

An investigation of mortality and cancer incidence in UK refinery and petroleum distribution workers 1951-2016.

In the 1970s, on the behalf of the Institute of Petroleum (IP) (now known as the Energy Institute (EI)), epidemiological cohort studies into the mortality and cancer morbidity experience of male employees from eight oil refineries and 476 petroleum distribution centres in the UK were developed [1-6]. The original cohorts comprised 34,569 oil refinery workers [1] and 23,358 petroleum distribution workers [2] – a total of 57,927 workers combined. All these male employees had a minimum period of employment of 12 months in the period 1950-75; some study subjects were first employed around the turn of the century. Analyses are now limited to those workers first employed after 1st January 1946, minimum of 12 months employment with some employment after 1st January 1951; the rationale for this re-definition has been supplied previously [6]. The revised cohorts now comprise 28,554 oil refinery workers and 16,467 petroleum distribution workers (numbers from latest EI reports [7, 8] using data to 2011) – a revised total of 45,021 workers combined.

Mortality data and cancer incidence data continue to be supplied by the Office for National Statistics (ONS) and NHS Digital. There is no contact with subjects in either of the cohorts and the project is based on a purely statistical analysis of work history records abstracted from company personnel files and follow-up data provided by ONS and NHS Digital. Mortality data are now available for the period 1951-2016 and cancer registration data are now available for the period 1971-2016.

The objectives of the study are to summarise the available mortality and cancer incidence data in relation to the cohorts and to determine whether any part of this experience might be related to occupational exposures; in which event further analyses capable of investigating the potential role of occupational exposures might be needed.

The revised cohorts contain pseudonymised identifying particulars, work history information (oil refinery or petroleum distribution centre, dates of commencing and leaving employment, job title in 1975 or last job if left employment before 1975), and follow-up information (date of death, underlying and contributory causes of death, cancer registration particulars) for 28,554 oil refinery workers and 16,467 petroleum distribution workers first employed in the period 1946-74. All subjects had a minimum of twelve months employment with some employment after 1st January, 1951. Six of the oil refineries were in England and Wales; the remaining two refineries were located in Scotland. A total of 403 of the petroleum distribution centres were in England and Wales; the remaining 73 centres were located in Scotland.

The latest EI report provides updates on mortality and cancer registration for the cohort of UK refinery and petroleum distribution workers to the end of 2011 [7, 8].

This current study is to maintain and further update the cohort database with mortality and cancer registrations up to the end of 2016.

Expected numbers of deaths will be calculated from male mortality rates (specified by five-year age-groups, five-year calendar periods and country [England and Wales, Scotland]) applied to similarly-defined arrays of person-years-at-risk (pyr) generated by the data. Expected numbers of cancers will be calculated in the same manner using cancer incidence rates. Workers enter the period at risk at the end of the twelve months minimum period of employment, or 1st January 1951, whichever is the later date. Workers leave the period at risk on the closing date of the study (31st December, 2016), the date of death, the date of emigration, or the date last known alive, whichever is the earlier date. These procedures will be accomplished using Stata (data analysis and statistical software). No contributions will be made to observed or expected numbers past the age of 85 years; this censoring will be applied for reasons supplied previously [6].

Overall standardised mortality ratios (SMRs) will be calculated as the ratio of observed to expected deaths. Overall standardised incidence ratios (SIRs) will be calculated as the ratio of observed to expected cancers. The significance of the differences in the EI cohorts between observed numbers and their corresponding expectations for both deaths and cancers will be assessed by means of the Poisson distribution. Tests for trend and heterogeneity have been described previously [6]. All significance tests will be two-tailed. Analyses relating to cancer registration will be limited to the period 1971-2016; the national cancer registration scheme began in 1971.

References:

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