Modern Medicine

A Textbook for Students

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Third Edition

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Preface to the First Edition

No book was so bad but some good might be got out of it – PLINY THE YOUNGER, AD 61–105

It is customary to offer some excuse for writing a new textbook of medicine. None other than Sir William Osler, that most distinguished of clinicians, recognised that they had some worth. He likened the study of medicine without the use of a textbook to that of venturing to sea without navigational charts. He was also wise enough to point out, however, that a study of medicine limited to textbooks alone was, in sea-faring terms, like never going to sea at all. There seems, therefore, to be some reason why a medical student should have some short, but selective, account of medicine to act as a 'navigational aid' during the initial and often difficult clinical appointments. One recognises, too, that the textbook becomes of declining value as experience and clinical expertise allow the student to acquire something that no textbook can provide, namely the ability to think and fathom clinical situations for themselves.

Textbooks of medicine abound. Many, however, are massive, expensive and their length too great for the average undergraduate to absorb. Others attract by their conciseness and cheapness. These tend, however, to be scrappy, incomplete and may give an unjustifiably dogmatic view of medicine. Both types are in our experience generally poorly illustrated and uninteresting to read. Both suffer from 'ageing' so that they are often seriously out-of-date the day they appear on the booksellers' shelves.

Our textbook hopefully avoids some of these problems. It is not unduly long when one considers the ever-increasing amount of information the present-day medical student must absorb. We hope, too, that the illustrations are meaningful, for we are certain that one good diagram is worth many pages of text. Neither have we been too 'wordy' when describing signs and symptoms, which we have usually tabulated. There would seem little point, to our minds, for using lengthy accounts of these phenomena when the first clinical appointment in medicine and any one of a number of excellent practical manuals will provide all that is necessary as regards instruction in eliciting signs and knowing about patterns of symptoms. We have included a fairly comprehensive account of molecular and inherited disease as, though rare, these disorders illustrate the enormous progress being made by biochemists and geneticists in this most exciting fringe of medicine. We hope, therefore, that students will forgive us this one 'luxury'. We have also included a section on dietetics and tables of normal values in clinical measurements so that students will be able to appreciate biochemical and other abnormalities readily without referring to other texts. Neither, at least at the time of writing this foreword, are we unduly out-of-date.

Above all, we have tried to give adequate space for the presentation of the problems of the cause, prevention and treatment of disease. Prevention is becoming of paramount importance because many of the major diseases we deal with can be prevented, and important clues as to the aetiology of others are now available from epidemiological and ecological surveys. A 'wind of change' is also blowing through the world of therapeutics resulting from a realisation of the important contribution the clinical pharmacologist can make. Adequate description of the drug treatment of disease is therefore essential.

The modern medical student finds every specialist branch of medicine and surgery making claims on him and competing for his time. There is a great danger that the student will be completely submerged in a wealth of seemingly disconnected facts. No specialist subject must take a greater part of the valuable curriculum time than it deserves. General medicine must remain the sheet anchor of the medical teacher's approach so that the subject shall remain as fresh and as exciting as it has been to the teachers who have experienced it.

We sincerely hope that this book by members of the teaching staff of the University of Bristol and our clinical colleagues in the United Bristol Hospitals will help students to enjoy the exciting journey that clinical medicine will present for them and that *this* navigational aid will allow them a fair and tranquil passage.

Many colleagues have helped us and in particular we would like to thank:
Professor Russell Fraser,
Dr D C E Speller,

Miss Phillipa Champion, Chief Dietician, United Bristol Hospitals,
Mr Leonard Clarke, Senior Technician, Department of Cardiology, United Bristol Hospitals,
Mr John Eatough, Superintendent Photographer, University of Bristol,
Miss Angela Manzi,
Mrs Christine Davis.

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Preface to the Third Edition

We have again been encouraged by the success of *Modern Medicine*, and we respond by producing our 3rd Edition. We have thoroughly updated all our material and have added a new chapter on environmentally induced disease. Though with a large Bristol influence, either from present teachers or those who have left to teach elsewhere, we have invited one distinguished Professor of Renal Medicine from another University – Bill Asscher – to contribute, and we are grateful to him for doing so. We are grateful, too, to those who have been replaced in this edition, and whose efforts helped to establish the book. We welcome, too, our newcomers. We hope that our combined efforts will have the desired effect of allowing medical students everywhere to understand and share in the excitment of clinical medicine.

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D W B
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Contents

1 Health and Disease

R E Midwinter and J R T Colley

This first chapter introduces a number of topics that students should find helpful in using this textbook. Inevitably a textbook of medicine will tend to concentrate on the diagnosis and treatment of the more severe aspects of disease; and these will be those diseases that are mostly seen in hospital practice. In developed countries most doctors work outside hospitals; in the community. The spectrum of disease they see is different from that in hospital. These differences are brought out in the first section of this chapter.

The doctor who wishes to practise good clinical medicine must be able to make decisions. When a patient consults him, it is necessary to decide whether or not the patient is ill. If he is ill, a decision has to be made about what sort of illness is involved. Then the most suitable treatment must be selected. Often in hospital practice the first decision has already been made by someone else, usually the referring doctor. Much of the undergraduate clinical curriculum is devoted to helping future doctors to choose between various diagnoses, and selecting the most appropriate treatments. Comparatively little time is spent on helping them to make decisions about whether or not people are ill, or on how to distinguish between what is normal or abnormal.

The next main section discusses the meaning of normality in the context of clinical measurements, and goes on to describe the variability of such measurements, the implication this has for clinical practice and ways of minimising such variation.

There follows a section that illustrates the ways in which disease patterns may be described and analysed in the search for clues to disease causation.

The next section emphasises the need for a rigorous assessment of treatments and describes the procedure for doing this using a controlled clinical trial. Finally a check list is provided as an aid in describing a disease.

The Clinical Spectrum

In the field of health care, normality and health are synonymous. Both states are difficult to define and are, therefore, not easy to measure. The World Health Organisation has defined health as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'. This is an idealistic definition and, if it were possible to quantify any of these terms, perhaps few people could be regarded as truly healthy. However, in the population at any one time the majority of people will probably have no detectable abnormality and would, therefore, be regarded as normal. Some of the remainder will be apparently normal and yet will possess some characteristic, for example overweight, which will put them in a high risk category in relation to the future chances of developing disease. Others will possess some precursor morbid state like atheroma, which has not yet given rise to any clinical circulatory impairment. A further group will show, on examination, signs of disease not previously recognised and not yet giving rise to symptoms. Some will have overt, recognisable signs and symptoms of disease and a few will have such advanced disease that they are in the process of dying. There is thus a 'clinical spectrum' of disease in populations, ranging from health to terminal illness. In general it is only those with recognised disease that tend to be seen as patients in hospital. They represent the tip of what has become known as the 'clinical iceberg'. Much disease, and most people who are at high risk of developing disease, remain undetected in the community (Fig. 1.1).

Many people with health problems do not consult a doctor. They either treat themselves or seek help from a neighbour or perhaps the local chemist (Table 1.1).

Of the people who seek medical advice and help, most will first of all consult a general medical practitioner. Some two-thirds, 64 per cent, of illnesses seen can be considered minor and do not require referral to hospital (Table 1.2). On the other hand 15 per cent are major, life threatening, illnesses (Table 1.3) and the remainder chronic illnesses. As can be seen from these two tables respiratory illnesses, mostly of the upper respiratory tract, and mental disturbances make up the two main illness groups seen in general practice. Against the background

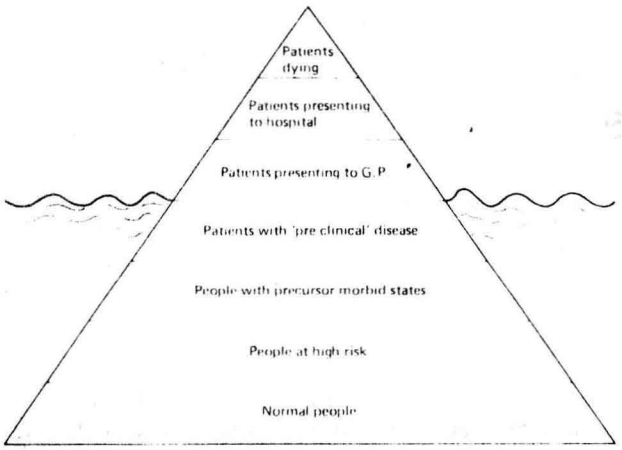

Fig 1.1 The clinical iceberg.

Table 1.1. Symptoms self-treated and doctor-treated (Wadsworth, Butterfield and Blaney, 1971)

Groups of symptoms	*Per cent of all symptoms*	*Per cent self-treated*	*Per cent doctor-treated*
Respiratory	26	63	37
Mental	21	80	20
Locomotor	15	61	39
Gastrointestinal	11	78	22
Central nervous system	8	59	41
Skin	5	73	27
Cardiovascular system	4	58	42
Accidents	3	78	22
Others	7	47	53
	100	72	28

Source: Journal of the Royal College of General Practitioners, Report from General Practice 16: 1973. Present state and future needs of general practice.

of such minor illness skill is needed to recognise patients in the early stages of more serious diseases; a time when symptoms and clinical signs may be inconclusive.

Patients with serious illnesses or whose illness is difficult to diagnose will tend to be sent to hospital for either outpatient or inpatient treatment. Thus the hospital clinician is confronted with a highly selected sample of patients and disease states. A house surgeon working in a general hospital may see and deal with two or three cases of acute appendicitis each day, whereas a general practitioner will only come across four or five cases in the course of a year.

The tip of the 'iceberg' are those who are in a terminal state. The conditions which account for most of the deaths taking place in England and Wales are shown in Table 1.4.

The importance of a disease in medical practice, in terms of how common and how severe it is, thus varies markedly from one level of presentation to another. A full table of death rates by cause per million persons for England and Wales is to be found at the end of this chapter (Table 1.10).

Table 1.2. Persons consulting for minor illnesses in a year in a hypothetical average practice of 2,500

Minor illness	
Conditions	*Consultations per 2,500 patients*
General	
Upper respiratory infections	500
Emotional disorders	300
Gastrointestinal disorders	250
Skin disorders	225
Specific	
Acute tonsilitis	100
Acute otitis media	75
Cerumen	50
Acute urinary infections	50
'Acute back' syndrome	50
Migraine	30
Hay fever	25

Source: Journal of the Royal College of General Practitioners, Report from General Practice 16: 1973. Present state and future needs of general practice.

Table 1.3. Persons consulting for acute major illnesses in a year in a hypothetical average practice of 2,500

Acute major (life-threatening) illness		
Conditions		*Consultations per 2,500 patients*
Acute bronchitis and pneumonia		50
Severe depression		12
Acute myocardial infarction		7
Acute appendicitis		5
Acute strokes		5
All new cancers		5
Cancer of lung	1–2 per year	
Cancer of breast	1 per year	
Cancer of large bowel	2 every 3 years	
Cancer of stomach	1 every 2 years	
Cancer of bladder	1 every 3 years	
Cancer of cervix	1 every 4 years	
Cancer of ovary	1 every 5 years	
Cancer of oesophagus	1 every 7 years	
Cancer of brain	1 every 10 years	
Cancer of uterine body	1 every 12 years	
Lymphadenoma	1 every 15 years	
Cancer of thyroid	1 every 20 years	
Suicide attempts		3
Deaths in road traffic accidents		1 every 3 years
Suicide		1 every 4 years

Source: Journal of the Royal College of General Practitioners, Report from General Practice 16: 1973. Present state and future needs of general practice.

Table 1.4. Some leading causes of death: England and Wales 1979

Category	*Number of deaths*	*Percentage of all deaths*
Ischaemic heart disease	155,647	26
Neoplasms	129,638	22
Chronic bronchitis, emphysema and pneumonia	75,374	13
Cerebrovascular disease	74,378	13
Accidents, poisoning, violence	21,153	4
All causes	593, 019	100

Source: OPCS Mortality Statistics for 1979, England and Wales. London: HMSO, 1980.

What is Normal?

Distribution of Clinical Measurements

Clinicians need yardsticks by which to assess normality and abnormality. A paediatrician confronted by a child who is small for his age will have to decide whether the smallness is of such a degree that it indicates or represents a disease state, or whether the child is simply below average height and is otherwise well. Height, like weight, is one measurement made in the clinical examination of a child as an index of disease or non-disease.

Children grow throughout childhood, so height in general increases with age. Yet if the heights of a group of boys of the same age are measured, it will be obvious that some will be very small, and some very tall, but the majority will fall towards the middle of the height range. If a frequency distribution of the heights of a sample of boys of the same age were plotted, the curve would look something like that shown in Fig. 1.2.

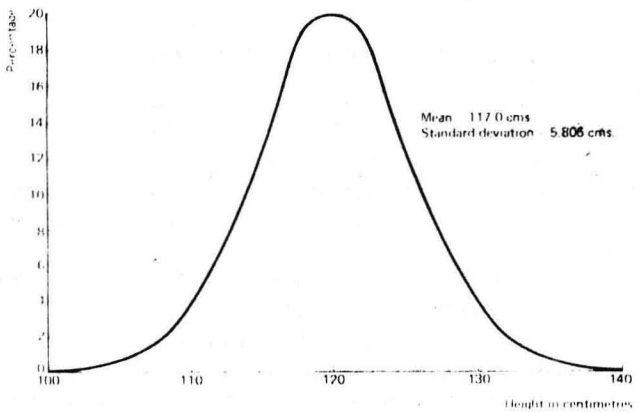

Fig 1.2 Frequency distribution of heights of a sample of boys and girls aged six years.

The curve would tend to have a symmetrical inverted bell shape. The average height for any age is easy to determine and is of some use as a clinical yardstick. Comparatively few boys are, however, of exactly average height. The majority are either just below or just above average, while successively decreasing numbers are taller or shorter and a very few are very small or very tall. This kind of frequency distribution is very like a mathematical curve called the curve of normal distribution.

Measure of Scatter

A further yardstick – a measure of scatter – is also needed as a clinical aid. It is possible to measure the average amount of scatter that exists about this mean. The measure of scatter or dispersion is called the standard deviation and has a rather complex mathematical formula. In practice it is an easy measure to calculate and it can be a very valuable yardstick. Within the area of the curve that lies between the arithmetic mean plus or minus one standard deviation (SD) lie about 68 per cent of the individual measurements that go to make up the curve (Fig. 1.3). Within the area encompassed by the mean plus or minus two standard deviations lie 95 per cent of the values, and within plus or minus three standard deviations, 99.7 per cent.

Is the Measurement Abnormal?

The chance of an individual measurement lying outside the range of the mean ±1 SD is about one in three, outside ±2 SD one in twenty, and outside ±3 SD, about three in a thousand. If a child is examined and his height is found to be outside the range of the mean height for his age ±2 SD, the odds are one in twenty that he could still be part of the normal population and simply very small or tall. It is more likely, however, that he is not part of the normal population but is part of a different population of very small or very tall children who are thus 'abnormal'.

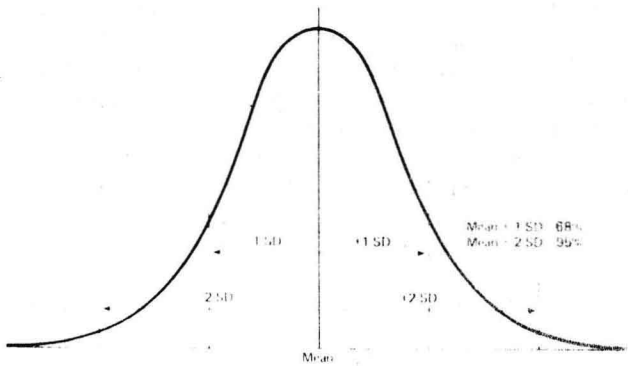

Fig 1.3 The normal distribution curve.

In clinical medicine the mean ±2 SD is often used somewhat arbitrarily to indicate what has become known as the normal range of attributes possessing this type of frequency distribution.

If all pathologically small children were so small that their heights did not overlap the normal range, it would be very easy to devise a simple cut-off point to separate the normal from the abnormal. In practice, however, this seldom happens and the small 'abnormal' distribution is 'lost' in the tail of the normal distribution. In this circumstance, if the yardstick mean ±2SD is used as a clinical guide to distinguish normality from abnormality, what happens is shown diagrammatically in Fig. 1.4. Here, while the cut-off point distinguishes most 'abnormals', it does so at the cost of incorrectly labelling some 'normals' as 'abnormal'.

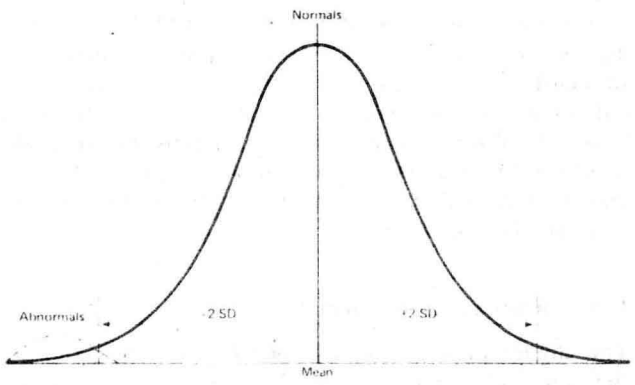

Fig 1.4 'Normal' and 'abnormal' distributions.

Measurement in Clinical Practice

Making a Diagnosis

The clinician's main task when presented with an ill patient is to formulate diagnoses and, where indicated, institute treatment. The process by which a diagnosis is made can be relatively simple, as in a child with suspected chickenpox. Here, knowledge that the child has never had the disease, has been in contact with a case, that the incubation period is appropriate, with physical signs of fever and a typical rash, will lead to a rapid and firm diagnosis. In contrast, many of the chronic diseases of middle and old age often present complex diagnostic problems. In part this is due to their wide range of possible clinical manifestations and degrees of severity. An example is cerebrovascular disease. This can present as a massive and life-threatening hemiplegia with prolonged loss of consciousness; at the other extreme it may present as episodes of transient and minor disturbance of vision. Both these manifestations can also be produced by pathology other than cerebrovascular disease. The process of arriving at a diagnosis under these circumstances can be highly complicated, relying upon several different sources of evidence. Past history, present symptoms, results of physical examination, biochemical, haematological and other tests would all contribute to a final diagnosis. The clinician assesses individual findings for their deviation from what is thought normal, and in so doing constructs particular patterns of findings that suggest a diagnosis, or several possible diagnoses. In clinical practice it is unusual for a diagnosis to be made on a single finding.

As so much weight is placed upon clinical findings in arriving at diagnoses, and thus deciding on the appropriate treatment, some indication is needed of the precision with which clinicians make these assessments. This becomes of particular importance when an individual physical sign or biochemical test does not depart greatly from what is considered normal.

Suppose that the precision with which the physical sign was measured, or the biochemical estimation was made, is poor. This may lead to a patient receiving a treatment that was not needed, or not receiving a treatment that could have given benefit; both outcomes being unsatisfactory for the patient. A further aspect involves the follow-up of patients. Here the clinician may be attempting to gauge whether, for example, a treatment is improving, worsening or making no difference to the patient's condition. If the clinician relies on a measurement with a poor precision to indicate progress, he may be led astray in concluding from an apparent change in the measurement that the patient's condition has changed, when in truth this may not have happened. It is necessary to know how inherently variable the clinical measurements are that are used to make diagnoses and to assess the results of treatment.

Sources of Variation in Clinical Measurements

There are two main sources of variation in clinical measurements (Fig. 1.5). The first arises from the underlying true or biological variation. For example, systolic blood pressure in an individual varies from occasion to occasion, often quite widely and in a fairly unpredictable way.

The second source of variation is that associated with the measurement of the attribute itself. This variation can be partly due to the imprecision of the instrument being used, to inconsistencies in the clinician making the measurement, and when several clinicians assess the same patient, to differences in their techniques of measurement.

The underlying biological variation, imprecision of the

measurement technique and inconsistencies in the individual clinician tend to be random. This is of importance in clinical medicine as the greater the random variation of a measurement the less confidence can be placed upon it.

Variation between clinicians has been extensively studied and is usually systematic. This means that an individual clinician may tend consistently either to over-report, or under-report, findings compared with

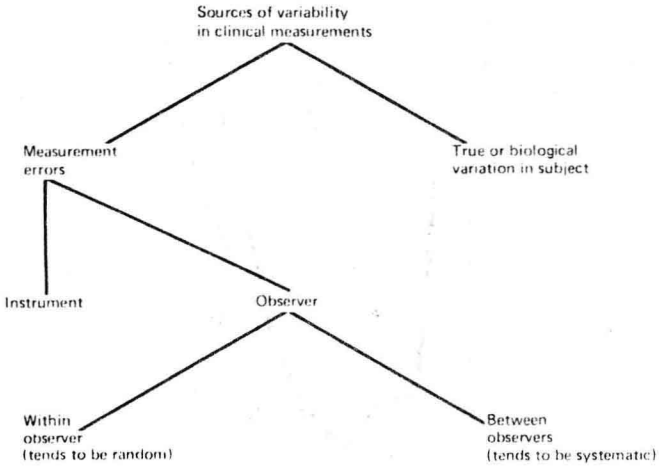

Fig 1.5 Variation and clinical measurement.

another clinician. This can be seen in Fig. 1.6 where four doctors independently assessed men for the presence of cough, sputum and history of bronchitis. The four doctors agreed well on the proportion of men who had a history of bronchitis but agreed very poorly on the proportion with cough and sputum. Dr A assessed 12 per cent of the men as having sputum while Dr D found 40 per cent.

Systematic differences such as these have been found, for example, in the assessment of chest signs, heart size, heart sounds, retinal pathology, liver size, peripheral arterial pulses, and reading of chest X-rays. Attention is drawn to this aspect of clinical measurement simply to alert the reader to the potential size and sources of differences that may be found in certain clinical measurements.

Minimising Measurement Variation

The true, or biological variation may be reduced if the factors that influence what is being measured are known. Blood pressure can change for a number of reasons, for example, whether the subject is lying, sitting or standing. By strictly defining the circumstances under which blood pressure is measured, variation due to posture can be minimised. A further aid is to make repeat measurements on the subject and take the mean.

Between observer differences may also be reduced by defining precisely the criteria required before reporting that a clinical sign is present. In the examples above, where the doctors disagreed on the presence of cough and sputum, an agreed definition of what constituted a cough, or production of sputum would have produced better

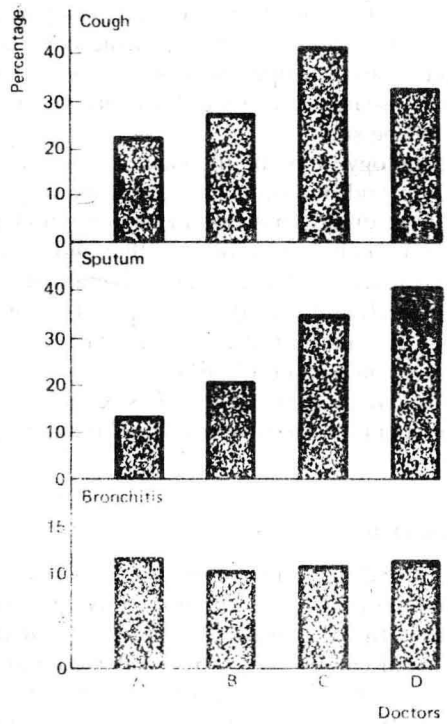

Fig 1.6 Observation variation in assessing the presence of chest symptoms and past history of bronchitis.

From: Cochrane A L, Chapman P J and Oldham P D (1951) Observer errors in taking medical histories, *The Lancet* i: 1007–1009.

agreement on the proportion of men with these symptoms. The Medical Research Council produced a set of standard questions to aid the investigation of chronic bronchitis. Those on cough are as follows:

The investigation of chronic bronchitis

1 **Do you usually cough first thing in the morning in the winter?**
2 **Do you usually cough during the day or during the night in the winter?**
If 'Yes' to 1 or 2
3 **Do you cough like this on most days for as much as three months each year?**

The Epidemiological Approach to Medicine

Populations and Diseases

The medical student starting clinical practice will be confronted with a succession of patients with often unrelated problems. After a while, patterns will begin to take shape as experience is gained. It will become apparent that people with similar problems have several characteristics in common. Thus will begin an awareness of the epidemiological approach to medicine. The recognition that some types of people are more at risk of developing a particular disease than others leads one to question why this should be so.

Epidemiology may be defined as the study of the distribution and determinants of disease in populations. The study of disease patterns in human populations is an early step in a chain of processes that ends in identifying the cause of disease. If cause can be identified, then it may be a relatively easy matter to prevent a disease from occurring. It makes sense to prevent, rather than to try to treat, often inadequately, the late effects of disease processes. Yet at present, and in most countries, far more money is spent on 'curative medicine' than on 'preventive medicine'.

Sources of Data

To study the distribution of disease in populations, mortality and morbidity information must be available or obtainable. In developed countries, information about numbers and causes of death is collected and published routinely. Numbers of deaths are usually measured accurately; the accuracy of cause of death is less certain. Information about illness, or morbidity statistics, is also collected and published. However, for many reasons, including the difficulty of defining illness, the quality of morbidity information is more variable. Mortality and morbidity statistics provide numerators for measuring disease frequencies in populations. It is necessary to relate them to denominators which are population measurements. These demographic statistics are also collected and published routinely in developed countries. Censuses are held primarily for legal and administrative purposes and the information collected is also of use in health care, not only as denominators for rates but also for health care planning purposes. Some developing countries have vital statistical information relating to the populations of city areas but not for the whole country, while others have little or no routine information available at all.

Time, Place, Persons

It has been known since the time of Hippocrates that personal, place and time factors influence whether or not people become ill.

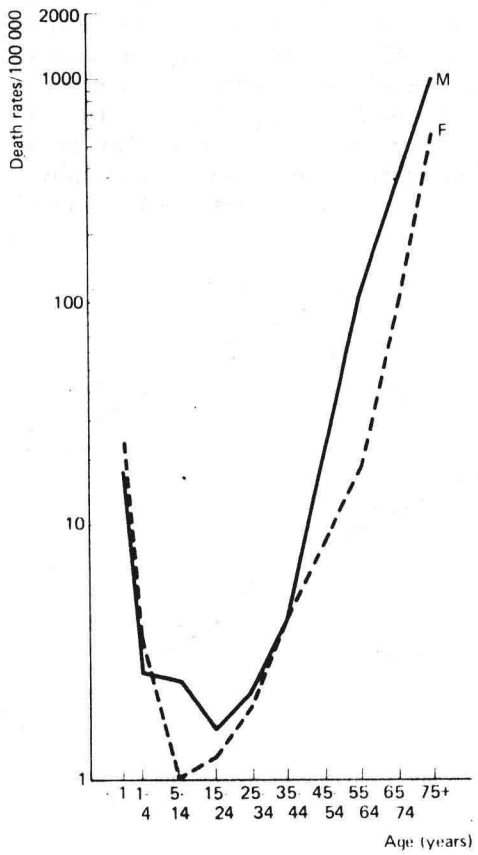

Fig 1.7 Death rates from pneumonia and bronchitis in The Netherlands, 1969.

From: Respiratory disease in Europe. Report on a study (1974). Regional Office for Europe. WHO: Copenhagen.

Age and Sex Of the personal factors, age is one of the most important. In developed countries death rates, except in the first year of life, are very low until middle age or late middle age, when they begin to rise steeply (Fig. 1.7).

Because of this marked association, the age structure of populations must be taken into account when attempts are made to compare death rates. Various standardisation techniques are available to make this possible. In developing countries, death rates in the first few years of life are usually very high: in some areas more than 50 per cent of children die before the age of five. Infant mortality rates – deaths in the first year of life – are a useful index of the 'healthiness' or otherwise of a country.

The sex of an individual is also an important determinant of health or disease. The male appears to be the

biologically weaker sex, and death rates are higher for males than for females at almost every age.

Ethnic and Cultural Factors These factors have important influences, though it is often difficult to separate their individual effects. Death rates among the non-white population of the United States are higher, age for age, than among the white. The differences are mostly explainable in terms of a poorer total environment rather than in 'racial' terms. Few Seventh Day Adventists die of lung cancer; cigarette smoking is not encouraged in that sect.

Social Class Some striking patterns emerge when social class and morbidity or mortality are examined. Because death rates vary so considerably with age and between the sexes, when the mortality experiences of two or more groups are compared it is necessary to take their age and sex structure into account. The standardised mortality ratio (SMR) is one of the measures mentioned above which compensates for such variations. Table 1.5 shows

Table 1.5. SMR and social class: men aged 15 to 64, England and Wales 1970 to 1972

	Social Class					
Cause of Death	*I*	*II*	*IIIN**	*IIIM**	*IV*	*V*
Malignant neoplasm, all sites	75	80	91	113	116	131
Stomach cancer	50	66	79	118	125	147
Lung cancer	53	68	84	118	123	143
Ischaemic heart disease	88	91	114	107	108	111
Polyarteritis nodosa	126	117	109	94	111	81
Bronchitis and emphysema	36	51	82	113	128	188
Stomach ulcer	54	53	99	102	117	209
Prostatic hyperplasia	57	92	97	93	107	156
Motor vehicle accidents	77	83	89	105	121	174

* *N*: non-manual, *M*: manual

Source: The Registrar General's Decennial Supplement, England and Wales 1971, Occupation Mortality Tables. London: HMSO, 1978.

SMRs for selected causes of death for men aged 15 to 64 in England and Wales. The average experience for the whole population of employed men between those ages is defined as 100 and the higher the figure, the greater is the risk.

Occupation Occupation affects health in a variety of ways. First, there are jobs which are dangerous in that physical, chemical or biological hazards are directly involved. Second, there are jobs that are relatively poorly paid, so that in societies where health care or education have to be purchased directly, individuals and their families are at a disadvantage. There are also occupations that are mentally stressful but which demand little physical activity, a combination which may lead to an increased likelihood of the development of coronary artery disease. The Office of Population Censuses and Surveys in England and Wales publishes after each census an Occupational Mortality Supplement which is an excellent source of information, although occupational mortality figures must be interpreted with caution. Table 1.6 shows the risk by occupation of death from circulatory diseases.

Table 1.6. SMRs by occupation: circulatory diseases, men aged 15 to 64, England and Wales 1970 to 1972

	SMR
University teachers	47
Farmers	79
Postmen	79
Medical practitioners	85
Dentists	89
Electricians	103
Lorry drivers	106
Service, sport and recreation workers	110
Clerks	118
Nurses	122
Police officers	131
Coal-mine workers underground	132
Telephone operators	133
Fishermen	137
Publicans and innkeepers	151
Tailors	159
Bricklayers' labourers	239

Source: The Registrar General's Decennial Supplement, England and Wales 1971: Occupational Mortality Tables. London: HMSO, 1978.

Marital Status Marital status, and morbidity and mortality experiences are related. Death rates in England and Wales in divorced people are about twice those of married people of the same sex and age. For specific causes of death, such as road traffic accidents, there may be a threefold difference in risk. Death rates for single persons are higher than for the married. While these differences are statistically significant ones, this does not necessarily mean that the relationships are causal. For instance, the higher death rates among single people may be partly due to the fact that individuals with physical or mental handicap are less likely to marry than are those without.

Geography Patterns of disease and death tend to vary throughout the world. The patterns are largely determined by the state of economic and other development of the country concerned. In developing countries the major problems are those of infections, parasitism and undernutrition, though little reliable data are available for what amounts to about 70 per cent of the world's population. Health services in developed countries, on the other hand, will deal mainly with diseases of ageing populations, of wear and tear, of stress and overindulgence. Tables 1.7

Table 1.7. Death rates per 100,000 population, England and Wales 1979

Acute myocardial infarction	220·8	(0·6)
Cerebrovascular disease	151·3	(10·1)
Lung cancer	70·7	(2·0)
Breast cancer	47·9	(0·7)
Bronchitis, emphysema, asthma	47·0	(2·3)
Stomach cancer	23·0	(0·7)
Motor vehicle accidents	11·8	(14·4)
Diabetes mellitus	9·8	(2·7)
All causes	1206·0	(523·4)

( ) = corresponding rates for Thailand 1979.
Source: World Health Statistics Annual 1979, Vol. 1 Vital Statistics and Causes of Death. WHO, Geneva, 1981.

Table 1.8. Death rates per 100,000 population, Thailand 1979

Ill-defined and unknown causes	127·9	(2·6)
Senility	110·7	(2·7)
Infectious and parasitic diseases	48·3	(4·6)
Accidents	36·0	(30·2)
Acute upper respiratory infection	27·6	(0·2)
Diseases of pulmonary circulation	27·3	(74·1)
Homicide	25·9	(1·1)
Respiratory tuberculosis	14·6	(1·0)
All causes	523·4	(1206·0)

( ) = corresponding rates for England and Wales 1979.
Source: World Health Statistics Annual 1979, Vol. 1 Vital Statistics and Causes of Death. WHO, Geneva, 1981.

and 1.8, taken from the World Health Organisation's Annual Report for 1979, compare and contrast the leading causes of death in England and Wales and in Thailand.

Less obviously explained geographical variations in disease patterns occur within countries. There are often quite striking local variations even from one small neighbourhood to another. Some of these reflect differences in general between the urban and rural environment. In England and Wales, death rates from chronic bronchitis and emphysema are considerably higher in towns than in rural areas (Fig. 1.8).

The excess urban deaths are partly 'explained' by the greater degree of air pollution experienced by town dwellers. Other local differences are less easy to 'explain'. Table 1.9 shows that the risk of dying from stomach cancer is almost three times greater in North and West Wales than in many rural areas of Central and Eastern England.

Time Trends Variations in disease patterns also occur with time. Fig. 1.9 shows how lung cancer deaths in males have increased dramatically in Britain during this century and how some of the factors that have been suspected as being causal have varied over the same period. The only

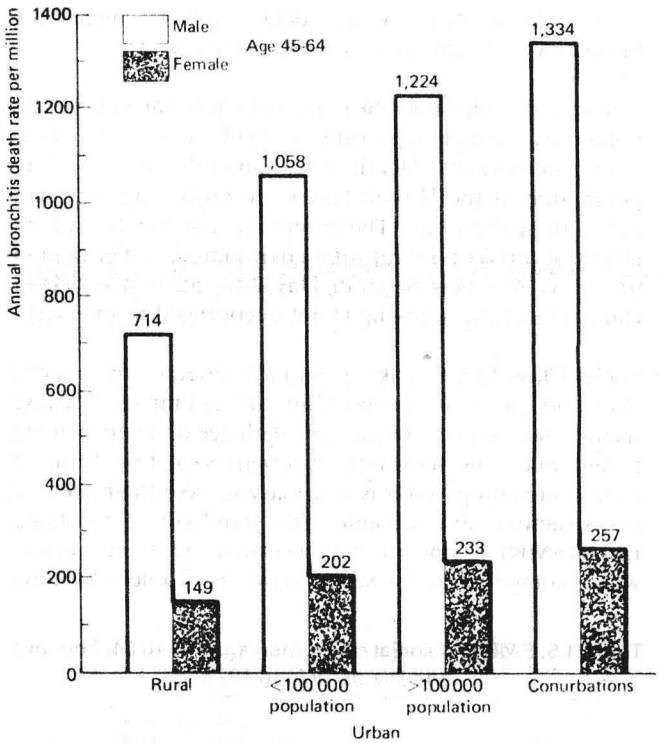

Fig 1.8 Death rates from bronchitis in middle age in rural and urban areas, England and Wales 1959 to 1963.

From: Air Pollution and Health. A report for the Royal College of Physicians (1970). Pitman: London.

Table 1.9. Stomach cancer: SMR by rural district: females, England and Wales 1969 to 1973

Rural district of:	*SMR*
Merionethshire	172
Cardiganshire	167
Caernarvonshire	160
Carmarthenshire	151
Denbighshire	140
Glamorgan	140
Northern region	110
Yorkshire and Humberside region	97
West Midlands region	88
South West region	82
East Anglia region	72
South East region	68

Source: The Registrar General's Decennial Supplement, England and Wales 1969 to 1973. Area Mortality. London: HMSO, 1981.

factor that precedes the rise in lung cancer mortality by the right time interval and increases in parallel is cigarette consumption.

This variation is a long term one. Others occur over short periods of time. Epidemics of infectious diseases have been of importance since early in man's history and