

Table 2.11. Summary of epidemiological studies of arsenic in drinking-water and other cancers

Reference	Location	End-point	Exposure	Site	No. of cases	Study outcome	Comments	
<i>Ecological studies</i>								
Taiwan								
Chen <i>et al.</i> (1985)	84 villages on the SW coast	Mortality 1968–82, all ages	Endemic area for chronic arsenic toxicity (Blackfoot disease)	Colon	Men	Age- and sex-adjusted SMR (95% CI)	SMRs for a total of 11 sites. Prostate not investigated; mid-year population: 141 733 in 1968, 120 607 in 1982; national rate in 1968–82 used as the standard for estimation of SMR	
				Small intestine	54	1.6 (1.2–2.0)		
				Leukaemia	17	2.98 (0.6–3.4)		
					45	1.4 (1.0–1.8)		
				Colon	Women	1.7 (1.3–2.1)		
				Small intestine	61	0.97 (0.1–1.8)		
Chen <i>et al.</i> (1988a)	42 villages on the SW coast	Mortality 1973–86, all ages	Median level of arsenic in drinking-water grouped into 3 strata, 1962–64	Prostate		Age-standardized mortality rates per 100,000	899 811 person–years, rate per 100 000, age-standardized to 1976 world population	
						General population		1.5
						< 300 µg/L		0.5
						300–600 µg/L		5.8
						> 600 µg/L		8.4

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Wu <i>et al.</i> (1989) (contd)			> 600 µg/L	Prostate	3 M	9.18		
				Leukaemia	1 M	2.69		
					0 F	0.00		
				Nasopharynx	2 M	8.58		
					1 F	4.89		
				Oesophagus	2 M	6.55		
					0 F	0.00		
				Stomach	10 M	56.42		
					2 F	5.98		
				Colon	3 M	12.5		
	5 F	17.21						
			Uterine cervix	1 F	3.92			
Chen & Wang (1990)	42 villages on the SW coast	Mortality 1972–83, all ages	National survey of 83 656 wells (1974– 76); average arsenic content for each of 314 precincts or townships			Percentiles of age- adjusted mortality rate/100 000 person–years		
					<i>Men</i>	<i>25th</i>	<i>50th</i>	<i>75th</i>
				Oesophagus		3.6	6.0	9.2
				Stomach		14.8	10.2	28.8
				Small intestine		0.6	1.1	1.9
				Colon		4.2	5.6	7.2
				Rectum		1.9	2.7	3.9
				Pancreas		1.3	2.1	3.0
				Nasal cavity		1.1	1.3	2.6
				Larynx		1.1	1.7	2.8
				Bone/cartilage		1.1	1.8	2.9
				Prostate		0.9	1.4	2.3
				Brain		0.7	1.1	1.8
				Leukaemia		1.3	2.1	2.7

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Chen & Wang (1990) (contd)					<i>Women</i>	<i>25th</i> <i>50th</i> <i>75th</i>		
				Oesophagus		1.1	1.8	2.8
				Stomach		7.2	10.0	13.7
				Small intestine		0.6	0.9	1.6
				Colon		3.6	5.5	6.9
				Rectum		1.5	2.3	3.3
				Pancreas		1.4	2.1	2.7
				Nasal cavity		0.6	1.0	1.6
				Larynx		0.5	0.9	1.5
				Bone/cartilage		1.0	1.7	2.5
				Breast		2.7	4.4	6.2
				Cervix uteri		3.8	6.2	8.3
				Ovary		0.8	1.4	2.0
				Brain		1.0	1.5	2.2
Leukaemia		1.1	1.7	2.4				
Tsai <i>et al.</i> (1999)	Four townships (SW)	Mortality 1971–94, all ages	Endemic area for chronic arsenic toxicity		<i>Men</i>	SMR (95% CI)	SMRs with national reference, unless otherwise stated; *SMRs with local reference Men, 1 508 623 person–years; women, 1 404 759 person–years; national rates in 1971–94 used as the standard for SMR estimation	
				Pharynx	24	1.1 (0.7–1.7)		
				Oesophagus	69	1.7* (1.3–2.1)		
				Stomach	195	1.4* (1.2–1.5)		
				Intestine	15	2.1 (1.2–3.5)		
				Colon	91	1.4 (1.1–1.7)		
				Rectum	46	1.2 (0.9–1.7)		
Nasal cavity	40	3.7 (2.6–5.0)						

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Tsai <i>et al.</i> (1999) (contd)				Larynx	30	1.8 (1.2–2.5)		
				Bone	41	2.3 (1.7–3.2)		
				Prostate	48	1.96 (1.4–2.6)		
				Brain	19	1.1 (0.7–1.8)		
				Lymphoma	56	1.4 (1.1–1.8)		
				Leukaemia	67	1.3 (1.04–1.7)		
				<i>Women</i>				
				Pharynx	10	2.2 (1.1–4.1)		
				Oesophagus	12	0.8 (0.4–1.4)		
				Stomach	111	1.4* (1.2–1.7)		
				Intestine	8	1.3 (0.5–2.5)		
				Colon	83	1.4* (1.1–1.8)		
				Rectum	33	1.5* (1.03–2.11)		
				Nasal cavity	29	5.1 (3.4–7.3)		
				Larynx	13	3.8 (2.0–6.4)		
				Bone	34	2.2 (1.5–3.1)		
				Brain	21	1.8* (1.1–2.7)		
				Lymphoma	35	1.4 (1.0–2.0)		
				Leukaemia	40	1.1 (0.8–1.4)		
Chile								
Rivara <i>et al.</i> (1997)	Regions II and VIII, northern Chile	Mortality 1950–92	Arsenic-contaminated Region II	Larynx		Relative risk (Region II versus Region VIII), 3.4 (95% CI, 1.3–8.6)	Population: 411 000 in Region II, 1 700 000 in Region VIII. Antofagasta (Region II) versus Region VIII.	

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<i>Cohort studies</i>								
Japan								
Tsuda <i>et al.</i> (1995)	454 residents living in Namikicho and Nakajomachi in Niigata Prefecture	Mortality 1959–92	High-dose arsenic contamination (through a factory) of well-water used for drinking (1955–59)	Uterus	0 0 2 2	Arsenic concentration (ppm) < 0.05 0.05–0.99 ≥ 1 Total	SMR (95% CI) 0.0 (0–8.0) 0.0 (0–37.6) 13.5 (2.4–48.6) 3.0 (0.5–11.1)	113 persons who drank from industrially contaminated wells in 1955–59, then followed for 33 years; rates in Niigata Prefecture in 1960–89 used as the standard for estimation of SMR

SMR, standardized mortality ratio; CI, confidence interval; M, male; F, female; SIR, standardized incidence ratio; OR, odds ratio