Appendix

Sex differences in the relationship between socioeconomic status and cardiovascular disease: a systematic review and meta-analysis

Appendix methods: Search terms used

"female", "women", "male", "men", "sex", "cardiovascular disease" , "coronary heart disease", "myocardial infarction", "stroke", "cerebrovascular disease", "socioeconomic factors", "social class", "income", "education*", "occupation", "socio*", "inequit*", "inequal*", "disparit*", "disadvantage", ", “cohort*”, “prospective*”, “longitudinal*”, “population-based”, “ecologic study”, “registries”, “census”.

Use of an asterisk denotes an open ended search term. No limits were placed on the basis of language, country or publication date.

Appendix figure legends

Appendix figure 1: Multiple-adjusted pooled relative risk of cardiovascular disease outcomes associated with lowest versus highest socioeconomic status in men and women. SES: Socioeconomic status.

Appendix figure 2: Funnel plot with pseudo 95% confidence limits for the age-adjusted data comparing lowest to highest level of education. a) For data in Figure 3 (CHD) ; b) For data in Figure 4 stroke; c) For data in Figure 5 (CVD).

Appendix figure 3: Age-adjusted and multiple-adjusted women-to-men ratio of relative risks of coronary heart disease, highest compared to lowest area level disadvantage.

Appendix figure 4: Age-adjusted and multiple-adjusted women-to-men ratio of relative risks of coronary heart disease, lowest compared to highest income level.

Appendix figure 5: Age-adjusted and multiple-adjusted women-to-men ratio of relative risks of coronary heart disease, manual compared to non-manual occupations.

Appendix figure 6: Age-adjusted and multiple-adjusted women-to-men ratio of relative risks of stroke, highest compared to lowest area level disadvantage.

Appendix figure 7: Age-adjusted and multiple-adjusted women-to-men ratio of relative risks of stroke, lowest compared to highest income level.

Appendix figure 8: Age-adjusted and multiple-adjusted women-to-men ratio of relative risks of stroke, manual compared to non-manual occupations.

Appendix figure 9: Age-adjusted and multiple-adjusted women-to-men ratio of relative risks of cardiovascular disease, highest compared to lowest area level disadvantage.

Appendix figure 10: Age-adjusted and multiple-adjusted women-to-men ratio of relative risks of cardiovascular disease, manual compared to non-manual occupation.

Appendix figure 11: Age-adjusted women-to-men ratio of relative risks of cardiovascular disease outcomes by subgroup, lowest compared to highest educational attainment
*analysis are conducted using individual participant data (the Asia Pacific Cohort Studies Collaboration, the Atherosclerosis Risk in Communities Study, the National Health and Nutrition Examination Survey III, and the Scottish Heart Health Extended Cohort Study).

Appendix figure 12: Age-adjusted women-to-men ratio of relative risks of cardiovascular disease outcomes by primary compared to secondary or compared to tertiary educational attainment. Analysis were conducted using individual participant data (the Asia Pacific Cohort Studies Collaboration, the Atherosclerosis Risk in Communities Study, the National Health and Nutrition Examination Survey III, and the Scottish Heart Health Extended Cohort Study).

Appendix table 1: Quality assessment of the included studies

Study	S1	S2	S3	S4	C1	O1	O2	O3	Sum
ARIC (1)	1	1	1	1	2	1	1	1	9
APCSC-ANZ (2, 3)	1	1	1	1	2	1	1	1	9
APCSC-Asia (2, 3)	1	1	1	1	2	1	1	1	9
ARIC (4)	1	1	1	1	2	1	1	1	9
Bas Rhin registry (5)	1	1	1	0	2	1	1	1	8
BASIC (6)	1	1	1	1	2	1	1	1	9
CALIBER (7)	1	1	1	1	2	1	1	1	9
CCHS; GPS (8)	1	1	1	1	2	1	1	1	9
CCM follow-up Study (9)	1	1	1	1	2	0	1	1	8
CPSII Nutrition Cohort (44)	1	1	1	1	2	0	1	1	8
CVDNOR (45)	1	1	1	1	2	1	1	1	9
Dutch National Register (10)	1	1	1	1	2	0	1	0	7
Dutch National Register (11)	1	1	1	1	2	1	1	0	8
Entire Swedish population (12)	1	1	1	0	2	1	1	0	7
EPIC (13)	1	1	1	1	2	1	1	1	9
EPIC Norfolk (14)	1	1	1	1	2	0	1	1	8
EPIC Norfolk (15)	1	1	1	1	2	1	1	1	9
FINAMI (16)	1	1	1	1	2	1	1	0	8
FINMONICA stroke register (17)	1	1	1	1	2	1	1	1	9
FINRISK (18)	1	1	1	1	2	1	1	1	9
French National Institute of Statistics (INSEE) (19)	1	1	1	1	2	0	1	0	7
HUNT-2 (20)	1	1	1	1	2	0	1	0	7
ILMS (21)	1	1	1	1	2	0	1	1	8
JACC (22)	1	1	1	1	2	0	1	0	7
JMS (23)	1	1	1	1	2	1	1	1	9
JPHC I (24)	1	1	1	1	2	1	1	1	9
MATISS (25)	1	1	1	1	2	0	1	1	8
MONICA Glasgow (26)	1	1	1	1	2	1	1	0	8
MONICA Novobirsk (27)	1	1	1	1	2	0	1	1	8
MONICA; PAMELA (28)	1	1	1	1	2	1	1	1	9
MORGAM (29)	1	1	1	1	2	0	1	1	8
Mumbai Cohort Study (30)	1	1	1	1	2	0	1	1	8
Muncipality of Barcelona (31)	1	1	1	1	2	0	1	1	8
NHANES I (32)	1	1	1	1	2	1	1	1	9
NHANES III (33)	1	1	1	1	2	1	1	1	9
NHANES I (34)	1	1	1	1	2	1	1	1	9
NIH-AARP Diet and Health Study (35)	1	1	1	1	2	0	1	0	7
NSW-ISC (36)	1	1	1	0	2	0	1	0	6
PCCS; NEMESIS; ARCOS (37)	1	1	1	1	2	1	1	0	8

Population and Housing census (38)	1	1	1	1	2	1	1	1	9
Population census Malmö (39)		1	1	1	2	1	1	0	7
Population registry of Central and Capital Region (40)	1	1	1	1	2	1	1	0	8
Renfrew/Parsley (41)	1	1	1	1	2	1	1	0	8
Renfrew/Parsley (42)	1	1	1	1	2	1	1	0	8
SHHEC (43)	1	1	1	1	2	1	1	1	9
Swedish Work and Mortality Database (44)	1	1	1	1	2	0	1	1	8
Three Norwegian counties (45)	1	1	1	1	2	0	1	0	7
TLS (46)	1	1	1	1	2	1	1	0	8
Whitehall (47)	1	1	0	1	2	1	1	0	7

Citation number in parentheses. See appendix table 2 for full study names

Studies were rated on quality assessment criteria according to a modified version of the Newcastle-Ottawa Quality assessment scale listed on the next page (*studies received one point for the achievement of these criteria):

Quality assessment criteria

Selection

S1) Representativeness of the exposed cohort
- a) truly representative of the general population*****
- b) somewhat representative of the general population
- c) selected group e.g. patient groups
- d) no description of the derivation of the cohort

S2) Selection of the non exposed cohort
- a) drawn from the same community as the exposed cohort *****
- b) drawn from a different source
- c) no description of the derivation of the non exposed cohort

S3) Ascertainment of exposure
- a) secure record (validated events) *****
- b) structured interview
- c) written self report
- d) no description

S4) Demonstration that outcome of interest was not present at start of study
- a) yes *****
- b) no

Comparability

C1) Comparability of cohorts on the basis of the design or analysis
- a) study controls for age*****
- b) study does not control for additional factors in baseline model adjusted for age (cohort or year ok)*****

Outcome

O1) Assessment of outcome
- a) independent blind assessment or record linkage of fatal and non-fatal events*****
- b) independent blind assessment or record linkage of fatal events
- c) self report
- d) no description

O2) Was follow-up long enough for outcomes to occur
- a) yes (at least 3 years) *****
- b) no

O3) Adequacy of follow up of cohorts
- a) complete follow up - all subjects accounted for *****
- b) subjects lost to follow up unlikely to introduce bias - > 10% follow up, or description provided of those lost *****
- c) follow up rate < 90% and no description of those lost
- d) no statement

Appendix table 2: Characteristics of included studies

Study name (citation number)	Baseline study years	Country	Follow-up (years)	n (% women)	Age range	CHD, n (% women)	Stroke, n (%women)	CVD, n (%women)	Fatal (F), non-fatal (NF)	SEPSES indicator (no categories)	Maximum adjustment
APCSC-ANZ (2, 3)	1989-96	ANZ	8	91743 (55)	20-104	2156 (21)	725 (30)	3232 (24)	F & NF	Education (3)	Age, DM, smoking, SBP, TC, HDL-C
APCSC-Asia (2, 3)	1961-93	Asia	7	227123 (29)	20-107	583 (34)	1263 (34)	2726 (35)	F &NF	Education (3)	Age, DM, smoking, SBP, TC, HDL-C
ARIC (1, 4)	1987-89	USA	10	15732 (55)	45-64	1616 (42)	930 (52)	2339 (45)	F & NF	Education (3) Area Deprivation (3)	Age, DM, smoking, SBP, TC, HDL-C
Bas Rhin registry (5)	2000-03	France	4	450000 (NA)	35-74	1193 (24)	NA	NA	F & NF	Area Deprivation (5)	age
BASIC (6)	2000	USA	3	Population of Nueces, Texas (NA)	73	NA	1247 (NA)	NA	N	Area Deprivation (2)	age, ethnicity
CALIBER (7)	1997-10	UK	6	1937360 (51)	30+	33769 (42)	17641 (56)	78618 (47)	F & NF	Area Deprivation (5)	Age, ethnicity, smoking, DM, SBP, TC, HDL-C, BMI
CCHS; GPS (8)	1976 -94	Denmark	32	22782 (54)	20+	3061 (41)	NA	NA	F & NF	Income (4)	age, smoking, alcohol, SBP, TC, BMI, PA, DM
CCM follow-up Study (9)	1991	Canada	10	1091800 (39)	35-64	NA	NA	NA	F	Education (4) Occupation (5)	age
CPSII Nutrition Cohort (48)	1992	USA	8	179383 (47)	50-75	3451 (23)	944 (38)	NA	F	Education (5) Area Deprivation (6)	age
CVDNOR (49)	2001-09	Norway	8	Norwegian population	35-94	141332 (40)	NA	NA	F	Education (3)	age
Dutch National Register (10)	1995-00	The Netherlands	5	11381474 (45)	0-59	NA	NA	NA	F	Area Deprivation (2)	age
Dutch National Register (11)	1997-07	The Netherlands	10	Dutch population	35-95	317563 (37)	NA	NA	F & NF	Area Deprivation (5)	age

Entire Swedish population (12)	1995	Sweden	4	2637628 (50)	40-64	52360 (27)	NA	NA	N	Income (5) Area Deprivation (10)	age
EPIC (13)	1992-96	Spain	10	41438 (62)	30-65	538 (20)	NA	NA	F & NF	Education (5)	age, paternal occupation, smoking, DM, hypertension, hyperlipidemia, CVD drugs use, and OCT use, HRT, postmenopausal status
EPIC Norfolk (14)	1993-97	UK	13	22486 (55)	39-79	NA	NA	683 (39)	F	Occupation (6)	Age, smoking, BMI
EPIC Norfolk (15)	1993-97	UK	10	22486 (55)	39-79	NA	683 (52)	NA	F & NF	Occupation (6)	Age, BMI, smoking, DM, SBP, TC
FINAMI (16)	1988	Finland	15	233287 (55)	35-99	15374 (47)	NA	NA	F & NF	Income (5) Education (2) Occupation (3)	Age
FINMONICA stroke register (17)	1982-83	Finland	10	390564 (NA)	25-74	NA	6903 (43)	NA	F & NF	Income (3) Education (3)	Age
FINRISK (18)	1982-97	Finland	5	19272 (53)	35-64	1137 (31)	NA	NA	F & NF	Occupation (6)	Age, smoking, alcohol, PA, TC, BP, BMI
French National Institute of Statistics (INSEE) (19)	1990-99	France	9	213874 (51)	30-64	NA	NA	11724 (31)	F	Education (5) Occupation (10)	Age
HUNT-2 (20)	1995-97	Norway	9	44128 (53)	30-99	551 (40)	NA	NA	F	Education (3)	Age, chronic illness, smoking, PA, alcohol
ILMS (21)	1983	Israel	10	152150 (52)	45-89	7529 (59)	NA	14732 (45)	F	Education (3)	Age
JACC (22)	1988-90	Japan	11	39999 (58)	40-79	439 (42)	NA	NA	F	Education (3)	Age
JMS (23)	1992-95	Japan	12	10640 (61)	57	84 (32)	367 (46)	NA	F & NF	Education (3) Occupation (3)	Age, TC, PA, alcohol, marital status, smoking, obesity, hypertension, DM
JPHC I (24)	1990	Japan	13	39228 (52)	40-59	NA	NA	1799 (35)	F & NF	Education (3)	Age, smoking, alcohol, PA, BMI, dietary intake, screening tests
MATISS (25)	1983	Italy	17	8512 (53)	20-75	NA	NA	288 (NA)	F	Education (4)	Age, smoking, SBP, BMI, HDL-C

MONICA Glasgow (26)	1985	UK	6	195831 (51)	25-64	5542 (28)	NA	NA	F & NF	Area Deprivation (4)	Age
MONICA Novobirsk (27)	1984-95	Russia	10	11404 (43)	25-64	293 (20)	146 (30)	524 (25)	F	Education (4)	Age, smoking, TC, SBP, alcohol, BMI
MONICA; PAMELA (28)	1986-92	Italy	12	5084 (51)	35-74	319 (24)	229 (21)	NA	F & NF	Education (2)	Age, SBP, DM, smoking, TC, HDL-C, BMI (women only)
MORGAM (29)*	1982-97	Europe	10	68455 (43)	40-64	NA	NA	2878 (21)	F	Education (3)	Age, SBP, TC, smoking
Mumbai Cohort Study (30)	1991-97	India	6	148173 (40)	30+	2460 (31)	765 (40)	4451 (39)	F	Education (5)	Age, smoking, BMI, religion, mother tongue
Municipality of Barcelona (31)	1984	Spain	9	20648 (44)	15+	NA	NA	207 (14)	F	Occupation (6)	Age
NHANES I (32)	1971-75	USA	15	6025 (54)	25-74	1096 (44)	NA	NA	F & NF	Education (4)	Age, SBP, DBP, hypertension, TC, BMI, DM, smoking, alcohol, PA, marital status, race/ethnicity
NHANES I (34)	1971-75	USA	20	4710 (53)	45-74	NA	652 (51)	NA	F & NF	Education (4) Income (4)	Age, smoking, DM, history CHD, alcohol, PA, BP medication, SBP
NHANES III (33)	1988	USA	13	18603 (46)	18-90	973 (51)	329 (58)	1337 (53)	F	Education (3)	Age, DM, smoking, SBP, TC, HDL-C
NIH-AARP Diet and Health Study (35)	1995-96	USA	10	409775 (43)	50-71	NA	NA	8952 (NA)	F	Area Deprivation (5)	Age
NSW-ISC (36)	1991-92	Australia	4	Inhabitants of NSW	35-74	58506 (29)	NA	NA	F & NF	Area (4)	Age
PCCS; NEMESIS; ARCOS (37)	1995-02	ANZ	1-3	relevant population data from census (NA)	15+	NA	3077 (54)	NA	F	Area Deprivation (5)	Age
Population and Housing census (38)	1987	Sweden	23	2939771 (48)	30-69	121496 (22)	61421 (34)	NA	F & NF	Occupation (5)	Age
Population census Malmö (39)	1990	Sweden	10	69625 (51)	40-65	NA	1648 (38)	NA	F & NF	Income (4) Occupation (7)	Age
Population registry of Central and Capital Region (40)	2001	Denmark	4	1727938 (55)	30-66	NA	NA	126045 (48)	F & NF	Income (2)	Age, marital status

Renfrew/ Parsley (41)	1972	UK	20	14947 (47)	45-64	NA	1271 (53)	NA	F & NF	Area Deprivation (7)	Age, smoking, SBP, DBP, height, FEV, BMI, TC, DM, history CHD
Renfrew/ Parsley (42)	1972	UK	15	14952 (53)	45-64	NA	NA	1869 (39)	F	Occupation (4) Area Deprivation (3)	Age, DBP, TC, BMI, FEV, smoking, angina, ECG ischaemia, bronchitis
SHHEC (43)	1984-87	UK	16	13287 (51)	30-74	2592 (39)	1084 (43)	3796 (41)	F & NF	Education (3) Occupation (6) Area Deprivation (5)	Age, DM, smoking, SBP, TC, HDL-C
Swedish Work and Mortality Database (44)	1990	Sweden	12	2825117 (49)	30-64	NA	4886 (33)	NA	F	Income (4)	Age
Three Norwegian counties (45)	1974-76	Norway	24	44684 (49)	35-49	1601 (21)	NA	2335 (22)	F	Education (2)	Age, smoking, PA, marital status, BMI, SBP, DBP, cholesterol
TLS (46)	1997	Italy	5	523755 (52)	35-74	15114 (27)	NA	NA	F & NF	Education (3)	Age
Whitehall (47)	1985-88	UK	5	10308 (33)	35-55	417 (36)	NA	NA	N	Occupation (6)	Age

ANZ, Australia and New Zealand; APCSC-ANZ, Asia-Pacific Cohort Study Collaboration-Australia/New Zealand; APCSC-Asia, Asia-Pacific Cohort Study Collaboration-Asia; ARCOS, Auckland Regional Community Stroke Study; ARIC, Atherosclerosis Risk in Communities Study; BASIC, Brain Attack Surveillance in Corpus Christi Project; BMI, body mass index; BP, blood pressure; CALIBER, Cardiovascular disease research using LInked Bespoke studies and Electronic health Records; CCHS, Copenhagen City Heart Studies; CCM Follow-up Study, Canadian Census Mortality Follow-up Study; CHD, coronary heart disease; CPS II Nutrition Cohort, American Cancer Society Nutrition Cohort; CVD, cardiovascular disease; CVDNOR, Cardiovascular Disease in Norway Project; DBP, diastolic blood pressure; EPIC, European Prospective Investigation into Cancer and Nutrition; FEV, forced expiratory volume; GPS, Glostrup Population Studies; HDL-C, high density lipoprotein cholesterol; HRT, hormonal replacement therapy; HUNT, Nord-Trøndelag Health Study; ILMS, Israel Longitudinal Mortality Study; JACC, Japan Collaborative Cohort Study for the Evaluation of Cancer Risk; JMS, Jichi Medial School Cohort Study; JPHC, Japan Public Health Center-based Prospective Study; MATISS, Malattie Aterosclerotische Istituto Superiore di Sanita; MONICA, Multinational MONItoring of trends and determinants in CArdiovascular disease; MORGAM, MOnica Risk, Genetics, Archiving and Monograph; NA, not available; NEMESIS, Northeast Melbourne Stroke Incidence Study; NHANES, National Health and Nutrition Examination Survey; NHEFS, NHANES I Epidemiologic Follow-up Study; NIH-AARP, National Health Institute-American Association of Retired Persons; NSW-ISC, New South Wales Inpatient Statistics Collection; OCT, oral contraceptive therapy; PA, physical activity; PAMELA, pressioni Arteriose Monitorate E Loro Associazioni; PCS, Perth Community Stroke Study; SBP, systolic blood pressure; SHHEC, Scottish Heart Health Extended Cohort; TC, total cholesterol; TLS, Turin Longitudinal Study; UK, United Kingdom; USA, United States of America

* When pooling estimates across countries within the MOnica Risk, Genetics, Archiving and Monograph (MORGAM) project, (29) we excluded estimates from the UK due to overlap with the SHHEC study, which had a longer follow-up and a greater number of events.
Study references are provided in the appendix reference list

Appendix table 3: Categorisation of educational attainment across included studies

Studies	Number of categories	Category thresholds
APCSC - ANZ	3	None or primary, secondary, tertiary
APCSC - Asia	3	None or primary, secondary, tertiary
ARIC	3	<high school, high school graduate, some college, and > college graduate
CCM follow-up Study	4	<secondary graduation, secondary graduation, post-secondary diploma, university degree
CPSII Nutrition Cohort	5	<high school, high school or vocational school, some college, college, graduate school
CVDNOR	3	Basic education (compulsory education), upper secondary education (high school or vocational school) and tertiary education (college or university)
EPIC	5	No formal education, primary school, technical training, secondary school, and > university degree
FINAMI	2	Basic (<9 years of full-time education), secondary or higher
FINMONICA stroke register	2	Basic, corresponding to ≤9 years of full-time education, and secondary or higher, corresponding to >9 years of full-time education
French Institute of National Statistics (INSEE)	5	No diploma, primary, technical, secondary, university
HUNT-2	3	Primary, secondary, tertiary
ILMS	3	0 to 8 years (elementary), 9 to 12, and 13 years and over (high education)
JACC	3	Followed education up to 15 years of age, up to 16-17 years of age, up to or over 18 years of age
JMS	3	Followed education up to 15 years of age, up to 16-17 years of age, ≥ 18 years of age
JPHC I	3	Primary, secondary, tertiary
MATISS	4	None, primary, secondary, high
MONICA Novobirsk	4	Primary (less than 8 years in total), secondary (9-12 years in total), higher secondary (more than 12 years in total), university (university degree)
MONICA; PAMELA	2	High, low
MORGAM	3	Derived from cohort-specific, gender-specific and age-specific tertiles of the distribution of years of schooling
Mumbai Cohort Study	5	Illiterate, primary school, middle school, secondary school, college
NHANES I	4	Less than high school, high school, some college, college
NHANES III	3	< high school, high school graduate, some college, > college graduate
NHEFS	4	< 8 years in total, 8-11 years in total, 12 years in total, > 12 years in total
SHHEC	3	None or primary, secondary, tertiary
Three Norwegian counties	2	Low, high
TLS	3	Low, medium, high

Appendix table 4: Age- and multiple CVD risk factor-adjusted risk factor adjusted ratios of women:men relative risks (95% confidence intervals) of CVD, CHD and stroke. Data pooled over the 4 IPD studies using random effects meta-analysis inverse variance weighting.

	Age-adjusted RRR	Multiple-adjusted RRR
CHD	1.35 (1.02, 1.79)	1.32 (1.07, 1.63)
Stroke	1.00 (0.77, 1.32)	1.00 (0.77, 1.31)
CVD	1.19 (0.94, 1.50)	1.22 (0.93, 1.59)

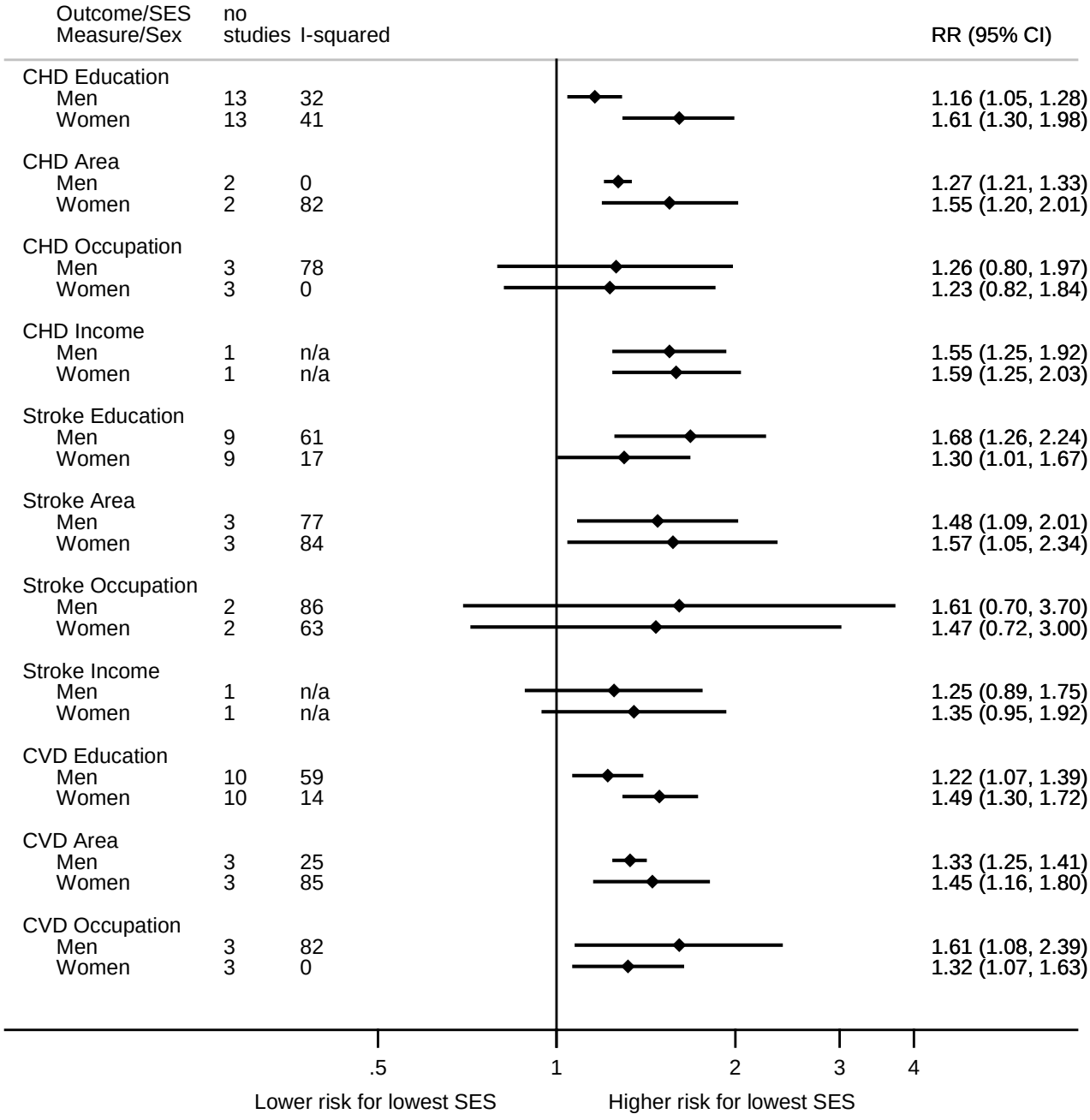
Appendix table 5: Ratios of women:men relative risks (95% confidence intervals) before and after adjustment for diabetes and smoking. Data pooled over the 4 IPD studies using random effects meta-analysis inverse variance weighting.

	Diabetes	Smoking
CHD		
Basic adjustment[1]	1.32 (1.07, 1.63)	1.27 (0.99, 1.62)
Additional adjustment[2]	1.37 (1.03, 1.83)	1.32 (1.07, 1.63)
Stroke		
Basic adjustment[1]	1.00 (0.77, 1.31)	0.90 (0.67, 1.22)
Additional adjustment[2]	1.00 (0.77, 1.32)	1.00 (0.77, 1.31)
CVD		
Basic adjustment[1]	1.22 (0.93, 1.59)	1.21 (0.84, 1.76)
Additional adjustment[2]	1.23 (0.91, 1,67)	1.22 (0.93, 1.59)

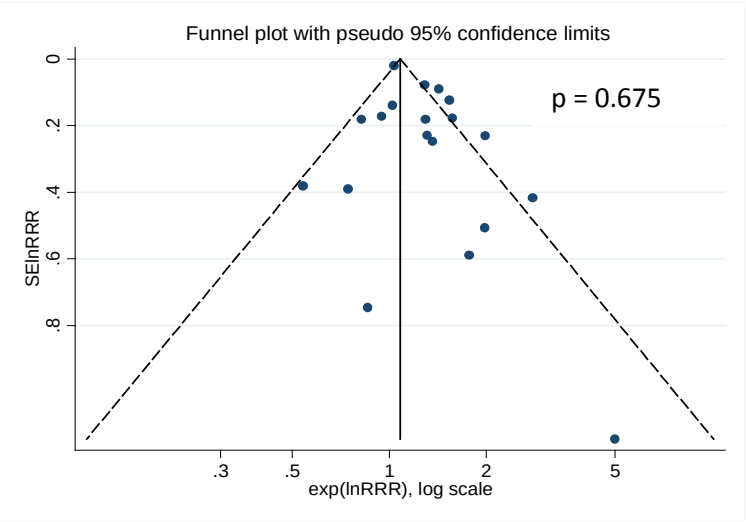
[1] Adjusted for age, total and HDL cholesterol and systolic blood pressure and either smoking (for column 1) or diabetes (for column 2)

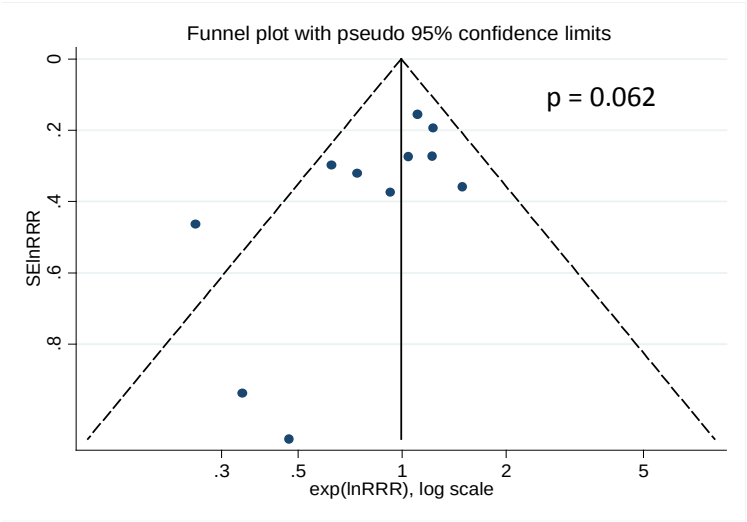
[2] Additionally adjusted for diabetes (for column 1) or smoking (for column 2)

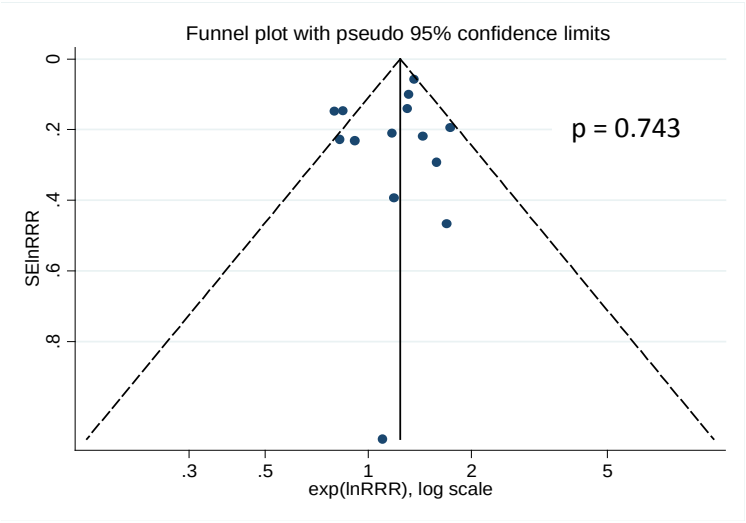
Appendix figure 1



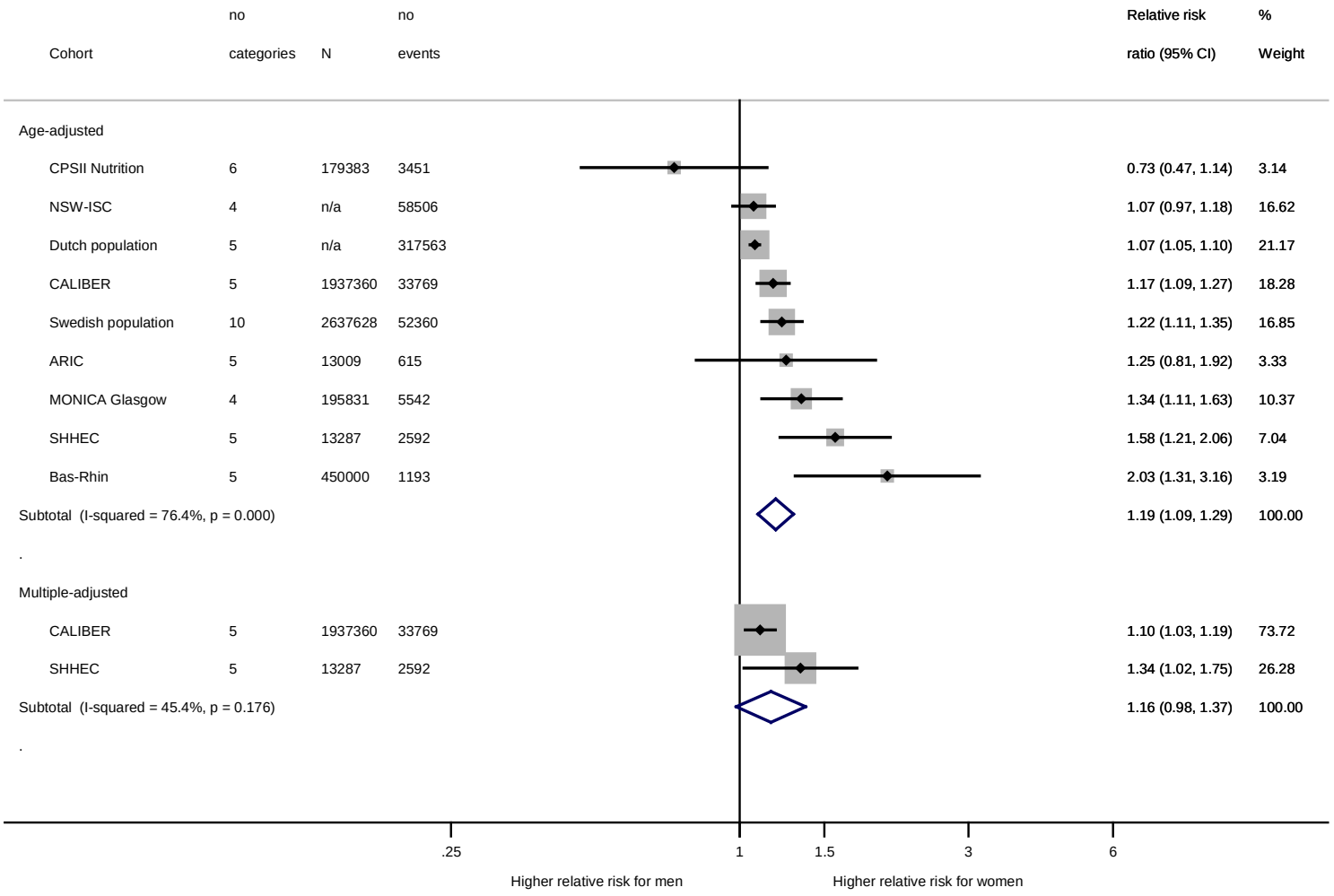
Appendix figure 2



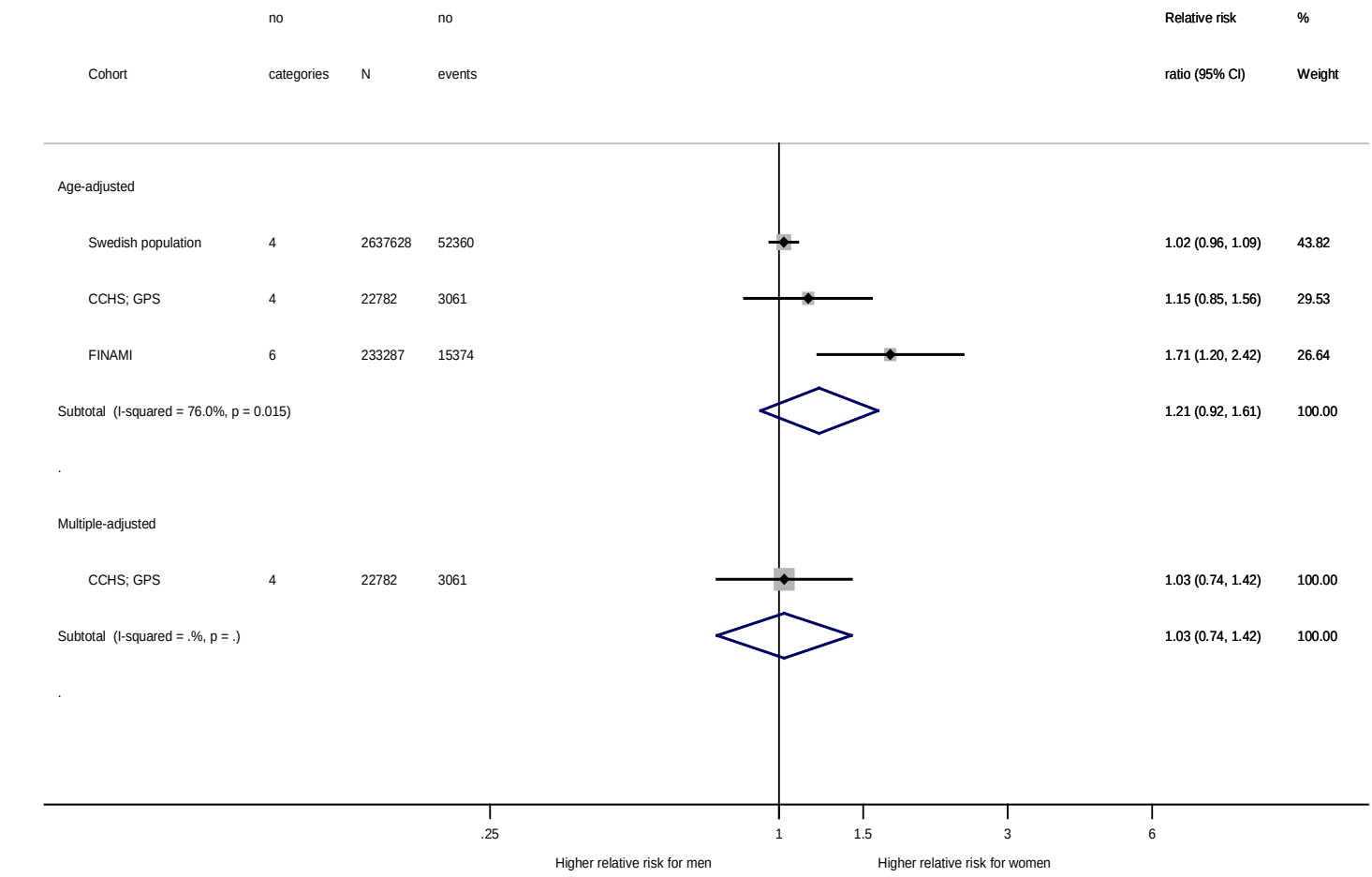




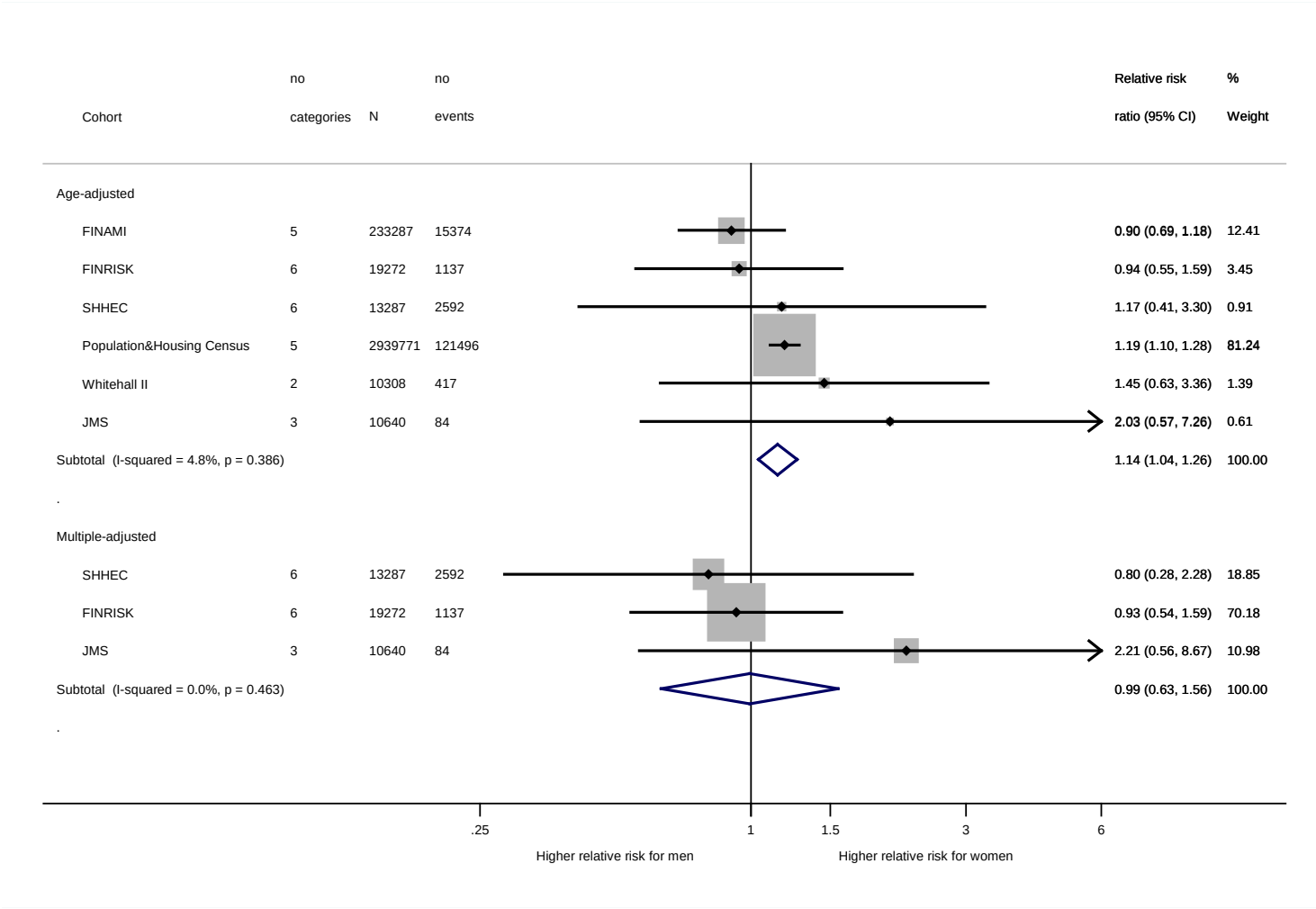
Appendix figure 3



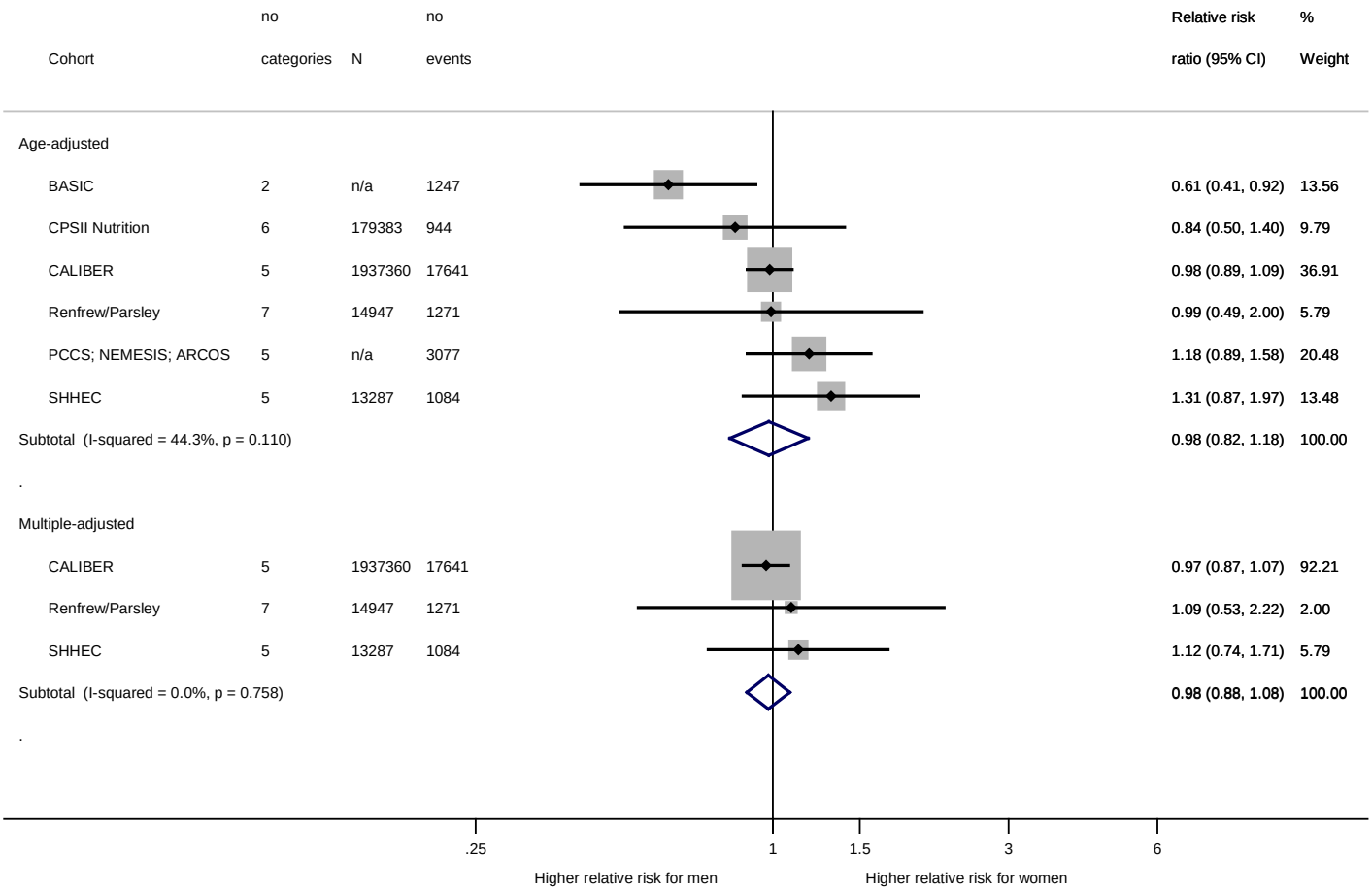
Appendix figure 4



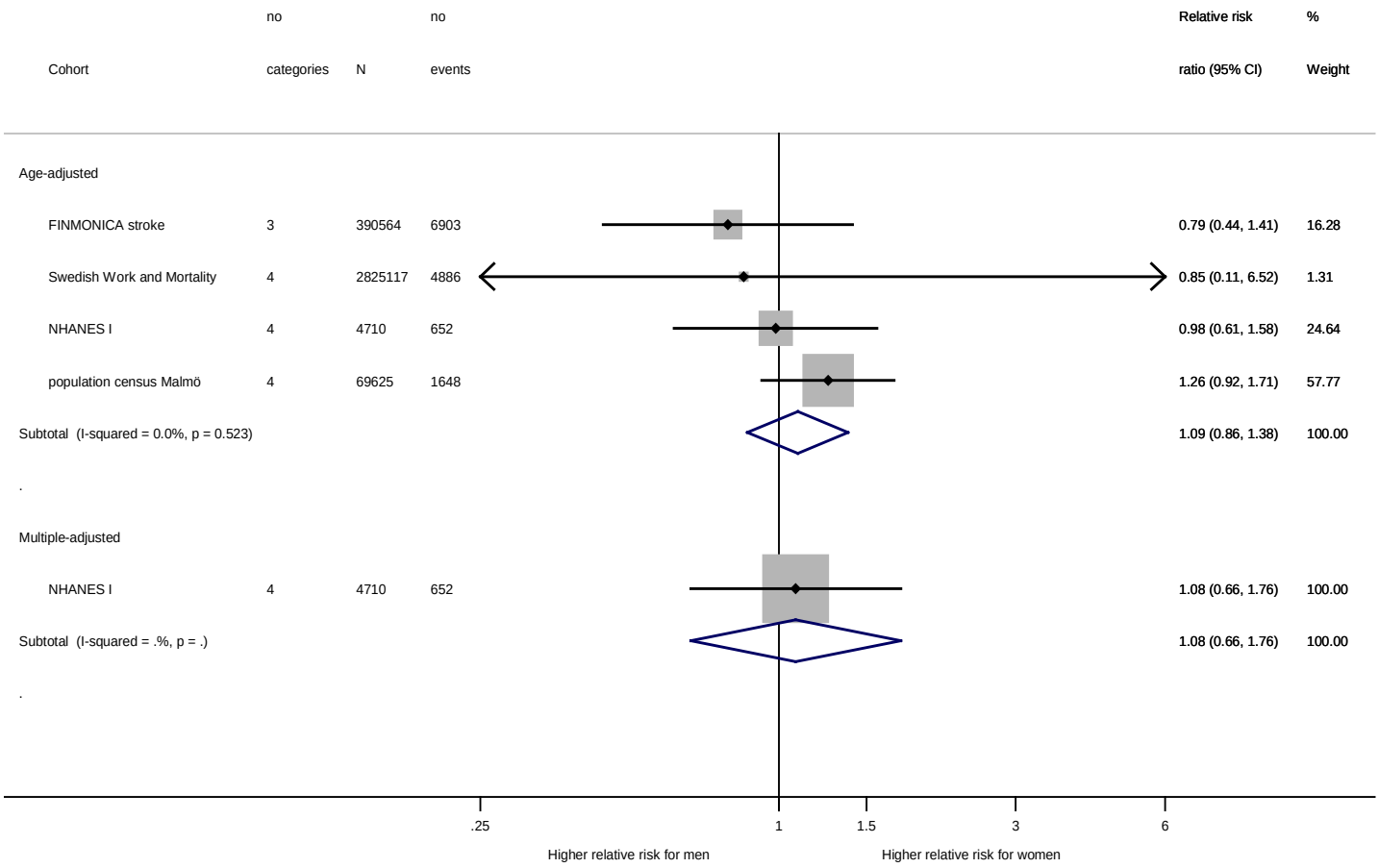
Appendix figure 5



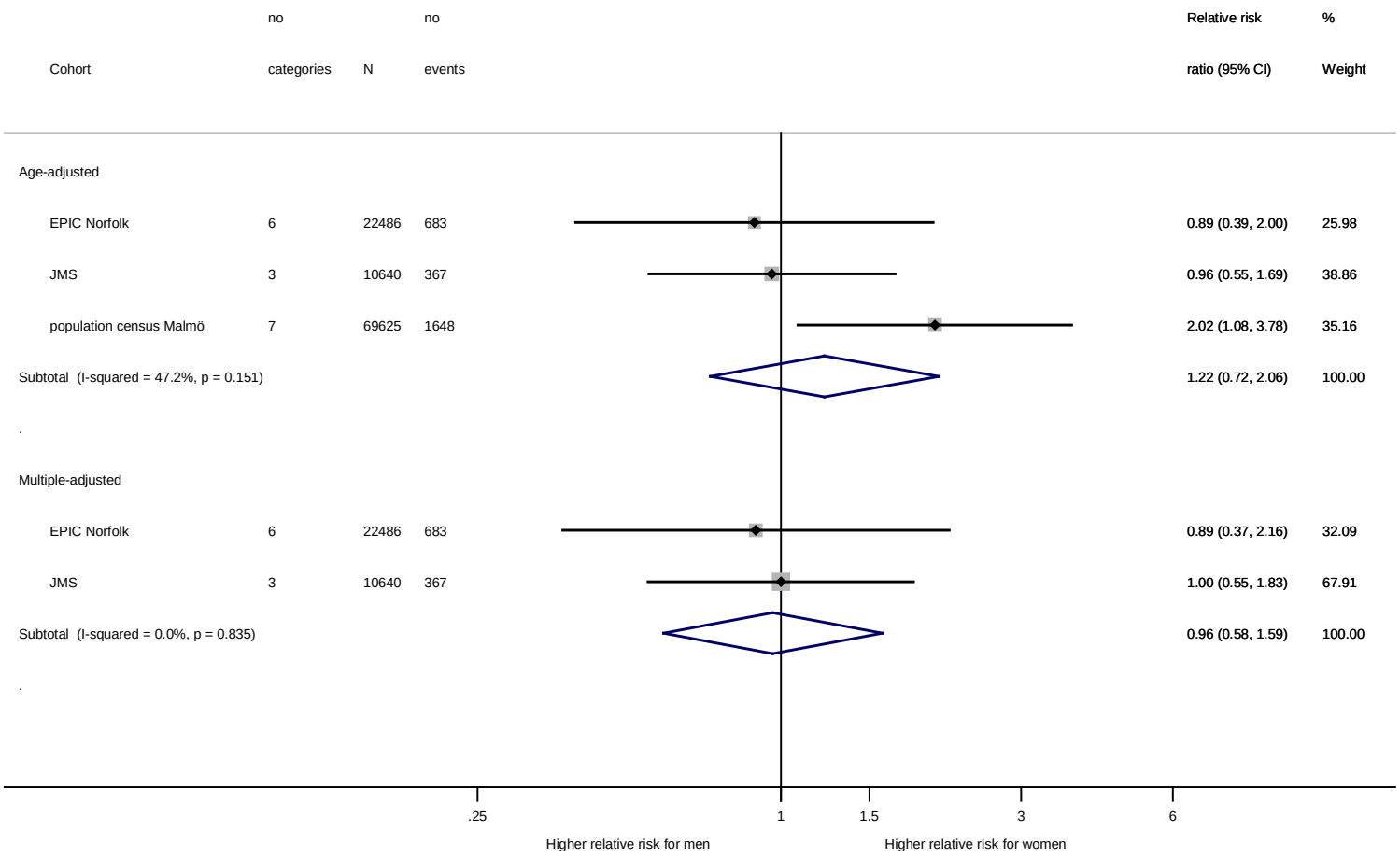
Appendix figure 6



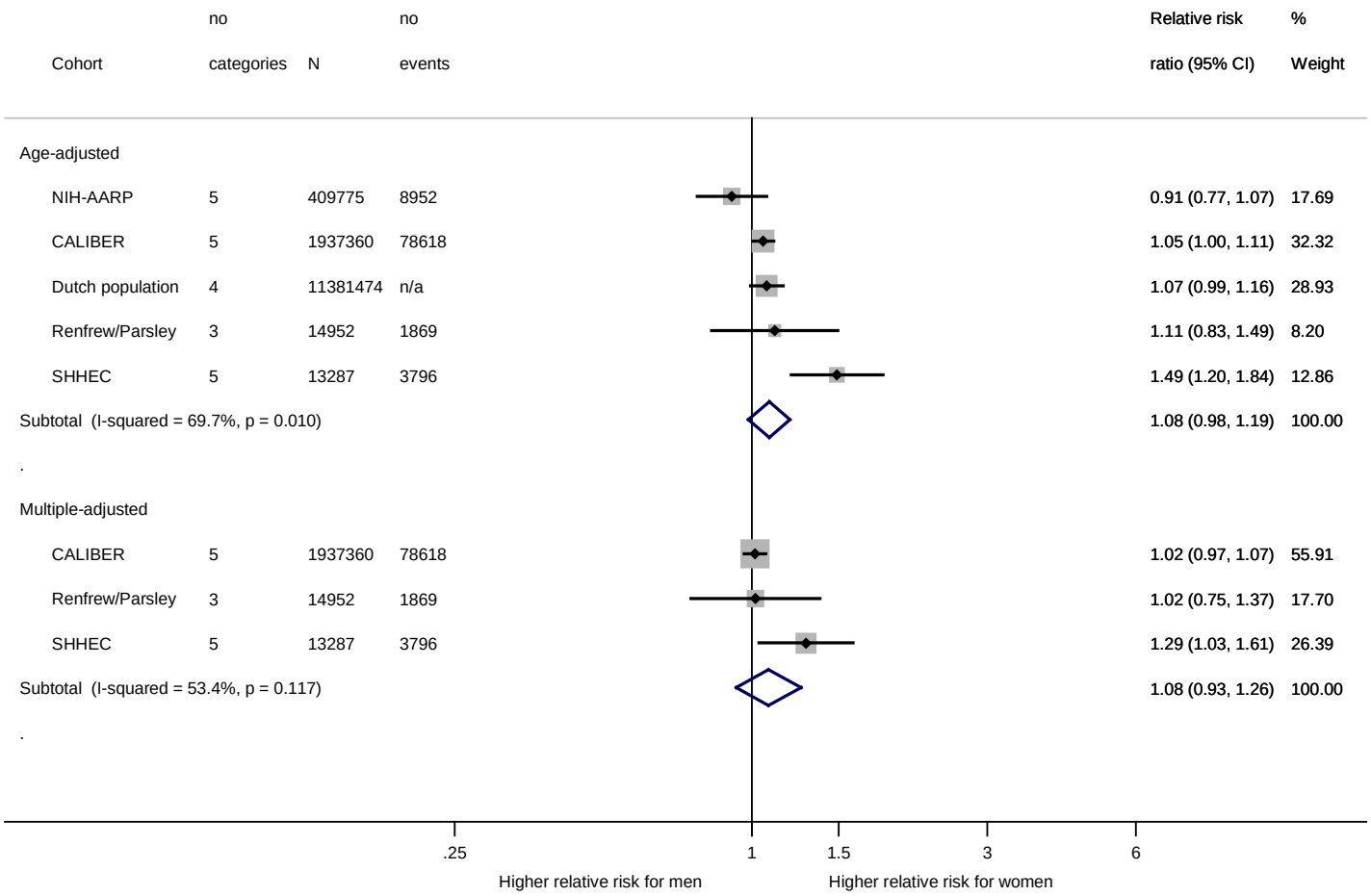
Appendix figure 7



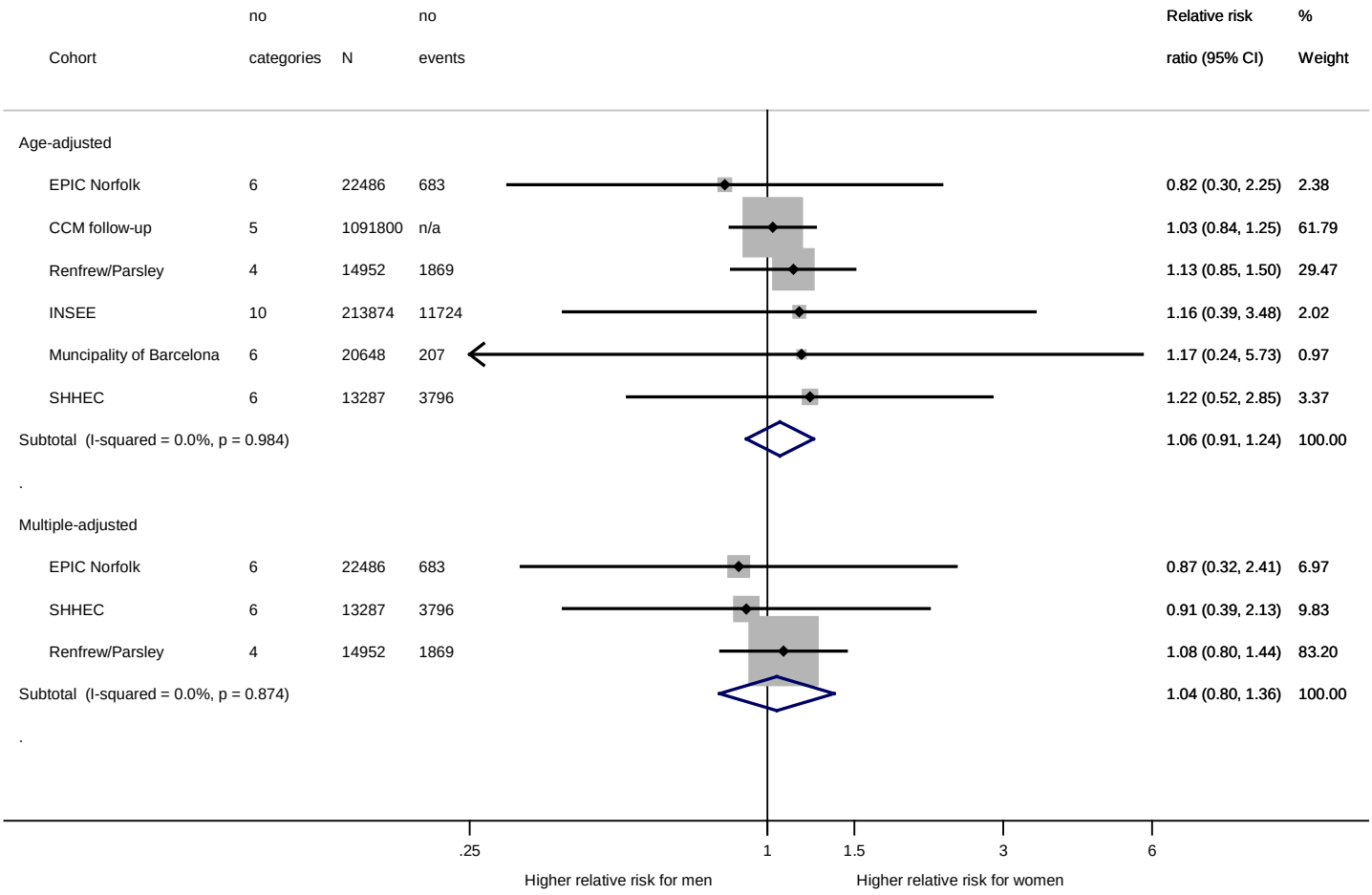
Appendix figure 8



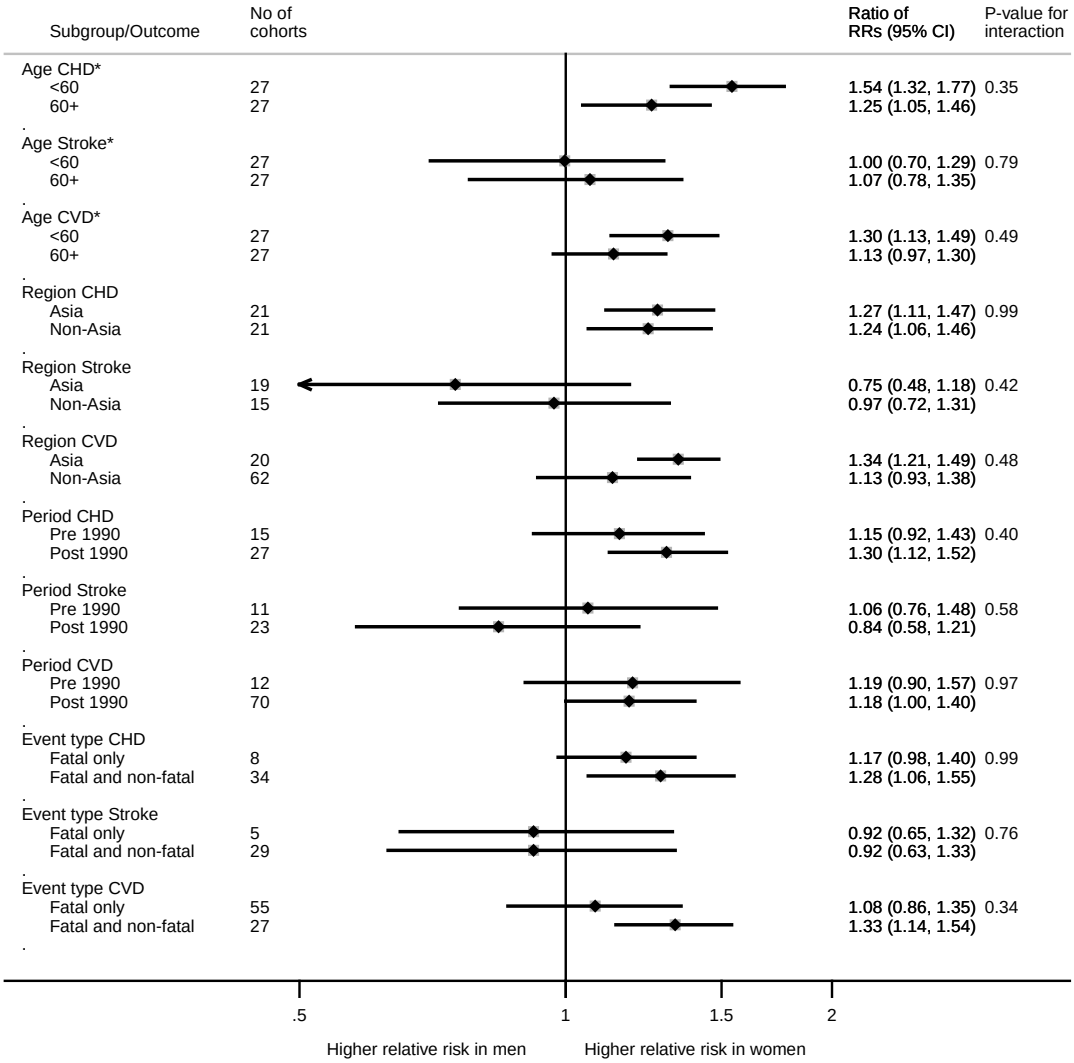
Appendix figure 9



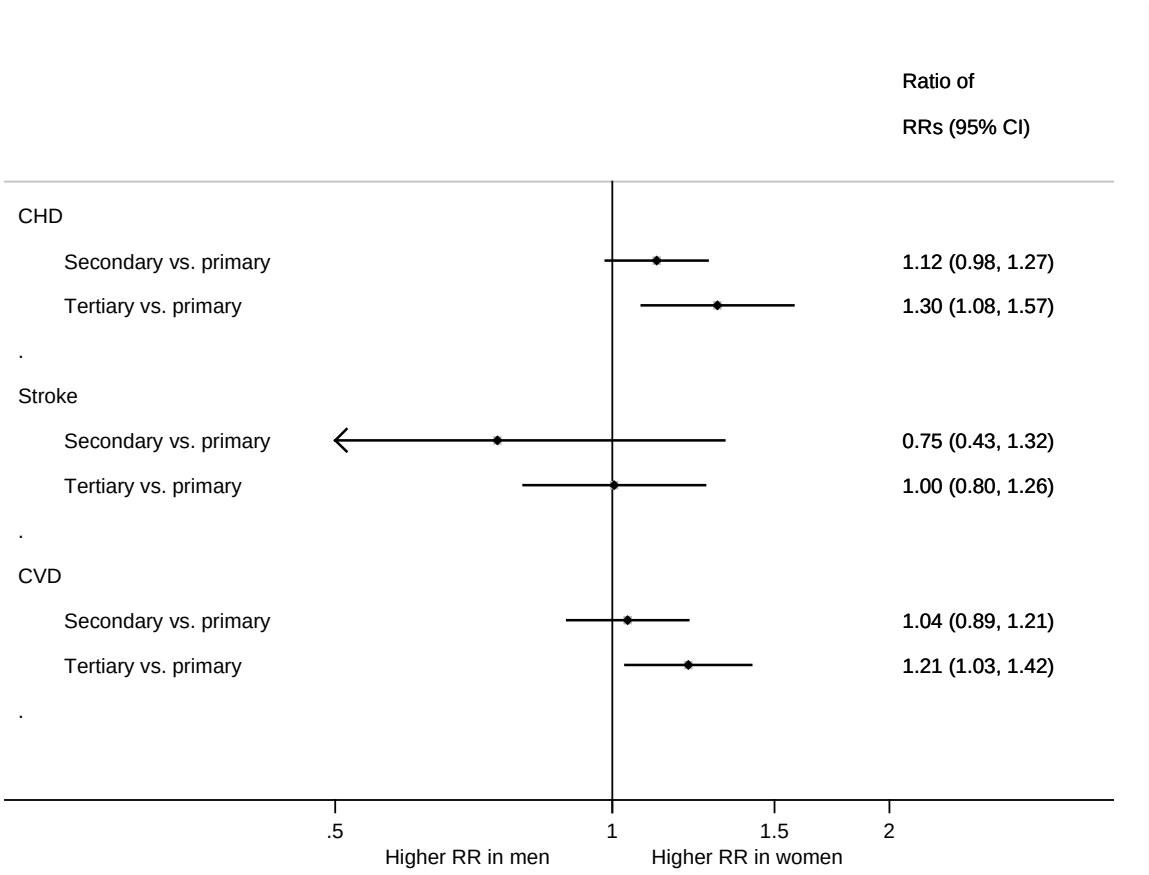
Appendix figure 10 - Age-adjusted and CVD risk factor-adjusted women-to-men ratio of relative risks of cardiovascular disease, white collar compared to blue collar (or manual) occupation.



Appendix Figure 11



Appendix figure 12



Appendix references

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