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CORONARY HEART DISEASE IN MEDICAL PRACTITIONERS

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In a previous paper some aspects of the recent history of coronary disease were examined. The evidence given there supported the widely held view that there has been some true increase of coronary thrombosis and coronary heart disease during the present century, apart from the effect of the ageing of the population, and it was suggested also that this increase may not have been due to an increase of the underlying chronic atheroma (Morris, 1951). The present report turns to the contemporary situation, and gives some results of an inquiry on coronary heart disease carried out in various occupations.

There is no doubt that coronary heart disease is a major problem of the public health, and, however the certified causes of death are regarded, coronary heart disease must now be among the commonest. Little is known about its causes, and experience of other conditions suggests that examination of the epidemiology may well be rewarding. There are indications, also, from clinical experience and the figures of the Registrar-General, of social factors in coronary heart disease, in work and mode of life, and these clues must be followed up. If coronary heart disease is in fact commoner than it used to be, environmental *changes* with which the increase may be associated must be sought, however indirectly such changes may seem to operate.

An investigation has been conducted in several occupational groups; and the results of this study in one group, medical practitioners, are now being given because the information was obtained in a special way and because it is likely to be exceptionally reliable. There is some general feeling, too, that doctors may suffer more than others from coronary heart disease, and the present figures may give some idea, at least, of the "ceiling" of this disease in the population. This occupation, moreover, though of particular interest, is amongst the least studied.

Material and Methods

The present study was made from the records of the Medical Sickness, Annuity and Life Assurance Society, Ltd. (after this called "the Society"), a mutual benefit organization which has several thousand doctors on "non-cancellable" sickness and accident policies (Heath, 1939). "Non-cancellable" indicates a form of insurance in which renewal is not subject to annual review by the Society, and continuance of the policy is thus independent of morbidity experienced while holding the policy. The Society's records of the later attacks of a disease, therefore, are as representative as its records of the first attacks. Most policies issued provide for payment of a weekly benefit from the outset of any sickness, or accident, causing total incapacity to carry out the member's occupation for seven days or longer. The inquiry was limited to the records of members holding these "immediate benefit" policies, since the records of other policies providing "deferred benefit" do not give full information concerning the early part of a period of incapacity. The Society's policies in general terminate at age 60 or at age 65 years, and the present inquiry is restricted to ages 35–64 years, inclusive. Males only were studied because of the small number of women in the Society in the age groups most important to this inquiry. Throughout the report, therefore, when "medical practitioners" or "doctors" are mentioned, reference is intended to male members of this Society, of the ages stated, holding the relevant insurance—and to no others.

The "population" being studied, although it is substantial and may include about a quarter of the country's doctors in the ages considered, is *selected*, because a full medical examination is given to all applicants. It is possible, therefore, for instance, that doctors who know they have diabetes or material hypertension may hesitate even to apply for insurance. The great majority of policy-holders, however, join in their late twenties and early thirties—that is, before coronary heart disease, or the conditions with which it may be associated, can usually be recognized. Such selection as this is likely to be in the "safe direction" for the present inquiry, for it will reduce the number of cases found, and not exaggerate it. There is no information on which to base discussion of the more subtle selective factors. Is it the more anxious personality who applies for a policy? Or the more careful? Or the man who is less careful but who knows himself to be so, and wishes to protect his dependants from the risks he cannot stop himself taking? Does an unhealthy family history prompt the taking out of insurance? There is even less basis on which to discuss the unconscious motivation involved. The mortality of members of this Society cannot be compared with that of all "physicians and surgeons, etc.," reported in the Registrar-General's occupational

mortality supplement for 1930–2 (Registrar-General, 1938), because the age structure of the Society's membership during those three years is unknown.

Payment of benefit is on the basis of medical certificates which involve at least two doctors—the patient and his medical attendant. Although a "specialist opinion" is not of course necessary, examination of a large proportion of the records of first illness from coronary heart disease showed that such confirmation of the diagnosis had, in fact, been recorded in three-quarters of the cases, often with copies of electrocardiographic findings, etc. As a routine precaution all the certificates for each illness were considered and the final diagnosis was used. The recording was carried out with a combination of serial numbers and names, which permitted the fullest use of the available information, and at the same time preserved the confidential nature of the records. All deaths of members are known to the Society, including coroners' cases, and a copy of the death certificate is obtained.

Coronary heart disease in the present inquiry includes the following disorders arising on atheroma of the coronary arteries, with thrombosis, obstruction, occlusion: the clinical syndromes usually called "*coronary thrombosis*" (*sudden deaths* and *myocardial infarction*); *angina pectoris* (or of effort); and occasional cases described as "*coronary insufficiency*," etc. Cases diagnosed as "angina pectoris," without a pathology being stated, were also included. "Ischaemic heart disease" is the more accurate term, but "coronary heart disease" is convenient and in too common use to be discarded. Throughout the paper reference is intended only to the above *clinical* manifestations of the disease, together with their complications and consequences, and not at all to the natural history of the disease in *pathological* terms. "First attack," for example, and "first clinical attack" are used interchangeably.

Apart from the main statements on the certificates, referring in the present instance to coronary heart disease, further information was often given—for example, on hypertension and other associated conditions. No particular attention, however, can here be paid to these. The present type of study, moreover, is not suitable for the consideration of such clinical matters as the site of infarction. The mortality analysis, similarly, deals only with coronary heart disease as the certified cause of death; often there was evidence of necropsy, but this aspect had also to be ignored.

In summary, therefore, information about the male members of the Society aged 35–64 years who hold immediate benefit non-cancellable sickness insurance, and are absent from work because of coronary heart disease, is available as follows: *Where the absence lasts less than a week:* Information only about *deaths*, from death certificates (and, often, other reports). *Where the absence lasts a week or longer:* Information on medical certificates about the *illness*, from the *first* day of the absence. Date of ending of *absence*, as well as its beginning. Information about *deaths* as above.

Figures will be presented for *morbidity* and *mortality*. The annual rates of occurrence of various manifestations of the disease at different ages will be worked out in the usual way, by reference to the total number of men concerned—for example, if over a given period there is an average of 12 cases a year (the "numerator") in men aged 50–54 years, and over the same period an average "population" of 1,500 doctors of that age with non-cancellable insurance (the "denominator"), the *average annual rate* is 8 per 1,000.

Since *comparison of rates* in two population groups can be misleading if one group includes more old people than the other, the rates in this paper which summarize the experience of men over a wide age range—for example, 40–59 years—will be *standardized* for age. The "standard" population that will be used here is the civilian population of England and Wales in mid-1949, the latest figures available at the time from the Registrar-General.

PART I: THE DISEASE IN MEDICAL PRACTITIONERS

Incidence

The "incidence" gives the number attacked by coronary heart disease for the first time, so far as is known, in 1,000 of these medical practitioners per year. The number of new cases is a basic figure to have in studying disease in any "population," whether it is this group of doctors or one doctor's practice. As used here, the "incidence" is the rate of all first manifestations of coronary heart disease, regardless of the form taken, that (*a*) were recognized and diagnosed among these medical practitioners, and (*b*) led to absence from work lasting a week or more, or to death. The attack was regarded as a first attack if there had been no previous claim for benefit for coronary heart disease.*

Column 1 of Table I shows the ages; column 2 the average number of practitioners holding the relevant insurance

TABLE I.—*Incidence of Coronary Heart Disease in Medical Practitioners, 1947–50. Men Aged 35–64 Inclusive. Average Annual Rates per Thousand*

Ages Last Birthday (Years) (1)	Mean Population (2)	No. of First Attacks (3)	Incidence—First Attack Rate p.a. (4)
35–39	1,155	2	—
40–44	1,367	12	*2·2*
45–49	1,549	21	*3·4*
50–54	1,006	28	*7·0*
55–59	696	33	*11·9*
60–64	407	27	*16·6*
All ages 35–64 incl.	6,180	123	*5·0*
Standardized rate at ages	40–59 incl.		*5·5*
" " " "	40–64 "		*7·1*

Ages.—All recording was based on year of birth. Ages are therefore in fact ages attained at the beginning of the calendar year.

Mean Population.—This was calculated from annual counts of the Society's membership, as on January 1 of the five years 1947–51. All men included held non-cancellable sickness and accident insurance, at the date of the count, of a type providing benefit from the beginning of periods of absence from work because of sickness which lasted seven days or more. The members of the Society are mostly resident in the United Kingdom, though there are a few elsewhere.

First Attacks.—These are men clinically attacked by coronary heart disease (as defined) for the first time between January 1, 1947, and December 31, 1950, who, at the time of this attack, held insurance of the type above. The figures are made up of (*a*) non-fatal first attacks causing absences from work for seven days or more, and (*b*) *all* fatal first attacks.

Incidence.—First attacks per 1,000 living, per annum.

Standardized Rates.—These are based on the civilian population of England and Wales in mid-1949.

*It is not possible to be absolutely certain that first claims for coronary heart disease always represented first absences for this condition, or that first absences always coincided with the first diagnosis, or first diagnoses with first clinical attacks. Diagnoses may be missed, and atypical and premonitory cardiac pain, for instance, may be overlooked. It is conceivable, too, that angina pectoris, even when diagnosed for the first time, and even among medical practitioners, did not always lead to as much as a week's sick leave. It is not possible, however, to check this kind of matter, and since it is unlikely that such reservations could be common enough to affect the age or other trends being investigated, they will be ignored. The further possibility that practitioners may have taken time from work, and not troubled to claim the benefit to which they were entitled, is also not likely to have modified the results. The Society's experience of claims made retrospectively is that such claims have rarely to be made for illnesses which have lasted any length of time. Eighty per cent. of observed first absences for angina pectoris, and 97% of observed first absences for "coronary thrombosis" (that was not rapidly fatal) lasted more than a month. The *average* first absences were, of course, much longer. In brief, it is considered that the chain of events, first diagnosis of coronary heart disease—sick absence for a week or longer—claim for benefit, is reasonably complete. The "sudden" deaths are in a different category, and are covered.

in each age group over the four years 1947–50; column 3 is the number of first attacks recorded in the four years; and column 4 gives the "incidence"—the annual rate of first attack per 1,000 in each age group. Column 4 shows a steep incline from the late thirties to 16.6 per 1,000 among men in their early sixties (Fig. 1).

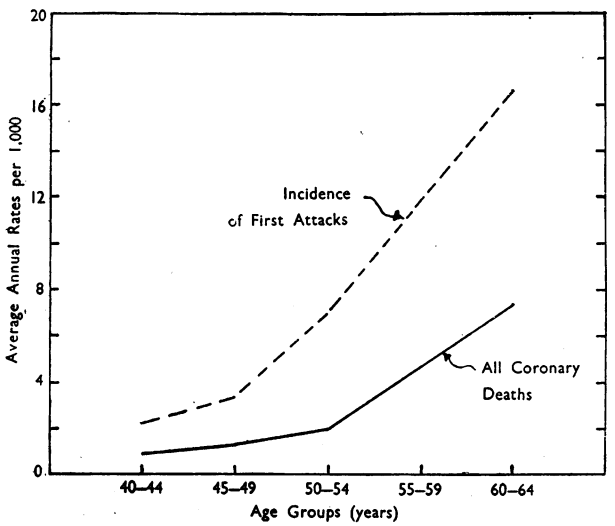


FIG. 1.—Incidence and mortality in coronary heart disease, 1947–50. Male medical practitioners aged 40–64 inclusive. (See notes to Tables I and II for information about the Society's membership, etc.)

Mortality Rates

Coronary heart disease is the main "cause of death" in the Society after 35 years of age, about one-third of all mortality among members being ascribed to it, and this fraction does not vary with age. Under, say, 50 years this fraction will be influenced by the Society's policy of selection, but after about 50 it may represent a more complete picture of the experience of medical practitioners. Table II includes all the "coronary" deaths in the population described in Table I. Columns 2, 4, and 6 give the number of deaths; columns 3, 5, and 7, in italics, the relevant rates.

TABLE II.—*Mortality from Coronary Heart Disease in Medical Practitioners, 1947–50. Men Aged 35–64 Inclusive. Average Annual Rates per Thousand*

Ages Last Birthday (Years) (1)	Deaths in First Six Days of First Attack		Deaths in First Month of First Attack		All "Coronary" Deaths	
	No. (2)	Rate (3)	No. (4)	Rate (5)	No. (6)	Rate (7)
35–39	1	—	1	—	2	—
40–44 ..	9	*0·8*	5	*0·9*	5	*0·9*
45–49 ..			6	*1·0*	8	*1·3*
50–54 ..	14	*2·1*	5	*1·2*	8	*2·0*
55–59 ..			12	*4·3*	13	*4·7*
60–64	5	*3·1*	9	*5·5*	12	*7·4*
35–64 incl. ..	29	*1·2*	38	*1·5*	48	*1·9*
40–59 ,, ..	23	*1·4**	28	*1·7**	34	*2·0**
40–64 ,, ..	28	*1·6**	37	*2·2**	46	*2·8**

* *Standardized rates.*

For notes on ages, the Society's population, and standardized rates, see Table I.

Columns 4 and 5: Lengths of sick absences were calculated in years to 2 decimal places. Deaths in the first "month" were taken to be those occurring in 0·08, or less, of a year.

Columns 6 and 7: All deaths ascribed to coronary heart disease, as defined. The rates of column 7, Table II, may be compared with the American rates for 1938–42:

Mortality From Coronary Heart Disease in Medical Practitioners of U.S.A.

Age		Age	
35-39 ..	0.37 per 1,000	50-54 ..	3.76 per 1,000
40-44 ..	1.02 ,, ,,	55-59 ..	5.92 ,, ,,
45-49 ..	1.79 ,, ,,	60-64 ..	8.03 ,, ,,

(Dublin and Spiegelman, 1947; Dublin, 1951).

Columns 2 and 3 deal with the deaths occurring quickly and referred to throughout this report as "sudden." The exact duration of the illness in the present series of "sudden" deaths cannot be specified. No benefit is paid for absence lasting less than seven days; and in these cases, since the question of a claim for sickness benefit does not arise, there is no obligation on the relatives or executors to state how long the illness lasted, or on the Society to ask for the information. Though it is known that in the majority the death occurred very quickly, it can only be stated of them all that they occurred within six days of the onset of illness causing incapacity to work. The "sudden" death rate, column 3, rises to 3.1 per 1,000 at 60–64 years of age. Columns 4 and 5 of Table II include all deaths occurring in the first month of the clinical disease; the rate rises to 5.5 at 60–64 years. Columns 6 and 7 represent all deaths certified as due to coronary heart disease in these practitioners (Fig. 1). This rate reaches 7.4 per 1,000 at 60–64 years.†

The main fact that emerges from Table II is the predominance of the first clinical attack, even as represented here only by the first month of absence from work, in the total mortality from coronary heart disease in these men under 65 years of age. About 80% of the mortality at 40–64 from coronary thrombosis, myocardial infarction, and their consequences, in 1947–50, occurred in the first month (cf. columns 5 and 7 of Table II). Sixty per cent. of the total coronary mortality rate represented the deaths occurring, as described, very quickly in the first few days of the first clinical attack—standardized rates of 1.6 per 1,000 in column 3 and 2.8 per 1,000 in column 7. (The Society's experience of 1940–6 was similar enough to that of 1947–50 for the deaths of the 11 years 1940–50 to be amalgamated in Fig. 2.) If this figure of 55 or 60% is at all typical of

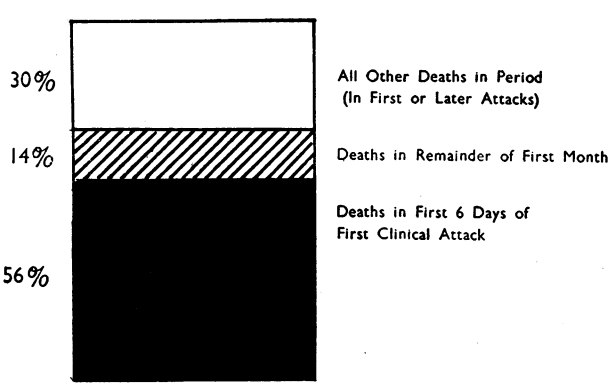


FIG. 2.—Deaths from coronary heart disease occurring in 1940–50. Male medical practitioners aged 40–64, inclusive. There were 104 coronary deaths in these members during the 11-year period.

what is happening in the general population in the coronary heart disease of middle age, it sharply focuses the gravity of the "acute" phases of this "chronic" disease, and points very clearly to the time of greatest need for therapy—the first few days of the first clinical attack of "coronary thrombosis." The size of this figure is interesting for two other reasons: it reinforces the conviction formed during the earlier investigation (Morris, 1951) that cardiac pathology cannot be studied properly to-day unless there is the closest relationship between the hospital and the coroner's court, especially if the hospital cannot, or does not, provide

†Gosse (1942) made a study of material from the same source, in which he paid attention to the mortality from coronary heart disease among the medical profession. In wartime conditions it was not possible for the Society to construct the considerable subsidiary recording system necessary to produce the results here published. In particular, the Society's normal records in some respects concern *policies* rather than *lives*, and many members have more than one policy. Much of the labour involved in the present inquiry has been spent in ensuring that information based on policies has been properly allocated to lives. It follows that the analyses in this paper cannot be compared directly with the broader figures given by Gosse, and no attempt has been made to do so.

facilities for the B(rought) I(n) D(ead). The size of this fraction may also explain some of the variation in the mortality rates reported in hospital series of "coronary thrombosis" (McCain, Kline, and Gilson, 1950; Tulloch and Gilchrist, 1950). If hospitals have an open door for all types of "emergencies" they are more likely to admit these men who will die in the first few days, with consequences in their statistics. Hospitals having a different admission policy may see few such patients, and show much "better" mortality rates, though the general practitioners and coroner's pathologists of the district may find the rates surprising.

Before leaving these morbidity and mortality figures it may be mentioned that there was no particular concentration of first attacks or of deaths in any part of the year, though the April–June quarter had the lowest numbers.

The Individual Practitioner's Chances

What are the chances that members of the Society will develop coronary heart disease, and die of it, should current attack and mortality rates continue? The numbers in the present inquiry are small, but the rates (Tables I and II) progress with sufficient regularity to justify an attempt to answer these questions. Appendix 1 sets out the details of the methods adopted: here it need only be said that a "life table" approach was made. To estimate the chances of *getting* the disease before age x, the rates of first clinical attack at different ages under x are used, and the resulting numbers attacked at each age are summed. These rates, however, are not quite the same as in Table I, because the present calculations are concerned only with the incidence among those who have not yet had the disease, and are thus "eligible" for a first attack, whereas Table I deals with all who are alive at particular ages. Moreover, there is some evidence in the four years' material of an increase in the occurrence (or recognition) of non-fatal first attacks in 1949–50, compared with 1947–8, and, as the basis of the probabilities being estimated is the *current* frequency of the disease, the incidence rates were therefore recalculated for 1949–50. To estimate the chances of *dying* from coronary heart disease before any particular age x, the chances at individual ages under x are similarly calculated and brought together. In this instance the "eligibles" are all those who are alive, because those who have had the disease before are very much exposed to the risk of dying of it; and the mortality rates of Table II were used because there was little difference in the mortality experience of 1947–8 and of 1949–50.

Table III shows the probability that these medical-practitioner members of the Society, not as yet suffering from clinical coronary heart disease, will be attacked before particular ages. If present rates of incidence continue, it can be seen by reading horizontally along the bold figures that, of 1,000 men aged 35, three may be expected to develop the disease in the next five years—that is, before they are 40, another seven by 45, and so on. Of 1,000 aged 60, 90 will be likely to get it in the next five years—that is, before they are 65. The cumulative "chances" up to age 65 are shown in the last column of Table III, and indicate, for example, that, of 1,000 at 35 or 40, 200, or one in five, are likely to get the clinical disease before age 65; and the proportion is little different at 45. Since the probability of getting the clinical disease *under* 35 years of age is extremely small, it may be said, roughly speaking, that the chances at 35 represent the chances from the beginning, and that they continue about the same till 45—that is, these medical practitioners under 45 years of age who have not so far been attacked by coronary heart disease have approximately a 20% chance of being attacked before they reach 65. The estimates for intermediate periods can easily be read from Table III—for example, of 1,000 at 50 years of age the chances are that 110 will get coronary heart disease before 60.

TABLE III.—*Chance of Getting Coronary Heart Disease*

The number of male medical practitioners who, not having previously been clinically attacked by it, would get coronary heart disease before reaching certain ages.

Age x (Years)	Of 1,000 Men Aged x, the Number Indicated Below Would Get Clinical Coronary Heart Disease Before Age					
	40	45	50	55	60	65
35	**3**	**10**	**27**	**67**	**130**	**200**
40		7	24	65	129	200
45			18	59	124	196
50				43	110	184
55					72	152
60						90

Coronary heart disease refers to the clinical manifestations of "coronary thrombosis," angina pectoris, etc., as defined.

Rates of first attack used in calculating the table are based on the Society's experience in 1949–50; rates of death are based on data for 1947–50. The table is constructed on the assumption that both these rates will continue indefinitely.

The "population" is as described in Table I, but excludes in each age group those who have already been attacked by coronary heart disease.

Technical details may be found in Appendix 1.

Table IV provides similar estimates for the chances of dying. It shows, for instance, reading again along the bold figures, that, of 1,000 men alive at 35, 75, or 7.5%, will be likely to die of coronary heart disease before they reach 65, should current death rates in the Society continue. Of 1,000 at 60, 38 may be expected so to die before 65.

TABLE IV.—*Chance of Dying from Coronary Heart Disease*

The number of male medical practitioners who would die of coronary heart disease before reaching certain ages.

Age x (Years)	Of 1,000 Men Aged x, the Number Indicated Below Would Die of Coronary Heart Disease Before Age—					
	40	45	50	55	60	65
35	**3**	**6**	**12**	**23**	**42**	**75**
40		3	9	20	39	73
45			6	17	37	71
50				11	31	66
55					20	56
60						38

Rates of mortality used in calculating the table are based on the Society's experience in 1947–50, and the table is constructed on the assumption that these rates will continue indefinitely.

The "population" is as described in Table I.

Technical details may be found in Appendix 1.

Fig. 3 summarizes both tables in terms of a hypothetical 15 male practitioners aged 35.

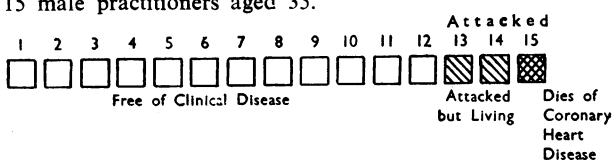


FIG. 3.—The individual practitioner's chances. Of 15 practitioners aged 35, 12 can expect to be free of clinical coronary heart disease up to the age of 65, two to suffer from the disease without dying, and one to die of it before that age. These figures are based on the current experience of the members studied. They are less precise than the figures in Tables III and IV, from which they are derived.

Prevalence of Coronary Heart Disease

The probability among these medical practitioners of developing coronary heart disease before 60 years of age is about one in eight, before 65 about one in five; but that does not mean that 12 to 20% of them at 60–64 years of age will have the disease: many will die beforehand. It is worth trying to get some idea of the *prevalence* of coronary heart disease in these medical practitioners, of how many of them are *affected* during a particular time, whether by a first attack of the disease or any later manifestation of it. No corresponding figures seem to be available for any other population group. The following methods were used.

Consider, for simplicity, the population born, say, in 1890, who are alive at some time during 1950. This population could be divided as follows:

(*a*) Men who have an attack starting in 1950 which is the first clinical manifestation of coronary heart disease.

(*b*) Men who have an attack starting in 1950 which is a second or later clinical episode of coronary heart disease, but who do not have a first attack in 1950.

(*c*) Men who had an attack before the beginning of 1950, who continue to be incapacitated for part or all of that year, but have no attack starting in 1950.

(*d*) Men who have had an attack of coronary heart disease in an earlier year but, having returned to work, do not have an attack starting in 1950.

(*e*) Men who have never been attacked by the clinical disease, and do not suffer from it during 1950.

(In the present paper, of course, "attack" means "absence" for at least seven days or death.) These classes are mutually exclusive and make up the total of these medical practitioners or, indeed, of any "population." Class *a*, it will be remembered, gives the *incidence* and has already been considered. Class *b* together with Class *a* gives what may be called a *total attack rate* of all persons attacked in a period. This is not a particularly interesting statistic and has not been considered in this report.† Classes *a*, *b*, and *c*

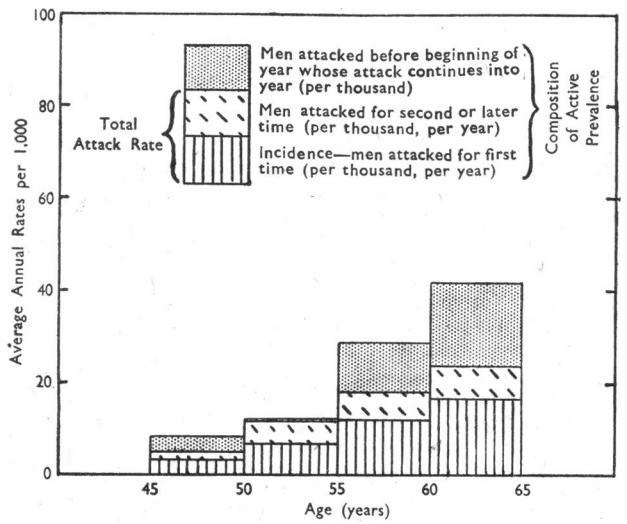


FIG. 4.—Active prevalence of coronary heart disease, 1950. Male medical practitioners aged 45–64 inclusive. The active prevalence figures refer to 1950 only (Table V); the total attack rates are averages for 1949 and 1950 (see text), and the incidence rates for 1947–50 (Table I).

together, in the present material, form the total number of men disabled from work during the year for as much as a week, or who die—a figure that may be called the "*active prevalence*" of the disease. Columns 2 and 3 of Table V describe this in the present population, in the year 1950.

TABLE V.—*Prevalence of Coronary Heart Disease in Medical Practitioners, 1950. Men Aged 35–64 Inclusive. Average Annual Rates per Thousand*

Ages Last Birthday (Years) (1)	"Active Prevalence"		"Latent" Disease		"Total Prevalence" per 1,000 (6)
	No. (2)	Rate (3)	No. (4)	Rate (5)	
35–39	2	—	—	—	—
40–44	2	—	5	*3·7*	*5·2*
45–49	13	*8·3*	13	*8·3*	*16·7*
50–54	14	*11·9*	20	*17·0*	*28·9*
55–59	21	*28·7*	19	*26·0*	*54·7*
60–64	19	*41·6*	22	*48·1*	*89·7*
35–64 incl.	71	*11·1*	79	*12·4*	*23·5*
40–59 ,,	50	*10·6**	57	*12·4**	*23·5**
40–64 ,,	69	*15·2**	79	*17·6**	*33·2**

* *Standardized rates.*

"Active prevalence" = men disabled from work for at least seven days because of coronary heart disease, during any part of 1950. (The sum of Classes *a*, *b*, and *c* in the text.)

"Latent" disease = men who had an attack of coronary heart disease during 1940–9 inclusive, but who were not disabled from work for at least seven days on that account during 1950. (Class *d* in the text.)

"Total prevalence" = the sum of "active prevalence" and "latent" disease.

The mean of the counts of the relevant part of the Society's membership as on January 1, 1950, and January 1, 1951, was used for the population.

†The relevant rates per 1,000 in 1949–50 were: at 35–39 years, 0.9; at 40–44, 1.1; at 45–49, 5.1; at 50–54, 11.8; at 55–59, 18.1; and at 60–64 years, 23.7 (see Fig. 4.)

The "active prevalence" rate climbs with age to about 40 per 1,000, or 4% of all alive at 60–64 years (Fig. 4).

This "active prevalence" rate, however, tells only part of the story, as can be seen from Fig. 1, where the total coronary mortality (column 7 of Table II) is plotted against the incidence of new cases (column 4 of Table I). It is at once obvious that there must be a steady and substantial build up of non-fatal cases which is seriously understated in the "active prevalence." In clinical terms it is clear why this rate is an inadequate picture of the total burden of the disease. The "active prevalence" measures the disability to work; but many who have an attack of "coronary thrombosis" return to work (it may be very modified work), and thus may not appear in a complete disability rate in any particular year, however much their mode of life is otherwise changed by the disease. These are the Class *d* cases, and quite a number of them may in fact have manageable angina of effort. What is required, therefore, is a measure of all who have been attacked by coronary heart disease, have survived it, and in whom the disease is "latent," though *potentially* it can become very "active" at any time and lead to complete disability to work—Class *d*.

The records were therefore searched for all men born in 1885–1914 (corresponding to ages 35–64 years in 1950) who had suffered from coronary heart disease in the period 1940–9 and who were alive in 1950, but not absent from work in that year on account of it, and thus included in the "active prevalence." The present material is particularly suitable for this kind of study because men can be observed till they reach 60 or 65: they cannot be written off the books for ill-health (as in a factory), nor do they lapse from follow-up study (as may happen in a cardiac clinic), and it is rare for any man to give up all his non-cancellable sickness policies.

The result of this search was to add to the "active prevalence" (column 3 of Table V) a "latent" prevalence of less active disease (column 5) slightly larger than the "active prevalence" itself, and reaching almost 50 per 1,000, or 5%, at 60–64. These figures, moreover, may slightly underestimate the true position, as the experience before 1940 was not examined, and this might have yielded a few further survivors to add to the totals with "*latent*" *disease* in 1950.

The "active prevalence" and "latent" disease can be added together to give an estimate of the total clinical prevalence, or the cumulative burden of the disease, in this population group (Fig. 5). The "*total prevalence*" of coronary heart disease in these medical practitioners in 1950, at 50–54 years of age, was about 3% in all. In those

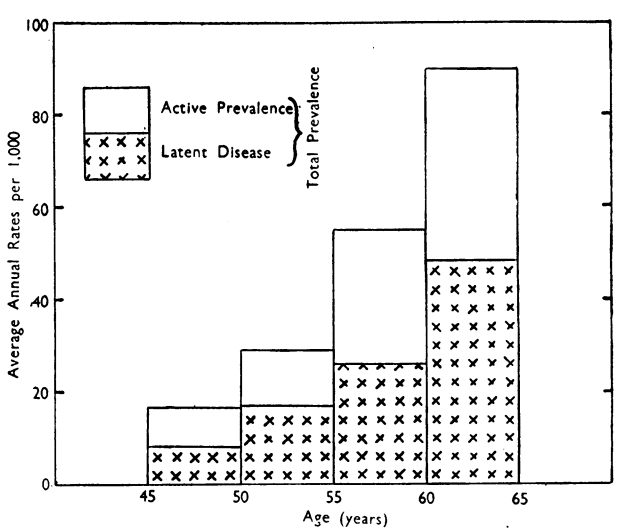


FIG. 5.—Total prevalence of coronary heart disease, 1950. Male medical practitioners aged 45–64, inclusive (see Table V). Latent disease = men attacked in a previous year who are not absent on account of the disease during the year.

surviving to 60–64 years of age the "total prevalence" was about 9%. In the light of such figures terms like "epidemic" may be justified.

Prognosis

Up to this the main problem has been, What proportion of men are attacked by coronary heart disease?—for example, as in Tables I, III, and V. Attention will now be turned to prognosis, and the questions that will be asked can be expressed as, What happens to men so attacked? The present series of questions, that is, deals only with the *cases* of the disease, and not with the *population* in which these occur; the approach will be the usual one of the clinician, not that of the epidemiologist. It is therefore possible to make use of cases occurring in the Society before 1947, even though details of the membership at different ages in those years are not available in a form suitable for calculation of rates. The records of first attacks of coronary heart disease in 1940–6 were therefore extracted, and the information was added to that already available for 1947–50. (Medical papers relating to most of the deaths before the war were lost by enemy action in 1940.) The Society's experience is a useful basis for studies of prognosis because, as stated, regular contact is kept with all members until they reach the age limit or die. On the other hand, the fact that the data deal only with men under 65 years of age is a serious limitation in discussing the prognosis for life, though not of course for work. The present inquiry was stopped on June 30, 1951, an arbitrary date on which it was convenient to cease observation of the men. Appendix 2 describes the methods adopted in drawing up Tables VI and VII.

TABLE VI.—*Prognosis for Life and Death in "Coronary Thrombosis." Experience of Medical Practitioners from the Onset of the First Clinical Attack, 1940–51. Men Aged 40–64 Inclusive*

(A) Percentage of men dying and surviving at various periods from onset of first attack.

Time	First 6 Days	Rest of 1st Month	Rest of 1st Year	2nd and 3rd Years	4th and 5th Years	6th and 7th Years
Dying in period	30	8	2	6	3	3
Cumulative mortality*	30	38	40	46	49	52
Surviving period	70	62	60	54	51	48

* Up to end of period specified.

(B) Percentage of men dying and surviving, by age.

Ages Last Birthday (Years)	Dying in First 6 Days	Dying in 1st Month	Dying in First 3 Years	Surviving First 3 Years
40–49	29	33	39	61
50–64	31	40	50	50
40–64 incl. ..	30	38	46	54

These tables are based on the experience of 192 medical practitioners, who had a first attack of "coronary thrombosis" between January 1, 1940, and December 31, 1950. Observation was continued till June 30, 1951, except for men who died or whose policies terminated before. The total number followed in the fifth year was 46, and in the seventh, 26. In the third year there were 35 men aged 40–49, and 39 aged 50–64 inclusive. Men whose first presentation of coronary heart disease was not as an attack of "coronary thrombosis" were excluded from these tables. Details of the methods of calculation used may be found in Appendix 2.

TABLE VII.—*Absence from Work on Account of Coronary Heart Disease After the First Attack of "Coronary Thrombosis." Experience of Medical Practitioners who Survived Their First Illness, 1940–51. Men Aged 40–64, Inclusive*

(A) Second Absences		(B) Working Time Lost	
No. of Years After the End of First Attack = t (1)	% Survivors of First Attack Absent from Work Again, Because of Coronary Heart Disease, Within t Years (2)	No. of Year After the End of the First Attack (3)	Average Time Lost per Man Because of Coronary Heart Disease During the Year (4)
1	14%	1st	0·6 month
2	30%	2nd	1·1 months
3	33%	3rd	0·9 month
4	35%	4th	0·8 ,,
5	45%	5th	0·8 ,,
6	49%	6th	0·9 ,,

The first absence for "coronary thrombosis" was taken to represent the first attack.

Columns 1 and 3: The date of return to work was taken as the "end of the first attack."

Column 4: "Time lost" is calculated from the number of days of total disability to work. No attempt is made to estimate the number of working hours lost, by distinguishing working days from Sundays and public holidays; and no allowance could be made for periods of absence lasting less than a week, of for periods of part-time work.

There were 107 survivors of the first attack. For Table A observation was continued until June 30, 1951, or until the second absence (or death without further absence), except for men whose policies terminated. The number under observation in each year diminishes from the original 107 to 35 in the fourth year and 21 in the sixth year. For Table B the only difference was that observation did not cease with a second absence. The numbers under observation in any year are therefore slightly greater.

Details of the methods used in calculating the proportions and averages in these tables are given in Appendix 2.

Prognosis in "Coronary Thrombosis"

Without arguing the unitary pathology and, in particular, functional pathology of coronary heart disease associated with atheroma, this discussion falls naturally into two parts—the prognosis in "coronary thrombosis" (myocardial or cardiac infarction), and that in angina pectoris (angina of effort). The level of diagnosis in a group like this is probably high enough to justify the division. The prognosis in "coronary thrombosis" will be dealt with first.

Prognosis for Life and Death

It is already clear from Table II that the crucial period for life and death, at any rate in the ages being considered, is the first few days of the first clinical attack.

First Days of First Clinical Attack.—In the 11 years 1940–50 inclusive there were 192 first diagnoses of "coronary thrombosis," as defined, in men aged 40–64 who held the relevant insurance. These men may be regarded as a cohort to be followed through. The proportion who died in the first six days of the first clinical attack (Fig. 6) was 30% (Table VI,A). It varied a little with age—from 28% at 40–44 years, to 34% at 55–59 years—and the relative stability of this fraction through middle age was not altogether expected. There was no change in the fraction from 1940–6 to 1947–8; in 1949–50 it was rather lower, which may be an indication, possibly, of an increasing diagnosis of less classical and milder cases.

Rest of the First Month.—The next column in Table VI,A shows the mortality in the remainder of the first month. It is still heavy—8% of the original number of men (and 11% of those surviving)—but not nearly so heavy as in the first few days (Fig. 6). In total, therefore, about 38% of these medical practitioners who were first attacked by coronary heart disease in the form of a "coronary thrombosis" in 1940–50 died in the first month of their illness; about 62% survived the first month. It is not known whether any of these men received anticoagulant treatment. It is unlikely that the deaths in the first few days could have been much affected by this form of therapy, and the number of deaths in the remainder of the first month, both in 1940–6 (when there must have been little such treatment) and in 1947–50 (when there may have been much), is impossibly small for

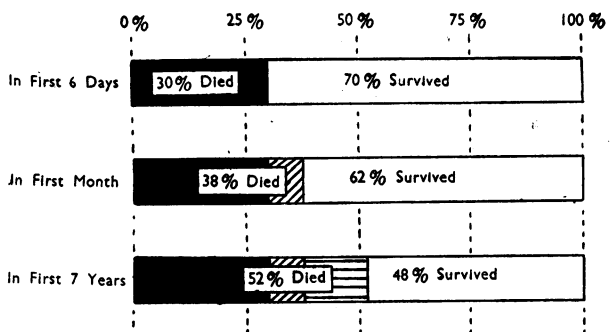


FIG. 6.—Prognosis for life and death in "coronary thrombosis." Experience of medical practitioners from the onset of the first clinical attack, 1940–51. Men aged 40–64 inclusive (see Table VI,A).

any comparisons; all the more since other changes in the same period, such as an improvement in diagnosis, need to be considered.

Attention is now turned to the survivors of the first month, whose passage, it may be said at once, is decidedly less stormy than heretofore.

In Following Years.—In the remaining 11 months of the first year another 2% of the original cohort died from coronary heart disease, or its complications, and this figure is typical of the annual experience in the next six years. Table VI,A gives some detail—in the second and third years from the onset, for example, a further 6% died, making a total mortality up to the end of the three years of 46% (30%+8%+2%+6%); 54% of the original cohort who could be followed survived the three years.

In Younger and Older Men.—Table VI,B gives a simple analysis by age. There is little difference in the outlook during the first six days; thereafter, for the three years which can be adequately followed, the prognosis seems to be better in the younger men. By the end of the third year there is a difference of 11%, with 61% of the men aged 40–49 at onset of first attack of "coronary thrombosis" surviving, but 50% of those who were aged 50–64 years. This conforms with the general experience on the deterioration of prognosis with age (Friedberg, 1949; Eckerström, 1951). However, the numbers are too small to exclude the possibility that we may be dealing with a chance effect.*

Prognosis for Further Sick Absence

Analysis of the further absences from work on account of coronary heart disease among those who have survived their first illness is worth while in clinical and social terms, if not in pathological terms. The frequency of such further absences is high in the two years following the return to work, Table VII,A, with 30% of the men having a second bout of absence. The cumulative proportion of those who have had a further sick absence for coronary heart disease, or its complications, reaches about 50% by the end of the sixth year. No differences with age were discernible in these further absences—that is, the younger men seemed to have as many second absences as the older, though, as was noted before, their mortality on the whole may be less. Numbers, however, are small in the different age groups.

Prognosis for Work

The point of view here is rather different: in the formulation of any policy for, say, the future employment of men with coronary heart disease it is necessary to know their capacities as well as their needs. In practical terms, how much time may men who have survived their first attack (as reckoned by their return to work after the first illness) expect to lose in the years thereafter? The present material contains some evidence on this, and its restriction to ages under 65 does not matter so much. The length of each absence is known, and it is therefore possible to calculate the average amount of time lost by each man per year. It is of course likely that some of the men who did not claim sickness benefit were in fact partially disabled and on less than full duty; but this partial disablement cannot be included in Table VII,B. The figures in that table indicate that, on average, the survivors of the first clinical attack of "coronary thrombosis" missed only about one month's work in each of the next six years because of coronary heart disease (Fig. 7). Some of these men, as shown above, died during the years following the first attack; they are included in the present account until the year in which they went absent because of their final illness. More precisely, therefore, Table VII,B indicates, for instance, that the men who survived *to* the beginning of the fifth year from the end of the first attack lost an average of 0.8 month (or about four weeks) *in* the fifth year because of coronary heart disease.

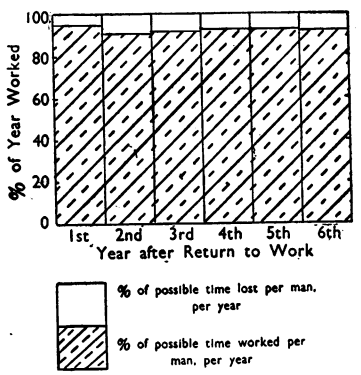


FIG. 7.—Prognosis for work. Experience of medical practitioners who survived their first illness, 1940–51. Men aged 40–64 inclusive. Sick absence for other than coronary heart disease, its complications and consequences, has been ignored (see Table VII,B).

Prognosis in Angina Pectoris

There were 42 first attacks of angina pectoris (or "of effort") during 1940–50 which were ascribed to coronary atheroma—or in which no underlying pathology was stated—in comparison with the 192 first attacks of "coronary thrombosis"; (and nine, which have been ignored, of "coronary insufficiency" and the like). Presentation with angina pectoris became commoner with age (Fig. 10). The first absence in these cases of angina lasted on average for about three months compared with about five months for "coronary thrombosis." Later absences of men who initially were absent with angina were increasingly ascribed to "coronary thrombosis," of course, and lasted longer.

With such small numbers examination of prognosis is less profitable, but one fact did emerge clearly: the outlook for life among the cases first presenting as angina pectoris is

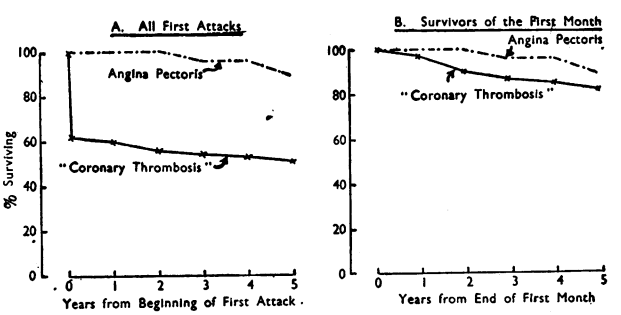


FIG. 8.—Prognosis for life and death in "coronary thrombosis" and angina pectoris, 1940–51. Male medical practitioners aged 40–64, inclusive.

Prognosis in the First Attack and Second Attack.—Clinically it is even more important to know the outlook in the various attacks of "coronary thrombosis." The present material, however, is not very suitable for this type of analysis. These records are only of sick absence and death, and a *further* attack supervening during the convalescence from a *first*, for example, would not necessarily be recorded separately, if the patient had not yet returned to work from the first illness. Nevertheless, figures for the first month do probably refer to the first attack of "coronary thrombosis," and probably include most of the deaths *in* the first attack. The only indication that can be given of the mortality in second attacks is the experience in second *absences*. Many of these very likely refer to second attacks; but a few may refer to even later attacks (if more than one attack was included in the first absence); and a few may be due to relapses of the first attack; or complications and cardiac failure; or to external factors aggravating the cardiac condition. Following are the relevant figures; they show the trend with age, particularly after the first week:

Ages Last Birthday (Years)	Experience	First Attack/ Absence		Second Absence (and ? Attack)
		First 6 Days	Rest of 1st Month	
40–49 incl.	No. of men followed through	63	45	16
	No. dying	18	3	2
50–64 incl.	No. of men followed through	129	89	17
	No. dying	40	12	6

Third absences are too few for analysis.

very different from that of the men first presenting as "coronary thrombosis." In angina it is similar, in the five years that can be studied, to the prognosis in men who have *survived* their first critical month of "coronary thrombosis" (Fig. 8). About 11% of the men first presenting with angina pectoris died in the next five years. About 16% of those who survived the first month of "coronary thrombosis" died in the next five years, but this figure has to be added to the 38% who had already died *in* the first month. In terms of a "severity" spectrum of the natural history of coronary heart disease, therefore, the more slowly developing, relatively benign, cases of angina pectoris seem to be at one end, the "sudden" deaths from "coronary thrombosis" as first clinical manifestation, at the other, with a wide range of severity between.

Summing-up of Prognosis in Middle Age

If the figures in this series are at all representative, "coronary thrombosis," as regards its mortality, belongs to the most "acute" diseases rather than to the "chronic" diseases. It is clearly unwise to consider the prognosis for life of men first presenting with "coronary thrombosis" except in terms of the first days of the first attack (30% mortality in six days, in this series), the rest of the first month (8% mortality), and the years thereafter (about 2% of the original cohort died annually in each of the next seven years) (Fig. 9). About 80% of those who survived the first month were

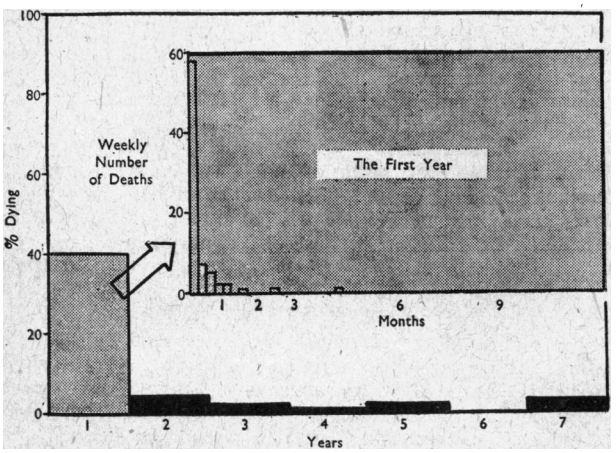


FIG. 9.—Prognosis for life and death in "coronary thrombosis." Experience of medical practitioners from the onset of the first clinical attack, 1940–51. Men aged 40–64 inclusive. Distribution of deaths by time from onset of first attack (see Table VI,A).

Number of Deaths in Each Week in the First Year

Week	Deaths	Week	Deaths
1	58	7	1
2	7	8–10	0
3	5	11	1
4	2	12–18	0
5	2	19	1
6	0	20–52	0

alive at the end of five years. This improvement after the first month was due not so much to mortality in later attacks being less than in the first—though this also may be so—as to the fact that a second attack does not necessarily occur at all for some years. On the present evidence, about half the men who survived their first illness and returned to work did not have as much as a week's further sick absence for coronary heart disease in the six years following. In consequence the work record, for whole-time or part-time work, of men who survived their first attack is good: they may each lose on average only about four weeks a year for coronary heart disease in the six following years. The prognosis for life of men first presenting as angina pectoris seems to be better than that of men first presenting as "coronary thrombosis." Indeed, they seem to miss the early crises altogether, and their outlook, for a few years at any rate, is similar to that of the men with "coronary thrombosis" who have survived the first terrible month.*

This discussion of prognosis deals only, of course, with middle-aged medical practitioners. The evolution of coronary heart disease in the elderly may be quite different.

Mode of Presentation of Coronary Heart Disease

Fig. 10 illustrates the fraction at each age that the cases of "sudden" death form of all presenting coronary heart disease in these medical practitioners. It can now be stated

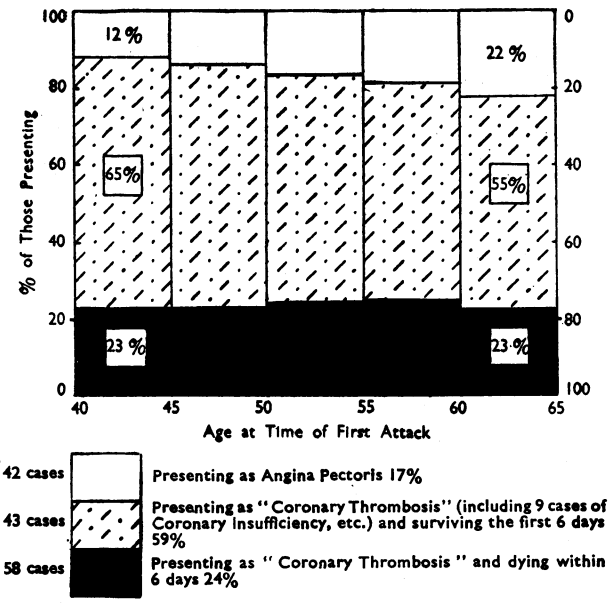


FIG. 10.—Mode of presentation of coronary heart disease, 1940–50. Male medical practitioners aged 40–64, inclusive.

in round numbers that at 40–44 years of age coronary heart disease presents as "sudden" death (within six days) in about a quarter of the cases, as less severe "coronary thrombosis" in about 60%, and as angina pectoris in somewhat over 10%. At 60–64 years of age the fractions are again about a quarter as "sudden" deaths, somewhat over 50% as not so severe "coronary thrombosis," and somewhat over 20% as angina pectoris. These three manifestations

*It is perhaps worth while to stress here the difference between two fractions which are discussed in this paper. The first, mentioned previously under "Mortality Rates," gives the proportion of deaths within six days of the onset of the first attack—that is, "sudden" deaths—formed of *all deaths* from coronary heart disease (whenever these deaths occurred, whether in the first or later attacks). At *ages 40–64*, in the 11-year period 1940–50, this fraction was 56%. The second fraction, discussed in the present section on prognosis, is the proportion of "sudden" deaths among all the *first attacks* of "coronary thrombosis." In the same period, and in men of the same age, this second fraction was 30%. Since it is probably true that most people who have coronary heart disease, especially "coronary thrombosis," will eventually die of it, there is at first sight an apparent contradiction here. Closer examination shows, however, that the first fraction—that is, of the observed deaths—depends on the ages studied; whereas the second—that is, of first attacks—does not appear to vary much, at least within the age range 40–64. During 1940–50 "sudden" deaths, as said, formed 56% of all "coronary" deaths: but this 56% was made up of 62% at ages 40–49, 58% at 50–59, and 44% at 60–64 years. It is easy to account for this variation. At early ages there will be few people who have been previously attacked by the disease and who are therefore likely to die at long intervals after the first attack. The fraction, therefore, falls with age, and quite possibly at greater ages than 65 it will be even lower than 44%. The fraction which "sudden" deaths form of all coronary deaths *at all ages* is thus likely to be considerably lower than 56%, and the contradiction between this figure and that of 30% may well be a result of the particular age range studied, and the limited period under observation. However that may be, the first and higher fraction of 56%, applying as it does to men aged 40–64, brings into prominence the fact that more than half of the deaths that do occur in middle age, when the problems of the disease are at their most serious, are in fact "sudden."

accounted for all but nine of the 243 "first presentations" of coronary heart disease in the years 1940–50, inclusive. The nine were variously described as "coronary insufficiency," etc.

PART II: THE DISEASE IN GENERAL PRACTITIONERS AND IN OTHER DOCTORS

In a social medical inquiry, concerned eventually with possible relationships between health and ways of living, "medical practice" is rather a wide social category to be assumed homogeneous in its experience of a disease. The general practitioner, the consultant, and the medical officer of health may lead professional lives at least as disparate as many "occupations" usually distinguished in this type of study. The practical difficulty is how, without personal inquiry, to decide which of a large group of doctors are G.P.s, consultants, etc., so that the experience of different sections of the profession can be compared. The only readily available source of information on what doctors do is the *Medical Directory*; and study of its contents showed that it is practicable to classify doctors into the following broad categories:

Category 1.—This comprises those who, it may reasonably be presumed, are full-time *general practitioners* (or almost so)—doctors with no appointments and merely a name and address in the *Directory*; or with certain types of appointment, such as Post Office medical officer or appointed factory doctor, and no other appointments.

Category 2.—This, so far as can be determined, is composed of full-time clinical *consultants/specialists*—men on the staff of teaching hospitals, or certain other major hospitals; and men with at least two specialist appointments at non-teaching hospitals (in certain cases having particular diplomas). Any indications of general practice, such as the mention of a partnership, would exclude a man from this category.

Category 3.—An intermediate group, fairly well defined outside the university centres, of general-practitioner specialists—that is, men who are both; who are in general practice and also do some specialist work, usually having one appointment, such as surgeon or physician (but not "clinical assistant" or "medical officer") at the local non-teaching hospital; doctors recorded as being merely "on the staff" of cottage hospitals are not included. Men in this category will be referred to as *G.P.-Specialists* in contrast to full-time general practitioners (Category 1), and full-time consultants/specialists (Category 2).

Category 4.—A number of small groups of various full-time *public officials*—medical officers of health, doctors in Government departments, regular officers in the armed Forces; and to these may be added a small number of full-time staff of mental and fever hospitals and tuberculosis sanatoria who are not of consultant status; and men holding academic non-clinical posts.

Category 5.—Retired practitioners; those of "address unknown"; and those who could not be classified.

This seemed a useful grouping, and it was decided to apply it in the next stage of the inquiry—an attempt to find whether any of the major sections of the profession, as these were represented in the Society, had more or less coronary heart disease than any other. There is good reason to believe that there is a high level of diagnosis among all the members, and that in a condition of such duration and gravity extraneous factors that might affect the sick-absence rates for minor ill-health will not apply. The attempt necessarily involved three steps: (1) to determine the total number in the various categories among the relevant members of the Society, at different ages, by sampling; (2) to identify the occupational category in each recorded case of coronary heart disease; and (3) to calculate the incidence of the disease in the various categories. It was decided to make a pilot test of the experience of 1949 and 1950.

Ten per cent. of the relevant membership at each year of age over 45 was taken (a strictly random sample using random sampling numbers); and the "first attacks" of 1949–50 in members aged 45–64 were shuffled in with this sample. First attacks only were included because men may change their jobs on account of their health, and if the possible effects of work on disease are the object of study, not the possible effects of disease on the work that men do, first attacks are likely to give the most reliable information. The cases were included with the sample to preserve the ignorance of the unit's staff of individual identity, and thus to eliminate any possible bias, as well as to preserve the confidential nature of medical records. All these persons—the 10% sample plus those attacked for the first time—were then marked in the *Medical Directory*. The two authors of this report who were ignorant which of the names represented a man with a first attack and which did not independently categorized all the names, discussing together and agreeing on the doubtful ones; there was no particular difficulty in allocation, and the great majority sorted themselves at once. The third author, who held the key to the names, then placed each person appropriately, by age and category, as a "first attack" or as a member of the sample population (as a matter of fact four "first attacks" were also drawn in the sample). Finally, rates of incidence of coronary heart disease were calculated for the various categories, on the assumption that the occupations in the whole of the relevant membership were distributed in the same way as those in the sample. The results, which were surprising, are summarized in Table VIII, for the general-practitioner group and the rest.

TABLE VIII

Findings	Category	
	1 General Practitioners	2+3+4+5 The Rest
No. of first attacks of coronary heart disease in 1949–50 at 45–64 years	46	21
No. in 10% sample of "population"	213	197
Annual incidence per 1,000 at 45–64 years (standardized for age) ..	11·8	6·2
Standard error of this rate	±2·1	±1·5

Since it is unlikely that there is much difference in the level of diagnosis among different sections of the profession, or in the extent to which they would claim benefits in such serious and prolonged illness, these figures were suggestive of a true excess among the general practitioners. Critical examination of the data failed to upset this trend, which was evident in all five-year age groups, in each of the major geographical regions of the United Kingdom, and when the general practitioners were compared with each of the other categories taken by itself—all evidence of that "internal consistency" of the material so important in dealing with small numbers. Various manipulations had no effect—for example, the reallocation of "marginal" occupations among the various categories, the exclusion of all who were classified as general practitioners on *negative* grounds (that is, because they had no more than their names and addresses in the *Directory*), and the separation of fatal from non-fatal attacks. It did appear that the members designated as full-time general practitioners had a higher incidence than the other members of the Society.*

There are three major possible sources of weakness in the above trial: (1) the limitations of sampling; (2) the difficulties, and possibly the "fluke" effect of the small number of attacks, whereby one or two might materially alter the rates; and (3) the allotment of occupation on the basis of the *Medical Directory*. These weaknesses had to be dealt with so far as possible, and this is what we did. The first problem was met by drawing a further, and quite separate, 10% sample of the relevant membership; the occupational

*It may be mentioned that there was no material difference in the *ages* at which the general-practitioner members and the men in the other categories took out their first immediate benefit policies with the Society. The average age of this among the "*cases*" of coronary heart disease was 34.6 years in the general practitioners and 32.6 in the remainder; among the "sample" it was 32.6 years in the general practitioners and 31.4 in the others.

distribution of this sample was very similar to that of the first. The number of cases of coronary heart disease was increased by including the first attacks of 1947–8. (A further "trial" was then carried out by shuffling these 1947–8 cases in with the *new* sample, and the results were similar to those tabulated above.) The third problem, the allotment to type of work, was more troublesome. It was decided to ignore Category 5—the "retired," etc.—which left the following categories of membership:

Category 1 .. .. (the full-time) General Practitioners
Categories 2, 3, and 4 the Other Doctors

All in these four categories who were resident outside the United Kingdom were also excluded. The number of cases in 1947–50 was thus reduced by five, and the size of the sample by about 4%. The small changes in the occupational distribution of the membership from January 1, 1947, to January 1, 1951, were assessed, and the sample of the total relevant membership finally set up was an average for the whole four-year period 1947–50. On the main issue, however, it was clear that some quite independent check of the occupational allotment was necessary. We therefore decided to classify sufficient of the two samples and sets of cases again, and on this occasion from the official National Health Service lists. Only such a procedure, it was felt, would adequately test the categorization already made from the *Medical Directory*. It can be said straight away that the result of this check showed a surprising degree of conformity between the findings from the National Health Service lists in mid-1951 and the allocations already made from the *Directory*; surprising in view of the changes introduced by the N.H.S., the fact that a certain proportion of doctors did not join it, and because a number of men must have retired or died between the date of the *Medical Directory* used for categorization and that of the lists used for checking (see Appendix 3).

The final analysis can now proceed with some confidence. The two 10% samples were pooled, giving a one-in-five sample; as were also the first attacks of 1947–50. In addition, further to increase the numbers, the first attacks at ages 40–44 in the years 1947–50 were now included, and a one-in-five sample of the relevant membership in that age group also was drawn and categorized, making now a grand total of just over 1,100 names. Tables IX, X, and XI assemble the results by age and category, so far as is reasonable with the small numbers involved. Table IX sets out the

TABLE IX.—*Incidence of Coronary Heart Disease in Medical Practitioners—Occupational Comparison, 1947–50. Men Aged 40–64 Inclusive. Average Annual Rates per Thousand*

Ages Last Birthday (Years)	General Practitioners, Category 1	Other Doctors, Categories 2+3+4
	Incidence	Incidence
40–49	*4·3*	*1·3*
50–54	*8·1*	*5·0*
55–59	*14·4*	*7·2*
60–64	*18·4*	*11·1*
40–64 incl.	*8·8**	*4·4**

* Rates standardized for age on the civilian population of England and Wales in mid-1949.

Occupation categories: The classification adopted was intended to distinguish:

Category 1 General Practitioners: Full-time general practitioners.
,, 2 Consultants/Specialists: Full-time clinical (including academic) specialists.
,, 3 "G.P.-Specialists": Doctors who are both.
,, 4 Public Officials: Full-time officials in central and local government; regular serving officers, etc.

Incidence is the rate of first clinical attack of coronary heart disease, per 1,000.

For further details, including number of cases involved, see Tables X and XI.

All data are for men in the Medical Sickness, Annuity and Life Assurance Society, Ltd., resident in the United Kingdom, with non-cancellable sickness insurance. (Retired practitioners, etc., have been excluded.)

TABLE X.—*Incidence of Coronary Heart Disease in Medical Practitioners—Occupational Comparison, 1947–50. Men Aged 40–64 Inclusive. Figures in Roman Type=First Clinical Attacks; in Italics=Average Annual Rates per 1,000*

Ages Last Birthday (Years)	Occupation						
	(1) General Practitioners. Category 1	(2) Consultants/ Specialists. Category 2	(3) "G.P.-Specialists." Category 3	(4) Public Officials. Category 4	(5) All Except General Practitioners. Categories 2+3+4	(6) General Practitioners and "G.P.-Specialists." Categories 1+3	(7) Consultants/Specialists and Public Officials. Categories 2+4
40–44	9 *3·0*	4 *1·7*	1	1	6 *1·3*	27 *3·6*	5 *1·5*
45–49	17 *5·5*						
50–54	19 *8·1*	7 *4·7*	7 *7·1*	3 *6·7*	9 *5·0*	24 *8·0*	4 *3·4*
55–59	23 *14·4*				8 *7·2*	25 *12·8*	6 *7·9*
60–64 incl. ..	14 *18·4*	5 *12·5*	3 *10·7*	2	10 *11·1*	17 *16·4*	7 *11·3*

See notes to Table IX.
Rates per 1,000 were calculated from the number of first attacks (numerator), and the total numbers corresponding by age and occupation in the Society (denominator). These total numbers were estimated from the sum of two independent 10% samples drawn by single years of age from the relevant membership. No rates are calculated for less than three cases.

TABLE XI.—*Incidence of Coronary Heart Disease in Medical Practitioners—Occupational Comparison, 1947–50. Men Aged 40–64 Inclusive. Average Annual Rates per 1,000—Standardized*

Ages Last Birthday (Years)		Occupation						
		(1) General Practitioners. Category 1	(2) Consultants/ Specialists. Category 2	(3) "G.P.-Specialists." Category 3	(4) Public Officials. Category 4	(5) All Except General Practitioners. Categories 2+3+4	(6) General Practitioners and "G.P.-Specialists." Categories 1+3	(7) Consultants/ Specialists and Public Officials. Categories 2+4
40–59 incl.	No. of first attacks	68	11	8	4	23	76	15
	Average membership	2,510	960	630	340	1,930	3,140	1,300
	Incidence ..	*7·1*	*3·1*	*3·2*	*3·9*	*3·3*	*6·3*	*3·3*
	Standard error ..	±1·0	±1·0	±1·3	±2·1	±0·74	±0·81	±0·88
40–64 incl.	No. of first attacks	82	16	11	6	33	93	22
	Average membership	2,700	1,060	700	395	2,155	3,400	1,455
	Incidence ..	*8·8*	*4·5*	*4·3*	*4·7*	*4·4*	*7·8*	*4·4*
	Standard error ..	±1·2	±1·2	±1·5	±2·1	±0·85	±0·96	±1·0

See notes to Tables IX and X.
Average membership estimated from the 20% sample.
The standard errors of the rates quoted above allow for the standardization.
Standardized rates are based on the civilian population of England and Wales in mid-1949. (The standardized rates at 45–64 inclusive were Category 1, *10·8* per 1,000; and Categories 2+3+4, *5·5* per 1,000.)

main findings, Table X gives the details, Table XI is a summary table.

Three things stand out:

(1) In this Society, during 1947–50, the full-time general-practitioner members aged 40–64 had about twice as high an incidence of coronary heart disease as the other members (Table IX). The inclusive figures of 8.8 and 4.4 per 1,000 are standardized to take into account the differences of age composition in these two large groups. If Categories 1 and 3, the only ones in which general practitioners are at all likely to be classified, are merged and compared with the remainder (columns 6 and 7 of Tables X and XI), the incidence for this all-inclusive general-practitioner group is still about 1.8 times that of the others.

(2) The excess among general-practitioner members is seen at all ages studied, but is greater at 40–49 years than at 50–64 (Table IX, and columns 1 and 5 of Table X), the ratio of the incidence being:

	General Practitioners (Category 1) : Other Doctors (Categories 2+3+4)
At 40–49 years	3·3 : 1
,, 50–59 ,,	1·8 : 1
,, 60–64 ,,	1·7 : 1

(3) There is, unexpectedly, no indication of an occupational gradient with the intermediate group of "G.P.-Specialists" between the general practitioners and the specialists. Table XI shows that the standardized incidence at 40–59 and 40–64 years of age among general practitioners is different from the rest—the specialists, G.P.-specialists, and public officials; and the composite rate for these three categories as shown in column 5 of Table XI is a fair account of them all (Fig. 11). The numbers, however, in Categories 2, 3, and 4 are very small, so that no conclusions can be drawn about them individually.*

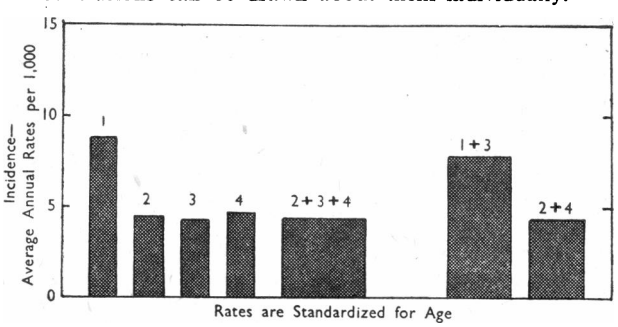


FIG. 11.—Incidence of coronary heart disease in general practitioners and other doctors, 1947–50. Men aged 40–64, inclusive. Category 1, general practitioners; Category 2, consultants/specialists; Category 3, G.P.-specialists; Category 4, public officials. (See Tables IX, X, and XI for further details of membership of Society, etc.)

*_Statistical "significance" of the differences in the rates._—The main difference—that is, that between the rate for Category 1 and the combined rate for Categories 2, 3, and 4, at ages 40–64 inclusive—might appear by chance, if in fact there is *no* occupational difference, less than once in 1,000 times. The significance of the differences between the rate for Category 1 and the rates for Categories 2, 3, and 4, taken separately, is also indicated below:

Ages	Category 1 and			
	Category 2	Category 3	Category 4	Categories 2+3+4
p at 40–59 incl. $\simeq$	0·002	0·003	0·04	0·001
p ,, 40–64 ,, $\simeq$	0·003	0·003	0·02	0·0007

The differences among Categories 2, 3, and 4 are not significant by any standard.

p for the difference between Categories 1+3 and Categories 2+4 is 0·004 both for ages 40–64 and ages 40–59; for the difference between Categories 1+3 and Category 2 alone it is 0·009 for ages 40–64, and 0·006 for ages 40–59.

These values of p allow for the facts that the population was estimated from a sample, and that for each comparison the sign of the difference is consistent in each age group. Consequently, these values of p cannot be deduced directly from the standard errors of the *standardized* rates quoted in Table XI.

The cases are too few to quote many special rates that would be of interest. But it can be said that the findings were rather stable, and the general-practitioner members did have an excess in each of the four years 1947–50; in fatal as well as in non-fatal cases; in angina pectoris as well as in "coronary thrombosis," in diagnoses with and without "specialist confirmation"; and in the different parts of the United Kingdom taken separately. Recalculation of Tables III–VII in terms of general practitioners and other doctors has not yet been undertaken.

New or Old?

Clearly the next question is, When did this higher incidence of coronary heart disease among the general-practitioner members appear; is it a new or an old phenomenon? Adequate records of the Society for dead members are available only as far back as 1940, and the question therefore becomes, Is the higher incidence among these general practitioners a post-war development, or was the experience of 1940–6 similar to that of 1947–50? Unfortunately, though there are some interesting pointers, it is not possible to answer even this question at all satisfactorily.

To obtain such an answer two sets of facts would be needed about the experience of 1940–6, just as they were needed for 1947–50: (1) the number of first attacks at different ages in each occupational category during 1940–6; and (2) the number of members at different ages in each category during those years. The first attacks of 1940–6 are already known from the study of prognosis, and these can be categorized from the *Medical Directory* of the year preceding the attack. But for various reasons it is quite impracticable to reconstruct the age and occupational structure of the Society in the war years, so that rates comparable with those of Tables IX, X, and XI may be calculated. An idea of the main characteristics of the wartime membership can be obtained, however, if two assumptions may be made: (*a*) if it can be assumed that the occupational distribution of the Society's members in the years 1942–5 was similar to that found *five years later* in 1947–50, in men *five years older*—that is, if it can be assumed that the proportion of general practitioners to other doctors, aged 40–59, in 1942–5 was similar to the proportion observed in the members aged 45–64 in 1947–50; and (*b*) if it can be assumed, further, that the occupational distribution of the members in 1942–5 was reasonably typical of the longer period 1940–6. In defence of these assumptions it may be stated that the membership of the Society is a very stable one, especially over 40 years of age, and it remained particularly stable during the war; the ratio of general practitioners to other doctors, moreover, was found to be similar in each five-year age group during the years 1947–50 except in the oldest age group.

The assumptions are therefore fairly reasonable: nevertheless, with such hypothetical information about the "population," all that can be expected are estimates, rather than facts, about what took place during the war.

In Table XII the 1940–6 material is analysed, so far as the nature of the information permits. The occupational *distribution* of the members in 1940–6 is estimated, as described, by projection backwards; the average *number* of first attacks of coronary heart disease, per year, in men aged 40–59, is given; and the annual averages of cancer deaths at the same ages have been added for comparison. The *ratios* between these average annual numbers are given in parentheses and in italics.

TABLE XII.—*Findings in Men Aged 40-59 Years*

	1940–6		1947–50	
	General Practitioners	Other Doctors	General Practitioners	Other Doctors
Occupational distribution of membership (Ratio)	*1·2*: *1*		*1·3*: *1*	
Average no. of first attacks of coronary heart disease per year	6·9	6·3	17	5·8
(Ratio of averages)	(*1·1* : *1*)		(*2·9* : *1*)	
Average annual number of first attacks of coronary heart disease fatal in the first month	1·9	2·0	5·3	1·5
(Ratio of averages)	(*0·9* : *1*)		(*3·5* : *1*)	
Average no. of deaths from malignant disease per year	1·6	1·7	2	2·3
(Ratio of averages)	(*0·9* : 1)		(*0·9* : *1*)	

N.B.—There are no *rates* in this table, but merely *numbers* of cases per year in two groups, and *ratios* of these numbers to each other.

There are several points of interest in this table. The *ratio* of the first attacks of coronary heart disease (general practitioners: other doctors) is different in 1940–6 from that in 1947–50 (1.1:1 and 0.9:1, in 1940–6, as against 2.9:1 and 3.5:1 in 1947–50). The ratios in 1940–6, when compared with the ratio of the numbers in the two occupational groups in those years (1.2:1), suggest that there was little, if any, excess coronary heart disease among general practitioners during the war.† If the experience of the "G.P.-Specialists" is added to that of the general practitioners the findings are again unaffected. These figures are interesting in light of the American observation that there was no material difference in the coronary mortality rates of medical specialists and non-specialists in the years 1938–42 (Dublin and Spiegelman, 1948).

Table XII also suggests that the excessive number of first attacks of coronary heart disease among the general-practitioner members in 1947–50 was due more to an increase of first attacks in them than to a reduction in the "other doctors." The relevant figures, as given in the table, are 6.9 and 17 (per annum) for general practitioners, compared with averages of 6.3 and 5.8 for the other doctors. The occupational changes in the membership during 1947–50 are known to be very small, and there is nothing in this, or in the increase even of the *total* number of members with non-cancellable insurance between 1940–6 and 1947–50, or in the ageing of the members within the range 40–59 years, that could possibly account for this more than doubling of the number of first attacks of coronary heart disease among the general practitioners.

Furthermore, Table XII suggests that this increase of first attacks among general practitioners in 1947–50 may represent a real increase, and is not merely the result of improving *diagnosis* with readier recognition of milder, or atypical cases. The average numbers of fatal and non-fatal first attacks among the general practitioners have increased in step. The proportion, therefore, of first attacks which were soon fatal—a proportion that may be used as a crude index of the severity of the cases being recognized—did not change materially in the two periods (1.9/6.9, 27%, almost equals 5.3/17, 31%).‡ The similarity of this fraction in 1940–6 and 1947–50 suggests that there was little change in the level of diagnosis in the two periods. The similarity of these early case-fatality ratios in the general practitioners and other doctors (in the other doctors the ratios in the two periods were 32% and 26%) supports, also, the proposition that the level of diagnosis in these two groups was similar.§

Finally, it may be remarked that the stability of the cancer mortality figures suggests that there has been no general breakdown in the Society's recording system, or any major "experimental error" affecting in particular one section of the membership. This stability, moreover, strengthens the previous impressions of the stability of the membership of the Society.

Such confirmatory arguments, however, cannot substitute for the absence of needed facts. An attempt had to be made to deal with the problem, and this is the best we have been able to do. It will be remembered (Fig. 12; Josiah Macy Jr. Foundation, 1951) that there is some evidence of a diminution of coronary heart disease during the recent war in several European countries, and of a rise after the war. Possibly there was some general factor that operated to produce an "abnormal" occupational distribution among the membership during the war. At the most it may here be said that there seems to have been little, if any, excess of coronary heart disease among general-practitioner members during the war. It appears that there may have been some increase of the disease among these general practitioners

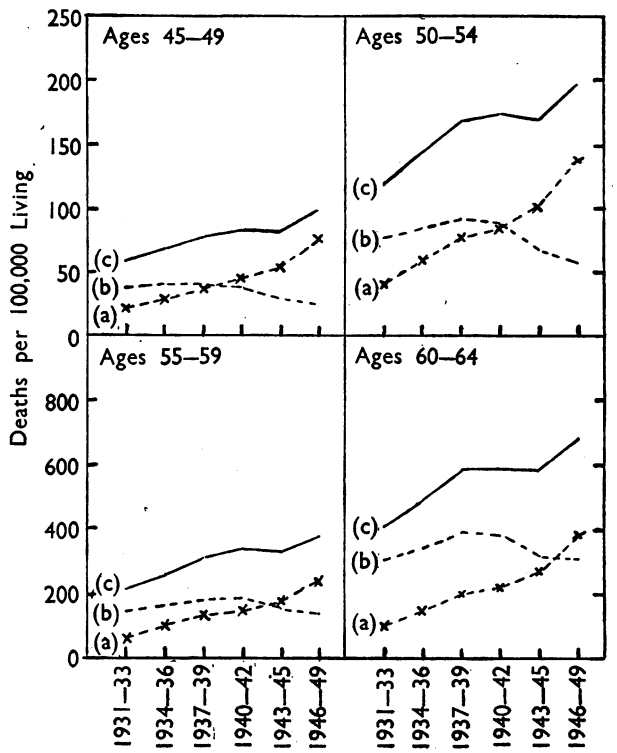


FIG. 12.—Mortality from heart disease, 1931–49. Men aged 45–64, inclusive. England and Wales. (Registrar-General.) (*a*) ×---×---× Diseases of Coronary Arteries, Angina Pectoris. (Int. List No. 94) (*b*) ------ Chronic Myocardial Disease, excluding those specified as Rheumatic, but including Myocardial Infarction. (Int. List Nos. 93 *c*, *d*; 162 *a*, *c*.) (*c*) ——— The sum of (*a*) and (*b*).

since the war, and this increase may be related to the excess of the disease found among them in 1947–50. Because of the hypothetical nature of the 1940–6 "population" it is impossible to say by how much the true average *rate* of first attack among the general practitioners increased from 1940–6 to 1947–50, whether one age group was affected more than another (though the indications are that men in their fifties were affected at least as much as men in their forties), or when the increase began. The higher incidence among these general practitioners, it may be recalled, was present throughout the four years 1947–50. There is unfortunately no other evidence to appeal to for confirmation—or otherwise, and it is a particular pity that analysis of the pre-war situation is impossible.

Part II, above, is an example of simple epidemiology (Gordon, 1950)—the exploration of rates of incidence in different social groups. This step may of itself make an immediate contribution to aetiology, but its main value is usually to raise questions rather than to answer them, and at the same time to provide an economical "way in" to further study, through comparison, for instance, of the circumstances of high and low incidence. In epidemiological inquiries large-scale hypotheses can often be formulated and tested, supplementary to those of the bedside and laboratory; and hypotheses framed in clinical and laboratory study can often be independently validated. Finally, as an experimental science, epidemiology can try to apply its notions "in the field"—for example, by correcting faults that appear to be relevant and observing the subsequent incidence.

If the situation in this Society is at all representative, interesting and important questions must arise about the health of doctors, and about the possible contribution which doctors might be able to make, through their own health and sickness, to the better understanding of coronary heart disease, and, eventually, to the development of a rational preventive programme. But *is* the experience of the Society true of the whole profession? We are quite unable to answer this question. A great deal of effort could be spent in an attempt to estimate how typical the members of the Society are of all the doctors in the country. For instance,

†The same indication arises if the men *first* attacked by coronary heart disease in 1940–6, who had a *second* absence for this in 1947–50, are categorized. There were 26 such men, aged 40–59, in the four years 1947–50—13 general practitioners and 13 other doctors; that is, an average of 3.3 per year in both groups, and a ratio of 1.0:1. These *further* absences, it should be noticed, occurred in exactly the same population, and in the same period, that showed occupational group averages of 17 and 5.8 for *first* attacks, with a ratio of 2.9:1 (see Table XII).

‡There were, in fact, as already mentioned, some signs of an improvement in this early case-fatality ratio during 1949–50, but this is too slight to affect the argument, the more particularly as better treatment may have contributed to the reduction in fatality.

§Another indication of the level of diagnosis is the number of such less definite diagnoses as "myocardial degeneration," "myocarditis," etc., compared with the definite diagnoses alone accepted as coronary heart disease for the purposes of this investigation. These less definite diagnoses were few in either period, or in either group. The average annual number of "first attacks" of "myocardial" disease in 1940–6 was 1.1 both for general practitioners and other doctors; while in 1947–50 the figures were 1.5 and 1.0, respectively.

a superficial examination of the available statistics indicates that rather more than a quarter of all general practitioners aged 40–64 years appear to be members included in this inquiry, rather less than a quarter of the consultant/specialists. We do not, however, consider this to be the correct kind of approach to the problem. The first thing that should be done is to estimate the incidence of the disease *directly, in the profession as a whole.* Only this could prove how typical are the occupational differences—and apparent similarities—demonstrated here among the *members of this Society.* And only in this way could the relevant associations and relationships of the disease be adequately investigated.

An appropriate field survey would be necessary, and this could conveniently do more than determine the incidence rates in different sections of the profession. Questions could be designed to explore such differences of incidence as may be discovered, in terms of current thinking on the pathogenesis of coronary heart disease, and in terms of the structure of the profession and the different roles within it. To be most fruitful, of course, such a survey should also be based on *ad hoc* case study—for example, of the work, habits, and social relations of general practitioners, of different ages, in different types of practice, recently recovered from "coronary thrombosis," and of "controls." The opportunity should be taken to disentangle the antecedents of coronary heart disease among doctors, whether or no it is confirmed to be commoner in one group of them; it is important enough in all.

Various methods of inquiry are open. It may not be practicable (though it need not be entirely ruled out) to compare the prevalence of the chronic atheroma and the acute thrombosis in different sections of the profession, a study that would be particularly valuable for the understanding of the fundamental processes of coronary heart disease (Morris, 1951). Nor would doctors make easy subjects for investigations of the psychological components of the disease; though such matters as hours of sleep, load of work and responsibility, and the response to upsetting situations are "psychological" as well as "physical." (It is remarkable how little study has been reported on the nature, predispositions, and consequences of medical practice, and on such matters as the emotional satisfactions and stresses involved in different types of professional life.) The distribution of the disease in town and country, and different types of town and different parts of the country, should be examined. The influence of "constitution," of family history in different sections of the profession, and of physique (Gertler, Garn, and White, 1951) could be investigated, together with their possible relation to the "environmental" factors. Considerably more clinical detail than is presented here can be collected. Records of the war history (both wars), as well as post-war experiences of patients and "controls," are needed. Studies of the blood lipids, at present so promising, though where they are leading is still clouded in mystery, may be possible, with a long-term follow-up; and assessments of diet and nutrition. The association and dissociation of other disorders and coronary heart disease might be investigated (see Gregg, 1950). Analogous studies might be carried out on the incidence among doctors of such conditions as "essential" hypertension, duodenal ulcer, and of course cancer. In brief, the occasion might be taken for the profession to examine itself, medically and socially.

Finally, before leaving this discussion of coronary heart disease in medical practitioners, it may be worth pointing out that this study has been made with simple methods and in a small—though well-defined—"population." The number of men studied, in fact, might be found in a town of 30,000 or 35,000 people, a town the size of Hereford, or Taunton, or Airdrie. In view of the growing interest of the medical officer of health in epidemiological inquiries on the non-infectious diseases, it is reassuring to see that they may well be usefully carried out with modest resources, as is already well known to be possible in the acute infections (Paul, 1950). The present inquiry, by its reference to a well-defined "population," by its study of a "cohort," and by its use also of some clinical approaches, has yielded elementary information on the incidence and prevalence of one of the most serious diseases in the population. It has raised questions on the natural history in middle age, and has provided some facts on the life of its victims. It has given some indication of what would be involved in a field survey of the principal cardiovascular diseases, and has suggested one approach to the investigation of causes, through its uncovering of what may be an "experiment of opportunity."

PART III: THE DISEASE IN MEDICAL PRACTITIONERS AND IN OTHERS

There is a widespread impression that doctors suffer more from coronary heart disease than the rest of the population, though the papers on the subject have been divided (Osler, 1910; Boas and Boas, 1949). This impression is based on clinical experience and mortality rates from England and Wales and the United States (Registrar-General, 1938; Dublin and Spiegelman, 1947). The clinical evidence is of doubtful value. Quite simply, in order to determine whether there is any difference in the experience of doctors and others, it is necessary to know, for a definite period of time, the ratio

$$\frac{\text{No. of cases of coronary heart disease in doctors}}{\text{No. of doctors among whom these cases are occurring}}$$

and it must be possible to compare this with the corresponding ratio

$$\frac{\text{No. of cases in other people}}{\text{population in which these are occurring}}$$

In both it is necessary to know the sex and ages of those in the numerator and denominator. (The problem is exactly the same as in comparing the experience of one group of doctors with that of another.) Many of these facts are not usually available in clinical work, and impressions based on the numbers of doctors seen by any individual or in any clinic are apt to be quite inaccurate. Probably the least reliable impressions are those of distinguished physicians who may have a quite disproportionate number of doctors in their personal practice, and generalize from that. The mortality rates present other kinds of problem: in particular, the latest from this country are for 1930–2, as the war prevented the holding of the 1941 census and the publication of the traditional Decennial Supplement on Occupational Mortality based upon it. The clinical recognition of "coronary thrombosis" was not yet very common in this country in 1930–2. Moreover, as indicated in Part II of this paper, it may not be sufficient to group all medical practitioners together as was done in those death rates.

Since the present inquiry forms part of a wider investigation which includes a number of non-medical groups, it provides an opportunity for reconsideration of this question which has caught the imagination of physicians on both sides of the Atlantic. The non-medical groups include professional, scientific, technical, executive, and clerical grades of the Civil Service (established men only), a large number of schoolmasters, several grades of Post Office workers, the Metropolitan Police, building workers of the London County Council, drivers, conductors, and several other grades of the staff of London Transport Executive, and various smaller professional, clerical, and industrial groups. In all, the diagnoses made among a miscellaneous group of about 200,000 men for 1949 and/or 1950 can be considered here—that is, a number that might be found in a city of a million people or so. Between 35 and 40 years of age there are relatively few cases, and after 60 the conditions of service in the various organizations and grades differ so considerably that it is not always practicable to define who remains and why. The experience of men aged 40–59 years will therefore be considered and, as before, first attacks of the disease will provide the main material for comparison. The information was specially obtained for the purposes of

this research by the various occupational health services in their examinations of workers (especially those absent from work for any length of time), as well as from the certificates given by general practitioners, hospitals, and consultants and sent to employers. A particular check was kept so far as possible on the "suspect labels" of "myocardial" disease, etc. The main findings are presented below.

Incidence of Coronary Heart Disease

Standardized Rate per 1,000 Men Aged 40–59

General practitioners	7.1 (Table XI)
Other doctors	3.3 "
Miscellaneous, non-medical group	2.5

Comparing, first, the experience of the "*other doctors*" and the non-medical group, it may be said that an incidence of 3.3 is little higher than 2.5. If, therefore, the experience of this non-medical group is at all typical, it would appear that doctors in this country are diagnosing first attacks of coronary heart disease about as often in the population as a whole as they are diagnosing it in those members who are not full-time general practitioners.

Here we must digress to emphasize what such figures mean. When an attempt is made to compare the incidence of a disease in one group with that in another, what is in fact being compared is the incidence of the *diagnosis* of the disease in the two groups. Now there is no justification whatever for supposing that the *level* of diagnosis of coronary heart disease is the same in the medical profession as in the public, and therefore no justification for assuming that because similar rates are here reported the true incidence is similar. These medical rates almost certainly include a high proportion of all the coronary heart disease that produced symptoms among the "other doctors." In the miscellaneous non-medical group it is not possible to say more than that the methods of diagnosis and collection adopted *may* have resulted in an equally high proportion of coronary heart disease being recognized and recorded; but quite likely it did not.* If many of the cases in the non-medical group are being wrongly called coronary heart disease, there may in fact be some real excess of it among "other doctors." On the other hand, if many cases of coronary heart disease among the miscellaneous group are being overlooked, it may well be that these "other doctors" have a *lower* incidence than the population as a whole, in so far as this is represented by the group being studied.

The fatal first attack rates show similar trends, and so do the total mortality rates (Fig. 13). In the following, the rates for England and Wales are estimated from the provisional figures for 1950, kindly supplied to us by the Registrar-General (1952, personal communication), and are based on the Sixth Revision of the International List of the Causes of Death. (One effect of this revision is that deaths from myocardial infarction are now included with coronary disease.) These national figures are used because the *total* mortality is required, and there is no means of assessing how many of the deaths from coronary heart disease that do not occur in the first clinical attack will be recorded by employers in the above non-medical group, since the first (non-fatal) attack may result in a change of employment. The rates of medical practitioners are for the Society's members in 1947–50, and they include deaths in later as well as in first attacks.

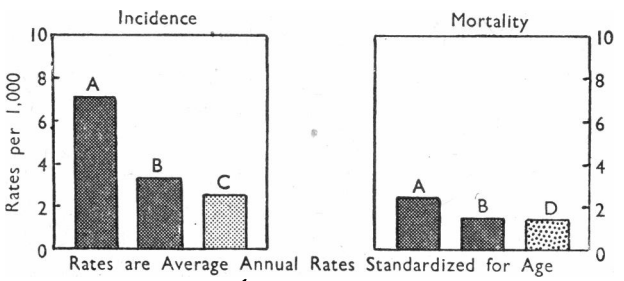


FIG. 13.—Coronary heart disease in medical practitioners and in others. Men aged 40–59, inclusive. A=General practitioners (Category 1), 1947–50. B=Other doctors (Categories 2+3+4), 1947–50. C=Miscellaneous non-medical group, 1949–50. D=England and Wales, Civilian Population, 1950 (provisional). A and B held Medical Sickness, Annuity and Life Assurance Society Immediate Benefit Policies.

*The early case-fatality ratio—that is, the proportion of first attacks that were rapidly fatal—is higher among this miscellaneous group than among these "other doctors." But as the advantage of the "other doctors" may partly be due to better *treatment*, as well as to better *diagnosis* with the recognition of milder cases, and the relevant number of "other doctors" variously affected is small, this aspect cannot be satisfactorily discussed.

Mortality from Coronary Heart Disease

Standardized Rate per 1,000 Men Aged 40–59

General practitioners	2.4
Other doctors	1.5
Males, England and Wales	1.4

It should be remembered, moreover, in comparing the 1.5 and 1.4 that 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.

The problem is very different when comparing the experience, and particularly the incidence, of the *general-practitioner* members with the non-medical group. If the figures presented here for the non-medical group bear any relation to reality, it may well be that these general practitioners have a higher incidence than that group. Moreover, if these miscellaneous professional, clerical, and industrial workers are at all representative of men in their age groups, and if, similarly, the general-practitioner members of this Society are typical of all general practitioners, the higher incidence reported here may be evidence in support of the common impressions on the subject. The differences noted in these total mortality rates are smaller than for the incidence, owing possibly to recent changes in the incidence of first attacks, fatal and non-fatal, among general practitioner members. If this is the reason it may be an illustration how recent variations in *incidence* rates may not appear simultaneously in the corresponding *total mortality* rates, which, in a disease that is often chronic, must show a time-lag and include deaths from illnesses originating over a long period.

Here this problem of a possible difference between medical practitioners and the rest of the population must unsatisfactorily be left. It is an interesting question, but not at present one with a great deal of meaning. Eventually it may be practicable to carry out large-scale diagnostic surveys of coronary heart disease in the population, with standardized methods, and in the course of these it may be possible to answer this particular question.

Summary and Conclusions

A study was made of clinical coronary heart disease diagnosed among over 6,000 male medical-practitioner members of the Medical Sickness, Annuity and Life Assurance Society, Ltd., aged 35–64, who held "immediate" non-cancellable sickness insurance, providing benefit, on receipt of a medical certificate, for periods of incapacity to work which last seven days or more. The Society also has knowledge of all deaths in its membership, even when these occur after an illness of less than seven days. Apparently about a quarter of the male doctors of the country in the ages studied belong to the Society, and hold this type of insurance. The report deals only with these doctors, and no information is available about the doctors who do not belong to the Society (or about those who do belong but have other kinds of policy). A full medical examination is given to all applicants for membership of the Society.

The average annual *incidence* of first clinical attacks of coronary heart disease ("coronary thrombosis"—acute myocardial infarction—and angina pectoris) in

these medical practitioners during 1947–50 increased with age, to reach 16.6 per 1,000 at 60–64 years.

The coronary *death rate* in 1947–50 similarly rose with age to 7.4 per 1,000 at 60–64 years; and it accounted for about a third of all mortality in these insured medical practitioners in each five-year age group. The deaths were mainly concentrated in the first attack; in 1940-50, inclusive, 56% of all deaths from coronary heart disease among the members aged 40–64 were "*sudden*," occurring in the first six days of the first clinical attack, and another 14% took place in the remainder of the first month. Coronary deaths occurring after the first month of the first attack accounted for only 30% of the total coronary mortality among these medical practitioners in the eleven years 1940–50.

On current experience, the *probability* that the *individual practitioner* member under 45 years of age who has not yet been attacked by it will be attacked by clinical coronary heart disease before he reaches 65 are about one in five, or 20%. The chances that the individual practitioner under 45 years of age will die of it are about one in fourteen, or between 7.1% and 7.5%.

In 1950 the *prevalence* of coronary heart disease among the members aged 60–64 years was about 9%. The 9% was made up of rather more than 4% "active prevalence"—men who were disabled from work for at least a week during the year because of coronary heart disease; and rather less than 5% with "latent" disease —men who had suffered from the disease before 1950, and were alive in 1950 but not incapacitated from work on account of it during that year for as long as a week.

The *prognosis for life in "coronary thrombosis"* was examined from the onset of the first clinical attack. About 30% of all these men aged 40–64 experiencing first attacks died in the first six days of the first attack —the "sudden" deaths; another 8% died in the remainder of the first month, making 38% in all in the first month. Thereafter the picture is quite different, with 2% dying in the remainder of the first year, and an average of about 2% dying annually in the next six years. Men aged 40–49 at the date of onset of the first clinical attack had apparently a rather lower mortality during the few years that can be observed than those aged 50–64. Of the men who survived their first attack of "coronary thrombosis" about half had no further *absence* for coronary heart disease (or its complications) that lasted as much as a week during the next six years. The average *time lost from work* for coronary heart disease during the next six years by men who survived their first attack was about four weeks per man per year. This figure makes no allowance for part-time work, etc.

The outlook for life of men first presenting with *angina pectoris* was very much better than for the others. During the five years from the date of onset about 11% of them died; their prognosis for life was therefore about the same as in men first presenting with "coronary thrombosis" who had *survived* the first month, with its 38% mortality.

The *mode of first presentation* of coronary heart disease in these medical practitioners aged 40–64 was about 24% as "sudden" death; 55% as less severe "coronary thrombosis"; 17% as the relatively benign angina pectoris; and 4% of miscellaneous "coronary insufficiency," etc. The proportion of angina pectoris increased from 12% at 40–44 to 22% at 60–64; the proportion of the intermediate group of less severe "coronary thrombosis" was smaller in the older men; the proportion of "sudden" deaths as first manifestation changed little with age.

The *membership* of the Society holding these immediate sickness insurance policies was sampled and divided into *four occupational categories*: full-time general practitioners, full-time consultants/specialists, "G.P.-Specialists," and public officials. The *incidence* of first attacks of coronary heart disease in 1947–50 was twice as high among the full-time general-practitioner members aged 40–64 as in the rest. The excess incidence was seen in each five-year age group, in first attacks that were soon fatal as well as in those that were not, and in each of the four years 1947–50. When the "G.P.-Specialists" were added to the full-time general practitioners, the incidence in this composite group was 1.8 times the incidence in the remainder. There was little difference between the rates of the full-time specialists, the "G.P.-Specialists," and the public officials, but the numbers in each of these three categories were very small.

Evidence about 1940–6 is incomplete. Such information as is available suggests that there was little, if any, excess among the general-practitioner members during the war. There is no information on the situation before the war.

Finally, the experience of these medical practitioners was compared with that of a large miscellaneous group of men in the civil services, in the professions, and in industry. The incidence of coronary heart disease in this *non-medical* group was well below that of the full-time general practitioners, and resembled that of the other doctors. A comparison with the provisional mortality rates from coronary disease among the males of England and Wales in 1950 gave similar results.

We are obliged to many for helping us in this investigation: to the Directors of the Medical Sickness, Annuity and Life Assurance Society, Ltd. for allowing us free use of their existing records and for setting up the elaborate additional recording apparatus that was necessary; to Mr. E. A. J. Heath, manager and actuary of the Society, and to other members of its staff; to the Registrar-General and the various chief medical officers and their medical and lay colleagues for providing us with the information from which the non-medical rates of Part III were calculated; to the officers of the Accountant General's Department of the Ministry of Health, and in particular Mr. A. A. Greneski and Mr. H. W. Meyer; to the chief medical officers of the Department of Health for Scotland and the Ministry of Health and Local Government, Northern Ireland; to Dr. L. I. Dublin; to Messrs. J. and A. Churchill Ltd. and Mr. B. S. Stanton, Editor of the *Medical Directory*; to Professor A. Bradford Hill, for most valuable criticism and advice on Part II; to Mr. R. D. Clarke for generous help on the whole paper; to colleagues and friends for many suggestions; and to the secretarial staff of the Unit for much practical assistance.

REFERENCES

Bailey, W. G., and Haycocks, H. W. (1946). *Some Theoretical Aspects of Multiple Decrement Tables.* London.
Boas, E. P., and Boas, N. F. (1949). *Coronary Artery Disease.* Chicago.
Dublin, L. I. (1951). Personal communication.
—— and Spiegelman, M. (1947). *J. Amer. med. Ass.*, **134**, 1211.
—— —— (1948). Ibid., **137**, 1519.
Eckerström, S. (1951). *Acta med. scand.*, Suppl. 250.
Friedberg, C. K. (1949). *Diseases of the Heart.* London.
Gertler, M. M., Garn, S. M., and White, P. D. (1951). *J. Amer. med. Ass.*, **147**, 621.
Gordon, J. E. (1950). In *Epidemiology of Mental Disorder.* Milbank Memorial Fund, New York.
Gosse, A. Hope (1942). *British Medical Journal*, **2**, 567.
Gregg, D. E. (1950). *Coronary Circulation in Health and Disease.* London.
Heath, E. A. J. (1939). *J. Inst. Actuaries*, **70**, 271.
Josiah Macy Jr. Foundation (1951). J. Dedichen *et al. Factors Regulating Blood Pressure.* Transactions of the Fifth Conference, New York.
McCain, F. H., Kline, E. M., and Gilson, J. S. (1950). *Amer. Heart J.*, **39**, 263.
Morris, J. N. (1951). *Lancet*, **1**, 1, 69.
Osler, W. (1910). Ibid., **1**, 697.
Paul, J. R. (1950). In *Research in Medical Science.* New York.
Registrar-General of England and Wales (1938). Decennial Supplement, Part IIa. London.
—— Statistical Review, Tables, Part I, Medical, 1938-49. London.
—— Text, Vol. 1, Medical, 1940-7. London.
Tulloch, J. A., and Gilchrist, A. Rae (1950). *British Medical Journal*, **2**, 965.

APPENDIX 1

The Individual Practitioner's Chances: Methods of Calculation

To calculate the probabilities shown by Tables III and IV it was necessary to construct two life tables showing the subsequent history of a hypothetical body of 1,000 practitioners coming under observation at exactly age 35 (the lowest age in both Tables III and IV) as follows:

Chance of Getting Coronary Heart Disease (Table III)

At each age from age 35 to age 65 the life table shows:

l_x, the number at the beginning of the year of age x to $x+1$, not yet clinically attacked by coronary heart disease.

c_x, the number (out of l_x at the beginning of the year of age) clinically attacked during the year of age (these must all be first attacks on account of the definition of l_x).

d_x, the number (out of l_x at the beginning of the year of age) who die during the year of age (except on account of coronary heart disease, in which case they would be already included in c_x).

The number of "living," l_x, are thus subject to two mutually exclusive causes of reduction—and it will be seen that $l_x - c_x - d_x$ gives l_{x+1}, the number living, and not yet clinically attacked by coronary heart disease, at the beginning of the year of age $x+1$ to $x+2$.

Table III shows the probabilities of being attacked for the first time between age x and age y in the form of numbers per 1,000 at age x. These probabilities are given by the formula

$$\frac{c_x + c_{x+1} + \ldots + c_{y-1}}{l_x} \times 1{,}000$$

To construct the life table, estimates were needed of (*a*) the rate of first attack in a population of lives not yet attacked, and (*b*) the rate of death from causes other than coronary heart disease in the same population. For the reasons given in the text, the first attack rate was obtained from data for 1949–50. The number of lives attacked in any given year was estimated from the "total prevalence" figures in Table V and subtracted from the total mean population to give the number of lives not yet attacked. The "non-coronary" death rate among lives not yet attacked was assumed to be the same as the "non-coronary" death rate among the whole group investigated, no closer estimate being practicable. This rate was based on data for 1947–50, since no important changes in death rate had taken place in this period and the larger figures thus available gave a smoother progression of rates with age. This "non-coronary" death rate was thus in fact, though not in theoretical basis, the same as the "non-coronary" death rate used in the life table leading to Table IV.

The rates obtained were those for five-year age groups. To obtain rates for individual ages the group rates were plotted and a smooth curve drawn passing through or close to these points so as to estimate the trend in terms of individual ages, the rates for which were read off. The life table was then calculated.

Chance of Dying from Coronary Heart Disease (Table IV)

At each age from age 35 to age 65 the life table shows:

l'_x, the number living at the beginning of the year of age x to $x+1$, whether already clinically attacked by coronary heart disease or not.

d'_x, the number, out of l'_x at the beginning of the year of age, who die from coronary heart disease during the year of age.

d''_x, the remainder of the deaths during the year of age.

The number living at the beginning of the year of age $x+1$ to $x+2$, l_{x+1}, is thus given by $l'_x - d'_x - d''_x$.

The probabilities shown by Table IV (in the form of numbers per 1,000 at age x) of dying from coronary heart disease between age x and age y (whether already clinically attacked at age x or not) are given by the formula

$$\frac{d'_x + d'_{x+1} + \ldots + d'_{y-1}}{l'_x} \times 1{,}000$$

To construct the life table estimates were needed of (*a*) the rate of death from coronary heart disease, and (*b*) the rate of death from all other causes, in both cases in the total population, whether attacked or not. These were obtained from data of 1947–50 as mentioned in the text. The rates obtained were for five-year age groups and rates for individual ages were found by the process described above.

There is a theoretical objection to this life table, and hence to Table IV, in that the body of lives among whom rates were actually observed is subject to the addition of new entrants who have just passed a medical examination satisfactorily and who therefore have not yet been clinically attacked. The practical effect of this objection must, however, be small in this investigation because the number of new entrants above, say, age 40 is extremely small in relation to the existing membership at these ages. Furthermore, the practical effect, if any, of the existence of a small number of recently selected lives is to underestimate slightly the death rates observed, and thus Table IV cannot on this account exaggerate the position.

A further difficulty, which applies to both life tables, is that where more than one force of decrement is involved the process of passing from the observed rates to the numbers in the life table is theoretically more complex than where a life table showing the single decrement of "death from all causes" is concerned. This complexity arises from the fact that the forces of decrement considered are operating simultaneously. In the second life table, for example, a death (in d''_x) at time t between age x and $x+1$ is dependent on the same life not having died of coronary heart disease between age x and $x+t$. The details of a theoretically correct process depend on the form of the original observed rate, and the considerations involved are fully discussed by Bailey and Haycocks (1946). In the present inquiry the scale of the investigation and the progression and actual size of the rates observed made it possible to apply the original rates for individual ages directly to a radix—that is, the hypothetical body of "lives" whose subsequent history is shown by the life table—of 1,000 at age 35 without affecting the final figures presented. In other circumstances this would not necessarily be possible.

APPENDIX 2

Prognosis: Methods of Calculation

As explained in Part I of the text under "Prognosis," all calculations were based on the 243 first absences for coronary heart disease starting in the years 1940–50, inclusive, among men aged 40–64 inclusive. These 243 cases were divided into three groups: 192 which presented in the first absence as "coronary thrombosis," 42 which presented as angina pectoris, and 9 which presented as "coronary insufficiency," etc. (Some of the cases presenting as angina pectoris had further absences where the condition was diagnosed as "coronary thrombosis," but this did not affect the grouping which was determined by the diagnosis in the first absence.) Attention was mainly focused on the 192 cases of "coronary thrombosis," because the number of cases of angina pectoris gave little scope for analysis. The other nine cases were ignored in this context.

Prognosis was considered from three points of view: (1) *Prognosis for life and death*—the chance of dying of coronary heart disease in a given time, measured from the beginning of the first absence from work on account of it. (2) *Prognosis for further absence*—the chance of being absent again because of coronary heart disease in a given time after the end of the first absence. (3) *Prognosis for work*—the average amount of time lost from work because of coronary heart disease, in a given time after the end of the first absence.

All three concepts were explored with the cases presenting as "coronary thrombosis"—the second and third applying, of course, only to the men who could be followed until they returned to work after the first absence. There were 107 such men out of the original 192; 80 died in the first absence, and five could not be followed to the end of it. For angina pectoris it was only possible to attempt prognosis for life and death.

It was not possible to follow all cases for an equal length of time, if only because an arbitrary date had to be chosen at which observations ceased (June 30, 1951), and the cases arose at different times during the 11-year period. The method adopted was to measure time for each case from the beginning of the first absence, or from return to work after the first absence, according to the particular type of prognosis considered. The observation time was broken up into periods of a year (except for the first year in prognosis for life and death, which was divided into different intervals—see below), and the experience in each year was considered for all those cases which were still under observation at the beginning of the year. The proportion surviving, for instance, to the end of the first year was calculated from the first year's data. From the second year's data the proportion of these survivors who reached the end of the second year was calculated. The product of the two proportions gave the proportion of the original number who survived to the end of the second year, and so on. A cumulative product was thus obtained which gave the proportion surviving up to the end of any given number of years from the beginning of the first absence.

The principle was also adapted to calculate the proportion of those returning to work who had a further absence in a given number of years after such return, using the proportion having further absences in individual years.

It was necessary to consider the experience year by year. An alternative would have been to calculate the proportion dying before the end of a given year by dividing the number of deaths in that time by the total number of persons observed (suitably adjusted for lapses of observation). This would, however, give undue weight to the experience of the first few years, when the numbers under observation are far greater.

In any given year (or shorter period) expressions had to be found which would give good estimates of the proportion dying (and hence the proportion surviving), or the proportion having a second attack, in the year, allowing for the fact that it was not possible to observe everybody for the whole year.

Reasons for Lapse of Observation.—The reasons why men could not be observed for a whole year were as follows: (1) Their policies might terminate during the year, on reaching the age of 60 or 65. (2) The end of the observation period (June 30, 1951) might fall within the year. (3) They might die from (*a*) coronary heart disease or (*b*) another condition.

Prognosis for Life and Death

The percentage dying in the year from coronary heart disease was calculated from the following formula:

$$\frac{\text{No. of persons dying during the year from coronary heart disease} \times 100}{X+Y+Z}$$

Where X = one year each for all those alive and under observation for the whole year.

Y = the sum of the observed parts of a year for those in 1, 2, or 3*b* above.

Z = one year each for those in 3*a* above who would have been followed for the whole year had they lived; and for the rest, the sum of the parts of a year for which they would have been followed had they lived.

The formula had to be slightly modified in the first year, which was divided into three unequal periods—the first six days, the remainder of the first month, and the rest of the year. This decision was adopted because by far the greatest part of the mortality in the first year (and indeed in the whole natural history of the disease under 65 years of age) occurs in the first few weeks—in fact, in the first few days.

In the first six days Y = 0 because no absence occurred within six days of the policy terminating, and, since no absences starting in 1951 were considered, could not occur within six days of June 30, 1951. For the same reason Z is all deaths from coronary heart disease. In this case, then, X + Y + Z is simply all absences starting in the period.

Similarly, for mortality in the rest of the first month, no absences started within a month of termination of the policy and could not occur within a month of June 30, 1951. X + Y + Z here is all survivors of the first six days.

In the rest of the first year it was necessary to convert all periods of observation, which had been calculated in decimals of a year, to decimals of eleven months.

After the first year there were no special difficulties.

Calculations were made for each 5-year age group from 40–64, age always being reckoned from the start of the first absence.

Prognosis for Further Absence

This applies, of course, only to those who returned to work after the first absence, and there is no problem of unequal periods in the first year. Numbers were not large enough to attempt the calculation for the men with angina pectoris.

In each year after return to work the percentage of survivors who, not having had a further absence, started one in that year was calculated according to the formula:

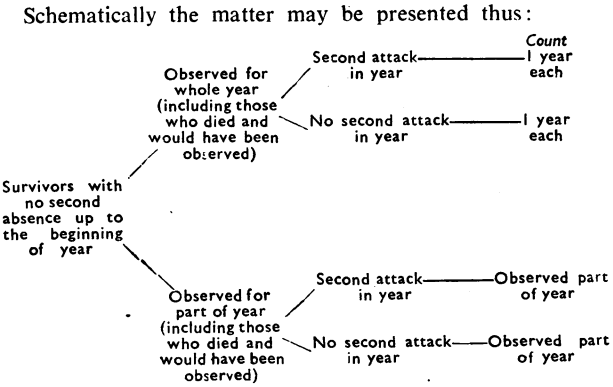
$$\frac{\text{No. of persons starting a second absence in the year} \times 100}{U+V+W}$$

Where U = one year each for all those who, not having had a second absence before the year in question, were alive and under observation for the whole year, *whether or not* they started a second absence during the year.

V = for those who, not having had a second absence before the year in question, were alive but could not be followed for the whole year for reasons 1, 2, or 3*b* above—the sum of the observed parts of a year, *whether or not* they started a second absence during the year.

W = for those in 3*a* above who did not have a second absence before the year in question, and who died during the year from coronary heart disease—one year each for those who would have been followed to the end of the year had they lived and, for the rest, the sum of those parts of the year for which they would have been followed had they lived.

Schematically the matter may be presented thus:



"Further absence" includes all cases in which death occurred after return to work from the first absence, even when the fatal illness lasted less than seven days, and was therefore not recorded as an absence.

Prognosis for Work

As for "Prognosis for Further Absence," this applies only to those who returned to work after the first absence and to the "coronary thrombosis" group.

In each year after return to work the percentage of time lost from coronary heart disease was calculated according to the following formula :

$$\frac{\text{Total time lost from work on account of coronary heart disease in the year} \times 100}{\text{Total possible time at work in the year}}$$

where the "total time lost" is the sum of all periods of absence during the year from coronary heart disease among those under observation at the beginning of the year (including the remainder of the year for those who died during the year); and "possible time" is what would have been possible if there had been no absence—that is X+Y+Z of "Prognosis for Life and Death" if calculated from return to work.

"Time lost" does not refer to the actual working hours. The data merely give the days lost, and these are converted to fractions of a year.

Throughout these calculations exact dates at which absence began and ended, and policies terminated, permitted accurate calculations of the periods of exposure to risk and time off work. The methods would of course not be applicable without adjustment where such complete information was not available. All fractional periods were worked in decimals of a year correct to two decimal places.

The fact that in "coronary thrombosis" a very large proportion of deaths occur in the first few days of the first absence means that what at first seemed a considerable body of data did not give as much information about prognosis for life and death as had been hoped. The information about how prognosis varied with age, for instance, was disappointing. Thirty per cent. of all first attacks result in death within six days and 38% within a month, but, of the 91 *recorded* deaths amongst the 192 cases presenting as "coronary thrombosis," 74, or about 80%, occurred within the first month.

A disease, like pulmonary tuberculosis, in which the chance of early death is relatively small, and in which the deaths are more evenly spaced in time, would give greater scope for the methods used.

APPENDIX 3

Independent Categorization of Samples of Membership, and of Men having First Attacks of Coronary Heart Disease, from the Records of the National Health Service

The following are the results of the two checks that were applied to test the validity of the categorizations already made (and summarized in Table XI) from the *Medical Directory* of 1946, 1948, and 1949.

Category from *Medical Directory* (1)	General Practitioners		Hospital Staff	
	No. Checked on N.H.S. Lists for General Medical Services (2)	Proportion Found on N.H.S. Lists (3)	No. Checked on N.H.S. Lists for Hospital Service (4)	Proportion Found on N.H.S. Lists (5)
General practitioners, Category 1	485	91%	122	1·6%
Consultants/specialists, Category 2	186	1·6%	87	85%
G.P.-Specialists, Category 3 ..	123	88%	123	66%
Public officials, Category 4 ..	68	13%	68	2·9%

Column 1—The four main categories as described in the opening of Part II of this report.

Column 2—All in the samples aged 45–64, and all cases of first attack alive and at work after July 5, 1948, were checked on the general medical services lists of N.H.S.

Column 3—The proportions of those in column 2 who were found to be providing general medical services under the N.H.S. Act. Most of the public officials who were providing such service were clearly doing so for other members of their own staffs.

Column 4—It was impracticable to classify hospital service as "specialist" or otherwise. The following general practitioners are included in the 122 categorized from the *Medical Directory* as general practitioners who were now checked for hospital service: all in the samples who were not found in the general medical services lists; all in the samples who were resident in Scotland and Northern Ireland; all G.P.s who had first attacks of coronary heart disease in 1947–50 and who were alive and at work after July 5, 1948. The 87 consultants/specialists whose names were now checked included all so categorized who were *not* on the staff of teaching hospitals; and all the relevant cases of coronary heart disease.

Column 5—The proportions of those in column 4 now found to be rendering N.H.S. hospital service. The 2 of the 122 categorized as general practitioners who were found to be under contract for hospital service were also rendering general medical services. 12 of the 41 "G.P.-Specialists" not found in the N.H.S. lists seemed to have lost their hospital appointments very recently, judging from the changes in the *Medical Directory* between 1946–9 and 1951; 27 still record these appointments in the 1951 *Medical Directory*; 2 had retired. Two "public officials" now found to be clinical specialists were also clearly continuing as public health officers: 2 of 68 is 2·9%.

HERPES ZOSTER VARICELLOSUS

BY

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In 1892 von Bókay, of Budapest, described the simultaneous appearance of herpes zoster and varicella in the same patient, and he advanced the theory that the two conditions were caused by the same virus. Seiler (1949) has estimated that the yearly incidence of herpes zoster in Edinburgh is 2 per 1,000 of the population, and that 3.8% of these zoster cases are complicated by a varicelliform eruption.

Most uncomplicated zoster cases in this region are dealt with by local practitioners, and few are referred to the Infirmary. During the period under review (1947–50 inclusive) the number of zoster cases seen was 79, of which 67 were uncomplicated, 6 suffered from involvement of the eye, and the remaining 6 cases were complicated by a generalized varicelliform eruption. Five of the cases are summarized in the Table on the opposite page, and the sixth is described in greater detail below.

Case Reports

Case 6.—A man aged 69 was suffering from haemorrhagic herpes zoster in the distribution of the ophthalmic division of the fifth cranial nerve on the right side. The condition had been present for seven days. Before the attack of zoster his health had been excellent and there was no history of his having taken drugs of any sort. Blood examination showed no abnormality. He had never had herpes zoster or varicella previously. The day after the appearance of the zoster lesions a generalized varicelliform eruption developed suddenly. This eruption reached its maximum distribution within 24 hours, and thereafter no fresh lesions developed. He was photographed on the day he first reported, and a biopsy of a vesico-pustule on the right forearm was done by one of the doctors in the department.

Case 7.—The doctor who had done the biopsy on Case 6 complained of general malaise, anorexia, and headache 13 days later, and on the following day a typical varicella eruption developed, beginning in the scalp and on the fauces, and appearing in crops on the trunk, back, face, and arms during the subsequent three days. At its height two days later the rash was profuse, especially on the back, but by this time the constitutional symptoms had subsided. There was no previous history of herpes zoster or of varicella, although the patient had often been in contact with both diseases. He was clear of varicella lesions in 16 days.

Case 8.—The technician who had photographed Case 6 complained of general malaise and had the typical features of varicella 15 days after his one and only contact with Case 6—that is, two days after Case 7 had developed varicella.