Table 2.1. Case-control studies of arsenic exposure and cancer

Reference, study location and period	Organ site (ICD code)	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	Relative risk (95% CI)*	Adjustment for potential confounders	Comments
Wicklund *et al.* (1988) Washington state, 1968-1980	Respira-tory cancer	155 male white orchardists who died in Washington state between 1968 and 1980 from respiratory cancer.	155 male white orchardists who died in Washington state between 1968 and 1980 from causes other than respiratory cancer; refusal rate 4.9%; two groups of non orchardists also matched to case subjects	Interviewer-administered standardized questionnaire	<u>Types of Exposure</u>		Smoking	Interview of next of kin
					Lead arsenate exposure exclusively	0.79 (0.25-2.5)		
					DDT exposure exclusively	0.91 (0.4-2.08)		
					Both lead arsenate and DDT exposure	1.12 (0.56-2.23)		
					Neither lead arsenate nor DDT exposure	1.00		
					<u>Years of lead arsenate use</u>			
					1 -14	1.42 (0.81-2.47)		
					15 or more	0.66 (0.37-1.18)		
					No exposure	1.00		
					<u>Acres on which lead arsenate sprayed</u>			
					1-24	0.69 (0.38-1.24)		
					25 or more	1.29 (0.74-2.24)		
					No exposure	1.00		
					<u>Acres of lead arsenate use</u>			
					1-49	0.94 (0.54-1.62)		
					50 or more	1.07 (0.59-1.92)		
					No exposure	1.00		

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Pesch *et al.* (2002) Slovakia, 1996-99	Skin	264 non melanoma skin cancer cases registered at the Department of Pathology of Bojnice Hospital, Slovakia. Cases were recruited if they were: 1. Current residents of the districts 2. Not older than age 80 years 3. Diagnosis of NMSC as primary tumor	286 Population controls matched to cases on gender and age (5-year classes) from a random address sample of the mandatory registry of the district	Interviews conducted by trained staff using a standardized questionnaire ascertaining demographic characteristics with detailed occupational and residential history and details on diet, outdoor activities, skin type and smoking habits. Environmental arsenic exposure with residential history. Arsenic in drinking water, food was also considered.	*Arsenic exposures with the place of residence as a proxy of distance related exposure measures*		Correction for spatial selection bias Gender Age (cut off age: 60 years)	1. When the spatial trend in the NMSC incidence was attributed to environmental arsenic exposure, confounding by the emission of large quantities of other agents from power plant as well as chemical plants could not be excluded. 2. The individual arsenic dose for a study subject cannot be assessed precisely by means of a questionnaire or by using environmental data, particularly for past exposure. 3. Reliability of food frequency data are limited. 4. Diet rich in fruits and vegetables may have masked the adverse effects of arsenic 5. Historical data on arsenic in drinking water was missing. 6. High urinary and soil arsenic concentrations in the vicinity of chemical plants
					<u>Without interaction terms</u>			
					Low Exposure	1.00		
					Medium Exposure	1.72 (1.42-2.08)		
					High Exposure	1.90 (1.39-2.60)		
					Trend test	1.50 (1.31-1.72)		
					<u>With interaction terms</u>			
					Low Exposure	1.00		
					Medium Exposure and male gender	2.41 (1.85-3.14)		
					High Exposure and male gender	1.75 (1.14-2.70)		
					Medium Exposure and female gender	1.28 (0.79-1.99)		
					High Exposure and female gender	2.19 (1.61-3.10)		
					Assessment using dietary arsenic exposures (weighing food frequencies with arsenic concentration and annual food consumption of food items)			
					Low	1.00		
					Medium	0.86 (0.59-1.26)		
					High	1.19 (0.64-2.12)		
					Assessment using dietary arsenic exposures (weighing food frequencies with arsenic concentration and consumption of homegrown food items)			
					Low	1.00		
					Medium	1.12 (0.77-1.64)		
					High	1.83 (0.98-3.43)		

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Beane Freeman *et al.* (2004) Iowa, 1999-2000	Skin – Malig-nant melano-ma	645 eligible cases of melanoma ascertained through Iowa Cancer Registry. Only whites aged more than 40, yielding 662 eligible and 368 cases (57.1% responded to survey); 355 (55% provided toenail clippings)	732 eligible (randomly selected) colorectal cancer cases identified through Iowa Cancer Registry. 373 participants (50.9% submitted the survey) and 353 (48.2% provided toenail clippings)	Measurement of toenail arsenic content using atomic assumption spectrophotometry	<u>Toenail arsenic (μg/g)</u> ≤0.020 0.021-0.039 0.040-0.083 ≥0.084 *p* for trend = 0.001	**OR** 1.0 1.0 (0.6-1.6) 1.7(1.1-2.7) 2.1(1.4-3.3)	Age Gender Education	Comparison group consists of cancer cases, old age group, more male control participants Relatively low response rate. Ingestion important route of exposure.
Kennedy *et al.*(2005) Leiden, The Netherlands	Skin	161 with Squamous Cell Carcinoma (SCC), 302 with nodal basal cell carcinoma (nBCC), 152 with superficial multifocal basal cell carcinoma (sBCC), 12 with malignant melanoma (MM) 2.4% men and 0.8% women were exposed to Arsenic	386 controls; no additional data were provided	Exposure was assessed using personal interview data: Number of days of exposure per year, number of years of exposure	<u>Cancer among men</u> SCC nBCC sBCC MM	 1.9 (0.3-13.0) 2.0 (0.4-10.8) 3.2 (0.5-19.9) 7.1 (1.1-45.5)	Age Skin type Smoking	

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Taeger *et al.* (2008) East Germany, 1946-1990	Lung cancer (ICD-9 162)	3174 deceased male workers with known history of uranium mining who died from lung cancer. Mean age at death was 61.93 years.	4892 deceased male workers with known history of uranium mining who died from circulatory diseases. Mean age at death was 62.91 years.	Exposure data were extracted from a detailed WISMUT JEM for different jobs in various mining facilities. Annual levels of Arsenic quartz and radon were measured with available measurements, measurements based on remodeled historical exposure settings, model calculations and expert ratings. Individual cumulative arsenic exposure was measured as arsenic years (accumulated arsenic exposure in µg/m^3 as annual shift times duration of exposure in years)	 Arsenic (µg/m^3 × years) *All miners* 0 >0-125.83 ≥125.83 *Silicotics* 0 >0-125.83 ≥125.83 *Non silicotics* 0 >0-125.83 ≥125.83	**OR** 1.00 1.43 (1.27-1.6) 1.07 (0.94-1.21) 1.00 1.78 (1.43-2.2) 1.39 (1.13-1.71) 1.00 1.34 (0.16-1.55) 1.18 (0.99-1.4)	Age Calendar year	For exposure to arsenic in drinking water there is limited previous evidence of ischemic heart disease. Such data is however not available for inhaled arsenic at the time of the study.

*Data presented as odds ratios (OR).