

**Table 2.9. Case-control studies of exposure to radium-224, 226 or 228 and their decay products**

Reference, study location and period	Characteristics of cases	Characteristics of controls	Exposure assessment	Organ site (ICD code)	Exposure categories	Relative risk (95% CI)	Adjustment for potential confounders	Comments
Guse <i>et al.</i> (2002) Wisconsin, USA 1980–97	319 Wisconsin residents reported to the state cancer-reporting system. Data completeness of system 93–95%.	10 controls per case (total of 3198), selected from the general population.	Data on public utilities' measurements of total $\alpha$ and on Ra-226 & Ra-228 levels in drinking water, linked to ZIP codes.	Osteosarcoma	<u>Maximum total Ra (pCi/l):</u> <2.5 (or total $\alpha$ <3): 2.5–4.9: 5.0–20.6: 20.7–29.2 29.3 or more <u>Median total Ra (pCi/l):</u> <2.5 (or total $\alpha$ <3): 2.5–4.9: 5.0–7.6: 7.7–8.95 8.96 or more	1.0 0.69 (0.42–1.15) 0.81 (0.56–1.15) 1.12 (0.56–2.23) 0.49 (0.15–1.59) 1.0 0.92 (0.58–1.43) 0.86 (0.56–1.33) 0.49 (0.21–1.15) 1.00 (0.49–2.05)	Age Percentage of handlers/equipment cleaners/labourers in ZIP code. Percentage below poverty line in ZIP code.	Lack of individual-level data on water consumption and other potential risk factors. Exposures much lower than in studies of radium dial painters.
Hirunwatthanakul <i>et al.</i> (2006) Songkhla Province, Thailand 1999–2004	32 confirmed cases, resident in Na Mon district, who were identified from regional cancer registry, the local radiotherapy unit, or hospital. All but two cases were deceased in 2004.	Four controls per case, sampled from the general population resident in the same district, matched by age and gender.	Amount of drinking water per day and information on other risk factors, assessed by interviews with study subjects or relatives. Place of residence linked to GIS map on radium concentrations in shallow well water.	Oral cavity, pharynx and oesophagus	Estimated radium intake from drinking water: <50 Bq/day 50–100 Bq/day >100 Bq/day	1.00 2.83 (0.50–16.2) 29.8 (4.39–201)	Gender, 5-year birth cohort, tobacco consumption, betel chewing status, consumption of sea food, fresh water fish and vegetables.	Availability of individual-level data on water consumption, obtained directly from controls and from alive cases (n= 2) or relatives of deceased cases (n= 30). Small total number of cases. Large relative risks reported for other potential risk factors.