ANALYSIS OF THE HARM INVOLVED IN VARIOUS OCCUPATIONS

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In 1977 the International Commission of Radiological Protection (ICRP) published a report entitled "Problems Involved in Developing an Index of Harm" (ICRP-Publication 27, Pergamon Press, Oxford). The report, prepared for the Commission by Sir Edward Pochin, discussed the difficulties of making an appropriate comparison on radiation and other effects in occupational safety analyses. In the report a quantitative index was suggested that takes account of the length of life or full activity lost as a result of occupational accidents and diseases.

The basic data of occupational risks considered in the report were very limited and came only from a few nations. Therefore, a memorandum prepared by Sir Edward Pochin specifying the data needed to make a more broadly based assessment of an index of harm was sent by the Commission through various international organisations to their Member States. This paper is a response to the request for additional data.

Valuable information of the type requested can be drawn from the statistics of the industrial accident insurance system of the Federal Republic of Germany. The system covers about 20 million people. A basic legal requirement of the system is that accidents, classified in work accidents and road accidents as well as occupational diseases are to be reported. The minimum reporting requirement for an accident is that the injured person is absent from work for a period of more than three days. The minimum reporting requirement for an occupational disease is that there exists medical diagnosis that such a disease may be present. The number of reported cases fulfilling the minimum reporting requirement is considerably affected by changes of the social and economic situation. Such data are not very reliable for objective risk comparisons of various occupations. Therefore the data presented in this paper are based upon that fraction of the reported cases which led to acknowledgement of a certain degree of permanent disability. Because only a limited number of all the data available can be presented, the paper concentrates on work accidents reported during the period from 1977 to 1981 and on a limited selection of occupations.

One item requested in the memorandum referred to above concerned the age distribution of males and females involved in fatal work accidents in various occupations.
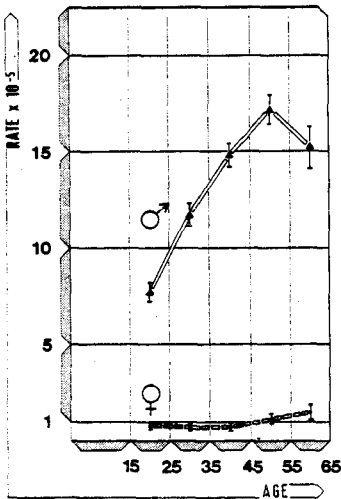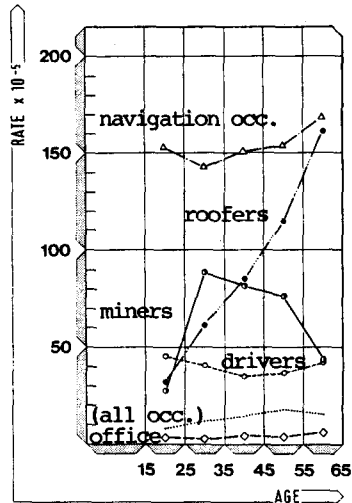
Fig. 1

Fig. 2

Figure 1 shows the age distribution based on the annual number of
fatal work accidents, averaged over all occupations considered, per
100,000 male or female workers respectively.

It illustrates that on average the male workers' accident rate is
larger by more than one order of magnitude than the corresponding
rate for female workers. It should however be mentioned that a few
occupations exist where the female workers' accident rate is
larger than the corresponding rate for male workers. This applies
for example to the occupation of motor vehicle drivers.

Figure 2 shows the age distribution based on the annual number of
fatal work accidents per 100,000 male workers in selected occupations.
Due to a change of the scale of the accident rate axis, the average
of all occupations considered, which is represented by a dotted line,
now appears in the lower part of the figure. The figure illustrates
not only the large differences of fatal work accident rates in the
selected occupations but also the characteristic occupation related
age distributions of the fatal work accident rates which differ con-
siderably from the distribution obtained by averaging over all occu-
pations considered.

The significant reduction of the accident rate of miners over 50
is due to the fact that labour legislation in the Federal Republic of
Germany permits miners above this age to choose whether they are
engaged in less dangerous mine work. No similar legislation applies
to the other occupations referred to in fig. 2.

Another item requested in the memorandum referred to above
concerned the age distribution of work accidents judged to involve
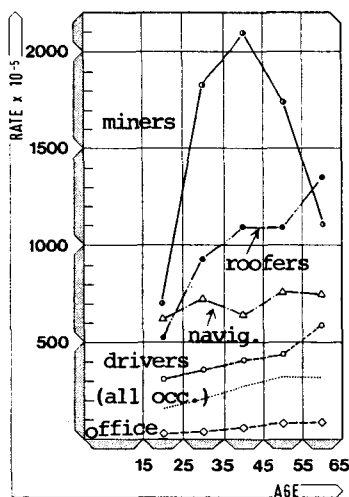permanent total or partial loss of working capacity.

Fig. 3

Figure 3 shows the age distribution based on the anual number of non-fatal disabling accidents per 100,000 male workers in selected occupations. As in figure 2, the average of all occupations considered is represented by a dotted line. Obviously the occupation related age distributions, as found in the analysis of the fatal work accident rates, are largely maintained, but the order of the rates attributable to the selected occupations can change. If fatal work accidents are considered the highest rates relate to navigation occupations but if non-fatal disabling accidents are considered the highest rates relate to miners.

With respect to the significant reduction of the accident rate for miners over 50, again the explanation given above applies. In the other occupations selected the order of the rates appears at first sight to be maintained. It should be kept in mind however, that data on only a few selected occupations are presented in figures 2 and 3.

The annual numbers of fatal or non-fatal disabling work accidents are primarily measures of the probability with which these accidents occur. These numbers, though related to specific types of accidents do not take into account the severity of the accidents.

If fatal accidents occurring in an occupation are considered the severity of the accidents may be expressed by the average number of years lost per accident. By multiplying this average with the average number of fatal accidents occurring per 1000 workers, a measure is obtained which takes into account both the probability and the severity of the accidents.

If non-fatal disabling accidents occurring in an occupation are considered, the severity of the accidents may be expressed by the average percentage of disability caused per accident. By multiplying this average with the annual number of non-fatal disabling accidents occurring per 1000 workers, again a measure is obtained which takes into account both the probability and the severity of the accidents.
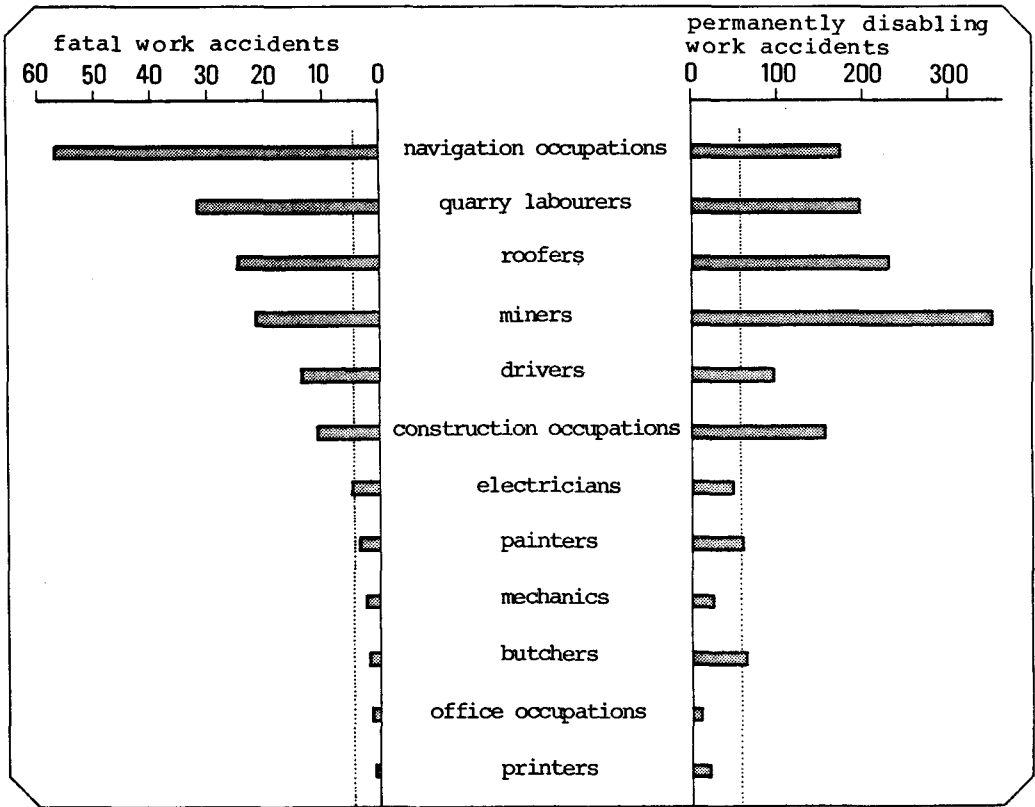
Fig. 4

In Figure 4 a comparison is made of the products of probability and severity as defined above for fatal (left side) and permanently disabling accidents (right side) occuring in selected occupations. The value of the product applicable to the average of all occupations considered is represented by a dotted line on each side.

The figure shows that significant changes of the rank order do not concern only miners and navigation occupations but also other occupations. Therefore in general it would appear to be impossible to assess the risk of non-fatal disabling work accidents from the risk of fatal work accidents.

It is hoped that information of the type presented here will be of help in developing an index of harm for occupational risks.

The authors wish to express their thanks to the Central Association of the Industrial Injuries Insurance Institutes for kindly making available the basic data needed for this study.