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ABSTRACT

The thesis is primarily a study of the mortality and morbidity in the 1970s of males 15-64 years in England and Wales, and incidentally, is also a study of the inadequacies and shortcomings of measures of mortality and morbidity. No hypotheses are tested; it is a descriptive study using secondary sources.

The mortality and morbidity of males of working age has implications for the state in respect of expenditure on health care, social security cash payments, and other welfare benefits and for society in respect of loss of production. However, as discussed in the first three chapters, attempts at measuring mortality and morbidity are beset with many problems. Mortality is a definite event which can be measured, thus the major problems are the different types of measures available, and the accuracy of recording of causes of death. In contrast, morbidity is partly a subjective experience, lasting over a period of time and consequently is much more difficult to quantify. The advantages and disadvantages of various sources of mortality and morbidity data are discussed.

The second part of the study uses published data to examine patterns of mortality and morbidity of males 15-64 years in the 1970s. This involves an examination of causes by disease categories and an analysis of deaths and illness by sex, age, social class, occupation, marital status and region.

In the final chapters the major causes of death are examined in relation to use of hospital beds and general medical practitioner services. The possibility of prevention is considered and speculations are made as to the implications of this.

A STUDY OF MORTALITY AND MORBIDITY OF MALES 15-64 YEARS IN ENGLAND AND WALES IN THE 1970s

by

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Chapter 1

Introduction

The thesis is primarily a study of the mortality and morbidity in the 1970s of males 15-64 years in England and Wales, and incidentally is also a study of the inadequacies and shortcomings of the measures of mortality and morbidity. No hypotheses are tested; it is a descriptive study using secondary sources.

Males between the ages of 15 and 64 years are the major part of the nation's workforce[1]. Consequently their mortality and morbidity has implications for the state in respect of expenditure on health care, social security cash payments and other welfare benefits and also for society in respect of loss of production. However, attempts at measuring mortality and morbidity are beset with problems as noted in the introduction to the Registrar General's Decennial Supplement on 'Area Mortality 1969-73 (OPCS 1981) :

> '... Too much reliance should not be placed on these mortality statistics as indicators of the incidence of diseases let alone its causation. Death comes at the end of a long chain of events, with many intervening stages between initial causation and final outcome. In the early nineteenth century it may have been justifiable to equate death with incidence of disease for conditions such as cholera, typhoid and other fevers. Today our medical armamentarium is vastly improved. Logically we should turn to morbidity statistics of hospital patients, G.P. consultations or absence from work on account of sickness but such measures have their own errors, biases and other inadequacies causing difficulties in their use. Mortality statistics still hold pride of place as counting an incontrovertible fact.'
>
> ibid p.2.

An understanding of the patterns and processes of mortality and morbidity can influence public policy in three

respects. First it may encourage the scope and nature of preventive measures. These may take many different forms ranging from vaccination to road traffic regulations and from factory acts to improved ambulance services. Second,it may assist in the rational planning of health care resources. This is now recognised to be more difficult than was thought in the past. The classical example of these difficulties is the misconception of the creators of the National Health Service that higher standards of therapy and free access to health care would lead to a reduction in the prevalence of disease and thus would reduce demand for health care. Nowadays it is recognised that if people are cured of one disease, they survive to suffer later from other diseases. Thus the better and more accessible a health care service, the greater may be the volume of the service which is demanded and thought to be required. Third, a better understanding of patterns of mortality and morbidity and their interaction with demographic changes may assist in the planning of community services such as retirement and widows pensions, housing and education.

The extent to which mortality and morbidity are inter-related can be examined in the context of the following four classifications of disease:

1. Diseases which are usually fatal and sudden and result in minimal expenditure.
2. Diseases which are fatal, usually after a prolonged illness and involve relatively high expenditure.
3. Diseases which are non-fatal for which no cure is

known, and spontaneous recovery is the norm; expenditure on therapy tends to be low but the economic cost due to absence from work may be quite high.

4. Diseases which are non-fatal but for which cure and/or care may involve high expenditure.

The study falls into two parts; Chapters 2, 3 and 4 cover the issues arising in attempting to measure mortality and morbidity. In advanced societies in which population censuses are taken and births and deaths are registered it is possible to identify certain characteristics which influence the occurrence of death. These fall into four broad groups: pathological and genetical, biological (age and sex), social (class, occupation and marital status) and environmental. Death in the overwhelming majority of cases is an indisputable fact which occurs at a specific time and place to a person of known sex, marital status and age. The cause of death and the person's occupation are frequently somewhat less definite but mortality statistics are in general better grounded and more reliable than most statistics used by social scientists. Mortality statistics can be indicators but are not measures of the health of a population group. Much ill-health does not result in death but much death indicates a society which is diseased in more than one sense of this term.

Chapter 2 concentrates on ways of measuring mortality and some of the problems involved and Chapter 3 examines characteristics by which mortality can be measured and which themselves appear to influence mortality.

Morbidity in contrast to mortality is difficult to define and therefore difficult to measure. The problems of measuring morbidity are discussed in Chapter 4. Many apparent indicators of ill-health are in fact determined or at least influenced by other factors. Hospital admissions are related to the number of hospital beds and the 'bed turnover'; absence from work due to illness is partly influenced by levels and rules (waiting days and tax liability) of sickness insurance benefit and of occupational sick pay. General practitioners' consultations are also dubious indicators of ill-health. The easier the access to the general practitioner, the more pleasant the surgery premises, the more caring the doctor, the more frequently will he be consulted. It must, however, also be noted that many people who are ill for various reasons take no steps to bring this to anyone's attention and thus much illness which causes slight or severe pain and discomfort is unrecorded. Certain illnesses can be diagnosed by clinical examinations, X-rays or pathological tests but similar or identical measurable manifestations may result in apparently different levels of pain and disability. Other illnesses have no symptoms which can be objectively verified but may cause severe pain and disability. In this sense, being ill is partly a subjective condition.

The second part of the study concentrates on the mortality and morbidity of males 15 to 64 years. Most data refer to 1977 but as some mortality and morbidity data are not available for every year the dates vary on occasions: for example the analyses of mortality by social class and occupation rely on data provided in the Registrar General's Decennial Supplement

on 'Occupational Mortality 1970-72' (OPCS 1978a) and the analysis of consultations with general practitioners refers to 1970-71 since the only data available are those provided by the Second National Morbidity Survey conducted in these years.

In a study of the relationship between two variables there is the choice of considering the characteristics of the first in terms of the second or vice-versa. In this study it might seem logical to consider morbidity before mortality but the order has been reversed as mortality data are generally considered to be more reliable.

Chapter 5 analyses mortality by cause of death. There are analyses by age, sex, marital status, social class, occupation and region.

Chapter 6 examines patterns of morbidity, reference being made to:

(a) self-reported morbidity - data provided by the General Household Survey.

(b) consultations with general practitioners - data provided by 'Morbidity Statistics from General Practice.'

(c) sickness absence statistics - data provided by Social Security Statistics.

(d) use of hospital beds - data provided by the Hospital In-Patient Enquiry.

To give a more comprehensive picture of morbidity of males

15-64 years brief reference is also made to some other health services.

The first of the three concluding chapters, Chapter 7, examines relationships between mortality and morbidity especially in respect of utilisation of health services. Chapter 8 attempts to evaluate the economic burden to the individual and to the community caused by illness and premature death. Finally, Chapter 9 discusses the possibility and implications of preventing diseases.

The study concludes with a very brief speculation about future problems in the measurement of mortality and morbidity.

Chapter 2

Measurement of Mortality

As a preliminary to examining and interpreting mortality statistics it is necessary to consider the various ways of measuring mortality. Basically there are four ways of expressing mortality data:

1. The number dying within a given period, usually expressed as deaths per 1,000, within one year - mortality rate.
2. The average expectation of life at various ages.
3. The proportion of people who survive up to specific ages - survival rate.
4. The ratio of mortality rates of specific age-groups to each other or to an average - mortality ratio.

It should be noted that although ways of expressing mortality data can be classified into four categories, within each category several measures may be considered.

In the first category - mortality rates - the most basic measure is the Crude Death Rate (CDR). This is the number of deaths per 1,000 population per year. It is calculated by dividing the number of deaths in a population, by the population (usually mid-year estimate) and multiplying this ratio by 1,000.

This measure is of limited use in comparing different populations as it does not take into account differences in age-sex composition.

The greater the proportion of older people, ceteris paribus, the greater will be the Crude Death Rate.

Age-Specific Death Rates refer to the number of deaths of specified ages per 1,000 population of that age. It is calculated in the same way as Crude Death Rates. Table 2.1 is an illustration of the use of age and sex-specific death rates.

Table 2.1

Death rates per 1,000 population: Analysis by age and sex. England and Wales, 1977

	All ages	0-1*	1-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65-74	75-84
Males	12.1	15.0	0.6	0.3	0.3	0.8	0.9	0.9	2.0	6.9	18.8	48.9	111.1
Females	11.4	12.0	0.5	0.2	0.2	0.3	0.4	0.5	1.4	4.1	9.9	25.2	70.8

Note: * = Deaths per 1,000 Live Births.

Source: O.P.C.S.(1979a) 'Mortality Statistics 1977' London H.M.S.O. Table 4.

This is a useful way of seeing at a glance, differences in mortality between the sexes and in different age-groups. However, when wishing to compare and contrast larger populations, category specific death rates are cumbersome, thus it is preferable to use a measure which is a condensed form of these rates. A comparison of the CDRs (Crude Death Rates) of two populations may be misleading as these rates are the combined effect of age and sex composition as well as of age-specific mortality rates. It is therefore more meaningful to compare the mortality rates of two populations in such a way that no account is taken of the differences in their age and sex composition. This can be done by calculating standardised

death rates separately for each sex. These Age Standardised Death Rates are derived by applying the age composition of a standard population to the age-specific death rates of a given population. This rate like the CDR is normally expressed as rate per 1,000 population.

Those measures specified in the first and second categories, that means, the average expectation of life at various ages and the proportion of people who survive up to specific ages, are combined in Life Tables. The first life table is generally acknowledged to have been compiled in the late seventeenth century, but the first English national life tables were not compiled until 1842 by William Farr.[1] Although census figures had been available since 1801, it was not until 1837 with the implementation of the Births and Deaths Registration Act of 1836, that it became possible to complete such tables on a national scale. Since those early days there have been many refinements,[2] but basically a life table can be described as a way of expressing mortality rates by showing on the basis of current mortality rates, the number out of 1,000 (or whatever size of cohort is used as the start or "radix" of the table) surviving to specific ages and the number of those dying between successive points on the age scale.

Incorporated in life tables is a series of 'expectation of life' for each age in the table, that means the average number of years individuals on reaching certain ages may be expected to live. It is important to note that 'expectations of life' are averages referring to a specific age. Thus if a group of males age 15 years has an average expectation of life of 55 years, this does not mean that

the same group thirty years later has an average expectation of 25 years. Their expectation of life will be greater as the least healthy/fit members of the group will have died in the intervening period.

The construction of life tables is described in Appendix A. Table 2.2 is an example of English Life Tables in an abridged form; figures are given at five year intervals instead of yearly ones. (Abridged life tables are the ones most frequently used in published mortality statistics).

Table 2.2

Examples of English Life Tables

England and Wales

Age$_x$	English Life Table No. 12, 1960-62						Life Table, 1973-75			
	Males			Females			Males		Females	
	l_x	q_x	$\overset{o}{e}_x$	l_x	q_x	$\overset{o}{e}_x$	l_x	$\overset{o}{e}_x$	l_x	$\overset{o}{e}_x$
0	100,000	0.02449	68.1	100,000	0.01896	74.0	10,000	69.5	10.000	75.7
5	97,175	0.00057	65.1	97,795	0.00042	70.7	9,790	66.0	9,837	72.0
10	96,939	0.00039	60.2	97,635	0.00024	65.8	9,772	61.1	9,825	67.1
15	96,742	0.00059	55.3	97,514	0.00030	60.8	9,756	56.2	9,814	62.1
20	96,293	0.00119	50.6	97,336	0.00044	56.0	9,713	51.4	9,796	57.2
25	95,753	0.00099	45.8	97,105	0.00054	51.1	9,664	46.6	9,775	52.4
30	95,265	0.00115	41.1	96,811	0.00075	46.2	9,621	41.8	9,751	47.5
35	94,652	0.00155	36.3	96,384	0.00114	41.4	9,570	37.0	9,719	42.6
40	93,790	0.00235	31.6	95,724	0.00180	36.7	9,496	32.3	9,665	37.9
45	92,433	0.00399	27.0	94,685	0.00284	32.1	9,365	27.7	9,572	33.2
50	90,085	0.00728	22.7	93,080	0.00439	27.6	9,123	23.4	9,412	28.7
55	85,916	0.01331	18.6	90,652	0.00682	23.2	8,719	19.4	9,169	24.4
60	78,924	0.02287	15.1	86,967	0.01088	19.1	8,082	15.7	8,811	20.3
65	68,490	0.03648	12.0	81,286	0.01808	15.3	7,137	12.4	8,284	16.4
70	54,806	0.05566	9.3	72,483	0.03104	11.8	5,805	9.6	7,492	12.9
75	38,914	0.08434	7.0	59,360	0.05370	8.8	4,152	7.4	6,307	9.8
80	22,933	0.12747	5.2	41,890	0.09108	6.4	2,500	5.8	4,683	7.3
85	10,169	0.18659	3.9	23,115	0.14729	4.6	1,166	4.6	2,780	5.6
90	3,047	0.25593	3.0	8,782	0.22128	3.3				
95	573	0.32385	2.4	2,024	0.30323	2.5				
100	68	0.62017	2.0	264	0.37788	2.0				

Source: Central Statistical Office (1977) Annual Abstract of Statistics 1977. London: H.M.S.O. Table 2.33 p.51

The notation used at the head of each column denotes the more common elements of the life table.

Age_x The age of the population at the beginning of the year.

l_x The number of persons alive at the beginning of the year x, that is the number of 'survivors'.

q_x The chance or probability of a person dying between age x and age x + 1 where x can have any value between 0 and the longest observed duration of life.

e.g. q30 is the chance that a person who has reached his 30th birthday will die before his 31st, or in this abridged table q30 is the chance of a person dying before his 35th birthday.

This probability of dying, calculated from the mortality rates experienced by the population on which the life table is based, is the ratio of those who fail to survive a particular year of life to those who started that year of life. Probabilities of dying are usually calculated for each year of life but in Table 2.2 q_x refers to five yearly intervals.

$\overset{o}{e}_x$ The expectation of life at year x. (As explained in the text above this refers to the average duration of life beyond each age). The calculation of the expectation of life is described in Appendix A.

Other elements which are recorded in full life tables are:

d_x The number who die during the year.

p_x The probability of a person surviving between age x and age x + 1 where x can have any value between 0 and the longest observed duration of life. (This is the reciprocal of q_x). ? Complement

L_x The number of years lived during the year.

T_x The number of years expected to be lived by population age x.

It follows from the description of the elements of a life table (and the construction of it described in Appendix A) that there are certain data requirements: the mid-year population at each age and

the number of deaths taking place between each age and the next. This often limits the construction of life tables as such information is not always available for single years of life, but instead refers to five or ten yearly age-groups. Census years are the most reliable years for providing such data for in other years populations at various ages are estimated.

Inherent in life tables is the assumption that mortality rates will continue at current rates. This is a somewhat unrealistic assumption as in the past, mortality rates have consistently declined. It deserves notice that at the extremes of life, that means for the very young and the very old, the assumption that deaths are uniformly distributed over each year is not correct but this is a reasonable assumption for the 15 - 64 age-group which is the subject of this study.

Within these limitations life tables provide several useful measures for various comparative purposes. For example, in Table 2.3 an abridged occupational life table by social class, differences in mortality experience between the various social classes are clearly evident. A man in Social Class I at the age of 45 years has an average expectation of life of 28.5 years whilst a man in Social Class V at the same age has an average expectation of life of 26.2 years.

Table 2.3

Abridged occupational life tables by social class

		Number surviving at age x out of 100,000 at age 15 (l_x)				Expectation of life at age x (ex)	
		15	45	55	65	15	45
All men		1,000	955	886	712	55.6	27.4
Social Class							
I	Professional etc. occupational	1,000	970	920	775	57.2	28.5
II	Intermediate occupations	1,000	968	914	766	57.0	28.3
IIIN	Skilled occupations non-manual	1,000	962	890	727	56.0	27.5
IIIM	Skilled occupations manual	1,000	961	893	707	55.7	27.2
IV	Partly skilled occupations	1,000	950	874	693	55.1	27.0
V	Unskilled occupations	1,000	929	835	643	53.5	26.2

Note: Figures reduced from 10,000 to 1,000.

Source: O.P.C.S. (1978a) 'Occupational Mortality 1970-72'. The Registrar General's Decennial Supplement for England and Wales. London: H.M.S.O. Table 8A p191.

When discussing death rates it was noted that in comparing mortality rates of two or more different population groups it is necessary to have some form of standarisation thus eliminating any differences caused by divergence in the age-sex structure of the populations being studied. The fourth category of mortality measures consists of ratios which incorporate such standardisation. The two most common of these ratios are the Comparative Mortality Figure (CMF) and the Standardised Mortality Ratio (SMR).

The Comparative Mortality Figure is calculated by applying

the age-specific death rates of the given population to the age-groups of a standard population. The number of deaths thus calculated (the expected number of deaths) are expressed as a ratio of the observed number of deaths which occurred in the standard population. The CMF can only be calculated if the number of deaths in each age-group of the given population are known. It tends to be misleading if the number of deaths in a particular age-group is small, so that one or two deaths more or less will lead to considerable variations in the age-specific mortality rate of that age-group. This calculation is known as direct standardisation.

The Standardised Mortality Ratio is calculated by applying the age-specific death rates of the standard population to the age-groups of the given population. The ratio of the number of deaths observed to the number of deaths expected on this basis, is the Standardised Mortality Ratio. This rate can thus be calculated for any given group for which the age composition and total number of deaths are known. This calculation is known as indirect standardisation.

As shown in the example given, Table 2.4, appreciable differences between the Standardised Mortality Ratio and the Comparative Mortality Figure will be observed if the age distribution of a group being studied differs markedly from the standard age distribution. If the age-specific mortality rates are constant or the age distribution is similar to that for the standard population then the Standardised Mortality Ratio and the Comparative Mortality Figure will be similar.

Table 2.4 Examples illustrating Calculation of Standardised Mortality Ratios and Comparative Mortality Figures

	Standard Population		
	1	2	3
Age group	Composition %	Mortality Rate per 1,000	Number of Deaths
0 - 15	25	5	125
15 - 34	25	10	250
35 - 64	25	20	500
65+	25	70	1750
	100		2625

Population A		
4	5	6
Composition %	Mortality Rate per 1,100	Number of Deaths
10	10	100
35	15	525
40	30	1200
15	80	1200
100		3025

Population B		
7	8	9
Composition %	Mortality Rate per 1,000	Number of Deaths
30	4	120
30	8	240
30	15	450
10	60	600
100		1410

$$\text{S.M.R.} = \frac{\text{No. of deaths observed}}{\text{No. of deaths expected in given population if that population was subjected to mortality rates of a standard population}} \times 100$$

Population A

$$\therefore \frac{\text{Col.6}}{\text{Col. 4 x Col. 2}} \times 100 = \frac{3025}{\begin{matrix}10\text{x}5 \quad (50)\\ 35\text{x}10 \quad (350)\\ 40\text{x}20 \quad (800)\\ 15\text{x}70 \quad (1050)\end{matrix}} \times 100$$

$$= \frac{3025}{2250} \times 100$$

$$\therefore \text{S.M.R.} = 134$$

Population B

$$\frac{\text{Col.9}}{\text{Col.7 x Col.2}} \times 100 = \frac{1410}{\begin{matrix}30\text{x}5 \quad (150)\\ 30\text{x}10 \quad (300)\\ 30\text{x}20 \quad (600)\\ 10\text{x}70 \quad (700)\end{matrix}} \times 100$$

$$= \frac{1410}{1750} \times 100$$

$$\therefore \text{S.M.R.} = 81$$

$$\text{C.M.F.} = \frac{\text{Expected No. of deaths of standard population subjected to mortality rates of given population}}{\text{Observed deaths in standard population}} \times 100$$

$$\therefore \frac{\text{Col. 5 x Col. 1}}{\text{Col. 3}} \times 100 = \frac{\begin{matrix}10\text{x}25 \quad (250)\\ 15\text{x}25 \quad (375)\\ 30\text{x}25 \quad (750)\\ 80\text{x}25 \quad (2000)\end{matrix}}{2625} \times 100$$

$$= \frac{3375}{2625} \times 100$$

$$\therefore \text{C.M.F.} = 129$$

$$\frac{\text{Col.8 x Col.1}}{\text{Col. 3}} \times 100 = \frac{\begin{matrix}4\text{x}25 \quad (100\\ 8\text{x}25 \quad (200)\\ 15\text{x}25 \quad (375)\\ 60\text{x}25 \quad (1500)\end{matrix}}{2625} \times 100$$

$$= \frac{2175}{2625} \times 100$$

$$\therefore \text{C.M.F.} = 83$$

Within this fourth category of mortality measurement, in addition to the most frequently used ratios, namely SMRs and CMFs, other measures merit consideration when examining mortality and morbidity patterns of adult males. Two such measures are used by the Registrar General in 'Occupational Mortality 1970-72' where insufficient data is available to calculate one of the above measures. Both summarise mortality by cause of death.

The Proportional Mortality Ratio (PMR) is calculated in a way similar to that of the Standardised Mortality Ratio. (See Appendix B). The expected number of deaths from individual causes is calculated from the proportions of all deaths in the standard population, attributed to the causes studied. Age standardisation is the same as for the SMR and like the SMR it is expressed as a percentage ratio.

This does not measure mortality rates as it takes no account of the population 'at risk', but simply indicates whether a high or low proportion of deaths from a particular cause was recorded. The proportion for an individual cause may be high because the rate for that cause is high, or alternatively rates for other major causes may be low. The Proportional Mortality Ratio does not indicate for what reason a figure is high or low.

The Proportional Registration Ratio (PRR) is a variant of the Proportional Mortality Ratio and is of particular interest in the study of mortality and morbidity patterns since it is used in the analysis of cancer data. (See O.P.C.S. 1979a'Occupational Mortality 1970-72' p11). It is defined by the Registrar General as:

> " The percentage ratio of the number of registrations from a particular cancer in the group studied to the number expected from the age-specific proportions of total cancer registrations attributed to that in England and Wales."
>
> O.P.C.S. 1978a p.xvii

It is calculated in the same way as the Proportional Mortality Ratio (See Appendix B) but uses only the proportion of cancer regisistrations instead of the proportions of all deaths. The age standardised proportion for a particular site is then compared with that for the standard population.

Although it is not a measure of mortality, the Area Comparability Factor is of some importance in the study of mortality. It is a factor used by RegistrarGeneral to adjust local death rates to the national population structure. (In this case the standard population death rates are the national rates for the current year.) Often the problem arises that whereas the number of deaths at each age are known for the whole country and its localities for the census years, in subsequent years only the total number of deaths and total population of the localities are known. The problem of adjusting the local Crude Death Rates in these later years for comparisons between localities is met by using the Area Comparability Factor. A common form of this factor is obtained by dividing the average age-specific death rates for the whole country in the census year by a similar average for the locality. The corrected death rate for any given locality is obtained by multiplying the Crude Death Rate by the Area Comparability Factor.

Another important use of the Area Comparability Factor is to

adjust rates to make allowances for those areas which have a higher number of invalids than average due to the location of certain types of hospitals or homes in its' boundaries.

It should be noted that it is not only in the study of mortality data that the concept of a multiplying factor is used: similar 'factors' are used in the Hospital In-Patient Enquiry in the study of morbidity data.

Table 2.5 examines the main indices of mortality: Expectation of Life, Survival rates, Death rates per 1,000, and Standard Mortality Ratios, in relation to some of the main factors by which mortality is categorised and which themselves appear to influence mortality rates. In this table as in the whole study of mortality statistics there are problems due to the lack of data available, and especially due to discrepancies in the years and in age-groups to which figures relate. However, the table shows clearly how the use of different measures using the same original data can produce results which appear to be quite contradictory. It is a good illustration of how by selecting appropriate measures differences can be maximised or minimised. The truth has many facets.

All these figures have some degree of veracity because they are based on relating the numbers of deaths in population groups to aggregates in those groups. However, the particular index chosen can leave the reader with very different impressions. For example, referring to divergences between Social Class I and V, the age-specific survival rate of males aged 45 - 49 years differs by a mere 0.5%, the number of men surviving to 45 years differs by 4%, the expectation

Table 2.5 Differences in Mortality and Survival Measures illustrated by sex and selected ages, occupations, social classes and regions

Characteristic	Description	1. Expectation of Life			2. Survival Rates out of 1000		3. Age-Specific Death Rates per 1,000 population			4. Age Specific Survival Rates per 1,000 population. (Reciprocal of Col.3)			5. Mortality Ratios (S.M.Rs)
AGE and SEX	Age (years)	15	45	65	45	65	15-24	45-54	55-64	15-24	45-54	55-64	All Causes
	Male	56.4	27.9	12.5	940	721	0.9	6.8	18.8	999.1	993.2	981.2	All Ages
	Female	62.3	33.3	16.5	960	832	0.4	4.1	9.9	999.6	995.9	990.1	100
	Difference	5.9	5.4	4.0	20	111	0.5	2.7	8.9	0.5	2.7	8.9	100
	Excesss %	11	19	32	2	15	125	66	90	0.05	0.3	0.9	
OCCUPATION	Males												
	Age (years)	45			45		45 - 49			45 - 49			45 - 54
	Administrators & Mngrs.	28.6			971		3.9			996.1			72
	Miners & Quarrymen	25.8			958		6.7			993.1			130
	Difference	2.8			13		2.8			2.8			58
	Excess %	11			1		72			0.3			81
SOCIAL CLASS	Males												
	Age (years)	45			45		45 - 49			45 - 49			15 - 64
	Social Class I	28.5			969		3.7			996.3			77
	Social Class V	26.2			929		8.2			991.8			137
	Difference	2.3			40		4.5			4.5			60
	Excess %	9			4		122			0.5			78
REGION	Males												
	Age (years)	0			50		45 - 54			45 - 54			All ages
	North West	67.9			901		8.1			991.9			112
	East Anglia	71.3			927		5.3			994.7			89
	Difference	3.4			26		2.8			2.8			23
	Excess %	5			3		53			0.1			26

Note: Excess % = % of excess of higher over lower figure.
Source: See overleaf

Table 2.5

Source:

Age and Sex	-	Central Statistical Office (1977) 'Annual Abstract of Statistics 1977' London. H.M.S.O. Table 2.33 O.P.C.S. (1979b) 'Mortality Statistics 1977 - Area' London. H.M.S.O. Tables 2,3
Occupational and Social Class	-	O.P.C.S. (1978a), 'Occupational Mortality, 1970-72 The Registrar General's Decennial Supplement for England and Wales' London H.M.S.O. Table 3.3, 5B, 5C, 8A and Appendix 2, Table A.
Region	-	O.P.C.S. (1979b) 'Mortality Statistics 1977-Area' London. H.M.S.O. Table 2,3 Gardner, M. and Donnan, S. (1977) 'Life expectancy - variations among regional health authorities' Population Trends No.10 Winter p.10 - 12 N.B. Figures refer to 1974-75

of life at age 45 years by 9% while the mortality ratios for men aged 15 - 64 years differ by 78% and the age-specific mortality rates for men aged 45 - 49 years by a colossal 122%. All these indices are different facets of the same truth but they show dramatically how the choice of an index can support arguments based on minimal social class differences and also others based on enormous social class differences.

The table also illustrates that by any measure, mortality differences are greater by age than by sex, greater by sex than by occupation and greater by occupation than by social class. The differences by occupation and social class are however, partly a reflection of a division into an arbitrary number of groups. The explanation for the discrepancies between age specific mortality rates which are very large and survival rates which are very small, is that at younger ages the proportion of deaths in a population is very small; thus a difference in age-specific mortality between 4 per 1,000 and 8 per 1,000 is 100 per cent, while the corresponding rate difference between 996 and 992 is a mere 0.4 per cent.

The difficulties encountered in interpreting data are well illustrated in Table 2.6. This shows that in Period 1 the Infant Mortality Rate (IMR.) for Social Class V is twice that of Social Class I and that therefore the corresponding mortality ratio of Social Class V is twice that of Social Class I. In period II the IMR of both social classes are only half of what they were in Period I but the proportionate difference between them - the mortality ratio - has remained the same. This appears to support the supposition that social class differences have remained unaltered. When however

Table 2.6 Infant Mortality and Survival Rates per 1,000 Births and Mortality Ratios by Social Class

Period	Social Class	I	V	All	Excess of I over V
I	Mortality Rate	12	24	18	
	Survival Rate	988	976	982	12
	Mortality Ratio	67	133	100	
IIA	Mortality Rate	6	12	9	
	Survival Rate	994	988	991	6
	Mortality Ratio	67	133	100	
IIB	Mortality Rate	5	13	9	
	Survival Rate	995	987	991	8
	Mortality Ratio	55	144	100	

Source: Based on a table by Kaim-Caudle (1977) Inequality p.91 in Heisler, H. (1977) Foundations of Social Administration. London: Macmillan

one compares the survival rates - the reciprocals of the mortality rates - the very opposite seems to be the case. In Period I twelve more children out of a 1,000 born survived in Social Class I than in Social Class V (988 against 976) while in Period II only an additional six children survived in Social Class I as compared with Social Class V (994 against 988). Put differently 1.2 per cent more children survived in Social Class I in Period I but only 0.6 per cent in Period II. This appears to support the supposition that social class differences have narrowed. When comparing Period 1 with Period III the alternative interpretation of the data leads to even more contrasting conclusions. The mortality rate of Social Class I has declined by more than half (12 to 5) while that of Social Class V has declined by less than half (24 to 13) with the consequence that

the differences in the mortality ratios have widened from 67 (67 against 133) to 89 (55 against 144). This appears to indicate that social class differences have increased. Yet again a comparison of the survival rates leads to exactly the opposite inference. In Period I 1.2 per cent more children survived in Social Class I than in Social Class V while in Period III the corresponding proportion has declined to 0.8 per cent thus indicating a narrowing of social class differences. An undue concentration on comparing mortality ratios may thus give results which are misleading.

As this study concentrates particularly on the mortality of males between the ages of 15 and 64 years, it is important to consider the concept of 'Years of life lost'. Closely linked to the concept of the expectation of life, this is not so much a measure of mortality as a measure of the impact of mortality on the population. If a man of 30 years dies, it might be assumed that had the 'contingency of death' not arisen, he might have lived the remainder of a normal span of life whereas a man of 90 years, might have only a short time to live. Obviously, the implications of this are that the loss to the population is greater when deaths occur in the younger age groups. This measure is of particular interest for the number of 'working years of life' lost and thus it is usual for calculations to be made for years of 'total life' lost and years of 'working life' lost. The 'total life' span is usually designated as 85 years and 'working life' span is regarded as terminating at 65 years having commenced at 15 years. Calculations are made in relation to specific diseases. Table2.7 is extracted from a table produced annually by the Registrar General. (See O.P.C.S. 1979a Mortality Statistics. England and Wales 1977).

Table 2.7 Years of life lost due to mortality from certain causes: number of deaths from certain causes, death rates per 10,000 population, mean ages at death, years of 'working life' lost and years of 'total life' lost per 10,000 population (Males) England and Wales 1977

ICD No.	CAUSE OF DEATH	TOTAL DEATHS		Mean age of Death	Years of life lost			
					Age 15 - 64 years		Total to age 85 years	
		Number	Rates per 10,000 population		Years lost (Thousands)	Rates per 10,000 population	Years lost (Thousands)	Rates per 10,000 population
	ALL CAUSES	289,773	121	68.4	1214.7	508	4793.1	2004
140 -209	Cancer (all sites)	67,182	28	67.9	226.8	95	1067.6	446
162	Cancer of Trachea, Bronchus and Lung	26,705	11	68.0	71.9	30	406.5	170
410 -414	Ischaemic Heart Disease	89,411	37	69.3	24.3	102	1338.2	559
430 -438	Cerebrovascular Disease	27,831	12	73.5	45.6	19	341.0	143
480 -493	Pneumonia, Bronchitis (Chronic and Unspecified) Emphysema and Asthma	38,607	16	74.4	70.1	29	283.3	118
740 -759	Congenital Anomalies	1,780	1	13.7	73.7	31	125.6	52
Rem 760 -779	Other causes of Perinatal Morbidity	1,778	1	0.5	88.9	37	149.7	63
E800 - E949	Accidents	7,968	3	44.0	177.0	74	318.5	133

Source: O.P.C.S. (1979a) 'Mortality Statistics 1977. England and Wales' London; H.M.S.O. Table 24

The mean age of death for all causes and for each specific cause of death is calculated by aggregating the ages at death and dividing by the number of deaths; for example age at death 52, 35, 66, 47, mean age at death 200 divided by 4 equals 50 years. Years of life lost to age 85 are calculated by aggregating the differences between age at death and 85 years for all deaths. While years of working life lost are calculated by aggregation, for death at ages of 15 years and above, of the difference between age at death and 65 years for all deaths; for deaths below 15 years the calculation is the same except that the aggregate of the differences between age at death and 15 years has to be deducted. The rates are obtained by dividing the total years lost by the number in the relevant population group and multiplying by 10,000.

These calculations of 'years of life lost' are based on the implicit assumption that if people were not to die from a specific disease they would survive to the age of 65 or 85 years respectively. This assumption is of dubious validity. If people were not to die of this specific disease for which the calculations are made they may of course die of other diseases before they reach the age of 65 or 85 years. It may even be thought more probable that people who on account of advances in drug therapy are prevented from dying of a particular disease at an early age, are more prone than the average person to die at an early age of another disease.

The measurement of years of life lost provides an interesting interpretation of cause specific mortality data. Diseases which are generally acknowledged to be the scourge of the twentieth century, namely cancer and ischaemic heart disease, account for a large percentage

of working years lost, although in fact the mean age of death in both cases is above retirement age. This contrasts with death due to accidents for which the average age at death is only 44 years but which account for many years of lost working life. Deaths due to accidents are only some 8 per cent of deaths due to ischaemic heart disease but years of working life lost due to accidents are as much as three-quarters of years of working life lost due to ischaemic heart disease.

To conclude this summary look at methods of mortality measurement, it is necessary to be aware of the various problems and pitfalls. For example, when analysing sub-categories of populations such as occupations, yearly fluctations may be misleading and when dealing with small groups variations of one or two cases can influence figures substantially. Thus on the whole it is preferable to aggregate figures over three to five year periods as is done by the Registrar General in 'Occupational Mortality 1970-72' and 'Area Mortality 1969-73'.

In addition although mortality rates can be standardised, as has been shown, providing that the necessary data are available, in any comparisons, it is essential to ensure that the statistics have been compiled in the same way. For example, in comparing SMRs the same standard population must be used in all calculations.

These problems are most acute in the analysis of historical trends when rates may have to be recalculated to facilitate comparisons. There are additional problems inherent in the study of historical trends, for not only may the basis of measuring mortality have changed over the years but the boundaries of countries or local areas may have

altered. This also applies to the definition of terms and the relative size of groups. In England boundaries of the Standard Regions were changed as recently as April 1st 1974 as part of local government reorganisation.

All diseases nowadays are classified according to the International Statistical Classification of Diseases, Injuries, and Causes of Death (first published 1893) which is revised every ten years.[3] The latest revision, the ninth, came into use on January 1st 1979. Although it is possible to identify changes from one edition to the next, problems occur, not so much when specific diseases may have been allocated a different number, but when the reader may be unaware of major category classification changes for example, when, 'strokes' are moved from 'Diseases of the Central Nervous System' to 'Diseases of the Cardio-vascular System.' (Ipsen 1978 p.46).

In addition to these basic classification changes, one must be aware of further problems caused by changes in diagnostic terminology, changes in diagnostic technology leading to more causes of death from particular diseases being recognised, improvements in treatments leading to lower case fatality rates and changes in the incidence of diseases. (O.P.C.S. 1978b 'Trends in Mortality 1951-1975' p.13).

The problem of changes in classification, also applies when examining death rates in specific occupations and amongst social classes, for these are other subjects whose parameters have changed over the years. Possible re-distribution of the population between occupations and social classes, create additional problems. Possibly

the greatest source of error is the vagueness in the description of occupations, especially on death certificates which may result in the same person being described differently on the Census form and on the death certificate. Such differences in description which may also be due to other factors reduces the validity of occupational mortality rates and ratios.

It is not only occupational classification which can be queried on death certificates. As pointed out in 'Area Mortality 1969-73 (O.P.C.S. 1981 p.10) the accuracy of the recording of death has been studied extensively. There are not only difficulties, particularly among the elderly or when there are several contributing causes, in accurately determining the underlying cause of death but different certification practice in different regions may also be a source of discrepancies.

In a recent study of certification of death by Family Practitioners who unlike hospital doctors do not have easy access to modern diagnostic technology, Gau and Diehl (1982 'Disagreement among general practitioners regarding cause of death' British Medical Journal Vol.284 23rd January) found that when case histories concerned only one organ system ninety per cent of doctors agreed on the cause of death. However, if more than one organ system was concerned less than half the doctors were in agreement.

The study also confirmed several other suppositions:

a) Death certificates under-report chronic diseases such as cancer and diabetes mellitus.

b) Adverse drug reactions, whether fatal or not, are seldom recorded.

c) The percentage of doctors who elected to inform the coroner varied widely thus confirming the view that stigmatising diseases such as suicide and alcoholism are believed to be under-reported 'to save the relatives unnecessary distress'.

Gau and Diehl attribute differences in the coded causes of death to either 'justifiable differences of opinion among the doctors as to the cause of death' or 'the OPCS, in using standardised coding rules, assigned diagnostic codes that did not reflect what the doctors considered to be the 'true' underlying cause of death.'4 They recommend that doctors should be made aware of the coding rules used by the OPCS so that they may more accurately designate what they believe to be the underlying cause of death.

Chapter 3

Factors influencing Mortality

About one per cent of the population of England and Wales die every year. Thus 576 thousand people died in 1977 out of a population of 49.1 millions. Mortality as has been shown, can be measured by certain characteristics, for example, age, sex, marital status, occupation, social class and region. Not only do these factors form denominators for measuring mortality but they themselves, as will be shown, influence mortality. The chances of an individual being included in the one per cent of the population who die, vary largely according to the various characteristics listed. This is not to say that these are the only influences on mortality as in addition to the well-known environmental influences there are many unidentified factors including inherited characteristics.

Table 2.5 showed how the specific measurement chosen is likely to influence the inferences drawn and also illustrated what whatever the form of measurement, factors such as age, sex, occupation, social class and region (there were no complete figures available for marital status), influence mortality. These relationships are examined in this chapter.

AGE

It is a truism to state that age exerts a great influence on mortality, as this is reflected in the public's attitude towards death. The death of an elderly person is seen in a philosophical

frame of mind expressed in such phrases as: "at least he has had a good life" or "good innings", while that of a younger person is regarded as "being a tragedy" or "a wasted life".

The importance of the age factor may be underestimated as a result of this general acceptance. While the chances of dying increase gradually year by year after the first year of life, it is in the extremes of life that the majority of deaths occur. This is expressed in Nam and Gustavus' (1976 Population. 'The Dynamics of Demographic Change') suggestion that there is an age curve to mortality:

> " "The human organism develops from creation until shortly after puberty, at which time a steady state of body cell population exists. From that point onwards, growth becomes negative, cells are lost and the process of ageing continues. The risks of mortality correspond to a greater degree with this human growth process, being greatest at birth and during old ages, when cells are first forming or becoming depleted and least during the later childhood years.
>
> This pattern of biological developments, noted in all types of peoples, results in a standard age curve of mortality ... ... the death rate starts at a high peak immediately after birth, falls to a minimum in early teens, and then rises, gradually at first, then more and more rapidly as age advances, until the last survivors of the generation are gone."
>
> Nam and Gustavus ibid. p. 60.

Nam and Gustavus (ibid.) refer to this pattern being noted in all types of peoples. This pattern has already been shown in Table 2.1. There is the same slight peak after birth as described by Nam and Gustavus, although not on the same scale as in developing countries with high infant and child mortality rates. In Table 2.1 rates remain comparatively stable until the age-group 35 - 44 years when rates begin to increase (for males) from 2.0 per 1000 to 6.9

per 1000 for those aged 45 - 54 years. It is not until the middle 50s that the first year of life's mortality rates are reached again. This is reached by a fairly substantial increase from 6.9 per 1000 to 18.8 per 1000. From this age-group onwards the rise in mortality rates is very dramatic.

It is this same trend that results in most people dying after the age of 65 years, so that three-quarters of all deaths occur in one-seventh of the population.

1977	Total number of deaths	= 576,060
	No. of deaths occurring over 65 years	= 435,298
∴	Deaths over 65 years as % of all deaths	= 75.6%
1977	Home population in mid-year estimates	= 49.1 millions
	Home population mid-year estimates over 65 years	= 7.1 millions
∴	No. over 65 years as % of total population	= 14.5%

The age factor is not only important in the sense that the body cells deteriorate over time but the individual is exposed also to other factors such as occupation, environment and stress.

Not only does age influence the chance of dying but it influences also the way in which an individual dies. It is evident from Table 2.1 that for a man aged between 55 and 64 years the contingency of dying is about 20 times that of a man

aged between 20 and 24 years. (0.9 per 1000 compared with 18.8 per 1000). It is also unlikely that the cause of death will be the same. A young person in his early twenties is more likely to die as a result of an accident or violence, than from one of the degenerative diseases such as carcinoma or circulatory disease to which older persons succumb.

SEX

Table 2.1 also shows that male mortality rates for all age-groups exceed those of females. In the age-group 20 - 24 years male mortality is more than double that for females. This is mainly explained by accidents and violence, which are more prevalent amongst men, being the major causes of death at this age. The same cause also results in the differences at earlier ages as boys tend to have a greater spirit of adventure due to a mixture of biological and social factors.

However, differential sex rates persist throughout all age-groups but in the later years the causes of the sex differential in mortality rates are more difficult to explain. To some extent these differentials are due to differences in life-style; for example, women still smoke and drink less than men and employment patterns also differ. This supposition is favoured by the Registrar General (OPCS 1978b Trends in Mortality 1951-75 p8) on the grounds that the recent 'widening of the gap' can hardly be due to any inherent difference between the sexes.

This sex difference in mortality rates is a phenomenon by no means peculiar to England and Wales. This was illustrated by D.F. Roberts (1976 Sex Differences in Disease and Mortality) in his study of sex differences in disease and mortality, in which he observed similar differences in the United States and New Zealand. In his study Roberts noted that the changing pattern of sex differences was of particular interest.

> "There has been a spectacular fall in western countries in the last two hundred years, during which expectation of life at birth has more than doubled from about 35 to nearly 75 years. This spectacular mortality decline has not been equally shared by the two sexes. No matter to which country we look, the pattern emerges."
>
> (Roberts ibid p. 27)

This pattern to which Roberts refers is:

> "A consistently elevated male mortality, a steady decline in both sexes, and increasing differences between males and females."
>
> (Roberts ibid p. 27)

Table 3.1 illustrates the 'increasing difference' between male and female mortality over the past century in Great Britain. In some age-groups there do seem to be indications of a slight narrowing of the gap but the overall picture is such that it can be concluded that females have benefitted most and are still benefitting most from the decline in mortality rates.

Table 3.1

Age-specific death rates: ratios of male to female, by age, Great Britain

Period	15-24	25-34	35-44	45-54	55-64
1846-50	1.00	0.96	1.01	1.15	1.13
1896-1900	1.12	1.13	1.21	1.28	1.24
1946-50	1.13	1.06	1.27	1.56	1.73
1951-55	1.70	1.27	1.28	1.61	1.88
1956-60	2.20	1.45	1.34	1.65	1.98
1961-65	2.35	1.53	1.40	1.67	2.05
1966-70	2.33	1.62	1.42	1.65	2.03
1971-75	2.29	1.68	1.43	1.65	1.95
1976	2.45	1.67	1.43	1.63	1.93

Source: O.P.C.S. (1978c) Demographic Review 1977 - a report on population in Great Britain. London H.M.S.O. Table 2.4.

The Registrar General attributes the recent divergence between male and female rates to three major causes of death: ischaemic heart disease, lung cancer and in young people, accidents and violence, but does speculate that such divergence may have reached its maximum. Whereas mortality of males from lung cancer seems to be levelling out, rates are increasing for females. Similarly deaths caused by accidents and violence seem to be following the same pattern and it is suggested that figures for deaths caused by ischaemic heart disease also indicate similar trends.

It is suggested that the success of preventive measures can be judged by whether the 'narrowing of the gap' will be

achieved by a levelling down of the mortality of males or a levelling up of that of females. (OPCS 1978b p. 35). Inherent in this suggestion is the assumption that the three major diseases specified are preventable, and that they are influenced by environmental factors. As female lifestyle more closely approximates to that of males with more women going out to work, it may be thought that female mortality will likewise approximate to that of males. Some studies of female mortality seem to indicate that this indeed might be the case already. Although not referring to England and Wales but to Europe, Cuvillier (1979 p.12) noted that the lifespan of employed women is probably lower than it is generally believed to be if only because of the increased likelihood of accidents.

The validity of these claims, however, seems extremely dubious. The number of women killed in industrial accidents is very small and cannot possibly have any effect whatsoever on the average expectation of life. Even if it can be substantiated that the average expectation of life of women who work outside the home is less than that of women who have no paid employment, this may well be due not to women being in employment but due to women working outside the home having certain characteristics, for example, husbands having lower incomes, which predisposes them to a higher mortality rate.

Such studies, however, are an important reminder of how particular facts or trends may be masked by the overall 'group' figures. This point is emphasised by Bergmann et al (1975).

Both men and women die at all ages over a range of more than one hundred years: the difference in their respective expectation of life at birth is about six years. However, Bergmann's study has shown that more than eighty per cent of all female deaths can be matched with a contemporaneous male death. This means that eighty per cent of males and females experience the same mortality. It is the difference between the remaining twenty per cent which influences the sex differentials.

The persistent and large sex differential in mortality rates is one of the most perplexing aspects of mortality. There are no adequate explanations for the marked increase in the differential in the eighty years up to the 1960s nor any proper explanation of why it appears to have stabilised since. This phenomenon is all the more puzzling as it affects all ages and has persisted over a period of time when the causes of death have changed quite dramatically. The virtual elimination of deaths from infectious diseases does not seem to have affected the differential.

Marital Status

> "... ... marriage is a healthy state. The single individual is more likely to be wrecked on his voyage than the lives joined together in matrimony."
>
> Farr. W. 1858

Farr's observation about France in the mid-nineteenth century applies equally to England and Wales today. This is illustrated in Table 3.2. At all ages mortality rates of single,

widowed and divorced persons exceed those of married persons. The excess, again for both sexes, reaches a peak at about the age of 30 and thereafter declines fairly rapidly. At all ages and for both sexes the excess mortality with two exceptions is greater for the divorced than the widowed and with three exceptions greater for the widowed than for the single. The marital status differences are thus greatest at ages where the mortality is least and are least at ages where mortality is greatest.

Table 3.2

1970-72 mortality rates for single, widowed and divorced as percentages of those for married

	Men				Women		
	Rates as % of those for married men				Rates as % of those for married women		
AGE	SINGLE MEN	WIDOWERS	DIVORCED MEN	AGE	SINGLE WOMEN	WIDOWS	DIVORCED WOMEN
22	197				176		
27	242				268		
32	259		255		245		184
37	247		268		196		193
42	197	201	218		176		146
47	175	197	203		150	149	153
52	162	170	186		138	128	129
57	141	158	170		127	123	123
62	133	153	155		118	121	124
67	119	141	139		108	117	120
72	113	128	132		108	112	116
77	112	123	124		106	114	130
82	109	120	115		108	113	131

Source: OPCS (1979) 'Life Tables: The Registrar General's Decennial Supplement for England and Wales 1970-72 Table G p.10, London:HMSO.

Table 3.3 which shows the age-specific mortality rates by marital status illustrates that while the conjugal sex differences are quite marked and ubiquitious they are of a distinctly smaller order of magnitude than age differences.

Table 3.3

Age-specific Mortality Rates by Marital Status for Males. England and Wales 1977

Males	Total	Single	Married	Widowed	Divorced
15-19	0.8	0.8	0.7	-	-
20-24	0.9	1.0	0.6	-	-
25-34	0.9	1.6	0.7	2.4	1.4
35-44	2.0	4.0	1.7	4.0	3.4
45-54	6.8	10.6	6.1	12.0	9.9
55-59	14.1	20.2	12.9	22.2	20.6
60-64	23.9	31.0	22.0	34.3	34.3
65-74	48.9	53.5	44.9	65.6	69.4

Source: OPCS (1979a) Mortality Statistics 1977 London:HMSO (Table 10) for number of deaths*

C.S.O. (1979) Annual Abstract of Statistics, 1979 p. 20, London: HMSO, for marital-age composition.

Note: *Total includes those deaths not assigned a marital status.

In the 1967 Statistical Review of England and Wales (1971 Part III p. 135) the Registrar General drew attention to factors which influence analyses of mortality by marital status.

1. There is a tendency for widows and widowers to be understated at the census and overstated at death - the effect of these errors will be to exaggerate the true mortality associated with widowhood.

2. The average age of the widowed population is higher than that of other marital status groups. (Within age-groups).

3. Those deaths in which the marital status is not recorded may influence the rates. Almost a quarter of these are accidental and violent deaths which will have been certified by a coroner and a disproportionate number occur in the younger age-groups. In the calculation of age-specific rates by marital status these deaths may either be excluded or be distributed on a proportional basis. In the former case this would mean minimal levels would be recorded whereas in the latter, an allocation on a proportional basis may influence categories which may already be inflated. (See item 1).

4. A further factor tending to inflate mortality rates for those widowed is the disproportionate influence of accidental deaths in young adult age-groups. Among these is a large number of motor vehicle accidents involving the death of both marriage partners. In such cases, if they do not both die instantaneously, one will be recorded as widowed at the time of death.

The reasons for differences in marital status mortality rates like those of sex differences are perplexing. The differences between single and married mortality rates may at least partially be due to the natural selection process by which those who are fit tend to marry whereas those who are less fit frequently do not marry. This may be the case when comparing figures for single males and females in the middle years of life up to the 40s

with those of their married counterparts. In the later years this phenomenon may reflect other factors such as 'emotional state' and 'practical support'. For whereas in older age-groups those who are married have someone to care for them when ill, they may also have a greater will to survive. The converse of this may be the reason for the higher mortality rates of those not married and particularly of widowed persons at all ages. Several studies have examined the effect of widowhood on mortality and have identified the effect of bereavement as being greatest in the first six months. (Young et al 1963, Parkes et al 1969). The extent to which a disproportionately high death rate in the first six months following bereavement influences the published death rates for widowers and widows cannot be ascertained as the relevant information is not available.

It should be remembered that an individual in the course of a life-time may be in all of these categories and that consequently these populations are constantly changing. At later stages the 'selection process' may be in operation again with remarriages for the more fit 'widowed' and 'divorced' and its resultant effect on mortality rates.

Occupation

Like age, occupation could be described as an obvious characteristic to consider when regarding the probabilities of dying. To give an extreme example, a soldier is running a greater risk of dying than a postman or an underground miner is likely to encounter more danger than a bank clerk. How much

influence occupation exerts on mortality has been widely discussed. It has long been recognised that certain occupations carry risks. The first general work on the effect of individual occupations, "De Morbis Artificum Diatribo" by Ramazzini was written in 1713, but the first real specific reference to this subject using national figures was William Farr's contribution in the mid-nineteenth century, to the Registrar General's Annual Report of 1851. Since 1861 occupational mortality has been examined in a series of Registrar General's Decennial Supplements, in more detail than is possible in an annual report. Over the years although the mortality of men in relation to their occupation has remained the focal point of these Decennial Supplements, the scope of the study has been widened to include analyses not only by age and cause of death, but studies of related infant mortality, childhood mortality and female mortality.

The latest Decennial Supplement, "Occupational Mortality, the Registrar General's Decennial Supplement for England and Wales 1970-72" states its reasons for the study of occupational mortality as follows:

> "Today, the average man who lives three score years and ten will have been employed for 60% of these years; and for each year he will have spent more than half the days of the year at work. The nature of the trades he performs for eight hours each working day might consequently be expected to exert some influence on his health. He is unlikely however, to be aware of the diversity of these influences, what they are and how they are felt."
>
> Occupational Mortality 1970-72 p. 1.

In previous years, attempts have been made to assess the influence of occupation by comparing mortality rates of

males with those of married women classified according to their husband's occupation. This was based on the assumption that mortality rates for males and females experiencing the same environmental factors would be similar and that differences between them might be attributed to the man's occupation. However, the increase in the number of working females makes this assumption more dubious. This was one of the three factors that led to the latest Decennial Supplement comparing SMRs for married men with those for married women. The other two were the acknowledgement that women are not always subjected to the same environment and experience the same lifestyle as their husbands and the realisation that women on the whole tend to die from different diseases.

Further problems are encountered on account of the mobility of the working population and the changes of occupations at different stages of life. There is also natural selection, thus some occupations which involve strenuous physical activity attract young and fit people whilst those which require less fitness are taken up by others. The Registrar General (OPCS 1978a) noted this selection process:

> "The grouping of those occupations with high death rates from epilepsy ... suggests that epileptics seek relatively light work in which they are not responsible for heavy machinery. Such occupations are commonly pursued in small factories, possibly reflecting the type of employer in general more favourably disposed to employing disabled people."
>
> Occupational Mortality 1970-72 p. 142

In order to compensate for the differential ages of various occupations, rates are standardised but all the same these factors should be borne in mind.

Table 3.4 shows mortality by occupation order for men aged 15-64 years and married women by husband's occupation aged 15-64 years. (Figures were selected from a complete occupation order table and give the occupation orders with the three highest and the three lowest SMRs for men). As can be seen there appears to be quite a dramatic difference and it would be tempting to assign something in the nature of the occupation as a cause of death. However, an examination of the corresponding figures for married women shows that their mortality ratios are correspondingly high and low. This suggests that it may be the lifestyle and environment which are associated with an occupation rather than the nature of the occupation that influences mortality.

Table 3.4

Mortality Ratios by occupation order, married men and married women (by husband's occupation) aged 15-64 1970-72

Married Men 15-64 yrs. SMRs	Occupation Order		Married Women (husband's occupation) 15-64 SMRs
77	XXIV	Administrators and Managers	79
78	XXV	Professional technical workers, artists	81
87	XIV	Makers of other products	95
130	XVIII	Labourers	144
141	II	Miners and quarrymen	159
148	XXVI	Armed forces (British and foreign	151

Source: OPCS (1978a) Occupational Mortality 1970-72: The Registrar General's Decennial Supplement for England and Wales. Series DS No.1

In spite of this it must be admitted that in some cases it is the specific nature of the work which causes certain diseases. Certainly it would be very difficult to refute that pneumoconiosis is caused and aggravated by coal dust and to argue that it is merely caused by lifestyle. Similar to the effect of coal dust on miners, the carcinogenic effect of workers inhaling asbestos and B-naphthylamine is well recognised as an occupational hazard.

Social Class

With the publication of the Black Report on 'Inequalities in Health' (DHSS 1980) interest has centred again on the importance of social class as a factor influencing mortality. As pointed out by Nichols (1979) and Reid (1981) definitions of 'social class' can vary. For the purpose of this study 'social class' refers to the Registrar General's social classes which 'form the basis of all commonly used social class classification in Britain' (Reid 1981 p. 39).

It is of interest to note that the Registrar General's 'social classes' had their origin in a climate of similar concern over disparities in mortality rates. In the latter part of the nineteenth century following the social surveys by Charles Booth in London and Seebohm Rowntree in York a social classification of the population was thought to be desirable so that the mortality rates of all strata of society could be examined. Such a classification was attempted by Stevenson in 1911, primarily for the purpose of analysing infant mortality

(Leete and Fox 1977). Eight classes based on occupations were distinguished. Since then modifications have been made, the latest being introduced in the 1971 Census.

Table 3.5 lists the social classes and gives examples of occupations included in them. It should be noted that the allocation of occupations to these classes is not based on 'the average level of remuneration of particular occupations', the rationale of the categorisation being:

> "The unit groups included in each of these categories (i.e. social classes) have been selected so as to ensure that, so far as is possible, each category is homogeneous in relation to the basic criterion of the general standing within the community of the occupations concerned. This criterion is naturally correlated with, and its application conditioned by, other factors such as education and economic environment, but it has no direct relationship to the average level of remuneration of particular occupations."
>
> Classification of Occupations 1970

However, due to being based on occupation and employment status, the Registrar General's social classes have a strong economic bias. Thus it might not only be cultural factors (which are known to affect an individual's attitude to health care and 'take up' of health services) that influence mortality rates, but also the relative wealth or poverty of the classes and the life-styles associated with them.

Table 3. 5

The Registrar General's Social Classes. Some examples of occupations included in each class.

Social class	Examples of occupations included
I Professional	Accountant, architect, chemist, company secretary, doctor, engineer, judge, lawyer, optician, scientist, solicitor, surveyor, university teacher.
II Intermediate	Aircraft pilot or engineer, chiropodist, farmer, laboratory assistant or technician, manager, proprieter, publican, member of parliament, nurse, police or fire-brigade officer, schoolteacher.
III(N) Skilled non-manual	Auctioneer, cashier, clerical worker, commercial traveller, draughtsman, estate agent, sales representative, secretary, shop-assistant, typist, telephone supervisor.
III(M) Skilled manual	Baker, bus-driver, butcher, bricklayer, carpenter, cook, electrician, hairdresser, miner(underground), policeman or fireman, railway engineer,driver/guard, upholsterer.
IV Partly skilled	Agricultural worker, barman, bus conductor, fisherman, hospital orderly, machine sewer, packer, postman, roundsman, street vendor, telephone operator.
V Unskilled	Charwoman, chimney sweep, kitchen hand, labourer, lorry driver's mate, office cleaner, railway porter, van guard, window cleaner.

Note: These are mainly basic occupation titles; foremen and managers in many occupations listed are allotted to different classes.

Source: Reid (1981), Table 2.5 based on Classification of Occupations 1970, pp 1-89 and appendices B1 and B2.

The earliest classification showed an inverse correlation between mortality and social class: Social Class I had a lower level of mortality than Social Class V. As Blaxter points out, in those days;

> "When access to medical care was unequal and environmental causes of ill-health were very prominent, social class differentials could not but be expected to be great."
>
> Blaxter 1976 p. 112.

However, as indicated by the Black Report (DHSS 1980), the Decennial Supplement on Occupational Mortality (OPCS 1978a) and Brotherston (1976) social class differentials are still in existence. As noted in Chapter 2, care must be taken in the

interpretation of sub-analyses of mortality data but it was observed in the Decennial Supplement:

> "Differences between the social classes in the death rates for men were apparent irrespective of whether they were measured by crude death rates, by direct age-standardised death rates or by standardised mortality rates."
>
> OPCS 1978a p. 37

and

> "Differences between the classes are clear and regular at all ages."
>
> ibid p. 196

This can be seen in Table 3.6 which shows age-specific death rates for males 15-64 years analysed by social class. Under the age of 25 years there is a very slight variation in the gradient between social classes I, II and IIIN but after 25 years these gradients are consistent.

Table 3.6

Death Rates by age and social class: men aged 15-64 years
Deaths per 1000

Social Class	Age-group									
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
I	0.9	0.6	0.6	0.8	1.2	2.2	3.7	6.7	12.9	21.4
II	0.8	0.8	0.7	0.8	1.2	2.2	4.2	7.3	12.4	23.0
IIIN	0.7	0.7	0.8	1.0	1.6	2.9	5.7	9.8	15.3	25.1
IIIM	0.9	0.8	0.8	1.0	1.6	2.9	5.4	9.3	16.7	30.0
IV	1.4	1.2	1.1	1.3	1.9	3.4	6.1	10.5	17.2	29.2
V	1.5	1.5	1.9	2.1	3.0	4.8	8.2	13.0	20.3	32.1
Unclass-fied	5.6	3.5	2.6	3.0	3.4	6.1	9.3	14.9	23.1	22.8
All men	0.9	1.0	0.9	1.1	1.7	2.9	5.4	9.2	15.5	26.0

Source: OPCS (1978a) Occupational Mortality 1970-72. The Registrar General's Decennial Supplement for England and Wales, London HMSO, Table 4.3

It is also argued that for some diseases differentials are widening. (Blaxter 1976 p. 115, Brotherston 1975 p. 74). In a discussion of the 'old diseases of poverty', largely influenced by infection and poor environment and the 'new' diseases of affluence, for example, diseases associated with obesity, Blaxter points out that it might be expected that gradients should slacken because;

(a) as benefits of modern public health and scientific medicine become available to all, the gradient in the 'old' diseases should have diminished.

(b) as the benefits of affluence spread through the population, the negative social class gradient of the 'new' diseases should also have diminished.

In practice it was found that for the 'old' diseases, although mortality rates had fallen steadily, differentials had widened, while for the 'new' diseases gradients had not slackened but reversed;

> "there are now very few diseases indeed where rates in social class I and II are higher than those in classes IV and V"
>
> Blaxter 1976 p. 113

Blaxter suggests that the widening differentials of the 'old' diseases can be explained 'in an increasingly mobile society, by the operation of a more efficient selection process.' Referring to the reversed gradient for the 'new' diseases Blaxter points out that mortality rates conceal certain facts about health. Of those diseases causing death before old age, much

relies on early identification and treatment and it is well recognised that use of health services varies considerably according to social class.

Blaxter concludes

> "It appears to be the rule, to which there are few exceptions, that where rates are falling class differentials are widening, and where they are rising, differentials reverse. It is hard to escape the conclusion that in conditions where medical science is making great strides, there is a cultural lag in the diffusion of these advances throughout the social classes."
>
> Blaxter 1976, p. 115.

In addition, social class differentials are persistent throughout the country:

> "The social class gradients persisted throughout the regions for overall mortality and for cause-specific mortality."
>
> OPCS (1978a) p. 179-80

This observation is substantiated in Table 3.7 which analyses mortality by social class for those regions with the lowest (84) and the highest (116) overall SMRs.

Table 3. 7

Mortality of men age 15-64 by standard region and social class

Standard Region	Social Class						
	I	II	IIIN	IIIM	IV	V	All men
East Anglia	67	74	93	87	86	111	84
North Western	86	96	112	123	132	155	116
England and Wales	77	81	99	106	114	137	100

Source: OPCS (1978) Occupational Mortality 1970-72. The Registrar General's Decennial Supplement for England and Wales, London HMSO, Table 8.4 p. 182

Reid (1979 p. 136) warns that the interpretation of the general pattern of the relationship between social class and causes of death is not straightforward in that there are clearly two aspects of social class that are involved. These are:

1. Wealth, personal habits. diet, home environment, physical exercise and mental stress (the latter two are partly general occupational factors)
2. Specific occupational hazards.

However, it should be remembered that much of today's morbidity/mortality attributed to these factors above does not simply result from present day circumstances but to a large extent is also a reflection of society in the past. In a society where social mobility is increasingly evident it is of dubious validity to attempt a causal type relationship between social class and mortality especially since the concept of social class is dependent on other variables. Thus perhaps it is safer to assign social class as a 'statistical concept for classifying data, not as a means of explaining why or how social differentials exist.' (CSO 1975 'Social Trends' p.10).

REGION

It was recognised as early as the mid-nineteenth century that different sectors of the population have different mortality rates. Although earlier studies had appeared comparing mortality in the regions of England and Wales in the Ninth Annual Report of the Registrar General 1838-44, it was not until 1864 that the first full decennial analysis of regional mortality appeared as a supplement to the Registrar General's

twenty-fifth Annual Report. Since then, with the exception of 1941, Decennial Supplements have appeared every decade. The objectives of regional mortality surveys were set out clearly in the introduction of the 1951 Decennial Supplement on Area Mortality (Registrar General 1958). They are stated to:

> "draw attention to areas with particularly unfavourable mortality experience, so that local factors responsible can be looked for and remedial measures taken;"
>
> and
>
> "reveal geographical patterns of disease incidence that may provide clues about the causation of these diseases."

To some extent these objectives have been achieved in that differences in regional mortality have now been officially recognised and patterns detected in various diseases. However, as pointed out by Chilvers (1978 p. 16)

> "the difficulty of taking effective action is illustrated by the fact that in the first regional survey in 1846, Lancashire experienced the highest mortality of any county in England and Wales and its position remained unchanged in 1971."

Chilvers, in a study of regional mortality in England and Wales 1969-73, using SMRs as the indices of mortality, found that:

> "A very definite regional pattern is apparent for males, mortality being high in the three northern regions and in South Wales. In particular, mortality levels in the North West region and South Wales were 12 and 11 per cent respectively above the national average. In contrast, the South East and South West regions both had SMRs of 93 and East Anglia had an SMR of 89. The same overall pattern is apparent for females but the contrasts in the regions were not as strong as for males."
>
> Chilvers 1978, Regional Mortality 1969-73 p. 16.

This regional pattern is apparent in Table 3.8 which shows regional variations in mortality for males standardised by age and by age and social class, referring to 1970-72. It can be seen that differences persist independent of the social class composition of the regions. (It was also observed in the discussion of social class that social class variations are persistent throughout the regions, thus suggesting that these two factors are independent of each other).

Table 3.8

Regional Variations in Mortality: Males: 1970-72

Standard Region	SMR standardised for: Age	Age and social class
Northern	113	113
Yorkshire	106	105
North West	116	116
East Midlands	96	94
West Midlands	105	104
East Anglia	84	83
South East	90	90
South West	93	93
Wales I (South)	114	117
Wales II (North & West)	110	113
England and Wales	100	100

Source: OPCS (1978a) Occupational Mortality 1970-72, The Registrar General's Decennial Supplement for England and Wales, London: HMSO, p. 180

The recognition of higher mortality rates existing in the North and West of the country has been well recorded (Howe, 1963, Coates Rawstrom 1971, O.P.C.S. 1978a), although there have been variations in the demarcation line; 'Tees-Exe'; 'Severn to the Wash';'Severn to the Humber', and 'Severn to the Tees'.

In an article examining life expectancy in each regional health authority, Gardner and Donnan (1977) put into perspective the regional range.

Table 3.9

Average expectation of life at birth from abridged life table for 1974-75 England and Wales

Regional Health Authority	Expectation of life (years) Males	Females	Difference (females-males)
East Anglian	71.3	76.9	5.6
Oxford	71.3	76.9	5.6
Wessex	70.9	76.7	5.8
South West Thames	70.8	76.7	5.9
South Western	70.6	76.8	6.2
North West Thames	70.4	76.4	6.0
South East Thames	70.1	76.3	6.2
North East Thames	69.9	76.3	6.4
Trent	69.4	75.4	6.0
West Midlands	69.1	75.4	6.3
Yorkshire	68.9	75.2	6.3
Wales	68.5	75.1	6.6
Mersey	68.3	74.5	6.2
Northern	68.2	74.4	6.2
North Western	67.9	74.3	6.4
England and Wales	69.5	75.7	6.2

Source: Gardner and Donnan (1977) 'Life expectancy: variations among Regional Health Authorities' Population Trends, No. 10. Winter

As can be seen from Table 3.9 the regional range is 3.4 years for males and 2.6 for females. They point out that:

(a) It has taken 26 years (1949-1975) for the average male lifespan to increase by the current regional range and 20 years for the female average to do likewise.

(b) In 1975 in the U.S.A. the expectation of life was 68.7 years for males and 76.5 years for females. The corresponding data for England and Wales in 1975 was 69.5 years and 75.7 years. Thus the international differences between the U.S.A. and England and Wales of 0.8 years for both sexes are appreciably less than those observed between the regions within the country. (Even if adjustments are made just using the white population in comparison, figures are 69.4 years males and 77.2 years females, very similar to England and Wales).

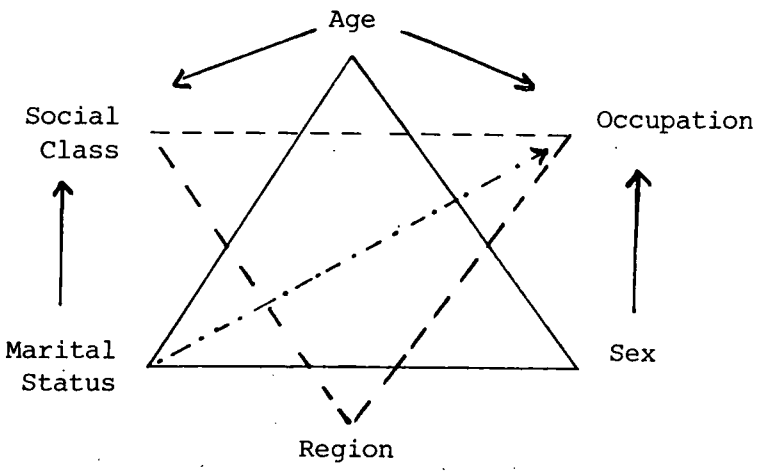
(c) They calculated that the elimination of cancer as a cause of death would increase life expectancy by about 2.9 years for males and 2.6 years for females. The range between regions is greater than the effect of cancer as a cause of death.

Both Chilvers and Gardner and Donnan in their respective studies conclude that to some extent the effect of urbanisation is reflected in these differences. Male mortality varies more than female mortality amongst the regions and it was noted by Gardner and Donnan that in the less urban, less industrial regions

with higher life expectancies the male lifespan is not depressed so far below that for females as in the regions containing large industrial centres. However, as Chilvers points out, the problem is to identify which components of urban life - occupation, social class, lifestyle or relative poverty and wealth - are relevant to mortality.

Other factors which merit consideration are the physical environment and the effect of selective migration of healthy individuals from North to South. Two factors relating to the physical environment which are of particular interest are 'air' and 'water'. The effect of air pollution on respiratory diseases is well known. An association between high nitrate concentration in drinking water and stomach cancer was suggested by Hill et al (1973) but perhaps a more well-known association between water and morbidity is the simple (non-toxic) goitre believed to be due to lack of iodine in the water. This is very prevalent in Switzerland, parts of America and in certain regions of England such as Derbyshire, hence its nickname, 'Derbyshire neck' (Bloom 1973).

Characteristics influencing mortality



No individual characteristic discussed above could predispose an individual towards death from certain causes: they work in conjunction with each other. The diagram above attempts to show this relationship of the various characteristics of mortality rates.

Age, sex, and marital status can be regarded as one closely knitted group: social class, occupation and region as another. Superimposed and interwoven in this basic pattern, and tying the two groups together are:-

(a) The marital status of a woman affects her social class, as women are classified by their husband's social class.

(b) Age can affect social class, as an individual may find himself in different classes at different stages of his life.

(c) Age can influence occupation; some occupations, for example, those requiring a large amount of physical exertion, are more suited to those in the younger generation, whilst some occupations are assigned to the older age-groups with more experience.

(d) Sex, even in the present climate of sex equality and equality of job opportunity, can still exert some influence on choice of occupation. As yet there are no female underground coal-miners.

(e) To a limited extent marital status can influence occupation, for example, a single, widowed or divorced person with family commitments might be restricted

as to the type of job they can undertake.

In addition to these basic characteristics by which patterns of morbidity and mortality can be monitored, there may be other factors at play, which are less tangible, but which nevertheless interweave with the factors discussed above and which themselves undermine the health of the population. These additional 'risk' factors can be considered under the heading of physical and social environment. One of the leading proponents of the influence of environment on population is T. McKeown (1976) who shows that the 'modern rise of population' was due not to great advances in medical knowledge and technology, but to improvements in diet and sanitation. He concludes:

> "Ten thousand years ago the transition from a nomadic to a settled existence, with domestication of plants and animals resulted in an increase in food supplies, a reduction of mortality and the growth of populations; but with unrestricted expansion of numbers, food supplies again became marginal. The aggregation of large malnourished populations created the condition required for the propagation and transmission of micro-organisms, and so led to the predominance of infectious diseases as causes of sickness and death. This established a high level of mortality which limited the rate of population growth.
>
> The chain of influences was broken during the eighteenth and nineteenth centuries when advances in agriculture brought an increase in food supplies. The improvement in nutrition which followed led to the decline of infectious diseases and to a reduction of mortality and growth of population. This advance, unlike the earlier one associated with the first agricultural revolution was not reversed, because declining birth rates limited the growth of population and so maintained the favourable balance between food and numbers. An additional and in a sense quite separate, influence was reduction of exposure to infection, particularly intestinal infection, which resulted from improvements in the quality of water and food."
>
> Source: McKeown, 1976, p. 162-3.

Today's environmental hazards in Britain are not, for the majority of the population, those to which McKeown refers. Much has been done to provide most housing with the basic amenities and gross overcrowding has been eliminated in most areas. (In some immigrant areas it still persists). The Clean Air Act of 1956 has virtually eliminated air pollution in many populous areas, thus eliminating the hazards of 'smogs' which were a feature of urban life in the larger cities in the 1950s and preceding years. Although many environmental health problems to which McKeown referred have disappeared, they have been replaced by new ones such as radiation, lead fumes and fire hazards due to synthetic materials.

? only in immig areas

It is, however,'risk factors' associated with the social environment which perhaps have the most impact on the health of an individual. Associations between diet and heart disease, smoking and cancer of the lung and alcoholism and liver disease have been widely publicised in recent years. (DHSS 1976). Alcohol is also a contributing factor in many road traffic accidents, which are the major cause of death for young adults. Most of these factors are part of an individual's behaviour pattern over which the individual has some control.

In addition to these more overt risk factors much attention has centred on the concept of stress as an underlying factor in disease.

> "Stress appears to play a critical role in disease. The stress of adjusting to change may generate a wide variety of diseases and change is the hallmark of modern society."
>
> J.H. Knowles, 1977, p. 62.

Stress, it might be argued, is on occasions induced by factors beyond an individual's control. It is this lack of control which causes stress. Such stress may be considered an inherent characteristic of a post-industrial society in which levels of expectation for the great majority of the population normally exceed levels of attainment and thus cause frustration and dissatisfaction.

Chapter 4

Measurement of Morbidity

Having examined the various factors affecting mortality, it is important to remember that these are never placed on a death certificate. A feature of modern society's attitude towards death is that it must be pathologically based: Man's death must be attributed to disease or trauma. This concept is of even greater relevance when considering mortality of males between the ages of 15 and 64 years, because the problem of mortality affected by old age is not relevant to this group. If old age is considered the only legitimate cause of death one might conclude that the approximate 30 per cent of all male deaths which occur within this age-group might be regarded as avoidable. Therefore since death is attributed to disease, the incidence of diseases at ages below 65 years ought to be avoidable.

In the following chapters, attempts will be made to identify the diseases causing mortality in this age-group. An attempt will also be made to examine the incidence of these particular diseases in general. Thus it will be possible not only to identify the relative incidence and prevalence of particular diseases causing morbidity in males 15 to 64 years, but also which diseases are most likely to prove fatal. It should be remembered that in addition to some diseases proving fatal, some diseases can terminate the productive life of an individual though they do not actually kill him. In addition it should be noted that mortality resulting from accidents or violence is unlikely to be preceded by illness.

Before examining this incidence of morbidity and mortality as defined in medical terms, it is necessary to consider the concepts of 'health', 'disease' and illness' and the problems inherent in attempting to measure morbidity.

Many discussions of concepts of health tend to centre on the two belief systems stemming from Ancient Greece. McKeown (1979, The Role of Medicine) in his consideration of the evolution of health concepts refers to Dubos' description of the dual nature of medicine which resulted from these ideas which have been promoted with varying emphasis in all periods down to the present day.

> "The myths of Hygieia and Asclepius symbolise the never-ending oscillation between two different points of view in medicine. For the worshippers of Hygieia, health is the natural order of things, a positive attribute to which men are entitled if they govern their lives wisely. According to them, the most important function of medicine is to discover and teach the natural laws which will ensure a man a healthy mind in a healthy body. More sceptical, or wiser in the ways of the world, the followers of Asclepius believe that the chief role of the physician is to treat disease, to restore health by correcting any imperfections caused by the accidents of birth or life."
>
> T.McKeown 1979 p.3

As both McKeown and the report of a working party chaired by Sir Douglas Black,on 'Inequalities in Health' (DHSS 1980 p 5-6) indicate, the latter concept has been central to the development of medicine. Major developments took place during and after the Renaissance: the development of the Cartesian philosophy of the seventeenth century which conceived of the body as a machine that could be taken apart and reassembled if its structure and functions were understood, provided an impetus for scientific experiments. Apparent successes seemed to validate this mechanistic perspective. McKeown urges caution when attributing the transformation of human

health to the increase in knowledge of the structure and functions of the body and to the increase in knowledge of disease processes. However, for many years the scientific medical model was thought to be successful and to-day the engineering approach is still predominant in medicine.

In recent years there has been some attempt to implement the more 'social model' of health. After the end of the Second World War, the World Health Organisation adopted as its definition of health:

> "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."

This approximates closely the ideas symbolised by the goddess Hygieia in ancient Greece. In Britain, in the last decade a greater emphasis on prevention of ill-health, led to such publications as "Prevention and Health : Everybody's Business" (DHSS 1976) and "Inequalities in Health" (DHSS 1980). In response to research findings there is a growing concern about the effect of behavioural and environmental factors on health.

The implications of the current predominant mechanistic approach to ill-health for this study of morbidity and mortality is that there is an emphasis on supposedly 'objective' rather than 'subjective' criteria for illness. Field (1976) illustrates this in his discussion of the social definition of illness and disease, in which he defines the concepts of disease and illness as follows:

> "Disease..... refers to a medical conception of pathological abnormality which is indicated by a set of signs and symptoms. 'Illness' on the other hand refers to a person's subjective experience of 'ill-health' and is indicated by the person's feelings of pain, discomfort, and the like. It is possible, of course, both to feel ill without having a disease or to have a disease without feeling ill."
>
> Field, 1976 p.334

Such a definition makes one aware of the inherent potential for misinterpretation. Illich (1976) expounds at length on the dubious nature of disease as a medical conception and of relying on doctors to interpret the signs and symptoms and thus make a diagnosis.

> "Diagnostic bias in favour of sickness combines with frequent diagnostic error. Medicine not only imputes questionable categories with inquisitorial enthusiasm; it does so at a rate of miscarriage that no court system could tolerate."
>
> Illich 1976 p.93

Not only is there the possibility of diagnostic error on the part of the doctor, and discrepancies in the subjective interpretation of the same symptoms by different doctors, but as medical knowledge increases largely due to new diagnostic aids (for example, fiberoscopes in the diagnosis of different types of ulcers or malignant neoplasms of the stomach and duodenum) definitions and classifications change.

This developing knowledge is recognised in ten yearly updating of the International Statistical Classification of Diseases, Injuries and Causes of Death. (ICD) These changes in classification contribute to the difficulty of assessing historical trends in diseases.

Unlike the measurement of mortality which is the enumeration of very definite events, for which a certificate must be obtained by law, the measurement of morbidity poses many problems. In attempting to measure morbidity it is important to remember that the only morbidity which can be measured is that which is reported, and some studies suggest that that which is reported represents only the 'tip of the iceberg' (Last 1963, Israel and Teeling-Smith 1967, Brown 1973). In a study by Dunnell and Cartwright it was found that although 91% of people claimed to have some symptoms in a two-week period, and 55% had taken medicines the day before the interview, only 16% had consulted a doctor in the two-week period. (Dunnell and Cartwright 1972 p.11-15). This however, is not surprising. For many medical conditions there either is no treatment or drug therapy is the only appropriate treatment and for people who have symptoms to continuously visit the doctor would not be appropriate or necessary.

As pointed out illness is a subjective experience, and consequently usually (apart from any screening programmes, for example, in schools) reported morbidity depends on the willingness of the individual to acknowledge and to adopt what Parsons (1951 'The Social System' p.436-437) refers to as the 'sick role'.

Not only may individual differences in pain thresholds account for differences in acknowledging illness, but a man's occupation and his claim to various benefits influence his decision to report his illness to a doctor and 'claim exemption from normal social role responsibilities'. (Parsons 1951, p.436). For example, a worker in an office based sedentary occupation may be able to continue

working although suffering from a severe upper respiratory infection or 'backache' whilst a labourer working in wintery conditions on a building site may not and thus after two days would have to report his illness to a doctor in order to gain a medical certificate of sickness to send to his employer and to his local DHSS office in order to receive his wages or sickness benefits. A South Wales Family Practitioner, Tudor Hart (1971) argued that a large number of visits to the doctor by working-class patients are administrative in that the main aim is the legitimation of illness by a doctor's certificate. From this it is obvious that factors relating to benefit claim rules and ease of obtaining repeat prescriptions as well as occupation play their part in the reporting of some illnesses by some people.

Should the 'non-working' wives of these hypothetical white collar workers and labourers suffer from the same 'illness', they may not report them as they are not entitled to benefit and do not require a certificate of sickness to satisfy an employer. Obviously if the nature of the illness was so severe as to incapacitate them in their role as housewives their illness might be reported in order to receive treatment and to legitimise exemption from their normal roles, in the eyes of family and friends.

It should also be borne in mind that it is not only differences in pain thresholds or occupational factors which affect the reporting of disease, but cultural expectations of levels of health. As suggested by Doyal (1979 'A Matter of Life and Death : Medicine, Health and Statistics) middle class workers may be less willing to

'tolerate' physical and psychological discomfort. In addition it is suggested that middle-class workers may also have more generous sick pay so that they would be more likely to be absent from work. This suggestion is contervailing the hypothetical situation discussed above. Doyal also states that the possibly more physically demanding and 'objectively less desirable' nature of the work situation of manual workers may make it more likely that they report sick. Doyal refers to different expectations of levels of health amongst different social classes; this argument could equally be extended to such categories as race or 'generations'.

Thus it can be seen that sickness absence statistics are a dubious indicator of the ill-health of the nation as they cover only that morbidity which is reported amongst the employed and insured population of the country thus excluding sickness amongst the elderly, children, many married women and the unemployed. Furthermore many periods of sickness absence which last less than three days are excluded.[1] In addition as has been shown, this reported morbidity may include some sickness which is reported purely on account of a person's occupation and in other circumstances might have gone unreported. It should also be noted that the notorious 'backache, lumbago, migraine and headaches' may disguise malingering.

A feature of modern life is that man is a member of various social circles and it is usual for a man's work environment to be separate from his home environment. Although legitimatisation of the sick role is required for his work environment, the protection against malingering to which Parsons (1951 p.437) refers (that is the

sanctions imposed by society on the encumbent of the sick role to discourage malingering) is not necessarily enforced in his home environment if his family and friends are aware of his lack of motivation for work.

Doyal (1979) draws attention to further problems in using sickness absence as an indicator of the ill-health of the nation. Although rates of sickness absence in Britain have been rising continually from the 1960s onwards, this is difficult to reconcile with the decline in a number of diseases such as gastric and duodenal ulcers, kidney infections and TB, which previously caused a large volume of sickness absence. Doyal referring to Whitehead (1971) and Taylor (1974) points out that causes of sickness absence which have increased are 'sprains and strains' and 'nervous debility and headache' and thus the 'harder', more objectively and clinically discernible causes of sickness absence have been replaced by more subjective ones. Wells (1981 p.6) noted that in 1978/79 nearly 23 million days of incapacity (6.2 per cent of the total) were attributable to those symptoms listed. This was almost five times the number recorded in 1954/55 when these diagnoses accounted for just 1.7 per cent of overall absence. The reason for the increase in these more subjective illnesses is difficult to determine due to the paucity of data. Whether it is the result of workers providing excuses to avoid work (this supports the allegation that social security sickness benefit encourages absenteeism) or whether it is the nature of present day work producing such symptoms of stress, is impossible to elucidate in a system where in order to be absent from work and still receive income one has to be 'sick' and have one's absence explained in medical terms.

Another fact to be borne in mind, when considering certificates of sickness in relation to patterns of morbidity is that doctors may under-report some diseases such as cancer so as not to cause distress to the patient and his family who handle these certificates. In such cases an explanatory note should, in theory, be sent to the local DHSS office.

As economic, social and occupational factors influence the amount of sickness reported, it is interesting to speculate how high levels of unemployment might influence morbidity rates as represented by sickness benefit statistics. There are three possibilities: morbidity rates

a) may be higher because it is less onerous to claim sickness than unemployment benefit

b) may be lower because of an unwillingness to be absent from work as this may result in a loss of employment

c) may also be lower because some men who were most likely to be ill might be those who have already lost their jobs.

Stern (1982) claimed that:

"A lot of unemployment is concentrated among groups who have high mortality rates anyway and one must also allow for ill-health - physical or mental - causing unemployment and/or causing people to remain unemployed for long periods."

New Society 10th June 1982 p.421-422

This would appear to give credence to the third point, but it

is perhaps more likely that all three possibilities operate together and not in isolation, to influence sickness absence rates.

It has thus been shown that many problems in the attempt of quantifying illness are caused by the fact that illness and health are subjective experiences which are influenced by various occupational and administrative factors as well as by social norms and expectations.

Another major problem is that in contrast to death which is an event which occurs at a point in time, illness exists over a period of time. Consequently a variety of factors need to be considered. For example in computing the amount of morbidity in a given period does one count the number of persons reporting illnesses or the number of illnesses reported or both? (For some people will be ill more than once and others will have more than one illness). Secondly does one count the number of illnesses which arise in a given period or the number extant in it, irrespective of whether they first arose in it or extended into it from a previous period?

Bradford Hill's (1971 'Principles of Medical Statistics) classification of illnesses that exist in a population during a given time interval enumerate four possibilities:

(1) Illness beginning during the interval and ending during the interval.

(2) Illnesses beginning during the interval and still existing at the end of the interval.

(3) Illnesses existing before the beginning of the interval and ending during the interval.

(4) Illnesses existing before the beginning of the interval and still existing at the end of the interval. Bradford Hill 1971 p.241

In addition Bradford Hill in his broad categorisation of sickness highlights another problem: what exactly should be regarded and counted as morbidity? He reduces sickness to three categories:

A) Congenital or acquired defects, injuries or impairments such as residual paralysis from a past attack of poliomyelitis.

B) Latent or incipient diseases usually not recognised by the person affected but revealed by laboratory or other tests, for example, diabetes or tuberculosis in their early stages.

C) Manifest disease recognised by the patient or by his medical attendant. ibid p.238

Category B itself raises a further problem: when should these latent or incipient diseases be regarded as clinically manifest diseases? Variations in frequency of clinical tests influence the incidence of diseases in Category B.

There are two basic measures of morbidity; incidence and prevalence. 'Incidence' refers only to <u>new</u> cases occurring in a given time interval whereas 'Prevalence' refers to <u>all</u> cases, new

and old. Ways of expressing these measures are:

i) The Incidence Rate: the number of illnesses (spells or persons as applicable) beginning within a specified period of time and related to the average number of persons exposed to risk during that period (or at its mid-point).

ii) The Period Prevalence Rate: the number of illness (spells or persons as applicable) existing at any time within a specified period and related to the average number of persons exposed to risk during that period (or at its mid-point).

iii) The Point Prevalence Rate: the number of illnesses existing at a specified point of time and related to the number of persons exposed to risk at that point of time.

Bradford-Hill 1971 p.241

Another measure commonly used in the study of morbidity patterns is the Average Duration of Sickness (and the frequency distribution upon which it is based). This measure may be used in several ways;

a) the average duration of sickness per person : based on the total population exposed to risk.

b) the average duration of sickness per sick person: based on the number of persons sick.

c) the average duration of sickness per illness: based on the number of illnesses.

In studying published morbidity statistics one encounters many of the problems cited. As has already been shown, the use of sickness absence statistics as an indicator of the nation's ill-health is dubious. They record absences from work but not the frequency and duration of illness. Thus they are influenced by many extraneous factors, for example, the tendency to return to work on Monday rather than any other day of the week.

In this study of morbidity and mortality of males aged 15 to 64 years reference will be made to sickness absence statistics but any conclusions drawn will be made in the context of the limitations cited.

Many of the morbidity data available are records of the utilisation of the National Health Service resources and this itself presents problems related to these records. The Hospital In-Patient Enquiry is based on a ten per cent sample of all in-patients (excluding maternity patients) of non-psychiatric NHS hospitals and is produced yearly by DHSS, OPCS and the Welsh Office to serve two purposes:

a) Administrative use - to provide information about the use of the hospital services in terms of age, sex and other characteristics of the patients, and also of the diseases and operations performed, for the purpose of central planning and to assist regional development and local supervision.

b) Epidemiological use - to provide information on a national and regional basis about illness among hospital

patients as a guide to morbidity occurrence in the community.' DHSS et al. 1980 p iv.

Although the Hospital In-Patient Enquiry claims to have epidemiological uses, there are inherent difficulties in the interpretation of the data. Differences in resource allocations between regions may well affect inter-regional differences in the apparent utilisation of resources. It is impossible to determine how far the existence of a service creates its own demand whilst the lack of a service suppresses demand. Likewise data about waiting lists should be regarded with caution: if a doctor knows a waiting list to be extensive he may decide not to refer patients for specialist treatment or similarly a consultant may decide not to refer a patient for in-patient treatment.

Two major drawbacks of the Hospital In-Patient Enquiry are: discharges and deaths are treated as one category and the number of discharges and deaths are counted, not the individuals who were discharged or who have died. Thus an individual admitted and discharged more than once with a particular disease(or a different disease) would appear more than once in the statistics. This causes no problems if one examines the amount of time and resources devoted to particular diseases and to particular age-groups, but if one examines the incidence of disease in particular age-groups some figures are inflated. Although many data referring to age, sex, diagnosis, duration of stay and Regional Health Authority of individual episodes of patient care are published, data referring to occupation or social class are not published or known centrally. Regional Health Authorities vary considerably in

their collection of such data: one collects and codes it whereas another has deleted 'occupation' from the SH3 Return form. Prior to 1963 admission rates on an occupational basis were published in the Hospital In-Patient Enquiry Reports, but largely due to quite legitimate doubts about the quality of the information these data are no longer collected. 'The Black Report' (DHSS 1980) recognises the value of such data for their interpretive potential and recommends that at least some of the administrative data-collection processes undertaken by Health Authorities should include the recording of 'occupation'. It suggested that:

> 'a pilot inquiry into data quality and implications of HIPE returns in a small number of AHAs which do currently code occupation would be worthwhile. As a second stage of such an inquiry, and if the collaboration of hospital staff could be secured, the attempt might be made to check the reliability of occupational information recorded on admission (perhaps through next-of-kin).'
>
> DHSS 1980 p. 214.

The Hospital In-Patient Enquiry data relate to Regional Health Authorities but these regions are so large that intra-regional differences are easily concealed. In the study of factors influencing mortality rates:

> 'regional differences in mortality can be explained to some extent by differences in the distributions of the population between urban and rural areas in the different regions.'
>
> C. Chilvers 1978 p. 19.

This limits inferences which can be drawn from differences between such large administrative units.

However, within the context of the present study, data provided by the Hospital In-Patient Enquiry serve two purposes. First,it provides an indication of the extent to which NHS

hospitals are used by males between the ages of 15 and 64 years, compared with other age-groups of males and with females of corresponding ages. Second, it is possible to ascertain why males in this age-group are admitted to hospital. For this particular age-group it is relatively safe to ascribe the medical diagnosis as being the main reason for admission. However, even for this age-group the absence or inability of a family to provide support might influence the decision to admit a person to hospital or influence the duration of stay. In older age-groups social factors influence the admission of patients to hospital and the duration of their stay to quite a marked extent.

In studying the reasons for admission, that is the medical diagnosis, the measure to which reference will be primarily made is the average number of beds in daily use[2]. This will be supplemented by discharge rates per 1000 (bearing in mind the problems cited above) and the mean duration of stay. Thus it will be possible to separate those diagnoses which have the highest average number of beds in daily use due to a high discharge rate (large number of spells) and short duration of stay and those with a low discharge rate (low numbers of spells) and long duration of stay. Where possible reference will be made to Regional Health Authorities, keeping in mind, however, that not only is resource allocation an important factor influencing data, but that local policy decisions regarding treatment of certain diseases may also distort the data. It is well recognised that duration of stay for specific diseases does vary considerably between hospitals. (Culyer 1976 p. 54, Fernow et. al. 1978, Heasman 1972).

Another major source of morbidity data is the Health Section of the General Household Survey published annually by the Office of Population Censuses and Surveys. From 1971 to 1976 the main emphasis of this section was on:

> 'establishing patterns of service use in relation to chronic and acute sickness and the wide range of demographic data collected by the General Household Survey.'
>
> GHS 1977 OPCS 1979e p. 80

In 1977 and 1978 a different format was used in which more emphasis was placed on respondents' own perceptions of their state of health. However, in 1979 the GHS reverted to the earlier format. The major health topics covered are: self-reported chronic illness, self-reported acute sickness (restricted activity in a two-week reference period), consultations with GPs, use of health and personal social services, attendance at out-patients departments and in-patient spells.

Like the Hospital In-Patient Enquiry, the General Household Survey has some advantages and some disadvantages. It is the only regular morbidity survey which asks respondents about their state of health, thus avoiding the problems associated with sickness absence statistics and statistics which reflect the utilisation of services available. One of its advantages is that data are broken down into socio-economic classes[3]. However, it must be remembered that results are based on the respondents' perception of their own ill-health and as the Black Report points out:

> 'on the willingness and ability to explain it to lay interviewers.'
>
> DHSS 1980 p. 200.

There is no validation of the data against medical records and there is no attempt to ascertain the medical severity of any condition reported. Unfortunately the data are produced for Great Britain only; there is no analysis by regions. In addition because of the change in format, comparisons over time are difficult.

A further source of morbidity data are the National Morbidity Surveys which examine the pattern of morbidity in general practice in England and Wales. The first such study was carried out in 1955-56 with the co-operation of 76 practices (120 practitioners). A second national study commenced in 1970/71 based on 53 practices, and this was continued in 1971/72 with 43 practices participating. At the end of this period it was decided that sufficient information had been obtained from the large study group but a smaller group of 24 practices representing approximately 123,018 patients at risk were invited to continue with recording for a further four years. (RCGP et. al. 1982 p.1) Patients consulting, and consultation rates were recorded per 1000 population, episodes of illness and referrals were recorded in absolute numbers, rates per 1000 population at risk and frequency of occurrence. Thus these surveys whose populations are a representative sample of the age/sex structure of the population provide some indication of the use of general practitioner services. However, this is another measure of the utilisation of resources; all measures refer only to that morbidity which the public choose to report.

Data for the 1970/71 survey was classified according to 'College Classifications'[4] and the International Classification of Diseases. (In 1971/72 only the International Classification

of Diseases was used). The possibility of diagnostic error by general practitioners who normally diagnose without modern technological aids makes findings referring to specific diseases not absolutely definite.

One of the advantages of the morbidity survey is a socio-economic analysis of the data collected in the 1970/71 survey, by marital status, social class and occupation order. This data is presented in the form of Standardised Patient Consulting Ratios[5] (SPCRs). These are derived by applying, for each age group, the observed patients consulting rates to the census population.

In the 1970/71 survey data was analysed by standard regions but in the 1971/72 survey data was analysed by 'regional groups'. Since some regions contained few study practices and changes in the number of participating practices affected the regional representativeness of the population in the sample the standard regions were amalgamated into three main regional groups:

North: - Northern, Yorkshire and Humberside, and North West.

Midlands: - East Midlands, West Midlands, East Anglia and Wales

South: - South East and South West.

In this study reference will be made to the 1970/71 data which are more comprehensive as they cover socio-economic groups and the standard regions.

Many of the problems which arise when trying to correlate published morbidity and mortality data are highlighted by the

Black Report in its attempt to compare data from the General Household Survey with data from the Hospital In-Patient Enquiry (DHSS 1980 p. 206). There are the problems of differences in definitions and in time intervals. The H.I.P.E. statistics include long-stay patients, for example, geriatric patients who are obviously under-represented in the GHS figures, and statistics are reported on an annual basis. Rates of discharge and death are combined in one rate, although it would be possible to separate them. In contrast, the GHS rates refer to the number of medical and surgical in-patients spells per 1000 persons, in private households, in a three-month reference period.

When comparisons are extended to include mortality statistics, sickness absence statistics and morbidity statistics from general practice the problems are even more manifest. Table 4.1 attempts to summarise the major problems encountered; different populations, time-spans, age-groups, diagnostic categories, regions, and the variations in analyses by marital status, social class and occupation. These represent just those differences which occur in presentation of data; further complications arise with the different measures used and with ratios and rates using different denominators. Some problems can be counteracted more easily than others; however, due to the incompatibility of this data no direct comparisons are possible. Nevertheless information derived from analyses of the various sources of data provides an indication of diseases which are most likely to prove fatal and also of the relative importance of disease groups as regards utilisation of NHS services.

Table 4.1 A comparison of particulars of major publications relating to mortality and morbidity

Source of data	Population	Sample	Time spans	Age-groups	Diagnostic categories	Regions	Sub-analyses of diagnoses available
Mortality Statistics	England & Wales Mid-year Home population	100%	Calendar Year	15 - 24 25 - 34 35 - 44 45 - 54 55 - 64	I.C.D.	Regional Health Authorities & 'Standard' Regions	Age, sex, marital status. (Others available in decennial supplements)
Hospital In-patient Enquiry	England & Wales Mid-Year Home population	10% of NHS hospital beds excluding beds in psychiatric & convalescent hospitals	Calendar Year	5 year intervals or 15 - 24 25 - 44 45 - 64	Abridged I.C.D.	Regional Health Authorities	Age, sex, (marital status every three years)
General Household Survey (Health Section)	Great Britain & England & Wales for some tables	Sample of general population resident in private (i.e. non-institutional) homes	2 weeks or 3 months or Calendar year	16 - 44 45 - 64	'Acute' and 'Chronic'	Standard Regions	Age, sex, socio-economic groups.
Social Security Statistics	Great Britain & England & Wales for some tables. The proportion of population eligible for benefit	2% of all claimants	Statistical year (Mid-year - mid year)	5 year intervals or Under 20 20 - 29 30 - 39 40 - 49 50 - 59 60 - 64	Selected I.C.D. chapters and selected diseases	Standard Regions	Age and sex
Morbidity Statistics from General Practice 1970-71	England and Wales	Volunteer GPs (53 practices) selected to be representative of regional population distribution	November - November	15 - 24 25 - 44 45 - 64	I.C.D. and 'College classification	Standard Regions	Age and sex (Marital status, social class, and occupation available in separate supplement)

Sources: see overleaf

Table 4.1

Source: O.P.C.S. (1979a) Mortality Statistics 1977. London: HMSO

DHSS et a. (1980) Hospital In-Patient Enquiry 1977 London: HMSO

O.P.C.S. (1981a) General Household Survey 1979 London: HMSO

DHSS (1980a) Social Security Statistics 1978 London: HMSO

O.P.C.S. (1974) Morbidity Statistics from General Practice, Second National Study 1970-71. London HMSO.

Chapter 5

Mortality by Cause of Death

In 1977 the total number of deaths for males between the ages of 15 and 64 years was 81,639. This accounted for 28 per cent of deaths for men of all ages (289,773). As Table 5.1 shows, although this 28 per cent relates to a span of fifty years, 17 per cent relates to the last ten years in this age-range and 11 per cent to the first forty years.

Table 5.1

Deaths occurring between the ages of 15 and 64 years by age-groups expressed as a percentage of all deaths and of all deaths between these ages. England and Wales 1977.

a) Males

	Years					
All Men	15 - 64	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64
100	28.2	1.1	1.1	2.0	6.8	17.2
(289,773)	(81,639)	(3,219)	(3,270)	(5,695)	(19,600)	(49,855)
	100	3.9	4.0	7.0	24.0	61.1

b) Females

All Ages	Years					
	15 - 64	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64
100	16.7	0.5	0.7	1.4	4.2	10.1
(286,155)	(47,828)	(1,318)	(1,870)	(3,883)	(11,929)	(28,828)
	100	2.8	3.9	8.1	24.9	60.3

Source: OPCS (1979c) Mortality Statistics 1977 - Cause, England and Wales, London: H.M.S.O., Table 2

It is important to note that within the age-range being studied, 61 per cent of deaths occur in the age-group 55-64 years and a mere four per cent in each of the first two decades of working life. Consequently, the analysis of this mortality by age-groups and cause of death will refer to diagnostic groups rather than specific diseases, thus avoiding very small numbers in the younger age-groups. Inherent in the study of disease specific mortality is the possibility of bias due to diagnostic error. This bias should be reduced by the use of the International Classification of Diseases' Diagnostic Groupings.

There are seventeen ICD diagnostic groups[1], classifying diseases according to their anatomical sites, pathology or causative agents. All seventeen diagnostic groups are listed in table 5.2, but groups XI and XV will be excluded from this study as they are not applicable to males between the ages of 15 and 64 years.

Table 5.2

International Statistical Classification of Diseases, Injuries and Causes of Death, 1965, (Eighth Revision). Diagnostic Groupings

ICD GROUP NUMBER	DIAGNOSTIC GROUP
I	Infective and Parasitic Diseases
II	Neoplasms
III	Endocrine, Nutritional and Metabolic Diseases
IV	Diseases of the Blood and Blood forming organs
V	Mental Disorders
VI	Diseases of the Nervous System and Sense Organs
VII*	Diseases of the Circulatory System
VIII	Diseases of the Respiratory System
IX	Diseases of the Digestive System
X	Diseases of the Genito-Urinary System
XI	Complications of Pregnancy, Childhood and the Puerperium
XII	Diseases of the Skin and Subcutaneous tissue
XIII	Diseases of the Musculo-Skeletal System and Connective Tissue
XIV	Congenital Anomalies
XV	Certain causes of Perinatal Morbidity and Mortality
XVI	Symptoms and Ill-Defined Conditions
XVII	Accidents, Poisonings and Violence. (Arranged in two different systems; the N numbers (medical causes) and the E numbers (social causes)

Source: W.H.O. (1967) International Classification of Diseases, Injuries and Causes of Death, Eighth Revision, Geneva, W.H.O.

As shown in Table 5.3, six diagnostic groups (counting Groups VIIa and VIIb as two groups), account for 95 per cent of all deaths of males between the ages of 15 and 64 years.

Table 5.3

Deaths as a percentage of total number of deaths in each age-group between 15 - 64 years. (Males) Five major ICD Diagnostic Groups, England and Wales, 1977

Diagnostic Group		Deaths as percentage of all deaths in age-groups					
		15-24	25-34	35-44	45-54	55-64	15-64
All Causes		100	100	100	100	100	100 (81,639)
VII	Diseases of the Circulatory System	4.0	13.3	40.6	51.7	51.5	47.4 (38,673)
a)	Rheumatic fever, hypertensive disease and heart disease	2.3	9.7	34.0	44.1	41.9	39.0 (31,878)
b)	Diseases of the Peripheral Circulatory System	1.7	3.7	6.6	7.6	9.6	8.4 (6,795)
II	Neoplasms	10.0	18.9	22.2	27.3	30.4	27.9 (22,744)
XVII	Accidents, Poisonings and Violence	70.0	48.2	19.9	7.0	2.8	9.5 (7,717)
VIII	Diseases of the Respiratory System	3.6	4.3	5.0	5.9	8.9	7.5 (6,131)
IX	Diseases of the Digestive System	1.2	3.0	3.5	3.2	2.3	2.6 (2,152)
	SUB-TOTAL	88.8	87.8	91.2	95.1	95.9	94.9 (77,417)

Source: OPCS (1979c), Mortality Statistics 1977 - Cause - England and Wales, London: H.M.S.O., Compiled from Table 2

However, the aggregate percentage of deaths occurring in these categories tends to mask the considerable variation amongst the five decennial age-groups between 15 and 64 years. There are two extreme examples of this. Although deaths from diseases of the circulatory system account for almost half of all deaths between the ages of 15 and 64 years, in the decade 15-24 years they account for only four per cent of deaths in contrast to the decade 55-64 years, where deaths from this particular cause account for 52 per cent of all deaths. Similarly, while 10 per cent of all deaths in the 15-64 years age group are caused by accidents, poisonings and violence, these account for 70 per cent in the age-group 15-24 years but only three per cent for the age-group 55-64 years.

Table 5.3 illustrates the relative importance of diagnostic groups at different stages of life. In contrast to this, Table 5.4 shows the relative importance of age-groups for diagnostic groups.

Table 5.4

Deaths in ten year intervals expressed as percentages of all deaths in selected Diagnostic Groups, Males, England and Wales, 1977

Diagnostic Group		15-24	25-34	35-44	45-54	55-64	15-64
	All Causes	3.9	4.0	7.0	24.0	61.1	100
VII	Diseases of the Circulatory System	0.3	1.1	6.0	26.2	66.4	100
a)	Rheumatic Fever, Hypertensive Disease and Heart Disease	0.2	1.0	6.1	27.1	65.6	100
b)	Diseases of the Peripheral Circulatory System	0.8	1.8	5.5	21.8	70.1	100
II	Neoplasms	1.4	2.7	5.6	23.6	66.7	100
XVII	Accidents, Poisonings and Violence	28.8	20.4	14.7	17.8	18.4	100
VIII	Diseases of the Respiratory System	1.9	2.3	4.7	18.8	72.3	100
IX	Diseases of the Digestive System	1.8	4.6	9.2	29.3	55.3	100

Source: OPCS (1979c) Mortality Statistics 1977 - Cause England and Wales, London H.M.S.O. Compiled from Table 2.

Amongst these six diagnostic groups diseases of the respiratory system are clearly diseases of advancing age - 72 per cent of deaths are in the last decade of the age span; this is also though to a less extent the case for rheumatic fever, hypertensive disease and heart disease , diseases of the peripheral circulatory system and neoplasms. Accidents poisonings and violence, in contrast, result in disproportionally more deaths in the earlier decade of the age-span while diseases of the digestive system have a greater number of deaths in the middle years of life.

It can be seen that in what appeared to be the most vulnerable age-group, 55-64 years (61 per cent of mortality between 15 and 64 years) the overall age-specific death-rate is 18.8 per 1000 population. Diseases of the circulatory system which accounted for over half of the deaths in this age-group have an age-specific death-rate of 9.7 per 1000 population. The diagnostic group, 'Accidents, poisonings and violence' ascribed as cause of death in 70 per cent of the deaths occurring between the ages 15-24 when examined in the context of the home population has an age-specific death rate of less than one per 1000 population. It so happens that the age-specific death rates from accidents, poisonings and violence are virtually the same for all five age-groups.

It is interesting to compare male mortality with that of females. As can be seen in Table 5.1 deaths between the ages of 15 and 64 years represent only 17 per cent of all female deaths, while they account for 28 per cent of all male deaths. However, the age-distribution of female mortality corresponds remarkably closely to that of males. Sixty per cent of female mortality between 15 and 64 years occurs within the last decade of this age-span.

The major causes of death analysed by diagnostic groups, are identical to those of males but the relative importance of these groups is different. For example in Table 5.7 neoplasms are the major cause of death for females between 15 and 64 years whereas for males, neoplasms are second in importance to diseases of the circulatory system. It is difficult to ascertain whether this is due to an excess of deaths from 'neoplasms' for females, or a low number of deaths from diseases of the circulatory system in this age-group.

It is also relevant to note the differences between male and female mortality within these diagnostic groups. Major sites of malignant neoplasms differ between the sexes; for males, 15-64 years, carcinoma of the trachea, bronchus and lung accounts for 27 per cent of deaths caused by neoplasms whereas for females it accounts for only 14 per cent. Similarly although carcinoma of the breast accounts for 41 per cent of deaths from neoplasms for females in this age-group, for males it is less than one per cent. Within the category of diseases of the circulatory system 74 per cent of deaths for males 15-64 years are caused by ischaemic heart disease, for females this ratio is only 39 per cent.

Table 5.6

Deaths as a percentage of total number of deaths in each age-group between 15-64 years. (Females) Five major ICD Diagnostic Groups England and Wales 1977

Diagnostic Group	Deaths as % of all deaths in age-groups					
	15-24	25-34	35-44	45-54	55-64	15-64
All Causes	100	100	100	100	100	100
II Neoplasms	17.7	30.4	45.5	49.0	41.5	42.6
VII Diseases of the Circulatory System	7.5	12.9	21.3	27.9	38.1	32.4
a) Rheumatic Fever, Hypertensive Disease & Heart Disease	4.1	6.6	12.1	17.3	25.8	21.2
b) Diseases of the Peripheral Circulatory System	3.4	6.4	9.2	10.6	12.3	11.1
VIII Diseases of the Respiratory System	5.4	6.4	5.6	6.6	7.5	7.0
XVII Accidents, Poisonings and Violence	46.9	28.1	13.7	6.2	3.3	7.0
XI Diseases of the Digestive System	1.9	3.2	2.9	2.9	3.0	2.9
SUB-TOTAL	79.4	81.0	89.0	92.6	93.4	91.9

Source: OPCS (1979c), Mortality Statistics 1977, Cause - England and Wales - London: H.M.S.O. Compiled from Table 2.

Age and sex are only two of the variables by which mortality is classified and which, as has been shown, exert an influence on mortality rates. Social class and occupation are variables of particular interest in an examination of mortality of males of working age. It should be noted that figures referring to social class and occupation are based on the years 1970-72 (Source: OPCS (1978a) Occupational Mortality 1970-72. The Registrar General's Decennial Supplement for England and Wales). When conducting such sub-analyses one is dealing with comparatively small categories; hence to counteract any bias caused by yearly fluctuations mortality is calculated over a three year period. The relative importance of the major causes of death for 1970-72 are similar to 1977. (ibid, p.42, Table 4.8)

It was noted in Chapter 3 that social class differences are persistent throughout all age-groups. (See table 3.6). In table 5.7 which shows the SMRs for the major diagnostic groups identified above analysed by social class, it can be seen that social class gradients are also apparent for each diagnostic group.

Table 5.7

Mortality of Males 15-64 years analysed by social class and selected causes of death. 1970-72

Diagnostic Group	I	II	IIIN	IIIM	IV	V
All Malignant Neoplasms	75	80	91	113	116	131
Diseases of the Circulatory System	86	89	110	106	110	118
Diseases of the Respiratory System	37	53	80	106	123	187
Diseases of the Digestive System	83	91	97	92	109	152
Accidents, Poisonings and Violdence	78	78	83	94	122	197

Source: OPCS (1978a), 'Occupational Mortality 1970-72', The Registrar General's Decennial Supplement for England and Wales, London: H.M.S.O. Table 4a

However for some categories the gradient is steeper than others. The diagnostic group, 'diseases of the circulatory system' which accounts for almost half of all deaths in this age-span has the lowest differential between Social Class I and Social Class V - only 32 (86 for Social Class I compared to 118 for Social Class V). 'All malignant neoplasms' accounting for 30 per cent of deaths has the second lowest differential of 56 (75 for Social Class I and 131 for Social Class V). The remaining three categories have particularly high rates for Social Class V. The diagnostic group, 'diseases of the respiratory system' has the steepest gradient - a differential of 150 between Social Class I (37) and Social Class V (187).

The SMR as was shown in Chapter 2 tends to accentuate social class gradients. Thus the mortality rate for accidents, poisonings and violence is 0.5 per thousand. (See Table 5.5). The 173 SMR for Social Class V in Table 5.7 thus implies a mortality rate of about 0.9 per 1000 while the 78 for Social Class I and II implies a rate of about 0.4 per 1000. Looked at from this perspective the social class gradient does not appear quite so alarming. The same argument applies even more to the digestive diseases diagnostic group.

It was observed in table 5.1 that the age-span 55-64 years accounts for sixty per cent of all deaths between 15 and 64 years. Table 5.8 analyses the mortality of this decade by social class. Perhaps not surprisingly it closely resembles that for 15-64 years. The same gradients persist with the differential between Social Class I and V being least for diseases of the circulatory system (18) and most for diseases of the respiratory system (142).

Table 5.8

Mortality of Males 55-64 years analysed by social class and selected causes of death 1970-72

	Social Classes					
Diagnostic Group	I	II	IIIN	IIIM	IV	V
All Malignant Neoplasms	75	80	89	117	115	129
Diseases of the Digestive System	96	94	94	101	106	135
Accidents, Poisonings and Violence	96	80	85	96	109	173
Diseases of the Circulatory System	94	92	108	109	109	112
Diseases of the Respiratory System	36	55	79	114	122	178

Source: OPCS (1978a) "Occupational Mortality 1970-72, The Registrar General's Decennial Supplement for England and Wales, London: H.M.S.O. Table 4c

It is interesting to note that the two diagnostic groups most likely to be influenced by lifestyle and the environment are those which have the steepest social class gradients namely, 'accidents, poisonings and violence', and 'diseases of the respiratory system'.

It was decided in the introduction to this Chapter that emphasis would centre on diagnostic groupings rather than specific diseases to avoid problems of small samples. However, it is of interest to note, as highlighted in the Black Report (D.H.S.S., 1980, p.73) in its examination of the Decennial Supplement on 'Occupational Mortality 1970-72' that out of 92 causes of death selected for men aged 15-64 years:

> 'For only 4 causes were mortality ratios for I and II higher than for IV and V:- accidents to motor vehicle drivers, malignant neoplasms of the skin, malignant neoplasms of the brain and polyarteritis nodosa and allied conditions."
>
> OPCS 1978a Table 4a

Thus even while keeping the differences in SMRs between the social classes in perspective it must be acknowledged that such differentials do exist for the majority of diseases.

Table 5.9a analyses the major causes of death for males 15-64 years by selected occupation orders (1970-72). Three occupation orders with high overall SMRs and three with low SMRs were selected. It must be remembered that the 27 occupation orders collapse 223 occupation units and thus it is possible that considerable differences between units may be masked. Nevertheless the orders broadly correspond to industrial orders in the Standard Industrial Classification and thus an analysis of differences between the rates for industrial orders provides an indication of differences between the industries (OPCS, 1978a, p.67).

As might be expected from the previous analysis of mortality by social class, those diagnostic groups, namely diseases of the respiratory system and accidents, poisonings and violence which had the steepest social class gradients are those which have the highest and lowest recorded SMRs. For example, for diseases of the respiratory system Order XXV 'Professional, technical workers, artists', has an SMR of 41 whereas Order XVIII 'Labourers' and

Table 5: 9a

Standardised Mortality Ratios by Selected Occupation Orders and Selected Causes of Death 1970-72 : men aged 15-64 years

Occupation Order	Causes of Death						
	Malignant Neoplasms	Diseases of circulatory system	Diseases of respiratory system	Diseases of digestive system	Accidents, poisonings & violence	All causes S.M.R.	Deaths
II Miners and quarrymen	120	137	244	136	150	144	8,964
V Furnace, forge, foundry, rolling mill workers	135	116	167	115	80	122	3,432
XVIII Labourers nec	133	122	193	155	210	141	27,938
I Farmers, foresters, fishermen	92	82	90	92	135	91	10,041
XXII Sales workers	89	96	72	91	87	90	18,470
XXV Professional, technical workers, artists	72	83	41	75	75	75	17,388

Table 5: 9b

Mortality Ratios Standardised for Social Class by Selected Occupation Orders and Selected Causes of Death 1970-72: men aged 15-64 years

Occupation Order	Causes of Death					
	Malignant neoplasms	Diseases of circulatory system	Diseases of respiratory system	Diseases of digestive system	Accidents, poisonings & violence	All causes S.M.R.
II Miners & quarrymen	105	128	219	142	155	133
V Furnace, forge, foundry, rolling mill workers	119	108	151	120	81	114
XVIII Labourers nec	102	104	105	104	108	104
I Farmers, foresters, fishermen	92	82	98	92	128	91
XXII Sales workers	104	98	107	95	103	100
XXV Professional, technical workers, artists	92	95	89	86	96	94
All men S.M.R.s	100	100	100	100	100	100
All men Deaths	73.313	127,138	26,960	6,431	23,788	273,139
All men %	26.8	46.5	9.9	2.4	8.7	100

Source: OPCS (1978a) Occupational Mortality 1970-72 The Registrar General's decennial supplement for England and Wales. London : HMSO. Tables 5D and 5K

Order II 'Miners and quarrymen' record extremely high SMRs of 193 and 244 respectively. Similarly for accidents, poisonings and violence, Order XXV 'Professional, technical workers and artists' has an SMR of 75 whilst Order XVIII 'Labourers' has an SMR of 210.

Again it is the two diagnostic groups, diseases of the circulatory system and malignant neoplasms, which account for over two thirds of deaths in this age-span, which have the lowest differentials between the highest and lowest recorded SMRs.

When standardised by social class, social class can be seen to have affected mortality ratios considerably. For most orders such as Order XXV 'Professional, technical workers and artists' and Order XVII 'Labourers', the SMR becomes nearer to 100 after social class standardisation. However mortality ratios for Order II 'Miners and quarrymen' remain elevated for diseases of the circulatory system, respiratory system and digestive system and for accidents, poisonings and violdence, with SMRs of 128, 219, 142 and 155 respectively. SMRs for the latter two disease groups show a slightly increased SMR when standardised by social class.

Tables 3.5 and 3.6 illustrated that there were regional variations in the mortality experiences of males 15-64 years. Table 5.10 analyses mortality by selected cause of death for males 55-64 years in the Regional Health Authorities of England and Wales 1977. It can be seen that regional variations in mortality are not consistent for all diseases. For example, although for

all causes the Northern Region has a higher mortality ratio than East Anglia (113 and 89 respectively), for ischaemic heart disease, all malignant neoplasms and cerebrovascular disease, the situation is reversed. For bronchitis and emphysema, however, the mortality ratio of the Northern Region is more than double that of East Anglia, (140 compared with 66).

It is apparent that there are considerable variations in differentials between the regions for these diseases. For ischaemic heart disease there is a differential of only 13 between West Midlands with the lowest mortality ratio of 93 and Wessex and South-Western with ratios of 106. For cerebrovascular diseases and all malignant neoplasms the differential between the highest and lowest mortality ratios are 44 and 27 respectively while for bronchitis and emphysema there is a massive differential of 76 between the Northern Region (140) and Wessex (64).

Yet again the major causes of death namely diseases of the circulatory system and neoplasms show less variation on sub-analysis than diseases of the respiratory system. On closer analysis of bronchitis and emphysema it can be seen that regions with highest mortality ratios are in the North and West of the country.

Table 5.10

Mortality analysed by Regional Health Authority and Selected Cause of Death. Ratio of Actual to Expected Deaths 1977. Males 55-64 years.

Regional Health Authority	All Causes	Ischaemic Heart Diseases	Cerebro-vascular Disease	Bronchitis and Emphysema	All Malignant Neoplasms	Cancer of the lung
England & Wales	100	100	100	100	100	100
Northern	113	99	102	140	102	106
Yorkshire	107	103	96	126	100	99
Trent	99	103	116	113	97	99
East Anglia	89	100	113	66	105	100
North-West Thames	88	101	80	78	106	99
North-East Thames	94	96	85	90	110	114
South-East Thames	89	102	88	75	101	102
South-West Thames	89	99	91	71	101	101
Wessex	90	106	86	64	103	98
Oxford	88	96	81	92	106	94
South-Western	86	106	97	80	95	86
West Midlands	104	93	105	116	100	103
Mersey	118	98	102	104	102	115
North Western	114	99	116	105	99	102
Wales	111	103	124	119	83	72
Age-specific death rate/ 1000 England and Wales 1977	18.8	7.1	1.3	0.9	5.7	2.5

Source: OPCS (1979b) 'Mortality Statistics 1977 - Area' England and Wales, London: H.M.S.O., Compiled from Table 4

This regional pattern of mortality was noted in Chapter 3. In this table it is apparent for the 'All Causes' ratio and although not to the same extent, for bronchitis and emphysema and for ischaemic heart disease, cancer of the lung and cerebrovascular disease.

Other disease-specific studies conducted have identified similar patterns. Acheson and Sanderson (1978, 'Strokes: social class and geography, Population Trends, No. 12, Winter) in their study of 'strokes' noted 'the familiar pattern of higher mortality north-west of the Tees-Exe line'. Chilvers found that whereas some cancers showed very marked differences in their regional distribution others showed considerable homogeneity:

> 'For example among the malignant neoplasms of the digestive tract, the regional variation in SMRs from stomach cancer is great whereas the intestinal and rectal cancers show much less variation.'
>
> Chilvers (1978) Cancer Mortality: the regional pattern, Population Trends, No. 12, Summer, 'p.8.'

Although Chilvers' study referred to the incidence of cancer for both sexes while Table 5.10 refers to males 55-64 years, the relatively small regional variation in this table for 'all malignant neoplasms' might be explained by Chilvers' findings.

There are no regular sources of data for an analysis of mortality by age, sex, marital status and cause of death. The only information available is derived from ad hoc studies. It was noted in Chapter 3 that there are differences in the aggregate mortality experience between those who are married and those who are single, widowed or divorced. Sub-analyses by cause of death

also reveal that patterns exist within the diagnostic groups identified as the major causes of death. Although referring to the age-span 15 to 84 years, thus extending beyond the range of this study, the Registrar General in the Statistical Review of England and Wales for 1967 noted that:

> 'Throughout the cardiovascular and respiratory disease categories the SMRs for widowers are high in relation to the level for all causes, with the exception of arteriosclerotic heart disease. This is consistent with the results of an analysis of mortality among widowers in the first six months of bereavement* except that arteriosclerotic hear disease then showed the greatest proportional excess of all the cause groups studied. It may be that this common cause of death shows a much lower excess with the passage of time, but even so the excess mortality is in marked contrast with all the other marital status groups. This excess is apparent at all ages and declines with increasing age in both sexes. Among respiratory diseases the mortality of widows and widowers from both pneumonia and bronchitis is high.
>
> OPCS, 1971, p.134

Note: * the study to which reference is made is that of Parkes et al., (1969).

In this study it was also noted that for widows and widowers, although the SMRs for all malignant neoplasms were lower than for all causes, they were still higher than for any other marital status group and reflected consistently higher age-specific rates. This observation is supported by an American psychologist, LeShan (1977). In a study of cancer patients spanning two decades, he identified a basic emotional pattern amongst cancer patients and noted that the incidence of cancer varied with marital status, rates being highest for the widowed and divorced.

High SMRs for the single, widowed and divorced were also recorded for gastro-intestinal diseases, notably peptic ulcer and cirrhosis of the liver. For accidents, poisonings and violence the highest SMRs were recorded for unmarried males.

In conducting a cause-specific study of the mortality of males, some well-known facts are noted. Above it has been shown that the factors influencing mortality discussed in Chapter 3 have a direct relationship with specific diseases. For example:

a) Younger men are more likely to be killed in accidents whereas older men are more likely to have a myocardial infarction (heart attack) or cancer of the lung.

b) Males dying from a malignant neoplasm are more likely to die from cancer of the lung whereas females are more likely to die from cancer of the breast.

c) Males in Social Class V are more likely to die from bronchitis and emphysema or be killed in accidents than males in Social Class I.

e) Men in the North or West of England are more likely to die from a disease of the respiratory system than men in the South or East of England.

f) Men who are widowed, divorced or single are more likely to die from a malignant neoplasm than married men.

All these patterns are identifiable but as was also shown in Chapter 3 they are all interlinked. In this chapter it has been shown that the major causes of death, perhaps not all that surprisingly, follow these same patterns.

One of the penalties of using such large groupings as Diagnostic Groups and Regions to avoid biases of small numbers is that local variations may be masked. In addition unfortunately the choice of standardisation, so valuable in comparative studies, for example, of regions and occupations must also be regarded with caution and, as pointed out earlier, absolute differences should be kept in perspective.

Chapter 6

Patterns of Morbidity

In the previous chapter in discussing mortality of males aged 15-64 years the emphasis was on diseases resulting in death. The numerous problems of measuring morbidity were discussed in Chapter 4. This chapter will examine diseases suffered by this age-group, analyses being based on:-

(a) Self-reported morbidity and use of services as recorded in the General Household Survey.

(b) Use of G.P. services - first contact initiated by patient, repeat visit requested by G.P. Episode of illness recorded in 'Morbidity Statistics from General Practice'.

(c) Use of G.P. services for certification of illness - contact initiated by patient, illness confirmed and diagnosis made by doctor and recorded in 'Social Security Statistics.'

(d) Use of hospital services - a professional decision of one or more doctors - recorded in the 'Hospital In-Patient Enquiry'.

Not all these statistics refer to the same geographical area; the General Household Survey and sickness absence statistics refer to Great Britain while the Hospital In-Patient Enquiry and 'Morbidity Statistics from General Practice' refer to England and Wales. Nor do all the data refer to the same population. The General Household Survey refers to all men aged 15-64.

The 'Morbidity Statistics from General Practice' refer only to consultations with NHS practitioners and thus exclude private consultations outside the NHS. The sickness absence statistics refer to employees only, excluding certain employees, for example civil servants, and is restricted to men who have claimed benefit. In certain circumstances illnesses of three days or less are excluded. The Hospital In-Patient Enquiry again covers only NHS patients and excludes patients in psychiatric and convalescent hospitals.

To give a more complete picture of the state of health of males in this age range some brief comments will also be made about dental condition, defective eyesight and hearing.

General Household Survey

Data about ill-health and up-take of certain health care services are published annually in the General Household Survey. This is a continuous survey based on a sample of the general population in private households in Great Britain. In 1979 the sample contained 8,964 men aged between 16 and 64 years. The data was analysed by sex, six age-groups, of which two are 16-44 years and 45-64 years, six socio-economic groups and by economic activity. The replies to the questions asked are the subjective assessment of the informants' health and his recall of services used.

The findings of the survey appear to show that men of working age are in rather a poor state of health. To the general question 'Over the last 12 months, would you say your health

has on the whole been good, fairly good or not good ? four per cent of the 16-44s and 14 per cent of the 45-64s replied 'not good'. To the question 'Do you have any long-standing illness, disability or infirmity ? (By long-standing I mean anything that has troubled you over a period of time or that is likely to affect you over a period of time)' 21 per cent of the younger age-group and 39 per cent of the older age-group of working age replied in the affirmative. The answer to the additional question 'Does this illness or disability limit your activity in any way ?' was affirmative for 10 per cent of the younger (16-44 years) and 26 per cent of the older men (45-64 years). The fact that more than a quarter of the men in the last two decades of working life claim that illness or disability limits their activities seems remarkable. The reported prevalence of both long-standing illnesses and of long-standing illnesses limiting activities is about twice as great for semi-skilled and unskilled manual workers in the older age-group as it is for men in managerial and professional occupations.

A question aimed at soliciting information about acute sickness also revealed a remarkable high prevalence. The question asked was: 'During the two weeks ending yesterday, did you have to cut down on any of the things you usually do because of illness or injury ?' To this 10 per cent of the younger men and 14 per cent of the older men gave a positive response. These proportions include informants with a long-standing condition that caused additional restrictions during the previous fortnight. On the basis of these replies men in the younger age-group experienced annually 14 days and men

in the older age-group 29 days of restricted activity. Men in semi-skilled and unskilled occupations do not merely report approximately 50 per cent more acute sickness than men in managerial and professional occupations but they also tend to be sick for longer periods. Thus they report about twice as many days of restricted activity in a year as men in the more favoured occupations.

The average number of General Practitioners (NHS) consultations reported was 2.7 per year for the 16-44s and 4.4 for the 45-64s. As many as nine per cent of the younger and 14 per cent of the older age-group reported consulting their General Practitioner in the 14 days before they were interviewed. The rate of consultation was greater amongst manual than amongst non-manual workers. Considering the large proportion of all men who reported restricted activity on account of illness the proportion consulting GPs appears to be comparatively low.

The General Household Survey also shows attendances at Hospital Casualty and Outpatients Departments in a three month reference period. Eleven per cent of males 16-44 years and 13 per cent of males 45-64 years reported visiting such departments. The average number of attendances within this three month reference period were 2.3 for the younger age-group and 2.8 for the older one.

The questions about health in the GHS in 1979 were similar or identical to those asked in 1976 and in previous years. In 1977 and 1978 the questions were altered and

respondents were shown checklists of common health problems or symptoms so as to indicate to respondents the range of health problems that should be included. This resulted in a massive increase in reported chronic health problems, so that 45 per cent of males in the 16-44 age-group and 65 per cent of those aged 45-64 reported a chronic health problem. (GHS 1977 Table 6.1). The change in the questions asked showed clearly the extent to which the answers are influenced both by the phraseology of the question and by any prompting used to elicit an answer. These are inherent problems of questionnaire surveys.

It deserves, however, also to be noted that when the same questions are asked every year the answers show a higher degree of consistency and frequently also show clearly discernible trends. (See Table 7.1 1977).

Also of relevance to this study is the section in the GHS relating to reasons for absence from work in a reference week. Absence from work due to 'own illness or accident' is of particular interest. This data is useful in that it covers all employees unlike DHSS incapacity statistics which refer only to those claiming benefit. These GHS figures also include absences lasting less than three days which are frequently omitted from incapacity statistics.

There are sub-analyses for employees only by socio-economic group and industry group but neither are analysed by sex. However, it is interesting to note that highest levels of reported absence were amongst manual workers: skilled manual,

semi-skilled manual, and unskilled manual reported 7,8 and 7 per cent respectively. In contrast managers and professional workers, - managers in large establishments, managers in small establishments and professional workers - reported three per cent only.

In the analysis of the reasons for absence from work due to own illness or accident by industry group the highest levels of absence were in 'Mining and quarrying' 10 per cent, 'Textiles' nine per cent, and 'Bricks, pottery, glass' eight per cent.

With reference to this particular section of the report, it should be recalled that the GHS is based on a comparatively small sample and that there is thus a danger that on account of small numbers in certain categories the annually computed rates may vary quite independently of actual changes. Furthermore comparisons of the 1979 figures with earlier years are also hampered as 1979 data refer to employees only, while the data for earlier years related to all working persons including the self-employed.

Morbidity Statistics from General Practice

The great majority of cases of ill health receive no medical attention at all; they are cured by spontaneous recovery, temporary or permanent changes in life-style, household remedies or the taking of non-prescribed medicines. Those illnesses which are attended by doctors generally are treated solely by GPs. Their treatment is relatively inexpensive and in 1976/77 in Great Britain amounted to 5.1 per cent of expenditure of the NHS. The medicines GPs prescribed were somewhat more expensive and absorbed a further 7.9 per cent of NHS expenditure (DHSS 1980c). Comparatively little is known about GP care, about the characteristics of the patients they see and the nature of the illnesses they treat. There have been a number of ad hoc studies of General Medical Practices but data covering the whole country which can claim to be reasonably representative are only available from the two national studies of Morbidity Statistics from General Practice discussed in chapter four. The second survey 'Morbidity Statistics from General Practice 1970-71' (OPCS 1974) covered a population of 292 thousand including 91 thousand men aged between 15 and 64 years, registered with 115 general practitioners in 53 practices. The age, sex and geographical distribution of the study population was very similar to that of the population of England and Wales. The 115 participating practitioners were volunteers and not selected by random sample. Their selection was determined mainly with the object of obtaining a study population with the appropriate geographical distribution. It is, however, reasonable to assume that their patients and their patient's illnesses were representative of the population of the two countries.

Table 6. 1

Annual consultation rates per 100 men registered by age and selected diagnostic condition

	All ages	0-4	5-14	15-24	25-44	45-64	65-74	75+
All Diseases & Conditions	256	379	192	182	210	301	370	451

Diagnostic Group *	All ages**	15-24	25-44	45-64
Mental Disorders	18	12	25	29
Diseases of the Nervous System & Sense Organs	20	12	15	19
Diseases of the Circulatory System	23	1	8	47
Diseases of the Respiratory System	60	43	42	56
Diseases of the Digestive System	13	8	14	18
Diseases of the Skin & Subcutaneous Tissue	19	22	17	18
Diseases of the Musculo-Skeletal System and Connective Tissue	19	9	23	35
Symptoms and Ill-defined Conditions	22	15	17	22
Accidents, Poisonings and Violence	20	30	22	19
Prophylactic Procedures and other Medical Examinations	14	12	11	18
SUB TOTAL	228	164	194	281
OTHERS	28	18	16	20
ALL DISEASES	256	182	210	301

Notes: * Ten diagnostic groups with the highest consultation rates.
** Including 'under 15s' and '65 and over'

Source: OPCS (1974) Morbidity Statistics from General Practice. Second National Study 1970-71 London: HMSO Table 10.

Table 6. 2

Patients Consulting. Annual rates per 100 men registered, by age and selected diagnostic condition.
Males.

	All ages	0-4	5.14	15-24	25-44	45-64	65-74	75+
All Diseases and Conditions	63	91	64	59	58	60	65	69

Diagnostic Group *	All Ages**	15-24	25-44	45-64
Mental Disorders	7	6	9	9
Diseases of the Nervous System & Sense Organs	11	8	8	10
Diseases of the Circulatory System	6	1	3	10
Diseases of the Respiratory System	26	23	20	20
Diseases of the Digestive System	6	5	6	7
Diseases of the Skin & Subcutaneous System	11	13	9	9
Diseases of the Musculo-Skeletal System and Connective Tissue	8	5	10	13
Symptoms & Ill-Defined Conditions	13	10	10	11
Accidents, Poisonings and Violence	10	15	10	8
Prophylactic Procedures and other Medical Examinations	10	9	9	7

Note: * Ten diagnostic groups with the highest 'Patient Consulting Rates'.
**Including 'under 15s' and '65 and over'.

Source: OPCS (1974) Morbidity Statistics from General Practice. Second National Study 1970-71. London HMSO, Table 11.

The 1971 survey showed that the consultation rate per 100 population was least for the age-group 15-24 and thereafter increased with age (See Table 6. 1). There were 182 consultations per 100 men aged 15-24, 210 per 100 men aged 25-44 and 301 for men aged 45-64 years. The ten diagnostic groups with the highest consultation rates accounted for almost 90 per cent of all consultations. It is interesting to note three of the groups which are not amongst these ten: 'neoplams', one of the major causes of death, accounted for only five consultations for males of all ages, the rate for diseases of the genito-urinary system was of the same magnitude and that for infective and parasitic diseases was only 11 out of 256 consultations.

For the three age-groups covering men of working age - 15-24, 25-44 and 45-64 - the consultation rate for diseases of the respiratory system was the highest by quite a substantial margin. It showed no marked association with age but was higher in the last twenty years of working life than in the previous thirty years. For the 45-64s the next highest diagnostic group was diseases of the circulatory system with 47 out of 301 consultations. This disease group had a strong age gradient: it accounted for only one out of 189 consultations for the 15-24s. For this youngest age-group the second most frequent consultation rate was for accidents, poisonings and violence - 30 out of 189 consultations. This disease group had an inverse age gradient with only 19 consultations per 100 men aged 45-64, while four other groups had a positive age gradient - mental disorders, diseases of the nervous system and sense organs, diseases of the digestive system and diseases of the musculo-skeletal system and connective tissues.

Amongst registered patients of all ages 63 per 100 had consulted their general practitioner (See Table 6. 2). This rate shows remarkably little variation with age, it varied only between 58 and 60 for the three age-groups of men of working age. It seems therefore that age affects the number of consultations much more than the proportion of the population consulting a general practitioner. The rate of registered patients visiting the GP during the year per 100 registered patients is, of course, less than the addition of the patient consulting rates for all disease groups as the same patient may consult the general practitioner for several diseases in the course of the twelve months. For each of the three age-groups covering men of working age, one third or more of all the men consulting the general practitioner consult him at least once about a respiratory disease.

In 1982 a socio-economic analysis of the second morbidity survey was published, thus providing data on social class, occupation and marital status. The data was analysed using Standardised Patient Consulting Ratios (SPCRs) in order to allow for different age structures in the groups analysed. (See chapter 4, note 4).

Considering that between the ages of 15 and 64 years males have higher mortality rates than females it is interesting to note that for all diagnostic categories except accidents, poisoning and violence standardised patient consulting ratios are higher for females than males. (After the age of 65 years for some categories the pattern is reversed, for example respiratory diseases). Rates for females are particularly high for diseases of the genito-urinary system.

In the analysis by social class the standardised patient consulting ratios showed a slight social class gradient for all diseases and conditions. However, these overall figures conceal a great variation in respect of various groups of diseases and specific conditions. The major reason for consultations, namely diseases of the respiratory system, showed a strong social class gradient for males 15-64 years. The gradient was strongest for acute bronchitis which had SPCRs of 57 for Social Class I compared with 150 for Social Class V. Amongst respiratory diseases only acute pharyngitis and tonsillitis lacked a social class gradient although the highest SPCRs were still in Social Class V.

For circulatory diseases an analysis by social class produces a confused picture. It was found that there was:

> 'some evidence for men that SPCRs for arterial diseases are higher for classes IIIM, IV and V. The less urgent or serious conditions display different patterns; amongst men hypertension and haemorrhoids are more common in classes I, II and IIIN, while the highest SPCRs for angina and varicose veins are in classes IIIM, IV and V'.
>
> RCGP et al. 1982 p. 24.

Positive social class gradients were also observed for diseases of the digestive system and of the musculo-skeletal system. Accidents, poisonings and violence also showed a distinct social class gradient, although the otherwise steady gradient was disturbed by SPCRs of 121 for Social Class IIIM and 115 for Social Class IV. This effect was most apparent for 'sprains and strains, and lacerations.'

For mental disorders and diseases of the nervous system there were no particular social class gradients, although for the former higher SPCRs were recorded in Social Classes IIIN, IV and V, while for the latter the highest SPCRs were recorded in Social Classes I and II.

In the analysis of morbidity statistics by occupation the broad classification of occupation orders are used to keep the number of patient consultations in each occupational group up to an adequate level. Some of the highest SPCRs were recorded for 'miners and quarrymen' for infective and parasitic diseases (191), mental disorders (207), diseases of the respiratory (188) and digestive (251) systems and accidents (341). It was suggested that the need for certification of sickness is a possible contributor towards the high SPCRs recorded for all disorders. SPCRs for 'Gas, coke and chemical workers' showed great similarity with miners, they also having a high SPCR for mental disorders (195). In addition a high consulting rate was noted for genito-urinary diseases. (182)

Textile workers also showed a comparatively high patient consulting rate, figures being raised for mental disorders (136), diseases of the nervous system and sense organs (129) of the respiratory system (124) of the skin and subcutaneous tissue (135) and for accidents (122). Furnace, forge and foundry workers showed notably high SPCRs for diseases of the nervous system and sense organs (156) accidents (174) and diseases of the musculo-skeletal system and connective tissue (144). The Report suggested that these figures may reflect the environmental conditions experienced by these workers.

Some occupation orders such as 'Engineering and allied trades workers etc.', 'Labourers' and 'Transport and communication workers' contain such large heterogeneous groups of workers that it is unlikely that any specific occupational factors could be isolated. All other orders showed only relatively slight divergences from the average for overall SPCRs, but some had raised SPCRs for specified diagnostic groups. For example, 'Glass and ceramic workers' had high rates for mental disorders (153), 'Woodworkers' for neoplasms (165), 'Clothing workers' for circulatory diseases (199).

Data for marital status are given in the socio-economic analysis of the 1970-71 survey. Whereas analyses of mortality data show that married men have lower rates than single, widowed and divorced men it is the single who have the lowest rates for consulting a doctor. In some conditions the widowed and divorced were found to have markedly raised SPCRs compared to single and married men. Such conditions included accidents, mental disorders and diseases of the digestive system.

D.H.S.S. Incapacity Statistics

In Chapter 4 the reasons why the DHSS sickness absence statistics are dubious indicators of morbidity were discussed: they refer only to the population entitled to claim benefits and are also subject to a variety of other limitations. All the same the statistics are of sufficient interest to merit examination.

In the year ending at the first Monday in June 1978 about five million men claimed either sickness or invalidity benefit and lost an aggregate of 274 million working days. Approximately two-thirds of the men made only one claim, 19 per cent two, seven per cent three and six per cent four or more claims; so that the individual number of claimants was about 4.1 million men who each had an average of about 67 days absence.

The number of men incapacitated for sickness and invalidity on June 3rd 1978 - the first Monday in June - was 861 thousand. The distribution of these men by duration of absence and age is shown in Tables 6. 3, a, b and c. The long average duration of incapacity is explained by the fact that more than two-fifths of the men absent on that day had been absent for more than 52 weeks[1], almost another third had been absent for 4 - 52 weeks and only just over a quarter had been absent for four weeks or less. The duration of incapacity varies widely with age. Amongst the 20-29 age-group 64 per cent had been absent for four weeks or less and only 6 per cent for more than 52 weeks: in contrast in the 60-64 age group only 10 per cent had been absent for four weeks

Table 6.3

Claimants incapacitated for Sickness and Invalidity on 3rd June 1978 Analysed by Duration of Spell and Age. (Males)

(a) Numbers (Thousands)

	All ages	Under 20	20-29	30-39	40-49	50-54	55-59	60-64	65+
Up to 4 weeks	244	17	53	55	45	24	28	22	1
4 - 52 weeks	265	7	25	37	48	36	48	63	2
Over 52 weeks	353	-	5	21	44	47	72	130	32

(b) Percentages

All durations	100	100	100	100	100	100	100	100	100
Up to 4 weeks	28	71	64	49	33	22	19	10	3
4 - 52 weeks	31	29	30	33	35	34	32	29	6
Over 52 weeks	41	-	6	18	32	44	49	61	91

(c) Durations of Spells experienced by claimants. Analysed by Age (Percentages)

	All ages	Under 20	20-29	30-39	40-49	50-54	55-59	60-64	65+
All durations	100	3	10	13	16	12	17	25	4
Up to 4 weeks	100	7	22	23	18	10	12	9	-
4 - 52 weeks	100	3	9	14	18	14	18	24	1
Over 52 weeks	100	-	1	6	12	13	21	37	9

Notes: 1. Discrepancies in totals are due to rounding of figures.

2. Based on 2 per cent sample of claimants.

Source: DHSS (1980a) Social Security Statistics 1978. London HMSO. Calculated from Table 3.44.

or less while as many as 61 per cent of all claimants had been absent for more than 52 weeks. The proportion of all claimants absent for 4 - 52 weeks was broadly the same for all ages while absence of up to four weeks as a proportion of all absences declined consistently with age and absence over 52 weeks increased consistently with age. Looked at from another angle, of all those incapacitated for four weeks or less, 70 per cent were under 50 years and 30 per cent 50-64 years while of all those incapacitated for 52 weeks or more 71 per cent were between 50-64 years while only 19 per cent were under 50 years.

D.H.S.S. Incapacity Statistics by Cause

It has already been mentioned that claims to sickness and invalidity benefit may be due to a multiplicity of causes amongst which ill-health is only one. All the same all such claims have to be supported by a doctor's certificate[2]. Each working day lost due to certified incapacity is thus ascribed to a medical diagnostic category. In Table 6. 4 a and b the days of certified incapacity are analysed by age and by the ten diagnostic categories which account for more than 96 per cent of all working days lost. For the under 20s and the 20-29s diseases of the respiratory system and accidents, poisoning and violence are by far the most important causes of incapacity accounting for 64 per cent and 47 per cent of all days lost. The two categories remain important, though to a lesser extent, in the following two decades, but in the last 15 years of working life account for only 25 per cent of days of incapacity.

Table 6.4a Days of Certified Incapacity for Sickness and Invalidity in the period 6th June 1977 to 3rd June 1978 Analysed by Cause of Incapacity (a) and Age

Millions

Diagnostic Category	All ages	Under 20	20-29	30-39	40-49	50-59	60-64	65+
Diseases of the Respiratory System	52.0	1.7	6.1	5.9	6.9	14.3	13.5	3.6
Diseases of the Circulatory System	47.9	0.1	0.3	1.4	5.1	17.0	18.1	6.0
Diseases of the Musculo-skeletal system & Connective tissue	35.9	0.3	2.6	5.1	6.8	9.9	8.9	2.5
Accidents, Poisoning and Violence	29.4	2.6	7.2	6.2	5.0	5.2	2.6	0.6
Symptoms and Ill-defined Conditions	29.1	0.6	3.2	4.8	5.6	8.0	5.4	1.4
Mental Disorders	22.7	0.1	2.4	4.4	4.7	7.0	3.4	0.7
Diseases of the Nervous System and Sense Organs	18.7	0.2	1.0	2.1	3.6	5.6	4.8	1.4
Diseases of the Digestive System	15.0	0.3	2.0	2.4	2.9	3.9	2.7	0.7
Infective & Parasitic Diseases	9.1	0.5	2.1	1.9	1.4	1.9	1.0	0.2
Diseases of the skin & Subcutaneous Tissue	4.0	0.2	0.7	0.7	0.8	0.9	0.5	0.1
Sub-Total	263.8	6.6	27.6	34.9	42.8	73.7	60.9	17.2
ALL CAUSES	273.5	6.7	28.2	35.8	44.5	76.7	63.6	17.9

Note: (a) According to International Classification of Diseases 1965

Source: DHSS (1980a) Social Security Statistics 1978 London HMSO, Table 3.83.

Table 6. 4b Days of Certified Incapacity for Sickness and Invalidity in the Period 6th June 1977 to 3rd June 1978

Analysed by Cause of Incapacity* and Age

Percentages

Diagnostic Category	All ages	Under 20	20-29	30-39	40-49	50-59	60-64	65+
Diseases of the Respiratory System	19.0	25.4	21.6	16.5	15.5	18.6	21.2	20.1
Diseases of the Circulatory System	17.5	1.5	1.1	3.9	11.5	22.2	28.5	33.5
Diseases of the Musculo-skeletal system & Connective tissue	13.1	4.5	9.2	14.2	15.3	12.9	14.0	14.0
Accidents, Poisoning and Violence	10.8	38.8	25.5	17.3	11.2	6.8	4.1	3.4
Symptoms and Ill-defined Conditions	10.6	9.0	11.4	13.4	12.6	10.4	8.5	7.8
Mental Disorders	8.3	1.5	8.5	12.3	10.6	9.1	5.3	3.9
Diseases of the Nervous System and Sense Organs	6.8	3.0	3.5	5.9	8.1	7.3	7.6	7.8
Diseases of the Digestive System	5.5	4.5	7.1	6.7	6.5	5.1	4.3	3.9
Infective & Parasitic Diseases	3.3	7.5	7.5	5.3	3.1	2.5	1.6	1.1
Diseases of the Skin & Subcutaneous Tissue	1.5	3.0	2.5	2.0	1.8	1.2	0.8	0.6
Sub-Total	96.4	98.7	97.9	97.5	96.2	96.1	95.9	96.1
ALL CAUSES	100	100	100	100	100	100	100	100

Note: *According to International Classification of Diseases 1965.

Source: DHSS(1980a) Social Security Statistics 1978 London HMSO, Table 3.83.

At these ages diseases of the circulatory system account for about a quarter of all days of incapacity.

A superficial examination of these percentages can, however, be quite misleading: thus accidents, poisonings and violence account for 39 per cent of days of absence for the under 20s but only for four per cent for the 60-64s. This appears to indicate that absence due to accidents, poisoning and violence is more important for the youngest than for the oldest age-group. This, however, is not the case: for both age-groups the number of days lost is the same - 2.6 millions. The high percentage for the younger age-groups (covering four years) is due to only 6 - 7 million days being lost from all causes, while for the oldest age-group (covering five years) the aggregate days lost were 63.6 millions, almost ten times as many. The percentages in Table 6. 4b thus have a far more definitive meaning when read vertically than when read horizontally.

An examination of Table 6. 4a shows that for eight of the ten diagnostic categories the number of days lost due to incapacity increases with age though to a varying extent. The increase is greatest for diseases of the circulatory system and diseases of the musculo-skeletal system and least for diseases of the skin and subcutaneous tissue and diseases of the digestive system. Only for accidents, poisoning and violence and infective and parasitic diseases do the number of days of incapacity not increase with age in a regular pattern.

Table 6. 4c Causes of Incapacity Analysed by Age and Days of Certified Incapacity and Invalidity in the period 6th June 1977 to 3rd June 1978

(Percentages)

Diagnnostic Category	All ages	Under 20	20-29	30-39	40-49	50-59	60-64	65+
Diseases of the Respiratory System	100	3.3	11.7	11.4	13.3	27.5	26.0	6.9
Diseases of the Circulatory System	100	0.2	0.6	2.9	10.7	35.5	37.8	12.5
Diseases of the Musculo-skeletal system & Connective tissue	100	0.8	7.2	14.2	18.9	27.6	24.8	7.0
Accidents, Poisoning and Violence	100	8.8	24.5	21.1	17.0	17.7	8.8	2.0
Symptoms and Ill-defined Conditions	100	2.1	11.0	16.5	19.2	27.5	18.6	4.8
Mental Disorder	100	0.4	10.6	19.4	20.7	30.8	15.0	3.1
Diseases of the Nervous System and Sense Organs	100	1.1	5.3	11.2	19.3	30.0	25.7	7.5
Diseases of the Digestive System	100	2.0	13.3	16.0	19.3	26.0	18.0	4.7
Infective and Parasitic Diseases	100	5.5	23.1	20.9	15.4	20.9	11.0	2.2
Diseases of the Skin & Subcutaneous Tissues	100	5.0	17.5	17.5	20.0	22.5	12.5	2.5
ALL CAUSES	100	2.5	10.3	13.1	16.3	28.0	23.3	6.5

Source: Social Security Statistics 1978, London: HMSO, Table 3.83.

In Table 6. 4c, which should be read horizontally, days of incapacity for each diagnostic category are analysed by age-groups. The under 30s account for 13 per cent of all days of incapacity but 33 per cent of all days lost due to accidents, poisonings and violence and 29 per cent of all days lost due to infective and parasitic diseases. These two disease categories are thus disproportionately important for the young of working age. The age-group 50-64 accounts for 51 per cent of all days of incapacity but for 73 per cent of days lost due to diseases of the circulatory system and 56 per cent of diseases of the nervous system and sense organs. These two diseases are thus disproportionately important towards the end of working life.

Diseases of the respiratory system account for more days of incapacity than any other category; the days of incapacity increase with age in much the same pattern as that of incapacity for all causes. An examination of specific diseases within this category shows, however, that not all of them have the same age-gradient. This is illustrated in Table 6.5 for two diseases.

Under 40 years influenza is the most important specific disease. This age-group experiences almost half of all the days of incapacity due to influenza. After 40 years, bronchitis (excluding acute bronchitis) is the major disease within this diagnostic category. Ninety per cent of days of certified incapacity due to bronchitis are experienced by males over 40 years of age (eighty per cent over 50 years).

Table 6.5

Diseases of the Respiratory System

Days of Certified Incapacity for Sickness and Invalidity in the Period 6th June 1977 to 3rd June 1978 Analysed by Age

Millions

Cause of Incapacity	All Ages	Under 20	20-29	30-39	40-49	50-59	60-64	65+
All diseases of the Respiratory System	52.0	1.7	6.1	5.9	6.9	14.3	13.5	3.6
Influenza	7.1	-	1.7	1.6	1.4	1.4	0.5	-
Bronchitis (excluding acute bronchitis)	25.0	0.2	0.9	1.3	2.7	8.3	9.2	2.4

Source: DHSS (1980a) Social Security Statistics, 1978. London HMSO. Table 3.83

The number of days of incapacity due to sickness and invalidity are the compound of two factors: the number of spells of incapacity and the average duration of each spell. An examination of spells of incapacity[3] by causes compared with days of incapacity shows the divergences in the average duration of spells of incapacity for the different disease categories. This is demonstrated in Table 6.6. This shows that for all ages 19 per cent of the days of incapacity but 34.5 per cent of the spells of incapacity are caused by diseases of the respiratory system; the average duration of spells for diseases in this category is much shorter than the average for all causes. The opposite is the case for diseases of the circulatory system which accounts for 17.5 per cent of all days of incapacity but only 3.5 per cent of spells of incapacity; the average duration of spells is thus longer than that for all causes. Other disease categories which have above average lengths of duration of incapacity are diseases of the musculo-skeletal system, mental disorders and diseases of the nervous system and sense organs while accidents, poisonings and violence, diseases of the digestive system, infective and parasitic diseases and diseases of the skin and subcutaneous tissue have below average durations of spells.

The relationship between days of incapacity and numbers of spells is not the same at all ages. This is shown by exmaining the age impact for accidents, poisonings and violence - for all ages the proportion of spells greatly exceeds the proportion of days of incapacity while for the age-group 20-29 the position is reversed: the proportion of days exceed the

Table 6.6

A Comparison of Spells of Incapacity and Days of Incapacity by Cause. Males 20-29 and 50-59. Great Britain 1977/78

Percentages

Diagnostic Category	All Ages		20-29		50-59	
	Days	Spells	Days	Spells	Days	Spells
Diseases of the Respiratory System	19.0	34.5	21.6	36.3	18.6	33.4
Diseases of the Circulatory System	17.5	3.5	1.1	0.6	22.2	7.6
Diseases of the Musculo-Skeletal System and Connective Tissues	13.1	9.6	9.2	6.4	12.9	12.6
Accidents, Poisonings & Violence	10.8	15.3	25.5	19.8	6.8	10.2
Symptoms and Ill-Defined Conditions	10.6	10.4	11.4	8.7	10.4	11.9
Mental Disorders	8.3	2.9	8.5	2.9	9.1	2.7
Diseases of the Nervous System and Sense Organs	6.8	3.0	3.5	2.2	7.3	3.4
Diseases of the Digestive System	5.5	6.7	7.1	6.9	5.1	6.4
Infective and Parasitic Diseases	3.5	9.7	7.5	12.4	2.5	6.7
Diseases of the Skin and Subcutaneous tissue	1.5	2.3	2.5	2.5	1.2	2.3
SUB TOTAL	96.4	97.9	97.9	98.6	96.1	97.3
ALL CAUSES	100	100	100	100	100	100

Source: DHSS (1980a) Social Security Statistics 1978 London HMSO. Compiled from Table 3.83 and 3.65

proportion of spells of incapacity. In the 50s spells once again greatly exceed days of incapacity. These divergencies do not indicate that the duration of spells of accidents, poisonings and violence are longer in the 20s than in the 50s, they merely reflect that the average duration of spells for all causes is much shorter in the 20s than in the 50s.

Wells (1981,p7) noted that in 1978/79 nearly 30 per cent of all male days of certified absence (equal to 84 million days) were due to hypertensive disease, ischaemic heart disease, chronic bronchitis and arthritis and rheumatism. In 1977/78 these four diagnoses accounted for 28.3 per cent of all days of certified absence and were equal to 77.3 million days. Wells postulated that:

> 'a significant proportion of these days are occurring in prolonged spells of absence some of which will not terminate before retirement age because fitness to carry out those tasks previously undertaken may never again be achieved.'
>
> Wells 1981 p. 6.

A study of invalidity statistics for 1977/78 (Table 6. 7) reveals that 37 per cent of all claimants of invalidity benefit (those absent from work for longer than 168 days) were incapacitated because of these four specific diseases.

This appears to support Wells' supposition that these diseases influence figures substantially because of the long duration of the spells of absence ascribed to them.

Table 6.7

Claimants of Invalidity Benefit Analysed by Selected Causes of Incapacity

Diagnoses	Claimants	Proportion of Claimants
	Thousands	Percentages
All causes	462	100.0
Hypertensive disease	21	4.5
Ischaemic heart disease	54	11.7
Bronchitis (excluding acute bronchitis)	53	11.5
Arthritis and rheumatism (excluding rheumatic fever)	43	9.3
SUB TOTAL	171	37.0

Source: DHSS (1980a) Social Security Statistics 1978 London HMSO. Table 4.40.

Further sub-analyses of causes of sickness absence are hindered by the paucity of data available. There are no published data by cause of incapacity relating to occupation[4], social class and marital status[5]. Figures are available by sex, thus a comparison with female rates would be possible but since approximately half of married women in 1977/78 exercised their right to opt out of the National Insurance Scheme this comparison would be of limited validity.

Causes of incapacity data are published for the Standard Regions but as these data are not standardised for age and occupation they are only of very limited relevance to this study. As one would expect, in all regions diseases of the respiratory system, circulatory system and musculo-skeletal system are the major causes of days and spells of certified incapacity. Amongst the regions there are variations; for example, in the North and North West, diseases of the respiratory system are the major cause of incapacity while in East Anglia and the South-West diseases of the circulatory system account for most days lost.

It is, however, generally acknowledged that regional differences in levels of sickness absence exist. Wells (1981) points out it might be appropriate to link regional differences to industrial structure since:

> 'those parts of the country experiencing higher than average incapacity rates tend to have a greater concentration of industries in which absence levels are raised.'
>
> Wells 1981 p.4.

This supposition is counteracted by Taylor's (1979) findings in a study of Post Office employees which showed regional disparities even though his sample was standardised for age and occupation. Thus it might be concluded that there are other underlying factors influencing sickness absence. Whitehead (1971) came to a similar conclusion in his study of trends in certification of sickness absence:

> 'Regions with high levels of sickness absence are characterised as regions with higher than average mortality rates, higher than average unemployment rates and lower than national average earnings and as regions tending to lose rather than gain population by migration. Regional analyses more than any other suggest that levels of incapacity are closely related to levels of standards of living.'
>
> Whitehead 1971 p. 20.

A major problem in an analysis of sickness absence statistics is that since 1973/4 no figures have been available to show the number of persons covered by sickness/invalidity benefit insurance. If the population 15-64 years is used as a proxy, this denominator, as was pointed out by Wells (1981 p. 4) will lead to an over-statement of crude rates because some six per cent of all claims are attributable to persons older than the official retirement age. If analyses were restricted to the 15-64 years age range of this study there would be an understatement of rates as population figures include those not in the work-force and/or those men not entitled to sickness benefit.

Relevant to the discussion of absence from work due to incapacity are those absences caused by industrial injury. Industrial injury benefit is paid the first 26 weeks of

incapacity resulting from industrial accidents and prescribed diseases. In the statistical year 1977/78 industrial accidents were responsible for 499 thousand new spells and 13.2 million days of certified incapacity. (Figures refer to Great Britain and also include data for males over 65 years; these account for a very small proportion of spells and days of certified incapacity).

When analysed by industry it is not surprising that mining and quarrying and construction industries have the highest rates of incapacity for which industrial benefit is paid. These two groups combined account for 27 per cent of spells and 34 per cent of days of certified incapacity. Males in the mining and quarrying indistry experienced 71 thousand spells and lost two million working days, whilst men in the construction industries experienced 65 thousand spells and lost 1.8 million working days.

Prescribed diseases accounted for eight thousand new spells of certified incapacity and 0.3 million days of certified incapacity. The major cause of incapacity was 'non-infective dermatitis of external origin' which accounted for five thousand spells and 0.2 million lost working days.

Industrial injury benefit is not payable for pneumoconiosis, byssinosis or occupational deafness. These are compensated by industrial disablement benefit payable from the date of development of the disease. This benefit is payable for a disablement due to an industrial injury or disease and normally follows a period

of injury benefit. The basic benefit depends on a medical assessment of the degree of disablement due to the injury or disease which is expressed as a percentage of loss of faculty. With the exception of pneumoconiosis and byssinosis, disablement benefit is paid as a lump sum gratuity in respect of loss of faculty of less than 20 per cent and as a pension in respect of a 20 per cent or greater loss of faculty.

Use of Hospital Beds by Males aged 15-64 years

Hospital inpatient tratment at any time is received by less than two in 1000 of this age-group but the use of hospital beds justifies a fairly extensive discussion as the cost of this treatment is high and the great majority of the staff employed in the NHS are working in hospitals.

The annual Hospital In-patient Enquiry statistics contains tables analysing the use of hospital beds by sex, age and disease. On the basis of these tables summarised in Table 6. 8 it is possible to examine the use of beds from three perspectives:

(1) Average number of beds used per 10,000 population (Table 6.9)

(2) The average number of beds used by each age-group analysed by disease groups (diagnostic groups). (Table 6. 10)

(3) The average number of beds used for each diagnostic category analysed by age-groups. (Table 6. 11).

The analysis of hospital beds related to population size shows that for the five decades of working age the use of beds declines slightly between 15-24 years and 25-34 years but thereafter increases rapidly with age. At age 15-24 about one in 1000 men are in hospital while for men aged 55-64 this proportion is four in a 1000. For eight of the ten diagnostic categories, which account for at least 79 per cent of the use of hospital beds for each decade of working age, the use of

Table 6.8 Average Number of Beds in Daily Use by Males - analysed by Age and Selected Diagnostic Categories, England and Wales 1977

Diagnostic Categories	0 - 14	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	15 - 64	65 +	All Males
Diseases of the Peripheral Circulatory System	14	34	111	206	527	1271	2149	6110	8274
Symptoms and Ill-Defined Conditions	888	354	364	387	609	936	2650	3303	6842
Rheumatic Fever, Hypertensive Disease and Heart Disease	17	27	65	272	895	1521	2780	3704	6501
All Malignant Neoplasms	46	33	79	167	594	1419	2292	3902	6239
Diseases of the Respiratory System	1043	210	171	168	323	757	1629	3202	5873
Diseases of the Digestive System	507	418	456	550	816	1149	3389	1843	5740
Fractures, Dislocations and Sprains	464	1026	472	419	325	401	2643	1134	4241
Diseases of the Nervous System	210	131	94	317	341	790	1673	2072	3953
Diseases of the Musculo-Skeletal System and Connective Tissue	302	274	401	470	478	568	2191	1112	3605
Other Injuries and Reactions	599	607	373	231	259	243	1713	420	2732
SUB-TOTAL	4090	3114	2586	3187	5167	9055	23109	26802	54000
Others	3331	694	680	647	987	1681	4689	5068	13090
All Causes	7421	3808	3266	3834	6154	10736	27798	31870	67090

Source: DHSS et al (1980), Hospital In-Patient Enquiry 1977. London H.M.S.O. Table 9b

Table 6.9 Average Number of Beds in Daily Use per 10,000 Males - Analysed by Age and Selected Diagnostic Categories. England and Wales 1977

Diagnostic Category	0 - 14	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	15 - 64	65+	All Males
Diseases of Peripheral Circulatory System	0.02	0.09	0.3	0.7	1.8	4.8	1.4	21.9	3.5
Symptoms and Ill-Defined Conditions	1.6	1.0	1.0	1.4	2.1	3.5	1.7	11.9	2.9
Rheumatic Fever, Hypertensive Disease and Heart Disease	0.03	0.1	0.2	1.0	3.1	5.7	1.8	13.3	2.7
All Malignant Neoplasms	0.08	0.09	0.2	0.6	2.1	5.3	1.5	14.0	2.6
Diseases of the Respiratory System	1.9	0.6	0.5	0.6	1.1	2.9	1.1	11.5	2.5
Diseases of the Digestive System	0.9	1.1	1.3	1.9	2.8	4.3	2.2	6.6	2.4
Fractures, Dislocations and Sprains	0.8	2.8	1.3	1.5	1.1	1.5	1.7	4.1	1.8
Diseases of the Nervous System	0.4	0.4	0.3	1.1	1.2	3.0	1.1	7.4	1.6
Diseases of the Musculo-Skeletal System and Connective Tissue	0.5	0.7	1.1	1.7	1.7	2.1	1.4	4.0	1.5
Other Injuries and Reactions	1.1	1.7	1.1	0.8	0.9	0.9	1.1	1.5	1.1
SUB-TOTAL	7.33	8.6	7.3	11.3	17.9	34.0	15.0	96.2	22.6
Others	5.97	1.8	2.0	2.3	3.5	6.4	2.9	18.2	5.4
All Causes	13.3	10.4	9.3	13.6	21.4	40.4	17.9	114.4	28.0

Source: DHSS et al (1980), Hospital In-Patient Enquiry 1977. London H.M.S.O. Table 9b and Appendix E.

Table 6.10 Average Number of Beds in Daily Use by Males - Analysed by Age and Selected Diagnostic Categories. (Percentages of Age-Groups) England and Wales 1977

Diagnostic Categories	0 - 14	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	15 - 64	65+	All Males
Diseases of the Peripheral Circulatory System	0.2	0.9	3.4	5.4	8.6	11.8	7.7	19.2	12.3
Symptoms and iII-Defined Conditions	12.0	9.3	11.2	10.1	9.9	8.7	9.5	10.4	10.2
Rheumatic Fever, Hypertensive Disease and Heart Disease	0.2	0.7	2.0	7.1	14.5	14.2	10.0	11.6	9.7
All Malignant Neoplasms	0.6	0.9	2.4	4.4	9.7	13.2	8.2	12.2	9.3
Diseases of the Respiratory System	14.1	5.5	5.2	4.4	5.3	7.1	5.9	10.1	8.8
Diseases of the Digestive System	6.8	11.0	14.0	14.3	13.3	10.7	12.2	5.8	8.6
Fractures, Dislocations and Sprains	6.3	26.9	14.5	10.9	5.3	3.7	9.5	3.6	6.3
Diseases of the Nervous System	2.8	3.4	2.9	8.3	5.5	7.4	6.0	6.5	5.9
Diseases of the Musculo-Skeletal System and connective Tissue	4.1	7.2	12.3	12.3	7.8	5.3	7.9	3.5	5.4
Other Injuries and Reactions	8.1	15.9	11.4	6.0	4.2	2.3	6.2	1.3	4.1
SUB-TOTAL	55.1	81.7	79.3	83.2	84.1	84.4	83.1	84.2	80.6
Others	44.9	18.3	20.7	16.8	15.9	15.6	16.9	15.8	19.4
All Causes	100	100	100	100	100	100	100	100	100

Source: DHSS et al (1980), Hospital In-Patient Enquiry 1977: London H.M.S.O. Table 9b

Table 6. 11 Average Number of Beds in Daily Use by Males - Analysed by Age and Selected Diagnostic Categories (Percentages of Diagnostic Categories) England and Wales 1977

Diagnostic Categories	0-14	15.24	25-34	35-44	45-54	55-64	15-64	65+	All Males
Diseases of the peripheral circulatory system	0.2	0.4	1.3	2.5	6.4	15.4	26.0	73.8	100
Symptoms and ill-defined conditions	13.0	5.2	5.3	5.7	8.9	13.7	38.7	48.3	100
Rheumatic fever,hypertensive disease and heart disease	0.3	0.4	1.0	4.2	13.8	23.4	42.8	57.0	100
All malignant neoplasms	0.7	0.5	1.3	2.5	9.5	22.7	36.7	62.5	100
Diseases of the respiratory system	17.8	3.6	2.9	2.9	5.5	12.9	27.7	54.5	100
Diseases of the digestive system	8.8	7.3	7.9	9.6	14.2	20.0	59.0	32.1	100
Fractures, dislocations and sprains	10.9	24.2	11.1	9.9	7.7	9.5	62.3	26.7	100
Diseases of the nervous system	5.3	3.3	2.4	8.0	8.6	20.0	42.3	52.4	100
Diseases of the musculo-skeletal system and connective tissue	8.4	7.6	11.1	13.0	13.3	15.8	60.8	30.8	100
Other injuries and reactions	21.9	22.2	13.7	8.5	9.5	8.9	62.7	15.4	100
ALL CAUSES	11.1	5.7 (13.7)	4.9 (11.8)	5.7 (13.8)	9.2 (22.1)	16.0 (38.6)	41.4 (100)	47.5	100

Source: DHSS et al. (1980) Hospital In-Patient Enquiry 1977, London HMSO Table 9b

beds increases with age. The two exceptions are:'fractures, dislocations and sprains' (fractures) and 'other injuries and reactions' (injuries). In the youngest decade 45 per 100,000 population are in hospital on account of some injury; the corresponding rate for the oldest decade is 24. For other diagnostic categories the position is quite reversed thus for 'malignant neoplasms' one per 100,000 aged 15-24 but 53 aged 55-64 are in hospital. The increase for 'diseases of the peripheral circulatory system' (circulatory diseases) and for 'rheumatic fever, hypertension and heart disease' (heart disease) are of the same magnitude. For a third group of diagnostic categories; 'diseases of the respiratory system' (respiratory diseases), 'digestive system' (digestive diseases), 'nervous system' (nervous system diseases) and of the 'musculo-skeletal system and connective tissue' (musculo-skeletal diseases) hospitalisation increases with age but to a lesser extent.

An examination of the use of hospital beds by age-groups shows that for those aged 15-24 'fractures' and 'injuries' account for more than two-fifths of all hospitalisation while the proportion of beds used for circulatory disease and heart disease and 'neoplasms' is quite minimal. These latter three diagnostic categories increase steadily and rapidly with age and in the last decade of working age account for about two-fifths of all beds used while at that age the proportion of beds used for 'fractures' and 'injuries' has declined to a mere six per cent.

In considering the meaning and relevance of these proportions a point made previously must be recalled: the

percentages in each group are dependent on each other; a specific percentage may be high because another is low and vice versa. Thus while examining the use of hospital beds by age-group the predominant characteristic is the large proportion of beds used for 'fractures' and 'injuries' by the 15-24 year age-group and the low proportion of beds used for these conditions by the 55-64 year age group; the relative proportions - 43 per cent and six per cent - differ by a factor of seven. However, as has already been noted above, the use of hospital beds for 'fractures' and 'injuries' - 45 and 24 - per 100,000 populations for these two age-groups, differs by only a factor of two.

A similar apparent discrepancy arises in the case of 'digestive diseases'. They account for about 11 per cent of beds used by both the 15-24 and the 55-64 year age-groups and a slightly higher proportion in the three intervening decades. Yet when considering the use of beds per 100,000 populations these diseases showed a marked increase with age from 11 for the 15-24 years to 43 for the 55-64s. The use of beds for respiratory diseases and musculo-skeletal diseases have similar characteristics.

Similarly to the findings in the discussion of sickness absence statistics some diagnostic groups have an apparently consistent pattern for all age-groups but these broad categories mask specific diseases which vary in importance at different ages. For example within the 'digestive diseases' category the number of beds used for 'hernia (with or without obstruction)'

rises from 9 per cent for 15-24s to 23 per cent for 35-44s and 35 per cent for males aged 55-64 years.

The distribution of hospital beds occupied by patients of various ages receiving treatment for specific diseases is of course influenced by the age structure of the population. The over 65s occupy almost half of all beds occupied by males while those aged 15-64 occupy just over two-fifths. After the age of 25 the use of hospital beds increases with age. Less than five per cent are used by the age-group 25-34 years while 16 per cent are used by the 55-64 age group. Thus almost two-fifths of all beds used by males of working age are used by males in the last decade of that age span. This is shown clearly in Table 6:12.

Table 6.12

Average Number of Beds in Daily Use. Analysed by Age-Groups (Males)

Percentages

	0-14 years	15-64 years	65 yrs & over	All men
(a)	11.1	41.4	47.5	100

	15-24	25-34	35-44	45-54	55-64	15-64	All Men
(b)	5.7	4.9	5.7	9.2	16.0	41.1	100
	13.7	11.8	13.8	22.1	38.6	100	

Source: DHSS et al. (1980) Hospital In-Patient Enquiry 1977: London : HMSO. Compiled from Table 9b.

For four diagnostic categories: 'fractures', 'injuries', 'musculo-skeletal diseases' and 'digestive diseases' about three-fifths of all beds are occupied by men of working age, for the other diagnostic groups the proportion is substantially less.

These other groups are mainly diseases markedly predominating in old age. The only diagnostic categories for which children occupy more than a tenth of all beds are: 'ill-defined conditions', 'respiratory diseases', 'fractures' and 'injuries'. The average use of hospital beds for the various diagnostic categories by each age-group is determined by two factors: the mean duration of stay (MDS) and the discharge rate (DR) - per 10,000 males of a particular age (spells of hospitalisation). Identical bed usage in respect of two diagnostic groups by one age-group may thus be the result of one having a low MDS and a high DR and the other having the opposite characteristics.

The mean duration of stay for all causes of hospitalisation increases markedly with age. It was 6.8 days for the age-group 20-24 and 13.7 days - twice as long - for the age group 60-64 years. (See Table 6.13). For all diagnostic categories the MDS increases with age - it is at least double for the 60-64s than it is for the 20-24s for four categories and about half as great again for the other six. The longer MDS may be due to a number of factors. First the healing process for older men may take longer than for younger men. Second, the domestic circumstances of older men - widowers or single men living on their own - may make it necessary to keep them in hospital for longer than would otherwise be necessary. Third, the disease pattern within diagnostic categories may not be the same for different age-groups and older men may suffer more than younger men from diseases which require longer periods of spells in hospital.

Table 6. 13 Male Hospital In-Patients, Selected Diagnostic Categories: Mean Duration of Stay. England and Wales, 1977

Days

Diagnostic Categories	0 - 4	10-14	20-24	30-34	40-44	50-54	60-64	70-74	All males
Diseases of the peripheral circulatory system	6.6	7.3	5.1	7.5	9.2	12.7	20.0	34.3	26.4
Symptoms and ill-defined conditions	5.1	5.2	6.0	5.8	6.2	8.2	10.3	14.5	9.7
Rheumatic fever, hypertensive disease and heart disease	8.2	8.9	9.6	8.8	10.4	11.4	13.2	13.6	15.0
All malignant neoplasms	8.3	14.4	9.4	11.7	14.4	14.1	13.2	16.0	14.9
Diseases of the respiratory system	5.4	5.1	5.7	5.7	6.3	9.7	14.2	17.3	10.0
Diseases of the digestive system	4.4	5.0	5.4	6.5	7.7	8.4	10.0	12.3	8.2
Fractures, dislocations and sprains	11.2	6.7	12.9	11.9	14.3	13.3	18.7	27.4	15.1
Diseases of the nervous system	12.1	7.2	14.6	9.2	43.8	30.1	47.0	48.1	32.9
Diseases of the musculo-sketetal system and connective tissues	13.7	21.5	9.6	11.3	12.5	13.2	14.0	19.8	14.8
Other injuries and reactions	3.2	3.6	3.9	5.0	5.1	7.4	8.1	13.0	4.9
ALL CAUSES	6.2	5.7	6.8	7.2	9.6	10.8	13.7	18.3	11.8

Source: DHSS et al. (1980) Hospital In-Patient Enquiry 1977, London HMSO. Table 9b.

Table 6.14 Selected Diagnostic Categories. Examples of the importance of specific diseases for the age-groups 20-24 and 60-64 years. Analysed by Average Number of Beds in Daily Use, Mean Duration of Stay and Discharge Rates per 10,000 population (Males).

	Males 20 - 24			Males 60 - 64		
	ABD	M.D.S.	DR/10,000	ABD	M.D.S.	DR/10,000
DISEASES OF THE DIGESTIVE SYSTEM	215	5.4	82.9	593	10.0	172.4
Appendicitis	76	6.6	23.8	23	10.8	6.1
Hernia (with or without obstruction)	28	6.0	9.7	212	7.9	78.4
DISEASES OF THE PERIPHERAL CIRCULATORY SYSTEM	18	5.1	7.1	755	20.0	109.3
Cerebro-Vascular Disease	3	7.3	0.8	457	30.1	44.0
Varicose Veins of lower extremities	7	4.5	3.2	25	7.2	10.0
DISEASES OF THE RESPIRATORY SYSTEM	104	5.7	37.5	476	14.2	97.5
Pneumonia	5	7.8	1.4	83	15.7	15.3
Bronchitis and Emphysema	1	-	-	200	20.2	28.8
Asthma	12	6.1	4.2	30	11.8	7.5
Hypertrophy of Tonsils and Adenoids	19	5.2	7.5	2	-	-
DISEASES OF MUSCULO-SKELETAL SYSTEM AND CONNECTIVE TISSUE	148	9.6	32.1	290	14.0	60.1
Arthritis and Spondylitis	9	-	-	190	18.0	30.5
Rheumatoid Arthritis and allied conditions	4	-	-	47	16.9	8.0
Osteo-Arthritis and allied conditions	1	-	-	131	18.1	21.1
Internal Derangement of joints	63	8.8	14.7	6	7.1	2.4
Displacement of Intra-vertebral Discs	21	18.4	2.4	20	15.9	3.7

Notes: ABD = Average Number of Beds in Daily Use

MDS = Mean Duration of Stay

DR/10,000 = Discharge rates per 10,000 population

Source: DHSS et al (1980), Hospital In-Patient Enquiry 1977. London H.M.S.O. Table 9b

The ten diagnostic categories each contain diseases which utilise beds in different ways and are differently related to the patient's age. This is illustrated in Table 6. 14 which shows the major specific diseases within selected diagnostic groups at age 20-24 and 60-64 years. They show wide variation in bed usage, mean duration of stay and discharge rates. Thus for digestive diseases appendicitis is the disease of the young and hernia the disease of the old. Appendicitis patients, aged 20-24 years occupy more than a third of the beds occupied by this age-group, but such patients aged 60-64 years occupy only four per cent of beds occupied by their age-group. The discharge rate for the younger age-group is four times as high as that for the older group and the effect of this on bed usage is only partly offset by the average stay in hospital of the older age-group being half as long again as that of the younger age-group. The position in respect of hernia is quite different. Only 12 per cent of beds occupied by patients aged 20-24 years in the diagnostic category are occupied by hernia cases while the corresponding proportion for the 60-64 year age-group is about 35 per cent. The discharge rate for the older age-group is 78 per 10,000, more than eight times in excess of that for the younger age-group. Similarly amongst respiratory diseases bronchitis is a disease of the old with virtually no hospital patients in the younger age-group.

An examination of discharge rates shows that there are slightly in excess of five hospital spells per 100 men aged 20-24 years but 13 spells per 100 for the 60-64 age-group (see Table 6. 15). The discharge rate for men in the early 30s

Table 6.15 Selected Diagnostic Categories. Discharge Rates per 10,000 population (Males). England and Wales 1977

Diagnostic Categories	0 - 4	10 - 14	20 - 24	30 - 34	40 - 44	50 - 54	60 - 64	70 - 74	All Males
Diseases of the Peripheral Circulatory System	1.5	1.5	7.1	19.8	35.7	66.5	109.3	182.1	47.1
Symptoms and Ill-Defined Conditions	218.4	69.8	62.7	63.9	80.1	106.6	143.0	221.8	107.3
Rheumatic Fever, Hypertensive Disease and Heart Disease	2.0	1.3	3.3	10.6	45.7	115.5	188.7	254.5	66.0
All Malignant Neoplasms	2.7	2.4	3.9	8.2	20.7	70.4	183.8	326.7	63.6
Diseases of the Respiratory System	228.3	58.7	37.5	31.0	34.2	53.2	97.5	197.4	89.2
Diseases of the Digestive System	80.9	71.6	82.9	77.3	101.5	131.4	172.4	196.3	106.1
Fractures, Dislocations and Sprains	20.1	44.0	64.3	39.4	31.3	31.3	30.1	37.0	42.7
Diseases of the Musculo-Skeletal System and Connective Tissue	9.1	13.0	32.1	40.6	50.5	47.9	60.1	59.1	37.2
Other Injuries and Reactions	168.9	91.5	131.9	81.4	60.5	48.9	43.5	40.1	84.8
SUB-TOTAL	747.5	364.0	434.4	383.3	474.6	689.3	1058.0	1568.6	662.3
Others	676.1	145.5	97.0	100.9	101.7	134.6	231.4	374.4	201.6
All Causes	1423.6	509.5	531.4	484.2	576.3	823.9	1289.3	1943.0	863.9

Source: DHSS et al (1980), Hospital In-Patient Enquiry 1977, London H.M.S.O. Table 9b

is somewhat lower than that for men in the early 20s but thereafter increases with age at an accelerating rate. For 'fractures' the rate is highest at age 20-24 years and declines by more than half by the age of 60-64 years. For 'injuries' the rate is also highest in the early 20s but is two-thirds less in the early 60s. For all other diagnostic categories the discharge rate increases with age though the rate of increase for different diagnostic categories differs greatly. In general the increase in discharge rates with increasing age is more rapid than the increase in the mean duration of stay.

An analysis of the various tables makes it possible to classify diseases which account for substantial use of hospital beds into three groups: those with a high discharge rate, those with relatively long durations of stay and those which have both these characteristics. This is done in Table 6. 16 which shows for each of the five decades of working age:

1. The diagnostic category with the highest percentage of beds in daily use;
2. the category with the longest mean duration of stay;
3. the category with the highest discharge rate.

This shows that for all age-groups the diagnostic categories which have the longest mean duration of stay have relatively low discharge rates and vice versa.

Both mean duration of stay and discharge rates for every disease are closely related to the number of hospital beds per 10,000 population. As this differs markedly between the 14

Table 6.16 Male Hospital In-Patients: maximum average beds in daily use, mean duration of stay and discharge rates analysed by diagnostic categories for five age-groups. England and Wales 1977

	ABD %	M.D.S. Days	D.R/10,000
Age-group 15 - 24 yrs			
1. Fractures, Dislocations and Sprains	26.9	12.9	64.3
2. Diseases of the Nervous System	3.4	14.6	8.7
3. Other Injuries and Reactions	15.9	3.9	131.9
Age-group 25 - 34 yrs			
1. Fractures,Dislocations and Sprains	14.5	11.9	39.4
2. Fractures,Dislocations and Sprains	14.5	11.9	39.4
3. Other Injuries and Reactions	11.4	5.0	81.4
Age-group 35 - 44 yrs			
1. Diseases of Digestive System	14.3	7.7	101.5
2. Diseases of the Nervous System	8.3	43.8	14.4
3. Diseases of the Digestive System	14.3	7.7	101.5
Age-group 45 - 54 yrs			
1. Rheumatic Fever,Hypertensive Disease and Heart Disease	14.5	11.4	111.5
2. Diseasesof the Nervous System	5.5	30.1	17.6
3. Diseases of the Digestive System	13.3	8.4	131.4
Age-group 55 - 64 yrs			
1. Rheumatic Fever, Hypertensive Disease and Heart Disease	14.2	13.2	188.7
2. Diseases of the Nervous System	7.4	47.0	29.6
3. Rheumatic Fever, Hypertensive Disease and Heart Disease	14.2	13.2	188.7

Notes: ABD = Average number of beds in daily use - figures relate to 10yr periods. Percentages of all beds in daily use

MDS = Mean Duration of Stay. Figures refer to last 5yrs of 10 year span under examination

DR/10,000 = Discharge Rate per 10,000 population. Figures refer to last 5 years of 10 year age-span under examination

Source: DHSS et al (1980),Hospital In-Patient Enquiry 1977, London: H.M.S.O: Table 9b

Regional Health Authorities in England and Wales and even more between the 200 District Health Authorities[6] it is interesting to examine the extent to which R.H.A.s with low bed population ratios have low mean durations of stay and low discharge rates for the various diagnostic categories.

It would appear from table 6. 17 that mean duration of stay and discharge rates per 10,000 population for selected diagnostic groups are influenced by the number of beds available. In 1977 Yorkshire had an allocation of 8.2 beds per 1000 population whereas Oxford had 6.4 per 1000. (The rate for England was 8.2 per 1000). It is interesting to compare these two regions; Yorkshire's bed population ratio being equal to the average for England, and Oxford being a region with a low bed population ratio.

Table 6. 17

A comparison of mean duration of stay and discharge rates per 10,000 population for selected diagnoses. Yorkshire & Oxford Regional Health Authorities 1977

Diagnostic Group	Yorkshire		Oxford	
	M.D.S.	DR/10,000	M.D.S.	DR/10,000
All Causes	14.4	984.5	10.2	868.6
All malignant neoplasms	16.8	69.6	14.0	58.4
Rheumatic fever, hypertensive disease and heart disease	18.6	67.4	16.2	42.7
Diseases of the peripheral circulatory system	40.3	5.3	23.5	42.1
Diseases of the respiratory system	10.0	91.1	9.0	75.0
Diseases of the digestive system	9.5	102.1	7.5	96.4
Fractures, dislocations and sprains	19.9	42.1	14.1	35.8
Other injuries & reactions	4.6	88.2	4.3	77.7
Symptoms & ill-defined conditions.	12.1	101.8	9.3	91.2

Source: DHSS et al (1980), Hospital In-patient Enquiry 1977 London : HMSO, Table 9b.

Yorkshire has a higher mean duration of stay and higher discharge rates per 10,000 population for every diagnostic category. Even though no account has been taken of age and sex composition of these two regions it seems to be the case that without exception for all disease categories the number of spells in hospital per 10,000 population as well as the mean duration of stay increases with the number of beds available.

The average number of beds in daily use by men aged 15-64 years is slightly smaller than that used for females of this age. This difference is partly explained by differences in the age structure of the sexes and partly by this age-span including women of child-bearing age. Though maternity beds are not included in the average beds in daily use figures, beds used for diseases of the genital system and conditions of pregnancy, childbirth and puerperium accounted for one in seven beds used by women of this age-group. At these ages the mean duration of stay of men tends to be longer than that of women while women up to the age of 45 experience more hospital spells. It is only in the last decade of this age-span that males occupy a larger number of beds in daily use. The decade 55-64 accounts for 39 per cent of beds used by males and 33 per cent used by females 15-64 years.

A comparison of use of beds by males and females 55-64 years (Table 6. 18) reveals that whereas diseases of the circulatory system account for approximately 25 per cent of beds used by males and double the amount used for males with

malignant neoplasms, for females diseases of the circulatory system account for only 17.5 per cent, slightly exceeding malignant neoplasms which account for 15 per cent of beds used. Within this category of malignant neoplasms there are differences in the relative importance of sites of neoplasms between the sexes. For males 32 per cent of beds, the largest proportion, are used for cancer of the trachea, bronchus and lung. In contrast, for females only 10 per cent of beds are used for this form of cancer, the largest proportion being used for cancer of the breast (20 per cent).

Table 6. 18

A comparison of the use of beds by males and females aged 55-64 years. England and Wales, 1977

Diagnosis	Males		Females	
	ABD	%	ABD	%
All Causes	10,736	100	9,732	100
All malignant neoplasms	1,419	13.2	1,466	15.1
Rheumatic fever, hypertensive disease and heart disease	1,521	14.2	736	7.6
Diseases of the peripheral circulatory system	1,271	11.8	964	9.9
Diseases of the respiratory system	757	7.1	480	4.9
Diseases of the digestive system	1,149	10.7	832	8.6
Diseases of the musculo-skeletal system	568	5.3	883	9.1
Symptoms and ill-defined conditions.	936	8.7	927	9.5

Source: DHSS et al (1980) Hospital In-patient Enquiry 1977, London : HMSO, Table 9b.

Women use a smaller proportion of beds for diseases of the respiratory and digestive systems than men (4.9 and 8.6 per cent compared with 7.1 and 10.7 per cent respectively). In contrast, nine per cent of beds used by females in this age-group are used for diseases of the musculo-skeletal system compared to only five

per cent for males.

For both sexes the number of beds used for symptoms and ill-defined conditions is approximately the same.

Every three years an analysis is made of hospital in-patients by age, sex and marital status. Figures below refer to the 1978 Hospital In-Patient Enquiry (DHSS et al 1981).

The data contained in the Hospital In-Patient Enquiry shows that both discharge rates (spells of hospitalisation) and mean duration of stay (average length of spell) vary widely between men of different marital status. The published figures differentiate only between those who are married and others. The 'others' thus include all never-married, divorced and widowed. The proportion of others is least for the 25-34s and thereafter increases with age.

At all ages after 20 years the mean duration of stay of married men is less than that of other men. The different length of average hospital spells tends to increase with age both in number of days and proportionally. As can be seen from Table 6. 19 it is less than one day for the three age-groups between 20-45 and at these ages does not exceed 16 per cent. The difference does , however, increase quite markedly for the 45-64s. At these ages it is four and a half days or 41 per cent. For that half of all hospital patients who are above the minimum retirement age the difference in average stay is an even larger proportion.

The average discharge rate per 1000 men is also decidedly lower for married than for other men. In the early 20s the difference is just over a third. It is about two-thirds for the 25-34s, exceeds three-quarters for the 35-44s and drops to just over half for the 45-64s. The combined effect of lower discharge rates and lower mean duration of stay for married than for other men on the average number of beds in daily use is quite considerable. If never-married, divorced and widowed men aged 45-64 had the same discharge and mean stay rates as married men they would have required, assuming everything else had remained the same, only 2,000 beds instead of the 4,500 they used in 1978. If all other men aged 20-64 had had the same discharge and stay rates as married men the beds used by them on the same assumption, would have been 4,000 rather than 8,000 and the aggregate number of beds used by men of all conjugal conditions of that age would have declined from 25 to 21 thousands, a reduction of about 16 per cent.

The reasons why the never-married, divorced and widowed have more hospital spells and stay in hospital longer are partly social and partly medical. By social is meant that men of these conjugal statuses are taken into hospital in clinical conditions when married men would not be taken and that men of these statuses are kept in hospital longer than married men in the same clinical condition. Medical refers to never-married, divorced and widowed men being more prone to contract diseases which require hospital treatment and to suffer diseases or disease conditions which require on average longer spells of hospitalisation.

The relative importance of the two reasons can not be ascertained with any degree of certainty but three factors are likely to contribute to the comparatively excessive use of hospital beds by men who are not married. First they are less likely to have somebody - wives or children - to care for and nurse them at home; second the less fit tend to marry less frequently than those who enjoy good health and third the not-married men may have life-styles which are less healthy - they may smoke and drink more and have less regular and wholesome meals.

Table 6. 19

Mean Duration of Stay, Discharge Rates and Average Number of Beds in Daily Use, Males analysed by Marital Status and Age, England and Wales, 1978

	All ages	20-24	25-34	35-44	45-64	65-74	75+
Mean duration of stay							
Married - days	12.2	6.2	6.4	8.0	10.9	15.2	20.9
Other - days	11.2	6.8	7.4	8.9	15.4	22.2	32.2
Discharge rate per 1000 population							
Married	83	43	42	49	86	157	244
Others	91	58	68	86	133	219	330
Average Number of Beds used daily							
000s							
Married	34.4	0.4	1.9	2.6	12.1	10.3	7.1
Others	32.4	1.4	1.2	0.9	4.5	5.4	10.0

Note: Includes all NHS Hospital beds except maternity, psychiatric, convalescent, private.

Source: DHSS et al (1981) Hospital In-patient Enquiry 1978 London: HMSO.

This pattern of shorter duration of stay for married men is evident for most of the major diagnostic groups. There are only two exceptions: married men aged 35-44 year have a slightly longer mean duration of stay than 'others' for musculo-skeletal diseases and married males aged 20-24 for respiratory diseases.

With one exception, namely musculo-skeletal diseases, discharge rates per 10,000 population for most diagnostic groups are also higher for 'others' than for married men. After the age of 25 rates are considerably higher for 'others' for symptoms and ill-defined conditions and digestive diseases.

Further analyses of use of hospital beds by diagnostic group is restricted by lack of data. There are no analyses by occupation and social class and although an analysis by region and diagnostic group is published this does not cover age and sex.

Hitherto attention has concentrated on the use of beds in non-psychiatric hospitals which in 1977 accounted for almost two-thirds of hospital beds available in Great Britain. (CSO 1980 p. 86). The use of psychiatric beds is discussed annually in 'In-patient Statistics from the Mental Health Enquiry for England' (DHSS 1980b). Since 1973 figures have been produced separately for Wales. Data is not presented in the form of average number of beds in daily use but of admission and discharge rates. 'Mental illness' hospitals and units are distinguished from 'mental handicap' hospitals and units.

In 1977 males 15-64 years accounted for 81 per cent of all male admissions to mental illness hospitals and units, but for only 57 per cent of admissions to mental handicap hospitals and units. Discharge and death rates per 10,000 population are relatively small (see Table 6. 20) compared to those for males in non-psychiatric hospitals. The total discharge rates for all men is 32 per 10,000 in mental illness hospitals and units and 4.1 per 10,000 in mental handicap hospitals and units compared with 863 per 10,000 in non-psychiatric hospitals and units. In the context of this study figures are too small to justify an analysis by age and diagnostic group. This difference in discharge rates is largely explained by the longer mean duration of stay in psychiatric hospitals.

Table 6. 20

Mental Illness and Mental Handicap Hospitals and Units. England 1977. Discharges and Deaths by Age. Rates per 10,000 Males.

	All ages	15-19	20-24	25-34	35-44	45-54	55-64
Mental Illness	32	14	38	47	47	42	37
Mental Handicap	4	10	7	3	2	2	2

Source: DHSS (1980b). Inpatient Statistics from the Mental Health Enquiry for England, 1977. London : HMSO, Table A3.1 p. 16 and Table B6.1

In non-psychiatric hospitals duration of stay is measured in days; in psychiatric hospitals it is measured in months. In 1977 in mental illness hospitals and units only 57 per cent of all male discharges and deaths occurred within a month, 27 per cent between one and three months and ten per cent between three months to one year. (DHSS 1980b. Table A4.1). In mental handicap hospitals and units (DHSS 1980b Table B7.1) 74 per

cent occurred in under three months, six per cent between three months and a year, and 14 per cent had been resident for over five years.

These long durations of stay are also emphasised in Table 6. 21 which shows the number of resident patients at 31st December, 1977 in mental illness and mental handicap hospitals and units.

Table 6. 21

Mental Illness and Mental Handicap Hospitals and Units. Male Resident Patients by Age and Duration of Stay at 31st December, 1977

	Residents all ages		Residents aged 15-64 years
	000s	More than 5 years %	000s
Mental Illness	35	51	22
Mental Handicap	26	77	21

Source: DHSS (1980b) In-Patient Statistics from the Mental Health Enquiry for England 1977, London : HMSO. Tables A24.2, B20.2, B21.2.

Approximately half of all males in mental illness hospitals and units had been there for over five years and in mental handicap hospitals and units over three quarters of all males had been there for over five years. Men of working age occupy a larger proportion of all accommodation (beds or residents) in psychiatric hospitals than in other hospitals - mental illness hospitals and units 63 per cent, mental handicap hospitals and units 81 per cent but only 41 per cent in other hosptials.

Dental Health

Dental services differ from most other major health services in that proportionally more services are rendered to people of working age than to either children or the elderly. In this they differ from hospital, pharmaceutical and ophthalmic services which cater disproportionally for the elderly,and General Medical Practitioner Services which cater disproportionally for both the young and the elderly.

Dental Health was discussed in the Report of the Royal Commission on the National Health Service (DHSS 1979). It was pointed out:

> 'Dental health is part of general health and by any standards the dental health of the nation is poor ... Total tooth loss is a good measure of the ultimate breakdown of dental health.'
>
> DHSS 1979 9.7

In 1978, as shown in Table 6. 22, about a quarter of the male population were edentulous, that means they had no natural teeth. (Todd et al, 1980)

Table 6. 22

Total Tooth Loss for Different Age-Groups. Males and Females England and Wales, 1978

Age	Percentage who are edentulous	
	Males	Females
16-24	-	-
25-34	3	4
35-44	9	14
45-54	24	33
55-64	41	56
65-74	72	76
75 and over	86	87
All	24	32

Source: Todd et al (1980) Table 4.3

Not surprisingly the proportion of males who are edentulous increases with age. The loss of teeth is a state which cannot be reversed. Some people lose their teeth in their twenties and live edentulously for another fifty years. It is therefore impossible to reduce rapidly the proportion of the population who are edentulous. This is only possible for the younger age-groups.

As can be seen in Table 6. 22, at every age the proportion of the edentulous is greater for females than males. Edentulousness also shows regional and social class variations. In 1978 the proportion of men above the age of 16 years who were edentulous was 34 per cent in Wales and 32 per cent in the area of the Northern and Yorkshire Health Regions, but only 14 per cent in the two North Thames Regions and 17 per cent in the two South Thames Regions. (Todd et al. 1982 Table 3.4)

Social class differences in the proportion of males who are edentulous are also considerable. In 1978 the proportion of men in Social Class IV and V was 32 per cent but for Social Classes I, II and IIINM it was only 17 per cent (Todd et al 1982 Table A2). The social class differences are greatest at younger ages and gradually diminish with advancing age but even at ages 55-64 the proportion of adults who are edentulous is still half as great again for the two bottom social classes, the semi-skilled and unskilled workers, as it is for the three classes of non-manual workers. (Todd et al, 1980, Table 4.6).

To a large extent edentulousness is influenced by lifestyle and nutrition as well as by environmental and hereditary factors. It is also a reflection of previous uptake of dental services and ultimately of the provision of such services. This last fact has significance for health in general. To what extent current patterns of morbidity are a reflection of the past is an equally relevant question for the state of health in general as it is for dental health.

Males Reporting Defective Vision and Hearing

The 1979 General Household Report contains some interesting data about difficulties with eyesight and hearing. About two-thirds of the males 16-44 years do not wear glasses and have no difficulty with their eyes; the corresponding proportion for males 45-64 years is only one eighth. Difficulties with eyesight have no marked socio-economic group bias, though slightly more manual workers than other men do not wear glasses but have difficulties with their eyesight. Difficulties with hearing at working age is less common than difficulties with eyesight. Not wearing a hearing aid and having no difficulty in hearing is reported by 93 per cent of the younger and 82 per cent of the older men. About half of all men of working age wear spectacles but only about one per cent wear a hearing aid. Difficulty with hearing has, however, a marked socio-economic group gradient. The data for men of working age are not published but amongst men of all ages about 18 per cent of the semi-skilled and unskilled manual workers but only about 11 per cent of men in the managerial and professional occupations have difficulties with hearing.

Chapter 7

Relationships between Mortality and Morbidity

In Chapters 2, 3 and 4 the problems of measuring mortality and morbidity were discussed. In Chapters 5 and 6 some of these problems have been highlighted. However, it has been shown, and this is emphasised in Table 7.1 diseases have different impacts on mortality and morbidity. In this table 'new episodes of illness' (episodes occurring after the start of the survey) are used as indicators of the use of general medical practitioner services.[1] As in previous tables the average number of beds in daily use are used as indicators of the utilisation of hospital resources.

Diseases of the circulatory system are the major cause of death accounting for almost half of all deaths. They also account for the largest percentage of beds used by males 15-64, but their impact on deaths is more than double that on the use of hospital beds (47 per cent compared with 18 per cent). In contrast only three per cent of new episodes of illnesses recorded by general practitioners in 1970-71 were for circulatory diseases. In addition there are differences in the impact of specific diseases. Ischaemic heart disease, particularly myocardial infarction, accounts for most deaths and most hospital beds in use for circulatory diseases. While haemorrhoids account for a quarter of new episodes of illness treated by general practitioners, myocardial infarction and other ischaemic heart diseases account for less than a fifth.

Table 7.1

A comparison of the impact of selected diagnostic groups on mortality and morbidity. Analysed by percentage of deaths, of average number of beds in daily use in non-psychiatric hospitals, and of new episodes of illness treated by general medical practitioners

Diagnostic group	Males 15-64 years		
	Deaths %	Average No. of beds in daily use %	New episodes of illness %
Neoplasms	27.9	10.2	0.6
Diseases of the Circulatory System	47.4	17.7	3.4
Diseases of the Respiratory System	7.5	5.9	22.9
Diseases of the Digestive System	2.6	12.2	5.0
Accidents, Poisonings and Violence	9.5	15.7	10.3
SUB-TOTAL	94.9	61.7	42.2
OTHERS	5.1	38.3	57.8
ALL CAUSES	100.00	100.00	100.00

Source: OPCS (1979c) Mortality Statistics 1977 - Cause, London : HMSO. Table 2
DHSS et al (1980) Hospital In-Patient Enquiry 1977, London: HMSO. Table 9b
OPCS (1974) Morbidity Statistics from General Practice 1970-71, London: HMSO, Table 16.

Neoplasms show a slightly different pattern; it is the second major cause of death, ranks fourth as regards use of hospital beds, but as a proportion of new episodes of illness attended by general practitioners it accounts for a mere 0.6 per cent.

In the study of mortality, the category of 'neoplasms' was used, thus including all neoplasms malignant and non-malignant, whilst in Chapter 6, in the analysis of the use of hospital beds. 'all malignant neoplasms' was analysed, thus excluding benign neoplasms and neoplasms of the lymphatic and haematopoetic tissue. Neoplasms were not amongst the major diagnostic groups examined in the analysis of sickness absence statistics and morbidity statistics from general practice. In Table 7.2 neoplasms are separated into malignant and non-malignant. It is only for new episodes of illness in general practice that benign neoplasms are of any consequence (62 per cent): over half of these benign neoplasms are neoplasms of the skin. However, this is an example of how percentages may be misleading in that this represents 60 per cent of a comparatively very small number of new episodes.

Table 7.2

Males 15-64 years Neoplasms: Malignant and Non-Malignant - Percentages

	Deaths %	Average No. of beds in daily use %	New episodes of illness %
Neoplasms	100.00	100.00	100.00
Malignant neoplasms	99.5	92.5	37.1
Non-malignant neoplasms	0.5	7.5	62.9

Source: OPCS (1979c) Mortality Statistics 1977 - Cause, London : HMSO Table 2.
DHSS et al (1980) Hospital In-Patient Enquiry 1977. London: HMSO, Table 9b.
OPCS (1974) Morbidity Statistics from General Practice 1970-71, London: HMSO, Table 16.

Diseases of the respiratory system show the opposite pattern to those discussed above: they account for more than a fifth of all new episodes of illness but only eight per cent of deaths and six per cent of hospital beds. Within this group there are also examples of differences in the importance of specific diseases; a third of all new episodes of illness are due to acute naso-pharyngitis and acute tonsillitis and a sixth to acute bronchitis and bronchiolitis. Only two per cent were due to chronic bronchitis and even less due to asthma. In contrast, bronchitis, emphysema and asthma accounted for half of all deaths from respiratory diseases and more than a third were due to pneumonia. Almost a quarter (23 per cent) of hospital beds used for respiratory diseases are used for bronchitis and emphysema and about one tenth for asthma.

Diseases of the digestive system show an interesting pattern, being more important for use of hospital beds (12 per cent) than new episodes of illness (five per cent) and deaths (three per cent). Over a quarter (27 per cent) of hospital beds in daily use for this age-group are used for hernia and 13 per cent for appendicitis. In contrast, only four per cent of deaths are caused by hernia of the abdominal cavity, the major causes are diseases of the liver, gallbladder and pancreas (44 per cent) and diseases of the oesophagus, stomach and duodenum (32 per cent). Only nine per cent of new episodes of digestive diseases illness were due to hernia, the major category, disorders of the function of the stomach accounting for 22 per cent of new episodes.

Like diseases of the digestive system, accidents, poisonings and violence account for a greater proportion of the use of

hospital beds than of deaths and new episodes of illness. The more serious injuries of fractures account for 91 per cent of beds used for this category. The major causes of death within this diagnostic group are fractures of the skull, spine and trunk (26 per cent) and 22 per cent are due to internal injury of chest, abdomen and pelvis. However, fractures account for only seven per cent of new episodes of illness seen in general practice, but superficial injuries and sprains and strains account for 42 per cent and 37 per cent respectively.

In Table 7.1 these five diagnostic groups combined account for almost all mortality (85 per cent) more than three fifths of beds in daily use but only just in excess of two thirds of new episodes of illness seen by general practitioners. This would appear to support McKeown's suggestion that there is no necessary close relation between morbidity and mortality:

> 'The diseases that shorten our lives are not usually the ones that diminish their quality from day to day.'
>
> T. McKeown 1979 p. 112

It is therefore interesting to consider which diagnostic groups are attended by general practitioners, and/or treated in hospitals but which do not result in death. Four diagnostic groups account for another 36 per cent of new episodes of illness; these are 'symptoms and ill-defined conditions' (10 per cent), diseases of the skin and subcutaneous tissue (nine per cent), of the musculo-skeletal system and connective tissue (nine per cent) and of the nervous system and sense organs (eight per cent). Perhaps not too surprisingly in the light

of the discussions above, within those categories it is the more minor and vaguely described illnesses which are seen by general practitioners. For example, eczema and dermatitis account for a quarter of all new episodes of illnesses ascribed to skin diseases, conjunctivitis accounts for 14 per cent of diseases of the nervous system and sense organs, and within the vague category of 'symptoms and ill-defined conditions', 'cough' accounts for 11 per cent of new episodes of illness in this category.

Three of these four diagnostic groups are also amongst the major causes of use of hospital beds as shown in Chapter 5. 'Symptoms and ill-defined conditions' account for 9.5 per cent, diseases of the musculo-skeletal system for eight per cent and diseases of the nervous system (excluding sense organs) for six per cent.

As a large percentage of hospital workload is diagnostic, it is to be expected that 'symptoms and ill-defined conditions' will occupy a considerable number of beds.

Chapter 8

The Economic Burden of Morbidity and Premature Death

The cost of diseases to the individual and to the community consists of two components:

(a) the economic costs involved in caring and curing

(b) the value of production lost.

Obviously the costs involved in caring and curing will vary tremendously according to whether diseases are treated in hospital or by a general practitioner. Only 16 per cent of patients receiving medical attention in any year become hospital in-patients (Wilson 1981 p. 142) but the costs they cause far outweigh those incurred by patients who are attended only by general medical practitioners. In 1976/77 in England, hospital services accounted for £2,866 million (59 per cent) of aggregate expenditure on the health services (£4,867 million). This compared with only £315 million (seven per cent) spent on general medical services and £476 million (10 per cent) on pharmaceutical services (DHSS 1980b Table 2.7). Thus the estimated expenditure per capita was approximately £62 for hospital services, £7 for general medical services and £10 for pharmaceutical services.

In 1976 the average number of consultations per person per year for all males was 2.9 thus the estimated average cost per consultation was £2.30 . The average cost of each prescription was about £1.63 and the average number of prescriptions per consultation was 2.2 (including repeat prescriptions); so that the cost of drugs per consultation was £3.60. The aggregate

cost was thus £5.90 per consultation. If this is compared with the average cost per in-patient week in an acute hospital - £240 - the cost of a week's stay in hospital is the equivalent of 41 consultations with a general practitioner.

However, the cost per in-patient week varies considerably between hospitals: acute hospitals £240, mainly acute £203, mental illness £81, and mental handicap £71 (DHSS 1980b Table 2.9). As Abel-Smith (1976) points out there are essentially three elements in the running cost of a hospital - hotel cost, care cost and diagnostic/treatment cost. The hotel cost is approximately the same for each day in hospital while care cost depends on the patient's level of dependency and type of care required. Usually as the patient's condition improved so his dependency decreases. Diagnostic and treatment cost varies greatly between patients depending on what diagnostic tests are conducted, whether surgery is required and the cost of other treatments. Thus the average cost per day of a hospital will vary according to the precise functions it is performing. In view of this latter comment it is not surprising that it is recognised that treatment costs are highest in the first few days of hospital stay. (Abel-Smith 1976, p. 114, Bevan 1980, p.172)

As regards the contribution of these three elements to the cost of an inpatient day, three-fifths of expenditure are for direct care, diagnostic and treatment costs and two-fifths for hotel cost, this latter category including the more general services of estate services, cleaning and catering. (DHSS et al. 1979 , p. 36).

As noted by Lalonde (1974 p. 38):

> 'for every statistical average reflecting a condition in the health field, or in any social field for that matter, there are a number of 'populations' which contribute very unevenly to the average.'

This is particularly true in the computation of average costs; they conceal considerable variations. Wilson and Wilson (1982) calculated indices for use of health services by different age-groups. Their data are reproduced in Table 8.1. For all health and personal services the age-group 15-64 years absorbs the least expenditure (with the exception of use of hospital services by the 15-64 years group).

Table 8.1

Estimated current expenditure per head on health and personal social services by age-groups, England, 1978/79, as percentage of average expenditure at all ages.

	Expenditure (£ at 1980 currency prices)					
Services provided	All ages	0-4	5-15	15-64	65-74	75+
Hospital and community health services	100	109	43	57	196	474
Family Practitioner services	100	114	114	71	114	229
Personal Social Services	100	150	117	33	117	600
Total	100	117	61	58	167	447

Source: Wilson and Wilson (1982) The Political Economy of the Welfare State, London: George Allen and Unwin, p. 149.

Based on The Government's Expenditure Plans 1981/2 to 1983/4 Cmnd 8175, London: HMSO 1981, Table 2.11.4.

In computing costs, reference to averages also conceals the probable differences in cost between cases in different specialities or different diagnostic groups. (Beresford 1972 p. 174). Beresford et al studied the utilisation by in-patients of pathology and

X-Ray services for diagnostic groups to identify which groups are heavy, medium and light users of these services. Several diseases examined are of relevance to this study: peptic ulcer was found to make high use of both these services whilst hernias make a low use of both. The major respiratory disease, bronchitis, made high use of pathology but low use of X-Ray facilities whilst pneumonia made medium use of each. Cancer of the colon made high use of X-Ray facilities and medium use of pathology. Perhaps slightly surprisingly coronary diseases made medium use of pathology and low use of X-Ray facilities. Fractured femurs, not surprisingly, made low use of pathology facilities and medium use of X-Ray facilities. As Beresford suggests, ideally this type of study should be extended to include the larger cost items of theatre usage and nursing hours.

Thus, although neoplasms, diseases of the circulatory and digestive systems, and accidents, poisonings and violence can be regarded as expensive diseases in terms of their utilisation of hospital beds, there will be considerable differences in expenditure incurred by these groups because of differences in resources used, as well as differences in mean durations of stay. Most diseases of the digestive system, neoplasms and accidents, poisonings and violence are more likely to be treated in surgical wards whilst diseases of the circulatory system are more likely to be treated in medical wards.

Of these major categories identified, diseases of the respiratory system is the only category treated mainly in general

practice. As discussed earlier, most respiratory diseases are of a minor nature. As this particular category is a major reason for sickness absence from work, it is quite probable that many of these episodes were due to the need for a doctor's certification of incapacity to work. It will be interesting to examine the influence of self-certification of absence from work on these reasons for consulting a general practitioner.

It is beyond the scope of this study to examine in detail the cost of these diseases, but it is of interest to note the breakdown of expenditure on the coronary heart diseases as analysed by the Office of Health Economics (1982 p. 46). Coronary heart disease is a collective term given to the various 'symptomatic manifestations which are the result of injurious processes occurring in the coronary arteries' and contributes considerably to the diagnostic group, 'diseases of the circulatory system'.

Table 8.2

Estimated cost of medical care for coronary heart disease in 1981 England and Wales

	£ million	Percentage
Hospital care: Approximately 2.5 million inpatient days	153.8	60
Outpatients	6.6	3
Pharmaceuticals: approximately 18.2 million prescriptions for preparations acting on the heart.	84.5	33
General Medical Services: coronary heart disease accounts for 1.66 per cent of consultations.	9.9	4
Totals	254.8	100

This table shows clearly the large share of hospital cost. These figures refer to all patients with coronary heart disease

and thus will be strongly biased by the high percentage of elderly with this disease. However, it serves to illustrate the relative distribution of expenditure on this disease, hospital care accounting for three-fifths of all expenditure and pharmaceuticals one third.

The second way in which the cost of these diseases can be assessed is the financial loss to the individual and to the community in the form of lost earnings and production.

It was noted in Chapter 2 that a way of measuring mortality is to measure the years of working life lost (Table 2.7). In 1977 mortality of males 15-64 years accounted for 1.2 million years of working life lost; all cancers accounted for 19 per cent, ischaemic heart disease for 20 per cent and accidents for 15 per cent. Even though for every one death from accidents there were five deaths from ischaemic heart diseases, for every one year of life lost due to accidents only two were lost due to ischaemic heart disease. This reflects the low average age of men dying from accidents compared with men dying from ischaemic heart disease.

These deaths result in reduced output, lower Gross National Product and also in higher income transfers, increased expenditure on widows' and orphans' pensions. However, some deaths such as those caused by diseases of the circulatory system, which occur usually towards the end of working life, may result in an increase of GNP per head, by reducing pension payments to non-producers by more than the loss of production in the few remaining years of working life.

Of course a reduction of GNP due to premature death assumes a state of full employment. In a situation of high unemployment, provided that the individual has no specialised skills, there would not necessarily be any loss of GNP. There might be an increased expenditure on widows' and orphans' pensions but this would be more than offset by reduced expenditure on unemployment benefit.

Morbidity on the whole results in temporary loss of output. This has several interesting dimensions. Although sickness absence statistics measure days of certified incapacity, the actual loss of production will vary according to the type of work performed by the individual. For example, there may be no loss if a worker is able to make up, after return to work, the output lost. In contrast, if an individual is a member of a team of six workers, the loss of production may exceed a sixth if the individual's role is essential to the work of the team. In addition there is the loss suffered due to under-utilisation of capital in various production processes. There may be a financial burden on the state in terms of support for an individual and his dependents in the form of sickness benefit. However, for individuals who receive nothing else but sickness benefit a substantial proportion of their lost earnings is borne by the individuals themselves by way of reduction in income. In situations where sick pay is paid by the employer covering the whole of the individual's salary, the cost is borne by the consumer in that prices are raised to incorporate losses incurred by sickness absences. Below are two examples illustrating how the cost of sickness absence can be distributed.

Example A

> In 1977 Mr. X with no dependents and earning the average weekly wage of £76.80 was absent from work for one week receiving flat rate sickness benefit of £7.35 allowing three waiting days. He had two consultations with his general practitioner and received one prescription.

In this example the majority of the cost of his absence is borne by the individual, the loss to the employee is £69,45, whereas the cost to the community as estimated above is £4.60 (consultation), plus £1.63 (prescription) plus £7.35 (sickness benefit), a total of £13.58.*

Example B.

> Mr. Y, also single and earning the average weekly wage is admitted to an acute hospital ward for one week after having been off work the previous week and have seen his general practitioner twice and having been prescribed two medicines. He returns to work one week after being discharged from hospital.

In this case the larger share of the cost of absence is borne by the community: £240 (hospital) plus £36.75 (sickness benefit) plus £4.60 (consultation) plus £3.26 (prescription), a total of £284.61. His own loss of wages after deduction of sickness benefit received will have been £193.65. *

The relative burden and benefit borne by the individual and the community partly depends on the period covered. The employee will have paid tax and national insurance contributions and thus may arguably have already paid for his stay in hospital. However, if his stay in hospital is occurring at the beginning of his career, the financing of this may be considered as a

* In neither of these examples is allowance made for the changes in income tax liability.

transfer of income from the working sector of the population to the non-working.

From the discussion of sickness absence statistics in Chapter 6 it is evident that the majority of causes of incapacity do not require treatment in hospital. Thus in most cases, redistribution of income from the working to the non-working sectors of the population is mainly in the form of social security cash benefits and to a lesser extent the cost of family practitioner services.

Chapter 9

Perspectives

At the beginning of this study it was suggested that fatal diseases in the age-group 15-64 years may be preventable. All of these diseases have been analysed, where data allowed, by age, sex, marital status, occupation, social class and regions and all showed positive or negative gradients for one or more of these factors. It might be assumed that if certain factors produce gradients for diseases, then an element in the factor is the causative agent. However, as has been noted, this is a dubious assumption since so many of these factors are inter-dependent. In addition, a strong inter-relationship exists between the factors discussed and life-style. It is interesting to note that all five of the major diagnostic groups identified are associated with life-style:

Neoplasms, particularly of the lung	-	Cigarette smoking
Diseases of the Circulatory System	-	Smoking, diet, stress, lack of exercise.
Diseases of the Respiratory System	-	Smoking
Diseases of the Digestive System	-	Diet, stress and alcohol - the latter particularly associated with liver diseases.
Accidents, Poisonings and Violence	-	Road traffic accidents, in many cases alcohol is regarded as a contributing factor.

In any attempt to counteract the influence of these habits and customs there is not only the problem of trying to change an

individual's life-style and attitudes, but also the ethics of state intervention, the freedom of the individual and the responsibility of the individual all of which were examined at length by Knowles (1976). The DHSS poses the question:

> 'How far should the individual be free to harm himself, when society has to deal with the consequences ?'
>
> DHSS 1976 p. 93.

For many years people have been led to believe that treatment will be available for any disease or injury and consequently little attention has been paid to prevention. Smoking, consuming alcohol, drinking and driving, over-indulgence in food, promiscuity, refusal to wear seat belts are only some of the habits over which the individual has control. If people cannot be persuaded into accepting responsibility for their own health the alternatives are for the government to penalise, prohibit or tax certain goods and behaviour patterns and thereby infringe the liberty of the individual or to provide incentives to encourage changes in life-styles. The nature of the problem seems to demand the judicious and simultaneous application of persuasion, deterrence and incentive. This is by no means easy and is certain to lead to organised opposition. Publicans, bar-maids, off-licence retailers, workers and shareholders in breweries do not favour policies which restrict consumption of alcohol. Nor are shareholders and workers in the tobacco industry indifferent to the level of cigarette consumption. The advertising industry as well as the media are another powerful economic group which directly profit from behaviour patterns which are injurious for health.

The current emphasis on preventative measures in Britain stems from the realisation that:

> 'curative medicine may be increasingly subject to the law of diminishing returns.'
>
> DHSS 1976 p. 6.

However, as pointed out in the same document from which this quotation is taken there is:

> 'the paradox that prevention (or cure, for that matter) by enabling more people to reach an age at which they are increasingly likely to become dependent may eventually increase the calls on our national resources.'
>
> ibid p. 84.

The cost-effectiveness of health services is a subject constantly reviewed by social scientists and economists. In the context of this thesis it would be interesting to study the cost-effectiveness of use of hospital beds, to determine how much treatment results in cures, or is palliative, what treatment is mainly caring and what percentage of patients die in spite of hospital treatment. In spite of McKeown's assertion that there is no necessary relationship between morbidity and mortality in that not all morbidity results in death, in the majority of cases such a relationship exists in that death is usually preceded by illness. Over half of all deaths occur in NHS hospitals (OPCS 1979a Table 14). Very few deaths are sudden and incur no expenditure, the main exceptions possibly being road traffic accidents and heart attacks but even these may result in expensive, heroic life-saving attempts. Most deaths involve some attempts at curing even though the result may only be palliative.

If preventative measures should be successful for males 15-64 years the question arises, what impact this would have on

society ? Some diseases such as those of the circulatory system are more likely to be deferred than to be eradicated. These diseases are part of the ageing process and man must die eventually. If more males survived to old age there would be an increase in the non-fatal intractable diseases with their resultant demand for care; such diseases according to McKeown affect adversely the quality of life from day to day. Such a development would lead to an increase in the demand for caring facilities without necessarily reducing the demand for therapy.

In present day economic conditions with an increasing tendency for machines to replace manual and routine clerical workers there is ample scope for satisfying the requirements for more staff in the caring services. Many illnesses require only a basic level of care; assistance with washing, toileting, feeding and dressing; not necessarily a sophisticated level of nursing or therapy.

Prevention of the major diseases would also have demographic implications. In Trends in Mortality 1951-75 (OPCS 1978b p. 8) it was calculated that if current female age-specific death rates were applied to the male population there would be a reduction of 41 per cent in male deaths below the age of 65 years. In 1973 there were 98 thousand deaths of males under 65 years: the figure would be reduced by 40 thousand if male mortality could be brought down to female levels.

Demographic changes would have financial implications, the exact nature of these depending on the state of employment.

Although in 1976 DHSS suggested that prevention will increase the active earning life of individuals rather than to simply avert premature death (DHSS 1976 p.88), in a state of high unemployment it would result in an increased expenditure on social security cash payments. Furthermore, if the reduction in mortality was to increase the chronic sick this would increase the number claiming social security benefits. Needless to say, with more people surviving into old age, the larger number of pensioners would be another financial burden on the state.

However, the social connotations of demographic changes must not be forgotten; there would be less widows particularly over the age of 65 years and thus the burden of social isolation, one of the major problems of the elderly, would be eased. These changes would also have implications for housing, for example, a reduction in one person households.

In the past, improvements in health appear to have changed people's expectations of health; this led to a greater demand for further care and treatment. Thus although it appears prima facie that the major impact of the prevention of these diseases would be a saving on hospitals and general medical services, this is by no means necessarily true.

Although there has been a decline in the more objectively defined diseases as was noted in sickness absence statistics the more subjective illnesses such as 'headaches' and 'back pain' have increased. However, as was pointed out, these might not

reflect ill-health but other factors. In a review of literature on causes of sickness absence Taylor (1979) noted that out of over thirty causes only two were strictly concerned with ill-health. Much emphasis has been placed on the concept of job satisfaction, a very heterogeneous concept, as a cause of absence from work. This idea was supported by Wells (1981) in an analysis of previously unpublished General Household Survey data which illustrated that absence from work was closely associated with the degree of job satisfaction. Wells also suggests that already in periods of high unemployment absenteeism declines, particularly short spells of sickness absence attributable to minor ailments.

In future the problems of measuring morbidity and mortality may well be somewhat different than they have been in the past. With advances in technology diagnosis may become more accurate and therapy may become more effective. The change in the nature of diseases with a greater prevalence of those which have no symptoms which can be objectively measured has already been noted. The trend towards private medicine and fee-paying hospitals will result in the NHS hospital statistics excluding an increasing proportion of patients in the higher income groups. An analysis by region, social class or occupation will become less valid since society is becoming increasingly mobile in each of these spheres. This will make it more likely that inferences based on such analyses will only have limited validity. It is now recognised that some diseases may lie dormant for many years after the initial contact with the causative agent, for example asbestos and mesothelioma.

Finally the techniques of measurement will improve, longitudinal, prospective linked studies of mortality will make it possible to study the association of mortality with many more factors than has been the case in the past.[1]

Appendix A

Construction of Life Tables

The basic element of the life table is the 'probability of dying' represented by 'q_x' (q_x - the probability of dying at age x). This is the ratio of deaths observed in a year of life to the number who set out on that year of life.*

$$q_x = \frac{D}{(P + \frac{1}{2}D)}$$

NB. $\frac{1}{2}D$ is added to the mid year population (P) on the assumption that deaths occur uniformly throughout the year, and thus half of all deaths will have occurred in the first six months. This does not, in fact hold true in the extremes of life - for the very young and the very old.

Having calculated the values of q_x for each year of life, the life table can be constructed, by taking an arbitrary number, for example 1,000, 10,000 or 100,000 as the 'radix' or start of the table and following this base population from birth until death. By relating the probability of infants dying in the first year of life to the number forming the radix, it is possible to find the number likely to die in the first year of life. By subtracting this number from the radix of the table there is found the number likely to survive the first year of life, that means, 1_x - the number alive at age 1 year. Similarly, by applying 'q_x' to the number surviving to year one, there is found the number likely to die between ages one and two years. This number is then subtracted from the number of survivors at age one to find the number who are likely to have survived to age two.

These calculations are repeated for every year of the life table, until there are no survivors.

* Often a period of three years is used instead of one year in order to reduce the effect of short-term fluctuations in mortality caused by influenza epidemics or severe winters.

Calculation of Expectation of Life

The expectation of life can be calculated from the column of deaths (d_x) or the column of survivors (1_x)*. In the former, the total number of years lived by the original 100,000 (or whatever is the radix of the life table) is calculated. Hence if there are 2,449 deaths between the aged of 0 and 1 it is presumed these males lived an average half a year, thus their contribution of the total number of years lived is 2449 x ½. Between age 1 and 2 if there are 153 deaths it is assumed the average length of life was 1½ years hence (153 x 1½ years). This procedure is continued until the end of the life table where there may only be 4 deaths occurring between 104 and 105. Their average life was 104½, thus they contribute to the total years (4 x 104½).

Proceeding to the final point the total years of life lived by the population of 100,000 is

(2499 x ½) + (153 X 1½) + ... (4 x 104½) +

(2 x 105½) +(1 x 106½) + (1 x 107½)

The expectation of life is the mean number of years lived and so this sum is divided by the 100,000 persons starting age 0 to whom it relates.

In short the $\overset{o}{e}_x$ at birth equals the sum of all values of $d_x \times (x + \frac{1}{2})$ divided by 100,000.

Using the survivors column, by summing the 1_x column from age 1 the number of whole years lived by the 100,000 persons is calculated (obviously the 100,000 at the start of the table are excluded since they are starters at 0 and at that point have lived no duration). However, in this calculation there is no allowance for the period lived by each person in the year of his death. To counteract this, it is assumed that all lived half a year in the year of their death; thus to the sum of column 1_x is added 100,000 times a half. The average, or expectation of life is then this sum divided by the 100,000 at the start of the table.

The expectation of life at a later age than 0, for example 25, is the average length lived beyond that age by the survivors at age 25. It can be calculated by either of these methods, the sume of years lived relating only to the entries beyond age 25, and the denominator, to give the average, being of course, the survivors at age 25.

* Expectations of life are always calculated separately for the sexes.

Source: Sir A. Bradford-Hill (1971) Principles of Medical Statistics , London: The Lancet Limited. p. 220-236.

Benjamin, B. (1968) Health and Vital Statistics London: George Allen and Unwin Ltd. p. 92-115.

Appendix B

Proportional Mortality Ratios. (PMR)

Like the Standardised Mortality Ratio, the Proportional Mortality Ratio is derived by indirect standardisation but in contrast to SMRs, the PMR only summarises mortality by cause of death. The expected number of deaths for individual causes of death are calculated from the proportions of all deaths in the standard population attributed to the causes of interest. Age standardisation is the same as for the SMR. An example of the calculation of PMRs is shown in Table A1.

Proportional Registration Ratios. (PRR)

The Proportional Registration Ratio is a variant of the PMR and is used in the analysis of cancer data. Instead of considering the proportion of all deaths which is the basis of the PMR, the proportion of all cancer registrations is used. The age-standardised proportion for a particular site is then compared with that for the standard population.

Table A1 Examples of the calculation of Proportional Mortality Ratios

	Standard Population		
	(1)	(2)	(3)
	Total No. of Deaths - All Causes	No. of Deaths from Ca. Lung	Ca.Lung as proportion of all Deaths
0 - 15	125	5	0.04
15 - 34	250	25	0.10
35 - 64	500	100	0.20
65 +	1750	400	0.23
	2625	530	

Population A	
(4)	(5)
Total No. of Deaths - All Causes	No. of Deaths from Ca. Lung
100	10
525	50
1200	300
1200	300
3025	660

Population B	
(6)	(7)
Total No. of Deaths - All Causes	No. of Deaths from Ca. Lung
50	5
400	40
800	200
1300	300
2550	545

$$\text{P.M.R.} = \frac{\text{No. of deaths observed}}{\text{No. of deaths expected}} \times 100$$

$$\therefore \text{P.M.R. for Pop.A} = \frac{\text{Col.5}}{\text{Col.4} \times \text{Col.3}} \times 100$$

$$= \frac{660}{\begin{array}{l}100 \times 0.04 \quad (4.0)\\ 525 \times 0.10 \quad (52.5)\\ 1200 \times 0.20 \quad (240.0)\\ 1200 \times 0.23 \quad (276.0)\\ \hline 572.5\end{array}} \times 100$$

$$\therefore \text{P.M.R.} = 115$$

$$\therefore \text{P.M.R. for Pop.B} = \frac{\text{Col.7}}{\text{Col.6} \times \text{Col.3}} \times 100$$

$$= \frac{545}{\begin{array}{l}50 \times 0.04 \quad (2.0)\\ 400 \times 0.10 \quad (40.0)\\ 800 \times 0.20 \quad (160.0)\\ 1300 \times 0.23 \quad (299.0)\\ \hline 501.0\end{array}} \times 100$$

$$\therefore \text{P.M.R.} = 109$$

Footnotes

Chapter 1

1. Although since the beginning of the school year 1972/73 the statutory school-leaving age has been 16 years, all the socio-economic analyses used in this study (with the exception of the General Household Survey) rely on 1971 census data; consequently 15 years of age is designated as the start of 'working life'. In addition much of the mortality and morbidity data is analysed in five and ten year intervals commencing at 15 years.

Chapter 2.

1. William Farr was the first medical statistician at the General Registrar's Office (1839) and pioneered the proper analysis of the more adequate registration data and census material which had then become available.

2. For a history of life tables, see Bernard Benjamin (1968) 'Health and Vital Statistics' London : George Allen and Unwin Ltd., pp 105-112.

3. The International Classification of Diseases, Injuries and Causes of Death had its origin in a list of causes of death. At the Sixth Decennial International Revision Conference in 1949 the classification was extended to cover non-fatal injuries.

4. Underlying Cause of Death - It was agreed by the Sixth Decennial International Revision Conference that the cause to be tabulated as the underlying cause of death should be designated: (a) the disease or injury which initiated the train of morbid events leading directly to death, or (b) the circumstances of the accident or violence which produced the fatal injury.

Chapter 4.

1. Periods of sickness lasting less than three days are not eligible for sickness benefit.

2. The Average Number of Beds in Daily Use is described by the Hospital In-Patient Enquiry as follows:

> 'The aggregate number of bed-days of cases in the sample who were discharges in the year in question, multiplied by the appropriate multiplying factor and divided by the number of days in the year. In some tables the number of beds used is related to the appropriate population. This measure has two purposes. For planning, it indicates the number of beds actually used in the treatment of specified groups of patients; secondly for some conditions it might provide a better basis for

comparison of morbidity than the discharge rate (spells) because it is the total hospital 'load' for each group which is related to the population, rather than the number of separate spells of hospital care.'
DHSS et al (1980)

3. Socio-economic classes:- Fifteen of the Registrar General's 17 socio-economic groups (Categories 16, Members of the Armed Forces, and 17, Occupations inadequately described, are excluded) are collapsed into six categories. They are not identical to the Registrar General's social classes but according to Reid (1979 p. 45) are clearly parallel.

4. The Royal College Classification of Diseases and Conditions 'College Classification' - is a list of diagnoses comprising over 500 categories and is condensed from the International Classification of Diseases and Causes of Death (WHO). The list was originally produced by the Royal College of General Practitioners, and is based on the observed frequency of occurrence of diseases in general practice in the United Kingdom.

5. Standardised Patients Consulting Ratio (SPCR):- this measure attempts to allow for possible different age structures in the groups being analysed. For example, in studying social class figures the age-specific patient consulting rates from the study population are applied to the number in the respective age-groups in each social class thus deriving an expected number of patients consulting for each class. This is then compared with the actual number of patients consulting and the results expressed in a percentage ratio form. Thus an SPCR of 110 for a particular group implies that even allowing for the age structure of the group, it has an approximately 10 per cent higher number of patients consulting than would be expected from the overall population patients' consulting rates.

Chapter 5.

1. An eighteenth diagnostic category is sometimes used. This is a supplementary classification of factors influencing health status and contact with health services. It is provided to deal with occasions when circumstances other than a disease or injury classifiable to categories 000 - 999, the main part of the ICD, or of the E code, are recorded as diagnoses or 'problems'. This can arise in two main ways:

   (a) When a person who is not currently sick encounters the health service for some specific purpose, such as to act as a donor of an organ or tissue, to receive prophylactic vaccination or to discuss a problem which is itself not a disease or injury.

(b) When some circumstance or problem is present which influences the person's health status but is not in itself a current illness or injury. Such factors may be elicited during population surveys, when persons may or may not be currently sick, or be recorded as an additional factor to be borne in mind when the person is receiving care for some illness or injury. Such an example would be a person with an artificial valve in situ.

Examples of this eighteenth diagnostic category are:

1. XVIII Persons undergoing preventive measures and those without current complaint or sickness:
Hospital In-Patient Enquiry 1977
(DHSS et al 1980)

2. XVIII Prophylactic procedures and other medical examinations.
Morbidity Statistics from General Practice 1970-71 (OPCS 1974).

Chapter 6.

1. An analysis of causes of incapacity is distorted by the high proportion of all who have already been beneficiaries for more than 52 weeks. This results in a bias towards those diseases which normally last for prolonged periods such as diseases of the circulatory system, while the diseases most frequent amongst those who are incapacitated for three days or less are likely to be under-reported. Although Wells (1981) suggested that spells of absence attributed to permanently sick or disabled individuals under retirement age who are unlikely to work again act as counterbalances to the various sources of shortfall in the calculation of sickness absence statistics, in an examination of the reasons for sickness absence these will create a bias towards those diseases causing long-term incapacity.

2. From 14th June 1982 a doctor's statement (certificate) is no longer necessary for claiming incapacity benefits for sickness or injury lasting less than eight days.

3. Any direct comparison between days of incapacity and spells on incapacity is invalidated since the former refers to days of incapacity throughout the statistical year 1977/78 while the latter is an analysis of spells commencing in this period. Thus any spells which began before June 6th 1977 and terminated after this date or continued throughout the statistical year are excluded. However, general trends can be noted, namely that an analysis of spells of certified incapacity by age reveals different disease patterns to those observed in an analysis of days of certified incapacity.

4. Although there are no published data for sickness absence by cause of incapacity relating to occupation and social class, at the beginning of this chapter in discussion of data available in the General Household Survey it was noted that certain industries have raised absence levels.

5. Although there are no published data by cause of incapacity relating to marital status, Whitehead (1971) noted that incapacity rates vary with the number of dependent children in the family. Generally speaking there is little difference in age-specific incapacity rates for men with and men without children but for men with children the age-specific incapacity rates increase with the number of children. While rates for men with one or two children are, on the whole, lower than those for all men, those for men with three or more children are markedly higher. According to Whitehead there are two possible explanations: large families might be more exposed to certain types of infectious diseases; or the gap between net income while working and when sick decreases, as the number of dependents increases. The very lowest earners with large families will receive nearly as much by way of flat-rate sickness benefit as for their low-paid jobs plus family allowances.

6. Prior to April 1982 the National Health Service had a three-tier administrative structure organised on a regional, area and district basis. However, after this date the Government brought into effect a new structure which retained the regional health authorities in their previous form but which combined the responsibilities of the former area health authorities and district management teams in new district health authorities.

Chapter 7

1. 'New episodes of illness' are used as indicators of the use of general medical practitioner services because there are no published data available for 'patients consulting' and 'consultations' (used in chapter 6) in a form which would allow comparisons with 'average number of beds in daily use' and mortality data for males 15 - 64 years.

Chapter 9

1. Fox, A.J. and Goldblatt, P.O. (1982) 1971-1975 Longitudinal Study: socio-demographic mortality differentials. London: HMSO. This was published when the thesis had been completed and was being typed.

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