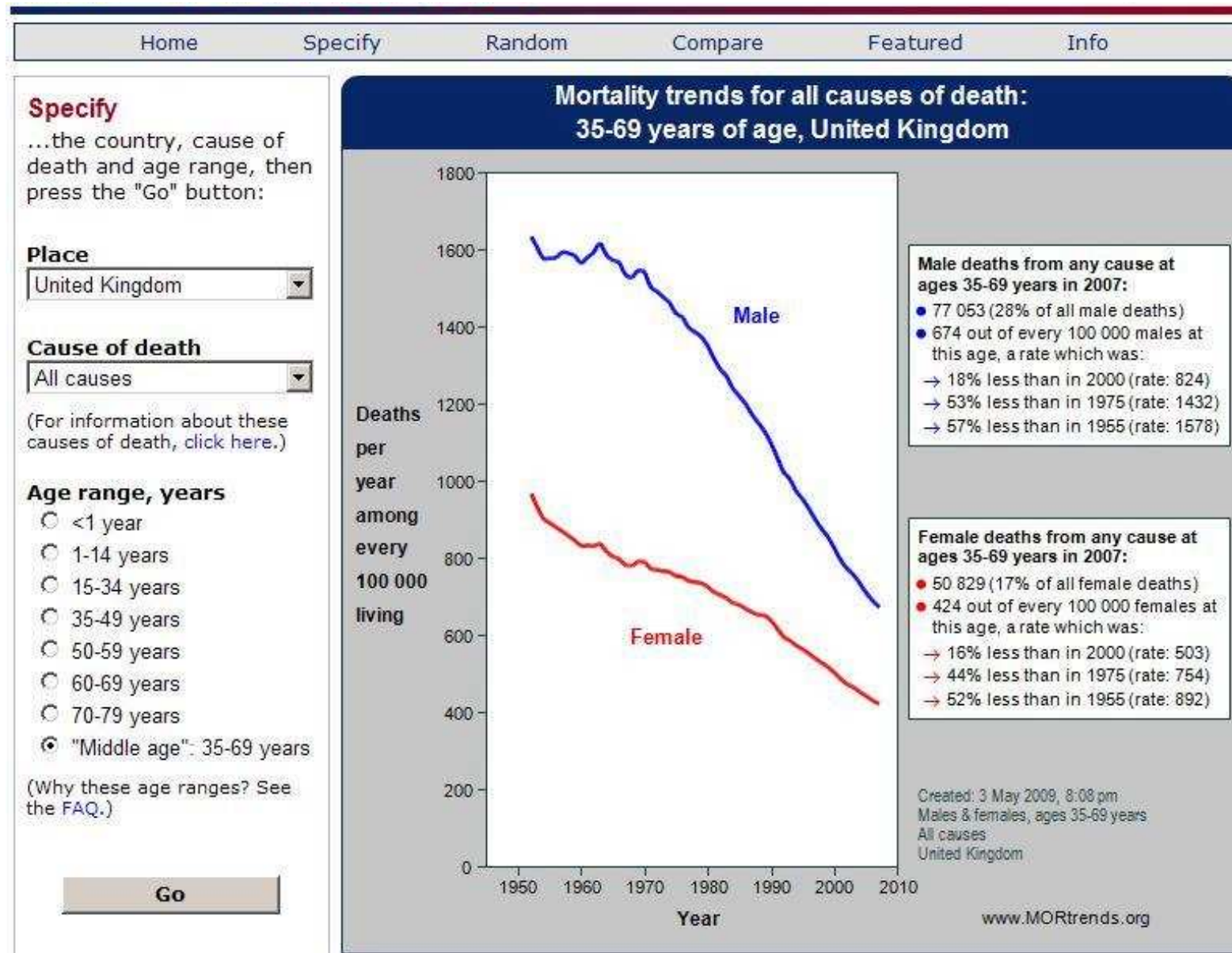


Data : WHO. Standardised for age, 3-yr moving averages.

IHD and stroke mortality would be 20% lower if BMI still at 1985 levels



Data : WHO. Standardised for age, 3-yr moving averages



Epidemiological research needs

Effects of lifelong obesity

Effects of obesity on morbidity

Effects of different measures of obesity on
particular causes of death

Conclusions

- PSC is an example of what can be achieved by international collaboration
- PSC and EPIC results are complementary, but more large-scale prospective evidence needed
- Main way that obesity kills is by vascular disease
- Moderate obesity is common and shortens life by 3 years (but smoking = 10 years)
- Despite increasing obesity, vascular (and overall) mortality continues to fall

Mortality graphs

www.mortrends.org

PSC slides

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

