Benefits and risks in medical care

A symposium held by the
Office of Health Economics

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These papers were originally presented at an Office of Health Economics Symposium entitled 'The Benefits and Risks of Medical Care', held at the King's Fund Centre on 19th March 1974.

The morning session was chaired by Lord Hunt of Fawley and that of the afternoon by Dr C A Cooke.

Introduction

The physical health and longevity of the people of countries such as Britain has improved dramatically during the course of the past 100 years. In the middle and later decades of the 19th century the average Englishman had at birth a life expectancy of around 40 years. Today it is nearly 70 years. In 1898 the pioneer social investigator Seebohm Rowntree recorded in a survey in York an infant mortality of 247 per 1,000 live births amongst the poorest class and one of 94 per 1,000 amongst the well-to-do. Today infant mortality in Britain is on average well below 20 per 1,000 live births, although the class related differentials remain.

The roots of these demographic changes lie in the gradual social and economic development of western Europe during the course of several centuries. The transition in the now economically developed world from the previous situation of high and fluctuating mortality linked with high fertility to one of low mortality balanced by low fertility cannot be directly attributed to medicine and its allied disciplines at least until its later, post First World War, stages.

But in the past 50 years the growth of modern pharmacological knowledge together with factors like improved surgical techniques has given the medical profession the power to make major changes in the level of physical health and the chances of survival enjoyed by the population as a whole. Advanced medicine now ensures that the great majority of people in the richer parts of the world survive into old age. And in the poorer nations its potential for accelerating the changes in standards of health which took Europe some hundreds of years to achieve are immense, although limited by general factors associated with economic and social development.

The symposium which this book records concentrated its attention on assessing the value of modern medical care mainly in the former area, that is in the economically developed world. It was in particular concerned with questions surrounding the risks and benefits of medicine in societies like that of present day Britain. What are the limitations to its growth? How far is the extension of life threatening procedures justified in the pursuit of a better quality of life? What social changes is the health service indirectly promoting and what are their likely effects? How can we best control the use of medical techniques which are potentially beneficial but which carry with them relatively high levels of risk to individuals or to the community?

Objective measurement in areas such as these is fraught with conceptual and methodological difficulties. Dr Crombie in his paper on changes in patterns of recorded morbidity recalls the aphorism 'while there's death there's hope', pointing out that this at least is a fairly easily quantifiable event. But in the area of experienced 'sickness' he goes on to argue convincingly that thresholds of illness perception vary within populations,

pointing to evidence relating to Britain over the past 20 years. Such work goes some way to supporting commentators such as Ivan Illich[1] who suggest that medicine in societies such as ours perpetuates its own demand, drawing ever more types of human experience into the definition of illness and helping to generate distress in new areas whilst alleviating it in others. Although such arguments may be thought to be extreme and unfounded when the records in respect of many forms of explicit physical illness are examined, they draw attention to some of the possible dangers of an excessive reliance on health care in areas of primarily social or psychological dis-ease.

In fact, even the hope that mortality can provide a reasonably clear guide to the risks and benefits of medicine today was somewhat undermined by several speakers. For example, Professor Cambell showed that the mortality rates in parts of Wales and northern England were consistently higher than the national average and attributed this, in part at least, to environmental variables. Similar considerations were raised with regard to the Registrar-General's figures (Table 1) showing high death rates among people in the poorer socio-economic classes. Even in Britain with its free NHS such variations indicate not only probable variations in

Table 1 *Comparative incidence of social class mortalities in different age-groups for men, married women, and single women (1959–63)*

	Social class	*15–19*	*20–24*	*25–34*	*35–44*	*45–54*	*55–64*	*65–74*
Men	I	72	59	73	69	76	78	86
	II	106	85	72	73	77	84	94
	III	97	90	89	97	100	102	116
	IV	118	100	107	104	104	101	105
	V	142	149	181	181	158	134	123
Married women	I	38	79	83	75	78	76	74
	II	41	64	76	79	82	85	93
	III	97	97	99	102	102	102	111
	IV	88	92	103	106	104	106	107
	V	159	159	163	153	144	136	128
Single women	I	97	79	67	82	86	83	103
	II	103	70	56	65	82	99	144
	III	78	72	74	73	86	104	144
	IV	95	98	93	97	104	116	166
	V	197	213	145	132	105	119	130

Source Registrar-General's Decennial Supplement Tables 3 and 4, as quoted by Townsend P, *Lancet*, 1974, i, 1179.

Note These figures are by now outdated by over a decade. The publication of the Registrar-General's next Decennial Supplement is therefore awaited with interest.

the quality of health care available to people in different situations of life but also that medicine is still powerless to compensate for the relatively high health risks experienced by those who do not enjoy the material privileges of the majority of the population. Thus death rates are indicators of broad social determinants of health as well as of the quality of medicine available to a population.

Other papers also demonstrated how difficult it is to derive a true picture of the risks of specific aspects of medical care. For instance, Professor Bunker estimated that surgery is associated with perhaps 20–30,000 deaths each year in this country although few of these are recorded as such. And although American figures such as those quoted by Dr Wardell and others from evidence recently presented at US Senate Health Subcommittee hearings (which appear to mainly stem from a single ongoing study in Boston[2]) imply that it is possible that an equivalent number are related to the use of medicines in this country, George Teeling-Smith demonstrated that the official British statistics on deaths due to medicines show mainly cases of deliberate self poisoning. An outstanding illustration of how little available statistics may actually reflect reality is that of the use of certain aerosol bronchodilators in the mid 1960s. Inman (1970)[3] has pointed out that although perhaps over 1,700 deaths were due to this cause only six were so recorded.

However, although these relatively high estimates of the risks to life resulting from the use of sophisticated surgical and pharmaceutical treatments are initially alarming a consideration of their overall context may well show that the therapies involved are not usually misused, even when those deaths which occur in cases where the life of the individual concerned is already seriously threatened are excluded.

For example, a considerable proportion of all deaths due to medicine consumption result from therapy given for rheumatic conditions. But the choice confronting many of those suffering from rheumatism is often in real terms that of suffering the hazards of long term drug therapy and the reduction of life expectancy entailed in order to avoid for a period of years levels of pain and immobility which would probably lead to an early social if not physical death. Again, with regard to the 45 or so deaths a year reported as resulting from the use of oral contraceptives in the late 1960s these are more than balanced by the relatively high risk which would have been associated with the pregnancies prevented. Other forms of contraception are not always acceptable and often cannot provide the same sense of freedom as does 'the pill'.

John Bunker mentioned in his contribution the fact that many members of the public are prepared to accept considerable risks in the pursuit of pleasure. Medical care is a service which shows a positive income elasticity of demand and under present social conditions it must be expected that if

national or personal wealth increases so too will the demand for health care. It is clearly a duty of physicians not to cause harm; but where the balance of risks versus the benefits of medicine is subjective it is not possible to produce a logical argument in favour of restricting an individual's right to expose him or her self to danger in the pursuit of an improved 'quality of life' unless this is part of a socio-political philosophy applying equally to all other areas of existence.

Many of those speaking, both formally and in the discussions which followed papers, recognised that the social significance of medicine extends to affect many other parts of community life. It was also noted by Dr Wardell how little is known of the overall effects of particular patterns of care within society.

However, there is already some evidence on the effects of patterns of care such as the institutionalisation of groups like the mentally ill or handicapped. These can influence both the attitudes of 'normal' people to those carrying such a label and the actual pathology of the conditions involved. Not only can the threshold of illness perception be changed by the availability of care but the definition and experience of particular complaints can be similarly varied.

Professor Shepherd in his exposition on progress and problems in mental health illustrated this point in connection with the development of psychotherapeutic drugs and alternative forms of treatment. He also mentioned the possibility of changes in the social order stemming from further innovations in this area. Is the development of psychopharmacology and mood altering medicines a possible prelude to a 'brave new world', or might advances in behaviourist orientated psychotherapy lead to the type of attitude moulding envisaged for the fictional *1984*?

But despite the importance of recognising that health care does not exist as a phenomenon which is insulated from other social events and systems, it should be recognised that accurate predictions as to cause and effect in this field would be extremely difficult, if not impossible, to make. And certainly recommendations as to policy in such areas must be made on primarily subjective evaluations and political beliefs rather than as a result of scientific observation alone. Hence it would appear that the role of the objective analyst in assessing the risks and benefits of medicine is centred on evaluating specific limited aspects of care, as Bill Laing does in relation to the question of child resistant containers for medicines. His paper underlines the need for scientific awareness of the economic and social effects of patterns of care and those of possible alternatives, as well as those associated with biological risks or rewards, before policy decisions can be usefully made.

Towards the close of the symposium both Professor Bunker and Dr Wardell raised questions relating to governmental attempts to control

potentially harmful medical practices or innovations. An important point made in relation to the introduction of new pharmaceutical products was that delay in this area, whilst occasionally prudent, can also be damaging. The retardation of the entry of new products onto the market may itself cost lives where effective alternatives do not exist or where the existing medicines carry high risks. Clearly rigorous efforts to ensure maximum administrative efficiency in this field are needed, a goal most likely to be achieved if those producing medicines and those controlling their use can work in close co-operation. Some degree of differentiation between the interests of manufacturers and consumers may be of value if only to limit the extent of 'pharmacological enthusiasm' on the part of the latter. But the degree of polarisation to be found in the United States at the present time appears to have led to inefficiencies.

Professor Bunker raised an important point in relation to the American Professional Standards Review Organisations, the bodies through which the medical profession is itself expected to establish the standards for optimal care. His conclusion that in the field of surgery at least the profession is likely to overvalue the service it provides and hence to encourage over-utilisation of facilities is disturbing. It calls into question the right of the medical profession to decide in all cases the most desirable pattern of health care for individuals or communities and again stresses the need for epidemiological, demographic, sociological and economic variables to be scientifically examined if an optimal pattern of medical treatment is to be obtained.

Thus a key understanding to emerge from this OHE symposium is the need for better information in these areas of evaluation. If the recently reorganised NHS is to succeed in efficiently orientating its services to the wellbeing of the population it is toward these fundamental planning issues rather than to short term considerations of the management of present services that much of its new effort must be directed.

Yet a careful consideration of all the data presented in this volume and of the references which were made during the course of the papers' presentation and discussion suggests one rather more important conclusion. This is simply that in many areas we already know, and have known for some time, enough about the root causes of much current morbidity and premature mortality in Britain to be able to avoid its occurrence. Where it is related to occupational and associated economic factors or to scarcity of resources available for compensating the handicapped for their disadvantages or to behaviour stimulated by fashion or by advertising, as in the case of smoking, the opportunities for intervention are already apparent. OHE hopes to examine these issues more fully in a future symposium on the social determinants of health. But even now it is clear that, in the near future at least, significant improvements in the

physical and mental wellbeing of much of the population will probably depend on the extent to which health care ceases to be the preserve of narrow professional interest and becomes instead a general social and personal responsibility.

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References

1. Illich I, *Lancet*, 1974, **i**, 918.
2. Shapiro S, Slone D, Lewis G and Jick H, 1971 *Journal of the American Medical Association*, **216**, No 3.
3. Inman W H W, *British Medical Bulletin*, 1970, **25**, 248.

Changes in mortality in England and Wales at adult ages between 1940–71

Professor Hubert Campbell

Introduction

During the three decades between 1940 and 1970 England and Wales probably experienced greater changes in the economic, social and medical environment than at any previous period in our history. It is my purpose today to consider how did this effect the mortality of the people. But as Mr Laing will be considering the effects the changes have had upon children, I have confined my data to adults over 25 years of age.

The sources of data which I have used are entirely drawn from the annual reports of the Registrar-General of England and Wales, but of course he can in no way be held responsible for my use of his information nor for the accuracy of my figures.

Sex specific crude rates

The crude mortality per 1,000 population for each sex and for each individual year from 1940–71 is shown in Table 1 and it is surprising how little these rates have fluctuated during the 30 years. The male rates during the war years and immediately afterwards are artificially inflated because as a result of the withdrawal of a large proportion of the fit population from the denominator those at higher risk of mortality were left in the civilian population and this increased the apparent mortality during those years. There is little that can be done now to compensate for this distortion.

From 1950 to 1971 the male crude mortality rate has fluctuated between 13·4 per 1,000 in 1951 and 11·8 in 1967 and the female rate between 11·8 in 1951 and 10·5 in the following year 1952. In the year 1951 an influenza epidemic and cold weather caused an excess mortality of at least 6 per cent over expectation which was followed by a depression the following year as high risk patients had been removed by the epidemic of the preceding year. A similar peak and trough are seen in the rates for 1963 and 1964.

Sex standardised mortality ratios by sex

During these years the population was expanding and the proportion of persons at the higher ages was increasing. If we make allowance for this factor and compare each year with the experience of the triennium 1950–52, we obtain the standardised mortality ratios (SMR) which are the ratios of the total number of deaths occurring in a given year compared to the

Table 1 *Crude mortality per 1,000 persons and standardised mortality rates 1950–52 being standard. All ages. England and Wales 1940–71*

Year	*Males* *Crude rate*	*SMR*	*Females* *Crude rate*	*SMR*
1940*	16·1	135	12·9	141
1941*	15·7	124	11·8	127
1942*	14·4	109	10·7	111
1943*	15·3	109	11·3	114
1944*	15·3	106	10·8	108
1945*	15·0	103	10·8	106
1946*	13·4	101	10·9	106
1947*	13·6	106	11·3	108
1948*	11·9	93	10·1	95
1949*	12·6	99	11·1	103
1950	12·3	98	11·0	101
1951	13·4	106	11·8	106
1952	12·2	96	10·5	93
1953	12·2	96	10·7	94
1954	12·2	95	10·5	91
1955	12·5	97	10·9	93
1956	12·5	96	10·9	92
1957	12·3	94	10·7	88
1958	12·4	95	11·0	90
1959	12·3	94	11·0	89
1960	12·2	92	10·9	87
1961	12·6	95	11·4	90
1962	12·6	96	11·3	89
1963	12·8	98	11·6	91
1964	12·0	91	10·7	83
1965	12·2	93	10·9	83
1966	12·4	94	11·1	85
1967	11·8	88	10·7	80
1968	12·4	93	11·4	85
1969	12·5	94	11·3	84
1970	12·3	92	11·2	82
1971	12·2	90	11·1	82
Ratio 1971/1946	91%	89%	102%	77%

Sources Registrar-General's Statistical Review Pt. 1, Medical
*Based upon civilian population only.

deaths that would have been experienced if the rates for the standard years had prevailed. An SMR greater than 100 shows a worse experience than the standard and less than 100 shows a better experience.

It is clear from these ratios that there has been an appreciable improvement in the mortality experienced during the 22 years, 1950–71, the male

deaths have fallen by 10 per cent in 1971 compared with 1950–52 and the female deaths by 18 per cent. This greater benefit to women than to men is a feature that will be constantly recurring.

Age and sex specific rates

Table 2 shows the mortality rates for each decade of age for each sex for six quinquennia from 1941 to 1970. This again reveals the artificial increase in the mortality rates recorded for males under 45 years of age during the 1940s, but it also shows that over the age of 45 there have been only trivial falls in the mortality experienced by men between 1951 and 1970. The reason for the 10 per cent fall in the SMR observed above is mainly due to the very large improvements in infant mortality and in mortality from 1 to 14 which will be discussed later by Mr Laing.

Women, however, have shown quite appreciable falls in their mortality at all ages. Even in the age range 45 to 64 the female rates have fallen by 12 per cent between 1951 and 1970. It is only in the age group 85 and over, which is an open ended group and hence one in which the average age is increasing, where there is no apparent change in the female death rates.

Table 2 *Sex and age, specific mortality per 1,000 population. England and Wales 1941–70*

	Males						
	Age group						
Quinquennium	*25–34*	*35–44*	*45–54*	*55–64*	*65–74*	*75–84*	*85+*
1941–45*	4·2	4·8	9·9	23·1	51·7	122	226
1946–50*	1·9	3·2	8·5	22·4	51·6	119	242
1951–55	1·4	2·7	7·9	22·5	54·6	127	266
1956–60	1·2	2·4	7·4	21·9	53·7	123	239
1961–65	1·1	2·4	7·4	21·8	54·2	123	253
1966–70	1·0	2·3	7·1	21·2	53·2	119	254
	Females						
	Age group						
Quinquennium	*25–34*	*35–44*	*45–54*	*55–64*	*65–74*	*75–84*	*85+*
1941–45*	2·5	3·3	6·4	14·0	36·0	93·5	207
1946–50*	1·8	2·6	5·5	12·8	34·4	93·2	209
1951–55	1·1	2·1	4·9	11·8	33·1	92·4	222
1956–60	0·8	1·8	4·5	10·9	30·7	86·4	213
1961–65	0·7	1·8	4·4	10·6	29·6	84·2	207
1966–70	0·6	1·7	4·3	10·3	28·0	78·0	203

Sources Registrar-General's Statistical Review Pt. 1, Medical
*Based upon civilian population only.

Sex ratio

The net result of these changes has been to widen the gap in mortality between men and women so that now men aged 55 to 64 have a mortality more than double that of their wives and at most other ages the surplus is of the order of 66 per cent. These are very large differences indeed and are poorly reflected in the summary statistic of an expectation of life where men have an expectation of life at birth only four years less than women.

Table 2a shows the male/female ratio for each age group for each quinquennium and demonstrates how the gap is widening.

Table 2a *Age specific male/female mortality ratios. England and Wales 1941–70*

	Age group						
Quinquennium	*25–34*	*35–44*	*45–54*	*55–64*	*65–74*	*75–84*	*85+*
1941–45	1·68	1·45	1·55	1·65	1·44	1·30	1·09
1946–50	1·05	1·23	1·55	1·75	1·50	1·28	1·16
1951–55	1·27	1·29	1·61	1·91	1·65	1·37	1·20
1956–60	1·50	1·33	1·64	2·01	1·75	1·42	1·12
1961–65	1·57	1·33	1·68	2·06	1·83	1·46	1·22
1966–70	1·67	1·35	1·65	2·06	1·91	1·53	1·25

Causes of death

Mortality is not a single force operating to destroy life, but is a combination of various disease processes, some genetic, some traumatic, some environmental and some inherent in the ageing process each of which must be examined in detail if unnecessary deaths due to environmental causes are to be reduced.

The choice of which diseases to consider in a brief review is difficult and I have selected those diseases which appeared at least once in the top ten causes of death in a specific sex and age group and there have been only 15 such diseases.

Considerable precautions must be taken in interpreting such figures. The cause of death is obtained from the death certificate by selecting, in the opinion of the certifying doctor, the underlying cause of death and by coding and classifying this according to the International Classification of Diseases.

Every ten years this classification is amended and revised according to the advice of current medical knowledge and hence there is a discontinuity in time at each new revision which cannot be avoided. The Registrar-General publishes a double coding of a series of deaths to demonstrate the possible effects of these changes, but these cannot of course be extrapolated indiscriminately over a decade.

Moreover, the increase in medical knowledge, the increasing availability of medical services and the advances in diagnostic tools for detecting the presence of disease has probably improved the accuracy of diagnosis over time. But nevertheless all comparative studies of diagnoses still show great variations in reproducibility of cause of death.

With these considerable reservations let us examine Table 3, where the crude mortality rates by sex for the 15 important diseases for the four years 1941, 1951, 1961, 1971, and Table 4 where age and sex specific rates are shown for 1941 and 1971.

Table 3 *Crude death rates per million. All ages by cause of death (top ten at any time). England and Wales 1941–71*

	Males				*Females*			
Cause of death	*1941*	*1951*	*1961*	*1971*	*1941*	*1951*	*1961*	*1971*
Respiratory tuberculosis	795	375	80	26	448	181	27	10
Cancer of stomach	423	387	348	305	269	286	252	206
Cancer of lung	230	550	871	1060	48	91	139	224
Cancer of breast	—	—	—	—	323	352	389	446
Cancer of uterus	—	—	—	—	210	178	165	153
Rheumatic heart disease	259	194	154	108	307	298	233	172
Coronary heart disease	805	1756	2121	2603	348	938	1200	1579
Myocardial degeneration	2144	1710	860	891	1982	2129	1301	879
Cerebrovascular disease	1228	1378	1394	1309	1262	1734	1925	1948
Influenza	197	351	155	13	162	370	150	13
Pneumonia	849	578	634	733	553	496	637	885
Bronchitis	1053	1079	942	823	681	627	322	255
Road accidents	301	172	208	197	70	52	78	90
Accidental falls	145	86	82	77	136	117	144	148
Suicide	135	134	133	95	62	72	90	81

Note
1941 5th Revision of ICD
1951 6th Revision of ICD
1961 7th Revision of ICD
1971 8th Revision of ICD

Principal disease entities

Respiratory Tuberculosis was still an important cause of death during the 1940s even though the rate had been declining for over half a century. Now in the 1970s the mortality from this disease at ages under 45 is almost negligible and only a small reservoir of infected elderly males remain. The causes for this decline are many which have been discussed by Springett

Table 4 *Age specific mortality by cause for males only. Rates per million population under age 65. England and Wales 1941 and 1971*

Cause of death	*25–34*		*35–44*		*45–54*		*55–64*		*65–74*	
	1941	*1971*	*1941*	*1971*	*1941*	*1971*	*1941*	*1971*	*1941*	*1971*
Respiratory tuberculosis	1192	4	1036	11	1232	23	1252	55	726	121
Cancer of stomach	31	4	120	40	406	203	1096	685	2170	1601
Cancer of lung	39	18	142	132	480	812	965	2845	1050	5910
Rheumatic heart disease	167	16	214	55	456	126	906	262	1830	438
Coronary heart disease	11	70	127	672	546	2724	1514	7083	3450	16280
Cerebro Vascular disease	31	39	95	112	491	416	2086	1527	6460	5750
Influenza	58	2	99	4	174	9	383	15	643	55
Pneumonia	158	24	277	54	611	149	1271	566	1970	2310
Bronchitis	78	4	190	35	759	259	2166	1351	4340	4640
Road accidents	266	183	203	134	239	137	367	203	529	273
Suicide	100	95	130	127	180	146	295	171	374	222

and others. The introduction of adequate therapy in the early 1950s although it accelerated the decline was only one of a multiplicity of reasons why the disease has almost disappeared.

Cancer mortality, as a whole group of diseases, has increased but *Cancer of the Stomach* has declined in importance both amongst males and females at all ages and this is a world wide trend. But it is necessary to enter a caveat here for the mortality from *Cancer of the Pancreas* has increased steadily almost to replace the missing cases of stomach cancer and it has proved most difficult to validate whether this is a true change of disease patterns or whether it is better diagnosis.

With *Cancer of the Lung*, however, there is no such reservation, the increase for both men and women is over fourfold in the 30 years, but as the male rate was then already four times greater than the female rate it would appear that women are now entering the stage men were at 30 years ago.

There is no need to elaborate on the aetiology of this condition, but despite the apparent failure of educational campaigns to reduce smoking of cigarettes, there is a glimmer of hope in the figures. The mortality rate from cancer of the lung amongst men under 45 has declined slightly and there seems to be a cohort of men born after 1925 who are at lower risk of the disease. It is to be hoped that these men will carry this reduced susceptibility with them into the higher ages when the mortality is so much greater.

Cancer of the Female Breast has shown a tendency to increase slightly at all ages during this time by about 15 per cent in 30 years. The women now at high risk of the disease are the women who had reduced family size and delayed pregnancy during the 1930s. Their daughters have had earlier pregnancies and larger families in the 1950 and 1960s so possibly these latter women will not continue to have such a high mortality from breast cancer.

Cancer of the Cervix was not separated from cancer of the uterus in the earlier returns, but in the period 1951–71 there was a decline of about 25 per cent in the mortality. However, there may be difficulties in ascribing any significance to this.

Cardiovascular causes of death have been particularly subject to extensive and complex changes in the ICD such that it is almost impossible to establish a continuous series over 30 years. There were marked differences between the fifth and sixth revisions and a complete change in the mode of classification between the seventh and eighth revisions.

Rheumatic Heart disease, however, is one cause that may be consistent and this has declined in both men and women at all ages, and at ages 25–34 this reduction is of the order of 90 per cent, so there is a prospect of the virtual elimination of this disease as a cause of death if this cohort remains free of the condition as it advances through life.

Arteriosclerotic and degenerative heart disease, which includes coronary artery disease and myocardial degenerations, have accounted for over a third of all deaths during the 30 years and within this broad diagnostic group there has been almost no change in male mortality, but an improvement in female mortality between 1950 and 1967 of 26 per cent.

Within these groups, however, there has been either a change in nosology or nomenclature because the term coronary artery disease has gradually replaced myocardial degeneration even at the older ages where there seems to be little epidemiological distinction to be found between men dying of either conditions. It is, however, clear that in the age range 45–64 there truly has been an epidemic of cardiovascular disease causing deaths labelled coronary artery disease.

At other ages and amongst women it would seem more probable that the great increase in deaths attributed to coronary disease might be a simple shift in nomenclature.

Cerebro Vascular diseases are a group that have had several changes of classification, but despite this there does seem to be a valid continuity of the statistical series. These cases are prominently diseases of advanced age and the large increase in the female crude rate in Table 3 is seen to be a function of the age structure of the population as the age specific rates for these diseases had declined at all ages in Table 4a. There is no evidence of an increase in these diseases.

It is particularly interesting to note that at adult ages *road traffic accidents* have been relatively stable over the 30 years and amongst men over 25 the rates have even declined despite the very great increase in traffic density and speed.

Suicide has also remained relatively constant despite large changes in the availability of toxic substances and of alteration in the legal and moral status of suicide in society.

Less frequent causes of death

Amongst the 15 principal causes of death only tuberculosis has shown a large and consistent fall in the last 30 years and all the other changes have been equivocal or limited to particular groups of the population. It is, therefore, necessary to consider whether there have been large changes in some of the less frequent causes of death. This is done in Table 5 which reports the total mortality from cancer and in Table 6 which reports those diseases which at some time have recorded over 2,500 deaths in a year.

Amongst the cancers there has been a steep decline in *oro-pharyngeal cancers*, a decline in male *colonic and rectal cancers* and *laryngeal cancers*, but all these minor improvements are swamped by the increase in *lung cancers* and in female *breast and ovarian cancers* in *bladder cancers* and in miscellaneous cancers. There is evidence of a changing pattern and hence

Table 4a *Age specific mortality by cause for females only. Rates per million population under age 65. England and Wales 1941 and 1971*

Cause of death	*25–34*		*35–44*		*45–54*		*55–64*		*65–74*	
	1941	*1971*	*1941*	*1971*	*1941*	*1971*	*1941*	*1971*	*1941*	*1971*
Respiratory tuberculosis	1777	2	490	6	346	13	314	15	242	26
Cancer of stomach	19	6	57	24	215	77	612	261	1370	667
Cancer of lung	11	8	30	52	99	246	181	529	266	789
Cancer of breast	32	41	209	239	550	617	814	952	1050	1190
Rheumatic heart disease	174	14	266	66	456	169	773	324	1640	504
Coronary heart disease	7	12	23	94	118	458	513	1891	1550	6790
Cerebro Vascular disease	24	39	102	120	623	380	2017	1155	6140	4420
Influenza	29	1	48	1	107	8	211	11	572	33
Pneumonia	96	16	149	43	256	102	555	333	1400	1421
Bronchitis	30	6	71	20	229	99	708	303	2680	747
Road accidents	38	49	34	39	55	63	90	92	151	183
Suicide	55	51	70	65	113	108	140	131	117	142
Puerperal causes	244	17	163	12	6	0	—	—	—	—

Table 5 *Crude death rates per million by cancer, all ages. England and Wales 1941–71*

	Males				*Females*			
Type of cancer	*1941*	*1951*	*1961*	*1971*	*1941*	*1951*	*1961*	*1971*
Mouth and pharynx	123	74	48	42	24	28	27	24
Oesophagus	91	71	61	72	32	37	44	54
Stomach	423	387	360	305	269	286	260	206
Large intestine	251	202	164	172	256	240	228	236
Rectum	212	172	130	132	107	106	101	105
Pancreas	68	77	93	116	46	60	80	97
Larynx	51	38	28	26	9	9	7	5
Lung and bronchus	230	550	869	1060	48	91	139	224
Breast					323	352	389	446
Ovary					85	112	127	146
Uterus					210	178	165	153
Prostate	127	143	164	170				
Bladder	70	85	96	116	25	32	38	44
Leukaemia	29	47	60	70	25	41	50	55
All others	317	294	313	375	262	250	285	352
All cancers	1992	2120	2386	2656	1681	1822	1940	2147

evidence of environmental aetiology of cancer, but no evidence of an overall improvement.

Amongst the non-malignant less frequent causes of death, however, there is a very different pattern, the majority of these causes have declined markedly over the years and some have disappeared into the history of medicine.

Tubercular meningitis, meningococcal infections, diphtheria and *whooping cough* were all important causes of death only 30 years ago which have now disappeared.

Syphilis which was important, particularly amongst men who survived the First World War, has also almost disappeared as a cause of mortality.

Diabetes is a condition which is difficult to assess by means of mortality analysis as it frequently occurs as a contributory cause of death, but not as an underlying cause of death. There is no evidence of any long term change in the mortality from this disease.

Pernicious Anaemia and sub-acute combined degeneration of the cord (SCD) have almost disappeared from mortality as a result of effective

Table 6 *Crude death rates per million population, all ages, both sexes. Certain causes of death. England and Wales 1941–71*

Cause of death	*1941*	*1951*	*1961*	*1971*
Tubercular meningitis	60	20	2	1
Meningococcal infection	53	7	4	3
Syphilis	74	40	10	3
Whooping cough	62	10	0·5	0·5
Diphtheria	68	1	0·2	0·0
Diabetes	125	85	84	100
Pernicious anaemia	65	26	14	7
Epilepsy	45	21	15	13
Paralysis agitans	31	37	36	34
Multiple sclerosis	24	21	19	17
Asthma	76	81	25	25
Pneumoconiosis (males only)	15	29	31	20
Gastric ulcer	93	69	43	34
Duodenum ulcer	48	60	43	36
Appendicitis	48	27	14	7
Hernias	69	39	33	26
Chronic nephritis	239	123	61	41
Hyperplasia of prostate	306	216	137	50
Congenital malformations	121	106	115	93
Senility	446	216	154	67
War death of civilians	504	—	—	—
MV traffic accidents	166	103	141	142
Accidental drug poisoning	4	6	4	11
Accidental falls	140	102	114	113
Homicide	5	4	6	8

Sources Registrar-General's Statistical Review Pt. 1, Medical

Note
1941 5th Revision of ICD
1951 6th Revision of ICD
1961 7th Revision of ICD
1971 8th Revision of ICD

treatment, but the neurological diseases, *epilepsy*, *paralysis agitans* and *multiple scelerosis* are all on a plateau without any evidence of a changing pattern.

Asthma is a particularly difficult topic to assess not only because of

changes in classification, but also because of changes in medical opinions on the aetiology of the disease. The very important minor epidemic of asthma deaths in the period 1962–67 which has been attributed to an excessive dose of isoproterenol in nebulisers is not detectable on the macroscopic scale of this review.

Deaths from abdominal conditions amenable to surgical treatment, which include the *peptic ulcers*, *appendicitis* and *hernias*, have all greatly declined.

There has been a very large reduction in the mortality from genito-urinary diseases with a decline of 80 per cent in *chronic nephitis* and in *hyperplasia of prostate*. But it should be noted that the greatest part of this fall had already occurred by 1961 before artificial kidneys became available.

Congenital malformations have fluctuated as a cause of death, but no trend is to be observed.

Deaths attributed to *senility* have almost completely disappeared and this is an excellent illustration of the changes in practice of doctors signing certificates. These deaths are now attributed to some other specific cause and non-specific diagnoses are almost entirely eliminated.

Geographic analysis

One of the original aims of the National Health Service was to obtain a more even distribution of the public health and medical services between different parts of the country.

Table 7 shows that whilst this may have been achieved in the allocation of resources it has made no effect at all upon the gradients in mortality that exist and have existed between various regions and towns.

The ratio of the local adjusted death rate to the national rate is almost exactly equivalent to the Standardised Mortality Ratio except that it makes use of a rolling standard in that each area in a given year is compared with the national rate for that same year and hence the ratios are consistent between themselves for any one year, but are not consistent between different years.

The rank order of the regions, of the cities and of the administrative counties remains almost unchanged over 20 years. Merthyr Tydfil, Rhondda, Ebbw Vale in Wales, Gateshead, Preston and Liverpool in England, remain at the bottom of the league tables. Oxford, Bournemouth and Eastbourne remain at the top.

A similar constancy in mortality ratios can also be detected between social class as a result of the occupational mortality studies.

Thus despite the considerable alterations that have taken place in the number of hospital beds and in the doctor/patient ratio in the poorer economic areas of the country, it is clear that the general social environment still has an important effect upon mortality.

Table 7 *Ratio of local adjusted death rate to national rate. England and Wales 1951–71*

Area or city	*1951*	*1961*	*1971*
Northern	1·09	1·12	1·14
East and West Riding	1·09	1·14	1·14
North Western	1·17	1·23	1·16
North Midlands	0·95	1·02	—
Midlands	1·02	1·06	—
Eastern	0·86	0·91	0·90
London and South East	0·93	0·96	0·94
Southern	0·88	0·93	0·92
South West	0·94	0·97	0·94
Wales	1·11	1·14	1·13
Selected County Boroughs			
Birkenhead	1·14	1·17	1·13
Derby	1·09	1·13	1·06
Exeter	1·02	1·05	0·90
Gateshead	1·23	1·28	1·24
Bristol	0·99	0·98	1·02
Preston	1·28	1·26	1·29
Liverpool	1·30	1·26	1·31
Norwich	0·94	1·00	1·00
Newcastle	1·15	1·15	1·30
Oxford	0·89	0·79	0·84
Bournemouth	0·91	0·91	0·93
Eastbourne	0·92	1·02	0·88
Cardiff	1·11	1·10	1·13
Merthyr Tydfil	1·22	1·24	1·27
Rhondda MB	1·36	1·38	1·36
Ebbw Vale UDC	1·20	1·33	1·27
Selected Admin Counties			
Berkshire	0·87	0·86	0·83
Derbyshire	0·98	1·07	1·08
Durham	1·11	1·15	1·17
Hampshire	0·84	0·95	0·82
Lancashire	1·13	1·23	1·14
Oxfordshire	0·81	0·87	0·85
West Sussex	0·86	1·05	0·80
Glamorgan	1·19	1·20	1·20
Monmouthshire	1·11	1·18	1·16

Recent mortality trends in the world

Looking beyond our own slopes, what has happened in the world at large? General mortality has fallen in most parts of the world since 1950. The amount of fall has tended to be greater in the less developed countries than

in the developed countries. It appears that countries that started their mortality decline more recently have tended to show more rapid decline than those who started earlier. Many less developed countries have shown a rate of mortality decline never attained in the history of the more developed countries.

However, there appears to have been a widespread retardation in the rate of mortality decline towards the end of the 1950s and into the 1960s. In the more developed countries the rise in expectation of life for men has virtually come to a halt. In the less developed countries, although not all the 1970 census figures are as yet available, data available to date suggests that in some countries mortality levels have not shown as great a decline in the 1960s as was expected.

Mortality differentials

International comparative studies show also that between the developing countries there are wide variations in the rate of mortality decline and these are now well spread out over a wide range of general mortality levels.

Age patterns show various stages of change from the 'U-shaped' pattern in the countries of highest mortality to that 'J-shaped' pattern of the developed countries. The greatest improvements are seen in childhood mortality between ages 5 and 14. Infant mortality rates, such as are available, also show wide variations between developing nations, but in all cases these have improved.

Male mortality usually exceeds female mortality, but there are examples of less developed countries where females have a worse record than males. On the whole, females have profited more from the improvements in mortality of the past two decades with a resulting widening of the sex differential in the majority of countries where females were already at the beginning of the period of observation in an advantageous position and a reduction (or virtual elimination) of the female excess mortality in the exceptions referred to above.

While it is believed that recent mortality decline has been due, especially in the developing countries, primarily to health service activities, it is clear that these health services did not achieve those results completely independently of general improvements associated with socio-economic development.

The wide variations in the extent to which mortality has actually declined in the less developed countries raise the question to the extent to which socio-economic levels actually determine or contribute to the mortality levels and their rates of change in these countries. Similar questions have also been raised in connection with the slowing-down in decline in many advanced countries in the 1960s.

In such considerations of relative contributions of health service activities and socio-economic development to mortality change, it is important to take into account the variations in the scope of services that are included within the direct responsibility of the health authorities in different areas or countries, and the changes that have taken place in this field of responsibility from one time to another.

It was also pointed out that the division between health services and socio-economic development may in fact be a completely artificial one, anyway, since any socio-economic development plan would usually include plans for the development of the health services as well.

Discussion

In the discussion which followed Professor Campbell's paper two main points were made. The first was that although in the developing countries major changes in the patterns of mortality may still emerge as a result of the extension of traditional methods of medical care major improvements in health in countries such as Britain are only likely to emerge as a result of related social changes. In this context emphasis was placed by a number of participants, including Professor Backett, Mr Lee and Dr Adelstein, on the social class variations in life expectancy and infant mortality which exist in modern Britain to virtually the same extent as they did at the end of the 19th century.

The second area of interest to emerge related to the difficulty of comparing figures collected at different times and places. It was pointed out by Lord Hunt and others that changes in the use of terms such as senility have affected recorded mortality rates in a number of specific areas. Diagnostic improvements with regard to conditions such as cancer of the stomach or pancreas have also given rise to certain statistical trends which do not in fact mirror any real changes in the causes of mortality in the population.

Changes in patterns of recorded morbidity

Dr Donald Crombie

We are attempting at this symposium to draw up a balance sheet of the risks and benefits of modern medical care and in particular to identify the changes which may have occurred during the past 20 years.

My contribution, which I can only call a reconnaissance and then not even in strength, is to approach this task indirectly via an exploration of three main sources of information:

1 Hospital statistics.
2 Sickness benefit statistics.
3 The first and second National Morbidity Surveys.

Such a balance sheet should be based on reproducable measurements of change of health or morbid status. These measurements should ideally be on an absolute scale but a relative scale must usually suffice. First we need consistently applicable, reproducable and communicable definitions of 'health' and 'morbidity' and it is here that I envy Dr Campbell for in the words of Lancelot Hogben 'while there's death there's hope'.

On the whole you are either alive or dead but the definitions between 'good health' or 'feeling well' on the one hand and 'ill health' or 'morbidity' on the other hand, have never been clearly defined.

I find it interesting that in current colloquial English, 'health' as a word for the 'condition of the body and mind', is neutral with respect to quality. Health can be either 'good' or 'ill'. In this colloquial and archaic sense of the word the 'Health' services are in fact rationally and well named.

'Ill health' and 'good health' are relative terms, and whether an individual at any point in time considers himself 'well' or 'ill' depends on the interaction of a variety of factors. Interpretation of the data which follows will be primarily dependent on an understanding of patient behaviour and some of these factors are listed in Table 1.

This is an arbitrary and not necessarily a complete list. The most important factors are the personal expectations of the patient which in turn are determined by the norms for the underlying attitudes and values of the society in which he was brought up or now exists.

In western society, the recent shift in meaning of the word 'health' from a neutral position to the one which equates 'normal' health with 'good health' is a major normative change which we have already identified, the result of the increasing control of much serious acute illness during the

Table 1 *Sources of variations in morbidity rates recorded by general practitioners*

Actual:	Age
	Sex
	Environmental variables such as: Nutrition, occupation, social status, housing conditions, geographic and climatic conditions, basic standards of health care
	Screening and presymptomatic diagnosis.
	Preventive and prophylactic procedures.
Apparent:	Threshold of awareness of illness; related to: (a) Cultural norms, and: (b) Individual idiosyncrasies.
	Threshold for consulting: reflected in episode rates.
	Consultation patterns of doctors: reflected in consultation rates/episode.
	Discrimination of recorders: reflected in increased detail concerning multiple causes.
	A recording system which encourages increased discrimination.
	Certification procedures for short-term absence from work.
	Usage of alternative sources of advice and care: Casualty departments and other direct hospital access; Other non-medical professionals (nurses, HVs). Social agencies. Chemists. Screening and presymptomatic diagnosis.
	Preventive and prophylactic procedures.

first 50 years of this century. This normative change has resulted in the concept of 'threshold' in health care.

There is first awareness of the threshold between normal and ill health. The individual does not consider himself 'ill' until he has crossed this threshold.

There is next the 'threshold' for seeking advice for 'illness' once it has been recognised. To some extent this is reflected directly in the 'episode rates' for recorded illness.

There are then thresholds for levels within the health care system itself. In the past this threshold was from general practitioners to hospital care. More recently, thresholds for advice from non-medically qualified professionals such as nurses, social workers and health visitors are appearing.

The threshold for seeking advice will also vary with the accessibility of care, its direct costs to the user, any insurance and sickness benefits to which an 'ill' person may be entitled and the actual arrangements for certifying illness.

Changes in the usage rates for health care agencies over time must take account of and be corrected for any changes in these thresholds if crude usage rates are to be used for estimating absolute changes in the health status of the community. This is the nub of the interpretation of data presented here.

Table 2 summarises the basic rates from the two National Morbidity Surveys.

Apparently, the episode rate/100 patients at risk (probably the most scientifically satisfying measure for comparing morbidity rates) rose from 133 to 181, an increase of nearly 40 per cent between 1955 and 1970.

However, the consultation rate per episode fell from 2·81 to 1·66, a fall of approximately 40 per cent and the episode rate/patient consulting only rose by 25 per cent.

The overall consultation rate/100 patients registered fell from 374 to 301, a fall of approximately 20 per cent.

Table 2 *Comparison of first and second National Morbidity Surveys*

	First NMS May 1955–April 1956	*Second NMS Nov. 1970–Oct. 1971*
Population	370,000+	290,000+
Patients consulting/100 population at risk	67·0 m. 63 f. 70	67·2 m. 63 f. 71
Consultation rate/100 patients registered	374 m. 339 f. 408	301 m. 256 f. 343
Episode rates/100 population at risk	133 m. 121 f. 144	181 m. 154 f. 206
Consultation rate/episode	2·81 m. 2·80 f. 2·83	1·66 m. 1·7 f. 1·6
Episodes/patients consulting	2·0 m. 1·9 f. 2·1	2·5 m. 2·3 f. 2·7
Patients attending hospital/100 persons at risk (Accident and emergency)	27 (19) (11)	35 (22) (18)
Total attendances at hospital/100 persons at risk (Accident and emergency)	93 (27)	102 (30)

Has the work load increased by 40 per cent or been reduced by 20 per cent? Did the general practitioner see 40 per cent more or 20 per cent less illness in 1970 compared with 1955?

These usage rates are also determined by the definitions and criteria used by general practitioners. Any increase in diagnostic discrimination with an increasing awareness of multiple causes for example may result in each of these causes being graded as a separate illness. Also the actual method of recording data may encourage or discourage this tendency to increasing discrimination.

For example, in the first National Morbidity Survey carried out by the Royal College of General Practitioners and the Registrar-General in 1955, reported illness was recorded on a patient record card with a line for each episode of illness. Subsequent consultations for each episode required a minimal entry on the appropriate episode line.

In the second National Morbidity Survey carried out in 1970–71 by the Royal College of General Practitioners, the Office of Population Censuses and Surveys and the Department of Health and Social Security, reported illness was recorded in a Disease Index.

The Disease Index system would maximise the opportunities for changes in the development of the illness itself or in the diagnostic terminology used by the recording doctor to be reflected in appropriate elaboration of episode terminology and also some increase in the recorded episode rates.

Sickness benefit and certified incapacity

Before looking at the details of these changes in morbidity recorded by general practitioners we should look at, if only to dismiss, the influence of sickness certification and disability (Table 3).

These data relate only to the last decade and not to the 1950s but they will suffice for our purpose. The important information relates to the

Table 3 *Sickness benefit 1962–70 (males) new spells (a) and days (b) of certified incapacity (excluding influenza) per person at risk*

	1962–		*1970–*	
Age	*a*	*b*	*a*	*b*
20–24	0·330	5·5	0·438	6·8
55–59	0·388	23·0	0·384	26·0
60–64	0·433	39·5	0·385	44·6
All ages (age standardised)	0·348	13·2	0·397	15·8

Source From tables 11.4 and 11.5, annual report of CMO of DHSS. HMSO 1972

gradual increase for men under 55 of the recorded spells of sickness and total days of absence per person at risk in each successive year of the decade. Any large variations from year to year can be almost entirely explained by the presence or absence of influenza epidemics.

These increases are maximal for the younger age groups and the trend is reversed for men over 55 for new spells of illness only. On the other hand, the number of days of certified incapacity per person at risk shows for each year a marked increase with age. This reflects the increasing incidence of chronic diseases with age but the gradual increase in the annual figures for the total days of absence and spells of illness probably reflects the relative improvements in sickness benefit payments as much as anything.

These trends are not exactly matched in the morbidity recorded by general practitioners, but any difference can probably be explained by the retirement from the work force of increasing numbers on grounds of ill health after the age of 55 so that the figures for spells of illness are reduced. Long term incapacity (i.e. incapacity which lasts throughout a year is recorded as one spell of illness) accounts for more than one-third of all days of incapacity.

We can complete our reference to sickness disability data by mentioning that the only other changes of any importance over the past decade have been marginal improvements in the rates for bronchitis and certain skin conditions. These qualitatively important, though numerically small, improvements probably reflect a gradual improvement in the working environment. 'Hypertensive disease' and 'Ischaemic heart disease' have risen for spells, days of incapacity and rates.

Changes in hospital usage

The trends can be inferred from the conventional data related to bed occupancy, discharges and deaths and out-patient attendance. (Relevant Department of Health and Social Security Report.)[4]

Bed occupancy rates (Table 4) have shown dramatic falls for medical and long term psychiatric beds in general, a disproportionately smaller increase in the geriatric and chronic sick beds and relatively unchanged rates for all other major specialities. This is notwithstanding the increase in the population at risk from 42 to 47 million. The average lengths of stay (in brackets) have shown equally dramatic falls.

It is not surprising, therefore, that the numbers of deaths and discharges (Table 5) from this reduced number of beds show an even more dramatic increase. If the actual load of true morbidity which generates the need and use of hospital beds has not increased over the last 15–20 years (and this is the inference which I shall draw later from the comparison of the data from the two National Morbidity Surveys) then the increase in discharges must reflect a lower threshold for hospital usage. Even an increase in

Table 4 *Changes in hospital usage*

	1953	*1970*
Total population	42,400,000	47,327,718
Average daily bed occupancy		
Total	424,199	372,218
All medical	71,241 (33·6)	48,052 (15·3)
All surgical	59,977 (14·7)	58,011 (10·1)
Gynaecological	7,797 (11·7)	8,800 (6·3)
Obstetrical and GP unit	15,820 (12·2)	16,627 (7·2)
Geriatrics and chronic sick	50,179	56,875
All psychiatric	200,871	169,723

Average length of stay (days) in brackets.

Table 5 *Changes in hospital usage. Discharges and deaths*

	1950	*1970*
Total	3,085,491	5,328,954
All medical	641,318	1,054,832
All surgical	1,259,367	2,100,335
Gynaecological	202,485	486,554
Obstertical and GP unit	412,696	843,921
Geriatrics and chronic sick	83,852	184,510
All psychiatric	81,735	203,129

deaths in hospital compared with those in the individual's own bed in the community must reflect a similar trend.

The out-patient and casualty departments of hospitals (Table 6) are the interface between the general practitioner and hospital services.

Table 6 *Changes in hospital out-patient usage*

	1955	*1970*
New out-patients		
Total	11,635,886	16,390,822
All medical	1,970,186	2,077,654
All surgical	3,682,599	4,224,888
Gynaecological	349,279	542,049
Obstetrical and GP mat.	547,291	813,163
Psychiatric	141,343	229,617
Accident and emergency	4,728,181	8,209,369
Total out-patients		
All departments	39,584,241	48,096,505
Accident and emergency	11,560,966	14,082,882

The totals of new patient attendances here show the same trends as for deaths and discharges. The most dramatic increases are in accident and emergency attendances. However, this 'increase' in the number of new attendances has been accompanied by a reduction in the number of return visits/new patient and the increases in total out-patient attendances, though large, are proportionately much less. We must also remember that the majority of in-patients also appear in these out-patient statistics.

If there has not been any increase in true morbidity there are two main possible explanations for these in-patient and out-patient trends:

1 The additional attendances are for relatively less serious conditions or for follow-up routine surveillance of more serious conditions previously cared for by general practitioners.

2 The hospital system has become more efficient in terms of a reduction in the number of out-patient attendances and in bed days required for the solution of any specific clinical problem.

Both these explanations would appear to be relevant.

Comparison of the two National Morbidity Surveys

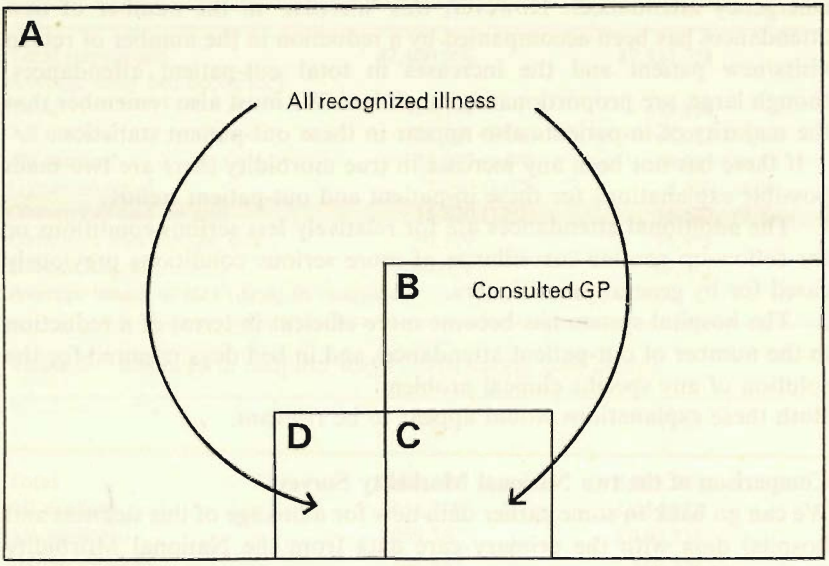
We can go back to some earlier data now for a linkage of this sickness and hospital data with the primary care data from the National Morbidity Surveys (Table 2).

In numerical terms, for every 133 episodes/100 patients at risk in 1955–56, a maximum of 27 patients were brought to hospital care. Of these 11 attended accident and emergency departments. From other figures (Crombie 1959) we know that approximately eight of these 11 by-passed the general practitioner, so that a maximum of 19 patients attended from the 67 who brought the 133 episodes of illness to their general practitioners. I am forced to put these findings in this clumsy way, for we cannot say that the hospital figures definitely represent separate patients. Each 'patient attending' hospital more properly equates with an 'episode of illness'.

The corresponding figures for 1970–71 are 67 patients bringing 181 episodes of illness to their general practitioners of which 35 attend hospitals, 18 at the accident and emergency departments. Of this 18 probably some 13 by-passed the general practitioner.

These findings are summarised in Figure 1, adapted from a unique diagram produced by the Horders in 1954, the equivalent findings from a similar study carried out by Wadsworth, Butterfield and Blaney in 1971, and the annual reports from the Department of Health. The estimate for A (the awareness threshold) are based on the two small surveys carried out in London and can be a general guideline only. The Horders' estimate for 1954 agreed closely with the Sickness Survey carried out by Stocks (1949) on larger representative samples of the general population.

Figure 1 *Thresholds for consultation and awareness of illness (after Horder and Horder 1954)*



C Referred to hospital by GP
D Direct access hospital

Spells (episodes) of illness/100 patients at risk

	1954		1970	
A	680 (H & H)		1,900 (W, B & B)	
B	133		181	
C	19	27	22	35
D	8		13	

In summary, then, there has probably been a 180 per cent increase in the aberrations from health which people perceive as illness. Notwithstanding this there has only been a 36 per cent increase in the number of separate aberrations from health brought to general practitioners as episodes of illness and a 30 per cent increase in those reaching the hospitals. Of these the estimated increase due to direct referrals by general practitioners is only from 19 to 22 patients/100 population at risk.

If reductions in the number of consultations or visits per episode or spell of illness reflect increased clinical efficiency, then general practitioners have been even more successful than their hospital colleagues in containing the increased demands for care.

Data from general practice

We can now look in more detail at the comparative data from the two National Morbidity Surveys.

Table 7 simply shows the reasonable representativeness of the survey population and of the minimal changes over the 16 years' interval. The original survey included England and Wales, the second England only.

Table 7 *Population of England and Wales. Percentage distribution by age and sex*

	(*England and Wales*) *mid 1955*		(*England only*) *mid 1971*	
	M	*F*	*M*	*F*
0–	11·6	11·0	12·5	11·3
15–	20·2	20·6	20·1	18·6
45–	11·8	13·3	12·1	12·2
65–	4·6	6·9	5·2	8·0
All	48·1	51·9	48·6	51·4
Total population	42,400,000		47,327,718	

Survey populations. Percentage distribution by age and sex

	M	*F*	*M*	*F*
0–	11·2	10·6	12·8	11·1
15–	18·7	21·0	20·5	19·1
45–	12·1	13·8	11·8	11·7
65–	5·0	7·6	4·9	7·4
All	47·0	53·0	48·0	52·0
Total population registered	269,832			

The increases from 1955 to 1970 in the illness (or episode) rates per person registered for illness reported to general practitioners (Table 8) are apparent for both sexes at all ages but especially so for females where the

Table 8 *Illnesses (episodes)/patients at risk*

	*I (8)**		*II (10)*	
	M	*F*	*M*	*F*
0–	1·5	1·5	2·0	1·9
15–	1·0	1·4	1·3	2·4
45–	1·1	1·2	1·4	1·9
65–	1·4	1·6	1·8	1·9
All	1·2	1·4	1·5	2·1
	1·33		1·81	

*Numbers in brackets in the title of tables refer to the appropriate tables in the National Morbidity Survey publications.

greatest increase of all is in the age group 15–45. Although the equivalent episode rates per patient consulting (Table 9) show similar trends, there is less variation with age.

Any apparent variations between episode rates per patient at risk (Table 8) and per patient consulting (Table 9) are largely explained by any

Table 9 *Illnesses (episodes)/patient consulting*

	I (8)		*II (9)*	
	M	*F*	*M*	*F*
0–	2·1	2·1	2·5	2·5
15–	1·8	2·1	2·1	2·7
45–	1·9	2·1	2·3	2·7
65–	2·1	2·1	2·6	2·8
All	1·9	2·1	2·3	2·7
	2·1		2·5	

variations in the number of patients/100 population who consult at all (Table 10). For example, for males in the first survey, these rates vary from

Table 10 *Number of patients consulting/100 population*

	I		*II*	
	M	*F*	*M*	*F*
0–	74	74	73	71
15–	58	70	59	74
45–	60	67	60	67
65–	68	73	66	67
All	63	70	63	71

58 patients consulting per 100 at risk in the age group 15–45 to 74 per 100 at risk in the age group 0–15. There was little change in these rates for males in the second survey 15 years later. The equivalent rates for females tend to be higher than for males at all ages in both surveys. There is however a reduction in the rates for females 0–15 and 65+ in the second survey compared with the first, and a rise in the rates for the age group 15–45. Only the rates for females age 45–64 remained unchanged between the two surveys. In other words, the major consistent change in health care usage by patients between the two surveys as measured by episode rates, is in the reporting of an increased number of episodes by those who attend the doctor at all. On the whole the episode rate is determined mainly by the patient and reflects directly the patient's judgement and decisions about attending the doctor.

The greatest changes of all have taken place in the number of consultations per episode of illness (Table 11). This rate is determined more by the doctor than the patient though increasingly doctors put the onus on the patient to make the final decision about return visits for minor illness. In both surveys the consultation rate per episode increases with age but less steeply in 1970–71 than 1955–56. The increasing consultation rate with age has been maintained, reflecting the greater severity and seriousness of reported illness in general with increasing age.

Table 11 *Consultations per episode*

	I		*II*	
	M	*F*	*M*	*F*
0–	2·1	2·1	1·3	1·3
15–	2·5	2·6	1·3	1·6
45–	3·6	3·4	2·1	1·8
65–	4·2	4·0	2·2	2·3
All	2·8	2·9	1·7	1·6

The major reduction in consultation rates in the face of an increase in the rate of reported illness may seem paradoxical. It is logical only if primary assessment is the most important component of the generalist's role. On the other hand, this change in emphasis in the allocation of the general practitioner's time has been achieved in the second survey with a proportionately smaller referral of the illnesses which required more consultations in the earlier survey.

We must now see if there is any evidence for the contention that the rate of true morbidity has not increased between the two survey years notwithstanding the marked increase in episodes reported to general practitioners and brought for hospital care. If this contention is true then there should be no increase in the reporting rates for serious illness.

Any of the large identified increases of reported illness should be confined to relatively trivial and/or self-limiting conditions. This is in fact what we find though interpretation of the data is complicated by the fact that morbidity rates from the first survey were presented only as patients consulting with the disease and not episode rates as such.

For comparison between rare diseases or at least for conditions in which second attacks in the same individual during one year are rare, patient consulting rates will be almost equivalent to episode rates. For purposes of comparison of data between the two surveys, we have to use the patient consulting rates.

In Table 12 results are given as rates for patients consulting at least once

per 1,000 population at risk, for illnesses grouped by the main categories of the ICD. The figures have been approximately adjusted for changes of categories between the seventh and eighth revisions of the ICD.

Table 12 *Patients consulting (at least once)/1,000 population by main categories*

	I (9)		*II (11)*	
Infections and parasitic	55·0		70·7	
Neoplasms	10·7		12·0	
Endocrine, nutritional and metabolic	19·2		26·0	
(Allergic)	(31·6)			
Blood		m. 4·7		
	14·3	f. 22·9	12·1	
		m. 32·4		
Mental	50·0	f. 65·6	109·9	
Nervous system and sense organs (excluding CVD)	114·9		113·1	
Circulatory system (including CVD)	73·3	m. 54·4	66·2	
		f. 80·9		
Respiratory system	264·2		260·6	
(plus asthma, hay fever) (13·6)	(277·8)			
Digestive	107		60·7(+ D&V 91·2) (121)	
Genito-urinary	52·9	m. 18·1	74·9	
		f. 83·8		
Complications of pregnancy	16·9		22·4	
Skin and subcutaneous (including urticarial, excluding warts)	113·5		113·3	
Bones and organs of movement	86·8		91·3	
Congenital malformations	2·0		2·4	
Diseases of early infancy	2·6		0·4	
Symptoms of ill-defined conditions	94·8		141·7(− D&V 111·2) (244)	
Accidents, poisoning and violence	102		82·5	
			AN 48·5	
Prophylaxis	53·4	m. 35·1	138·9 OC 59·1	
		f. 69·7	Cer. 22·1	
All conditions	670·0		671·7	

The illness groupings with the smallest percentage increases or, in some cases, actual reductions, include: neoplasms; diseases of the blood and blood forming organs; diseases of the nervous system and sense organs; diseases of the circulatory system and accidents, poisoning and violence. These are the groupings with the greatest proportion of serious conditions. In contrast, the conditions with the greatest percentage increases include: communicable diseases; mental psycho-neurotic and personality dis-

orders, symptoms and ill defined conditions and prophylactic procedures. These are the groupings with the lowest proportions of serious conditions.

Within each of the main groupings, we can find further evidence of this trend but also of other real changes, however small in the rates for certain individual conditions. In general we shall find that the more serious the condition, the smaller the change in the rates between the two surveys. Tables 13–24 contain the comparative consulting rates/1,000 population for selected conditions in the two surveys. Any important increase in rates from the first to the second survey is marked by a ' + ' and any reduction by a ' — '.

In the text which follows the words 'increase' and 'reduction' will refer to the differences in these rates from the first to the second survey.

Communicable Diseases (Table 13)

The marked reductions in the rates for all tuberculous conditions is not unexpected. Most of the epidemic exanthemata will show increases or reductions depending on whether or not they were epidemic at the time of the survey. The reduction of measles by less than 50 per cent is perhaps disappointing in view of the immunisation campaign.

Table 13 *Patients consulting (at least once)/1,000 population for infection and parasitic conditions*

		I (9)	*II (11)*
— Tuberculous	Risk	2·9	0·5
	Other	0·8	0·2
Mumps		5·0	1·6
— Measles		8·1	4·8
Poliomyelitis		0·2 (77)	0·0 (8)
— Syphilis		0·3	0·1
+ Gonococcal		0·1	0·4
+ Scabies		0·9	3·6
All infections and parasitic		55·0	70·7

Poliomyelitis, on the wane in 1955 had virtually been eliminated by 1970.

The reduction in the rate of syphilis is compounded of two elements. The first is the virtual elimination of the later stages of the disease, which reduces the prevalence rate and the second, the concomitant gradual increase in the incidence rate between the two surveys. The effect of the first by 1970 was numerically greater than the effect of the second but this situation may not persist. The rates for gonococcal and other venereal disease show a four-fold increase, largely attributable to an equivalent in-

crease in incidence. Figures for incidence and prevalence rates are available only for the second survey.

The increase in the rates for scabies show a similar trend. We shall see later that this also applies to a wide range of minor inflammatory conditions of the genito-urinary tract, not usually considered venereal.

Neoplasms (*Table 14*)

Carcinoma of lung shows the expected increase. This increase and the increase for carcinoma of bladder are reflected in mortality rates. The reduction for carcinoma of stomach is also reflected in mortality rates and in reductions for peptic ulcer and some other abdominal conditions. The increase in the rate for all malignant conditions from 8·0 to 8·6 is reflected in an equivalent rise in the mortality rates.

Table 14 *Patients consulting* (*at least once*) *with neoplasms/1,000 population*

	I (*9*)	*II* (*11*)
+ Carcinoma of bladder	0·1	0·4
− Carcinoma of stomach	0·5	0·3
+ Carcinoma of lung	0·5	0·9
Carcinoma of cervix	0·4	0·5
(All malignant conditions)	(8·0)	(8·6)
− Benign neoplasm of uterus	1·8	1·0
+ Benign neoplasm of skin	0·9	2·4
All neoplasms	10·7	12·0

The increases for benign neoplasms of skin are difficult to explain and may simply reflect an increased reporting of these conditions rather than an increased incidence.

The reduction for benign neoplasms of the uterus, virtually fibroids, probably reflects the interaction of two main components, an increased control of menorrhagia by hormone therapy even when fibroids are the cause and a possible true reduction in incidence in women who take oral contraceptives for any length of time.

Endocrine, metabolic and Nutritional Disease (*Table 15*)

The decrease for 'simple goitre and thyrotoxicosis' is confined to females while the increase for diabetes mellitus and gout are confined largely to males over 50 years of age.

The reduction for pernicious anaemia is probably spurious and represents an improvement in the specificity of diagnosis. The diagnosis for many patients in the 1930s was often based on what would now be con-

Table 15 *Patients consulting (at least once)/1,000 population with endocrine, metabolic and nutritional conditions*

	I (9)		*II (11)*	
− Simple goitre and thyrotoxicosis	1·7	m. 0·4 f. 3·0	1·3	m. 0·5 f. 2·0
Myxodema and cretinism	1·7		1·8	
+ Diabetes mellitis	3·7	m. 2·9 f. 4·4	4·5	m. 4·3 f. 4·7
+ Gout	0·8	m. 1·2 f. 0·4	1·6	m. 2·7 f. 0·6
Pernicious anaemia	2·0		1·4	
Iron deficiency and other specified anaemias	5·9	m. 1·5 f. 9·8	9·2	m. 2·6 f. 15·3
All endocrine, nutritional and metabolic	19·2		26·0	

sidered inadequate data. Many of these patients would have died between the two surveys. The increase for 'other anaemias' is probably the result of two conflicting trends. There is an increasing use of specific tests on a routine basis which therefore uncovers a greater proportion of the real prevalence. There is an increasing tendency to make the diagnosis only on the basis of specific tests.

Allergic conditions included in this category in the seventh revision of the ICD and therefore in the first survey, have been reallocated to other categories as in the eighth revision which formed the basis for the second survey.

Mental Psychoneurotic and Personality Disorders (Table 16)

There has been a marked increase in all categories in this group. However, the largest part of this increase is due to neurotic depression while the rates for other psychoneurotic conditions show much smaller differences. This increase in the rate for neurotic depression probably reflects an increased diagnostic awareness by the general practitioners rather than an increased awareness and reporting of depression by the patients. If the latter was the explanation, the increase should have been evident in all psycho-neurotic categories. This is probably also the explanation for the apparent increase for psychotic conditions for the bulk of this increase can be attributed to 'affective' psychoses usually depression. Also, we shall find that there has been a proportionate decrease in the rates for 'menopausal' symptoms, suggesting that the diagnosis of neurotic depression may have been used as an alternative diagnosis in the second survey.

Table 16 *Patients consulting (at least once)/1,000 population for mental illnesses*

	I (9)	*II (11)*
Psychoses	2·2	7·3 Schizo 1·4 Affect 4·1
+ Psychoneurosis	45·7	79·3
(Neurotic depression)	(1·4)	(31·4)
Alcoholism	0·2 m. 0·3 f. 0·1	0·8 (including other drug dependence)
All mental, psychiatric and neurotic	50	109·9

Nervous System and Sense Organs (Table 17)

There have been fewer changes in the rates of individual conditions in this category than in any other. The increase for otitis externa probably reflects a true increase in incidence. The increase is mainly confined to those

Table 17 *Patients consulting (at least once)/1,000 population for conditions affecting the nervous and sense organs*

	I (9)	*II (11)*
Otitis externa	5·3	7·9 (all over 15)
Otitis media	19·8	28·1
Other diseases including mastoid, etc.	5·3	5·3
Deafness	1·8 under 15 m.1·2 f. 0·8	3·5 under 15 m. 3·9 f. 1·9
All	114·9	113·1

over 15 while the increase in the rates for otitis media are greatest in the younger age groups. The increases for otitis media may reflect a greater diagnostic awareness of the condition as a cause of illness in children and an increasing use of the auriscope as much as a true increase in incidence. The increases for deafness are relatively greatest in the youngest age groups and may also reflect the same trend of increasing awareness and deliberate search for abnormality by screening. The rate for males is twice that for females in the under 15 age group for no easily discernible reason.

Circulatory System (Table 18)

The drop in the rates for rheumatic fever and its consequences reflects the absence of new young recruits to the cohort since the incidence of rheu-

Table 18 *Patients consulting (at least once)/1,000 population for conditions affecting the circulatory system*

	I (9)			*II* (11)		
– Rheumatic fever	1·7			1·2		
Hypertension (total)	15·7			19·1		
Benign	14·7	m. 7·5 f. 21·0	1·4 14·0 31·3 2·6 35·9 74·1	18·7	13·1 0·1 3·5 30·1 25·8 0·1 5·5 43·0	45
+ Angina	3·5			4·2		80
+ Other coronary ischaemia	3·7			5·3		
+ Cerebro vascular disease	4·9			5·3		
+ Other disease of arteries	2·0			3·5		
– Chilblains	3·55			1·0		
Varicose veins, lower ext.	11·8			8·9		
Haemorrhoids	7·5					
+ Phlebitis and thromb.-phleb.	2·4			3·8	males and females over 45 as well as 15–44 mainly and increase in	
+ Pulmonary embolism and infarction	0·2			0·3	males	
All circulatory	73·3			66·2		

matic fever dropped dramatically some 30 years ago. However this may well hide a more recent trend towards a slowly rising rate in the incidence of rheumatic fever. This point cannot be established from these comparative figures for incidence and prevalence were not separated in the first survey as they were in the second.

The moderate increase in the rates for hypertension probably reflects greater diagnostic awareness and greater use of routine screening for hypertension, rather than any true increase in total incidence. The rates for males of all ages have increased proportionately more than for females suggesting that the greater clinical importance and poorer prognosis of untreated hypertension in males has influenced and biased this directed clinical diagnostic search.

The rates for all conditions related to degenerative changes in important arteries, particularly the coronary and cerebral vessels, have all risen and roughly in the same proportions. These rises are also reflected in mortality rates and strengthens the likelihood that these represent real increases in the incidence of these clinically important conditions.

Chilblains show a noteworthy reduction in rates.

The increase in the rates for phlebitis, and thrombo-phlebitis are for both males and females and for those over 45 years of age as well as those

in the earlier age group. This and the fact that the equivalent increase in the rates for pulmonary embolism and infarction is more marked in males than females, makes it unlikely that the use of oral contraceptives can be a major aetiological factor.

Respiratory System (Table 19)

There have been several changes in the classification of minor upper and lower respiratory tract conditions in the second survey compared with the first and this vitiates the direct comparison of rates for many individual conditions.

Table 19 *Patients consulting (at least once)/1,000 population for conditions affecting the respiratory system*

	I (9)		*II* (11)	
Acute nasopharyngitis	81·1		109·5	Febrile 44·2 Non-febrile 65·3
Acute sinusitis	2·1		12·5	
Acute pharyngitis	28·3	63·7	75·4	
Acute tonsilitis	35·4			
Laryngitis and tracheitis	14·6		18·5	
Influenza	38·2		5·9	
+ Total minor respiratory	(198·7)		(221·8)	
less Influenza	(160·5)		(215·9)	
Acute bronchitis and bronchiolitis	48·9		57·9	
− Pneumonia	5·8		3·3	
Chronic bronchitis	11·1		11·5	
Pleurisy	1·3		1·3	(incl. effusion 0·2)
Hypertrophy of TS and AS	5·3	(20 1·9 0·4 0·2)	1·6	(53 0·7 0·1 0·1)
Pneumoniocosis	0·2		0·2	
− Bronchiectasis	1·2		0·6	
Chronic sinusitis	8·1	18·6	1·6	16·6
Chronic pharyngitis and nasopharyngitis (catarrh II)	10·5		15·0	
Asthma	8·5		10·2	
Hay fever	5·1		10·6	
All respiratory	264·2		260·6	
plus Asthma and hay fever	(277·8)			
less Influenza	(239·6)		(254·8)	

The marginal increase in the rates for acute bronchitis and bronchiolitis and the fall in the rates for pneumonia are in contrast to the equivalent mortality rates. This is the only major clinical area where the trends for morbidity and mortality rates are incongruent. This difference may simply

reflect a bias towards recording the more serious diagnosis 'pneumonia' rather than 'bronchitis' when a patient actually dies.

In the face of a general rise in the rates for all other respiratory conditions, the reductions for hypertrophy of tonsils and adenoids and for chronic sinusitis, probably reflect changes in diagnostic fashion rather than true changes in incidence. In any case these falls are almost counter-balanced by an equivalent increase in the rates for chronic pharyngitis and nasopharyngitis. On the other hand the decrease in the rate for the more serious condition bronchiectasis, though small, probably does reflect a true reduction in incidence.

The near equivalence of the total patient consulting rates of 277·8 and 260·6 for the first and second surveys respectively (239·6 and 254·8 respectively, if influenza is omitted) may at first seem at variance with the interpretation of the rates for conditions considered separately. However, we have already established that the main difference in patient consulting behaviour between the two surveys is an increased rate of reporting by those patients who report at all and that the proportions who report no illness (33 per cent) remained constant. We can infer, therefore, that many more of the patients in the second survey who reported one illness, reported a second compared with those in the first survey. The equivalent 'episode rates'/1,000 population, if available for the first survey would have been the logical data for examining this hypothesis. In the absence of this more accurate basis we can use the sum of the rates for patients attending at least once per 1,000 population for each of the separate conditions. This will still underestimate the true situation to the extent that some patients will have more than one episode of illness within a single condition category. However, this is only likely to be a large source of error for the most commonly occurring conditions such as coryza and influenza. The summed patient/consulting rates/1,000 population at risk for the first and second surveys are 331·6 and 342·4 respectively (293·4 and 336·6 if influenza, epidemic in the first survey is omitted).

The trends are even more obvious if we consider the minor respiratory conditions separately from all others.

If the rates for all minor conditions are summed we find a marked increase in the rates for the second (221·8) compared with the first (198·7). This difference becomes even more marked (215·9 and 160·5 respectively) if we remove the rate for influenza which was epidemic in 1955–56 but not in 1970–71. On the other hand, the rates for all other conditions, on the whole the more serious, were only 120·7 in the second compared with 132·9 in the first survey.

Digestive System (*Table 20*)

The reported reduction of rates for diseases of teeth and supporting tissues

in the second compared with the first survey, are mainly confined to the age group 0–14 years while the reduction in the equivalent rates for peptic ulcer are evident at all ages. The reduction in the rates for disorders of function may reflect the increased use of the alternative psychoneurotic rubrics to describe the same conditions.

Table 20 *Patients consulting (at least once)/1,000 population for conditions affecting the digestive system*

	I (9)		*II (11)*	
– Teeth and supporting tissues	14·5		8·6	reduction in under 15 mainly
Ulcer of stomach	1·9		0·8	
– Ulcer of duodenum	5·9	9·2	3·5	6·6 Differs at all ages
Other peptic ulcer	1·4		2·3	
Disorders of function of	21·5		11·4	
– Stomach and duodenum and others			2·6	14·0
Gastritis and duedonal	13·9			
– Acute D&V	22·2		(30·5)	
Constipation	8·1		7·0	
– Hernia	7·3		5·5	
– Appendicitis	4·0		1·9 (all ages)	
Cholelithiasis	0·9		1·0	
– Cholecystitis	2·0		1·4	
Other liver and gall bladder	0·6		0·6	
All digestive	107		60·7	
			(+ Acute D&V 91·2)	
Total patients consulting	(116·5)		(97·1)	

It is not possible to be certain whether the reduction in the rates for hernia reflects a true reduction in incidence or simply an increasing use of surgery which results therefore in a general reduction in prevalence, or both.

The reduction at all ages in the rates for acute appendicitis, and acute cholecystitis probably reflect a true reduction in incidence for the rates for appendicectomy and cholecystectomy have fallen during the same period (Doll, 1973).

Genito-Urinary Tract (Table 21)

There has been a general increase at all ages in the rates for all infective conditions of the genito-urinary tract, but in 15–45 year age group mainly for orchitis, epididymitis, salpingitis and oophoritis. This trend is probably related to the similar trends already noted for gonorrhoea and scabies.

There has also been a doubling in the rates for renal calculus.

Table 21 *Patients consulting (at least once)/1,000 population for genito-urinary conditions*

	I (9)			*II (11)*	
+ Pyelitis and pyelo nephritis	2·6			6·0	
+ Calculus of kidney and ureter	0·3			0·7	
+ Cystitis	10·5			18·0	(all ages)
+ Urethritis (non-v)	0·2			1·0	
+ Orchitis and epididymitis	1·0			1·7	15–45 mainly
+ Salpingitis and oophoritis	0·6			1·1	15–45 mainly
− Utero-vaginal prolapse	6·4			3·5	all ages
+ Disorders of menstruation	24·1	Amenorrhagia	14·5	49·9	
		Hypomenorrhagia	11·0		
		Ovular pain	0·5		
		Dysmen	7·5		
		Irregular menstruation	10·4		
		Disorder of menarche	0·5		
		Other	5·5		
Menopausal symptoms	18·5			10·1	
+ All genito-urinary	52·9			74·9	
+ Abortion	3·1	Therapeutic	1·9	4·8	
		Spontaneous	2·9		
− Complications of puerperum	6·5			3·1	

The rates for complications of the puerperium and utero-vaginal prolapse not unexpectedly are halved in the second compared with the first survey.

The increase in the rates for abortions are confined to those classed as therapeutic in the second. Presumably the majority of the equivalent abortions dealt with criminally in the first survey, were not reported to general practitioners.

The rates for reported disorders of menstruation doubled between the two surveys. This may reflect an increasing awareness by women of the effectiveness of hormone therapy in controlling these abnormalities. Indirectly it may also be the reason for the reduction in the recorded rates for fibroids already noted.

Disease of Skin and Subcutaneous Tissues (*Table 22*)

There is a general reduction at all ages in the rates for skin infections of all types. This may reflect improved working conditions rather than improved standards of hygiene. This reduction is counterbalanced by a general increase in eczema and seborrheic dermatitis. This in turn may reflect an in-

Table 22 *Patients consulting at) least once)/1,000 population for conditions affecting the skin and subcutaneous tissues*

	I (9)		*II (11)*	
− Boil and carbuncle	20·5		11·3	
− Cellulitis of finger and toe	10·4		6·9	
− Impetigo	10·6		7·7	
Other	7·6		9·8	
+ Dermatitis	12·1	24·3	Seborrheic 4·2	39·4
			Occupational 0·9	
			Sp. allergen 8·6	
+ Eczema	12·2		Other 25·7	
Psoriasis	3·3		3·2	
− Hair and hair follicles	3·9		1·8	
− Sweat and sebaceous glands	9·2		3·5	
All skin and subaceous cuticles	113·5		113·3	

crease in the potential skin allergies and irritants in our present environment particularly those associated with obsessive cleanliness. There is no obvious explanation for the reduction in the rates for diseases of hair, hair follicles, sweat and sebaceous glands.

Diseases of Bone and Organs of Movement (*Table 23*)
The increase in the rate for spondylitis may simply reflect greater diagnostic awareness. If the category for arthritis, used only in the first survey is combined with osteo-arthritis the rates for the first and second surveys become 17·1 and 18·2. The reason for the large increase in the rates for internal derangements of the knee joints is not obvious.

Table 23 *Patients consulting (at least once)/1,000 population for conditions affecting the bones and organs of movement*

	I (9)	*II (11)*
Rheumatoid arthritis	4·8	5·0
Spondylitis	0·2	7·1
Osteo-arthritis	11·2	18·2
plus arthritis unspecified	(5·9) 17·1	
Internal derangement of knee	0·6	3·0
All bones and organs of movement	86·8	91·3

Accidents, Poisoning and Violence (*Table 24*)
The reduction in the rates for accidents, poisoning and violence may be in part due to an increasing number with these conditions by-passing the

Tables 24 *Patients consulting (at least once)/1,000 population. Accidents, poisoning and violence*

	I (9)		*II (11)*
Fractures	9·0		8·8
Sprains and strains	26·5		30·0
Head injury (excluding skull)	4·4		1·0
Laceration and other wound	15·4		
Superficial injury	11·2	47·0	43·8
Contusion and crushing	20·4		
Foreign body entering through orifice	3·6		1·7
Burns	5·5		3·2
All conditions	102·0		82·5

general practitioner and going directly to casualty departments. However for the more clearly defined and serious conditions, the rates are remarkably similar.

Summary

This interpretation of changes between the mid 1950s and 1970 in the three main sources of data can be summarised as follows:

Patients probably became more aware of aberrations from normal health;

There was a lowering of the threshold for consultation;

The reduction in the threshold for consultation was largely confined to the less serious and self-limiting conditions;

There is no evidence of any reduction in the rate of reporting in acute conditions in general and acute serious conditions in particular. On the contrary there is a marked *increase* in the reporting of acute conditions in general. Any increases in rates for chronic conditions are marginal;

The increase in the rates for presentation of illness to general practitioners, has been accompanied by an even greater reduction in the average consultation rate/illness presented. There has been a smaller increase in the rates of attendance of new patients at out-patient and emergency departments of hospitals. These rates are proportionately less than the increase in the equivalent episode rates for conditions reported to general practitioners. The rates for direct referrals to emergency departments by general practitioners have hardly increased at all;

Such increases as there have been in referrals to out-patient departments, probably represent:

1 a transfer of patients requiring surveillance and follow-up for chronic serious conditions, from general practice to the hospital setting;

2 transfer of patients between different out-patient specialities without reference back to their general practioner and;

3 patients attending so-called emergency and casualty departments without contacting the general practitioner first;

There has been a proportionate increase in deaths and discharges from hospital;

The hospital services have reduced the average length of stay for illness and the number of total consultations per patient attending out-patient departments;

There have been increases in the number of spells of sickness absence per year at all ages under 55, maximal in the youngest age groups;

There was a real reduction in the incidence of certain conditions, in particular: tuberculosis, bronchiectasis, carcinoma of stomach, rheumatic fever and its consequences, peptic ulcer, appendicitis, acute cholecystitis, complications of the pueperium, utero-vaginal prolapse, boils and carbuncles, disorders of hair, hair follicles, sweat and sebaceous glands, chilblains and possibly also all skin infections in general;

There was probably a marginal increase in the true incidence rates for certain conditions: gonococcal infections, scabies, non-specific urethritis, orchitis, epididymitis, salpingitis and oophoritis in the age group 15–45 mainly;

There was a marked increase in rates for: all other urinary infections at all ages; carcinoma of bladder and lung; diabetes (males over 45); gout (for males); angina of effort and other coronary ischemia; cerebro-vascular accidents and other diseases of arteries; phlebitis and thrombo-phlebitis (but both for males and females of all ages) and therapeutic but not spontaneous abortions.

This tentative and superficial comparison of the health of the populations in 1955–56 compared with 1970–71 raises more questions than it answers. In particular it highlights the importance of changes in the thresholds for the perception and awareness of illness as the main factor in the increasing deluge of reported morbidity. What it does not do is to identify the reasons for the changing expectations which generate these so called 'needs'. 'While there's death there is hope', but, in the words of the Belfast graffiti, 'Is there a life before death?'.

Discussion

In response to questions from Professors Shepherd, Elmes and Logan Dr Crombie said that it was extremely difficult, with the data at present available, to relate the patterns of morbidity he was reporting to the action taken to relieve it in areas such as drug therapy or to attempt to measure the efficacy of such treatment. Professor Vessey pointed out that variations

in consultation rates at home or in surgeries could be promoted by changes in the expectations of and advice given by practitioners whilst Dr Morton commented that similar changes amongst patients could affect the treatment they ask for and subsequently receive. Dr Crombie agreed and also illustrated the difficulty of interpreting the available figures by showing that although old people apparently receive less attention from their general practitioners than they did 15 years ago, in that their consultation rates have fallen, they now receive relatively more than they did in relation to all other groups in the population, whose consultation rates have fallen faster.

Overall the discussion relating to Dr Crombie's paper mirrored that on Professor Campbell's in that, as Dr Draper commented, it drew attention to the importance of the social determinates of disease processes as well as the fairly well understood and quantified biological factors involved.

References

Collaborative Study RCGP, OPCS, DHSS (1974). Morbidity Statistics from General Practice – Second National Study 1970–71. Studies on Medical and Population Subjects No. 26. HMSO.

Crombie D L (1959), 'A Casualty Survey', *J. Coll. Gen. Pract.*, **12**, 346.

Department of Health and Social Security (1972). On the State of the Public Health. Annual Report. HMSO, London.

Doll Professor Sir Richard (1973). 'Monitoring the National Health Service', *Proc. Roy. Soc. Med.*, **66**, 729.

Horder J and Horder E (1954). 'Illness in general practice', *Practitioner*, **173**, 177.

Logan W P D and Cushion A A (1958). Morbidity Statistics from General Practice Vol. 1, Studies on Medical and Population Subjects No. 14, HMSO, London.

Stocks P (1949). Sickness in the Population of England and Wales in 1944–47, HMSO, London.

Wadsworth M E J, Butterfield W J H and Blaney R (1971). 'Health Sickness: The Choice of Treatment', Tavistock Publications, London.

Department of Health and Social Security and Office of Population Censuses and Surveys (1973). Report on Hospital In-Patient Enquiry for the year 1972. HMSO, London.

Progress and problems in mental health

Professor Michael Shepherd

Perhaps I should begin by trying to clarify what is covered by the rather ambiguous title of my contribution to this symposium. In his letter of invitation Mr Teeling-Smith asked for 'a broad overview of the changes in psychiatric practice over the past 20 years and against this background to balance the benefits and the disadvantages of what has been achieved'. This is, I think you will agree, rather a lot to compress into twenty-five minutes, especially as some sort of historical perspective is needed if justice is to be done to so complex a topic. My initial reaction was therefore decidedly negative. On reflection, however, I came to realise that I was being asked to do little more than to up-date and bring together views which I have already recorded at various times over two decades. They represent, of course, no more than the opinions of one participant-observer whose judgement may be questioned but who has attempted to take stock of a changing situation on more than one occasion in the past and so can at least avoid the charge of retrospective falsification.

It is, I think, generally accepted that the most obvious single change in the treatment of mental disorders in the post-war period has been the widespread use of psychotropic medication. Any attempt at evaluation, however, must take account of several related factors. In the first place, treatment in psychiatry is traditionally a triadic procedure which includes psychological measures and social or environmental manipulation as well as physical agents. The lineage of the psychological approach can be traced to the 'moral' forms of treatment in the 19th century and to Pinel's emphasis on the significance of 'consolatory language, kind treatment and the revival of extinguished hopes'. The social aspects of treatment are omnipresent since they not only determine the structure of psychiatric services, but also provide close links with the matrix of public and professional opinion on which all forms of intervention depend. Psychotropic drugs, of course, fall into the category of physical agents but it is important to recall that their arrival radically altered the concept of this dimension of treatment. If, for example, one looks at the first edition of so influential a book as Sargant and Slater's *Physical Methods of Treatment in Psychiatry*, originally published in the 1940s,[1] there are full chapters on 'The Insulin Treatment of Schizophrenia', 'Modified Insulin Therapy', 'Convulsion Therapy', 'Continuous Sleep Treatment', 'Diet, Vitamins and Endocrines', 'Prefrontal Leucotomy', and 'The Malarial Treatment of General Paralysis'. By contrast, apart from some discussion of the special uses of intravenous barbiturates and the available anti-convulsants, reference to drugs

is compressed into a single chapter devoted to 'Chemical Sedation and Stimulation', in which the substances considered are bromides, paraldehyde, barbiturates, amphetamine sulphate and thyroid preparations.

Against this background the course of events following the arrival of the first wave of psychotropic drugs in the early 1950s can be divided broadly into three phases. There was, of course, some overlapping in time and substance but for the purposes of convenience the first phase can be regarded as having extended through the 1950s, the second phase to have lasted until the late 1960s and the third up to the present time. I would entitle them the phases of initial impact, evaluation and consolidation respectively and should like to consider each in turn.

Phase 1: (the phase of initial impact)

The phenothiazines, reserpine, the butyrophenones, the monoamine oxidase inhibitors, the tricyclic compounds, the propanediols and the thioxanthenes all became available within a short span of time. The most obvious consequence of their introduction into clinical practice was the speed and completeness with which they were adopted. Within a few years the staple treatment of the functional psychoses had been transformed: insulin units had closed down in most hospitals and there was a sharp decline in the frequency of the other crude forms of physical treatment, including electro-convulsive therapy. In extra-mural practice, too, the newer drugs rapidly superseded their predecessors.

The spirit of acceptance was not, of course, universal and several studies showed that the expressed attitudes of psychiatrists to the three broad modalities of treatment influenced their opinions of pharmacotherapy.[2] Some of the opposition was voiced by proponents of psychological treatment on the grounds that an impersonal prescription was no substitute for the doctor-patient relationship. The viewpoint of the committed psychotherapist has, in fact, remained consistent to the present time. It was recently stated clearly by a prominent American psychoanalyst contributing to the current debate on the declining prestige of psychoanalysis in the United States. Asked her opinion of drug therapy she said:

'I think that drug therapy is like a crutch. It can help to tune down panic states and severe anxiety states for the moment, but I don't think that it has any lasting effects. Psychoanalysis really tries to treat the motives and causes of these anxieties. The patient needs some meditative process: "What is it all about?" he must ask, and "How am I my own worst enemy?" Drugs cannot eliminate alienation, mistrust, and fear.'[3]

The initial reaction of several advocates of social psychiatry to chemotherapy was also guarded, especially on the controversial issue of the resident-populations of mental hospitals which began to decline in the mid 1950s after having risen steadily for many years. The role played by

drugs in this trend was contested in this country by Sir Aubrey Lewis who put the issue bluntly when he wrote that '. . . if we had to choose between abandoning the use of all the new psychotropic drugs and abandoning the Industrial Resettlement Units and other social facilities available to us, there would be no hesitation about the choice: the drugs would go'.[4] On the same lines Ødegaard in Norway pointed to the variation between statistics from different institutions and concluded that paradoxically '. . . in hospitals with a favourable therapeutic situation the psychotropic drugs brought little or no improvement in the rate of discharges. In hospitals with a low pre-drug discharge rate on the other hand, the improvement was considerable'.[5]

Despite these factional disagreements, however, the vast majority of psychiatrists welcomed and adopted the new range of psychotropic drugs in their clinical practice. And, further, the scientific significance of the drugs was acknowledged by the need to resurrect an old term, psychopharmacology, to cover a new scientific discipline. It must be emphasised, however, that the psychopharmacologists did not provide a more rational understanding of the basis of their treatment. Most of the drugs were introduced and used empirically and neither their site nor their mode of action was clearly understood. Reviewing the accumulated experimental work of the period I was forced to conclude that 'While a great deal of knowledge has accrued about the hungry pigeon, the thirsty rat and the frightened monkey, relatively few attempts have been made to determine whether the information can be applied to human responses.'[6]

More surprising, perhaps, was the relative lack of clinical research designed to evaluate the efficacy of pharmacological treatment during this phase. Most of the extravagant claims made on behalf of individual drugs were unrelated to controlled experimentation. In consequence, the verdict I felt compelled to express on the status of psychopharmacology in 1960 was understandably cautious:

'In the light of current knowledge', I wrote, 'it would be difficult . . . to base the reputation of psychopharmacology on a large body of established knowledge about either the therapeutic value or the pharmacodynamic action of the psychotropic drugs. To what then can the high status of the subject be attributed? Though it may not be possible yet to provide a comprehensive answer to this question it is apparent that a full explanation does not fall within the framework of the physical or clinical sciences. Status, we may recall, is a sociologic concept closely related to economic class, and the evidence supports Professor Toman's view that it has been the socio-economic impact of new drugs in psychiatry which has inspired the "veritable explosion of research on the action of drugs". For 150 years the history of the therapeutics of mental disorder has demonstrated the importance of social and professional attitudes as the pendulum has

oscillated between the "moral" and the so-called physical methods of treatment. In retrospect it is clear that the newer pharmacologic compounds were introduced to psychiatry at a time which favoured their adoption: on the one hand, a growing disillusion with psychological treatment had become increasingly evident even where these methods had been taken up with most enthusiasm; on the other, the seams of the older physical methods of treatment had been exhausted and even their most ardent advocates were dissatisfied with the crudity of the empirical tools at their disposal. The great majority of eclectic psychiatrists had long recognised the limitations of available methods of treatment and they have welcomed the clinical possibilities of the new drugs, finding great advantages in the relative flexibility of pharmacotherapy and, less obviously, in the employment of measures which are more in keeping with the traditional forms of medical care. Their eagerness to employ pharmacologic methods of treatment stimulated by a vigorous campaign on the part of the pharmaceutical industry, has played an important role in the widespread adoption of drug therapy in psychiatric institutions. The still more extensive use of drugs in the extramural practice of psychiatrists and general practitioners appears to reflect not only the attitudes and habits of physicians but also the expectation of their patients as representatives of a public alive to the importance of mental distress and strongly influenced by the cult of tranquillity. . . .

'Nonetheless, while the rise of psychopharmacology carries lessons for the medical sociologist, an interdisciplinary scientific programme of great potential value has been evolved. Whatever the practical outcome of the effort which is being expended on the pharmacotherapy of neuropsychiatric disorders, it is certain that the interest of distinguished workers in many fields has been aroused and encouraged by the preliminary findings. Their work signifies aspiration rather than achievement at the present time, but the assurance of their prospective collaboration justifies a sober optimism for the future.'[6]

Phase 2: (the phase of evaluation)

Several productive developments can be recorded of this phase. With the significant exception of the treatment of anxiety by β-adrenergic blockers and the benzodiazepines, few radically new compounds were introduced but numerous modifications of established drugs made their appearance. Some of the potential hazards as well as the advantages of psychotropic medication became more apparent in the form of a host of recorded adverse reactions.[7] (I shall make no reference to the use of psychotropic drugs for the purpose of suicide, an issue which Mr Teeling-Smith is to raise in his contribution.) It was, indeed, one such phenomenon, the hypertensive crises associated with the interaction of monoamine oxidase

inhibitors with various foodstuffs which furnished a particularly elegant demonstration of how parallel animal and human studies could be applied productively to a problem of clinical psychopharmacology,[8] and the implications of psychotropic drug action as a research-tool for the study of the biological mechanisms of mental illness were underlined in the report of a World Health Organisation Scientific Group which was published in 1967.[9] Significantly, the first textbook of psychopharmacology, which appeared at about the same time, was co-authored by a psychiatrist, a clinical pharmacologist and a biochemist.[10]

With further clinical experience the more extreme biases for and against pharmacotherapy were tempered by a growing appreciation of its value and its limitations. If it became apparent that the control of symptoms was a more realistic objective than the cure of disease, it was also clear that such an achievement had in itself facilitated the changing climate of opinion towards mental disorder which in this country was embodied in the Mental Health Act of 1959. The result was singled out for comment by Sir George Godber in his annual report of the Department of Health and Social Security last year, 'More active psychiatric treatment made more effective by the development of new drugs and greater understanding of the social problems by the general public as well as by those professionally concerned, has radically altered the position of the mentally ill.'[11] Inasmuch as this view is based on the increasing number of patients discharged from mental hospitals it implies, of course, extra-mural facilities which cannot always be taken for granted.

In many ways, however, the most far-reaching step at this time was the increasing recognition of the need for clinical evaluation of psychotropic medication and, in the process, to take account of the role played by the biologically 'non-specific', i.e. the psycho-social, aspects of the chemotherapy of most mental disorder.[12] It was soon demonstrated, for example, that the pharmacodynamic action of the drugs could not account for more than about one-third of the observed improvement in a psychiatric institution and that the 'non-specific' factors must claim attention in any attempt to evaluate the observed effects. These factors made it very difficult to interpret the results of many of the early hospital reports which were mostly conducted on a small scale, and the difficulties were increased in the treatment of extra-mural 'minor' emotional disorders which are influenced still more profoundly by psychological and social factors.

Probably the most impressive demonstration of this issue was provided by the large scale multi-centred clinical trial of the treatments of depressive illness conducted under the aegis of the Medical Research Council which in 1959 set up a sub-committee concerned with clinical trials in the field of mental disorder.[14] The need for such an investigation was pressing, as there were already several conflicting reports about the value of anti-

depressant drugs at the time.[15] The objective of the study was to compare the efficacy of ECT, a tricyclic compound, a monoamine oxidase inhibitor and a placebo in the treatment of in-patients suffering from depressive disorders. The tablets were administered by the 'double-blind' method and progress was assessed by a standardised procedure. Uniform criteria were established for admission to and exclusion from the study so as to ensure as much homogeneity as possible. Fifty-five physicians working in some 30 hospitals provided more than 250 patients who were all followed up for six months from the date of entry to the trial, receiving their treatment for the first month in hospital and, on their discharge, visiting the out-patient department at specified intervals.

Two of the various conclusions drawn from this investigation may be emphasised here. First, its successful prosecution proved that a complex multi-centred trial along the lines which the MRC had pioneered in other branches of medicine could be successfully applied to psychiatry. Secondly, the results showed that while about one-third of the patients responded satisfactorily to placebo, there proved to be no way of distinguishing between those patients who did or did not respond to either drug or placebo. Therefore, although the drugs were being misused, in the sense of being used unnecessarily by a substantial section of the trial-population, the information was of only limited value to the clinician charged with the care of the individual patient.

Phase 3: (the phase of consolidation)

The developments of the past few years may be briefly categorised as scientific, clinical and social.

On the scientific front technical advances have stimulated an interest in psychotropic drugs among clinical pharmacologists and there has been a welcome and productive increase in the number and quality of collaborative studies between laboratory and clinical workers. It is now evident that the current intensive study of the role of the biogenic amines in neurotransmission was greatly stimulated by the biological action of psychotropic compounds. Whereas such work has led to no therapeutic advance in the field of mental disorders comparable to the use of L-dopa in Parkinsonism it has proved possible to derive a number of sophisticated biological hypotheses from animal studies which are testable in man. It has been suggested, for example, that the phenothiazines and the butyrophenones act by increasing catecholamine turnover by a feed-back mechanism consequent on their blocking action on postsynaptic catecholamine receptors. On this assumption a potentiation of the drug action was postulated after tyrosine hydroxylase inhibition by α-methyltyrosine. Carlsson and his colleagues have shown this to be true not only of food-

reinforced operant behaviour in rats but also for schizophrenic symptomatology in man.[16]

In the clinical field there have arrived a new crop of 'me-too' compounds along with a tendency to explore combinations of drugs and to employ them in conjunction with other forms of treatment. More importantly, the concept of evaluation has been extended to tackle not only the question 'Is the drug effective?', but also the questions 'For whom is it effective?', and, if so, 'For how long should it be prescribed?'. The first of these questions, involving as it does the attempts to identify drug-responders, has received an impetus from the methods which have been developed to estimate plasma-levels of several psychotropic compounds,[17] though so far the results have been equivocal in respect of both therapeutic response and adverse effects. The second question entails a more complex view of evaluation which is directly relevant to the two major chemotherapeutic innovations in the management of psychotic illness which have been registered during the period. In the continued absence of superior new compounds these must be accounted the controversial use of lithium carbonate as a 'prophylactic' agent in the treatment of recurrent affective illness[18] and the use of long-acting phenothiazines for schizophrenia.[19] The so-called 'maintenance therapy' which has been advocated as an essential feature of both these régimes calls for a clinical assessment which takes into account the time-scale on which they are administered, and several studies have been designed with this objective.[20,21]

The most striking recent social trend in psychopharmacology has been the remarkable increase in prescription-figures of the benzodiazepines. While Parish has documented the phenomenon in this country Blackwell has recently pointed to a parallel situation in the United States, especially concerning diazepam.[22] As he goes on to show, only about 30 per cent of the use of diazepam was for mental illness: 17 per cent was for musculoskeletal, 16 per cent for circulatory, 8 per cent geriatric, 6 per cent for neurological, 6 per cent for gastro-entestinal, 3 per cent for genito-urinary illnesses, and 7 per cent for a miscellany of other conditions.* Further, in nearly two-thirds of cases the drug was prescribed in combination with other substances. Clearly, therefore, the so-called 'anxiolytic' drugs are being widely used in medicine by a variety of specialists for a variety of conditions.

What is the explanation for this remarkable phenomenon? Parish himself has stressed the role of the pharmaceutical industry. Mr Teeling-Smith is on record as having stated that, 'we must view the present volume of use of psychotropic medicines in much the same light as we should view the amount of claret and port consumed by the Victorian middle-classes',[23]

*These figures, derived from American market research data, do not necessarily represent UK usage – Editor.

arguing that the lowering of class-barriers has democratised the form if not the content of drug-taking behaviour. Others accuse the medical profession of over-prescription or invoke the vagaries of fashion. To add to the miscellany I would recall John Ryle's comment on the treatment of minor emotional disorders, written nearly 30 years ago: 'Faults of upbringing, domestic stress, industrial fatigue, inadequate sleep and holidays, economic anxieties – factors eventually alterable by improved education, more ample accommodation for families, factory welfare and social insurance – have also played their significant part. In the meantime we try to cope with their consequences with bottles of medicine and certificates and a multiplication of psychiatric clinics at an ever-increasing cost to the community.'

Since opinions far outnumber facts in so nebulous an area, so we should be grateful to the state of South Carolina which recently banned benzodiazepines from its medicaid programme on the grounds of expense.[24] A comparison of prescription-writing six months before and after the ban showed that 35 per cent of the prescriptions were made up by phenothiazines, anti-depressants and barbiturates, but that 65 per cent of the drugs were not replaced. There are, of course, several possible explanations of this discrepancy: for example, the drugs may have been obtained privately or self-medication may have increased. Certainly what figures we have are large enough to direct attention to the abuse-potential of many psychotropic drugs. Here it is relevant to recall that the 1971 Vienna Convention on Psychotropic Drugs has required the World Health Organisation to supply an assessment of these substances and that there is an increasing shift of emphasis from physical to what is now called psychic dependence, which has been described as 'characterised by mainly psychic or mental phenomena on prolonged intake, such as drug-seeking behaviour, an intensive "liking" for the drug and an overpowering compulsion or drive to continue to take the drug to achieve a different state of mind, with less obvious symptoms on withdrawal, the prolonged use in a number of cases leading to unsocial behaviour and to psychic or psychotic manifestations'.[25] This problem is, of course, now a matter of international concern and is acknowledged to be part of what has been called the 'risk profile' of any psychotropic drug, which incorporates potential risks to the public health, to public safety and to the well-being of the dominant social order.

In sum, then, I hope that I have been able to show that whereas psychotropic drugs are now, after 20 years, firmly established in our therapeutic armamentarium, and have been instrumental in strengthening an important biological link between psychiatry and medicine, to the benefit of both. It is clear that a more rational basis for their use in clinical practice will have to antedate the various misuses which inevitably attend all empirical

remedies. There are reasonable grounds for anticipating the acquisition of such knowledge in the next 20 years.

Discussion

In the debate arising from the paper it was argued that the prescribing of many psychotropic drugs was largely a matter of fashion, particularly with regard to questions such as which benzodiazapines are currently most favoured in certain countries. Dr Crombie expressed some surprise that in view of the large increases in reported psychiatric morbidity that anti-depressants were not more widely used and it was suggested by Professor Elmes that a 'take off' in their use could be expected.

References

1. Sargant W and Slater E T O (1944): 'An Introduction to physical methods of treatment in psychiatry', Edinburgh, Livingstone.
2. Shepherd M (1964): 'The effectiveness of drugs in relationship to psychological and social forms of treatment'. *Neuropsychopharmacology*, vol. 3, Eds Bradley P B, Flugel F and Hoch P, Elsevier, 139.
3. Weigert E (1973): 'The future of analysis', *Psychiatric News*, VIII, **22**, 11.
4. Lewis A (1959): 'The impact of psychotropic drugs on the structure, function and future of psychiatric services (a) In the hospitals', *Neuropsychopharmacology*, vol. 1, Elsevier, 207.
5. Ødegaard Ø (1964): 'Pattern of Discharge from Norwegian psychiatric hospitals before and after the introduction of the psychotropic drugs', *Amer. J. Psychiat.*, **12**, 772.
6. Shepherd M (1961): 'The present status of psychopharmacology', *J. Chron. Dis.*, **13**, 289.
7. Shepherd M, Lader M and Lader S (1968): 'Central Nervous System Depressant Drugs', *Side Effects of Drugs*, vol. VI, edited by Meyler L and Herxheimer A, Excerpta Medica Foundation, Amsterdam, 51.
8. Blackwell B and Marley E (1966): 'Interactions of cheese and its constituents with monoamine oxidase inhibitors', *Brit. J. Pharmacol*, **26**, 120.
9. World Health Organisation Technical Report Series No. 371 (1967): 'Research in psychopharmacology', Geneva, WHO.
10. Shepherd M, Lader M and Rodnight R (1968): 'Clinical Psychopharmacology', London, English Universities Press.
11. Godber G (1973): 'On the state of the public health (1972)', *Health Trends*, **5**, 65.
12. Shepherd M (1961): 'The influence of specific and non-specific factors on the clinical effects of psychotropic drugs', *Neuropsychopharmacology*, Ed. Rothlin E, Elsevier, 183.
13. Rashkis H A and Smarr E R (1958): 'A method for the control and evaluation of socio-psychological factors in pharmacological research', *Psychiat. Res. Rep.*, American Psychiatric Association, **9**, 21.
14. Medical Research Council, Report by its Clinical Committee (1965): 'Clinical trial of the treatment of depressive illness', *Brit. Med. J.*, **1**, 881.
15. Kimbell L, Overall J E and Hollister L E (1965): 'Antidepressant drugs: myth or reality?' *J. New Drugs*, **5**, 9.
16. Carlsson A, Persson T, Roos B-E and Walinder J (1972): 'Potentiation of phenothiazines by α-methyltyrosine in treatment of chronic schizophrenia', *J. of Neurol. Transmission*, **33**, 83.
17. 'Monitoring plasma concentrations of psychotropic drugs' (1974): Drug and Therapeutics Bulletin, 12, **2**, 6.

18. Blackwell B and Shepherd M (1968): 'Prophylactic Lithium: another therapeutic myth?', *Lancet*, **i**, 968.
19. Watt D C (in press): 'The outpatient treatment of schizophrenia with long-acting neuroleptics'.
20. Hirsch S, Gaind R, Rohde P, Stevens B and Wing J K (1973): 'Outpatient maintenance treatment of chronic schizophrenics with fluphenazine decanoate injections: a double blind placebo trial', *Brit. Med. J.*, **1**, 633.
21. Mindham R H S, Howland C and Shepherd M (1973): 'An evaluation of continuation therapy with tricyclic antidepressants in depressive illness' *Psychol. Med.*, **3**, 5.
22. Blackwell B (1973): 'Psychotropic drugs in use today: the role of diazepam in medical practice', *J.A.M.A.*, 225, **13**, 1637.
23. Teeling-Smith, G (1973): 'Psychotropic drugs and society', in 'The medical use of psychotropic drugs', *J. Royal. Coll. Gen. Pract.*, Suppl. No. 2, **23**, 58.
24. Keller M H, McCurdy R L (unpublished): 'Medical practice without anti-axiety drugs'.
25. Goldberg L (1973): 'Summary' in 'Psychic Dependence', Eds Goldberg L and Hoffmeister F. Bayer-Symposium IV, Springer-Verlag, 224.

The benefits and risks for children: An account of the reduction in mortality and morbidity due to pharmacological progress and a discussion of the extent of accidental poisoning from its products

William Laing

I first of all want to illustrate quickly with available statistics the very considerable benefits that the last 30–40 years have brought to the health of children. Some of these benefits, though we cannot be certain how much, can be directly attributed to developments in medical care.

I then intend to mention some of the disadvantages and risks to the health of children that have inevitably accompanied the provision on a massive scale, of new types of preventive and curative medical care.

I do not wish to go on to draw up a balance sheet, even if one could when so many complex causes and effects are inextricably mixed in the historical data that is available. Instead, I simply want to make the point that in the 1970s, now that the overwhelming benefits from the eradication of many infectious diseases have been realised, we must look very much more carefully at the balance sheet at the present point of time, perhaps using more sparingly and only in a limited range of circumstances, those forms of medical care which were originally responsible for the vast improvement that has taken place in the health of children as well as other sections of the population.

I then want to illustrate how, in the absence of any further major breakthroughs, for instance in the treatment of cancer among children, the issues of risks and benefits from medical care are likely to resolve themselves into more and more finely balanced arguments. As an example, I will look at the issues of the risk of accidental poisoning among young children which accompanies the wide availability of potent drugs in many households.

Benefits

The figures that I would like to use in order to demonstrate improvements in the health of children are all mortality statistics. This is because death is clear cut and unambiguous and if one attempts to present consistent series on morbidity the attempt will nearly always be confounded by

changes in definition and uncertainties over levels of reporting in the community as a whole. Good and comprehensive retrospective morbidity rates simply do not exist for children or for any other age group.

If one looks at death rates among children aged 1–14 from the time that statistics first became available in the 19th century to the present day one can see a steady decline throughout the early part of the 20th century to about the late 1930s. The rate of decline then accelerated, after a hiccup in the early war years, until the early and mid 1950s when it started levelling off again. It is among young children, out of all age groups, that the fall in deaths has been the biggest.

What factors were responsible for the changes in mortality? Any answer must contain a large element of guesswork. Before the 1920s or 1930s, however, it is unlikely that the totality of medical care had any significant effect. The decline in mortality must, therefore, be explained by the environmental and social changes that were taking place in the late 19th and early 20th centuries. Better sanitation, better nutrition, less overcrowded housing through smaller families, improved basic education and better standards of living generally are all aspects of the broad pattern of social and economic development taking place during that time but it is impossible to arrange the factors in order of importance. It is from the 1930s that the statistical trends suggest that improved medical care began to have a significant effect on mortality.

Again, it is not possible to isolate the effect of a single variable using historical data, when other variables remain uncontrolled, but there seems little doubt that it was the control of infections through prevention and treatment that was largely responsible for the acceleration of the decline in mortality.

Over the period 1931–35 to 1970, over 80 per cent of the drop in death rates relate to the causes set out in Table 1. What has happened is that the dramatic decline in childhood diseases has radically altered the pattern of childhood mortality. It is almost wholly the control of infections that has cut the death rate per million children from over 3,000 in 1931–35 to 437 in 1970. Accidents and cancer have been left as the major causes of childhood deaths.

Diphtheria and tuberculosis* are the two conditions where the most dramatic cuts in death rates were brought about by developments in preventive and curative medical care.

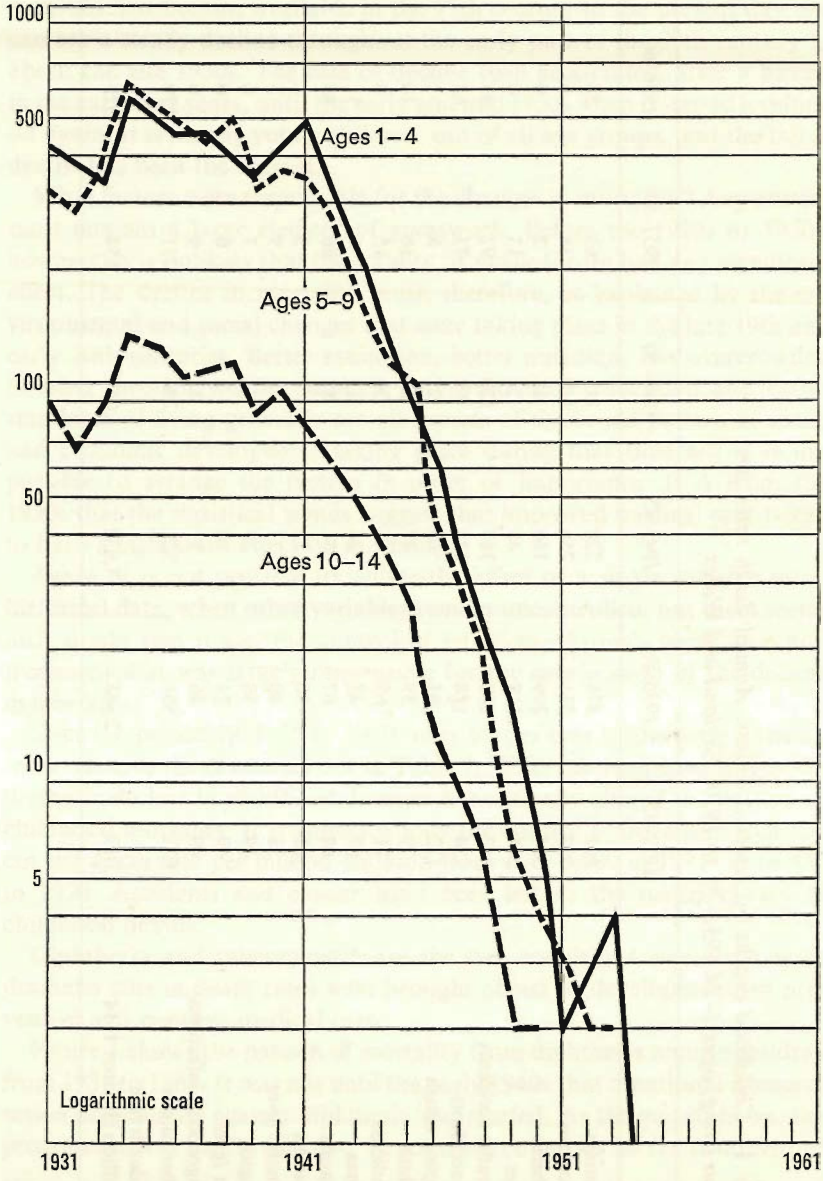
Figure 1 shows the pattern of mortality from diphtheria among children from 1931 to 1961. It was not until the early 1940s that a national immunisation programme against diphtheria was started. As the graph shows, the programme was highly effective. In contrast, countries on the continent of

*Environmental improvements such as the increased provision of new housing after the war were also of considerable significance here.

Table 1 *Childhood deaths by selected causes. Annual death rates per million living, ages 1–14 1931–35 to 1970, England and Wales*

	1931–35	*1936–40*	*1941–45*	*1946–50*	*1951–55*	*1956–60*	*1970*
Pneumonia	561	376	220	111	63	53	36
Tuberculosis	332	231	256	149	38	6	2
Diphtheria	304	299	160	18	2	0	0
Measles	241	118	48	24	13	4	3
Non-traffic accidents	142	168	187	120	92	83	73
Road accidents	134	118	145	99	73	62	68
Whooping cough	132	81	65	27	8	1	0
Bronchitis	79	58	47	23	16	14	4
Appendicitis	71	65	48	30	15	8	3
Influenza	67	42	24	11	6	11	3
Neoplasms	64	67	74	82	86	85	71
Mastoiditis	61	36	22	9	3	2	1
Rheumatic fever	51	40	27	18	9	3	0
Meningitis	49	38	28	13	7	6	7
Scarlet fever	49	24	10	2	0	0	0
Meningococcal infections	49	46	17	12	6	6	6
All other causes	631	561	522	294	211	179	160
Total death rate Per million children 1–14	3,017	2,368	1,932	1,047	654	523	437

Figure 1 *Diphtheria: child death rates per million. England and Wales 1931–60*



Source Registrar-General's Statistical Review, Pt. 1

Europe did not have effective universal immunisation against diphtheria until the late 1940s and between 1943 and 1946 the disease reached epidemic proportions in Europe while at the same time it had been cut short in Britain.

Figure 2 shows the pattern of mortality from tuberculosis. Mortality had been declining since the 19th century but there was an accelerated decline from the mid 1940s. In this case, immunisation (through BCG) was not the primary cause of the decline. The availability for the first time of effective means of both recognising and treating the disease was of greater significance. Streptomycin was introduced in 1946. Together with PAS and INH the treatment of TB was revolutionised. Effective recognition and treatment in this case proved to be an efficient means of prevention as well by eradicating many of the sources of new infections.

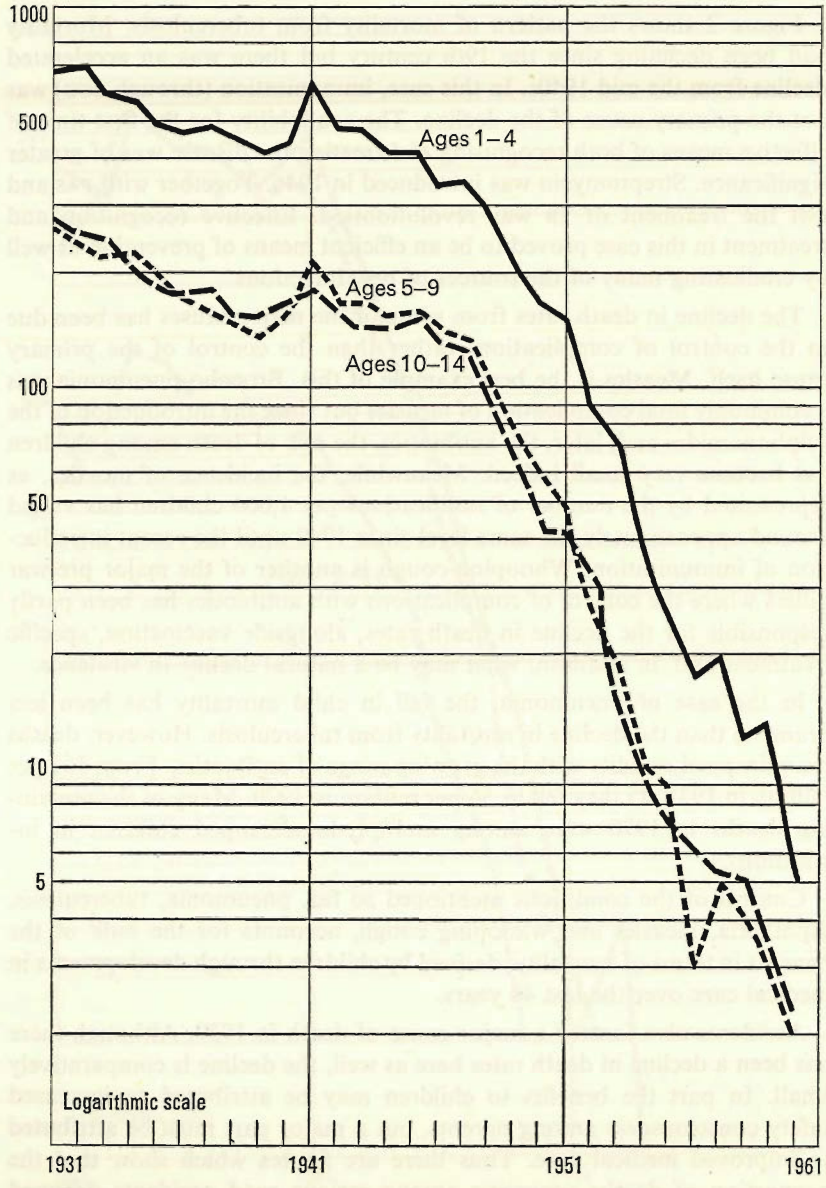
The decline in death rates from some of the major causes has been due to the control of complications rather than the control of the primary cause itself. Measles is the best example of this. Broncho-pneumonia was a commonly fatal complication of measles but since the introduction of the sulphonamides and, later, the antibiotics, the risk of death among children has become very small indeed. Meanwhile, the incidence of measles, as represented by the number of notifications per 1,000 children has varied around approximately the same level since 1940 until the recent introduction of immunisation. Whooping cough is another of the major pre-war killers where the control of complications with antibiotics has been partly responsible for the decline in death rates, alongside vaccination, specific treatment and, in addition, what may be a natural decline in virulence.

In the case of pneumonia, the fall in child mortality has been less dramatic than the decline in mortality from tuberculosis. However, deaths have dropped steadily with the growing range of antibiotics. From 561 per million in 1931–35 they fell to 36 per million in 1970. Many of the remaining deaths in 1970 were among multiply-handicapped children in institutions.

Control of the conditions mentioned so far, pneumonia, tuberculosis, diphtheria, measles and whooping cough, accounts for the bulk of the benefits in terms of mortality, derived by children through developments in medical care over the last 40 years.

Accidents also formed a major cause of death in 1930. Although there has been a decline in death rates here as well, the decline is comparatively small. In part the benefits to children may be attributed to increased safety consciousness among parents, but a major part must be attributed to improved medical care. Thus there are figures which show that the proportion of deaths occurring among serious road accidents dropped significantly during the post-war years, presumably due to more efficient

Figure 2 *Tuberculosis; child death rates per million. England and Wales 1931–60*



Source Registrar-General's Statistical Review, Pt. 1

ambulance services, the availability of blood transfusions, improved surgical techniques, antibiotics to control infections and so on.

The benefits to children's health from improved medical care, therefore, have been huge. Just to give an idea of the order of magnitude of the improvement, the bulk of which can be attributed to the control of infections, one can compare the level of mortality among children now with the level which would have obtained if there had been no accelerated decline in mortality rates from the late 1930s to the mid 1950s.

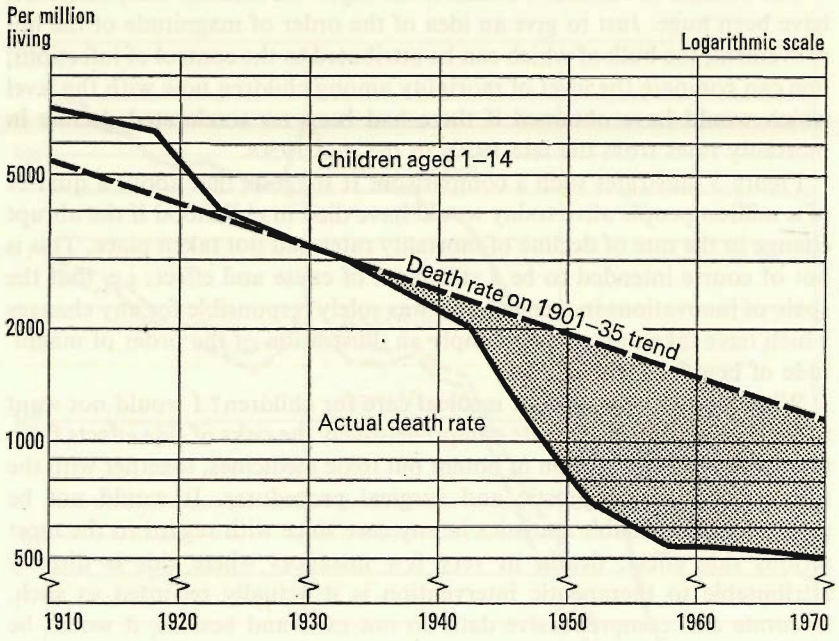
Figure 3 illustrates such a comparison. It suggests that about a quarter of a million people alive today would have died in childhood if the abrupt change in the rate of decline of mortality rates had not taken place. This is not of course intended to be a statement of cause and effect; i.e. that the spate of innovations in medical care was solely responsible for any changes which have taken place. It is simply an illustration of the order of magnitude of benefits involved.

What then are the risks of medical care for children? I would not want to even attempt to enumerate comprehensively the risks of side effects from therapeutic administration of potent but toxic medicines, together with the risks implicit in diagnostic and surgical procedures. It would not be possible with available statistics in any case since with regard to the most serious side effect, death, in very few instances where this is directly attributable to therapeutic intervention is it actually recorded as such. Accurate and comprehensive data do not exist and besides, it would be fruitless to attempt to draw up a balance sheet of past benefits and past damage. I think there would be little argument if one were to say that benefits in total have far exceeded the disadvantages of medical care, but there is little point in posing a question in such general terms. It is much more relevant to health service policy to pick out specific live issues where the risks and benefits appear on the face of it to be quite evenly balanced.

One could look here at the benefits from prescribing useful medicines to pregnant women against the possible risk of teratogenic side effects. Or one could look at the benefits from immunisation against whooping cough in comparison with the risks of brain damage among a small proportion of immunised children.

Where risks and benefits appear finely balanced, it is likely that one of two things have happened. On the one hand, we may be faced with a situation of diminishing returns from effective medical intervention, where the risks have 'caught up' with the benefits. Such seems to be the case with smallpox vaccination in developed countries. The chances of an infection occurring are now so low that neither the possibility of infection spreading, nor the disruption of any measures necessary to contain infection, seem to make worthwhile the risks of deaths and other side effects stemming from vaccination. The same could be said about the detection of tuberculosis

Figure 3 *Death rate per million living. England and Wales 1911/15–1968. Five yearly averages 1911/15–1961/65. Annual rates 1966–68*



Source Registrar-General

through mass miniature radiography. Diminishing returns in a country where tuberculosis is now relatively rare make it simply not worthwhile, though in this case it is the expense of the programme rather than the risk to health that is the critical factor.

On the other hand, situations of finely balanced risk and benefit may arise as experience and knowledge of a particular form of medical intervention develops. It may then become possible to define high risk groups in the population. As it becomes practical health policy to separate off high risk groups from the mass of the population to whom risk may be minimal, one gets a situation analogous to that of diminishing returns, except that the diminishing benefits (in relation to risks) are associated with just a part of the population rather than the population as a whole.

The very general point I am trying to make here is that where there have been massive breakthroughs in medical care, it has often been self evident that their benefits are far greater than the risks for the population as a whole. But if diminishing returns set in, or if it becomes possible to separate out high risk groups, then decisions are likely to become more

challenging, requiring more and better information and more expert and sophisticated evaluation techniques. Thus, the more successful medical care becomes, and the wider and more comprehensive our knowledge of risks and benefits, the greater should be the tendency for policy making efforts to concentrate themselves on precisely measured situations in areas where the issues of risks and benefits are finely balanced. Furthermore, given that health service resources are limited, the expense of the various alternative solutions must always be a factor in the weighing of risks and benefits.

As the second part of this paper, to illustrate this general point about health service policy making, I want to look in detail at an issue which is quite live at the moment, that of accidental poisoning among young children.* I want to show how argument on risks and benefits can be finely balanced here and how important it is, therefore, to have very precise information about the situation one is trying to alter and equally, how important it is to replace nebulous ideas about the epidemiology of the situation with results from rigorous scientific enquiry.

Table 2 shows the number of deaths in England and Wales among the 0–4 age group, certified as due to accidental poisoning. Most of the deaths are due to medicines, 17 out of the 21 in 1970. The remainder are certified as due to 'other solid and liquid substances'.

Among children the incidence of death from accidental poisoning is significant only in the 1–4 age bracket. It reaches a peak in the second year of life. In the remaining years of childhood, between the ages of 5 and 14, deaths from accidental poisoning become very rare. During adult life,

Table 2 *Deaths certified as accidental poisoning due to drugs and medicines and other solid and liquid substances, 0–4 age group. England and Wales 1963–71*

	0–4	*1 year*
1963	29	1
1964	40	5
1965	31	1
1966	29	4
1967	24	6
1968	23	1
1969	23	4
1970	21	0
1971	23	2

Source Registrar-General, various years

*Mr Laing was talking shortly before the publication of the Medicines Commission (Working Group) report on this topic. *Editor.*

deaths certified as due to accidental poisoning become more common, but they are of an entirely different nature, often representing compassionate accident verdicts to give the benefit of the doubt to probable suicides.

To place accidental poisoning among the 1–4 age group in perspective, the 21 deaths in 1970 accounted for 3·3 per cent of the total of 635 accidental deaths and 0·9 per cent of the 2,326 deaths overall. Traffic accidents, by comparison were recorded as causing 214 deaths and drowning as causing 84 deaths.

Deaths, however, only account for a very small proportion of the number of incidents of poisoning among young children, both those which enter the formal structure of medical care and those which do not.

At one extreme it has been suggested (Locket 1973) that there may be as many as half a million poisoning episodes among children in Britain each year. However, there is little substantive evidence to support this.

The only reasonably hard data on the incidence of non-fatal childhood poisoning come from the analysis of admissions to NHS hospitals in the Hospital In-patients Enquiry. However, there may be considerable doubt, even here, as to whether the number of admissions to hospital really represents the number of poisoning episodes for which hospital treatment would be of benefit. Apart from the hypothetical 'iceberg' of untreated poisonings, there is the converse possibility that many admissions to hospital take place when the suspected poisoning has not in reality taken place.

Table 3 shows the number of admissions to hospitals in England and Wales attributed to poisoning among children under five years of age.

Up to the year 1969 there was a steady increase in childhood poisoning

Table 3 *Admissions to hospital attributed to accidental poisonings due to medicaments and other solid and liquid poisonous substances, 0–4 age group. England and Wales 1963–70*

	Admissions	*% of all poisonings all age groups*	*% of all 0–4 admissions*
1963	9,530	23	3·3
1964	11,780	23	
1965	13,600	25	
1966	15,000	25	
1967	17,990	26	4·7
1968	20,280	27	5·2
1969	24,820	27	
1970	23,570	25	

Source Hospital In-patient Enquiry

admissions. In 1970 there was a downturn but the 23,570 admissions still representing a 150 per cent increase over 1963.

Table 4 shows the breakdown of hospital poisoning admissions by type of substance. Medicaments are recorded as being responsible for two-thirds of all 0–4 poisoning admissions. Poisoning attributed to other noxious substances such as petrol and corrosive accounted for the remaining third.

Table 4 *Poisoning admissions to hospital by type of substance, 0–4 age group. England and Wales 1970*

	Numbers	*Per cent*
Medicaments		
Anti-infectives	350	1·5
Hormones	250	1·1
Affecting blood constituents	750	3·2
Sedatives	830	3·5
Psychotropic	1,650	7·2
Unspecified	2,620	11·1
Analgesic	6,930	29·3
Miscellaneous	2,360	10·1
Sub total	15,790	67·0
Other poisonous substances		
Alcohol	300	1·2
Petroleum	1,200	5·0
Solvents	1,300	5·5
Corrosives	1,280	5.4
Metals	120	0·5
Gas	90	0·4
Noxious foodstuffs	1,430	6·0
Miscellaneous	2,070	8·9
Sub total	7,780	33·0
Grand total	23,570	100

Source Hospital In-patient Enquiry

By far the largest group of admissions is that attributed to analgesics, 29 per cent of the total in 1970, and the vast majority of these cases are recorded as involving aspirin. Table 5 shows trends in 'aspirin and other analgesic' admissions since 1958.

The cost of the 24,000 odd admissions in 1970, with an average stay in hospital of 1·5 days can be tentatively estimated at £350,000 in the year, assuming the daily cost for a poisoning case is equal to the average cost per in-patient per day (i.e. approximately £10 per day in 1970). If the intensity of care were such that the cost were doubled to £20 a day for childhood

Table 5 *Admissions to hospital attributed to aspirin and other analgesics. Also deaths certified as due to aspirin poisoning, 0–4 age group. England and Wales*

Year	*All analgesics*	*Aspirin (cat. 965.1)*	*Other analgesics*	*Aspirin deaths*
1951				8
1952				9
1953				4
1954				3
1955				4
1956				1
1957				6
1958		750*		8
1959		1,060*		6
1960		1,280*		12
1961		1,780*		8
1962		1,970*		8
1963		3,200*		6
1964		4,430*		13
1965		4,870*		8
1966		4,680*		2
1967	6160†	5,760*	400‡	9
1969	7455†	6,850*	605‡	4
1970	6927†			5
1971				7

*ICD: N 965.1–specific to aspirin
†ICD: N 965.0–N 965.9 – all analgesics
‡Difference between these two figures
Sources Hospital In-patient Enquiry, various years
Registrar-General's Statistical Review, various years

poisonings then the total cost would go up to £700,000 a year in 1970 terms. About two-thirds of this relates to poisoning by medicines, i.e. about £500,000.

In summary, accidental poisoning by medicines among young children is responsible for about 20 deaths a year. It was recorded as causing about 16,000 admissions to hospital in England and Wales in 1970 at a cost of about half a million pounds. In addition to this there is probably a very small amount of residual morbidity from poisoning (though this mainly occurs with poisoning with non-medicaments, like bleach). Finally, there is the unquantifiable sum of personal anxiety and concern among the parents of the children involved.

These figures, therefore, in so far as they reflect reality, make up a measure of one of the particular risks associated with the ready availability of certain medicines, both on and off prescription, among a large propor-

tion of households. In practice, it would be difficult to argue that the hazards involved justify severe limitation on the use of the medicines. However, it is worth asking if and how the risks can be minimised without depriving adults of valuable drugs. The two key questions are then a) which are the most effective means of preventing incidents of child poisoning and b) what are the costs of the alternative means?

At present there are three broad approaches to the problem. First of all, a decision may be taken to do nothing on the grounds that priority ought to go to other health problems. Second, straightforward health education could be directed to parents in an attempt to persuade them to make the home a less dangerous place, for example by observing simple rules of safety and keeping medicines out of reach of children. Third, an attempt may be made to intervene in the process of production and distribution in order to make it as physically difficult as possible for young children to gain access to them irrespective of the safety consciousness of parents. In particular, the use of child resistant containers has been advocated for all potentially dangerous medicines.

In the case of straightforward health education aimed at imbuing greater safety consciousness, there is very little firm ground on which to base estimates of either costs or effectiveness. In the case of child resistant containers on the other hand there is evidence from the USA and Canada that they can be effective in reducing recorded episodes of poisoning.

However, leaving cost-effectiveness considerations aside for the present, there are some far more fundamental points to be made about the way in which the issues have been stated. First, it may be that the available statistics do not give a reliable indication of the size of the problem. Second, the circumstances which lead to childhood poisoning may have been misunderstood and it is possible that common sense methods of prevention may, therefore, be misconceived.

There is growing circumstantial evidence that suggests the need for a very close look at basic assumptions. Recent work by the research division of the Health Education Council has, in fact, produced evidence which strongly suggests that a significant proportion of poisoning admissions do not involve an episode of poisoning at all. Looking at all cases of childhood poisoning in the Bristol area reported to the health services, they found that, among a large number of the 163 cases studied, the evidence of actual ingestion was dubious. In 67 of the cases the evidence of poisoning presented by the parents could only be described as 'deficiency of substance certain or uncertain'. In relatively few cases was there concrete evidence of ingestion.

In addition, no significant association could be found between the existence of signs and symptoms of poisoning in the child and admissions

to hospital, or even between the existence of signs and symptoms and treatment by stomach washout.

What this suggests is that little if any attempt is made to distinguish between suspected and actual poisoning and that the same sort of treatment is given by hospitals in both cases. This evidence is far from conclusive, but a simple study analysing the contents of stomach washouts could provide objective confirmation of any failure to distinguish between those who do and those who do not in reality require treatment for poisoning.

Of course, even if a very large proportion of admissions did prove to be, in the strictest sense, 'unnecessary' this would not necessarily mean that great efforts should be made to separate the 'false positives' from those who have in fact been poisoned. In the absence of a simple and highly sensitive and specific test for poisoning, the policy of random treatment may well be desirable for fear of otherwise increasing the number of 'false negatives', i.e. those who are deemed not to have been poisoned but might later prove to have been so. This in itself would be an interesting area for the study of the risks and benefits of medical care.

In addition the Health Education Council's data indicated that the (approximately) two-thirds of poisoning cases that involved drugs were split half and half between prescription medicines and household medicines bought over the counter. This may be expected in view of the fact that most aspirin is bought without prescription but it clearly has implications as to the relevance of child resistant containers for prescription medicines only. It was also found that the vast majority of accidents occurred when substances were in use within the last 24 hours. Thus the widely held view that medicine cabinets full of old and forgotten medicines are dangerous may not have a great deal of foundation. Furthermore, this finding suggests that any campaign to clear out medicine cabinets might even prove to be counter-productive if the medicines were gathered together for disposal but not effectively disposed of immediately.

It is only through well organised and well directed research that questions like these can be raised and answered and an accurate profile of the circumstances of childhood poisoning built up.

How effective, therefore, are prevention programmes likely to be on the basis of present evidence and what sort of new information is needed before a really objective assessment can be made, both of effectiveness and of value for money relative to other uses of health service resources?

The first broad approach to prevention is straightforward health education. Health education might include anything from direct advertising to persuade parents to keep poisons out of reach of children, to advice from health and welfare personnel to take care and to the use of warnings on packaging containing medicines and other poisons. Objective evidence is

lacking but there is little reason to suppose that any sort of health education programme could, by itself, be very effective in reducing morbidity (whether real or suspected) or mortality from poisoning among children. Warnings alone may simply serve to increase anxiety (and thus suspected poisonings) while even if parents could be persuaded more often to follow common sense rules of safety, such as on storage of medicines, there is no clear cut evidence that this would have the effect of reducing the incidence of poisoning. For example, an American study by Sobel (1969) found, in a study of 400 families, that the 122 families with a history of accidental poisoning among children were not significantly different from the 278 control families in either the number of exposed poisons around the house or medicines storage habits. This supports the view, commonly held in America, that some factor other than the availability of poisons determines the number of poisoning incidents. The view that is often stated is that the child in a 'disturbed' home where routine has for some reason been upset, will have a much higher propensity to eat whatever is in reach.

If this is the case then the outlook for education stressing common sense rules of safety and storage seems very bleak. Unless a very high degree of safety consciousness could be instilled in parents such a programme may have little effect and it seems unlikely that very high standards of safe storage in homes could be generally achieved and maintained by education alone. Thus another American study, a surprise survey of paediatricians' homes (who might be expected to have a high level of knowledge and motivation for safety consciousness) found that even they failed to adhere to the basic safety principle of keeping poisons out of reach of children (Scherz 1970).

The other major method of prevention is the use of child resistant containers for medicines, with or without an educational programme as well. This would be relevant to most of the 20–30 childhood deaths a year (as long as non-prescription medicines, especially aspirin, were included as well) and to the two-thirds of hospital admissions which are recorded as involving medicines.

At least two published studies, one in Canada and one in the United States, have indicated that widespread use of child resistant containers can significantly reduce the incidence of accidental poisoning among children (Breault 1968, Scherz 1969). In the American studies (Scherz 1969) the actual number of poisoning incidents after the introduction of child resistant containers was reduced to about 10 per cent of the expected level based on experience prior to introduction and two-thirds of these were from improper use of containers. However, both the American and Canadian study were undertaken in conditions that raise further questions. For example, the American one had as its population the children of

military personnel on an air force base, and this population may not be typical.

In the light of the foregoing, it may be asked whether it is worthwhile putting into practice any of the means at our disposal of minimising the risks of child poisoning at our disposal. The available evidence on the most cost effective approach is far from conclusive. But the use of child resistant containers seems the best bet, not least because they might be expected to reduce the incidence of suspected poisonings as well as actual poisonings.

Just to get an idea of the order of magnitude of costs and benefits, an expenditure of something over half a million pounds a year (in 1971 terms) on child resistant containers could, if 100 per cent effective, save a maximum of about 20 lives a year plus half a million pounds a year of hospital costs together with the attendant distress (assuming that all suspected poisonings are prevented along with actual poisonings). This may, on the face of it, make child resistant containers seem a good buy but there are two points that ought to be considered before drawing conclusions. First of all, there may be (and almost certainly are) areas of the health service where expenditure of a similar amount of money could be expected to bring greater returns. In the case of a preventive measure like this, which is removed from the imperative of the face to face contact between doctor and patient, the more cost effective programme should receive priority.

The second point is where two or more health programmes are vying for priority it is important to know exactly how effective each programme is likely to be and the reliability of information available in respect of child poisoning and its prevention is subject to a great deal of doubt.

Furthermore, just as an aside to indicate how complex the whole exercise of balancing risks and benefits is, it should be mentioned that there are a large number of different types of child resistant containers from blister packs to press and twist containers. Their efficiencies in preventing access to medicines clearly have to be tested and this is normally done at the present time directly by selecting a sample of about 200 children and giving them containers to try to open. Apart from the expense of such a procedure repeated many times it is worth noting that in the process experimenters would be, in effect, teaching quite a large number of children how to open such containers.

The thought that I want to conclude with is the one that I brought up at the beginning. It is only when risks and benefits appear finely balanced or where cost considerations are critical that the precise measurement of the relevant variables becomes of paramount importance in health service policy making. In very few of these situations however, can we claim to have the necessary comprehensive knowledge of the issue under consideration. Nor can we claim to be able to predict all the consequences and ramifications of one course of action against another. Even where an

issue appears to be quite simple, like accidental poisoning among children, rigorous scrutiny shows how many misconceptions can be rooted in a 'common sense' view of the 'facts' as they appear to be and how 'common sense' courses of action (like exhortation to empty medicine chests of old medicines) may in the event even be counter-productive. There is, I think, a long way to go before we can come up with pat answers about risks and benefits of medical care in those crucial areas where there is room for doubt.

Discussion

Unfortunately there was little time available for discussing Mr Laing's paper before the conference adjourned for lunch. In general, however, there was agreement that an economic approach could be of value to the planning and delivery of medical care in, for example, identifying areas of diminishing marginal returns or low cost effectiveness although it was not thought that many of the complex social factors involved could ever be quantified in economic terms.

References

Breault H J, Poisonings are preventable – Experience with one million child-resistant containers. Presented at the Canadian Paediatric Society Annual Meeting. Saskatoon, 26th June 1968.
Locket S, *Practitioner*, 1973, **210**, 165–70.
Scherz R G, Military Medicine, 1969, **139**, 1522.
Scherz R G, *Paed. Clinics. N. America*, 1970, **17**, 713–27.
Sobel R, *Paediatrics*, 1969, **44**, 811.

Adverse reactions and harmful misuse of medicines

George Teeling-Smith

This paper makes no attempt to focus on the extent or seriousness of the harmful effects which modern medicines can cause, because that aspect of the subject is already well documented. As far as morbidity is concerned, for example, it is generally accepted that a substantial number of acute medical beds in hospital are occupied by those suffering as a result of having consumed some medicine or another usually to excess. In the case of mortality, for England and Wales in 1971 the Registrar-General recorded 2,822 deaths as being due to the adverse effects of medicinal agents (ICD Nos. N 960–79). Even this figure understates the extent of the problem, because doctors must often be reluctant to bring to the coroner's court details of deaths in which they suspect that the medication which they prescribed was at least a contributing factor.* However, rather than retreading this already well covered ground, this paper instead sets out to analyse in more detail the nature of the problem and to discuss some of the implications which arise.

Undesirable consequences following the consumption of medicines can vary enormously in severity and significance. At one extreme there are the rashes or nausea which are almost commonplace with certain classes of medication. These are an inconvenience rather than a serious hazard. They are generally insignificant in comparison to the therapeutic benefit in the treatment of the primary disease. These relatively trivial unwanted effects shade over into those of greater consequence, such as the adverse effects of the corticosteroids. These again shade into the truly disastrous sequelae such as deafness due to nerve damage caused by streptomycin. Such disasters, which are so often tragically unpredictable, were epitomised by the teratogenic effects of thalidomide. Finally, there is the ultimate catastrophe of death whether it is caused, for example, by agranulocytosis following the therapeutic administration of chloramphenicol or by the deliberate consumption of a massive overdose of barbiturates. Because death is a specifically quantifiable event, much of the discussion in this paper will concentrate on this aspect of the problem. The general principles, however, apply equally to morbidity as well as to mortality.

The analysis of the problem falls into three parts. The first attempts to split apart what could be described as genuine therapeutic misadventure,

*As an adverse reaction or overdose is an 'unnatural' cause of death it cannot generally be certified by the doctor without reference to the coroner.

on the one hand, from the deliberate abuse of medicines on the other. It will be shown that it is the latter which is responsible for the great majority of what are usually loosely referred to as 'adverse reactions to drugs'. Second, some reference will be made to the difference in public attitudes to the risk of genuine adverse reactions to medicines as against the risks of other forms of therapy. Finally, the medical and social implications of the present epidemic of deliberate abuse of medicines will be discussed. From this analysis the picture which is sometimes presented of medicines doing as much harm as good will be called into question. In its place will appear a much more complex picture reflecting in many ways the present-day problems of society as a whole.

The Registrar-General's figure of 2,822 deaths, quoted earlier, must be the starting point of the analysis. His own review provides some breakdown of these deaths. Unfortunately, for a variety of reasons the figures are difficult to interpret precisely. The main difficulty arises from the more or less subjective way that death certificates are made out and subsequently interpreted in the Registrar-General's office. All 'unnatural' deaths, which include poisoning and suicide, will result in a coroner's inquest and the death certificate is, therefore, made out by the coroner rather than the doctor. The coroner, in the conditions of uncertainty which inevitably surrounds many deaths from poisoning, may be influenced partly by the impact of his verdict on the victim's relatives. As is explained below if the reasons for a person's behaviour leading up to his death are uncertain, for example in a case where substantial quantities of alcohol have been consumed before an overdose of barbiturates, the coroner is likely to favour a verdict of self-poisoning undetermined as between an accident or suicide rather than a verdict of outright suicide. He may even take the view that, given the evidence, such a death was most likely to be accidental. The range of classifications of causes of death available to the coroner allow of all these alternatives.

A further complication arises because deaths from unnatural causes, including poisoning and suicide, are recorded in two ways by the Registrar-General. First they are recorded under what he describes as the external cause of death (the 'E' classifications). Second, the same deaths are recorded again according to the nature of the injury (the 'N' classifications). Unfortunately, the only way to try to reconcile the two analyses is to include under both classifications deaths caused by noxious substances (excluding gas) together with deaths caused by medicines. This is because in a number of the 'E' headings the Registrar-General merely refers to 'solid and liquid substances'. The great majority of deaths so attributed are caused by medicines, but they also include a small number of deaths, for example, caused by corrosive liquids. Table 1 show how the relevant deaths are recorded under the two sets of classification. First, the 41 deaths attributed

Table 1 *Deaths associated with poisoning by solid and liquid substances. England and Wales 1971*

External cause		
ICD No	*Cause*	*Number*
E 850–59	Accidental poisoning: medicines	538
E 860–69	Accidental poisoning: noxious substances	76
E 931	Other and unspecified therapeutic procedures	41
E 950	Suicidal poisoning solid and liquid substances	1,847
E 980	Undetermined solid and liquid substances	603
		3,105
Nature of Injury		
ICD No	*Cause*	*Number*
N 960–79	Adverse effect of medicines	2,822
N 980–85	Toxic effect of noxious substances	
+ N 988–89	(excluding gas poisoning)	181
		3,003*

Source Registrar-General's Statistical Review for 1970.
* *Note* There is no explanation for the 102 'missing' deaths recorded under the N classifications. For 1970 there was a precise reconciliation.

to therapeutic procedures (E 931) are clearly the result of an accident or mistake in treatment. They may, however, include cases where a genuine error in medication has occurred as well as those involving an unpredictable adverse reaction. The 538 deaths recorded as due to accidental poisoning by medicines (E 850–59), however, are likely to include three distinct types of death. First, some may be due to therapeutic misadventure, although in such cases they should properly have been classified under heading E 931. Second, some will be genuine accidents, when as a result of carelessness by the individual concerned or by his relatives the wrong medicine or the wrong quantity has been consumed. Third, and probably most frequently, they will include cases where the medicine was deliberately self-administered in a potentially fatal dose, either with suicidal intentions or probably more often as a gesture of despair – a 'cry for help'. As previously explained, in recording an accidental death in such cases the coroner is giving the victim and his relatives the benefit of the doubt, assuming that the fatal outcome was unintentional even if an overdose of the medicine was taken deliberately. Finally, the 1,847 deaths due to suicide (E 950) and the 603 in which there was uncertainty as to whether the fatal outcome was accidental or intentional (E 980) make up a total of 2,450 deaths which must have involved self-administration of an overdose. Suicide could not even have been suggested unless the individual concerned had administered the poison to himself.

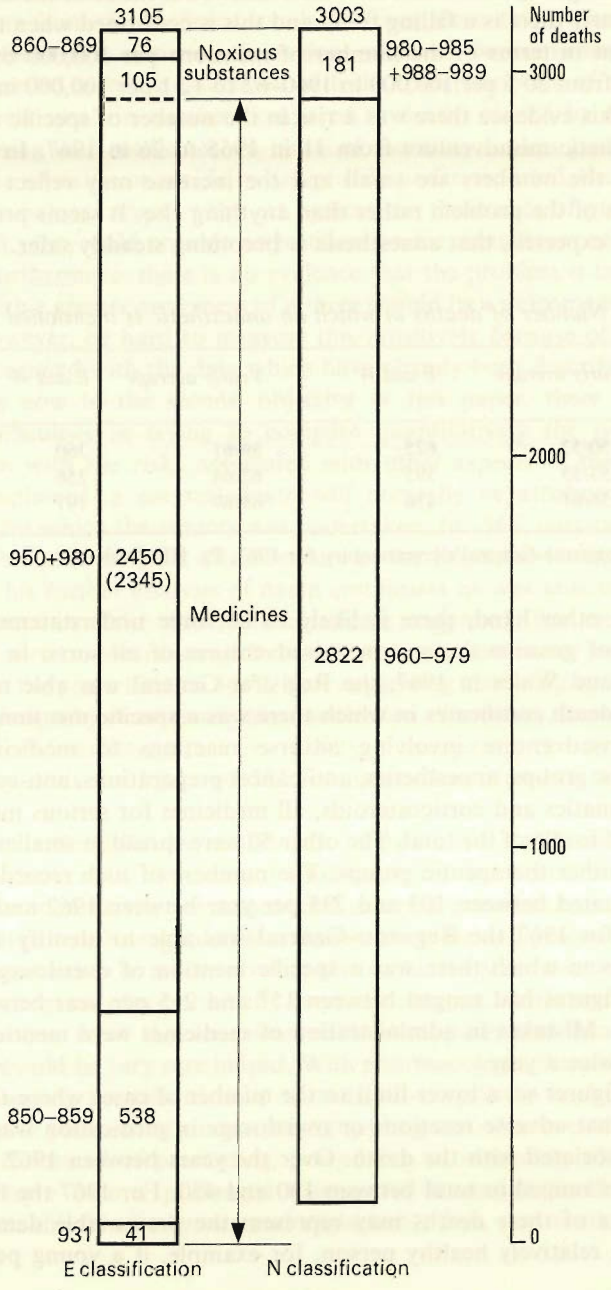
Figure 1 shows diagramatically a reconciliation of the E and the N classifications based on the discussion above.* It shows that the 181 deaths caused by noxious substances (N 980–85 and N 988–89) must be divided between the 76 such accidental deaths (E 860–69) and the two categories E 950 and E 980, both of which involve deliberate self-administration. The other two E classifications (E 850–59 and E 931) specify or imply the use of a medicine. Thus, the only major uncertainty in relation to the 2,822 deaths recorded as being due to the adverse effect of medicines rests on how many of the 538 accidental deaths due to medicines (E 850–59) must be added to the 41 specifically recorded as being due to therapeutic misadventures (E 931). Even if half of the 538 fell in that category it would still mean that only about 300 out of the 2,822 deaths attributed to medicines were due to therapeutic misadventure. That is little more than one-tenth of the Registrar-General's crude figure which is sometimes carelessly quoted in this context. This leaves about 2,700 of the deaths attributed to adverse effects of medicine as being clearly associated with self-administration, with at least 2,450 having resulted from a deliberate overdosage. Hence this evidence shows that at least four-fifths of the 2,822 deaths recorded as being due to the adverse effects of medicines are cases of intentional self-poisoning, either as deliberate suicides or as gestures of protest which ended unintentionally in death.

The evidence showing that only a small proportion of deaths attributed to adverse reactions is due to mistakes or accidents in therapy can also be approached from another direction. For this it is necessary to turn to the Registrar-General's Part III commentary on his statistics for 1967 which contained a specific discussion on 'Therapeutic misadventures and other complications of medical care' (page 164). This starts with a brief statement about the problem of getting precise figures from this end either. This is because deaths are normally recorded as due to the underlying cause, that is the disease being treated, even if it is known that a mistake or accident in therapy was the ultimate causal event. It is only where the underlying cause is unknown that a death due to therapeutic misadventure will be so recorded. Thus in his main tables the Registrar-General's Statistical Review for 1967 records only 47 deaths attributed to therapeutic misadventure and late complications of therapeutic procedures (ICD No E 931). However, in an attempt to get behind these figures in his commentary, the Registrar-General scrutinised the death certificates in all other categories in a search for any references to the effect of surgical or medical treatment.

The evidence so produced is inevitably weak. On the one hand reference may be made to a specific compound, particularly the anaesthetic in the

*There is no explanation for the discrepancy of 102 deaths between the two classifications. For 1970 the figures coincided precisely.

Figure 1 *Reconciliation of poisoning deaths classified by external cause (E) and nature of injury (N) respectively*



case of a surgical death, without its necessarily having contributed to the fatal outcome. Table 2 shows the yearly average numbers of death certificates in England and Wales on which mention is made of the anaesthetic used. Clearly there is a falling trend and this is confirmed when the figures are set out in terms of the number of mentions per 100,000 operations. They fell from 20·5 per 100,000 in 1960–62 to 12·1 per 100,000 in 1965–67. Against this evidence there was a rise in the number of specific references to anaesthetic misadventure from 11 in 1965 to 26 in 1967. In this case, however, the numbers are small and the increase may reflect a greater awareness of the problem rather than anything else. It seems probable, as would be expected, that anaesthesia is becoming steadily safer.

Table 2 *Number of deaths in which an anaesthetic is mentioned*

Yearly average	*E and W*	*Yearly average*	*E and W*
50/52	625	59/61	360
53/55	595	62/64	256
56/61	456	65/67	197

Source Registrar-General's commentary for 1967, Pt. III, Table c85

On the other hand, there is likely to be some understatement of the numbers of genuine therapeutic misadventures of all sorts. In total, for England and Wales in 1967, the Registrar-General was able to identify only 146 death certificates in which there was a specific mention of therapeutic misadventure involving adverse reactions to medicines. Five therapeutic groups, anaesthetics, anti-cancer preparations, anti-coagulants, anti-rheumatics and corticosteroids, all medicines for serious indications, accounted for 96 of the total. The other 50 were spread in smaller numbers over the other therapeutic groups. The numbers of such recorded deaths had fluctuated between 103 and 235 per year between 1962 and 1967. In addition for 1967 the Registrar-General was able to identify 184 death certificates in which there was a specific mention of overdosage. In this case the figures had ranged between 157 and 215 per year between 1962 and 1967. Mistakes in administration of medicines were mentioned only once or twice a year.

These figures set a lower limit to the number of cases where the doctor thought that adverse reactions or overdosage in medication was to some extent associated with the death. Over the years between 1962 and 1967 the figures ranged in total between 180 and 450. For 1967 the figure was 332. Some of these deaths may represent the preventable demise of an otherwise relatively healthy person, for example, if a young person dies

under the anaesthetic when undergoing a minor operation or investigation. In others, for example, with the anti-cancer preparations, death may have done no more than cut short by a few weeks a distressing terminal illness.

However, from the evidence available from these two aspects of the Registrar-General's statistics there does seem to be confirmation that deaths recorded as being associated with the therapeutic use of medicines are relatively small in number compared to deaths caused by deliberate self-poisoning with medicines. In terms of mortality, unless genuine fatal therapeutic mistakes or accidents are grossly under-reported, the negative side of the balance sheet, when set against the thousands of young lives saved each year, could provide no justification for curtailment of pharmacology. Furthermore, there is no evidence that the problem is increasing. Indeed, with a greater awareness of it there should be a welcome reduction. It will, however, be hard to measure this sensitively because of the difficulties associated with the data which have already been described.

Turning now to the second objective of this paper, there are even greater difficulties in trying to compare quantitatively the risks from medication with the risks associated with other aspects of therapy. As already explained, a surgical death will normally be attributed to the diagnosis for which the surgery was undertaken. In 1967, only two deaths were attributed to surgical misadventure in the Registrar-General's main tables. In his further analysis of death certificates he was able to identify only 88 cases in which the death certificate suggested that accidents in technique were a contributory factor. This figure had varied between 71 and 98 for the years 1962 to 1967, thus suggesting that surgery was considerably less subject to error than medication. There are, however, two factors which militate against the validity of comparing this figure of 88 for surgery with the figure of 332 for medicines (184+146 referred to above).

The first is the difficulty in trying to compare the significance of 'the failure to recover' in the different situations of surgery and medication. Except in comparatively rare cases such as acute pneumonia, a course of medication cannot be regarded as a short-term lifesaving procedure. Most medication is either to relieve a relatively trivial illness or else to arrest or delay the progress of a potentially more serious one. With the relatively trivial illnesses, from the discussion so far it appears that fatal adverse reactions would be very rare indeed. With pharmacology, therefore, one is usually assessing the serious risks of medication against a background of preventing or postponing an otherwise crippling and often eventually fatal disorder. If instead of preventing, postponing or extending what would normally have been a prolonged disease the treatment itself causes a rapid death this is an obvious and remarkable fact, and is likely to be recorded.

Surgery, on the other hand, is in many cases concerned with a life and death situation. Heroic surgery for an apparently inoperable carcinoma, or to relieve an internal obstruction in a patient already debilitated beyond the point where recovery can be expected, must often precipitate an inevitable death. In cases such as these, or if, for example, the surgeon's knife must necessarily go imprudently near to a vital organ it would be ridiculous and inhumane to record a fatal slip as an accident of technique.

Furthermore, if a medicine has been responsible for an accidental death the blame falls on an impersonal tablet or injection. In the case of an operation, the responsibility usually falls firmly on the shoulders of the surgeon or the anaesthetist. Recriminations cannot bring back the dead patient and are likely merely to add to the relatives' distress. Hence, it is usually undesirable to bring to light in a coroner's court details of what in retrospect appeared to have been a fatally erroneous surgical procedure. Thus, in spite of the Registrar-General's published statistics it still seems likely that people are generally right to assume that major surgery, even if not concerned with a life and death situation, is a great deal more hazardous than the average pharmacological treatment.

Henry Miller in his recent book *Medicine and Society* puts the matter succinctly in relation to his own specialty of neurology. 'It is above all necessary to preserve a sense of proportion. It is true, for example, that carbamazepine (Tegretol) produces bone-marrow depression that causes a fatal blood disease in something like one in 10,000 patients treated for the intolerable agony of trigeminal neuralgia, that such an idiosyncratic occasional outcome is entirely unpredictable – and when it occurs it is likely to be widely publicised. What is not made clear to the public is that no neurosurgeon would claim an operative mortality anything like as low as one in 10,000 for the same condition: however, we have not yet been conditioned to accept the rare fatality of medical treatment with the equanimity that attaches to the commoner disasters of surgery. Today's physicians must steel themselves to affirm in coroners' courts that treatment with effective modern drugs very often implies a small calculated risk of more or less serious side-effects – and that the risk is consciously and tacitly accepted because it is enormously outweighed by the much greater chance that the drug will restore health or actually save life.'

The general thesis that the public and professions demand much higher standards of safety in pharmacology than in surgery was fully developed in the previous OHE publication in this series, *The Pharmaceutical Industry and Society*. It is, therefore, unnecessary to repeat it here. In addition Professor Bunker is to deal specifically in his paper with the risks of surgery. However, it seems clear that the public, and the coroners and the press in particular, still apply dual standards, accepting levels of risk in surgery which in pharmacology would certainly debar a medicine from clinical use.

Passing on to the third aspect of the question, the epidemic of self-poisoning, the analysis of the Registrar-General's figures has already highlighted the fact that most deaths caused by medicines result from the victim having deliberately taken a substantial overdose which in the event proved fatal. The epidemic proportions of this self-poisoning are best seen by an examination of the statistics for hospital admissions.

It is commonly pointed out that anything up to 10 per cent of all medical admissions are due to adverse reactions to medicines. For England and Wales in 1970 according to the Hospital In-patient Enquiry the number of such admissions was 79,000 or 7 per cent of all medical admissions. In 1956 the figure was less than 20,000. As with mortality, it is often implied that this dramatic increase in admissions is due to iatrogenic disease indicating gross pharmacological carelessness or incompetence in general practice or in hospital out-patient clinics. However to at least as great an extent as with mortality, these admissions in fact result from deliberate self-administration of an overdose of medicine. More than four-fifths of all admissions are associated with analgesics, hypnotics or psychotropics which are the categories of medicine most often associated with self-poisoning.

In the past it was normal to use the phrase 'attempted suicide' to describe cases of deliberate self-poisoning from which the victim recovered. More recently, however, this has appeared to be inappropriate terminology. In a large proportion of cases of self-poisoning either the circumstances in which the poison is consumed or else the quantity swallowed are such as to suggest that the person had every intention of either being discovered in time for their life to be saved or else recovering spontaneously if not discovered. It is now commonly suggested, that these people had no intention of taking their life and instead intended their self-poisoning to be a dramatic appeal for attention or gesture of despair. Thus the self-poisoning was neither accidental nor suicidal, but a deliberate misuse of the medication under social or psychological stress.

This impression is confirmed by the very high proportion of self-poisoning cases which recover. In 1967, there were 67,300 hospital admissions, of which 66,500 survived. The 801 deaths represented a case fatality rate of only 1·2 per cent (R. Goulding, Self-poisoning. *Brit. J. Hosp. Med.*, 1971, 5, 249). If all self-poisoning deaths are related to the number of hospital admissions, the case fatality rate still does not exceed 4 per cent.

Thus there is a situation in which self-poisoning with medicines has become a popular method of suicide and an even more popular method of calling for attention or publicising one's despair. It seems unlikely that the two phenomena can be clearly separated. Some very determined suicide attempts will end in recovery and survival. Some gestures of despair will end unintentionally in death. And probably in a large proportion of cases

the individual's own motives in consuming an overdose may be confused even to themselves. It is, however, convenient to look first at the patterns of suicide and then to consider the social significance of the growth in popularity of gestures of self-poisoning.

First, the increasing use of medicine as the suicidal agent in Britain has been associated with a slow decline in the suicide rate. Whether this is because fewer people have suicidal intentions or because medicines are less predictable in their outcome than other suicidal agents is not known. However, the greater availability of potent medicines and their more frequent misuse has not resulted in any increase in the number of suicides.

Table 3 gives, for an arbitrary selection of countries, some international perspective. England and Wales are well down the international league table, although others are lower still. For Northern Ireland, the sharp fall below the level for England and Wales has coincided with the violent disturbances in the Province. For Greece and Mexico, however, the figures may largely reflect under-reporting.

Table 3 *Suicides and self-inflicted injury rates per 100,000 persons – selected countries, 1971*

Hungary	36·1	United States	11·1
German Democratic Republic	30·3	England and Wales	8·1
Austria	22·9	Israel (Jewish population)	6·8
Sweden	22·2*	Northern Ireland	3·5
German Federal Republic	22·2*	Greece	3·3
Japan	15·5	Mexico	0·7
France	15·3*		

*1970 figures

Source WHO Statistics Reports, Vol. 26, No. 11, 1973

Table 4 shows the methods used for those of the same countries for which statistics are available. The variations are remarkable. There seems from the figures to be strong national fashions in the method of suicide. The Americans shoot themselves; the French strangle themselves. The British poison themselves, formerly with gas but now more often with medicines; the Germans and Japanese divide their loyalties between strangling and poisoning. However, there seems to be no correlation between the overall suicide rates and the proportion using poisons as the agent. It seems, therefore, that the availability of modern medicines and their misuse as a method of suicide cannot in any realistic sense be held responsible for the numbers of suicides which occur.

The same cannot, however, be said in relation to the misuse of medicines for self-poisoning to make gestures of despair. The annual report of the

Table 4 *Methods of suicide; rates per 100,000, 1965–69*

	Solid or liquid poisons	*Gas*	*Hanging and strangulation*	*Drowning*	*Firearms*	*Cutting or piercing*	*Jumping*	*Other*
West Germany	4·7	2·5	8·5	1·5	1·0	0·3	0·9	1·2
Japan*	6·2	0·8	6·6	1·9	0·1	0·3	0·3	1·7
France	1·4	0·8	7·2	2·1	2·0	0·2	0·5	1·4
USA	1·7	1·3	1·5	0·3	5·4	0·2	0·3	0·3
England and Wales	3·9	3·1	1·1	0·6	0·4	0·2	0·2	0·4
Northern Ireland	2·3	1·2	0·6	1·1	0·3	0·1	0·1	0·1

*1960–64

Source WHO Statistics Report Vol. 26, No. 3, 1973

Belfast Poisons Information Service for 1972 drew attention to the high proportion of adults in which the psychotropic medicines were implicated. There seems little doubt that putting potential agents of self-poisoning into the hands of already unstable patients has been a causal factor associated with the epidemic of self-poisoning. This does not mean that the medicines themselves are to blame or that their use should be more restricted. It means that they are being used by a sector of the population to express dramatically the continued depression, anxiety or despair which neither the medicines themselves nor the doctor who prescribed them have been able to relieve.

Seen in this light the epidemic of self-poisoning clearly needs much more sensitive evaluation than the phenomenon has in the past received. It has to be seen as an aspect of the total morbidity of the disease for which the medicines were prescribed. Research is needed to see how it fits into the overall natural history of the disease. Is it an indictment of the inadequate facilities for psychotherapy, for example, as is sometimes suggested? Or, on the other hand, is the self-poisoning an event analogous to the 'resolution by crisis' which used to be a feature of pneumonia and other infections before the advent of the antibiotics? Or is it simply that as the accepted ethics of society have changed the former taboo on a personal admission of despair outside bereavement has diminished? The concept embodied in the title of the musical *Stop the world; I want to get off* is perhaps one which is peculiar to the second half of the 20th century.

It might be argued that the spread of the self-poisoning gesture for the

present is an inevitable corollary of the highly desirable 'open-door treatment' policy in psychiatric hospitals. In the 1930s and before, many of those with unstable personalities or deviant behaviour patterns would have been compulsorily admitted into the custody of mental hospitals. Their lifelong incarceration would have kept them safe from self-injury (in a padded cell if necessary) but their treatment was not necessarily any less costly to society or less distressing to themselves or to their relatives than the present-day therapy which involuntarily includes some resuscitation from self-poisoning.

However, these are speculative matters, and the only sound policy one can propose is for a great deal more sensitive and extensive research. The emergence of this epidemic of expressed despair or need for attention must be taken seriously, not as an indictment of the medications used but as an indictment of the society which has driven people to such extreme action. A problem dramatically exposed in this way can sometimes lead to a solution which would have been withheld if the problem had remained concealed. If research is undertaken into the epidemic of self-poisoning as a gesture it could lead to a resolution of an underlying problem – the stresses of present-day society – which it has so dramatically brought into the open. There is huge scope for epidemiological studies to extend further our understanding of the phenomenon and it is timely that the community physicians should have come into being in our health service at a time when so urgent a problem faces both them and the psychiatrists.

To summarise, the treatment of disease has always been associated with some risk. Modern medicines are often dangerous substances and should be treated as such. However, the evidence available suggests that we expect much higher margins of safety for our medicines than we have traditionally accepted for surgery. In consequence they probably do considerably less harm. However, standards will continue to rise and risks will be minimised, although already the balance in pharmacology falls firmly on the benefit side despite the accidents which do occur.

In terms of the amount of harm caused by medicines, it is their deliberate personal abuse which is responsible for the great majority of morbidity and mortality. There is no evidence that their availability has adversely affected the overall trend of deliberate suicide. It is a new phenomenon – the self-poisoning gesture – which has emerged on an epidemic scale. This has brought to the surface a measure of the underlying personal despair and distress in society, of whose extent we previously had no such dramatic expression. If the phenomenon is systematically investigated as part of the pattern of psychiatric morbidity in society, it may lead to a better understanding and more effective prevention and treatment of the mental diseases.

Discussion

Mr Teeling-Smith's paper drew considerable criticism from a number of those present. Both Doctor's Herxhiemer and Draper argued that it would have been more relevant for him to have attempted to quantify the mortality caused by medicines used for explicitly therapeutic purposes than to concentrate on the figures of the Registrar-General which involve a large proportion of suicides and self-poisoning. It was emphasised that many drug deaths are not detected or recorded at present.

Professor Elmes illustrated this with the example of a Canadian study which indicated that a number of the patients suffering from heart complaints who had died in hospital could be shown to have received 'fatal' doses of digoxin although their death certificates did not record this. He also said that figures obtained in Northern Ireland indicated that up to one-tenth of hospital admissions there involved adverse reactions to drugs, probably with a degree of associated mortality, and that research in New Zealand had shown that up to one-third of all those leaving hospital suffered some detectable ill effects from the medicines they had received.

Mr Teeling-Smith accepted the weakness of the figures currently available but felt justified in limiting his paper to those most frequently quoted or consulted. With regard to Professor Elmes' remarks he suggested that the Canadian findings might be expected with regard to digoxin, which has only quite recently been shown to have such a varying bio-availability, whilst the New Zealand findings underlined the loose way in which the term drug reaction is used, including everything from a rash to death.

Dr Beaumont of Glaxo laboratories mentioned an article on death after taking medicaments published in the *British Medical Journal* of 16 March 1974 which showed the mortality attributable to certain medicines over a seven year period*, although it was emphasised that even these could be far from complete.

There was also some debate as to whether the current high rate of attempted as opposed to successful suicides is due to inefficient techniques, dictated primarily by fashion, or to a genuine intention on the part of those involved to avoid death.

*Numbers of deaths reported as possibly due to drugs in seven and a half years or less.

Oral contraceptives	332	Acetylsalicylic acid	72
Phenylbutazone	217	Oxyphenbutazone	69
Chlorpromazine	102	Indomethacin	68
Corticosteroids	94	Halothane	57
Isoprenaline	84	Amitriptyline	50
Phenacetin	77		

Source Committee on Safety of Drugs data as quoted by Girdwood R H, *Brit. Med. J.*, 1974, **1**, 501

Risks and benefits of surgery

Professor John Bunker

The total risk resulting from surgery is large. Nearly two million operations a year are performed in Great Britain and, with an immediate postoperative mortality of 1–1·5 per cent, this should yield 20–30,000 deaths – ten times as many as official statistics attribute to drugs. This number of deaths represents a large non-monetary 'cost' of surgery. To justify such a large cost in human lives calls for a large return in benefits of surgery. These benefits remain for the main part unmeasured, as we have heard is also the case for drugs. Indeed, we are a long way off from achieving the finely balanced assessment of risks and benefits to which Mr Laing hopes we can look forward.

What are the benefits of surgery? Ordinarily, one thinks of surgery as primarily concerned with the saving of life in acute emergencies and the delaying of death in the long run. In the past, without perhaps even giving it much thought, I accepted this as self-evident, and I suspect that most physicians and certainly the public shared my assumptions. It therefore came as a bit of a shock to reach the conclusion that the principal purpose of surgery is something quite different: that only a small number of operations can be expected to save lives, and that whether large or small this life-saving effect cannot be detected as a result of surgery in general or of individual operations in particular.

Probably not more than 10 per cent of operations qualify as 'emergency', and only a fraction of these deal with conditions directly affecting life or death. The principal reason why the effect of emergency surgery on life expectancy cannot be identified, however, is probably related to the fact that emergency surgery is available to all, or nearly all, of the public. Therefore, when we compare one group or one population of patients with another, although overall operation risks may differ markedly the effect of surgery in saving lives is not apparent.

Urgent or 'death delaying' surgery – primarily surgery for malignancy – also appears to represent a small fraction of all surgery performed. Operations are not classified on the basis of presence or absence of malignancy, but an indirect estimate may be made on the basis of new diagnoses of malignant neoplasms. If all new diagnoses represent patients who had one cancer operation in a given year (and presumably some will have more, some fewer), this would account for only 5 per cent of all surgery performed in the United States. Large variations in operation rates for cancer do apparently occur, but there is not much evidence that many

lives are saved and, in any event, the net effect is probably not measurable in terms of a decrease in overall population mortality.

It is my view, therefore, that the large majority of surgery is directed towards improvement in the quality of life – to the relief of disability, discomfort, and disfigurement. These 'quality-of-life' operations all carry a mortality, of course, and so they do have an effect on life expectancy, but the effect is an adverse one. Thus, I assume that everyone receives emergency surgery and I postulate that the large differences in operation rates reported within as well as between countries are largely among discretionary or quality-of-life operations; if I am correct in my assumptions, more surgery should be associated with more deaths. The available data are consistent with this hypothesis.

For example, the United States reports twice as many operations per unit population as England and Wales and at all age levels.[1] Age specific mortality is also higher in the USA for all ages below 65.[2] After correcting for differences in accident rates, suicides, and homicides, the difference remains large and unexplained. Much of this remaining difference I believe can be accounted for on the basis of differences in operation rates. Exactly how much one can only speculate. If the operations performed in the United States in excess of those in England and Wales are primarily discretionary procedures in good risk patients, as seems reasonable, and if we assign a mortality of 0·5 per cent to those excess operations, approximately one-third of the difference in age-specific mortality rates could be explained. But if a good deal of the difference in operation rates consists of 'heroic' procedures in poor risk patients, as also seems possible, as much as a half of the difference in population death rates might be explained.

Similarly, Wennberg and Gittelsohn have reported large variations in operation rates among small area populations in Vermont,[3] and they have subsequently observed a statistically significant positive association between operation rates and population-based mortality. Their observation lends some additional support to the hypothesis proposed above; at the same time, it is apparent that surgery is such a varied diagnostic mix that this kind of speculation is not very satisfactory or convincing.

Far more convincing is the fact that even for operations which are presumably life saving, such as appendectomy, we again find that more surgery is associated with more deaths. Lichtner and Pflanz have recently reported that appendectomy rates in the Federal Republic of Germany are two to three times higher than those of other countries, and that mortality attributed to appendicitis is also three times as great as in most other countries.[4] Three-quarters of the appendices removed were reported to be normal; from this finding, the authors rule out the possibility of an increased prevalence of disease and conclude that the most probable reason

why Germany's mortality rate from appendicitis is higher than that in other countries is that appendectomy is performed more often than elsewhere.

Here again, I assume that nearly everyone gets an appendectomy when the diagnosis is clear cut, and that the variations in appendectomy rates occur in clinical situations where indications for surgery are tenuous. When more appendectomies are performed for diminishing indications, ultimately the risk of the operation can be expected to exceed the risk of the disease.

Vayda has recently suggested much the same possibility for another common surgical condition.[5] He reports that 'for diseases of the gall-bladder, the mortality rate in elderly women and men was twice as high in Canada [as in England and Wales] although the cholecystectomy rate was five times higher', and he cautiously suggests that 'some of the excess mortality may conceivably be attributed to the increased surgery'.

A similar conclusion has also been drawn by Duncan Neuhauser of the Harvard School of Public Health, in an unpublished analysis of the risk of inguinal herniorrhaphy in the elderly (personal communication). On the basis of the mortality of elective herniorrhaphy, the risk of strangulation and the mortality of emergency operation after strangulation, Neuhauser predicts that, in the hands of the average surgeon, the risk of elective herniorrhaphy at the age of 65 or above is four times as great as the risk of not operating. The question that Neuhauser raises is of special interest and importance at present, in view of the fact that the number of herniorrhaphies in the Medicare population (i.e., aged 65 and over) has doubled since 1965.

The generalisation of Neuhauser's analysis presents immediate difficulties. Neither surgeons nor patients are apt to be average, and it is hardly fair to withhold herniorrhaphy from the fit 65 year old with a longer than average life expectancy and for whom the risk of surgery may be considerably less than average. Even if it were possible to show in a given case that elective herniorrhaphy, or some other operation shortens life expectancy, this does not necessarily mean that the operation should not be done. If the expectation of relief from disability or discomfort is sufficiently large, a small or even moderate risk of operative or post-operative death may be an acceptable price to pay. (In this regard, it is of some interest to consider Starr's estimates of the large risks the American public is willing to accept in the pursuit of recreation and other personal goals.[6])

Assuming that some risks are worth taking to obtain some benefits, there is urgent need of better data on which to base such judgements. Overall risk data for specific operations and for age groups are available and the effect of pre-operative physical status on mortality and morbidity

can be approximated with reasonable precision. But very little outcome data are available from which to predict the benefits for individual operations or for surgery as a whole. What is needed, of course, is detailed information on the natural history of each operation-diagnostic category, including how it is modified by surgery. Such data must be based on the experience of large populations, not just that of one or two institutions which may make a specialty of a given procedure in selected patients. Long term follow up must be included in an attempt to exclude the short term placebo effects of surgery, effects which may be quite large.

To collect this data will take much time and effort. The recently legislated Professional Standards Review Organisations (PSROs) in the United States may offer the opportunity to work closely with practising physicians to develop such data as part of the ongoing review which they are now required by law to carry out.

Many decisions will need to be made before such data can be developed. The introduction of National Health Insurance, which seems imminent, will place large additional demands on an already over-extended medical economy. Patients in areas of low access to surgery and low operation rates, such as reported by Lewis in Kansas[7] and by Wennberg and Gittelsohn in Vermont,[3] should presumably be offered more surgical care, if more can be shown to be needed. Unfortunately, there is no operational definition of surgical need, nor can we measure it in any quantitative sense. Rather than necessary or unnecessary, operative surgery is comprised of a spectrum of procedures of greater or lesser urgency. At one end are the true emergencies and at the other end a variety of semi-frivolous procedures which must be considered a luxury. 'Need' in the latter category is in the mind of the purveyor (surgeon) or of the consumer (patient). It is a perceived need and the demand of the patient clearly plays a large role in how it is defined. But, unfortunately, the patient is not an informed consumer and the apparent over-use of surgical services in the United States is often attributed to this lack of consumer knowledge.

There is, of course, at least one segment of the patient population which does possess such knowledge, namely, physicians themselves. It has seemed to us, therefore, of special interest to ascertain the surgical experience of physicians and their families as patients and for comparison we have collected similar data for three other professional groups of equivalent education and affluence.[8] The study was carried out in California, where *per capita* income and surgeon and physician to population ratios are high. Our hypothesis was that operation rates for most groups would be as high as or higher than for the country as a whole but that physicians, as informed consumers cognisant of risks as well as benefits, would undergo fewer operations than other groups.

A small number of commonly performed operations were selected as the

basis for comparison: appendectomy, cholecystectomy, thyroidectomy, and hemorrhoidectomy in both sexes; inguinal herniorrhaphy in men and hysterectomy in women. These operations were chosen because of the wide variation in their reported rates. Mastectomy was also included, on the assumption that rates for this operation should be relatively stable among population subgroups.

Mail questionnaire was selected for economy and justified, at least in part, by Breslow's report of an accuracy of mail questionnaires closely equivalent to that of personal interview or telephone.[9] Response rates for the first mailing ranged from 60 to 75 per cent and reached 75 to 83 per cent after the second mailing.

Rates for male physicians and for the other three professional groups were closely similar for four of the five operations. The fifth, thyroidectomy, was performed approximately twice as often in physicians as in lawyers or businessmen, but the difference was not statistically significant.

Physicians' wives tended to have more operations than wives of the other three professional groups; they underwent appendectomy and thyroidectomy significantly more often than lawyers' wives ($P < 0{\cdot}01$); cholecystectomy significantly more often than lawyers' and businessmen's wives ($P < 0{\cdot}01$) and hysterectomy significantly more often than businessmen's wives ($P < 0{\cdot}01$).

As with male physicians and lawyers, female physicians reported as many as or more operations than female lawyers. For cholecystectomy, the difference was significant ($P = 0{\cdot}02$) and differences for several other of the operations showed suggestively low P values. Spouses of female physicians had higher operation rates than spouses of female lawyers for each of the five operations, though none of the differences was significant at the 5 per cent level.

The cumulative risk of organ removal was calculated, as a function of age, for some of the operations and compared with similar data for men and women in the United States and in the Oxford area of England.[10] The most striking differences were in hysterectomy rates: the risk of hysterectomy for physicians' wives exceeded 50 per cent at age 65, compared with the national rate of 33 per cent and a rate of 17 per cent for the Oxford area. Cumulative rates for appendectomy, hemorrhoidectomy and thyroidectomy were also greater for physicians and their spouses than estimated rates for the USA population while those for herniorrhaphy, cholecystectomy, and mastectomy were less. Total operations were approximately 25–30 per cent greater for both male and female physicians than those estimated for the general population in the United States.

Thus, we observed high operation rates for professional groups in a geographic area of abundant medical resources. However, and contrary to our expectations, physicians as patients reported operation rates as high as

or higher than those reported by other professional groups. We conclude that physicians place a high value on surgical care whether they are the purveyors or the recipients of such care.

With the activation of Professional Standards Review Organisations (PSROS) in the United States the American medical profession is now expected to establish norms and standards for optimal care. It has been assumed by some that this will tend to reduce the volume of services offered by physicians or approved for reimbursement. To the contrary, we predict that such norms or standards, based on current medical knowledge and opinion, will provide formal sanction to broaden therapeutic criteria which in turn will lead to further increases in demands for surgical care.

High rates of surgery can be expected to become still higher. Yet we have doubts concerning the effectiveness of such high rates, even in the present study. Our doubts will continue in the absence of reliable cost-benefit and risk-benefit data on which to base an assessment of the appropriateness of a given level of medical or surgical care. Indeed, it is the dearth of risk-benefit data and the attendant uncertainty which encourages therapeutic intervention, medical as well as surgical. When uncertainty exists, 'it is better to impute disease than deny it and risk overlooking or missing it.'[11]

We conclude that over-utilisation is likely, but we do not believe that it is inevitable. Better data on which to estimate costs, risks, and benefits are urgently needed and will require time and effort to obtain. In the meantime it is incumbent on physicians to use currently available data, such as that of the Vermont Data System[3] and the Oxford Medical Record Linkage System[12], to examine and monitor the risks and benefits of specific operations and their application to the problems of individual patients. The quality of care which they and their colleagues, as physicians, receive might provide an appropriate subject for initial study and a useful basis for comparison in subsequent studies of the medical and surgical care of the population at large.

Discussion

The discussion stimulated by Professor Bunker's paper centred on the difficulties of establishing randomised controlled trials of surgical procedures. Professor Vessey argued in favour of attempts to do so, quoting as a successful example of such a trial work conducted by the MRC on the value of radiotherapy as opposed to surgery in the treatment of oat-celled carcinoma. Dr Herxhiemer pointed out that it would often be difficult to separate the risks of surgical procedures from those associated with simultaneously administered drug therapies.

Professor Bunker said that as yet many surgeons had not fully understood the extent to which surgery was concerned with improving the

quality of, rather than saving, life. He illustrated this viewpoint with the example of much cancer surgery. Professor Campbell developed this theme with examples of alternative operations such as traditional haemorrhoidectomy as opposed to Parks' plastic operation which have similar mortalities but cause differing degrees of morbidity. He compared these to alternative pharmacological therapies in that a choice designed to optimise the wellbeing of the recipients of such procedures can be made as a result of objective comparison.

References

1. Bunker J P, 'Surgical Manpower. A Comparison of Operations and Surgeons in the United States and in England and Wales', *New Eng. J. Med.*, **282**, 135–44, 1970.
2. Burgess A M, Jr, Colton T, Peterson O L, 'Categorical programs for heart disease, cancer and stroke. Lessons from international death rate comparisons'. *New Eng. J. Med.*, **273**, 533–37, 1965.
3. Wennberg J, Gittelsohn A, 'Small Area Variations in Health Care Delivery', *Science*, **182**, 1102–08, 1973.
4. Lichtner S, Pflanz M, 'Appendectomy in the Federal Republic of Germany: Epidemiology and medical care patterns', *Medical Care*, **9**, 311–30, 1971.
5. Vayda E, 'A Comparison of Surgical Rates in Canada and in England and Wales', *New Eng. J. Med.*, **289**, 1224–29, 1974.
6. Starr C, 'Social benefit versus technological risk', *Science*, **165**, 1232–38, 1969.
7. Lewis C E, 'Variations in the Incidence of Surgery', *New Eng. J. Med.*, **281**, 880–84, 1969.
8. Bunker J P, Brown B W, Jr, 'The Physician-Patient as informed consumer of Surgical Services', *New Eng. J. Med.*, **290**, 1051–55, 1974.
9. Breslow L, 'Alameda and Contra Costa Counties', *Milbank Mem. Fund Quarter*, **43**, 317–25, 1965.
10. Fairbairn A S, Acheson E D, 'The extent of organ removal in the Oxford area', *J. Chron. Dis.*, **22**, 111–22, 1969.
11. Freidson E, Profession of Medicine. New York, Dodd Mead, 1970.
12. Acheson E D, Record Linkage in Medicine. London, Livingstone, 1968.

Assessment of the benefits, risks and costs of medical progress

Dr William Wardell

Because our present levels of knowledge about the benefits, risks and costs of medical progress are so meagre, it is premature to attempt to construct detailed quantitative balance sheets. What I shall do is discuss how one might go about constructing a balance sheet of medical advances, and consider the sort of data we would need to enter into it and the methods of evaluating such data.

The idea of 'cost-benefit' will be used here in its broad sense, the term 'cost' generally including both biological risks and economic penalties. (As Campbell[1] has pointed out, the use of the terminology 'risk-benefit' tends to equate biological risk with all the costs incurred, thus underestimating society's total costs.)

Types of benefits and costs

The types of benefits and costs that are taken into account in analysing medical advances depend first on what terms or units measurements are being made, and second on whose behalf, and by whom, the analysis is being performed. The number of persons benefiting or losing will clearly be an important consideration.

Terms of the Analysis. In medicine we are accustomed to thinking in terms of hard data such as mortality and morbidity figures, and softer data such as psychic and social factors. Our concepts are not at all well suited to evaluating the human nuances of therapeutic effect. As Feinstein[2,3] has pointed out in the context of drug evaluation, there are serious defects in our current attempts to assess 'safety' and 'efficacy'. These defects include our tendency to think in terms of statistical (rather than clinical) significance; our disregard of the total therapeutic situation in our concern for obtaining information on drug efficacy that is scientifically 'respectable'; and our currently inadequate attention to comorbidity, prognostic stratification, and the many problems of extrapolating from the results of clinical trials to the population at large. The dehumanised nature of the information we obtain about therapeutic effects means that we can seldom evaluate the impact of a therapy in terms of the whole patient. We thus lack the data necessary for comprehensive cost-benefit analyses.

Even if we possessed all the relevant data, we do not know how to weigh it up in medical terms. We cannot formally integrate multiple drug

effects – particularly diverse beneficial effects with equally diverse unwanted effects. Because any given situation involves many effects, we end up with a multivariate expression of widely diverse content: what should we conclude, for example, about a therapy that caused three deaths while prolonging the life of 1,000 people by an average of five years, and giving peace of mind to a million others?

One approach to the problem of multiple effects is to reduce all gains and losses to a common measure, of which the most feasible is monetary value. Although this measure is distasteful to doctors, the techniques for cost-benefit analysis have been developed to a very high degree by economists and carry deserved weight with those who finance health care. Mr Laing's paper at this meeting is of considerable interest from that point of view, because of the clear-cut economic insight it provides into an otherwise difficult argument.

Viewpoint of the analysis. Consider the case of a new therapeutic modality that, while unusually effective in a few patients, is either very expensive or very toxic to the community as a whole under the conditions of its use. (It could have a high incidence of toxicity to those who take it, or it might cause the rapid emergence of a virulent resistant organism that attacks otherwise healthy people.) An informed patient (or his doctor) might decide that in his case the benefits substantially outweigh the risks, making the therapy highly desirable for him; but a third party such as the insurance company or government faced with paying for the therapy, or a regulatory agency faced with taking responsibility for the drug's total impact on the whole community, may justifiably decide that the costs to the community outweigh the benefits. This illustrates not only the influence of the viewpoint from which a cost-benefit analysis is performed, but also the important distinction between cost and benefit to an individual versus cost and benefit to society. Many cost-benefit analyses can be considered from these two (often opposed) points of view. A good discussion of this point is given by Campbell.[1]

A classic example of the conflict between individuals' costs and benefits and those of society is seen in the thalidomide tragedy. At the time of its introduction, thalidomide was the first (and only) hypnotic available that was non-lethal when taken in large overdose. After its removal from the market in 1961, no other comparably safe hypnotic appeared until the benzodiazepines, of which hypnotic variants were marketed several years later (in Britain, nitrazepam in 1965; in the USA, flurazepam in 1971). I have reviewed[4] the potential effects in the USA of delay in approval of a benzodiazepine hypnotic; 3,700 deaths, including those of 50 children could potentially have been avoided from 1965 to 1971 (these figures are extremely conservative, and may be at least trebled). A similar argument

could be applied to both countries with respect to the years, following the withdrawal of thalidomide, during which a safe hypnotic was not available. The conflict this example illustrates is over the introduction and withdrawal of thalidomide: the unique and life-saving benefits this drug possessed at the time for certain individuals, versus its gruesome hazard to many others from its availability and (after the hazard had been defined) inappropriate use.

This example also shows that therapeutic advances cannot be assessed in isolation, but only under conditions of their actual use.

Nature of the available medical evidence

Restricting ourselves to conventional, if limited, medical considerations, and disregarding the viewpoint of the analysis, let us now briefly survey the sort of evidence that is currently available to those who wish to undertake cost-benefit analyses of medical progress. At the same time, one can attempt to make rough comparisons of relative risk and benefit in these different spheres. In each category we need to consider the short term and long term aspects separately.

Diagnostic procedures. In the short term, the risks are well known. The benefits are known, but not usually in terms that can be easily compared against the risks. There has been little follow-up of long term hazards of invasive diagnostic procedures, although a few hazardous examples are well known – for example thorium as a radiological contrast agent.

Immunisation. In the short term, the benefits and risks of immunisation have been well measured under conditions of actual use, and the quality of data here is among the best in medicine. (Perhaps because it is so firmly based on the science of epidemiology.) In the long term, we have good evidence of the efficacy of some of the older vaccines (for example, smallpox). We are, however, extremely poorly informed of the long-term risks of immunisation, especially with the newer live-virus vaccines. The advent of measles vaccine, for example, has raised the theoretical possibility of adult measles and neo-natal measles developing in new forms, and there is also the example of contamination of some of the early Salk vaccine with SV-40 virus, the long term effects of which are only now being speculated about.

Surgery. As we heard from Dr Bunker, the benefits of surgery are surprisingly ill-defined; furthermore there have been few comparative studies done, an experimental approach being the exception in this field. The risks, as Dr Bunker has shown us, are not well known and seem to be considerably higher than is generally accepted. In the long term, the position is worse; for example, we are not well informed of the long-term effects of

procedures such as thymectomy, tonsillectomy, and aorto-coronary by-pass surgery. There is a great need to improve our standards here; as the rationale for surgery gets more sophisticated (for example, prophylactic procedures) there is a clear need for comparative studies with long term follow-up.

Drugs. Because of the rise in standards of drug evaluation over the last decade due to regulatory procedures and scientific advances, we are unusually well-informed about the short-term effects of drugs under certain conditions – the controlled clinical trial. Both the benefits and the risks of drugs when used under these circumstances are relatively well defined by comparison with the other spheres of medicine, although even here (as Feinstein pointed out) we have insufficient information in absolute terms to make truly valid cost-benefit decisions. A serious and sometimes unrecognised defect is our lack of evidence of the impact of drugs on the whole population as used in clinical practice. That is, our best information comes from the relatively artificial situation of clinical trials. The benefits and risks, even in the short term, of drugs under conditions of actual use are essentially unknown.

It is also notable that most of what little information we have on drug effects in practice is concerned with hazards, and not benefits. This is because of the development, in the past decade, of relatively sophisticated systems for collecting data on adverse drug reactions. There are no comparable systems for collecting data on the benefits drugs confer. We are therefore poorly placed to make the sophisticated cost-benefit analyses needed in modern medicine. In the long term, there are only a few situations in which the benefits of drugs are known. Perhaps the best examples are those of infectious diseases as we saw in earlier papers in this seminar. Other examples include the efficacy of drugs in conditions such as diabetes and hypertension, but here the effect on vital statistics is harder to discern. In addition, there are the more recently-recognised hazards of carcinogenicity and mutagenicity, information on which is only now beginning to appear at the experimental level.

In other aspects of health care, cost-benefit analyses have been performed on organisational topics such as the development of coronary-care units, and the use of nurse-practitioners instead of general practitioners as medical people of first contact. Again there is very scant information about the full costs and benefits of these procedures, over limited periods.

Summarising the present state of evidence, we have, in the short term, reasonable information about the *hazards* of diagnostic and therapeutic procedures and, (in a few areas) some knowledge of the benefits. There tends to be an imbalance in that we know less about benefits than hazards, particularly where drugs are concerned. We know very little indeed about

the relative benefits of alternative therapies – and, as therapies proliferate, this is the information we increasingly need to have.

In the long term, we know even less about either the benefits or risks of any of the procedures in common use, and we are at present driven to overall measures such as mortality and morbidity data. With crude retrospective descriptions such as these, I am generally pessimistic about our chances of dissecting out the role of specific health care procedures. It is tempting to infer that the enormous decrease in the mortality of certain infectious diseases was a result of the introduction of specific therapies. But I was impressed with Dr Crombie's cautionary table of the possible causes of these trends, which had 'specific and prophylactic procedures' as fourteenth on a long list. The 'outcomes' that can be derived from mortality and morbidity figures are of more or less treated disease, in a setting where neither the contribution of the natural history of the disease, nor the effect of treatment, can be dissected out.

There are, of course, some exceptions, notably the fruits of epidemiological investigations mainly in the area of drug toxicity – for example, the thalidomide, monoamine oxidase, bronchodilator and aminorex stories. These have usually depended on special types of morbidity and mortality surveys, such as the spontaneous reporting systems for adverse drug reactions.

The conclusion that I derive from all this is that the only way we are going to be able to measure benefits and risks and to weigh the outcome is by experiment; and that the experiments will need to be on a much larger scale than hitherto. Who should pay for these huge prospective studies is going to be a problem: the UGDP study cost $7 million and yielded an equivocal result; it has been estimated that to do a long-term study of a *new* oral hypoglycemic will cost $25 million and take at least ten years.

Drugs compared with other agents

How do drugs measure up against other therapies and other environmental hazards? In view of Dr Bunker's most interesting figures it would obviously be instructive to see some formal cost-benefit comparisons of drug versus surgical therapeutics. However, the necessary controlled studies involving surgical therapy are usually unavailable. (Spodick[5] has pointed out the double scientific standard that exists in surgical and medical therapeutics, at least in the cardiovascular area. His review of the literature of that specialty for 1971 showed that nearly half the 21 reported medical studies were controlled, while none of 49 surgical studies were controlled.)

A comparison of relative risks (but not benefits) can be made by comparing British adverse drug reaction experience, as reviewed by Girdwood,[6] with the mortality rates given by Dr Bunker. (This comparison

is obviously very crude, but one has to start somewhere; I shall conveniently ignore the caveats surrounding the use of the numerator and denominator data for drugs, and also assume that the under-reporting rate for surgical mortality is the same as that for drug-induced mortality.)

From Girdwood's Table II, the death rate reported from such dangerous drugs as anticoagulants, β-blockers and stimulants, and anti-inflammatory analgesics is in the range 3–30 per million prescriptions. From Dr Bunker's figure of 1–1·5 per cent immediate post-operative mortality, it would take between 300 and 5,000 prescriptions of one of these drugs to equal the risk of having an operation. Even a prescription for sodium aurothiomalate, by far the most toxic drug on the list, has (per prescription) only 1 per cent of the mortality risk of surgery. It would obviously be worth making some comparisons of drugs and surgery in specific therapeutic situations, using prospectively obtained data.

The hazards (but not the benefits) of drugs versus other environmental chemicals were examined recently, in the report of the Panel on Chemicals and Health of the President's Science Advisory Committee.[7] This was an attempt to compare a variety of known and surmised threats to health from chemicals in terms of the percentage of all chemical-related deaths in 1967 that could be hypothetically linked to each cause. In this report, it was suggested that there were 75,000 deaths in the United States in 1967 which were due to adverse drug reactions. (This figure seems rather high but since no documentation was given, I could not check it. In any case, work aimed to clarify the adverse reaction death rate in the USA is currently under way, and results should be available soon.) Using that value, however, the number of deaths from adverse drug reactions is about the same as that due to alcohol abuse, or about a quarter of that due to cigarette smoking. This gives us some frame of reference; and it allows us to make intuitive judgements about the relative risks of these. Since the benefit side of the argument is ignored, a proper cost-benefit analysis is not feasible.

Examples of current cost and risk-benefit arguments

A few cost-benefit analyses have been attempted in economic terms. Examples are studies on a rheumatic disease treatment centre,[8] and a coronary care unit.[9] The problem with these is that there is no control group, which is particularly necessary for comparison with other available therapy; the benefits are overstated in the above types of analysis.

An area that has had its costs and benefits analysed in considerable detail is that of family planning. In 1969, Tietze[10] compared the risks to life from contraception and abortion with those associated with continuation of pregnancy, using a variety of contraceptive and abortion policies. On the statistics available at that time, the safest policy for a

fertile woman was to use a moderately (but not 100 per cent effective contraceptive (diaphragm or condom) plus abortion for contraceptive failure. The mother's risk of dying from these procedures was one-sixth that of women using the same contraception without abortion, and one twenty-fifth that of women who used neither contraception nor abortion (0·4, 2·5 and 8–12 deaths/100,000 women per annum, respectively). Subsequent improvements in the mortality statistics for both childbirth and abortion have changed these figures slightly, but not, according to the author, the conclusions.[11]

Relatively sophisticated economic analyses of contraceptive programmes have also been performed. Estimates of the long-term benefit/cost ratio of family planning programmes range from 20:1 to over 100:1.[12] Even in the short term, and considering only the costs of medical care, public assistance and opportunity, the benefit/cost ratio is impressive. Jaffe[12] recently estimated government savings with respect to government costs of family planning services to be between 1·8 and 2·5:1 in as little as one year.

Recently, Simmons and Stolley[13] raised some provocative questions about the consequences of the increasing rate of antibiotic usage. They put forward the argument that much antibiotic use is 'inappropriate' by certain standards. For example, antibiotics are often given without cultures; or prophylactically in situations where they have not been proved to be effective. Simmons and Stolley also pointed to an association between the increased use of broad-spectrum antibiotics and the increasing frequency of gram-negative septicemias (which, the authors allege, are now occurring at a rate of 300,000 cases per annum, with 100,000 fatalities). They posed the question: Have we reached the point where risks from the use of these drugs outweigh their benefits?

In a response by the AMA Department of Drugs, it was pointed out that high use does not necessarily mean overuse; that serious adverse drug reactions do not necessarily imply that the drug was misused; and that an increasing incidence of adverse drug reactions does not necessarily mean that the drugs are being used inappropriately. To which one must add that no attempt was made to match, against these putative hazards, the benefits which could be considerable, although hard to measure.

This debate is instructive. It illustrates the rather primitive risk-benefit data we have to deal with in which neither the risks nor the benefits have been clearly defined, for reasons of both logical and (particularly) informational deficiency. This emphasises our need for direct measures, preferably by experiment.

Another instructive example is the cost (in terms of mortality and handicap) of preventing retrolental fibroplasia. Since 1950, the oxygen concentrations supplied to low birth-weight babies in hospitals have been restricted. Cross[14] and Bolton and Cross[15] have provided good epi-

demiological evidence to support the idea that this has led to a large increase in the death rate due to hypoxia in this group of babies. They estimate that since 1950, the cost of preventing retrolental fibroplasia has been more than 20,000 unnecessary deaths in England and Wales, and more than 150,000 in the United States; and that these numbers are far larger (by 16 times) than the numbers of babies who would have been blinded by a more liberal oxygen policy. Fortunately, it appears that improved application and monitoring of oxygen therapy in these babies can reduce mortality while preserving vision.

Improvement of drug utilisation

A point that emerges from some of these examples is that, whether or not we can accurately measure the benefits and costs associated with drug therapy, it is possible to improve this ratio by optimising the way therapies are used. If drugs were used perfectly, few constraints on drug development – and none on utilising – would be necessary. The methods whereby drug utilisation is controlled, and the ways in which it can be improved, are thus of special importance.

The main control currently employed in the USA is control over the access of drugs to the market. In addition, there appears to be a growing interest in the control of drug utilisation through the concept of 'approved' (labelled) uses[16] and the restricted release of new drugs. The approved labelling control has no *direct* legal force yet, its sanctions apparently stemming from the fact that use for unlabelled purposes increases the physician's liability in a malpractice action.[17] (It should be noted, however, that the possibility of giving FDA-'approved' uses more legal weight has been mentioned in Congressional hearings.[18])

None of these controls currently employed in the USA is wholly desirable, because they respectively prevent or deter a physician from making available the drugs in question to patients who may really need them. Alternative mechanisms of improving drug utilisation should be examined to find a system under which patients would benefit most. In Britain[19] and some other countries, educational rather than regulatory means are relied upon to encourage better drug utilisation. In New Zealand and Australia, tight control over drug utilisation has been exerted for decades through an alternative mechanism, namely the conditions to be fulfilled for the reimbursement of drug costs by the government.[20]

The role of legislation and regulation

Finally, I would like to examine the role of legislation and regulation in controlling cost-benefit ratios. There is growing government interest in this approach particularly in the USA where several developments are converging to bear on drugs (and, in some cases, other aspects of medicine).

The growth of government payment schemes has already led in some States to controls over drugs in terms of formulary and price constraints; the nature of this control, relatively crude in the past, is now being made immeasurably more sophisticated with the implementation this year of Professional Standards Review Organisations. Of particular relevance to drugs is Senator Kennedy's proposal to create a National Center for Clinical Pharmacology, some of the specific aims of which are to create new methods of controlling drug utilisation.

One of my special interests in legislation and regulation is in the outcome of an experiment-of-nature, namely the international differences that arose between Britain and the United States in regulating the introduction of new drugs to the market in the 1960s. In 1962, the Kefauver-Harris Amendments to the USA Food, Drug and Cosmetics Act made it considerably harder for new drugs to be approved for the American market. Britain adopted a slightly different approach: during most of the past decade, Britain while also adopting new and higher standards has had a less restrictive approach to approving drugs for the market, together with more input to the procedure by the medical professions, an appeal to education rather than regulation to guide proper drug usage, and better post-marketing drug surveillance. On studying the differences that arose,[4,21–23] it was found that in nine therapeutic categories during the decade 1962–71, nearly four times as many new drugs (i.e. single chemical entities) became exclusively available in Britain as in the USA. In addition, where differences occurred in the introduction dates of mutually-introduced drugs, twice as many drugs were introduced first in Britain as in the USA. When examined by therapeutic category, this drug lag was found to be most marked in the areas of cardiovascular, gastrointestinal and respiratory medicine, and diuretic and antibacterial therapy. This study documented what was well known abroad but not generally understood within the USA.

In the second part of the study,[23] British usage and American awareness of some new therapeutic drugs were surveyed in five therapeutic areas (angina, hypertension, asthma, pyelonephritis and gastric ulcer). It was found that certain drugs then unavailable in the USA had made a large impact on the prescribing habits of British experts, whose therapy was likely to be substantially different from that which could be prescribed by Americans. By contrast, most of the American specialists surveyed had a very low level of knowledge about those and other new drugs not yet available to them, despite the fact that some of those drugs had been in widespread use abroad in their own specialties for up to a decade. (Those Americans who were aware of a drug's properties, however, usually wished to have that drug available to them.) The lack of American awareness of new (and even not-so-new) drugs was unexpected and surprising.

In the third part of the study, the implications of these substantial

international differences in the availability, use, and knowledge of new therapies were analysed to determine whether, in therapeutic terms, Britain had gained or lost from adopting the less restrictive policy.[4] The therapeutic impact of a new drug on the whole community was found to be difficult to assess, mainly because there are few methods or data available for measuring the benefits drugs confer. On the evidence currently available, Britain probably did not lose appreciably from the introduction of a greater number of new drugs, nor from the possibility that a few of these may have been of questionable value. The main deleterious effect was that Britain suffered more toxicity from new drugs than did the USA, as could be anticipated from the fact that more new drugs were marketed in Britain. However, in comparison with the size of the *total* burden of drug toxicity, that portion due to new drugs was found to be extremely small, and would in any case be at least partially offset by the adverse effects of older alternative drugs had the latter been employed instead. Conversely, Britain experienced clearly discernible gains by introducing useful new drugs either earlier than the United States or exclusively. On balance, Britain appeared to have gained in comparison from its less restrictive policy toward the marketing of new drugs coupled with a more rigorous programme of post-marketing surveillance.

It should be clearly understood that these differences are not due solely to legislative and regulatory factors; several other influences are involved, especially in the form of decisions made in the pharmaceutical industry. However, legislative and regulatory factors are undeniably important, a point made by the FDA itself.

There are important lessons to be learned from the bold American actions taken over the past twelve years to tighten the legislation and regulation of drugs and therapeutics. Like the drugs they set out to control, the 1962 laws and their regulations have had mixed results.* It is worth noting that if judged by the very standards they set for drugs, the 1962 laws themselves could not be approved because no evidence of their 'safety' or 'efficacy' exists: they were implemented in a scientifically uncontrolled manner and no measures of their effects were even sought.

We are now only beginning in retrospect to evaluate the effects of the

*Although my own and other[24] studies have dealt with one particular sector (the introduction of new drugs) in which, on the evidence currently available, the losses during the 1962 Amendments' first decade of operation appear to have outweighed the gains, this does not mean that the law itself is at fault; what we are seeing is the result of relatively subtle nuances in the law's interpretation and application. Nor does it mean that the law has been suboptimally applied in all sectors: there have, on the contrary, been obvious and important benefits which include elevation of the standards of drug investigation and control of drug promotion. It would be highly desirable to have objective measures of the law's *total* effects but at present there are insufficient data to allow this.

changes that began in 1962, and it is doubtful whether their full impact can ever be known.

The fundamental point, generally unrecognised, is that any legislative or regulatory intervention is an experiment which deserves careful planning of its design and evaluation.[25] We are now, especially in the USA, at the threshold of larger and bolder legislative and regulatory experiments that affect not only drugs but also the broader fabric of medical practice. We should at the very least acknowledge the experimental nature of these new policies and act accordingly. Their implementation should be designed as experiments with valid controls, and systems for measuring the results (costs and benefits) must be set up in advance. Only in this way can the impact of new legislation and regulation be ascertained and the benefits for society maximised.

Discussion

Professor Elmes expressed misgivings as to the peer group evaluation system being introduced in America and the legal pressures towards conformity. He pointed to the desirability of leaving room for innovations in care and to the benefits to be derived from the study of groups who had received different regimes of care. Dr Wardell concurred.

Towards the end of the debate Dr Draper again expressed the view that biologically orientated innovations in medicine could at present do little to improve health and that what he felt to be most needed was enhanced social insight. And he argued that what is required in the latter area is not simply an extended knowledge of the sociology of the health care professions and their work but of what constitutes 'good health' in the normal population. However, Dr Meade suggested that those present should not allow themselves to feel that medicine had achieved nothing in recent years and he pointed to the desirable improvements since the 1950s mentioned by Professor Campbell in the opening paper.

References

1. Campbell R R, Food Safety Regulation: cost-benefit analysis. AEI-Hoover Policy Studies. American Enterprise Institute for Public Policy Research, Washington, DC 20036, 1974.
2. Feinstein A R, 'How do we measure "safety" and "efficacy",' *Clin. Pharm. Therap.* **12**, 544–58, 1971.
3. Feinstein A R, 'The need for humanized science in evaluating medication', *Lancet*, **ii**, 421–23, 1972.
4. Wardell W M, 'Therapeutic implications of the drug lag', *Clin. Pharm. Therap.* **15**, 73–96, 1974.
5. Spodick D H, 'The surgical mystique and the double standard. Controlled trials of medical and surgical therapy for cardiac disease: analysis, hypothesis, proposal', *Am. Ht. J.* **85**, 579–83, 1973.
6. Girdwood R H, 'Death after taking medicaments', *Brit. Med. J.*, **1**, 501–04, 1974.

7. National Science Foundation, Science and Technology Policy Office, President's Science Advisory Committee: Detailed recommendations in: Report of the Panel on Chemicals and Health, Chapter 3, 13–250, September 1973. NSF 73–500, National Science Foundation, Washington, DC.
8. Brooks R G, 'Cost-benefit analyses of patients treated at a rheumatism centre'. *Ann. Rheum. Dis.*, **28**, 655, 1969.
9. Reynell P, Reynell M, 'The cost-benefit analysis of a coronary care unit'. *Brit. Med. J.*, **34**, 897–900, 1972.
10. Tietze C, Mortality with contraception and induced abortion. Studies in Family Planning 1, **45**, 6–8, 1969.
11. Tietze C, Dawson D, Induced abortion: A fact book. Reports on Population/ Family Planning **14**, 1–56, 1973.
12. Jaffe F S, Short-term costs and benefits of United States family planning programs. Studies in Family Planning 5, **3**, 98–105, 1974.
13. Simmons H, Stolley P, 'This is medical progress?'. Trends and consequences of antibiotic use in the United States. JAMA, **227**, 1023–28, 1974.
14. Cross K W, 'Cost of preventing retrolental fibroplasia?', *Lancet*, **ii**, 954–56, 1973.
15. Bolton D, Cross K, 'Further observations on cost of preventing retrolental fibroplasia', *Lancet*, **i**, 445–48, 1974.
16. Legal status of approved labelling for prescription drugs; prescribing for uses unapproved by the Food and Drug Administration. *Federal Register*, **37** (158): 16503–05, 15th August 1972.
17. Bergen R, Prescription of drugs contrary to package-insert recommendations. JAMA, **220**, 11, 1972.
18. US Senate Committee on Labor and Public Welfare, Subcommittee on Health: *Hearings on the Quality of Health Care: Human Experimentation*, **1**, 21st February 1973.
19. Dunlop D, The British System of Drug Regulation, Landau R L (ed.): *Regulating New Drugs*. Chicago Center for Policy Study, University of Chicago Press, 229–37, 1973.
20. Wardell W M, 'Control of drug utilisation in the context of a national health service: the New Zealand system', *Clin. Pharm. Therap.*, **16**, 3, part 2, 585–94, 1974.
21. Wardell W M, The drug lag, an international comparison. Proceedings of the Fifth International Pharmacological Congress, IUPHAR, July 1972.
22. Wardell W M, 'Introduction of new therapeutic drugs in the United States and Great Britain: an international comparison', *Clin. Pharm. Therap.*, **14**, 773–90, 1973.
23. Wardell W M, British usage and American awareness of some new therapeutic drugs, *Clin. Pharm. Therap.*, **14**, 1022–34, 1973.
24. Peltzman S, The benefits and costs of new drug regulation, Landau R L (ed.): *Regulating New Drugs*. Chicago Center for Policy Study, University of Chicago Press, 113–211, 1973.
25. Cochrane A L, Effectiveness and efficiency: random reflections on health services. London, The Nuffield Provincial Hospitals Trust, 1972.