

Table 2.2 Cohort studies of workers in the rubber industry and lymphatic and hematopoietic cancers

Reference, location, name of study	Cohort description	Exposure assessment	Organ site (ICD code)	Exposure categories	No. of cases/deaths	Relative risk (95% CI)*	Adjustment factors	Comments
Leukaemia								
Li and Yu (2002a), Shanghai, China	Nested case-control study; 1598 workers (934 men, 664 women) employed >1 year in a rubber manufacturing plant from 1973-1997; 4 controls per case, matched by gender and age (± 3 years)	Work history from company records and questionnaire; jobs coded in 5 categories	Leukemia (204-207)	<i>Job category</i> General service Milling, etc. Curing Inner tire tube Building	1 1 2 3 1	OR 0.4 (0.1-4.0) 0.4 (0.0-4.0) 0.6 (0.1-6.0) 7.8 (0.8-78.8) 0.4 (0.0-3.3)		Reference category is no exposed. Loglinear relation between the OR for leukemia and cumulative exposure years in the inner tire tube department.
Weiland <i>et al.</i> (1996); Weiland <i>et al.</i> (1998); Straif <i>et al.</i> (1998), Germany	11663 male workers aged <85 years, employed >1 year in 5 rubber plants from 1950-1981; mortality follow up 1981-91; vital status 100%; cause of death 97%	Work history reconstructed from archived cost center codes. Classified into 6 work areas by type and stage of manufacturing process	Leukemia (204-208)	Overall <i>Work area</i> Material preparation Technical rubber Tires Storage Maintenance Other	11 14 1 3 6 6	SMR 1.5 (1.0-2.1) 2.2 (1.1-3.9) 1.9 (1.0-3.2) 0.2 1.8 (0.4-5.3) 1.1 (0.4-2.5) 1.8 (0.7-3.9)	Stratified analyses by year of hire and years of employment	Local reference. Increased risk for workers in material preparation with ≥ 10 years employment. No excess due to lymphoma was observed

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Malignant lymphoma including multiple myeloma								
Mundt <i>et al</i> (1999), Germany	2871 female workers employed >1 year in 5 rubber plants and actively employed from 1976-1980; mortality follow up 1976-91; vital status 99%; cause of death 94%	Work history reconstructed from archived cost center codes. Classified into 6 work areas by type and stage of manufacturing process	Lymphatic system (200-203)	Overall <i>Year of hire</i> <1950 1950-59 ≥1960	4 0 2 2	SMR 1.8 (0.5-4.5) 0 2.7 (0.3-9.6) 1.9 (0.2-6.9)		Local reference. No excess due to leukemia was observed
Straughan and Sorahan (2000); Dost <i>et al.</i> (2007), United Kingdom, BRMA health research project II	8651 workers of 41 rubber manufacturing plants (7561 men, 1090 women) employed >1 year during 1982-1991, office workers were excluded; mortality and incidence follow-up 1983-2004; vital status 98%	Workers considered exposed if employed in rubber manufacture; period from hire as surrogate for cumulative exposure	Multiple myeloma (203)	Men Women <i>Industry sector</i> Tire Rubber goods Men Women	5 2 0 7 3 3	SMR 3.9 (1.3-9.0) 9.5 (1.2-34.4) 0 (0-7.0) 7.1 (2.9-14.7) SRR 1.2 (0.3-3.6) 8.1 (1.7-23.7)	Stratification by industry sector (tire manufacture or general rubber goods)	Local reference

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All lymphatic and hematopoietic cancers combined								
Wilczyńska et al. (2001), de Vocht et al. (2009), Poland	17636 workers (11582 men, 6054 women) employed >3 months during 1950-95 in a rubber tire plant; mortality follow-up 1950-2001; vital status 97%; cause of death 88%	JEM for exposure to aromatic amines, inhalable aerosols and rubber fumes from a database of exposure data for the European rubber industry	Lymphatic and hematopoietic tissue (200-208)	Men		SMR	5-year lagging, sex-specific analyses	No increased mortality risk of leukemia or multiple myelomas
				Overall	14	0.6 (0.4-1.1)		
				<i>Quartiles</i>				
				Aromatic amines	24	RR		
				I		1.0		
II		2.1 (0.5-7.9)						
III		1.3 (0.2-7.2)						
IV		3.0 (0.8-11.1)						

JEM-job-exposure matrix, OR-odds ratio, RR-relative risk, SMR-standardized mortality ratio, SRR-standardized rate ratio