

Estimating occupational exposures in large general populations made easier

In occupational epidemiology we are interested in associations between exposures that occur in the workplace and detrimental health effects. Ultimately with the goal of preventing harmful exposures to continue. Simply comparing exposed workers with non-exposed workers will not help with setting exposure limits – we need to quantify the risk. For example, we want to be able to say: “exposure to 10 microgram per cubic metre dust for 10 years results in a 30% higher risk of disease X”. To express health risks per unit of exposure, we first need to assess levels of exposure quantitatively.

General population studies provide larger statistical power when studying risk factors for rare diseases with long latency, such as cancers and neurological disorders, than studies limited to one particular industry. However, quantitative exposure assessment in general population studies is more complicated due to the wide range of jobs that people may have had and workplaces people might have worked in. Unlike for workers in some specific industries, workplace measurement data are not readily available for subjects in the community at large. Another hurdle is that exposures causing these types of diseases are often experienced many years or decades ago.

In our paper we describe a method to enable quantitative exposure assessment in general population studies. Exposure levels in the workplace have been monitored over several decades. We have collated monitoring data for five lung carcinogens (including silica, asbestos, chromium, nickel and polycyclic aromatic hydrocarbons) from many centralized databases and research institutes all over Europe and Canada into one database. Using these data we developed a statistical model. This model was then turned into a so called job-exposure matrix. The matrix we developed had three axes – namely calendar year, job title and region – assigning an exposure level to each unique combination. When job histories from subjects under study are linked to this matrix, individual exposure histories can be derived.

This framework can be used for other exposures as well. Even when there is not a sufficient amount of data available to develop the job-exposure matrix with all three axes, a simplified matrix can be made, as we showed for polycyclic aromatic hydrocarbons. The *a priori* classification of jobs as non-, low or highly exposed was in that case calibrated by measurement data. Together with the inclusion of a time trend it still allowed for deriving quantitative exposure levels.

Once developed, the job-exposure matrix can also be applied to other study populations, allowing the study of potential associations with other diseases. For example, while silica is a known lung carcinogen, the job-exposure matrix for silica could be used to study whether silica also increases the risk of renal cancer.

Using quantitative exposure measurement data in the construction of general population job-

exposure matrices is an important methodological step forward. With these matrices, quantitative exposure–response relations between occupational exposures and health effects in community-based studies can be derived. Evidence resulting from such community-based studies will strengthen occupational risk assessment that is now predominantly based on industry-based studies with often higher exposures.

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[SYN-JEM: A Quantitative Job-Exposure Matrix for Five Lung Carcinogens.](#)

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