

Table 2.3 Case-control studies of exposure to formaldehyde and cancer of the nasopharynx

Reference, study location, and period	Characteristics of cases	Characteristics of controls	Exposure assessment	Organ site (ICD code)	Exposure categories	Number of Exposed Cases	Relative risk (95% CI)	Adjustment for potential confounders	Comments
Olsen <i>et al.</i> (1984) Olsen & Asnaes (1986), Denmark, 1970–82	754 incident patients [sex distribution not reported] selected from the Danish Cancer Registry including 488 carcinomas of the nasal cavity and sinuses and 266 carcinomas of the nasopharynx	2465 patients with cancers of the colon, rectum, prostate and breast; frequency-matched by sex, age (± 5 years) and year of diagnosis (± 5 years); 4.2% of men and 0.1% of women exposed to formaldehyde	Record linkage with pension fund with compulsory membership; job title from Central Pension Registry; exposure assessed blindly as certain, probable, unlikely, unknown	Nasopharynx (146) (ICD revision not given)	Industries and occupations with certain or possible exposure Men Women	NR NR	0.7 (0.3–1.7) 2.6 (0.3–21.9)	Unadjusted	Among controls, 4.2% of men exposed, 0.1% of women
Vaughan <i>et al.</i> (1986a), USA, 1979–83	285 incident cases [sex distribution not reported] identified by the local Cancer Surveillance System, aged 20–74 years, including oro- and hypopharynx (205), nasopharynx (27) and sinuses (53)	552 identified by random-digit dialling	Job–exposure linkage system based on industry and occupation, resulting in four categories: high, medium, low and background	Nasopharynx	Low exposure Medium or high exposure # years 1-9 10+ Exposure Score 5-19 20+	7 4 8 3 3 3	1.2 (0.5–3.3) 1.4 (0.4–4.7) 1.2 (0.5-3.1) 1.6 (0.4-5.8) 0.9 (0.5-5.7) 2.1 (0.6–7.8)	Cigarette smoking and race	

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Vaughan et al. (1986b), USA, 1979–83	285 incident cases [sex distribution not reported] identified by the local Cancer Surveillance System, aged 20–74 years, including oro- and hypopharynx (205), nasopharynx (27) and sinuses (53)	552 identified by random-digit dialing	Residential exposure: residential history since 1950	Nasopharynx	Mobile home	4	2.1 (0.7–6.6)	Cigarette smoking and ethnic origin	
					> 10 years	4	5.5 (1.6–19.4)		
					Particle-board at home	6	1.4 (0.5–3.4)		
					> 10 years	4	0.6 (0.2–2.3)		
Roush <i>et al.</i> (1987), USA, 1935–75	198 men with sinonasal cancer and 173 with nasopharyngeal cancer registered at the Connecticut Tumor Registry	605 men who died during the same period, selected by random sampling without matching or stratification	Job title, industry, specific employment, year of employment, obtained from death certificates and city directories to determine occupation at 1, 10, 20, 25, 30, 40 and 50 years prior to death	Nasopharynx	Probably exposed for most of working life	21	1.0 (0.6–1.7)	Age and calendar period	
					Plus exposure > 20 years before death	17	1.3 (0.7–2.4)		
					Plus exposure to high level for some years	9	1.4 (0.6–3.1)		
					Plus exposure to high level > 20 years before death	7	2.3 (0.9–6.0)		

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West <i>et al.</i> (1993), Philippines [study years not reported]	104 incident cases (76 men, 28 women) histologically confirmed	104 hospital controls matched for sex, age and hospital ward type; 101 community controls matched for sex, age and neighbourhood	Personal interview with occupational history; occupation classified as likely or unlikely to involve exposure to formaldehyde; duration of exposure; 10-year lag period; years since first exposure; age at start of exposure	Nasopharynx (ICD code not given)	< 15 years	19	2.7 (1.1–6.6)	Years since first exposure to dust and/or exhaust fumes Adjusted for education, dust/exhaust, processed meats, fresh fish consumption, smoking, anti-mosquito coils and herbal medicine	
					> 15 years	8	1.2 (0.5–3.2)		
					< 15 years (10-year lag)	11	1.6 (0.6–3.8)		
					> 15 years (10-year lag)	8	2.1 (0.7–6.2)		
					Age > 25 years at first exposure	11	1.2 (0.5–3.3)		
					Age < 25 years at first exposure	16	2.7 (1.1–6.6)		
					First exposure < 25 years before diagnosis	12	1.3 (0.6–3.2)		
					First exposure > 25 years before diagnosis	14	2.9 (1.1–7.6)		
Armstrong <i>et al.</i> (2000), Malaysia, (Selagor and Federal Territory), 1987–92	282 histologically confirmed cases of nasopharyngeal carcinoma in Chinese men and women from four centres (prevalent and incident cases) who had lived in the area for ≥5 years [no information on age distribution]	One Chinese control selected by multistage area sampling per case, matched by age and sex	Structured in-home interviews; occupational exposures assessed by a job–exposure matrix	Nasopharyngeal squamous-cell carcinoma (ICD code not given)	Any (unadjusted)	[28]	1.24 (0.67–2.32)	Diet and tobacco use	Mixture of prevalent (42%) and incident (58%) cases
					Any (adjusted)		0.71 (0.34–1.41)		

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Vaughan <i>et al.</i> (2000), USA 1987–93	196 men and women [sex distribution not reported] from five cancer registries, aged 18–74 years	244 population-based selected by random digit dialling, and frequency-matched by sex, cancer registry and age (5-year groups)	Structured telephone interviews; occupational exposures assessed by a job–exposure matrix	Epithelial nasopharyngeal carcinoma: epithelial NOS (801x–804x), undifferentiated or non-keratinizing (8020–1, 8072–3, 8082), squamous-cell (805x–808x, except 8072–3)	Ever exposed	79	1.3 (0.8–2.1)	Age, sex, race, centre, cigarette use, proxy status and education	Data presented for any potential exposure (possible, probable or definite); not influenced by a 10-year lag period, or adding wood dust exposure to models	
					<i>Max. exposure (ppm)</i>					
					< 0.1	60	1.4 (0.8–2.4)			
					0.1–0.5	14	0.9 (0.4–2.3)			
					> 0.5	5	1.6 (0.3–7.1)			
					<i>p</i> for trend		0.57			
					<i>Duration (years)</i>					
					1–5	24	0.8 (0.4–1.6)			
					6–17	26	1.6 (0.7–3.4)			
					> 18	29	2.1 (1.0–4.5)			
					<i>p</i> for trend		0.070			
					<i>Differentiated squamous-cell and epithelial NOS only</i>					
					Ever exposed	61	1.6 (1.0–2.8)			
<i>Duration (years)</i>										
1–5	16	0.9 (0.4–2.1)								
6–17	20	1.9 (0.9–4.4)								
> 18	25	2.7 (1.2–6.0)								
<i>p</i> for trend		0.014								
<i>Cumulative exposure (ppm–years)</i>										
0.05–0.4	15	0.9 (0.4–2.0)								
> 0.4–1.10	22	1.8 (0.8–4.1)								
> 1.10	24	3.0 (1.3–6.6)								
<i>p</i> for trend		0.033								

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Hildesheim <i>et al.</i> (2001) Taiwan, China, 1991–94	375 histologically confirmed hospital cases (31% women), aged < 75 years	325 community controls, individually matched on sex, age (5 years) and district of residence	Structured in-person interviews; occupational exposures assessed by an industrial hygienist; blood specimen was tested for anti–Epstein–Barr virus antibodies.	Nasopharynx; > 90% non-keratinizing and undifferentiated; remainder squamous-cell carcinomas (ICD code not given)	Ever exposed	74	1.4 (0.93–2.2)	Age, sex, education and ethnicity	Observations were not influenced by adding wood dust exposure to models; in a sub-analysis restricted to 360 cases and 94 controls seropositive for at least one type of antibody against Epstein–Barr virus, the association between exposure to formaldehyde and nasopharyngeal cancer appeared somewhat stronger.
					<i>Duration</i>				
					1–10 years	31	1.3 (0.69–2.3)		
					>10 years	43	1.6 (0.91–2.9)		
					<i>p</i> for trend		0.08		
					<i>Cumulative exposure</i>				
					< 25	29	1.3 (0.70–2.4)		
					> 25	45	1.5 (0.88–2.7)		
					<i>p</i> for trend		0.10		
					Yrs since first exposure				
<20	19	2.3 (0.95–5.8)							
≥20 years	55	1.2 (0.76–2.0)							
Age at first exposure									
<25 years	62	1.3 (0.8–2.0)							
≥25 years	12	3.4 (0.94–12)							