Wood dust exposure and lung cancer risk: a meta-analysis

David G Hancock,[1] Mary E Langley,[1] Kwan Leung Chia,[1] Richard J Woodman,[1] E Michael Shanahan[1,2]

▸ Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/oemed-2014-102722).

[1]School of Medicine, Flinders University, Bedford Park, South Australia, Australia
[2]Department of Rheumatology, Southern Adelaide Local Health Network, Adelaide, South Australia, Australia

Correspondence to
Dr David G Hancock, School of Medicine, Flinders University, Bedford Park, South Australia 5042, Australia; hanc0130@flinders.edu.au

Received 20 November 2014
Revised 29 June 2015
Accepted 5 September 2015
Published Online First
24 September 2015

ABSTRACT
Occupational lung cancers represent a major health burden due to their increasing prevalence and poor long-term outcomes. While wood dust is a confirmed human carcinogen, its association with lung cancer remains unclear due to inconsistent findings in the literature. We aimed to clarify this association using meta-analysis. We performed a search of 10 databases to identify studies published until June 2014. We assessed the lung cancer risk associated with wood dust exposure as the primary outcome and with wood dust-related occupations as a secondary outcome. Random-effects models were used to pool summary risk estimates. 85 publications were included in the meta-analysis. A significantly increased risk for developing lung cancer was observed among studies that directly assessed wood dust exposure (RR 1.21, 95% CI 1.05 to 1.39, n=33) and that assessed wood dust-related occupations (RR 1.15, 95% CI 1.07 to 1.23, n=59). In contrast, a reduced risk for lung cancer was observed among wood dust (RR 0.63, 95% CI 0.39 to 0.99, n=5) and occupation (RR 0.96, 95% CI 0.95 to 0.98, n=1) studies originating in Nordic countries, where softwood dust is the primary exposure. These results were independent of the presence of adjustment for smoking and exposure classification methods. Only minor differences in risk between the histological subtypes were identified. This meta-analysis provides strong evidence for an association between wood dust and lung cancer, which is critically influenced by the geographic region of the study. The reasons for this region-specific effect estimates remain to be clarified, but may suggest a differential effect for hardwood and softwood dusts.

INTRODUCTION
Occupational lung cancers represent approximately 75% of all occupational cancers[1–4] and are a major health burden with relatively poor 5-year survival rates compared with the majority of other cancers.[5 6] Up to 10–20% of lung cancers have been attributed to occupational exposures[1–4] and a synergistic effect has been observed between smoking and many of the occupational exposures.[1–4]

Occupational exposure to wood dust remains extremely common in a wide range of jobs, despite advances in occupational health and safety policies.[7–10] Wood dust was confirmed as a group 1 human carcinogen in 1995 by the International Agency for Research on Cancer (IARC).[7] However, wood dust has only been conclusively linked to sinonasal cancers, despite individual studies suggesting an association with a range of respiratory and digestive tract cancers.[7 8 11] Although the nasal cavity/sinuses appear to be the predominate locations for wood dust deposition, wood processing generally produces a wide variety of particle sizes, at least some of which have been shown to be able to deposit in the lungs.[12–16] Wood dust has also been confirmed as a respiratory irritant and has been shown to be directly carcinogenic in lung cancer cell lines and to induce lung inflammation in animal models following nasal instillation.[17–20] While the evidence for lung deposition and direct cellular toxicity provide a plausible biological mechanism for wood dust-induced lung cancer, the relative frequency of deposition in each location may explain the stronger evidence for sinonasal versus lung cancer.[7 8 14 16]

While wood dust exposure has been frequently associated with lung cancer, a confirmed association has not been established by the IARC due to heterogeneous results in the literature.[7 8] A number of factors have been suggested to contribute to this heterogeneity, including the type of wood dust assessed (hardwood vs softwood),[7 8] confounding by smoking[1–4] and misclassification bias related to the method used for determining dust exposure.[21–23] While, hardwood dust has been conclusively defined as a human carcinogen, limited evidence exists for softwood dust.[7 8] However, very few occupational cancer studies have clarified the type of wood dust to which their cohort is exposed making assessment of this variable difficult. Interestingly, the primary wood type varies between countries, and so geographic region may serve as a proxy variable for the type of wood dust assessed in each study.[7 24] In particular, wood exposure in Nordic countries is primarily to softwood dust, while hardwood dust exposure is relatively more prevalent in many other countries.[7 24]

We performed a systematic review and meta-analysis of the available literature in order to clarify the association between wood dust and lung cancer. We also aimed to assess the influences of geographic region (as a measure of softwood dust exposure), adjustment for smoking and exposure classification methods using subgroup analyses.

METHODS
Search strategy
We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to conduct our review and analysis. A systematic search of the databases CINAHL (from 1982), EMBASE (from 1974), Google Scholar (from ~1980), JSTOR (from ~1909), MEDLINE (from 1946), PubMed (from 1946), ScienceDirect

CrossMark

To cite: Hancock DG, Langley ME, Chia KL, *et al*. *Occup Environ Med* 2015;**72**:889–898.

(from ~1856), Web of Science (from 1990) and Wiley Online Library (from ~1989) through to June 2014 was completed. The search terms used to search all databases were combinations of Wood Dust ('wood dust', 'sawdust', 'saw dust', 'hardwood dust', 'softwood dust') AND Lung Cancer ('lung cancer', 'lung adenocarcinoma', 'lung carcinoma', 'lung malignancy'). No additional restrictions were used in the search. A systematic search of the Chinese literature in the database CNKI (from 1915) through to June 2014 was also completed. The English search terms were translated into Chinese as: Wood Dust ('木屑', '鋸木屑', '軟木屑', '硬木屑', '木塵', '木粉', '木粉塵', '軟木粉塵', '硬木粉塵', '木材性粉塵') and Lung Cancer ('肺癌', '肺腺癌', '肺'). The Google Scholar, JSTOR, ScienceDirect and CNKI databases perform full-text searches, and thus allow for the identification of studies without 'Lung Cancer' and/or 'Wood Dust' in the abstract.

To identify additional articles that assessed wood dust-related occupations and lung cancer risk, we performed an additional PubMed (from 1946) database search using terms for Wood-Related Occupations (occupation, hardwood, softwood, wood, woodworker, carpenter, furniture, cabinet, joiner, mill, sawmill) AND Cancer (cancer, carcinoma, adenocarcinoma). Cancer was used in the search string in order to identify articles where 'Lung Cancer' was not specifically listed in the abstract.

References in all identified publications, and in the IARC monographs on wood dust,[7 8] were also reviewed for additional studies.

Eligibility criteria

This review included cohort and case–control studies looking at the relationship between wood dust and lung cancer. Papers assessing wood dust directly were chosen as the primary outcome, while studies that assessed wood dust-related occupations were included as a secondary outcome. We included all studies into the meta-analysis that met the following criteria:

1. Contained an estimate of relative risk for lung cancer or data allowing such estimates to be calculated.
2. Contained a risk estimate related to a dichotomous index of exposure (ever vs never) or data allowing such estimates to be calculated.

3a. Contained an explicit analysis of wood dust as an exposure category at an individual not occupational level
OR
3b. Contained an analysis of a wood dust-related occupation (ie, woodworkers, carpenters and furniture/cabinet makers).

4. Were published in English or Chinese.

Study selection

All articles identified in the database searches were initially screened for eligibility based on their titles and abstracts, followed by a full-text review of eligible articles. All English language articles were independently screened by two authors (DGH and MEL). Chinese language articles were initially screened for eligibility based on their titles and abstracts by a single author (KLC), while all full-text reviews were discussed by two authors (DGH and KLC). Disagreements between reviewers were resolved by consensus among all authors (DGH, MEL and KLC).

Data extraction

Data was extracted manually by one author for both the English (DGH) and Chinese (KLC) literature, and was subsequently reviewed by another author (MEL/DGH). Risk estimates for total lung cancer were extracted for the primary analysis, but risk estimates for histological subtypes were also extracted for subanalysis. When multiple methods for defining wood dust exposure were used in a single paper (ie, job-exposure matrix and self-reported), the risk estimate using the exposure classification method presented as the 'gold standard' by the authors of the paper was used. When males and females were analysed separately, the risk estimates for males were included as males represent the majority of those exposed to wood dust.

Publications presenting data on the same cohort of patients were identified by comparing the author lists and study locations. The most recent paper from each cohort was chosen unless a previous paper had a larger cohort size or presented a risk estimate adjusted for more confounding variables. In addition, when a study analysed a subset of the larger population in a cohort, we included the study that used the entire population, even if this was not the most recent study (eg, the full cohort vs the non-smoking subset of the full cohort). The choice of study publication was confirmed by consensus.

Information from each paper was extracted on (1) study design, (2) country of study, (3) sample size, (4) wood dust exposure measure/occupation (5) and measures of effect including 95% CIs and adjusting/matching variables. Byar's approximation was used to recalculate missing 95% CIs for cohort studies, while crude ORs were computed for case–control studies without summary effect measures. For data sets in which no events were observed in one of the groups, 0.5 was added to all observations.[25]

Risk of bias in individual studies

The risk of bias in each study was determined using the Newcastle-Ottawa Scale, which assesses participant selection, comparability and outcome/exposure assessment to a maximum of nine stars.[26] We rated studies as having low bias (7–9 stars), medium bias (5–6 stars) and high bias (0–4 stars). The risk of bias was determined by two independent authors for English (MEL/DGH) and Chinese (KLC/DGH) publications. Discrepancies in score (generally no more than 1 point) were resolved via consensus.

Statistical analysis

All statistical analyses were performed using the Metafor package in R.[27] For each meta-analysis, a random-effects model was specified using the restricted maximum-likelihood estimator method.[27] Random-effects models were chosen due to the significant heterogeneity in most analyses. For the purposes of pooling risk estimates, ORs were assumed to approximate the true risk ratio, since the baseline risks for lung cancer are generally low.[28] The primary meta-analysis was performed on all case–control and cohort studies assessing wood dust exposure and lung cancer (not separated into histological subtypes). A priori subgroup analyses were performed based on the geographic region of the study (studies originating outside and inside the Nordic countries (Denmark, Finland, Iceland, Norway, Sweden) as a measure of softwood dust exposure, the method for determining wood dust exposure (job-exposure matrix, self-reported or combination methods) and the use of adjustment for smoking. The Nordic countries were specifically chosen as a proxy variable of softwood dust exposure due to the predominant softwood dust exposure in these countries.[7 24 29–31] Subanalyses were also performed on all studies that assessed histological subtypes of lung cancer (adenocarcinoma, squamous cell carcinoma, small-cell lung carcinoma or other) and on studies that assessed lung cancer risk among wood dust-related occupations (ie, woodworkers, furniture makers, carpenters). Studies directly assessing wood dust exposure and those assessing wood dust-related occupations were analysed separately due to the inherent differences/limitations unique to each study design (ie, different misclassification errors, heterogeneity between occupation definitions and occupation-specific confounders).

The potential for publication bias was determined by assessing funnel plot asymmetry using the Egger regression test.[27] Asymmetry in a funnel plot (the effect estimates vs their SEs) tests for small study effects (with large SEs), which may suggest publication bias. However, asymmetry can also be due to true biological heterogeneity.[32] Heterogeneity between studies was assessed using the I^2 statistic. Following the Cochrane handbook (http://www.cochrane-handbook.org), I^2 values were interpreted as showing moderate (30–60%), substantial (50–90%) and considerable (75–100%) heterogeneity.[25]

RESULTS

Study characteristics

Figure 1 details our study selection process. A total of 85 articles were included in the final meta-analysis.[5 30 33–115] The included studies are detailed in online supplementary table S1. An additional 56 articles that met the inclusion criteria were identified (see online supplementary table S2), but not used in the meta-analysis as they represented publications on an overlapping cohort of patients, duplicate publications or publications missing information necessary for the meta-analysis. Five additional studies were excluded for presenting data that could not be dichotomised into ever versus never exposure.[116–120] Forty studies[5 30 34–36 38 40 42–44 50–54 60 62 64 65 67 69 70 73–76 86 90 91 93 96 97 99 100 102 105 106 110 113 115] were rated as having a low risk of bias using the Newcastle-Ottawa Scale (see online supplementary table S1).

Primary meta-analysis on lung cancer and wood dust exposure

Twenty-four case–control, five nested case–control and nine cohort studies assessing the association between wood dust and lung cancer were included in the primary meta-analysis (figure 2). The studies originated from Belgium,[55] Canada,[42 69 99 109] Chile,[59] China,[48 67 79 106 111 113 114] England,[84] Finland,[30 74] Holland,[76] India,[63] Iran,[68] Norway,[75] Pakistan,[81] Poland,[105] Russia,[34] Sweden,[72 86] Uruguay[52] and the USA.[35 36 38–40 73 78 88 102 110] Overall, a significantly increased risk for developing lung cancer following wood dust exposure was observed (RR 1.25, 95% CI 1.11 to 1.41, n=38), with 'considerable' heterogeneity between studies (I^2=82.1%, p<0.01; figure 2).

Subgroup analysis by geographic region of study

Owing to the well-described predominant softwood exposure in the Nordic countries,[7 24] the geographic region of each study was used as a measure of the type of wood dust to which that cohort was exposed. In the subgroup analysis of studies originating outside of the Nordic countries (mixed hardwood and softwood dust), there was a significantly increased risk for developing lung cancer associated with wood dust exposure (RR 1.34, 95% CI 1.19 to 1.50, n=33), with 'moderate' heterogeneity (I^2=39.4%, p=0.07; figure 3). In contrast, among studies originating in the Nordic countries (predominantly softwood dust exposure), there was a significantly reduced risk for developing lung cancer (RR 0.63, 95% CI 0.39 to 0.99, n=5), with 'moderate-substantial' heterogeneity (I^2=55.6%, p=0.05; figure 3).

Subgroup analysis of smoking-adjusted studies

Twenty-three of the wood dust studies controlled for smoking (see online supplementary table S1). The overall association between wood dust and lung cancer incidence was maintained among all studies that controlled for smoking (RR 1.31, 95% CI 1.10 to 1.56, n=23). The significantly increased risk for lung cancer was also maintained among studies originating outside the Nordic countries (mixed hardwood and softwood dust) that controlled for smoking (RR 1.48, 95% CI 1.29 to 1.69, n=19, I^2=0.0%). However, the reduced risk for lung cancer was no longer significant among studies originating within the Nordic countries (predominantly softwood dust exposure) that controlled for smoking (RR 0.64, 95% CI 0.40 to 1.01, n=4, I^2=62.2%).

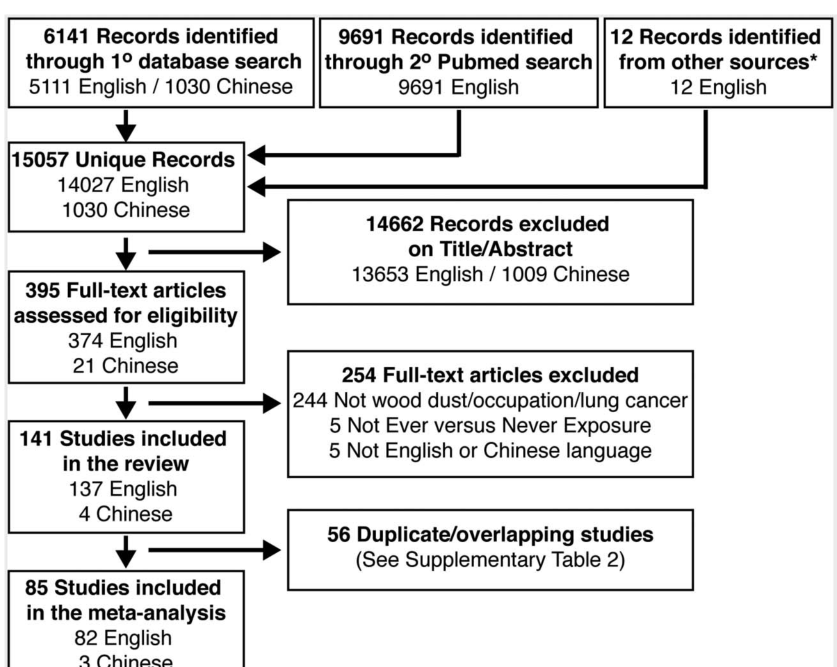


Figure 1 Flow chart of study selection strategy. *Other sources include the International Agency for Research on Cancer (IARC) monographs and the reference lists of relevant publications. Potentially relevant studies were not counted if they were identified using the database search.

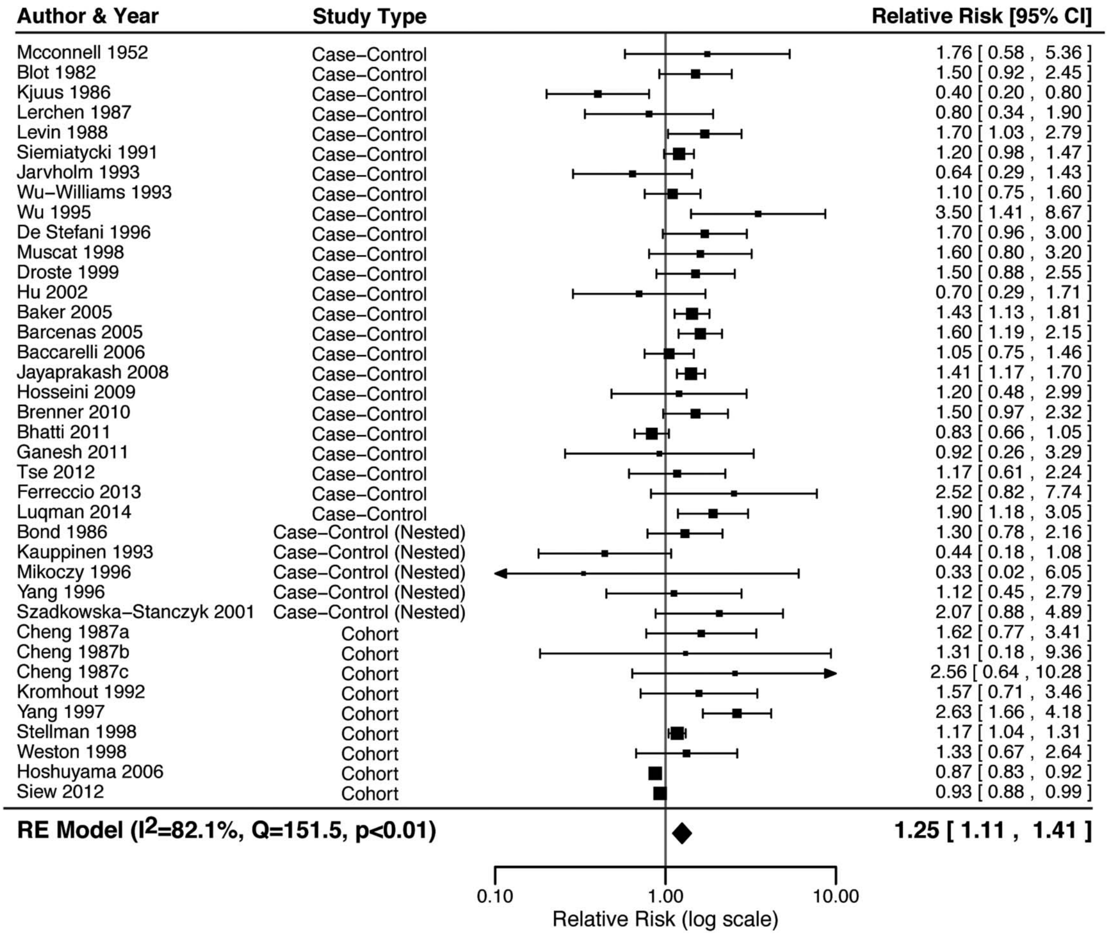


Figure 2 Forest plot of all studies assessing wood dust and lung cancer incidence.

Subgroup analysis on method for classifying wood dust exposure

Nineteen of the studies used self-reported exposure, 15 studies used a job-exposure matrix, and four studies used a combination of methods to determine wood dust exposure (see online supplementary table S1). Across all studies, a significantly increased risk for lung cancer incidence following wood dust exposure was identified in studies using self-reported exposure (RR 1.29, 95% CI 1.15 to 1.45, n=19, I^2=23.5%) or combination methods (RR 1.47, 95% CI 1.11 to 1.96, n=4, I^2=50.5), but this association failed to reach significance among those studies using a job-exposure matrix (RR 1.18, 95% CI 0.93 to 1.48, n=15, I^2=92.1%). However, a greater proportion of the studies that used a job-exposure matrix did not control for smoking and/or originated in the Nordic countries (where softwood dust is the predominate exposure). When this subgroup analysis was repeated in a post hoc analysis restricted to studies originating outside of the Nordic countries (mixed hardwood and softwood dust exposure) that also controlled for smoking, a significantly increased risk was observed among studies using the self-reported (RR 1.33, 95% CI 1.16 to 1.51, n=12, I^2=20.0%), job-exposure matrix (RR 1.76, 95% CI 1.29 to 2.42, n=5, I^2=28.9%) and/or combination (RR 2.09, 95% CI 1.01 to 4.34, n=2, I^2=61.3%) methods.

Subanalysis of lung cancer histological subtypes

Ten studies assessed the effect of wood dust exposure on various histological subtypes of lung cancer (see online supplementary table S1). A significantly elevated risk for developing all of the histological subtypes of lung cancer was observed following wood dust exposure (figure 4). The elevated risk ratios were highest for squamous cell carcinomas (RR 1.54, 95% CI 1.24 to 1.92, n=4), followed by those for adenocarcinomas (RR 1.32, 95% CI 1.08 to 1.60, n=7) and small-cell lung carcinomas (RR 1.32, 95% CI 1.05 to 1.66, n=7). Similar trends were observed when the analysis was restricted to studies that controlled for smoking.

Subanalysis on lung cancer and wood dust-related occupations

Fifty-nine studies assessed the association between wood dust-related occupations and lung cancer risk (see online supplementary table S1). Consistent with the wood dust meta-analysis, a significantly increased risk for lung cancer was observed across all studies (RR 1.15, 95% CI 1.07 to 1.23, n=59), with 'considerable' heterogeneity between studies (I^2=88.8%, p<0.01; figure 5). This association remained significant when the multiple subcohorts from a single paper were removed (RR=1.15).[33 58 115] This association was also not dependent on a single occupational group and remained significant when studies assessing 'furniture makers' (RR=1.16, n=55) or 'carpenters' (RR=1.09, n=40) were removed in a post hoc analysis. Finally, this association was also not dependent on the study type, as the association remained significant when case–control (RR 1.17, n=34) and cohort (RR 1.12, n=26) studies were analysed separately.

A significantly increased risk for lung cancer (RR 1.15, 95% CI 1.07 to 1.24, n=58) was observed among the studies

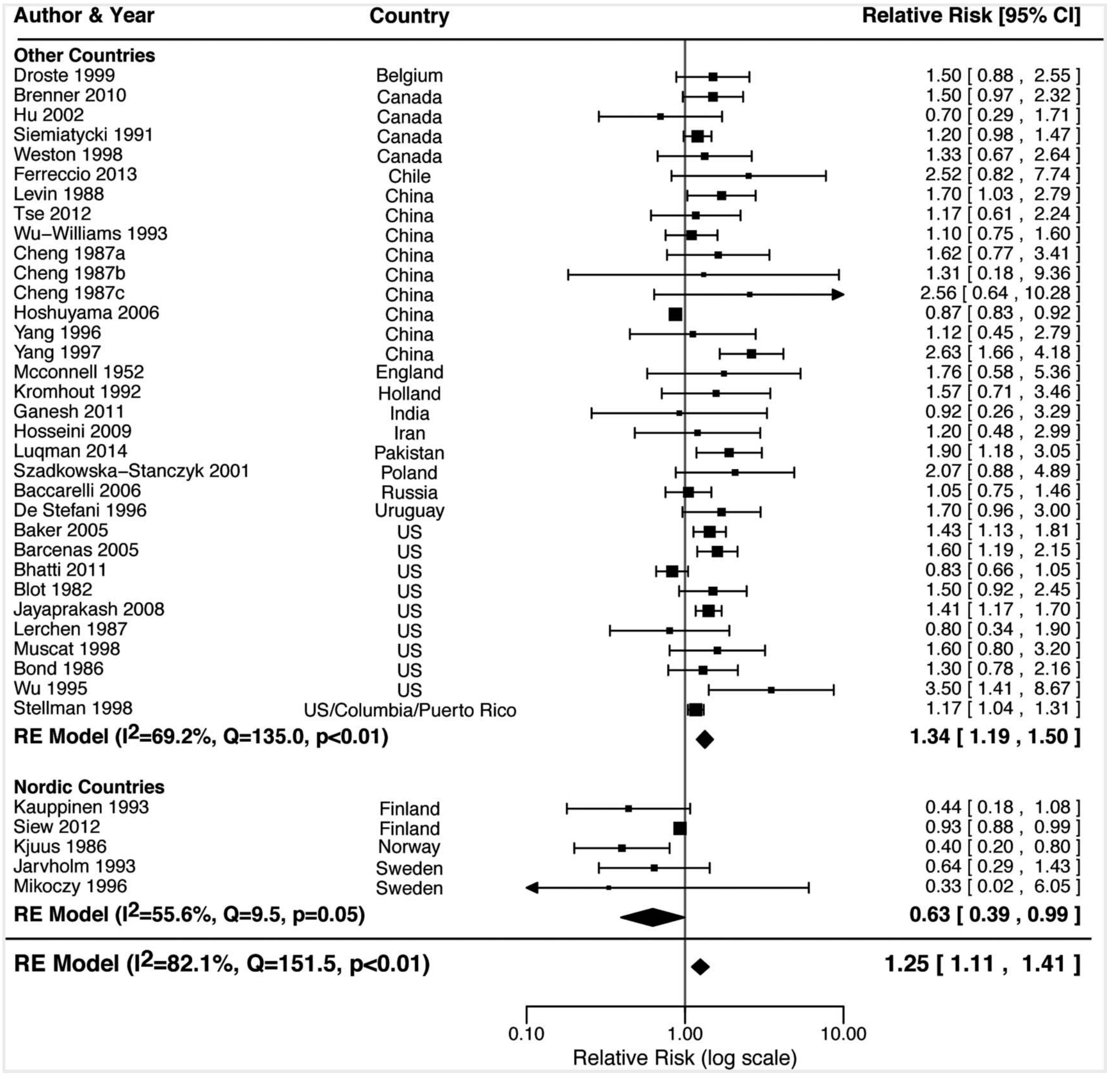


Figure 3 Forest plot all studies assessing wood dust and lung cancer incidence, subdivided based on the geographic region of study origin.

originating outside the Nordic countries, while a significantly reduced risk for lung cancer (RR 0.96, 95% CI 0.95 to 0.98) was observed in the one included study[5] that originated in the Nordic countries (predominantly softwood dust exposure; figure 5).

Publication bias

No evidence for publication bias was observed on visual inspection of funnel plot asymmetry across all wood dust studies (see online supplementary figure S1A) and there was no evidence using Egger's test for small study bias (p=0.456). There was some suggestion of funnel plot asymmetry across the wood dust-related occupational studies (see online supplementary figure S1B), although this failed to reach significance using Egger's test for small study bias (p=0.080).

DISCUSSION

Occupational exposure to wood dust was confirmed to be carcinogenic to humans (group 1) by the IARC in 1994, but the evidence as a risk factor for lung cancer has been inconsistent.[7] The recent IARC monograph Volume 100C also failed to confirm an association between lung cancer and wood dust due to the heterogeneous findings in the literature.[8 11] Our robust literature search and meta-analysis showed a significantly elevated risk for developing lung cancer following wood dust exposure when pooling all studies (figure 2). We also observed this significantly elevated risk in studies that assessed lung cancer risk among wood dust-related occupations, and not wood dust exposure per se (figure 5). Importantly, evidence for wood dust deposition in the lungs and its in vitro carcinogenicity provide a biological mechanism to support the observed elevated risk for lung cancer.[7 8 14 16] The results of this meta-analysis were maintained when studies that had not controlled for smoking were excluded. Smoking is the strongest risk factor for lung cancer, and confounding due to cigarette smoking often limits the accurate assessment of the effects of other lung carcinogens.[1 4]

We had initially hypothesised that studies originating from the Nordic countries would show a proportionally lower risk for lung cancer due to the predominant softwood dust exposure in these countries[7 24 29–31] and the limited evidence supporting the carcinogenicity of softwood dust.[7 8] In support of this hypothesis, we observed a significantly elevated risk for developing lung cancer among studies originating outside of the Nordic countries and a significantly decreased risk among studies originating from the Nordic countries (figures 3 and 5). Furthermore, the only two wood dust studies in this meta-analysis that specified the type of dust to which their

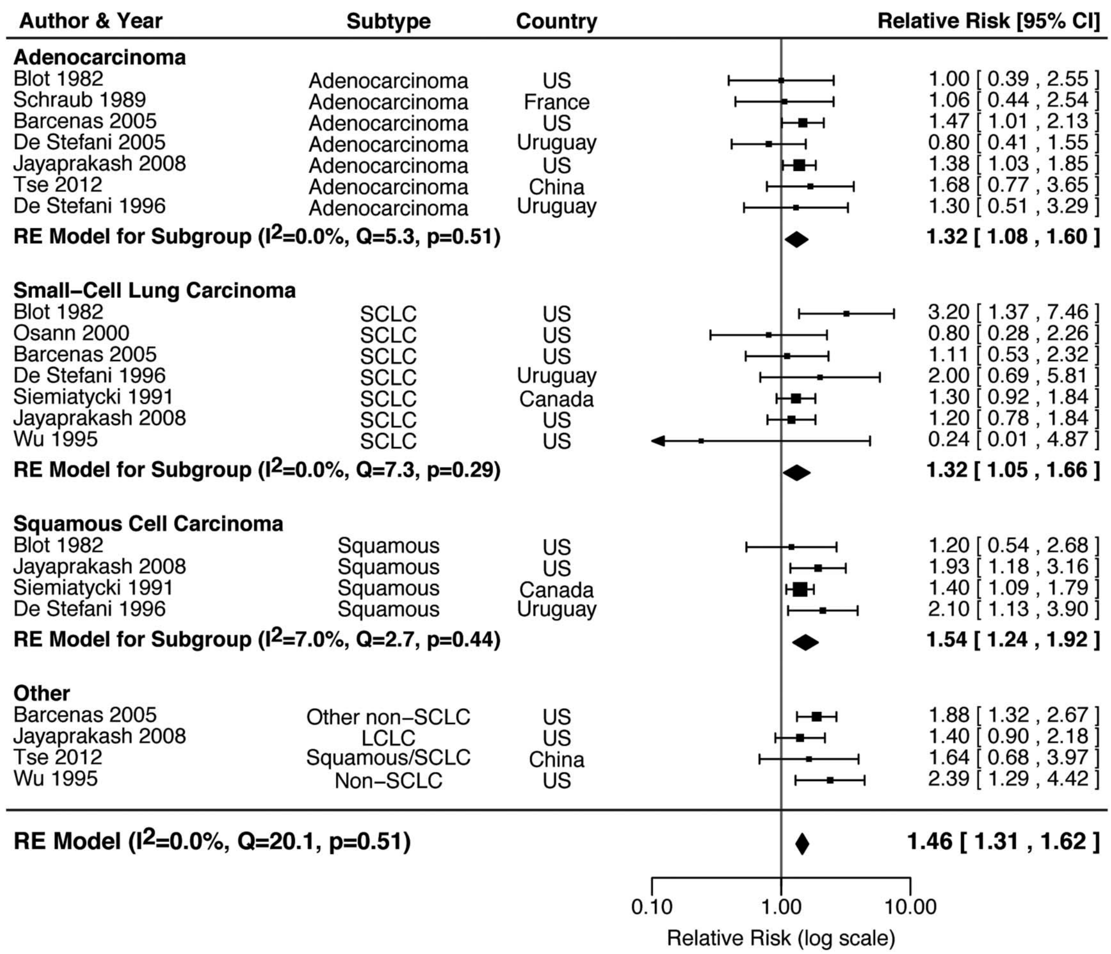


Figure 4 Forest plot of all studies assessing wood dust and histological subtypes of lung cancer, subdivided based on histological subtype. SCLC, small-cell lung carcinoma; LCLC, large-cell lung carcinoma.

cohort was exposed independently concluded that their identification of a decreased risk was due to the predominant softwood dust exposure in their cohorts.[30 38] However, one of these studies originated in the USA[38] indicating that wood dust type rather than region is the likely cause of the differential risk effects of hardwood and softwood dusts on lung cancer. Consistent with these findings, all studies assessing wood dust-related occupations that described predominant exposure to softwood dust also showed a decreased or non-significant risk for lung cancer, independent of their origin in the Nordic countries.[5 38 96 101]

While we used the geographic region of the study population as a measure for the type of wood dust exposure, there are a number of other potential explanations that may contribute to the region-specific trends observed in this meta-analysis. This includes unidentified confounders,[2 3 31] genetics[7 8 121 122] and/or differences in occupational health and safety standards between countries.[2 5 123–126] A potential confounder for the decreased risk for lung cancer with wood dust exposure is bacterial endotoxins, arising from bacterial colonisation of either stored wood or loose wood dust.[31 38 127] Bacterial endotoxin is thought to protect against lung cancer,[127] and thus increased exposure to this bacterial contamination among wood workers compared with the general population may help explain the reduced risk estimates for lung cancer in the Nordic countries.[31 38] The contrasting risk estimates may also be due to region-specific differences in genetics, environment or health policies, which might reduce the size of any increased risk. Nordic countries are generally thought to be world leaders in occupational health and safety practice, especially at the time when majority of these studies were conducted.[5 123 124] The lack of any increased risk among the Nordic countries may therefore be due to differences in the wood dust-exposed workers, such as exposure to relatively lower levels of wood dust or other harmful exposures as a result of better occupational health and safety practice.[2 125 126]

One of the most commonly cited limitations of the observational studies on wood dust exposure is the potential for measurement bias in the exposure assessment.[22 76] Self-reported exposure strategies are generally susceptible to recall bias, while job-exposure matrix strategies can be susceptible to variations in true exposure under a given job title.[22 76] However, an increased risk for lung cancer was observed across all methods of determining wood dust exposure, especially after controlling for geographic region and smoking. This finding was supported by three studies that directly compared the exposure methods and showed no significant differences between methods.[36 55 76]

We also assessed the association between wood dust exposure and the different histological subtypes of lung cancer (figure 4). We observed significantly increased risk estimates for all histological subtypes of lung cancer, with the highest risk for squamous cell carcinomas (although CIs largely overlapped). This appears to contradict data on sinonasal cancers, where adenocarcinomas have been most frequently observed among

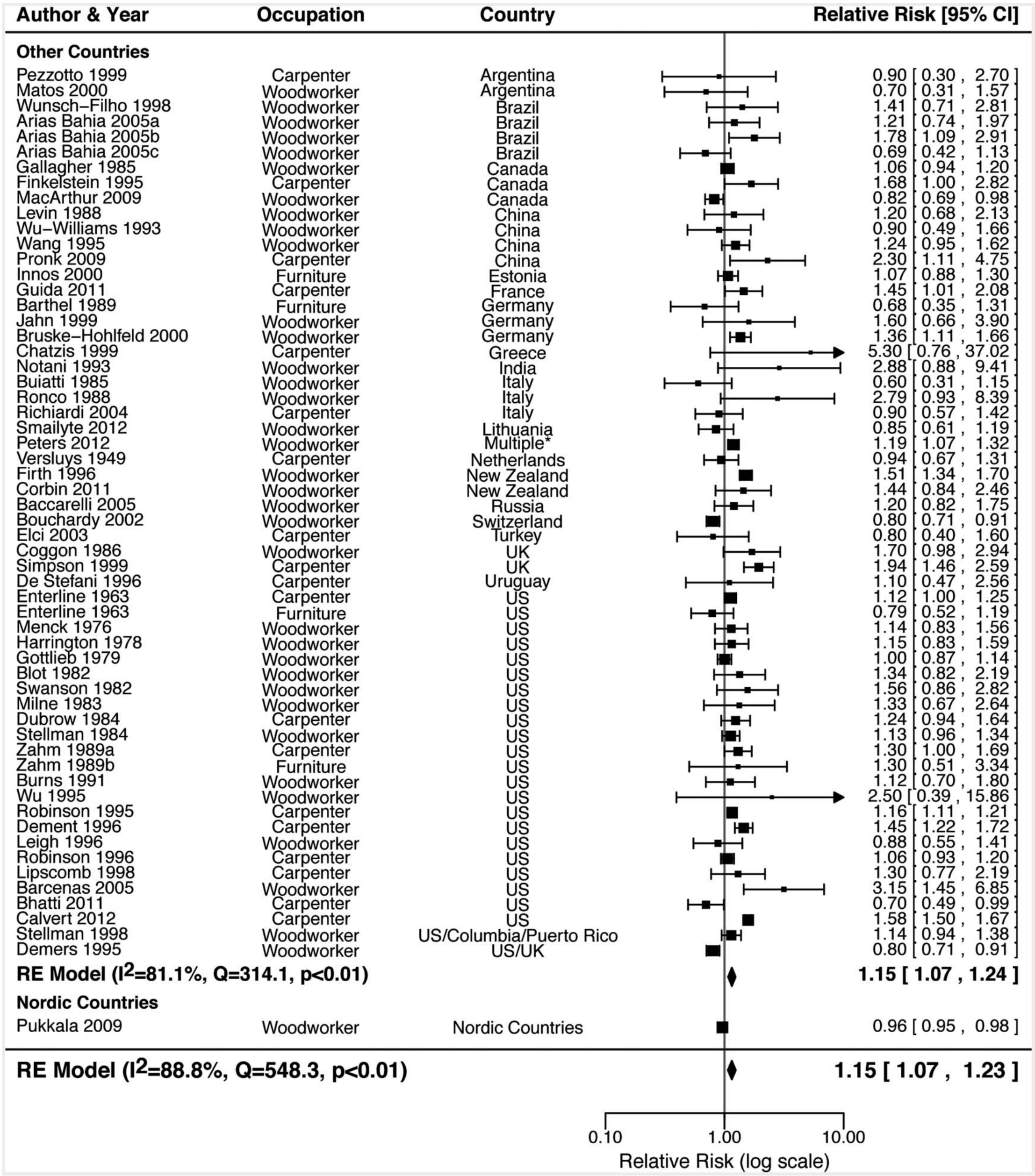


Figure 5 Forest plot all studies assessing wood dust-related occupations and lung cancer incidence, subdivided based on the geographic region of study origin.

woodworkers,[7 8] although some studies have identified squamous cell carcinomas more commonly.[30 128] Overall, these data suggest that wood dust increases the risk for all subtypes of lung cancer, and not only a specific subtype.

To the best of our knowledge, this is the first systematic review or meta-analysis assessing wood dust and lung cancer risk, outside of the IARC publications.[7 8] We performed a robust search of the English and Chinese literature and identified a large number of studies not included in the IARC publications. Our analysis also included a large number of studies where wood dust and lung cancer was not the primary outcome of the paper, thereby reducing the likelihood of publication bias of positive results, which was supported by our assessment of funnel plot asymmetry. However, it is also possible that studies assessing a large number of exposures would provide a less accurate assessment of true wood dust exposure, although we found no evidence to support this hypothesis.

In the current meta-analysis, we chose to primarily focus on studies that specifically assessed wood dust exposure in order to provide the most direct assessment of the relationship between wood dust exposure and lung cancer risk. We also aimed to avoid some of the inherent challenges/limitations of assessing purely occupation-based studies, including the heterogeneity in occupational classifications and the greater risk for individual occupation-specific factors obscuring any wood dust-specific effects.[25 103 129 130] Consistent with this, some of the studies showed a large degree of variation in the individual risk estimates when multiple different wood dust-related occupations analysed within the same paper (not shown).[45 103] However, the observation of a significantly elevated risk for lung cancer (of similar magnitude) among these occupation-based studies (figure 5) adds further weight to the association between wood dust and lung cancer, and also suggests that our focus on wood dust-specific studies did not bias the results of this meta-analysis.

There are a number of potential limitations to our meta-analysis. First, we were unable to perform any analyses to assess the dose–response relationship between wood dust and lung cancer or to determine any effects related to duration of exposure. These factors were generally not assessed or assessed using a variety of approaches making a quantitative synthesis unfeasible. Second, the included studies varied greatly in their study design/population characteristics and accounting for all these factors in our meta-analysis was not feasible. Finally, unknown confounding exposures might still explain our findings. Asbestos, silica, formaldehyde, solvents and exhausts are all associated with wood dust-related professions and have been independently linked with lung cancer.[3 7 8] However, the studies included in this meta-analysis analysed wood dust exposure from a diverse range of occupational contexts, thereby limiting the possibility that a single confounding exposure accounted for the observed associations.

In conclusion, this meta-analysis has demonstrated significant associations between lung cancer and wood dust exposure or employment in wood dust-related occupations, with an increased risk among studies that originated outside of the Nordic countries (mixed hardwood and softwood dust exposure). The reduced risk for lung cancer observed following wood dust exposure in Nordic countries may be due to the predominant softwood dust exposure in these countries. Larger studies designed to explore the causes of these differing associations are needed.

Contributors DGH was involved in study design and supervision, analysis and interpretation of data, statistical analysis, and drafting of the manuscript. MEL and KLC were involved in analysis and interpretation of data, and critical revision of the manuscript. RJW was involved in statistical analysis and critical revision of the manuscript. EMS was involved in drafting of the manuscript and critical revision of the manuscript.

Competing interests None declared.

Provenance and peer review Not commissioned; externally peer reviewed.

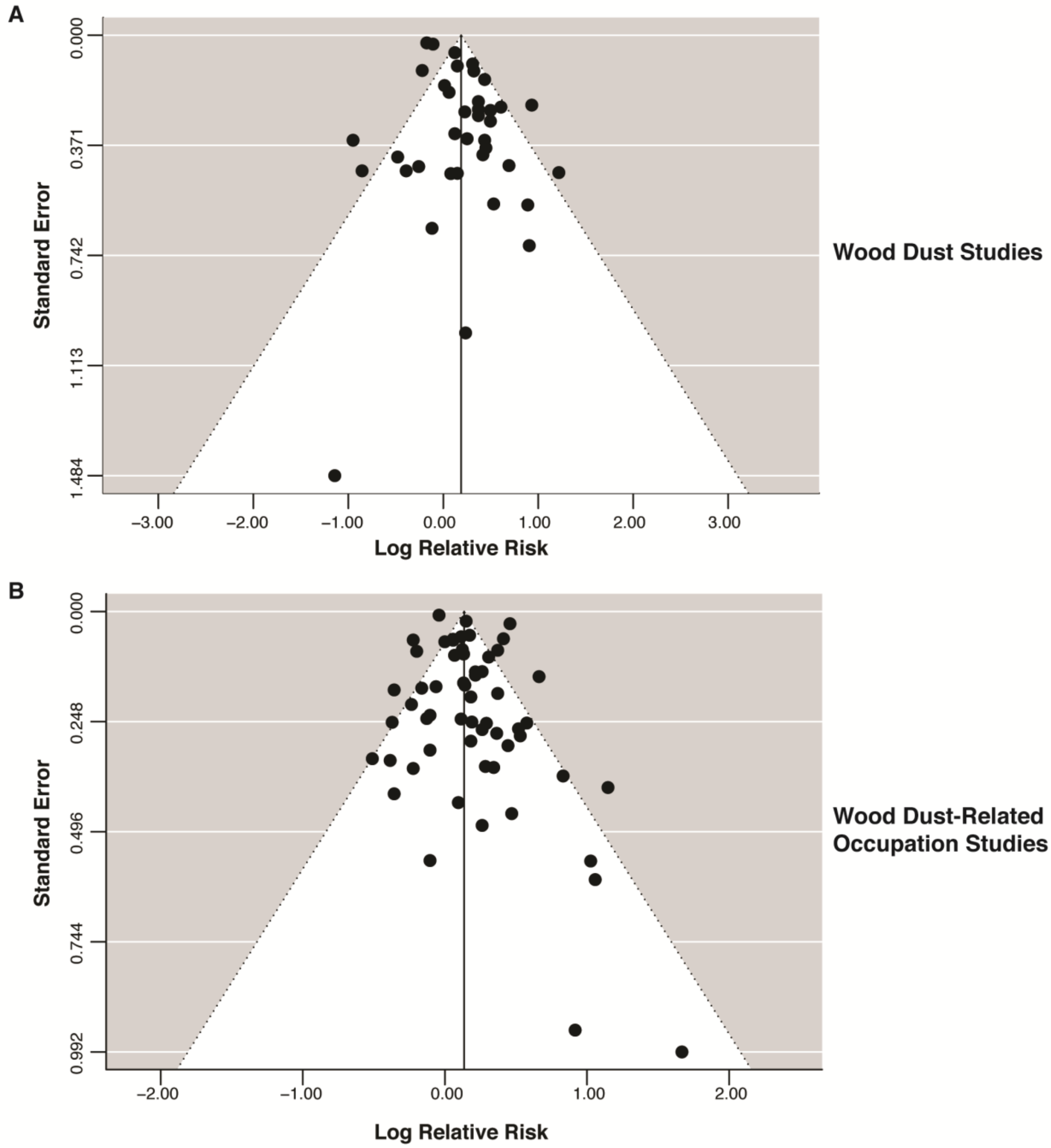
REFERENCES

1 Field RW, Withers BL. Occupational and environmental causes of lung cancer. *Clin Chest Med* 2012;33:681–703.
2 Franceschi S, Wild CP. Meeting the global demands of epidemiologic transition—the indispensable role of cancer prevention. *Mol Oncol* 2013;7:1–13.
3 Freund A. Listing occupational carcinogens. *Environ Health Perspect* 2005;113:A152.
4 Spyratos D, Zarogoulidis P, Porpodis K, *et al*. Occupational exposure and lung cancer. *J Thorac Dis* 2013;5(Suppl 4):S440–5.
5 Pukkala E, Martinsen JI, Lynge E, *et al*. Occupation and cancer—follow-up of 15 million people in five Nordic countries. *Acta Oncol* 2009;48:646–790.
6 Rushton L, Hutchings SJ, Fortunato L, *et al*. Occupational cancer burden in Great Britain. *Br J Cancer* 2012;107(Suppl 1):S3–7.
7 IARC Working Group on the Evaluation of Carcinogenic Risks to Humans. *Wood dust and formaldehyde*. World Health Organization, International Agency for Research on Cancer, 1995.
8 IARC Working Group on the Evaluation of Carcinogenic Risks to Humans. *Wood dust: a review of human carcinogens: arsenic, metals, fibres, and dusts*. World Health Organization, International Agency for Research on Cancer, 2012.
9 Labreche F, Duguay P, Ostiguy C, *et al*. Estimating occupational exposure to carcinogens in Quebec. *Am J Ind Med* 2013;56:1040–50.
10 Ruano-Ravina A, Garcia-Lavandeira JA, Torres-Duran M, *et al*. Leisure time activities related to carcinogen exposure and lung cancer risk in never smokers. A case-control study. *Environ Res* 2014;132C:33–7.
11 Straif K, Benbrahim-Tallaa L, Baan R, *et al*. A review of human carcinogens—part C: metals, arsenic, dusts, and fibres. *Lancet Oncol* 2009;10:453–4.
12 Andersen HC, Andersen I, Solgaard J. Nasal cancers, symptoms and upper airway function in woodworkers. *Br J Ind Med* 1977;34:201–7.
13 Brown JS, Gordon T, Price O, *et al*. Thoracic and respirable particle definitions for human health risk assessment. *Part Fibre Toxicol* 2013;10:12.
14 Nylander LA, Dement JM. Carcinogenic effects of wood dust: review and discussion. *Am J Ind Med* 1993;24:619–47.
15 Oberdorster G, Oberdorster E, Oberdorster J. Nanotoxicology: an emerging discipline evolving from studies of ultrafine particles. *Environ Health Perspect* 2005;113:823–39.
16 Demers PA, Teschke K, Kennedy SM. What to do about softwood? A review of respiratory effects and recommendations regarding exposure limits. *Am J Ind Med* 1997;31:385–98.
17 Bornholdt J, Saber AT, Sharma AK, *et al*. Inflammatory response and genotoxicity of seven wood dusts in the human epithelial cell line A549. *Mutat Res* 2007;632:78–88.
18 Maatta J, Lehto M, Leino M, *et al*. Mechanisms of particle-induced pulmonary inflammation in a mouse model: exposure to wood dust. *Toxicol Sci* 2006;93:96–104.
19 Maatta J, Luukkonen R, Husgafvel-Pursiainen K, *et al*. Comparison of hardwood and softwood dust-induced expression of cytokines and chemokines in mouse macrophage RAW 264.7 cells. *Toxicology* 2006;218:13–21.
20 Perez-Rios M, Ruano-Ravina A, Etminan M, *et al*. A meta-analysis on wood dust exposure and risk of asthma. *Allergy* 2010;65:467–73.
21 Bourgkard E, Wild P, Gonzalez M, *et al*. Comparison of exposure assessment methods in a lung cancer case-control study: performance of a lifelong task-based questionnaire for asbestos and PAHs. *Occup Environ Med* 2013;70:884–91.
22 Fritschi L, Siemiatycki J, Richardson L. Self-assessed versus expert-assessed occupational exposures. *Am J Epidemiol* 1996;144:521–7.
23 Hardt JS, Vermeulen R, Peters S, *et al*. A comparison of exposure assessment approaches: lung cancer and occupational asbestos exposure in a population-based case-control study. *Occup Environ Med* 2014;71:282–8.
24 Andersen A, Barlow L, Engeland A, *et al*. Work-related cancer in the Nordic countries. *Scand J Work Environ Health* 1999;25(Suppl 2):1–116.
25 Higgins JP, Green S, Collaboration C. *Cochrane handbook for systematic reviews of interventions version 5.0.2 [updated September 2009]*. Cochrane Collaboration, 2009.
26 Wells G, Shea B, O'Connell D, *et al*. The Newcastle-Ottawa Scale (NOS) for assessing the quality of non randomised studies in meta-analyses. Secondary the Newcastle-Ottawa Scale (NOS) for assessing the quality of non randomised studies in meta-analyses. 2014. http://www.ohri.ca/programs/clinicalepidemiology/oxford.asp
27 Viechtbauer W. Conducting meta-analyses in R with the metafor package. *J Stat Software* 2010;36:1–48.
28 Grant RL. Converting an odds ratio to a range of plausible relative risks for better communication of research findings. *BMJ* 2014;348:f7450.
29 Laakkonen A, Kyyronen P, Kauppinen T, *et al*. Occupational exposure to eight organic dusts and respiratory cancer among Finns. *Occup Environ Med* 2006;63:726–33.
30 Siew SS, Kauppinen T, Kyyronen P, *et al*. Occupational exposure to wood dust and formaldehyde and risk of nasal, nasopharyngeal, and lung cancer among Finnish men. *Cancer Manag Res* 2012;4:223–32.
31 Rushton L. Organic dusts and respiratory cancer: a complex issue. *Occup Environ Med* 2006;63:717.
32 Sterne JA, Sutton AJ, Ioannidis JP, *et al*. Recommendations for examining and interpreting funnel plot asymmetry in meta-analyses of randomised controlled trials. *BMJ* 2011;343:d4002.
33 Arias Bahia SH, Echenique Mattos I, Koifman S. Cancer and wood-related occupational exposure in the Amazon region of Brazil. *Environ Res* 2005;99:132–40.
34 Baccarelli A, Khmelnitskii O, Tretiakova M, *et al*. Risk of lung cancer from exposure to dusts and fibers in Leningrad Province, Russia. *Am J Ind Med* 2006;49:460–7.
35 Baker JA, McCann SE, Reid ME, *et al*. Associations between black tea and coffee consumption and risk of lung cancer among current and former smokers. *Nutr Cancer* 2005;52:15–21.
36 Barcenas CH, Delclos GL, El-Zein R, *et al*. Wood dust exposure and the association with lung cancer risk. *Am J Ind Med* 2005;47:349–57.
37 Barthel E, Dietrich M. Retrospective cohort study of cancer morbidity in furniture makers exposed to wood dust. *Z Gesamte Hyg* 1989;35:279–81.
38 Bhatti P, Newcomer L, Onstad L, *et al*. Wood dust exposure and risk of lung cancer. *Occup Environ Med* 2011;68:599–604.
39 Blot WJ, Davies JE, Brown LM, *et al*. Occupation and the high risk of lung cancer in Northeast Florida. *Cancer* 1982;50:364–71.
40 Bond GG, Flores GH, Shellenberger RJ, *et al*. Nested case-control study of lung cancer among chemical workers. *Am J Epidemiol* 1986;124:53–66.
41 Bouchardy C, Schuler G, Minder C, *et al*. Cancer risk by occupation and socioeconomic group among men—a study by the Association of Swiss Cancer Registries. *Scand J Work Environ Health* 2002;28(Suppl 1):1–88.
42 Brenner DR, Hung RJ, Tsao MS, *et al*. Lung cancer risk in never-smokers: a population-based case-control study of epidemiologic risk factors. *BMC Cancer* 2010;10:285.
43 Bruske-Hohlfeld I, Mohner M, Pohlabeln H, *et al*. Occupational lung cancer risk for men in Germany: results from a pooled case-control study. *Am J Epidemiol* 2000;151:384–95.

44 Buiatti E, Kriebel D, Geddes M, *et al*. A case control study of lung cancer in Florence, Italy. I. Occupational risk factors. *J Epidemiol Community Health* 1985;39:244–50.
45 Burns PB, Swanson GM. The Occupational Cancer Incidence Surveillance Study (OCISS): risk of lung cancer by usual occupation and industry in the Detroit metropolitan area. *Am J Ind Med* 1991;19:655–71.
46 Calvert GM, Luckhaupt S, Lee SJ, *et al*. Lung cancer risk among construction workers in California, 1988–2007. *Am J Ind Med* 2012;55:412–22.
47 Chatzis C, Danaka G, Linos A, *et al*. Lung cancer and occupational risk factors in Greece. *J Occup Environ Med* 1999;41:29–35.
48 Cheng W, Zuo H, Hao Z. [Cancer mortality among woodworkers in Tianjin]. *Chin J Ind Hyg Occup Dis* 1987;5:22–5.
49 Coggon D, Pannett B, Osmond C, *et al*. A survey of cancer and occupation in young and middle aged men. I. Cancers of the respiratory tract. *Br J Ind Med* 1986;43:332–8.
50 Corbin M, McLean D, Mannetje A, *et al*. Lung cancer and occupation: a New Zealand cancer registry-based case-control study. *Am J Ind Med* 2011;54:89–101.
51 De Stefani E, Boffetta P, Brennan P, *et al*. Occupational exposures and risk of adenocarcinoma of the lung in Uruguay. *Cancer Causes Control* 2005;16:851–6.
52 De Stefani E, Kogevinas M, Boffetta P, *et al*. Occupation and the risk of lung cancer in Uruguay. *Scand J Work Environ Health* 1996;22:346–52.
53 Dement J, Pompeii L, Lipkus IM, *et al*. Cancer incidence among union carpenters in New Jersey. *J Occup Environ Med* 2003;45:1059–67.
54 Demers PA, Boffetta P, Kogevinas M, *et al*. Pooled reanalysis of cancer mortality among five cohorts of workers in wood-related industries. *Scand J Work Environ Health* 1995;21:179–90.
55 Droste JH, Weyler JJ, Van Meerbeeck JP, *et al*. Occupational risk factors of lung cancer: a hospital based case-control study. *Occup Environ Med* 1999;56:322–7.
56 Dubrow R, Wegman DH. Cancer and occupation in Massachusetts: a death certificate study. *Am J Ind Med* 1984;6:207–30.
57 Elci OC, Akpinar-Elci M, Alavanja M, *et al*. Occupation and the risk of lung cancer by histologic types and morphologic distribution: a case control study in Turkey. *Monaldi Arch Chest Dis* 2003;59:183–8.
58 Enterline PEPD, McKiever MFBA. Differential mortality from lung cancer by Occupation. *J Occup Med* 1963;5:283–90.
59 Ferreccio C, Yuan Y, Calle J, *et al*. Arsenic, tobacco smoke, and occupation: associations of multiple agents with lung and bladder cancer. *Epidemiology* 2013;24:898–905.
60 Finkelstein MM. Occupational associations with lung cancer in two Ontario cities. *Am J Ind Med* 1995;27:127–36.
61 Firth HM, Cooke KR, Herbison GP. Male cancer incidence by occupation: New Zealand, 1972–1984. *Int J Epidemiol* 1996;25:14–21.
62 Gallagher RP, Threlfall WJ, Band PR, *et al*. Cancer mortality experience of woodworkers, loggers, fishermen, farmers, and miners in British Columbia. *Natl Cancer Inst Monogr* 1985;69:163–7.
63 Ganesh B, Sushama S, Monika S, *et al*. A case-control study of risk factors for lung cancer in Mumbai, India. *Asian Pac J Cancer Prev* 2011;12:357–62.
64 Gottlieb MS, Pickle LW, Blot WJ, *et al*. Lung cancer in Louisiana: death certificate analysis. *J Natl Cancer Inst* 1979;63:1131–7.
65 Guida F, Papadopoulos A, Menvielle G, *et al*. Risk of lung cancer and occupational history: results of a French population-based case-control study, the ICARE study. *J Occup Environ Med* 2011;53:1068–77.
66 Harrington JM, Blot WJ, Hoover RN, *et al*. Lung cancer in coastal Georgia: a death certificate analysis of occupation: brief communication. *J Natl Cancer Inst* 1978;60:295–8.
67 Hoshuyama T, Pan G, Tanaka C, *et al*. Mortality of iron-steel workers in Anshan, China: a retrospective cohort study. *Int J Occup Environ Health* 2006;12:193–202.
68 Hosseini M, Naghan PA, Karimi S, *et al*. Environmental risk factors for lung cancer in Iran: a case-control study. *Int J Epidemiol* 2009;38:989–96.
69 Hu J, Mao Y, Dryer D, *et al*. Canadian Cancer Registries Epidemiology Research Group. Risk factors for lung cancer among Canadian women who have never smoked. *Cancer Detect Prev* 2002;26:129–38.
70 Innos K, Rahu M, Rahu K, *et al*. Wood dust exposure and cancer incidence: a retrospective cohort study of furniture workers in Estonia. *Am J Ind Med* 2000;37:501–11.
71 Jahn I, Ahrens W, Bruske-Hohlfeld I, *et al*. Occupational risk factors for lung cancer in women: results of a case-control study in Germany. *Am J Ind Med* 1999;36:90–100.
72 Jarvholm B, Larsson S, Hagberg S, *et al*. Quantitative importance of asbestos as a cause of lung cancer in a Swedish industrial city: a case-referent study. *Eur Respir J* 1993;6:1271–5.
73 Jayaprakash V, Natarajan KK, Moysich KB, *et al*. Wood dust exposure and the risk of upper aero-digestive and respiratory cancers in males. *Occup Environ Med* 2008;65:647–54.
74 Kauppinen TP, Partanen TJ, Hernberg SG, *et al*. Chemical exposures and respiratory cancer among Finnish woodworkers. *Br J Ind Med* 1993;50:143–8.
75 Kjuus H, Skjaerven R, Langard S, *et al*. A case-referent study of lung cancer, occupational exposures and smoking. I. Comparison of title-based and exposure-based occupational information. *Scand J Work Environ Health* 1986;12:193–202.
76 Kromhout H, Heederik D, Dalderup LM, *et al*. Performance of two general job-exposure matrices in a study of lung cancer morbidity in the Zutphen cohort. *Am J Epidemiol* 1992;136:698–711.
77 Leigh JP. Occupations, cigarette smoking, and lung cancer in the epidemiological follow-up to the NHANES I and the California Occupational Mortality Study. *Bull NY Acad Med* 1996;73:370–97.
78 Lerchen ML, Wiggins CL, Samet JM. Lung cancer and occupation in New Mexico. *J Natl Cancer Inst* 1987;79:639–45.
79 Levin LI, Zheng W, Blot WJ, *et al*. Occupation and lung cancer in Shanghai: a case-control study. *Br J Ind Med* 1988;45:450–8.
80 Lipscomb HJ, Dement JM. Respiratory diseases among union carpenters: cohort and case-control analyses. *Am J Ind Med* 1998;33:131–50.
81 Luqman M, Javed MM, Daud S, *et al*. Risk factors for lung cancer in the Pakistani population. *Asian Pac J Cancer Prev* 2014;15:3035–9.
82 MacArthur AC, Le ND, Fang R, *et al*. Identification of occupational cancer risk in British Columbia: a population-based case-control study of 2,998 lung cancers by histopathological subtype. *Am J Ind Med* 2009;52:221–32.
83 Matos EL, Vilensky M, Mirabelli D, *et al*. Occupational exposures and lung cancer in Buenos Aires, Argentina. *J Occup Environ Med* 2000;42:653–9.
84 McConnell RB, Gordon KC, Jones T. Occupational and personal factors in the aetiology of carcinoma of the lung. *Lancet* 1952;2:651–6.
85 Menck HR, Henderson BE. Occupational differences in rates of lung cancer. *J Occup Med* 1976;18:797–801.
86 Mikoczy Z, Schutz A, Stromberg U, *et al*. Cancer incidence and specific occupational exposures in the Swedish leather tanning industry: a cohort based case-control study. *Occup Environ Med* 1996;53:463–7.
87 Milne KL, Sandler DP, Everson RB, *et al*. Lung cancer and occupation in Alameda County: a death certificate case-control study. *Am J Ind Med* 1983;4:565–75.
88 Muscat JE, Stellman SD, Richie JP Jr, *et al*. Lung cancer risk and workplace exposures in black men and women. *Environ Res* 1998;76:78–84.
89 Notani PN, Shah P, Jayant K, *et al*. Occupation and cancers of the lung and bladder: a case-control study in Bombay. *Int J Epidemiol* 1993;22:185–91.
90 Osann KE, Lowery JT, Schell MJ. Small cell lung cancer in women: risk associated with smoking, prior respiratory disease, and occupation. *Lung Cancer* 2000;28:1–10.
91 Peters S, Kromhout H, Olsson AC, *et al*. Occupational exposure to organic dust increases lung cancer risk in the general population. *Thorax* 2012;67:111–16.
92 Pezzotto SM, Poletto L. Occupation and histopathology of lung cancer: a case-control study in Rosario, Argentina. *Am J Ind Med* 1999;36:437–43.
93 Pronk A, Coble J, Ji BT, *et al*. Occupational risk of lung cancer among lifetime non-smoking women in Shanghai, China. *Occup Environ Med* 2009;66:672–8.
94 Richiardi L, Boffetta P, Simonato L, *et al*. Occupational risk factors for lung cancer in men and women: a population-based case-control study in Italy. *Cancer Causes Control* 2004;15:285–94.
95 Robinson C, Stern F, Halperin W, *et al*. Assessment of mortality in the construction industry in the United States, 1984–1986. *Am J Ind Med* 1995;28:49–70.
96 Robinson CF, Petersen M, Sieber WK, *et al*. Mortality of Carpenters' Union members employed in the U.S. construction or wood products industries, 1987–1990. *Am J Ind Med* 1996;30:674–94.
97 Ronco G, Ciccone G, Mirabelli D, *et al*. Occupation and lung cancer in two industrialized areas of northern Italy. *Int J Cancer* 1988;41:354–8.
98 Schraub S, Belon-Leneutre M, Mercier M, *et al*. Adenocarcinoma and wood. *Am J Epidemiol* 1989;130:1164–6.
99 Siemiatycki J. *Risk factors for cancer in the workplace*. Boca Raton: CRC Press, 1991.
100 Simpson J, Roman E, Law G, *et al*. Women's occupation and cancer: preliminary analysis of cancer registrations in England and Wales, 1971–1990. *Am J Ind Med* 1999;36:172–85.
101 Smailyte G. Cancer incidence among workers exposed to softwood dust in Lithuania. *Occup Environ Med* 2012;69:449–51.
102 Stellman SD, Demers PA, Colin D, *et al*. Cancer mortality and wood dust exposure among participants in the American Cancer Society Cancer Prevention Study-II (CPS-II). *Am J Ind Med* 1998;34:229–37.
103 Stellman SD, Garfinkel L. Cancer mortality among woodworkers. *Am J Ind Med* 1984;5:343–57.
104 Swanson GM, Belle SH. Cancer morbidity among woodworkers in the U.S. automotive industry. *J Occup Med* 1982;24:315–19.
105 Szadkowska-Stanczyk I, Szymczak W. Nested case-control study of lung cancer among pulp and paper workers in relation to exposure to dusts. *Am J Ind Med* 2001;39:547–56.
106 Tse LA, Yu IT, Qiu H, *et al*. Occupational risks and lung cancer burden for Chinese men: a population-based case-referent study. *Cancer Causes Control* 2012;23:121–31.
107 Versluys JJ. Cancer and occupation in the Netherlands. *Br J Cancer* 1949;3:161–85.

108 Wang QS, Boffetta P, Parkin DM, *et al*. Occupational risk factors for lung cancer in Tianjin, China. *Am J Ind Med* 1995;28:353–62.
109 Weston TL. *Application of a job exposure matrix to assess cancer mortality risk in a cohort of working men*. Queen's University at Kingston, 1998.
110 Wu X, Delclos GL, Annegers JF, *et al*. A case-control study of wood dust exposure, mutagen sensitivity, and lung cancer risk. *Cancer Epidemiol Biomarkers Prev* 1995;4:583–8.
111 Wu-Williams AH, Xu ZY, Blot WJ, *et al*. Occupation and lung cancer risk among women in northern China. *Am J Ind Med* 1993;24:67–79.
112 Wunsch-Filho V, Moncau JE, Mirabelli D, *et al*. Occupational risk factors of lung cancer in Sao Paulo, Brazil. *Scand J Work Environ Health* 1998;24:118–24.
113 Yang Y, Wang M, Wang Z, *et al*. [A retrospective cohort study between wood dust and cancer]. *Chin J Ind Med* 1996;9:5–9.
114 Yang Y, Wang M, Wang Z, *et al*. [A cohort study on lung cancer and exposure to wood dust]. *Chin J Ind Hyg Occup Dis* 1997;15:277–81.
115 Zahm SH, Brownson RC, Chang JC, *et al*. Study of lung cancer histologic types, occupation, and smoking in Missouri. *Am J Ind Med* 1989;15:565–78.
116 Bovenzi M, Stanta G, Antiga G, *et al*. Occupational exposure and lung cancer risk in a coastal area of northeastern Italy. *Int Arch Occup Environ Health* 1993;65:35–41.
117 Damber LA, Larsson LG. Occupation and male lung cancer: a case-control study in northern Sweden. *Br J Ind Med* 1987;44:446–53.
118 Goldberg M, Goldberg P, Leclerc A, *et al*. A 10-year incidence survey of respiratory cancer and a case-control study within a cohort of nickel mining and refining workers in New Caledonia. *Cancer Causes Control* 1994;5:15–25.
119 Preller L, Balder HF, Tielemans E, *et al*. Occupational lung cancer risk among men in the Netherlands. *Occup Environ Med* 2008;65:249–54.
120 Williams RR, Stegens NL, Goldsmith JR. Associations of cancer site and type with occupation and industry from the Third National Cancer Survey Interview. *J Natl Cancer Inst* 1977;59:1147–85.
121 Ridge CA, McErlean AM, Ginsberg MS. Epidemiology of lung cancer. *Semin Intervent Radiol* 2013;30:93–8.
122 Yang IA, Holloway JW, Fong KM. Genetic susceptibility to lung cancer and co-morbidities. *J Thorac Dis* 2013;5(Suppl 5):S454–62.
123 Gustavsen B. Work Organization and the 'Scandinavian Model'. *Econ Ind Democracy* 2007;28:650–71.
124 Suikkanen A, Kunnari M. *Principles and concepts in Nordic occupational safety and health policies: dimensions of strategic thinking and approaches*. Copenhagen: Nordic Council of Ministers, 2009.
125 Li CY, Sung FC. A review of the healthy worker effect in occupational epidemiology. *Occup Med (Lond)* 1999;49:225–9.
126 Shah D. Healthy worker effect phenomenon. *Indian J Occup Environ Med* 2009;13:77–9.
127 Gioffre A, Marramao A, Ianno A. Airborne microorganisms, endotoxin, and dust concentration in wood factories in Italy. *Ann Occup Hyg* 2012;56:161–9.
128 Kuijpens JH, Louwman MW, Peters R, *et al*. Trends in sinonasal cancer in The Netherlands: more squamous cell cancer, less adenocarcinoma. A population-based study 1973–2009. *Eur J Cancer* 2012;48:2369–74.
129 Hayes RB, Gerin M, Raatgever JW, *et al*. Wood-related occupations, wood dust exposure, and sinonasal cancer. *Am J Epidemiol* 1986;124:569–77.
130 Luce D, Leclerc A, Morcet JF, *et al*. Occupational risk factors for sinonasal cancer: a case-control study in France. *Am J Ind Med* 1992;21:163–75.

Supplementary Figure 1. Funnel plot of all a) studies assessing wood dust and lung cancer risk and b) studies assessing wood dust-related occupations and lung cancer risk.



Supplementary Table 1. Summary of case-control and cohort studies included in the meta-analysis

Author Date [Ref]	Type	Outcome	Control	Measure	Smoking Control	Country	Years	Cancer	Point Estimate	Cases/Ctrls OR Obs/Total Cohort	NOS
Arias Bahia 2005a [1]	Cohort	Incidence	-	Occup (W)	N	Brazil	1988-1991	Lung	SIR 1.2(0.7-1.9)	18/138	4
Arias Bahia 2005b [1]	Cohort	Incidence	-	Occup (W)	N	Brazil	1988-1991	Lung	SIR 1.8(1.1-2.8)	18/138	4
Arias Bahia 2005c [1]	Cohort	Incidence	-	Occup (W)	N	Brazil	1988-1991	Lung	SIR 0.7(0.4-1.1)	18/138	4
Baccarelli 2006 [2]	Case-Control	Mortality	H	JEM	Y	Russia	1993-1998	Lung	OR 1.1(0.8-1.5)	210/717	9
				Occup (W)				Lung	OR 1.2(0.8-1.7)	540/582	
Baker 2005 [3]	Case-Control	Incidence	H	SR	Y	US	1982-1998	Lung	OR 1.4(1.1-1.8)	993/986	7
Barcenas 2005 [4]	Case-Control	Incidence	H	O	Y	US	1995-2002	Lung	OR 1.6(1.2-2.1)	1368/1192	7
								Adenocarcinoma	OR 1.5(1-2.1)	573/1192	
								SCLC	OR 1.1(0.5-2.3)	96/1192	
								Squamous/LCLC	OR 1.9(1.3-2.7)	544/1192	
				Occup (W)				Lung	OR 3.2(1.5-6.9)	1368/1192	
Barthel 1989 [5]	Cohort	Incidence	-	Occup (F)	N	Germany	1973-1984	Lung	SIR 0.7(0.3-1.2)	162/759	6
Bhatti 2011 [6]	Case-Control	Incidence	P	JEM	N	US	1993-1996	Lung	OR 0.8(0.7-1.0)	258/456	7
				Occup (C)				Lung	OR 0.7(0.5-1)	440/845	
Blot 1982 [7]	Case-Control	Incidence	H	SR	N	US	1978-1979	Lung	OR 1.5(0.9-2.4)	83/342	6
								Adenocarcinoma	OR 1.0(0.4-2.6)	53/254	
								SCLC	OR 3.2(1.4-7.6)	57/241	
								Squamous	OR 1.2(0.5-2.5)	57/267	
				Occup (W)				Lung	OR 1.3(0.8-2.2)	181/342	
Bond 1986 [8]	Nested Case-	Mortality	P	JEM	N	US	1940-1980	Lung	OR 1.3(0.8-2.2)	308/588	7

	Control										
Bouchardy 2002 [9]	Cohort	Incidence	-	Occup (W)	N	Switzerland	1980-1993	Lung	OR 0.8(0.7-0.9)	236/58134	6
Brenner 2010 [10]	Case-Control	Incidence	P	SR	Y	Canada	1997-2002	Lung	OR 1.5(1-2.4)	308/771	8
Bruske-Hohlfeld 2000 [11]	Case-Control	Incidence	P	Occup (W)	Y	Germany	1988-1996	Lung	OR 1.4(1.1-1.7)	3541/3498	7
Buiatti 1985 [12]	Case-Control	Incidence	H	Occup (W)	Y	Italy	1981-1983	Lung	OR 0.6(0.3-1.1)	376/892	7
Burns 1991 [13]	Case-Control	Incidence	H	Occup (W)	Y	US	1980	Lung	OR 1.1(0.7-1.8)	5935/3956	6
Calvert 2012 [14]	Case-Control	Incidence	H	Occup (C)	N	US	1988-2007	Lung	OR 1.6(1.5-1.7)	13268/97669	5
Chatzis 1999 [15]	Case-Control	Incidence	H	Occup (C)	Y	Greece	1987-1988	Lung	OR 5.3(0.7-32.2)	256/458	5
Cheng 1987a [16]	Cohort	Mortality	-	JEM	N	China	1964-1983	Lung	SMR 1.6(0.7-3.2)	7/649	6
Cheng 1987b [16]	Cohort	Mortality	-	JEM	N	China	1968-1983	Lung	SMR 1.3(0.1-6.1)	1/162	6
Cheng 1987c [16]	Cohort	Mortality	-	JEM	N	China	1964-1983	Lung	SMR 2.6(0.5-8.2)	2/105	6
Coggon 1986 [17]	Case-Control	Incidence	H	Occup (W)	N	UK	1975-1980	Lung	OR 1.7(1-3)	738/2214	6
Corbin 2011 [18]	Case-Control	Incidence	P	Occup (W)	Y	New Zealand	2007-2008	Lung	OR 1.4(0.8-2.5)	458/796	7
De Stefani 1996 [19]	Case-Control	Incidence	H	SR	Y	Uruguay	1993-1994	Lung	OR 1.7(0.9-2.8)	270/383	7
								Adenocarcinoma	OR 1.3(0.5-3.2)	NS/383	
								SCLC	OR 2.0(0.7-5.9)	NS/383	
								Squamous	OR 2.1(1.1-3.8)	NS/383	
				Occup (C)				Lung	OR 1.1(0.5-2.7)	270/383	
De Stefani 2005 [20]	Case-Control	Incidence	H	SR	Y	Uruguay	1994-2000	Adenocarcinoma	OR 0.8(0.4-1.5)	338/1014	7
Dement 2003 [21]	Cohort	Incidence	-	Occup (C)	N	US	1979-2000	Lung	SIR 1.5(1.2-1.7)	137/13354	7
Demers	Pooled	Mortality	-	Occup	N	US/UK	1940-	Lung	SMR 0.8(0.7-	575/28704	7

1995 [22]	Cohort			(W)			1984		0.9)		
Droste 1999 [23]	Case-Control	Incidence	H	JEM	Y	Belgium	1995-1997	Lung	OR 1.5(0.9-2.6)	199/257	6
Dubrow 1984 [24]	Nested Case-Control	Mortality	-	Occup (C)	N	US	1971-1973	Lung	OR 1.2(0.9-1.6)	48/34879	5
Elci 2003 [25]	Case-Control	Incidence	H	Occup (C)	Y	Turkey	1979-1984	Lung	OR 0.8(0.4-1.6)	1354/1519	6
Enterline 1963a [26]	Cohort	Mortality	-	Occup (F)	N	US	1950	Lung	SMR 0.8(0.5-1.2)	23/?	6
Enterline 1963b[26]	Cohort	Mortality	-	Occup (C)	N	US	1950	Lung	SMR 1.1(1-1.3)	316/?	6
Ferreccio 2013 [27]	Case-Control	Incidence	P	SR	Y	Chile	2007-2010	Lung	OR 2.5(0.8-7.7)	17/135	6
Finkelstein 1995 [28]	Case-Control	Mortality	P	Occup (C)	N	Canada	1979-1988	Lung	OR 1.7(1-2.8)	576/2219	7
Firth 1996 [29]	Cohort	Mortality	-	Occup (W)	N	New Zealand	1972-1984	Lung	SIR 1.5(1.3-1.7)	278/26207	6
Gallagher 1985 [30]	Cohort	Mortality	-	Occup (W)	N	Canada	1950-1979	Lung	SMR 1.1(0.9-1.2)	283/457083	7
Ganesh 2011 [31]	Case-Control	Incidence	H	SR	N	India	1997-1999	Lung	OR 0.9(0.3-3.3)	408/1383	4
Gottlieb 1979 [32]	Cohort	Mortality	-	Occup (W)	N	US	1960-1975	Lung	OR 1.0(0.9-1.2)	2805/2805	7
Guida 2011 [33]	Case-Control	Incidence	P	Occup (C)	Y	France	2001-2007	Lung	OR 1.5(1.0-2.1)	2241/2770	8
Harrington 1978 [34]	Case-Control	Mortality	P	Occup (W)	N	US	1961-1974	Lung	OR 1.2(0.8-1.6)	595/539	6
Hoshuyama 2006 [35]	Cohort	Mortality	-	JEM	N	China	1980-1993	Lung	SRR 0.9(0.8-0.9)	26/90182	7
Hosseini 2009 [36]	Case-Control	Incidence	M	SR	N	Iran	2002-2005	Lung	OR 1.2(0.5-3.1)	242/484	6
Hu 2002 [37]	Case-Control	Incidence	P	SR	N	Canada	1994-1997	Lung	OR 0.7(0.3-1.8)	161/483	8
Innos 2000 [38]	Cohort	Incidence	-	Occup (F)	N	Estonia	1968-1995	Lung	SIR 1.1(0.9-1.3)	105/6786	7
Jahn 1999 [39]	Case-Control	Incidence	P	Occup (W)	Y	Germany	1988-1993	Lung	OR 1.6(0.6-3.8)	686/712	5
Jarvholm	Case-	Incidence	P	SR	N	Sweden	1983-	Lung	OR 0.6(0.3-1.5)	147/131	5

1993 [40]	Control						1984				
Jayaprakash 2008 [41]	Case-Control	Incidence	H	SR	N	US	1982-1998	Lung	OR 1.7(1.2-2.4)	651/1260	7
								Adenocarcinoma	OR 1.4(1.0-1.9)	205/1260	
								LCLC	OR 1.4(0.9-2.2)	77/1260	
								SCLC	OR 1.2(0.8-1.8)	97/1260	
								Squamous	OR 1.9(1.2-3.2)	209/1260	
Kauppinen 1993 [42]	Nested Case-Control	Incidence	P	JEM	Y	Finland	1957-1982	Lung	OR 0.4(0.2-1.1)	117/408	8
Kjuus 1986 [43]	Case-Control	Incidence	H	SR	Y	Norway	1979-1983	Lung	OR 0.4(0.2-0.8)	176/176	7
Kromhout 1992 [44]	Cohort	Incidence	-	JEM	Y	Holland	1960-1985	Lung	HR 1.6(0.7-3.4)	69/856	8
Leigh 1996 [45]	Cohort	Mortality	-	Occup (W)	N	US	1979-1984	Lung	SMR 0.9(0.5-1.3)	?/173438	5
Lerchen 1987 [46]	Case-Control	Incidence	P	SR	Y	US	1980-1982	Lung	OR 0.8(0.3-1.7)	333/501	5
Levin 1988 [47]	Case-Control	Incidence	P	SR	Y	China	1984-1985	Lung	OR 1.7(1-2.7)	269/308	6
				Occup (W)				Lung	OR 1.2(0.7-2.2)	733/760	
Lipscomb 1998 [48]	Cohort	Incidence	-	Occup (C)	N	US	1989-1992	Lung	SIR 1.3(0.7-1.9)	13/10938	6
Luqman 2014 [49]	Case-Control	Incidence	H	SR	N	Pakistan	2010-2013	Lung	OR 1.9(1.2-3.1)	400/800	4
MacArthur 2009 [50]	Case-Control	Incidence	H	Occup (W)	Y	Canada	1983-1990	Lung	OR 0.8(0.7-1.0)	2964/10223	5
Matos 2000 [51]	Case-control	Incidence	P	Occup (W)	Y	Argentina	1994-1996	Lung	OR 0.7(0.3-1.5)	200/397	6
Mcconnell 1952 [52]	Case-Control	Incidence	H	SR	N	England	1946-1950	Lung	OR 1.8(0.6-5.4)	100/200	4
Menck 1976 [53]	Cohort	Mortality	-	Occup (W)		US	1968-1973	Lung	SMR 1.1(0.8-1.5)	39/3938	5
Mikoczy 1996 [54]	Nested Case-Control	Incidence	P	JEM	N	Sweden	1958-1959	Lung	OR 0.3(0-6.7)	22/55	7
Milne 1983	Cohort	Mortality	-	Occup	N	US	1958-	Lung	SMR 1.3(0.7-	925/6420	5

[55]				(W)			1962		2.6)		
Muscat 1998 [56]	Case-Control	Incidence	H	SR	Y	US	1978-1992	Lung	OR 1.6(0.8-3.2)	365/251	6
Notani 1993 [57]	Case-Control	Incidence	H	Occup (W)	Y	India	1986-1990	Lung	OR 2.9(0.9-9.6)	246/212	6
Osann 2000 [58]	Case-Control	Incidence	P	SR	Y	US	1990-1993	SCLC	OR 0.8(0.3-2.4)	98/204	8
Peters 2012 [59]	Case-Control	Incidence	H	Occup (W)	Y	Multiple	1985-2005	Lung	OR 1.2(1.1-1.3)	13479/16510	7
Pezzotto 1999 [60]	Case-Control	Incidence	H	Occup (C)	Y	Argentina	1992-1997	Lung	OR 0.9(0.3-2.7)	367/586	5
Pronk 2009 [61]	Cohort	Incidence	-	Occup (C)	Y	China	1996-200	Lung	RR 2.3(1.1-4.7)	8/71067	8
Pukkala 2009 [62]	Cohort	Incidence	-	Occup (W)	N	Nordic Countries	1961-2005	Lung	SIR 1(0.9-1)	10941/15mil	7
Richiardi 2004 [63]	Case-Control	Incidence	P	Occup (C)	Y	Italy	1990-1992	Lung	OR 0.9(0.6-1.5)	956/1253	6
Robinson 1995 [64]	Cohort	Mortality	-	Occup (C)	N	US	1984-1986	Lung	SMR 1.2(1.1-1.2)	1489/876731	6
Robinson 1996 [65]	Cohort	Mortality	-	Occup (C)	N	US	1987-1990	Lung	SMR 1.1(0.9-1.2)	2648/27362	7
Ronco 1988 [66]	Case-Control	Mortality	P	Occup (W)	Y	Italy	1976-1980	Lung	OR 2.8(0.9-8.4)	164/492	8
Schraub 1989 [67]	Case-Control	Incidence	P	SR	N	France	1978-1985	Adenocarcinoma	OR 1.1(0.4-2.5)	53/160	5
Siemiatycki 1991 [68]	Case-Control	Incidence	H	O	Y	Canada	1979-1983	Lung	OR 1.2(1.0-1.5)	174/NS Exposed	7
Siew 2012 [69]	Cohort	Incidence	-	JEM	Y	Finland	1971-1995	Lung	RR 0.9(0.9-1.0)	2750/1.2mil	8
Simpson 1999 [70]	Cohort	Incidence	-	Occup (C)	N	UK	1971-1990	Lung	RR 1.9(1.4-2.6)	50/381915	7
Smailyte 2012 [71]	Cohort	Incidence	-	Occup (W)	N	Lithuania	1978-2007	Lung	SIR 0.9(0.6-1.2)	36/1518	6
Stellman 1984 [72]	Cohort	Mortality	-	Occup (W)	N	US	1959-1972	Lung	SMR 1.1(1-1.3)	135/417120	5
Stellman 1998 [73]	Cohort	Mortality	-	SR	Y	US, Columbia, Puerto Rico	1982-1988	Lung	IDR 1.2(1.0-1.3)	317/315,266	7
				Occup				Lung	RR 1.1(0.9-1.4)	111/315266	

				(W)							
Swanson 1982 [74]	Cohort	Incidence		Occup (W)	N	US	1970-1978	Lung	SMR 1.6(0.8-2.7)	11/1070	6
Szadkowska-Stanczyk 2001 [75]	Nested Case-Control	Mortality	P	JEM	Y	Poland	1968-1995	Lung	OR 2.1(0.9-4.9)	79/237	7
Tse 2012 [76]	Case-Control	Incidence	P	SR	Y	China	2004-2006	Lung	OR 1.2(0.6-2.2)	1208/1069	7
								Adenocarcinoma	OR 1.7(0.8-3.6)	440/1069	
								Squamous/SCLC	OR 1.6(0.7-4)	490/1069	
Versluys 1949 [77]	Cohort	Mortality	-	Occup (C)	N	Netherlands	1931-1935	Lung	SMR 0.9(0.7-1.3)	35/51124	6
Wang 1995 [78]	Case-Control	Incidence	H	Occup (W)	N	China	1981-1987	Lung	OR 1.2(1.0-1.6)	4806/14685	6
Weston 1998 [79]	Cohort	Mortality	-	O	N	Canada	1971-1991	Lung	RR 1.3(0.7-2.6)	9/52,390	6
Wu 1995 [80]	Case-Control	Incidence	H	O	Y	US	?-1995	Lung	OR 3.5(1.4-8.6)	180/270	7
								Non-SCLC	OR 2.4(1.3-4.4)	180/270	
								SCLC	OR 0.2(0.0-4.1)	180/270	
				Occup (W)				Lung	OR 2.5(0.4-6.1)	180/270	
Wu-Williams 1993 [81]	Case-Control	Incidence	P	SR	Y	China	1985-1987	Lung	OR 1.1(0.8-1.7)	966/960	6
				Occup (W)				Lung	OR 0.9(0.5-1.7)	966/960	
Wunsch-Filho 1998 [82]	Case-Control	Incidence	H	Occup (W)	Y	Brazil	1990-1991	Lung	OR 1.4(0.7-2.8)	398/860	5
Yang 1996 [83]	Nested Case-Control	Mortality	P	JEM	Y	China	1972-1992	Lung	OR 1.1(0.5-2.8)	21/75 Exposed	8
Yang 1997 [84]	Cohort	Mortality	-	JEM	Y	China	1972-1992	Lung	SMR 2.6(1.6-4.1)	20/2362	6
Zahm 1989 [85]	Case-Control	Incidence	H	Occup (C)	Y	US	1980-1985	Lung	OR 1.3(1-1.7)	4431/11326	7
Zahm 1989	Case-	Incidence	H	Occup	Y	US	1980-	Lung	OR 1.3(0.5-3.3)	4431/11326	7

[85]	Control			(F)			1985				

H=Hospital; P=Populations; SR=Self-Reported - Wood Dust Exposure; JEM=Job-Exposure Matrix - Wood Dust Exposure; Occup=Wood-Dust Related Occupation (W = Woodworker; F = Furniture; C = Carpenter); O=Other Wood Dust Exposure; SCLC= Small-cell lung carcinoma; LCLC=Large-cell lung carcinoma; OR=odds ratio; IDR=Incidence Density Ratio, HR=Hazard Ratio; RR=Risk Ratio; SMR=Standardised Mortality Ratio; SRR=Standardised Rate Ratio; SIR=Standardised Incidence Ratio; NOS=Newcastle-Ottawa Scale score. Recalculated odds-ratio not controlled for smoking.

Supplementary Table 2. Summary of studies that met the inclusion criteria but were not included in the meta-analysis with justifications for their exclusion

Author Date [Ref]	Study	Reason for Exclusion	Summary of Findings
Acheson 1984 [86]	Cohort	Used in Pooled Cohort of Demers 1995 [22]	Significant association between wood dust-related occupation and a reduced risk of lung cancer (SMR 0.8, 95% CI 0.7-0.9) - UK
Andersson 1999 [87]	Cohort	Same Cohort as Pukkalla 2009 [62]	No significant association between wood dust-related occupation and lung cancer (Denmark = SIR 1.0, 95% CI 1.0-1.1); Significant increased risk (Finland = SIR 1.1, 95% CI 1.1-1.2); Significant reduced risk (Norway = SIR 0.8, 95% CI 0.8-0.9; Sweden = SIR 0.7, 95% CI 0.7-0.7) -
Andersson 2001 [88]	Cohort	Same Cohort as Pukkalla 2009 [62]	No significant association between wood dust-related occupation and lung cancer (SMR 1.3, 95% CI 0.6-3.1) - Sweden
Andersson 2010 [89]	Cohort	Same Cohort as Pukkalla 2009 [62]	Significant association between wood dust-related occupation and a reduced risk of lung cancer (SMR 0.7, 95% CI 0.4-1.0) - Sweden
Andersson 2013 [90]	Cohort	Same Cohort as Pukkalla 2009 [62]	Significant association between wood dust-related occupation and a reduced risk for lung cancer (SIR 0.6, 95% CI 0.3-0.9) - Sweden
Baccarelli 2005 [91]	Case-Control	Same Cohort as Baccarelli 2006 [91]	Mixed association between wood dust-related occupation and an increased risk for lung cancer (Wood Industry = OR 9.3, 95% CI 2.0-42.8; Carpenters = OR 1.2, 95% CI 0.3-4.2) - Russia
Bardin-Mikolajczak 2007 [92]	Case-Control	Same Cohort as Peters 2012 [59]	Significant association between wood dust-related occupation and an increased risk for lung cancer (OR 7.5, 95% CI 1.5-39.9) - Czech Republic, Hungary, Poland, Romania, Russia, Slovakia
Blair 1985 [93]	Cohort	Used in Pooled Cohort of Demers 1995 [22]	No significant association between wood dust-related occupation and lung cancer (SMR 1.0, 95% CI 0.7-1.3) - US
Blair 1990 [94]	Cohort	Used in Pooled Cohort of Demers 1995 [22]	No significant association between wood dust-related occupation and lung cancer (SMR 1.5, 95% CI 0.8-2.4) - US
Carpenter 1999 [95]	Cohort	Same Cohort as Simpson 1999 [70]	Significant association between wood dust related occupation and an increased risk for lung cancer (PRR 1.71, 95% CI 1.05-2.66) - UK
Carstensen 1988 [96]	Cohort	Same Cohort as Pukkalla 2009 [62]	No significant association between wood dust-related occupation and lung cancer (OR 1.0, 95% CI 0.9-1.1) - Sweden
Consonni 2010 [97]	Case-Control	Same Cohort as Peters 2012 [59]	No significant association between wood dust-related occupation and lung cancer (OR 1.0, 95% CI 0.6-1.5) - Italy
Correa 1984 [98]	Case-Control	No data for 95% Confidence Interval	Significant association between wood dust and an increased risk for lung cancer (OR 1.4) in Louisiana, US
Demers 1998 [99]	Cohort	Duplicate - see Demers 1995 [22]	-
Etzel 2008 [100]	Case-Control	Same Cohort as Barcenas 2005 [4] - Less Specific for Wood Dust	Significant association between wood dust and an increased risk for lung cancer (OR 1.5, 95% CI 1.1-2.1)
Gerhardsson 1985 [101]	Cohort	Same Cohort as Pukkalla 2009 [62]	No significant association between wood dust-related occupation and lung cancer (SIR 0.9, 95% CI 0.7-1.2) - Sweden
Gorlova 2006 [102]	Case-Control	Same Cohort as Barcenas 2005 [4] - Less Specific to Wood Dust	Significant association between wood dust and an increased risk for lung cancer in non-smokers (OR 2.6, 95% 1.1-6.4)
Haldorsen 2004	Cohort	Same Cohort as Pukkalla 2009	Significant association between wood dust-related occupation and an increased risk of lung cancer

[103]		[62]	(SIR 1.3, 95% CI 1.2-1.3) - Norway
Hall 1991 [104]	Cohort	Same Cohort as Dement 2003 [21]	No significant association between wood dust-related occupation and lung cancer (SIR 2.5, 95% CI 0.9-6) - US
Jappinnen 1989 [105]	Cohort	Same Cohort as Pukkalla 2009 [62]	No significant association between wood dust-related occupation and lung cancer (SIR 1.0, 95% CI 0.6-1.4) - Finland
Ji 2005 [106]	Cohort	Same Cohort as Pukkalla 2009 [62]	No significant association between wood dust-related occupation and lung cancer (SIR 0.8, 95% CI 0.7-0.8) - Sweden
Jockel 1992 [107]	Case-Control	Same Cohort as Bruske-Hohlfeld 2000 [11]	No significant association between wood dust-related occupation and lung cancer (OR 0.7, 95% CI 0.3-1.9) - Germany
Jockel 1998 [108]	Case-Control	Same Cohort as Bruske-Hohlfeld 2000 [11]	No significant association between wood dust-related occupation and lung cancer (OR 1.3, 95% CI 0.9-1.8) - Germany
Kauppinen 1986 [109]	Case-Control	Same Cohort as Kauppinen 1993 [42] - Earlier Study	No significant association between wood dust and lung cancer (OR 1.68)
Kawachi 1989 [110]	Case-Control	Same Cohort as Firth 1996 [29]	Significant association between wood dust-related occupation and an increased risk of lung cancer (OR 1.3, 95% CI 1.2-1.6) - New Zealand
Kreuzer 1999 [111]	Case-Control	Same Cohort as Bruske-Hohlfeld 2000 [11]	Significant association between wood dust-related occupation and an increased risk of lung cancer (OR 1.3, 95% CI 1.1-1.6) - Germany
Kreuzer 2002 [112]	Case-Control	Same Cohort as Bruske-Hohlfeld 2000 [11]	Significant association between wood dust-related occupation and an increased risk of lung cancer (OR 13.4, 95% CI 1.6-112.2) - Germany
Kvale 1986 [113]	Cohort	Same Cohort as Pukkalla 2009 [62]	No significant association between wood dust-related occupation and lung cancer (SIR 1.6, 95% CI 0.9-2.8) - Norway
Laakkonen 2006 [114]	Cohort	Same Cohort as Siew 2012 [69] - Earlier study	No significant association between wood dust and lung cancer in low (SIR 1.1, 95% CI 1.0-1.2) medium (SIR 1.0, 95% CI 1.0-1.0) and high (SIR 0.9, 95% CI 0.7-1.0) exposure categories in Finish males. Similar results for females
Laakkonen 2008 [115]	Cohort	Duplicate - See Laakkonen 2006 [114]	-
Matos 1998 [116]	Case-control	Duplicate - see Matos 2000 [51]	-
Mchugh 2010 [117]	Case-Control	Same Cohort as Barcenas 2005 [4] - Subset of Mexican-Americans	No significant association between wood dust and lung cancer (OR 1.3, 95% CI 0.9-2.1)
Miller 1989 [118]	Cohort	Used in Pooled Cohort of Demers 1995 [22]	No significant association between wood dust-related occupation and lung cancer (SMR 0.9, 95% CI 0.6-1.2) - US
Miller 1994 [119]	Cohort	Used in Pooled Cohort of Demers 1995 [22]	No significant association between wood dust-related occupation and lung cancer (SMR 1.0, 95% CI 0.8-1.1) - US
Morabia 1992 [120]	Case-Control	No data for 95% Confidence Interval	No significant association between wood occupation and lung cancer (OR 1.4)
Olsen 1979 [121]	Cohort	Same Cohort as Pukkalla 2009 [62]	No significant association between wood dust-related occupation and lung cancer (SMR 0.9, 95% CI 0.6-1.5) - Denmark

Olsen 1979 [122]	Cohort	Same Cohort as Pukkalla 2009 [62]	No significant association between wood dust-related occupation and lung cancer (SMR 1.1, 95% CI 0.9-1.3) - Denmark
Olsen 1987 [123]	Cohort	Same Cohort as Pukkalla 2009 [62]	No significant association between wood dust-related occupation and lung cancer (Woodworker = SIR 0.9, 95% CI 0.8-1.1; Carpenter = SIR 1.1, 95% CI 0.9-1.3) - Denmark
Olsen 1988 [124]	Cohort	Same Cohort as Pukkalla 2009 [62]	No significant association between wood dust-related occupation and lung cancer (Processing = SIR 0.9, 95% CI 0.7-1.1; Manufacture = SIR 1.0, 95% CI 0.9-1.1) - Denmark
Pohlabeln 2000 [125]	Case-Control	Same Cohort as Peters 2012 [59]	No significant association between wood dust-related occupation and lung cancer (OR 0.6, 95% CI 0.3-1.0) - Germany/Italy/Portugal/UK/France/Spain/Sweden
Pukkala 1983 [126]	Cohort	Same Cohort as Pukkalla 2009 [62]	Significant association between wood dust-related occupation and an increased risk of lung cancer (SIR 1.3, 95% CI 1.2-1.4) - Finland
Rang 1981 [127]	Cohort	Overlap with Pooled Cohort of Demers 1995 [22]	No significant association between wood dust-related occupation and lung cancer (SMR 0.8, 95% CI 0.6-1.1) - UK
Robinson 1986 [65]	Cohort	Used in Pooled Cohort of Demers 1995 [22]	No significant association between wood dust-related occupation and lung cancer (SMR 0.8, 95% CI 0.6-1.1) - US
Roscoe 1992 [128]	Cohort	Used in Pooled Cohort of Demers 1995 [22]	No significant association between wood dust-related occupation and lung cancer (SMR 1, 95% CI 0.8-1.3) - US
Sankila 1990 [129]	Cohort	Same Cohort as Pukkalla 2009 [62]	Significant association between wood dust-related occupation and an increased risk of lung cancer (Carpenters = SIR 1.3, 95% CI 1.2-1.4); No significant association (Woodworkers = SIR 1.3, 95% CI 0.8-2) - Finland
Schabath 2005 [130]	Case-Control	Same Cohort as Barcenas 2005 [4] - Less Specific for Wood Dust	Significant association between wood dust and an increased risk for lung cancer (OR 1.7, 95% CI 1.3-2.1)
Schoenberg 1987 [131]	Case-Control	No data for 95% Confidence Interval	No Significant association between wood dust and lung cancer (Carpenters or Furniture = OR 0.9-1) - US
Siemiatycki 1986 [132]	Case-Control	Duplicate - see Siemiatycki 1991 [68]	-
Siemiatycki 1990 [133]	Case-Control	Duplicate - see Siemiatycki 1991 [68]	-
Spitz 2007 [134]	Case-Control	Same Cohort as Barcenas 2005 [4] - Less Specific for Wood Dust	No significant association between wood dust and lung cancer for never smokers (OR 0.9, 95% CI 0.5-1.7), former smokers (OR 1.2, 95% CI 0.9-1.7), and current smokers (OR 1.2, 95% CI 0.9-1.6)
Tse 2011 [135]	Case-Control	Same Cohort as Tse 2012 [76] - Subset of non-smokers	No significant association between wood dust and lung cancer (OR 1.4, 95% CI 0.3-7.6) or lung adenocarcinomas (OR 2.2, 95% CI 0.4-12.0)
Wang 1999 [136]	Cohort	No data for 95% Confidence Interval	Association between wood dust-related occupation and lung cancer (SMR 1.19)
Yang 1996 [137]	Cohort	Duplicate - see Yang 1997 [84]	
Yenugadhati 2009a [138]	Case-Control	Same Cohort as MacArthur 2009 [50]	No significant association between wood dust-related occupation and lung cancer (OR 1.3, 95% CI 1.0-1.8) - Canada
Yenugadhati 2009b	Case-	Same Cohort as MacArthur	No significant association between wood dust-related occupation and lung cancer (OR 0.9, 95% CI

[139]	Control	2009 [50]	0.8-1.1) - Canada
Zeka 2006 [140]	Case-Control	Same Cohort as Peters 2012 [59]	No significant association between wood dust-related occupation and lung cancer (OR 0.7, 95% CI 0.3-2.2) - Czech Republic, Hungary, Poland, Romania,Russia, Slovakia, UK

REFERENCES

1. Arias Bahia SH, Echenique Mattos I, and Koifman S. Cancer and wood-related occupational exposure in the Amazon region of Brazil. Environ Res 99(1):132-40, 2005.
2. Baccarelli A, Khmelnitskii O, Tretiakova M, Gorbanev S, Lomtev A, Klimkina I, Tchibissov V, Averkina O, Rice C, and Dosemeci M. Risk of lung cancer from exposure to dusts and fibers in Leningrad Province, Russia. Am J Ind Med 49(6):460-7, 2006.
3. Baker JA, McCann SE, Reid ME, Nowell S, Beehler GP, and Moysich KB. Associations between black tea and coffee consumption and risk of lung cancer among current and former smokers. Nutr Cancer 52(1):15-21, 2005.
4. Barcenas CH, Delclos GL, El-Zein R, Tortolero-Luna G, Whitehead LW, and Spitz MR. Wood dust exposure and the association with lung cancer risk. Am J Ind Med 47(4):349-57, 2005.
5. Barthel E and Dietrich M. Retrospective cohort study of cancer morbidity in furniture makers exposed to wood dust. Z Gesamte Hyg 35(5):279-81, 1989.
6. Bhatti P, Newcomer L, Onstad L, Teschke K, Camp J, Morgan M, and Vaughan TL. Wood dust exposure and risk of lung cancer. Occup Environ Med 68(8):599-604, 2011.
7. Blot WJ, Davies JE, Brown LM, Nordwall CW, Buiatti E, Ng A, and Fraumeni JF, Jr. Occupation and the high risk of lung cancer in Northeast Florida. Cancer 50(2):364-71, 1982.
8. Bond GG, Flores GH, Shellenberger RJ, Cartmill JB, Fishbeck WA, and Cook RR. Nested case-control study of lung cancer among chemical workers. Am J Epidemiol 124(1):53-66, 1986.
9. Bouchardy C, Schuler G, Minder C, Hotz P, Bousquet A, Levi F, Fisch T, Torhorst J, and Raymond L. Cancer risk by occupation and socioeconomic group among men--a study by the Association of Swiss Cancer Registries. Scand J Work Environ Health 28 Suppl 1:1-88, 2002.
10. Brenner DR, Hung RJ, Tsao MS, Shepherd FA, Johnston MR, Narod S, Rubenstein W, and McLaughlin JR. Lung cancer risk in never-smokers: a population-based case-control study of epidemiologic risk factors. BMC Cancer 10:285, 2010.
11. Bruske-Hohlfeld I, Mohner M, Pohlabeln H, Ahrens W, Bolm-Audorff U, Kreienbrock L, Kreuzer M, Jahn I, Wichmann HE, and Jockel KH. Occupational lung cancer risk for men in Germany: results from a pooled case-control study. Am J Epidemiol 151(4):384-95, 2000.
12. Buiatti E, Kriebel D, Geddes M, Santucci M, and Pucci N. A case control study of lung cancer in Florence, Italy. I. Occupational risk factors. J Epidemiol Community Health 39(3):244-50, 1985.
13. Burns PB and Swanson GM. The Occupational Cancer Incidence Surveillance Study (OCISS): risk of lung cancer by usual occupation and industry in the Detroit metropolitan area. Am J Ind Med 19(5):655-71, 1991.
14. Calvert GM, Luckhaupt S, Lee SJ, Cress R, Schumacher P, Shen R, Tak S, and Deapen D. Lung cancer risk among construction workers in California, 1988-2007. Am J Ind Med 55(5):412-22, 2012.
15. Chatzis C, Danaka G, Linos A, Kales SN, and Christiani DC. Lung cancer and occupational risk factors in Greece. J Occup Environ Med 41(1):29-35, 1999.
16. Cheng W, Zuo H, and Hao Z. [Cancer mortality among woodworkers in Tianjin]. Chinese Journal of Industrial Hygiene and Occupational Diseases 5(1):22-5, 1987.
17. Coggon D, Pannett B, Osmond C, and Acheson ED. A survey of cancer and occupation in young and middle aged men. I. Cancers of the respiratory tract. Br J Ind Med 43(5):332-8, 1986.

18. Corbin M, McLean D, Mannetje A, Dryson E, Walls C, McKenzie F, Maule M, Cheng S, Cunningham C, Kromhout H, Blair A, and Pearce N. Lung cancer and occupation: A New Zealand cancer registry-based case-control study. Am J Ind Med 54(2):89-101, 2011.
19. De Stefani E, Kogevinas M, Boffetta P, Ronco A, and Mendilaharsu M. Occupation and the risk of lung cancer in Uruguay. Scand J Work Environ Health 22(5):346-52, 1996.
20. De Stefani E, Boffetta P, Brennan P, Deneo-Pellegrini H, Ronco A, and Gutierrez LP. Occupational exposures and risk of adenocarcinoma of the lung in Uruguay. Cancer Causes Control 16(7):851-6, 2005.
21. Dement J, Pompeii L, Lipkus IM, and Samsa GP. Cancer incidence among union carpenters in New Jersey. J Occup Environ Med 45(10):1059-67, 2003.
22. Demers PA, Boffetta P, Kogevinas M, Blair A, Miller BA, Robinson CF, Roscoe RJ, Winter PD, Colin D, Matos E, and Vainio H. Pooled reanalysis of cancer mortality among five cohorts of workers in wood-related industries. Scand J Work Environ Health 21(3):179-90, 1995.
23. Droste JH, Weyler JJ, Van Meerbeeck JP, Vermeire PA, and van Sprundel MP. Occupational risk factors of lung cancer: a hospital based case-control study. Occup Environ Med 56(5):322-7, 1999.
24. Dubrow R and Wegman DH. Cancer and occupation in Massachusetts: a death certificate study. Am J Ind Med 6(3):207-30, 1984.
25. Elci OC, Akpinar-Elci M, Alavanja M, and Dosemeci M. Occupation and the risk of lung cancer by histologic types and morphologic distribution: a case control study in Turkey. Monaldi Arch Chest Dis 59(3):183-8, 2003.
26. Enterline PEPD and McKiever MFBA. Differential Mortality from Lung Cancer by Occupation. Journal of Occupational Medicine 5(6):283-290, 1963.
27. Ferreccio C, Yuan Y, Calle J, Benitez H, Parra RL, Acevedo J, Smith AH, Liaw J, and Steinmaus C. Arsenic, tobacco smoke, and occupation: associations of multiple agents with lung and bladder cancer. Epidemiology 24(6):898-905, 2013.
28. Finkelstein MM. Occupational associations with lung cancer in two Ontario cities. Am J Ind Med 27(1):127-36, 1995.
29. Firth HM, Cooke KR, and Herbison GP. Male cancer incidence by occupation: New Zealand, 1972-1984. Int J Epidemiol 25(1):14-21, 1996.
30. Gallagher RP, Threlfall WJ, Band PR, and Spinelli JJ. Cancer mortality experience of woodworkers, loggers, fishermen, farmers, and miners in British Columbia. Natl Cancer Inst Monogr 69:163-7, 1985.
31. Ganesh B, Sushama S, Monika S, and Suvarna P. A case-control study of risk factors for lung cancer in Mumbai, India. Asian Pac J Cancer Prev 12(2):357-62, 2011.
32. Gottlieb MS, Pickle LW, Blot WJ, and Fraumeni JF, Jr. Lung cancer in Louisiana: death certificate analysis. J Natl Cancer Inst 63(5):1131-7, 1979.
33. Guida F, Papadopoulos A, Menvielle G, Matrat M, Fevotte J, Cenee S, Cyr D, Schmaus A, Carton M, Paget-Bailly S, Radoi L, Tarnaud C, Bara S, Tretarre B, Luce D, and Stucker I. Risk of lung cancer and occupational history: results of a French population-based case-control study, the ICARE study. J Occup Environ Med 53(9):1068-77, 2011.
34. Harrington JM, Blot WJ, Hoover RN, Housworth WJ, Heath CW, Jr., and Fraumeni JF, Jr. Lung cancer in coastal Georgia: a death certificate analysis of occupation: brief communication. J Natl Cancer Inst 60(2):295-8, 1978.
35. Hoshuyama T, Pan G, Tanaka C, Feng Y, Yu L, Liu T, Liu L, Hanaoka T, and Takahashi K. Mortality of iron-steel workers in Anshan, China: a retrospective cohort study. Int J Occup Environ Health 12(3):193-202, 2006.
36. Hosseini M, Naghan PA, Karimi S, SeyedAlinaghi S, Bahadori M, Khodadad K, Mohammadi F, Kaynama K, and Masjedi MR. Environmental risk factors for lung cancer in Iran: a case-control study. Int J Epidemiol 38(4):989-96, 2009.
37. Hu J, Mao Y, Dryer D, White K, and Canadian Cancer Registries Epidemiology Research Group. Risk factors for lung cancer among Canadian women who have never smoked. Cancer Detect Prev 26(2):129-38, 2002.

38. Innos K, Rahu M, Rahu K, Lang I, and Leon DA. Wood dust exposure and cancer incidence: a retrospective cohort study of furniture workers in Estonia. Am J Ind Med 37(5):501-11, 2000.
39. Jahn I, Ahrens W, Bruske-Hohlfeld I, Kreuzer M, Mohner M, Pohlabeln H, Wichmann HE, and Jockel KH. Occupational risk factors for lung cancer in women: results of a case-control study in Germany. Am J Ind Med 36(1):90-100, 1999.
40. Jarvholm B, Larsson S, Hagberg S, Olling S, Ryd W, and Toren K. Quantitative importance of asbestos as a cause of lung cancer in a Swedish industrial city: a case-referent study. Eur Respir J 6(9):1271-5, 1993.
41. Jayaprakash V, Natarajan KK, Moysich KB, Rigual NR, Ramnath N, Natarajan N, and Reid ME. Wood dust exposure and the risk of upper aero-digestive and respiratory cancers in males. Occup Environ Med 65(10):647-54, 2008.
42. Kauppinen TP, Partanen TJ, Hernberg SG, Nickels JI, Luukkonen RA, Hakulinen TR, and Pukkala EI. Chemical exposures and respiratory cancer among Finnish woodworkers. Br J Ind Med 50(2):143-8, 1993.
43. Kjuus H, Skjaerven R, Langard S, Lien JT, and Aamodt T. A case-referent study of lung cancer, occupational exposures and smoking. I. Comparison of title-based and exposure-based occupational information. Scand J Work Environ Health 12(3):193-202, 1986.
44. Kromhout H, Heederik D, Dalderup LM, and Kromhout D. Performance of two general job-exposure matrices in a study of lung cancer morbidity in the Zutphen cohort. Am J Epidemiol 136(6):698-711, 1992.
45. Leigh JP. Occupations, cigarette smoking, and lung cancer in the epidemiological follow-up to the NHANES I and the California Occupational Mortality Study. Bull N Y Acad Med 73(2):370-97, 1996.
46. Lerchen ML, Wiggins CL, and Samet JM. Lung cancer and occupation in New Mexico. J Natl Cancer Inst 79(4):639-45, 1987.
47. Levin LI, Zheng W, Blot WJ, Gao YT, and Fraumeni JF, Jr. Occupation and lung cancer in Shanghai: a case-control study. Br J Ind Med 45(7):450-8, 1988.
48. Lipscomb HJ and Dement JM. Respiratory diseases among union carpenters: cohort and case-control analyses. Am J Ind Med 33(2):131-50, 1998.
49. Luqman M, Javed MM, Daud S, Raheem N, Ahmad J, and Khan AU. Risk factors for lung cancer in the pakistani population. Asian Pac J Cancer Prev 15(7):3035-9, 2014.
50. MacArthur AC, Le ND, Fang R, and Band PR. Identification of occupational cancer risk in British Columbia: a population-based case-control study of 2,998 lung cancers by histopathological subtype. Am J Ind Med 52(3):221-32, 2009.
51. Matos EL, Vilensky M, Mirabelli D, and Boffetta P. Occupational exposures and lung cancer in Buenos Aires, Argentina. J Occup Environ Med 42(6):653-9, 2000.
52. McConnell RB, Gordon KC, and Jones T. Occupational and personal factors in the aetiology of carcinoma of the lung. Lancet 2(6736):651-6, 1952.
53. Menck HR and Henderson BE. Occupational differences in rates of lung cancer. J Occup Med 18(12):797-801, 1976.
54. Mikoczy Z, Schutz A, Stromberg U, and Hagmar L. Cancer incidence and specific occupational exposures in the Swedish leather tanning industry: a cohort based case-control study. Occup Environ Med 53(7):463-7, 1996.
55. Milne KL, Sandler DP, Everson RB, and Brown SM. Lung cancer and occupation in Alameda County: a death certificate case-control study. Am J Ind Med 4(4):565-75, 1983.
56. Muscat JE, Stellman SD, Richie JP, Jr., and Wynder EL. Lung cancer risk and workplace exposures in black men and women. Environ Res 76(2):78-84, 1998.
57. Notani PN, Shah P, Jayant K, and Balakrishnan V. Occupation and cancers of the lung and bladder: a case-control study in Bombay. Int J Epidemiol 22(2):185-91, 1993.

58. Osann KE, Lowery JT, and Schell MJ. Small cell lung cancer in women: risk associated with smoking, prior respiratory disease, and occupation. Lung Cancer 28(1):1-10, 2000.
59. Peters S, Kromhout H, Olsson AC, Wichmann HE, Bruske I, Consonni D, Landi MT, Caporaso N, Siemiatycki J, Richiardi L, Mirabelli D, Simonato L, Gustavsson P, Plato N, Jockel KH, Ahrens W, Pohlabeln H, Boffetta P, Brennan P, Zaridze D, Cassidy A, Lissowska J, Szeszenia-Dabrowska N, Rudnai P, Fabianova E, Forastiere F, Bencko V, Foretova L, Janout V, Stucker I, Dumitru RS, Benhamou S, Bueno-de-Mesquita B, Kendzia B, Pesch B, Straif K, Bruning T, and Vermeulen R. Occupational exposure to organic dust increases lung cancer risk in the general population. Thorax 67(2):111-6, 2012.
60. Pezzotto SM and Poletto L. Occupation and histopathology of lung cancer: A case-control study in Rosario, Argentina. Am J Ind Med 36(4):437-43, 1999.
61. Pronk A, Coble J, Ji BT, Shu XO, Rothman N, Yang G, Gao YT, Zheng W, and Chow WH. Occupational risk of lung cancer among lifetime non-smoking women in Shanghai, China. Occup Environ Med 66(10):672-8, 2009.
62. Pukkala E, Martinsen JI, Lynge E, Gunnarsdottir HK, Sparen P, Tryggvadottir L, Weiderpass E, and Kjaerheim K. Occupation and cancer - follow-up of 15 million people in five Nordic countries. Acta Oncol 48(5):646-790, 2009.
63. Richiardi L, Boffetta P, Simonato L, Forastiere F, Zambon P, Fortes C, Gaborieau V, and Merletti F. Occupational risk factors for lung cancer in men and women: a population-based case-control study in Italy. Cancer Causes Control 15(3):285-94, 2004.
64. Robinson C, Stern F, Halperin W, Venable H, Petersen M, Frazier T, Burnett C, Lalich N, Salg J, Sestito J, and et al. Assessment of mortality in the construction industry in the United States, 1984-1986. Am J Ind Med 28(1):49-70, 1995.
65. Robinson C, Fowler D, Brown D, and Lemen R. Plywood Mill Workers Mortality Patterns 1945-1977. Cincinnati, OH: National Institute for Occupational Safety and Health, 1986.
66. Ronco G, Ciccone G, Mirabelli D, Troia B, and Vineis P. Occupation and lung cancer in two industrialized areas of northern Italy. Int J Cancer 41(3):354-8, 1988.
67. Schraub S, Belon-Leneutre M, Mercier M, and Bourgeois P. Adenocarcinoma and wood. Am J Epidemiol 130(6):1164-6, 1989.
68. Siemiatycki J, *Risk factors for cancer in the workplace*. 1991: Boca Raton: CRC Press.
69. Siew SS, Kauppinen T, Kyyronen P, Heikkila P, and Pukkala E. Occupational exposure to wood dust and formaldehyde and risk of nasal, nasopharyngeal, and lung cancer among Finnish men. Cancer Manag Res 4:223-32, 2012.
70. Simpson J, Roman E, Law G, and Pannett B. Women's occupation and cancer: preliminary analysis of cancer registrations in England and Wales, 1971-1990. Am J Ind Med 36(1):172-85, 1999.
71. Smailyte G. Cancer incidence among workers exposed to softwood dust in Lithuania. Occup Environ Med 69(6):449-51, 2012.
72. Stellman SD and Garfinkel L. Cancer mortality among woodworkers. Am J Ind Med 5(5):343-57, 1984.
73. Stellman SD, Demers PA, Colin D, and Boffetta P. Cancer mortality and wood dust exposure among participants in the American Cancer Society Cancer Prevention Study-II (CPS-II). Am J Ind Med 34(3):229-37, 1998.
74. Swanson GM and Belle SH. Cancer morbidity among woodworkers in the U.S. automotive industry. J Occup Med 24(4):315-9, 1982.
75. Szadkowska-Stanczyk I and Szymczak W. Nested case-control study of lung cancer among pulp and paper workers in relation to exposure to dusts. Am J Ind Med 39(6):547-56, 2001.
76. Tse LA, Yu IT, Qiu H, Au JS, and Wang XR. Occupational risks and lung cancer burden for Chinese men: a population-based case-referent study. Cancer Causes Control 23(1):121-31, 2012.

77. Versluys JJ. Cancer and occupation in the Netherlands. Br J Cancer 3(2):161-85, 1949.
78. Wang QS, Boffetta P, Parkin DM, and Kogevinas M. Occupational risk factors for lung cancer in Tianjin, China. Am J Ind Med 28(3):353-62, 1995.
79. Weston TL, *Application of a job exposure matrix to assess cancer mortality risk in a cohort of working men*. 1998: Queen's University at Kingston.
80. Wu X, Delclos GL, Annegers JF, Bondy ML, Honn SE, Henry B, Hsu TC, and Spitz MR. A case-control study of wood dust exposure, mutagen sensitivity, and lung cancer risk. Cancer Epidemiol Biomarkers Prev 4(6):583-8, 1995.
81. Wu-Williams AH, Xu ZY, Blot WJ, Dai XD, Louie R, Xiao HP, Stone BJ, Sun XW, Yu SF, Feng YP, Fraumeni Jr JF, and Henderson BE. Occupation and lung cancer risk among women in northern China. Am J Ind Med 24(1):67-79, 1993.
82. Wunsch-Filho V, Moncau JE, Mirabelli D, and Boffetta P. Occupational risk factors of lung cancer in Sao Paulo, Brazil. Scand J Work Environ Health 24(2):118-24, 1998.
83. Yang Y, Wang M, Wang Z, and Zhan C. [A retrospective cohort study between wood dust and cancer]. Chinese Journal of Industrial Medicine 9(1):5-9, 1996.
84. Yang Y, Wang M, Wang Z, and Zhan C. [A cohort study on lung cancer and exposure to wood dust]. Chinese Journal of Industrial Hygiene and Occupational Diseases 15(5):277-81, 1997.
85. Zahm SH, Brownson RC, Chang JC, and Davis JR. Study of lung cancer histologic types, occupation, and smoking in Missouri. Am J Ind Med 15(5):565-78, 1989.
86. Acheson ED, Pippard EC, and Winter PD. Mortality of English furniture makers. Scand J Work Environ Health 10(4):211-7, 1984.
87. Andersen A, Barlow L, Engeland A, Kjaerheim K, Lynge E, and Pukkala E. Work-related cancer in the Nordic countries. Scand J Work Environ Health 25 Suppl 2:1-116, 1999.
88. Andersson E, Hagberg S, Nilsson T, Persson B, Wingren G, and Toren K. A case-referent study of cancer mortality among sulfate mill workers in Sweden. Occupational and Environmental Medicine 58(5):321-324, 2001.
89. Andersson E, Persson B, Bryngelsson IL, Magnuson A, and Westberg H. Cancer mortality in a Swedish cohort of pulp and paper mill workers. Int Arch Occup Environ Health 83(2):123-32, 2010.
90. Andersson E, Westberg H, Bryngelsson IL, Magnuson A, and Persson B. Cancer incidence among Swedish pulp and paper mill workers: a cohort study of sulphate and sulphite mills. Int Arch Occup Environ Health 86(5):529-40, 2013.
91. Baccarelli A, Tretiakova M, Gorbanev S, Lomtev A, Klimkina I, Tchibissov V, Averkina O, and Dosemeci M. Occupation and lung cancer risk in Leningrad Province, Russia. Med Lav 96(2):142-54, 2005.
92. Bardin-Mikolajczak A, Lissowska J, Zaridze D, Szeszenia-Dabrowska N, Rudnai P, Fabianova E, Mates D, Navratilova M, Bencko V, Janout V, Fevotte J, Fletcher T, t Mannetje A, Brennan P, and Boffetta P. Occupation and risk of lung cancer in Central and Eastern Europe: the IARC multi-center case-control study. Cancer Causes Control 18(6):645-54, 2007.
93. Blair A, Walrath J, and Rogot E. Mortality patterns among U.S. veterans by occupation. I. Cancer. J Natl Cancer Inst 75(6):1039-47, 1985.
94. Blair A, Stewart PA, and Hoover RN. Mortality from lung cancer among workers employed in formaldehyde industries. Am J Ind Med 17(6):683-99, 1990.
95. Carpenter L and Roman E. Cancer and occupation in women: identifying associations using routinely collected national data. Environ Health Perspect 107 Suppl 2:299-303, 1999.
96. Carstensen JM, Pershagen G, and Eklund G. Smoking-adjusted incidence of lung cancer among Swedish men in different occupations. Int J Epidemiol 17(4):753-8, 1988.

97. Consonni D, De Matteis S, Lubin JH, Wacholder S, Tucker M, Pesatori AC, Caporaso NE, Bertazzi PA, and Landi MT. Lung cancer and occupation in a population-based case-control study. Am J Epidemiol 171(3):323-33, 2010.
98. Correa P, Pickle LW, Fontham E, Dalager N, Lin Y, Haenszel W, and Johnson WD. The causes of lung cancer in Louisiana. Lung Cancer: Causes and Prevention, Deerfield Beach: Verlag Cheine International:73-82, 1984.
99. Demers PA and Boffetta P, *Cancer Risk from Occupational Exposure to Wood Dust: A Pooled Analysis of Epidemiological Studies*. 1998: International Agency for Research on Cancer.
100. Etzel CJ, Kachroo S, Liu M, D'Amelio A, Dong Q, Cote ML, Wenzlaff AS, Hong WK, Greisinger AJ, Schwartz AG, and Spitz MR. Development and validation of a lung cancer risk prediction model for African-Americans. Cancer Prev Res (Phila) 1(4):255-65, 2008.
101. Gerhardsson MR, Norell SE, Kiviranta HJ, and Ahlbom A. Respiratory cancers in furniture workers. Br J Ind Med 42(6):403-5, 1985.
102. Gorlova OY, Zhang Y, Amos CI, and Spitz MR, *Lung cancer risk factors in never smokers: an analysis of epidemiological factors*, in *AACR Meeting Abstracts*2005. p. 520.
103. Haldorsen T, Andersen A, and Boffetta P. Smoking-adjusted incidence of lung cancer by occupation among Norwegian men. Cancer Causes Control 15(2):139-47, 2004.
104. Hall NE and Rosenman KD. Cancer by industry: analysis of a population-based cancer registry with an emphasis on blue-collar workers. Am J Ind Med 19(2):145-59, 1991.
105. Jappinen P, Pukkala E, and Tola S. Cancer incidence of workers in a Finnish sawmill. Scand J Work Environ Health 15(1):18-23, 1989.
106. Ji J and Hemminki K. Occupation and upper aerodigestive tract cancers: a follow-up study in Sweden. J Occup Environ Med 47(8):785-95, 2005.
107. Jockel KH, Ahrens W, Wichmann HE, Becher H, Bolm-Audorff U, Jahn I, Molik B, Greiser E, and Timm J. Occupational and environmental hazards associated with lung cancer. Int J Epidemiol 21(2):202-13, 1992.
108. Jockel KH, Ahrens W, Jahn I, Pohlabeln H, and Bolm-Audorff U. Occupational risk factors for lung cancer: a case-control study in West Germany. Int J Epidemiol 27(4):549-60, 1998.
109. Kauppinen TP, Partanen TJ, Nurminen MM, Nickels JI, Hernberg SG, Hakulinen TR, Pukkala EI, and Savonen ET. Respiratory cancers and chemical exposures in the wood industry: a nested case-control study. Br J Ind Med 43(2):84-90, 1986.
110. Kawachi I, Pearce N, and Fraser J. A New Zealand Cancer Registry-based study of cancer in wood workers. Cancer 64(12):2609-13, 1989.
111. Kreuzer M, Pohlabeln H, Ahrens W, Kreienbrock L, Bruske-Hohlfeld I, Jockel KH, and Wichmann HE. Occupational risk factors for lung cancer among young men. Scand J Work Environ Health 25(5):422-9, 1999.
112. Kreuzer M, Heinrich J, Kreienbrock L, Rosario AS, Gerken M, and Wichmann HE. Risk factors for lung cancer among nonsmoking women. Int J Cancer 100(6):706-13, 2002.
113. Kvale G, Bjelke E, and Heuch I. Occupational exposure and lung cancer risk. Int J Cancer 37(2):185-93, 1986.
114. Laakkonen A, Kyyronen P, Kauppinen T, and Pukkala EI. Occupational exposure to eight organic dusts and respiratory cancer among Finns. Occup Environ Med 63(11):726-33, 2006.
115. Laakkonen A, *Occupational exposure to organic dusts and cancer among Finnish workers: special emphasis on the food industry and agriculture*. 2008: Työterveyslaitos.
116. Matos E, Vilensky MV, and Boffetta PB. Environmental and occupational cancer in Argentina: a case-control lung cancer study. Cad Saude Publica 14 Suppl 3:77-86, 1998.

117. McHugh MK, Kachroo S, Liu M, D'Amelio AM, Jr., Dong Q, Hong WK, Greisinger AJ, Spitz MR, and Etzel CJ. Assessing environmental and occupational risk factors for lung cancer in Mexican-Americans. Cancer Causes Control 21(12):2157-64, 2010.
118. Miller BA, Blair AE, Raynor HL, Stewart PA, Zahm SH, and Fraumeni JF, Jr. Cancer and other mortality patterns among United States furniture workers. Br J Ind Med 46(8):508-15, 1989.
119. Miller BA, Blair A, and Reed EJ. Extended mortality follow-up among men and women in a U.S. furniture workers union. Am J Ind Med 25(4):537-49, 1994.
120. Morabia A, Markowitz S, Garibaldi K, and Wynder EL. Lung cancer and occupation: results of a multicentre case-control study. Br J Ind Med 49(10):721-7, 1992.
121. Olsen J and Sabroe S. Mortality among bricklayers and carpenters/cabinet makers. Scand J Soc Med 7(2):49-54, 1979.
122. Olsen J and Sabroe S. A follow-up study of non-retired and retired members of the Danish Carpenter/Cabinet Makers' Trade Union. Int J Epidemiol 8(4):375-82, 1979.
123. Olsen JH and Jensen OM. Occupation and risk of cancer in Denmark. An analysis of 93,810 cancer cases, 1970-1979. Scand J Work Environ Health 13 Suppl 1:1-91, 1987.
124. Olsen JH, Moller H, and Jensen OM. Risks for respiratory and gastric cancer in wood-working occupations in Denmark. J Cancer Res Clin Oncol 114(4):420-4, 1988.
125. Pohlabeln H, Boffetta P, Ahrens W, Merletti F, Agudo A, Benhamou E, Benhamou S, Bruske-Hohlfeld I, Ferro G, Fortes C, Kreuzer M, Mendes A, Nyberg F, Pershagen G, Saracci R, Schmid G, Siemiatycki J, Simonato L, Whitley E, Wichmann HE, Winck C, Zambon P, and Jockel KH. Occupational risks for lung cancer among nonsmokers. Epidemiology 11(5):532-8, 2000.
126. Pukkala E, Teppo L, Hakulinen T, and Rimpela M. Occupation and smoking as risk determinants of lung cancer. Int J Epidemiol 12(3):290-6, 1983.
127. Rang EH and Acheson ED. Cancer in furniture workers. Int J Epidemiol 10(3):253-61, 1981.
128. Roscoe RJ, Steenland K, McCammon CS, Jr., Schober SE, Robinson CF, Halperin WE, and Fingerhut MA. Colon and stomach cancer mortality among automotive wood model makers. J Occup Med 34(8):759-68; discussion 769-70, 1992.
129. Sankila RJ, Karjalainen ES, Oksanen HM, Hakulinen TR, and Teppo LH. Relationship between occupation and lung cancer as analyzed by age and histologic type. Cancer 65(7):1651-6, 1990.
130. Schabath MB, Delclos GL, Martynowicz MM, Greisinger AJ, Lu C, Wu X, and Spitz MR. Opposing effects of emphysema, hay fever, and select genetic variants on lung cancer risk. Am J Epidemiol 161(5):412-22, 2005.
131. Schoenberg JB, Stemhagen A, Mason TJ, Patterson J, Bill J, and Altman R. Occupation and lung cancer risk among New Jersey white males. J Natl Cancer Inst 79(1):13-21, 1987.
132. Siemiatycki J, Richardson L, Gerin M, Goldberg M, Dewar R, Desy M, Campbell S, and Wacholder S. Associations between several sites of cancer and nine organic dusts: results from an hypothesis-generating case-control study in Montreal, 1979-1983. Am J Epidemiol 123(2):235-49, 1986.
133. Siemiatycki J. Discovering occupational carcinogens in population-based case-control studies: review of findings from an exposure-based approach and a methodologic …. Occupational Cancer Epidemiology, 1990.
134. Spitz MR, Hong WK, Amos CI, Wu X, Schabath MB, Dong Q, Shete S, and Etzel CJ. A risk model for prediction of lung cancer. J Natl Cancer Inst 99(9):715-26, 2007.
135. Tse LA, Yu IS, Au JS, Qiu H, and Wang XR. Silica dust, diesel exhaust, and painting work are the significant occupational risk factors for lung cancer in nonsmoking Chinese men. Br J Cancer 104(1):208-13, 2011.

136. Wang E, Dement JM, and Lipscomb H. Mortality among North Carolina construction workers, 1988-1994. Appl Occup Environ Hyg 14(1):45-58, 1999.
137. Yang Y, Wang M, Wang Z, and Zhan C. [Nested case-control studies of wood dust and cancer]. Journal of Occupational Health and Damage 11(2):65-7, 1996.
138. Yenugadhati N, Birkett NJ, Momoli F, and Krewski D. Occupations and lung cancer: a population-based case-control study in British Columbia. J Toxicol Environ Health A 72(10):658-75, 2009.
139. Yenugadhati N, Birkett N, Momoli F, and Krewski D. Industries and lung cancer: A population-based case-control study in British Columbia. Toxicological and Environ Chemistry 91(3):451-484, 2009.
140. Zeka A, Mannetje A, Zaridze D, Szeszenia-Dabrowska N, Rudnai P, Lissowska J, Fabianova E, Mates D, Bencko V, Navratilova M, Cassidy A, Janout V, Travier N, Fevotte J, Fletcher T, Brennan P, and Boffetta P. Lung cancer and occupation in nonsmokers: a multicenter case-control study in Europe. Epidemiology 17(6):615-23, 2006.