Supplemental Material, Table 1. Cohort and linkage studies assessing lung and respiratory cancer among persons with occupation as a painter, arranged by geographical region and publication date.

<table>
<thead>
<tr>
<th>Reference, location, time period</th>
<th>Cohort description</th>
<th>Exposure assessment</th>
<th>Organ site (ICD code)</th>
<th>Exposure categories</th>
<th>No. of cases/deaths</th>
<th>RR/SIR/SMR (95% CI)</th>
<th>Adjustment for potential confounders</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gubéran <em>et al</em> (1989) Switzerland 1971-84</td>
<td>1916 male painters from the 1970 Geneva census were linked to the Geneva Cancer Registry and followed for cancer incidence during 1971-84</td>
<td>Occupational classifications were obtained from the 1970 census</td>
<td>Lung, bronchus, trachea (ICD8 162)</td>
<td>Painters</td>
<td>40</td>
<td>SIR (95% CI) 1.47 [1.05-2.00]</td>
<td>Age, sex, matrimonial status, calendar year</td>
<td>In IARC volume 98 Reference = Swiss population; Painters showed excess mortality from alcoholism (SMR, 6.25; 90%CI, 2.46–13.14; 5 deaths) and from cirrhosis (SMR, 1.59; 90%CI, 0.96–2.49; 14 deaths), suggesting excess alcohol consumption among painters.</td>
</tr>
<tr>
<td>van Loon <em>et al</em> (1997) Netherlands 1986-90</td>
<td>58 729 men, aged 55-69 yrs, were enrolled from the general Dutch population and followed for lung cancer incidence from 1986-90 by linkage to national and regional registries</td>
<td>Paint exposure was obtained from job history as part of a self-administered questionnaire and case by case expert assessment</td>
<td>Lung</td>
<td>Paint dust exposure</td>
<td>RR (95% CI) 1.00 (ref) [2.41 (1.07-5.44)] 2.29 (0.61-8.63) 2.48 (0.88-6.97) &lt; 0.01</td>
<td>Age, other occupational exposures, smoking habits, dietary intake of vitamin C, B-carotene and retinol</td>
<td>Cumulative probability of exposure = probability x duration of exposure; *calculated using a fixed effects model</td>
<td>In IARC volume 98</td>
</tr>
<tr>
<td>OPCS (1958)</td>
<td>Registered deaths of 221,941 men and women aged 20-64 yrs in the broad occupational category of painters and decorators</td>
<td>Occupation at time of death or last occupation from death certificates; Occupations coded according to the Census 1951, Classification of Occupations</td>
<td>Lung, bronchus, trachea, primary cancer (ICD6 162)</td>
<td>Other painters &amp; decorators</td>
<td>SMR (95% CI)</td>
<td>Age, sex</td>
<td>In IARC volume 47 Reference = population of England and Wales</td>
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<tr>
<td>England &amp; Wales 1949-53 UK</td>
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<tr>
<td>England &amp; Wales 1959-63 UK</td>
<td>Registered deaths of men and women aged 15-64 in England and Wales</td>
<td>Last occupation recorded on the death certificate?</td>
<td>Lung, bronchus, trachea, primary and unspecified primary or secondary (ICD7 162, 163)</td>
<td>Painters &amp; decorators Age 15-64 yrs men &amp; women</td>
<td>1.43 [1.36-1.51]</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>men</td>
<td>1.43 [1.36-1.50]</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>women</td>
<td>4.00 [1.09-10.24]</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>single women</td>
<td>4</td>
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<td></td>
<td></td>
<td>Aerographers, paint sprayers Men (15-64 yrs)</td>
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<td></td>
<td></td>
<td>1.62 [1.32-1.97]</td>
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</tr>
<tr>
<td>OPCS (1978), no.1</td>
<td>Registered deaths of 273,129 men aged 15-64</td>
<td>Last occupation recorded on the death certificate, as coded by the 1970 Classification of Occupations</td>
<td>Lung, bronchus, trachea (ICD8 162)</td>
<td>Painters &amp; decorators</td>
<td>1.39 [1.30-1.49]</td>
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<tr>
<td>England &amp; Wales UK 1970-72</td>
<td></td>
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<td></td>
<td>Northern region</td>
<td>1.69 [1.27-2.21]</td>
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<td></td>
<td></td>
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<td></td>
<td>South West region</td>
<td>0.91 [0.66-1.22]</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>Painters, decorators n.e.c.</td>
<td>1.22 [1.13-1.31]</td>
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</tbody>
</table>


| Reference       | Study Details                                                                 | Mortality of men and women in 1931-71, ages 15-64 | Occupation recorded at the time of cancer registration/death and coded using various methods | Lung, bronchus, trachea (ICD 2,3,4,6,7,8 47b, 162-164) | Painters & decorators | SMR (95% CI) | Age, sex, calendar year |
|-----------------|-------------------------------------------------------------------------------|--------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------------------|----------------------|--------------------------|
| Logan (1982)    | England & Wales 1851-1971                                                    | Men                                              | 20-64 yrs (1931) | NG | 1.17 (NG) | Age, sex, calendar year |
|                 | UK                                                                  | Women                                            | 15-64 yrs (1961) | NG | 1.40 (NG) | Age, sex, calendar year |
|                 |                                                                  | 15-64 yrs (1971)                                 | NG | 1.39 (NG) | Age, sex, calendar year |
|                 | UK                                                                  | Men                                              | 15-64 yrs (1971) | NG | 4.08 (NG) | Age, sex, calendar year |
|                 | UK                                                                  | Men                                              | 15-64 yrs (1971) | NG | 4.08 (NG) | Age, sex, calendar year |

**Note:** OPCS = Office of Population Censuses and Surveys; NG = Not given.
<table>
<thead>
<tr>
<th>Study</th>
<th>Location</th>
<th>Study Period</th>
<th>Cancer Registry</th>
<th>Employment Records</th>
<th>Cancer Site</th>
<th>Occupation</th>
<th>SIR (95% CI)</th>
<th>Age</th>
<th>Reference</th>
<th>Exclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mikkelson (1980)</td>
<td>Denmark</td>
<td>1971-75</td>
<td>Scandinavia</td>
<td>2601 male painters belonging to two Copenhagen painters’ unions followed for lung cancer incidence</td>
<td>Membership in painters’ union</td>
<td>Lung, bronchus, trachea (ICD8 [162])</td>
<td>Painters</td>
<td>NG</td>
<td>1.1 (NG)</td>
<td>Age</td>
</tr>
<tr>
<td>Olsen &amp; Jensen (1987)</td>
<td>Denmark</td>
<td>1970-79</td>
<td>Scandinavia</td>
<td>12,166 male incident cancer cases from the Danish Cancer Registry were linked with employment records</td>
<td>Longest employment held from pension fund registries, coded using ISIC</td>
<td>Lung, bronchus, trachea, primary cancer (ICD7 162)</td>
<td>Painters in the construction industry</td>
<td>SPIR (95% CI)</td>
<td>1.49 (1.19-1.85)</td>
<td>Age, calendar time</td>
</tr>
</tbody>
</table>

In IARC volume 47 Reference = all Copenhagen males > 30 years of age Excluded from meta-analysis because of overlap with Pukkala et al (2009).
<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Follow-up Period</th>
<th>Cancer Registry</th>
<th>Occupation</th>
<th>SMR (95% CI)</th>
<th>SIR (95% CI)</th>
<th>CI</th>
<th>Reference Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Englund (1980); Engholm and Englund (1982)</td>
<td>30,580 members of the painters’ union followed up (through 1971 for cancer incidence and through 1974 for mortality) by record linkage with the Swedish Cancer Registry and the yearly death registers of the Swedish Central Bureau of Statistics, respectively.</td>
<td>1966-74</td>
<td>Cancer incidence was also assessed through linkage of 1960-73 Cancer Registry data with the 1960 Population Census. 25,805 of these painters reported being in the building trade in the 1960 population census.</td>
<td>Lung, bronchus, trachea (ICD7&amp;8, 162)</td>
<td>Painters</td>
<td>124</td>
<td>1.27 [1.06-1.51]</td>
<td>In IARC volume 47 Reference = Swedish males; There is substantial overlap between these cohorts. Excluded from meta-analysis because of overlap with Pukkala et al (2009).</td>
</tr>
<tr>
<td>Carstensen et al (1988)</td>
<td>1622 547 Swedish men in the 1960 national census, aged 30-64 years and gainfully employed, were linked to the Swedish Cancer Registry and followed for cancer incidence from 1961-79</td>
<td>1961-79</td>
<td>Occupations and industries were obtained from the 1960 census and coded using ILO standards. Smoking data were obtained from a large survey among an age-stratified random sample of the Swedish population in 1963.</td>
<td>Trachea, bronchus, lung (ICD7 162.0, 162.1, 163)</td>
<td>Painters and paperhangers</td>
<td>425</td>
<td>1.01 (0.88-1.16)</td>
<td>In IARC volume 98 Reference = Swedish males; It is likely that paperhangers work in the same job environment as painters or may also paint, and it is reasonable to consider this category as a whole as “painters”. Excluded from meta-analysis because of overlap with Pukkala et al (2009).</td>
</tr>
<tr>
<td>Study</td>
<td>Countries</td>
<td>Sample Description</td>
<td>Occupation and Cause of Death</td>
<td>SIR (95%CI)</td>
<td>Birth Cohort, Sex, Site</td>
<td>Reference</td>
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</tr>
<tr>
<td>Skov et al (1993)</td>
<td>Denmark 1970-80, Finland 1971-80, Norway 1961-84, Sweden 1961-79</td>
<td>87,004 economically active, male painters and lacquers included in the national census of 4 Scandinavian countries were followed-up for cancer incidence by linking individual records with national cancer registries.</td>
<td>Painter (ICD7 162.0,1)</td>
<td>1.30 (1.22-1.38)</td>
<td>Birth cohort, sex, site</td>
<td>In IARC volume 98 Reference = economically active census population or total population in same region (Sweden only); Excluded from meta-analysis because of overlap with Pukkala et al (2009).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown et al (2002)</td>
<td>Sweden 1971-89</td>
<td>People in the painting trades or painting industry (42,433 male painters and 6,662 male and 2,136 female pictorial artists) obtained from 1960 and 1970 Swedish census data were linked to the Cancer Environment Register to follow-up for cancer incidence from 1971-89.</td>
<td>Male painters (classified either in 1960 or 1970)</td>
<td>1.2 (1.1-1.3)</td>
<td>Age, sex, calendar year</td>
<td>In IARC volume 98 Reference = national population; Lung cancer risk was not increased among artists; Excluded from meta-analysis because of overlap with Pukkala et al (2009).</td>
<td></td>
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</tr>
</tbody>
</table>
Pukkala et al. (2009) in press
Scandinavia

15 million people aged 30-64 years in the 1960, 1970, 1980/1981 and/or 1990 censuses and the 2.8 million incident cancer cases diagnosed in these people in a follow-up until about 2005 were linked to Nordic national registries

Occupation from self-administered census questionnaire, coded using ISCO codes adapted to Nordic countries

Lung, bronchus, trachea (ICD7, ICD9, ICD-O-1-3)
Painters [3465]
Men 3418
Norway 1971-1991 smoking adjusted
Women 260
1.38 [1.22-1.56]
1.52 (1.34-1.72)
1.90 (1.40-2.53)

SIR (95%CI)

Country, sex, age, period

Reference = national populations; Estimated 69.1% of Norwegian male painters smoked; Nordic Occupational Cancer (NOCCA) project; Update of Andersen et al. (1999)

Enterline & McKiever (1963); Guralnick (1963)
USA 1950

Men aged 20-64 who died in the USA in 1950

Usual occupation and industry recorded from death certificates, coded using International Occupational Classification

Lung, bronchus, trachea, primary cancer (ICD6 162)
Painters and plasterers 118
White 113
Non-white 5
Painters (construction), paperhangers, glaziers 212
White 200
Non-white 12

SMR (95% CI)

Age, race

Reference = 1950 US census population

In IARC volume 47

Dunn & Weir (1965)
California, USA 1954-62

Prospective study of >68,000 men working in ‘suspicious’ occupations (12,512 painters and decorators) followed for an average of 7 years to determine causes of mortality, as assessed by linkage to California death records; unexposed group = public utility electric workers, excluding workers employed in suspect jobs

Men were enrolled based on their occupation, identified through unions and mailed questionnaire (85% response rate)

Lung
Painters & decorators 91
smoking adjusted 91

SMR (95% CI)

Age, smoking

Reference = Total male population of California; Public utility employees not engaged in suspect job classes were used as a smoking control group because their smoking pattern closely resembled the general California male population; Specific occupations studied had fewer nonsmokers and more heavy smokers than did the smoking control group.

In IARC volume 47
<table>
<thead>
<tr>
<th>Study Details</th>
<th>Study Design</th>
<th>Occupations</th>
<th>Last occupation from death certificates and surveillance registry files, coded using the 1970 US Census occupational classification system</th>
<th>Lung, bronchus, trachea</th>
<th>Painter</th>
<th>SMR (95% CI)</th>
<th>age</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menck &amp; Henderson (1976)</td>
<td>Pooled mortality and morbidity data of 2,161 deaths from lung cancer in and 1,777 incident cases of lung cancer among white males aged 20-64, identified from the LA County Cancer Surveillance Program Records</td>
<td>Lung, bronchus, trachea</td>
<td>Painter</td>
<td>87</td>
<td>1.58 [1.27-1.95]</td>
<td>age</td>
<td>In IARC volume 47 Reference = all occupations; Morbidity and mortality data were pooled because of the high mortality rate of lung cancer and the relatively high accuracy of death certification regarding lung cancer (45 deaths + 42 incident cases)</td>
<td></td>
</tr>
<tr>
<td>Petersen &amp; Milham (1980)</td>
<td>Death certificates of 3558 painters in California</td>
<td>Occupation from death certificate</td>
<td>Lung</td>
<td>Painters, except construction and maintenance</td>
<td>NG</td>
<td>NG; Excess of lung cancers observed compared to expected.</td>
<td>Age, year of death</td>
<td>In IARC volume 47 Excluded from the meta-analysis due to lack of information and possible overlap with Dunn &amp; Weir (1965).</td>
</tr>
<tr>
<td>Whorton et al (1983)</td>
<td>2200 painting union members (2197 men, 3 women) linked to the California Tumor Registry</td>
<td>1976-77 union membership files</td>
<td>Lung, bronchus, trachea and pleura (ICDO1 162)</td>
<td>Painter</td>
<td>15</td>
<td>SIR (95% CI) 1.99 [1.12-3.30]</td>
<td>Age, sex, year</td>
<td>In IARC volume 47 Reference = mid-year SMSA California population</td>
</tr>
<tr>
<td>Dubrow &amp; Wegman (1984)</td>
<td>34,879 white men &gt; 20 years old</td>
<td>Usual occupation from death certificate, coded using SIC codes</td>
<td>Lung, bronchus, trachea (ICD8 162)</td>
<td>Painters grouped shipyard</td>
<td>110</td>
<td>SMOR (95% CI) 1.31 [1.08-1.58]</td>
<td>age</td>
<td>In IARC volume 47 Reference = 25% random sample of death files, excluding cancer and liver &amp; liver cirrhosis; SMOR is equivalent to an exposure odds ratio from a case-control study using dead controls, standardized by age</td>
</tr>
</tbody>
</table>
Mortality of 57175 white male painters and allied tradesmen currently or formerly members of a painters’ union for ≥ 1 year during 1975-79; 33,098 men from “mixed” locals were primarily or exclusively painters
Painters’ union records from local chapters Lung, bronchus, trachea (ICD8, 162) Painters, construction and maintenance 448 SMR (95% CI) Age
1.18 (1.06-1.32) In IARC volume 47 Reference = US white males; The union represents most unionized painters in the US; members of “mixed” locals consisted primarily or exclusively of painters; Excluded from meta-analysis because later updated by Steenland & Palu (1989)

Stockwell & Matanoski (1985) New York State, USA, 1975-79
Nested case-control study 124 incident male lung cancer cases identified from the New York State Cancer Registry and 371 non-cancer controls randomly selected from union membership files and stratified by birth date and geographical region Occupation from union records and questionnaire Lung, bronchus, trachea (ICD8, 162) Painter ever/never usual trade union specialty never wore a respirator wore a respirator yes or no respirator
52 51 37 NG NG RR (95% CI) smoking, beer drinking, asbestos exposure, geographical region
2.57 (1.34-4.94) none
2.75 (1.45-5.21) none
3.17 (1.43-7.05) none
5.45 (1.01-29.33) Age, education,
1.14 (0.34-3.79) smoking
[1.94 (0.73-5.16)]* non
In IARC volume 47 No significant differences in smoking habits were found when comparing smoking characteristics in painters and non-painters; Excluded from meta-analysis because overlaps with Matanoski et al (1986) and later updated by Steenland & Palu (1989); *Calculated using a fixed effects model.

1178 painters were followed during 1954-80 within a cohort assembled from a roster of approximately 300,000 white male WWI veterans who served in the US Armed Forces some time during 1917-40 and who held active government life insurance policies Mailed questionnaire that inquired about tobacco use, usual industry of employment and occupation, coded using 1950 Census Occupation and Industry codes Respiratory system (ICD7 ) Painters, Construction and maintenance Not construction and maintenance 36 4 SMR (95% CI) Smoking, age, calendar time
1.1 [0.77-1.43] 1.2 [0.33-3.07] In IARC volume 98 Reference = US white males
<table>
<thead>
<tr>
<th>Study</th>
<th>Location/Industry</th>
<th>Duration</th>
<th>Number of Painters</th>
<th>Duration of Exposure</th>
<th>Source of Exposure Data</th>
<th>Exposure Variable(s)</th>
<th>Number of Cases</th>
<th>Incidence Rate</th>
<th>Confidence Interval</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alexander et al (1996)</td>
<td>Seattle, WA, USA</td>
<td>1974-94</td>
<td>2429</td>
<td>≥ 6 months</td>
<td>Work history records</td>
<td>Chromium [VI] estimated from industrial hygiene measurements and work-history records; cumulative exposure to chromium [VI] = years in each job x TWA for each exposure category</td>
<td>Entire cohort</td>
<td>SMR (95% CI)</td>
<td>Age, sex, race, calendar year</td>
<td>In IARC volume 98 Reference = Puget Sound population during 1974–94; No information on smoking; no trend with cumulative exposure to chromium VI but slightly positive trend with duration of employment as a sander/polisher; small numbers preclude conclusions</td>
</tr>
<tr>
<td>Boice et al (1999)</td>
<td>Lockheed Martin Plant Burbank, Los Angeles county, California, USA 1960-96</td>
<td>1216 painters (1139 men, 77 women) employed ≥ 1yr in the aircraft industry, followed-up retrospectively for mortality</td>
<td>Detailed job history was obtained from work history cards</td>
<td>Lung, bronchus, trachea (ICD9, 162) Painter</td>
<td>SMR (95% CI) Age, sex, race, calendar year</td>
<td>In IARC volume 98 Reference = California worker and general US populations; Other cancer causes non-informative due to small numbers of deaths; painting not described in detail except that paints contained chromates. There is a possible small overlap with Dunn &amp; Weir (1965) and Menck &amp; Henderson (1976)</td>
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<tr>
<td>Steenland &amp; Palu (1999)</td>
<td>California, Missouri, New York, Texas, USA 1975-94</td>
<td>42 170 painters and 14 316 non-painters with ≥ 1yr union membership were identified from union records and followed from 1975-94 by linkage to national and local registers; Restricted to white men (98% of the cohort).</td>
<td>Job titles were inferred from union membership records which identified the specialty affiliation and trade of the local union for all members</td>
<td>Lung Painter</td>
<td>SMR (95% CI) Age, calendar time.</td>
<td>In IARC volume 98 Update of Matanoski et al (1986) Reference = general US population; No information on trade of individual members; SRRs compared painters to non-painters;</td>
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<tr>
<td>Study: Pronk et al (2009)</td>
<td>Location: Shanghai, China</td>
<td>Time Period: 1996-2005</td>
<td>Participants: 71,067 never smoking women that held a job outside the home; aged 40-70 years; identified through resident offices in 7 representative urban communities; average 4.1 years prospective follow-up for mortality &amp; cancer incidence by linkage to Shanghai Cancer Registry and in-person biennial contact; 219 lung cancer diagnoses; &gt;92% participation rate</td>
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</tbody>
</table>

**In-person interview to obtain detailed lifetime occupational histories for each job held >1 year; coded according to the 1986 Chinese National Standard Occupational and Industry Codes Manual** | 

**Bronchus or lung (ICD-9 162.0-162.9)** | 

**Painter (construction, automotive industry, and other users)** | 

| Years employment* | HR (95% CI) | 

| 0 | 1.0 (ref) | 

| <10 | 0.83 (0.12-5.90) | 

| ≥10 | 2.75 (1.12-6.73) | 

| <20 | 2.17 (0.89-5.31) | 

| ≥20 | 1.36 (0.19-9.75) | 

**Passive smoking, family history of cancer, education age, passive smoking (smokers excluded), education level, family history of lung cancer** | 

| Risk increased with duration of employment & time since 1st employment. Information obtained by contacting authors. | 

**Abbreviations:** CI, confidence interval; HR, hazard ratio; ICD, International Classification of Diseases; RR, relative risk; SIR, standardized incidence ratio; SMR, standardized mortality ratio; n.e.c., not elsewhere classified
Supplemental Material, Table 2. Case-control studies of lung cancer among persons with occupation as a painter, arranged by geographical region and publication date.

<table>
<thead>
<tr>
<th>Reference, Location, Time period</th>
<th>Characteristics of cases</th>
<th>Characteristics of controls</th>
<th>Exposure Assessment</th>
<th>Exposure</th>
<th>No. of exposed cases</th>
<th>OR (95% CI)</th>
<th>Adjustment for potential confounders</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ronco et al (1988) Italy 1976-80</td>
<td>126 men who died from lung cancer; 77% participation rate</td>
<td>Random sample of 384 men who died from causes other than from smoking-related or chronic lung diseases; matched by year of death and age (≥ 10 yrs); 78% participation rate</td>
<td>Lifetime occupational history from interview with next of kin; coded using ILO classification</td>
<td>Painter</td>
<td>5</td>
<td>1.33 (0.43 – 4.11)</td>
<td>age, year of death, smoking, other employment in suspect high-risk occupations</td>
<td>In IARC volume 47</td>
</tr>
<tr>
<td>Jahn et al (1999); Bruske-Hohlfeld et al (2000) BIPS study in Bremen area and Frankfurt/Main area (Germany) 1988-93</td>
<td>686 women, &lt; 75 yrs of age at diagnosis, of German nationality; 3498 men, &lt; 76 yrs of age at diagnosis, living in Germany for at least 25 years, resident in the study region; 100% confirmed by histology or cytology. Response rate 63% BIPS, 77% GSF [73% overall]</td>
<td>712 female and 3541 male population controls randomly selected from population registries or by random digit dialing, individually (BIPS study) or frequency (GSF study) matched to cases by sex, age, and region. Response rate 60% BIPS, 41% GSF [45% overall]</td>
<td>Standardized questionnaire with full occupational history and supplementary job-specific modules, administered during a face to face interview; jobs coded according to the classification of the German Statistical Office (Statistiches Bundesamt)</td>
<td>Ever painters (women)</td>
<td>13</td>
<td>3.0 (0.73–12.33)</td>
<td>Smoking, asbestos, education, age, region of residence</td>
<td>In IARC volume 98</td>
</tr>
<tr>
<td>GSF study in Nordrhein-Westfalen, Rheinland-Pfalz and Bayern, Saarland, Thuringen, and Sachsen (Germany) 1990-96</td>
<td>650 non-smoking cases (509 women, 141 men)</td>
<td>1542 non-smoking controls (1011 females, 531 males); Community based controls in 6 centres, hospital controls (diseases not related to tobacco smoking) in 5</td>
<td>In-person interview for lifetime occupational history, coded using ISCO and ISIC classification; non-smokers = subjects who smoked &lt; 400</td>
<td>Ever painters (men)</td>
<td>6</td>
<td>1.84 (0.59–5.74)</td>
<td>Age, centre</td>
<td>In IARC volume 98</td>
</tr>
<tr>
<td>Pohlabeln et al (2000) 12 centres in Germany, Italy, Portugal, Sweden, UK, France and Spain 1988-94</td>
<td>650 non-smoking cases (509 women, 141 men)</td>
<td>1542 non-smoking controls (1011 females, 531 males); Community based controls in 6 centres, hospital controls (diseases not related to tobacco smoking) in 5</td>
<td>In-person interview for lifetime occupational history, coded using ISCO and ISIC classification; non-smokers = subjects who smoked &lt; 400</td>
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<td>6</td>
<td>1.84 (0.59–5.74)</td>
<td>Age, centre</td>
<td>In IARC volume 98</td>
</tr>
</tbody>
</table>

*These studies have substantial overlap with Kreuzer (2001, 2002) that presented results for painters in lifetime non-smoking men [2.31 (0.57-9.47)] and women (OR=1.2), respectively. BIPS study overlaps with Jöckel et al (1998).*

Low response rate among controls with potential for selection bias; frequency matched cases and controls of the GSF-study were post-hoc stratified according to the matching variables age, region; *fixed effects model used to calculate a weighted average; These studies have substantial overlap with Kreuzer (2001, 2002) that presented results for painters in lifetime non-smoking men [2.31 (0.57-9.47)] and women (OR=1.2), respectively. BIPS study overlaps with Jöckel et al (1998).*
Europe

<table>
<thead>
<tr>
<th>Study</th>
<th>Methodology</th>
<th>Controls</th>
<th>Risk Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bouchardy et al (2002)</td>
<td>9106 men from cantonal Cancer Registries, aged 25 or more (and 65 or less in St Gall and Vaud)</td>
<td>49028 male non-lung cancer registrants from the same registries and period</td>
<td>273</td>
</tr>
<tr>
<td></td>
<td>centres and both community and hospital-based controls in 1 centre.</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plasterers and painters (in the construction industry)</td>
<td></td>
<td>1.1 (1.0–1.3)</td>
</tr>
<tr>
<td></td>
<td>Age, registry, civil status, period of diagnosis, nationality, urban/rural residence, socioeconomic status, histological confirmation, information from death certificate only (cases)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>956 men from active search in all hospitals of the study areas, aged less than 75; response rate: 86% in Turin, 72% in Eastern Veneto; all cases histologically or cytologically confirmed</td>
<td>1253 male population-based controls, matched by study area, 5-year age groups; response rate: 85% in Turin, 74% in Eastern Veneto</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lifetime occupational history obtained from interviewer-administered questionnaire, coded using ISCO and ISIC codes</td>
<td>Ever painters small cell carcinoma Construction painters Painters, n.e.c.</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>Plasterers and painters (in the construction industry)</td>
<td></td>
<td>1.7 (1.1–2.8)</td>
</tr>
<tr>
<td></td>
<td>Age, study area, smoking (never, ex-, active smokers), number of job periods, education</td>
<td></td>
<td>5.2 (1.2-23)</td>
</tr>
<tr>
<td>Europe</td>
<td>540 (474 men, 66 women) autopsy cases from the St Petersburg central pathology laboratory, serving 88 state hospitals in the study area. Occupational records retrieved for all cases.</td>
<td>582 (453 men, 129 women) individuals with autopsy-based diagnoses of non-cancer and non-tobacco related conditions, frequency matched by sex, age, area, year of death (20 painters). Occupational records retrieved for all controls.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lifetime occupational histories were obtained from personal records (&quot;Green Book&quot;), coded based on ISCO and ISIC classification</td>
<td>Ever painters &lt; 10 years ≥ 10 years</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Painters, n.e.c.</td>
<td></td>
<td>0.6 (0.3–1.4)</td>
</tr>
<tr>
<td></td>
<td>Age, sex, smoking</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Post-mortem examinations were conducted in about 95% of decedents. Information on smoking was abstracted from medical records at local health centres, but neither the proportion of success nor the quality of data assessed were stated. Occupational histories from the “Green Books” are reported to be complete.</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>New smokers = smoked &lt;100 cigarettes in lifetime;</td>
<td></td>
<td>0.8 (0.2–3.0)</td>
</tr>
<tr>
<td>Europe</td>
<td>223 never smoking cases (48 men, 175 women)</td>
<td>1039 non-smoking controls (534 men, 505)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In-person interview to obtain lifetime</td>
<td>Painters Men</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Painters, n.e.c.</td>
<td></td>
<td>[1.81 (0.72-4.59)]</td>
</tr>
<tr>
<td></td>
<td>Age, registry, civil status, period of diagnosis, nationality, urban/rural residence, socioeconomic status, histological confirmation, information from death certificate only (cases)</td>
<td></td>
<td>NG</td>
</tr>
<tr>
<td></td>
<td>Never smokers = smoked &lt;100 cigarettes in lifetime;</td>
<td></td>
<td>None</td>
</tr>
</tbody>
</table>


Europe

Europe
Czech Republic, Hungary, Poland, Romania, Russia, Slovakia, United Kingdom 1998-2002

Europe
diagnosed at participating centers; 20-74 years; lived in the study area for ≥ 1 year; 100% confirmed by histology or cytology; 86% participation rate

women); selected from patients that did not have malignant neoplasms, respiratory diseases, or other smoking related disorders or selected from healthy individuals in the general population (Warsaw, Liverpool only); 85% participation rate

occupational histories for jobs held ≥ 1 year; jobs coded by ISCO or NACE

Women 6 1.8 (0.53-6.0) sex, age, study center

Painters were classified as working in construction, automotive industry and other users

Coggon et al. (1986)

Cleveland, Humberside, Cheshire counties, UK 1975-80

United Kingdom

738 male bronchial cancer cases, aged 18-54 yrs, identified from hospital and cancer registry records

1221 other cancers

Occupation from mailed questionnaire

Painters and decorators 20 1.3 [0.62-2.72] age, smoking, residence, respondent

In IARC volume 47

52.1% overall response rate; The variance was doubled to approximate an adjusted 95% CI. The unadjusted 95% CI was 0.78-2.18. Included in the analysis restricted to case-control studies but excluded from the combined meta-analysis because of possible overlap with OPCS (1986).

Kjuus et al. (1986)

Norway 1979-83

Scandinavia

176 male incident lung cancer cases (ICD 162-163), < 80 years; 99% response rate

176 age-matched hospital controls excluding those with physical or mental handicaps, poor general health, or diagnosed with chronic obstructive lung disease; 99% response rate.

Interview and worksite records for longest job held; coded using Nordic Classification of Occupations; Exposed if worked ≥3 years

Painting, paper-hanging (occupation)

Paints, glues, lacquer (exposure)

5 1.7 (0.4 - 7.3) Age, smoking

In IARC volume 47

17

17.2 (0.6 – 2.6)

Wynder & Graham (1951)

Subset of 200 cases from a Hospital Chest Service from a total of 709 US male cases of confirmed cases with epidermoid, undifferentiated or unclassified lung cancer

200 controls with a chest disease other than lung cancer from the Hospital Chest Service

Lifetime occupational history from interview

Painter > 5 years within the last 40 years

11 [5.76 (1.41-23.44)] None

In IARC volume 47

The chest diseases were not specified. Only 2 painters were nonsmokers (smoked < 1 cigarette/day for >20 years). Cases and controls were of similar age and economic status.
<table>
<thead>
<tr>
<th>Study</th>
<th>Location</th>
<th>Cohort Details</th>
<th>Methodology</th>
<th>Controls Details</th>
<th>Exposure Details</th>
<th>Risk Estimates</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breslow et al. (1954)</td>
<td>California, USA</td>
<td>518 patients with histologically confirmed lung cancer from 11 hospitals</td>
<td>Interview</td>
<td>518 hospital controls matched by hospital, age, sex, race; excluded admission of lung cancer or a chest disease</td>
<td>Hospital, age, sex, race</td>
<td>1.87 (0.93-3.77)</td>
<td>The gender distribution is not presented.</td>
</tr>
<tr>
<td>United States of America</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.50 (0.14-1.82)</td>
<td></td>
</tr>
<tr>
<td>Viadana et al. (1976); Decouflé et al. (1977); Houten et al. (1977)</td>
<td>Buffalo, NY, USA 1956-65</td>
<td>Lung cancer cases (ICD 162, 163) from 1159 white male cancer cases at a treatment center, age ≥ 14 years</td>
<td>Non-cancer admissions from the same cancer treatment center</td>
<td>Lifetime occupation recorded during interview before diagnosis, coded using the Standard Industrial Classification Manual</td>
<td>Painter, except construction and maintenance for ≥ 5 years</td>
<td>1.71 [1.08-2.77]</td>
<td></td>
</tr>
<tr>
<td>United States of America</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.90 [1.32-2.48]</td>
<td></td>
</tr>
<tr>
<td>Third National Cancer Survey</td>
<td>United States of America</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(p &lt; 0.01)</td>
<td></td>
</tr>
<tr>
<td>Milne et al. (1983)</td>
<td>Alameda County, CA, USA</td>
<td>925 lung cancer deaths (747 men, 178 women)</td>
<td>Painting (men)</td>
<td>occupation from death certificates, coded using the Bureau of Census Industrial and Occupational Classification System</td>
<td>Painter (men)</td>
<td>1.80 [1.09-2.98]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>age</td>
<td></td>
</tr>
</tbody>
</table>

In IARC volume 47, Unexposed = clerical occupations; The CI was estimated by doubling the variance.
<table>
<thead>
<tr>
<th>United States of America</th>
<th>(reported as the “reduced control group”)</th>
<th>United States of America</th>
<th>(reported as the “reduced control group”)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lerchen et al. (1987)</strong></td>
<td>771 cases (333 men, 173 women) identified from a SEER tumor registry; Hispanic whites and whites ages 25-84 years; 89% response rate</td>
<td><strong>New Mexico, USA 1980-82</strong></td>
<td>771 controls (499 men, 272 women) from randomly selected phone numbers and Medicare rosters; frequency matched by sex, ethnicity, 10-year age category; 83% response rate</td>
</tr>
<tr>
<td>Interview for lifetime occupational history; jobs coded using the SIC or SOC</td>
<td><strong>United States of America</strong></td>
<td>Interview for lifetime occupational history; jobs coded using the SIC or SOC</td>
<td>Interview for lifetime occupational history; jobs coded using the SIC or SOC</td>
</tr>
<tr>
<td>Ever construction painters (males)</td>
<td>9</td>
<td>Ever construction painters (males)</td>
<td>9</td>
</tr>
<tr>
<td>2.7 (0.8 – 8.9)</td>
<td>age, ethnicity, smoking</td>
<td>2.7 (0.8 – 8.9)</td>
<td>age, ethnicity, smoking</td>
</tr>
<tr>
<td><strong>Vineis et al (1988)</strong></td>
<td>2973 men from cancer registries, co-operating hospitals or death certificates, resident in selected areas of the states; response rate range: 70%-93%.</td>
<td><strong>Analysis of 5 case-control studies in Louisiana, Florida, Pennsylvania, Virginia and New Jersey, USA, 1970s and 1980s</strong></td>
<td>3210 men from hospital records, decedents, death certificates, licensed drivers, matched by characteristics varying from study to study, with age always included; response rate range: 63%-89%</td>
</tr>
<tr>
<td>Life-time occupational history obtained during interviews with subjects or next of kin, coded using SIC and 1970 Census Classification</td>
<td>Painters</td>
<td>Painters</td>
<td>Painters</td>
</tr>
<tr>
<td>Painters 201</td>
<td>1.1 (0.9–1.4)</td>
<td>Painters 201</td>
<td>1.1 (0.9–1.4)</td>
</tr>
<tr>
<td>Age, birth cohort, smoking</td>
<td>Age, birth cohort, smoking</td>
<td>Age, birth cohort, smoking</td>
<td>Age, birth cohort, smoking</td>
</tr>
<tr>
<td><strong>Zahm et al (1989)</strong></td>
<td>4431 white male cases with histological type and grade recorded at Missouri Cancer Registry, residing in Missouri</td>
<td><strong>Missouri, USA 1980-85</strong></td>
<td>11 326 white male non-lung cancer registrants from the same Registry and period, excluding cancers of lip, oral cavity, esophagus, lung, bladder, ill-defined or unknown sites</td>
</tr>
<tr>
<td>Occupation at the time of diagnosis abstracted from medical records, coded using US Bureau of Census classification</td>
<td>Painters, paper hangers, plasterers &lt;60 yrs of age</td>
<td>Painters, paper hangers, plasterers &lt;60 yrs of age</td>
<td>Painters, paper hangers, plasterers &lt;60 yrs of age</td>
</tr>
<tr>
<td>Painters 37</td>
<td>2.0 (1.2–3.3)</td>
<td>Painters 37</td>
<td>2.0 (1.2–3.3)</td>
</tr>
<tr>
<td>Age, smoking</td>
<td>Age, smoking</td>
<td>Age, smoking</td>
<td>Age, smoking</td>
</tr>
<tr>
<td><strong>Burns &amp; Swanson (1991)</strong></td>
<td>5935 (3918 males, 2017 females; 77% white, 23% black) from Occupational Cancer Incidence Surveillance System/Metropolitan Detroit Cancer Surveillance System, aged 40-84 years; response</td>
<td><strong>Detroit metropolitan area, USA recruitment period not specified, probably 1984-87, as in Swanson et al, 1993.</strong></td>
<td>3956 (1981 males, 1975 females) with colon and rectum cancer, registry-based</td>
</tr>
<tr>
<td>Life-time occupational history obtained during telephone interviews to the subjects or to their surrogates, coded using US Bureau of Census classification.</td>
<td>Painters (usual occupation, grouped)</td>
<td>Painters (usual occupation, grouped)</td>
<td>Painters (usual occupation, grouped)</td>
</tr>
<tr>
<td>Painters 97</td>
<td>1.96 (1.23–3.13)</td>
<td>Painters 97</td>
<td>1.96 (1.23–3.13)</td>
</tr>
<tr>
<td>Age at diagnosis, race, smoking, gender</td>
<td>Age at diagnosis, race, smoking, gender</td>
<td>Age at diagnosis, race, smoking, gender</td>
<td>Age at diagnosis, race, smoking, gender</td>
</tr>
<tr>
<td>In IARC volume 98 Interviews to surrogates: 53.7% for cases, 27.5 % for controls. Unexposed group: selected occupations and industries with little or no exposure to carcinogens. Proportion of histologic confirmation not given; 93.4% overall response</td>
<td>In IARC volume 98 Unexposed group: selected occupations and industries without a well-established or suspected carcinogenic exposure; Studies analyzed: Correa et al (1984), Blot et al (1980, 1982, 1983), Schoenberg et al (1987)</td>
<td>In IARC volume 98 Interview to surrogates: 53.7% for cases, 27.5 % for controls. Unexposed group: selected occupations and industries with little or no exposure to carcinogens. Proportion of histologic confirmation not given; 93.4% overall response</td>
<td>In IARC volume 98 Interview to surrogates: 53.7% for cases, 27.5 % for controls. Unexposed group: selected occupations and industries with little or no exposure to carcinogens. Proportion of histologic confirmation not given; 93.4% overall response</td>
</tr>
</tbody>
</table>
United States of America

rates: 94% for cases and
95% for controls

Swanson et al (1993)
Detroit metropolitan area, USA
1984-87
3792 males (2866 white, 926 black) from
Occupational Cancer Incidence Surveillance System/Metropolitan
Detroit Cancer Surveillance System (participant in SEER),
aged 40-84 years; 100% histologically confirmed.

United States of America

Life-time occupational and smoking history obtained during telephone
interviews with subjects or their surrogates. Jobs
coded using US Bureau of Census classification

Painting machine operators:
White males

<table>
<thead>
<tr>
<th>Employment (years)</th>
<th>0</th>
<th>1-9</th>
<th>10-19</th>
<th>20+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>88</td>
<td>23</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>95%</td>
<td>1.1</td>
<td>0.6</td>
<td>3.9</td>
</tr>
</tbody>
</table>

Black males

<table>
<thead>
<tr>
<th>Employment (years)</th>
<th>0</th>
<th>1-9</th>
<th>10-19</th>
<th>20+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12</td>
<td>17</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>87</td>
<td>1.5</td>
<td>9.9</td>
<td>8.7</td>
</tr>
</tbody>
</table>

p for trend

<10 yrs 40 [1.10 (0.61-2.34)]* 0.6 (0.2-1.1)
≥10 yrs 40 [2.23 (1.05-4.73)]* 1.8 (0.3-12.3)
<20 yrs 53 [1.15 (0.65-2.04)]* 0.7 (0.3-1.1)
≥20 yrs 27 [4.62 (1.61-13.31)]* 0.5 (0.2-1.1)

Age at diagnosis, pack-years of
age, geographic area, race, smoking, study period

In IARC volume 98

Interviews with surrogates: 56.1% for cases, 29.5% for
controls; Unexposed group: selected occupations and
industries with little or no exposure to carcinogens. >90%
overall response rate; This
paper does not represent an independent set of cases and
controls, but is a re-analysis of
a sub-group reported in the study of Burns & Swanson
(1991). Therefore it was
omitted from the overall meta-
analysis but kept for the
analysis by duration.
*Calculated using a fixed
effects model.

Morabia et al (1992)
Detroit, Chicago, Philadelphia, Pittsburgh,
New York, Long Island, San Francisco,
Birmingham, USA
1980-89
1793 male cases from 24
hospitals; 100% confirmed
by histology; response rate
not given. Number of
cases that were painters
not given.

American Health
Foundation study

United States of America

3228 controls not
hospitalized for lung
cancer but including
tobacco related conditions;
matched by age, race,
hospital, smoking history,
admission date; response
rate not given.

Standardized
questionnaire, administered during a
face to face interview.
Only “usual” occupation
recorded, plus exposure
circumstances to up to 2
agents out of a list of 44
(study period 1980-4), or
up to 6 agents (study
period 1985-9); Jobs
coded using US Bureau of
Census classification

Painters [13] 0.8 [0.32-2.03]

Age, education, smoking

In IARC volume 98
The variance was doubled to
approximate an adjusted
95%CI. The unadjusted 95%CI
was 0.41-1.54.

New York City, Long
Island, Philadelphia,
Washington D.C.,

365 black men and 185
black women with
histologically confirmed
lung carcinomas recruited
from teaching hospitals

251 male and 135 female
black patients admitted to
teaching hospitals for
conditions unrelated to
tobacco use, matched by

Interviewer-administered
questionnaire. Only
“usual” occupation and
whether the job entailed
regular exposure to an

Ever painters [24] 1.32 (1.30-1.35)*
Men 30 0.7 (0.3-1.1)
Men (no overlap) [19] 0.68 (0.29-1.59)
Women 5 1.8 (0.3-12.3)

Age, education, smoking

In IARC volume 98
Response rate: over 90%
overall (no specific rate by
gender or case-control status
given); The study partially
Detroit, and Chicago, USA 1978-96
United States of America

race, gender, 5 years age groups, month of diagnosis occupational exposure (for a minimum of 8 hours a week) was obtained from interviews with subjects or their next of kin or death certificates

Siemiatycki et al. (1987)
Montreal, Canada, 1979-85
Canada

857 male cases (159 oat-cell, 359 squamous-cell, 162 adenocarcinoma, 177 other types)

Other cancers

Interview to obtain lifetime occupational history; painters coded using Canadian occupation classification

Mineral spirit exposure

OR (90% CI)

1.1 (0.8 – 1.4)

1.2 (1.0 – 1.5)

1.7 (1.2 – 2.3)

1.0 (0.7 – 1.3)

0.8 (0.6 – 1.1)

1.4 (NG)

age, socio-economic status, ethnicity, cigarette smoking, blue/white collar

In IARC volume 47

Of those exposed to mineral spirits, 21% were in construction trades (mostly painters)

Excluded from meta-analysis because risk associated with occupation as a painter is not presented

Siemiatycki et al. (1991)
Montreal, Canada, 1979-85
Canada

857 incident male cases; aged 35-70 yrs; histologically confirmed; 79% response rate

533 population controls, 1360 cancer controls; 72% response rate;

Interview to obtain lifetime occupational history; painters coded using Canadian occupation classification

Construction painter

Any exposure

Substantial exposure

OR (90% CI)

1.4 [0.77-2.17]

(90% CI, 0.8-2.3)

1.7 (0.8-3.4)

Age, family income, ethnicity, respondent type, cigarette & alcohol index,

In IARC volume 47

The ORs were higher and the 90% CIs were narrower when restricted to lung squamous cell cancers.

Finkelstein et al. (1995)
Hamilton and Sault Ste-Marie, Ontario, Canada, 1979-88
Canada

967 men who died of lung cancer, aged 45-75 yrs, residing in the study areas

2821 men who died of any cause other than lung cancer, matched by age, year of death, and city of residence

Occupation (job and industry) as reported on the death certificate

Painters & plasterers

16

1.25 (0.63–2.36)

Age, year of death, city of residence

In IARC volume 98

No information was available on smoking

De Stefani et al. (1996)
Montevideo, Uruguay, 1993–94
South America

270 male patients from five major hospitals in Montevideo, aged 30-75 years

383 male hospital-based controls: other cancer sites except oral cavity, pharynx, oesophagus, stomach, larynx and bladder.

Interviewer-administered questionnaire with lifetime occupational history.

Ever painters

Employment (years)

1–20

21+

Squamous cell

Small cell

18

1.2 (0.6–2.4)

0.9 (0.2–3.0)

1.4 (0.6–3.1)

1.5 (0.6–3.4)

2.8 (0.8–9.9)

Age, residence, education, tobacco smoking (pack-years), alcohol consumption

In IARC volume 98

Descriptive characteristics and separate response rates for cases and controls were not given; Overall response rate for all cancer sites 97.4%
<table>
<thead>
<tr>
<th>Study</th>
<th>Methodology</th>
<th>Control Group</th>
<th>Case Group</th>
<th>Results 1</th>
<th>Results 2</th>
<th>Results 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wünsch-Filho <em>et al</em> (1998)</td>
<td>398 cases (307 men, 91 women) from 14 hospitals, living in the metropolitan area of Sao Paulo; 100% confirmed by histology or cytology</td>
<td>860 controls (546 men, 314 women) hospitalized for non-tobacco related conditions, matched by age, sex, hospital</td>
<td>Standardized questionnaire with full occupational history, administered during a face to face interview</td>
<td>Ever painters (men)</td>
<td>Ever painters (men)</td>
<td>Age, smoking, hospital, tobacco use, age, sex, hospital, age, hospital, smoking (pack-years), other occupations with significant ORs (p&lt;0.05)</td>
</tr>
<tr>
<td>Sao Paulo, Brazil 1990-91</td>
<td>338 male newly diagnosed primary lung cancer patients from three medical institutions of Rosario City; mean age 60.3 ± 9.5; 100% histologically confirmed</td>
<td>586 hospital based males controls admitted for a non-smoking related disease at the same hospitals for traumatic conditions, urological diseases, acute surgical conditions, and other illnesses, matched by age (± 3 years); mean age 60.1 ± 10.2 yrs</td>
<td>Standardized questionnaire with lifetime occupational history for each job held &gt;1 year.</td>
<td>House painters</td>
<td>Squamous cell</td>
<td>Age, smoking habit, lifelong cigarette consumption</td>
</tr>
<tr>
<td>Rosario City, Argentina 1992-98</td>
<td>397 male controls hospitalized for non-tobacco related conditions, residing in the town or province of Buenos Aires, matched by hospital and age; response rate 99%</td>
<td>Face to face interview using standardized questionnaire for full occupational history, coded using ISCO/ISIC; Further details requested for occupations held &gt;1 year.</td>
<td>Ever painters general</td>
<td>Ever blowtorch</td>
<td>Age, hospital, smoking (pack-years), other occupations with significant ORs (p&lt;0.05)</td>
<td></td>
</tr>
<tr>
<td>South America</td>
<td>1014 males hospitalized for conditions related to tobacco smoking, matched by age, residence and urban/rural status; response rate 95.7%</td>
<td>Interviewer-administered questionnaire with lifetime occupational history, Ever painter Employment (years)</td>
<td>Ever painter Employment (years)</td>
<td>1–20</td>
<td>1–20</td>
<td>Age, residence, urban/rural status, education, smoking status and years since quitting and age at start, number of cigarettes per day.</td>
</tr>
<tr>
<td>De Stefani <em>et al</em> (2005)</td>
<td>338 male patients from four major hospitals in Montevideo, aged 30-89 years; response rate 96.8% (338 subjects); 100% histologically confirmed; restricted to lung adenocarcinomas.</td>
<td>760 age-matched</td>
<td>Lifetime occupational history from interview, Ever painter duration (yrs)</td>
<td>15</td>
<td>1.4 (0.5 – 3.5)</td>
<td>Age, smoking</td>
</tr>
<tr>
<td>Montevideo, Uruguay, 1994–2000</td>
<td>733 incident male cases, aged 35-64, identified</td>
<td>760 age-matched</td>
<td>Lifetime occupational history from interview, Ever painter duration (yrs)</td>
<td>15</td>
<td>1.4 (0.5 – 3.5)</td>
<td>Age, smoking</td>
</tr>
<tr>
<td>South America</td>
<td>397 male controls hospitalized for non-tobacco related conditions, residing in the town or province of Buenos Aires, matched by hospital and age; response rate 99%</td>
<td>Face to face interview using standardized questionnaire for full occupational history, coded using ISCO/ISIC; Further details requested for occupations held &gt;1 year.</td>
<td>Ever painters general</td>
<td>Ever blowtorch</td>
<td>Age, hospital, smoking (pack-years), other occupations with significant ORs (p&lt;0.05)</td>
<td></td>
</tr>
<tr>
<td>Levin <em>et al</em> (1988)</td>
<td>338 male patients from four major hospitals in Montevideo, aged 30-89 years; response rate 96.8% (338 subjects); 100% histologically confirmed; restricted to lung adenocarcinomas.</td>
<td>760 age-matched</td>
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<td>Age, smoking</td>
</tr>
</tbody>
</table>

* The variance was doubled

In IARC volume 98

Hospital controls: 20.3% eye disorders, 18.3% fractures, 17.9% abdominal hernias, 11.0% injuries, 7.9% acute appendicitis, 7.2% diseases of the skin, 5.8% varicose veins, 3.9% hydatid cyst, 2.9% blood disorders, 2.6% urinary stones and 2.2% osteoarticular disorders.
### China: 1984-85

Population controls classified according to the Chinese population census:

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Cases</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 9</td>
<td>718</td>
<td>1.0 (ref)</td>
<td></td>
</tr>
<tr>
<td>10 - 19</td>
<td>7</td>
<td>1.9 [0.36-16.60]</td>
<td></td>
</tr>
<tr>
<td>20 - 29</td>
<td>2</td>
<td>2.8 [0.07-62.47]</td>
<td></td>
</tr>
<tr>
<td>≥ 30</td>
<td>1</td>
<td>0.3 [0.01-5.81]</td>
<td></td>
</tr>
</tbody>
</table>

### Asia: 1984-85


- 246 male patients from Tata Memorial Hospital in Bombay; age not given; 98% histologically confirmed
- 212 male hospital-based controls diagnosed with cancers of the mouth (n=160) and oro- or hypopharynx (n=27), and non-cancerous oral disease (n=25), frequency matched by age and community; age not given
- Interviewer-administered questionnaire with lifetime occupational history.
- Ever painters
- 6
- 1.62 (0.4–7.0) Age, community, smoking (two groups)

### New Zealand: 1980-84

Bethwaite et al (1990) New Zealand Oceania

- 4224 male cases had known occupation among 5031 cases identified from the New Zealand Cancer Registry, aged 20 or more at registration; % microscopic confirmation not given
- 15 680 male non-lung cancer registrants with known occupation, [out of 19731 identified] from the same Registry and period, aged 20 or more at registration; % microscopic confirmation not given
- Current/most recent occupation as recorded at the time of registration and smoking history obtained through telephone interview, coded using NZSCO
- Painter decorators, steel and other construction painters, car painters, spray painters, signwriters, other unclassified painters
- 88
- 1.12 (0.93–1.52) Age

### Abbreviations:

ETS, environmental tobacco smoke; NG, not given; OR, odds ratio; CI, confidence interval; ASCR, Association of Swiss Cancer Registries; SIC, Standard Industrial Classification; SOC, Standard Occupational Classification; ISCO; ISIC; NZSCO, New Zealand Standard Classification of Occupations; NACE, Nomenclature Générale des Activités Économiques dans les Communautés Européennes

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Note: The table provides a summary of occupational exposures and associated risks for various studies conducted in China and Asia. The data is used to approximate an adjusted 95% CI calculated using a fixed effects model.
Supplemental Material, Table 3. Proportionate mortality studies of painting and lung cancer, arranged by geographical region and publication date.

<table>
<thead>
<tr>
<th>Reference, location</th>
<th>Cohort description</th>
<th>Exposure assessment</th>
<th>Organ site (ICD code)</th>
<th>Exposure categories</th>
<th>No. of cases/deaths</th>
<th>PMR (95% CI)</th>
<th>Adjustment for potential confounders</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terstegge <em>et al</em> (1995)</td>
<td>The Netherlands 1980–92</td>
<td>Painters were obtained from a registry with which nearly all commercial painters are affiliated</td>
<td>Lung, trachea, bronchus, pleura, thymus, heart, mediastinum, less defined parts of respiratory tract (ICD 162–165)</td>
<td>Commercial painters</td>
<td>1480</td>
<td>1.20 (1.14–1.26)</td>
<td>Age, time period</td>
<td>In IARC volume 98 Reference = proportion of lung cancers among all deaths within the Dutch male population during 1980–1992</td>
</tr>
<tr>
<td>OPCS (1958) England &amp; Wales 1949–53</td>
<td>Registered deaths of men and women aged ≥65 yrs in the broad occupational category of painters and decorators</td>
<td>Occupation at time of death or last occupation from death certificates; Occupations coded according to the Census 1951, Classification of Occupations</td>
<td>Lung, bronchus, trachea, primary cancer (ICD6 162)</td>
<td>Other painters &amp; decorators</td>
<td>Men 461</td>
<td>1.30 [1.18–1.42]</td>
<td>Age, sex</td>
<td>In IARC volume 47 Reference = mortality rates of painters taken from the 1951 national census</td>
</tr>
<tr>
<td>OPCS (1978), no.1 England &amp; Wales 1970–72</td>
<td>Registered deaths of 277,168 men, aged 15–64</td>
<td>Last occupation recorded on the death certificate, as coded by the 1970 <em>Classification of Occupations</em></td>
<td>Lung, bronchus, trachea (ICD8, 162)</td>
<td>Painters &amp; decorators</td>
<td>Painters, decorators n.e.c.</td>
<td>847</td>
<td>2.25 [1.17–1.34]</td>
<td>Age</td>
</tr>
</tbody>
</table>
OPCS (1986), no. 6
UK (Scotland, England & Wales) 1979–80, 1982–83

United Kingdom
Men aged 15–74 in England & Wales in 1981


OPCS (1995), no. 10

United Kingdom
Men, aged 20–74 years, England 1981–87

Occupation recorded at the time of cancer registration/death

OPCS (1995), no. 10

29 689 male painters and decorators, aged 20–74 years, who died during 1979–80 or 1982–90, linked to census denominators

Last full-time occupation was obtained from death certificates

Lung, bronchus, trachea (ICD9 162)

Painters, decorators, French polishers

Men 779
Women 128
Other spray painters, males 34
Painters & decorators nec 226
French polishers

1.21 [1.13–1.30]
1.33 [1.11–1.58]
1.56 [1.08–2.18]
1.25 [1.09–1.42]

PRR (95% CI)

1.56 [1.08–2.18]
1.25 [1.09–1.42]

PCMR (95% CI)

In IARC volume 47
Female mortality was from England & Wales only

PRR indicates the differences in the proportions of all cancer registrations for a given occupation attributable to particular sites

In IARC volume 98

Data for 1981 were omitted because of questionable quality

This study partially overlaps with the Registrar General’s report (1996); Mesothelioma excluded from the meta-analysis

Overlaps with Guralnick
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Time Period</th>
<th>Methodology</th>
<th>Number of Cases</th>
<th>Occupation</th>
<th>Cause of Death</th>
<th>Mortality Measure</th>
<th>Reference</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>McKiever (1963)</td>
<td>United States</td>
<td>(1963)</td>
<td>Cohort study using 263 lung cancer deaths among white male spray painters and 1001 controls</td>
<td>226</td>
<td>Spray painter</td>
<td>Lung, bronchus, trachea (ICD8, 162)</td>
<td>PMR (95% CI)</td>
<td>1.41 [0.87–2.15]</td>
<td>In IARC volume 47</td>
</tr>
<tr>
<td>Chiazze et al (1980)</td>
<td>United States</td>
<td>1970–76</td>
<td>Nested case-control study using 263 lung cancer deaths among white male spray painters and 1001 controls</td>
<td>226</td>
<td>Complete work history from plant records</td>
<td>Lung, bronchus, trachea (ICD8, 162)</td>
<td>Spray painter</td>
<td>21</td>
<td>Race, sex, age, cause of death</td>
</tr>
<tr>
<td>Dalager (1980)</td>
<td>USA</td>
<td>1959–77</td>
<td>Follow-up for mortality through 1977 (deaths certificates 90% complete)</td>
<td>202</td>
<td>Respiratory organs (ICD7, 160–164)</td>
<td>Painters</td>
<td>PCMR (95% CI)</td>
<td>1.84 [0.90–2.23]</td>
<td>In IARC volume 47</td>
</tr>
<tr>
<td>Milham (1983)</td>
<td>USA</td>
<td>1950–79</td>
<td>Death records of 429,926 men and 25,066 women in Washington state</td>
<td>630</td>
<td>Occupation from death certificate</td>
<td>Lung, bronchus, trachea (ICD6-8 162)</td>
<td>Painters, mainly construction and maintenance</td>
<td>PMR (95% CI)</td>
<td>1.21 [1.06–1.37]</td>
</tr>
<tr>
<td>Miller et al (1986)</td>
<td>USA</td>
<td>1986</td>
<td>Identification of 630 white male painters from obituaries</td>
<td>630</td>
<td>Occupation from obituaries</td>
<td>Lung</td>
<td>PCMR (95% CI)</td>
<td>0.8 (0.4–1.7)</td>
<td>In IARC volume 98</td>
</tr>
</tbody>
</table>
registry of death certificates of 1757 artists deceased during 1940–69 for all sites combined was used as the comparison group. The PMR for lung cancer was not significantly elevated.

Wang et al (1999) North Carolina, United States

All male construction workers who lived and died in North Carolina during 1988–94 Usual occupation was obtained from coded death certificates

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerographers, paint sprayers</td>
<td>Persons applying paint, enamel or lacquer by spraying excluding those spraying glass or ceramics.</td>
</tr>
<tr>
<td>Coach painters</td>
<td>As described.</td>
</tr>
<tr>
<td>Other painters &amp; related occupations</td>
<td>Sign painters, poster painters, scene painters, vehicle painters and spray painters, other occupations related to paint</td>
</tr>
<tr>
<td>Painter, Construction and Maintenance</td>
<td>Paint walls, equipment, buildings, bridges, and other structural surfaces, using brushes, rollers, and spray guns. May remove old paint to prepare surface prior to painting. May mix colors or oils to obtain desired color or consistency.</td>
</tr>
<tr>
<td>Painters, decorators n.e.c.</td>
<td>Persons preparing surfaces and applying paint, enamel or lacquer other than by spraying; sign writing; wall papering; french polishing. Decorators of glass and ceramics are excluded.</td>
</tr>
<tr>
<td>Painters, decorators</td>
<td>Those in the building industry are dedicated to achieving two main objectives - to provide the final finishing to buildings and to protect surfaces from dirt and damp.</td>
</tr>
<tr>
<td>Plasterers &amp; painters</td>
<td>Plasterers, stucco plasterers, building painters, paperhangers</td>
</tr>
<tr>
<td>Painters, paperhangers</td>
<td>Painters and paperhangers apply finishes to walls, ceilings, and other surfaces. Although painting and paperhanging are two separate trades, many workers have mastered both. Painters apply paint, varnish, and other finishes with brushes, rollers, and spray machines.</td>
</tr>
</tbody>
</table>

Abbreviations: OPCS, Office of Population Censuses and Surveys; n.e.c, not elsewhere classified; NG, not given; SPIR, standardized proportional incidence ratio; CI, confidence interval; ILO, International Labor Office and the United Nations Statistical Office; ISCO, International Standard Classification of Occupations; ISIC, International Standard Industrial Classification; NG, not given; PCMR, proportionate cancer mortality ratio; RR, rate ratio or relative risk; SIC, Standard Industrial Classification; SIR, standardized incidence ratio; SMR, standardized mortality ratio; SMSA, Standard Metropolitan Statistical Area; TWA, time-weighted average; PRR, proportional registration ratio

Supplemental Material, Table 4. Definitions of occupations involved in painting trades.
Abbreviations: n.e.c., not elsewhere classified

References


Frances Drever, ed. 1996. The Registrar General's Health and Safety Executive; Occupational Health: Decennial supplement. HMSO: London


