Table 2.12 Case–control studies on cancers in offspring and parental exposure to welding/welding fumes (web only)

Reference, location, enrolment/follow-up period	Population size, description, exposure assessment method	Organ site	Exposure category or level	Exposed cases/ deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Buckley et al. (1989) USA and Canada 1980–1983	Cases: 75; children newly diagnosed registered at the CCSG trial (*n* = 46) or pathology reports from the treating institution (*n* = 29), with parents residing in the USA or Canada. Controls: 75; age matched, identified through random digit dialling Exposure assessment method: Questionnaire; Occupational exposures reported by questionnaire a list of 51 chemicals and substances were read during the interview and ever exposure recorded	Hepatoblastoma	Paternal exposure: welding	12	1	Matched on age	Limitations: small size, only 75 of the 116 eligible cases could be included in the study
Olshan et al. (1990) USA 1984–1986	Cases: 200; Wilms' tumour cases diagnosed before age 16 with confirmed histopathology Controls: 233; controls (+/– 2 years of case) were matched to each case through modified random digit dialling using the area code and first 5 digits of the phone number of the case household. Exposure assessment method: Questionnaire; parent completed questionnaire covering the full occupational history of the father, in relation to jobs held for 6 months or more since age 18. Welders and flame cutters is the category studied	Childhood cancer: Wilms' tumour	Paternal occupation as welder			Matched on age and area	Strengths: largest Wilms' tumour study on parental occupational risk factors. Limitations: small size
			Welder (preconception)	6	4 (0.45–35.79)		
			Welder (during pregnancy)	5	8.22 (0.95–71.27)		
			Welder (postnatal)	6	7.58 (0.9–63.95)		

Table 2.12 Case–control studies on cancers in offspring and parental exposure to welding/welding fumes (web only)

Reference, location, enrolment/follow-up period	Population size, description, exposure assessment method	Organ site	Exposure category or level	Exposed cases/ deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Wilkins & Wellage (1996) Columbus, Ohio, USA 1975–1982	Cases: 94; incident CNS tumour cases diagnosed < age 20 Controls: 166; random digit dialling, individually matched to cases by sex, race, year of birth, survival up to the case's diagnosis Exposure assessment method: Questionnaire; obtained by questionnaire	Brain (Childhood cancer)	Paternal occupation as welder or welder-related occupation			Matched by sex, race, year of birth and survival up to case diagnosis	
			Non-welding and non-EMF related occupations (Ref)	NR	1		
			Welding related job (preconception, 1 year)	6	3.83 (0.95–15.55)		
			Welding related job (pregnancy)	5	2.5 (0.67–9.31)		
			Welder (preconception, 1 year)	3	1.75 (0.23–13.21)		
			Welder (pregnancy)	2	1 (0.09–11.03)		
Olshan et al. (1999) USA and Canada 1992–1996	Cases: 504; hospital incident neuroblastoma diagnosed under age 19. Controls: 504; telephone random digit dialling to select controls individually matched to cases on date of birth Exposure assessment method: Questionnaire; telephone interviews to fathers, in some cases (12%) mothers were used as proxy for fathers interview	Brain (Childhood cancer): neuroblastoma	Paternal occupation: welders, cutters	4	0.5 (0.1–1.6)	Mother's race, mother's age, mother's education, household income, birth year, matched on date of birth	

Table 2.12 Case–control studies on cancers in offspring and parental exposure to welding/welding fumes (web only)

Reference, location, enrolment/follow-up period	Population size, description, exposure assessment method	Organ site	Exposure category or level	Exposed cases/ deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Smulevich et al. (1999) the Russian Federation, Moscow 1986–1988	Cases: 593; incident childhood cancer cases diagnosed age 0–14 identified through Moscow Central Cancer Dispensary Controls: 1181; 2 healthy controls individually matched to case on age, sex and residence. 1 control from children living in same building, 1 control from another building in same subdistrict. Exposure assessment method: Questionnaire; collected with face- to -face interviews	Childhood cancer: (all combined)	Paternal occupation as welder Welder (ever before conception) Welder (2 months before conception)	 32 22	 1.8 1.4	Parental alcohol consumption, matched by age, sex and residence	
Cordier et al. (2001) 7 countries 1976–1994	Cases: 1218; cases of primary malignant tumours of the brain or cranial nerves diagnosed at age < 20 Controls: 2223; general population controls either pair-matched or frequency matched to cases on sex and birth year Exposure assessment method: Questionnaire	Brain (Childhood cancer): ICD9 191 and ICD-9 192.0	Paternal occupation: welder (ever during 5 yr prior birth)	20	0.97 (0.5–1.7)	Matched on sex and birth year or age	Strengths: large size

Table 2.12 Case–control studies on cancers in offspring and parental exposure to welding/welding fumes (web only)

Reference, location, enrolment/follow-up period	Population size, description, exposure assessment method	Organ site	Exposure category or level	Exposed cases/ deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Abdolahi et al. (2013) USA and Canada 1998–2006	Cases: 198; incident cases treated at one of the nine participating institutions in the USA and Canada Controls: 245; controls free of cancer based on referrals from the case child's relatives and friends in the same or adjacent age category. Exposure assessment method: Expert judgement; Based on a detailed job history of occupations held for 6 months or more during the 10 years before conception, experts assessed probability, intensity and frequency of a list of exposures, including welding fumes. Raters achieved fair agreement in the assessment for welding fumes (kappa = 0.49–0.56)	Childhood cancer: sporadic bilateral retinoblastoma	Paternal exposure to welding fumes			Father's smoking status, race, education, age, proxy interview	Limitations: associations by average intensity of paternal duration of exposure (both during 10 years and 1 year before conception) have no significant *P* trend (values not reported)
			Welding fumes (10 years before conception)	29	1.22 (0.68–2.19)		
			Welding fumes (1 year before conception)	17	1.19 (0.57–2.49)		
		Childhood cancer: sporadic bilateral retinoblastoma	Time-weighted average levels of paternal exposure to welding fumes (10 years before conception)			Father's smoking status, race, education, age, proxy interview	
			Welding fumes none-low (ref)	386	1		
			Welding fumes moderate	28	1.08 (0.48–2.42)		
			Welding fumes high	29	1.36 (0.62–3.01)		
		Childhood cancer: sporadic bilateral retinoblastoma	Time-weighted average levels of paternal exposure to welding fumes (1 year before conception)			Father's smoking status, race, education, age, proxy interview	
			Welding fumes none-low (ref)	410	1		
			Welding fumes moderate	18	1.51 (0.56–4.05)		
			Welding fumes high	14	0.9 (0.31–2.61)		

Table 2.12 Case–control studies on cancers in offspring and parental exposure to welding/welding fumes (web only)

Reference, location, enrolment/follow-up period	Population size, description, exposure assessment method	Organ site	Exposure category or level	Exposed cases/ deaths	Risk estimate (95% CI)	Covariates controlled	Comments
Togawa et al. (2016) Finland, Norway, Sweden 1978–2012	Cases: 8112; testicular germ cell tumour cases age 14–49 from national cancer registries Controls: 26 264; population controls from population registries had cases individually matched by country and year of birth Exposure assessment method: Expert judgement; The Nordic JEM (with country specific data on the proportion of workers and mean level of exposure) was applied to the parental occupation retrieved from censuses	Testis: Testicular Germ Cell Tumours	Levels of paternal exposure to welding fumes			Matched on year and country of birth	Strengths: very large size, objectively obtained information on parental occupation. Country specific JEM Limitations: no information on a range of potential confounders. However, the text mentions that adjustment for confounders did not modify the OR
			Welding fumes non exposed (ref)	6778	1		
			Welding fumes low	953	1.09 (1.01–1.18)		
			Welding fumes high	124	0.97 (0.79–1.19)		
			Trend-test *P* value: 0.99				
		Testis: Testicular Germ Cell Tumours	Levels of maternal exposure to welding fumes			Matched on year and country of birth	
			Welding fumes non-exposed (ref)	6977	1		
			Welding fumes low	26	1.02 (0.65–1.59)		
			Welding fumes high	15	1.23 (0.64–2.36)		
			Trend-test *P* value: 0.87				

CI, confidence interval; JEM, job–exposure matrix; NR, not reported; OR, odds ratio; yr, year.

References

Abdolahi A, van Wijngaarden E, McClean MD, Herrick RF, Allen JG, Ganguly A, et al. (2013). A case-control study of paternal occupational exposures and the risk of childhood sporadic bilateral retinoblastoma. Occup Environ Med. 70(6):372–9. http://dx.doi.org/10.1136/oemed-2012-101062 PMID:23503471

Buckley JD, Sather H, Ruccione K, Rogers PC, Haas JE, Henderson BE, et al. (1989). A case-control study of risk factors for hepatoblastoma. A report from the Childrens Cancer Study Group. Cancer. 64(5):1169–76. http://dx.doi.org/10.1002/1097-0142(19890901)64:5<1169::AID-CNCR2820640534>3.0.CO;2-I PMID:2547509

Cordier S, Mandereau L, Preston-Martin S, Little J, Lubin F, Mueller B, et al. (2001). Parental occupations and childhood brain tumors: results of an international case-control study. Cancer Causes Control. 12(9):865–74. http://dx.doi.org/10.1023/A:1012277703631 PMID:11714115

Olshan AF, Breslow NE, Daling JR, Falletta JM, Grufferman S, Robison LL, et al. (1990). Wilms' tumor and paternal occupation. Cancer Res. 50(11):3212–7. PMID:2159375

Olshan AF, De Roos AJ, Teschke K, Neglia JP, Stram DO, Pollock BH, et al. (1999). Neuroblastoma and parental occupation. Cancer Causes Control. 10(6):539–49. http://dx.doi.org/10.1023/A:1008998925889PMID:10616823 PMID:10616823

Smulevich VB, Solionova LG, Belyakova SV (1999). Parental occupation and other factors and cancer risk in children: II. Occupational factors. Int J Cancer. 83(6):718–22. http://dx.doi.org/10.1002/(SICI)1097-0215(19991210)83:6<718::AID-IJC3>3.0.CO;2-TPMID:10597184 PMID:10597184

Togawa K, Le Cornet C, Feychting M, Tynes T, Pukkala E, Hansen J, et al. (2016). Parental occupational exposure to heavy metals and welding fumes and risk of testicular germ cell tumors in offspring: a registry-based case-control study. Cancer Epidemiol Biomarkers Prev. 25(10):1426–34. http://dx.doi.org/10.1158/1055-9965.EPI-16-0328 PMID:27439405

Wilkins JR 3rd, Wellage LC (1996). Brain tumor risk in offspring of men occupationally exposed to electric and magnetic fields. Scand J Work Environ Health. 22(5):339–45. http://dx.doi.org/10.5271/sjweh.151PMID:8923606 PMID:8923606