LUNG CANCER RISK AT LOW ASBESTOS EXPOSURE:
META-REGRESSION OF THE EXPOSURE-RESPONSE
RELATIONSHIP

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Objectives Most previous lung cancer studies focused on
individuals heavily exposed to asbestos. Therefore, the exist-
ing estimated lung cancer risks per unit of exposure are mainly
based on, and applicable to, high exposures. However, increas-
ing interest lies in estimating risk at low exposures.

Methods We fitted linear and non-linear meta-regression
models to 104 aggregated risk estimates extracted from 19
asbestos lung cancer studies. Associated RRs were calculated
for several low cumulative asbestos exposure levels. The sen-
sitivity of these RRs to the inclusion or exclusion of specific
studies was assessed.

Results A natural spline model fitted our data best. With this
model the relative lung cancer risk for cumulative exposures
levels of 0.1 f-y/ml, 4 f-y/ml, and 40 f-y/ml was estimated to lie
between 1.000 and 1.001, 1.013 and 1.027, and 1.13 and 1.30,
respectively. After stratification by fibre type, a three to four-
fold difference in RRs between chrysotile and amphibole fibres
was found for exposures below 40 f-y/ml. Fibre type-specific
risk estimates were strongly influenced by a few studies.

Conclusions The natural spline regression model indicated
that at lower asbestos exposure levels, the increase in RR
of lung cancer due to asbestos exposure may be larger than
expected from previous meta-analyses. Heterogeneity in the
results, however, limited accurate assessment of potency dif-
fences between different fibre types. Low exposed industry
or population-based cohorts with quantitative estimates of
asbestos exposure are required to substantiate the risk esti-
mates at low exposure levels from our new, flexible meta-
regression.