

Question 3: In 2008, the WATCH papers note that 'Approach 4' in the risk assessment would be for the results to undergo a reality check for various population subgroups. This does not seem to have been taken forward and we wondered why?

Extract from the minutes of the February 2008 WATCH meeting:

Approach 4 – “Reality checks” of Hodgson and Darnton models for various population subgroups

24. “During the discussion (at the November 2007 meeting) it was stated that there is an indication that the incidence of ‘non-attributable’ mesothelioma has increased in the general population; this might be causally associated to past asbestos exposures in the general air, particularly near to sites of asbestos use. Further work could be carried out to investigate the apparent relationship between the data for environmental air asbestos levels (historically and currently) and the risk of mesothelioma in the general population. Any apparent relationship so derived might then be “reality checked” against predictions for this exposure scenario that would be made by extrapolating from data relating to higher levels of asbestos exposure.”

25. The HSE team needs more time to consider how this might be taken forward and notes that this work would be dependent on the estimates of the extent of the increases in “environmental” cases.

The increase in the incidence of non-attributable cases of mesothelioma referred to in paragraph 24 was a finding in a recent case-control study of mesothelioma in the British population¹. That study found that 62% of mesotheliomas in women born in the 1940s were “background” cases not attributed to occupational or domestic asbestos exposure. The large increase in annual female cases overall prior to the period in which the cases selected in the case-control study occurred implies that there has been an increase in these background cases, many of which were presumably caused by asbestos exposures from unknown sources including (potentially) general low-level ambient environmental exposures. This same pattern of background mesothelioma risk also applies to men, but makes up a smaller proportion of the larger numbers of males cases, most of which are caused by occupational exposure. The case-control study suggests the background lifetime risk of mesothelioma has increased to about 1 per 1250 (80 per 100,000) for both men and women born in the 1940s, and this is likely to be several times higher than the original background risk due to spontaneous cases or cases from causes other than asbestos that applied before asbestos was widely used in Britain.

The idea behind “Approach 4” as described above was to put any available information about likely environmental asbestos exposure levels during appropriate time periods together with reasonable assumptions about likely exposure durations in order to derive a relationship between environmental exposure and the

background lifetime risk as observed in the case-control study, and then check if the Hodgson and Darnton (H&D) model, when extrapolated, produced similar predictions of lifetime risk for these environmental exposures. It might be considered that even though there is an absence of good empirical data on historic exposures, a range of plausible environmental exposure scenarios could be derived such that the lifetime risk could be tested against the H&D model. However, as discussed below, there are considerable difficulties in taking forward such an approach which undermine its ability to deliver any new evidence about the effects of low-level asbestos exposures.

The H&D model requires specific inputs in order to make predictions, including the cumulative exposure, the age at first exposure and the type of asbestos. Thus to make approach 4 work requires the partitioning of the population into relevant groupings, each with appropriate estimated values of these necessary exposure inputs. A simplistic view of how non-occupational population asbestos exposures may have been distributed might be that a most of the population were exposed to a constant low background ambient concentration, whilst a smaller proportion had episodes of unwitting exposure at higher levels but for shorter periods which were largely a result of the activity of others working with asbestos. Clearly the reality will be more complex with considerable variation in exposures for individuals within both categories depending on the amount of time spent in buildings containing asbestos, or in proximity to those working with asbestos, or to other environmental sources of exposure such as living near industrial sites where asbestos was being used. There will also be variation in the ages at which such exposures occurred and in types of asbestos fibre involved.

A key difficulty in developing this picture into a plausible description of non-occupational exposures is uncertainty about the relative importance of such low-level and higher-level exposure groupings in contributing to the overall background risk. The case-control study was not able to elucidate any sources of background exposure despite detailed questioning of participants in relation to residential history and other potential non-occupational factors such as DIY work. However, this does not necessarily mean that relatively high-level unwitting exposures did not make an important contribution. After all, during the 1950s, 1960s, and into the 1970s asbestos was being widely used and often poorly controlled potentially leading to widespread opportunities for such exposure among those not working directly with it. If the case-control study participants were simply unaware of episodes of asbestos exposure above general ambient levels this would not be identified by the study.

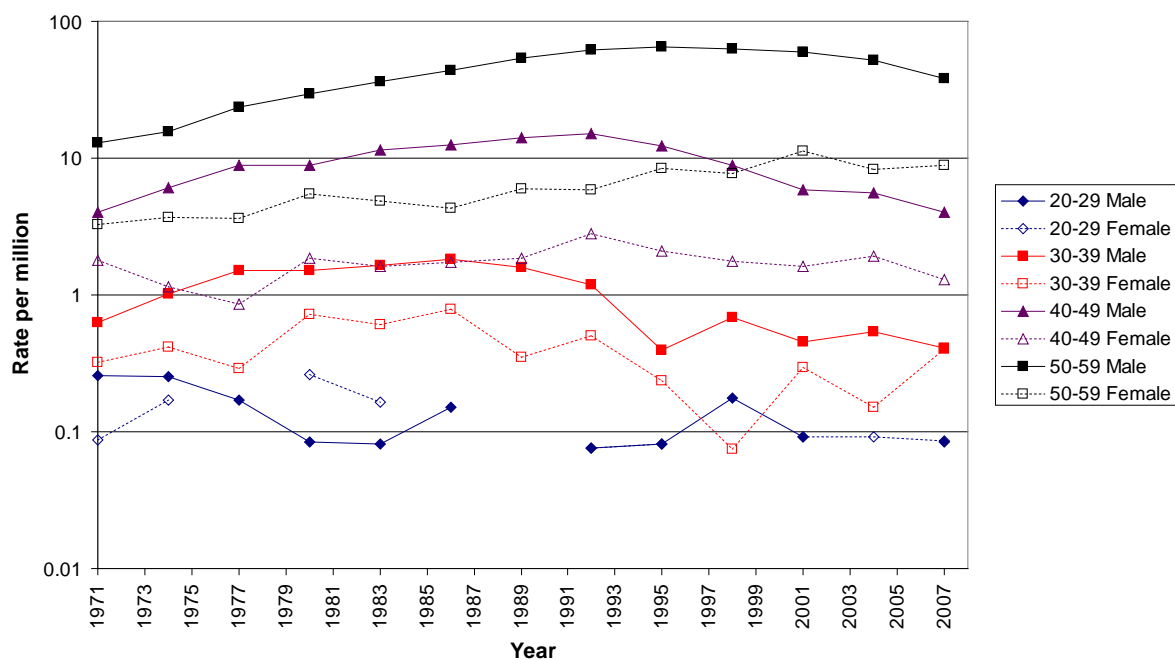
Statistical modelling of national mesothelioma mortality by HSE provides some broad-level information about overall population exposure in Britain. Two features of this work are of some relevance here. Firstly, these models tend to predict that the exposures that contribute to the overall burden of mesothelioma mortality tend to occur at working age or above. Whilst not all such exposures may be occupational in a strict sense, this observation may further support the role of unwitting exposures arising from the occupational activity of others since such exposures could

be more likely at working ages. Secondly, alternative projection models for males that use empirical data based on asbestos imports predict that, apart from a very small constant annual number of background cases, most of the mesothelioma burden is a result of the exposures among part of the population that were exposed at higher levels. Both of these observations should be treated with caution: we can't rule out that they are artefacts resulting from the way the models are parameterised. Nevertheless, they appear to support the case for higher exposures having played a role in the increased background risk observed in the British case-control study, and this is not solely a result of low-level exposure.

An examination of British age-specific mesothelioma mortality rates also provides some limited insight into the possible role of asbestos exposures below working age. The chart below shows GB mesothelioma mortality rates for 10-year age categories up to age 59 for males and females. Each data point represents the average rate for a three-year period (plotted against the mid-point year) in order to smooth out some of the variation arising from the small numbers of cases in the younger age categories.

The difference between male and female rates becomes more marked with increasing age highlighting the strong effect of occupational exposures in men. Although mesothelioma rates at ages 20-29 (the blue diamonds on the chart) are based on very small numbers (18 male deaths and 13 female in total during 1970-2008), the rates were similar for males and females which is consistent with the effects of occupational exposures (that were more prevalent in men) not being apparent below age 30. If asbestos was the cause of deaths in this age range, exposures must have occurred in childhood or teenage years, and given the observation period 1971-2008, such exposures would have taken place during about 1950 and 1990. Had there been an important increase in such exposures during this period, it would presumably have produced an observable increase in the mesothelioma rate. In fact the rate is relatively flat, and this is against the likelihood of improving recording of mesothelioma on death certificates. If female mesotheliomas at ages 30-39 were mainly a result of non-occupational asbestos exposures below working age, the declining death rate in this category would be suggestive of a reduction rather than an increase in such exposures in the past.

Mesothelioma deaths by 3-year period, age and sex, Great Britain, 1970-2008



Source: British mesothelioma register, HSE

The issues discussed above cast considerable doubt as to whether the exercise originally envisaged under approach 4 would actually provide any further clarification of the risk in relation to low-level exposures, and as a result this has so far not been pursued further by HSE.

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References

1. Rake C, Gilham C, Hatch J, Darnton A, Hodgson J, Peto J. (2009) Occupational, domestic and environmental mesothelioma risks in the British population: a case-control study. Br J Cancer 100(7):1175-83.