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Socioeconomic and Occupational Mortality Differentials in Europe

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The considerable improvements in life expectancy in the early post-war period in Europe led to an optimistic view on future socio-economic and occupational differentials in mortality; the hypothesis was put forward that "as the overall death rate of a population is lowered, class differentials may similarly decline".

In the 1970s the interest in socio-economic and occupational differentials in mortality was revived. There were several reasons behind this concern, the first being the observation in some developed countries in the 1960s of a stagnation or even an increase in male mortality. In Europe these adverse trends were most pronounced in low mortality countries as the Netherlands, Norway and Denmark. These unfavourable changes occurred simultaneously with an expansion in health care expenditures and led to concepts as "the diminishing return from health investments" and "the medical nemesis". The second reason was the general threat of ecological catastrophes caused by side-effects of technological innovations, especially from new synthetic chemicals and the use of nuclear power. The third reason was the improved technical possibilities for studies of mortality differentials related to specific population characteristics. In Europe the statistical tools were especially improved in the Scandinavian countries where personal identification numbers were introduced in the 1960s.

METHODS USED IN EUROPEAN STUDIES OF SOCIO-ECONOMIC AND OCCUPATIONAL DIFFERENTIALS IN MORTALITY

A precondition for studies on socio-economic differentials in mortality is the availability of comparable data on social characteristics of decreased persons (the numerator) and of the population at risk (the denominator). The way in which this comparability may be obtained is depend on the local, vital registration system. Without comparability estimated data for the denominator may be used. In Europe data on socio-economic and occupational differentials in mortality are available now from the UK, France, and the Scandinavian countries. Below a short description is given of the methods used in these countries.

United Kingdom

The study of occupational mortality was commenced in England & Wales already in 1851. With decennial intervals these studies have been continued up to the present time based on the same methodology. The population's distribution in sex, age and occupation as known from the decennial censuses is used as denominator in these studies; and the distribution by sex, age and occupation of deaths occurring in a 3 or 5-year period around the censuses is taken from the death certificates and used as numerator. Both on the census forms and on the death certificates the definition of occupation refer to last full time occupation. However, discrepancies are revealed when individual death certificates are linked to individual census records, e.g. more men are recorded as miners and farmers on the death certificates than on the census forms.

For one hundred years the decennial supplement on occupational mortality for England & Wales was the most important data source for documentation of social inequalities in Europe. Due to the possible inconsistency between numerator and denominator there has been, however, a certain reluctance in accepting mortality excesses registered for specific occupational groups in these studies. Occupational risks have been identified mainly by alert clinicians.

Recently, the decennial studies have been supplemented with a longitudinal study of a sample of the 1971-census population. Deaths and, as far as possible, emigrations are traced through the manual population register (National Health Service Central Register).

France

The UK model for the study of occupational differentials in mortality did not become part of the routine statistics in continental Europe before World War II. But in France a study following this approach took place in the 1950s, and experiences from this study led to the initiation of a follow-up study based on a sample of 500,000 men from the 1954-census. In the follow-up procedure deaths were traced through the manual population register (Repertoire national identification des personnes). Emigrations were not registered. The follow-up procedure gave access to information on vital status only, whereas linkage with death certificates containing information on cause of death was prohibited for confidentiality reasons.

Norway, Sweden, Finland and Denmark

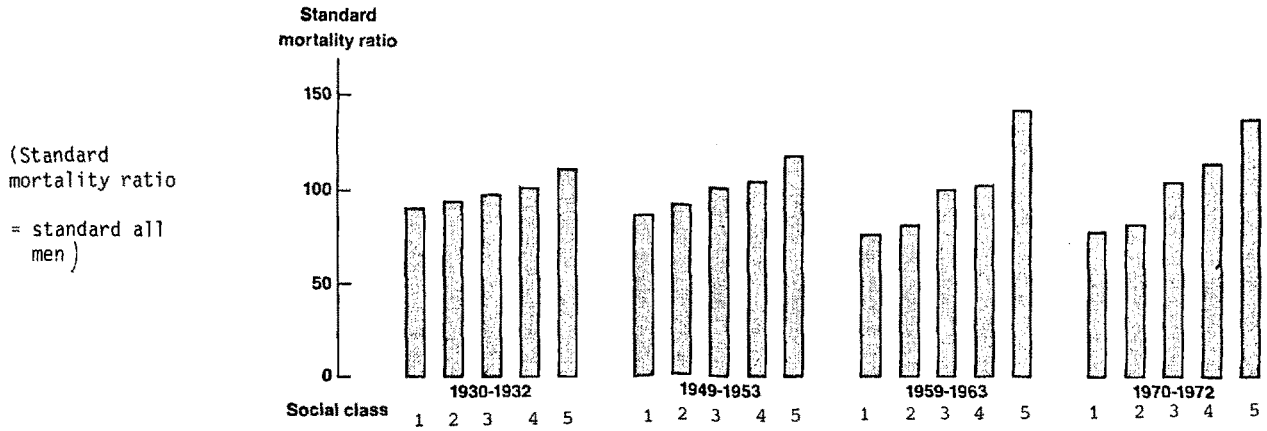
The methods used in the Scandinavian countries are described together as they are essentially equal. The key-point is computerized census and death certificate data with personal identification numbers. In Denmark the Central Population Register was set up in 1968, and in the register information is kept on all persons living in the country since 1968. A Danish study of occupational mortality included the complete 1970-census population, and deaths and emigrations occurring within the following five years were identified through a linkage of individual records from the 1970-census with individual records in the Central Population Register in 1977. For deceased persons cause of death was found by linkage with yearly death certificate tapes. The occupation registered in Scandinavian censuses refer to employment on the census date, which implies a certain limitation for the interpretation of recorded mortality differentials. In order to overcome this bias a linkage of individual records from the 1960 and 1970-censuses has been carried out in Norway. The linked census data permit identification of persons remaining in the same occupation for at least a ten year period.

SOCIO-ECONOMIC DIFFERENTIALS IN MORTALITY

Data on socio-economic differentials in mortality and data on occupational differentials in mortality serve different purposes despite the fact that they are collected by use of the same methods, and often in the very same studies.

Since 1921 the population in the UK-decennial supplements has been divided into five social classes: I.

Fig. 1 : Mortality for males aged 15-64, by social class, England & Wales



Professional occupations, II. Intermediate occupations, III N. Non-manual, skilled occupations, III M. Manual, skilled occupations, IV. Partly skilled occupations, and V. Unskilled occupations. The decennial supplements have shown a persistent social gradient in overall mortality, as illustrated in fig. 1. Both before and after World War II the SMR, standardized mortality ratio, for men in social class I has been below that of any other class, and the SMR for men in social class V has been above that of any other class. The differences are most pronounced in younger ages. In 1970-72 the death rate for men at age 25-29 in social class V was more than 3 times the death rate for men at the same age in social class I, whereas the size of the difference at age 60-64 was only 1.5.

As described in the section above there are methodological differences between the European studies, e.g. in a linked versus an unlinked approach, in duration of follow-up periods, in social classifications, and in choice of standard populations. However, data on male mortality from both France and the Scandinavian countries confirm the British pattern of a social gradient in overall mortality; most pronounced in younger ages. Reanalysis of original data permit a more thorough comparison of mortality data across countries. Figs. 2a and 2b show mortality in the early 1970s for unskilled and semi-skilled men in England & Wales, Norway and Denmark compared with mortality for all economically active men and all men, respectively. In both diagrams male unskilled workers are shown to have an excess mortality in younger ages which diminish towards the average mortality for the male population at the pensionable age. Part of the negative slope of the mortality graph by age is explained by an excess mortality among male unskilled workers from accidents and violent deaths, which is only slightly affected by age. Half the number of deaths in the younger age groups are due to these causes, but only 5% of the deaths at age 60. However, deaths from natural causes show an excess mortality for unskilled workers in younger ages too, thus indicating unfavourable health conditions early in life. The recorded reduction in the excess mortality for male unskilled workers in the older age groups seems in part to be an artefact due to the phenomenon that sick and disabled, unskilled workers leave the labour market on average earlier than similarly disadvantaged persons from other social classes. When early pensioners are included in the analysis social class differentials in male mortality persist at pensionable age. The mortality differences at older ages are due mainly to accidents and violent deaths, cancer and respiratory diseases, whereas male unskilled workers at the age of 60 have a mortality from circulatory diseases approximately equal to the average for all men. In Northern Europe half the number of deaths among men at age 60 are due to circulatory diseases.

Prevention of premature deaths and improvements in health must be kept in mind as purposes behind studies of socio-economic differentials in mortality. But low social class is not a risk factor from a biological point of view, and studies of socio-economic differentials in mortality therefore do not offer direct clues to preventive interventions. However, as long as a social gradient in mortality persists these

Fig. 2A : Relative mortality distributed by age for male unskilled and semi-skilled workers in Denmark 1970-75, and Norway 1970-73.(Economically active men at the time of the 1970-censuses.)

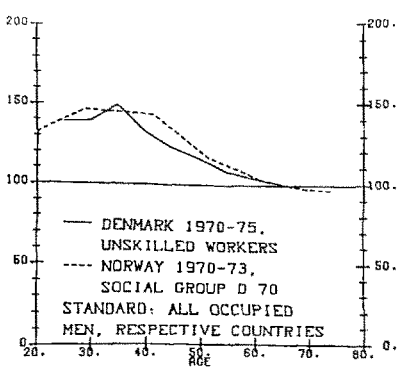
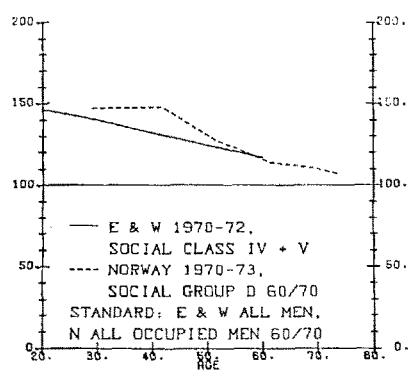


Fig. 2B : Relative mortality distributed by age for male unskilled and semi-skilled workers in England & Wales 1970-72, and Norway 1970-73. (Economically active men and early pensioners at the time of the 1970-censuses.)



studies are justified, because they document the need of further effort in order to eliminate inequalities in health. The Danish study of occupational mortality in 1970-75 showed that only half the number of deaths among men in the economically active age groups would occur if the mortality for all men was reduced to the mortality level recorded in the study for farmers.

OCCUPATIONAL DIFFERENTIALS IN MORTALITY

As indicated in the section on methodology the possible inconsistency between numerator and denominator has limited the emphasis that could be given to mortality excesses observed for specific occupational groups in the UK decennial supplements. Furthermore, as long as the decennial supplement was the only available information system om occupational mortality the possibility that an observed excess risk was generated purely by chance could not be ruled out before data were available from in-depth epidemiological studies.

The numerator-denominator problem is overcome in data files based on individual record linkage, and the availability now of occupational mortality studies from several countries makes it possible to rule out excess risks generated by chance by comparison of results across countries. Given the better quality and the increased number of studies, data on occupational mortality may serve now as a valuable supplement to the clinical identification of occupational risks. Recently, excess cancer risks in two occupational settings were indicated based on observations on occupational mortality and cancer incidence studies.

A consistent excess risk of lung cancer among butchers was found in England & Wales (1970-72), Denmark (1970-75) and Sweden (1961-73). Butchers also had an excess risk from lung cancer in England & Wales around the 1961 and 1951 censuses. Supportive evidence came from surveys in Hamburg and Baltimore, but not from the proportional mortality data in Washington State or from the case-control study at Roswell Park Memorial Institute. However, updated data from Denmark (1975-80) and Sweden (1974-79) have confirmed previous observations. In Sweden the excess lung cancer risk is only partly explained by an above + average tobacco consumption among butchers. In Denmark the excess risk is concentrated among butchers employed in this job for many years.

Workers exposed to electrical and magnetic fields were noticed to have an excess risk of acute leukemia in Washington State during the period 1950-79. Supportive evidence here came from the Cancer Surveillance Program in Los Angeles County (1972-79), and the risk estimates were higher for acute myeloid leukemia. A reanalysis of mortality data from England & Wales (1970-72) showed no excess of acute myeloid leukemia for all electrical occupations taken together, but high risks were observed for several subgroups. A case-control study based on 1973 death certificates in England & Wales allowed use of a more appropriate occupational classification for groups exposed to electrical and magnetic fields. This study showed an overall relative risk of 2.3 for acute myeloid leukemia in all exposed occupations taken together.

Occupational risks identified from clinical observations are mainly those causing rare types of diseases, and case clusters are usually observed in communities where certain occupational exposures are concentrated. The nationwide occupational mortality studies provide the potential for identifying moderately elevated risks for common diseases among occupational groups spread throughout the country. Generation of clues from occupational mortality or occupational morbidity studies has been called "automatized case reports". Clues to preventive interventions are not offered directly by occupational mortality studies, but they may serve as a useful tool for directing in-depth epidemiological and experimental studies.

Census data and death certificate data have been the basis for studies of socio-economic and occupational differentials in mortality in the UK, France and the Scandinavian countries. Hopefully, more European countries will take up the use of these routine data sources for studies of mortality differentials.

Sozio-ökonomische und berufliche Sterblichkeit in Europa

In England und Wales, Frankreich und den skandinavischen Ländern wurden die sozio-ökonomischen und beruflichen Unterschiede der Sterblichkeit mit Daten aus den Volkszählungen und den Todesscheinen untersucht. Diese Studien zeigen die Beständigkeit eines sozialen Gradients im Bereich allgemeiner Sterblichkeit und weisen somit daraufhin, dass dieser Aspekt der sozialen Gerechtigkeit noch zu realisieren ist. Diese Studien liefern auch nützliche ergänzende Beiträge zu klinischen Studien über berufsspezifische Risikofaktoren. Es ist zu hoffen, dass noch mehr europäische Länder ihre diesbezüglichen Daten in ähnlicher Weise auswerten werden.

Différences socio-économiques et professionnelles de la mortalité en Europe

Au Royaume-Uni, en France et dans les pays scandinaves, les différences socio-économiques et professionnelles de la mortalité ont été étudiées en utilisant les données des recensements et des certificats de décès. Ces études font constater la persistance d'un gradient social de la mortalité générale, et montrent par conséquent que cet aspect de l'équité sociale doit encore être réalisé. Ces études offrent également des compléments utiles aux études cliniques pour l'identification des risques spécifiques à certaines professions. Il faut souhaiter que d'autres pays européens exploitent les données disponibles dans cette perspective.

Notes

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A complete list of references can be obtained from the author.