

Appendix A: Studies included in Prospective Studies Collaborative meta-analysis of blood pressure and cause-specific mortality

Study by region (and year screening began)	Number of participants included in analyses	Number of deaths included in analyses			Mean age at death (years)	Mean time to death (years)
		Stroke	IHD	Other vascular		
Europe: 33 studies						
BIRNH (1980)	10 153	58	118	141	68	5
BRHS (1978)	7354	70	436	—*	62	9
BUPA (1975)	21 187	112	679	144	64	10
Caerphilly (1979)†	1783	11	96	11	62	8
CB project (1974)	48 719	71	229	87	50	9
CCHS (1976)†	13 369	158	528	212	70	10
FMCS (1966)	47 068	1135	3013	795*	68	13
Finrisk (1972,77,82,87)†	37 891	437	1699	331	61	10
GPS (1977)	9553	63	184	79	68	6
Gothenburg Women (1968)	1403	25	69	—*	67	17
IPC-PARIS (1978)†	193 289	221	376	251	59	8
Israeli IHDS (1963)†	9719	348	927	278	67	14
Leuven (1985)	1035	12	13	18*	73	4
Norwegian (1974)†	47 880	189	917	269	54	10
NPHS (1972)†	3082	16	122	46	67	11
OG Rome (1979)	3168	28	97	8	63	6
Oslo (1972)	15 821	81	743	126	57	11
Paris (1967)	7464	103	196	297	62	14
PROCAM (1978)†	13 613	17	94	10	56	4
Renfrew/Paisley (1972)†	11 117	290	865	125	66	10
SC Croatia (1958)	1291	131	88	82	67	15
SC Finland (1959)	1513	68	310	53	66	14
SC Greece (1960)	1130	75	41	42	68	16
SC Italy (1960)	2285	117	180	101	66	14
SC Netherlands (1960)	783	28	131	32	67	15
SC Serbia (1962)	963	97	75	75	67	16
SHHS (1984)	11 282	48	175	34	59	5
Speedwell (1979)†	1793	21	96	16	64	8
Tromso (1979)	16 509	9	104	15	51	6
UK HDPP (1971)†	13 146	234	1321	240	66	13
Varmland (1963)	96 137	4371	12 926	2981*	72	12
West Scotland (1970)	6558	158	643	96	65	14
Whitehall (1967)	18 155	214	1306	251	64	8
Subtotal	676 213	9016	28 797	7246	67	12
North America or Australia: 18 studies						
ARIC (1986)†	14 607	32	125	93	62	4
Busselton (1966)†	6277	196	485	168	75	15
Charleston (1960)	2067	145	380	182	71	18
CHS (1989)†	4511	32	87	57	79	2
Evans County (1960)†	2958	57	137	55	71	16
Framingham (1949)†	3099	142	451	162*	72	25
Honolulu (1965)†	7549	323	427	146	73	16
LRC (1972)	8028	100	345	105	69	10
MHHP (1980)†	16 883	29	123	52	66	4
MHS (1980)	7284	9	24	13	64	3
NHEFS (1971)†	12 919	311	967	461	73	11
Perth (1979)	9251	40	121	36	69	10
PRHHP (1965)†	9129	174	262	240	65	7
Rancho Bernardo (1971)	5415	186	478	243	79	11
Tecumseh (1959)†	4004	149	404	213	71	14
US Health Professionals (1986)‡	21 926	27	134	47	66	4
US Nurses (1988)‡	49 518	35	83	34	62	3
US Physicians (1981)‡	7712	38	119	83	70	7
Subtotal	193 137	2025	5152	2390	71	12
Japan or China: 10 studies						
Ikawa (1975)†	2124	52	12	48	69	10
Japan Railway: EJR (1973)†	54 827	221	120	168	53	5
Kyowa (1981)†	4213	27	16	24	67	6
Noichi (1975)†	2199	54	18	63	70	10
Ohasama (1990)†	2452	9	4	3	69	2
Saitama (1986)	3474	23	12	33	71	4
Seven Cities China (1986)†	7264	49	—	—*	67	2
SC Japan (1958)	913	96	32	20	67	15
Shanghai (1972)†	9017	249	81	43	66	11
Shibata (1977)†	2241	139	39	54	76	8
Subtotal	88 724	919	334	456	64	8
Total: 61 studies	958 074	11 960	34 283	10 092	68	12
MRFIT (1973)§	353 168	1285	11 360	4139*	59	10

*“Other vascular” deaths from these studies were either not provided or not further subdivided. †Studies with remeasurements of blood pressure during follow-up used to correct for time-dependent regression dilution (appendix B). ‡In these studies of US physicians, nurses, and other health professionals, the participants reported their own blood pressures. §The North American MRFIT observational study was analysed in parallel, not in the combined analyses, using the same methods.

Table A1: Characteristics of contributing prospective observational studies (including numbers of individuals with data available for sex, SBP, DBP, total cholesterol at baseline, and subsequent vital status)

References to studies in table A1 by region

Europe: 33 studies

- BIRNH:** De Backer G. Nutrition and Health: an interuniversity study. Regional differences in dietary habits, coronary risk factors and mortality rates in Belgium. I. Design and methodology. *Acta Cardiol* 1989; **94**: 89–99.
- BRHS:** Shaper AG, Pocock SJ, Walker M, Cohen NM, Wale CJ, Thomson AG. British Regional Heart Study: cardiovascular risk factors in middle-aged men in 24 towns. *BMJ* 1981; **283**: 179–86.
- BUPA:** Law MR, Wald NJ, Hackshaw A, Bailey A. Systematic underestimation of association between serum cholesterol concentration and ischaemic heart disease in observational studies: data from the BUPA study. *BMJ* 1994; **308**: 363–66.
- Caerphilly:** The Caerphilly and Speedwell Collaborative Group. Caerphilly and Speedwell collaborative heart disease studies. *J Epidemiol Community Health* 1984; **38**: 259–62.
- CB Project:** Verschuren MWM, Kromhout D. Total cholesterol concentration and mortality at a relatively young age: do men and women differ? *BMJ* 1995; **311**: 779–83.
- CCHS:** Schnohr P, Jensen G, Lange P, Scharling H, Appleyard M. The Copenhagen City Heart Study. Osterbroundersogelsen. A book of tables with data from the third examination (1991–94). *Eur Heart J* 2001; **3** (suppl): 1–83.
- FMCS:** Reunanen A, Aromaa A, Pyorala K, Punsar S, Maatela J, Knekt P. The Social Insurance Institution's coronary heart disease study: baseline data and 5-year mortality experience. *Acta Med Scand* 1983; **673** (suppl): 1–120.
- Finrisk:** Antikainen RL, Jousilahti P, Vanhanen H, Tuomilehto J. Excess mortality associated with increased pulse pressure among middle-aged men and women is explained by high systolic blood pressure. *J Hypertens* 2002; **18**: 417–23.
- GPS:** Schroll M, Jorgensen T, Ingerslev J. The Glostrup Population Studies, 1964–1992. *Dan Med Bull* 1992; **39**: 204–07.
- Gothenburg Women:** Bengtsson C, Gredmark T, Hallberg L, et al. The population study of women in Gothenburg 1980–81—the third phase of a longitudinal study. Comparison between participants and non-participants. *Scand J Soc Med* 1989; **17**: 141–45.
- IPC-PARIS:** Rudnichi A, Safar M, Asmar R, Guize L, Benetos A. Prevalence of cardiovascular risk factors in a French population. *J Hypertens* 1998; **16** (suppl): S85–90.
- Israeli IHDS:** Goldbourt U, Yaari S, Medalie JH. Factors predictive of long-term coronary heart disease mortality among 10 059 male Israeli civil servants and municipal employees: a 23-year mortality follow-up in the Israeli Ischemic Heart Disease Study. *Cardiology* 1993; **82**: 100–21.
- Leuven:** Staessen JA, Wang JG, Brand E, et al. Effects of three candidate genes on prevalence and incidence of hypertension in a Caucasian population. *J Hypertens* 2001; **19**: 1349–58.
- Norwegian:** Bjartveit K, Foss OP, Gjervig T, Lund-Larsen PG. The cardiovascular disease study in Norwegian counties: background and organization. *Acta Med Scand* 1979; **634** (suppl): 1–70.
- NPHS:** Meade TW, Mellows S, Brozovic M, et al. Haemostatic function and ischaemic heart disease: principal results of the Northwick Park Heart Study. *Lancet* 1986; **2**: 533–37.
- OG-Rome:** Menotti A, Spagnolo A, Scanga M, Dima F. Multivariate prediction of coronary deaths in a 10 year follow-up of an Italian occupational male cohort. *Acta Cardiol* 1992; **47**: 311–20.
- Oslo:** Haheim LL, Holme I, Hjermann I, Leren P. Risk of fatal stroke according to blood pressure level: an 18-year follow-up of the Oslo Study. *J Hypertens* 1995; **13**: 909–13.
- Paris:** Filipovsky J, Ducimetiere P, Darné B, Richard JL. Abdominal body mass distribution and elevated blood pressure are associated with increased risk of death from cardiovascular diseases and cancer in middle-aged men: the results of a 15- to 20-year follow-up in the Paris prospective study I. *Int J Obes Relat Metab Disord* 1993; **17**: 197–203.
- PROCAM:** Cullen P, Schulte H, Assmann G. The Munster Heart Study (PROCAM): total mortality in middle-aged men is increased at low total and LDL cholesterol concentrations in smokers but not in nonsmokers. *Circulation* 1997; **96**: 2128–36.
- Renfrew/Paisley:** Hawthorne VM, Watt GC, Hart CL, Hole DJ, Davey Smith G, Gillis CR. Cardiorespiratory disease in men and women in urban Scotland: baseline characteristics of the Renfrew/Paisley (midspan) study population. *Scott Med J* 1995; **40**: 102–07.
- SC Croatia/SC Finland:** Menotti A, Keys A, Blackburn H, et al. Twenty-year stroke mortality and prediction in twelve cohorts of the Seven Countries Study. *Int J Epidemiol* 1990; **19**: 309–15.
- SC Greece:** Dontas AS, Menotti A, Aravanis C, Ioannidis P, Seccareccia F. Comparative total mortality in 25 years in Italian and Greek middle aged rural men. *J Epidemiol Community Health* 1998; **52**: 638–44.

- SC Italy:** Menotti A, Seccareccia F, Lanti M, Giampaoli S, Dima F. Time changes in predictability of coronary heart disease in an Italian aging population. *Cardiology* 1993; **82**: 172–80.
- SC Netherlands:** van den Hoogen PC, Feskens EJ, Nagelkerke NJ, Menotti A, Nissinen A, Kromhout D. The relation between blood pressure and mortality due to coronary heart disease among men in different parts of the world. Seven Countries Study Research Group. *N Engl J Med* 2000; **342**: 1–8.
- SC Serbia:** Nedeljkovic S, Ostojic MC, Grujic MZ, et al. Coronary heart disease deaths in 25 years. The experience in the three Serbian cohorts of the Seven Countries Study. *Acta Cardiol* 1993; **48**: 11–24.
- SHHS:** Tunstall-Pedoe H, Woodward M, Tavendale R, A'Brook R, McCluskey MK. Comparison of the prediction by 27 different factors of coronary heart disease and death in men and women of the Scottish Heart Health Study: cohort study. *BMJ* 1997; **315**: 722–29.
- Speedwell:** The Caerphilly and Speedwell Collaborative Group. Caerphilly and Speedwell collaborative heart disease studies. *J Epidemiol Community Health* 1984; **38**: 259–62.
- Tromso:** Bonna KH, Thelle DS. Association between blood pressure and serum lipids in a population: the Tromso Study. *Circulation* 1991; **83**: 1305–14.
- UK HDPP:** Rose G, Tunstall-Pedoe HD, Heller RF. UK heart disease prevention project: incidence and mortality results. *Lancet* 1983; **1**: 1062–66.
- Värmland:** Törnberg SA, Holm LE, Carstensen JM, Eklund GA. Risks of cancer of the colon and rectum in relation to serum cholesterol and beta-lipoprotein. *N Engl J Med* 1986; **315**: 1629–33.
- West Scotland:** Davey Smith G, Hart C, Hole D, et al. Education and occupational social class: which is the more important indicator of mortality risk? *J Epidemiol Community Health* 1998; **52**: 153–60.
- Whitehall:** Reid DD, Brett GZ, Hamilton PJ, Jarrett RJ, Keen H, Rose G. Cardiorespiratory disease and diabetes among middle-aged male civil servants: a study of screening and intervention. *Lancet* 1974; **1**: 469–73.

North America or Australia: 18 studies

- ARIC:** The ARIC investigators. The Atherosclerosis Risk in Communities (ARIC) Study: design and objectives. *Am J Epidemiol* 1989; **129**: 687–702.
- Busselton:** Knuiman MW, Vu HT, Bartholomew HC. Multivariate risk estimation for coronary heart disease: the Busselton Health Study. *Aust NZ J Public Health* 1998; **22**: 747–53.
- Charleston:** Keil JE, Sutherland SE, Knapp RG, Lackland DT, Gazes PC, Tyroler HA. Mortality rates and risk factors for coronary disease in black as compared with white men and women. *N Engl J Med* 1993; **329**: 73–78.
- CHS:** Fried LP, Borhani NO, Enright P, et al. The Cardiovascular Health Study: design and rationale. *Ann Epidemiol* 1991; **1**: 263–76.
- Evans County:** Heyman A, Karp HR, Heyden S, et al. Cerebrovascular disease in the bi-racial population of Evans County, Georgia. *Stroke* 1971; **2**: 509–18.
- Honolulu:** Kagan A, ed. The Honolulu Heart Program: an Epidemiological Study of Coronary Heart Disease and Stroke. Reading, UK: Harwood Academic Publishers, 1996.
- LRC:** Jacobs DR, Mebane IL, Bangdiwala SI, Criqui MH, Tyroler HA. High density lipoprotein cholesterol as a predictor of cardiovascular disease mortality in men and women: the follow-up study of the Lipid Research Clinics Prevalence Study. *Am J Epidemiol* 1990; **131**: 32–47.
- MHHP:** Luepker RV, Rastam L, Hannan PJ, et al. Community education for cardiovascular disease prevention. Morbidity and mortality results from the Minnesota Heart Health Program. *Am J Epidemiol* 1996; **144**: 351–62.
- MHS:** Luepker RV, Jacobs DR, Shahar E, et al. Ten-year trends (1985 through 1995) in acute coronary heart disease mortality, morbidity and medical care: the Minnesota Heart Survey. *Circulation* 2001; **104**: 19–24.
- MRFIT:** Neaton JD, Kuller L, Stamler J, Wentworth DN. Impact of systolic and diastolic blood pressure on cardiovascular mortality. In: Laragh J, Brennen BM. Hypertension: pathophysiology, diagnosis, and management. New York: Raven Press, 1995.
- NHEFS:** Cox CS, Mussolino ME, Rothwell ST, et al. Plan and operation of the NHANES I Epidemiologic Followup Study, 1992. National Center for Health Statistics. *Vital Health Stat* 1997; **1**: 1–231.
- NHLBI Framingham Heart Study:** Dawber TR, Meadors GF, Moore FE. Epidemiological approaches to heart disease: the Framingham study. *Am J Public Health* 1951; **41**: 279–86.
- Perth:** National Heart Foundation and Australian Institute of Health and Welfare. Risk Factor Prevalence Study—Survey 3, 1989. National Heart Foundation, Canberra, 1991.
- PRHHP:** Garcia-Palmieri MR, Costas R Jr. Risk factors of coronary heart disease: a prospective epidemiologic study in Puerto Rico. *Prog Cardiol* 1986; Chapter 6: 101–190.

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- Tecumseh:** Higgins M, Keller JB. Cholesterol, coronary heart disease, and total mortality in middle-aged and elderly men and women in Tecumseh. *Ann Epidemiol* 1992; **2**: 69–76.
- US Health Professionals:** Ascherio A, Rimm EB, Hernan MA, et al. Intake of potassium, magnesium, calcium, and fiber and risk of stroke among US men. *Circulation* 1998; **98**: 1198–204.
- US Nurses:** Fiebach NH, Hebert PR, Stampfer MJ, et al. A prospective study of high blood pressure and cardiovascular disease in women. *Am J Epidemiol* 1989; **130**: 646–54.
- US Physicians:** Sesso HD, Stampfer MJ, Rosner B, Gaziano JM, Hennekens CH. Two-year changes in blood pressure and subsequent risk of cardiovascular disease in men. *Circulation* 2000; **102**: 307–12.
- Japan or China: 10 studies*
- Ikawa:** Shimamoto T, Komachi Y, Inada H, et al. Trends for coronary heart disease and stroke and their risk factors in Japan. *Circulation* 1989; **79**: 503–15.
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- Kyowa:** Iso H, Naito Y, Sato S, et al. Serum triglycerides and risk of coronary heart disease. *Am J Epidemiol* 2001; **153**: 490–99.
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- Saitama:** Imai K, Matsuyama S, Miyake S, Suga K, Nakachi K. Natural cytotoxic activity of peripheral-blood lymphocytes and cancer incidence: an 11-year follow-up study of a general population. *Lancet* 2000; **356**: 1795–99.
- Seven Cities China:** Fang XH, Kronmal RA, Li SC, et al. Prevention of stroke in urban China: a community-based intervention trial. *Stroke* 1999; **30**: 495–501.
- SC Japan:** Jacobs DR, Adachi H, Mulder I, et al. Cigarette smoking and mortality risk: twenty-five-year follow-up of the Seven Countries Study. *Arch Intern Med* 1999; **159**: 733–40.
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Appendix B: Estimation of "usual" blood pressures during particular exposure periods

There were 162 000 individuals with a systolic blood pressure (SBP) remeasurement at 1–5 years (average 3·4 years) after the baseline measurement (see table B1 below). For the ten categories of baseline SBP, the mean of the remeasurements in a particular category was found to be related to the mean, x, of the baseline measurements in that category by the formula:

$$F=145.9+0.669(x-150)-0.0017(x-150)^2$$

Likewise, there were 124 000 individuals with an SBP remeasurement at 6–15 years (average 8·3 years) after baseline, and the mean of this remeasurement for the ten categories of baseline SBP was found to be given by:

$$L=146.9+0.576(x-150)-0.0023(x-150)^2$$

In each baseline SBP category, the usual SBP at t years after baseline (irrespective of study, age, or sex) was therefore estimated as $F+(L-F)(t-3.4)/4.9$, because this yields the formula F at 3·4 years and the formula L at 8·3 years. As a baseline measurement of SBP is less informative about the usual SBP after a greater interval of time, the differences in usual SBP between successive SBP categories became progressively smaller as the age at death increased (table 1 in main report). The analyses for diastolic blood pressure (DBP) were similar to those described above for SBP, except that the baseline DBP measurement was used to divide people into only six categories (see tables B1 and B2 below). The corresponding formulae used to estimate usual DBP were:

$$F=87.4+0.615(x-90)-0.0016(x-90)^2; \text{ and}$$

$$L=85.6+0.494(x-90)-0.0036(x-90)^2$$

Baseline blood pressure categories and ranges (mm Hg)		First remeasurement at 1–5 years (mean 3·4) after baseline				Last remeasurement at 6–15 years (mean 8·3) after baseline			
Group	Range	Number with repeat visits	Baseline (x)	Observed	Predicted (F)	Number with repeat visits	Baseline (x)	Observed	Predicted (L)
Systolic blood pressure (SBP)									
i	<115	30 109	106·4	114·4	113·4	19 532	106·4	117·7	117·4
ii	115–124	35 240	119·9	123·8	124·2	22 180	119·7	127·3	127·5
iii	125–134	35 218	129·6	130·8	131·5	22 329	129·4	133·5	134·2
iv	135–144	26 912	139·4	137·9	138·6	16 964	139·2	140·2	140·5
v	145–154	16 197	149·3	145·4	145·4	10 144	149·1	146·3	146·4
vi	155–164	9 273	159·3	152·4	152·0	5 890	159·1	153·0	152·0
vii	165–174	4 952	169·2	158·6	158·1	3 299	169·1	157·7	157·1
viii	175–184	2 665	179·2	164·6	164·0	1 689	179·1	161·6	161·8
ix	185–194	1 375	189·2	169·7	169·6	877	189·3	164·6	166·0
x	≥195	1 464	209·3	179·0	179·7	1 017	211·3	174·1	173·0
Difference (x–i)			102·9	64·6	66·2		104·9	56·5	55·6
Regression dilution ratio*			0·63	0·64			0·55	0·54	
Diastolic blood pressure (DBP)									
i	<75	51 621	67·4	73·0	72·7	31 955	67·3	72·7	72·6
ii	75–84	57 256	79·7	80·6	81·0	35 891	79·6	79·9	80·1
iii	85–94	35 335	89·2	86·7	87·0	23 283	89·0	85·0	85·2
iv	95–104	13 720	98·8	93·0	92·8	8 775	98·7	89·5	89·7
v	105–114	4 043	108·8	98·7	98·5	2 926	108·7	94·0	93·6
vi	≥115	1 430	122·2	105·4	105·7	1 091	122·6	97·7	97·8
Difference (vi–ii)†			42·5	24·8	24·7		43·0	17·8	17·7
Regression dilution ratio*				0·58	0·58		0·41	0·41	

*Ratio of the cited difference in observed or predicted blood pressure at remeasurement to that in baseline blood pressure. †Difference is for group (vi) to group (ii), since risks for group (i) appear to be above the age-specific regression lines of log risk versus usual DBP (see figures 2, 4, and 6 in main report).

Table B1: Observed and predicted blood pressure values in baseline-defined categories for individuals with remeasurements

DBP (mm Hg): baseline-defined categories and values ranges			Estimated "usual" DBP at an average of 5 years before death for deaths at ages				
Group	Range	Mean	40–49	50–59	60–69	70–79	80–89
i	<75	67·8	73·0	73·3	73·3	73·1	73·9
ii	75–84	79·8	81·2	80·9	80·6	80·3	80·0
iii	85–94	89·3	87·5	86·8	86·1	85·4	84·8
iv	95–104	99·0	93·7	92·5	91·3	90·1	88·9
v	105–114	108·9	99·9	97·9	96·0	94·1	92·2
vi	≥115	122·4	107·9	104·9	101·9	98·7	95·3
Difference (vi–ii)*		42·6	26·6	24·0	21·2	18·4	15·4
Regression dilution ratio†			0·63	0·56	0·49	0·42	0·35
Years from baseline‡			2	4	6	8	10

*Difference is given for groups (vi) to (ii) since risks for group (i) are above the age-specific regression lines in graphs of log risk versus usual DBP (see figures 2, 4, and 6 in main report). †Ratio of the cited difference (vi–ii) in usual DBP at the start of each decade to that in baseline DBP. ‡Mean years from baseline to start of age range, for those who died in it (estimated as 5 years less than mean years from baseline to death). Hence, regression dilution ratios for usual blood pressure at an average of about 1 year before death in each decade are equivalent to those for years from baseline to start of age range plus 4 years (eg, 0·49, rather than 0·63, for usual DBP at age 40–49 years).

Table B2: Mean baseline values and estimated usual values of DBP (as provided for SBP in table 2 of main report)

Appendix C: **Calculation of effective variances for log risks, and calculation of age-specific regression lines**

Calculation of the effective variance of the log of the floating absolute risk

With five age ranges (40–49, . . . , 80–89 years) and ten systolic blood pressure (SBP) categories there are 50 log relative risks, numbered 0 to 49 (0–9 for the SBP categories at age 40–49 years; 10–19 for those at age 50–59 years, etc). Standard relative risk calculations define one of these 50 groups as the reference category, and then calculate the log risk for each of the other 49 categories relative to this, yielding a Cox variance of zero for the log relative risk in the reference group and a Cox variance for each of the 49 other groups that includes the effects of the play of chance in the results for the reference group. Floating absolute risk calculations yield exactly the same 50 log risks, but instead assign an “effective variance” to each of them (including the reference group), calculated as follows. Let the 50 effective variances that are to be attributed to the log risks $b_0, b_1, b_2, \dots, b_{49}$ in the 50 groups be written as $v_0, v_1, v_2, \dots, v_{49}$ respectively (where group 0 is the reference group, with b_0 zero but v_0 positive), and let b denote the inverse-variance-weighted average $\sum w_j b_j$ (where the weight w_j is the inverse of v_j , $\sum 1/v_k$). Let c_{ij} denote the Cox covariance of the log risk ratio b_i with the log risk ratio b_j (so c_{ij} is zero if i or j are zero); let x_i denote the variance attributed to $(b_i - b)$ by Cox’s method (so $x_i = c_{ij} - 2\sum w_j c_{ij} + \sum \sum w_j w_k c_{jk}$); and let p_i denote the variance calculated for $(b_i - b)$ from the 50 effective variances (so $p_i = v_i - 2w_i v_i + \sum w_j v_j$). The 50 effective variances are then chosen to ensure that the variance with which each b_i differs from the weighted average b is exactly correct (ie, they are computed iteratively to ensure that each p_i equals the corresponding x_i : a program for solving these 50 simultaneous equations is available from the Prospective Studies Collaboration Secretariat).

Calculation of age-specific regression lines

Consider the results for deaths during one particular decade of age (eg, 50–59 years, for which the subscript i varies from 10 for the lowest SBP category to 19 for the highest), and let u_i denote the usual blood pressure at the start of that age range in group i ($i=10, \dots, 19$). Within this age range, let B and U denote the inverse-variance-weighted averages of the 10 log risks and of the 10 usual SBP values respectively, and define S as $\sum (u_i - U)(b_i - B)/v_i$ and T as $\sum (u_i - U)^2/v_i$ (with summation from $i=10$ to 19). For this particular age range, the best-fitting straight line through these log mortality rates goes through the point (U, B) and has slope S/T (which has variance $1/T$). Hence, for example, the log hazard ratio for a 20 mm Hg lower usual SBP would be $-20 S/T$, so the corresponding hazard ratio would be $\exp(-20 S/T)$, with 95% confidence limits $\exp(-20[S/T \pm 1.96/\sqrt{T}])$.

Appendix D: **Comparisons between different blood pressure indices (measured once only at baseline) as predictors of stroke and ischaemic heart disease (IHD) mortality rates**

Straight lines, one for each decade of age, relate risk (plotted on a doubling scale) to the measured value of the given blood pressure index, yielding a χ^2_1 statistic. The value for 40–89 years is the sum of the values for the five separate age ranges, which is provided in table 3 of the main report. Comparisons of values are appropriate only within each column: for a given age range and disease, larger values indicate better predictive ability.

BP index (measured once only at baseline)	Age (years) at risk (and numbers of stroke deaths)					Sum: 40–89 (11 688)
	40–49 (414)	50–59 (1372)	60–69 (2939)	70–79 (4327)	80–89 (2636)	
Systolic (SBP)	172 (86%)	585 (85%)	758 (91%)	579 (91%)	76 (84%)	2170 (89%)
Diastolic (DBP)	173 (86%)	651 (94%)	664 (80%)	474 (75%)	76 (84%)	2038 (83%)
Pulse pressure	46 (23%)	184 (27%)	358 (43%)	287 (45%)	29 (32%)	905 (37%)
Mean arterial pressure	201 (101%)	711 (103%)	826 (99%)	624 (98%)	93 (102%)	2455 (100%)
Mid blood pressure	200 (100%)	692 (100%)	833 (100%)	633 (100%)	91 (100%)	2451 (100%)

Mid blood pressure= $1/2$ SBP+ $1/2$ DBP, mean arterial pressure= $2/3$ DBP+ $1/3$ SBP, and pulse pressure=SBP–DBP.

Table D1: **Stroke: χ^2_1 values relating age-specific mortality rates to a single measurement of the blood pressure index (and percentage of age-specific χ^2_1 for mid blood pressure)**

BP index (measured once only at baseline)	Age (years) at risk (and numbers of IHD deaths)					Sum: 40–89 (33 867)
	40–49 (1322)	50–59 (5594)	60–69 (10 450)	70–79 (10 852)	80–89 (5649)	
Systolic (SBP)	266 (85%)	943 (91%)	1303 (96%)	673 (95%)	142 (92%)	3327 (93%)
Diastolic (DBP)	263 (84%)	810 (78%)	958 (70%)	479 (68%)	106 (69%)	2615 (73%)
Pulse pressure	61 (19%)	362 (35%)	673 (49%)	364 (51%)	72 (47%)	1532 (43%)
Mean arterial pressure	316 (100%)	1020 (98%)	1312 (96%)	680 (96%)	150 (97%)	3478 (97%)
Mid blood pressure	315 (100%)	1038 (100%)	1363 (100%)	707 (100%)	154 (100%)	3577 (100%)

Conventions as for table D1.

Table D2: **Ischaemic heart disease (IHD): χ^2_1 values relating age-specific mortality rates to a single measurement of the blood pressure index (and percentage of age-specific χ^2_1 for mid blood pressure)**