Socio-economic Differential Mortality in Industrialized Societies

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United Nations Population Division
(New York)

World Health Organization
(Geneva)

Committee for International Cooperation in National Research in Demography
CICRED (Paris)

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F O R E W O R D

In early July 1980, CICRED convened a meeting in Geneva (Switzerland) in view of promoting inter-institutional cooperation in the field of socio-economic differential mortality in industrialized societies. The meeting was jointly sponsored by the United Nations (Population Division) and the World Health Organization (Department of Dissemination of Statistical Information). This brochure comprises all the national reports presented at the meeting and the general report prepared after. The reader can thus obtain a comprehensive view of socio-economic differential mortality in the developed countries, as well as the research work currently being conducted on this topic. At the next meeting (Wiesbaden, Federal Republic of Germany; 1st to 3rd July, 1981), the participants will draft a common research plan, to be implemented on a voluntary basis by various national institutions.

All these undertakings are being developed as part of the CICRED programme of inter-centre cooperative research[1]. The programme is based on the two principles of mutual assistance and self-help.

The enthusiastic participation of an important number of national institutions in the programme is very encouraging both from the point of view of research progress and of international cooperation in demographic studies.

Jean BOURGEOIS-PICHAT
CICRED Chairman
May 1981

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1. *The other projects in the programme deal with : (i) infant and childhood mortality in the Third World; (ii) demography of the family; (iii) integration of population variables in the planning process; (iv) causes and impact of international migration upon Third World development.*

Report of the First Meeting

on

Socio-economic Differential Mortality in the Industrialised Countries

(Geneva, July 3rd-4th, 1980)

BACKGROUND

1. At the invitation of CICRED, WHO, and the UN (Population Division), a number of experts from various industrialised countries attended a meeting in Geneva on July 3rd and 4th, 1980. The meeting was a follow-up to the UN/WHO joint meeting on socio-economic determinants and consequences of mortality, convened from June 18th to 25th, 1979, in Mexico City (Mexico).

2. In industrialised countries, demographic interest in mortality decreased in the 1960s, following decades of rapid decline in the levels of mortality. Most experts assumed that this decline would, almost automatically, continue until a feasible mini mum was reached. There was a virtual standstill or even reversal of the declining trend of mortality observed in the 1960s in many developed countries for main sex/age groups - a stagnation of deterioration independent of the initial level of a country and of its organisation of medical care. This was followed, in the 1970s, by a dramatic resumption of the downward trend in some countries, but a continuation of unfavourable courses in others. This has contributed to a regeneration of interest in mortality. Failure to provide a reliable data base using morbidity measures to replace the traditional mortality indices, coupled with developments in the use of "need" indicators as the basis of resource allocation, have also contributed to renewed activities in the field of mortality.

3. Traditionally, studies of socio-economic differentials in mortality have provided a statistical base which demographers and epidemiologists have used to test and to generate hypotheses as to some of the determinants and consequences of mortality. However, as well as pointing to the differences in patterns across different sections of the community, these measures also indicate how these patterns are changing in time ans space. They can therefore provide the basis for evaluating the distributional effects of health and social policies.

4. The above-mentioned meeting in Mexico City identified a number of programmes and plans for programmes being developed by individual industrialised countries. It recommended that an international forum be established to encourage an exchange of ideas and experiences. The present meeting was designed to examine the state of scientific research and health policy regarding socio-economic differentials in mortality in the industrialised societies. Experts were invited as representatives or observers from national institutions and international bodies (see appendix). The chairpersons for the four sessions were Mr. Léon Tabah, Professor Evelyn Kitagawa, Mr. Jean Bourgeois-Pichat and Dr. Harald Hansluwka. Professor John Fox was appointed rapporteur.

CURRENT PROGRAMMES AND PLANS FOR THE 1980s

5. In the first session of the meeting, the participants outlined their country's activities in this area. CICRED subsequently agreed to bring together these programmes. They will be attached to this report of the meeting and published by CICRED for wider circulation.

6. A wide variety of approaches were being applied in the different countries with limited documentation available as to the reasons why individual approaches were adopted. The second session of the meeting was devoted to a discussion of the various approaches with the aim of identifying some of their more general properties. The six main approaches are outlined below :

(i) Cross-sectional, unlinked studies

The approach used in the United Kingdom since 1851 - also used regularly in Japan and Hungary - is based on the tabulation of deaths by "last occupation" with censuses providing the denominators needed for comparison between occupations by age and cause of death. The main, well-known limitations derive primarily from numerator-denominator biases. Nevertheless, the approach has been demonstrated to be of great value, particularly because it allows comparison of mortality accross a large number of occupational groups by an extensive list of causes of death. This approach is very cheap because the only cost derives from the extra coding of death certificates.

(ii) Matched-records approach

The approach used in the USA after the 1960 census is based on a sample of death records (for people who died shortly after the census) being matched back to their census schedules. The main point of the approach is to overcome the numerator and denominator biases intrinsic to the unlinked approach. The main weakness of the approach stemmed from its cost. It may, however, be seen as an example of the prospective approach, described next, with follow-up for a limited period.

(iii) Prospective studies

A number of countries, in particular France*, Denmark, Norway, Hungary, Finland and the United Kingdom*, were able to routinely link mortality records back to census records. Other countries, in particular Italy and the USA, were able to follow this approach in the study of infant mortality (linking birth and death records). The cost of this approach depended on the availability of an identity number which was widely reported. Hence, the approach was now routinely adopted in Scandinavia, but more difficultly elsewhere. A limitation of the samples used in France and the UK derived from the small numbers of deaths that were being analysed, restricting the studies to broad occupational and social groups and to major groups of causes of death. It was also suggested that, next year, a follow-up survey to the 1981 Labour Force Survey in Germany may also be used as the basis for a prospective study; it was hoped that this would include detailed questions on persons no longer in the household, including persons who had died.

(iv) Mortality "follow-back" studies

The USA was proposing to mail questionnaires to elicit additional information on the characteristics of a large stratified sample of decedents in the United States. This study aims to collect information from next-of-kin on life style, occupation, migration, education and income to compare with the population rates based on the Current Population Survey nearest to the mid-point of the interval for which death statistics are collected. The approach looked interesting and relatively cheap, but may suffer from similar limitations to other retrospective studies.

(v) Longitudinal studies

The distinction between a prospective and a longitudinal study derives from a measure of change in characteristics. The former collects information about individuals at a single point in time such as the census and then follows the individuals to death; the latter records information at a number of points, e.g., successive censuses. The model study was that planned for the UK. It was, however, noted that Norway and Finland had already linked mortality in the 1970s to occupation as recorded by the 1970 *and* the 1960 censuses. The main strengths of the approach derive from its measures of mobility and the ability to assess the contributions of mobility to differentials observed.

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* only on a sample basis

(vi) Ecological studies

Two ecological approaches were outlined. In the first, used mainly in Italy, Belgium, Holland, Australia, Japan and the UK, death rates for small areas were correlated with other measures for those areas (for example, using a multiple regression approach). The second, used in the USA, characterised small areas and then allocated each individual who died to the socio-economic group associated with his area of residence. These methods were cheap and made full use of a wide range of data available. However, they suffer from the well-known weaknesses of ecological analysis.

It was noted with interest that the USA was contemplating a research programme to compare the efficiencies of alternative data collection methodologies.

7. In the course of the discussions, a number of important, more fundamental issues were raised. In particular, some participants noted that, because of methodological difficulties, measures of socio-economic differentials had tended to concentrate on male mortality in the 15-64 age range, with little effort to study the patterns for females or the elderly (the latter were of increasing interest and importance). Most of the approaches concentrated on occupation-based classifications, even though it was recognised that occupation may only provide a proxy for wealth, housing, income and education. The value of longitudinal studies was to be expected from the added understanding they could provide of the role of social mobility and changes in individuals' circumstances, to the differentials observed. It was clear that only by studying these and by introducing other factors would a better understanding as to the causation of these differentials be obtained. Life style and environmental characteristics (including weather, water hardness, pollution and access to hospital facilities, etc.), should, where possible, be incorporated into studies if these are to provide perspective. By thus broadening the scope of individual programmes, research teams would need to represent a number of disciplines if they were to contribute to an advance in the understanding of the results of these programmes.

8. Even in the UK, with its long time-series of data, measures of the change in differentials were limited. However, the methodology should be improved first to provide the basis for within-country analyses and then for comparing between countries.

PLANS FOR COORDINATING ACTIVITIES FOR 1981-1983

9. The wide differences in the approaches adopted in individual countries was considered strong evidence for the need for a continued exchange of ideas and for a central framework to provide the basis for these activities to be coordinated. The following proposals were agreed :

A. A network on socio-economic differentials in mortality in industrialised societies will be created; the members of the network will be the people attending the present meeting and representatives of other institutions, national and international, which are interested in undertaking research on socio-economic differentials in mortality. Membership would not be restricted to representatives of demographic institutions.

B. A meeting will be convened annually, in late June or early July, to give members of the network the opportunity to exchange views on the state-of-the-art and, possibly, to promote bilateral cooperation.

C. An annual document would be produced. Initially, it would include the report of this meeting and an outline of research programmes in various countries. At later meetings, it would be up-dated and bring in reports from groups not represented.

D. Consultations will be undertaken during the period July 1980 - June 1981 with the aim of possibly drawing up an integrated plan of research to be presented at the mid-1981 meeting. This plan will be carried out during the two or three subsequent years by a number of research institutions, on a voluntary basis.

E. Consideration should be given to ways of extending information about socio-economic differentials into the public domain; in particular, of bringing it to the attention of policy makers and social planners. One way of achieving this would be through wide circulation of the annual document (cf. "C" above).

10. The experts emphasised that research on socio-economic differentials in mortality has far-reaching effects, not solely for the rich countries, but also for the Third World. They gave a mandate to CICRED and WHO to seek financial support to implement the above plan of action. The UN, the IUSSP, the Committee of Experts on Mortality and Morbidity of the Council of Europe (chaired by Professor E. Grebenik), etc., would also be interested in the developments proposed here and may wish to contribute to the next meeting.

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LIST OF PARTICIPANTS

AT THE FIRST MEETING

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FACTS AND WORKS:

COUNTRY REPORTS

B E L G I U M

Recherches au

DEPARTEMENT DE DEMOGRAPHIE
UNIVERSITE CATHOLIQUE DE LOUVAIN

I. Mortalité régionale et comportements différentiels

Dans la littérature scientifique, épidémiologique et médicale, de nombreuses variables ont été rattachées aux principales causes de mortalité : variables d'ordre biologique, variables de consommation alimentaire, de comportement (stress, tabagisme) d'environnement, ou indicateurs socio-économiques. Après en avoir dressé la liste, les auteurs ont tenté de mesurer leur impact sur la mortalité régionale belge.

Pour chacune des causes régionalisées : maladies ischémiques du coeur, cérébro-vasculaires, tumeurs des voies respiratoires et de l'estomac, accidents et suicides, ils se sont efforcés de déterminer la ou les variables qui différencient le plus les régions. L'analyse discriminante a servi d'instrument d'analyse. Elle a permis d'atteindre la limite de ce que peut apporter une approche de type écologique : faute de données individuelles et suivies, les variables ont été mesurées à partir de données agrégées et donc imparfaites quant à leur pouvoir explicatif.

Le rôle des variables de consommation sur la régionalisation des diverses causes de mortalité a néanmoins pu être dégagé : tabagisme, alcoolisme, consommation de beurre ont un pouvoir explicatif réel. Les variables d'environnement telles la dureté de l'eau ou la pollution atmosphérique apparaissent, par contre, non discriminantes.

II. Enquête sur les habitudes et comportements en matière alimentaire, tabagique et d'exercice physique dans le cadre d'un projet action/éducation visant à réduire la mortalité et la morbidité cardio-vasculaire dans le Luxembourg belge

Il s'agit d'un projet visant à amener la population cible (hommes et femmes de 20 à 50 ans) à éviter et à corriger les facteurs de risque des maladies cardio-vasculaires en choisissant à bon escient ses aliments, en équilibrant son alimentation, en modifiant ses habitudes tabagiques, sportives et de loisir, en se soumettant aux examens médicaux préventifs.

Si l'on connaît bien les facteurs de risque qui engendrent les troubles cardio-artériels, on connaît moins bien, par contre, la distribution de ces comportements dans l'espace social et culturel. On a de fortes raisons de penser que les groupes socio-culturels ne sont pas homogènes du point de vue de la consommation alimentaire, du tabagisme, de la prévention médicale, des activités sportives, etc.

L'enquête permettra de lutter plus efficacement contre le risque coronarien dans la mesure où seront mieux définis les "patterns" sociaux et individuels de comportement et où seront connus, grâce à des "check-up" médicaux, l'état de santé et les antécédents médicaux des sujets enquêtés. Elle débouchera sur une action d'éducation de la population dans son ensemble et de chaque individu examiné.

III. Programme de recherche sur la mortalité infantile

1. Point de départ : Constat de différences régionales importantes (différences allant du simple au double) en matière de mortalité infantile, au niveau de l'arrondissement administratif.

Données : Publications de l'état civil, mortalité des nés vivants/naissances vivantes par arrondissement administratif autour des années 70.

Publication : *Etat démographique de la Wallonie et éléments pour une politique de population. Rapport POLIWA*, Département de démographie. Documents du Centre d'étude de la population et de la famille, 1977, 412 p.

2. Analyse des différences individuelles en matière de mortalité infantile (mortinatalité, mortalité néonatale précoce, mortalité postnéonatale) en proposant une méthode d'identification de "familles à risque".

Données : Appariement des bulletins d'état civil de naissance et de décès des enfants mort-nés et décédés avant leur premier anniversaire en 1974 et 1975. Les variables disponibles sont classiques : nationalité. profession, âge, état civil et date de mariage des parents. Nombre d'enfants issus du mariage actuel et date de naissance (avec mention d'un décès éventuel) de ces enfants.

Méthode : Analyse de segmentation sur les enregistrements individuels en distinguant divers types de décès.

Publication : Masuy-Stroobant, G., Loriaux, M., Cérard, H. : *Mort ou survie à la naissance? Pour une identification des familles à risque. Rapport POLIWA 2.* Département de démographie. Documents du Centre d'étude de la population et de la famille, 1979, n°. 5, 222 p.

3. Afin de tenter d'expliquer les différences de risque observées entre diverses "familles" (les données de l'état civil ne contiennent guère d'information sur les comportements, etc.), une enquête intensive est menée dans le Hainaut auprès de toutes les nouvelles accouchées en 1979 et 1980.

Données : Enquête auprès des mères et portant sur diverses variables de comportement : surveillance de la grossesse, conditions du travail professionnel, navettes, contraception, circonstances de l'accouchement, habitudes en matière de consommation de café, tabac et alcool, caractéristiques du nouveau-né, variables d'identification (profession, instruction, nationalité, âge, histoire génésique) de la mère, du père et caractéristiques de l'union, conditions de logement et questions sur les intentions de la mère quant à l'alimentation et la garde éventuelle de l'enfant.

Méthode de l'enquête : Les enquêtes sur les naissances sont distribuées aux mères pendant leur séjour en maternité. Les décès sont observés par les infirmières du service d'obstétrique, s'ils se produisent très vite après l'accouchement (y compris les mort-nés); les décès d'enfants qui se produisent après le retour de la mère (et de l'enfant) à domicile sont observés par l'infirmière visiteuse de l'Oeuvre Nationale de l'Enfance.

L'enquête a pu se faire grâce au concours des services d'obstétrique de toutes les maternités de la province du Hainaut et des infirmières de l'Oeuvre Nationale de l'Enfance, section Hainaut.

Enquête en cours : pas encore de publication en juin 1979.

4. En cours : Travaux de thèse de G. Masuy-Stroobant qui, en partant d'une identification de familles à risque au niveau individuel (cf . pt. 2), va tenter d'expliquer les différences régionales de mortalité infantile partiellement par des concentrations particulières de familles à risque (faible ou élevé) dans leur arrondissement de résidence, et partiellement par des facteurs de contexte (équipement, emploi, aspects sociaux et culturels, etc.).

La liaison avec le pt. 3 pourra s'opérer également : tentative d'explication des différences de risque des familles identifiées (en 2) par l'analyse des comportements différentiels.

5. En cours : Recueil des renseignements publiés par l'état civil de tous les pays d'Europe (y compris l'Europe de l'Est, URSS exclue) concernant la mortinatalité, la mortalité néonatale précoce (décès au cours de la première semaine de vie) et la mortalité postnéonatale, par division administrative au sein de chaque pays. Parallèlement, on a recueilli les définitions de né-vivant et de mort -né en vigueur dans ces divers pays, afin de s'assurer de la comparabilité des données.

Etat de la recherche : Les données sont rassemblées pour tous les pays (à l'exclusion de la France) et l'objectif serait d'établir une carte européenne de la mortalité infantile en raffinant au niveau des divisions administratives.

D E N M A R K

OCCUPATIONAL MORTALITY IN NORWAY, DENMARK AND FINLAND, 1971 - 1975

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1. Introduction

The Central Statistical Offices in Norway (1), Denmark (2) and Finland (3) have recently published reports on occupational mortality. In this paper, the results from the three studies will be compared.

Table 1.1 shows some basic facts about the three populations during the period covered by the studies. The size of the 1970 census population was about 4 million in Norway, 5 million in Denmark and 4.5 million in Finland. The expectation of life at the age of 0 during the years 1971-1975 was 71.4 for men, and 77.7 for women in Norway. The expectation of life in both Denmark and Finland was lower, with a difference of 4.7 years between Norwegian and Finnish men. About 90% of men in the age group 20-64 years were economically active at the 1970 census in the three countries. Among women, however, 60% were economically active in Finland, and only 33% in Norway.

Table 1.1 : 1970 Census population, expectation of life 1971-1975, and percent of occupied. Norway, Denmark and Finland

	Men	Women
1970 Census population		
Norway	1,926,148	1,947,985
Denmark	2,451,397	2,486,182
Finland	2,219,985	2,378,351
Expectation of life at age 0, 1971-1975		
Norway	71.4	77.7
Denmark	70.9	76.5
Finland	66.7	75.2
Percent of occupied aged 20-64 years		
Norway	89.5	33.4
Denmark	92.2	52.1
Finland	87.0	60.0

Sources : Statistisk Sentral byrå : Folke- og boligtelling 1970, hefte II, naering, yrke og arbeidstid m.m. Oslo, 1975

Danmarks Statistik : Folke- og boligtaellingen 1970, CI, Beskaeftigelse og erhverv. København, 1974.

Tilastokeskus : Folkeräkningen 1970, Del II A, näringsgren och yrkesställning. Helsinki, 1973.

Nordisk Statistisk årsbok 1979, Stockholm, 1980.

2. Methods

The studies are based on the 1970 census populations, and the mortality in these cross-sectionally registered populations is followed up for a three (Norway) or five year period (Denmark and Finland).

It is the personal identification numbers, which were introduced in Norway in 1964, in Denmark in 1968 and in Finland in 1964 which have provided the possibility for this sort of studies.

The 1970 census data and the death certificates from the following years were, in all three countries, registered according to personal identification numbers. The follow-up of the mortality in the 1970 census populations is based on a linking of the death certificates from the follow-up period to the equivalent personal records in the 1970 census data. The linking is based on the personal identification number.

However, despite the common background, minor variations in the study designs do exist. Below, a short description of the designs will be given.

Norway

1. Census date : November 1st, 1970.

2. Classification of occupations : Nordic occupational classification (NYK) , equivalent to ISCO.

3. Follow-up period : 1.11.70 - 31.12.73.

   "occupied persons with unknown occupation are excluded from the study".

4. Lost to follow-up : not described.

5. Computation of age-specific death rates :

   $$M_x = \frac{dx}{mx}$$

   where dx is the number of deaths in the age group x in the follow-up period, and mx is the number of persons in the age group x at the census.

6. Computation of mortality index :

   Direct standardisation CMF. Standard population : all occupied persons. Age group : 20-69 years.

Denmark

1. Census date : November 9th, 1970.

2. Classification of occupations : Special Danish code.

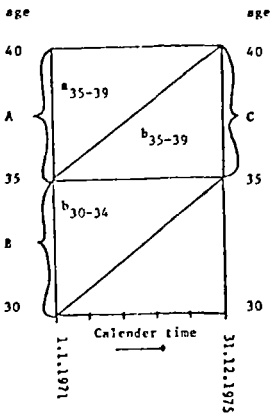
3. Follow-up period : 9.11.70 - 8.11.75.

4. Lost to follow-up : The follow-up of the 1970 census population is based on the central population register, which holds information about all persons who have been residents in Denmark since the setting up of the register in 1968. 1,897 persons out of 3,567,384 persons in the census population were lost to follow-up = 0.05%.

5. Computation of age-specific death rates :

$$M_x = \frac{ax + bx}{1/2(A+C)\ 5}$$

definitions in the diagram below :



6. Computation of mortality index :

Indirect standardisation, SMR. Standard population : all occupied persons. Age group : 35-64 years.

3. General mortality level and occupational structure

In all the reports, the tabulation of mortality difference is based on direct or indirect age standardised indices.

Equal index values for an occupational group in Norway, Denmark and Finland do not necessarily mean that the group has the same mortality in all the countries. And, vice versa, the same mortality does not necessarily give the same index value.

One of the reasons for this is that the standard populations - all occupied persons - do not have the same mortality in the three countries. Due to differences in methods of computation and in age grouping, the mortality in the three standard populations can only be compared graphically (see figure 3.1).

Occupied Finnish men have a higher mortality than occupied Danish and Norwegian men. Among occupied women, however, it is the Danish group which has the highest mortality, followed by the Finnish and the Norwegian groups.

A second reason for the discrepancies between the mortality index values and the mortality levels for occupational groups is the differences between the countries in occupational structure.

Table 3.1 shows the relative distributions of occupied persons in the 1970 census populations according to main industry and occupational status. The data show that the percentage of self-employed men in agriculture is lower in Denmark (8.9%) and Norway (9.8%) than in Finland (17.5%). Given the same relatively low mortality for this group of men, the index value for the Finnish group will by definition be closer to 100 than

the index value for the Danish and the Norwegian group, because the Finnish group constitutes a greater part of the standard population.

Figure 3.1. Age-specific death rates for occupied males and females in Norway (1971-73) Denmark and Finland (1971-75)

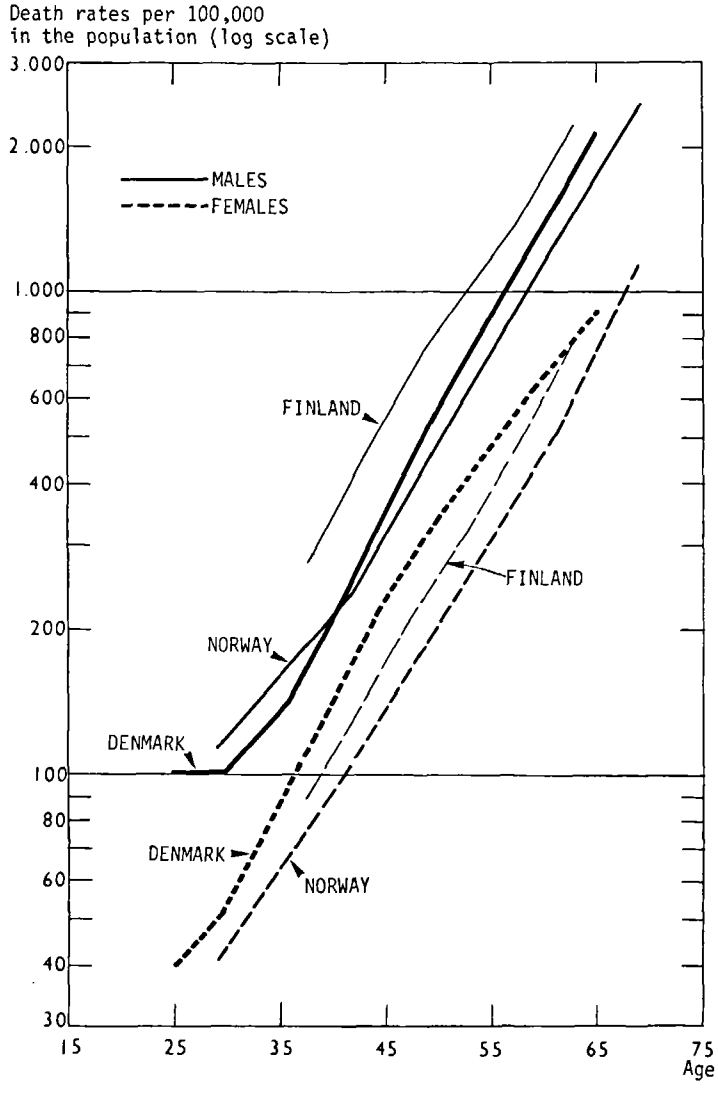


Table 3.1 : Economically active population, 1970, by sex, industry and occupational status. Relative distribution

	Norway, 1970			Denmark, 1970			Finland, 1970		
	Employees	Salaried employees	Workers	Employees	Salaried employees	Workers	Employees	Salaried employees	Workers
MEN :									
Agriculture, etc.	9.8	3.4		8.9	0.4	3.5	17.5	0.9	4.9
Manufacturing, etc.	1.6	30.6		2.9	6.0	23.9	0.8	5.0	22.6
Construction	2.3	9.6		2.0	0.7	10.8	0.7	1.3	11.3
Commerce	2.6	11.6		3.8	7.0	2.9	1.6	6.5	3.8
Transport, communication	1.4	11.1		1.2	3.5	3.7	1.8	1.5	6.1
Services	0.8	14.7		2.2	10.2	2.9	0.7	6.9	3.9
Activity unknown	0.0	0.2		----	0.6	2.9	0.1	0.2	1.2
TOTAL	18.5	81.4		21.0	28.4	50.6	23.2	22.3	53.8
WOMEN :									
Agriculture, etc.	6.9	0.5		5.9	0.1	0.4	15.0	0.2	0.7
Manufacturing, etc.	0.5	17.6		1.9	5.8	13.6	0.8	5.0	16.6
Construction	0.0	0.7		0.7	0.7	0.1	0.0	0.5	0.8
Commerce	3.0	24.0		3.8	13.3	1.4	2.4	17.9	8.0
Transport, communication	0.0	6.2		0.4	2.6	0.5	0.1	2.7	1.0
Services	1.5	38.9		2.6	26.3	17.9	1.0	17.1	8.8
Activity unknown	0.0	0.2		----	0.8	1.1	0.0	0.3	0.3
TOTAL	11.9	88.1		15.3	49.6	35.0	19.3	43.7	36.3

Source : Nordisk Statistisk årsbok, 1975

4. *Total mortality and economic activity*

The division of the population into occupied and not occupied is, in Norway, Denmark and Finland, at the same time a division according to health (Table 4.1).

The total mortality for not occupied men is two and a half to three times the mortality for occupied men. Additionally, the mortality is high among men with no (occupation unknown) or insufficient (labourer not elsewhere classified) occupational information on the census form.

Table 4.1 : Total mortality by economic activity

SMR	Occupied in 1970			Not occupied in 1970	
		of whom:			of whom:
	All persons	labourer n.e.c.	occupation unknown	All persons	Housewives
Norway, 20-69 years					
Men	100	not comp.	not comp.	255	-
Women	100	not comp.	not comp.	174	not comp.
Denmark, 20-64 years					
Men	100	167	231	281	-
Women	100	-	240	161	140
Finland, 35-64 years					
Men	100	164	not comp.	282	-
Women	100	162	not comp.	189	not comp.

n.e.c. : not elsewhere classified

Not occupied women have a total mortality 1.75 times the mortality for occupied women. It is important to remember that the group of not occupied women is much bigger than the equivalent group of men (see table 1.1). The majority of not occupied women are housewives, and the SMR for housewives in Denmark is 140.

Due to the excessive mortality among the not occupied part of the population, only the occupied part has been used as standard population for the calculation of the mortality indexes in Norway, Denmark and Finland.

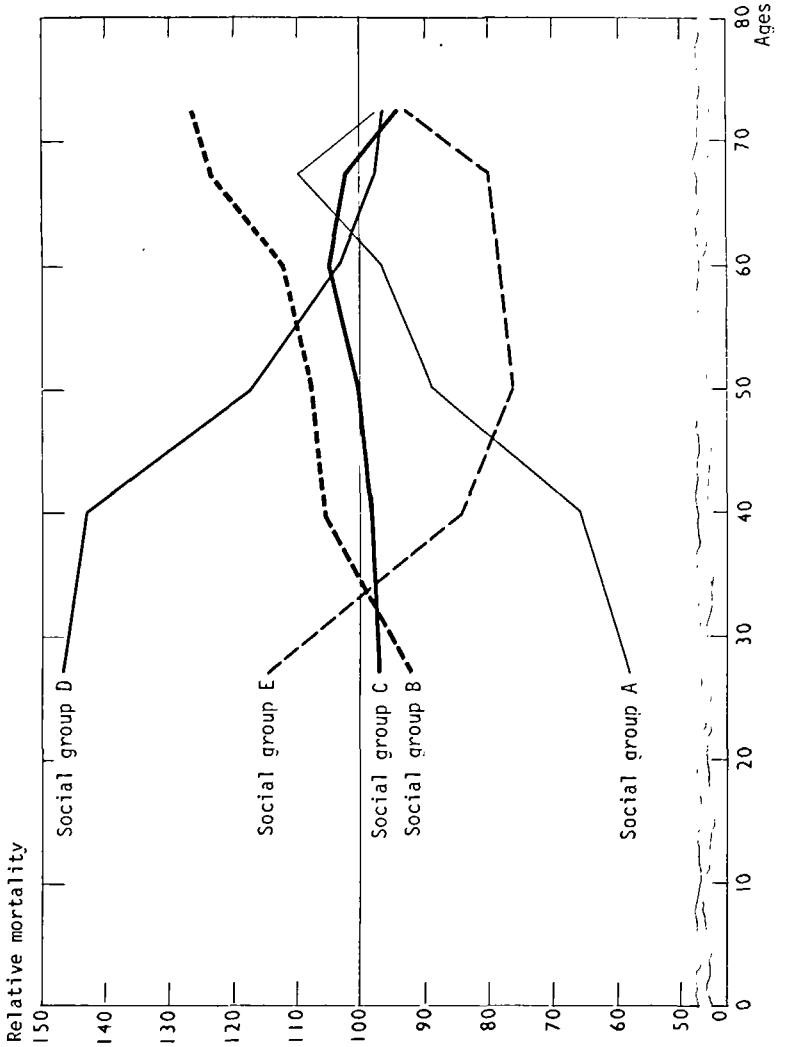
5. Total mortality and social groups

The Norwegian population has been divided into five social groups. Social group A consists of persons with university education, higher administrative positions, etc. Social group D is unskilled workers. Social group E includes farmers and workers in agriculture. Figure 5.1 shows the total mortality for men by age and social groups.

The occupational status groups have been used as social groups in the Danish study. But it must be stressed that the occupational status groups are relatively heterogeneous. Figure 5.2 shows the total mortality for men and women by age and occupational status.

An eight-group socio-economic classification is used in the Finnish study.

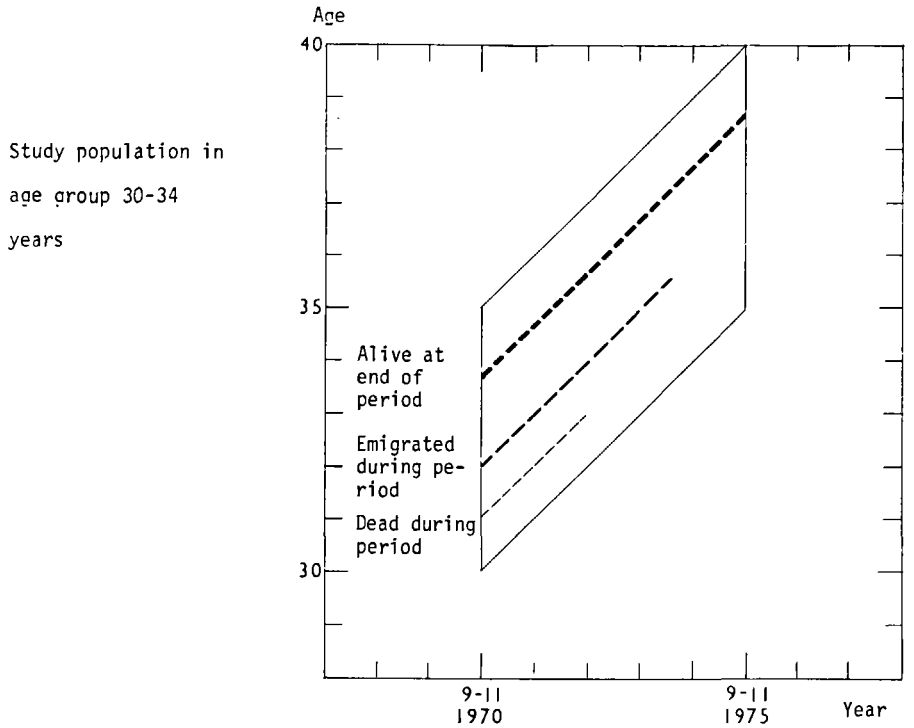
Figure 5.1. Norway. Men. Total mortality. Age-specific death rates for social groups as per cent of the death rates for all occupied persons.



5. Computation of age-specific death rates :

$$M_x = \frac{dx}{px}$$

where px is the sum of the observed person years at risk, defined in the diagram below :



6. Computation of mortality index :

Indirect standardisation, SMR. Standard population : all occupied persons. Age group : 20-64 years.

Finland

1. Census date : December 31st, 1970.

2. Classification of occupations : NYK.

3. Follow-up period : 1.1.1971 - 31.12.1975.

4. Lost to follow-up : 4,263 deaths out of a total number of 218,000 deaths = 0.5%.

Figures 5.1 and 5.2 show a relatively high mortality for social group D in Norway, and for unskilled workers in Denmark. The excess mortality among unskilled men is biggest at the age of 35 years and disappears towards the pensionable age.

The relatively small group of self-employed women in Denmark has a higher mortality than the large group of unskilled women. The same pattern is seen for Finnish women in Table 5.1.

Figure 5.2 : Denmark. Men and women. Total mortality. Age-specific death rates for occupational status groups as a percent of death rates for all occupied persons

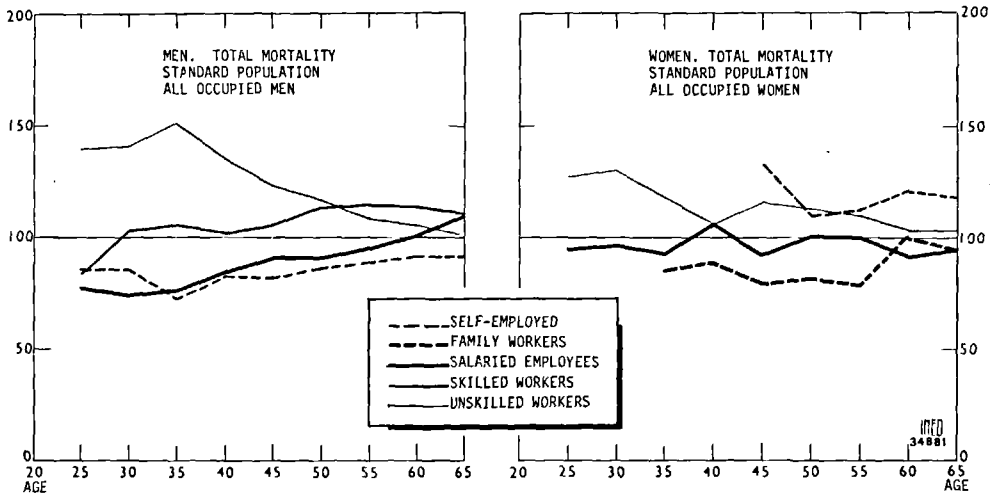


Table 5.1 : Finland. Men and women. Total mortality by socio-economic groups

	Males	Females
Employers	78	77
Farmers on own account	70	66
Other own account workers	84	79
Managers and higher administrative or clerical employees	53	58
Lower administrative or clerical employees	61	61
Skilled or specialised workers	73	67
Labourers	94	69
Pensioners and other economically inactive independent persons	237	200
All persons	100	100

Note : The index value used in this table is CMR calculated for the age group 30-69 years with the total population as standard population.

6. Total mortality and occupation

Due to differences in the classifications of occupation in the censuses and in the following groupings in the mortality studies, it is not possible to compare the mortality figures for occupational groups defined in exactly the same way in all of the three countries. Below, occupational groups defined as equally as possible will be compared. The figure for men will be examined first.

Teachers, farmers and men with university degrees have low mortality in Norway, Denmark and Finland (Table 6.1).

Table 6.1 : Men. Low total mortality

	Norway	Denmark	Finland
Pedagogical work	75	73*	63
Farmers	78	62*	85*
Technical work, etc.	86	79	72*

Note : published index values, for method of computation, see section 2.

* selected values

The impact of low mortality can be illustrated by the following calculation from Denmark. The Danish 1970 census includes 1.4 million economically active men, aged 20 to 64 years. During the following five years, 1970-75, 47,000 of these men died. If we assume that all the 1.4 million men had instead been subject to the mortality pattern observed for farmers, only 24,000 would have died over the five years. This means that, if it was possible the reduce the mortality level for all Danish men to the level observed for farmers, only half the yearly number of deaths among men in the economically active age groups would occur.

Again, it must be stressed that equal index values do not necessarily mean that the groups have the same mortality. Figure 6.1 shows the age-specific mortality for teachers. Despite a lower index value, Finnish teachers have a higher mortality than Danish and Norwegian teachers.

Men in hotels and restaurants, in deck and engine room, and in mining and quarrying have a high mortality (Table 6.2).

Table 6.2 : Men. High total mortality

	Norway	Denmark	Finland
Hotels, restaurants	134	195	153
Deck, engine-room	137	218	128
Mining, quarrying	133	---	131

Note : published index values

If all the 1.4 million economically active men in Denmark were subject to the mortality observed for waiters and cooks (hotels and restaurants in Table 6.2), 78,000 would die during a five-year period, i.e., 31,000 men more than the actual number of deaths.

Some occupational groups have a high mortality in one or two of the three countries, or a relatively high mortality in all the countries (Table 6.3).

Undoubtedly, the occupational classifications used in the studies are decisive for the results. This problem can be illustrated by the mortality figures for persons working in the food industry :

		Mortality index
NORWAY		
code	69, 76, 80, 82, 99, 84, 86 Electrical, - graphic, - food and beverage work, etc.	107
FINLAND		
code	72 (82)	
	Food and beverage work	96
DENMARK		
Code	642 : butchers	127
	645 : bakers	143
	732 : unskilled workers in slaughterhouses	98
	733 : unskilled workers in food industry	92
	--- : unskilled workers in breweries	139

Figure 6.1. Age-specific mortality for men in pedagogical work

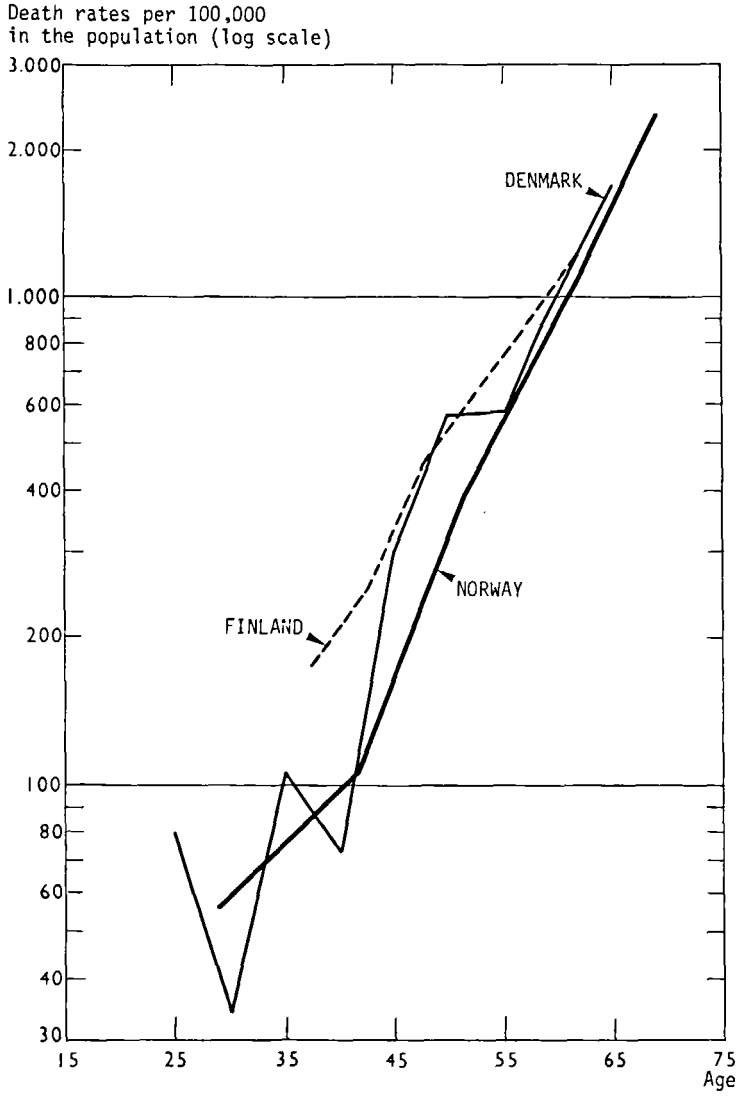


Table 6.3 : Men. High total mortality in some countries, or relatively high mortality in all countries

	Norway	Denmark	Finland
Forestry work	79	-	131
Fishing, whaling and sealing work	121	112	88
Construction work n.e.c.	98	95	133
Painting work	107	108	123
Longshore men and related freight-handlers	117	104	117
Commercial travellers and manufacturers' agents work	119	116	112
Sales work from offices and retail sales work	111	117	113
Bookkeeping and cashier work		101	126
Other clerical work	106	124	92

Note : published index values n.e.c. : not elsewhere classified

The high mortality for butchers, bakers and brewery workers can only be identified when these groups are separated from other workers in the food and beverage industry.

The mortality differences among women are smaller than among men, as shown in Figure 5.2, and the smaller number of economically active women means that broader occupational classifications are used in the analyses of the mortality pattern for women.

Table 6.4 : Women. Pedagogical work, agricultural work, and women with university degrees

	Norway	Denmark	Finland
Pedagogical work	103	94*	83
Agricultural work	94	72*	87*
Technical work, etc.	108	98	105*

Note : published index values * selected values

Table 6.4 shows the mortality indexes for the occupational groups of women equivalent to the low mortality occupational groups of men. Women working in agriculture (primarily family workers at farms) have a low mortality, as is the case among men.

However, opposite the figures for men, women with university degrees are not a low risk group.

Among women, as among men, the occupational classifications are decisive for the results obtained. Nurses and assistant nurses have an average mortality in Denmark, while waitresses and sandwich maids are at high risk, with a SMR of 156. In Norway, these occupations have been grouped together, with a common CMR of 98. The Norwegian group of hotel, restaurant and domestic work includes the Danish groups cleaning staff in hotels and restaurants and home helps. A real difference seems to exist between the Danish group of waitresses and sandwich maids and the Finnish group of women with waiting work. The Danish group includes 9,090 women aged 20-64 years with a SMR of 156. The Finnish group includes 10,860 women aged 35-64 years with a SMR of 106.

NORWAY		
code		Mortality index
03	medical work	
10	public administration	
11	administration of private enterprises	88
05	other professional health and medical work	
04	nursing care	98
92	waiting work	
91	hotel, restaurant and domestic work	109
DENMARK		
538	nurse	91
539	assistant nurse	99
762	waitress, sandwich maid	156
764 b	cleaning staff, private	106
765	home help (not domestic servants)	91
FINLAND		
03 (03,04)	medical and nursing work	78
04 (05)	other professional health and medical work	129
81 (91)	hotel, restaurant and domestic work	109
82 (92)	waiting work	106

Table 6.5 shows the index values for groups of Danish and Finnish women with high mortality. The Norwegian data have been excluded from the table because only very broad occupational groups are used in the study.

7. Causes of death

There is a certain covariation for men between the mortality due to diseases and the mortality due to accidents, suicides, etc., as illustrated in Figure 7.1 from the Finnish study. No equivalent covariation exists for women.

Apart from the covariation, Figure 7.1 shows a larger variation for men in the mortality from accidents, etc., than in the mortality from diseases. The same pattern is seen for Danish men in Figure 7.2. Where there is an outspoken social difference in the mortality due to accidents, etc., an equivalent - but less age-consistent - difference in the mortality due to other diseases, almost no difference in the mortality due

Table 6.5 : Women. High total mortality in Denmark or Finland

	Denmark	Finland
Laboratory technicians	113	118
Commercial work	117 self.emp. 100 employees	115
Other professional health and medical work	-	129
Artistic and literary work	-	138
Clerical work	100	113
Longshoremen and related freighthandlers	121	100
Postal and other messenger work		86
Road transport work		-
Iron and metal ware work		112
Electrical work	120	91
Stationary engine and motor-power work		116
Wood work	-	113
Construction work n.e.c.	-	123
Waiting work	156	106
Hygienical and beauty treatment work	94[a]	138

Note : published index values (a) self-employed hairdressers

to cardiovascular diseases over the age of 50 years.

The mortality pattern for women in Figure 7.3 is different from the mortality pattern for men. Among women, the biggest mortality differences are found for cardiovascular diseases, while almost no difference is found for the mortality due to accidents, etc.

The analyses of the mortality pattern for occupational groups by causes of death is an important step in the identification of risk factors. Below, two examples of comparison of cause-specific mortality figures from the studies are given.

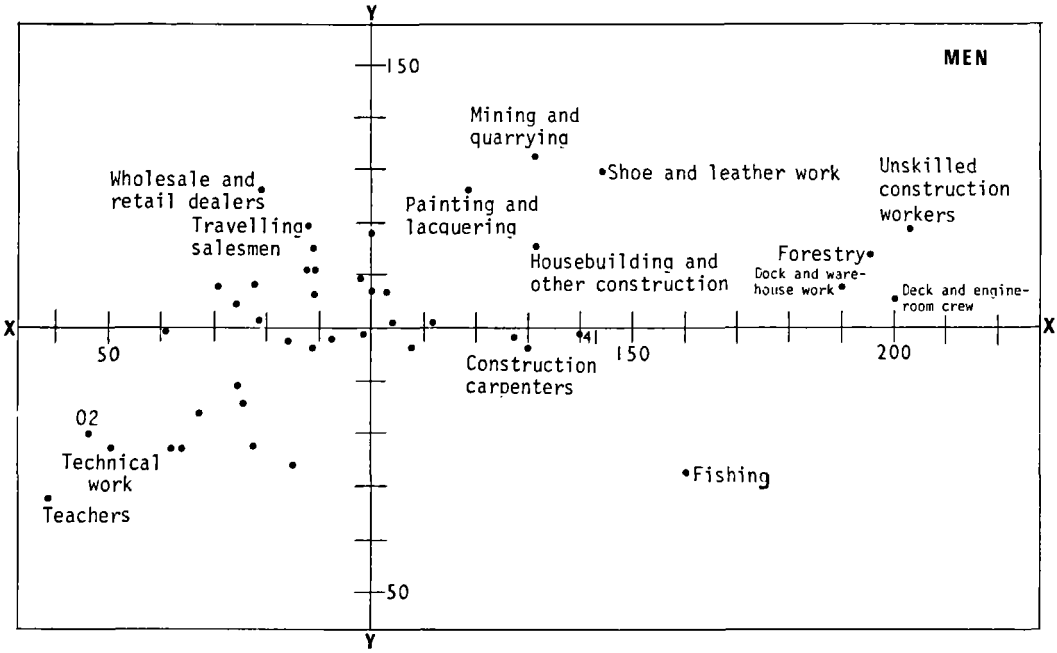
Male workers in the chemical industry have a total mortality equivalent to the average mortality for economically active men in all of the three countries. However, their mortality from lung cancer (ICD 162) is one and a half times the average rate (Table 7.1).

Higher educated men have a lower suicide rate (ICD E 950-959) than men with only basic education. For women, however, the pattern is different, with higher educated women having the highest suicide rate. This pattern is seen both in Denmark (Table 7.2) and in Finland (Table 7.3), although different classifications of education are used in the two studies. The suicide rate for economically active men in Denmark is higher than the suicide rate for economically active women. Among salaried employers and public

Figure 7.1. Men and women. Finland. Age standardized mortality from diseases and from accidents, etc., in different occupations.

X = accidents, poisoning and violence

Y = diseases



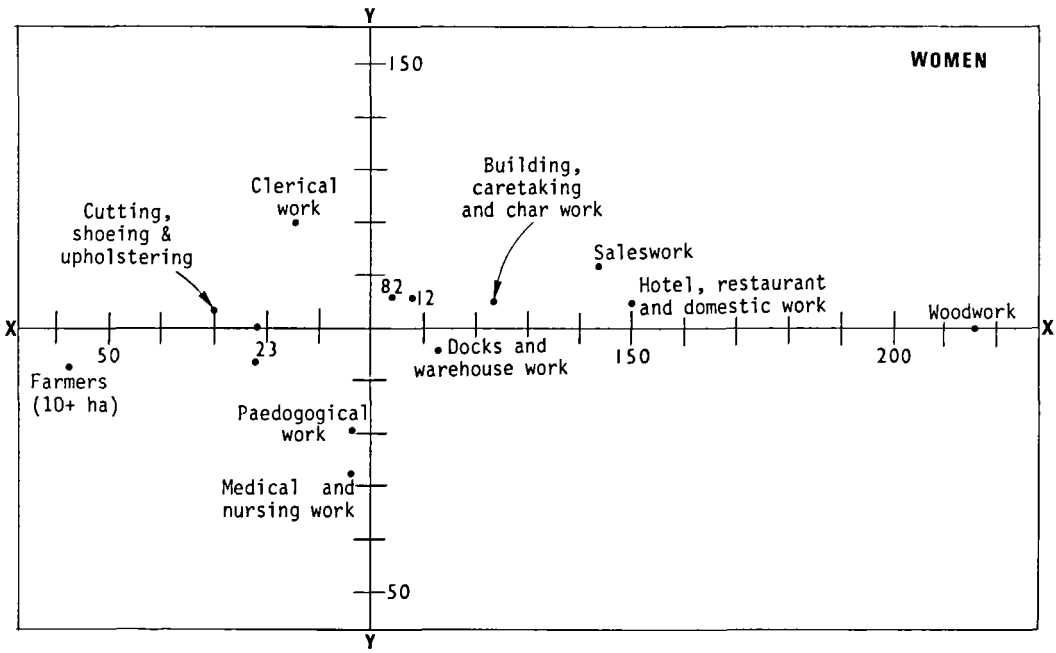


Figure 7.2. Men. Denmark. Main causes of death. Age-specific death rates for occupational status groups as per cent of death rates for all occupied men.

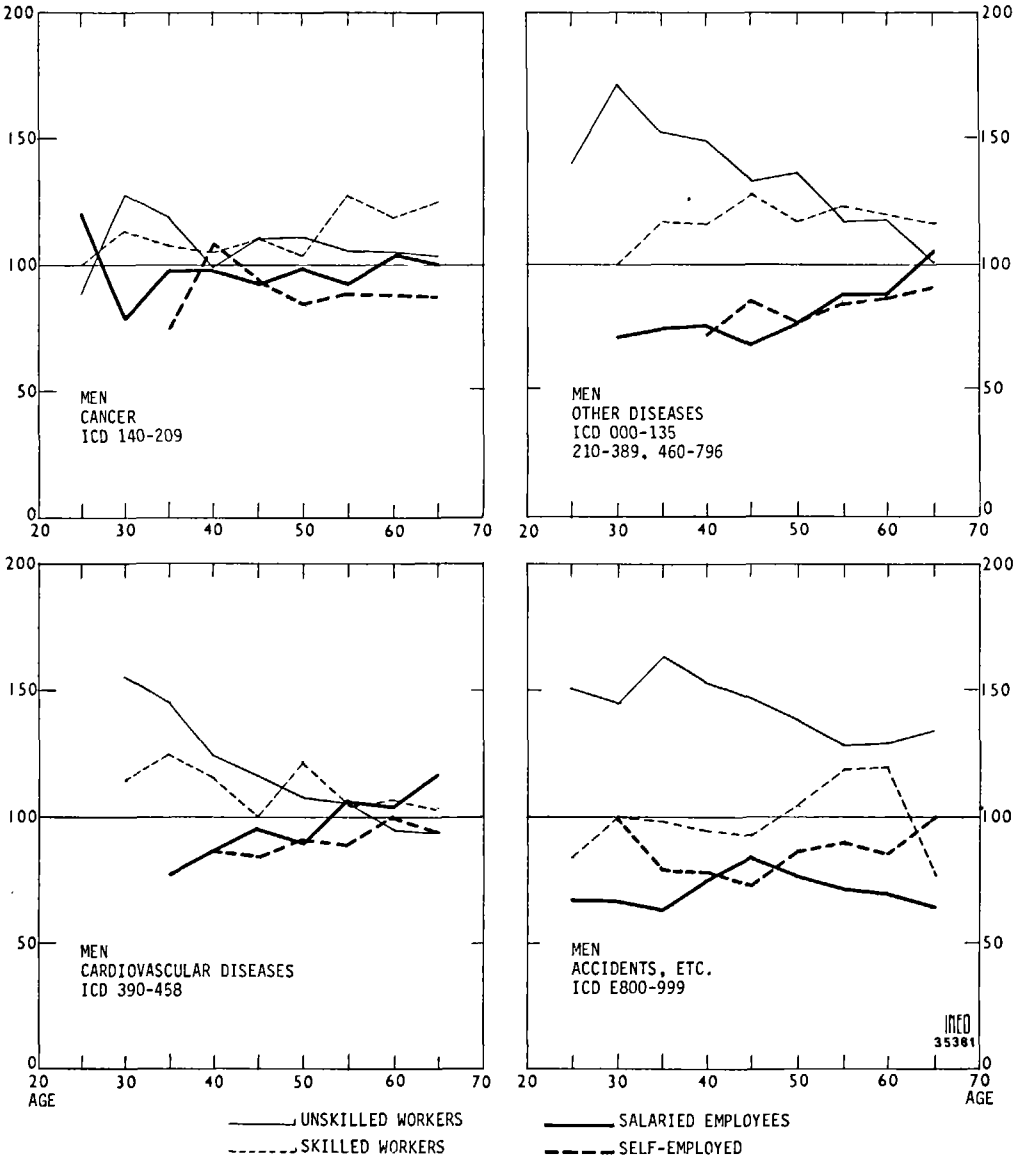


Figure 7.3. Women. Denmark. Main causes of death. Age-specific death rates for occupational status groups as per cent of death rates for all occupied men.

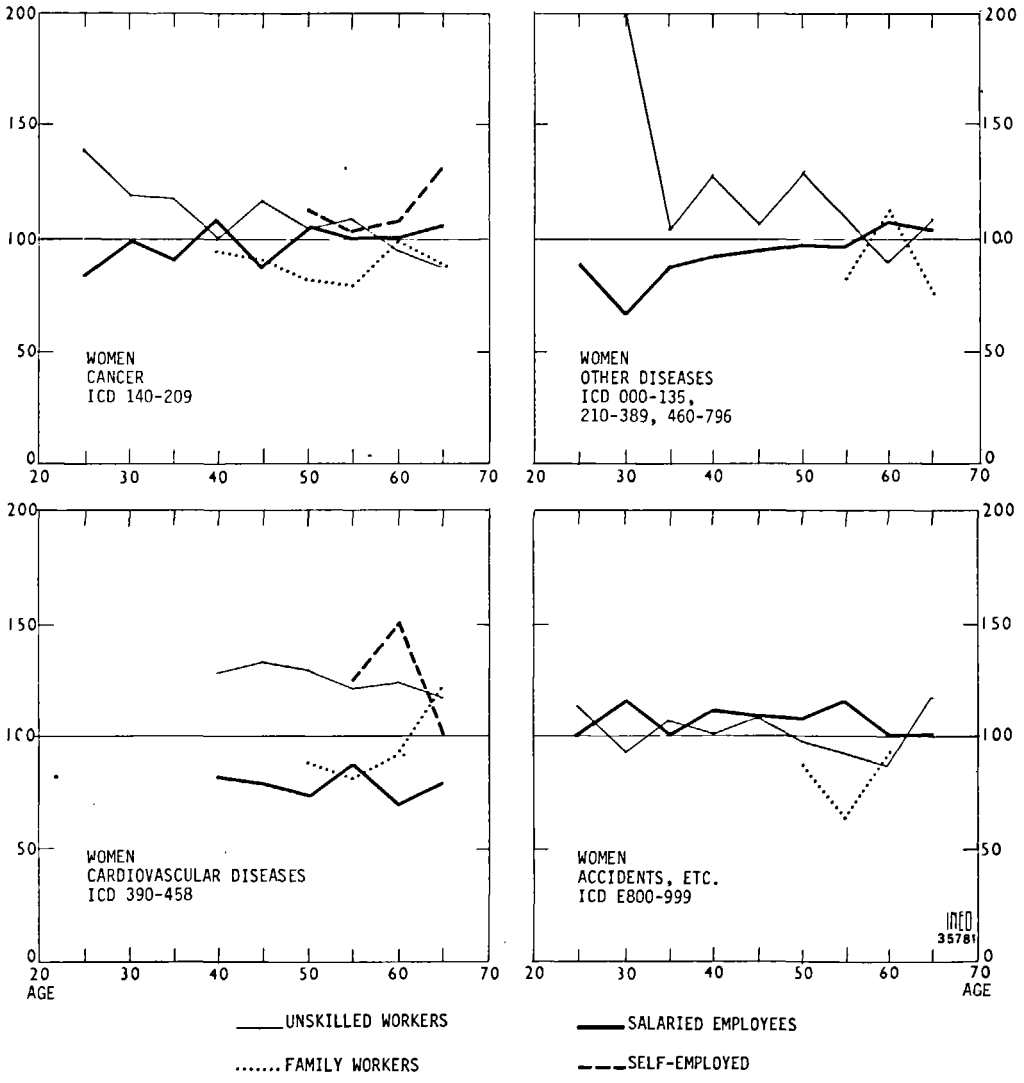


Table 7.1 : Men. Mortality among workers in chemical and related process work

	Norway	Denmark	Finland
Total mortality	108	104	102
Cancer ICD 140-209	139	120	109
Cancer digestive organs	147[a]	121[b]	-
Lung cancer ICD 162	167	146[c]	146

Note : published index values
a) ICD 150,151, 153, 154
b) ICD 150-159
c) ICD 160-163

servants I (with university education), however, the suicide rate for women is about twice the rate for men. Twenty two suicides occurred among women and 59 suicides among men in this occupational group during the years 1970-1975.

The Norwegian study does not include mortality figures for suicide.

Table 7.2 : Denmark. Men and women. Mortality index for suicides ICD E950-959. Selected occupations

	Men	Women
All occupied	100	100
Salaried employees	86	115
Salaried empl. I	75	246
II	81	100
III	78	139
IV	114	104
Unskilled workers	117	88

Note : published index values

Table 7.3 : Finland. Men and women. Mortality index for suicides ICD E950-959 by education

	Men	Women
All persons	100	100
Lower level of basic education and unknown	113	98
Upper level of basic and lower level of secondary education	80	98
Upper level of secondary education	57	100
Higher education	62	124
Note : published index values		

8. Mortality among housewives

Forty percent of women aged 20-64 years old were housewives at the time of the 1970 census in Denmark. The housewives have a higher mortality than economically active women, SMR 140, and the mortality difference between the two groups is increasing with age (see Figure 8.1).

In order to identify possible high risk subgroups, the mortality among housewives has been analysed according to husbands' occupation .

Table 8.1 shows the SMR's for all Danish women, economically active classified according to own occupational status and housewives classified according to husband's occupational status. Only groups containing minimum 5 % of all women aged 20-64 years are included. The table shows that female pensioners, and housewives married to unskilled and skilled workers have a higher total mortality than the average for all women. Family workers and salaried employees have the lowest mortality. The same pattern is found for cancer, circulatory diseases, and other diseases, but not for accidents.

Unfortunately, we do not know whether the women being registered as housewives at the 1970 census have formerly been economically active.

9. Linking of 1960 and 1970 census data

The personal identification numbers for the Norwegian population have been reconstructed back to the 1960 census, and the individual records from the 1960 and the 1970 censuses linked together.

These linked data have provided the possibility for a study of the mortality in the Norwegian population in the period November 1st, 1970 to December 31st, 1973, for social and occupational groups either defined according to economic activity in 1960, in 1970, or in 1960 and 1970 combined (4).

3,174,428 persons participated in both censuses. Records for between 13,000 and 18,000 persons could not be linked. Classifications and standardisations are as in the previous Norwegian report.

One of the problems in the interpretation of the results from the studies based on the 1970 census registrations is that a certain part of the populations in the older age groups have left their earlier occupation and are registered as pensioners at the time of the census.

Based on the linked data, however, it is possible to study the mortality differences between occupational groups including the persons who were economically active

Figure 8.1. Denmark. Women. Age-specific mortality for housewives (log scale)

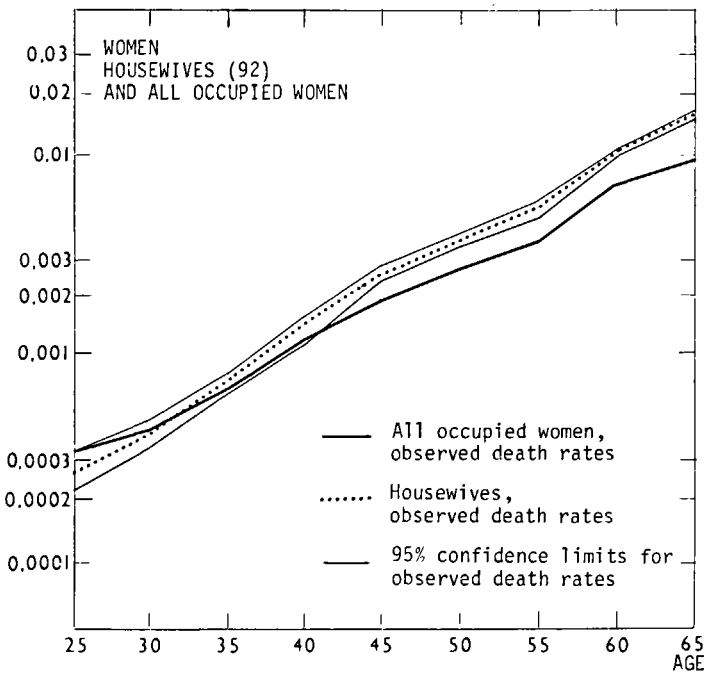


Table 8.1 : Denmark. Women. Total mortality and main causes of death. Economically active women and housewives by occupational status groups

Total mortality	SMR	Cancer ICD 140-209	SMR	Cardiovascular diseases ICD 390-458	SMR	Other diseases ICD 000-136 210-389,460-796	SMR	Accidents etc. ICD E 800-999	SMR	Per cent of all women 1) 20-64 year	Per cent
All women	100	All women	100	All women	100	All women	100	All women	100	All women	100
Family workers .	66	Family workers .	81	Salaried empl. .	50	Family workers .	41	Family workers .	60	Salaried empl. .	26
Salaried empl. .	74	Salaried empl. .	90	Family workers .	62	Salaried empl. .	51	House/Self empl.	77	Unskil. workers	16
Unskil. workers	82	House/Self empl.	92	House/Salaried e.	73	Unskil. workers	56	House/Unskil. w.	78	House/Salaried e.	11
House/Salaried e.	84	Unskil. workers .	93	Unskil. workers .	79	House/Salaried e.	75	House/Salaried e.	84	House/Unskil. w.	10
House/Self empl.	88	House/Salaried e.	94	House/Self empl.	90	House/Self empl.	90	House/Skilled w.	84	House/Self empl.	8
House/Skilled w.	108	House/Skilled w.	105	House/Skilled w.	116	House/Skilled w.	121	Unskil. workers	87	Family workers .	7
House/Unskil w.	118	House/Unskil. w.	115	House/Unskil. w.	131	House/Unskil. w.	132	Salaried empl. .	95	House/Skilled w.	6
Pensioners	169	Pensioners	127	Pensioners	166	Pensioners	242	Pensioners	223	Pensioners	5

Note: 1) Other groups: Self employed 2 per cent, housewives married to men with disability pension, etc. 2 per cent, housewives married to men with old peoples pension 2 per cent, skilled workers 1 per cent, housemaids 1 per cent, persons living on alimony 1 per cent, students 1 per cent, and housewives not-matched 1 per cent.

in 1960, but out of work in 1970. The change in the number of persons and the mortality indexes is illustrated for two occupational groups in Table 9.1.

Table 9.1 : Norway. Men. Number of persons and mortality index for selected groups defined according to economic activity in 1970 and in 1970/60.

	All men	Pedagogical work	Deck and engine-room work
Number of persons 20-69 years in 1970			
Economically active in 1970	1,000,891	29,388	17,085
Economically active in 1970, or in 1960 if out of work in 1970	1,050,909	29,498	19,196
"Early pensioners" as per cent of active in 1970	5.0%	0.4%	12.4%
Mortality index			
Economically active in 1970	100	75	137
Economically active in 1970 or in 1960 if out of work in 1970	100	68	179

Note : published index values

The inclusion of early pensioners increases the number of men in the group "deck and engine-room work" by 12.4%, but the number of men in "pedagogical work" by only 0.4%, and leads to a widening of the mortality gap between the two groups. The mortality index values change from 75 and 137, respectively, to 68 and 179 after inclusion of men who were economically active in 1960, but out of work in 1970.

The three Nordic studies based on the 1970 census data show the following mortality indexes for women working in the textile industry :

Norway :		Mortality index
Code		
70, 71, 72	textile work	101
Denmark :		
731	sewers	92
734	other unskilled workers in textile industry	

Finland

60	textile work	97
61	cutting, sewing and upholstering work, etc.	98

Although concordant, these mortality indexes around the average level for occupied women are surprising, because the work in the textile industry is known to be hard and monotonous piece-work.

However, the observed mortality pattern might be due to a high turnover rate in the industry. The linked Norwegian data make it possible to study this problem.

Table 9.2 : Norway. Women aged 20-69 years in 1970 by occupation in the textile industry in 1960 and 1970

Code	Number of persons	Status in 1960	Status in 1970
B	11,164	in textile	not occupied
D_1	5,511	in textile	other job
C	4,148	in textile	in textile
D_2	2,944	other job	in textile
O-C-D_2	10,270[a]	not occupied	in textile

a : 17,362 persons in the textile industry in 1970, minus group C and group D_2.

Table 9.2 shows that, of the 17,362 (4,148 + 2,944 + 10,270) women working in the Norwegian textile industry in 1970, only 24% (4,183) have been working in the industry for at least ten years, and 59% (10,270) have entered the labour market during the foregoing ten years.

Of the 20,823 (11,164 + 5,511 + 4,148) women who were working in the textile industry in 1960, and who were still alive and living in Norway in 1970, 54% (11,164) have left the labour market in 1970 and 26% (5,511) have changed to another job.

The mortality during the years 1970-73 was 66% higher - SMR 166 - among the 20,823 women working in the textile industry in 1960 than among the 17,362 women working in the same industry in 1970 (1). Only 4,148 women were included in both groups.

The index value, measuring the mortality for women in the textile industry relatively to the mortality for all occupied women, increases from 101 to 110, when women employed in 1960 and out of the labour market in 1970 are included in the calculation.

(1) 317 observed deaths among the 20,823 women against 190.96 expected deaths, based on the age-specific death rates for the 17,362 women working in the textile industry in 1970.

Part of the women who have formerly worked in the textile industry, but have left the labour market in 1970, can probably be found in groups like the Danish "housewives married to unskilled workers", and will, consequently, contribute to the excess mortality observed in this group.

The conclusion from the mortality figures based on linked 1960 and 1970 census data is that a certain part of both men and women in high risk groups are leaving the labour market before the normal pensionable age, and thereby diminishing the mortality differences registered in studies based exclusively on occupational status shortly before death.

10. Discussion

The mortality for unskilled men is higher than the average mortality for occupied men in the Nordic countries. The excess mortality is 40-50% in the age groups 25-35 years, and declining towards the average level at the pensionable age.

Half the number of deaths among occupied men in the younger age groups are due to accidents, etc., and half the number of deaths in the older age groups are due to circulatory diseases. Therefore, the mortality pattern for male unskilled workers is mainly to be explained by an excess mortality from accidents, etc., in the younger age groups and an average mortality from circulatory diseases in the older age groups.

The mortality differences in the younger age groups are, however, not only due to accidents. Unskilled men have, at the age when they enter the labour market, a higher mortality from diseases than apprentices, students, and salaried employees (Table 10.1).

Part of the disappearance of the social differences in mortality towards the pensionable age is explained by the selection out of work of men from high risk occupations. Figure 10.1, based on the 1970 and 1970/60 Norwegian data, shows that the mortality differences between social group A and D increases in the older age groups when men economically active in 1960 but out of work in 1970 are included in the analysis.

Low mortality groups in both Norway, Denmark and Finland are farmers, teachers, and men with university education . If the mortality for Danish men could be reduced to the level observed for farmers, only half the yearly number of deahts among men in the economically active age groups would occur. High risk groups are men working in hotels and restaurants, on deck and in engine-rooms, and in mining and quarrying.

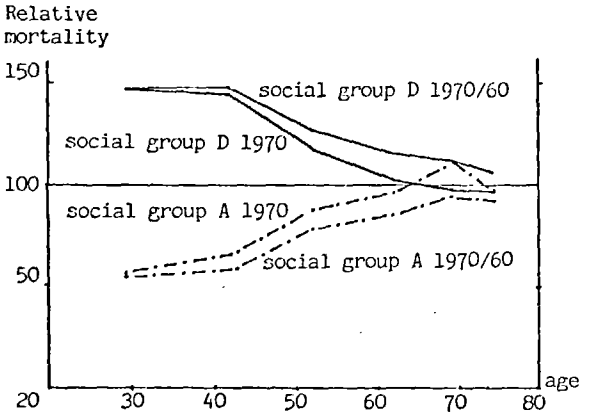
Table 10.1 : Denmark. Men. Age-specific death rates from all diseases, ICD 000 - 799.

	Age at 1970 census		
	15-19	20-24	25-29
	Death rate per 100,000 in the population		
Unskilled workers	38.4	36.3	58.3
Skilled workers and apprentices	27.0	24.3	46.1
Salaried employees	29.8	31.3	32.9
Self employed	----	39.7	30.1
Students	29.2	29.8	34.5
Pensioners	794.4	668.7	664.0

Note : unpublished data from the Danish study

It is *more difficult to obtain a picture of occupational mortality for females than for males. The lower labour participation rate and lower mortality rates for women lead to a generally inadequate number of cases for a detailed cause-specific death rate analysis* (3).

Figure 10.1 : Norway. Men. Age-specific death rates for social groups A and D as a per cent of death rates for all occupied men. Occupation in 1970 and in 1970/60.



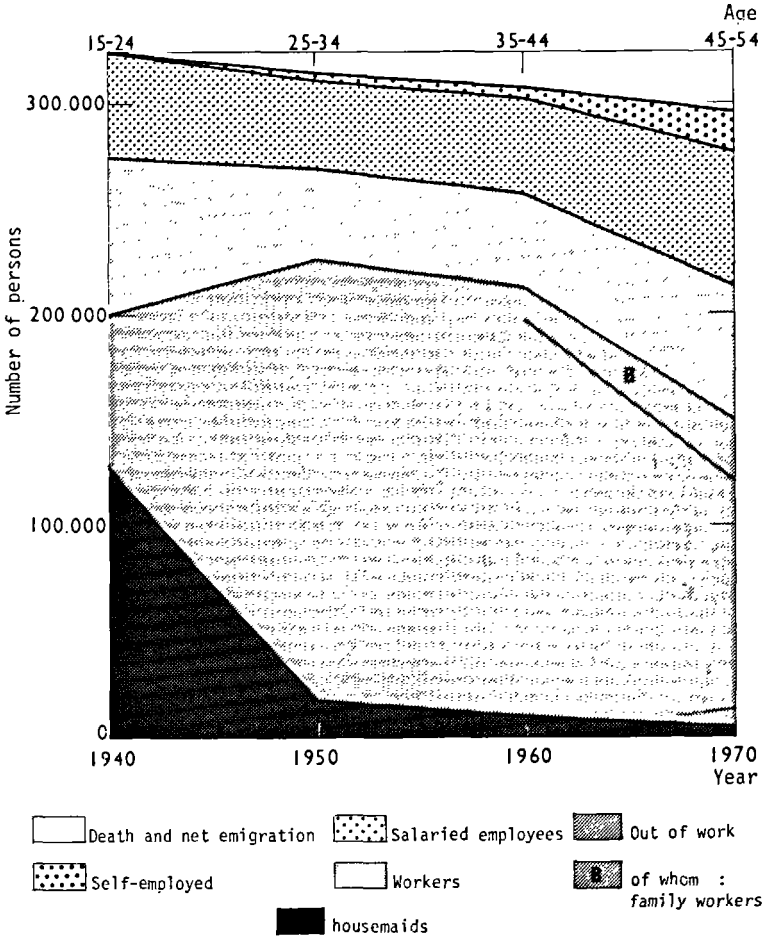
A common result of the Nordic studies is, however, that the mortality differences between occupational groups of women are smaller than the equivalent differences among men. Housewives have a 40% higher mortality than occupied women in Denmark, and especially high rates are found for housewives married to unskilled workers.

The occupational career for a generation of Danish women is shown in Figure 10.2, where the group of women aged 45-54 years in 1970 is followed back through the three foregoing decennial censuses. At the age of 15-24 years, the majority of the women were working either as housemaids, workers or salaried employees. From the beginning of the childbearing age, the majority of the women stayed at home until some of them joined the labour force anew between the 1960 and 1970 censuses. Within this generational pattern, additionally individual movements in and out of the labour market can take place. The linked Norwegian data show that, for example only 24% of the 17,000 women working in the textile industry in 1970 had been working in the industry for at least ten years. The mortality in 1970-1973 was considerably higher for the women who had left the textile industry and the labour market since 1960 than for women working in the industry in 1970 - immediately before the start of the mortality follow-up study.

A further complication for the study of occupational mortality differences among women is, therefore, the considerable amount of labour market movements, which are probably - more or less - simultaneously health selection processes.

Despite differences in classifications, methods of calculation, etc., the Nordic studies show some important common traits of the population health profile, e.g., a high lung cancer death rate for workers in the chemical industry, a low suicide rate for higher

Figure 10.2. Denmark. Women. Occupational career for a ten-year generation of women



educated men and a high suicide rate for higher educated women, etc. Standardisation of the tabulation procedure could extend the scope for this sort of comparison. Examples for further analysis could be mortality from digestive and circulatory diseases among salesmen and clerks, cancer mortality among laboratory technicians and pharmacists, and general mortality figures for specified groups of workers in the food industry.

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R E F E R E N C E S

1. Statistisk Sentralbyrå : Yrke og dødelighet (Occupational Mortality) 1970-1973. Statistiske analyser nr. 21. Oslo, 1976.
2. Danmarks Statistik : Dødelighed og erhverv (Occupational Mortality) 1970-1975. Statistiske Undersøgelser nr. 37. København, 1979.
3. Sauli, H. : Ammatti ja kuolleisuus (Occupational Mortality) 1971-1975. Tilastokeskus. Tutkimuksia, n°. 54. Helsinki, 1979.
4. Kristoffersen, L. : Yrke og dødelighet (Occupational Mortality), Statistisk Sentralbyrå. Rapporter 79/19. Oslo, 1979.

F I N L A N D

SOCIO-ECONOMIC DIFFERENTIAL MORTALITY IN FINLAND

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The Central Statistical Office of Finland has carried out a study on occupational mortality differentials by matching death certificate records with census records. The report from this study was published in 1979. In addition to occupation, other variables such as level of education, place of birth, religion and main language were included in the matched material, as this could be done without extra expense. The Central Statistical Office had no resources for carrying out more extensive analyses and the data set was made available to researchers outside the Office. The data are now used by a research group at the Department of Sociology of the University of Helsinki for studying mortality differentials by socio-economic status, level of education, region, marital status, main language, place of residence, etc.

Compilation of data

The whole population of Finland covered by the 1970 census is defined as the population at risk. The population immigrating after completion of the census is, therefore, excluded as are persons who have not been included in the census for one reason or another.

Data on all deaths in the period 1971-75, causes of death, etc., were obtained from death certificate data collected for the statistics on causes of death. Occupational and other background data on deceased persons were compiled from data from the 1970 census by linkage with the help of personal identification codes. There were 218,000 recorded cases of death in Finland in the period 1971-75. 4,263 of these deaths could not be matched with census records. More than 3,000 of the mismatches were due to inadequacies in the coverage of the census or to immigration after the census. These deaths occurred outside the population at risk and were excluded from the material. The approximately 1,000 cases involving a missing or changed personal identification code form the actual cases of non-response.

Emigration also produces non-response; data on the death of an emigrant who is thus excluded from the resident population in Finland are not included in the statistics on causes of death. In 1971-75, about 64,000 persons emigrated from Finland. Approximately 100 persons who were in the resident population at the time of the census have been estimated to have died abroad in 1971-75. On the basis of this estimate, about 1,100 cases of death, or approximately 0.5% of all cases falling within the scope of the survey have not been covered by it.

The design of the study resembles that of a follow-up survey; the population structure is analysed at a certain time followed by a study of mortality for five years. The material had been collected, however, for normal statistical purposes, and the specific needs of the analysis of differential mortality had not been taken into account in data collection.

The difficulties encountered, drawbacks and advantages

Since the study is based on matched records, the problem of consistency between the numerators and denominators of death rates has been solved satisfactorily. The calculations can be considered technically reliable because the information on occupation, social status, etc., of the diseased and the risk population have been measured and processed uniformly, and thus, the numerators and denominators correspond exactly to each other.

The main problems concern the interpretation of the observed mortality differentials. We do not have direct knowledge of the health risks persons are subject to, and we do not have life histories of the study population, etc. Especially, the interpretation of occupational mortality differentials has been difficult because of the lack of data on different selection processes. More relevant data is needed.

In measuring socio-economic differences, were are in need of good indicators of social status. The ones that are readily available are either subject to different selection processes (socio-economic status) and/or are too crude for distinguishing between relevant subgroups (e.g., education).

Main results

Mortality differentials between socio-economic groups were found to be rather large in the study period in Finland. There was also a strong and consistent adverse connection between education and mortality, especially among males. As to the causes of death, most of the results were "non-specific" : relative mortality differentials among social groups were similar for most causes of death studies, although the sizes of the differences varied. Those with better social status or more education had a smaller risk of dying than those with lower social status or less education in almost any disease or non-natural cause of death.

A most important problem among those that can be studied with socio-economic mortality data is : which of two alternative frameworks is more useful in explaining mortality differentials? The first framework may be called "the specific etiology framework" and the second "the unspecific etiology framework".

The specific etiology framework is the traditional framework of medicine. According to this, deaths are caused by specific diseases or injuries. Each specific disease has specific and identifiable causes (e.g., virus causing influenza or smoking causing lung cancer). To explain why there are differences between the mortality of the upper class and the working class, we have to analyse each cause of death separately and try to identify those "risk factors" of each disease to which the working class is more susceptible than the upper class. For example, in the study of the differences in mortality from coronary heart disease, the differences in smoking habits, intake of animal fat, physical exercise, etc., would be used to explain the socio-economic differential in mortality.

The non-specific etiology framework starts with the assumption that health is an indivisible resource of each individual. The living conditions of the individual determine the extent to which the health of the individual is weakened or the extent to which the individual is able to renew his health and resist degradation. The illness or death of a person cannot be understood correctly as the influence of specific risk factors, but as the outcome of a general process which is determined by the total life history and life situation of the individual (together with genetic characteristics of the person). Research using the unspecific etiology framework is not interested in the analysis of mortality from a specific cause of death in isolation from other causes of death. Rather, it attempts to develop hypotheses about the mechanisms through which living conditions and ways of life have an effect on many different causes of death and on total mortality. Such concepts as "stress" or "stressors", "life changes" and "ability to cope" may be useful in this kind of research.

The unspecific etiology framework leads us to expect that relative mortality differentials among social classes are similar for different causes of death. According to the specific etiology framework, no such uniformity could be assumed. Our results seem to support the hypothesis that socio-economic mortality differentials for men are general in character. It seems likely, however, that some specific factors, such as smoking, industrial dust or outdoor work, increase the excess risk of death from respiratory diseases and lung cancer in the lower class. Among women, the situation is more complicated since differences among social groups are less uniform than among men.

The regional differentials in Finland seem to be more specific than socio-economic differentials, since they are much greater and more consistent in cardio-vascular mortality than in mortality from other causes. This leads to the hypothesis that the determinants of

regional mortality differentials in cardio-vascular mortality are different in nature from those of socio-economic differentials.

Reports

a) Sauli, H. *Occupational Mortality in 1971-75.* Central Statistical Office of Finland, Studies n°. 54, Helsinki, 1979. The report describes the mortality of the 35-64 year old population by occupation, age and sex. The results are based on 43,886 male and 19,399 female deaths, of which 28,789 males and 7,223 females were economically active at the time of the census. Occupation was classified according to ISCO (two-digit level). The report contains an English summary and English explanations of the statistical tables and charts.

b) Sauli, H. *Socio-economic Differential Mortality in Finland in 1971-75.* M.A. thesis in sociology, University of Helsinki. In Finnish only.

c) Sauli, H. *The Socio-economic Aspects of Occupational Mortality in Finland.* Scandinavian Population Studies, 5, Oslo 1979.

d) Valkonen, T. *Comment.* Scandinavian Population Studies, 5, Oslo 1979.

F R A N C E

LA MORTALITE SUIVANT LE MILIEU SOCIAL

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Travaux effectués à l'INSEE
(English translation follows)

Le plus souvent, l'étude de la mortalité utilise deux sources statistiques distinctes : les registres de l'état civil et les recensements. Dans le calcul des quotients de mortalité, les recensements fournissent les dénominateurs, c'est-à-dire les effectifs soumis aux risques; les statistiques de l'état civil fournissent les numérateurs, c'est-à-dire les événements.

C'est ainsi que sont calculés les quotients de mortalité par sexe et âge, ou par région. Dans ces cas, en effet, il n'y a aucune ambiguité : le sexe ne change pas, l'âge est assez facile à déterminer et la localisation géographique ne pose pas trop de problèmes.

Si l'on veut étudier la mortalité suivant d'autres critères, la méthode précédente ne convient plus ou convient très imparfaitement : soit que le critère ne figure pas dans les statistiques de l'état civil (c'est le cas du niveau de diplôme en France), soit que le critère que l'on veut observer est difficile à décrire de manière objective : c'est le cas de la catégorie sociale.

La difficulté à appréhender la catégorie sociale intervient de plusieurs façons : la catégorie sociale, en France tout au moins, est définie à partir de la profession exercée, du statut professionnel (travailleur indépendant, employeur, salarié) et de la qualification professionnelle.

Entre le recensement qui décrit la population et le décès d'un individu, la situation professionnelle peut changer et, avec elle, la catégorie sociale où est classé l'individu. En particulier, on peut constater une surmortalité très forte des inactifs, une maladie ayant pu contraindre un individu à interrompre son activité. En outre, les conditions dans lesquelles est déclarée la profession diffèrent très sensiblement suivant qu'il s'agit du recensement,(où c'est la personne elle-même qui décrit sa profession), ou bien du décès. Même quand il n'y a pas eu changement de situation, le classement peut être très différent.

On utilise en France une méthode qui échappe partiellement à cet inconvénient. Chaque individu est classé dans une catégorie sociale une fois pour toutes, selon ses caractéristiques relevées lors d'un recensement.

1. Description méthodologique

En France l'INSEE met en oeuvre une méthode prospective : un échantillon d'individus nés en France a été prélevé dans les documents du recensement de la population de 1954. Après un tirage mécanographique, on est retourné aux bulletins de recensement pour noter l'identité des individus, ainsi que le lieu de naissance, caractéristiques qui ne sont pas utilisées pour l'exploitation statistique du recensement et ne figurent donc pas dans les fichiers.

Ensuite, on a rapproché cette liste nominative d'individus du Répertoire National d'Identification (1) : on n'a conservé que les individus qui ont pu être retrouvés dans ce répertoire. Des consultations périodiques de ce dernier ont, par la suite, permis de

1. Le Répertoire National d'Identification est un répertoire où sont inscrits tous les individus nés en France depuis 1881, avec leur date de naissance. On y transcrit le décès avec la date.

noter les décès survenus dans l'échantillon, ainsi que leur date, et donc de mesurer la mortalité, aussi bien de l'ensemble de l'échantillon que de tout groupe suffisamment nombreux, défini par ses caractéristiques en 1954, année du recensement.

2. Quelques caractéristiques de l'échantillon; durée d'observation

Un échantillon d'environ 500.000 hommes de 30 à 69 ans (en 1954) a été tiré du recensement de 1954. On a choisi douze catégories socio-professionnelles (1) dans la nomenclature des catégories socio-professionnelles définies en France à l'exclusion des groupes trop peu nombreux ou trop hétérogènes. Elles représentent les trois quarts environ de la population masculine de 30 à 69 ans. Seuls ont été tirés des individus français nés en France; pour les étrangers, même nés en France, le risque semblait trop grand que le décès ne soit pas porté au répertoire s'il survenait hors de France.

Les taux de sondage ont été choisis de façon à avoir 50.000 individus environ dans chaque catégorie socio-professionnelle et à observer autant de décès dans chaque groupe d'âge, ce qui a conduit à surreprésenter les jeunes.

Les 500.000 hommes étant sélectionnés, il a fallu retourner aux bulletins; on a profité de cette opération pour inclure, dans l'échantillon, les épouses des hommes mariés, soit environ 330.000. On a affecté à ces femmes la catégorie sociale de leur mari.

Plusieurs consultations (2) du répertoire ont été effectuées : en 1964, en 1972 et en 1973, permettant des mises à jour au 1er janvier 1961, puis au 1er janvier 1966 et, enfin, au 1er janvier 1972. Ces mises à jour ont donné lieu à différents calculs et à des publications (voir bibliographie en annexe).

3. Avantages et inconvénients de la méthode

La méthode appliquée en France par l'INSEE a été conçue pour éviter l'inconvénient majeur que représente l'utilisation de deux sources statistiques distinctes (voir plus haut). Elle a été rendu possible par l'existence du Répertoire National d'Identification. Si elle apparaît comme assez sûre, elle n'échappe pas à certains défauts :

- elle est coûteuse, puisqu'elle suppose le tirage d'un échantillon très important, avec retour aux documents du recensement;

- l'échantillon doit être suivi de longues années (et même jusqu'à extinction complète, si on veut s'assurer que les décès ont bien été tous enregistrés);

- le Répertoire National d'Identification n'est pas un instrument parfait : en particulier, certains décès survenus à l'étranger n'y sont pas transcrits et quelques individus y deviennent "immortels";

- par ailleurs, tout est figé à la situation décrite au recensement : la méthode ne permet pas de prendre en compte les changements de situation professionnelle ou géographique;

- enfin, compte tenu de la lente évolution de la mortalité aux âges adultes, la méthode n'est pas très adaptée à la mesure des évolutions et ne permet pas de bien répondre à la question suivante : les écarts se creusent-ils ou se réduisent-ils? Ceci s'explique par plusieurs raisons. Une première raison se com-

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1. Voir liste page suivante.
2. Les consultations ont, jusqu'ici, été manuelles car le répertoire n'a été automatisé qu'au cours de l'année 1973.

prendra à partir d'un exemple : considérons, par exemple, la mortalité entre 45 et 54 ans : en début de période d'observation (1955-1960), elle touche des individus âgés, au moment du recensement, de 40 à 54 ans; en fin de période (1966-1971), elle touche des individus qui avaient, en 1954, 30 à 43 ans, soit environ dix ans de moins. Un effet de sélection permet de penser que les individus actifs de 40 à 54 ans ont une santé suffisamment bonne pour être encore actifs à cet âge; meilleure, en moyenne, que les individus de 30 à 43 ans. Une autre raison provient des changements professionnels qui affectent la vie professionnelle, qui font que, par exemple, les manoeuvres de 30 ans ne sont pas tout à fait comparables à ceux de 55 ans.

4. Quelques résultats importants de l'enquête

L'enquête révèle des écarts importants de mortalité entre les classes sociales, qui se réduisent avec l'âge : les quotients de mortalité varient de 1 à 4 entre les catégories extrêmes à 35 ans, de 1 à 1,5 à 75 ans. Ces écarts se traduisent par une différence d'environ 8 ans entre les espérances de vie à 35 ans : 33 ans pour les plus touchés par la mortalité (les manoeuvres), 41 ans pour les moins touchés : instituteurs et cadres supérieurs.

Nombre de survivants à 75 ans (pour 1.000 à 35 ans), espérance de vie à 35 ans et quotients de mortalité à 35, 55, 75 ans par catégorie socio-professionnelle (hommes; période 1955-1971)

Catégorie socio-professionnelle[2]	Nombre de survivants à 75 ans pour 1.000 à 35 ans[1]	Espérance de vie à 35 ans	Quotient de mortalité pour mille à :		
			35 ans	55 ans	75 ans
42. Instituteurs	574	40,9	1,02	7,8	59,5
39. Cadres supérieurs, professions libérales	551	40,5	1,07	8,3	61,2
81. Clergé catholique	524	39,5	1,24	9,2	68,2
45. Cadres moyens (public)	518	39,3	1,33	9,5	68,3
43. Techniciens	507	39.0	1,55	10,2	67,8
44. Cadres moyens (privé)	489	38,5	1,78	11,1	69,0
00. Agriculteurs exploitants	473	38,0	1,90	11,7	71,7
60. Contremaîtres	472	37,8	2,02	11,9	70,5
62. Ouvriers qualifiés (public)	416	37,3	1,91	12,3	79,2
52. Employés (public)	448	37,2	1,98	12,4	77,6
29. Artisans et commerçants	460	37,6	2,21	12,5	71,3
51. Employés (privé)	448	37,4	2,28	13,0	73,8
64. Ouvriers spécialisés (public)	406	36,0	2,47	14,4	83,8
61. Ouvriers qualifiés (privé)	380	35,6	2,49	15,1	91,7
10. Salariés agricoles	356	34,8	2,72	16,2	96,9
63. Ouvriers spécialisés (privé)	362	34,7	3,02	16,6	91,2
68. Manoeuvres	310	32,9	4,38	20,5	96,0
FRANCE ENTIERE	412	36,1	2,69	14,6	79,6

[1] Le nombre de survivants a été calculé en appliquant à un effectif de 1.000 personnes de 35 ans les quotients de mortalité de 35 à 75 ans obtenus par ajustement.

[2] Dans toute la suite, il s'agit de la catégorie socio-professionnelle au recensement de 1954.

Dans toutes les régions et quelle que soit la taille des agglomérations, la hiérarchie des catégories est la même. Cependant, les différences sont plus marquées dans les grandes agglomérations.

Un rapprochement avec les statistiques de causes de décès montre que certaines d'entre elles affectent presque également toutes les catégories (maladies cardiaques) alors que d'autres causes épargnent presque totalement certaines catégories (les instituteurs, le clergé catholique ne meurent pratiquement pas d'alcoolisme). Contrairement à ce qu'on pourrait croire, on ne décèle pas de maladie de civilisation qui toucherait plus les groupes de niveau culturel élevé que les autres : ainsi, les quotients de mortalité par cancer sont les plus élevés dans les catégories défavorisées.

5. Prolongements de l'étude

Après quelques années d'interruption, l'étude de la mortalité suivant le milieu social va être reprise :

1. Une nouvelle mise à jour va être effectuée pour l'échantillon tiré du recensement de 1954;

2. Un nouvel échantillon est en cours de tirage à partir du recensement de 1975 : des hommes et des femmes ont été tirés indépendamment.

Ces deux travaux devraient permettre d'obtenir de nouveaux résultats dans le courant de l'année 1982.

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B I B L I O G R A P H I E

1. M. Febvay et M. Aubenque : "La mortalité par catégorie socio-professionnelle", Etudes statistiques n°. 3, juillet-septembre 1957.

Cet article présente quelques résultats concernant la mortalité suivant le milieu social, obtenus par la méthode classique utilisant l'état civil et les recensements.

2. M. Calot et M. Febvay : "La mortalité différentielle suivant le milieu social : période 1955-1960", Etudes et conjoncture n°. 11, novembre 1965.

3. G. Desplanques : "A 35 ans, les instituteurs ont encore 41 ans à vivre, les manoeuvres 34 seulement" : résultats de la période 1955-1965, Economie et statistique n°. 49, octobre 1973.

4. G. Desplanques : "La mortalité des adultes suivant le milieu social" : résultats de la période 1955-1971, Collection de l'INSEE, série D, n°. 44.

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E N G L I S H T E X T

(Original : French)

Very often, mortality studies use two statistical sources ; death certificate data and census data. In calculating mortality rates, the census data give the denominators, i.e., the population under risk and the certificates of deaths supply the numerators, i.e., the events.

Mortality rates according to sex and age are also calculated in this way, or according to region. In these cases, there is indeed no difficulty : sex does not change, age is enough easy to determine and geographic localisation causes no problem.

The difficulty in defining the socio-professional status is due to several reasons. In France, this status depends upon the profession, the "status" (independent worker, employer, wage-earner) and upon the skill.

Between the census, which describes the population, and the death of a person, the professional situation can change and, with it, the socio-professional status. Especially, we can measure a very high mortality of non-working people : a disease can have obliged an employed person to stop his activity. Besides, conditions under which the job is declared are very different at a census, where a person declares himself his situation, and at death : the same job can be classified in different social groups.

To avoid such a drawback, France uses a method where people are classified definitively in a category, according to their characteristics at a census.

1. Methodological aspects

France uses a prospective method : a sample of people born in France was drawn from the documents of the 1954 census : from the census reports, the identity was taken : name, surname and place of birth.

Then, these identified people were sought out in the central population register held by INSEE. In this register (manual until 1973 and now computerised) are inscribed all the people born in France, with name, surname, date and place of birth. When a person dies, date and place of death are added.

When a person of the sample was found in the register, it was possible to follow up his/her situation by checking in the register from time to time.

2. Sample characteristics; follow-up duration

A sample of about 500,000 men aged 30 to 69 years old in 1954 was drawn from the 1954 census. Twelve socio-professional categories were chosen amongst those defined in France, these twelve holding about three-quarters of the male population aged 30 to 69 years. When these men were married, their wives were included in the sample : about 330,000 women.

Three up-datings were achieved as of January 1st, 1961, January 1st, 1966, and January 1st, 1972. A fourth up-dating, as of January 1st, 1980, will be undertaken in 1981 or 1982. The up-datings which have already been carried out have led to some publications (see annex).

3. Drawbacks and advantages of the method

The prospective method used in France avoids the important drawbacks mentioned previously. Such a method is possible due to the existence of the register which can be considered as safe, but, nevertheless, presents some drawbacks :

- the cost is very high, since such a method needs a large sample;
- this sample must be followed up over a long time;
- the register has some faults : especially, some deaths occurring in foreign countries are not incorporated into the register;
- the characteristics are those at the time of the census : the method does not take into account the changes in the professional situation;
- finally, in a period where the mortality rates among adults change very slowly, the method does not permit to answer the question whether the differences between social groups are increasing or not. The different observation periods are, at the same time, different follow-up periods. At the 1954 census, only men capable of performing their job were to be included in an occupational group, apart from retired men; so, an increase in mortality must be expected for each occupational group when the follow-up period is prolonged.

4. Some results

The survey shows high differences between mortality rates in social groups and these differences are reduced when age increases : the mortality rates go from 1 to 4 between extreme groups at 35 and from 1 to 1.5 at 75. In other terms, life expectancy at 35 is eight years higher in the groups which have the lowest mortality : 41 years for teachers and senior management and professions, 33 years for unskilled workers.

In all regions and in all sizes of towns, the hierarchy of social categories is the same. But, in larger towns, differences are greater.

5. Further studies

The study of mortality according to occupation should be undertaken again :

- a new up-dating of the 1954 sample must be achieved;
- a new sample is being drawn from the 1975 census : men and women separately.

These two undertakings should allow to obtain new results in 1982.

N.B. See bibliography page 48.

F R A N C E

LA MORTALITE DIFFERENTIELLE DES ENFANTS DE MOINS D'UN AN

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Travaux effectués à l'INSEE

I. Aperçus méthodologiques

a. Indices courants de mortalité infantile

Les taux de mortalité infantile sont couramment calculés en France à partir de deux statistiques de l'état civil indépendantes : celle des naissances, d'une part, établie à partir des bulletins statistiques de naissance, et celle des décès, d'autre part, établie à partir des bulletins statistiques de décès qui, du fait qu'ils servent à établir la statistique des causes de décès, sont anonymes. Ces taux rapportent les décès survenus au cours d'une année aux naissances correspondantes (naissances de l'année d'observation et de l'année précédente).

Cette méthode ne permet pas d'affiner l'analyse de la mortalité infantile au-delà des taux par sexe et durée de vie, et d'étudier, par exemple, la mortalité infantile suivant l'âge de la mère ou la catégorie socio-professionnelle du père.

Le bulletin statistique de décès est le même pour tous les décédés et ne comporte pas de questions spécifiques aux enfants de moins d'un an telles que : circonstances de la naissance, qualité juridique, caractéristiques socio-démographiques des parents, etc.

De plus, même pour les informations qui figurent dans les deux bulletins, on ne peut être assuré que chaque enfant est classé de la même façon à la naissance et au décès, ce qui est nécessaire pour obtenir des taux de mortalité corrects.

A supposer que la situation n'ait pas changé entre les deux dates, rien ne prouve qu'elle ait été déclarée de façon identique dans les deux cas. Et même si elle a été déclarée de façon identique, ou au moins équivalente, elle peut avoir conduit à un classement différent, par suite d'une erreur lors de la codification ou de la saisie de l'information. Les erreurs de déclaration ou de codification sont, heureusement, rares lorsqu'il s'agit du sexe ou de la date de naissance; elles peuvent être beaucoup plus fréquentes lorsqu'il s'agit, par exemple, de la catégorie socio-professionnelle.

En outre, la situation réelle a pu changer entre la naissance et le décès de l'enfant (sauf, bien entendu, s'il s'agit d'une caractéristique permanente comme le sexe ou la date de naissance). Par exemple, le lieu de domicile (qui figure à la fois dans le bulletin de naissance et dans le bulletin de décès) n'est plus forcément le même lors du décès qu'au moment de la naissance.

b. Méthode utilisée pour l'étude différentielle

Le document de base n'est plus le bulletin statistique *anonyme* de décès, mais l'avis *nominatif* de décès, à but administratif, qui ne comporte que des caractéristiques d'état civil du décédé, en particulier le nom, les dates et lieux de naissance et de décès.

Ces avis de décès sont triés comme les bulletins de naissance par commune et date de naissance. Le nom permet de retrouver le bulletin de naissance de chaque enfant décédé. On ajoute alors simplement sur le bulletin de naissance la date du décès. Ainsi est

constitué un fichier des enfants décédés avant l'âge d'un an, extrait de celui des naissances. Tous les renseignements socio-démographiques concernant les parents sont pris au moment de la naissance. Il est ainsi possible de calculer des taux de mortalité pour toutes les catégories d'enfants définies par les renseignements portés sur les bulletins de naissance.

Il faut noter que les taux de mortalité ainsi calculés portent sur les enfants *nés* au cours d'une année civile (ou génération) et non sur les enfants *décédés* au cours de cette année comme dans les statistiques courantes.

c. Avantages et inconvénients de la méthode

A côté des avantages fondamentaux cités ci-dessus, cette méthode présente quelques inconvénients découlant du couplage d'un avis nominatif de décès à un bulletin statistique de naissance :

i. L'étude est limitée aux variables figurant sur le bulletin de naissance. La possibilité d'adjoindre de nouvelles variables dépend des possibilités de modification du bulletin de naissance.

ii. Impossibilité d'étudier la mortalité par cause de décès, celle-ci ne figurant pas sur l'avis de décès.

iii. Légère perte d'information : 1 à 3% d'avis de décès ne peuvent être rapprochés des bulletins de naissance. Ce fait est imputable essentiellement à trois causes :

- bulletins statistiques de naissance ou avis nominatifs de décès imparfaitement renseignés;
- enfants qui, nés illégitimes, ont changé de nom à la suite d'une adoption, d'une légitimation ou d'une reconnaissance (d'où risque de sous-estimation de la mortalité des enfants naturels. Toutefois, un changement de nom n'empêche pas toujours le rapprochement);
- enfants nés hors métropole et décédés en métropole pour lesquels on n'a pas de bulletin statistique de naissance.

L'importance relative de ces trois causes de non-appariement n'a pas été chiffrée.

4. Biais dû à l'émigration

Un enfant né hors de France métropolitaine et décédé en métropole est compris dans la statistique habituelle des décès, établie à partir des bulletins de décès; par contre, son avis de décès n'est pas compris dans la statistique spéciale de la mortalité infantile, puisqu'il n'a pas pu être apparié à un bulletin de naissance. Mais il n'en résulte pas d'erreur sur le taux de mortalité infantile mesuré par la méthode spéciale, puisque l'enfant n'est compris ni dans les naissances, ni dans les décès.

Au contraire, un enfant né en France métropolitaine et décédé hors métropole entraîne une sous-estimation de la mortalité infantile, car cet enfant est compris dans les naissances mais non dans les décès. Toutefois, la sous-estimation ne peut être que minime.

II. Principaux résultats

L'étude a commencé pour la génération 1950. Pour l'instant, les derniers résultats publiés sous forme détaillée sont relatifs aux générations 1966-1970.

1. La mortalité des enfants illégitimes dépasse d'environ 50% celle des enfants légitimes; elle diminue moins vite et l'écart s'accentue (tableau 1).

Dans le premier mois, la mortalité des enfants illégitimes qui, pour les générations 1955 à 1960, dépassait de 40% celle des légitimes, est, pour les dernières générations étudiées, de 60% supérieure. Du 2ème au 12ème mois, la mortalité est en moyenne de 70 à 75% plus élevée chez les illégitimes.

2. Les taux les plus faibles sont observés lorsque la mère a de 25 à 29 ans; ils sont plus élevés d'un tiers de 35 à 39 ans et de deux-tiers après 40 ans.

Avant 20 ans, les taux sont presque aussi élevés qu'au-delà de 40 ans (tableau 2).

L'évolution d'une génération d'enfants à la suivante est telle que la courbe représentative, en forme de U, se creuse, la baisse étant plus marquée aux âges de la mère où la mortalité est la plus faible.

3. La hiérarchie des catégories sociales selon le taux de mortalité infantile n'a pas été modifiée depuis vingt ans, mais l'écart relatif entre la catégorie la plus favorisée (professions libérales et cadres supérieurs) et les catégories les moins favorisées (mineurs et manoeuvres) s'est réduit de 1950 à 1959 et n'a guère changé depuis.

L'écart entre catégories extrêmes est plus important pour la période du 2ème au 12ème mois (le rapport est de 1 à 5 pour les générations 1956 à 1960, de 1 à 4 depuis) que pour le premier mois (1 à 2). La mortalité exogène est donc relativement plus forte dans les catégories les plus défavorisées.

Le taux moyen (toutes catégories réunies) de mortalité infantile coïncide à peu près avec celui des ouvriers qualifiés et des agriculteurs exploitants. La mortalité des enfants de manoeuvres nés en 1970 est égale à la mortalité infantile moyenne des enfants nés en 1960; celle des salariés agricoles est égale à celle des enfants nés en 1964. A l'inverse, la mortalité infantile moyenne des enfants nés en 1970 est celle des enfants de cadres moyens de la génération 1961 et des enfants de cadres supérieurs de la génération 1958 (tableau 3).

4. Qu'on étudie les différences de mortalité infantile en fonction de la nationalité du père ou celle de la mère, les résultats sont sensiblement les mêmes.

Globalement, la mortalité des enfants d'étrangers (Algériens exclus) n'est que légèrement supérieure à celle des enfants de parents français. Toutefois, l'écart relatif s'est accentué au cours de la période étudiée et dépasse 20% pour les dernières générations. La surmortalité des enfants d'Algériens est beaucoup plus importante, mais s'est un peu réduite avec le temps : + 90% (taux presque double) pour les générations 1956 - 1960, + 70% pour les générations 1966 - 1970.

Ces différences sont loin d'être les mêmes pour la mortalité du premier mois et pour celle du 2ème au 12ème mois. La mortalité du premier mois présente des disparités assez faibles.

Jusqu'en 1964, les taux sont les mêmes chez les étrangers que chez les Français, mais depuis, ils baissent moins vite. Chez les Algériens, la mortalité du premier mois dépassait celle des Français de 12% dans les générations 1956 à 1965; dans les générations 1966 à 1970, l'écart est passé à 25%.

Pour la mortalité du 2ème au 12ème mois, les disparités sont très importantes. Elles se sont accentuées au cours des cinq dernières années pour les enfants d'étrangers. Jusqu'à la génération 1964, leur mortalité moyenne du 2ème au 12ème mois était de 30% supérieure à celle des Français; depuis, l'écart est voisin de 60%. Chez les Algériens, le rythme de décroissance est sensiblement le même que chez les Français, mais le taux est trois fois plus élevé (tableau 4).

III. Prochaines étapes

L'exploitation des résultats relatifs aux générations 1970 - 1974 est en cours d'achèvement. Leur publication est prévue avant la fin de l'année 1981. L'étude portant sur les générations 1975 - 1979 est prévue pour 1983.

IV. B I B L I O G R A P H I E

1. M. Febvay et M. Croze : "Nouvelles données sur la mortalité infantile", Population, 1954, n°. 3

2. M. Croze : "La mortalité infantile suivant le milieu social", Actes du Congrès de l'Union internationale pour l'étude scientifique de la population, Ottawa, 1963.

3. S. Hémery et M.-C. Gérard : "La mortalité infantile en France selon le milieu social", Actes du Congrès de l'Union internationale pour l'étude scientifique de la population, Liège, 1973.

4. S. Hémery et Q. C. Dinh : "Facteurs socio-démographiques des disparités régionales de la mortalité infantile", Actes du Vème Colloque national de démographie, CNRS, Nice, 1976.

5. "Mortalité infantile des générations 1950 - 1951 et 1955 - 1960 suivant le milieu social et la résidence", I.N.S.E.E., Etudes et documents démographiques, n°. 9, Paris, 1965.

6. "Mortalité infantile des générations 1961 à 1970", I.N.S.E.E., Collection D, Démographie et Emploi, n°. 75. Paris. 1980.

Tableau 1 : Taux de mortalité infantile suivant la qualité juridique et la durée de vie

(pour 1.000 nés vivants)

Qualité juridique	Mortalité du 1er mois			Mortalité du 2è au 12è mois			Mortalité de la 1ère année		
	Générations			Générations			Générations		
	1956-1960	1961-1965	1966-1970	1956-1960	1961-1965	1966-1970	1956-1960	1961-1965 (1)	1966-1970
Légitimes	18,4	15,7	13,4	11,2	7,4	5,5	29,6	23,1	18,9
Illégitimes	26,0	23,8	20,9	20,4	13,2	9,9	46,4	37,0	30,8
Ensemble	18,9	16,1	13,9	11,7	7,7	5,7	30,6	23,8	19,6

Tableau 2 : Taux de mortalité infantile suivant l'âge de la mère et la durée de vie

(pour 1.000 nés vivants)

(enfants nés légitimes : générations 1963 à 1970)

Age de la mère	Mortalité du 1er mois	Mortalité du 2ème au 12ème mois	Mortalité de la 1ère année
Moins de 20 ans	18,7	8,0	26,7
20 à 24 ans	13,4	5,7	19,1
25 à 29 ans	12,4	5,5	17,9
30 à 34 ans	13,9	5,7	19,6
35 à 39 ans	17,0	6,3	23,3
40 ans ou plus	22,3	9,0	31,3
Tous âges	14,1	5,9	20,0

Tableau 3 : Taux de mortalité infantile suivant la catégorie socio-professionnelle du père et la durée de vie (enfants nés légitimes) (pour 1.000 nés vivants)

Catégorie socio-professionnelle du père	Mortalité du 1er mois			Mortalité du 2ème au 12ème mois			Mortalité de la 1ère année		
	Générations			Générations			Générations		
	1956-1960	1961-1965	1966-1970	1956-1960	1961-1965	1966-1970	1956-1960	1961-1965	1966-1970
0 Agriculteurs exploitants	20,8	16,7	13,8	10,4	6,4	4,9	31,2	23,1	18,7
1 Salariés agricoles	21,0	18,2	16,4	14,3	9,5	7,5	35,3	27,7	23,9
2 Patrons de l'industrie et du commerce	17,4	14,8	13,3	8,0	5,7	4,3	25,4	20,5	17,7
3 Professions libérales et cadres supérieurs	12,4	10,9	9,1	4,6	3,8	3,1	17,0	14,7	12,2
4 Cadres moyens	13,8	12,0	10,8	5,9	4,1	3,3	19,7	16,1	14,1
5 Employés	16,7	14,4	12,8	8,2	5,8	4,4	24,9	20,2	17,2
6 Ouvriers	19,3	16,7	14,3	13,5	8,9	6,5	32,8	25,6	20,8
dont :									
69 Ouvriers qualifiés et contremaîtres	17,7	15,5	13,4	10,4	7,0	5,6	28,1	22,5	18,9
63 Ouvriers spécialisés	19,6	17,2	14,8	13,3	9,5	6,9	32,9	26,7	21,7
65 Mineurs	22,6	20,6	18,1	25,7	16,0	10,2	48,3	36,6	28,3
68 Manœuvres	23,1	20,4	18,4	21,7	15,8	12,0	44,8	36,2	30,4
Ensemble FRANCE ENTIERE	18,9	16,1	13,9	11,7	7,7	5,7	30,6	23,8	19,6
Enfants légitimes	18,4	15,7	13,4	11,2	7,4	5,5	29,6	23,1	18,9

Tableau 4 : Taux de mortalité infantile suivant la nationalité des parents et la durée de vie (enfants nés légitimes) (pour 1.000 nés vivants)

Nationalité	Mortalité du 1er mois			Mortalité du 2ème au 12ème mois			Mortalité de la 1ère année		
	Générations			Générations			Générations		
	1956-1960	1961-1965	1966-1970	1956-1960	1961-1965	1966-1970	1956-1960	1961-1965	1966-1970
du père									
Français	18,4	15,6	13,2	10,8	6,9	5,0	29,2	22,6	18,2
Algérien	21,0	16,8	16,6	33,3	21,9	14,3	54,3	38,7	30,9
Etranger	18,4	15,5	14,8	13,1	8,9	7,6	31,5	24,4	22,4
de la mère									
Française	18,4	15,6	13,3	10,9	7,2	5,1	29,3	22,6	18,4
Algérienne	21,0	17,0	16,8	36,5	23,4	14,9	57,5	40,4	31,7
Etrangère	17,9	15,5	14,6	12,7	9,0	7,9	30,6	24,4	22,4
Ensemble des légitimes	18,4	15,7	13,4	11,2	7,4	5,5	29,6	23,1	18,9

F R A N C E

LES DIFFERENCES SOCIO-ECONOMIQUES DE MORTALITE

Travaux effectués à l'INED

Les différences socio-économiques de mortalité constituent un vaste champ de recherches tant du point de vue de la méthode utilisée que de celui des thèmes abordés.

L'INED, qui ne dispose pas des moyens nécessaires à l'investigation de base (traitement des données d'état civil, exécution d'enquêtes *ad hoc*) ne peut jouer qu'un rôle modeste, soit en amont (réflexion sur les méthodes), soit en aval (analyse des résultats), des travaux effectués par l'INSEE. Ces derniers font ici-même l'objet d'une autre note de Guy Desplanques. Celle-ci se bornera donc à rassembler les divers études effectuées par l'INED au cours des dernières années en les classant sous différents thèmes (les nombres entre parenthèses renvoient à la bibliographie jointe).

1. La mortalité par catégorie sociale

Méthodologie

La mesure de la mortalité par catégorie sociale pose de graves problèmes de méthode. Les résultats obtenus en rapportant directement les décès enregistrés à l'état civil, par catégorie socio-professionnelle (CSP) aux effectifs recensés de ces catégories, comparés aux résultats de l'enquête menée par l'INSEE sur le devenir d'un échantillon de personnes recensées en 1954, montrent un double "glissement" de la première méthode par rapport à la seconde (1). D'une part, du fait de l'imprécision des déclarations faites sur la CSP lors du décès, on note une forte sous-estimation de la mortalité des catégories les plus défavorisées et une surestimation de celle des catégories moyennes. D'autre part, plus on s'éloigne dans le temps, du point de départ de l'enquête INSEE, plus les résultats fournis par l'état civil sont inférieurs à ceux de l'enquête. Cela tient au fait que les premiers ne prennent en compte que les actifs alors que les seconds incluent, à mesure que le temps passe, une fraction croissante de personnes sorties d'activité, notamment pour raison de santé.

Cette comparaison ne donne évidemment qu'une vue très partielle des difficultés rencontrées et de la diversité des méthodes utilisées. Celles-ci sont, d'un pays à l'autre, d'une époque à l'autre, très variées et ouvrent un vaste champ d'action à l'analyse (7).

Mesure et évolution des différences

Malgré les difficultés de méthodes, les différences sont patentes. Cependant, deux idées assez généralement admises il y a une vingtaine d'années se sont avérées fausses. D'une part, les différences sociales de mortalité ne sont pas nées de la révolution industrielle. Elles existaient déjà dans l'Ancien Régime, même si elles se sont aggravées avec l'industrialisation (4). D'autre part, les différences n'ont pas disparu avec le développement de la prise en charge par la collectivité des dépenses de santé (4, 6, 8). Il semble, au contraire, qu'en valeur relative, elles se soient maintenues au cours des dernières décennies.

L'interprétation des différences

L'interprétation des différences sociales de mortalité est une question difficile, car elle doit tenir compte à la fois de la manière dont se constituent les catégories

sociales (processus qui n'est jamais vu qu'avec les verres déformants de la définition des catégories utilisées) et de la manière dont l'appartenance à ces classes sociales pèse sur les chances de survie. Y a-t-il un lien entre facteurs biologiques et appartenance sociale? Quelle est la part des effets de sélection dans les différences de mortalité observées? Ces questions commencent seulement à être éclairées par les résultats disponibles. De même que celles concernant la part des différents facteurs propres à l'appartenance sociale : instruction, conditions de travail, conditionnement culturel, etc. (6, 8).

2. Les autres différences socio-économiques de mortalité

Les facteurs socio-économiques de la mortalité ne se limitent pas à l'appartenance à une catégorie sociale, même si celle-ci est toujours corrélée avec les autres.

a. Les variations géographiques jouent un rôle important, au-delà de la structure sociale proprement dite, par le biais des différences culturelles ou environnementales (3, 5). L'importance croissante de la pollution industrielle redonne aux études géographiques toute leur actualité. L'INED est associé à l'Institut de Démographie de Rome dans un programme de recherche sur cette question.

b. Beaucoup d'autres variables socio-économiques pèsent sur les risques de décès. L'attention a été portée récemment, entre autre, sur l'état matrimonial, qui a toujours été un facteur largement discriminant (9).

B I B L I O G R A P H I E

1. LEVY, Claude.-La mortalité par accident des enfants et des adolescents dans huit pays (caractéristiques socio-économiques).- Réunion sur les facteurs et les conséquences socio-économiques de la mortalité. Mexico, Juin 1979 - ONU/OMS, New York, Genève, 1979. pp. 30 - 309.

2. LEVY, Claude et VALLIN, Jacques.- La mortalité par catégorie socio-professionnelle. Un essai de mesure directe.- à paraître dans Population.

3. NIZARD, Alfred et PRIOUX, France.- La mortalité départementale en France.- Population, 1975, n° 4/5, pp. 781-824.

4. NIZARD, Alfred et VALLIN, Jacques.- Influence du développement sur la mortalité différentielle.- Congrès international de la population Mexico 1977, UIESP, Liège 1977, pp. 441-481.

5. PRIOUX, France et VALLIN, Jacques.- Evolution des disparités de la mortalité infantile entre les départements français.- Les disparités démographiques régionales, Ve colloque national de démographie du CNRS, Nice 1976, CNRS, Paris 1978, pp. 391-399.

6. VALLIN, Jacques.- Facteurs socio-économiques de la mortalité dans les pays développés.- Réunion sur les facteurs et les conséquences socio-économiques de la mortalité. Mexico Juin 1979. ONU/OMS New York, Genève 1979, pp. 266-302.

7. VALLIN, Jacques.- La mortalité différentielle.- à paraître dans un manuel d'analyse de la mortalité publié par l'INED et l'OMS.

8. VALLIN, Jacques.et BEHM, Hugo.- Mortality differentials among human groups. Séminaire sur les aspects biologiques et sociaux de la mortalité et de la durée de la vie, Fiuggi 1980, UIESP, Liège, 1981.

9. VALLIN, Jacques et NIZARD, Afred.- La mortalité par état matrimonial, mariage sélection ou mariage protection.- Population, n° spécial, hommage à L. Henry, 1977.

F E D E R A L R E P U B L I C O F G E R M A N Y

PRESENT SITUATION AND FUTURE UNDERTAKING

I. The present situation of vital statistics, in particular on mortality

In the Federal Republic of Germany, vital statistics are based on the "Law of vital events and the current adjustment of population figures" of July 4th, 1957, amended on March 14th, 1980. The law lists the characteristics to be covered by vital statistics and the administrative agencies which are to supply the statistical material. Enumeration documents are the enumeration cards for marriages contracted, for births and deaths, and for legal dissolutions of marriages.

In the case of death, the following facts are currently covered :

(a) Day of decease, sex, date of birth, marital status and community of residence; for children in the first year of life : information on the legitimacy;

(b) Religious denomination and nationality;

(c) In the case of married persons : year of birth of the surviving spouse;

(d) Cause of death : for deaths within the first 24 hours of life, length of life also.

The enumeration cards for marriages, births and deaths are filled in by the registrar who records the relevant vital event. Competent is the registrar's office where the marriage is contracted, in the district of which the child was born or where the death occurred. The cause of death is not entered in the enumeration sheet, but in the confidential medical certificate of death. This medical certificate of death is transmitted via the public health office to the statistical office where the cause of death is then inscribed on the enumeration card. The registrars' offices thus transmit the enumeration cards, possibly via the administration of the *Kreis*, to the *Land* statistical offices. There, the enumeration cards are counted, coded and punched, the results then being mechanically tabulated according to the various characteristics.

The first preliminary results comprise only the monthly totals of marriages contracted, live births and foetal deaths as well as of deaths, while the final results contain numerous combinations of the characteristics mentioned before. In addition to the number of infants who died within the first year of life, those who died within the first 28 days are also reported. The regional classification of the tabulated results corresponds to administrative units (community, *Kreis*, governmental district, *Land*).

The evaluation of the data only covers demographic characteristics and causes of death. As to deaths, socio-economic characteristics are presently not covered by vital statistics.

From the statistics of the legal old age insurance, we know the number of pensioners who have died, subdivided by their last profession and their last employment status.

The statistics of persons employed in the public service provides us with departures by death by sector (administration, railroad, post) and by employment status (officials, employees, workers).

II. Projected undertakings

1. As soon as the results of the next population census are available (most probably, the census will not take place before 1982), these results, together with vital statistics, will be used to set up a new official life table. To observe demographic development, a life table is set up each year which is based on the current adjustment of the resident population and the average number of deaths of the last three years.

2. In 1973, a special investigation into infant mortality was undertaken in the *Länder* of the Federal Republic. It was possible to show in what way the mother's age, birth spacing, birth order, weight at birth, illegitimate/marital birth, and community size affect infant mortality. The study is scheduled to be repeated in 1980/81 whereby at least in some of the *Länder*, the economic activity of women with children is to be considered.

3. In connection with the 1% sample of the microcensus which is carried out each year in April, about 75% of the households will be questioned a second time. This allows to establish arrivals and departures of members of the household and the reasons for this. For members who died since the last inquiry, demographic and employment data from the first questioning are available. As, in connection with the 1978 and 1979 microcensus, information on occupation and vocational training had been gained and coded, it is planned to evaluate those cases of death which were counted at the repeated surveys in 1979 and 1980.

4. Probably beginning 1981, the employment records (files of those workers and employees who are insured under compulsory old age insurance) may be used as another source to check into differentiated mortality. In 1981, these records will, for the first time, show departures by death separately, so that those cases can then be evaluated by socio-economic characteristics (branch of industry, occupation, employment status, vocational training, marital status, number of children, and nationality).

J A P A N

MORTALITY OF THE MIDDLE AGED

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The average life expectation of the Japanese became the longest in the world in 1979 with a life span of 73.46 for men and 78.89 for women. The expectation of life means how many years an average person born in 1979 can expect to live. This also serves as a precise indicator of the general health conditions of the country. Counting the mortality : number of deaths divided by the population of each age group from 0 to 80 or more years old, it is clear that the mortality rate of each age group decreases every year and this tendency is clearer in the younger age groups. The close relationship between the age and mortality rate is the reason why the expectation of life is a precise indicator of the general hygiene of the country.

Health conditions in Japan show a great improvement each year and we have been enjoying a regular decrease in the death rate until lately, when it was found that the mortality of men in the 40's is not decreasing. It was at the Presidential-Appointed Researchers' meeting that Professor Toshio Kuroda (College of Economics of Nihon University, and ex-Director of the Institute of Population Problems, Ministry of Health and Welfare), suggested to me that I research the rumour that there is an increase in the number of deaths of the middle-aged. At first, I did not believe that such facts existed. How can only the middle-aged death rate increase while the general average life expectation gets longer? To prove that the middle-aged death rate is not increasing, I drew the death rate curve of each age group and tried to prove that there is no such special rise in the curve of the middle-aged. Strangely enough, contrary to my intentions, the curve showed a steep rise in the middle-aged death rate - only with men, not with women. Drawing the death rate from 1950 to 1976 on one chart, it was found that the middle-aged death rate curves started to rise in 1978. This phenomenon was proved even more clearly by adding the materials of two more years up to 1980.

The improvement of the health conditions in Japan have benefited each age group and we believed that Japan was enjoying longevity, but a certain group is not. Why is this? If we solve the "why?" questions, we can develop further longevity.

1. Does the rise in the middle-aged mortality come from the absolute increase of the middle-aged death rate or from the relative increase because the death rate of the other age groups decreased while that of the middle-aged remained unchanged?

2. Is there anything in the belief that 42 is a critical age for Japanese men? Or does this phenomenon happen because the middle-aged today had some problems in the past that cause diseases in the middle years?

3. Why does this happen to middle-aged men and not to middle-aged women?

4. How serious is the middle-aged death rate increase from a general health environment point of view?

5. Where does this happen more often : in rural areas or urban areas?

6. What are the death-causing diseases? Don't middle-aged women need special consideration too?

7. What are the countermeasures for this?

Here are the brief conclusions :

1. There is a relative increase. Taking the death rate on the vertical axis and ages on the horizontal, the death rate curves of each age group are drawn logarithmic on a chart, males and females separately. Curves are slid parallelly along the horizontal axis from 1950 to 1978. The death rate of each age group decreased every eyar, but that of the 40's remains unchanged since 1960. Those of the 30's and 50's are decreasing and so is that of the females aged 40. Why does the improvement in health conditions have no beneficial influence on males in their 40's?

2. I take the "debt of the past" explanation - because the rise of middle-aged death rates slid to the higher age groups as the years go by. This can be proved by connecting the death rates of the same birth year. Those who were born in 1930 were aged 40 in 1970 and 48 in 1978. The peak of the death rate was always occupied by those born in 1930 and several years before and after that. (Reporter Toshiro Saeki of *The Asahi Newspaper*.)

This phenomenon can be explained by the sexual death rate in n°. 3. The sexual death rate means the male death rate, taking the female death rate as 100. Drawing the sexual death rate of each age group from 1970 to 1978 on one chart while the peak of the 20's and 60's remains at the same level, that of those aged 40 slides at first from the early 40's to the late 40's later.

Those who were born in 1930 were 15 years old at the end of World War II. They were in adolescence when they were in the prime of their growth and they had to undergo the postwar food difficulties. Only a few of them suffered from decayed teeth.

3. It is not clear yet why no change in the middle-aged female death rate can be seen. Women also suffered from food scarcity. The only explanation one can find is that women can tolerate malnutrition more than men or that they have two sex chromosomes while men have only one. This can be a reasonable explanation.

4. The hygiene side of problems which affected the death rate recently includes the extreme decrease of infant mortality, a rise in youth mortality, and waves of influenza. All this while the middle-aged male mortality remained constant with these characteristics.

5. The middle-aged male mortality rate apparently shows an increase in the urban areas, including Tokyo and Osaka, which also supports the answer to problem 2, because food difficulties were more severe in the cities than in rural areas.

6. Diseases which cause an absolute increase of the middle-aged male mortality are : cirrhosis of the liver, diabetes mellitus, and subarachnoidal haemorrhage.

Diseases which cause a relative increase of middle-aged male mortality are : cerebral haemorrhage, ischaemic heart disease, and ulcers of the digestive organs, all of which relate to vascular diseases or haemorrhage. In the case of cirrhosis of the liver, it comes to hypertension of the portal veins caused by circulatory disturbance which leads to the varix rupture of the oesophagus and haemorrhaging of the upper digestive system. In the cases of diabetes mellitus, death by coma and infection became more rare through discoveries of antibiotics and insulin, while death by circulatory disturbances increased.

In cases of ulcers of the digestive system, many die of perforation or haemorrhage.

I make a hypothesis that the middle-aged today have problems in the vascular structure caused by the extreme food shortage in their adolescence.

Recently, stomach cancer has caused a high mortality rate among females in their 30's, though this is not the case for the middle-aged male. It is the case for neoplasms (tumours), both malignant and benign and of an unspecified nature, among females in their 40's. The curve of the middle-aged female death rate by neoplasms, however, draws a different pattern from that of the middle-aged male case.

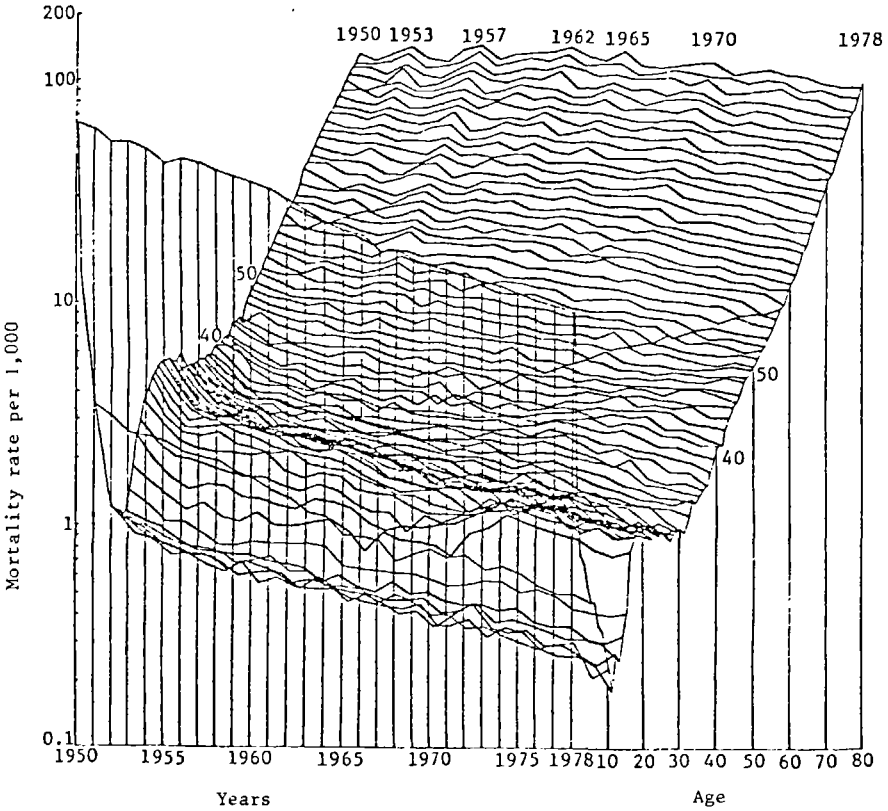
7. To take the appropriate countermeasures against the specific increase in the death of middle-aged males, it is necessary, in the first place, to recognise that this is caused by the deficiencies in their growth. It is recommended that special precautions be taken

to avoid cirrhosis of the liver and diabetes, that health examinations be regular for early discovery of sicknesses, and that if any illnesses are discovered, adequate medical care should be taken in view of a thorough recuperation.

However, in the first place, it is best to work on staying fit, being careful not to eat or drink excessively, and, if possible, to give up alcohol and smoking. We Japanese should not boast of our long life expectations, but should keep in mind leading a moderate, healthy life.

Transition of mortality rate of each group : Male

1950 - 1978



Age groups under 10 are taken only at the transitions of ages 0, 5 and 10, years are parallelly slid horizontally.

N E T H E R L A N D S

A REVIEW OF RESEARCH INTO THE SOCIO-ECONOMIC DETERMINANTS OF MORTALITY IN THE NETHERLANDS SINCE THE SECOND WORLD WAR

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Introduction

In this paper, I intend to give a summary of the research carried out on whether the socio-economic situation of individual people or geographical units in post-war Netherlands influences the death risks of these individuals and regions respectively. My review is not limited to studies in which socio-economic differences in mortality are the main subject, but also includes research in which the relation between socio-economic variables and mortality is merely an indirect factor. My paper ends with a broad evaluation of the research concerned.

In this overview, I shall use the same classification as Fox does in his report on the meeting, namely : the cross-sectional unlinked studies; the matched records approach; the prospective studies; the mortality "follow-back" studies; the longitudinal studies; and the ecological studies.

I. Cross-sectional unlinked studies

The earliest cross-sectional unlinked study which can be described here is that of Van Gelderen (1955) on Amsterdam and The Hague. For the years 1952 and 1953, the deaths of the 1-4 year olds were classified (for each city separately) according to occupation of father or mother and birth order of the deceased. (This information was derived from the enumeration card of the live birth which was traced through the birth certificate number recorded both on the personal card of the deceased and on the enumeration card of the live birth.) The population at risk (the 1 to 4 year olds) was estimated on the presumption that the total number of 1 to 4 year olds was distributed among the various paternal occupations in the same proportion as the children born in 1951. In Amsterdam, a total of 176 of the 60,293 one to four year olds died, in the Hague 105 out of 45,364.

In Amsterdam, there were no significant mortality differences in the pre-school age group between the three social classes distinguished, these three being : owners of large firms, managers, higher administrative personnel (I); owners of shops, lower administrative personnel, nursing staff, shop assistants, commercial travellers (II); and owners of small enterprises, labourers, domestic staff (III). The social classes in The Hague were defined somewhat differently : class I not only comprised administrative personnel, managers and professionals, but also commercial travellers; class II consisted of all the self-employed, and class III included lower police and fire brigade personnel, nursing staff, shop assistants. Finally, class IV covered all labourers. Significant differences in mortality between the social classes were not observed here either. It can be concluded that "prosperity has lost much importance for pre-school age mortality".

Amsterdam was once again subjected to an investigation of mortality differences between the occupational groups in the period 1947-1952 [De Wolff and Meerdink, 1954 (B); Meerdink, 1958]. This investigation concerned men in the age group 15-64. Information concerning the occupation of the deceased was taken from their personal card (most recent

occupation), whereas the data on the occupied population referred to 1947. Directly standardised mortality rates were calculated for six groups (liberal professions, civil servants, army personnel, teaching and nursing personnel; independently engaged businessmen; privately employed clerical staff, shop assistants; commercial agents; managers, foremen, higher technical staff, officers in the mercantile marine; skilled workers; unskilled labourers). Only the privately employed clerical staff showed a statistically significant higher mortality rate. For the highest social class, the mortality rate shows a difference from the worker's class which is only just on the borderline of significance. The governmental selection policy offers an explanation of the unfavourable figures where privately employed clerical staff are concerned.

In 1959, Hoogendoorn (1959) made a national inquiry into infant mortality in the years 1952-1954, based on an approach which can be included in the cross-sectional unlinked studies. The occupation of the fathers of infants who died in the period 1952-1954 was traced by means of linking the deceased's personal card to his/her birth enumeration card. The population at risk was estimated on the presumption that the distribution of livebirths among the various professions was identical to that of a 10 % random sample from the enumeration cards of legitimate live births in the years 1952-1953. The occupations were grouped as follows :

- employers and own-account workers in agriculture;
- other employers and own-account workers;
- farm labourers;
- other labourers;
- professionals;
- civil servants;
- other employees.

Together, the last three groups constituted the group : professionals and salaried employees. This study made it clear that there existed considerable differences in infant mortality between the social groups, especially between agricultural employers, farm labourers and other labourers, on the one hand, and the other groups (especially the professionals) on the other. The differences were most striking for the "environmental diseases"; this explains why infant mortality after the first week is most sensitive to the social group in which the child was born. In the first week, the high death rate of infants from farmers' families is striking. It is worth noticing that the figures mentioned here were, to a great extent, standardised for differences in the distribution of birth orders and ages among the social groups. (These data were also recorded on the enumeration cards.)

The only post-war research into mortality differences between social groups done on a national scale was carried out by the Central Bureau of Statistics. Maintaining the routine linkage to the cause of death certificate, the occupation of men aged 40-64 who died between 1959 and 1961 was determined by taking the last-mentioned occupation on their personal cards. This procedure produced ten occupational groups and 167 different occupations. The population at risk was calcualted from data from the 1960 census. The specification of occupation on the personal cards turned out to be inadequate and there was no information whatsoever about the duration of the last-mentioned occupation. In spite of this, the results of the inquiry were considered sufficiently useful.

Originally, the C.B.S. only published data on the total number of deaths divided into deaths by coronary diseases (ISCD, 1955; Nr. 420) and deaths by cancer of the lung (ISCD, 1955; Nrs. 162 and 163) (C.B.S., 1965 (A); C.B.S., (1965) (B). At a later stage, more attention was paid to deaths by cardio-vascular diseases (ISCD, 1955; Nrs.420-422) (C.B.S., 1969; De Groot, 1971). The cardio-vascular diseases accounted for 8,946 of the 35,338 deaths. It was deduced from the Standard Mortality Ratios (SMRs) that the total mortality (i.e., by all causes of death) of farmers (SMR = 66) and construction workers (SMR = 81) were clearly below the average. A high mortality rate was characteristic for other employers and own-account workers (SMR = 120), miners (SMR = 337), farm labourers and other manual workers. With the exception of farm labourers, the groups mentioned above, together with the professionals and salaried employees, also had high SMRs for cardio-vascular diseases. The SMRs of 23 separate occupations were also calculated and this also brought to light considerable differences. Among others, employees in the prin-

ting trade, metal workers, teachers and shopkeepers had a low SMR whereas physicians, hairdressers, salesmen, tailors, engine drivers and porters scored considerably higher. Frinking (1974) attempted a proportional reclassification of deaths in the group "No occupation and unknown", aiming at more reliable results; this did not, however, produce any fundamental differences.

In 1968, De Haas-Posthuma and De Haas published data relating to perinatal and infant mortality, classified according to occupation of the father. Although it is not actually mentioned, it may be presumed that they based their approach on Hoogendoorn's. The information referred to the years 1961-1962 (infant mortality) and 1961 (perinatal mortality ; in this case, the occupations of fathers of stillborn babies were taken from the enumeration card for infants reported as dead). Occupations are grouped into five social classes ranking from high to low (professional and clerical; managers and proprietors; farmers and farm-managers; farm-labourers; other labourers). Infant mortality is lowest in the highest social class and increases with decrease in social class. Farm labourers do not fit into the general pattern. The range in the stillbirth rate was wider than for any of the components of infant mortality.

III. Prospective studies

The Bureau for Statistics of the municipality of Amsterdam made a new inquiry into infant mortality by social group [Infant Mortality, 1953; De Wolff and Meerdink, 1954(A)] as a continuation of an earlier study (Differentiële, 1952) of which it was stated that there was reason to doubt the validity of the conclusions. This inquiry was of a prospective nature and was based on enumeration cards specifically for Amsterdam. Apart from the date of birth and (where necessary) the date of death, this card also stated the occupation of the father. Here, I shall restrict myself to the data on the approximately 90,000 births in the period 1946-1950. Four social groups were distinguished :

I Liberal professions, managers, teachers, higher government officials, higher employees

II Shopkeepers and artisans

III Lower government officials, lower employees, foremen, commercial travellers, warehouse clerks, nursing staff

IV Workers.

Considerable and statistically significant differences between the social groups were observed. With the exception of group II, infant mortality increased regularly as the social status/income dimension decreased. Group II ranks highest. This may be due to the fact that these own-account workers were not covered by the social insurance schemes and relied for their business to a large extent on the assistance of their wives. The stillbirth rate showed more or less the same picture as the infant mortality rate. Again, there is an increase from I to III and from III to IV with group II significantly above the rate of IV. It should be mentioned that, when higher ages are compared, the mortality differences become relatively more significant. The relatively heterogenous character of the group termed as "workers" is noticed.

In a prospective study carried out by the C.B.S. (1968) on late foetal death in the years 1961-1965, stillbirth rates were calculated according to occupational group of the father by linking enumeration cards for live births and for infants reported as dead. The lowest rate existed in the group "professionals and salaried employees, etc.", whereas farm labourers and other labourers clearly had somewhat higher stillbirth rates. A total of 17,308 stillbirths were included in the study.

Van Wely (1980) published data derived from the pension fund of N.V. Philips dating from 1971. The employees were divided into ten occupational classes according to income; difficulty and responsibility of work, education, etc. Among the non-retired employees, the SMR of the lower classes was 6 % higher and that of the higher classes 10 % lower than the national average of the total population. The retired employees showed the following figures in relation to the national average : 14 % higher for the lower classes and

13 % lower for the higher classes. Among the 45 to 54 year olds, the SMR was 19 % higher than the national average for the lower classes and 6 % higher for the higher classes [1].

IV. Follow-back studies

De Haas-Posthuma (1962) did a study using the follow-back survey method which produced (somewhat defective) information about the significance of socio-economic factors in relation to perinatal mortality. The study concentrated on four provinces and the city of Rotterdam and covered the period 1952-1953. Among other details, the occupation of the fathers of approximately 1,000 perinatal death cases and of approximately 1,000 babies from a control group, who were registrated before the birth of the perinatal death cases, were determined by means of enumeration cards (for live births and for infants reported as dead). Furthermore, interviews with parents of the babies concerned produced information on various socio-economic factors. Compared to the control group, the parents of perinatal death cases more frequently had the following characteristics :

- occupation : worker on own-account (especially own-account workers without personnel)
- occupation : manual worker (father)
- occupation : worker (mother)
- lower income
- lower prosperity level (a combination of occupational, income, educational and housing factors).

It was noticeable that the interviewers (nearly all medical doctors) usually met with a great willingness among their patients to divulge this information. Unmarried mothers and mothers with higher prosperity levels backed out of the inquiry more often than other mothers.

V. Longitudinal studies

In 1963, Schrama did a study on the employees of the Netherlands Postal and Telecommunication Services (P.T.T.), a nationalised company with 52,000 male and 8,000 female employees engaged all over the Netherlands. The information taken from the Occupational Health Service of the P.T.T. consisted of data on : medical examinations, periodic preventive medical examinations, visits paid to the medical officer, information from the treating physicians and other periodical information about the personnel. The investigation covered the period 1947-1961 and was concentrated on the 35-64 year olds. The men were divided into four groups :

I. Comprising the managerial staff (3,000 employees)

II. Comprising the lower clerical staff (consisting of 5,970 clerical officers, counter officers, etc.)

III. Comprising the technical staff and craftsmen (5,670 men who have to ambulant work in a high tempo)

IV. Including the uniformed personnel of the Postal Service (11,230 men).

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(1) The population at risk for the non-retired (younger than 65) numbered nearly 54,000 in the lower classes and nearly 20,000 in the higher classes; for the retired (mostly older than 65), these figures were : 4,000 and 2,400 respectively (Van Wely : personal communication, 1980). The higher classes here include personnel upwards from "higher employees".

The division shows differentiation according to average annual income, nature of the work and the amount of physical exertion. The mortality figures relate to 1,814 men and 164 women. The age-specific death rates of the male P.T.T. population were considerably lower than the corresponding figures for the population as a whole; the figures for the female P.T.T. population (consisting mainly of unmarried women) were partly higher and partly lower than the figures for women as a whole. If Schrama's age-specific death rates were to be standardised (standard population : the male population working in the communication sector), it would result in the highest number of deaths occurring among the office staff (II) and the lower among the managerial staff (I) and the postal delivery and forwarding men (IV). The enhanced risk of death of the clerical staff of the offices is *inter alia* due to the fact that, in this group, the greatest number of employees is taken up whose physical condition would be an impediment to their being employed in one of the other groups. Deaths caused by coronary diseases are most frequent among the clerical staff, those caused by cancer among the technical staff and craftsmen. The lowest death rates of these two causes are found among group IV and group I respectively.

VI. Ecological studies

Since the Second World War, results of seven ecological studies on the relation between mortality and socio-economic factors have been published. These studies related both to districts of the three large cities (Amsterdam, Rotterdam and The Hague[1]) and to (a random sample of) the Dutch municipalities. I shall discuss the studies conducted on district level first.

The Bureau of Statistics of the municipality of *Amsterdam* investigated the relation between the mortality level and the socio-economic level of 52 districts in Amsterdam (Differentiële, 1952; De Wolff and Meerdink, 1952). The investigation related to the period 1947-1949 and the results were compared with those of the period 1929-1932. Apart from directly standardised mortality rates for the total population, mortality figures for the 15-29 and 50-64 year olds were calculated and the infant mortality rate was also looked into.

Of the six socio-economic characteristics of these districts (the percentage of households in a certain district receiving state loan as financial support; the percentage of these loans given to the poor and the percentage given to those with low incomes; the percentage of cohabiting households; the percentage of households with insufficient sleeping space;and the number of inhabitants per room), only the last two turned out to have any significant positive relation to the total mortality rate. Mortality in the age groups 15-29 and 50-64 did not correlate with any of the socio-economic characteristics at all. This was also true with regard to the infant mortality rate. The conclusion was that the population's socio-economic circumstances had so improved that prosperity differences no longer directly meant mortality differences.

Van Gelderen (1955) examined the relation between the mortality rate of the 1-4 year olds and the socio-economic situation of 66 districts in *Amsterdam* and 40 districts in *The Hague*. His study covered the years 1952-1953. The Amsterdam districts were divided into three groups according to the percentage of inhabitants who received a state loan, because of too low incomes, in 1946 and 1947. No statistically significant differences between the "well-to-do", the mixed and the poor districts were found. However, when the Amsterdam districts were classified according to the number of inhabitants per room, significant differences in mortality of 1-4 year olds were observed; the poor districts (according to this classification) had a mortality rate which was clearly higher than average for 1-4 year olds. The districts in The Hague were divided into three groups according to the general impression of prosperity made by the various districts. The mortality differences between the three groups were slight and not significant.

In connection with an inquiry into the effects of population density on health and social adaptation, Levy investigated the influence of socio-economic characteristics of

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(1) In 1950, these three cities had populations numbering 804,000, 646,000 and 533,000 respectively. In 1960, these had grown to 865,000, 729,000 and 605,000 and had dropped to 719,000, 582,000 and 458,000 respectively by 1980.

districts on the mortality rate of those districts (Levy, 1974). His investigation covered Rotterdam, The Hague and Amsterdam.

- Information concerning the percentage of defective housing and the rental value of houses in 54 districts of *Rotterdam* was related to the indirectly age-standardised mortality rate and the infant mortality rate in the years 1968-1971 and to the perinatal mortality rate in the years 1970-1971. Apart from this, the suicide rate per district was also calculated.

- For *The Hague*, data on 31 districts were compiled. Amongst others, the median rental value of the houses in the districts (as a social indicator) was related to the mortality rate of the districts. The latter was measured by means of the indirectly standardised mortality rate (for 1968 and 1970), the infant mortality rate (for 1967-1972) and the death rates for suicide (1967-1971), accidents (excluding traffic accidents) and (standardised according to age) ischaemic heart disease (1969-1971).

- In *Amsterdam*, 66 district combinations were included in the study. The social class composition (on May 31st, 1960) was related to the standardised mortality rate (for the period 1966-1970), the infant mortality rate (for 1964-1968) and the age standardised death rate for heart disease (for the years 1969-1971).

The relation between mortality and the independent variables was tested separately for the three cities, with the aid of multiple regression on logarithmically transformed variables. Here, I shall restrict myself to the results concerning the socio-economic variables. In The Hague, there was a close positive correlation between the death rate for heart disease and the median rental value, whereas in the Rotterdam districts, the percentage of houses with a low rental value correlated positively to the death rate for all causes. The relations, in both cases, were independent of the influence of the crowding and density variables. No further correlations between mortality and socio-economic variables were found. A continuation of Levy's investigation of Rotterdam can be found in the publications of Herzog, Levy and Verdonk (1977) and Verdonk (1979).

In the first publication, identical socio-economic and mortality variables were used for the same Rotterdam districts as in Levy's 1974 inquiry. However, this information was complemented by age-standardised figures concerning death due to traffic accidents (for 1966-1972) and the authors analysed the material in a different manner. In their new statistical model, the variable "rental value" no longer had significant influence on the total mortality rate. The percentage of defective houses had a significant correlation with the infant mortality rate, but in an unexpected way, suggesting that the more affluent and better housed have higher infant death rates. Neither of these "socio-economic" variables (for both housing quality and rental value are related to income) had an independent effect on either perinatal mortality or on mortality due to traffic accidents or suicide. Verdonk's inquiry also concerned Rotterdam. His main aim was the study of the relation between categories of deviant behaviour and regional characteristics. The only difference, concerning mortality variables, between his study and that carried out by Herzog, Levy and Verdonk (1977) was that the total mortality rate was calculated and standardised separately for men and women. The number of districts analysed was cut down to 52. More important, however, was that the number of socio-economic variables was enlarged. Using factor analysis, the most suitable indicators for educational level of the working population, equipment in the home, branch of industry in which the population was employed, socio-economic situation of the working population, the rental value and the number of rooms per inhabitant were selected. Multiple regression analysis was directed mainly towards general deviance as a dependent variable, but in an appendix, the results concerning mortality were discussed briefly. Neither male or female mortality nor perinatal mortality or suicide were significantly related to any of the socio-economic variables occurring in the analysis. Infant mortality, however, correlated (negatively) with the social rank of the district (percentage of male employees). Districts characterised by high percentages of labourers with an income of less than fl. 12,000 were also characterised by a high infant mortality rate when all other variables were kept constant. It should be mentioned here that male mortality strongly correlates with the number of inhabitants per room.

By far the most important post-war inquiry relevant here is the Comparative District Inquiry of Amsterdam (Lau-IJzerman, 1979; 1980). Standardised mortality ratios (SMRs) were

calculated for 18 socio-economically homogeneous districts in Amsterdam for the years 1972-1976 (with the exception of 1974) for nine age groups and thirteen different causes of death (1). These figures were calculated according to sex. It was known how long the deceased had lived at the last address.

For each district, 101 potential explanatory variables relating to, amongst others, population density, physical environment and social heterogeneity were selected. Here, too, I shall restrict myself to the strictly socio-economic variables, i.e., the socio-economic status of the district (measured by means of the variables income, educational level, occupational level and telephone possession in 1960 and 1971 respectively) and housing quality measured with the aid of age, average rental value and equipment of the residences). The statistically most significant and theoretically most relevant of the 101 independent variables were selected and were related to SMRs for five different age groups and six different causes of death by means of multiple regression. It appeared from these analyses that the correlation between district characteristics and mortality increases significantly as duration of residence in a certain district increases.

The most important conclusion relevant to this paper is that higher mortality rates were found in districts with a low socio-economic status. This was mainly due to the chronic a-specific respiratory diseases, but there was also a larger number of deaths due to cancer of cervix uteri. There was a clearly negative relation between infant mortality and the socio-economic status of the district. On the other hand, there was a positive relation between the socio-economic status and the number of deaths due to cancer of the breast and to cerebrovascular diseases. The housing characteristics which, to a great extent, are determined by socio-economic factors, turned out to be just as important; factors such as humidity, bad quality and low rental value of the residence were positively related to the death risk. Because of the accumulation of negative district characteristics, however, it was almost impossible for the authors to indicate specific relations between mortality and district characteristics.

Since 1945, three ecological studies have been carried out on a national scale. In Drop's studies (1972; 1979), the relation between population density and level of well-being in different municipalities was the main subject. A total of 176 municipalities with populations between 5,000 and 20,000 (on May 31st, 1960) were included in her investigation. Together, these municipalities accounted for more than a quarter of the total Dutch population. The characteristics of deviant and pathological behaviour of the municipalities included eight variables which are indicative for the mortality level of the municipalities. These are : indirectly age-standardised figures concerning the total mortality over the period 1958-1962; deaths caused by traffic accidents; other accidents; malignant neoplasms; arteriosclerotic and degenerative heart diseases (the last two mentioned for 40-64 year-olds); the stillbirth and infant mortality rates; and the suicide rate. Her study comprised 65 independent variables of which a large number can be termed "socio-economic", but because of the way she processed her data, no connection between the socio-economic characteristics and the mortality rates of the municipalities can be derived from her publications. From the thirty variables which were thought indicative for pathological and deviant behaviour, three factors were composed by means of orthogonal component analysis and only deaths due to traffic accidents (on the dimension "Flight") and to other accidents (on the dimension "Vulnerability") seemed to correlate with other forms of pathological and deviant behaviour in such a way that - as part of the component - they could be used in further analysis. The same problem is encountered in her partial study of seventy urbanised municipalities (Drop, 1972).

Levy's study (1974; also, in Levy and Herzog, 1974) was based on data concerning 125 economic-geographic regions (which are aggregates of municipalities). An "economic health" index based on a factor analysis of 25 economic variables derived over the period 1960-1968 was used as socio-economic indicator. The higher the index was, the more favourable the socio-economic situation of the region. Apart from this,

1. Different forms of malignant neoplasms; three groups of heart diseases; influenza, pneumonia, bronchitis; accidents, poisoning and violence; symptoms and ill-defined conditions; other causes of death. The linkage of cause of death to data concerning residential area and duration of residence came about through date of birth, date of death and sex of the deceased.

the per capita income of the region was used as a socio-economic indicator. The mortality levels were calculated using the age-standardised mortality rate for the period 1966-1970, the infant mortality rate (1966-1970), the perinatal mortality rate (1966-1970), the suicide rate (1969-1971), the death rate due to accidents (other than traffic) and the sex-specific, age-corrected death rate due to ischaemic heart disease (1969-1971).

Multiple regression proved that the variable "economic health" had statistically significant independent effects on the mortality rate. Economically healthy regions generally show lower total mortality rates, lower rates of death due to cardio-vascular diseases (for both men and women) and lower infant and perinatal mortality. Herbert (1975) examined the relation between socio-economic characteristics and the mortality rate in the periods 1960-1964 and 1965-1969. He restricted his study to the 68 municipalities with more than 25,000 inhabitants (which included 50-55% of the total Dutch population). Mortality rates for ten age groups served as a base for his analysis. His independent variables comprised, among others, the educational level of men and women respectively, the socio-economic position of the male heads of households, the percentage of wage-earning labourers, the percentage of unemployment and the per capita income of the population. In both periods, infant mortality was significantly correlated with the percentage of higher occupations (heads of companies with more than ten employees, professionals, etc.). The relation between the two variables was negative.

Both in 1960-1964 and 1965-1969, the percentage of unemployed men was positively related to the death rate of the age group 45-64 years.

Conclusion and evaluation

From the various studies discussed here, I draw the provisional conclusion that, in the Netherlands, the socio-economic position still influences the mortality rate. This conclusion remains provisional because it is based on research which is significantly restricted both in content and in method, c.q. technique. The following points illustrate the substantive restrictions :

- the predominant concentration on the situation in and within the three large cities, especially Amsterdam (the most recent information about social mortality differences on a national scale refers to the early sixties!);

- the concentration on socio-economic differences and perinatal mortality and the neglect of the differences at especially the oldest ages;

- the neglect of social mortality differences among women.

Methodological objections concern :

- the predominant use of the ecological study design (often out of sheer necessity).

When conducting cross-sectional unlinked studies :

- the barely reliable information about the socio-economic position of the deceased when this information is taken from the personal card;

- the defective classification into social groups resulting in totally different groups being linked together;

- the great number of doubtful cases;

- the lack of correspondence between the occupational information in the census and that on the personal card of the deceased.

These summarised restrictions are amply sufficient to justify the setting up of a new inquiry comprising a wider range of aspects than has been the case up to now, such as research conducted or planned in the Scandinavian countries, France, England and the U.S.A.

R E F E R E N C E S

C.B.S. (1965 A)
Kwantitatieve betekenis van de ziekten der coronairvaten in het doodsoorzakenpatroon der in de leeftijd van 40-64 jaar overleden mannen, naar beroep; 1959-1961. Maandstatistiek van de bevolking en de volksgezondheid. Jaargang 13, Januari, nr. 1, p. 19-22.

C.B.S. (1965 B)
Kwantitatieve betekenis van longkanker in het doodsoorzakenpatroon van de in de leeftijd van 40-64 jaar overleden mannen, naar beroep; 1959-1961. Maandstatistiek van de bevolking en de volksgezondheid. Jaargang 13, April, nr. 4, p. 112-117.

C.B.S. (1968)
Doodgeboorte in Nederland 1918-1965. 's-Gravenhage, Staatsuitgeverij. 108 pp.

C.B.S. (1969)
Sterfte ten gevolge van hart- en vaatziekten 1950-1967. 's-Gravenhage, Staatsuitgeverij. 70 pp.

Differentiële (1952)
Differentiële sterfte te Amsterdam naar stadsgedeelten. Kwartaalbericht van het Bureau van Statistiek der Gemeente Amsterdam. 58ste Jaargang, nr. 1, Januari t/m Maart. p. 3-10.

Drop, M.J. (1972)
Population density and well-being in Dutch towns and cities. A critical comparison with the results of a density study in Chicago. Leiden, Nederlands Instituut voor Preventieve Geneeskunde TNO. 28 pp.

Drop, M.J. (1979)
Arbeidsverdeling, normatieve integratie en typen van afwijkend gedrag. Diss. University of Limburg. Maastricht. 246 pp. + 18

Frinking, G.A.B. (1974)
Sociale ongelijkheid voor de dood: fictie of realiteit. Demografie, Juni, no. 7. p. 1-4.

Gelderen, H.H. van (1955)
Pre-school child mortality in the Netherlands. Diss. University of Leiden. H.E. Stenfert Kroese N.V., Leiden. 138 pp.

Groot, M.J.W. de (1971)
Heart disease mortality and occupation. Tijdschrift voor Sociale Geneeskunde. Jaargang 49, nr. 17. p. 526-531.

Haas—Posthuma, J.H. de (1962)
Perinatale sterfte in Nederland. Onderzoek naar factoren die de perinatale sterfte beïnvloeden. Diss. University of Leiden. Van Gorcum en Comp. N.V., Assen. Deel I. 224 pp. Deel II. Tabellen.

Haas-Posthuma, J.H. de and J.H. de Haas (1968)
Infant Loss in the Netherlands. Vital and Health Statistics. Analytical Studies. National Center for Health Statistics. Series 3, nr. 11. U.S. Department of Health, Education and Welfare. Washington D.C. 63 pp.

Herbert, L. (1975)
Sterfteverschillen naar sociaal-economische kenmerken. Overzicht van bestaande onderzoekingen en een onderzoek op basis van ecologische gegevens in de periode 1960-1969 in Nederland. M.A. Thesis, Tilburg University. 116 pp.

Herzog, A.N., L. Levy and A. Verdonk (1977)
Some ecological factors associated with health and social adaptation in the City of Rotterdam. Urban Ecology, Vol. 2. p. 205-234.

Hoogendoorn, D. (1959)
De zuigelingensterfte in Nederland in verband met het geboorterangnummer van het kind, de leeftijd van de moeder en de sociale status van het gezin. Van Gorcum en Comp. Assen. 130 pp.

Lau-IJzerman, A., J.D.F. Habbema, P.J. van der Maas, T. van den Bos, J.B.J. Drewes P.M. Verbeek-Heida and J.W. Oosterbaan (1979)
Vergelijkend buurtonderzoek naar sterfte, ziekenhuisopname en langdurige arbeidsongeschiktheid in Amsterdam. Rapport nr. 1, Sterfte. Amsterdam. 106 pp. + Appendices.

Lau-IJzerman, A., J.D.F. Habbema, P.J. van der Maas, T. van den Bos, J.B.J. Drewes, P.M. Verbeek-Heida and J.W. Oosterbaan (1980)
Vergelijkend buurtonderzoek naar sterfte, ziekenhuisopname en langdurige arbeidsongeschiktheid in Amsterdam. Eindrapport. Amsterdam. 128 pp.

Levy, L. (1974)
Population Impaction, Health and Social Adaptation. A study of the effects of population density on health and social adaptation in the Netherlands. Rapport no. 14, uitgebracht ten behoeve van de Staatscommissie Bevolkingsvraagstuk. Ministerie van Volksgezondheid en Milieuhygiëne, Leidschendam. 96 pp.

Levy, L. and A.N. Herzog (1974)
Effects of Population Density and Crowding on Health and Social Adaptation in the Netherlands. Journal of Health and Social Behaviour. Vol. 15, nr. 3. p. 228-240.

Meerdink, J. (1958)
Differentiële sterfte naar sociale groepen. In: Vereniging voor Demografie. Differentiële sterfte. p. 33-40. 's-Gravenhage.

Schrama, P.G.M. (1963)
Bedrijfsgeneeskunde en volksgezondheid. Een onderzoek naar de betekenis van beroepsinvloeden en bedrijfsgezondheidszorg voor de epidemiologie van hart- en vaatziekten en kanker. Diss. University of Leiden. Van Gorcum en Comp. Assen. pp. 281.

Verdonk, B. (1979)
Stadsbuurten: de ene is de andere niet. Relaties tussen psychiatrische opname, andere categorieën van deviantie en kenmerken van gebieden: een sociologische studie. Diss. University of Rotterdam. Deventer, Van Loghum Slaterus, pp. 371.

Wely, P.A. van (1980)
Advies bedrijfsgezondheidszorg. Tijdschrift voor Sociale Geneeskunde. Jaargang 58, Supplement, oktober. p. 156-159.

Wolff, P. de et J. Meerdink (1952)
La mortalité à Amsterdam selon les quartiers. Population, 7e année, Octobre/Décembre, no. 4. p. 369-660.

Wolff, P. de et J. Meerdink (1954 A)
La mortalité infantile à Amsterdam selon les groupes sociaux. Population, 9e année, Avril/Juin, no. 2. p. 293-314.

Wolff, P. de and J. Meerdink (1954 B)
Mortality rates in Amsterdam according to profession. Proceedings of the World Population Conference, 1954. Rome, 31 August - 10 September 1954. Vol. I. p. 51-63. New York, United Nations.

Zuigelingensterfte (1953)
Zuigelingensterfte naar sociale groepen te Amsterdam. Kwartaalbericht van het Bureau van Statistiek der Gemeente Amsterdam. 59ste Jaargang, nr. 3. Juli t/m September. p. 145-151.

N E T H E R L A N D S

REGIONAL ANALYSIS OF SOCIO-ECONOMIC DIFFERENTIAL MORTALITY

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Earlier Dutch experiences

Until the present, Dutch research on socio-economic differential mortality has not been very interesting. A striking example of incapable Dutch mortality researchers is the conclusion of a cancer register due to an absence of scientific questions. Demographic mortality research ishard to do in the Netherlands because of privacy restrictions and limited means. A new generation of mortality investigators started research on regional mortality differences. Differences between districts of Amsterdam were researched by Paul van der Maas *et al*, regional differences in mortality within European countries were analysed by Frans van Poppel and the geographic distribution of cancer mortality in the Netherlands was published by Richard Hayes and others (1). The rest of this paper will deal with our research on the regional mortality differences in the Netherlands.

Method

Regional mortality will be correlated with smoking habits, butter consumption, socio-economic characteristics, weather and migration.

Material

Data on the numerators and denominators of mortality quotients are available for the period 1955-1978 per year of death by sex, age categories of ten years and 108 regions for all causes of death and several chronic diseases.

Data on smoking habits and butter prevalences are available from several nationwide surveys.

Data on socio-economic characteristics will be available from censuses and minicensuses.

Data on weather conditions are available from the KNMI.

Data on migration are poorly available.

Themes of the project

The first question is : are there regional mortality differences in the Netherlands? A recent atlas shows regional differences for cancer mortality (2). We might do a similar analysis for several chronic diseases.

The second question is : are the regional mortality differences consistent over the period 1955-1978? For the present, we are working on this problem. The Dutch regional mortality differences are smaller than, for example, the British regional differences (3). Still, the regional mortality differences for all cuases and several chronic diseases are reasonably consistent for the age categories 60-69 and 70-79 years of age by sex.

The third question is : are the regional mortality differences correlating with explanatory variables? During the period of three years, when we had to wait for detailed mortality data, some attention was paid to this question. Preliminary results were presented in the paper "Smoking and Mortality" at Fiuggi Terme in 1980. Provincial data on mortality for all causes and lung cancer correlated with smoking prevalences of males of 65 years and over.

The applied method will be similar to a recent Belgian study (4) : the socio-economic variables will be treated as control variables and the other variables as explanatory variables. A positive difference will be an analysis by sex and age categories; a negative difference will be a lower number of explanatory variables. It will hardly be possible to test Joossens' findings (5) for the Netherlands. Actually, one of the finest dietary surveys was done in the Netherlands at the end of the sixties. Unfortunately, the original data were not preserved. Data on butter consumption prevalences can be obtained from another survey.

The fourth question is : are the regional sex mortality ratios correlating with explanatory variables?

Methodological problems

The most important problem is that it can be hard to interpretate regional findings. Regional differences in sex mortality ratios can be interpreted on the ecological level (a relatively higher mortality of males in regions with socio-economic discrimination of females) (6), on the individual level (differences in life styles like smoking habits) (7), and in a biological setting (the small difference with the large consequences).

There are several other well-known problems. The following interesting variables cannot be included : air pollution (insufficient data), alcohol consumption (unreliable data), use of medical care (insufficient data available), biological and genetic factors (not available).

There are the problems of time lag, selective migration and biological selection. Another problem is : on how many respondents should a regional data point from a survey be based? Probably, we shall study this particular problem separately.

Dutch research on regional mortality had an interesting start during the last few years. A lot of work still remains to be done.

REFERENCES

1. R.B. Hayes *et al.*, *Geographic Distribution of Cancer Mortality in The Netherlands*, Rotterdam, 1980.

2. C.B.S., *Atlas van de kankerstrerfte in Nederland 1969-1978*, 's-Gravenhage, 1980.

3. M.J. Gardner, *Using the Environment to Explain and Predict Mortality*, Journal of the Royal Statistical Society, A, 136 (1973), pp.421-440.

4. A. Grosclaude, B. Lux, M. van Houte-Minet and G. Wunsche, *Mortalité régionale et comportements différentiels*, Population et Famille, 48 (1973 - 3), pp.1-43.

5. J.V. Joossens *et al.*, *The Pattern of Food and Mortality in Belgium*, Lancet, 1977, pp.1069-1072.

6. S. Preston, *Mortality Patterns in National Populations*, 1976, chapter 6.

7. S. Preston, *Older Male Mortality and Cigarette Smoking*, Berkeley, 1970.

N E T H E R L A N D S

SOCIO-ECONOMIC MORTALITY DIFFERENCES BETWEEN DISTRICTS IN THE CITY OF AMSTERDAM

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1. Objectives of the study

The main questions in this large study are :

a. Are there differences between the districts of the city of Amsterdam in mortality, hospital admissions and figures for chronic work disability?

b. If so, which districts can be classified as unhealthy (according to these measures)?

c. With which characteristics of districts are possible differences in mortality, etc., correlated?

d. How can these health differences be influenced?

2. Study design

The city of Amsterdam was divided into 67 districts. These again were grouped into 18 main districts. Grouping was done in such a way that maximal socio-economic homogeneity within the main districts was obtained.

Mortality figures were collected for the period 1972-1976. The analysis was entirely cross-sectional.

All figures were aggregated (according to different criteria, depending on the analysis) over the districts, so the study can be defined as completely ecological.

For all cases, the following information was obtained :

- age in nine classes;
- sex;
- district;
- diagnosis in 14 classes;
- duration of stay at last address.

This last variable (duration of stay) proved to be of paramount importance, as it enabled us to introduce a time element in the analysis, and to find some important associations which, otherwise, would bave been obliterated.

Table 1 :

Amsterdam, average population 1974-1976	728,465 inhabitants
Largest main district	74,960 "
Smallest main district	11,500 "
Mortality, average number of cases per annum	8,367 "
Hospital admissions, average number of cases per annum	69,765
Incident cases of chronic work disability	3,696 "

Table 2 : Main groups of characteristics of districts (originally, 101 characteristics per district were collected)

1. Demographic characteristics
2. Socio-economic characteristics
3. Housing quality
4. Density/crowding
5. Physical/chemical environmental factors
6. Geographical distribution of general practitioners
7. % of non-voters
8. Unemployment rates

5. Methods of analysis

After considering and testing several possibilities, standardisation of the mortality figures was selected as the most appropriate way of controlling for the variables sex and age. A flexible standardisation programme was written, including testing for significance and for homogeneity and some special features facilitating optimale selection of age groups (van der Maas and Habbema, 1981).

The analysis of the associations of mortality with the other health indicators (hospital admissions, disability) on one hand and the district characteristics on the other was done by means of correlation analysis (Spearman and Pearson correlations), stepwise multiple regression analysis and analysis of linear structural relationships with the LISREL computer programme. Analysis by means of loglinear modelling is in progress.

A special problem was the multicollinearity of many associations, which is a rather usual finding in this type of study, but which makes firm conclusions about the relative importance of several independent variables virtually impossible.

For testing very specific hypotheses (e.g., about air pollution levels and lung cancer mortality), a simple technique of clustering districts in three or four groups and determining standardised mortality ratios for these combined districts proved to be the most satisfactory approach.

4. Difficulties encountered

Probably these are the "classical" difficulties of (ecological) mortality studies :

a. long time-lag between request for data and the production by the data-collecting organisations;

b. privacy/confidentiality regulations which, for example, allow the National Bureau of Statistics only to produce highly aggregated data which, in turn, make the analyses rather rigid;

c. technical linkage problems, in which ± 3 % of the cases could not be correctly linked;

d. the well-known problems of complete ecological analyses. In this study, however, we were able to check the validity of the conclusions in a certain sense;

Many of the analyses were done not only for the 18 main (compound) districts, but also for the 67 composing districts;

e. problems of multicollinearity which are, as far as our experience goes, rather typical of ecological studies.

5. Some results

a. Standardised mortality ratios (SMRs) showed significant differences between districts. In districts with high SMRs, the age-specific mortality figures in each age group were about two times as high as in the districts with low SMRs. When these findings are translated into life expectancy by means of a compound life table method, life expectancy at birth proves to be at least five years longer in the better districts. Even more remarkable is the fact that these differences are still found at age 35.

b. Mortality figures for people over 65 in the various districts were not consistent with those for people under 65. Due to our information on mobility (duration of stay at last address), we were able to prove that this discrepancy is an artifact, produced by the concentration of nursing homes in some districts. This concentration gives rise to inflated mortality figures in these districts, at the same time as producing too low figures in other districts.

When mortality ratios were computed for people aged 65 and over, who had been living at their last address for at least three years, all discrepancies vanished, and SMRs became homogeneous on the whole.

c. Duration of stay at last address also proved to be very important in the analysis of the influence of specific environmental factors. Air pollution may serve as an example here : in the districts with relatively elevated air pollution levels, mortality for lung cancer was not elevated. When the analysis was restricted to people who had lived for at least ten years in these districts, mortality for lung cancer was significantly higher in these districts than elsewhere in Amsterdam.

In the same way, an association between drinking water hardness and mortality of ischaemic heart disease was found.

For the analysis of the influence of socio-economic differences, this duration of stay must be much less important. The reason is that people may readily move from more polluted to less polluted areas or vice versa, but will rarely move from rich districts to poor districts or vice versa. In other words, the socio-economic situation is a much more constant feature during life time than, for example, air pollution exposure. In our analysis, this hypothesis was very much sustained. Duration of stay at

last address did not influence the association between socio-economic variables and mortality.

d. The results of the mortality analysis were very much in accordance with the findings of the analysis of hospital admissions and work disability. High mortality figures in a district nearly always coincided with more hospital admissions and more disabled in the same district. This correspondence was even found for specific diagnosis groups.

6. Socio-economic mortality differentials

The most important single factor which correlated with mortality was average socio-economic status of the inhabitants of a district (a compound index of income, education and occupation).

Twenty percent of the variance in SMRs was accounted for by socio-economic status. In hospital admissions, on average 42% was accounted for, while this figure in work disability was as high as 83%.

The second most important group of district characteristics proved to be housing quality, which is partly independent of socio-economic factors. A very promising finding was that well known associations between some diagnoses and socio-economic status, which have been determined in individual mortality and morbidity studies, were also found in this ecological study. So, mortality of chronic non-specific lung diseases and of carcinoma of the cervix uteri was typically elevated in the poorer districts, while breast cancer mortality was elevated in the richer districts.

Infant mortality was still significantly higher in the poorer districts, even though the infant mortality figures in Amsterdam are very low (much lower than for the whole country on an average).

7. Conclusion

When this study started in 1976, many people deemed it highly improbable that any mortality differences within one city in Holland would be found, especially as, in Holland, real poverty does not exist (thanks to well organised social security), and access to medical care is equally guaranteed for all people.

The results of this study proved the situation to be entirely different, and will force many people to reconsider priorities in socio-economic and in health care matters.

For further research, a serious drawback is the fact that, due to privacy regulations and to a rather superficial (but complete) mortality registration, individual mortality analysis is nearly impossible.

The findings of this study comprise five volumes, all in Dutch. Papers in English are due to be published during 1982 and 1983. Colleagues who wish to be on the mailing list for reprints are invited to send their address to the authors.

REFERENCE

Maas, P.J. van der and J.D.F. Habbema : *Standardisation of Mortality and Morbidity Figurres, Possibilities and Limitations* (in Dutch). Tijdschrift voor Sociale Geneeskunde, 1981, in print.

N O R W A Y

NORWEGIAN EXPERIENCES AND UNDERTAKINGS

1. National past experiences

The first Norwegian analysis of occupational mortality (males) based on the person number system was conducted in the Central Bureau of Statistics by Tønnesen (1974). Data for males dying in the period from November 1st, 1960, to December 31st, 1964, were linked to occupational data for males 30-81 years of age in the Population and Housing Census 1960, using the identification number that every person living in 1960 was given. On the basis of about 70 main occupations in this census, 37 occupational groups were constructed for the analysis of occupational mortality. A comparison of mortality between socio-economic groups was also made. Here, Tønnesen found a clear, although not a special strong, negative correlation, with the lowest mortality in occupational groups with the highest socio-economic status.

The next analysis on occupational mortality was performed by Haldorsen and Glattre (Occupational Mortality 1970-1973, Central Bureau of Statistics, 1976) and included, for the first time, causes of death. In this study, data for men and women dying during the period from November 1st, 1970, to December 31st, 1973, were linked with data on occupation and place of residence for persons 16 years and over at the Population Census 1970. Haldorsen and Glattre constructed 28 occupational groups for males and 14 occupational groups for women on the basis of the Standard of Occupational Classifications (Arbeidsdirektoratet 1965) and the classification of occupational groups used in the 1970 census.

This analysis made by Haldorsen and Glattre showed a high age-specific mortality (Comparative Mortality Figure - CMF - as index) among males in the following groups :

Hotel, restaurant and waiting work, etc. ..... (134)
Fishing, whaling and sealing work ..... (121)
Deck and engine-room crew work ..... (137)
Mining and quarrying work, etc. ..... (133)

Common for these groups are irregular working-time and strenuous work.

Low mortality was found in the following occupational groups :

Technical, chemical, physical, biological work, etc. (86)
Pedagogical work (teachers, etc.) ..... (75)
Management in agriculture and forestry (mostly self-employed farmers) ..... (78)
Wood work (sawmill workers, carpenters, etc.)..... (86)
Farm, livestock work .....(87)
Forestry work ..... (79)

These groups include partly persons with regular working time, partly persons working outdoor on farms, etc.

The analysis revealed smaller variations in occupational mortality among females than among males.

As for mortality from main causes of death, more than half of the deaths among economically active males were due to "cardiovascular diseases and sudden death". Occupational groups with low mortality from these causes also had low total mortality. Mortality from violent and unnatural causes was high among groups having a high total mor-

tality. In addition, males in farm work and forestry work had high mortality from violent and unnatural causes, but they had a low total mortality.

Based on occupation (population census 1960), economically active persons were grouped into five social classes. With some exceptions, the mortality rates showed the expected pattern of higher mortality following lower social status for males.

The main purpose of the latest study made in Norway (Central Bureau of Statistics, 1979) was a re-examination of the results in "Occupational Mortality 1970-1973". taking into account occupational data from the Population Census 1960. This study was conducted by Kristofersen.

Among the 120,000 persons above 16 years who died during the period from November 1st, 1970, to December 31st, 1973, only about 21,000 were economically active at the Population Census 1970. "Economically active" means that the persons had income from own work as their main source of living during the last twelve months. Going back to the Population Census 1960 and linking occupational data from 1960 to the population in the 1970 census would give the study a more dynamic scope. First, it gave us the possibility to find occupational data for pensioners in 1970, and for some of the housewives in 1970. We were thus able to study earlier occupation and mortality for a great part of the economically non-active persons in 1970. We could also study occupational mortality based on occupational data for economically active persons 1970 and occupational data for 1960 (if any) for economically non-active persons 1970, put together. In this case, we made the assumption that most of the persons economically active in 1960 had been in their occupation several years before 1960 and most of them also after this year, so that working conditions had an impact on their health. The assumption that most of the economically active persons in 1970 had remained in the same occupation for several years was also implicit in the occupational mortality analysis 1970-1973.

Linking of data from the 1960 and the 1970 censuses also gave the possibility to study to which degree persons economically active in both censuses had changed occupation from 1960 to 1970.

The results of this analysis confirmed and strengthened the results found by Haldorsen and Glattre in 1976. The most interesting new knowledge (or hypothesis) was perhaps that (the typical) socio-economic differential mortality was stated also among women, when the economically active from the 1960 census were included.

2. Methodology

Linkage

The last study performed includes 1,051,000 males and 468,000 females economically active in 1960 and/or 1970. Among these groups, 25,800 males and 4,500 females died in the period 1970-1973.

The lapse in linkage of data from 1960 and 1970 was taken little care of. A total of about 3.2 million persons were present at both censuses. Of these, 13,000 to 18,000 were not linked, but this group includes economically as well as not economically active persons. Compared to the total population, no linkage referred to only about 0.5 %.

Data for the deceased were, by means of the identification number, combined with information on occupation in 1960 and/or 1970.

Definitions

Age : is defined as age per December 31st, 1970;

Mortality : is defined as deaths during the period November 1st, 1970 to December 31st, 1973, divided by population as per November 1st, 1970;

Economically active : person who had income from own work as his main source of livelihood during the last 12 months before the census.

Classifications

Occupation refers to the Nordic standard, principally in accordance with ISCO 1958. For this analysis, two-digit groups supposed to be homogeneous with respect to working conditions were combined into 28 occupational groups for males and 14 groups for females.

Economically active males and females were further grouped in five social classes by using information on their occupation.

Causes of death are classified in accordance with ICD, 8th revision, and grouped into :

1. a list of 26 categories; and
2. a list of 7 main categories.

Standardisation

For standardisation, both direct and indirect methods were used, and economically active males and females were used as standard population. For each occupational group, a mortality index according to the direct method was published.

3. Methodological shortcomings

Record linkage

As mentioned, record linkage between population census 1960 and 1970 failed for 0.5 % of the population. By matching deaths 1970-1973 to census data from 1960, the lack of linkage mostly referred to persons born after the census date in 1960. A further study of reasons for non-matching has not been made.

By adding census data for occupation from 1960, the number of deaths included in the study was increased from 17,500 males and 2,500 females to 25,800 and 4,500 respectively.

Occupation

In the Norwegian studies, occupation is extracted from the population census and refers to income from own work as the main source of living during the last twelve months before the census date.

Death certificates include a question on occupation, but the information given is not complete, and is not used for statistical purposes.

By using occupation for a fixed period, as in the census, one will, in some cases, get information of an occupation which is not relevant to the death, if the person has recently changed occupation. On the other hand, persons changing occupation during the observation period after the census will be registered with the occupation they had at the census.

By adding occupation from 1960, it was possible to include persons active in 1960, but not active in 1970. The assumption was that these persons could have stayed in the same occupation before 1960 and some time after 1960.

By combining data from 1960 and 1970, one could select persons belonging to the same occupational group at both periods. About 30 % belonged to this group. However,

a person can have changed his occupation once or more times between 1960 and 1970. Such changes have not been possible to include.

In the future, it will be possible to follow the active population, as there is established a central register including all employers and employees.

It can also be mentioned that some changes in the coding of occupation from 1960 to 1970 caused trouble, but it was possible to transfer individuals from one category to another.

Population under risk

During the observation period 1970-1973, deaths and migration occurred within the population. By linking population data November 1st, 1970, to a situation file from the central population register December 31st, 1973, persons dead or emigrated could be extracted. It could further be stated when the deaths and emigration occurred.

Because the mortality is rather low, and registered emigration of Norwegians often is temporary (limit 6 months for notification), it was not found necessary for a study covering only three years to make corrections.

4. Future and current undertakings

The Central Bureau of Statistics of Norway has in the working programme for the coming five years included an occupational mortality study, probably based on the death certificate material for the period November 1st, 1980, to December 31st, 1985. No definite plan has yet been worked out.

The Central Bureau of Statistics also has a running project trying to establish an official Norwegian socio-economic classification. This classification may be suitable in a forthcoming occupation mortality study.

The Fifth Scandinavian Demographic Symposium in June 1979, with occupational mortality as one of the topics discussed, suggested a closer Nordic cooperation in the further work in this field of research. According to a recommendation from the Conference of the Nordic Chief Statisticians, the topic was put on the agenda for the meeting of the Nordic Working Group for Population Statistics in September 1980. A proposal was made for a project by which the countries will analyse deaths during the period 1970 to 1980 according to a common method, to ensure comparability of the results.

Outside the Central Bureau of Statistics, mortality and social differences are studied by research institutes, partly covering mortality in general, partly specific causes.

U N I T E D S T A T E S O F A M E R I C A

CURRENT AND FUTURE UNDERTAKINGS IN THE UNITED STATES

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Several efforts are being contemplated in the United States during the 1980s to provide periodic or continuing information on socio-economic differentials in mortality. These include the following :

1. Linked records

A linked records study of infant deaths and live births for the birth cohort of 1980 is being planned. Because the birth record in the United States includes items on the educational attainment of parents, this study would provide data on infant mortality differentials by educational attainment of parents. Complementing the information on infant mortality will be national data on foetal mortality, so that perinatal mortality data - a combination of infant mortality and foetal mortality - will be available, in accordance with WHO recommendations. A linked records study was completed for births in 1960, but did not include socio-economic data.

2. Mortality followback study

A mortality followback study would use mail questionnaires to elicit additional information on the characteristics of a large stratified sample of decedents in the United States. Items of interest would include life style, occupational, migration, educational, and income characteristics of decedents. Existing items on the death certificate that relate to socio-economic status include race, ethnicity, occupation, and industry, the latter two of which are not currently coded on a routine basis.

3. Occupation and industry items on the death certificate

Currently, a number of states in the United States code occupation and industry on the death certificate. The National Center for Health Statistics will promote uniform coding of these items during the early 1980s which will permit calculation of occupational differentials in mortality.

4. Comparative methodologies

In a time of growing resource constraints, we consider it important to evaluate the relative efficiency of alternative data collection methodologies for producing information on socio-economic differentials in mortality.

U N I T E D S T A T E S O F A M E R I C A

PRESENT SHORTCOMINGS AND KNOWLEDGE GAPS IN U.S. STUDIES

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I : SHORTCOMINGS OF ALTERNATIVE METHODOLOGIES

1. Occupation differentials (based on regular tabulations of death and census data)

a. Different concepts of occupation on death certificates and census/survey schedules : usual occupation on death certificate; current occupation (e.g., as of preceding week) in census enumeration.

(i) Data therefore not usable above age 65 because usual occupation is reported on death certificate of retired persons, whereas no (or most recent) occupation is given in census.

(ii) There are also large discrepancies in the reporting of occupation on the two records for persons under age 65, in part due to the differences in concept and also to unreliable reporting of occupation.

b. Occupation provides poor coverage of women of all ages, and of men under 25 or over 65.

c. Because of these shortcomings, occupation of decedents is not coded on a regular basis nationally from the information provided on the death certificate. The most recent analysis of occupation differentials by this method was in 1950.

2. 1960 Matched Records Study

a. Twenty one per cent of the 340,000 deaths could not be matched with 100% (Stage I) census records; 20% of white deaths and 30% of non-white. Data collected for unmatched decedents in a subsample of 9,541 decedents included in a special Followback Mortality Survey were used to estimate the social and economic characteristics of decedents not matched with Stage II (25% sample of State I) census records; for example, data on the educational attainment of 481 unmatched white male decedents 25-64 years old in the Followback Survey were used to estimate the education level of the 4,860 unmatched white decedents of the same age in the Stage II census records (1). Thus, although it was possible to estimate the characteristics of unmatched decedents, the sampling error was increased by the small proportion of unmatched decedents included in the Followback Survey.

b. For various reasons, the socio-economic differentials derived from this study were limited to persons 25 and older. The design did not permit the measure-

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1. Evelyn M. Kitagawa and Philip M. Hauser : *Differential Mortality in the United States : A Study in Socio-economic Epidemiology*. Cambridge, Mass. : Harvard University Press, 1973. See tables A.3, A.14.

ment of infant mortality (since the study included deaths occurring during May-August *following* the 1960 census and most of the deceased infants were born *after* the census was taken). Small numbers diluted the usefulness of statistics of deaths to persons 1-24 years old, as well as the complications and high costs of undertaking special tabulations of the U.S. population 1-24 years old by characteristics of their parents, etc.

c. The high cost of the matching operation. The 1960 study cost over $1,000,000. The cost of a repetition of the same study design in 1980 would exceed $10,000,000 perhaps as much as $20,000,000. It is difficult to justify a repetition of this approach in the 1980s with this level of inflation. An expanded Followback Survey to obtain information of equal reliability will cost much less in the 1980s (see below).

3. Use of small geographic areas as units of aggregation of socio-economic groups

a. This approach has the advantage of providing data for all ages, including child mortality, and also permits analyses of changes in socio-economic differentials between successive census enumerations.

b. Its disadvantages are : (1) it is limited to metropolitan areas for which census data are compiled by census tracts; and (2) it ignores intra-tract socio-economic variations in mortality.

4. Child and teenage mortality from special CPS questions

(Summarise approach in recent paper by Mare and Matsumoto.)

5. Proposed study for 1980s : large-scale followback mortality survey

Design : Use of Followback Survey of 50,000 - 70,000 deaths as numerators, and CPS sample of population in 69,000 households as denominators of death rates.

a. Advantages

1. Can ask same questions in both surveys : for example, same concept of occupation for decedents and population base.

2. Can ask special questions pertaining to known risk factors in mortality : e.g., diet, smoking alcohol, in both surveys, in addition to questions on social and economic characteristics of individuals.

3. Will provide data on all age groups, using socio-economic characteristics of parents for minors.

4. Less expensive and less complex than Matched Records Study.

b. Disadvantages

1. Larger sampling error than equivalent number of deaths in Matched Records Study because both numerator and denominator of ratios subject to sampling error.

2. Such a large-scale Followback Survey may need to be spread over several years.

3. Need to estimate characteristics of decedents for whom questionnaires are not returned (about 6 % of decedents in 1960).

II : MAJOR KNOWLEDGE GAPS

1. Lack of comparable data over time and space to assess trends in socio-economic mortality, both for the United States as a whole and by geographic sub-areas. Virtually the only trend data available at present are for individual large cities or metropolitan areas, based on the use of census tracts as units for aggregating death and population statistics, utilising socio-economic indexes of the tract to allocate deaths and population to socio-economic subgroups.

2. Lack of adequately reliable data to assess trends in mortality differentials by marital status, race (other than Black/Non-black), ethnicity. Discrepancies in reporting of these items on the death certificates and census or survey records introduce errors in measurement of mortality differentials.

R E F E R E N C E S

Duncan, Otis Dudley (1961). "Occupational Components of Educational Differences in Income," Journal of the American Statistical Association, 56 (December 1961), 783-792.

Guralnick, Lillian, and Charles B. Nam (1959). "Census-NOVS Study of Death Certificates Matched to Census Records," The Milbank Memorial Fund Quarterly, 36 (April 1959), 144-153.

Hodge, Robert W., and Paul M. Siegel (1968). "The Measurement of Social Class," International Encyclopedia of the Social Sciences, vol. 15, pp. 316-325.

Moriyama, Iwao M., and Lillian Guralnick (1956). "Occupational and Social Class Differences in Mortality," in Trends and Differentials in Mortality. New York: Milbank Memorial Fund.

National Center for Health Statistics.

(June 1961). Vital Statistics--Special Reports, vol. 53, no. 1, The Comparability of Reports on Occupation from Vital Records and the 1950 Census (by David L. Kaplan, Elizabeth Parkhurst, and Pascal K. Whelpton). Washington,D.C.

(June 1968). Vital and Health Statistics, series 2, no. 29, Comparability of Age on the Death Certificate and Matching Census Record, United States, May-August 1960. Washington, D.C.

(May 1969). Vital and Health Statistics, series 2, no. 34, Comparability of Marital Status, Race, Nativity, and Country of Origin on the Death Certificate and Matching Census Record, United States, May-August 1960. Washington, D.C.

Reiss, Albert J., et al. (1961). Occupations and Social Status. New York: Free Press of Glencoe.

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