

Authors' Response to: Comment upon the article: Impact of occupational carcinogens on lung cancer risk in a general population

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We thank Pira and Coggiola for their comments¹ on our paper.² We agree that to estimate lifetime exposure to occupational carcinogens in a general population setting is a difficult task and requires valid assessment tools. It is for this reason that we chose as our job exposure matrix (JEM) the DOM-JEM that was developed specifically to be applied in studies of this kind.³

Pira and Coggiola express concern that the DOM-JEM is unable to distinguish between 'no', 'low' and 'high' exposed jobs/subjects. Their reasoning comes from the fact that among the 2529 men in our study classified as non-exposed to crystalline silica, two subjects reported at interview having been diagnosed with silicosis.

We believe that our method is sound. First, with a JEM approach in a population-based study (as this lung cancer case-control is) the JEM constructors would have to aim for a more specific than sensitive JEM³ in order to prevent serious misclassification of non-exposed individuals and consequent attenuation of risk estimates.⁴ By creating a very specific JEM, like DOM-JEM, only jobs with relatively high intensity and high prevalence of exposed individuals performing these jobs will be assigned (high) exposure. So for instance, within DOM-JEM the job titles shown in Table 1, coded using the five-digit International Standard Classification for Occupations (ISCO) 1968 codes,⁵ are assigned a 'high' exposure to crystalline silica.

Also, to take into account the small actual difference in silica exposures between the 'no' and 'low' categories we decided to use the intensity weights of 0, 1 and 4 when estimating cumulative years of silica exposure.

Second, as stated in our paper, the DOM-JEM has been compared with other JEMs and individual expert assessments in previous international studies.^{6,7}

Table 1 International Standard Classification for Occupations (ISCO) 1968 codes

5-digit ISCO code	Job title
71105	Miner (general)
71220	Stone splitter
71230	Mineral-crushing-machine operator
71240	Mineral-milling-machine operator
72930	Casting finisher
82020	Stone cutter and finisher
82080	Monument carver-setter
89440	Glass sandblaster
89960	Abrasives mixer
95945	Demolition worker

Notably, in the study of Peters *et al.*,⁶ the odds ratio for the association between lung cancer and silica obtained by applying the DOM-JEM was 1.26, almost identical to those obtained using case-by-case expert assessment (1.26) and a population-specific JEM (1.24). Similar results were obtained for exposure to diesel motor exhaust, whereas for asbestos DOM-JEM showed more consistent results as compared with the other two methods.

Third, it is of course possible on rare occasions for a worker performing a theoretically non-exposed job to be exposed (e.g. a schoolteacher exposed to asbestos from a ceiling), but any resultant occurrence of cases of silicosis in the 'no' exposure group does not intrinsically invalidate the JEM. This misclassification can only be addressed (if at all) when the exposure can

be assigned at the individual level, but it requires a much more detailed job history. Assigning all school-teachers an exposure to asbestos based on an anecdotal example would be wrong and would create an enormous amount of falsepositively assigned exposures resulting in risk estimates attenuated towards the null.

Fourth, the two cases of silicosis that we classified as non-exposed maybe incorrect due to reporting or diagnosis error. In fact, silicosis was only reported at interview in our study. Also, silicosis diagnosis is far from straightforward; radiographic evaluation even by qualified and experienced chest radiographers⁸ has a poor sensitivity and, whereas specificity is very good, false-positives may occur.⁹

In summary, we believe that the critique made by Pira and Coggiola of the DOM-JEM, based on a couple of (supposedly) misclassified subjects, without consideration of the whole study, is unfounded.

DOM-JEM is a job-exposure matrix specifically developed for population-based studies, with only job-title information in the job histories and with the explicit philosophy of being rather more specific than sensitive in the assignment of exposures so as to avoid misclassification of non-exposed subjects as much as possible. The assigned levels are an informative relative ranking of 'no', 'low' and 'high' exposure and without calibration will have no absolute meaning on a ratio scale (e.g. mg/m³-years of silica exposure).

Therefore, we stand by our conclusion that past occupational exposure to asbestos, silica and nickel-chromium, even at low levels, contributes substantially to the current lung cancer burden. Our estimates of population-attributable fractions of 18.1%, 5.7% and 7.0%, respectively, are necessarily imperfect but state-of-the-art and reasonable measures of the impact of these occupational carcinogens on lung cancer risk in this study population.²

References

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