Asbestos

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Estimating the Number of Asbestos-related Lung Cancer Deaths in Great Britain from 1980 to 2000

The asbestos exposure history for the GB working population is unknown. In the model presented here, relative asbestos exposure in occupational groups is assumed to correlate in some way with mesothelioma rates in those groups. After correcting for age and smoking effects, the model finds that the asbestos-related lung cancer: mesothelioma ratio is 0.65: 1 for the GB working population as a whole.

The authors work for the HSE Epidemiology Unit. The aim of the study was to estimate the number of asbestos-related lung cancer deaths in men in the 16 to 74 age group between 1980 and 2000.

Several studies have estimated the ratio of asbestos-related lung cancer to mesothelioma deaths. Previous estimates range from 1:1 to 5:1 (lung cancer: mesothelioma). These would seem to depend on exposure scenario and accuracy of correction made for smoking. Smoking is, by far, the dominant factor in lung cancer epidemiology (>90% of lung cancers could be due to smoking) and is known to have a synergistic effect on asbestos-related lung cancer. Corrections for smoking history are essential to any epidemiological estimates of asbestos-related lung cancer; small errors in this correction would have very significant effects on the results.

The authors assess exposure to smoking from the results of general household surveys, which included occupational information. Asbestos exposure in varying occupations was assumed to be related in some way to relative rates of mesothelioma in those occupations (an exponential relationship between asbestos related lung cancer and mesothelioma was assumed but only the linear term was significant). Rates of mesothelioma are fairly accurately known from the British mesothelioma register. Background rates of mesothelioma were assumed to 100 per year (independent of gender, assumed 50:50).

Active variables in the model were: smoking (as a function of occupational group), mesothelioma rates and occupational groupings (131 of them).

Between 1980 and 2000 there were 333,537 male lung cancer deaths in Great Britain and 12,820 mesothelioma deaths between ages 16 to 74. (A further 4,671 mesothelioma cases occurred in the 75+ age group). Estimates of smoking rates (current or former smoking) varied from 40% to 100% from one occupation to another; current rates were 35% and heavy smoking 20%.

The model suggests that 6,900 lung cancer deaths between 1980 and 2000 were caused by asbestos exposure in this age group and in these occupations. As a rough estimate, allowing for deaths which occurred after age 74 the authors propose 11,500 asbestos related lung cancers in all in that period, compared with 17,491 total mesothelioma cases. Asbestos was responsible for around 3% of all lung cancer deaths.

Averaging over 131 occupational groupings produced an estimate of the relationship between asbestos related lung cancer and mesothelioma of 0.65: 1. This is illustrated in the following figure:

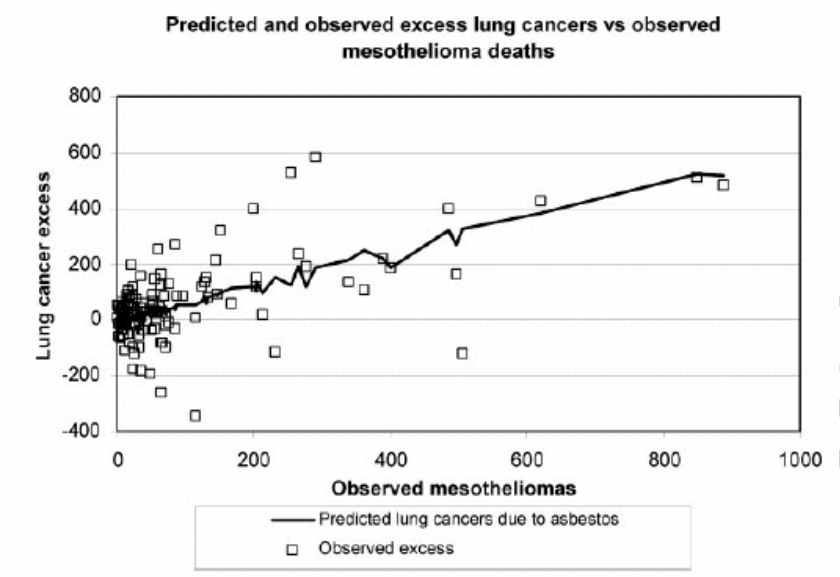

Fig. 1. Predicted and observed excess lung cancers versus observed mesothelioma deaths.

Observed mesothelioma rates in each of the 131 occupational groupings have been corrected for background levels. Some occupations (those below the zero line) clearly had fewer lung cancer cases than predicted from population statistics but most were above once the number of mesothelioma cases exceeded 200. There was no detail provided on the lung cancer results for the specific occupational groupings, it would be useful to know which groupings were associated with points above 200 mesothelioma deaths, up to that point the best fit slope could have been zero.

Comment

The overall ratio of asbestos related lung cancer to mesothelioma for Great Britain was estimated as 0.65:1 in all ages over 16. This is lower than generally found in studies of specific cohorts.

Use of mesothelioma rates as a proxy for actual asbestos exposure, relevant to lung cancer causation, is an interesting choice but combines two separable relationships into one and excludes the possibility of a threshold effect. The validity of this choice is questionable but in a study such as this (131 occupational groupings) and when rates of asbestos related lung cancer are very low, the approximation may be valid enough. The approximation should not be used in specific occupational settings without extensive validation work. Mesothelioma risk does vary with exposure.

In our view, the treatment of smoking as a variable would be the source of the greatest inaccuracies. It is not clear that these inaccuracies would tend to average out, in the course of calculation, to a sufficient degree, to leave a meaningful result.

The period from 1980 to 2000 would correspond to exposures between 1930 and 1980. During this period, individual exposures would more often have been very high. In our view, lower exposures would still present a risk for mesothelioma (reduced) but would have a disproportionately lower risk for lung cancer. Over time the ratio of lung cancer to mesothelioma should decrease.