

APPENDIX A – Studies included in the meta-analysis by study design

1. Cohort studies

Authors	Year	Region	Outcome	Study years (enrolment)	Years of F/U	Study population	Reference population	Exposure data source	Exposure variable	Outcome data source	Total # subjects incl.	# Subjects excl.	Duration of employment (Years)	Age at hire	Note
Aronson KJ, et al	1994	Canada (Toronto)	SMR	1950-89	49	Toronto area firefighters	Ontario male population	FDER	Years of exposure	DC	5414	476 (10.4% of initially eligible total)	Min 0.5 Max 55 Mean 25	Min 16 Max 62 Mean 25	SMRs by years since first exposure/years of employment/age specific
Baris D, et al	2001	USA (Philadelphia)	SMR	1925-86	61	Philadelphia fire department firefighters	Internal comparison US white male population	Philadelphia FDER	Number of runs, duration of employment	VS NDI PR DC others	7789	722	Min <1 Max 48 Mean 18	Min 16 Max 63 Mean 27	lagged analysis exposure # firefighter runs 2. duration of employment 3. company type engine, ladder
Bates M, et al	2000	New Zealand	SIR SMR	1977-95	I: 21 M:18	Full-time paid firefighters	New Zealand population	United fire brigades ass.of NZ	Duration of employment	NZ health information service	4221	53 (3.2% of IET)	Min 1 Max 41 Mean 15.9	NS	Variation over time
Bates M, et al	1995	New Zealand	SIR	1980-91	11	Testicular cancer diagnosed in firefighters in Wellington	New Zealand population	CR, Interview, MR	occupation	CR	350				Testis only. Overlapping population
Beaumont J, et al	1991	USA (San Francisco)	Mortality (RR)	1940-70	30	White male firefighters of the San Francisco fire department	US white male	SF FDER PSR ER	Duration of employment Time since first employment	DC PSR municipal ERR, mortality linkage system	3066	NS	Min 3 Max 30	NS	

Demers PA, et al	1992a	USA (Seattle, Tacoma, WA)	SIR SMR	1945-89	15	Male firefighters of Washington state	1) male graduate of Seattle police academy 2) Tacoma policemen employed btw 1944-79 3) local male population	FDER	occupation	Cancer surveillance system of Fred Hutchinson Cancer research center	2447	120(4.7% of IET)	Min 1 Max 30	NS	10 year lagged analysis
Demers PA, et al	1994	USA (Seattle, Tacoma, Washington)	SIR	1974-89		Male firefighters	1) US white male 2) police officers	FDER	Duration of active duty Duration of employment	DC CR	2447	120(4.7% of IET)	Min 1 Max 30	NS	
Deschamps S, et al	1995	France (Paris)	SMR	1977-91	14	Male firefighters	French male population	FDER	Duration of active duty	DC	830	NS	Min 5 Max: NS Mena18	NS	SMRs given collectively
Donnan S, et al	1996	UK	SMR SRR	1965-93		Male firefighters	UK population	NHS CR		CR	5568				
Eliopoulos E et al	1984	Australia (Western Australia)	SMR SPMR	1939-78	39	Male firefighters in Western Australia fire brigade	Western Australia males	FDER	Duration of employment	Death certificates	990	17	Min <=1 Max 60+ Mean: NS	NS	
Feuer&Rosenman	1986	USA (New Jersey)	PMR	1974-80	6	White male firefighters	1) US population 2) New Jersey white male population 3) New Jersey white male police	FDER Police and firemen EER	Duration of employment, Employment status	VS DC	263	NS	Min 10 Max 25+ Mean: NS	NS	
Gallagher RP et al	1989	Canada	PMR	1950-84	34	Firefighters aged 20+ in BC	BC population	DC	occupation	DC	578075				PMR by age group. Adjusted risk estimate not reported
Giles G, et al	1993	Australia (Melbourne)	ISIR	1917-89	9(80-89)	Male firefighters in Melbourne, Australia	Male population in Victoria	FDER union record CR	Duration of employment, time since first employment, age-specific	CR	2865	NS	Min <=15 Max =>30 Mean: NS	NS	ascertainment at least 95%
Guidotti TL	1993	Canada (Edmonton & Calgary)	SMR	1927-87	40	Urban firefighters in Alberta	Male population in Alberta	FDER	Duration of active duty	DC	3328	135	Min <= 1 Max 40+ Mean: NS	NS	Weighting of years of service with job category - Exposure index
Hansen ES	1990	Denmark	SMR	1970	10	Employed males btw ages of 15-69 reporting occupation of 'firefighter' or 'fireman' on national census	Male civil servants and salaried employees	NC	Occupation	DC	886	NS	NS	NS	

Lewis SS, et al	1982	USA (LA)	SMR	1940-80	40	Firefighters in LA area	US white male	NS	occupation	DC	6772	80	NS	NS	Non-comparable exposure or outcome measure - any mention of cancer in DC for firefighters vs. underlying cause of death in DC for national comparison
Ma F, et al	2005	USA	SMR	1972-99	27	Florida firefighters	Florida general population	VS HCFA	occupation	VS HCFA	5496	5.5%			
Ma F, et al	2006	USA (Florida)	SIR	1981-99	18	Florida firefighters	Florida general population	VS HCFA	occupation	VS CR HCFA	36813	6.7%			Males and females analyzed separately
Mastromatteo E	1959	Canada (Toronto)	SMR	1918-53	32	Active and pensioned firemen	Ontario city men	DC	Occupation	DC	1039	High proportion lost to F/U(20%)	NS	NS	All cancers together and not by site
Morton&Mafjanovic	1984	USA	SIR	1963-77	14	Cancer pts aged 16-74	Regional general population: age up to 67 in Seattle area	CR	Occupation	HR DC	1678				Number of cases is different in Tables VII (n=6) and XIII (n=11) – In Table II 'unemployed and not in labor force' is 27% of all men but 58% of total cases
Musk AW, et al	1978	USA (Boston)	SMR	1912-72	60	Male firefighters in Boston, MA	1) white males in US, 2) all males in MA, 3) white males in MA	FDER	occupation	DC	5655	264(lost to F/U) 194(failed to locate death certificates)	Min 3 Max:NS Mean:NS	Min ≤ 20 Max ≥ 40	Did not report p values or confidence interval
Peterson GR et al	1980	USA (CA)	PMR	1959-61		White male in CA 1959-61	Regional white male population	DC	occupation	DC	560				
Tornling G, et al	1994	Sweden (Stockholm)	SIR SMR	1931-83	I: 1958-86 M:1951-86	Stockholm male firefighters	Males in Stockholm county	FDER	Number of firefighter run, duration of employment, age-specific	CR DC	1116	37(3.2% of IET)	Min 1 Max 30+	NS	Family history and cryptorchidism data available
Vena& Fiedler	1987	USA (Buffalo)	SMR	1950-79	29	White male firefighters in NY	US general population	FDER	Duration of employment	DC	1867		Min 1 Max 40+	Min ≤ 24 Max 30+ Mean;NS	SIR/SMR by duration of employment latency analysis for some sites
Zeegers M, et al	2004	Netherland	Incidence RR	1986-93	7	Men aged 55-69 in Netherlands	Male population in Netherlands	Mailed Qs	occupation	CR	830	5% of IET			

* Abb
NS: not stated

NA: not available
IET: Initially eligible total
SMR Standardized mortality ratio
SRR standardized registration ratio
SIR standardized incidence ratio
PMR Proportional mortality ratio
FDER Fire department employment records
DC Death certificates
VS Vital statistics,
NDI national data index,
PR pension record
CR Cancer registry
MR Medical records
PSR personal records
ERR employee retirement records,
ER employment records,
NHS CR National health service central register
NC National census
HR hospital record
Qs self-administered questionnaires

2. Case - Control studies

Authors	Year	Region	Outcome	Study years (enrolment)	Study population	Reference population	Exposure data source	Exposure variable	Outcome data source	Total # subjects incl.	# Subjects excl.	Case selection method	Control selection method	Control matching criteria /cofactor	Note
Delahunt B, et al	1995	New Zealand	Incidence (RR)	1978-86	Male renal cell cancer pts over age of 20	Cancer pts over age of 20	CR	Occupation (~14% missing occupation code)	CR	1060		All cases	random	/age,smoke	Assumed that occupation at time of diagnosis is indicative of life-time occupation – Possible misclassification of occupation ~14% missing occupation code – # of firefighters and # of cases not given
Figgs LW, et al	1995	USA (24 states)	MOR	1984-89	Deceased individual-NHL	Regional general population	DC	Occupation	DC	143340		All cases	NS	Age, race, gender, region	
Gaertner RR, et al	22	Canada	Incidence (OR)	1994-97	Bladder cancer patients aged 20-74		Qs	occupation	Cr	3734	35-38%	All cases	random	Age, gender	Only 66% (cases) and 59% (controls) response rate Histologically confirmed CA
Goldberg M, et al	2001	Canada	Incidence (OR)	1979-85	Male firemen aged 35-70	Male population aged 35-70 in Montreal area	interview	occupation	Face to face interviews CR	2011					82% of all cases interviewed either directly or by proxy
Krishnan G, et al	2003	USA (San Francisco)	Incidence (OR)	1991-95, 1997-2000	Brain cancer pts aged 20+	General population aged 20+	Interview, work history	Occupation	personal interviews :Northern California cancer center rapid case ascertainment program	1743	22% of IET	All reported cases	Random digital dialing	Age, gender, ethnicity	Only 81% of cases gave an interview and from those 40% were reported by proxy
Krstev S, et al	1998a	USA (24 states)	MOR	1984-93	Males having cancer listed as the underlying cause of death on death certificate	Male dying from causes other than cancer	DC	occupation	DC	60878			Controls included subjects who died of all causes except cancer	Age, race	
Krstev S, et al	1998b	USA (Atlanta, Detroit, New Jersey)	Incidence (OR)	1986-89	Prostate cancer pts aged 40-79	General population aged 40-79	Interviews work history	Occupation	CR Interviews	2296	6(0.6% of IET)	Random within site, age and race	<65: random digit dialing >65: random selection through HCFA.	Age, region, race	

Ma F, et al	1998	USA	Mortality (MOR)	1984-93	Deceased male firefighters	Deceased males, all causes except cancer	DC	Occupation	DC	6607				/Age,race	To calculate expected numbers subjects who died of all causes except cancer were included (this is not representative of the general population)
Muscat&Wyn der	1995	NS	Incidence (OR)	1985-92	White, male cancer pts admitted to hospital	White males admitted to hospital	Hospital based Patients interview, work history	Occupation	HR	440	10% of IET		Frequency matching	Hospital, age, interview year	Insufficient data - Adjusted risk estimate not reported
Sama S, et al	1990	USA (MA)	MOR	1982-86	White male cancer pts age of 18+	White male cancer pts 1)police, 2)other sites	CR	Occupation Age-specific	CR	315				/Age,smoke	Controls were cases coming from policemen and statewide males Occupational information available for only ~50% of all cancer cases
Stang A, et al	2003	Germany	Incidence (OR)	1995-97	Cancer pts aged 15-69	German population within 5 region, aged 15-69	ER Patient interview, work history	occupation	MR HR	1066	84 of IET	All cases	random	Age, region	Pathology dept record – Response rate was 57% for controls and 78% for cases

MOR: mortality odds ratio

3. Other studies

Authors	Year	Study design	Region	Outcome	Study years (enrolment)	Years of F/U	Study population	Reference population	Exposure data source	Exposure variable	Outcome data source	Total # subjects incl.	# Subjects excl.	Note
Burnett C, et al	1994	Surveillance	USA (27 state)	Mortality (PMR)	1984-90	6	Deceased white male firefighters	Deceased white males from same regions	DC	occupation	DC	5744		Quality of occupation data No information on possible confounders
Dubrow R et al	1983	surveillance	USA/UK	PMR, SMR, IOR, PIR, MOR	Various years of F/U by study	N/A	firefighters	various	Various: DC, NC, HR, CR	occupation	DE CR NC	3539-204200		Combining results of surveillance studies – Mediocre quality of the data of many of the studies included – Misclassification possible
Firth HM, et al	1996	other	New Zealand	Incidence (SIR)	1972-84	12	Male firefighters diagnosed with cancer aged 15-64	National employment database; Males aged 15-64 years with full-or part-time work as stated on census	CR	occupation	CR	26207	10%	
Grimes G, et al	1991	surveillance	USA	Mortality (PMR, RR)	1969-88	19	Deceased firefighters age 20+	Deceased males, excluding firefighters age 20+	ER	Duration of employment occupation	DC	205	NS	
Milham S	1976	Other: surveillance	USA (Washington state)	Mortality (SPMR)	1950-71	N/A	Firemen in Washington state white male age 20+	General population in US(1950) & UK	DC	occupation	DC	300000		