

MORTALITY OF THE MEDICAL AND OTHER
PROFESSIONS WITH SPECIAL REFERENCE
TO HEART DISEASE

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The best prophet naturally is the best guesser; and the best guesser, he that is most versed and studied in the matters he guesses at: for he hath most *signs* to guess by.

THOMAS HOBBS, 1651

THIS quotation from *Leviathan* by Thomas Hobbes, mathematician and philosopher, is an apt description of the actuary's work in the field of mortality trends. The actuary realizes that much of his work is in the nature of the "educated guess" and this may indicate the division between him and others engaged in the field of vital statistics.

In "Occupation, Social Class and Mortality," *TSA XII*, 227 (1960), the writer dealt with the series of Decennial Supplements on Occupational Mortality by the British Registrar General and in particular with that published in 1958 [1],¹ the tenth of the series. This covered the census of 1951 and the deaths for the five years 1949-53 inclusive and will be referred to as the 1951 Report. This series is unique of its kind and is a mine of material for investigation on subjects on which little other material is available.

In the present paper the writer attributes much of the confusion in medical literature on mortality trends to the emphasis placed on "coronary disease" as a cause of death. However, regarding the group of diseases known on the North American Continent as cardiovascular-renal disease he establishes that the medical and other professions do experience a definitely higher mortality from this disease. Figures from the U.S. and England are given for the medical profession; figures relating to other professions are available only from the Registrar General's reports.

The previous Registrar General's supplement on occupational mortality which we refer to as the 1931 Report [2] was based on the census of 1931 and deaths for the three years 1930-32, there having been none in the intervening years because of the War. In that report a figure of 368 was given as the S.M.R. (Standardized Mortality Ratio) for deaths of "Physicians, Surgeons, etc." from "Angina pectoris." The corresponding figure

¹ Numbers in brackets refer to the references at the end of this paper.

twenty years later in the 1951 Report was 159. These figures are the ratios of actual to expected deaths, 100 representing the S.M.R. of "All Males" from the same disease: the age range is 20 to 64.

CORONARY DISEASE NAMED DOCTOR'S DISEASE

Following the publication of the figure 368, coronary disease, angina pectoris, coronary artery disease, ischemic heart disease, arteriosclerotic heart disease and the other names given or describing this affliction have

TABLE 1
CORONARY DISEASE, ANGINA PECTORIS
(Code No. 94: International List of Causes of Death, 1929 Edn.)
REGISTRAR GENERAL'S OCCUPATIONAL SUPPLEMENT, 1931
ENGLAND AND WALES
MALES: AGES 20-64

HIGHEST		ALL CAUSES	LOWEST		ALL CAUSES
Occupational Group	Coronary Disease Angina		Occupational Group	Coronary Disease Angina	
Physicians, Surgeons, etc.	368	106	Coal Mines—Other Workers below ground.	40	100
Wholesale Proprietors, etc.	235	99	Stone Miners, Quarriers	38*	89
Judges, Barristers, Solicitors, etc.	227	95	Agricultural and Gardeners' Labourers, etc.	32	71
Clergymen (Anglican Church)	218	69	Workers in Chemical Processes.	20†	66
All Males.	100	100	All Males.	100	100

* 6 deaths only.

† 2 deaths only.

also become known as "Doctor's Disease" on the assumption that medical men are peculiarly susceptible to it. There is also a fairly general acceptance, according to medical literature, that the disease afflicts business executives in far greater measure than the average; that it is increasing in intensity (the word "epidemic" is even used), and that it is associated with the modern pace of living.

Table 1 gives the occupational groups with the four highest and four lowest S.M.R.'s due to "Angina pectoris" in the 1931 Report, together with their S.M.R.'s from "All Causes." The traditionally low mortality of Anglican Clergy is confirmed by an S.M.R., "All Causes," of 69, but why

should the relative death rate from "Angina pectoris" be double the average?

The four highest ratios for deaths from "Angina pectoris" all refer to professions and the upper business owning class. The lowest ratios of all for both Angina and All Causes refer to "Workers in Chemical Processes," hardly considered as a healthy industry! Further the Angina S.M.R. of the latter group, given as 20, is based on two deaths only and the 38 for Stone Miners and Quarriers on six deaths only. The figures in Table 1 have been quoted in a well-known English textbook on heart diseases [3] as establishing the fact that "angina pectoris is a doctor's disease."

ERRORS IN OCCUPATIONAL RATES OF MORTALITY

Mortality rates of occupational groups are particularly susceptible to error. They are based on the comparison of the numbers engaged in any occupation as reported at the census date and the number dying reported as following that occupation or retired from it at the date of death. There are errors due to changes in occupation between census and death. Further, the occupation is generally given by the party himself at the census but by relatives to the best of their knowledge at death. There is a chronic tendency by relatives to upgrade the social status of the deceased.

In the writer's 1960 paper in *TSA* these errors were discussed in some detail. The discrepancies indicated in the sample analyzed in the Registrar General's 1951 Report of matching occupations at death and at the census were so great that the determination of the British investigators in going ahead was commented upon but the proviso was added: "In the opinion of the writer, the value of the results given in the Report raises questions as to the validity of the so called sample." The writer was not aware at that time of the major error made in the tabulations on which the 1951 Report was based and which is referred to in the Addendum to this paper.

ERRORS IN MORTALITY RATES OF SPECIFIC DISEASES

Death rates from specific diseases are subject to challenge on grounds which have been outlined in previous papers by the writer [4]. Two quotations will explain the difficulties. Alan E. Treloar, Professor of Biostatistics at the University of Minnesota has stated [5]:

The causation of a given death is always multiple so that the necessity of selecting a single cause for purposes of tabulation has become a distressing problem.

Physicians are required on death certificates to specify the primary or underlying cause of death as that condition or injury that initiated the train of morbid events leading directly to death. Formerly death was most

often caused by infectious or communicable diseases when the cause of death could be expressed as a single term.

As length of life increases, however, with the conquest of such diseases, ageing permits the development of degenerative processes that affect many body systems. The question then arises as to which of several existing conditions caused death [6].

There are some 800 rubrics or headings in the *International Statistical Classification of Causes of Death* (Sixth Revision). These include almost 60 separate headings for "Diseases of the Circulatory System," *i.e.*, diseases of the heart and arteries. Possibly cardiologists can justify each of these sixty odd rubrics, but the great majority of death certificates are completed by busy medical practitioners.

Mr. E. A. Lew gives additional evidence [7] on the care to be exercised in accepting coronary artery disease as a cause of death on medical certificates.

Even postmortem results are challenged. The following quotation given in the writer's recent paper [4] to the Institute of Actuaries is important enough to be repeated. It was taken from a paper in the well-known medical journal *The Lancet* published in London. It is entitled "Effects of Atherosclerosis on the Coronary Circulation" [8] (atheromatous deposits on the walls of the coronary arteries—the word atheroma being derived from the Greek word for porridge) and one of the authors was Professor of Pathology at the University of Durham, England.

. . . arterial thrombosis is in most instances localized, and the narrowing which results from it is usually confined to short lengths of the vessels often no more than one millimetre or two in extent. Therefore, to detect such narrowing the exhaustive research through all the major branches of the coronary system is required, irrespective of whether the vessels appear grossly atherosclerotic or not. . . .

CORONARY DISEASE—THE TREND IN ENGLAND

Table 2 indicates the trend of the death rate from the disease designated as "coronary disease," etc., in England and Wales over the period from 1920 to 1958. The divisions in the table are due to changes in procedure from 1940 on and the adoption of new codes and new tabulations. The figures are given as they appear in the Registrar General's annual reviews.

For males there is an increase in the death rate from this disease from 32 in 1920 to 156 in 1930. Then the rate doubles from 1931 to 1937 and doubles again from 1941 to 1949, with a 50% increase from 1949 to 1958. The figures for 1960 just issued show a further increase. The trend for

female deaths from this cause was similar. All these amazing increases from 1920 to 1949 occurred over a period when the death rate from *all* causes and at *all* ages had been on the decline and for female lives remarkably so.

CORONARY DISEASE—THE TREND IN THE U.S.A.

Table 3 shows the trend in the U.S.A. in death rates from "coronary disease," etc., from 1940 to 1958 in two divisions and as taken or calcu-

TABLE 2
CHANGES IN DEATH RATES
CORONARY DISEASE, ANGINA PECTORIS
ARTERIOSCLEROTIC HEART DISEASE
ENGLAND AND WALES

Angina Pectoris: Code No. 89 Standardized Annual Death Rates per Million Living					
Year:	1920	1924	1926	1928	1930
Males.....	32	53	52	101	156
Females.....	13	19	20	35	53

Diseases of the Coronary Arteries, Angina: Code No. 94 Standardized Annual Death Rates per Million Living					
Year:	1931	1935	1937	1938	1939
Males.....	168	279	338	360	406
Females.....	59	107	128	144	153

Diseases of the Coronary Arteries, Angina: Code No. 94 Comparative Mortality Indexes, 1938 = 1,000					
Year:	1941	1943	1945	1947	1949
Males.....	1,099	1,222	1,438	1,851	2,244
Females.....	1,084	1,198	1,384	1,765	2,314

Arteriosclerotic Heart Disease including Coronary Disease, Code No. 420 Standardized Mortality Ratios (Base Years 1950-52 = 100)					
Year:	1949	1952	1954	1956	1958
Males.....	82	105	112	121	129
Females.....	84	103	108	119	129

lated from the annual volumes of the U.S. National Office of Vital Statistics. For white male lives the increase from 1940 to 1948 was 47% and for the period 1950 to 1958 it was 21%. For white female lives the increases were 33% and 32% respectively. These are based on the crude death rates.

A FASHIONABLE MODE OF DYING?

Unless all our experience and knowledge are at fault we cannot accept these major changes in this cause of death as anything more than changes in fashion or nosological preferences of the certifying physician, and much expert testimony could be quoted to support this.

TABLE 3
CHANGES IN DEATH RATES
CORONARY DISEASE, ANGINA PECTORIS
ARTERIOSCLEROTIC HEART DISEASE
UNITED STATES: WHITE LIVES
CRUDE DEATH RATES PER MILLION LIVING

	ARTERIOSCLEROTIC HEART DISEASE INCLUDING CORONARY DISEASE CODE No. 420			DISEASES OF THE CORONARY ARTERIES, ANGINA PECTORIS CODE No. 94		
	1958	1950	Increase 1950 to 1958	1948	1940	Increase 1940 to 1948
Males	3,572	2,940	21%	1,676	1,143	47%
Females	2,057	1,560	32%	655	492	33%

CARDIOVASCULAR-RENAL DISEASE

In the literature on vital statistics in the U.S. it has been customary for many years to consider the group of diseases called cardiovascular-renal disease or c.v.r. for short. The combinations for c.v.r. disease used in this paper are Codes 330-334, 410-468, and 590-594 of the International List (Sixth Revision) or, generally, vascular lesions affecting central nervous system, diseases of the circulatory system, nephritis and nephrosis; to the layman these are cerebral hemorrhage, diseases of the heart and kidney disease.

The importance of the c.v.r. combination is that the effect on the group as a whole of the various changes in procedure, in coding, and transfers between rubrics and nosological preferences, are reduced to a minimum when the whole category is considered. Justification for the category may be found in Dublin and Lotka's *Twenty-five Years of Health Progress*, being

a study of the mortality experience of the Metropolitan Life Insurance Company of New York. The following statements made then in 1937 apply with even greater force today.

The functions of the heart, kidneys and blood vessels are so interrelated that the premature breakdown of one of these vital systems places an added strain upon the others and hastens their disintegration. As a result, diseases of these organs often co-exist in the same individual.

The cardiovascular-renal diseases usually develop insidiously and over a considerable period of time, so that it is often difficult to determine in which one of the group was initiated the chain of pathological changes which finally led to death. In considering the group of causes as a whole, this difficulty is largely overcome.

The c.v.r. category represented 45% of the male deaths from all causes in the age range 35 to 70 in England and Wales in the years 1956 to 1958. In the U.S.A. the ratio was 55%, indicating the greater importance of the category in that country (white males).

Should the point be made that researchers wish to know the trend of disease in greater detail than the c.v.r. category allows, one can only reply that national statistics are unsatisfactory for such fragmentation under the present system. Should the figures for individual rubrics of the c.v.r. category be used, they should be regarded with skepticism unless justified by other considerations.

MORTALITY OF SOCIAL CLASSES

Table 4 gives a summary of the Standardized Mortality Ratios as given in the Registrar General's 1931 and 1951 Reports on occupational mortality. It shows the mortality of medical practitioners in England and Wales relative to three other professions and also to the various social classes into which the population has been divided. The S.M.R.'s are given for "All Causes," "Cardiovascular-renal disease," the latter added to bronchitis and for "Coronary disease, angina." The ratios are given for wives classified in accordance with the occupation and hence social class of the husband. In this way by comparing husbands and wives it can be determined whether the relative S.M.R. of the husband is due to occupation which should not affect the death rate of the wife, or to environment when it should do so.

The reason for the classification of "C.V.R. and Bronchitis" is that prior to 1940 when a heart impairment was recorded on the same death certificate as bronchitis, priority was given to the heart impairment in recording the cause of death. At the older ages in England bronchitis is an important cause of death, judging from the records, and has been named

“English Disease.” When comparing heart disease death rates before and after 1940 this factor must be taken into account. Further, bronchitis is closely related to social class environment, the 1951 Report showing an S.M.R. for males in the lowest social class V of five times that in the highest social class I and over four times for the wives.

The five social classes are indicated by the following description:

TABLE 4
SOCIAL CLASSES AND PROFESSIONS
STANDARDIZED MORTALITY RATIOS (S.M.R.): ENGLAND AND WALES
AGES 20-64

	MALES (ALL MALES = 100)				WIVES (ALL WIVES = 100)			
	All Causes		C.V.R.		All Causes		C.V.R.	
	1931	1951	1931	1951	1931	1951	1931	1951
Medical Practitioner.....	106	89	137	129	79	84	83	73
Clergy (Anglican).....	69	81	85	122	85	80	60	78
Other Clergy.....	74	78	85	109	72	78	72	79
Legal Profession.....	95	88	104	110	n.a.	81	n.a.	66
I.....	90	93	104	105	81	88	67	86
II.....	94	88	105	105	89	89	85	83
III.....	97	101	96	102	99	101	99	101
IV.....	102	104*	99	86	103	104	108	108
V.....	111	118	105	102	113	110	117	110
	C.V.R. and Bronchitis		Coronary Disease, Angina		C.V.R. and Bronchitis		Coronary Disease, Angina	
	1931	1951	1931	1951	1931	1951	1931	1951
Medical Practitioner.....	125	112	368	159	80	71	†	106
Clergy (Anglican).....	78	103	218	153	57	76	†	82
Other Clergy.....	79	92	211	130	68	73	†	93
Legal Profession.....	95	97	227	121	n.a.	61	n.a.	75
I.....	97	100	237	161	65	81	157	97
II.....	100	96	147	116	84	83	126	130
III.....	96	102	96	105	99	101	93	101
IV.....	101	89	67	79	109	109	85	104
V.....	110	114	67	89	120	114	88	105

n.a. = not available.

* Adjusted to 1931 Classification.

† Ten or fewer deaths.

Class I—Professional: law, medicine, the Church, stockbrokers, bankers, the highest ranks of the Civil Service and business, including company directors, commissioned officers of the armed forces.

Class II—Managerial: owners of businesses, farmers, teachers, technicians and accountants.

Class III—Skilled Occupations: clerks, salesmen and sales clerks, foremen, fitters, armed forces (other ranks).

Class IV—Partly Skilled Occupations: machine minders, agricultural workers.

Class V—Unskilled Occupations: laborers (building and dockyard).

Reference has been made to the error in the Registrar General's 1951 Report (see Addendum). An important group of occupations was classified as Social Class I for deaths but Social Class II in the census returns. On this account the S.M.R.'s for both social classes I and II are combined in Table 4 and for comparative purposes this has also been done with the 1931 Report figures.

From Table 4 the following is noted:

(i) The increase of mortality from "All Causes" with lowering social class is shown. This would be expected, as all that is conducive to health, medical service and appreciation of the means to achieve health, is enjoyed in increasing measure as one moves up the social classes. This criterion is not satisfied by the S.M.R.'s for "Coronary disease, angina" for males either in the 1931 or 1951 Reports, the precipitate fall in the 1931 ratios from Class I to Class V being particularly noticeable. For wives the trend in "Coronary disease, angina" by social class also shows a precipitate fall from Class I to Class V in 1931, but the trend is reversed in 1951.

(ii) One would expect the S.M.R. for "C.V.R. and Bronchitis" to be high for Social Class V and the definite increase with lowering social class of wives in this category should be noted for both 1931 and 1951 Reports.

(iii) Considering the "C.V.R." category for the 1931 Report and bearing in mind that the selective rules would favor a record of heart disease in the lower social classes where bronchitis is a serious disease, it is surprising to note that social classes I and II combined give a high relative S.M.R. for c.v.r. disease for males, namely 105. For the 1951 Report where the selective rule would not operate, the same feature exists for male lives. As stated in (i) above, mortality should increase with the lowering of the social class and any reverse tendency should arrest our attention. For wives, the S.M.R. is unmistakably upwards with lowering social class for the "C.V.R." category.

THE PROFESSIONS

The importance of the figures regarding the four professions indicated in Table 4 is that errors in matching census and death returns would be

reduced to a minimum in these professional occupations. The descriptions in the 1951 Report of these occupations are: "Registered medical practitioners, radiologists"; "Clergymen (Church of England)"; "Ministers of other religious bodies (excluding Anglicans and Roman Catholics)"; "Judges, barristers etc., solicitors." Comments on their figures in Table 4 follow:

(i) The abnormally high S.M.R.'s for "Coronary Disease, angina" of these professions for both the 1931 and the 1951 Reports, particularly the former, are very evident in the table, namely 368 and 159. There is no reason why they should not be discredited as figures for this disease have been when considered previously in this paper.

(ii) For "All Causes" the relative S.M.R. of medical practitioners has definitely improved between 1931 and 1951 (106 to 89) and in the 1951 Report the 89 compares with 88 for social classes I and II combined. At 89, when compared with 100 for "All Males," the Medical Practitioner appears to enjoy a better over-all mortality than the average in the age range 20 to 64 which is being considered.

(iii) However, whether "C.V.R." disease or "C.V.R. and Bronchitis" is considered, the Medical Practitioner has a substantially higher comparative mortality than either of the other three professions or social classes I and II combined, the S.M.R.'s being as follows for c.v.r. disease, "All Males" being 100.

	Medical Practitioner	Anglican Clergy	Other Clergy	Legal Profession	Social Classes I and II Combined
1951..	129	122	109	110	105
1931..	137	85	85	104	105

(iv) It would not be expected that wives would share the husband's occupational disabilities where any exist, and in fact where the wives of professional men are concerned it would be expected that they would show a preferred position mortalitywise. This is confirmed by Table 4 if the figures for "Coronary Disease, angina" be ignored.

THE MEDICAL PRACTITIONER AND OTHER PROFESSIONS

A summary of Table 4 indicates that although the relative position of the Medical Practitioner has improved since 1931 and although his death rate from all causes is definitely below the average, yet so far as c.v.r. disease is concerned his death rate is definitely above that of other professions and of the social class with which he would normally be compared.

Further, the higher social class of professional men, administrators and managerial callings, although experiencing a lower mortality rate than the average, appears to be subject to a definitely higher mortality rate where c.v.r. disease is in question.

DEATH RATE BY AGE

A point of interest is whether the advantage or disadvantage in mortality is concentrated in any particular age groups. The same point of interest arises as regards "C.V.R." disease or "C.V.R. and Bronchitis." Table 5

TABLE 5
 MEAN ANNUAL DEATH RATE PER 1,000 "ALL MALES"
 AND
 RATIOS OF DEATH RATES OF PROFESSIONAL MEN TO "ALL MALES"
 REGISTRAR GENERAL'S 1951 REPORT—OCCUPATIONAL MORTALITY
 ENGLAND AND WALES

	AGE GROUP				
	35-44	45-54	55-64	65-69	70-74
	All Causes				
All Males	2.87	8.21	22.95	44.38	68.07
Medical Practitioner	80%	90%	92%	89%	90%
Clergy (Anglican)	76%	81%	83%	86%	83%
Other Clergy	54%	71%	85%	82%	93%
Legal Profession	68%	90%	98%	97%	92%
	C.V.R. Disease				
All Males	0.70	2.74	9.36	21.17	36.15
Medical Practitioner	109%	131%	134%	115%	101%
Clergy (Anglican)	106%	130%	122%	112%	91%
Other Clergy	50%	112%	117%	98%	116%
Legal Profession	96%	108%	117%	104%	106%
	C.V.R. Disease and Bronchitis				
All Males	0.78	3.25	11.45	25.24	41.77
Medical Practitioner	100%	112%	115%	100%	90%
Clergy (Anglican)	95%	112%	102%	98%	82%
Other Clergy	45%	97%	96%	86%	103%
Legal Profession	90%	96%	100%	94%	96%

gives the mean annual death rates for "All Males" as in the 1951 Report, with the ratios of the mortality for Medical Practitioners and the three other professions by age groups to that of "All Males." It is interesting to note the "hump" of the percentages as regards the professions of medicine and law with the peak at the critical age group 55-64.

ANOTHER BRITISH INVESTIGATION

The only other figures available relating to Coronary Disease of Medical Practitioners in Britain with which to compare the R.G.'s figures are given in Morris, Heady and Barley's paper in the British Medical Journal, 1952 [9]. The figures are based on the 6,000 male medical practitioners who were members of the Medical Sickness Annuity and Life Assurance Society, Ltd. in the years 1947-50, representing about one quarter of the male doctors in the country in the ages studied. The main value of the paper is regarding the *incidence* of coronary disease. However, the standardized death rates per 1,000 aged 40-59 from Coronary Heart Disease are given as follows:

General Practitioners	2.4
Other Doctors (specialists, consultants, etc.)	1.5
All Doctors	2.0
Males (England and Wales, 1950)	1.4

The paper comments on these figures as follows.

In comparing the 1.5 and 1.4 . . . even under 60 years of age there still are quite a number of deaths ascribed to "myocarditis," etc., in the Registrar General's Tables which are not included in the 1.4; among the medical practitioners the number so diagnosed is quite negligible.

This statement gives further support to what has been stated above as to the dubiety of mortality rate comparisons of coronary heart disease. No figures were given in the paper by which a comparison of the mortality from c.v.r. disease could be made.

The difference noted between the death rates of general practitioners and specialists will be referred to again in connection with the medical profession in the U.S.

MORTALITY OF AMERICAN PHYSICIANS

The A.M.A. 1938-42 Investigation

The centenary of the American Medical Association was the occasion for an investigation of the mortality of American physicians by Dublin and Spiegelman, statisticians of the Metropolitan Life Insurance Company [10]. It covered the years 1938 to 1942 and was based on the records

of the A.M.A., showing a "living" number in mid-1940 of 175,159. A summary of the results follows:

(i) For ages 25-64 the ratio of actual to expected deaths, comparing American physicians with White Males, U.S.A. was 101% for all causes of death. For all ages it was 102%.

(ii) For decennial age groups the corresponding ratios of actual to expected deaths (all causes) were:

35-44	45-54	55-64	65-74
81%	98%	111%	105%

(iii) For "diseases of the coronary arteries and angina pectoris" the ratios of actual to expected in these age groups were:

151%	174%	195%	190%	(ages 25-64: 183%)
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(iv) For the category of cardiovascular-renal disease the corresponding ratios of actual to expected deaths were:

119%	134%	134%	113%	(ages 25-64: 130%)
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The ratios for c.v.r. disease in the Registrar General's 1931 Report for Medical Practitioners versus All Males to be compared with (iv) above are:

104%	144%	137%	102%
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For coronary disease the over-all ratio in the Registrar General's 1931 Report of 368 for ages 20-64 indicates much higher ratios by age than in (iii) above.

The A.M.A. 1949-51 Investigation

A more recent investigation into the mortality of American physicians based on the records of the American Medical Association covers the years 1949-51 [11]. The "living" as of April 1950 were 204,450. A summary of the results is:

(i) The ratio of actual to expected deaths, ages 20-64, all causes, of American physicians relative to U.S. white males for the same period 1949-51 is 93% and by age groups (dividing ages 65 to 74 into two groups):

35-44	45-54	55-64	65-69	70-74
78%	93%	98%	101%	99%

(ii) For "Diseases of the Heart" (Codes 401,402.1, 410-443) the ratio of actual to expected deaths ages 20-64 is 112% and for the above groups of ages they are:

103%	109%	117%	115%	106%
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(iii) If to the deaths in (ii) those for Codes Nos. 330-334, 450 and 590-594 be added, thus approximating to the c.v.r. category, the ratio of actual to expected deaths for ages 20 to 64 is 109% and by groups of ages:

35-44	45-54	55-64	65-69	70-74
93%	109%	112%	112%	103%

The resemblances to the R.G.'s 1951 Report (covering deaths for the years 1949-53) are apparent: Physicians show a ratio of actual to expected deaths for "All Causes" of less than the average for all white males and a higher ratio than average for a group of diseases including the main components of heart diseases, rising to a peak for the age groups 55-64.

The figure of 93% in (i) above should be compared with 82% for U.S. Professional Workers (see *TSA XII*, p. 235). Thus U.S. Physicians compare unfavorably with their own social class in the U.S.

GENERAL PRACTITIONERS VERSUS SPECIALISTS

A paper by Dublin and Spiegelman corresponding to their paper already mentioned dealt with "Mortality of Medical Specialists 1938-1942" [12]. It was based on the same statistics, namely the American Medical Directory of 1940. Of the 175,146 physicians, 37,010 (21.1%) were described as full-time specialists and 138,136 "others (not specialists)" will be described here as General Practitioners.

The mortality in the age group 35-74 is shown as follows by the ratios of actual to expected mortality, taking the base as that of "All Male Physicians":

	All Specialists	General Practitioners	Total Number of Deaths
All Causes.....	78%	110%	12,419
Diseases of the Coronary Arteries and Angina Pectoris.....	97%	102%	2,879
Cardiovascular-renal Disease.....	81%	108%	7,442

The authors comment that the mortality of specialists from coronary disease is not much different from that of nonspecialists. This result differs from that of English medical men quoted above in the paper by Morris and others. The difference in the death rates from c.v.r. disease is quite striking, corresponding to that of "All Causes." The authors also comment on the self-selection exercised in continuing studies to become a specialist and the higher earnings enabling longer vacations. Further the concentration of specialists in large urban centers must be a factor in obtaining better medical services themselves.

There is much discussion these days on the organization of the medical profession. Can the higher mortality of the General Practitioner relative to the specialist and the higher mortality of the medical profession due to c.v.r. disease be cited as evidence that the present system should be changed as being obviously not in the interests of the General Practitioners themselves?

One would express the wish that the present statisticians of the Metropolitan Life who are both Fellows of the Society would bring the results of the investigations given in references 10, 11 and 12 up to date. I am informed that the American Medical Association does not intend to continue with its decennial investigation of physician mortality.

HIGHER C.V.R. DEATH RATE IN U.S.

One of the main characteristics of U.S. white male mortality compared with that of England is a much higher mortality rate from c.v.r. diseases. References 4 review this subject in some detail. The ratios of the rates of mortality from c.v.r. disease in the U.S. (white lives) to those in England, for the three years 1956-58 were as follows:

	35-44	45-54	55-64	65-69	70-74
Males.....	155%	153%	131%	119%	106%
Females.....	96	107	110	111	100

If the comparison had been made for the combined death rates due to c.v.r. disease *and* bronchitis the ratios would be much reduced at the older ages, for as stated above it is a serious cause of death in the lower social classes in England yet negligible in the U.S. However, in comparing physician or professional class mortality in both countries it may be ignored.

Is there any possible relationship between the excessive male mortality due to c.v.r. disease in the U.S. relative to England and the excessive mortality of professional men and, in particular, medical practitioners in both countries from that disease?

A STATE OF TENSION?

The writer is only too well aware of the facile explanations which are so readily given of mortality trends. However, having lived in both Canada and the U.S. as well as England he makes the following observations deferentially.

The long "fall" season in the U.S. gives a sense of euphoria (well-being) which is unduly stimulating. The caricature of the "big business executive" with several telephones on his desk all ringing at the same time has a

basis of fact. The concern of many large U.S. organizations for the health of their senior executives is due to the undue toll taken by c.v.r. disease and death. It is due to a state of tension—the notion that the best work is accomplished when one is keyed up to a high pitch as well as everyone else in the near field. It may be queried whether this state of tension can be maintained continuously without penalties.

The corresponding picture of the General Practitioner in England as well as other professional people and senior business executives who are subject to this more or less permanent state of tension in what is a relaxing climate may explain the greater mortality due to c.v.r. disease among them.

A comment on this from a U.S. source is the textbook on *Heart Disease* [13] by the eminent cardiologist Dr. Paul D. White. In the first edition, 1931, he had a separate chapter on angina pectoris and in italics he stressed its increase according to his personal experience with the comment: “the most effective move that we can make is to call a halt on the world’s mad rush of to-day.” In later editions the paragraph containing this statement was not italicized and in the latest editions it was omitted entirely. Quotations could be given indicating that every era seemed to observers then living to have its stresses from which apparently previous ages were free.

In a recent address in Toronto (March 1962) Dr. White expressed optimism as to the trend of atherosclerosis but emphasized the mystery of it all. He did refer to our “American Way of life” or as he phrased it, “The Misuse of Prosperity,” namely: rich food, overeating, using an automobile for a distance of a few hundred yards or an elevator or escalator to avoid a dozen steps or so.

The following figures indicate that his optimism is justified as regards U.S. white lives, for their age-adjusted death rates for cardiovascular-renal disease, per million living, are as follows:

	1949	1951	1953	1957	1958	1959
Males	5,288	5,078	5,058	5,060	5,060	5,003
Females	3,573	3,301	3,243	3,113	3,090	3,014

The codes used here are 330-334, 400-468 and 592-594 (I.S.C. 6th Edition). Omitting 590 and 591 is of trivial effect.

For England and Wales the figures for the c.v.r. category are not quoted by the Registrar General, but in Table 6 the Standardized Mortality Ratios for three groups comprising the c.v.r. category are given, indicating

that the trend for c.v.r. disease in England for females is the same as for the U.S., namely, downwards, but for males the best that can be said is that it is not moving upwards.

I wish to thank Mr. Ross Gray, F.S.A., for reading and commenting on the original manuscript on which the paper is based.

TABLE 6
COMPONENTS OF CARDIOVASCULAR-RENAL DISEASE
STANDARDIZED MORTALITY RATIOS (S.M.R.)
ENGLAND AND WALES 1950-1952 = 100

	1953	1955	1957	1958	1959	1960	NUMBER OF DEATHS 1958
	Diseases of the Circulatory System: Codes 400-468						
Males.....	95	98	95	98	94	96	99,907
Females.....	92	92	86	89	85	86	97,738
	Vascular Lesions Affecting Central Nervous System: Codes 330-334						
Males.....	99	105	100	102	100	99	31,298
Females.....	97	101	97	99	96	96	44,879
	Nephritis and Nephrosis: Codes 590-594						
Males.....	86	76	69	66	58	60	2,158
Females.....	80	70	58	57	51	49	1,920

ADDENDUM

ERROR IN REGISTRAR GENERAL'S 1951 DECENNIAL SUPPLEMENT ON OCCUPATIONAL MORTALITY

The writer only learned of this error after submitting a paper to the Institute of Actuaries which was presented in October 1961. The adjusted figures of the Standardized Mortality Ratios by Social Class given below affect the figures given by the writer in his paper to the Society in *TSA XII*. The following extract based on that which appears in *JIA* should serve to correct the record.

The error was announced in the course of a paper by Dr. W. P. D. Logan of the General Register Office entitled "Occupational Mortality" to the Royal Society of Medicine and reproduced in their *Proceedings*, Vol.

52, page 463. A majority of the deaths of "company directors (so returned)" and representing 10% of the total for Social Class I were presumably those of directors of small businesses and were "probably assigned in the Census tables to Social Class II." Mr. R. H. Daw, F.I.A., in a review of the Supplement which appeared in *JIA* 85, p. 104, noted the Standardized Mortality Ratio of 1,443 for this class and 1,496 for their wives compared to 100 for all male lives and wives respectively and gave it as an example of the noncorrespondence of death registration and census returns. The error vitiates the figures wherever given for Class I (professional) and Class II (intermediate between professional and skilled workers) throughout the enormous material of 431 foolscap pages of figures, apart from the companion "Commentary" volume of 171 pages. The only adjusted figures apparently available are those for the S.M.R. males, all causes of death, as shown in the table below, where the incorrect figures as published in the Supplement are also given for identification. Thus in any comparison in the 1951 Supplement the figures for Social Classes I and II must be combined as for wives as shown in the table.

With the corrected figures, the upward trend in mortality in England with the lowering of social class is definite in each period covered.

STANDARDIZED MORTALITY RATIO (AGES 20-64) BY SOCIAL CLASS

ENGLAND AND WALES, 1949-53						
	Males				Married Women	
	1921-23	1930-32	1949-53		1930-32	1949-53
			Published*	Corrected		
All occupied and retired.....	100	100	100	100	100	100
Social Class:						
I.....	82	90†	100	86	81}	89
II.....	94	94	90	92	89}	
III.....	95	97	101	101	99	101
IV.....	101	102	104	104	103	104
V.....	125	111	118	118	113	110

* The "published" figures above are when classification corresponds with that in 1930-32.

† When "Company directors (so returned)" are moved to Class II this figure is reduced to 88.

NOTE ON CODES FOR CARDIOVASCULAR-RENAL DISEASE

(International Standard Classification, Sixth Revision)

In the Registrar General's 1951 Report, although the aggregation Cardio-Vascular Diseases (330-334, 400-468) is used for Areal mortality,

the complete range, Codes 400-468, is not given for deaths by social class or occupation. It was necessary to sum the items given to approximate to the category cardiovascular-renal disease. There appears to be no official acceptance of the category c.v.r. disease.

In this note the various aggregations included in c.v.r. disease are summarized and their significance indicated in the age range 20-64 by showing the total number of deaths for "All Males" in each division as a percentage of the whole range 330-334, 400-468, 590-594 for three of the years of the 1951 Report, namely 1950, 1951 and 1952.

Code	Brief Description	Percentage
330-334	Vascular Lesions of Nervous System	18.70
400-402	Rheumatic Fever	0.29
410-422	Arteriosclerotic and Degenerative Heart Disease, Chronic Rheumatic Heart Disease	62.16
430-434	Other Diseases of the Heart	2.97
440-447	Hypertension	7.79
450	General Arteriosclerosis	1.39
451-468	Other Diseases of the Circulatory System	1.91
590-591	Acute Nephritis, etc.	0.66
592-594	Chronic Nephritis, etc.	4.13
		100.00

The aggregation favored by the writer follows that of Lew and Spiegelman in *TSA IX*, 160, entitled "principal cardiovascular-renal diseases," and omits from the above list Codes 400-402, thus aggregating 99.71% of the total.

That favored by the U.S. National Office of Vital Statistics, entitled "major cardiovascular-renal diseases" omits Codes 590 and 591, thus aggregating 99.34% of the total.

The aggregate based on the items given in the Registrar General's 1951 Report and used in this paper to give results based on that report, omits Codes 400-402, 430-434 and 451-468, thus aggregating 94.83% of the total.

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DISCUSSION OF PRECEDING PAPER

EDWARD A. LEW:

We are indebted to Mr. Pedoe for his thoughtful discussion of two interesting and controversial aspects of current mortality trends: the marked increase in the reported death rate from coronary disease and the relative mortality of the medical and other professions.

It should not be surprising that the rise in the death rate from coronary disease has been so difficult to interpret. It was not until about 1920 that the medical profession became interested in acute coronary obstruction and in disturbances of coronary circulation and not until 1930 that coronary disease was made a separate category in the classification of causes of death. In these years the concept of heart disease underwent radical changes, with a resulting shift in diagnostic emphasis from chronic valvular disease and some forms of acute heart disease to myocardial disease, particularly involving the coronary arteries. This was accompanied by major improvements in diagnostic criteria and facilities. The ingathering of physicians into the armed forces during World War II produced some greater uniformity in the diagnosis and certification of heart disease. In 1949, however, a fundamental change was made in the procedures and classifications used for recording causes of death, and this has largely invalidated direct comparisons between death rates from coronary disease prior to 1949 and those reported later. Furthermore, an even broader concept of arteriosclerotic heart disease began to gain acceptance, so that this diagnosis came to be increasingly used by coroners and medical examiners in cases of sudden death or where the deceased had not received medical attention.

There has been a time and an educational lag in the reporting of arteriosclerotic heart disease as a cause of death. For instance, the states which in 1940 reported the highest death rates from this cause showed the smallest increases in death rates from coronary disease during the 1940's, while the states with the lowest death rates in 1940 showed the greatest increases. The same was substantially true of the death rates from arteriosclerotic heart disease during the 1950's. The fact that the 1949-51 death rates from arteriosclerotic heart disease were highest in New York and California and lowest in New Mexico and Arkansas, with states like the latter showing by far the largest increases in death rates for this cause, suggests that the lag has been greatest in areas where medical standards and facilities have been poorest. Analogous differences in the quality and quantity of medical care have probably been responsible for a substantial part of the differences in death rates from arteriosclerotic

heart disease between the medically backward and the medically advanced countries.

One of the basic difficulties is that the etiology of arteriosclerotic heart disease is largely unknown, but many factors associated also with several other diseases are believed to be implicated in its development. A large proportion of deaths appears to involve two or more diseases, as indicated by the fact that three out of five death certificates filed in the United States show two or more diagnostic entries, so that the selection of a particular diagnosis as the cause of death may in some cases be arbitrary. In a 1956 study made in Pennsylvania hospitals, it was found that in half the cases of arteriosclerotic heart disease the kind and amount of diagnostic information available were characterized as sketchy, and in about an eighth of the cases it was concluded on review that the original diagnosis of arteriosclerotic heart disease had been doubtful or incorrect.

Despite the advances in our understanding of heart disease and despite more accurate diagnostic criteria, the certification of arteriosclerotic heart disease as the principal cause of death will remain questionable to a degree so long as it continues to rest in part on subjective judgments of physicians with widely diverse medical backgrounds. I agree heartily with Mr. Pedoe that mortality rates for broader categories, such as the principal cardiovascular-renal diseases, provide a better basis for judging mortality trends and for international comparisons.

A recently published mortality study by occupation, based on the 1950 United States Census (*Mortality by Occupation and Industry, Vital Statistics—Special Reports*, Vol. 53, No. 2 [September, 1962]), sheds some light on the current relative mortality of the medical and other professions. The ratios of actual to expected mortality or SMR's (total male population = 100 per cent) for a number of the leading professions were as follows:

	PER CENT	
	Ages 20-64	Ages 25-29
Social scientists.....	45	46
Natural scientists.....	56	55
College presidents, professors, and instructors..	52	51
Teachers (total).....	61	58
Teachers (white).....	57	54
Lawyers and judges.....	90	90
Physicians and surgeons (total).....	91	84
Physicians and surgeons (white).....	89	82
Dentists.....	87	89
Clergymen (total).....	109	104
Clergymen (white).....	83	76

Thus the mortality of the medical profession in the United States was found to be close to that of the legal profession, but somewhat higher than that of white clergymen, just as in England and Wales. The mortality of physicians, lawyers, and clergymen has been very much higher than that of scientists, college professors, and teachers.

An unpublished study made in the Metropolitan of men listed in *Who's Who in America* indicates that the lowest mortality has been experienced among distinguished clergymen, scientists, and college professors while distinguished physicians and lawyers had materially higher mortality than distinguished clergymen, scientists, and college professors.

The mortality study by occupation, based on the 1950 Census, brings out that among physicians and lawyers the mortality from the major cardiovascular-renal diseases was slightly higher than that reported for the total male population, and that their mortality from arteriosclerotic heart disease was from 25 to 30 per cent higher than that in the total male population. This is in general agreement with the findings for medical practitioners and the legal profession in England and Wales.

While opinions as to the effect of mental or emotional stress upon individuals abound, the few statistical studies are at variance with one another. Dr. Henry I. Russek in a paper, "Emotional Stress and Coronary Heart Disease in American Physicians" (*American Journal of the Medical Sciences*, December, 1960), concluded that coronary disease was apparently three times more prevalent among general practitioners than among dermatologists and pathologists who were considered to be under much lesser stress than general practitioners. In a paper entitled "Emotional Stress and Coronary Heart Disease in American Physicians, Dentists, and Lawyers" (*American Journal of the Medical Sciences*, June, 1962), Dr. Russek reached the conclusion that emotional stress was an important factor in coronary heart disease, particularly in the fifties and sixties. On the negative side were the findings of D'Alonzo, Densen, Fleming, and Munn ("The Prevalence of Certain Diseases among Executives in Comparison with Other Employees," *Industrial Medicine and Surgery*, Vol. 23 [August, 1954]), of Pell and D'Alonzo ("A Three Year Study of Myocardial Infarction in a Large Employed Population," *Journal of the American Medical Association*, Vol. 175 [February 11, 1961]) and of Lee and Schneider ("Hypertension and Arteriosclerosis in Executive and Non-executive Personnel," *Journal of the American Medical Association*, Vol. 167 [July 19, 1958]).

ROBERT C. TOOKEY:

Mr. Pedoe's paper makes interesting reading, especially when the reader follows the author's advice and studies the figures with his salt

cellar close at hand. In addition to the errors and distortions in basic data pointed out by the author in this and other papers, one factor in particular must be considered when comparing doctor death rates with the population mortality rates by cause of death. Since most physicians are very perceptive diagnosticians, they would usually notice the symptoms and have advance warning of any impending cardiac problem. A doctor with any

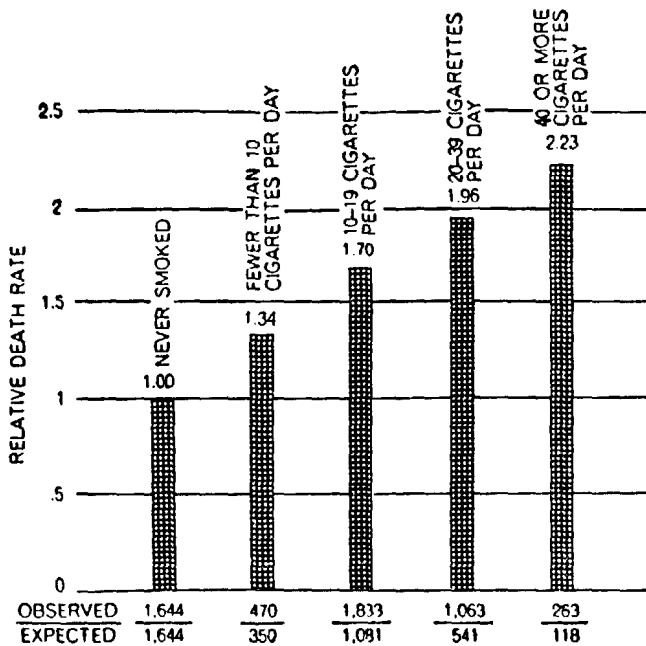


FIG. 1.—Daily cigarette consumption showed a direct correlation with relative death rate from all causes. The study followed 187,783 men between the ages of 50 and 69 for 44 months.

hint of a heart problem would probably inform at least one physician friend. It is a fair assumption that nearly all M.D. mortality from heart impairments would be accurately diagnosed, whereas this would not be the case in the general population. On the other hand, failure accurately to diagnose heart deaths in the general population is somewhat offset by the tendency to assume that death from an unknown cause would be the result of heart failure. Consequently, heart failure will often be given as the cause of death in the general population for lack of any better knowledge in these cases.

Since a high percentage of physicians are heavy cigarette smokers, it was thought that this might provide a clue to the cause of the higher coro-

nary death rate and that it might account for the difference between death rates in the United States and in England. Figure 1 is from the study of death rates by type and degree of cigarette smoking by Dr. Scuyler Hammond of the American Cancer Society.

The progression of mortality rates by number of cigarettes smoked per day is quite significant. The "observed to expected" ratios on lives who smoke cigarettes only occasionally, or who smoke cigars only and/or

TABLE 1*

Cause of Death	Observed Deaths	Expected Deaths	Excess Deaths	Percentage of Excess	Relative Death Rate
Total deaths (all causes)	7,316	4,651	2,665	100.0	1.57
Coronary artery disease	3,361	1,973	1,388	52.1	1.70
Other heart diseases	503	425	78	2.9	1.18
Cerebral vascular lesions	556	428	128	4.8	1.30
Aneurysm and Buerger's disease	86	29	57	2.1	2.97
Other circulatory diseases	87	68	19	0.7	1.28
Lung cancer	397	37	360	13.5	10.73
Cancer of the buccal cavity, larynx or esophagus	91	18	73	2.7	5.06
Cancer of the bladder	70	35	35	1.3	2.00
Other cancers	902	651	251	9.4	1.39
Gastric and duodenal ulcer	100	25	75	2.8	4.00
Cirrhosis of the liver	83	43	40	1.5	1.93
Pulmonary disease (except cancer)	231	81	150	5.6	2.85
All other diseases	486	453	33	1.2	1.07
Accident, violence, suicide	363	385	-22	-0.8	0.94

* Deaths among regular cigarette smokers, labeled "Observed Deaths," are compared with the number of deaths "expected" if the death rates for each age group among smokers had been the same as those found among nonsmokers. The table summarizes the results of the study conducted by the author and Daniel Horn. The column "Excess Deaths" can be considered as the excess number of deaths associated with cigarette smoking. "Relative Death Rate" is the observed number of deaths divided by the expected number.

pipes only, ranged from 1.09 to 1.22, indicating only a very slight additional mortality. Table 1 is taken from the same study and shows an observed to expected ratio of 1.70 for coronary artery disease among regular cigarette smokers.

Table 2 is taken from a report of the *Journal of the National Cancer Institute on Smoking Habits of Men and Women*. It compares the smoking habits of a special occupational group, doctor, dentist, and veterinarian, with those of a general population. One would infer from this table that there is actually a lower percentage of regular cigarette smokers and a

higher percentage of ex-smokers among physicians than in the general population. This seems logical in view of the doctor's professional knowledge of smoking habits and health. In fact, one eastern medical school reports that although ten years ago the smokers among their students outnumbered nonsmokers by over 3 to 1, the inverse of this ratio obtains today.

TABLE 2

	Farmer	Teacher, Legal Profession, and Clergy	Doctor, Dentist, and Veteri- narian	All Other
Age 30-39:				
Number of subjects.....	62	76	22	1,029
Per cent current cigarette.....	48.4	46.1	50.0	60.8
Per cent 21+ cigarettes.....	12.9	6.6	22.7	21.6
Number with history of regular cigarette.....	40	52	14	771
Per cent ex-cigarette.....	25.0	32.7	21.4	18.4
Age 40-49:				
Number of subjects.....	426	284	109	4,441
Per cent current cigarette.....	47.7	40.1	35.8	57.0
Per cent 21+ cigarettes.....	13.6	13.0	16.5	22.2
Number with history of regular cigarette.....	272	166	70	3,368
Per cent ex-cigarette.....	25.0	30.1	41.4	24.5
Age 50-59:				
Number of subjects.....	666	397	118	5,698
Per cent current cigarette.....	34.7	33.2	45.8	52.1
Per cent 21+ cigarettes.....	9.0	8.8	18.6	18.0
Number with history of regular cigarette.....	346	217	84	4,182
Per cent ex-cigarette.....	32.4	39.2	35.7	28.4
Age 60+:				
Number of subjects.....	904	224	74	4,167
Per cent current cigarette.....	24.2	19.2	28.4	33.9
Per cent 21+ cigarettes.....	2.4	2.2	8.1	6.1
Number with history of regular cigarette.....	357	79	37	2,431
Per cent ex-cigarette.....	36.7	45.6	43.2	41.5

Table 3, taken from a report in the *British Medical Journal* on mortality of British doctors by Doll and Hill, indicates the existence of a higher percentage of smokers among British doctors than among American doctors. In this report, the excess coronary mortality among smokers was not as great as indicated in the United States studies.

Some of these differences might be attributed to a difference in the methods of obtaining the basic data. It has been suggested that less extensive use of the electrocardiograph is made in Britain than in the United States, and in both countries considerably less use of it was made

prior to World War II than during the postwar period. This latter fact might partially explain the very steep secular trend in coronary deaths.

The higher coronary rate among general practitioners than among specialists and internists lends support to the theory that excessive stress is responsible for these heart attacks. The dermatologist, radiologist, internist, and pathologist experience less stress than the surgeon or general practitioner. The physician associated with a group wherein one doctor in the group will handle all night calls for a certain period enjoys many more nights of uninterrupted rest than the physician practicing on his own and, on the average, can expect to live longer.

TABLE 3

TOTAL NUMBER OF MAN-YEARS OF EXPOSURE BY NONSMOKERS AND SMOKERS OF DIFFERENT AMOUNTS OF TOBACCO: MEN ONLY, DIVIDED BY AGE

AGE IN YEARS	NON-SMOKERS*	ALL SMOKERS	MEN SMOKING A DAILY AVERAGE OF:		
			1-14 g.†	15-24 g.	25 g. or More
Under 35.....	10,143	25,346	12,548	10,002	2,796
35-44.....	7,130	34,081	13,625	13,380	7,076
45-54.....	4,136	28,020	9,477	10,371	8,172
55-64.....	1,907	18,002	6,333	6,514	5,155
65-74.....	1,078	11,384	5,201	3,893	2,290
75-84.....	720	5,711	3,334	1,701	676
85 and over...	136	892	616	230	46
All ages..	25,250	123,436	51,134	46,091	26,211

* A nonsmoker is defined as a person who has never consistently smoked as much as 1 g. of tobacco a day for as long as one year.

† One cigarette is equivalent to 1 g. of tobacco.

From the foregoing, we might conclude that the higher coronary rate among doctors is not due to smoking but perhaps due (a) to more accurate diagnosis of the cause of death of physicians than for the general population and (b) to the excess stress to which members of the medical profession are subjected.

Perhaps this higher coronary rate among doctors gives us a clue as to one of the reasons the output of our medical schools has lagged behind population growth and the average number of patients treated by the family physician has risen from 1,300 to 1,900 in thirty years. We might suspect that the progressive income tax, with its punitive levies upon the higher brackets, has made medicine, which exacts from would-be followers a heavy investment of time and money, a financial proposition of ever lessening appeal as inflation continues to escalate the doctor into higher

tax brackets. Nor do the persistent efforts of the administration to enact medicare, which physicians regard as the opening wedge to socialized medicine, add to its appeal. It is hoped that these factors coupled with the now known higher coronary rate among doctors do not ultimately give rise to a shortage of M.D.'s in this country.

(AUTHOR'S REVIEW OF DISCUSSION)

ARTHUR PEDOE:

The introductory quotation from Thomas Hobbes stresses my intention in the paper to emphasize the part the actuary can play and is needed to play in the field of vital statistics. Mr. E. A. Lew and Mr. R. C. Tookey by their contributions have endorsed this, their contributions being additions to, rather than commentaries on, the paper. Mr. Lew's discussion is in the best traditions of the Metropolitan Life, which has contributed so much to the study of American vital statistics.

A study of the decennial investigations of the mortality of the members of the American Medical Association indicates all too obviously the illumination of the subject when it is undertaken by actuaries, and I do trust Mr. Lew and his colleagues will note my suggestion regarding future investigations. Trends of mortality should be the particular concern of the life insurance industry, and, as "a nation's health is a nation's wealth," the profession first and foremost concerned with this, namely, the medical profession, should be foremost in our minds.

Idolatry of the statistic.—The pinch of salt to which Mr. Tookey refers is an understatement. The outpourings of figures by national and international bodies in the field of vital statistics threaten to overwhelm us. In particular the use of computers may well become a menace by increasing the volume and detail of the published figures. It appears that the greater the volume of material produced, the less effort and time are given to its consideration. This is where the actuary is needed—his "doubting Thomas" training which enables him to separate the wheat from the chaff.

The numbers of the medical profession.—Throughout this paper and its predecessor on the trend of mortality given to the Institute of Actuaries (Reference No. 4), the thought repeatedly arises as to the increasing demands on the medical profession. This is not only due to the expansion of medical knowledge and the development of medical techniques but also to the higher standards of living attained by the population showing itself in increased demands for medical services.

However, the total physician population of the United States per 100,000 population has remained practically stationary around the 133

mark since 1940. If we allow for increasing proportions of those in practice being engaged in government service, technical and research work, the proportion engaged in private practice, whether as specialist or general practitioner, has fallen substantially since 1940. Hence the mortality of the medical practitioner is a subject of national importance.

A report of the Surgeon General of the United States, *Consultant Group on Medical Education*, states: "Our hospitals are no longer able to operate without large contingents of foreign M.D.'s." The group found "it would require about 11,000 graduates annually merely to maintain the present ratio by 1975. This contrasts with about . . . 7,900 [planned] for 1965."

Medical research.—Mr. Lew refers to the contradictions in the published results of medical research. I have been surprised in reviewing medical journals on heart diseases to note, sometimes in the same issue, notification of results of research work flatly contradicting each other. The *New York Times* of November 26, 1958, quoted the president of the American College of Surgeons, that "90 per cent of medical research money was being wasted because it was not in competent hands." In particular the granting of funds for research work on a particular subject, specifically defined, is to be deplored; who knows where the next breakthrough will come from?

A new epoch in the study of heart disease has opened with the development of heart surgery. For the first time in human history, man is able to examine the living heart in action rather than deduce what is going on by listening to the sounds emanating from it; studying the heart of a corpse is quite a different matter.

Cigarette smoking.—Mr. Tookey's references to cigarette smoking might serve as the introduction to another paper. I may add that, according to the Registrar General's reports, medical men in England show up most favorably in their death rate from cancer (all sites) and also from lung cancer.

I must admit that until quite recently I was skeptical as to the relationship between lung cancer and smoking and particularly suspicious of figures as quoted from Dr. Hammond's study showing a ratio of 157 per cent for the over-all mortality of smokers to nonsmokers and with over ten times the death rate from lung cancer. I have been aware of an increasing indifference or casualness in public health matters in recent years, both in the United States and other countries, particularly where atmospheric pollution and water resources were concerned. I, therefore, felt that the stress on the effects of cigarette smoking was an unnecessary diversion. However, recent investigations under unimpeachable auspices

have been so definite in their results that one must acknowledge the seriousness of the situation.

In the United States one out of every four deaths (male, white) from cancer was due to lung cancer, the figures for 1959 being 29,332 and 128,422 deaths, respectively. In Canada the ratio is one to every six for 1960, the figures being 2,223 and 12,724, respectively; the 1959 results are similar.

Recently, the president of the Canadian Medical Association, Dr. M. R. MacCharles, (*C.M.A.J.*, March 16, 1963) addressed an open letter to the members of the Association stating: "The relationship between cigarette smoking and lung cancer has been accepted by major scientific bodies throughout the world." He requested the medical profession to show leadership in influencing the oncoming generation against cigarette smoking and themselves to refrain from smoking in public or before their patients.