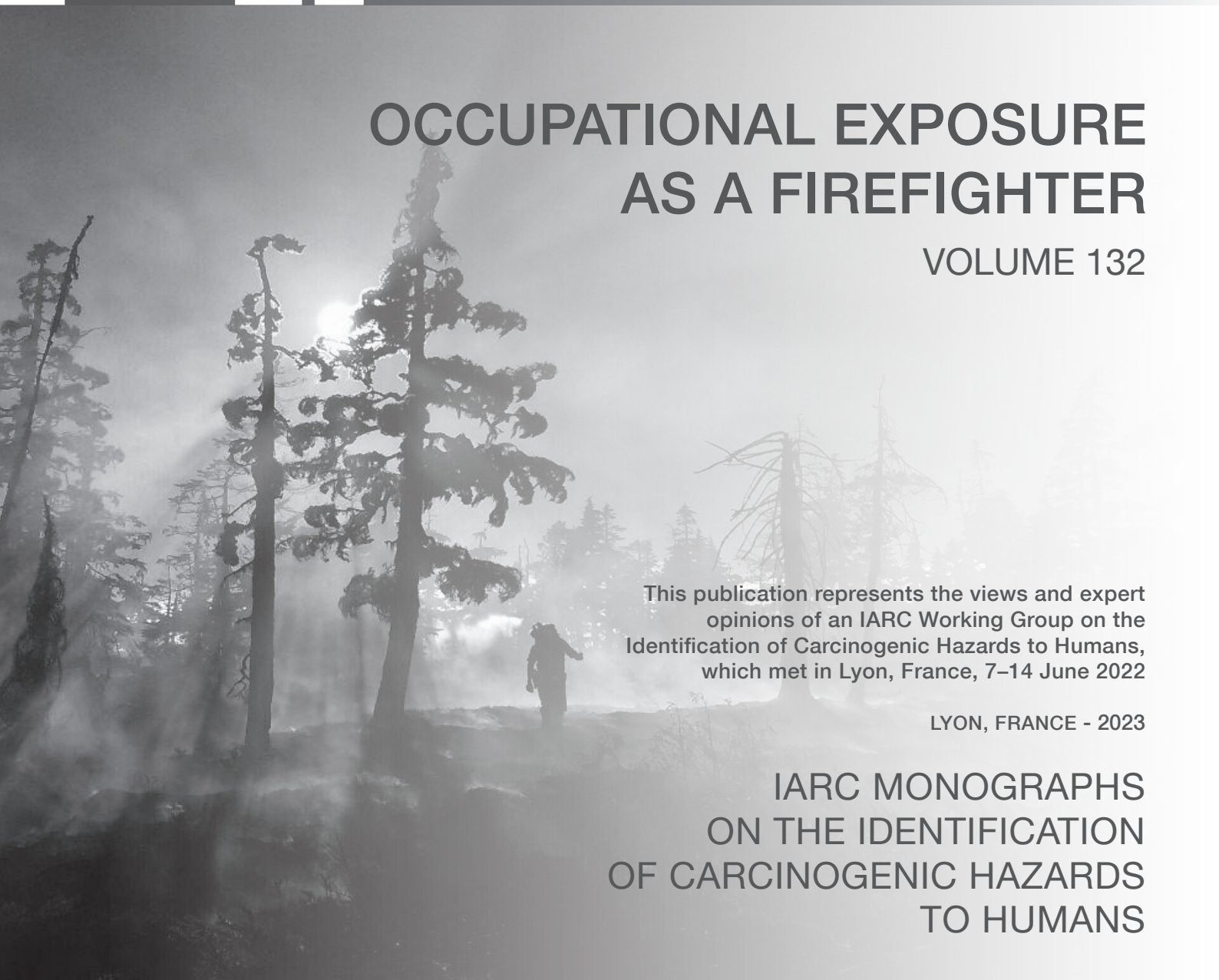
IARC MONOGRAPHS



OCCUPATIONAL EXPOSURE AS A FIREFIGHTER

VOLUME 132

This publication represents the views and expert opinions of an IARC Working Group on the Identification of Carcinogenic Hazards to Humans, which met in Lyon, France, 7–14 June 2022

LYON, FRANCE - 2023

IARC MONOGRAPHS ON THE IDENTIFICATION OF CARCINOGENIC HAZARDS TO HUMANS

International Agency for Research on Cancer

World Health Organization

Table S2.12 Cohort and case–control studies only reporting having ever worked as a firefighter and cancer of all sites combined

Reference, location enrolment/ follow-up period, study design	Population size, description, exposure assessment method	Cancer type (histopathology), incidence or mortality	Exposure category or level	Exposed cases or deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Amadeo et al. (2015) France Enrolment, 1 January 1979/ follow-up, 1979–2008 Cohort	10 829 male professional [career] firefighters employed in France on 1 January 1979, identified from 89 French administrative departments (93% of population) Exposure assessment method: ever employed as firefighter from employment records	All cancers combined, mortality	SMR (French population referent): Firefighters	749	0.95 (0.88–1.02)	Age, calendar year	*Exposure assessment critique*: Minimal quality. Exposure assessment only one point in time. Employed as any type of paid [career] firefighter. May include municipal and rural firefighters. *Strengths*: cohort coverage at the national level; relatively large cohort with long follow-up; robust linkages. *Limitations*: probable healthy-worker selection bias; includes only the 16% who were career civilian firefighters (79% were volunteers and 5% were military); lack of information on exposure and potential confounders.

Table S2.12 (continued)

Reference, location enrolment/ follow-up period, study design	Population size, description, exposure assessment method	Cancer type (histopathology), incidence or mortality	Exposure category or level	Exposed cases or deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Deschamps et al. (1995) Paris, France Enrolment, 1 January 1977/ follow-up, 1977 to 1 January 1991 Cohort	830 professional [career] male firefighters with ≥ 5 yr of service in the Paris Fire Brigade before 1977 Exposure assessment method: employed as firefighter with ≥ 5 yr of active fire combat duty from employment records	All cancers combined, mortality	SMR (French population referent): Firefighters	18	0.89 (0.53–1.40)	Age, calendar year	*Exposure assessment critique*: Satisfactory quality. Duration of active fire combat assessed only for deaths, not used in analyses. Municipal firefighters. *Strengths*: complete cohort enumeration. *Limitations*: small study size; probable healthy-worker selection bias; lack of information on exposure and potential confounders; probabilistic linkage of outcome data.
Ma et al. (2006) Florida, USA Enrolment, 1972–1999/ follow-up, 1981–1999 Cohort	36 813; all male (34 796) and female (2017) professional [career] firefighters certified in Florida from 1972 to 1999; the certification date was considered to be the date of first exposure Exposure assessment method: ever career firefighter from professional certification records	All cancers combined, incidence	SIR (Florida population referent): Male firefighters Female firefighters	970 52	0.84 (0.79–0.90) 1.63 (1.22–2.14)	Age, calendar year	*Exposure assessment critique*: Minimal quality. Only one point in time measure of exposure, no indication when exposure stopped. May include municipal and rural firefighters. *Strengths*: assesses cancer incidence; includes female firefighters; large male cohort. *Limitations*: probable healthy-worker selection bias; small female cohort; young age at end of follow-up; lacks information on exposure and potential confounders.

Table S2.12 (continued)

Reference, location enrolment/ follow-up period, study design	Population size, description, exposure assessment method	Cancer type (histopathology), incidence or mortality	Exposure category or level	Exposed cases or deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Ma et al. (2005) Florida, USA Enrolment, 1972–1999/follow-up, 1972–1999 Cohort	36 813; all male (34 796) and female (2017) professional [career] firefighters certified in Florida from 1972 to 1999 Exposure assessment method: ever career firefighter from professional certification records	All cancers combined, mortality	SMR (Florida population referent): Male firefighters	403	0.85 (0.77–0.94)	Age, calendar period	*Exposure assessment critique*: Minimal quality. Only one point in time measure of exposure, no indication when exposure stopped. May include municipal and rural firefighters. *Other comments*: those lost to follow-up were excluded from the analyses. *Strengths*: includes female firefighters; large male cohort; multiple linkages to assess vital status; conducted a sensitivity analysis among firefighters with longest tenure (certified 1972–1976). *Limitations*: probable healthy-worker selection bias; small female cohort; young age at end of follow-up; lacks information on exposure and potential confounders.
			Male firefighters certified 1972–1976	303	0.89 (0.80–1.00)		
			Female firefighters	8	1.03 (0.44–2.03)		

Table S2.12 (continued)

Reference, location enrolment/ follow-up period, study design	Population size, description, exposure assessment method	Cancer type (histopathology), incidence or mortality	Exposure category or level	Exposed cases or deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Grimes et al. (1991) Honolulu, Hawaii, USA 1969–1988 Cohort	205 deaths; all male firefighters with ≥ 1 yr of service in the City of Honolulu Fire Department Exposure assessment method: death certificate coding of usual occupation	All cancers combined, mortality	PMR (state population referent): All firefighters Caucasian [White] firefighters Hawaiian firefighters	 [58] [19] [29]	 1.19 (0.96–1.49) 1.11 (0.75–1.63) 1.23 (0.90–1.67)	NR	*Exposure assessment critique*: Minimal quality. Crude, relying on knowledge of usual occupation by death certifier. Possible differential misclassification from missing occupation on death certificates. May include municipal and rural firefighters. *Strengths*: long follow-up; examined risk by ethnic group (White/Hawaiian). *Limitations*: probable healthy-worker selection bias; unclear if underlying assumption that PMR will estimate an SMR is valid in this cohort; PMRs were not standardized by age or calendar period; no information on exposure and potential confounders. *Other comments*: number of deaths calculated by the Working Group.

Table S2.12 (continued)

Reference, location enrolment/ follow-up period, study design	Population size, description, exposure assessment method	Cancer type (histopathology), incidence or mortality	Exposure category or level	Exposed cases or deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Musk et al. (1978) Boston, Massachusetts, USA Follow-up 1915–1975 Cohort	5655 male professional [career] firefighters employed by the Boston Fire Department for ≥ 3 yr since 1915 Exposure assessment method: employed as municipal firefighter for ≥ 3 yr from employment records	All cancers combined, mortality	SMR: Firefighters vs Massachusetts male population Firefighters vs US White male population Active firefighters vs Massachusetts male population Retired firefighters vs Massachusetts male population	 367 367 97 270	 [0.86 (0.77–0.95)] [0.98 (0.88–1.08)] [0.73 (0.60–0.89)] [0.91 (0.81–1.02)]	Age, calendar period	*Exposure assessment critique*: Satisfactory quality. Ever employed as municipal firefighter. Other comments: Death certificates lacked for 7.9% (194) of confirmed deaths. *Strengths*: long follow-up. *Limitations*: probable healthy-worker selection bias; lack of information on cause for a proportion of deaths; lack of information on exposure and potential confounders.
Mastromatteo (1959) Toronto, Canada Enrolment, 1918–1954/ follow-up, 1921–1953 (Ontario rates), 1937–1953 (Ontario city rates) Cohort	1832; all active (1500) and retired (332) firefighters employed in the city fire department from 1918 to 1954 Exposure assessment method: ever employed municipal firefighter from superannuation and benefit fund registry	All cancers combined, mortality	Mortality (SMR): Firefighters vs Ontario men Firefighters vs urban Ontario men	 34 26	 [1.13 (0.80–1.57)] [0.96 (0.64–1.37)]	Age, calendar period	*Exposure assessment critique*: Minimal quality. Ever employed as municipal firefighter. *Strengths*: complete cohort enumeration. *Limitations*: large loss to follow-up.

Table S2.12 (continued)

Reference, location enrolment/ follow-up period, study design	Population size, description, exposure assessment method	Cancer type (histopathology), incidence or mortality	Exposure category or level	Exposed cases or deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Eliopulos et al. (1984) Western Australia Follow-up, 1939–1978 Cohort	990; all men employed as permanent full-time firefighters by the Western Australian Fire Brigade between October 1939 and December 1978 Exposure assessment method: ever employed as a permanent full-time firefighter, and categorical employment duration (years) as firefighters from employment records	All cancers combined, mortality All cancers combined, mortality	SMR (Western Australia referent): Employment as firefighter PMR (Western Australia referent): Employment as firefighter	 30 30	 1.09 (0.74–1.56) 1.37 (0.93–1.36)	Age, calendar period	*Exposure assessment critique*: Satisfactory quality. Unsure if permanent full-time status was maintained throughout study period. Municipal firefighters. *Strengths*: long follow-up time; low loss to follow-up. *Limitations*: probable healthy-worker selection bias; small study size; no personal information on exposure or potential confounders.
Zhao et al. (2020) Spain Enrolment, 2001/follow-up, 2001–2011 Cohort	9 579 759 (27 365 firefighters) men identified as residing in Spain on 1 November 2001, employed on the census date, and aged 20–64 yr; followed for mortality using a national death registry Exposure assessment method: employed as firefighter in week before census	All cancers combined, mortality	Occupation (MRR): All other occupations Firefighters	 126 445 335	 1 1.00 (0.89–1.12)	Age	*Exposure assessment critique*: Minimal quality. Firefighting self-reported at one point in time. Years of firefighting, may include municipal and rural firefighters. *Strengths*: large study size; low loss to follow-up; cohort coverage at the national level. *Limitations*: occupation determined by self-report at baseline; short follow-up and young cohort age; lack of information on exposure and potential confounders.

Table S2.12 (continued)

Reference, location enrolment/ follow-up period, study design	Population size, description, exposure assessment method	Cancer type (histopathology), incidence or mortality	Exposure category or level	Exposed cases or deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Pukkala et al. (2014) Denmark, Finland, Iceland, Norway, Sweden 1961–2005 Cohort	16 422 male professional [career] firefighters in the NOCCA cohort (a registry-based cohort study of Nordic country residents who participated in any computerized population census (1960, 1970, 1980/81, or 1990) and were followed up through linkage to national cancer registries), aged 30–64 yr, alive, and in the country in the year following census participation Exposure assessment method: employed as firefighter at time of census	All cancers combined excluding non-melanoma skin cancer, incidence	SIR (national referent)			Country, age, calendar period	*Exposure assessment critique*: Satisfactory quality. Self-reported firefighter as current job. Includes municipal and rural firefighters. *Strengths*: large study size; long follow-up time; assesses cancer incidence using high-quality outcome data; contrasts by country, observation period, and age; multiple sensitivity analyses. *Limitations*: probable healthy-worker selection bias; lack of information on exposure and potential confounders.
			Firefighters	2536	1.06 (1.02–1.11)		
		All cancers combined excluding non-melanoma skin cancer, incidence	Country (SIR):			Age, calendar period	
			Denmark	275	1.25 (1.11–1.41)		
			Finland	484	0.97 (0.89–1.06)		
			Iceland	24	0.96 (0.61–1.42)		
			Norway	644	1.20 (1.11–1.30)		
			Sweden	1109	1.00 (0.95–1.07)		

Table S2.12 (continued)

Reference, location enrolment/ follow-up period, study design	Population size, description, exposure assessment method	Cancer type (histopathology), incidence or mortality	Exposure category or level	Exposed cases or deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Sritharan et al. (2022) Ontario, Canada Enrolment, 1983–2019/follow-up, 1983–2020 Cohort	2 368 226 (firefighters 13 642; police 22 595); workers aged ≥ 15 yr who submitted lost-time workers' compensation injury and disease claims to the Workplace Safety and Insurance Board with known sex, birthdate, claim date, and occupation and industry information; incident cases identified using the Ontario Cancer registry Exposure assessment method: records; employed as firefighter at time of workers' compensation claim	All cancers combined, incidence	Referent (HR): Firefighters vs all other workers Firefighters vs police	 1730 1730	 1.23 (1.17–1.29) 1.03 (0.96–1.09)	Age at start of follow-up, birth year, sex	*Exposure assessment critique*: Minimal quality. Duration of firefighter work unclear. May include full-time, part-time, municipal, and rural firefighters. *Strengths*: large study size; long follow-up time; includes female firefighters; working population used as referent; assesses cancer incidence. *Limitations*: potential selection bias into claims database, as compensation claims used to identify the cohort may differ by occupation; lack of information on exposure and potential confounders.
Harris et al. (2018) Canada Enrolment, 1991/follow-up, 1992–2010 Cohort	CanCHEC: 1 108 410 (4535 firefighters); men participating in the long form Canadian census in 1991, employed with a valid occupation and aged 25–74 yr at cohort entry; incident cancers identified using a national cancer registry. Exposure assessment method: ever employed as firefighter data from census	All cancers combined, incidence	Occupation (HR): Non-firefighters Firefighters	 NR 505	 1 1.04 (0.96–1.14)	Age, region, education	*Exposure assessment critique*: Minimal quality. Self-reported firefighter as current or longest job. Includes municipal and rural firefighters. *Strengths*: study size; long follow-up time; national coverage of working population; assesses cancer incidence. *Limitations*: occupation determined at 1991 census based on self-report. Lack of information on exposure and potential confounders.

Table S2.12 (continued)

Reference, location enrolment/ follow-up period, study design	Population size, description, exposure assessment method	Cancer type (histopathology), incidence or mortality	Exposure category or level	Exposed cases or deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Muegge et al. (2018) Indiana, USA 1985–2013 Case–control	Cases: firefighters: 857; non-firefighters: 3054; cancer as the underlying cause of death in state death registry among registrants with complete information on year of death, age at time of death, sex, race, ethnicity, industry code, and occupation code; all firefighter cancers were included, but non-firefighter cancers only observed among non-firefighter decedents matched 4:1 to firefighter decedents on age at death, sex, race, ethnicity, and year of death Controls: firefighters, 1964; non-firefighters, 8218; non-cancer decedents among all firefighter decedents and a sample of non-firefighter decedents matched 4:1 to firefighter decedents on age at death, sex, race, ethnicity, and year of death Exposure assessment method: death certificate coding of usual occupation	All cancers combined, mortality	Death certificate occupation (OR): Non-firefighters Firefighters	 3054 857	 1 1.19 (1.08–1.30)	Sex, race, ethnicity, age at death, year of death	*Exposure assessment critique*: Minimal quality. Crude, relying on knowledge of usual occupation by death certifier. Possible differential misclassification from missing occupation on death certificates. May include municipal and rural firefighters. *Strengths*: matching on race or ethnicity. *Limitations*: deaths used as controls (numerator-based analysis); lack of information on exposure and potential confounding.

Table S2.12 (continued)

Reference, location enrolment/ follow-up period, study design	Population size, description, exposure assessment method	Cancer type (histopathology), incidence or mortality	Exposure category or level	Exposed cases or deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Ma et al. (1998) USA 1984–1993 Case–control	Cases: NR; all male cancer deaths with coded industry and occupation on death certificates from 24 states captured in a NIOSH database Controls: NR; all male non-cancer deaths in the NIOSH database Exposure assessment method: death certificate coding of usual occupation	All cancers combined, mortality	Group (MOR): White firefighters Black firefighters	 1817 66	 1.1 (1.1–1.2) 1.2 (0.9–1.5)	Year of death, age at death	*Exposure assessment critique*: Minimal quality. Crude, relying on knowledge of usual occupation by death certifier. Possible differential misclassification from missing occupation on death certificates. May include municipal and rural firefighters. *Strengths*: large study size (includes 6607 male firefighter deaths); broad geographical population coverage. *Limitations*: small number of cancer deaths among Black firefighters; non-cancer deaths used as controls (numerator-based analysis); lack of information on exposure and potential confounders.

Table S2.12 (continued)

Reference, location enrolment/ follow-up period, study design	Population size, description, exposure assessment method	Cancer type (histopathology), incidence or mortality	Exposure category or level	Exposed cases or deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Burnett et al. (1994) USA 1984–1990 Mortality surveillance	5744 deaths among firefighters; White male firefighters identified by evaluation of coded occupation on death certificates from 27 states Exposure assessment method: death certificate coding of usual occupation	All cancers combined, mortality	Group (PMR): Firefighters Firefighters, age < 65 yr at death	 1636 663	 1.10 (1.06–1.14) 1.12 (1.04–1.21)	Age	*Exposure assessment critique*: Minimal quality. Crude, relying on knowledge of usual occupation by death certifier. Possible differential misclassification from missing occupation on death certificates. May include municipal and rural firefighters. *Strengths*: large number of deaths; broad geographical population coverage. *Limitations*: numerator-only (PMR) analysis; errors in death-certificate occupation; lack of information on exposure or potential confounders.

CanCHEC, Canadian Census Health and Environment Cohort; CI, confidence interval; HR, hazard ratio; MOR, mortality odds ratio; MRR, mortality rate ratio; NIOSH, National Institute for Occupational Safety and Health; NOCCA, Nordic Occupational Cancer study; NR, not reported; OR, odds ratio; PMR, proportionate mortality ratio; SIR, standardized incidence ratio; SMR, standardized mortality ratio; vs, versus; yr, year.

References

Ahn YS, Jeong KS (2015). Mortality due to malignant and non-malignant diseases in Korean professional emergency responders. *PLoS One*. 10(3):e0120305. doi:10.1371/journal.pone.0120305 PMID:25756281

Ahn YS, Jeong KS, Kim KS (2012). Cancer morbidity of professional emergency responders in Korea. *Am J Ind Med*. 55(9):768–78. doi:10.1002/ajim.22068 PMID:22628010

Amadeo B, Marchand JL, Moisan F, Donnadieu S, Gaëlle C, Simone MP, et al. (2015). French firefighter mortality: analysis over a 30-year period. *Am J Ind Med*. 58(4):437–43. doi:10.1002/ajim.22434 PMID:25708859

Aronson KJ, Tomlinson GA, Smith L (1994). Mortality among fire fighters in metropolitan Toronto. *Am J Ind Med*. 26(1):89–101. doi:10.1002/ajim.4700260108 PMID:8074127

Bates MN, Fawcett J, Garrett N, Arnold R, Pearce N, Woodward A (2001). Is testicular cancer an occupational disease of fire fighters? *Am J Ind Med*. 40(3):263–70. doi:10.1002/ajim.1097 PMID:11598972

Bigert C, Martinsen JI, Gustavsson P, Sparén P (2020). Cancer incidence among Swedish firefighters: an extended follow-up of the NOCCA study. *Int Arch Occup Environ Health*. 93(2):197–204. doi:10.1007/s00420-019-01472-x PMID:31463517

Burnett CA, Halperin WE, Lalich NR, Sestito JP (1994). Mortality among fire fighters: a 27 state survey. *Am J Ind Med*. 26(6):831–3. doi:10.1002/ajim.4700260612 PMID:7892834

Daniels RD, Bertke S, Dahm MM, Yiin JH, Kubale TL, Hales TR, et al. (2015). Exposure-response relationships for select cancer and non-cancer health outcomes in a cohort of US firefighters from San Francisco, Chicago and Philadelphia (1950–2009). *Occup Environ Med*. 72(10):699–706. doi:10.1136/oemed-2014-102671 PMID:25673342

Daniels RD, Kubale TL, Yiin JH, Dahm MM, Hales TR, Baris D, et al. (2014). Mortality and cancer incidence in a pooled cohort of US firefighters from San Francisco, Chicago and Philadelphia (1950–2009). *Occup Environ Med*. 71(6):388–97. doi:10.1136/oemed-2013-101662 PMID:24142974

Demers PA, Checkoway H, Vaughan TL, Weiss NS, Heyer NJ, Rosenstock L (1994). Cancer incidence among firefighters in Seattle and Tacoma, Washington (United States). *Cancer Causes Control*. 5(2):129–35. doi:10.1007/BF01830258 PMID:8167259

Demers PA, Heyer NJ, Rosenstock L (1992a). Mortality among firefighters from three northwestern United States cities. *Br J Ind Med*. 49(9):664–70. doi:10.1136/oem.49.9.664 PMID:1390274

Deschamps S, Momas I, Festy B (1995). Mortality amongst Paris fire-fighters. *Eur J Epidemiol*. 11(6):643–6. doi:10.1007/BF01720297 PMID:8861847

Eliopulos E, Armstrong BK, Spickett JT, Heyworth F (1984). Mortality of fire fighters in Western Australia. *Br J Ind Med*. 41(2):183–7. doi:10.1136/oem.41.2.183 PMID:6722044

Feuer E, Rosenman K (1986). Mortality in police and firefighters in New Jersey. *Am J Ind Med*. 9(6):517–27. doi:10.1002/ajim.4700090603 PMID:3488681

Giles G, Staples M, Berry J (1993). Cancer incidence in Melbourne Metropolitan Fire Brigade members, 1980–1989. *Health Rep*. 5(1):33–8. PMID:8334236

Glass DC, Del Monaco A, Pircher S, Vander Hoorn S, Sim MR (2016b). Mortality and cancer incidence at a fire training college. *Occup Med (Lond)*. 66(7):536–42. doi:10.1093/occmed/kqw079 PMID:27371948

Glass DC, Del Monaco A, Pircher S, Vander Hoorn S, Sim MR (2017). Mortality and cancer incidence among male volunteer Australian firefighters. *Occup Environ Med*. 74(9):628–38. doi:10.1136/oemed-2016-104088 PMID:28391245

Glass DC, Del Monaco A, Pircher S, Vander Hoorn S, Sim MR (2019). Mortality and cancer incidence among female Australian firefighters. *Occup Environ Med*. 76(4):215–21. PMID:30674605

Glass DC, Pircher S, Del Monaco A, Hoorn SV, Sim MR (2016a). Mortality and cancer incidence in a cohort of male paid Australian firefighters. *Occup Environ Med*. 73(11):761–71. doi:10.1136/oemed-2015-103467 PMID:27456156

Grimes G, Hirsch D, Borgeson D (1991). Risk of death among Honolulu fire fighters. *Hawaii Med J*. 50(3):82–5. PMID:2061032

Guidotti TL (1993). Mortality of urban firefighters in Alberta, 1927–1987. *Am J Ind Med*. 23(6):921–40. doi:10.1002/ajim.4700230608 PMID:8328477

Harris MA, Kirkham TL, MacLeod JS, Tjepkema M, Peters PA, Demers PA (2018). Surveillance of cancer risks for firefighters, police, and armed forces among men in a Canadian census cohort. *Am J Ind Med*. 61(10):815–23. doi:10.1002/ajim.22891 PMID:30073696

Kang D, Davis LK, Hunt P, Kriebel D (2008). Cancer incidence among male Massachusetts firefighters, 1987–2003. *Am J Ind Med*. 51(5):329–35. doi:10.1002/ajim.20549 PMID:18306327

Kullberg C, Andersson T, Gustavsson P, Selander J, Tornling G, Gustavsson A, et al. (2018). Cancer incidence in Stockholm firefighters 1958–2012: an updated cohort study. *Int Arch Occup Environ Health*. 91(3):285–91. doi:10.1007/s00420-017-1276-1 PMID:29164319

Langevin SM, Eliot M, Butler RA, McClean M, Kelsey KT (2020). Firefighter occupation is associated with increased risk for laryngeal and hypopharyngeal squamous cell carcinoma among men from the

Greater Boston area. *Occup Environ Med*. 77(6):381–5. doi:10.1136/oemed-2019-106271 PMID:32107319

Lee DJ, Koru-Sengul T, Hernandez MN, Caban-Martinez AJ, McClure LA, Mackinnon JA, et al. (2020). Cancer risk among career male and female Florida firefighters: evidence from the Florida Firefighter Cancer Registry (1981–2014). *Am J Ind Med*. 63(4):285–99. doi:10.1002/ajim.23086 PMID:31930542

Ma F, Fleming LE, Lee DJ, Trapido E, Gerace TA (2006). Cancer incidence in Florida professional firefighters, 1981 to 1999. *J Occup Environ Med*. 48(9):883–8. doi:10.1097/01.jom.0000235862.12518.04 PMID:16966954

Ma F, Fleming LE, Lee DJ, Trapido E, Gerace TA, Lai H, et al. (2005). Mortality in Florida professional firefighters, 1972 to 1999. *Am J Ind Med*. 47(6):509–17. doi:10.1002/ajim.20160 PMID:15898094

Ma F, Lee DJ, Fleming LE, Dosemeci M (1998). Race-specific cancer mortality in US firefighters: 1984–1993. *J Occup Environ Med*. 40(12):1134–8. PMID:9871891

Marjerrison N, Jakobsen J, Demers PA, Grimsrud TK, Hansen J, Martinsen JI, et al. (2022b). A comparison of cancer incidence and mortality in the Norwegian Fire Departments Cohort, 1960–2018. *Occup Environ Med*. oemed-2022–108331. doi:10.1136/oemed-2022-108331 PMID:35589382

Marjerrison N, Jakobsen J, Grimsrud TK, Hansen J, Martinsen JI, Nordby KC, et al. (2022a). Cancer incidence in sites potentially related to occupational exposures: 58 years of follow-up of firefighters in the Norwegian Fire Departments Cohort. *Scand J Work Environ Health*. 48(3):210–9. doi:10.5271/sjweh.4009 PMID:35015085

Mastromatteo E (1959). Mortality in city firemen. II. A study of mortality in firemen of a city fire department. *AMA Arch Ind Health*. 20:227–33. PMID:14422193

McClure LA, Koru-Sengul T, Hernandez MN, Caban-Martinez AJ, Kobetz EN, Lee DJ (2021). Comparing cancer risk estimates using occupational record linkage approaches in male Florida firefighters. *Am J Ind Med*. 64(2):78–83. doi:10.1002/ajim.23205 PMID:33283309

Muegge CM, Zollinger TW, Song Y, Wessel J, Monahan PO, Moffatt SM (2018). Excess mortality among Indiana firefighters, 1985–2013. *Am J Ind Med*. 61(12):961–7. doi:10.1002/ajim.22918 PMID:30421827

Musk AW, Monson RR, Peters JM, Peters RK (1978). Mortality among Boston firefighters, 1915–1975. *Br J Ind Med*. 35(2):104–8. doi:10.1136/oem.35.2.104 PMID:656333

Petersen KU, Pedersen JE, Bonde JP, Ebbehoej NE, Hansen J (2018a). Long-term follow-up for cancer incidence in a cohort of Danish firefighters. *Occup Environ Med*. 75(4):263–9. doi:10.1136/oemed-2017-104660 PMID:29055884

Petersen KU, Pedersen JE, Bonde JP, Ebbehøj NE, Hansen J (2018b). Mortality in a cohort of Danish firefighters; 1970–2014. *Int Arch Occup Environ Health*. 91(6):759–66. doi:10.1007/s00420-018-1323-6 PMID:29808435

Pinkerton L, Bertke SJ, Yiin J, Dahm M, Kubale T, Hales T, et al. (2020). Mortality in a cohort of US firefighters from San Francisco, Chicago and Philadelphia: an update. *Occup Environ Med*. 77(2):84–93. doi:10.1136/oemed-2019-105962 PMID:31896615

Pukkala E, Martinsen JI, Weiderpass E, Kjaerheim K, Lynge E, Tryggvadottir L, et al. (2014). Cancer incidence among firefighters: 45 years of follow-up in five Nordic countries. *Occup Environ Med*. 71(6):398–404. doi:10.1136/oemed-2013-101803 PMID:24510539

Sama SR, Martin TR, Davis LK, Kriebel D (1990). Cancer incidence among Massachusetts firefighters, 1982–1986. *Am J Ind Med*. 18(1):47–54. doi:10.1002/ajim.4700180106 PMID:2378369

Sritharan J, Kirkham TL, MacLeod J, Marjerrison N, Lau A, Dakouo M, et al. (2022). Cancer risk among firefighters and police in the Ontario workforce. *Occup Environ Med*. 79(8):533–539. doi:10.1136/oemed-2021-108146 PMID:35354650

Stang A, Jöckel KH, Baumgardt-Elms C, Ahrens W (2003). Firefighting and risk of testicular cancer: results from a German population-based case-control study. *Am J Ind Med*. 43(3):291–4. doi:10.1002/ajim.10178 PMID:12594776

Tornling G, Gustavsson P, Hogstedt C (1994). Mortality and cancer incidence in Stockholm fire fighters. *Am J Ind Med*. 25(2):219–28. doi:10.1002/ajim.4700250208 PMID:8147394

Tsai RJ, Luckhaupt SE, Schumacher P, Cress RD, Deapen DM, Calvert GM (2015). Risk of cancer among firefighters in California, 1988–2007. *Am J Ind Med*. 58(7):715–29. doi:10.1002/ajim.22466 PMID:25943908

Vena JE, Fiedler RC (1987). Mortality of a municipal-worker cohort: IV. Fire fighters. *Am J Ind Med*. 11(6):671–84. doi:10.1002/ajim.4700110608 PMID:3605104

Webber MP, Singh A, Zeig-Owens R, Salako J, Skerker M, Hall CB, et al. (2021). Cancer incidence in World Trade Center-exposed and non-exposed male firefighters, as compared with the US adult male population: 2001–2016. *Occup Environ Med*. 78(10):707–14. doi:10.1136/oemed-2021-107570 PMID:34507965

Zeig-Owens R, Webber MP, Hall CB, Schwartz T, Jaber N, Weakley J, et al. (2011). Early assessment of cancer outcomes in New York City firefighters after the 9/11 attacks: an observational cohort study. *Lancet*. 378(9794):898–905. doi:10.1016/S0140-6736(11)60989-6 PMID:21890054

Zhao G, Erazo B, Ronda E, Brocal F, Regidor E (2020). Mortality among firefighters in Spain: 10 years of follow-up. *Ann Work Expo Health*. 64(6):614–21. doi:10.1093/annweh/wxaa036 PMID:32253442