

# The age of Maturity



50 years old

40 years old

60 years old

# The age of Maturity



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## Population Profile

AT the last census in 1966 there were nearly 12 million people aged between 45 and 64 in England and Wales. This age group, which for convenience will be termed 'middle age' throughout this paper, covers the second part of economically active life. It is a time during which, while many careers are still reaching a peak, a decline in physical and mental powers has already begun to set in. As middle age is entered, a new phase of life begins. Patterns of morbidity and mortality rapidly alter as degenerative diseases become increasingly more significant. Socially, middle age is associated with a change in the organisation of family life. For women, the menopause generally occurs during the mid forties. For both men and women, as children grow up and leave home, middle age brings declining parental responsibilities. In this sense the quotation, 'life begins at forty', may seem appropriate, but despite the great advances made during the last century, it is still too often the period in which life prematurely ends.

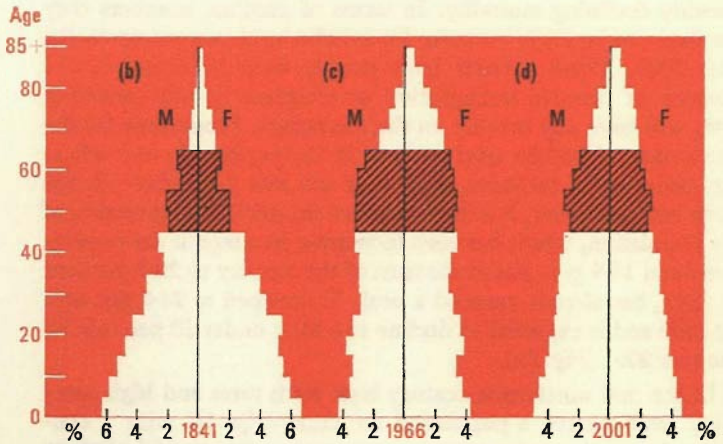
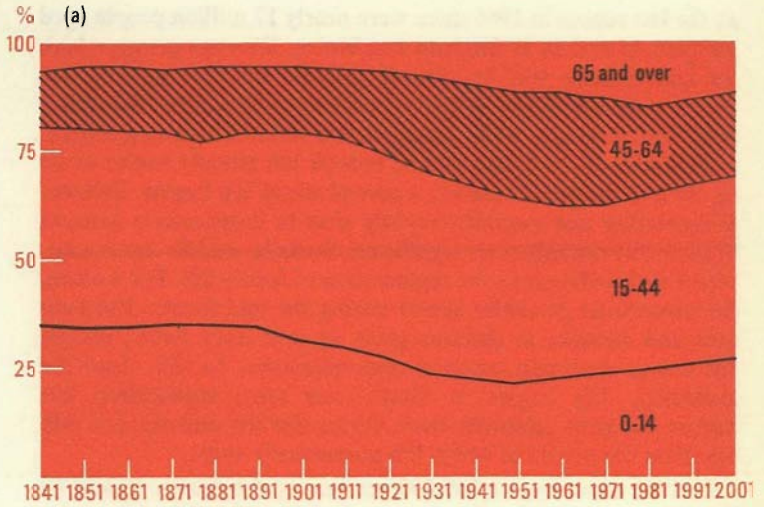
In 1901 there were 4,845,000 persons aged between 45 and 64 in England and Wales. Having reached 11,967,000 in 1966 their numbers are expected to decrease to 11,733,000 in 1981 and then rise again to 12,631,000 by 2001. These population projections are based on the assumptions of a fairly constant birth rate and steadily declining mortality. In terms of absolute numbers they are likely to be fairly accurate for middle aged persons up to the year 2001. These persons have already been born and in the absence of massive immigration or emigration, only mortality rates will have any bearing on their numbers. Projections for the proportion of middle aged persons in the population as a whole are rather more tentative since they are also dependent on the birth rate. However, it is believed that the middle aged section of the population, which has been increasing its share of the population from 14.9 per cent at the turn of the century to 25.7 per cent in 1961, has already reached a peak. It dropped to 24.8 per cent by 1966 and is expected to decline to a little under 20 per cent by the year 2001 (*Fig. 1a*).

In the mid nineteenth century high birth rates and high mortality rates created a population structure (*Fig. 1b*) with a concentration in the younger age groups, a structure typical of many

# Figure 1

## Population distribution, England and Wales 1841-2001

Source: Registrar General's Statistical Review of England and Wales, various years



underdeveloped countries today. The increase by 1966 in the proportion of middle aged people (and old people) (*Fig. 1c*) has resulted from two factors. Firstly, declining mortality rates have enabled more people to survive up to and through middle age. Secondly, a declining birth rate from the 1870s until the late 1930s has resulted in a proportionately smaller group of young persons. Together, these two factors have produced the present 'bulge' in the upper end of the scale (*Fig. 1c*). The 'ageing' of the population is permanent in that it derives from a reduction in mortality, but that part of it which results from a declining birth rate in the early part of the twentieth century is likely to be temporary. By the year 2001, as (*Fig. 1d*) shows, the present 'bulge' in the older age groups is expected to have disappeared.

Thus while we are at present faced with problems arising from an ageing population, in the future we shall face the prospect of a shift in the population mix from the older to the younger age groups. This reversal has already started for the middle aged section of the population, and for the over 65s, while their share of the population has not yet reached its peak, their decline, in percentage terms, is expected to start in the 1980s.

*Table A* shows the distribution of these persons by age, sex and

## Table A

*Population of England and Wales, 1966, by age and marital status*

*Source:* Sample Census 1966. Summary Tables

MALES	<i>Total</i>	<i>Single</i>	<i>Married</i>	<i>Widowed</i>	<i>Divorced</i>
	No.	%	%	%	%
45-49	1,512,100	10	88	1	1
50-54	1,524,800	9	88	2	1
55-59	1,468,700	8	87	4	1
60-64	1,268,100	8	85	6	1
45-64	5,773,700	9	87	3	1
FEMALES	<i>Total</i>	<i>Single</i>	<i>Married</i>	<i>Widowed</i>	<i>Divorced</i>
	No.	%	%	%	%
45-49	1,534,000	9	85	4	2
50-54	1,610,400	10	80	8	2
55-59	1,589,300	11	73	14	2
60-64	1,459,200	14	63	22	1
45-64	6,193,700	11	75	12	2

marital status in 1966. In the 45 to 49 age group, there are 104 women living for every 100 men. In the 60 to 64 age group, there are 115 women living to every 100 men. This disparity between the number of men and the number of women reflects the relatively greater mortality suffered by males, a phenomenon which starts to become really significant during middle age as the degenerative diseases rapidly increase. The disparity becomes even more marked in the older age groups. The social costs of premature mortality are highlighted by the statistics on widowhood. As many as 22 per cent of women in the 60-64 age group have been widowed. This compares with 6 per cent for men in the same age group. An interesting pattern emerges in respect of the proportion of single men and women at various ages. There are fewer single men and more single women in the older age groups in *Table A*. The explanation can be found in the relative numbers of men and women living when each of these cohorts<sup>1</sup> was at marriageable age. After the First World War there was a shortage of male marriage partners, thus fewer single men and more single women, but the balance has gradually been redressed, and has even swung in the other direction.<sup>2</sup>

<sup>1</sup>Cohort: the term used to describe a group of persons born in any one time period whose progress can then be observed as they grow older.

<sup>2</sup>The group of persons who composed the older age groups in 1966 tended to marry late in life, by which time the differential mortality rates for the sexes had placed men in a minority. The disparity in numbers was considerably increased by the loss of young men (aged over 65 in 1966) in the First World War and also by emigration. Thus there were insufficient males and consequently, in the older age groups at present, there is an excess of single women, and a comparatively low number of single men. As the effects of the First World War receded, as the customary age of marriage decreased, and as the general decline in mortality reduced the disparity in numbers of young men and young women, so the balance between marriageable men and marriageable women became more even. Mortality rates have now declined sufficiently to enable males to maintain their numerical superiority (the ratio of male to female births is about 1.05) right up to marriageable age. Thus the position of men *vis-à-vis* women has now been reversed.

## Mortality Trends

Since the end of the nineteenth century, there has been an almost continuous decline in mortality among the middle aged (*Fig. 2*). This is true for all age groups<sup>1</sup> although the older the age group the smaller the decline has been. Thus for the 45 to 54 age group there has been a 66 per cent decrease in the last 70 years, from 17.3 deaths per thousand living per annum in 1891-95 to an average of 5.86 per thousand in 1961-65. For the 55-64 age group the decrease has been rather less, 51 per cent, from 32.5 per thousand in 1891-95 to 15.9 per thousand in 1961-65. For both groups the decrease has been greater among women than among men.

Improving public health services, advances in medical diagnosis and treatment and the chemotherapeutic revolution of the last thirty years have all played their part in reducing mortality rates. No less important is the vast improvement that has taken place in living standards. Not only did unsatisfactory living and working conditions and inadequate nutrition both cause disease, and predispose towards disease, but also the economic circumstances of many patients created a barrier to effective treatment. Since the Second World War a doctor has usually been able to prescribe for most illnesses what he regards as the medically most desirable course of treatment. Previously treatment was often either too costly or could not be prescribed if it involved the patient in prolonged absence from work, with the consequent loss of income which his family could ill afford.

Young adults and children have, in terms of reduced mortality, obtained more benefit from these improvements than other sections of the community. This is largely attributable to the decline in mortality from infectious diseases. From the mid nineteen thirties the improved control of infectious diseases through the introduction of effective therapeutic agents caused a sharp acceleration in the downward trend of mortality among these younger persons. This accelerated decline has not occurred to any marked degree for the middle aged. Although the reduction in mortality among the middle aged from many infectious diseases,

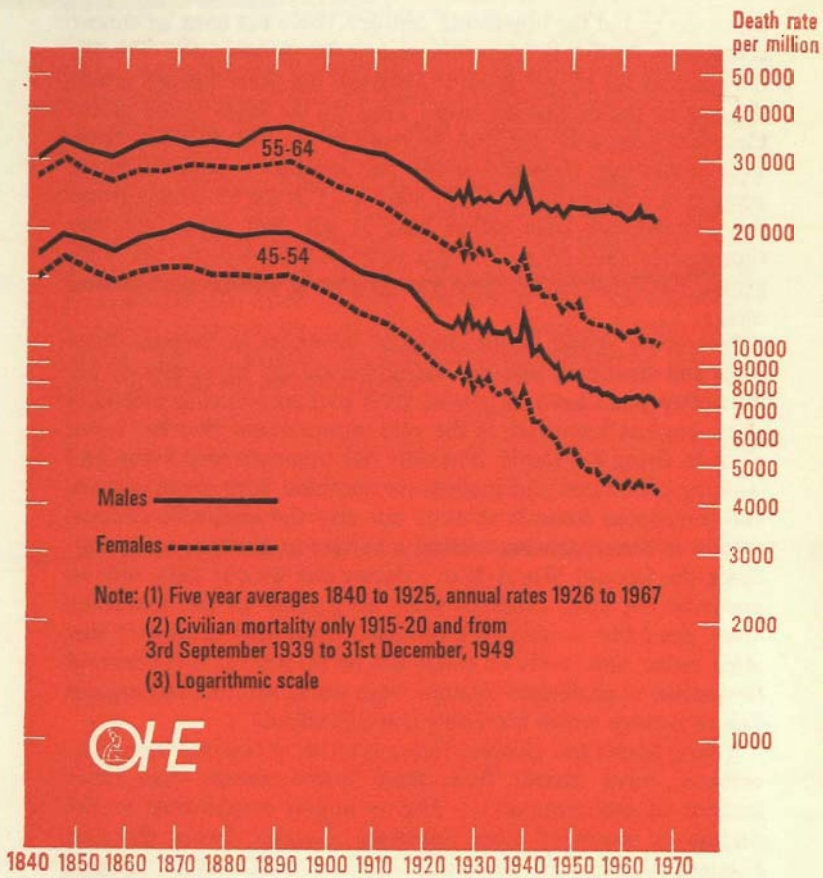
<sup>1</sup>Office of Health Economics, 1962, 1964, 1966a, 1968.



## Figure 2

*All Causes, death rates per million living, 1840-1967, England and Wales*

Source: Registrar General's Statistical Review of England and Wales, various years



particularly tuberculosis, has been comparable with that for younger persons, these diseases are of lesser weight among causes of death and therefore the effect of their control on overall mortality rates has not been so substantial. Furthermore, there have been increases in mortality from some causes which become preponderant towards middle age, particularly coronary heart disease and lung cancer. *Fig. 3* shows the leading causes of death from 1937 to 1967 for the 45 to 64 age group. The most significant changes that have taken place are the lower mortality from tuberculosis and the higher mortality from lung cancer among both sexes, and also the higher mortality rates for heart disease among men. For males, heart disease is now the largest cause of death, and for females, cancer.

The following commentary on mortality trends for certain diseases will generally use data from the 1930s onwards.

#### HEART DISEASE

Mortality from heart disease has been increasing over the past 30 years for middle aged men, and decreasing for middle aged women (*Fig. 4a*). In fact the decrease experienced by middle aged women has been shared by all groups of women except the very elderly and also by men under the age of forty. The explanation for the disparity between middle aged men on the one hand, and women and young men on the other, lies in the types of heart disease which predominate in each group. In short, mortality rates for heart disease involving the coronary arteries have been increasing among all age and sex groups, and in those groups where this type predominates, the overall mortality rates from heart disease have been increasing.

However, the magnitude of the increase in mortality from coronary heart disease is not at all clear. *Fig. 4b* shows the changes that have taken place in recorded mortality from 'arteriosclerotic' heart disease (ICD<sup>1</sup> 420) and 'degenerative' heart disease (ICD 421-422). It is the former, 'arteriosclerotic' disease which can be equated with coronary heart disease (virtually all deaths recorded against this rubric are specified as involving the coronary arteries). There has been an apparent increase in the 'arteriosclerotic' category and a decrease in the 'degenerative' category, but this cannot be taken at face value.

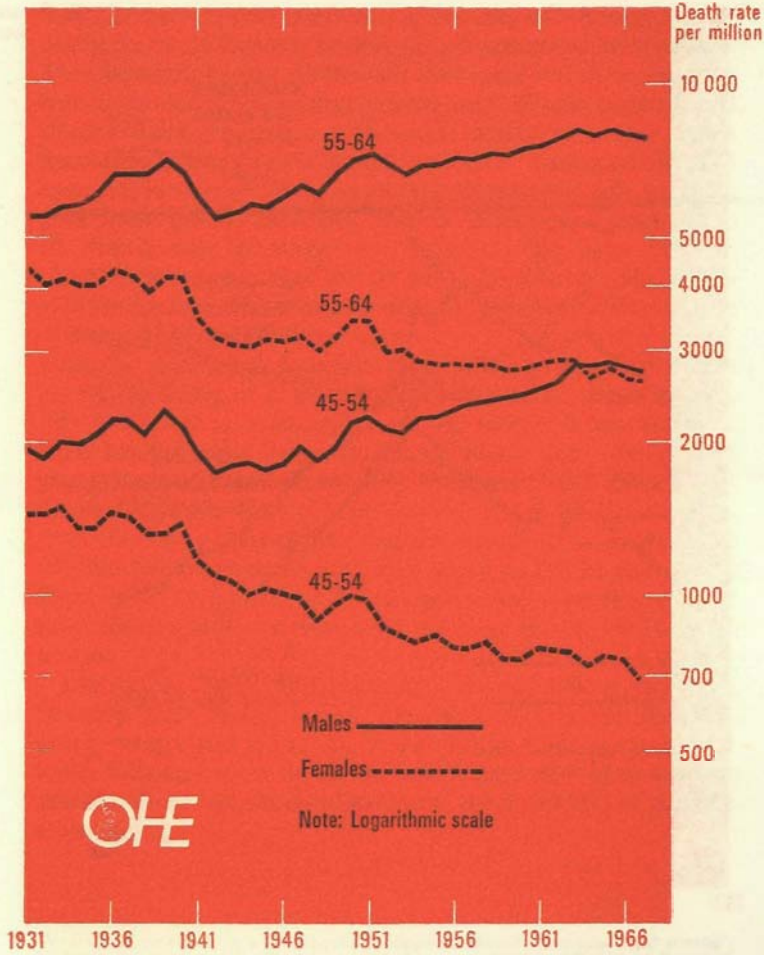
<sup>1</sup>'ICD', The International Statistical Classification of Diseases, Injuries and Causes of Death.



# Figure 4a

All diseases of the heart, death rates per million living by sex and age, England and Wales, 1931-1967

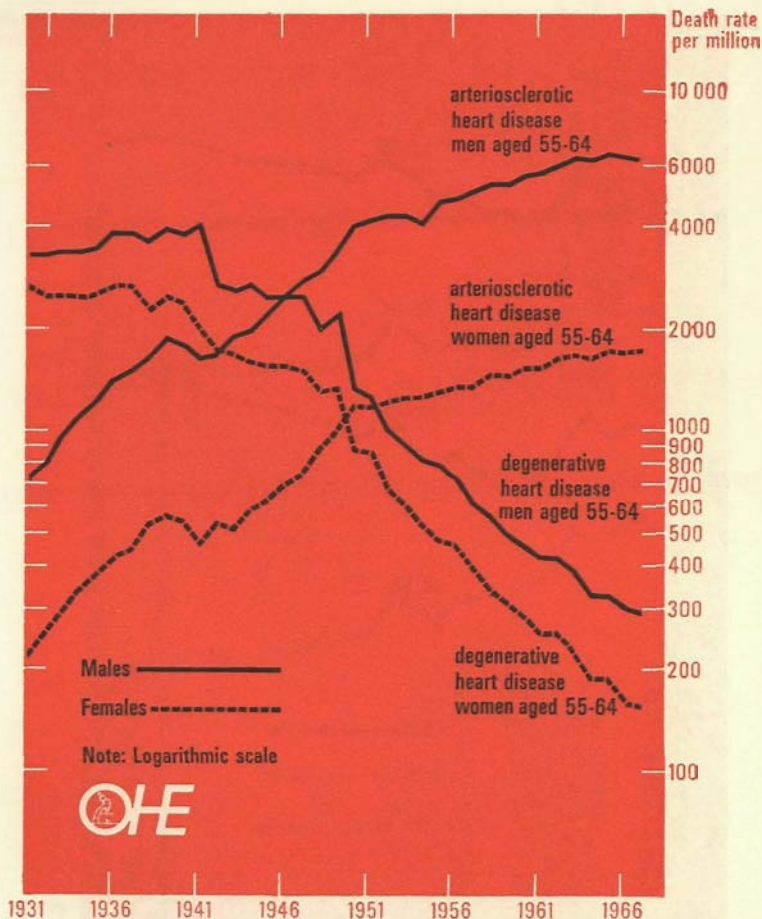
Source: Registrar General's Statistical Review of England and Wales, various years



## Figure 4b

Death rates per million living from arteriosclerotic and degenerative heart disease, men and women aged 55-64, England and Wales, 1931-1967

Source: Registrar General's Statistical Review of England and Wales, various years



As a result of ambiguity and associated changes in certification practice there has very probably been a shift of some magnitude, in the official records from the degenerative heart disease category to the arteriosclerotic heart disease category. This shift will have involved deaths which resulted from one and the same condition and this condition is almost certainly 'atherosclerosis'<sup>1</sup>.

Thus the rapid rise in mortality rates from arteriosclerotic heart disease is in part artefactual in that they increasingly include deaths that were formerly attributed to degenerative heart disease. This, however, cannot account for the overall rise in deaths from both arteriosclerotic and degenerative heart disease together, and all the evidence points to a considerable increase in mortality from heart disease involving the coronary arteries<sup>2</sup>. Among middle aged men, this is now by far the largest single cause of death. In 1967, 4378 deaths per million living, equal to 33 per cent of deaths from all causes, were attributed to 'arteriosclerotic heart disease'. (Another 5 per cent of all deaths were attributed to other forms of heart disease.) This compares with the next largest single cause of death, lung cancer, 14 per cent.

On the other hand, for middle aged women, only 1065 deaths per million living, or 15 per cent of deaths from all causes in 1967, were attributed to 'arteriosclerosis', and another 8 per cent to all other heart disease. Formerly, among middle aged women (and young men and women as well) rheumatic heart disease was the most common form of heart disease. The decline in mortality from rheumatic heart disease and the control of rheumatic fever which is its precursor has more than made up for the general rise in mortality from coronary disease, and overall mortality rates for heart disease have therefore been declining among middle aged women.

Factors associated with increased risk of falling victim to coronary heart disease include hypertension, cigarette smoking, excess weight and inactivity, stress and high blood cholesterol level. Although some or all of these factors may have a direct causal relationship, the development of the disease is not yet fully understood.

<sup>1</sup>Arteriosclerosis is a term which requires definition. Literally, it means 'hard arteries'. To some it is synonymous with 'atherosclerosis', a specific term referring to disease of the lining of the arteries. To others it means diffuse hyperplastic sclerosis, the pathology of high blood pressure, and to others still it simply means 'senile change' of any type or a mixture of types. It is not certain which specific types of heart diseases are included under the heading. An accurate diagnosis can only be made at post mortem. Without this the main symptoms and signs can be misinterpreted by non-pathologists.

<sup>2</sup>Office of Health Economics, 1966b.

Advances have been made recently, particularly in medicines to control hypertension. Surgical techniques too have shown considerable improvements. The replacement or excavation of narrow coronary arteries is becoming more widespread while the replacement of diseased heart valves with plastic substitutes or valves from cadavers has been performed successfully over the past decade. Unfortunately, these operations can only save the lives of a small minority of sufferers from heart disease. Consideration of environmental factors is less encouraging. Cigarette smoking remains as popular as ever, while excess weight, although not popular, remains as widespread as ever. The commonest form of exercise, walking, decreases as mechanical transport increases. Only half of all patients survive their first heart attack, and the majority of those who die will do so within an hour<sup>1</sup>. Thus for a large proportion there is unlikely to be sufficient time for curative measures to be applied and this argues strongly for greater efforts in the development of preventive and prophylactic measures to combat this growing epidemic.

#### CANCER

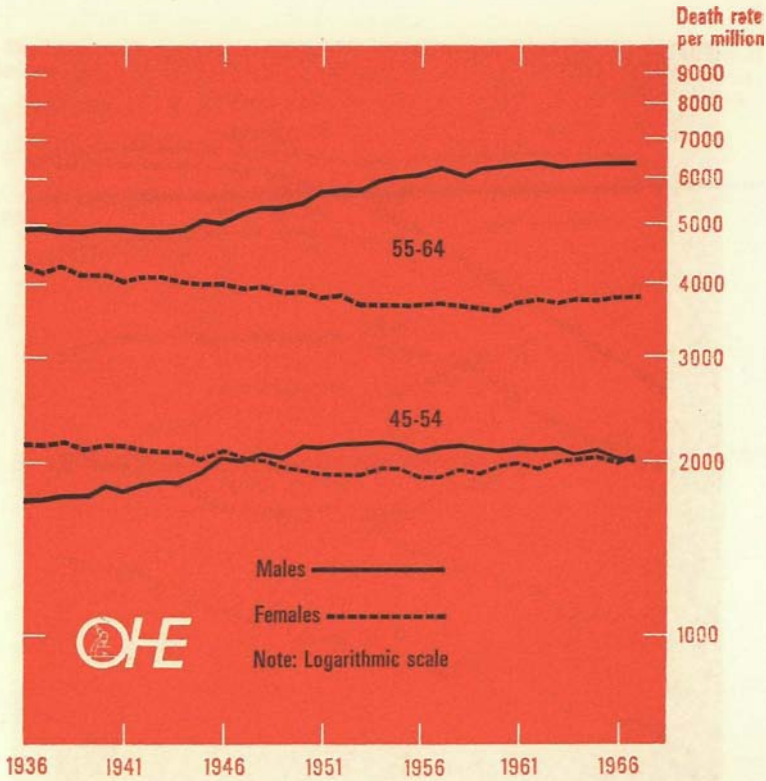
While heart disease is the most common cause of death among middle aged men, cancer predominates among middle aged women. In 1967, 39 per cent of all female deaths in the 45 to 64 age group, or 2800 deaths per million living, were caused by cancer. For men, the figure was 29 per cent, or 3860 per million living. *Fig. 5a* shows the movements, over the past thirty years, in mortality rates for cancer of all sites taken together. For males, rates increased between the war years and the nineteen fifties and then levelled off. For females, mortality declined continuously until the nineteen fifties and then levelled off and started to increase in the nineteen sixties.

In common with heart disease, it is necessary to analyse mortality rates for individual types of cancer before the broad trends can be understood. Fortunately ambiguity in terminology and classification causes fewer difficulties (although it must always be a problem) and the salient points are quite clear. Briefly, mortality rates for most of the important sites of cancer have either showed little variation over the past thirty years or have recorded a decrease. The incidence of cancer of the breast, the most common malignancy among middle aged women, accounting in 1967 for 25 per

## Figure 5a

Cancer of all sites, death rates per million living by sex and age, England and Wales, 1936-1967

Source: Registrar General's Statistical Review of England and Wales, various years

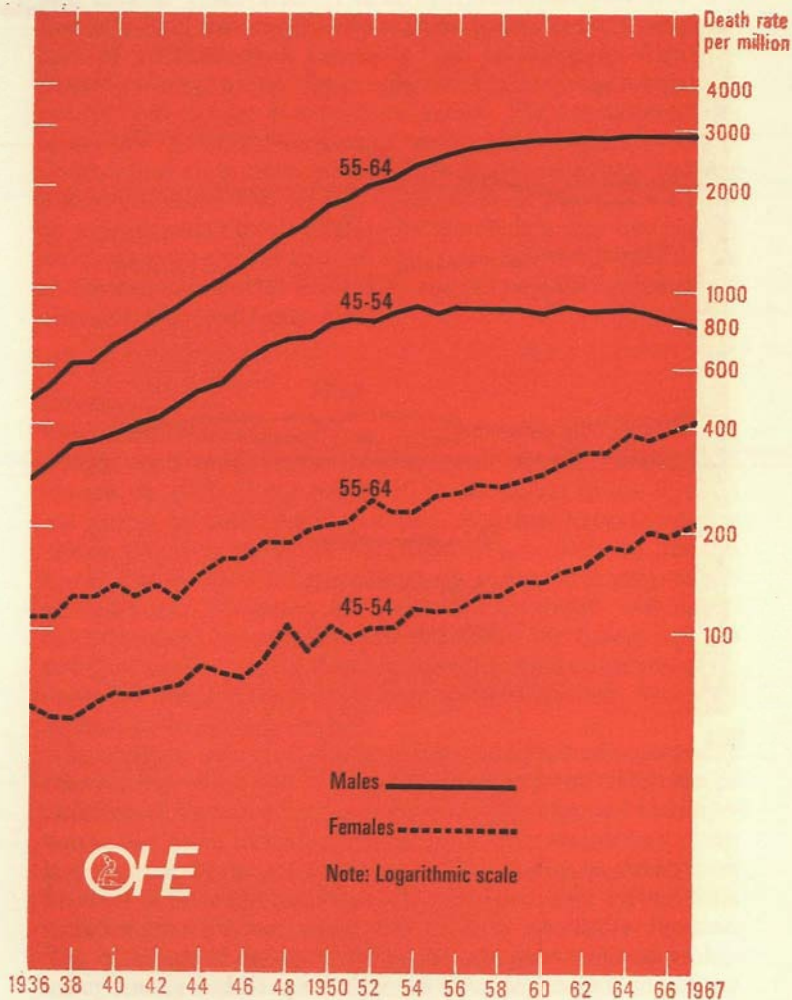




## Figure 5b

*Cancer of the lung, death rates per million living by sex and age, England and Wales, 1936-1967*

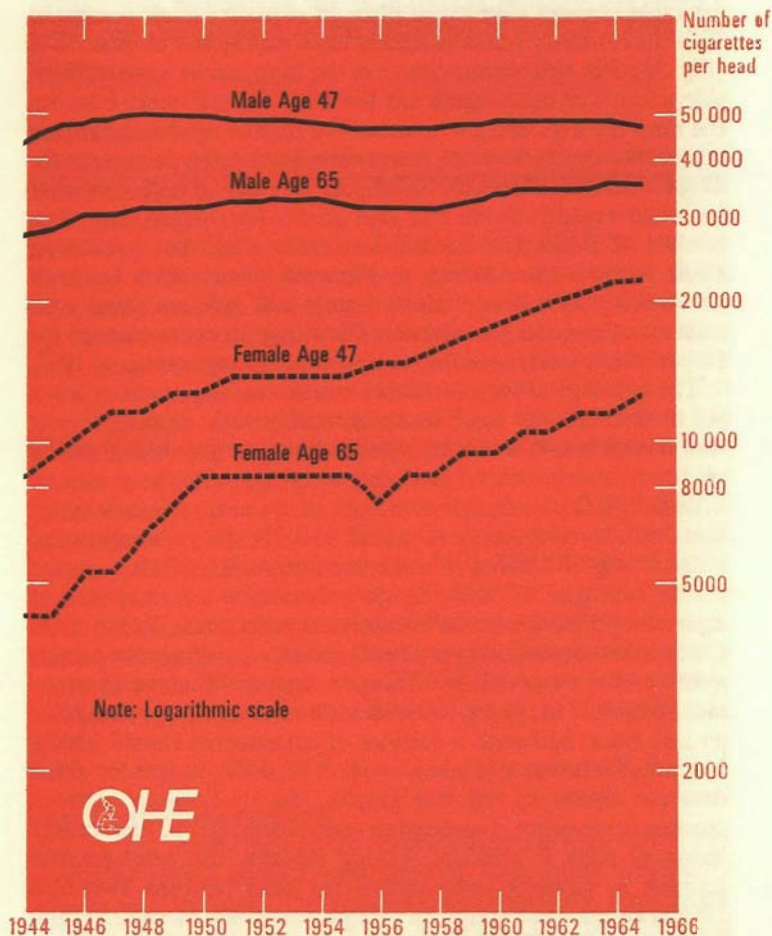
Source: Registrar General's Statistical Review of England and Wales, various years



## Figure 5c

Total number of cigarettes smoked per head over the previous ten years

Source: Tobacco Research Council Research Paper 1, 4th Edition.



cent of female cancer deaths, is approximately the same as it was in the nineteen thirties, although there is now some evidence of an upward trend. Cancer of the uterus (including cervical cancer) has been declining continuously over the past thirty years. For cancers of other sites common to both sexes, little overall change has taken place, except for cancer of the lung.

The trend for cancer of the lung has been unique. Very considerable changes have taken place in mortality rates, compared with the relatively stable mortality rates for cancers of other sites (*Fig. 5b*). For this reason cancer of the lung merits separate consideration. The most significant feature is the difference between the rates for men and for women. For middle aged men, among whom this cancer is much commoner, accounting at present for 47 per cent of all cancer deaths in this age group, mortality increased rapidly up to the end of the last decade and then levelled off. Recently it has even recorded a slight decrease among 45-54 year old men. Among middle aged women there has been no levelling off and mortality, though still low compared with male rates, continues to rise sharply. Lung cancer accounted for 12 per cent of all female cancer deaths in this age group in 1967.

The aetiology of lung cancer, or indeed any other cancer, is not yet understood, but the causal relationship with smoking is now well established. While many other factors may have had a bearing on the differences that have been noted between the trends in male and female mortality rates from lung cancer, the only factor that has altered radically in recent years is the consumption of tobacco. *Fig. 5c* shows, for the average male and the average female, at ages 47 and 65, the cumulative consumption of cigarettes per head over the previous ten years, from 1944 to 1965. Cumulative consumption is important since a malignancy takes a number of years to develop. It is not suggested that the development period is ten years, but back data to 1944 are only available on this basis. Although a number of adjustments should ideally be made, for instance to take account of the different ages for which data are shown in the two graphs, the relationship between changes in cigarette consumption and the changes in lung cancer mortality rates is striking. Among females, the proportionate increase in cigarette consumption per head between 1944 and 1965 is almost exactly equal to the proportionate increase in lung cancer mortality. This is not the case for males, but it can be seen that a similar levelling off has occurred in both cigarette consumption and lung cancer mortality rates.

It is unfortunate that there is little to be gained from the early diagnosis of lung cancer, since it is not yet feasible to detect the

disease sufficiently early to give a better prognosis.<sup>1</sup> This is also the case for cancer of most other sites, although there may be some advantage in the early detection of cancer of the breast. It is only for cervical cancer, which now accounts for 7 per cent of all female cancer deaths, that the institution of a large scale screening programme has been considered worthwhile. Although doubts have recently been raised as to its effectiveness<sup>2</sup>, it is generally considered that widespread use of screening facilities can make a significant contribution to the reduction of mortality from this cause.

#### TUBERCULOSIS

The conquest of tuberculosis is one of the most significant facts of recent medical history, a triumph for both public health measures and chemotherapy. Not only is it now curable at all stages, and thus vastly reduced as a cause of death, but its incidence has also declined dramatically through prophylaxis and better living standards, resulting in reduced disability and reduced demands on the resources of the health services. *Fig. 6* shows mortality rates for respiratory tuberculosis from the mid nineteenth century to date. The experience of the middle aged group is similar to that of young adults and children. Rates declined rapidly until the late 1940s. Improving environmental factors must have played a large part in the decline, but it may also be that during this period the British population was in the declining phase of a protracted epidemic of tuberculosis. From the late 1940s streptomycin, isoniazid and P.A.S. came into general use. With improved detection by mass miniature radiography, and effective medicines, the decline in mortality rates from tuberculosis was greatly accelerated. Among all age groups, tuberculosis now has little significance as a cause of death. While the disease killed 652 persons per million in the 45-64 age group in 1947, this had dropped to 59 per million in 1967.

#### OTHER RESPIRATORY DISEASES

During the second half of the nineteenth century, an increase in mortality among middle aged persons from other respiratory disease was recorded. The trend turned downwards towards the 1890s and with the advent of the sulphonamides, penicillin and the broad spectrum antibiotics from the late 1930s to the early

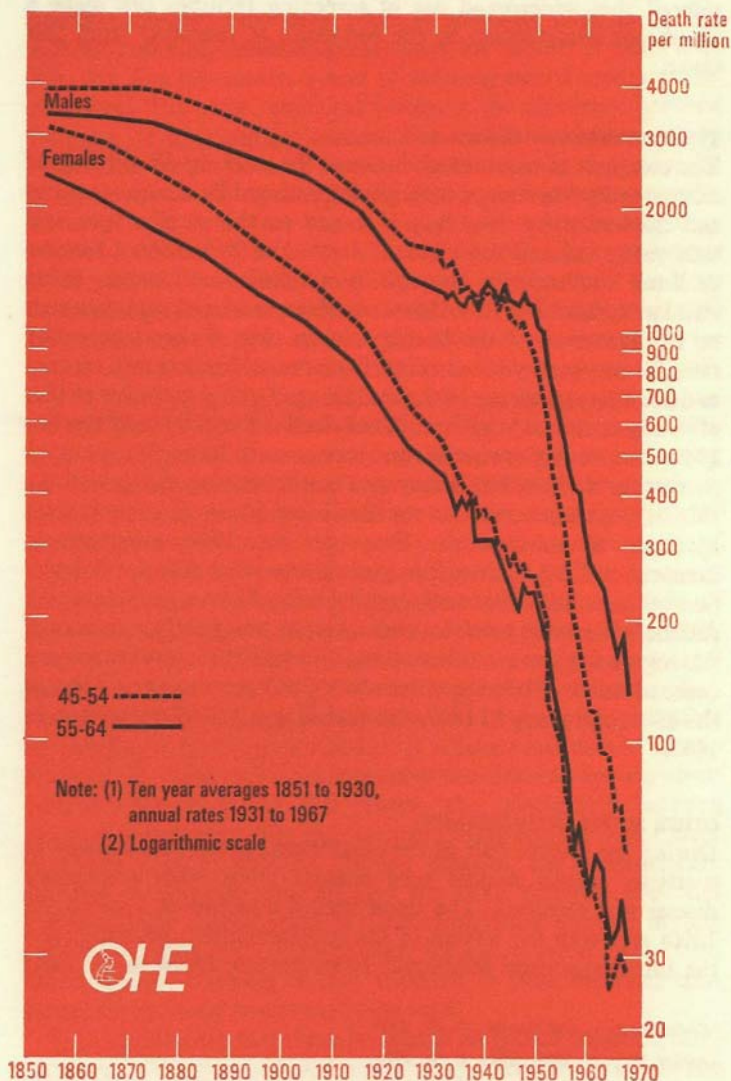
<sup>1</sup>Cochrane, A. L. and Fletcher, C. M., 1968.

<sup>2</sup>Ashley, D. J. B., 1966, Knox, E. G., 1966.

## Figure 6

*Tuberculosis of the respiratory system, death rates per million living by sex and age, England and Wales, 1851-1967*

Source: Registrar General's Statistical Review of England and Wales, various years



1950s, the downward trend was accelerated. From the early 1950s the decline levelled off. While mortality rates fluctuate quite significantly from year to year under the influence of the weather and the prevalence of influenza, respiratory disease accounted for 880 deaths per million living, or 9 per cent of all deaths within this age group in 1967. This compares with 1990 per million in 1937, or 14 per cent of all deaths. *Figs. 7 and 8* show mortality rates for bronchitis and pneumonia, the two major diseases in this category. Interpretation of bronchitis statistics is complicated by ICD revisions. *Fig. 7* shows a huge leap upwards due to a revision in 1940. Certifications for this condition are notoriously inaccurate, but there appears to have been a levelling off of the decline in deaths attributed to bronchitis in recent years. The levelling off has been most marked for 55-64 year old males, among whom rates have remained at the same level since the early 1940s. For males over the age of 65 there has been an increase in recorded bronchitis mortality.

For pneumonia, comparisons over time are also beset with difficulties. In common with young adults, pneumonia mortality rates among middle aged persons increased throughout the second half of the nineteenth century, decreased gradually up to 1940, and then declined at an accelerated rate up to the early 1950s. Since then the decline has tended to level off.

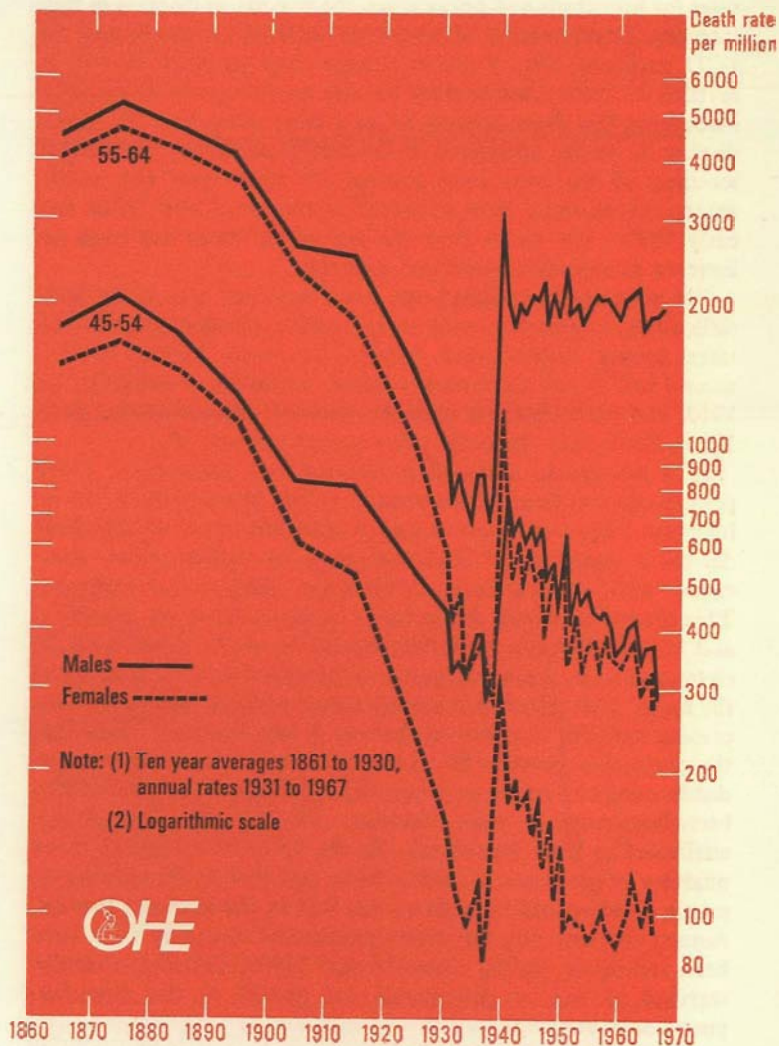
It is possible to distinguish between two main types, lobar pneumonia and bronchopneumonia. Lobar pneumonia is due to infection with pneumococci, and is a severe, often rapidly fatal disease if untreated. It is characterised by sudden onset, associated with marked fever, respiratory distress and cyanosis. This disease responds dramatically to sulphonamides, penicillin and other antibiotics. Bronchopneumonia, on the other hand, is characterised by a gradual spread of infection from the bronchi to the lungs. The infection is usually mixed with H. Influenza often present and the response to therapy is less dramatic. Although the distinction between the two is dubious in the certification of deaths except by expert pathologists, recorded mortality rates from bronchopneumonia have declined less rapidly than deaths attributed to lobar pneumonia. In the 45 to 64 age group, three quarters of pneumonia deaths were certified as bronchopneumonia as compared with about one half in the nineteen thirties. Among the very old, for whom pneumonia mortality rates have been increasing rapidly since the mid 1940s, virtually all deaths certified as due to pneumonia are placed in the bronchopneumonia category.

The levelling off of the decline in pneumonia mortality rates

## Figure 7

*Bronchitis, death rates per million living by sex and age, England and Wales, 1861-1967*

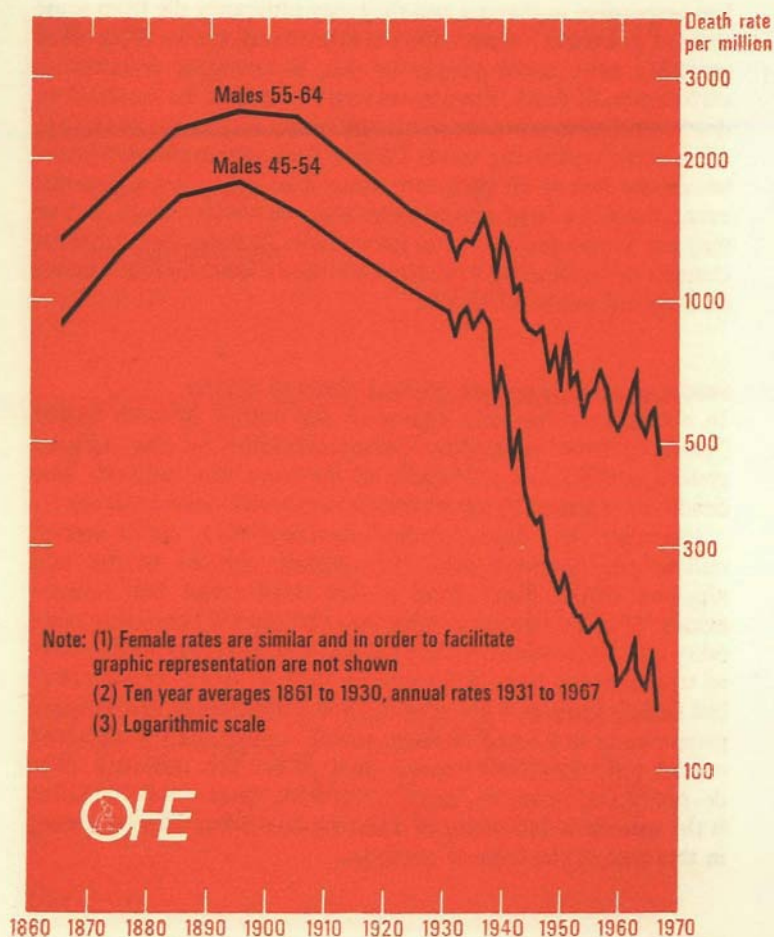
Source: Registrar General's Statistical Review of England and Wales, various years



## Figure 8

*Pneumonia death rates per million males living by age, England and Wales, 1861-1967*

Source: Registrar General's Statistical Review of England and Wales, various years





among the middle aged could reflect two phenomena. On the one hand, the therapeutic agents which originally brought about the dramatic decline may now be battling in an adverse environment, being used on more and more patients with a history of serious respiratory disease such as bronchitis. Antibiotics may have enabled these individuals to survive a number of episodes of respiratory illness but their damaged lungs become increasingly less responsive to therapy and they may ultimately die from some form of pneumonic illness. On the other hand, the levelling off of mortality rates could simply be due to changing practices in certification of death. Pneumonia must very often be recorded on death certificates when the death is in reality largely attributable to some other underlying cause. Deaths from uncomplicated pneumonia are rare at all ages, but, since it is very often a terminal event, there is a large area of uncertainty in which a death may or may not be certified as due to pneumonia. In these circumstances changes in certification practices may have a considerable bearing on recorded mortality trends.

#### VASCULAR LESIONS OF THE CENTRAL NERVOUS SYSTEM

In recent years vascular lesions of the central nervous system ('strokes') have been placed among diseases of the nervous system, and account for nearly all deaths in this category. The condition increases in significance as a cause of death with age.

Mortality rates from 'strokes' remained fairly stable among middle aged persons from the nineteen thirties to the mid nineteen fifties. Since then a downward trend has become evident (*Fig. 9*). Against a background of generally declining mortality this has resulted in the percentage of all deaths attributable to strokes rising from 8 per cent in 1937 to 10 per cent in 1957 but falling again to 9 per cent in 1967. The disease figures more prominently as a cause of death among women, with their lower overall mortality, than among men. What the mortality rates do not show, however, in common with diseases of the heart, is the considerable amount of disability associated with survivors, in this case in the form of paralysis.

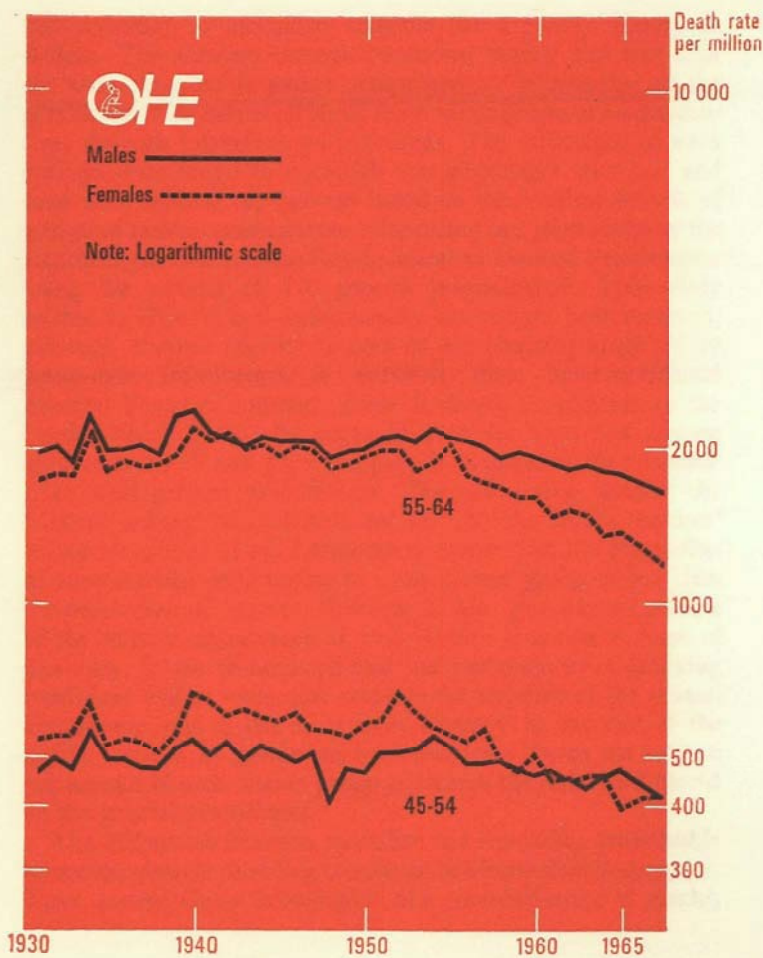
#### EXTERNAL CAUSES

A considerable proportion of deaths among children and young adults is attributable to external causes, including accidents and suicide. Mortality rates continue to increase with age, but decrease in prominence as a cause of death. For men between 45 and 64,

## Figure 9

*Vascular lesions of the central nervous system, death rates per million living by sex and age, England and Wales, 1931-1967*

Source: Registrar General's Statistical Review of England and Wales, various years



external causes account for a little over 4 per cent of all deaths. Motor vehicle traffic accidents make up about a third of this and suicide another third. External causes are responsible for a slightly greater proportion of all female deaths, almost 5 per cent. Motor accidents make up a quarter of this, and suicide almost a half.

# Mortality and Morbidity

THE collection of morbidity statistics has a patchy history in Britain. The sickness surveys conducted during and just after the war attempted to gather comprehensive information on the prevalence of disease at all levels from minor illness to hospitalisation, through interviews with patients. The difficulties of such surveys were found to outweigh any advantages they had and they were replaced by surveys based on the medical records of groups of general practitioners culminating in a joint study by the Registrar General and the Royal College of General Practitioners using the records of 170 general practitioners<sup>1</sup>. This study related to 1956/57 and unfortunately has not yet been repeated, although another exercise is now in the planning stage. More up-to-date information is available from Intercontinental Medical Statistics Limited. *Table B* shows, in addition to the breakdown of deaths by cause in 1966 for men and women aged between 45 and 64, a comparable breakdown for consultations with general practitioners. This, of course, ignores the 'clinical iceberg' of ill health not seen by the health services<sup>2</sup> or not recognised at all. Furthermore it identifies the proportion of consultations attributable to each disease group rather than the proportion of patients. However, it does give a broad picture of the relative significance of each disease group as a cause of disability. It can be assumed that the vast majority of disabling conditions will at some time come to the attention of the general practitioner who is the main 'port of entry' to the rest of the health services. In particular, the breakdown shows the relative importance of each disease group as regards the work load placed on the general practitioner.

The differences between mortality and morbidity attributable to certain chronic disabling conditions are immediately apparent. Thus, mental illness is negligible as a recorded cause of death<sup>3</sup>,

<sup>1</sup>Logan, W. P. D. and Cushion, A. A., 1958

<sup>2</sup>Last, J. M., 1963

<sup>3</sup>When mental illness is a contributory cause of death, e.g. suicide, it is not recorded as such.

**Table B***Mortality, Morbidity Comparison 1966*

Source: Registrar General 1966, British Medical Index 1966

		<i>GP consultations by major disease as a percentage of all disease, by sex 45-64</i>		<i>Deaths by major cause as a percentage of all deaths, by sex 45-64</i>	
		<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>
Infective and parasitic disease	001-138	2.7	1.8	1.3	1.1
Neoplasms	140-239	2.7	2.6	28.2	38.5
Allergic, endocrine system, metabolic and nutritional diseases	240-288	3.8	6.7	1.1	2.6
Diseases of the blood and blood-forming organs	290-299	1.0	2.7	0.2	0.4
Mental, psychoneurotic and personality disorders	300-326	4.4	8.2	0.1	0.2
Diseases of the nervous system and sense organs	330-398	7.9	8.2	8.3	13.0
Diseases of the heart	400-443	6.0	2.7	36.9	22.9
Diseases of the circulatory system excluding the heart	444-468	6.1	9.4	2.9	3.1
Diseases of the respiratory system	470-527	25.9	16.1	12.1	7.4
Diseases of the digestive system	530-587	11.0	7.7	2.7	3.0
Diseases of the genito-urinary system	590-637	1.7	7.0	1.2	1.8
Diseases of the skin and cellular tissue	690-716	6.3	5.8	0.1	0.1
Diseases of the bones and organs of movement	720-749	9.1	10.4	0.2	0.5
Congenital malformations	750-759	0.1	0.1	0.3	0.4
Certain diseases of early infancy	760-776	0.0	0.0	0.0	0.0
Symptoms, senility and ill-defined conditions	780-795	4.2	5.1	0.1	0.1
Accidents, poisonings and violence (external cause)	E800-999	6.8	5.0	4.5	4.7
Non-sickness including prophylactic injections and pre-natal care		0.4	0.4	0.0	0.0
<b>TOTAL</b>		<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

but accounts for 4.4 per cent of general practitioner consultations by middle aged males and 8.2 per cent of consultations by middle aged females. Since the overall consultation rates for males and females in this age group are very similar, it is fair to say that mental illness by this measure is almost twice as important for middle aged women as for middle aged men. The data indicate that rates are at their highest for middle aged women.

Diseases of the respiratory system emerge as the major cause of illness among middle aged patients consulting their general practitioners. The proportion of consultations is twice as great as the proportion of deaths, and among middle aged men it accounts for over a quarter of all consultations. In this age group, well over half of the respiratory disease takes the form of bronchitis (the majority described as chronic bronchitis) while very little is accounted for by pneumonia. However, there is little doubt that many of these bronchitis patients have from time to time some lung involvement, that is, bronchopneumonia. For males, rates are highest in the middle aged category, while for females, rates increase further among the over 65s. The prevalence of this disabling disease lends support to the idea, previously referred to, that the levelling off of the decline in mortality rates for respiratory disease can partly be attributed to deterioration of the condition of many middle aged lungs. A steady increase in airways resistance and respiratory failure weakens resistance to the illness, often bronchopneumonia, which eventually results in death.

Diseases of the bones and organs of movement, although very small as a cause of death, account for 9.1 per cent of consultations by middle aged men and 10.4 per cent by middle aged women. The category includes arthritis, lumbago and rheumatism, all chronic and disabling conditions. For males, consultations are at their highest in the middle aged groups, while for women, these disorders continue to increase in importance, as a cause of consultation, with age.

On the other hand, consultations for cancer are very low compared with deaths, reflecting the very high mortality associated with cancer. Deaths from heart disease too are proportionately very much greater than consultations, although the higher incidence of the disease group among males is reflected in the number of consultations which are more than twice as frequent for males as females.

These data not only have significance in terms of the load placed on the general medical services, but also in terms of the disability that each disease creates. The breakdown of general practitioner consultations by disease is similar to the breakdown

of causes of sickness absence from work. This may be expected, particularly for men, since a doctor's certificate is necessary to claim sickness benefit. Thus, respiratory disease accounts for 25 per cent of all working days lost through sickness among men aged 45 to 64, including 17 per cent due to bronchitis alone.

## Economic Aspects

THOUGH by no means an exhaustive list, there are two major components of the economic costs of disease, the direct costs, such as expenditure on the health services, and the indirect costs of lost production. The indirect costs of lost production can be divided into two further sub-heads, the cost of production lost through illness and the cost of production lost through death.

An analysis of the latter sub-heading involves a calculation of the economic value of a life to the community. This exercise has been undertaken in a number of studies, particularly in America<sup>1</sup>, but this has normally taken the form of a cost benefit analysis related to a specific investment in a preventive or curative programme. To measure the economic costs of mortality in the abstract is beset with conceptual and practical difficulties. Furthermore, if the exercise is to be undertaken at all it should relate to all age groups. To isolate the 45 to 64 age group would exclude from consideration all other age groups which would also be affected by any factors causing shifts in mortality rates.

For these reasons only the direct costs of ill health and the indirect costs of production lost through illness will be considered. To take the direct costs first, these are mainly attributable to the National Health Service. *Table C* shows how demands on the resources of the National Health Service increase with age<sup>2</sup>. Per capita expenditure in 1967 increased from £15.3 for the 0-14 age group to £66.9 for the over 65s. In the middle, the 45-64 age group, at £29.0 comes very close to the average per capita expenditure for all age groups. Expressing this another way persons aged 45-64, representing 24.6 per cent of the UK population in 1967, were responsible for 25.9 per cent of total health services expenditure.

This pattern holds true for hospitals, pharmaceutical services and general medical services, each of which offers services for every type of disease. It reflects both the higher incidence of

<sup>1</sup>Rice, D. P. and Cooper, B. S., 1967.

<sup>2</sup>An estimate of per capita cost of the health and welfare services by age in the National Institute Economic Review, August 1967, gives a figure for the 0-14 age group higher than the figure for the 15-64 group. The reason is that all maternity services, a very large item, were attributed to the infant, i.e. to the 0-14 group. In *Table C*, however, almost all the costs of maternity have been attributed to the 15-44 age group.



**Table C**

*Cost of the National Health Service attributable to the 45-64 age group, and other age groups, 1967, United Kingdom*

*Source: See appendix.*

<i>Service</i>	<i>Cost £million</i>	<i>Proportion of expenditure on each service %</i>	<i>Expenditure per capita £</i>
<i>45-64 group</i>			
Hospital	267	27.9	19.7
Pharmaceutical	50	29.4	3.7
General medical	31	24.5	2.3
General dental	14	17.9	1.0
Supplementary ophthalmic	11	47.0	0.8
Local authority health	21	12.5	1.5
All services 45-64 age group	394	25.9	29.0
All services 0-14 age group	200	13.1	15.3
All services 15-44 age group	474	31.1	21.8
All services over 65 age group	455	29.9	66.9
All services all ages (excluding miscellaneous services and NHS central administration)	1,523	100.0	27.7

disease and the lower response to therapy among older persons. It also reflects the larger proportion of women (who place greater demands on the health services than men) in the older age groups. A rather different pattern emerges for the other more specialised services. Only 12.5 per cent of the cost of the local authority health services is attributable to the 45 to 64 age group. This is because a large proportion of the services offered tend to be specific to persons over 65 and mothers and children, e.g. home nursing, midwifery and vaccination. On the other hand, almost half of the expenditure on the supplementary ophthalmic services is attributable to the 45 to 64 age group. Up to this age, most pairs of glasses provided are for distance only. At ages 45 to 64, there is a very considerable increase in the demand for reading glasses and bifocals. These glasses tend to be renewed less in later life and this accounts for the large proportion of expenditure by the supplementary ophthalmic services attributable to the middle

aged. A low percentage of the cost of the general dental services, 17.9 per cent, is attributable to the 45 to 64 group, and per capita costs decline further with age. Above the age of 45 over half the population have full dentures<sup>1</sup>. Much of the original cost of dentures has already been incurred and the cost of maintaining dentures in good condition is very much less than the cost of conserving natural teeth.

#### INDIRECT COSTS

The indirect cost of illness that is most susceptible to quantification in monetary terms is loss of production, though there are still many assumptions that must be made. *Table D* sets out estimates of the value of production lost through certified sickness absence, comparing losses attributable to the middle aged with losses attributable to other age groups. In this case middle age is arbitrarily defined by the age of retirement, 45-64 for men, but 45-59 for women. The term production is used to cover all types of work without distinction and its value is equated with average gross earnings of employees. (National income per economically active person could be used but this implies, wrongly, that labour is the sole economic input.) It is estimated, by multiplying the number of days lost through sickness by the productive value of a day's work, that sickness absence among middle aged persons was responsible for a loss of over £750 million in Britain in 1966/67, or nearly 3 per cent of the national income.

However, the estimates are based on records of sickness absence collected by the Department of Health and Social Security, and for various reasons the coverage and reliability of the derived statistics in *Table D* are not complete. An estimate has had to be made for the lost days attributable to the large number of married and widowed women employees not covered by sickness insurance. No other adjustment to the original data has been made, but various sections of the working population will still be excluded, particularly civil servants and economically active retirement pensioners who are free to opt out of the sickness insurance scheme. Furthermore, absence from work due to industrial accidents or prescribed industrial diseases is excluded. Working days lost in this category amount to about 8 per cent of days lost through certified sickness absence. For all these reasons the estimates of lost production in *Table D* will be too low. They will

<sup>1</sup>Bulman *et al*, 1968.

**Table D**  
*Indirect cost of certified sickness absence in terms of lost production, Great Britain*

Source: See appendix

	45-64 (Females 45-59)			Remainder other ages*			
	Days lost No.	Value of production per day £	Total lost production £million	Lost production per insured employee £	Days lost No.	Total lost production £million	Lost production per insured employee £
MALES							
1962-3	133,277,000	3.42	456	76	79,511,000	272	29
1963-4	131,134,000	3.73	489	82	80,613,000	301	32
1964-5	135,521,000	3.99	541	90	82,368,000	329	35
1965-6	147,053,000	4.27	628	104	88,086,000	376	40
1966-7	142,525,000	4.40	627	103	86,669,000	381	41
FEMALES, including estimate for married women and widows not covered by sickness insurance							
1962-3	57,979,000	1.73	100	55	68,301,000	118	19
1963-4	57,203,000	1.88	108	61	70,640,000	133	20
1964-5	59,847,000	2.01	120	68	74,366,000	149	22
1965-6	60,519,000	2.16	131	75	76,107,000	164	24
1966-7	58,712,000	2.25	132	76	72,942,000	164	24

\*including a very small proportion of women of 60 and over and men of 65 and over

also be too low in that the data used refer to certifiable sickness lasting for over three days, and thus exclude short term or un-notified sickness absence. Furthermore, no account is taken of that element of loss incurred by persons who, while continuing to work, suffer a loss of productivity through ill health, whether temporary or in the form of long term disablement. Finally, by far the most significant source of under-estimation is the exclusion of housewives. Housewives are not employed and their work has no market value<sup>1</sup> nor is any value placed upon their work in the national accounts. However losses associated with illness in this section of the community are no less real for being not readily quantifiable. *Table D*, therefore, grossly underestimates the losses associated with illness among women.

On the other hand, the estimates are overstated in the sense that a given percentage of days lost will not necessarily result in an equivalent percentage decline in production. Often colleagues can, by adding to their duties, partially make up for a person's temporary absence from work. Also, especially among administrative personnel, work can often wait until the sick person has recovered. This can be contrasted with the likely consequences of a similar number of man days lost through an industrial dispute<sup>2</sup>. In this case, the effect may be sufficiently concentrated to put a whole productive unit out of action, causing capital to lie idle, and often causing widespread dislocation in an integrated economy (the 'multiplier' effect in reverse). Sickness absence is not likely to produce this sort of effect until epidemic proportions are reached. It should be mentioned here that while middle aged persons do not suffer a larger number of episodes of sickness absence than their younger colleagues, each episode tends to be considerably longer. It is this factor which is responsible for the differences in days lost per employee by age noted in *Table D*. This long term absence, including permanent disablement, prevalent in middle age is likely to cause greater dislocation, both economically and socially, than short term absence.

It may also be asked to what degree sickness absence represents, at one extreme, total inability to work under any circumstances, and at the other extreme, plain malingering. There is no intention to pass judgement or to conjecture whether the distribution between the two extremes is normal or skewed to one end or the

<sup>1</sup>The going rate for domestic servants is sometimes equated with the value of a housewife's services. This, however, is far from satisfactory.

<sup>2</sup>Between 1962 and 1966, the number of days lost through industrial disputes ranged between 1½ million and 5½ million per annum, very small figures when compared with days lost through certifiable sickness absence in *Table D*.

other. The important point is that health and ill health are relative conditions, dependent on the individual's attitude and the choices open to him. It must be expected, in any wealthy society, that individuals will exercise a positive choice as to what level of ill health is tolerable, in relation to the associated financial and other losses he must bear in consequence. This means, of course, that an absolute decrease in the incidence of disease will not cause an equivalent decrease in the amount of sickness absence.

With all these reservations, what meaning can be attached to the estimates in *Table D*? In the first place, they give an order of magnitude. Whether or not the loss attributable to sickness absence among men aged 45-64 amounts to nearly 3 per cent of the national income, it is evidently a very considerable figure indeed. Over one tenth of all working days in this age group are lost through this cause. Secondly, since the estimates are calculated on the same basis, the losses associated with the 45-64 group can be compared directly with the losses associated with other age groups. Losses associated with middle aged persons are between two and three times as great, per capita, as losses associated with young men. This has important, and favourable, economic implications for the future in view of the prospective decrease in the proportion of middle aged persons in the working population. The third point places us on rather less solid ground but it may still be worth making. If the direct (National Health Service) costs in *Table C* are added to the indirect costs in *Table D*, then the implication is, even after due regard has been taken of the shortcomings of *Table D* in accuracy and coverage, that illness in the middle aged group at well over £1,000 million, causes a greater economic loss, man for man, than illness in any other age group.

There are many other aspects of the economic effects of ill health. From the point of view of the Exchequer, sickness benefits must be paid in proportion to the number of work days lost. These amounted to £152 million for persons over 45 and below retirement age and £100 million for other persons in 1966/7. Payments of other benefits and loss of tax revenue increase the burden on the Exchequer, but these are 'transfer' payments. While they have their effect on the distribution of income, notably in enabling the sick person to maintain an adequate standard of living during his incapacity, these costs ought not to be added to the direct and indirect costs estimated in *Tables C* and *D*, which approximate the quantum of real costs without specifying which sections of the community bear the burden.

## Discussion

THE cost of disease among the middle aged, or any other section of the community, is in the last resort unquantifiable. There is no possibility of expressing all the many intangible aspects of disease in monetary or any other standardised terms. But there are a number of objective criteria which help to identify those conditions which cause the greatest burdens, thus providing pointers to the areas in which increased activity is likely to prove most fruitful.

One criterion is mortality, in which case cancer, respiratory disease and heart and circulatory disease (including cardiovascular disease) are those conditions which are of major importance. 70,503 men and 43,985 women aged from 45 to 64 died in England and Wales in 1967. 80 per cent of the men and 71 per cent of the women died from the above causes. The impact of mortality does not end at the graveside. It creates lasting social dislocation through the bereavement of dependants. There were 748,490 widows and 182,070 widowers aged 45-64 living in England and Wales in 1966, and if it is the quality of life, rather than its existence, that is important, then it is this aspect of mortality that merits most attention. From both of these standpoints, it is a reduction in male mortality among the middle aged which would yield the greatest results. The most significant specific conditions among middle aged men are coronary heart disease and lung cancer.

From the economic standpoint, the greatest burdens are created by different diseases, typically the chronic, disabling conditions, common in middle and old age, but not often rapidly fatal. Mental illness, primarily because of the high demands placed on the hospital services, is the most expensive condition in terms of direct expenditure. However, if the indirect costs of ill health are greater than the direct costs in the middle age group, the diseases which cause the greatest absence from work are the most important from the economic point of view. For middle aged men, respiratory disease, particularly bronchitis, diseases of the heart and circulatory system, diseases of the digestive system and diseases of the bones and organs of movement, such as arthritis and rheumatism, are the largest causes of disability. For

women, respiratory disease, though not so predominant, is still the largest cause of disability in terms of absence from work, followed by heart and circulatory (mainly circulatory) disease, diseases of the bones and organs of movement and mental illness.

With these considerations in mind, what are the diseases of middle age which cause the greatest burden, and what prospects does the future hold out? Perhaps the greatest returns will derive from any prophylactic and therapeutic improvements related to coronary heart disease, cancer, bronchitis and mental illness. There have already been significant advances in all these fields. Medicines to control hypertension and modern surgical techniques have made an increasing impact on coronary heart disease. The antibiotics have revolutionised the treatment of bronchitis while extended remissions or cures are often possible with cancer, depending on the site, especially if detected early. There is tremendous scope for improvements through research and through greater and more efficient allocation of resources for treatment, but perhaps the field of activity with the greatest potential at present is prevention.

Prevention through early detection is likely to become one of the major growth areas in health expenditure, if better means can be found of detecting diseases sufficiently early and sufficiently accurately to give a really good prognosis. Prevention through prophylaxis may yield significant benefits. Influenza vaccines, for instance, may not only prevent influenza itself, but may prevent many cases of more serious respiratory disease developing from it, and measles vaccines may prevent early damage in childhood. For the future, there may be the possibility of a cancer vaccine. In all these areas there is a very large role for health education to play, for the success of many preventive programmes depends on the willing co-operation of the community. Health education also offers a means of reducing exposure to the underlying causes of disease. Thus, in the past, knowledge of the infectious diseases and the elevation of precautionary measures, cleanliness and hygiene into positive virtues certainly contributed to the decline in the incidence of those diseases. Now the greatest killers and the greatest causes of disability in middle age are degenerative conditions, the origins of which can often be found in behavioural patterns developed during early life.

One of the major underlying causes of morbidity and mortality among the middle aged, and one that is a prime target for health education, is cigarette smoking. It has been estimated<sup>1</sup> that over

50,000 deaths at all ages in 1966 from lung cancer, bronchitis and heart disease could be fairly attributed to smoking. This is particularly relevant for middle aged persons. Taken together these three diseases are largely responsible for the significantly slower decline in overall mortality among 55-64 year old men as compared with 55-64 year old women, previously shown in *Fig. 2*. Between 1927 and 1967 female mortality in this age group declined by 46 per cent. In the same years male mortality rates declined by only 17 per cent. It was seen in *Fig. 7* that although female bronchitis mortality in the 55 to 64 group halved in the last 25 years, male mortality rates hardly changed. Even though in this age group female mortality has been increasing as fast as male mortality in the case of coronary heart disease (*Fig. 4b*) and much faster in the case of lung cancer (*Fig. 5b*), where male mortality has stabilised during the 1960s, the absolute levels of mortality are very much higher among males. In the case of lung cancer, male mortality is still seven times higher than female mortality in the 55 to 64 age group. In the case of coronary heart disease it is three and a half times higher. Bronchitis, lung cancer and coronary heart disease mortality rates among males have therefore increased or remained high enough to effectively negate much of the improvement in mortality brought about by the control of infectious diseases. Considering the vast amount of disability associated with these diseases too, there is evidently a great deal of scope for improvement in the health of the nation, and particularly men, through a reduction in cigarette smoking.

Another problem of a totally different nature, but one which must also be a target for health education (to the extent that its origin does not lie in a metabolic or other physiological defect) is obesity. Obesity increases in prevalence with age and insurance studies indicate that mortality from almost all causes is significantly higher among overweight people.

The elimination of smoking and to a lesser extent obesity could dispose of a very great deal of morbidity and premature mortality. This would be particularly relevant to the middle aged for it is at this time of life, long before its natural end, that the effects of unhealthy behavioural patterns begin to take a really significant toll.

But health education is not a panacea. Most existing evidence suggests that simple awareness of the consequences of a particular mode of behaviour is unlikely to alter it permanently. Mere knowledge is of little immediate value to the individual without the motivation necessary to translate it into action. Our knowledge of the way patterns of behaviour are formed, and how



they can be changed, is as yet inadequate.

More research is needed, but any fruits of this research are likely to be enjoyed only in the long term. For adults, the modification of habits formed over a lifetime, and the development of new attitudes, will necessarily be lengthy tasks. The prime target of health education is likely to be the young, for it may be easier to promote healthy patterns of behaviour among the young than to alter unhealthy patterns of behaviour among adults. Again, the benefits will only become apparent in the long term, but the potential for improvement is huge. If realised, the children of today could look forward to a very much healthier middle age; healthier than can be expected for those who have already reached "the age of maturity".

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# Appendix

## SOURCES AND METHOD FOR TABLE C

The total costs shown include National Health Service expenditure by Central and Local Government and also payments made by patients. The following is a brief description of the method and sources used for each of the services shown; further details can be obtained from the Office of Health Economics.

### HOSPITAL SERVICES

These estimates have been based on time spent by patients in various types of hospital. Costs were equated with bed-days which were obtained by multiplying the number of discharges and deaths from hospitals by the average length of stay for each of the age groups. These were given, for each type of hospital, in the 1956-57 Hospital In-Patient Enquiry, Part 2 (HMSO 1961). They were adjusted to obtain the 1967 estimate. For psychiatric hospitals the figures were taken from 'A Census of Patients in Psychiatric Beds', 1963, by E. M. Brooke (HMSO 1967). These figures were also projected to 1967. The proportionate expenditure by hospital type was derived from the 1967 Hospitals' Year Book (Institute of Hospital Administrators, 1966) and adjusted to bring the slight difference between the 1956-57 Hospital In-Patient Enquiry definitions, and current definitions, of hospital type, into alignment. These proportions were then applied to the 1967 total UK expenditure figure for the hospital services as given in the 1968 *Annual Abstract of Statistics* (HMSO 1968).

### PHARMACEUTICAL SERVICES AND GENERAL MEDICAL SERVICES

The sources for allocating the expenditure on general medical and pharmaceutical services were the 1967 Medical Data Index and British Pharmaceutical Index. These publications are part of a research service provided by Intercontinental Medical Statistics, Limited. For the pharmaceutical services, an age breakdown based on the number of prescriptions written was applied to the 1967 UK expenditure figure for the pharmaceutical services as given in the 1968 *Annual Abstract of Statistics* (HMSO 1968). This latter source was also used to give total UK expenditure on the general medical services. The age breakdown used for the general medical services was taken from the Medical Data Index and was based on total consultations. The IMS age groups were adjusted to bring them into line with the age groups used elsewhere in *Table C*. An adjustment was also made for the surgery/home consultation variation by age.

#### GENERAL DENTAL SERVICES

The annual report of the Ministry of Health for 1967 (HMSO 1968) was used to obtain the proportionate age breakdown of expenditure. The group aged 45 and over was split into 45-64 year olds and those aged 65 and over by using an estimate given in No. 41 of the National Institute Economic Review (National Institute of Economic and Social Research, August, 1967). These proportions were then applied to the 1967 total UK expenditure on the general dental services as given in the 1968 Annual Abstract of Statistics (HMSO 1968).

#### SUPPLEMENTARY OPHTHALMIC SERVICES

The annual report of the Ministry of Health for 1960 (HMSO 1961) was used to give an age breakdown for sight tests and also for authorised pairs of spectacles, for England and Wales, 1959. Costs for these items were also given and thus a proportionate cost breakdown for age was obtained. These figures were then adjusted for population changes to obtain 1967 figures which were then applied to the 1967 total UK expenditure on the supplementary ophthalmic services as given in the 1968 Annual Abstract of Statistics (HMSO 1968).

#### LOCAL AUTHORITY HEALTH SERVICES

The annual report of the Ministry of Health for 1967 (HMSO 1968) was used to obtain proportionate age breakdowns for various Local Authority Health Services. Where figures were not given, estimates were made using the general population age structure, general practice consultation age structure, etc. The age group breakdowns were applied to the cost of each of the services and these were then added and repercentaged. This total proportionate age breakdown was then applied to the 1967 UK expenditure on the local health authority services as given in the 1968 National Income and Expenditure (HMSO 1968) to which payments made by patients had been added. These latter payments were estimated from an adjusted England and Wales figure given in the annual report of the Ministry of Health for 1967 (HMSO 1968).

#### SOURCES AND METHOD FOR TABLE D

*Table D* is based on the number of working days lost through certified sickness absence as reported to the Department of Health and Social Security. These incapacity statistics are obtained from a 5 per cent sample of claimants, whose claims are recorded at local offices of the Department. Coverage is restricted to Great Britain, i.e. it excludes Northern Ireland.

The first column (days lost) shows the total number of days of incapacity reported in each year among the insured population. The following sections of the working population are not covered by the National Insurance scheme and therefore their days of

incapacity do not enter into the total.

- (a) men over age 65 and women over age 60 who are retirement pensioners; and all men over age 70 and women over age 65
- (b) members of the Armed Forces
- (c) mariners while at sea
- (d) most non-industrial civil servants (who do not normally claim sickness benefit until an illness has lasted six months)
- (e) married women and certain widows who have chosen not to be insured for sickness benefit (about three-quarters of all married women in employment have chosen not to pay flat-rate contributions).

For males, coverage is very nearly complete, and no adjustments have been made to the days of incapacity reported to the Department.

For females, an estimate has been made to cover the large number of uninsured married women and widowed employees. In the absence of other information it has been assumed that those employed women not covered by National Insurance experience the same rates of sickness absence as those employed women who are covered. Female absence rates as reported to the Department have therefore been applied to the total female working population, derived from the Department of Employment and Productivity Gazettes.

The second column, value of production per day is taken as being equal to gross earnings per day. In the absence of information, no account is taken of possible differences in earnings by age, but account is taken of differences in earnings by sex. Information on earnings is derived from Department of Employment and Productivity Gazettes. The lower value of production per day attributed to woman as against man reflects both lower earning power and the larger number of part-time women employees.

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