

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Wynder <i>et al.</i> (1963) USA, 1957-61	300	Hospital, without smoking-related disease	Interview	Ever painter	18	[2.2] [1.0 – 4.5]	none	
Cole <i>et al.</i> (1972) USA, 1967-68	461	General population	Interview	Painter (men)	28	1.2 (0.71 – 1.9)	Age, smoking	
Decouflé <i>et al.</i> (1977); Houten <i>et al.</i> (1977) USA 1956-65	Bladder cancer cases (ICD7 181) from 11591 white male cancer cases at a treatment center, age ≥ 14 years	Non-cancer admissions from the same cancer treatment center	Lifetime occupation recorded during interview before diagnosis, coded using the Standard Industrial Classification Manual	Painter Ever < 60 yrs old ≥ 60 yrs old Ever (smoking adj) Worked ≥ 5 yrs < 60 yrs old ≥ 60 yrs old	16 3 13 12 1 11	1.62 [0.92-3.38] 1.68 [0.46-6.29] 1.61 [0.75-3.48] 1.72 (p>0.05) 1.51 [0.78-3.69] 1.04 [0.15-7.76] 1.59 [0.67-3.79]	age smoking, age age	Unexposed = clerical occupations
Williams et al (1977) USA 1969-1971	169 bladder cancer cases that reported an occupation, 95% histologically confirmed	2173 patients with cancers other than lung, larynx, oral cavity, esophagus, bladder that reported an occupation	Main lifetime employment from survey questionnaire, coded using the 1970 census classification	Painting (men)	1	0.42 [0.02-7.14]	Age, race, education, education, tobacco, alcohol, geographic location	Painting included construction workers, paper-hangers, and pattern & model makers; The CI was estimated by doubling the variance.
Howe <i>et al.</i> (1980) Canada, 1974-76	480 men	Neighbourhood	Interview	Commercial painting Ever spray painting	≥24 ≥16	1.0 (0.6 – 2.3) 1.8 (0.7 – 46)	none	After correction for exposure to other suspect 'high-risk' industry, RR for spray painter, 1.0

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Silverman <i>et al.</i> (1983) USA, 1977-78	303 men	Population	Interview	Ever painter Car painter	15 3	1.0 (0.5 – 2.2) 0.5 (0.1 – 2.1)	none	
Schoenberg <i>et al.</i> (1984) USA, 1978-79	658 men	Population	Interview	Ever painter Paint exposure	34 111	1.4 (0.85 – 2.3) 1.6 (1.2 – 2.1)	age, smoking, other employment	
Morrison <i>et al.</i> (1985) United Kingdom, USA, Japan, 1976-78	United Kingdom, 399 USA, 430 Japan, 226	Population	Interview	Paint and paint manufacture	23 35 5	0.7 [0.42-1.18] 1.5 [0.84-2.69] 0.7 [0.25-1.97]	Age, smoking	
Vineis & Magnani (1985) Italy, 1978-83	512 men	Hospital; other urological and surgical	Interview	Painter in building industry Car painter ≥5 years Carpentry painter Spray painter in different industries	12 7 1 2	1.0 (0.40 – 2.2) 2.0 (0.60 – 7.0) 0.6 (0.04 – 8.4) 1.2 (0.20 – 5.8)	Age, smoking	<i>Excluded from the meta-analysis because of inclusion in Kogevinas et al. (2003).</i>
Coggon <i>et al.</i> (1986) United Kingdom 1975-80	179 male cases of cancer and the bladder and renal pelvis, aged 18-54 yrs, identified from hospital and cancer registry records	1221 other cancers	Occupation from mailed questionnaire	Painters and decorators	10	0.7 [0.27-1.81]	age, smoking, residence, respondent	52.1% overall response rate; The variance was doubled to approximate an adjusted 95% CI. The unadjusted 95% CI was 0.78-2.18. Possible overlap with OPCS (1986).

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Miller <i>et al.</i> (1986) USA, 1977-78	2331 white cases; aged 21-84 years; 100% histologically confirmed	4525 white population-based controls; matched by age and sex	Interviewer-administered standardized questionnaire. A list of materials the subjects reported using in each job held for ≥ 6 months was evaluated to determine exposure to paint.	Painter (Artistic)	15	2.5 (1.1-5.7)	Smoking	Subjects were considered to be exposed if they were ever employed as an artist and had worked with paint. <i>Excluded from meta-analysis because artistic painters could have different exposures than other occupationally exposed painters.</i>
				Duration (years)	4	1.7 (NG)		
				<10 years	11	3.0 (NG)		
				10+ years		0.01		
				p for trend				
Jensen <i>et al.</i> (1987) Denmark, 1979-81	371	Population	Interview	Different painting industries	13	2.5 (1.1 – 5.7)	age, sex, smoking	<i>Excluded from the meta-analysis because of inclusion in Kogevinas <i>et al.</i> (2003).</i>
				Painter 10 years		1.4 (1.0 – 1.9)		
Iscovich <i>et al.</i> (1987) Argentina, 1983-85	117	Neighbourhood and hospital	Interview	Ever painter	3	0.55 [0.12 – 2.5]	Age, tobacco smoke	Adjusted for age and tobacco smoke, pooling the two control groups
Schiffers <i>et al.</i> (1987) Belgium, 1984-85	74	Population	Interview	Painter in high-risk occupation	NG	NG	NG	[A group of 16 jobs, including painting, were defined as hazardous and associated with a high risk for bladder cancer, but exposure to painting as a specific job did not show a significant excess.] No increased risk reported

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Siemiatycki <i>et al.</i> (1987a) Canada, 1979-85	486	Other cancers	Interview	Listed as white spirits, but in exposed group construction is 21% of total, mostly painters	91	1.0 (90% CI, 0.8 – 1.2)	age, socioeconomic status, ethnicity, cigarette smoking, blue/white collar work	<i>Excluded from meta-analysis because the exposure was not specific to painters.</i>
Claude <i>et al.</i> (1988) Germany	531 men	Hospital urological and homes for elderly	Interview	Ever painter Lacquer and paint Spray paints	15 78 52	1.3 (0.59 – 2.7) 1.5 (1.1 – 2.2) 2.9 (1.7 – 4.9)		Trend, p = 0.04 for exposure to spray paints. <i>Excluded from the meta-analysis because of inclusion in Kogevinas et al. (2003).</i>
Risch <i>et al.</i> (1988) Canada, 1979-82	781	Population	Interview; Exposed to paints in full- time job at least 6 months, 8-28 years before diagnosis	Commercial painting Men Women Spray painting Men Women	204 14 49 67	1.1 (0.77 – 1.6) 3.9 (0.9 – 26.7) 0.90 (0.39 – 2.1) 0.91 (0.48 – 1.7)	smoking	
González <i>et al.</i> (1989) Spain 1985–86	497 (438 men, 59 women) from 12 hospitals; below age of 79 years; response rate 71.9%; 100% histologically confirmed	583 hospital-based controls from the same hospitals, 530 population-based controls selected from census or municipal registers; matched by age and sex; response rate 70.5% for hospital controls and 65.7% for population controls	Interviewer-administered standardized questionnaire. All interviews were conducted at the subjects' home and occupational history included any job lasting more than six months.	Male Painters	17	1.16 (0.7–2.0)	Exposure to other high risk occupations and cigarette smoking (included in the model in three categories: smokers, ex-smokers and never-smokers)	The hospital controls were selected from hospital patients. Patients with the following diagnoses were excluded from the control selection: chronic respiratory diseases, coronary heart disease, infections of the urinary tract, haematuria and cancer of the respiratory tract. Excluded from the meta-analysis because of inclusion in Kogevinas <i>et al.</i> (2003).

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments			
Silverman <i>et al.</i> (1989a) USA 1977-78	2100 white men from registry of New Jersey, Connecticut, Iowa, New Mexico and Utah, plus Atlanta, Detroit, New Orleans, San Francisco, and Seattle; aged 21-84 years; response rate 75%; 100% histologically confirmed	3874 white male population-based controls, selected by random digit dialling for those 21-64 years, stratified sampling from the Health Care Financing Administration's lists for those aged 65-84 years; matched by age and geographic area; response rate 84% for aged 21-64 years, and 83% for aged 65-84 years	Interviewer-administered standardized questionnaire to collect detailed information on every job a subject had held for at least 6 months since the age of 12 years.	Construction and maintenance painter	76	1.5 (1.1-2.2)	Age, smoking	Workers within each industry were grouped by occupational code, and occupational codes were grouped by potential for similar exposure. The study transformed 417 census codes into 163 occupational categories that were meaningful for analysis. *the variance was doubled to approximate and adjusted confidence interval; **calculated using a fixed effects model.			
				Manufactured articles painter	25	1.3 (0.8-2.3)					
				Sign painter	NG	1.1 (0.3-3.7)					
				Artistic painter	13	1.8 (0.8-4.3)					
				All painters	116	1.5 (1.2-2.0)					
				<i>Duration (years)</i>							
				<5	50	1.7 [0.97-2.90]*					
				5-9	14	0.9 [0.38-2.34]*					
				10-24	26	1.6 [0.82-3.74]*					
				25+	22	1.9 [0.75-4.09]*					
				p for trend						0.001	
				<10 yrs	64	[1.44 (0.90-2.29)]**					
				≥ 10 yrs	48	[1.73 (0.98-3.04)]**					
<i>Duration (years) by initial year of employment as a painter</i>											
<1930											
<5	10	1.2 (NG)									
5-9	5	1.3 (NG)									
10+	18	3.0 (NG)									

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Silverman <i>et al.</i> (1989a) Contd.				1930–1939				
				<5	8	1.5 (NG)		
				5–9	2	0.4 (NG)		
				10+	9	1.5 (NG)		
				≥1940				
				<5	32	2.0 (NG)		
				5–9	7	1.0 (NG)		
				10+	21	1.4 (NG)		
Silverman <i>et al.</i> (1989b) USA, 1977–78	126 non-white men from Cancer Registry of New Jersey, Connecticut, Iowa, New Mexico, and Utah, plus Atlanta, Detroit, New Orleans, San Francisco, and Seattle; aged 21–84 years; response rate 75%; 100% histologically confirmed	383 population-based controls, selected by random digit dialling for those 21–64 years, stratified sampling from the Health Care Financing Administration’s lists for those aged 65–84 years; matched by age and geographic area; response rate 84% for aged 21–64 years, and 83% for aged 65–84 years	Interviewer-administered standardized questionnaire	All Painters Painter, construction and maintenance	5 4	1.2 (0.4–3.7) 1.4 (0.4–5.4)	All ORs were adjusted for smoking	Non-white men, 70% cases and 75% controls were black.
Silverman et al (1989 a, b) USA	See above	See above	See above	All painters (white & non-white)	121	[1.48 (1.16-1.90)]*	See above	*calculated using a fixed effects model

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Bethwaite <i>et al.</i> (1990) New Zealand 1980-84	912 male bladder cancer cases (ICD9 188) had known occupation among 1259 cases identified from New Zealand Cancer Registry; aged 20 or older ; % histologic confirmation not given	18 992 males with cancers other than bladder cancer from New Zealand Cancer Registry; with known occupation, [out of 23503 identified] from the same Registry and period, aged 20 or more at registration; % histologic confirmation not given	Data were collected through cancer registration, death certification and incidental necropsy findings	Painters Ever	24	1.52 (1.00-2.31)	Age	Potential selection bias for using other cancers to form the control group. Information on exposure was largely based on cancer registration.
				Age (years) 20-59	9	2.3 (1.2-4.5)		
				≥60	15	1.3 (0.8-2.2)		

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
La Vecchia <i>et al.</i> (1990) Italy 1985–88	263 (219 men, 44 women) from major teaching and general hospitals; below the age of 75 years; response rate greater than 97%; 100% histologically confirmed	287 (210 men, 77 women) hospital-based controls from the same hospitals; response rate greater than 97%; Controls were admitted for acute, non-neoplastic or urinary tract diseases.	Interviewer-administered standardized questionnaire to collect information on age at starting and stopping work in 19 industries or occupations, on subjects' role in the industry in terms of direct involvement in production aspects, and on exposure to 14 selected occupational agents or groups of agents	Painting (including spraying) dyes/paint exposure ≤ 10 years > 10 years p for trend	NG	1.8 [0.72-4.48] 1.6 [0.70–3.65] 4.8 [1.37-16.78] 0.04	Age, sex, smoking	
Burns & Swanson (1991) USA, 1984-87	2160 (1571 men, 589 women) from the Metropolitan Detroit Cancer Surveillance System; aged 40–84; response rate 94%; 100% histologically confirmed	3979 (1997 men, 1982 women) with cancer of the colon or rectum from the Metropolitan Detroit Cancer Surveillance System; response rate 95%	Life-time occupational history obtained during telephone interviews to the subjects or to their surrogates, coded using US Bureau of Census classification.	Painters	30	1.1 (0.7–1.9)	Cigarette smoking, race, gender, and age at diagnosis	It is unclear about the validity of occupational data from telephone-based surrogate interviews.

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Myslak <i>et al.</i> (1991) Germany 1984–87	403 men from three major hospitals; 82% response rate; 100% histologically confirmed	426 hospital-based controls with benign prostate diseases from the same hospitals; 84% response rate	Mailed standardized questionnaire was used to collect information on occupational history and smoking habits	Painters	21	2.8 (1.21–6.28)	none	While smoking information was collected, there was no indication that the study controlled for any confounding effect from smoking. <i>Excluded from meta-analysis because of overlap with Golka et al. (1999)</i>
Siemiatycki (1991) Canada, 1979-85	484 incident male cases; aged 35-70 yrs; histologically confirmed	533 population controls, 1879 cancer controls	Interview to obtain lifetime occupational history; painters coded using Canadian occupation classification	Construction painter Any exposure Substantial exposure Other painter Any exposure Substantial exposure	13 8 9 4	OR(90% CI) 1.3 (0.8-2.4) 1.7 (0.8-3.4) 1.1 (0.6-2.1) 0.8 (0.3-2.2)	Age, family income, ethnicity, respondent type, cigarette & alcohol index,	Excluded from the meta-analysis and replaced by Ramanakumar et al (2008) analysis

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments	
Kunze et al. (1992) Germany 1977-85	675 (531 men, 144 women) cases admitted to hospitals for lower urinary tract cancers; 100% histologically confirmed	675 controls admitted to the same hospitals as cases for non-neoplastic diseases of the urinary tract; matched by age (\pm 5 years) and sex at a 1:1 ratio	Interviewer-administered standardized questionnaire to collect occupational exposure information. Participants were asked to give a chronologic account of all jobs held at least 6 months and the duration of the employment. Length of employment in a certain occupation was computed from all jobs included in that occupation category.	Painters	15	1.3 (0.6-2.7)	Smoking status, lifetime cigarette consumption	63.7% male controls had hyperplasia of the prostate, 72.9% female controls had infection of the lower urinary tract. Cases were diagnosed with benign or malignant epithelial tumors of the urinary bladder, ureters, renal pelvis and urethra. Excluded from the meta-analysis because included in Kogevinas et al (2003). Excluded from the meta-analysis because of inclusion in Kogevinas et al. (2003).	
				Dyestuffs and paints					
				Duration (years)					
				1-9	6	1.2 (NG)			
				10-19	4	1.0 (NG)			
				20+	24	2.5 (p<0.05)			
				p for trend		0.03			
				Lacquer and paint	78	1.5 (1.1-2.2)			
				Spray paints					
				Ever	52	2.9 (1.7-4.9)			
Duration (years)									
1-9	13	4.7 (NG)							
10-19	8	8.4 (NG)							
20-29	14	2.0 (NG)							
30+	17	2.4 (NG)							
p for trend		0.004							

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Cordier et al. (1993) France, 1984–87	765 (658 men, 107 women) from seven hospitals, aged under 80 years; 100% histologically confirmed	765 hospital-based controls (no respiratory disease or symptoms suggestive of bladder cancer); matched at a 1:1 ratio by sex, age, ethnic origin and place of residence	Interviewer-administered standardized questionnaire to collect lifelong occupational history for each paid or unpaid job held for at least 6 months	Male painters Male spray painters	19 8	0.97 (0.50–1.88) 6.41 (0.79–51.9)	Hospital, place of residence, and smoking status	Excluded from the meta-analysis because of inclusion in Kogevinas et al. (2003).
Barbone et al. (1994) Italy, 1986–90	273 (236 men, 37 women) from clinic centres; 97.5% histologically confirmed	573 (390 men, 183 women) hospital-based controls from the same clinic centers.	Interviewer-administered structured questionnaire to collect usual occupation and employment in any of 18 industries and 13 occupational agents.	Painting (Males)	6	3.1 (0.7–13)	Age, cigarette smoking, coffee consumption, and area of residence	Controls were patients without bladder cancer, but admitted for trauma, non-traumatic musculoskeletal conditions, acute surgical conditions, eye diseases, and other conditions such as diseases of ears, nose, throat or mouth.
Hours et al (1994) France 1984-1987	116 cases (97 male, 19 female)	232 hospital-based controls matched by gender, hospital, age, nationality	Job history from in-person interview	Painting (regular leisure-time activity)	12	1.56 (0.56-4.58)	gender, hospital, age, nationality	Excluded from the meta-analysis because of inclusion in Kogevinas et al. (2003).

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments	
Siemiatycki et al. (1994) Canada, 1979–86	484 male cases from all large hospitals in the Montreal area; aged 35–70 years; response rate 84%; 100% histologically confirmed.	533 population-based controls selected from electoral lists and by random digit dialling; response rate 72%; 1879 cancer controls (except lung or kidney cancer) from the same hospitals; response rate 84%	Interviewer-administered semi-structured questionnaire to collect detailed lifetime job history. Experts translated each job into a list of potential exposures by means of a checklist that included 294 substances.	Construction painters			Age, ethnicity, socioeconomic status, smoking, coffee consumption, and the status (self/proxy) of the respondents	The results presented in the paper were based on pooled controls (cancer and population controls). There was rather little difference between results based on cancer controls and those based on population controls when analyses were carried out separately with cancer controls, population controls, or the pooled controls. Used only for the duration-response analysis.	
				Duration (years)	<10	5			1.2(0.4–3.2)
					>10	8			1.5(0.7–3.4)
				Other painters					
				Duration (years)	<10	5	1.1(0.4–3.0)		
					>10	4	0.9(0.3–2.7)		
Porru et al. (1996) Brescia, Italy, 1992–93	355 (275 men, 80 women) from the General Hospital of Brescia; men aged 24–84 years, women aged 26–87 years; response rate 98.6%; 100% histologically confirmed	579 (397 men, 182 women) hospital-based controls, selected from three hospitals; men aged 19–89 years, women aged 21–86 years; males matched by age; response rate 99.1%	Interviewer-administered structured questionnaire to collect information on lifetime occupation history for each job lasting for at least six months.	Male Painters	12	1.4 (0.6–3.5)	Age, residence, education, smoking, and coffee and alcohol consumption	Controls were patients with urological non-neoplastic diseases. If these diseases are also associated with paint exposure, use of the patients with these diseases may cause an underestimation of the association of interest. Excluded from the meta-analysis because of inclusion in Kogevinas et al. (2003).	

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Teschke et al. (1997b) Canada 1990-91	105 (88 men, 17 women) from British Columbia Cancer Registry; aged 19-75 years; response rate 88.2%; 100% histologically confirmed.	159 (112 men, 47 women) population-based controls selected from provincial voters list, frequency matched to the age and sex distribution of cases of all three types of cancers included in this study (bladder cancer, cancers of the nasal cavity and sinuses); response rate 80.3%	Subjects were interviewed either in person or by telephone using a standardized questionnaire to collect information on occupational history.	Ever employed as a painter	4	2.8 (0.4-21.3)	Cigarette smoking, sex, age	Latency analyses were conducted for all occupational groups with the most recent 20 years of employment removed.
				Employed as a painter with most recent 20 years removed	2	2.0 (0.1-33.0)		
Golka et al (1999) Germany 1984-88	412 male cases from urology departments of 3 hospitals in Dortmund, Germany, 1984-88. Response rate 82%	414 male controls with benign prostatic hyperplasia, Response rate 84%	Complete occupational history for jobs held > 1 year and at least 10 years before interview	Painters & lacquerers	21	2.24 (1.07-5.13)	Smoking	

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Pohlbeln et al (2000) Germany 1989-1992	300 cases (239 male, 61 female) of histologically confirmed cancer of the lower urinary tract (LUT); malignant tumours of the urinary bladder (89.6% ICD9: 188), ureter (1.0%), renal pelvis (3.7%), urethra (1.7%), multiple localizations (4.0%); 92.6% participation rate	300 controls with non-neoplastic diseases of the lower urinary tract individually matched to cases from the same hospitals with respect to sex, age & area of residence; 98% participation rate	Job history from in-person interview			No specific info on painters other than 3-fold increased risk	Age, sex, area of residence	Ex-smokers, stopped smoking > 1 year before the interview; Excluded from the meta-analysis because of inclusion in Kogevinas et al. (2003).

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Pesch et al. (2000) Germany, 1991-95	1035 cases (704 men, 331 women) of cancers of the urinary bladder, ureter, renal pelvis from hospitals; response rate 84%; 100% histologically confirmed.	4298 population-based controls (2650 men, 1648 women) selected from local residency registries, matched by region, age and sex; response rate 71%	Interviewer-administered structured questionnaire to collect information on lifetime occupational history. Two job-exposure matrices and one job task-exposure matrix were used to assess exposure to occupational agents.	Male Painters: duration		No summary OR	Age, study centre, smoking	90.2% of the male cases and 84.3% of the female cases had urinary bladder cancer. Categories for exposure duration (short, medium, long and very long) and level of exposure to paints and pigments (low, medium, high and substantial) were defined based on the 30th, 60th, 90th percentile in exposed controls. Excluded from the meta-analysis because of inclusion in Kogevinas et al. (2003).
				Medium	12	1.3 (0.6-2.6)		
				Long	6	0.7 (0.3-1.6)		
				Very long	5	1.6 (0.5-4.7)		
				Paints and Pigments				
				Male				
				Medium	97	1.0 (0.8-1.3)		
				High	75	1.0 (0.8-1.3)		
				Substantial	35	1.3 (0.9-2.0)		
				Female				
				Medium	9	1.7 (0.7-3.8)		
				High	5	0.6 (0.2-1.8)		
				Substantial	1	0.3 (0.03-2.5)		
				Paints: male				
				Medium	57	1.0 (0.8-1.3)		
				High	181	1.2 (1.0-1.5)		
				Substantial	67	1.2 (0.9-1.7)		
				Paints: female				
				Medium	25	0.8 (0.5-1.3)		
				High	31	0.9 (0.6-1.4)		
Substantial	9	0.9 (0.4-1.9)						
Use or production of paints								
Male								
Medium	29	0.6 (0.4-0.9)						
High	60	1.0 (0.7-1.3)						
Substantial	24	1.4 (0.8-2.3)						
Female								
Medium	5	1.0 (0.4-2.8)						
High	51	1.3 (0.9-1/8)						
Substantial	22	1.3 (0.8-2.3)						

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Bouchardy et al (2002) Switzerland 1980-93	3014 male cases from cantonal Cancer Registries of Basel, Geneva, St Gall, Vaud and Zurich, aged 25 or more (and 65 or less in St Gall and Vaud)	55,120 male non-bladder cancer registrants from the same registries and period	Longest, current or most recent occupation as recorded at the time of registration (main or best specified occupation in Zurich Registry), coded using the ASCR Classification of Occupations	Plasterers and painters (in the construction industry)	73	1.1 (0.8-1.4)	Age, registry, civil status, period of diagnosis, nationality, urban/rural residence, SES, histological confirmation, information from death certificate only (cases)	Adjusting for SES may over-adjust for occupational risk factors but serve as a surrogate for smoking. Overall 95.1% histologic confirmation for all sites.
Pelucchi et al.(2002) Milan area and Pordenone, Italy, 1985-92	110 women from major teaching and general hospitals; aged 30-79 years; response rate greater than 97%; 100% histologically confirmed	298 hospital-based controls from the same hospitals, aged 26-79; response rate greater than 97%	Interviewer-administered standardized questionnaire to collect information on occupation history and selected occupational exposures as well as other potential confounders	Dyestuff and painting industry	3	1.4 (0.3-6.8)	Age, study centre, education, BMI, cigarette smoking, coffee and alcohol consumption	Controls were patients diagnosed with acute, non-neoplastic, non-urinary or genital tract diseases. The study reported dyestuff and painting industry as one exposed group, and dyes have also been linked to bladder cancer.

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Zheng et al. (2002) USA 1986–89	1452 (1135 men, 317 women) from the State Health Registry; aged 40–85; response rate 85%; 100% histologically confirmed	2434 (1601 men, 833 women) population-based controls randomly selected from computerized state driver's license records for aged under 65; aged 65 years and older were selected from US Health Care Financing Administration listings; matched by gender and age; response rate 82% for aged under 65 and 80% for aged 65 and older	A standardized questionnaire was mailed to all participants to inquire about history of each job held for 5 years or longer since the age of 16.; a telephone interview was done with those who did not complete the mailed questionnaire.	Male painters (construction and maintenance)	11	2.7 (1.0–7.7)	Age, lifetime pack-years of cigarette smoking, and first-degree relative with bladder cancer	For each job recorded, detailed information was collected on job title, industry, the year the job began and ended, activities associated with the job.; 5 cases and 0 controls male construction & maintenance painters exposed < 10 years.
				All	5	not possible		
				Duration (years) < 10	6	1.4 (0.4–4.7)		
				>10	9	2.9 (0.9–9.1)		
				Male painting and paper-hanging	6	1.9 (0.5–6.5)		
Kogevinas et al (2003) Germany, France, Italy, Spain, Greece, Denmark 1976-1996	3346 male cases aged 30-79 yrs	6840 male hospital-based and population-based controls aged 30-79 yrs; individually or frequency matched on age & geographic area	Lifetime occupational history (for jobs held > 6 months) or longest job held; coded using ISCO 1968 and ISIC rev2 codes	Painters	116	1.17 (0.91-1.50)	Age, smoking, study center	Data were pooled from Claude et al (1998), Pohlabein et al (2000), Pesch et al (2000), Cordier et al (1993), Hours et al (1994), Vineis & Magnani (1985), Porru et al (1996), González et al (1989), Serra et al (2000), Rebelakos et al (1985), Jensen et al (1987); Unexposed group excludes subjects who worked in high-risk occupations; 93% cases & 78% controls had ever smoked
				Automobile painters employed > 25 yrs	19	1.95 (1.01-3.75)		
					NG	2.1 (0.6-7.1)		

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Colt et al. (2004) USA 1994–98	424 (331 men, 93 women) from the New Hampshire State Cancer Registry; aged 25–74; participation rate 74.3%; 100% histologically confirmed	645 (407 men, 238 women) population-based controls selected by using population lists from the New Hampshire Department of Transportation for less than 65 years of age, and from the Centres for Medicare and Medicaid Services of New Hampshire for those age 65 years and more; matched by age and sex 67.2%	Subjects completed a mailed questionnaire describing detailed lifetime occupational history and responses were reviewed by interviewers during an in-person interview	Male painters	12	[0.98(0.45–2.13)]	Smoking, age	The risk for painters was listed in a table for jobs with odds ratios less than 1.3. No confidence interval or p value was provided. Questionnaire included information on job title and place of work for each job held.
				Male painters, construction and maintenance	7	[0.78(0.30–2.03)]		
Gaertner et al. (2004) Canada, 1994–97	887 (535 men, 352 women) from 7 Canadian provincial cancer registries (Newfoundland, Prince Edward Island, Nova Scotia, Manitoba, Alberta, Saskatchewan, and British Columbia); aged 20–74 years; response rate 58% for males, 61% for females, respectively; 100% histologically confirmed	2847 population-based controls matched by age and sex; selected by random digit dialling for controls in Newfoundland and Alberta; others randomly sampled from the provincial health insurance plan database; response rate 59% for males, 65% for females	Information on occupational history was collected through mailed questionnaire	Male painters Female painters	12 3	0.74 (0.36–1.53) 1.08 (0.27–4.37)	Province, age, race, smoking, ex-smoking, and consumption of fruit, fried food, coffee and employment in other suspect occupations.	Two to five months after diagnosis, questionnaires were mailed to participants to obtain information on occupational history, smoking and other exposure information. Up to 12 occupations per person were recorded by the type of industry, service, company name, main job duties and job title.

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Band et al. (2005) Canada, 1983-90	1125 males from the British Columbia Cancer Registry; aged 20 years or older; response rate 64.7%; 100% histologically confirmed	8492 males from the British Columbia Cancer Registry; aged 20 years or older; matched by exact age and year of diagnosis; response rate 60.1%	Self-administered questionnaire (or completed by a proxy respondent) to collect detailed lifetime occupational history	Painters/Paper-hangers related Ever Usual	22 10	1.53 [0.95-2.47] 1.4 [0.71-2.76]	Tobacco smoking (age started smoking, average number of cigarettes, pipe or cigars smoked per day, total years smoked), alcohol drinking, marital status, education, respondent type (self or proxy)	Registry based, used patients with other cancers as controls excluding lung cancer and cancers of unknown primary site.
Reulen et al (2007) Belgium 2003-2005	202 cases (174 men, 28 women), ages 40-96, diagnosed with histologically confirmed transitional cell carcinoma of the bladder; 9% participation rate	390 controls (231 men, 159 women); selected from the general population of the province of Limburg by simple random sampling; >50 years old, Caucasian, with no previous diagnosis of bladder cancer; 26% participation rate	lifetime occupational history (jobs held >6 months) from in-person interview coded using ISCO codes	Painters & varnishers	10	2.2 (0.7-7.2)	sex, age, years of cigarette smoking, number of cigarettes smoked per day, current smoking status, education	

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Dryson et al. (2008) New Zealand, 2003-2004	213 incident cases of bladder cancer (165 men, 48 women); age 25–70 years; notified to the New Zealand Cancer Registry; ~64% participation rate	471 population controls (221 men, 250 women) randomly selected from the 2003 New Zealand Electoral Roll; frequency matched by age according to the 1999 age distribution of cancer registrations for NHL, bladder cancer & leukemia; ~48% participation rate	Full occupational history from in-person interview	Painters & paperhangers	11	1.42 (0.56–3.60)	gender, age group, smoking status, Maori ethnicity, occupational status	Numbers were too small (less than 10 cases 1 controls) for spray painters; *information on duration obtained by contacting authors; **calculated using a fixed effects model
				Men	10	1.28 (0.50–3.30)		
				Women	1	NG		
				Duration (yrs)*				
				0	205	1.0 (ref)		
				1-2	1	0.22 (0.02-2.35)		
				2-10	4	2.20 (0.37-13.08)		
				>10	3	0.98 (0.23-4.24)		
				<10	5	[0.96 (0.23-4.01)]**		
				Painter, decorator and/or paperhanger	7	1.35 (0.42–4.39)		
Golka et al (2008) Germany 1992-1995	156 male bladder cancer cases; 63% response rate	336 male controls diagnosed with prostate cancer; 72% response rate	Occupational history (for jobs held > 6 mo) from mailed questionnaire; coded using a German classification scheme (Statistisches Bundesamt, 1992)	Painter/varnisher	7	1.98 (0.64–6.11)	Age, smoking	The variable smoking pertains to the smoking status 10 yr ago; hence individuals who had quit smoking for more than 10 yr before first diagnosis were included in the nonsmoking group. Proportion of never smokers: 13% for bladder cancer, 26% for prostate cancer
				Men	7	1.41 (0.44–4.56)		
				Painting and decorating services industry	7	1.13 (0.39–3.29)		
				Men	6	1.11 (0.34–3.56)		
				Women	1	1.38 (0.10–19.76)		

Table 2.4 Case-control studies of persons exposed to painting and lower urinary tract cancer

Reference, Location, Time period	Characteristics of cases	Characteristics of controls	Exposure Assessment	Exposure	No. of exposed cases	OR (95% CI)	Adjustment for potential confounders	Comments
Ramanakumar et al. (2008) Canada 1979–1986	478 male bladder cancer cases from 18 hospitals in Montreal; aged 35–70 years; 100% histologically confirmed; 82% response rate.	1066 pooled age-matched controls (533 population controls from electoral lists and by random-digit-dialing, 533 controls from other cancers); response rate 72% and 84%	Detailed job history (including specific tasks and protective devices) obtained from in-person interviews and reviewed by a team of chemists and industrial hygienists who translated each job into a list of potential exposures by means of a checklist that included 294 substances	Ever worked as a painter Substantial exposure: Any paint product Metal coatings Wood varnishes, stains Wood and gypsum paints	17 37 13 18 25	1.0 (0.3–2.7) 1.3 (0.7–2.2) 1.7 (0.7–4.4) 1.7 (0.9–3.6) 1.0 (0.5–2.0)	Age, ethnicity, years of school attendance, median family income, the status (self/proxy) of the respondents, smoking and occupational exposure to asbestos, silica, cadmium compounds	No other cancer sites showed any evidence of an association with type of paint or stain. Overlaps with Parent et al. (2000); This study population is the same as that of Siemiatycki et al. (1994) and therefore used for the overall analysis.

OR, odds ratio; CI, confidence interval; ASCR, Association of Swiss Cancer Registries; SIC, Standard Industrial Classification; ISCO, International Standard Classification of Occupations; ISIC, International Standard Industrial Classification; NG, not given