Series DHI no. 3

OFFICE OF POPULATION CENSUSES AND SURVEYS

1951-
1975

Trends in mortality

England & Wales

HMSO £1.50 net

A publication of the Government Statistical Service

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London: Her Majesty's Stationery Office

First published 1978

ISBN 0 11 690667 7

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Introduction

This volume presents a number of statistical studies of mortality in England and Wales - studies of the type which until 1967 would have appeared in the commentary volumes of the *Registrar General's Statistical Reviews*. The studies illustrate some of the ways in which routine mortality statistics may be analysed.

Most of the material presented relates to the period 1951-1975 although Chapter 1 consists of a brief account of mortality trends in England and Wales from 1841 to the present day. Emphasis is placed on the growing gap between male and female mortality and a comparison is made between some of the major causes of death from 1931 to 1971. Three chapters follow relating to particular areas of mortality in which there are increasing death rates among some groups of the population: ischaemic and related heart disease in middle age; cancer of various sites; and accidents and violence in children and young people. No attempt is made to provide a comprehensive discussion of these topics and references to other sources are few. The aim is simply to bring to light a few of the clues which lie buried in the mass of official mortality statistics - clues which may help to solve some of our present problems of epidemiology and public health.

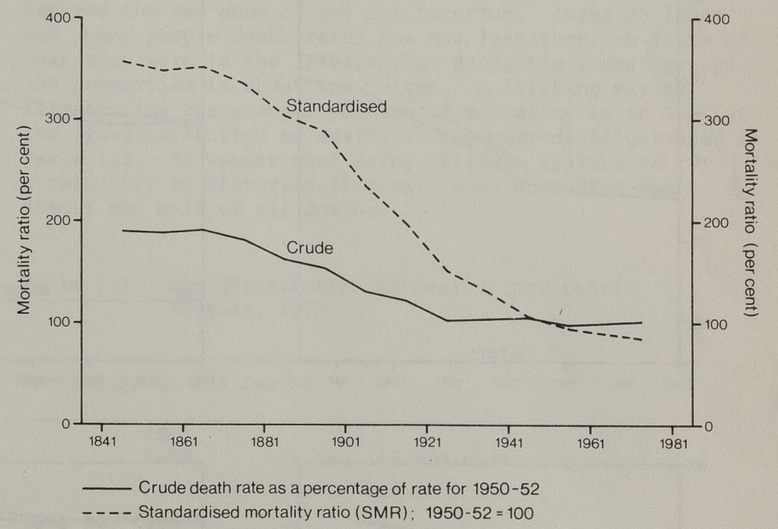
Virtually all the material analysed has been culled directly from the official mortality statistics published by OPCS. The appendix contains a brief description of these sources with particular reference to the transition from the *Statistical Reviews* to the new *Mortality Statistics* reference volumes (Series DH 1-5).

1. Trends in mortality 1841–1974

1841 is the first year for which there are comprehensive mortality statistics for England and Wales. Since then the crude mortality rate has been approximately halved. A greater part of this reduction, as Figure 1.1 shows, took place in the 60 years 1870-1930, the crude rate falling from 21.4 per thousand in the decade 1871-80 to 12.1 in 1921-30. These trends have been extensively described and analysed; McKeown et al (1, 2) have concluded that all the decline in the 19th Century and most of that in the 20th Century has been due to a decline in deaths from infectious diseases.

Since 1921 the crude death rate has hardly varied. This levelling off reflects the rapidly changing age and sex structure of the population rather than any sudden halt to the downward trend in mortality rates. To allow for such changes, which was hardly necessary in the earlier period when the age and sex structure remained reasonably stable, some method of standardisation is necessary.

Figure 1.1 Trends in mortality, 1841-1975



The method of standardisation chiefly used now by OPCS is the Standardised Mortality Ratio (SMR) which expresses the number of deaths registered in a particular period as a percentage of those expected in that year, had the age-sex mortality rates of a standard period operated in the year under review. Figure 1.1 shows how the ten-yearly SMR calculated with 1950-52 as a base has continued to decline from 151 in 1921-30 to 89 in the most recent decade 1961-70, and 85 in the five years 1971-75.

Life tables

But by far the oldest method of standardisation is provided by the life table, of which the history, stretching far back into the 17th Century has recently been reviewed by Cox (4, 5). The expectation of life, calculated by actuarial methods, reflects the individual age-specific death rates for each sex in a manner which allows for changes over time in the age and sex structure of the population. Figure 1.2 which is based on life tables published regularly by OPCS (6), shows changes in the expected age at death from Farr's Table of 1838-44 to the present day.

An advantage of the life table method is that it allows male and female mortality to be readily compared and that it enables the effect of death rates at different ages to be studied. (In this context it should be noted that the separate male and female SMRs given in Table 3 in *Mortality Statistics* (Series DH 1) should not be used for a direct comparison of male and female mortality.) The expectation of life at birth which is, as it were, the converse of the SMR, has increased over the 130 year period from 40 to 69 years in males and from 42 to 75 years in females. The gap between male and female expectancy persists at each age.

The bulk of the improvement in life expectancy has been due to very greatly reduced death rates in the very young: by

Figure 1.2 Expectation of age at death, 1841-1975

Table 1.1 Death rate by age (per 1000 population) 1841-50, 1901-10, 1961-70

Age	1841-50 (1)	1901-10 (2)	1961-70 (3)	Col (3) per cent of Col (1)
0-4	66.0	46.0	4.73	7
5-9	9.0	3.6	0.37	4
10-14	5.3	2.1	0.33	6
15-19	7.5	3.0	0.68	9
20-24	9.3	3.8	0.74	8
25-34	10.3	5.1	0.88	9
35-44	13	8.3	2.1	16
45-54	17	14	5.8	34
55-64	30	28	16	53
65-74	64	59	39	61
75-84	142	127	93	65
85 and over	301	261	218	72

the age of 15 male expectancy has increased only 12 years over the 130 year period and by the age of 65 there has been hardly any change. Table 1.1 summarises changes in age-specific death rates and shows clearly the difference between the two ends of the age-spectrum. Among children and young people death rates are now less than one-tenth of what they were in the 1840s whilst among the oldest groups the proportion is about two-thirds. A striking way of illustrating the changed pattern of mortality is to look at the age-distribution of deaths at two periods illustrated in Table 1.2. No wonder that dying children feature so prominently in Victorian fiction: they accounted for almost one half of all deaths.

Table 1.2 Age distribution of deaths (per cent) 1838-44, 1975

Percentage of all deaths

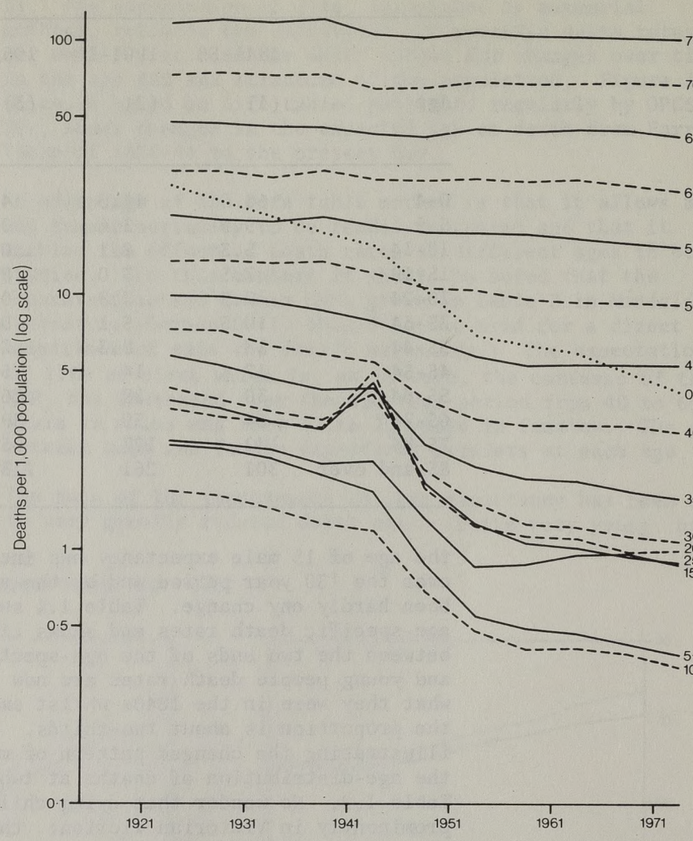
	Age 0-14	15-64	65 and over
1838-44	47	34	19
1975	2	23	75

Trends 1921-75

In order to understand more fully current trends in mortality it is necessary to study age-specific death-rates (Figure 1.3 and Appendix Table A.) To eliminate short-term fluctuations, caused for example by epidemics, the rates are calculated over five-year periods.

Figure 1.3 Deaths by age, 1921-75

a Males



At the older ages (55 or more for men and 65 or more for women) rates have declined steadily throughout the period 1921-74. For women the rate of decline has been steeper than for men; for example at ages 65-69 the net decrease over the 50 years was 13 per cent for men and 44 per cent for women. But below these ages three distinct periods may be identified:

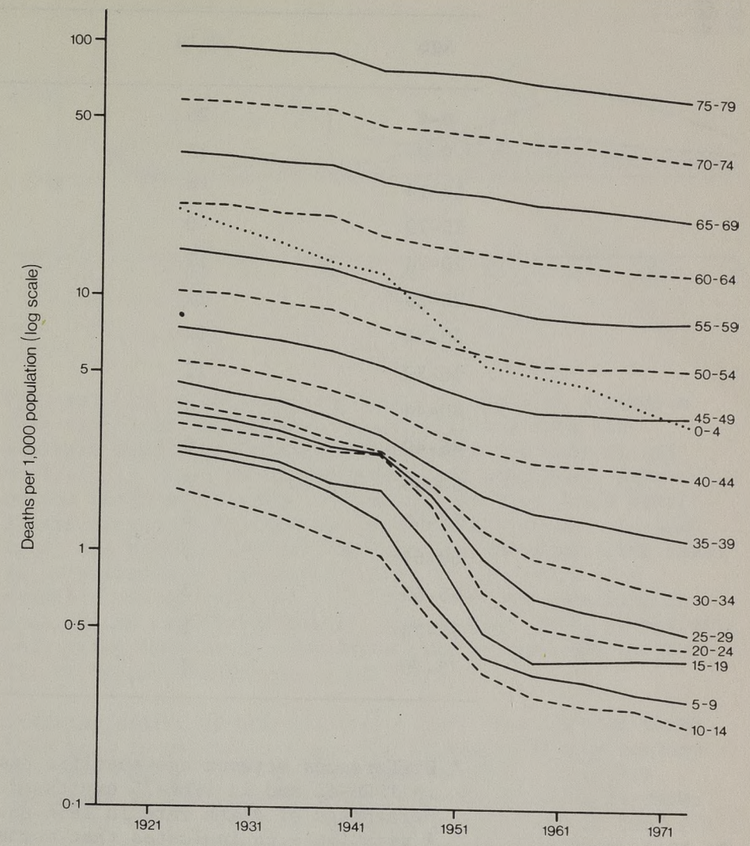
1921-5 to 1941-5 In this period there was a steady decrease in mortality at almost all ages: it was steeper for females than males and for younger than older people. In World War II mortality statistics were based on the artificially selected less fit civilian population and it is this, rather than war casualties, which accounts for the increase in male mortality at some ages in 1941-5.

1941-5 to 1956-60 There was a downturn in mortality rates, particularly at the younger ages. For the under 20s rates were cut by a half or more in a bare 15 years.

1956-60 to 1971-75 Mortality rates, particularly among the groups where the rate of decline had been steepest in the

Figure 1.3 Deaths by age, 1921-75

b Females



previous period, began to flatten out or even to increase. There is, of course, no objective way of determining whether a particular death rate has reached a real minimum and is beginning to increase; even rates based on five-year periods are subject to short-term fluctuations. But some idea of the current position is shown by Table 1.3 which compares age-specific mortality in the ten years 1966-75 with that of the previous decade. On this basis the rates for men at ages 15-19, 40-54 and 65-79 are unchanged or have shown only minimal decreases (less than 5 percent); for women they have increased slightly at ages 15-19 and decreased only minimally at ages 45-59.

Males and female death rates

The extent to which the gap between male and female mortality has been widening in recent years is illustrated in Figure 1.4 which shows for each age-group, the percentage excess of male, as compared with female, mortality. The two distinct 'humps' of excess male mortality in 1961-70 stand out dramatically. At ages 15-19 mortality among boys was 150 per cent higher than among girls - an entirely new pattern since World War II. At ages 55-64 male mortality

Table 1.3 Percentage decline in mortality* by age and sex from 1956-65 to 1966-75

Age	Male	Female
0-4	26	27
5-9	15	15
10-14	9	13
15-19	0	-2
20-24	12	12
25-29	12	19
30-34	12	20
35-39	13	15
40-44	4	8
45-49	0	3
50-54	3	1
55-59	8	3
60-64	7	8
65-69	3	9
70-74	1	10
75-79	2	10

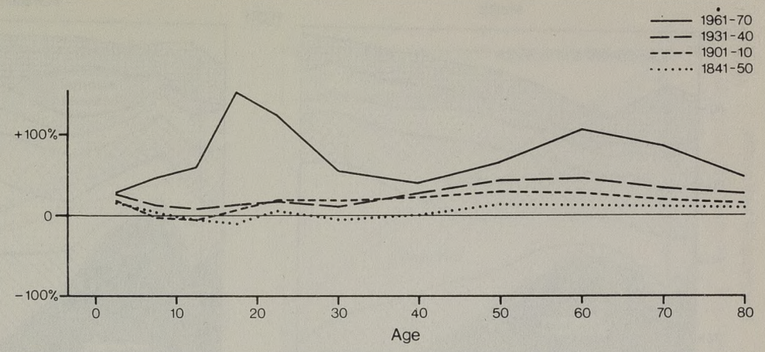
* Differences between age-specific death rate in 1956-65 and in 1966-75 expressed as a percentage of death rate in 1956-65. A negative sign indicates that mortality has increased.

in 1961-70 was 100 per cent higher than female compared with 28 per cent in 1901-10 and 12 per cent in 1841-50.

The recent widening of the gap between male and female mortality can hardly be due to any inherent difference between the sexes and must therefore be attributed to the effect of different environmental factors. The excess male mortality may therefore be taken as an index of 'preventable' deaths - no doubt a conservative one as many female deaths may be equally preventable. A measure of the number of such in a year can be obtained by applying current female age-specific death rates to the male population. On this basis no less than 41 per cent of current annual male deaths at ages below 65 may be regarded as preventable. In 1973 there were some 98,000 such deaths; the figure would be reduced by 43,000 if male mortality could be brought down to the female levels.

Before considering the nature of this excess male mortality something must be said about cause of death statistics and their reliability in long-term comparisons.

Figure 1.4 Percentage excess of male over female death rates by age, 1841-1970



Mortality by cause death

The analysis of mortality by cause of death is a problem that exercised the General Register Office from its earliest days. The cause of death used for statistical analysis is based on the diagnosis (or diagnoses) entered on the death certificate. Three out of four death certificates mention more than one separate diagnosis. In such cases the practice before 1940 was for the underlying cause to be selected by the coding clerk on the basis of a detailed set of rules of priority. But now selection is made by the certifying doctor, the current rules of priority only being invoked in rare cases such as when the certifier's intentions are not clear (7).

Internationally agreed classifications of causes of death have been in existence since the beginning of the century and have usually been revised decennially. Of recent revisions to the International Classification of Diseases (ICD) the 6th, introduced in 1950, and the 8th in 1967 (7) included major changes which have led to discontinuities in the statistics of many causes of death.

Trends in mortality rates ascribed to particular diseases may reflect changes of medical philosophy, and in clerical and statistical routine as much as in the real incidence and prevalence of the diseases themselves. In order to minimise (but not necessarily to eliminate) such sources of error, long term comparisons are sometimes best confined to broad and well-recognised disease groups.

Figure 1.5 shows the relative importance of nine main disease groups as causes of death in 1931, 1951 and 1973. The most striking feature of the comparison is the virtual disappearance of mortality due to infective diseases (of which the most important was, of course, tuberculosis) and to maternal causes, together with the reduction in the relative frequency of deaths due to respiratory, digestive and genito-urinary disease. To complement these decreases there have been relative increases in mortality due to three cause-groups, circulatory disease, neoplasms and accidents; between them these causes now account for 75 per cent of all deaths.

Figure 1.5 Mortality by cause, age and sex, 1931, 1951, 1973

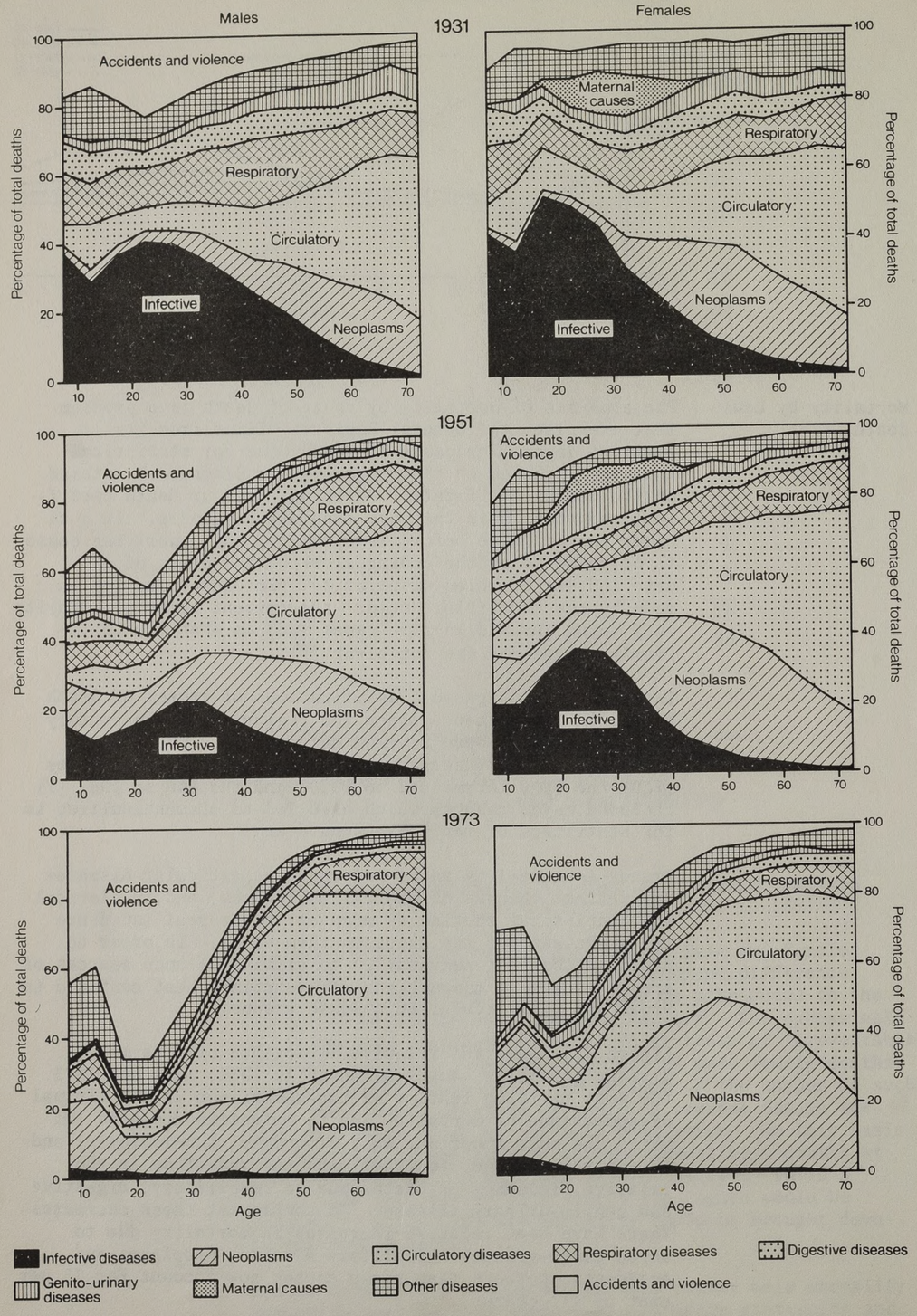
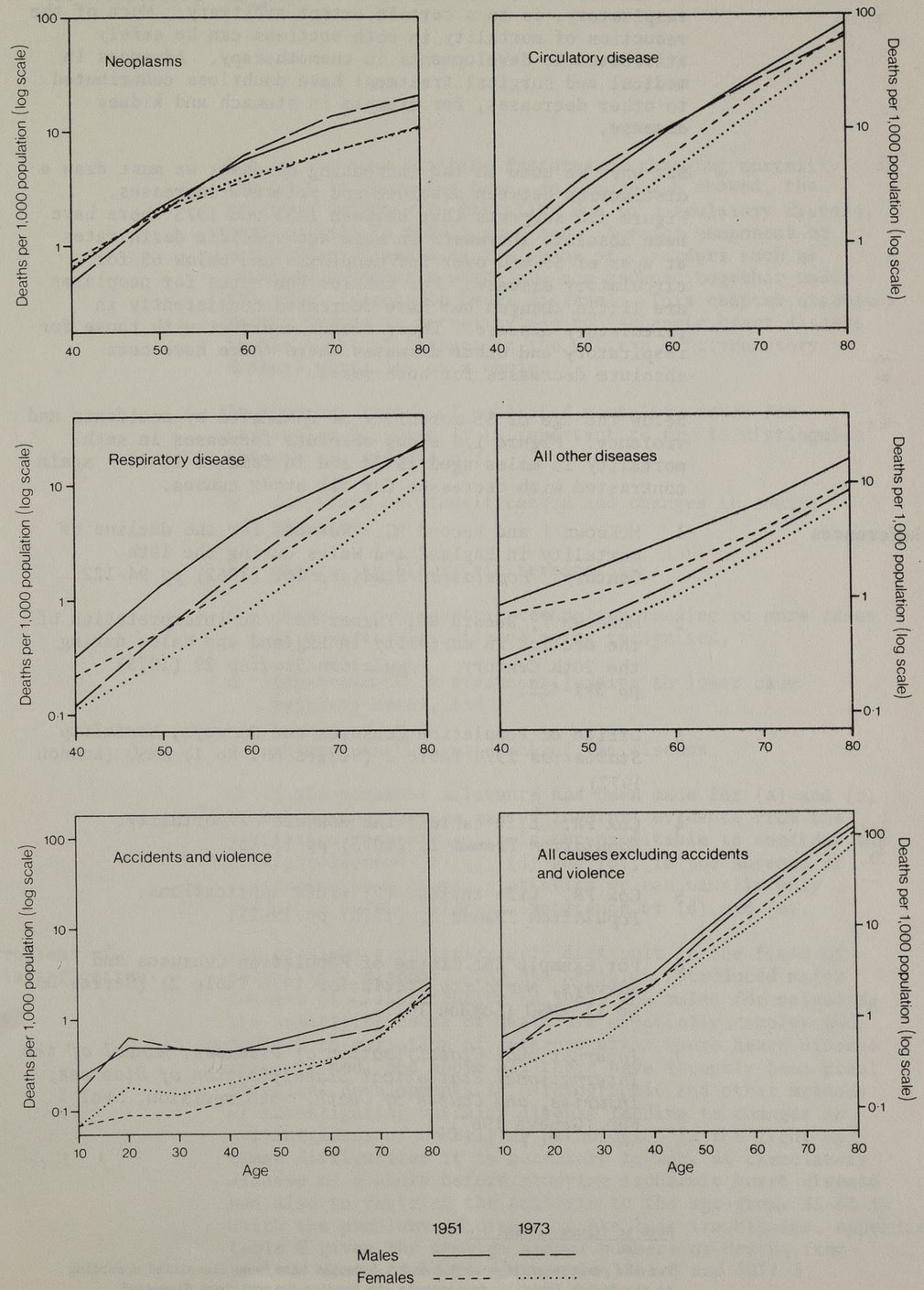


Figure 1.6 Deaths by cause, age and sex, 1951, 1973



Little need be said here about the declining diseases. The distinction in the classification between infective diseases of bacterial or viral origin and such diseases as bronchitis and influenza, included here under the heading respiratory, is to a certain extent arbitrary. Much of the reduction of mortality in both sections can be safely attributed to developments in chemotherapy. Advances in medical and surgical treatment have doubtless contributed to other decreases, for example in stomach and kidney disease.

But when we come to the increasing diseases we must draw a distinction between absolute and relative increases. Figure 1.6 suggests that between 1951 and 1973 there have been absolute increases in male age-specific death rates at ages of 55 and over for neoplasms and below 65 for circulatory disease. For females the rates for neoplasms are little changed but have decreased consistently in circulatory disease. These trends contrast with those for respiratory and other diseases where there have been absolute decreases for both sexes.

Below the age of 35 mortality is dominated by accidents and violence. Figure 1.6 shows absolute increases in such mortality in males aged 15-24 and in females 15-34 - again contrasted with decreases for all other causes.

References

1 McKeown T and Record RG. Reasons for the decline of mortality in England and Wales during the 19th Century. *Population Studies*, 16, (1962) pp 94-122.

2 McKeown T, Record RG, Turner RD. An interpretation of the decline in mortality in England and Wales during the 20th Century. *Population Studies* 29 (1975) pp 391-422.

3 Office of Population Censuses and Surveys, *Mortality Statistics* 1974 Table 3 (Series DH1 No 1) HMSO (London 1977).

4 Cox PR. Life tables: the measure of mortality. *Population Trends 1*, (1975) pp 13-15.

5 Cox PR. Life tables: (2) wider applications. *Population Trends 2*, (1975) pp 19-21.

6 For example in: Office of Population Censuses and Surveys, *Mortality Statistics* 1974 Table 21 (Series DH1 No 1) HMSO (London 1977).

7 *International Classification of Diseases: Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death.* 8th revision. Vol 1. WHO (Geneva 1967).

Note to figure 1.5 and 1.6

For the purpose of figures 1.5 and 1.6 deaths have been classified according to the Eighth Revision; for example the heading "circulatory diseases" includes cerebrovascular diseases in each period.

2. Ischaemic and related heart disease in middle age

One of the most striking features of changing mortality over the past 40 years has been, as Figure 1.5 showed, the relative increase in mortality due to circulatory disease, particularly in middle aged men. A major component of circulatory disease is the group of disorders such as coronary thrombosis which are now grouped together under the label 'ischaemic heart disease'. This chapter discusses recent trends in mortality due to ischaemic heart disease in the light of changes in the pattern of circulatory disease mortality as a whole.

In studying trends of published mortality rates for particular diseases it is important to try to distinguish between the effects of:

a revisions of classification and changes in coding practice,

b changes in diagnostic terminology,

c changes in diagnostic technology leading to more cases of a particular disease being recognised,

d improvements in treatment leading to lower case fatality rates, and

e changes in the incidence of the disease.

Until all possible allowance has been made for (a) and (b) by making what use we can of internal evidence from the statistics themselves, it is not profitable to consider the likely relevance of (c), (d) and (e); in the absence of comprehensive sickness statistics we can usually only speculate on the relative importance of (d) and (e).

Problems of classification

The problems are particularly difficult in the field of circulatory disease. The 8th Revision introduced major changes of classification in 1967; the rules for selecting the underlying cause of death are especially complex and subject to variation of interpretation where heart disease is mentioned; and above all there have recently been great technical developments in cardiographic and other methods of investigating vascular disease leading to changes in current ideas of underlying pathology. In the light of these difficulties it is necessary to look at circulatory disease as a whole before studying ischaemic heart disease and also to restrict the analysis to the age-group 35-64 in which the problems of diagnosis are less troublesome. Appendix table C gives the average annual numbers of deaths from various forms of heart disease in 1951-3 and 1971-3

Table 2.1 Circulatory disease: changes in average annual male deaths at ages 35-64, between 1951-53 and 1971-73*

Decreases	Number of deaths	Increases	Number of deaths
Active rheumatic fever	46	Ischaemic heart disease *(Arteriosclerotic heart disease including coronary disease)*	11,203
Chronic rheumatic heart disease	1,244	Other heart disease	69
Hypertensive heart disease	1,093		
Other hypertensive disease	691		
Other mycardial insufficiency *(Myocardial degeneration without mention of arteriosclerosis)*	1,987		
Chronic disease of endocardium *(Chronic endocarditis not specified as rheumatic)*	196		
		Net increase in all forms of heart disease	6,015
Cerebral embolism and thrombosis	1,006	Subarachnoid haemorrhage	209
Other and ill-defined cerebro-vascular disease	1,086	Aortic aneurysm	264
Arteriosclerosis	286	Other diseases of arteries	127
		Pulmonary embolism and infarction	197
		Other circulatory diseases	159
Net decrease in all other circulatory disease	1,422		

* Age standardised: see notes to Appendix table C

adjusted for changes in the population at risk. The dual classification of deaths in 1967 by the 7th and 8th Revisions (1) has enabled the two sets of figures to be made reasonably comparable, but no account is taken of any possible changes in selection of the underlying cause.

Mortality due to circulatory disease

Taking circulatory deaths as a whole the number of male deaths rose by 12 per cent over the 20 years, the share of total deaths increasing from 39 per cent to 50 per cent. For women circulatory deaths fell by 24 per cent representing a slight fall, from 39 per cent to 35 per cent, in the proportion of total deaths.

Table 2.1 gives a balance-sheet of male deaths, distinguishing between those causes for which there appears to have been an increase and those for which there appears to have been a decrease. There is little doubt that the decrease of 1987 deaths ascribed under the 6th Revision to myocardial degeneration without mention of arteriosclerosis (ICD 422.0 and 422.2) represents a simple switching of diagnoses when such terms as coronary heart disease and myocardial infarct become more widely used. There may also have been a shift from hypertensive disease as the importance of ischaemic heart disease became increasingly recognised. A further possibility is that at a time when ischaemic heart disease was increasing for whatever reason, hypertensive patients at risk from dying of cerebrovascular disease or other effects of hypertension might instead fall victim to ischaemic heart disease. But it is clear from the table that these changes are not in themselves sufficient to have accounted for the great increase in male deaths ascribed to ischaemic heart disease. Furthermore it is of course possible that some of the decreases in Table 2.1 are real; there is good evidence that fewer deaths are now caused by rheumatic heart disease and in more recent years the better control of hypertension may have led to fewer deaths being properly ascribed to this cause or to cerebrovascular disease.

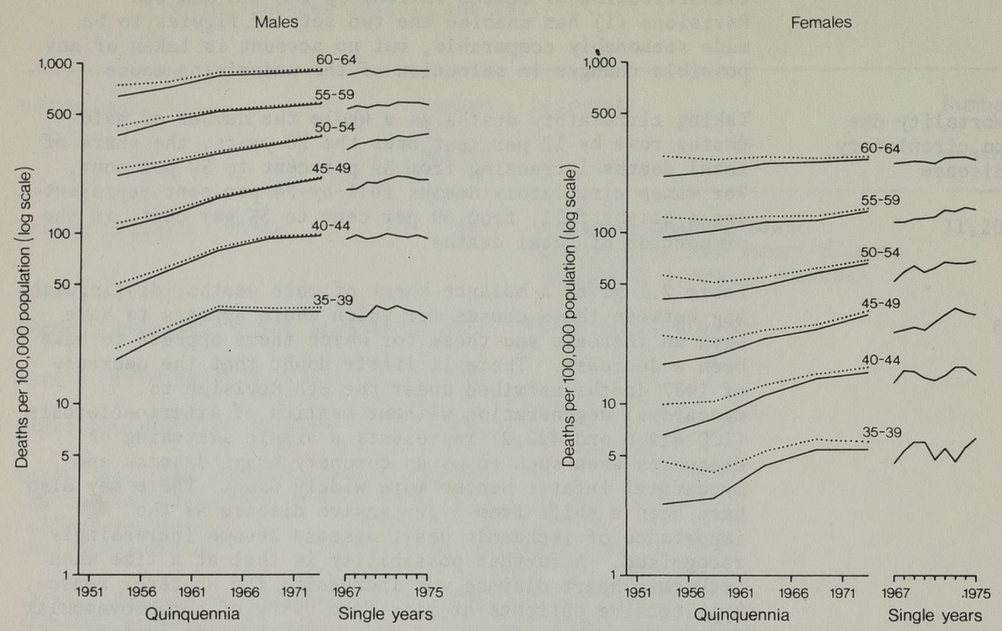
More refined diagnostic methods may account for some of the other apparently increasing diseases such as subarachnoid haemorrhage. But the increase in deaths due to aortic aneurysm probably shares a common cause with the increase in ischaemic heart disease.

In looking at female mortality we are on less sure ground. With a total decrease in circulatory disease mortality, the increase in ischaemic heart disease (which was much less than for men) could possibly be due to a switching of diagnoses. It may be noted that the decreases in hypertension and cerebrovascular disease were greater than for men.

Ischaemic and related heart disease

The effect of the transition from the 7th to the 8th Revision of the ICD on ischaemic and related heart disease is shown in detail in Appendix Table D in which the deaths in 1967 at ages 35-64 are classified according to both methods. It will be seen that the male deaths now assigned to the 8th Revision definition of ischaemic heart disease (A list, 83) accounted for about 97 per cent of those classified under

Figure 2.1 Ischaemic heart disease: deaths by age and sex, 1951-75



	ICD Revision 6th, 7th	8th
—— Arteriosclerotic (ischaemic) heart disease	420, 422·1	410-414
····· Arteriosclerotic and degenerative heart disease	420-422	410-414, 424, 428, 395·9

the 7th Revision as 'arteriosclerotic and degenerative heart disease' (A list, 81). There is, at these ages, good comparability between the new ischaemic heart disease heading and the 7th Revision headings in which mention is made of arteriosclerotic heart disease or coronary artery disease (420, 422.1). To obtain comparability with the wider 7th Revision heading which also includes degenerative heart disease (so-called) it is necessary to add in the 8th Revision headings of 424, 395.9 and 428 which include other myocardial and endocardial disease.

Figure 2.1 and Appendix table E give age-specific death rates for both definitions by five-year periods, from 1951 to 1975 and for single years from 1967 for the 8th Revision definition. Whichever method is used it is clear that at all ages there have been marked increases in the attributed rate of ischaemic heart disease mortality; below the ages of 50 the rates for men doubled in 20 years. The narrowing gap between the two sets of rates suggest that the possible switch from 'degenerative' to 'arteriosclerotic' causes of death referred to earlier was due to a gradual change in terminology rather than the result of changes of classification.

A welcome feature of the most recent figures is the suggestion that the rate of increase of ischaemic heart disease mortality has been slowed down or even halted for men

other than those in the 50-54 age group. But falling trends over the individual years 1971-75 should not necessarily be taken at their face value; they may be due to a succession of mild winters and the absence of a severe influenza epidemic. Both these factors are associated with reduced mortality from many diseases.

The picture among women is different: the levels of mortality are much lower, the rates now ranging from about one-sixth of the corresponding male rates at the younger ages to one-third at the older. Also the rates of increase are less steep than for the men, particularly if, in the earlier years, we include all deaths which could possibly be in fact due to ischaemic heart disease. And finally there is less evidence than for men of any recent improvements in the rates.

Since 1967 chronic and acute ischaemic heart disease have been separately classified. It may be of interest to note that the proportion of chronic disease appears to be slowly increasing; in males aged 35-64 it rose from 14.6 per cent of all ischaemic heart disease in 1967 to 18.5 per cent in 1974. However the unqualified diagnosis 'ischaemic heart disease', although probably increasingly used to describe acute attacks of ischaemia, is allocated to the heading 'chronic'. If this is so the observed change in the proportion of chronic to acute disease may simply reflect a change of words.

Reference

1 *Registrar General's Statistical Review of England and Wales for the year 1967. Part III Commentary.* Tables C95, C96. HMSO (London 1971).

3. Cancer

Cancer is not usually thought of as a single disease. The problems of aetiology, diagnosis and prognosis vary so much from site to site that it is customary to analyse the mortality statistics of each site separately. It is nonetheless of interest to study the picture of malignant disease as a whole: to look at the trends of total cancer mortality and to see the contribution of individual sites and types of cancer. The analysis which follows is derived largely from the recently published OPCS study of cancer mortality statistics for the period 1911-70. (1).

Mention has already been made of the various factors likely to influence changes in mortality rates ascribed to particular diseases. In the field of cancer changes in classification, coding and terminology are much less important than in circulatory disease but there are some forms of cancer where developments in diagnostic technique may well be the most important influence underlying reported mortality rates. In a field where such a high proportion of cases are (at least potentially) fatal there is a temptation to equate changes in mortality with changes in disease incidence.

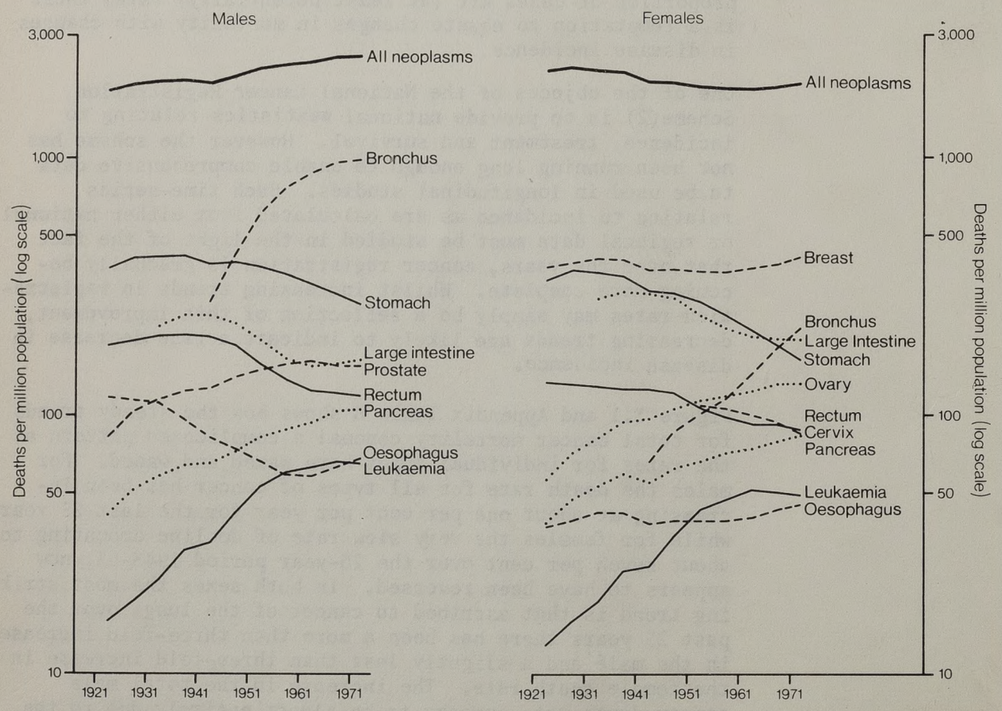
One of the objects of the National Cancer Registration Scheme(2) is to provide national statistics relating to incidence, treatment and survival. However the scheme has not been running long enough to enable comprehensive data to be used in longitudinal studies. Such time-series relating to incidence as are calculated from either national or regional data must be studied in the light of the fact that over the years, cancer registration is gradually becoming more complete. Whilst increasing trends in registration rates may simply be a reflection of this improvement, decreasing trends are likely to indicate a true decrease in disease incidence.

Figure 3.1 and Appendix Table B shows how the steady trends for total cancer mortality conceal a complicated pattern as the rates for individual types have waxed and waned. For males the death rate for all types of cancer has been increasing at about one per cent per year for the last 25 years while for females the very slow rate of decline amounting to about seven per cent over the 20-year period 1943-63, now appears to have been reversed. In both sexes the most striking trend is that ascribed to cancer of the lung: over the past 25 years there has been a more than three-fold increase in the male and a slightly less than three-fold increase in the female death rate. The increase in the total male cancer death rate appears to be almost entirely due to the 'explosion' of lung cancer which now accounts for about

40 per cent of cancer deaths. At every age the total male death rate for all cancers other than of the lung is decreasing. Although lung cancer accounts for a much smaller proportion of all female cancer mortality (about ten per cent) the increase in mortality due to this cause appears to be largely responsible for the recent slight upturn in total female cancer mortality.

It can hardly be doubted that the increase in lung cancer mortality reflects a true increase in disease incidence associated with cigarette smoking, but there is no other site where we can be so certain in interpreting the observed trends in mortality. In some types (for example, cancer of the pancreas and leukaemia) much of the increase must be due to more accurate methods of diagnosis. In both sexes mortality due to intestinal and gastric cancer has been generally decreasing, particularly in the 1940s and 1950s. Among the genito-urinary sites there have been increases in mortality due to bladder and prostrate cancer in men while for women there have been decreases in cancer of the cervix and uterus but a rise in cancer of the ovary. Among women the numerically most important site is the breast which now accounts for 20 per cent of all cancer mortality; the rate began to increase in the 1960s after a slow decline over the previous 30 years.

Figure 3.1 Cancer: deaths* by site and sex, 1921-74 (age-standardised death rates)



* Age-standardised death rates: see Appendix Table B

Cohort analysis

The tables in the OPCS study (1) are in the quinary-quinquennial form advocated by Case (3). This method identifies cohorts of individuals born at about the same time and so enables mortality to be related to the period of birth as well as to the period of death. It is thus possible to distinguish between so-called 'period effects' - patterns of mortality common to all ages and related to the time at which mortality occurred, and 'cohort effects' - patterns of mortality shared by groups of people subject to similar influences in early life.

If, for a particular form of cancer, the cohort effect appears to be stronger than the period effect it may be tentatively concluded that any observed trends in mortality are unlikely to be due to changes in methods of diagnosis or treatment. The existence of a cohort effect may also lead to cautious predictions concerning future trends in mortality.

In the following paragraphs these ideas are illustrated by a study of cancers of the lung, stomach, large intestine, breast and cervix.

Lung cancer

Lung cancer provides a good example of the value of this form of analysis. Figure 3.2 shows the death rate plotted in the conventional manner with the horizontal axis representing year of death, whilst along side the same curves, each of which gives the death rate at a particular age, are located on the horizontal scale according to the year of birth. (The same data can be plotted in cohort graphs in which each curve represents the changing death rate of a cohort as it ages; this method is invaluable in some instances but does not always lend itself to monochrome reproduction.) A comparison between the sets of graphs in Figure 3.2 suggests that:

a there is clear evidence of a cohort effect underlying the substantial increases in male mortality of all but the younger age groups; for men peaks of mortality were reached with those born in the early years of this century since when a steady decline seems to have started. To judge from the available data it appears that the female rates will reach their maxima with cohorts born from about 1926 and at about one-third of the corresponding rates for men. These trends are, of course, compatible with the hypothesis that lung cancer is caused by cigarette smoking, a habit usually formed early in life and believed to have a latent period of as much as 40 years between initial exposure and the appearance of the disease;

b the possibility that the recent falling death rates in males are due to better treatment results can certainly be discounted if only because, except at the very youngest ages the decreases are not shared by women. A recent survey by Doll (4) concludes 'that the reduction in the total amount of tar delivery to smokers both from a decrease in consumption and a decrease in yield per cigarette has accounted for most of the decline in male lung cancer mortality';

c the tendency for the peaks of male mortality to be shifted towards the right at the younger ages suggests that there may be a period effect as well as a cohort effect. Adelstein (5) suggests that the reduction in atmospheric pollution may have played a part here; and

d total male lung cancer mortality should now start to decline (1975 was the first year in which there was a fall in the *number* of male deaths) but female mortality, which is chiefly influenced by mortality over the age of 55, will continue to rise for many years.

Stomach cancer

Mortality from cancer of the stomach which numerically speaking is the second most important site after the lung, shows a very different picture (Figure 3.3): death rates are all declining; they are similar in the two sexes; there

Figure 3.2 Cancer of the lung: deaths by age and sex according to year of death, 1941-74, and year of birth

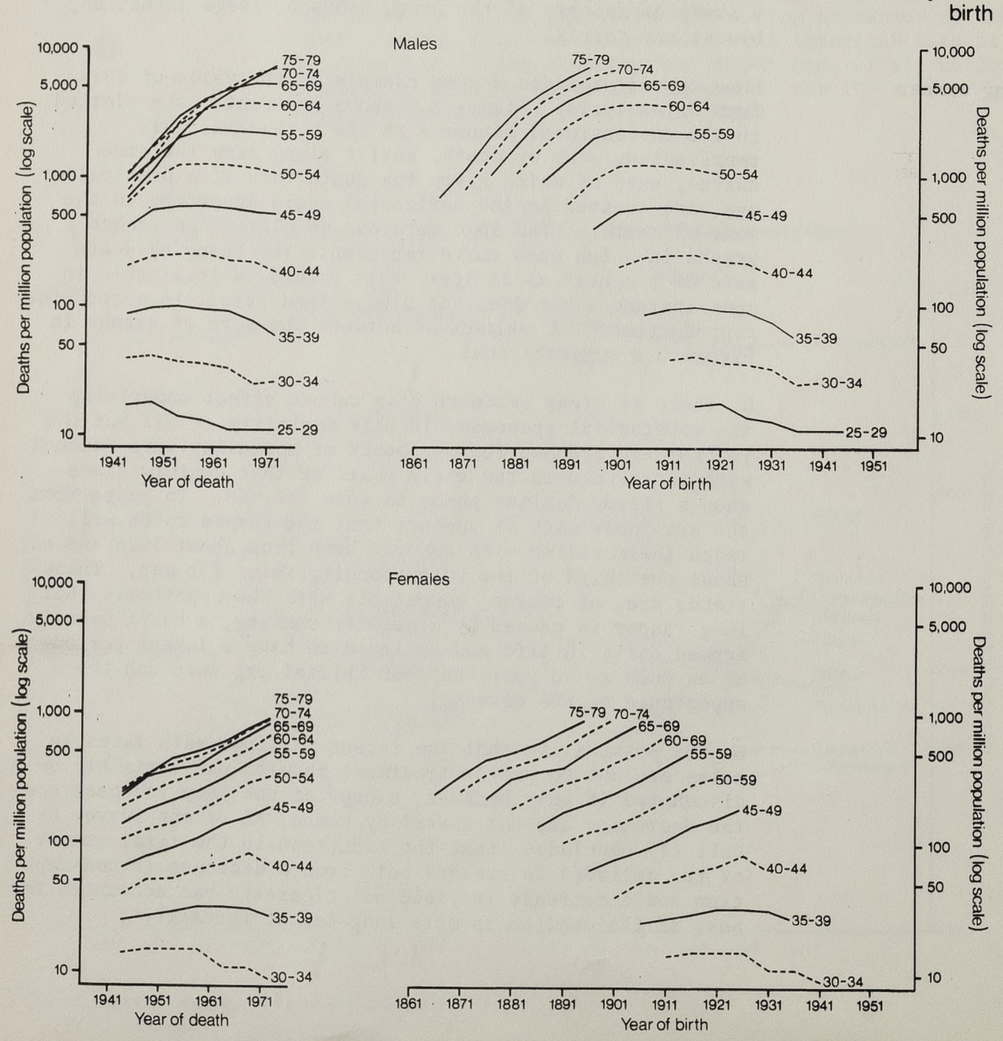


Figure 3.3 Cancer of the stomach: deaths by age and sex, 1921-74

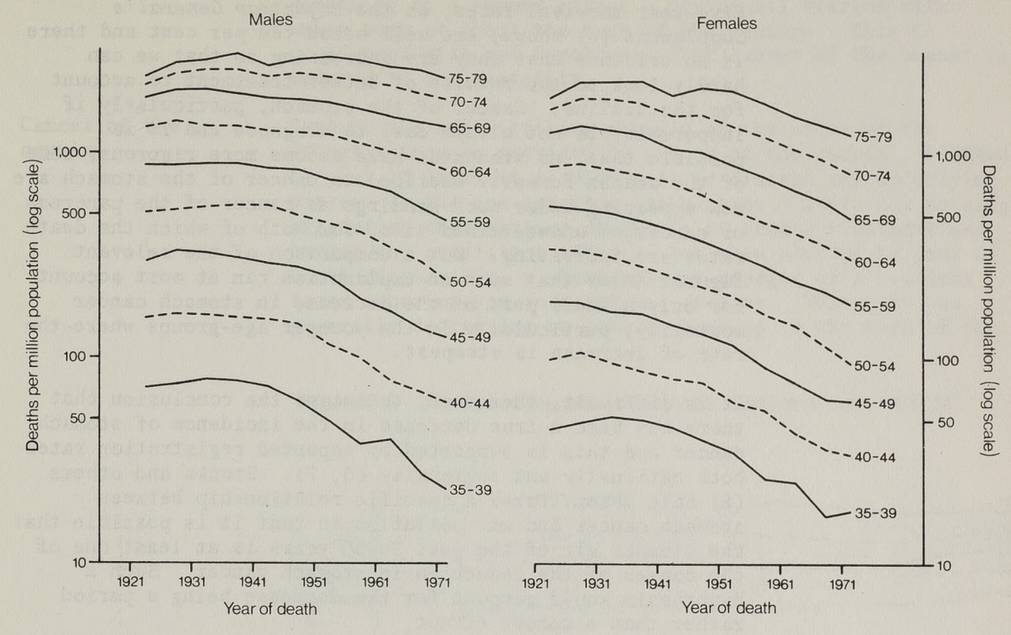
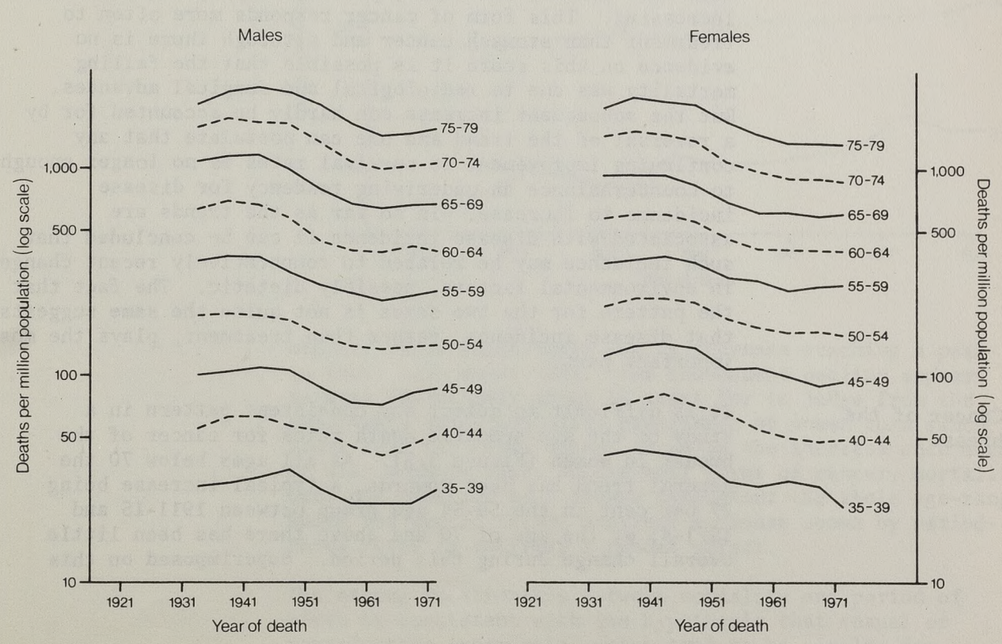


Figure 3.4 Cancer of the large intestine: deaths by age and sex, 1931-74



is little or no evidence of a cohort effect and nothing is gained by plotting mortality on the basis of year of birth.

Five-year survival rates, as the *Registrar General's Supplement* (6) shows, are well below ten per cent and there is no evidence that they are increasing so that we can hardly look to the results of better treatment to account for the decline. Cancer of the stomach, particularly if inoperable, is not always easy to diagnose and it is possible that, as standards have become more rigorous, some of the deaths formerly ascribed to cancer of the stomach are now appearing under such headings as cancer of the pancreas or cancer of undetermined site, for both of which the death rates are increasing. But a comparison of the relevant figures shows that such an explanation can at most account for only a small part of the decrease in stomach cancer mortality, particularly in the younger age-groups where the rate of decrease is steepest.

It is difficult, therefore, to escape the conclusion that there has been a true decrease in the incidence of stomach cancer and this is supported by reported registration rates both nationally and regionally (6, 7). Stocks and others (8) have demonstrated a specific relationship between stomach cancer and air pollution so that it is possible that the cleaner air of the past 20-30 years is at least one of the causes of the reduction in stomach cancer. Such a hypothesis would account for the decrease being a period rather than a cohort effect.

Intestinal cancer

Cancer of the large intestine (Figure 3.4) shows a similar picture to that of the stomach in so far as there is little evidence of a cohort effect. An important difference however is that the decrease in the 1940s and 1950s seems to have been halted; the rates, particularly for men, are now increasing. This form of cancer responds more often to treatment than stomach cancer and although there is no evidence on this score it is possible that the falling mortality was due to radiological and surgical advances. But the subsequent increase can hardly be accounted for by a reversal of the trend and one can postulate that any continuing improvement in survival rates is no longer enough to counterbalance an underlying tendency for disease incidence to increase. In so far as the trends are associated with disease incidence it can be concluded that such incidence may be related to comparatively recent changes in environmental factors, possibly dietetic. The fact that the pattern for the two sexes is not quite the same suggests that disease incidence, rather than treatment, plays the most important part.

Cancer of the breast

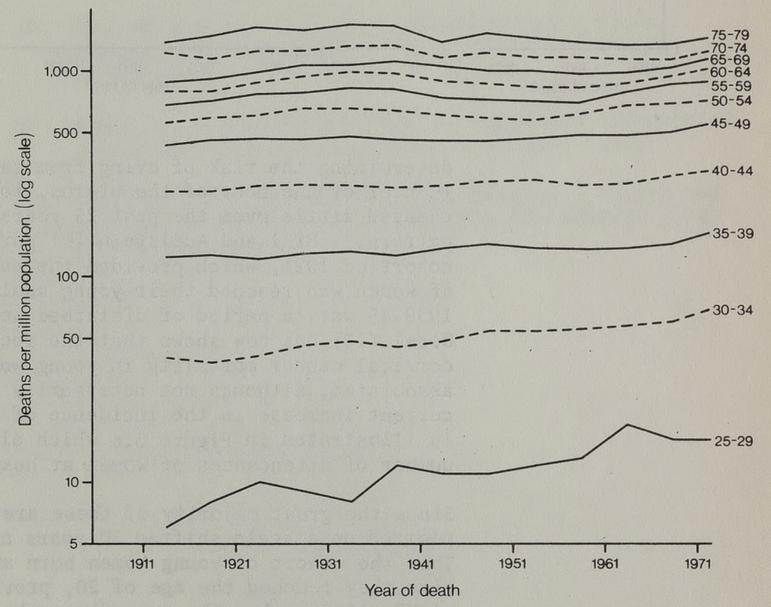
It is difficult to detect any consistent pattern in a study of the age-specific death rates for cancer of the breast in women (Figure 3.5). At all ages below 70 the general trend has been upwards, a typical increase being 27 per cent in the 50-54 age group between 1911-15 and 1971-4; at the age of 70 and above there has been little overall change during this period. Superimposed on this

picture is a cyclical pattern with death rates rising until the 1930s then falling and now rising again. The most recent increases, which affect all age-groups, demonstrate something of a cohort effect - having all started with women born at about the turn of the century. This is consistent with the hypothesis that cancer of the breast is related to low fertility.

Cancer of the cervix

Perhaps the most striking example of the value of the cohort method is provided by cancer of the cervix. Plotted by year of death it is difficult to discern any underlying pattern in the age-specific death-rates - certainly nothing suggesting that earlier diagnosis or better treatment was having any consistent effect. But when plotted by year of birth (Figure 3.6) a clear pattern emerges of a cyclical trend superimposed on a general decline. Mortality was generally decreasing in cohorts born up to the turn of the

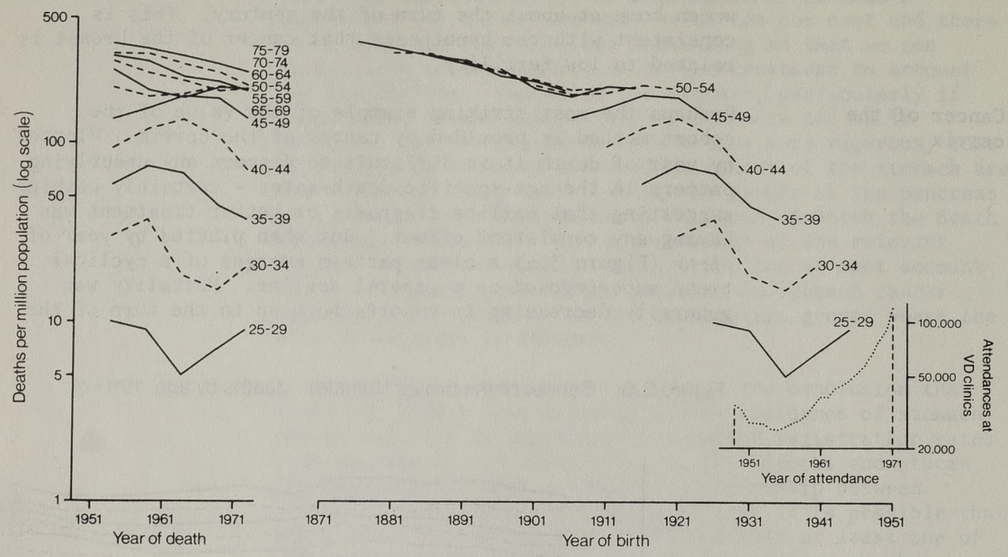
Figure 3.5 Cancer of the breast (female): deaths by age, 1911-74



century after which there was an increase reaching a peak in those born about 1921. The subsequent decline appears to have lasted only about 15 years for to judge from the admittedly small mortality experience of women born since about 1936 the rates appear to be on the increase once more. It also appears that, unlike most forms of cancer, mortality does not continue to increase throughout the whole age-range. Above the age of 50 any apparent increase shown by period-based rates is entirely a cohort effect.

The strong relationship between mortality and period of birth is consistent with the hypothesis that sexual or reproductive experience, which tend to be similar for women of the same cohort, play an important part in

Figure 3.6 Cancer of the cervix: deaths by age according to year of death, 1951-74, and year of birth; also attendances of women at hospital VD clinics, 1949-71



determining the risk of dying from cancer of the cervix. (Cancer of the body of the uterus, for which the rates have changed little over the past 25 years, shows no similar pattern.) Hill and Adelstein (9) pointed out that the cohort of 1921, which provided the earlier peak, consisted of women who reached their young adult life during the 1939-45 war 'a period of disturbed sexual relationships'. Beral (10) has now shown that the recent increase in cervical cancer mortality in young women is strongly associated, although not necessarily causally, with the current increase in the incidence of venereal disease. This is illustrated in Figure 3.6 which also gives the total number of attendances of women at hospital VD clinics (11).

Since the great majority of these are aged 16-24, these are plotted on a scale shifted 20 years after the date of birth. Thus the cohort of young women born around 1941 were, by the time they reached the age of 20, providing more attendances at VD clinics than the preceding cohort and by the age of 25 were subject to higher rates of mortality due to cancer of the cervix. But it should be emphasised that the number of deaths involved in the most recent increase is small. It is so far confined to the under-35 age-group in which there are now about 50 deaths per year due to this cause.

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11 Department of Health and Social Security. *Health and Personal Social Services Statistics for England 1974.* HMSO (London 1974).

4. Accidents and violence in young people

The recent emergence of a 'hump' of excess male mortality between the ages of five and 24 (Figure 1.4 page 00) is a direct consequence of the great reduction, in both sexes, in the level of mortality due to disease. As Table 4.1 shows there are three times as many deaths from accidents and violence in boys as in girls and the rates have not changed greatly in the past 40 years. But the contribution to total mortality by these causes was relatively small in 1931-35 (less than 20 per cent) so that the sex ratio of total mortality was largely determined by the fairly equal male and female rates of natural mortality. Today the position is quite different: accidents and violence cause one half of male and one third of female deaths at ages 5-24 so that the overall sex ratio is much more influenced than 40 years ago by the 3:1 ratio for violent deaths.

The purpose of this chapter is to examine post-war trends in mortality due to accidents and violence in the 5-24 age-group, paying particular attention to differences between the sexes.

A general picture of mortality due to accidences and violence is given in Table 4.2 which shows the *average annual number* of deaths due to selected causes in two periods. Due to changes in classification and coding practice the figures given for 1951-55 may not be exactly comparable with those for the current period: attention is

Table 4.1 Standardised* death rates (per 100,000 population) at ages 5-24, by sex, 1931-5, 1971-4

	1931-5		1971-4	
	Male	Female	Male	Female
All causes	233	212	65	33
Accidents and violence	47	15	38	12
All other causes	187	197	27	20

* Direct standardisation on the basis of the population distribution for 1966-70.

drawn later to some of the discrepancies. In studying the table it should be borne in mind that the population at risk was about 25 per cent higher in the later period.

For almost every one of the causes listed the deaths of males exceeded those of females, the ratio being tenfold or more in some instances. This is of course a simple reflection of the fact that boys of all ages are more likely to be involved in potentially dangerous activities than girls - whether at home, at work or at play. For some causes (for example deaths due to falling objects and to electric current) there is an obvious occupational factor: most of these deaths of young people over the age of 15 occurred at work (1).

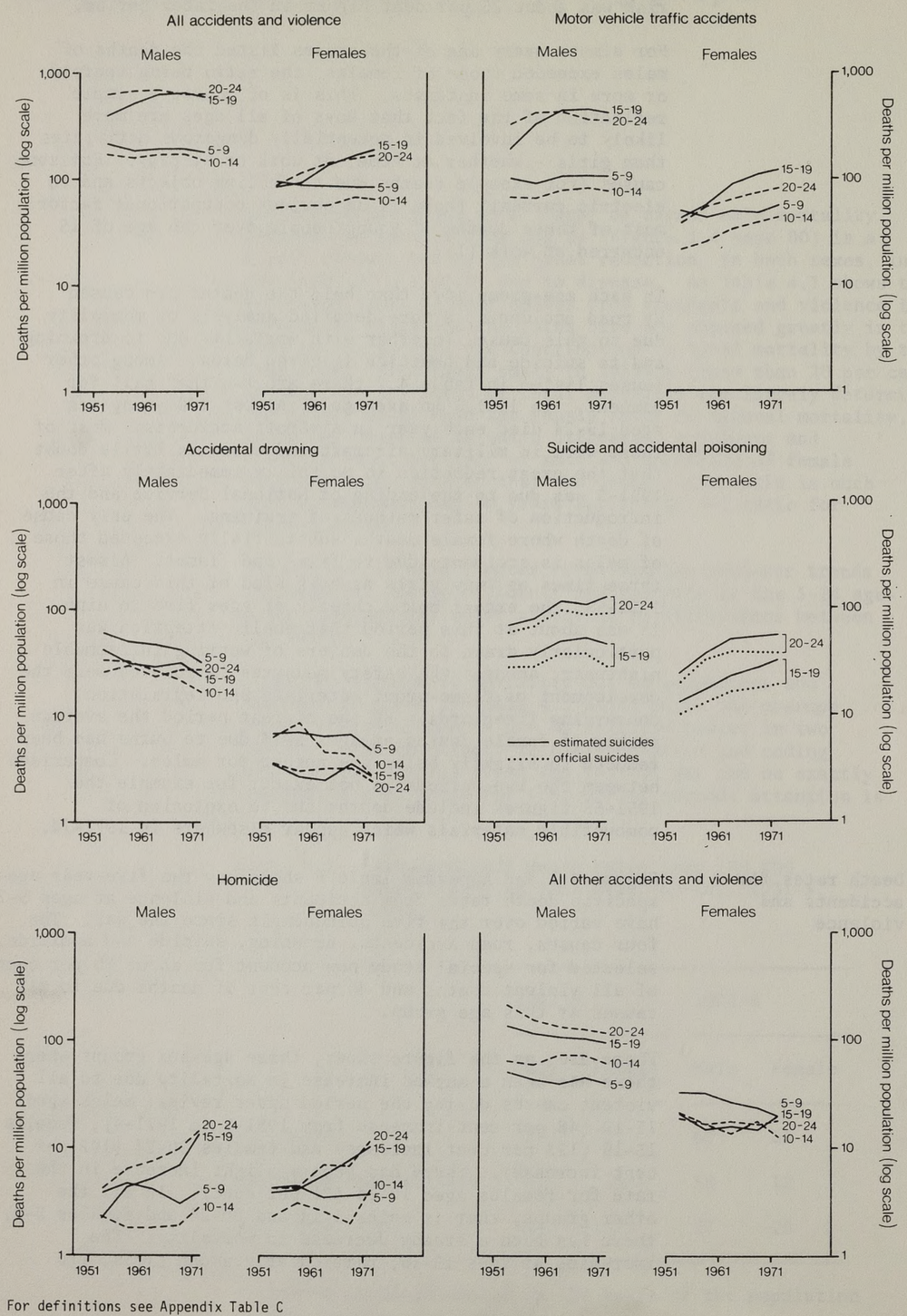
In each age-group more than half the deaths are caused by road accidents; a more detailed analysis of mortality due to this cause, together with mortality due to drowning and to suicide and homicide is given below. Among other causes listed in Table 4.2 there are two that call for comment. In 1951-5 an average of almost 100 young men aged 15-24 died each year in aircraft accidents. Most of these were in military aircraft and there is little doubt that the great reduction in mortality immediately after 1951-5 was due to the ending of National Service and the introduction of safer methods of training. The only cause of death where female deaths substantially exceeded those of males is accidents due to fires and flames. Almost three times as many girls as boys died of this cause in 1951-55, the excess being chiefly at ages five to nine. It was about at this period that public attention was particularly drawn to the dangers of wearing inflammable nightwear; amongst the safety measures introduced were the development of flame-proof materials and legislation concerning fireguards. By the current period the average number of female deaths at ages 5-14 due to burns had been reduced to slightly below the number for males. Comparison between the two periods is not exact; for example the 1951-55 figures include deaths due to explosion of combustible materials which appear elsewhere in 1971-74.

Death rates for accidents and violence

Figure 4.1 and Appendix Table F shows how the five-year age-specific death rates from accidents and violence at ages 5-24 have varied over the five quinquennia since the war. The four causes, road accidents, drowning, suicide and homicide, selected for special study now account for about 80 per cent of all violent deaths and 40 per cent of deaths due to all causes at this age group.

There are, as the figure shows, three age-sex groups where there has been a marked increase in mortality due to all violent causes during the period under review: males aged 15-19 (48 per cent increase from 1951-5 to 1971-4); females 15-19 (123 per cent increase) and females 20-24 (192 per cent increase). There has been a slight increase in the rate for females aged 10-14 (21 per cent). In all the other groups, that is males 5-14 and 20-24 and females 5-9, there has been a steady decrease in mortality. The increases at ages 15-19, particularly among girls, are

Figure 4.1 Accidents and violence: deaths at ages 5-24 by cause, age and sex, 1951-74



For definitions see Appendix Table C

Table 4.2 Accidents and violence: average annual deaths at ages 5-24 by age and sex, 1951-55, 1971-74

1951-55*				External cause of death (ICD 8th Revision)	1971-74			
5-14		15-24			5-14		15-24	
M	F	M	F		M	F	M	F
635	238	1,389	240	All accidents and violence	651	282	2,130	598
				Transport accidents:				
8	2	38	5	800-7 railway	6	2	25	2
300	124	735	122	810-27 motor and other road vehicle	362	189	1,340	346
8	1	38	2	830-8 water	10	3	29	2
1	-	97	4	840-5 air	1	2	11	2
				Other accidents:				
-	1	4	2	850-9 poisoning by drugs	2	3	35	18
6	4	18	8	860-77 other poisoning (incl gas)	6	2	28	11
42	12	64	7	880-7 falls	43	9	72	12
16	44	10	11	890-9 fires and flames	21	19	17	10
158	21	91	10	910 drowning	92	14	68	6
..	..	..	..	913 mechanical suffocation (incl hanging)	20	2	28	2
13	4	26	1	916 falling object	13	3	21	-
7	2	19	2	925 electric current	10	2	23	2
60	13	117	14	rem 800-999 other	38	14	107	20
				Other violence:				
4	1	117	42	950-9 suicide	3	2	202	97
10	11	14	12	960-9 homicide	14	15	48	37
..	..	..	..	980-2 open verdicts**, poisoning	-	1	34	24
..	..	..	..	983-9 open verdicts**, other	12	2	42	7
3,286	3,148	2,731	2,829	Average population (thousands)	4,013	3,808	3,523	3,408

* Deaths in 1951-55 are classified according to the 6th Revision. The categories shown in this table are not exactly comparable with those used for 1971-74.

** ie injury undetermined whether accidentally or purposely inflicted; such deaths were generally classified as accidental prior to 1967.

.. not available.

quite sufficient to account for the recent increases in total mortality at this age (Figure 1.3).

Motor vehicle traffic accidents

Motor traffic in Great Britain increased by threefold or more between 1951-5 and 1971-4 whether measured by the user of vehicles on the road or the estimated mileage (2). It is against this background that the figures for motor traffic mortality in Figure 4.1 should be studied; although there have been increases in the death rates for road accidents they are not generally of this order of magnitude. The figure shows a striking difference between the male and female patterns of mortality. For males aged 15-19 the rate was doubled during the first 10 years under review but otherwise the rates have remained fairly constant. All the female rates, although still well below those of the males, have continued to rise quite steeply, particularly at age 15-19.

Some light is shed on these trends by an analysis (Table 4.3) of mortality according to the status of the person killed. In looking at this table it should be borne in mind that it takes no account of the true population at risk. The death rate for pedal cyclists is calculated from the number of deaths of pedal cyclists as a proportion of all children and therefore reflects the prevalence of pedal cycling as well as its danger.

Table 4.3 Road accidents* classified by status of person killed; death rates (per 100,000 population) at ages 5-24, by sex and age, 1951-5, 1961-5, 1971-4

	1951-5		1961-5		1971-4	
	Male	Female	Male	Female	Male	Female
Age 5-14						
Pedestrians	5.5	3.1	5.2	3.0	5.9	3.3
Pedal cyclists	2.7	0.5	2.9	0.4	2.0	0.5
Other road users	0.6	0.3	0.9	0.8	1.0	1.1
Total	8.8	3.9	9.1	4.1	9.0	4.9
Age 15-24						
Pedestrians	1.8	0.8	2.7	1.0	3.6	1.6
Pedal cyclists	4.0	1.1	2.1	0.4	0.9	0.2
Riders or passengers of motor cycles	16.5	1.5	22.9	1.9	12.8	1.1
Other road users	3.7	0.9	14.9	4.4	20.4	7.2
Total	26.1	4.3	42.5	7.8	37.7	10.1

* Including non-motor traffic accidents.

At ages 5-14 most of the deaths are of pedestrians for whom death rates have changed little over the period. The rates for pedal cyclists have decreased among boys but remained steady for girls; for other road-users, almost entirely motor vehicle passengers, they have continued to increase, but faster among girls than boys.

The pattern is more complicated at the older group of 15-24. In young men an important component of mortality is of motorcyclists, for whom the rate fell more sharply in the 1960s than it had risen in the previous decade, thus leading to a slight decrease in total mortality. The same trend may be seen among girl motorcyclists but the level is so much lower, since far fewer girls ride motorcycles, that it has exerted little influence on the total rate which is largely determined by the still increasing rates among other road users such as drivers and passengers. For both sexes the mortality rate has been doubled for pedestrians and has been reduced by about three-quarters for pedal cyclists. The total mileage travelled by motor and pedal cycles was more than halved between 1964 and 1974 whilst that of other vehicles has almost doubled (3).

Crash helmets for motorcyclists, although increasingly used during the 1950s and 1960s did not become compulsory until 1973. The existence of an alternative classification for accidents and violence, that is by *Nature of Injury*, provide the opportunity to see whether the use of crash helmets appears to have been beneficial. Table 4.4 shows that, in fact, the proportion of fatalities among motorcyclists due to fractures of the skull began to decline quite sharply in 1973 although they still account for two out of five

Table 4.4 Deaths of motor cyclists (including passengers) caused by fracture of the skull, at ages 15-24, by sex, 1958-1974

	Number of deaths per year		Percentage of deaths due to fracture of skull	
	Male	Female	Male	Female
1958-60 Average	766	62	58	65
1961-65 "	754	62	54	57
1966-70 "	549	40	53	53
1971	452	46	51	76
1972	428	36	50	61
1973	440	38	42	61
1974	488	36	40	44

deaths. Four-fifths of girls killed on motorcycles are pillion riders (compared with less than 10 per cent for boys). The proportion of deaths caused by skull fractures has recently been higher for girls than for boys but owing to the small number involved it is too early to say whether the recent reduction is more than a chance finding.

Drowning

Accidental drowning is the second most frequent cause of death in young boys and accounts for about half the non-road deaths at ages 5-9. In spite of a general increase in outdoor activities it is gratifying to see decreasing rates in young people, a possible exception being in young men of 20-24 where the rate has risen slightly over the past 10 years.

Suicide

The problem of determining valid suicide rates in the light of recent legislation and changes in classification has been discussed in detail by Adelstein and Mardon (4). Apart from suicides certified as such by coroners there must be a number of suicidal deaths classified under accidents and open verdicts (Table 4.2). No distinction was made until 1967 between these two categories; estimates of the number of true suicides providing comparable figures for the whole period are therefore best obtained by adding in all deaths due to poisoning whatever the verdict. These figures will include some true accidents but will exclude some suicides by drowning, hanging, falls, or other means. The official suicide rates as shown in Figure 4.1, having increased quite sharply in the 1950s, have now levelled out. But the estimated rates, calculated as described above, continue to increase except among boys of 15-19; for girls in this age-group the rate has doubled in 20 years. About two thirds of official female suicides at ages 15-24 are due to poisoning by liquid or solid substances compared with one third for males.

Homicide

In numerical terms homicide is a relatively unimportant cause of death. This heading, which includes such verdicts as manslaughter and criminal neglect as well as murder, now accounts for the annual deaths of just over 100 children and young people aged 5-24. But the steep increases in the homicide mortality rate shown in Figure 4.1 provide a sharp reminder of the current growth of personal violence. The rates for both sexes at ages 15-24 have more than doubled over the past 20 years, during which period a similar increase has been shown at all ages (5). About half the male deaths are the result of stab wounds of one sort or another; for girls the most frequent cause was hanging or strangulation which account for about one third of the deaths.

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5. Conclusion

During the past twenty years mortality has generally continued to decline although for many male and some female age-groups the rate of decline has been minimal.

Much of the recent divergence between the male and female rates has been due to three causes of death: ischaemic heart disease, lung cancer and - in young people - accidents and violence. But there are signs that this divergence may have reached its maximum: for most age-groups male lung cancer mortality has flattened out or is declining while the rates continue to increase in most female age-groups; the same is true for violent and accidental deaths in young people. For ischaemic heart disease there is a suggestion from the most recent figures of a similar pattern. As the hazards to which men and women are exposed become more nearly equal the gap between their mortality rates may begin to close. A measure of the success of prevention will be whether this results from a 'levelling down' of the mortality of males or a 'levelling up' for females.

Appendix: Sources of mortality statistics for England and Wales

Annual publications

Mortality statistics have been published annually since 1837 by the General Register Office or its successor the Office of Population Censuses and Surveys. Until 1920 these appeared in the *Annual Reports of the Registrar General*. In 1921 the title was changed to *Registrar General's Statistical Review of England and Wales* which appeared in three parts:

I *Medical:* mainly mortality but also included notification of infectious diseases and weather

II *Civil:* births, marriages etc; renamed *Population* in 1958

III *Text:* renamed *Commentary* in 1954 but discontinued after 1967 when many regular tables were incorporated in Parts I and II.

The last *Statistical Review* (Parts I and II) to appear was for 1973, Part I being published in two volumes.

From 1974, mortality tables previously appearing in Part I have been published in five reference volumes under the general title of Mortality Statistics (Series DH1-5)*:

DH1 *Mortality statistics (general)* includes serial tables giving broad aspects of mortality since 1841 and also a 10-year serial table giving the numbers of deaths for each ICD heading (Table 7 from 1931-1973). A large number of subsidiary tables analyse mortality by a wide range of factors such as month and place of occurrence and method of certification.

DH2 *Mortality statistics: causes* consists almost entirely of a lengthy table giving, for the current year, the number of deaths by age and sex for each ICD heading (Table 17 from 1921 to 1973) together with a similar, but abridged, table giving age-specific death rates (previously Table 17A).

DH3 *Mortality statistics: childhood* contains all the tables relating to stillbirths infant and maternal mortality; also that portion of the former Table 17 giving numbers of deaths by cause at ages up to five.

* A full list of the tables appearing in the new volumes together with the corresponding table number from the old system can be obtained from; Medical Statistics Division, Office of Population Censuses and Surveys, St Catherines House, 10 Kingsway, London WC2B 6JP

DH4 *Mortality statistics:accidents and violence* includes tables analysing mortality due to accidents and violence by such factors as place of accident and, for poisonings, details of the substance ingested.

DH5 *Mortality statistics: area* consists of tables giving mortality to each B list cause by age, sex and region and also by sex and administrative area.

Mortality surveillance analyses

In 1976, OPCS published a set of mortality surveillance results for England and Wales covering the period 1968-74 and an updated set of analyses for 1968-75 is now available. The analyses indicate those causes with statistically significant changes in annual death rates by age and sex over the six years 1970-75. Each analysis sheet contains numbers of deaths and rates, for males and females separately, for one cause of death - the 'A' list cause recommended by the World Health Organisation. An additional sheet gives all causes of death. Indicators show the results of three statistical test for each five year age-group for the period 1970-75. Details of the statistical tests are provided together with a sheet giving the population figures used.

Individual cause analysis sheets my be ordered, at a cost of 12½p each (plus VAT and postage). The complete set is available as a bound volume or as microfilm. Costs are, for the complete bound set £14.50 (plus VAT and postage); for 35mm or 16mm microfilm £2.50 (plus VAT and postage).

Weekly and quarterly statistics

Weekly mortality statistics including, for example, the total number of deaths in England and Wales, deaths by age and selected cause in Greater London and infant deaths by administrative area, are published in *OPCS Monitors* (Series WR). A fuller quarterly analysis of deaths by sex and cause appears in the Monitor Series DH2 and a quarterly Monitor in the Series DH4, analyses deaths from accidents and violence. Quarterly death rates by age, sex, selected cause of death and region appear routinely in *Population Trends*, the OPCS quarterly journal.

Special studies and commentaries

Material which until 1967 would have been published in the *Commentary* volumes is now being published in a number of different forms: as introductory commentaries to the annual reference volumes; as special topic volumes - of which the present publication is an example; as separate publications in the series *Studies on Medical and Population Subjects;* as articles in *Population Trends*.

Recent volumes in the *Studies* series dealing with mortality are

29 Cancer mortality 1911-1970 HMSO 1975

30 Child health - a collection of studies HMSO 1976

32 Anencephalus, spina bifida and congenital hydrocephalus 1974-72 HMSO 1976.

A cumulative index to *Population Trends* is published in even-numbered issues of the journal.

Decennial supplements

The Registrar General has for many years published detailed analyses of mortality by occupation and area of residence based on experience around the time of the census. The detailed English Life Tables also appear in this form. The *Registrar General's Decennial Supplement, England and Wales*, 1961 consists of the following volumes:

Area Mortality Tables HMSO, 1967

Life Tables (English Life Tables No 12) HMSO, 1968

Occupational Mortality Tables, HMSO, 1971.

The first volume of the Decennial Supplement for 1971 - Occupational Mortality - was published in February 1978 (ref DS1).

Appendix table A: Death rates by age and sex (per million population) 1921-75

	All Ages	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
MALES																			
1921-1925	12946	26974	2551	1694	2657	3526	3803	4298	5725	7291	9880	13425	20375	30632	47937	73560	117723	201944	
1926-1930	12891	23120	2484	1609	2580	3296	3533	3840	5242	7142	9836	13552	19673	30432	47578	74656	120769	200301	
1931-1935	12743	20132	2279	1438	2449	3154	3156	3475	4615	6221	9247	13154	19272	28783	45862	73242	117576	204081	
1936-1940*	13495	17471	1962	1270	2154	2990	2960	3213	4223	5807	8617	13518	20089	30681	45792	73374	120740	183642	286331
1941-1945*	15158	15544	1690	1195	2217	4990	4457	4007	4269	5428	7826	12008	18562	28205	42834	64302	104466	161959	227040
1946-1950*	12735	10462	884	691	1333	1746	1808	2042	2588	3880	6723	10711	17438	28039	41779	64563	101751	157771	241632
1951-1955	12502	6949	548	480	860	1237	1266	1510	2107	3249	5710	10456	17428	28435	44500	68059	108090	166158	267494
1956-1960	12346	6312	487	403	877	1120	1062	1264	1895	3049	5260	9550	17270	27884	43487	67418	103261	161489	239185
1961-1965	12448	5809	467	407	951	1102	1008	1218	1855	3048	5333	9327	16534	28088	44196	67556	102320	157889	253059
1966-1970	12360	4846	425	389	961	975	930	1121	1692	3030	5307	9255	15878	26828	43953	67715	100766	143593	254162
1971-1975	12353	4119	387	346	876	987	887	1073	1583	2851	5293	9096	15292	25132	41432	66018	99794	147939	240903
FEMALES																			
1921-1925	11418	21784	2409	1722	2557	3107	3406	3755	4561	5504	7433	10353	15184	22986	36167	58230	94627	178783	
1926-1930	11369	18513	2252	1534	2410	2936	3211	3466	4168	5230	7007	10037	14331	22613	35022	57541	94181	176803	
1931-1935	11378	16019	2074	1373	2218	2767	2976	3212	3894	4796	6656	9361	13594	21074	33514	55763	91101	176649	
1936-1940	11630	13735	1706	1127	1866	2486	2594	2759	3373	4324	6122	8912	12869	20688	32821	54227	90542	174651	
1941-1945*	11086	12314	1305	970	1736	2412	2436	2488	2851	3709	5344	7596	11081	17193	28136	46792	77541	125296	206964
1946-1950*	10881	8144	642	544	1050	1539	1693	1836	2191	2930	4473	6646	9963	15956	26000	45307	76904	124449	208856
1951-1955	10874	5401	392	340	494	703	948	1215	1680	2501	3874	5988	9155	14866	25065	42993	74718	126724	225538
1956-1960	10884	4931	333	272	376	517	665	951	1429	2252	3536	5403	8398	13819	23104	40065	69228	117045	212520
1961-1965	11185	4518	318	252	380	473	596	856	1346	2180	3505	5299	8094	13357	22354	38905	65708	114178	206736
1966-1970	11174	3722	283	246	387	440	543	755	1218	2112	3415	5342	7992	12737	21216	36497	62158	101459	202994
1971-1975	11421	3193	269	212	386	429	484	685	1129	1975	3420	5261	8034	12359	20067	34388	59242	101333	193530

* Civilian

Appendix table B: Main types of cancer: standardized death rates by sex 1921-74

ICD (8th Rev)	Cause*	1921-25	1926-30	1931-35	1936-40	1941-45	1946-50	1951-55	1956-60	1961-65	1966-70	1971-74
	Males											
140-239	All neoplasms	1830	1926	1983	1999	1934	2076	2221	2301	2367	2454	2479
	Malignant neoplasm of:											
150	oesophagus	117	114	111	96	82	74	66	59	58	63	68
151	stomach	373	408	414	417	387	391	378	353	323	293	270
153	large intestine	..	..	221	244	243	227	194	165	154	159	163
154	rectum	187	196	203	205	201	187	158	138	124	122	119
157	pancreas	41	51	58	64	65	72	82	88	94	103	106
162, 163	bronchus etc	..	..	..	..	274	425	616	771	875	953	983
185	prostate	82	102	115	124	127	141	150	159	161	156	156
188	bladder	..	..	..	..	..	..	88	91	97	103	105
204-207	Leukaemia	16	19	23	30	32	42	53	60	63	66	65
	Females											
140-239	All neoplasms	2172	2224	2194	2134	1977	1963	1889	1848	1838	1878	1918
	Malignant neoplasm of:											
150	oesophagus	37	39	42	42	38	39	39	39	40	43	45
151	stomach	332	365	356	344	301	298	275	244	212	187	163
153	large intestine	..	..	281	300	296	284	242	217	201	197	196
154	rectum	133	131	129	126	126	121	106	98	92	92	88
157	pancreas	38	47	53	59	55	62	66	71	74	79	83
162, 163	bronchus etc	..	..	..	..	66	86	101	116	145	182	217
174	breast	375	390	403	399	364	367	361	359	370	385	409
180-182	uterus (including unspecified)	307	284	258	240	223	199	172	165	157	147	137
180	cervix	..	..	..	..	..	..	109	106	100	94	84
182.0	corpus uteri	..	..	..	..	..	..	52	49	46	42	41
183	ovary	56	71	81	94	97	106	114	119	122	131	132
188	bladder	..	..	..	..	..	..	35	36	35	36	37
204-207	Leukaemia	13	16	19	25	26	34	43	47	51	50	49

.. Not available

* Types of cancer are classified according to the 8th Revision of the ICD. Rates are calculated by direct standardization from the quinquennial rates published in Cancer Mortality, England and Wales (Studies on Medical and Population Subjects No 29) using the average population of 1951-55 as the base (male and female separately)

Appendix table C Circulatory disease: average annual number of deaths at ages 35-64, by sex, 1951-53, 1971-73

ICD 6th Rev	ICD 8th Rev	Cause of death (6th Revision titles, where different, are in italics)	1951-53 (adjusted*) Males	1951-53 (adjusted*) Females	1971-73 (actual) Males	1971-73 (actual) Females
400-2	390-2	Active rhuematic fever	54	60	8	7
410-6	393-8) less 395.9)	Chronic rheumatic heart disease	2,087	3,025	843	1,462
440-3	402, 404	Hypertensive heart disease	1,855	1,379	762	458
444-7	rem 400-4	Other hypertensive disease	1,185	752	494	214
420) 422.1)	410-4	Ischaemic heart disease *Arteriosclerotic heart disease, including coronary disease*	18,725	5,548	29,928	7,756
422.0) 422.2)	428	Other myocardial insufficiency *Myocardial degeneration without mention of arteriosclerosis*	2,176	1,814	189	176
421	424) 395.9)	Chronic disease of endocardium *Chronic endocarditis not specified as rheumatic*	699	354	503	198
430-4	420-3) 425-7) 429)	Other forms of heart disease	1,135	857	1,204	760
330	430	Subarachnoid haemorrhage	675	864	884	1,269
332	433, 434	Cerebral embolism and thrombosis	2,220	1,920	1,214	782
	431	Cerebral haemorrhage)	4,651	5,164	(1,860	1,541
rem 330-4	rem 430-8	Other cerebrovascular disease)			(1,705	1,201
450.0	440	Arteriosclerosis	450	258	164	90
022	093.0	Aneurysm of aorta (syphilitic)**	222	56	5	1
451	441	Aneurysm of aorta (non-syphilitic)**	208	105	689	233
rem 450-6) 570.2)	rem 440-7	Other disease of arteries	262	163	389	194
465	450	Pulmonary embolism and infarction	156	146	353	288
rem 460-8	rem 450-8) 448)	Other diseases of circulatory system	226	296	385	432
		All circulatory diseases	36,987	22,761	41,679	17,062
		All other diseases	58,610	35,993	41,875	31,583
		All causes	95,596	58,754	83,444	48,645

* The figures in this column are the numbers of deaths which would have occurred in 1951-53 if the age-specific death rates pertaining in these years had been applied to the population of 1971-73.

** Unspecified aneurysm of aorta was classified as syphilitic in 1951-53 and non-syphilitic in 1971-73.

Appendix table D Ischaemic and related heart disease*, numbers of deaths at ages 35-64, by sex, 1967

ICD Number	Cause of death (7th Revision)		Numbers of deaths			Cause of death (8th Revision)	ICD Number
420.0	Arteriosclerotic heart disease, so described	M	56)	(23,125	M	Acute myocardial infarction	410
		F	30)	(5,772	F		
420.1	Heart disease involving coronary arteries	M	27,236)	(427	M	Other acute and subacute ischaemic heart disease	411
		F	6,855)	(101	F		
420.2	Angina pectoris without mention of coronary disease	M	15)	(4,023	M	Chronic ischaemic heart disease	412
		F	7)	(1,221	F		
422.1	Other myocardial degeneration with arteriosclerosis	M	243)	(20	M	Angina pectoris	413
		F	177)	(10	F		
420,422.1	Total	M	27,550	27,595	M	Total	410-414** (A83)
		F	7,069	7,104	F		
	Chronic endocarditis not specified as rheumatic:					Chronic disease of endocardium:	
421.0	of mitral valve specified as non-rheumatic	M	11	13	M	mitral valve, non-rheumatic	424.0
		F	15	16	F		
421.1	of aortic valve not specified as rheumatic	M	456	(127	M	aortic valve, non-rheumatic	424.1
		F	150	(37	F		
				(328	M	aortic valve, not specified as rheumatic	395.9
				(111	F		
421.2) 421.4)	other, not specified as rheumatic	M	42	36	M	other endocardial structures	424.9
		F	54	51	F		
422.0	Fatty degeneration of the heart	M	11)				
		F	24)	348	M	Other myocardial insufficiency	428
			)	275	F		
422.2	Other myocardial degeneration (without arteriosclerosis)		) 398) 261)				
420-422 (A81)	Total	M	28,468	28,447	M	Total	(410-413 (424 (395.9 (428
		F	7,573	7,594	F		

* Classified according to 7th and 8th Revisions

** No deaths were classified to 414 (Asymptomatic ischaemic heart disease)

Appendix table E. Ischaemic and related heart disease: deaths per 100,000 population at ages 35-64 by sex and age, 1951-1975

	Age											
	35-39		40-44		45-49		50-54		55-59		60-64	
Males												
1951-55	18	*21*	45	*50*	105	*114*	218	*239*	374	*423*	636	*739*
1955-60	26	*28*	60	*63*	126	*133*	252	*266*	451	*482*	715	*775*
1961-65	35	*37*	79	*82*	160	*166*	292	*302*	509	*529*	839	*879*
1966-70	34	*36*	92	*95*	184	*189*	324	*332*	539	*554*	857	*887*
1971-75	34	*36*	95	*97*	206	*210*	363	*370*	566	*578*	884	*906*
1967	34		91		178		303		526		834	
1968	32		96		180		326		549		853	
1969	32		91		196		337		538		884	
1970	37		93		194		346		556		857	
1971	35		98		204		345		548		872	
1972	37		95		214		366		577		899	
1973	35		93		210		360		574		885	
1974	34		96		203		369		574		883	
1975	31		92		202		375		559		882	
Females												
1951-55	2.6	*4.6*	6.6	*9.9*	17	*25*	41	*56*	94	*124*	212	*280*
1956-60	2.8	*4.0*	8.2	*10.3*	19	*23*	43	*51*	102	*119*	230	*268*
1961-65	4.4	*5.3*	11.2	*12.9*	24	*27*	49	*55*	115	*125*	254	*278*
1966-70	5.4	*6.2*	14.0	*15.0*	27	*29*	58	*62*	118	*125*	259	*274*
1971-75	5.4	*6.0*	15.2	*16.3*	33	*35*	66	*69*	133	*139*	268	*279*
1967	4.5		13.2		26		52		115		257	
1968	5.3		15.7		27		59		115		259	
1969	6.0		15.5		28		64		120		262	
1970	6.0		14.1		27		59		121		260	
1971	4.7		13.7		30		62		123		254	
1972	5.5		14.6		33		67		136		272	
1973	4.6		16.4		36		66		132		274	
1974	5.6		16.4		34		66		140		276	
1975	6.3		14.7		33		68		137		264	

Note The figures in Roman type relate to ischaemic heart disease as currently defined (6th, 7th Revisions: 420, 422.1; 8th Revision 410-414).

Figures in italic type relate to the wider definition which also includes degenerative heart disease (6th, 7th Revision 420-422; 8th Revision 410-414, 424, 395.9, 428).

Appendix table F: Accidents and Violence: death rates at ages 5-24 by sex and age (per million population), 1951-74

ICD (8th Rev)	Cause*	Years	Males				Females			
			5-9	10-14	15-19	20-24	5-9	10-14	15-19	20-24
E800-999	All accidents, poisoning and violence	1951-55	21.2	17.0	39.3	62.3	9.4	5.3	8.3	8.7
		1956-60	18.6	15.9	50.2	67.2	8.6	5.6	9.3	11.3
		1961-65	19.1	17.0	61.6	69.1	8.5	5.6	13.6	14.0
		1966-70	19.2	16.9	62.8	61.4	8.3	6.6	16.2	15.2
		1971-74	17.6	14.8	58.3	62.6	8.3	6.4	18.4	16.7
E810-819	Motor vehicle traffic accidents	1951-55	9.8	6.5	18.2	31.7	4.9	2.1	4.2	3.7
		1956-60	8.8	6.3	31.8	40.8	4.2	2.5	5.5	5.3
		1961-65	10.1	7.5	42.9	41.6	4.8	3.3	8.8	6.2
		1966-70	10.2	7.9	43.6	34.6	4.7	3.8	10.9	7.2
		1971-74	10.1	7.4	40.7	34.4	5.5	4.2	12.0	8.0
E910, E984	Accidental and open verdict drowning	1951-55	6.0	3.4	4.1	2.6	0.68	0.62	0.35	0.36
		1956-60	5.0	3.2	3.1	3.0	0.70	0.85	0.27	0.30
		1961-65	4.6	2.6	2.9	2.3	0.64	0.45	0.25	0.32
		1966-70	4.2	2.2	3.2	2.7	0.67	0.44	0.35	0.32
		1971-74	3.1	1.6	2.4	2.7	0.47	0.27	0.27	0.24
E950-959	'Official suicide'**	1951-55	-	0.30	2.8	5.8	-	0.10	1.0	1.9
		1956-60	-	0.18	2.8	6.6	-	0.08	1.3	3.2
		1961-65	-	0.19	3.7	9.5	-	0.11	1.6	3.8
		1966-70	-	0.17	3.7	8.5	-	0.09	1.7	3.8
		1971-74	-	0.14	2.7	8.7	-	0.10	1.9	3.8
E850-877 E950-959 E980-982	'Estimated suicide'***	1951-55	:	:	3.4	6.8	:	:	1.3	2.4
		1956-60	:	:	3.6	7.8	:	:	1.7	3.7
		1961-65	:	:	4.8	11.5	:	:	2.3	5.0
		1966-70	:	:	5.1	10.7	:	:	2.7	5.3
		1971-74	:	:	4.5	12.4	:	:	3.2	5.5
E960-969	Homicide	1951-55	0.38	0.23	0.22	0.42	0.43	0.23	0.39	0.43
		1956-60	0.47	0.18	0.43	0.64	0.45	0.31	0.41	0.43
		1961-65	0.41	0.18	0.52	0.75	0.35	0.26	0.56	0.70
		1966-70	0.30	0.19	0.69	0.97	0.36	0.20	0.77	0.69
		1971-74	0.39	0.28	1.32	1.42	0.37	0.41	1.03	1.1
Remainder E800-999	All other accidents, poisoning and violence	1951-55	4.9	6.3	13.4	20.8	3.2	2.1	2.0	1.8
		1956-60	4.2	5.8	11.3	15.0	3.2	1.6	1.5	1.6
		1961-65	3.8	6.2	10.6	13.1	2.6	1.3	1.6	1.7
		1966-70	4.4	6.1	10.3	12.4	2.4	1.8	1.5	1.6
		1971-74	3.9	5.0	9.4	11.7	2.0	1.3	2.0	1.8

: Not appropriate

* Causes are classified according to the Eighth Revision of the ICD

** Suicides recorded as such by HM Coroners

*** Official suicides together with accidental poisonings. From 1967 the figures also include 'open verdict' poisonings which were previously classified under 'accidental'. Figures for estimated suicides are not given for age under 15; at these ages other open verdicts such as hanging and strangulation might be considered more relevant to the problem.

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