Table A: Outcome and exposure details

Study	Data source for outcomes	Outcome	Outcome definition	Shift work type	Shift work description	Downs & Black score
Akerstedt et al, 2004	Swedish Cause-of-Death register	all cause mortality	total mortality regardless of cause (Chapter XVII [N800–959], according to the 8th and 9th revisions of the ICD	mixed	"shift work included three-shift work, night work, evening work, roster work, and 'other forms'"	55%
Alfredsson et al, 1985	Swedish hospitalization register	MI	hospitalization for acute MI (ICD 410.00, 410.99)	irregular	"other than daytime" from appendix	66%
Allesoe et al, 2011	Danish National Patient Registry	coronary events	first ever hospitalization for IHD, including first ever MI, other acute or chronic IHD, angina or ECG-diagnosed heart disease (ICD-8 410-414, ICD-10 I20-25)	rotating, night and evening	"rotating, night and evening"	71%
Babisch et al, 2005	hospital discharge records	MI	confirmed diagnosis of acute MI or survivors of sudden cardiac arrest (ICD-9 410) following the WHO definition including ischemic ECG changes, clinical symptoms and enzymatic changes	unspecified	not explicitly defined	59%
Biggi et al, 2008	periodic medical examinations by an occupational health physician	coronary events	incident diagnosis of coronary artery disease	night	"night work is done from 23:35 to 05:35 h, Monday to Saturday"	41%

Boggild et al, 1999	National Health Service register and Danish Institute of Clinical Epidemiology register	coronary events, all cause mortality	hospital admission for acute MI and death certificate diagnoses (ICD-8 410-414)	mixed	“the participants were asked whether they worked irregular hours, shift work, often had night work…the working time information was dichotomized into daytime work and other working hours”	86%
Brown et al, 2009	self-report, National Death Index, next-of-kin report, medical records, death certificates	ischemic stroke	evidence of a neurologic deficit with sudden or rapid onset that persisted for >24 hours or until death, confirmed by neuroimaging in 91% of those with medical records	rotating	“at least 3 nights/month in addition to days and evenings in that month”	62%
Ellingsen et al, 2007	company medical records	coronary events	incident cases of coronary artery disease or MI	rotating	“shift workers were defined as those who worked eight hour rotating shift cycles, starting with 2 morning shifts, followed by 2 afternoon shifts and 2 night shifts”	41%
Falger and Schouten, 1992	hospital records	MI	definite first acute MI based on clinical history, standard ECG readings and maximum plasma enzyme levels	unspecified	not explicitly defined	52%
Fujino et al, 2006	administrative data held at regional research centers	total and cause-specific mortality	cardiovascular death (ICD-10 I00-I99), coronary death (I20-I25), cerebrovascular death (I60-I69)	rotating and night	“during your working life, until the present, what shift did you work most; mainly day time, mainly night (i.e. fixed-night shift), or alternative night and daytime (rotating-shift work)?”	66%

Fukuoka et al, 2005	hospital records	MI	elevated cardiac enzyme levels and a history of ischemic symptoms, relevant ECG changes or coronary artery intervention	night	“sociodemographic factors included…presence/absence of night shift work”	48%
Haupt et al, 2008	patient interview	MI	self-reported physician diagnosis of MI	mixed	“have you ever worked in shift and night work?”	66%
Hermansson et al, 2007	reports from hospitals and general practitioners, hospital discharge registers and death certificates	ischemic stroke	WHO MONICA criteria	mixed	“the shift work variable was based on the responses to two questions from the population surveys, since the question regarding workhours was not consistent in all the surveys. One question was from VIP study [“Do you have shift work or weekend-work?], and the other question came from the MONICA study [“what are your normal work hours? Regular workhours (a), shift work (b), variable hours (c) am not employed (d)”]	66%

Hublin et al, 2010	administrative databases held at the Population Register Centre of Finland, Statistics Finland, the Finnish Social Insurance Institution and the Finnish Centre for Pensions	coronary death, cardiovascular events	for coronary death: underlying cause of ICD-10 I20-I24 and ICD-8/9 410-414; for cardiovascular events, disability retirement due to cardiovascular disease (ICD-10 I00-I99 and ICD-8/9 390-459)	unspecified and night	“Is your present work or the work you last were doing: (1) mainly daytime work, (2) mainly nighttime work, (3) mainly shift-work or (4) I have never been working?”	75%
Karlsson et al, 2005	National Cause of Death Register (Sweden)	total and cause-specific mortality	death certificate diagnosis in the primary or contributory cause-of-death fields, based on five consecutive revisions of the ICD (6th-10th)	rotating	“a typical rotating three-shift schedule has traditionally been used to meet production needs” “a fourth shift was introduced to increase production” “a fifth shift was introduced to comply with legislation and to improve work conditions and to increase production”	69%

Kawachi et al, 1995	questionnaires, medical records, interviews, patient letters, National Death Index, reports from next-of-kin and postal authorities	coronary events, MI, total, cardiovascular and coronary mortality	MI was defined according to WHO criteria; coronary death was defined as fatal MI or CHD recorded on the death certificate as the underlying and most probable cause with previous evidence of CHD (externally corroborated); coronary events was nonfatal MI or fatal CHD; cardiovascular mortality was death from CHD or cerebrovascular disease	rotating	all participants were asked, "what is the total number of years you worked rotating night shifts (at least 3 nights/month in addition to days or evenings in that month)?"	79%
Knutsson et al, 1986	death certificates, occupational health unit records, county hospital records, family members, autopsy reports	coronary events	WHO criteria for MI and/or angina defined by typical symptomatology (supported by positive ECG-exercise testing)	rotating	"the shift workers worked a three-shift rota and were process operators"	66%
Knutsson et al, 1999	coronary and intensive care unit reports, hospital discharge registers and death certificates	MI	typical symptoms, blood marker changes, ECG changes and/or necropsy findings	mixed and night	"a shiftworker is a person whose work schedule includes hours beyond daytime. A night workers is a person who has a work schedule that always or often includes the time between 22:00 and 06:00"	83%

Koller, 1983	history-taking on a prospective medical check-up	coronary and cardiovascular events	ischemic heart disease (ICD-9 414) and cardiovascular events (414, 440-448, 458, 401-405, 454-456) as classified by a panel of physicians	rotating	“the vast majority of shift workers were working according to a swiftly rotating continuous 4-shift system with shorter morning and afternoon shifts (7h), a longer night shift (10h) and every 4 weeks one or two especially long day shifts (14h) over the weekends”	45%
Laugsand et al, 2011	hospital records and death certificates	MI	European Society of Cardiology/American College of Cardiology consensus guidelines	mixed	“do you have shift work, night work, or standing by duties?”	67%
Liu and Tanaka, 2002	admissions data for 22 hospitals	MI	ischemic cardiac pain lasting at least 30 minutes, enzyme change and supportive electrocardiography	rotating	“shift work was defined if subjects had rotating work”	52%
McNamee et al, 1996	death certificates	coronary death	cause of death coded as IHD on the death certificate	rotating	“shift work was predominantly a three shift, one week, forward rotation system”	59%
Netterstrom et al, 1999	coronary care unit admissions from two hospitals	MI	severe chest discomfort or ECG signs of MI accompanied by increased creatinine phosphokinase to at least twice the normal upper limit	unspecified	not explicitly defined	48%
Rafnsson and Gunnarsdottir, 1990	death certificates	coronary and total death	the officially classified underlying cause of death, reclassified according to ICD-7	mixed	“shiftwork operators work indoors three shifts, day and night”	59%

Steenland and Fine, 1996	death certificates	coronary death	death due to IHD (ICD-9 410-414) while working or within 1 week of work, with no prior indication of heart disease in their records	evening and night	not defined (2nd and 3rd shifts were considered evening and night shifts, respectively)	52%
Tarumi, 1997	death certificates	total and cardiovascular mortality	cardiovascular death listed on the death certificate and defined as death due to IHD (I20-I25) or stroke (I60-I69)	unspecified	not explicitly defined	45%
Taylor and Pocock, 1972a (re-analyzed by Knutsson et al, 2004)	death certificates	coronary, cerebrovascular, cardiovascular and total mortality	cause of death was coded in ICD-7 in accord with established rules for primary mortality tabulation	rotating	"men who had completed 10 years on shift work since 1946, any interruption being for less than six months"	45%
Taylor et al, 1972b	personnel records	cardiovascular events	medically certified absence from work lasting more than three days with a final diagnosis recorded as cardiovascular disease (excluding varicose veins and hemorrhoids)	mixed	"… six main types of shift work in addition to regular day work: three-shift discontinuous, three-shift continuous (traditional), three-shift continuous (rapidly rotating), permanent nights, alternate day and night, double days"	69%
Tuchsen, 1993	national inpatient register	coronary events	first admission with a discharge diagnosis of ICD-8 410-414	unspecified, evening, and night	"individuals belonging to occupational groups, whose at least 20% of individuals report of evening work, night work or any other form of shift work"	86%

Tuchsen et al, 2006	national patient register containing all hospital discharge data, outpatient data and emergency room visits	cardiovascular and coronary events	first hospital contacts with a principal diagnosis of circulatory disease (ICD-8 390-458, ICD-10 I00-I99) or ischemic heart disease (coding unspecified)	mixed	"What kind of work schedule do you have?" (permanent day duty/two shifts/three shifts/ fluctuating according to special schedule or rotation/permanent evening duty/permanent night duty/permanent morning duty/other"	59%
Vertin, 1978	company medical records	coronary events	absenteeism statistics defined using ICD-7 (Dutch modification) codes for IHD	unspecified	not explicitly defined	34%
Virkunnen et al, 2006	hospital discharge register and register of deaths	coronary events	ICD-8/9 410-414, ICD-10 I20-I25 (fatal or non-fatal)	mixed	"shift work was recorded in the questionnaire on the following 6-point item: day work, part-time work, 2-shift work, 3-shift work, irregular work, and night work"	62%
Virtanen and Notkola, 2002	national death register (vital statistics)	cardiovascular, cerebrovascular deaths	cardiovascular (ICD-9 390-459) and cerebrovascular deaths (ICD-9 430-438)	evening and night	not defined (2^{nd} and 3^{rd} shifts were considered evening and night shifts, respectively)	46%
Yadegarfar and McNamee, 2008	death certificates	coronary death	ICD 410-414 as determined from the code given by the UK Office of National Statistics	mixed	"shift workers was defined as someone who did shift work for a period of 30 days or more in total. Variety of shift patterns: three-shift continuous, forward rotation system, three shift non-continuous, seven-day double-day shifts, and five-day-double day shifts"	66%

Abbreviations: ECG electrocardiogram, CHD, coronary heart disease, ICD, International Classification of Diseases, IHD ischemic heart disease, MONICA Monitoring of Trends and Determinants in Cardiovascular Diseases, WHO World Health Organization

Table B: Detailed search strategies

Database	Search strategy
Medline	1. exp Cardiovascular Diseases/ or exp Cerebrovascular Disorders/ or exp Cardiovascular Agents/ or exp Cardiovascular System/ or Actuarial Analysis/ or Cause of Death/ or Death Certificates/ or Death, Sudden/ or Death/ or exp Morbidity/ or Fatal Outcome/ or Hospital Mortality/ or Life Expectancy/ or Life Tables/ or Mortality/ or Vital Statistics/ 2. Blood Pressure Monitors/ or Blood Pressure/ or exp Blood Pressure Determination/ or Hypertension/ or (blood pressure$ or hypertens$ or BP or SBP or DBP or diastolic$ or systolic$ or antihypertens$ or prehypertens$).mp. 3. (((hazard$ or cox) adj2 model$) or ((systolic$ or diastolic$) adj2 (dysfunction$ or function$)) or (arterial adj2 (occlusive or obstructive)) or (diabet$ adj2 (angiopat$ or microangiopat$)) or (ventric$ adj2 (dysfunction$ or function$ or rhythm$ or tachycardia$)) or actuarial$ or aortocoronar$ or angina or arrhythmi$ or arteriosclero$ or asystole$ or cad or cardi$ or carotid$ or cerebral$ or cerebro$ or chd or chf or coronary$ or cva$1 or cvd or dead or death$ or died or dying or embol$ or fatalit$ or heart or ihd or infarct$ or isch?emi$ or kaplan meier$ or kaplan-meier$ or lethal$ or life table$ or lifetable$ or mi or morbid$ or mortalit$ or myocardi$ or stroke$1 or thrombol$ or thrombos$ or vascular$ or vasculatur$).mp. 4. or/1-3 5. ((on-call or oncall) and (duty or duties or hours or shift$1)).tw. 6. ((shift$1 or post-shift$ or postshift$ or one-shift$ or two-shift$ or three-shift$) adj5 (duty or duties)).tw. 7. ((shift$1 adj (system$1 or breaks or hour$)) or (hour$ adj shift$1)).tw. 8. (shiftwork$ or shift-work$ or night-shift$ or nightshift$ or night work$ or nightwork$ or night-work$ or off-shift$ or night-call$1).tw. 9. ((overnight or night$ or float$) adj5 (schedul$ or call or on-call or oncall)).tw. 10. ((alternating or work$ or schedule$ or rotating or backward-rotat$ or extended$ or forward-rotat$ or night$ or day-night$ or overnight$ or unconventional or roster$) adj3 (shift$1 or post-shift$ or postshift$ or one-shift$ or two-shift$ or three-shift$)).tw. 11. ((night$ adj2 (duty or duties or float$ or work$)) or (atypical adj (schedule$1 or shift$1 or hour$1)) or (hour$1 adj2 (float$ or work$))).tw. 12. ((roster$ or work or alternating or rotating or night$) adj1 schedul$).tw. 13. Night Care/ma or exp Work Schedule Tolerance/ 14. or/5-13 15. (ergonomics or occupational or industrial).jw. not ((microbiology or physiology or hygiene).jw. or Occupational Exposure/ or expos$.ti. or (torque$ or cycling$).tw.) 16. Personnel Staffing and Scheduling/ or Chemical Industry/ or exp Medical Staff/ or exp Nursing Staff/ or exp Work/ or Food Industry/ or Industry/ or Metallurgy/ or Occupational Diseases/ or Occupational Groups/ or Occupational Health/ or Occupational Medicine/ or Occupations/ or Railroads/ or Textile Industry/ or Workload/ or Workplace/ or ma.fs. 17. or/15-16 18. Chronobiology Disorders/ or Circadian Rhythm/ or "Sleep Disorders, Circadian Rhythm"/ or (shift$1 or post-shift$ or postshift$ or one-shift$ or two-shift$ or three-shift$ or circadian$).tw. 19. 17 and 18

	20. 14 or 19 21. 4 and 20 22. ((shiftwork$ or shift-work$ or night-shift$ or nightshift$ or night work$ or nightwork$ or night-work$ or off-shift$ or night-call$1).ti. or (*Night Care/ma or exp *Work Schedule Tolerance/)) and health.ti. 23. or/21-22 24. 23 not ((animals/ or in vitro/) not (humans/ or exp persons/)) 25. limit 24 to "all child (0 to 18 years)" 26. limit 24 to "all adult (19 plus years)" 27. 25 not 26 28. 24 not 27 29. limit 28 to english language
EMBASE	1. exp cardiovascular disease/ or exp cardiovascular agent/ or exp cerebrovascular disease/ or cardiovascular risk/ or exp blood pressure/ or coronary risk/ or exp cardiovascular system/ or exp cardiovascular system examination/ or exp cardiovascular parameters/ or exp cardiovascular function/ or exp death/ or death certificate/ or morbidity/ or mortality/ or life table/ or vital statistics/ or "cardiovascular diseases and cardiovascular surgery".ec. 2. exp blood pressure/ or (blood pressure$ or hypertens$ or BP or SBP or DBP or diastolic$ or systolic$ or antihypertens$ or prehypertens$).mp. 3. (((hazard$ or cox) adj2 model$) or ((systolic$ or diastolic$) adj2 (dysfunction$ or function$)) or (arterial adj2 (occlusive or obstructive)) or (diabet$ adj2 (angiopat$ or microangiopat$)) or (ventric$ adj2 (dysfunction$ or function$ or rhythm$ or tachycardia$)) or actuarial$ or aortocoronar$ or angina or arrhythmi$ or arteriosclero$ or asystole$ or cad or cardi$ or carotid$ or cerebral$ or cerebro$ or chd or chf or coronary$ or cva$1 or cvd or dead or death$ or died or dying or embol$ or fatalit$ or heart or ihd or infarct$ or isch?emi$ or kaplan meier$ or kaplan-meier$ or lethal$ or life table$ or lifetable$ or mi or morbid$ or mortalit$ or myocardi$ or stroke$1 or thrombol$ or thrombos$ or vascular$ or vasculatur$).mp. 4. or/1-3 5. ((on-call or oncall) and (duty or duties or hours or shift$1)).tw. 6. ((shift$1 or post-shift$ or postshift$ or one-shift$ or two-shift$ or three-shift$) adj5 (duty or duties)).tw. 7. ((shift$1 adj (system$1 or breaks or hour$)) or (hour$ adj shift$1)).tw. 8. (shiftwork$ or shift-work$ or night-shift$ or nightshift$ or night work$ or nightwork$ or night-work$ or off-shift$ or night-call$1).tw. 9. ((overnight or night$ or float$) adj5 (schedul$ or call or on-call or oncall)).tw. 10. ((alternating or work$ or schedule$ or rotating or backward-rotat$ or extended$ or forward-rotat$ or night$ or day-night$ or overnight$ or unconventional or roster$) adj3 (shift$1 or post-shift$ or postshift$ or one-shift$ or two-shift$ or three-shift$)).tw. 11. ((night$ adj2 (duty or duties or float$ or work$)) or (atypical adj (schedule$1 or shift$1 or hour$1)) or (hour$1 adj2 (float$ or work$))).tw. 12. (night and work$).hw. 13. ((roster$ or work or alternating or rotating or night$) adj1 schedul$).tw.

	14. work schedule/ or shift worker/ or night work/ 15. or/5-14 16. (ergonomics or occupational or industrial).jw. not ((microbiology or physiology or hygiene).jw. or occupational exposure/ or expos$.ti. or (torque$ or cycling$).tw.) 17. occupational health and industrial medicine.ec. or occupational health/ or working time/ or occupational disease/ or personnel management/ or blue collar worker/ or industrial worker/ or worker/ 18. or/16-17 19. sleep disorder/ or sleep deprivation/ or circadian rhythm/ or "circadian rhythm sleep disorder"/ or (shift$1 or post-shift$ or postshift$ or one-shift$ or two-shift$ or three-shift$).tw. or circadian$.mp. 20. 18 and 19 21. ((shiftwork$ or shift-work$ or night-shift$ or nightshift$ or night work$ or nightwork$ or night-work$ or off-shift$ or night-call$1).ti. or (*work schedule/ or shift worker/ or *night work/)) and health.ti. 22. 15 or 20 23. 4 and 22 24. 21 or 23 25. 24 not ((exp "miscellaneous groups of organisms"/ or exp "in vitro study"/) not (human/ or exp "miscellaneous named groups"/)) 26. limit 25 to english language
SCOPUS	1. blood-pressure* or hypertens* or BP or SBP or DBP or diastolic* or systolic* or antihypertens* or prehypertens* 2. (arterial AND (occlusive or obstructive)) or (diabet* AND (angiopat* or microangiopat*)) or (ventric* AND (dysfunction* or function* or rhythm* or tachycardia*)) 3. aortocoronar* or angina or arrhythmi* or arteriosclero* or asystole* or cardi* or carotid* or cerebr* or coronar* or cva* or cvd or embol* or heart* or infarct* or ischaemi* or ischemi* or morbid* or mortalit* or myocardi* or stroke* or thrombo* or vascul* 4. OR/1-3 5. ((on-call or oncall) and (duty or duties or hours or shift*)) 6. ((shift* or post-shift* or postshift* or one-shift* or two-shift* or three-shift*) AND (duty or duties)) 7. "shift* system*" OR "shift* breaks" OR shift-hour* OR "hour* shift*" OR shift-system* 8. shiftwork* or shift-work* or night-shift* or nightshift* or "night work*" or nightwork* or night-work* or night-call* 9. ((overnight or night* or float*) AND (schedul* or call or on-call or oncall)) 10. ((worker* or rotating or night* or day-night* or overnight* or roster*) AND (shift* or post-shift* or postshift* or one-shift* or two-shift* or three-shift*)) 11. night-duty OR night-duties OR night-float* 12. work-schedul* OR alternating-schedul* OR rotating-schedul* OR night-schedul* 13. OR/5-12 14. ((shiftwork* or shift-work* or night-shift* or nightshift* or night work* or nightwork* or night-work* or night-call*) AND (death* OR health* OR metabolic*))

	15. ((OR/1-3) AND (OR/5-12)) OR 14 LIMITS LANGUAGES = (ENGLISH)
Science Citation Index Expanded	1. blood-pressure* or hypertens* or BP or SBP or DBP or diastolic* or systolic* or antihypertens* or prehypertens* 2. (arterial AND (occlusive or obstructive)) or (diabet* AND (angiopat* or microangiopat*)) or (ventric* AND (dysfunction* or function* or rhythm* or tachycardia*)) 3. aortocoronar* or angina or arrhythmi* or arteriosclero* or asystole* or cardi* or carotid* or cerebr* or coronar* or cva* or cvd or embol* or heart* or infarct* or ischaemi* or ischemi* or morbid* or mortalit* or myocardi* or stroke* or thrombo* or vascul* 4. OR/1-3 5. ((on-call or oncall) and (duty or duties or hours or shift*)) 6. ((shift* or post-shift* or postshift* or one-shift* or two-shift* or three-shift*) AND (duty or duties)) 7. "shift* system*" OR "shift* breaks" OR shift-hour* OR "hour* shift*" OR shift-system* 8. shiftwork* or shift-work* or night-shift* or nightshift* or "night work*" or nightwork* or night-work* or night-call* 9. ((overnight or night* or float*) AND (schedul* or call or on-call or oncall)) 10. ((worker* or rotating or night* or day-night* or overnight* or roster*) AND (shift* or post-shift* or postshift* or one-shift* or two-shift* or three-shift*)) 11. night-duty OR night-duties OR night-float* 12. work-schedul* OR alternating-schedul* OR rotating-schedul* OR night-schedul* 13. OR/5-12 14. ((shiftwork* or shift-work* or night-shift* or nightshift* or night work* or nightwork* or night-work* or night-call*) AND (death* OR health* OR metabolic*)) 15. ((OR/1-3) AND (OR/5-12)) OR 14 Refined by: Languages=(ENGLISH) AND [excluding] Subject Areas=(EVOLUTIONARY BIOLOGY OR GEOGRAPHY, PHYSICAL OR ORNITHOLOGY OR ORTHOPEDICS OR ZOOLOGY OR TROPICAL MEDICINE OR MARINE & FRESHWATER BIOLOGY OR VETERINARY SCIENCES OR FISHERIES OR FORESTRY OR MATERIALS SCIENCE, COATINGS & FILMS OR OPHTHALMOLOGY OR BIODIVERSITY CONSERVATION OR OCEANOGRAPHY OR CONSTRUCTION & BUILDING TECHNOLOGY OR OPTICS OR PARASITOLOGY OR ENTOMOLOGY OR PHYSICS, FLUIDS & PLASMAS OR METEOROLOGY & ATMOSPHERIC SCIENCES OR PLANT SCIENCES)
Conference Proceedings Citation Index-Science	1. blood-pressure* or hypertens* or BP or SBP or DBP or diastolic* or systolic* or antihypertens* or prehypertens* 2. (arterial AND (occlusive or obstructive)) or (diabet* AND (angiopat* or microangiopat*)) or (ventric* AND (dysfunction* or function* or rhythm* or tachycardia*)) 3. aortocoronar* or angina or arrhythmi* or arteriosclero* or asystole* or cardi* or carotid* or cerebr* or coronar* or cva* or cvd or embol* or heart* or infarct* or ischaemi* or ischemi* or morbid* or mortalit* or myocardi* or stroke* or thrombo* or vascul* 4. OR/1-3 5. ((on-call or oncall) and (duty or duties or hours or shift*)) 6. ((shift* or post-shift* or postshift* or one-shift* or two-shift* or three-shift*) AND (duty or duties))

	7. "shift* system*" OR "shift* breaks" OR shift-hour* OR "hour* shift*" OR shift-system* 8. shiftwork* or shift-work* or night-shift* or nightshift* or "night work*" or nightwork* or night-work* or night-call* 9. ((overnight or night* or float*) AND (schedul* or call or on-call or oncall)) 10. ((worker* or rotating or night* or day-night* or overnight* or roster*) AND (shift* or post-shift* or postshift* or one-shift* or two-shift* or three-shift*)) 11. night-duty OR night-duties OR night-float* 12. work-schedul* OR alternating-schedul* OR rotating-schedul* OR night-schedul* 13. OR/5-12 14. ((shiftwork* or shift-work* or night-shift* or nightshift* or night work* or nightwork* or night-work* or night-call*) AND (death* OR health* OR metabolic*)) 15. ((OR/1-3) AND (OR/5-12)) OR 14 Refined by: Languages=(ENGLISH) AND [excluding] Subject Areas=(EVOLUTIONARY BIOLOGY OR GEOGRAPHY, PHYSICAL OR ORNITHOLOGY OR ORTHOPEDICS OR ZOOLOGY OR TROPICAL MEDICINE OR MARINE & FRESHWATER BIOLOGY OR VETERINARY SCIENCES OR FISHERIES OR FORESTRY OR MATERIALS SCIENCE, COATINGS & FILMS OR OPHTHALMOLOGY OR BIODIVERSITY CONSERVATION OR OCEANOGRAPHY OR CONSTRUCTION & BUILDING TECHNOLOGY OR OPTICS OR PARASITOLOGY OR ENTOMOLOGY OR PHYSICS, FLUIDS & PLASMAS OR METEOROLOGY & ATMOSPHERIC SCIENCES OR PLANT SCIENCES)
BIOSIS previews	1. blood-pressure* or hypertens* or BP or SBP or DBP or diastolic* or systolic* or antihypertens* or prehypertens* 2. (arterial AND (occlusive or obstructive)) or (diabet* AND (angiopat* or microangiopat*)) or (ventric* AND (dysfunction* or function* or rhythm* or tachycardia*)) 3. aortocoronar* or angina or arrhythmi* or arteriosclero* or asystole* or cardi* or carotid* or cerebr* or coronar* or cva* or cvd or embol* or heart* or infarct* or ischaemi* or ischemi* or morbid* or mortalit* or myocardi* or stroke* or thrombo* or vascul* 4. OR/1-3 5. ((on-call or oncall) and (duty or duties or hours or shift*)) 6. ((shift* or post-shift* or postshift* or one-shift* or two-shift* or three-shift*) AND (duty or duties)) 7. "shift* system*" OR "shift* breaks" OR shift-hour* OR "hour* shift*" OR shift-system* 8. shiftwork* or shift-work* or night-shift* or nightshift* or "night work*" or nightwork* or night-work* or night-call* 9. ((overnight or night* or float*) AND (schedul* or call or on-call or oncall)) 10. ((worker* or rotating or night* or day-night* or overnight* or roster*) AND (shift* or post-shift* or postshift* or one-shift* or two-shift* or three-shift*)) 11. night-duty OR night-duties OR night-float* 12. work-schedul* OR alternating-schedul* OR rotating-schedul* OR night-schedul* 13. OR/5-12 14. ((shiftwork* or shift-work* or night-shift* or nightshift* or night work* or nightwork* or night-work* or night-call*) AND (death* OR health* OR metabolic*)) 15. ((OR/1-3) AND (OR/5-12)) OR 14

	Refined by: Languages=(ENGLISH) AND [excluding] Major Concepts=(BIOGEOGRAPHY OR PEST ASSESSMENT CONTROL AND MANAGEMENT OR CELL BIOLOGY OR PARASITOLOGY OR PESTICIDES OR MORPHOLOGY OR MEMBRANES OR ESTUARINE ECOLOGY OR SOIL SCIENCE OR BIODIVERSITY OR EVOLUTION AND ADAPTATION OR WILDLIFE MANAGEMENT OR FRESHWATER ECOLOGY OR FORESTRY OR MARINE ECOLOGY OR ANIMAL HUSBANDRY OR ANTHROPOLOGY)
Google Scholar	"shift work" AND (coronary OR cardiovascular OR myocardial OR ischemic OR infarction OR infarct OR stroke OR cerebrovascular OR ischemia OR vascular OR angina OR mortality OR morbidity OR death OR dead OR chd OR cad OR ihd) “shiftwork” AND (coronary OR cardiovascular OR myocardial OR ischemic OR infarction OR infarct OR stroke OR cerebrovascular OR ischemia OR vascular OR angina OR mortality OR morbidity OR death OR dead OR chd OR cad OR ihd) “rotating work” AND (coronary OR cardiovascular OR myocardial OR ischemic OR infarction OR infarct OR stroke OR cerebrovascular OR ischemia OR vascular OR angina OR mortality OR morbidity OR death OR dead OR chd OR cad OR ihd) “night work” AND (coronary OR cardiovascular OR myocardial OR ischemic OR infarction OR infarct OR stroke OR cerebrovascular OR ischemia OR vascular OR angina OR mortality OR morbidity OR death OR dead OR chd OR cad OR ihd) “evening work” AND (coronary OR cardiovascular OR myocardial OR ischemic OR infarction OR infarct OR stroke OR cerebrovascular OR ischemia OR vascular OR angina OR mortality OR morbidity OR death OR dead OR chd OR cad OR ihd)

Table C. Event counts in exposure (shift work) and comparison groups

Study, year	Outcome	Exposure group		Comparison group	
		events	subjects	events	subjects
Akerstedt et al, 2004	all cause mortality	127	3436	737	18975
Alfredsson et al., 1985	myocardial infarction	NR	NR	NR	NR
Allesoe et al., 2011	coronary events	NR	NR	NR	NR
Babisch et al., 2005	myocardial infarction	464	952	1417	3163
Biggi et al., 2008	coronary events	8	311	2	157
Boggild et al., 1999	coronary events	208	1123	798	4084
	all cause mortality	355	1123	1324	4084
Brown et al., 2009	ischemic stroke	1038	47664	622	32444
Ellingsen et al., 2007	coronary events	27	648	40	1914
	cardiovascular events	87	648	136	1914
Falger and Schouten, 1992	myocardial infarction	99	194	34	72
Fujino et al., 2006	coronary death	18	2011	63	14774
	cerebrovascular death	16	2011	109	14774
	cardiovascular death	48	2011	235	14774
	all cause mortality	144	2011	1138	14774
Fukuoka et al., 2005	myocardial infarction	6	10	41	84
Haupt et al., 2008	myocardial infarction	55	698	85	1812
Hermanson et al., 2007	ischemic stroke	44	138	150	469
Hublin et al., 2010	coronary death	NR	NR	NR	NR
	cardiovascular events	NR	NR	NR	NR
Karlsson et al., 2005	coronary death	287	2354	375	3088
	cerebrovascular death	35	2354	34	3088

Study, year	Outcome	Exposure group		Comparison group	
		events	subjects	events	subjects
	all cause mortality	760	2354	1090	3088
Kawachi et al., 1995	myocardial infarction	170	46956	78	32153
	coronary events	199	46956	93	32153
	coronary mortality	29	46956	15	32153
	cardiovascular death	NR	NR	NR	NR
	all cause mortality	NR	NR	NR	NR
Knutsson et al., 1986	coronary events	34	373	9	110
Knutsson et al., 1999	myocardial infarction	349	658	1657	3990
Koller, 1983	coronary events	7	199	0	68
	cardiovascular events	38	199	5	68
Liu and Tanaka, 2002	myocardial infarction	29	74	231	631
Laugsand et al., 2011	myocardial infarction	NR	NR	NR	NR
McNamee et al., 1996	coronary death	305	631	162	303
Netterstrom et al., 1999	myocardial infarction	12	37	64	215
Rafnsson and Gunnarsdottir, 1990	myocardial infarction	NA	NA	NA	NA
Steenland and Fine, 1996	coronary death	38	210	117	679
Tarumi, 1997	cardiovascular death	NR	NR	NR	NR
	all cause mortality	NR	NR	NR	NA
Taylor and Pocock, 1972	coronary death	NA	NA	NA	NA
	cerebrovascular death	NA	NA	NA	NA
	cardiovascular death	NA	NA	NA	NA
	all cause mortality	722	4188	736	3860

Study, year	Outcome	Exposure group		Comparison group	
		events	subjects	events	subjects
Taylor et al., 1972	cardiovascular events	12	774	18	774
Tuchsen, 1993	cardiovascular events	NA	NA	NA	NA
Tuchsen et al., 2006	cardiovascular events	113	927	449	4528
	coronary events	29	927	NR	NR
Vertin, 1978	coronary events	2	100	2	100
Virkunnen et al., 2006	cardiovascular	148	664	196	1140
Virtanen and Notkola, 2002	cerebrovascular death	NA	NA	NA	NA
Yadegarfar and McNamee, 2008	coronary death	354	694	281	576

Abbreviations: NR Not reported, NA Not applicable (because these studies used the event rate in general population to calculate standardized estimates)
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Table D. Meta-regression for all coronary events and subgroup analyses by shift schedule

Covariate	Estimated β coefficient (95% CI)	*P* value	r^2
study design (cohort vs. case-control)	-0.14 (-0.34 to 0.07)	0.19	0.032
study region (Europe vs. other)	0.17 (-0.09 to 0.44)	0.19	0.032
accrual start (per decade from 1940)	0.04 (-0.01 to 0.09)	0.11	0.029
maximum follow-up (per decade)	0.00 (-0.08 to 0.07)	0.95	0.044
sample size (per 1000 subjects)	0.00 (0.00 to 0.01)	0.44	0.018
% shift workers (of total sample)	-0.11 (-0.65 to 0.43)	0.70	0.031
mean age (per 10 years)	-0.01 (-0.12 to 0.11)	0.92	0.038
% male (of total sample)	0.02 (-0.25 to 0.28)	0.90	0.035
% blue-collar (of total sample)	-0.02 (-0.28 to 0.24)	0.88	0.012
rotating shift work	-0.06 (-0.25 to 0.14)	0.57	0.031
event type (MI vs. other coronary event)	0.05 (-0.15 to 0.25)	0.63	0.033
data source for outcomes (primary vs. administrative data)	-0.17 (-0.37 to 0.02)	0.08	0.032
sample risk (events per 100-person-years)	-0.12 (-0.40 to 0.16)	0.39	0.420
control group (day workers vs. general population)	0.07 (-0.16 to 0.29)	0.54	0.032
adjustment (unadjusted vs. adjusted)	-0.50 (-1.06 to 0.06)	0.08	0.031
number of confounders adjusted for	-0.01 (-0.03 to 0.01)	0.28	0.032
SES-adjusted	-0.12 (-0.03 to 0.07)	0.21	0.031
smoking-adjusted	-0.12 (-0.31 to 0.07)	0.22	0.031
risk analysis incorporates follow-up time	0.06 (-0.14 to 0.27)	0.54	0.033
methodological quality (Downs and Black scale)	-0.60 (-1.46 to 0.26)	0.17	0.030

study power (1-β)	0.12 (-0.13 to 0.39)	0.34	0.029
duration of shift work (per decade)	0.01 (-0.12 to 0.13)	0.94	0.000
Subgroup analyses by shift schedule	**Risk ratio (95% CI)**	I^2	***P* value**
evening	1.29 (0.69 to 2.41)	94%	0.43
irregular or unspecified	1.28 (1.01 to 1.63)	92%	0.04
mixed	1.22 (1.08 to 1.38)	46%	0.001
night	1.41 (1.13 to 1.76)	36%	0.002
rotating	1.21 (1.00 to 1.46)	71%	0.0495

Abbreviations: MI, myocardial infarction; SES, socioeconomic status

Figure A. Literature search and selection

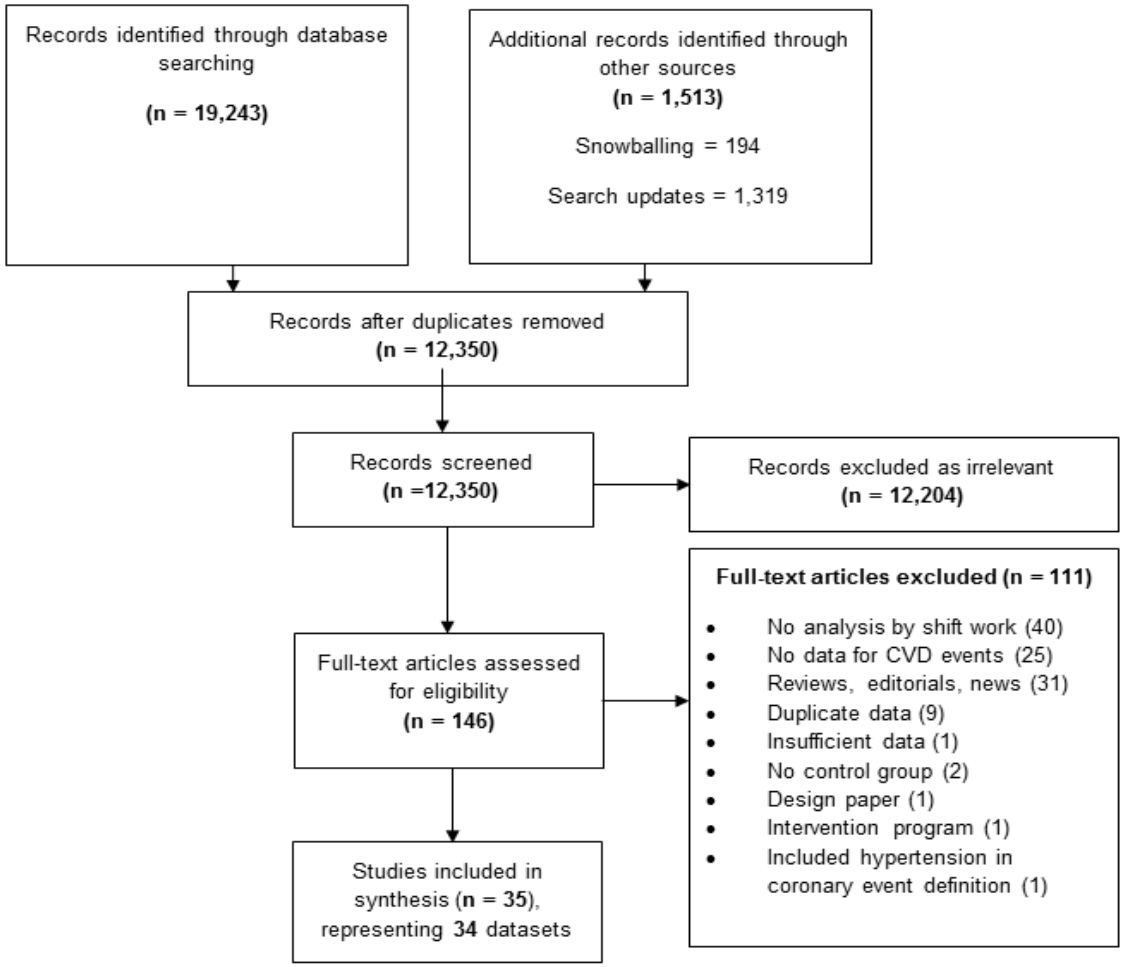
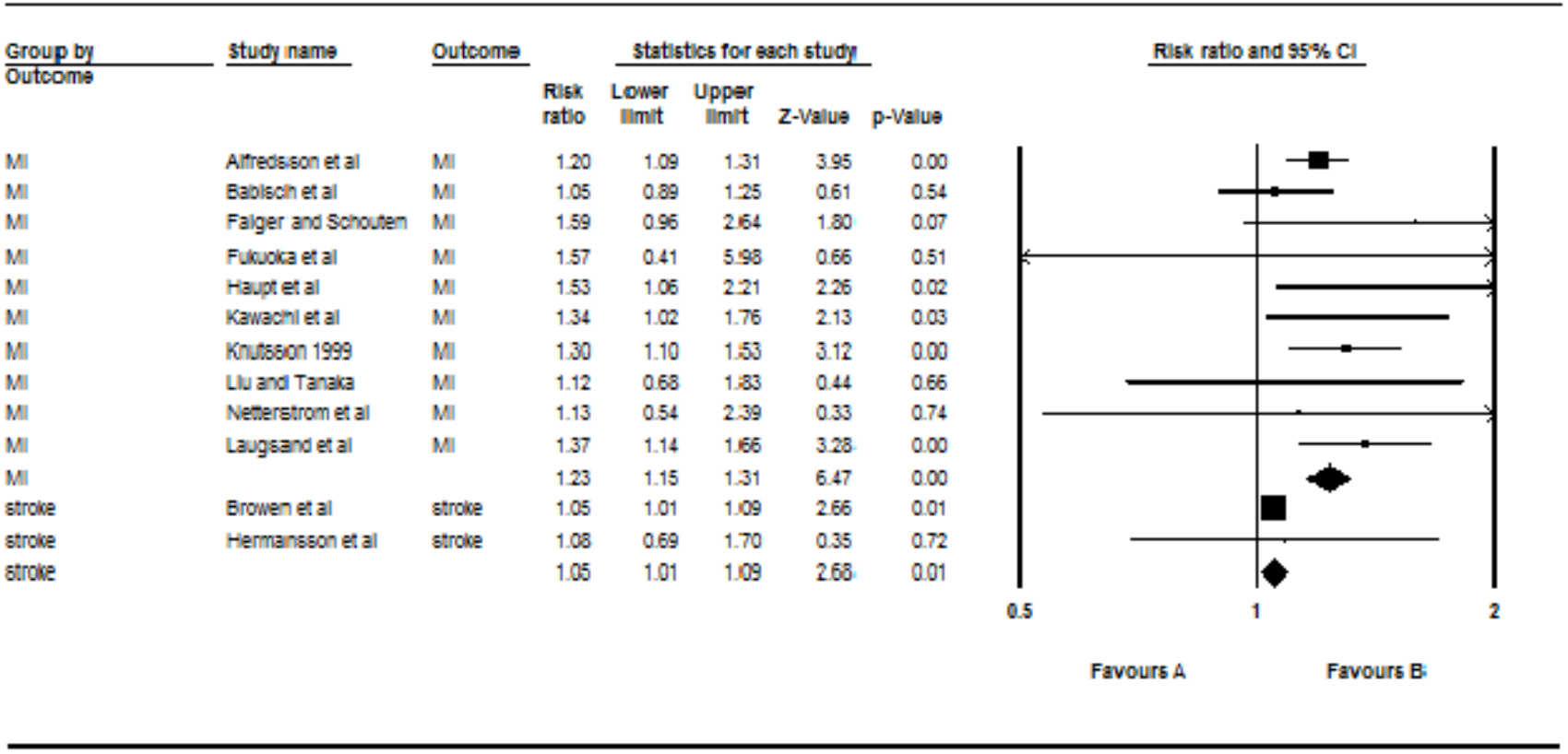


Figure B. Risk of bias in primary studies

Figure C. Meta-analysis of myocardial infarction and ischaemic stroke



Group by Outcome	Study name	Outcome	Risk ratio	Lower limit	Upper limit	Z-Value	p-Value
MI	Alfredsson et al	MI	1.20	1.09	1.31	3.95	0.00
MI	Babisch et al	MI	1.05	0.89	1.25	0.61	0.54
MI	Folger and Schouten	MI	1.59	0.96	2.64	1.80	0.07
MI	Fukuoka et al	MI	1.57	0.41	5.98	0.66	0.51
MI	Haupt et al	MI	1.53	1.06	2.21	2.26	0.02
MI	Kawachi et al	MI	1.34	1.02	1.76	2.13	0.03
MI	Knutsson 1999	MI	1.30	1.10	1.53	3.12	0.00
MI	Liu and Tanaka	MI	1.12	0.68	1.83	0.44	0.66
MI	Netterstrom et al	MI	1.13	0.54	2.39	0.33	0.74
MI	Laugsand et al	MI	1.37	1.14	1.66	3.28	0.00
MI			1.23	1.15	1.31	6.47	0.00
stroke	Brown et al	stroke	1.05	1.01	1.09	2.66	0.01
stroke	Hermansson et al	stroke	1.08	0.69	1.70	0.35	0.72
stroke			1.05	1.01	1.09	2.68	0.01

Figure D. Meta-analysis of secondary outcomes

Group by Outcome	Study name	Risk ratio	Lower limit	Upper limit	Z-Value	p-Value
CAD mortality	Fujino et al	2.32	1.37	3.94	3.12	0.00
CAD mortality	Hublin et al	1.11	0.84	1.47	0.73	0.46
CAD mortality	Karlsson et al	1.11	0.95	1.30	1.30	0.19
CAD mortality	Kawachi et al	1.19	0.63	2.24	0.54	0.59
CAD mortality	McNamee et al	0.85	0.61	1.18	-0.98	0.33
CAD mortality	Rafnsson and Gunnarsdottir	1.21	0.74	1.98	0.76	0.45
CAD mortality	Steenland et al	1.01	0.67	1.53	0.05	0.96
CAD mortality	Taylor and Pocock	1.03	0.90	1.18	0.43	0.66
CAD mortality	Yadegarfar and McNamee	1.03	0.80	1.33	0.22	0.82
CAD mortality		1.08	0.97	1.21	1.43	0.15
cerebrovascular death	Fujino et al	1.12	0.66	1.91	0.42	0.68
cerebrovascular death	Karlsson et al	1.56	0.97	2.50	1.85	0.06
cerebrovascular death	Taylor and Pocock	0.86	0.65	1.12	-1.12	0.26
cerebrovascular death	Virtanen and Notkola	1.19	1.01	1.40	2.14	0.03
cerebrovascular death		1.12	0.89	1.40	0.96	0.33
cardiovascular events	Ellingsen et al	1.89	1.47	2.44	4.91	0.00
cardiovascular events	Hublin et al	0.72	0.53	1.00	-1.96	0.05
cardiovascular events	Koller	2.73	1.12	6.64	2.22	0.03
cardiovascular events	Tayloer et al, 1972b	0.67	0.32	1.37	-1.10	0.27
cardiovascular events	Tuchsen et al, 2006	1.31	1.06	1.62	2.46	0.01
cardiovascular events		1.24	0.81	1.89	0.97	0.33
cardiovascular mortality	Fujino et al	1.59	1.16	2.18	2.88	0.00
cardiovascular mortality	Kawachi et al	1.46	0.95	2.24	1.74	0.08
cardiovascular mortality	Tarumi	2.14	0.63	7.29	1.22	0.22
cardiovascular mortality	Taylor and Pocock	1.02	0.90	1.15	0.26	0.80
cardiovascular mortality	Virtanen and Notkola	1.02	0.96	1.08	0.66	0.51
cardiovascular mortality		1.14	0.98	1.32	1.69	0.09
all cause mortality	Akerstedt et al	1.08	0.90	1.31	0.82	0.41
all cause mortality	Boggild et al	0.90	0.77	1.06	-1.30	0.19
all cause mortality	Fujino et al	0.98	0.82	1.17	-0.22	0.82
all cause mortality	Karlsson et al	1.02	0.93	1.11	0.44	0.66
all cause mortality	Kawachi et al	1.29	1.10	1.52	3.09	0.00
all cause mortality	Rafnsson and Gunnarsdottir	1.01	0.74	1.38	0.08	0.94
all cause mortality	Tarumi	0.96	0.59	1.56	-0.16	0.87
all cause mortality	Taylor and Pocock	1.03	0.93	1.14	0.57	0.57
all cause mortality		1.04	0.97	1.11	0.98	0.33