

Table 2.1 Cohort studies of inorganic acid mists and cancer

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
<i>Metal pickling</i>								
Ahlborg <i>et al.</i> (1981) Sweden	181 men employed 1951-1979 in a stainless steel pickling house	Sulfuric and nitric acid in 1950s; oxalic acid, ammonium bifluoride, soap 1960s and 1970s	Larynx (161)	Cases in entire cohort	3	[50 (16.13-155.03)]		
Beaumont <i>et al.</i> (1987), Steenland (1997), Steenland & Beaumont (1989), Steenland <i>et al.</i> (1988) USA	1165 (1156 male) steelworkers employed ≥6 months 1940-1965 in pickling-related jobs at 3 steel-manufacturing facilities, vital status through 1986, cancer status for subset of 1031 through 1994	Sulfuric acid in 1975, 1977, 1979 averaged 0.19 mg/m ³ for personal and 0.29 mg/m ³ for area samples	Lung (162) Larynx (161)	Ever-exposed Those with 20 years latency Ever-exposed Only sulfuric acid Only other acid Sulfuric acid daily	41 14 7 3 10	SMR 1.36 (0.97-1.84) 1.50 (1.05-2.27) RR 2.19 (1.2-3.7) 2.5 (1.7-4.7)	Smoking based on estimates from smoking survey of 841 workers or next of kin.	Incidence study did not include linking to cancer registries Other acid = hydrochloric, nitric, hydrofluoric, and hydrocyanic, "hydrochloric being the most common"
Mazumdar <i>et al.</i> (1975) USA	8465 men employed in 1953 in sheet and tin mill areas of 7 steel plants, vital status through 1966	Workers in pickling, coating, or specialty finishing areas (n=2822, 2763 white, 59 nonwhite) exposed to sulfuric, hydrochloric, or phosphoric acid fumes	All cancer Respiratory cancer	White males White males	248 85	1.08 1.15		Combined risk for departments exposed to acid mists: batch pickling and sheet dryers, coating, continuous pickling and electric cleaning, sheet finishing and shipping, stainless annealing, pickling and processing, and tin finishing and shipping not shown.

Table 2.1 Cohort studies of inorganic acid mists and cancer

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
Moulin <i>et al.</i> (2000) France	4288 male workers employed ≥1 year 1968-1991 at a stainless steel and metal alloy production factory, vital status through 1992; nested case-control study of 54 lung cancer deaths with 3 controls per case, matched on sex and date of birth; Nested case-control study for lung cancer with 3 controls per case, matched on sex + birth date	Work histories assessed for exposure to metals, acid mists, other agents. JEM developed.	Larynx (161)	Employed in plant	17	SMR 1.47 (0.9-2.4)	France regional comparison rates	Comparison region not specified No women died of lung or laryngeal cancer. Smoking history from medical records.
			Lung (162)	Employed in plant	54	SMR 1.20 (0.9-1.6)		
				Exposed to acid mists	5	OR 0.57 (0.16-1.20)	Smoking, PAH and silica exposure	
Hueper (1966) USA	779 workers in isopropyl alcohol plant 1927-1950	Department	Nasal sinus (160)	Entire cohort	2	SIR [21.3, 7.9-56.1]		Risk calculation for both sites combined
			Larynx (161)	Entire cohort	2			
Lynch, <i>et al.</i> (1979) USA	Process workers (333 male, 2 female) employed ≥1 month 1950-76 + cohort of chemical mechanics, supervisors, & refinery workers (408 male) who worked on isopropyl or ethyl alcohol process units 1950-77; follow-up through 1977	Department & job title + personal recall by retirees & company supervisors & personnel employees	Larynx (161)	Entire cohort	7	SIR 3.2 [1.5-6.7] 5.0 [1.4-21.6]	US white male comparison rates	A nasopharyngeal cancer also was reported
				Process workers	4			

Table 2.1 Cohort studies of inorganic acid mists and cancer

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
Soskolne <i>et al.</i> (1984) USA	50 men among those (n unspecified) who worked ≥ 12 months at plant, 1944-80. Ascertained: 14 while case employed, 12 as deceased annuitants, 3 ethanol unit follow-up, 8 living annuitant follow-up, 2 living annuitants who notified medical department, 11 non-company tumour registry, all histologically confirmed; controls, 225 men from same cohort, matched (3+:1) by duration of employment ± 4 years, year of first employment ± 3 years, age ± 3 years, race)	Plant industrial hygienist assigned ordinal grade (0-5) of likely sulfuric acid, ethyl alcohol, isopropyl alcohol, asbestos, nickel, and wood dust exposures to department- job-era categories, analyzed by mean grade over work history. Analysis presented for sulfuric acid only. Moderate 1.10-2.09 mean grade, high 2.10-4.88 mean grade	6 oropharynx (146), 2 naso-pharynx (147), 2 hypo-pharynx (148), one pharynx unspecified (149.0), 5 nose, nasal cavities, middle ear, accessory sinuses (160), 34 larynx (161)	Sulfuric acid "high" Sulfuric acid "moderate"	15 29	OR 5.2 (1.23-22.1) 2.9 (0.74-11.3)	Alcoholism, smoking (from plant medical records for those who did not leave employment <1955)	
Enterline (1982) USA	433 workers employed ≥ 3 months 1941-1965 in an isopropyl alcohol unit; 125 of 433 workers subsequently worked in jobs involving probable exposure to epichlorohydrin (ECH); follow-up through 1978	Department	Buccal cavity and pharynx (140-149)	Entire cohort Workers not subsequently employed in ECH unit	2 2	SMR 4.0 [1.0-16.0] 5.4 [1.4-21.6]	Texas comparison rates	

Table 2.1 Cohort studies of inorganic acid mists and cancer

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
Weil, <i>et al.</i> (1952) USA	182 workers employed 1928-1950 in an isopropyl alcohol unit	Department	Larynx (161) Nasal sinus (160)	Entire cohort Entire cohort 71 workers employed >5 years	1 4 4	$P < 1.0 \times 10^{-7}$		p value for 4 cases among 71 workers
Ott <i>et al.</i> (1989) USA	129 lymphohematopoietic malignancies (excluding Hodgkin disease) on 5785 death certificates from cohort mortality study; Controls randomly selected from cohort of 29,139 men, matched to cases (5:1) by decade of 1 st hire, survival at least to start of same 5-year period of employment as cases.	Job histories evaluated to start of final case 5-year period of employment. 21 "suspect" substances and 1020 substances in 52 groups rated as ever/never in each work area.	Non-Hodgkin lymphoma (200) Multiple myeloma (202)	Alkyl sulfates Ethanol unit Alkyl sulfates	8 5 1	OR 5.1 p<0.05 5.4 p<0.05 1.7		
Teta <i>et al.</i> (1992) USA	Isopropyl alcohol and ethyl alcohol male manufacturing workers 538 workers employed 1928-49 in isopropyl strong acid unit and/or 1930-68 in ethyl strong acid unit	Department and era	Buccal cavity and pharynx (140-149) Larynx (161) Lympho-sarcoma, reticulo-sarcoma (200)	Entire cohort Entire cohort Entire cohort	2 1 5	SMR 1.5 expected [1.33] (0.2-4.8) [1.43] (0-8.0) 5.6 (1.8-13.0)	U.S. national comparison rates	SMRs not all presented but confidence intervals were

Table 2.1 Cohort studies of inorganic acid mists and cancer

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
Teta <i>et al.</i> (1992) USA	Isopropyl alcohol and ethyl alcohol manufacturing male workers 493 workers (92 isopropyl, 316 ethyl) employed 1941-50 in isopropyl strong acid unit, 1949-92 in isopropyl weak acid unit, 1941-68 in ethyl strong acid unit, and/or 1969-85 in ethyl weak acid unit	Department and era	Buccal cavity and pharynx (140-149)	Entire cohort	1	SMR [1.43] (0-8.4)	U.S. national comparison rates	SMRs not presented but confidence intervals were
			Larynx (161)	Entire cohort	1	[3.33] (0.1-18.6)		
			Leukemia, aleukemia (204-ICD7)	Entire cohort	2	[2.86] (0.3-10.3)		
Alderson & Rattan (1980) UK	262 men employed 1949-80 in isopropyl alcohol unit for ≥ 1 continuous year	Department	Buccal cavity and pharynx (140-149)	Entire cohort	0	SMR	England and Wales national comparison rates	Average follow-up 15.5 years – possible insufficient latency for some workers
			Nasal sinus (160)	Entire cohort	1	50.0 p= 0.017		

Table 2.1 Cohort studies of inorganic acid mists and cancer

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
<i>Acid manufacture</i>								
Englander <i>et al.</i> (1988) Sweden	400 men employed ≥6 months 1961-1981 in a sulfuric acid factory, vital status through 1985	Sulfuric acid area samples 0.1-3.1 mg/m ³ , personal samples <0.1-2.9 mg/m ³	Mortality all cancer	Entire cohort	8	SMR 0.88, p>0.5	Mortality: Malmöhus county (excluding Malmö) rates. Incidence: Southern Swedish Regional Tumor Register	
				≥5 years latency	7	0.89, p>0.5		
				Morbidity	5	SIR 2.00, p=0.11		
				Respiratory cancer	4	1.83, p=0.18		
				Gastroin- testinal cancer	6 5	1.69, p=0.18 1.64, p=0.24		
Bladder cancer	5 5	3.77, p=0.01 4.36, p=0.006						
Hilt <i>et al.</i> (1985) Norway	287 men who worked at a nitric acid production plant 1928-1980, in Cancer Registry 1953-1980	Exposed to nitric acid vapors, nitrous gases, ammonia, asbestos	Lung and pleural (162/3)	Entire cohort	17	O/E 4.5 (2.6-7.2)	Norwegian Cancer Registry	There was also a case of laryngeal cancer
Pesatori <i>et al.</i> (2006) Italy	1409 (1372 male, including 1124 production workers and 248 white-collar workers, 37 female) employed ≥1 year 1962-1997 in a sulfuric acid factory, vital status through 2000.	Sulfuric acid area sample medians: 1977, 1.4 mg/m ³ ; 1979, 0.9 mg/m ³ ; 1981, 1.2 mg/m ³ . Threshold limit value (1 mg/m ³)	Larynx (161)	Male production workers	4	SMR 1.30 (0.35-3.33)	Tuscany comparison rates	505 of 1096 traceable male production workers previously worked in pyrite mining; 594 did not.
				No prior pyrite exposure	2	1.61 (0.20-5.82)		
				Male production workers	27	0.82 (0.54-1.20)		
				No prior pyrite exposure	5	0.39 (0.13-0.90)		
				Myeloid leukemia (205)	4 3	3.10 (0.84-7.94) 5.23 (1.08-15.3)		

Table 2.1 Cohort studies of inorganic acid mists and cancer

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
Rapiti, <i>et al.</i> (1997) Italy	505 men employed for any time from 17 February 1954 through 31 August 1970, vital status through 1991	125 ever worked in acid mixtures work process (sulfuric acid, nitric acid)	Cancer mortality	Entire acid mix group	18	SMR 1.04 (0.67-1.53)	Italian regional comparison rates; 90% confidence intervals	Factory opened 1913, no pre-1954 data, no analysis by duration of exposure or separately for those employed in earlier years Comparison region not specified
			Lung (162)	Entire acid mix group	8	1.62 (0.81-2.92)		
				30+ years latency	6	1.99 (0.87-3.92)		
Soap manufacture								
Forastiere <i>et al.</i> (1987) Italy	361 men employed ≥1 year 1964-1972, vital status 1969-1983, cancer incidence 1972-1983	Sulfuric acid vapors in hydrolysis and saponification areas, 0.64-1.12 mg/m ³	Larynx (161)	Entire cohort	1 death 5 cases	SMR 2.30 (0.1-11.4) 0.72 or 1.44 expected, depending on reference rates 1.69 (0.55-3.9)	All laryngeal cancer cases were smokers	
			Lung (162)	Entire cohort	5 deaths			
Phosphate processing & fertilizer manufacture								
Block <i>et al.</i> (1988) USA	3451 males (2610 white, 841 black) employed ≥6 months between 1950 and 1979 in phosphate fertilizer manufacture, vital status through 1981	Industrial hygiene analysis found only Maintenance and Chemical/ Fertilizer jobs had potential exposure to dust, fumes [mists?], or radiation	Lung (162)	Nonwhite males	9	SMR 1.04 1.62 p<0.05 1.42 0.86 1.22 1.64 1.61 2.48 p<0.05 1.91	US national comparison rates No lung cancer in non-smokers in group for which smoking data were available	
				White males	37			
				Employed ≥1 yr	27			
				1-9 years	9			
				With 20+ years latency	4			
				10-19 years	8			
				With 20+ years latency	3			
Larynx (161)	≥20 years	10						
	Nonwhite males	0						
	White males	2						

Table 2.1 Cohort studies of inorganic acid mists and cancer

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
Checkoway, <i>et al.</i> (1996), Checkoway <i>et al.</i> (1985a), Checkoway <i>et al.</i> (1985b) USA	22992 males (18446 white, 4546 nonwhite) employed in phosphate processing at 16 companies ≥ 3 months 1949-1978 and ≥ 12 months total, vital status through 1992	Job and department classified by exposure level to 6 agents	Lung (162)	White males	354	SMR 1.19 (1.07-1.32)	US national comparison rates	Vital status was updated but work histories were not
				Nonwhite males	105	1.13 (0.92-1.37)		
				<i>≥ 5 years sulfuric acid production:</i>				
				Whites	5	1.15		
				Nonwhites	1	2.07		
				<i>≥ 5 years phosphoric acid production:</i>				
Whites	9	1.66						
Nonwhites	1	0.49						
Stayner <i>et al.</i> (1985) USA	3199 (2981 male, 212 female, 6 sex unknown) employed 1953-1976 in phosphate fertilizer manufacture, vital status through 1977	Industrial hygiene survey in 1976, 8 sulfuric acid samples, 0.013-0.22 mg/m ³	Lung (162)	Entire cohort	10	SMR (90% CI) 1.13 (0.6-1.9)	US national comparison rates	
				White males	5	0.85		
				Nonwhite males	5	1.82		
				<i>Nitrate and/or phosphate fertilizer manufacture</i>				
Al-Dabbagh <i>et al.</i> (1986) UK	1448 (1327 male, 121 female) employed ≥ 1 year between 1946 and March 1981 in nitric acid or nitrate fertilizer manufacture, vital status through 1981	Exposure to nitrates but not to nitric acid mists estimated; compared with salivary nitrate and nitrite in current workers	Oesophagus (150)	Men heavily exposed (to nitrates)	3	[2.38 (0.77-7.38)]	Northern England and England and Wales national comparison rates both used	Includes only a 35% random sample of unvested employees who left work 1962-1972. No records for pre World War II employment (plant opened 1923). No separate analysis for nitric acid plant.
			Stomach (151)	All other men	2	[2.27 (0.57-9.09)]		
				Men heavily exposed (to nitrates)	7	[0.97 (0.46-2.03)]		
			Lung (162)	All other men	5	[1.03 (0.43-2.48)]		
				Men heavily exposed (to nitrates)	25	[1.19 (0.80-1.76)]		
			All other men	10	[0.68 (0.37-1.26)]			

Table 2.1 Cohort studies of inorganic acid mists and cancer

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
Bulbulyan <i>et al.</i> (1996) Russia	4996 (2039 men, 2957 women) employed ≥ 2 years between 1945 and 1985 in sulfuric acid tower, sulfuric acid contact, ammonia, phosphoric acid, nitric acid, or fertilizer manufacture departments of a large plant, vital status through 1990	Cumulative exposure calculated for nitrogen oxides, SO ₂ , and arsenic, but not acid mists	Stomach (151)	Sulfuric acid tower department	13	SMR 1.69 (0.90-2.89)	Moscow region comparison rates	Insufficient latency for any workers starting after 1980. No separate results for sulfuric acid contact, phosphoric acid, or nitric acid departments
				Men	11	2.04 (1.02-3.66)		
			Lung (162)	Sulfuric acid tower department	11	1.86 (0.93-3.34)		
				Men	10	1.87 (0.90-3.44)		
Fandrem <i>et al.</i> (1993) Norway	2023 men employed ≥ 1 year in calcium nitrate, fertilizer, or related departments and first employed between 1945 and 1979, cancer incidence 1953-1988	Measured nitrate dust levels used to construct job exposure matrix; exposure to nitric acid mists not estimated	Stomach (151)	<i>Nitrate index</i>		SIR	Norway national comparison rates	Factory complex includes nitric acid manufacture plant; this was not one of the "related departments" in the cohort
				1-19 level-years	6	0.85 (0.31-1.85)		
				20-39 level-years	3	0.83 (0.17-2.44)		
				40-59 level-years	3	1.07 (0.21-3.14)		
				60+ level years	3	0.88 (0.17-2.51)		
				Lung (162)	1-19 level-years	14		
20-39 level-years	5	0.91 (0.29-2.13)						
40-59 level-years	5	1.16 (0.37-2.72)						
60+ level years	6	1.02 (0.37-2.22)						
Hagmar <i>et al.</i> (1991) Sweden	2,131 males employed ≥ 3 months between 1963 and 1985 in nitrate fertilizer manufacture; 1,236 males employed ≥ 3 months between 1906 and 1962 in phosphate fertilizer manufacture, cancer morbidity 1958-1986	Nitrate exposure calculated & cumulative dose estimated for 1460 nitrate workers; exposure to nitric acid mists not estimated	Salivary gland (142)	Nitrate workers	2	SIR 6.45 (0.78-23.3)	≥ 10 years latency period Southern Sweden comparison rates	
				Phosphate workers	2	4.41 (0.53-15.9)		
			Lung (162)	Nitrate workers	10	0.90 (0.4-1.7)		
				Phosphate workers	24	1.50 (0.98-2.3)		

Table 2.1 Cohort studies of inorganic acid mists and cancer

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
Rafnsson & Gunnarsdóttir (1990) Iceland	603 men hired from 1954 through 1985 at a nitrate fertilizer plant	Plant produces nitric acid and uses it to make fertilizer, but exposure to nitric acid mists not estimated	Lung (162)	Entire cohort	4	SMR 1.39 (0.38-3.56)	Icelandic national comparison rates	Vital status through 1985? (not stated explicitly). 1974-85 hires (n=252) have insufficient latency
			Stomach (151)		4	0.93 (0.25-2.37)		
Zandjani <i>et al.</i> (1994) Norway	1756 men employed ≥1 year between 1947 and 1980 in a nitrate fertilizer plant, vital status and cancer incidence through 1992	Departments include nitric acid, but exposure to nitric acid mists not estimated	Stomach (151)	Hired before 1960	27	SIR 1.50 p<0.05	Rural Norway comparison rates	Results presented for some departments but not the nitric acid department
				Hired 1960 or later	1	0.53		
			Testis (178)	Hired before 1960	2	1.25		
				Hired 1960 or later	5	3.33 p<0.05		
Coggon <i>et al.</i> (1996) UK	4401 men who worked 1950-1990 at two battery manufacture (1243 workers) and two steel works factories (3158 workers) (different dates for each factory), vital status to 1993; 2678 (772 battery, 1906 steel works) definitely exposed to acid mists	Work histories reviewed and classified by likelihood of acid mist exposure	Lung (162)	Definitely exposed to acid mists	83	SMR 0.98(0.78-1.2)	UK national comparison rates	Results not presented separately for battery and steel plants
			Larynx (161)	Definitely exposed to acid mists	1	0.48 (0.01-2.7)		

Table 2.1 Cohort studies of inorganic acid mists and cancer

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
Coggon <i>et al.</i> (1996) (contd.)	<i>Nested case-control study</i> 15 men with upper aerodigestive cancer from a cohort of 4401 men who worked 1950-1990 at 2 battery manufacture and 2 steel works factories, 75 controls from the cohort, matched by date of birth and factory	Work histories reviewed and classified by likelihood of acid mist exposure. High exposure = >1 mg/m ³	Upper aerodigestive (140-141, 143-149, 160-161)	<i>Maximum acid exposure:</i>		OR		
				Low	2	1.9 (0.2-15.8)		
				High	9	1.3 (0.3-5.7)		
				Uncertain	1	1.0 (0.1-12)		
				<i>Cumulative acid exposure:</i>				
Intermediate or uncertain	5	1.0 (0.2-4.6)						
≥5 years high exposure	7	2.0 (0.4-10)						
Cooper <i>et al.</i> (1985) USA	4519 men employed ≥1 year 1947-1970 in 10 battery plants, vital status through 1980		Lung (162)	Entire cohort employment:	109	SMR 1.24 (1.02-1.5)	US white male comparison rates	No mention of acid in paper
				1-9 years	20	1.67 p<0.05		
				10-19 years	21	1.56		
				≥20 years	53	1.05		
				Entire cohort employment:				
Larynx (161)	6	1.28 (0.47-2.8)						
	1-9 years	1	1.85					
	≥20 years	4	1.41					
Malcolm & Barnett (1982) UK	1898 pensioners (1644 men, 254 women) employed 1892-1976 at 4 acid battery factories	Lead exposure classified as none, light, high. Acid exposure not categorized	All cancer	Males Females	293 25	[1.05 (0.94-1.18)] [1.00 (0.68-1.48)]	England and Wales national comparison rates	No records on unvested former workers

Table 2.1 Cohort studies of inorganic acid mists and cancer

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			
Sorahan & Esmen (2004) UK	926 men employed ≥1 year 1947-1975 in a nickel-cadmium battery plant, vital status through 2000	Cumulative cadmium exposure from work histories and job-exposure matrix. Sulfuric acid used 1947-1972 to dissolve nickel powder	Pharynx (146-149)	Entire cohort	4	SMR 5.59 (1.52-14.3)	England and Wales national comparison rates				
			Larynx (161)	Entire cohort	2	1.95 (0.24-7.06)					
			Lung (162)	Entire cohort	45	1.11 (0.81-1.48)					
				Hired 1947-1956	29	1.31					
				Hired 1957-1966	12	0.94					
						Hired 1967-1975			4	0.69	p-trend=0.15
						1-9 years from year of hire			7	1.49	
						10-19 years from year of hire			6	0.63	
						20-29 years from year of hire			15	1.21	
						≥30 years from year of hire			17	1.21	p-trend=0.72
OTHER INDUSTRIES											
Bond et al. (1986), Bond et al. (1991) USA	308 male decedents from cancers of the lung, trachea, and bronchus from a cohort of 19,608 employees (other causes) and 308 living from same cohort, matched to cases on race, birth year ± 5 years, year of hire, death year ≤5 years (for decedents)	Industrial hygienist reviewed each job for hydrochloric acid exposure, based on monitoring data 1974-1983	Lung (162)	Hydrochloric acid ppm-year 0.1-3.9 4.0-12.4 ≥12.5	62 45 22	RR 0.9 (0.6-1.3) 1.2 (0.8-1.9) 1.0 (0.6-1.8) p-trend = 0.35	Smoking	Referent group is the unexposed Matching on year of birth, year of first employment, and year of death may be overmatching “Living” controls could also be deceased if they died after the cases. Fifty decedent controls and 14 of the 97 dead “living” controls died of cancer.			

Table 2.1 Cohort studies of inorganic acid mists and cancer

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
Grimsrud et al. (2005) Norway	213 lung cancer cases who worked ≥ 1 year in a nickel refinery 525 controls (worked ≥ 1 year in the refinery, matched by sex and birth year, free of lung cancer at time case diagnosed)	Refinery exposure assessment, interview re other jobs	Lung (162)	<i>Sulfuric acid mist ($mg/m^3 \times years$)</i>		Adjusted OR	Smoking; exposures to nickel, arsenic, asbestos, and cobalt in the refinery; exposure to carcinogens in other employment	Unexposed are the referent group
				Low (0.02-0.7, mean 0.3 ± 0.2)	9	1.0 (0.4-2.3)		
				Medium (0.7-4.0, mean 2.3 ± 1.0)	11	1.0 (0.4-2.4)		
				High (4.1-37, mean 9.1 ± 7.0)	14	0.8 (0.3-2.0)		