

**Table 2.2 Cohort studies on all neoplasms in populations exposed to dioxins in industrial cohorts and in studies on industrial accidents**

Reference, location, name of study	Cohort description	Exposure assessment	Organ site (ICD code)	Exposure categories	No. of cases/deaths	Relative risk (95% CI)*	Adjustment for potential confounders	Comments
Steenland <i>et al.</i> (1999, 2001), USA	Cohort of 5132 workers (men) in 12 plants, producing chemicals contaminated by TCDD; 3538 workers with estimated TCDD exposure; 608 workers subcohort with chloracne; mortality follow-up 1948?-1993; vital status >99%	Company questionnaires and TCDD contamination, individual occupational history; chloracne 608 workers; job-exposure matrix 3538 workers; 177 TCDD serum	All neoplasms	All	377	1.13 (1.02-1.25)		SMR
				Chloracne subcohort	73	1.25 (0.98-1.57)		SMR
				Cumulative exposure score based on JEM, septile 7 vs septile 1, 15 yr lag		1.76 (1.14-2.72)		Internal comparison, Cox regression
				<i>Cumulative exposure based on TCDD serum level, 15 yr lag</i>				
				<335 ppt-yrs		1.0		Internal comparison, Cox regression
				335-<520		1.26 (0.79-2.0)		
				520-<1212		1.02 (0.62-1.65)		
				1212-<2896		1.43 (0.91-2.25)		
2896-<7568		1.46 (0.93-2.30)						
7568-<20455		1.82 (1.18-2.82)						
>20455		1.62 (1.03-2.56)			p-value trend=0.003			

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Ott & Zober (1996), Germany	243 workers accidentally exposed to TCDD in a TCP unit in a chemical plant; exposed during accident or in clean-up or demolition; mortality and incidence 1953-1992; vital status 100%; cause of death >99%	TCDD levels in 138 subjects in 1988-92; model based estimation other workers	All neoplasms	All cancers				Mortality [ $p_{\text{trend}} = 0.07$ ]; local reference  > 1 µg/kg bw; ≥ 20 years of latency
				<0.1 µg/kg bw	8	0.8(0.4-1.6)		
				0.1-0.99 µg/kg bw	8	1.2(0.5-2.3)		
				1.0-1.99 µg/kg bw	8	1.4(0.6-2.7)		
				≥ 2.0 µg/kg bw	7	2.0(0.8-4.0)		
All cancers	13	2.0(1.0-3.4)						
Flesch-Janys et al. (1995, 1998), Germany	1189 workers employed in a herbicide plant contaminated with PCDDs/PCDFs; mortality 1952-92	PCDD/PCDF-contaminated herbicides. 2,3,7,8-TCDD biological levels in 190 workers in 1992. Model-based estimation for other workers; cumulative lifetime exposure (area under the curve)	All neoplasms	All	124	1.41(1.17-1.68)	SMRs; p-value for trend=0.01	
				<125.2 TCDDng/kg fat	28	1.24 (0.82-1.79)		
				125.2–627.1 TCDDng/kg fat	29	1.34 (0.90-1.92)		
				627.1–2503.0 TCDDng/kg fat	31	1.34 (0.91-1.90)		
				2503.0 + TCDDng/kg fat	38	1.73 (1.21-2.40)		

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Becher et al. (1996), Germany	2479 workers from four plants involved in production of phenoxy herbicides and chlorophenols; mortality 1950s-89; vital status, 95%	Herbicides, PCDDs, PCDFs, 2,4,5-T, TCP, 2,3,7,8-TCDD, chlorophenols TCP, Chlorophenols, 2,3,7,8-TCDD	All neoplasms	All	138	1.2(1.0-1.4)		SMRs; The Boehringer-Ingelheim cohort is included
				20+ yrs since first exposure	77	1.2(0.95-1.5)		
Hooiveld et al. (1998), The Netherlands	1156 male workers from Factory A involved in production of phenoxy herbicides; industrial accident in 1963; mortality 1955-1991; follow-up 99%	Company questionnaire and individual occupational history; serum TCDD levels for 47 exposed workers; modelled TCDD levels for all workers	All neoplasms	Exposed to phenoxy herbicides	51	1.5 (1.1-1.9)		SMR SMR RR, Poisson regr. RR, Poisson regr.
				Exposed during accident	20	1.7 (1.1-2.7)		
				High TCDD vs Low		4.8 (2.0-11.3)		
				Medium TCDD vs Low		4.4 (1.9-10.4)		

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Boers et al. (2010), The Netherlands	2106 male workers from Factories A and B producing phenoxy herbicides (Factory A, TCDD contaminated; Factory B, TCDD not contaminated; follow-up 99%)	Company questionnaire and individual occupational history;	All neoplasms	Factory A	112	1.3 (0.86-2.01)		
				Factory B	80	1.54 (1.0-2.37)		
				Accident, Fact A	61	1.56 (0.86-2.80)		
Kogevinas et al. (1997), International	21863 in 36 cohort from 12 countries; Mortality 20851 men, 1012 women	2,3,7,8-TCDD or higher chlorinated PCDDs versus not exposed to 2,3,7,8-TCDD or higher chlorinated PCDDs or no PCDD exposure	All neoplasms	Exposed to 2,3,7,8-TCDD and higher	710	1.1 (1.0-1.2)		Combined PCDD-exposed workers (production and spraying) from 36 cohorts with varied follow-up from 1939 to 1992
				Exposed to lower or no PCDD	398	1.0 (0.9-1.1)		

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Bertazzi et al (2001), Italy	Residents in contaminated zones after the Seveso accident: Zone A, 724; Zone B, 4824; Zone R, 31647; age, 20-74 years; mortality follow-up 1977-1996	2,3,7,8-TCDD: Zone A; soil levels, 15.5-580µg/m <sup>2</sup> ; median blood levels in adults, 389 ng/kg (back-calculation) Zone B; soil levels, <50µg/m <sup>2</sup> ; median blood levels in adults, 78 ng/kg (back-calculation)	All neoplasms	Zone A & B				
				All	249	1.0 (0.9-1.2)		
				15+ yrs latency	83	1.1 (0.9-1.4)		
				Men	166	1.1 (1.0-1.3)		
				15+ yrs latency	58	1.3 (1.0-1.7)		
				Women	83	0.9 (0.7-1.1)		
Pesatori et al (2009), Italy	Residents in contaminated zones after the Seveso accident: Zone A, 724; Zone B, 4824; Zone R, 31647; age, 20-74 years; incidence follow-up 1977-1996	2,3,7,8-TCDD: Zone A; soil levels, 15.5-580µg/m <sup>2</sup> ; median blood levels in adults, 389 ng/kg (back-calculation) Zone B; soil levels, <50µg/m <sup>2</sup> ; median blood levels in adults, 78 ng/kg (back-calculation)	All neoplasms	Zone A	44	1.03 (0.76-1.38)		
				15+ yrs latency	19	1.27 (0.81-2.0)		
				Zone B	270	1.00 (0.89-1.13)		
				15+ yrs latency	92	1.02 (0.83-1.26)		
				Zone R	1808	0.96 (0.91-1.00)		