The relation of cancer to life assurance : a paper read at the Life Assurance Medical Officers' Association, May 5th, 1897, with a discussion / by Joseph Frank Payne.

With the author's compliments

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THE

RELATION OF CANCER

TO

LIFE ASSURANCE

BY

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A PAPER

Read at the Life Assurance Medical Officers' Association, May 5th, 1897, with a Discussion.

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Life Assurance Medical Officers' Association.

A General Meeting of the Association was held on Wednesday, May 5th, 1897, at the Rooms of the Medical Society of London, Chandos Street, the President, Sir Richard Douglas-Powell, Bart., M.D., in the Chair.

A Discussion was opened upon

"THE RELATION OF CANCER TO LIFE ASSURANCE,"

By **JOSEPH FRANK PAYNE**, M.D., F.R.C.P., *Physician to St. Thomas's Hospital, and to the Economic Assurance Society.*

The question of Cancer in relation to Life Assurance seems worthy of investigation on account of the large mortality caused by this disease, and also because it has received on the whole less attention than other diseases which are regarded as especially dangerous in relation to Life Assurance.

In England and Wales, for the ten years 1881-90, the total deaths from Cancer were 161,920, giving a rate of 589 per million. The deaths from Phthisis in the same period were 473,968, giving a rate of 1724 per million. The mortality from Cancer at all ages was thus rather more than one-third of that from Phthisis. If we take deaths over 25 years old, which alone are of interest for Life Assurance purposes, we find the numbers were 159,122 for Cancer, and 329,563 for Phthisis; that is, the former disease was about one-half as fatal as the latter. Taking deaths above 35 we find the numbers were 153,901 and 211,055, Cancer giving very nearly three-fourths the mortality of Phthisis. Above 45 Cancer turns the scale, causing 135,586

deaths, as against 112,877 from Phthisis. At higher ages the proportion of Cancer would be still greater. Since the majority of deaths of insured persons occur at the higher age, the mortality from Cancer in such persons might be expected to be much larger than from Phthisis. On the other hand the early deaths from Phthisis involve a much more serious loss to the office than the late deaths from Cancer. It is not easy to compare the risks implied by these considerations so as to decide which disease is the more dangerous. We can only conclude that both are of great importance. But we find that Cancer has received much less consideration as a factor in the mortality of insured persons than Phthisis.

There is, too, a general impression that Cancer is becoming increasingly prevalent, at least in this country; and there is no doubt that there is a rapid and continuous increase in the proportion of deaths registered as due to this disease, as shown in the Annual Reports of the Registrar-General. On the other hand, it has been said that this increase is apparent rather than real; and that the increase in registered deaths from this cause is due to greater accuracy in diagnosis; cases being now recognised as Cancer which were formerly assigned to other causes or left undetermined.

The arguments in favour of this view have been very ably stated by Mr. King and Dr. Newsholme in a paper in "The Proceedings of the Royal Society" (*Vol. LIV., p. 209—1893*).

Their arguments I cannot pretend to discuss fully on the present occasion; but I must briefly refer to them.

The most important argument is, that the increase in registered deaths from Cancer has taken place chiefly or almost entirely in cases where the decrease is referred to less easily detected or more inaccessible situations. This conclusion is supported by the statistics of mortality in the city of Frankfort-on-Main, where the seat of Cancer in fatal cases is carefully recorded; and also by the undoubted fact that Cancer is registered as increasing much more rapidly in males than in females.

It is assumed that Cancer in females (which occurs predominantly in the easily recognised forms of mammary and uterine

disease) is less influenced as regards its apparent prevalence, by accuracy of diagnosis, than in males, where the predominant form is Cancer of internal organs.

In criticism of these conclusions it may be urged:

1.—That the increase is so large and so continuous, that if due to accuracy of diagnosis, it implies an equally rapid and continuous improvement in the education and skill of the general practitioner; a conclusion which the experience of an old examiner makes one hesitate before accepting. Improvement in these respects there doubtless is, but hardly enough, I think, to account for the remarkable phenomena observed.

2.—The diagnosis of internal Cancer may be, in the absence of post-mortem examination, due, in some cases, to error, as well as in other cases to superior skill and knowledge. It does not necessarily imply the latter.

3.—The proportion of cases of Cancer in accessible parts (including skin, tongue, rectum, and genitals), does not seem to be so small in males as the objectors suppose. Mr. Roger Williams, in support of this conclusion, gives the following statistics:

Out of 2669 cases of Cancer in males observed during life, he finds the following proportion in 'accessible situations':

Tongue and Mouth ...	26·3	per cent.
Skin	14·3	,,
Lip	12·2	,,
Genitalia	6·8	,,
Rectum	7·5	,,
Total ...	67·1	,,

The returns of *Mortality* from Cancer give, it is true, a different result:

Rectum	8·3	per cent.
Tongue and Mouth ...	7·6	,,
Face	4·7	,,
Lip	2·4	,,
Jaw	2·3	,,
Pharynx and Fauces ...	2·2	,,
Total ...	27·5	,,

While for two internal organs we have the following rates:

Stomach	29·6 per cent.	
Liver	13·4	,,
Total ...	43·0	,,

The difference between these results and those of Mr. Roger Williams is no doubt partly explicable by the success of operation in dealing with external Cancers, so that these do not so often appear as causes of death. But it is admitted by the Registrar-General that the localization of Cancer in English certificates of death is, or at least was, extremely defective; and this I can myself confirm, by having gone over, with Dr. William Ogle, a number of such returns, and found the extreme difficulty, owing to vagueness of description, of allotting them to their respective organs. For the present these returns cannot be regarded as of much value.

The increase of mortality from Cancer in the two sexes is, no doubt, very unequal. I compare in this respect the rates given in the Registrar-General's returns for 1881 and 1895:

Death Rate from Cancer per Million of Persons Living.

	Persons.	Males.	Females.
1881 ...	520 ...	364 ...	668
1895 ...	755 ...	586 ...	914

The rates for 1895 are the highest on record.

The nearest whole numbers to express these results are:

	Persons.	Males.	Females.
Ratio	2 : 3 ...	3 : 5 ...	3 : 4
Actual increase in rate	$\frac{1}{2}$ ...	$\frac{2}{3}$ ...	$\frac{1}{3}$

These figures show how very large the increase is, and how unequally it is distributed.

The proportion of male deaths from Cancer to female deaths was, in

1881 ...	54·5 : 100
1895 ...	64·1 : 100

So that the mortality in males is approximating to that in females, though it is far from having reached it.

It is interesting to compare these figures with the diminished rates of mortality from Phthisis, which, for some reason, diminishes somewhat more rapidly in females than in males.

In 1895 the rates for Phthisis were

Persons ...	...	1398 per million.
Males ...	...	1564 ,,
Females ...	...	1243 ,,

So that the death-rate from Cancer in women is now $\frac{3}{4}$ of that from Phthisis; and if the present rates of increase and decrease respectively continue, Cancer must before long become equal to Phthisis in importance as a cause of death in women. In 1881, the rate for Cancer was less than one-third of that for Phthisis in persons generally.*

With regard to the *a priori* probability of an increase in Cancer, a remark by Dr. William Ogle deserves attention. Supposing Cancer, or the constitution predisposing to it, to be hereditary (on which Dr. Ogle forbears to express an opinion), and admitting, what is certain, that Cancer does not, as a rule, hinder fertility, and is not generally fatal till after the reproductive age; then the number of persons having this hereditary predisposition must be increasing in the population, unless there is some other cause in operation which interferes with this law.

No such opposing cause can be traced, so far as I know, beyond the well-known physiological law that all inherited departures from the normal tend to disappear, unless supported by some natural or artificial selection. So that an increasing prevalence of Cancer need not surprise us.

It may also be remarked that there are other facts which make it probable *a priori* that the mortality from Cancer should be increasing.

These are the greatly diminished mortality from Phthisis and from acute infectious diseases. Since both these causes of death act much earlier in life than Cancer, in proportion as they carry off a small number of persons at earlier ages, a larger number

* On this subject see W. Roger Williams on "Diseases of the Breast," p. 279; *British Medical Journal*, December 30th, 1893, and following Numbers.

will survive so as to be the victims of Cancer at a later period of life.

Since the mortality from the diseases mentioned has diminished more rapidly than the mortality from all causes, there must be other causes which act in keeping up the death rate. And among these I believe the increase of Cancer to be one.

On the whole, I conclude that the arguments of Messrs. King and Newsholme, ingenious and able as they are, have not disposed of this question. The presumption remains that Cancer is increasingly prevalent, and will have to be more and more considered as a cause of death in assured persons.*

Probability of a Life becoming affected with Cancer.

Since it may be taken for granted that no person known to have Cancer would be accepted for assurance, the problem is confined to that of prognosis, namely, the probability of the life acquiring and dying of Cancer.

Such a probability is supposed to be shown—

1.—By the occurrence in the life of what are called precancerous conditions.

2.—By the previous occurrence in the family of deaths from Cancer.

Precancerous Conditions.—It has been supposed that Cancer is frequently preceded by some chronic inflammatory condition of the organ affected, which might enable or help us to foretell its occurrence. I do not attach much importance to this point; but the following instances of such supposed conditions may be considered.

1.—Chronic Dyspepsia, especially if Alcoholic, is thought to predispose to Cancer of the stomach. Alcoholic Dyspepsia, sufficient to produce grave symptoms, would, of itself, be a sufficient ground of objection to a life, without taking into account the

* If I may express a personal judgment, I think the statistics, even as criticized by Dr Newsholme, show an increase in internal Cancer, especially of the digestive organs—stomach liver, and intestines. This increase being relatively greater in men, tends to equalize the distribution of Cancer between the two sexes. It is worth consideration whether this increase in Cancer of digestive organs is not related to the greatly increased consumption of meat by the working classes during the last 20 or 30 years.

possibility of Cancer supervening. But Dyspepsia in general could hardly give rise to symptoms *premonitory* of Cancer without suggesting the suspicion of Cancer of the stomach *actually existing;* and the gravity of even a suspicion is self-evident. I should doubt, however, whether the class of chronic dyspeptics are more liable to Cancer than other people.

2.—Certain conditions of the tongue, known as Leukoplakia, Tylosis (or Psoriasis Linguæ), are thought to predispose towards (or actually to run into) Epithelial Cancer. This is a matter chiefly of surgical experience, on which I hesitate to express an opinion. There are certainly conditions of the tongue resembling Psoriasis which have nothing to do with Epithelioma, but considering the difficulty of making a precise diagnosis, I think such cases should always be regarded with suspicion.

3.—Chronic inflammatory or hyperplastic conditions of the skin produced by certain irritants are said to be followed, in a certain numbers of cases, by Epithelial Cancer. Instances are the condition of the Scrotum, resulting from the irritation of soot, and similar conditions seen in workers in paraffin or similar substances. The significance of these cases seems to depend on the irritant itself, not on any simple inflammatory condition produced.

Chronic Eczema, *Psoriasis*, etc., are so rarely accompanied or followed by Cancer, that the association is probably fortuitous. But I myself know at the present moment one case of Chronic Eczema of the leg in an old woman, which was ultimately followed by Epithelial Cancer of the same part. This is, however, only a single case out of some thousand cases of Eczema.

Chronic Eczema of the Nipple has been regarded as an antecedent of Mammary Cancer. But this refers to the remarkable disease of the nipple described by Sir James Paget, which, whatever may be its nature, is certainly distinct from Eczema.

Chronic Inflammation of the Mamma itself has been said to be the antecedent of Cancer. This is strongly denied by Mr. Roger Williams. I have no experience which would justify me in expressing any opinion on the subject.

5.—Chronic Simple Ulcers deserve a little consideration in this connection. It has been said that a simple ulcer (*e.g.*, of the leg), may ultimately become cancerous. This question I must refer to the surgeons. Though I must say that, having had a large number of chronic ulcers under observation at the Hospital for Diseases of the Skin, I have never seen one thus affected. It is singular, on the other hand, that these very ulcers are popularly believed to be incompatible with or even preservative from Cancer of other parts, and on that account salutary. Broca, in his work on Tumours, refers to this popular belief, and says that the question was proposed as one for investigation by a Medical Society in London at the end of the last century. Since reading this remark some years ago, I have been on the look-out for cases which should confirm or refute this theory; and without attaching much importance to a purely negative observation, I may say that I have not met with a patient the subject of an open chronic ulcer who was affected with Cancer in any part.

Mr. Roger Williams draws attention to the rarity of chronic simple ulcers in cancerous patients. Out of 597 cases of Mammary Cancer, he found that condition in two only; though, as he remarks, the subjects of the two diseases are, in age and other circumstances, to a large extent similar.

The question appears to me, therefore, worthy of further investigation, and I beg to commend it to the notice of members of this society.

On the whole, it seems that the evidence afforded by so-called precancerous conditions towards the prognosis of Cancer is not important.

I pass, then, to the second line of evidence, bearing on the probability of a life dying of Cancer—that derived from family history.

Heredity in Cancer.

The most certain way of investigating this question would be to trace the progeny and descendants of persons dying of Cancer, and enquire whether the proportion of cancerous persons among these was larger than in the general population. Unfortunately,

this cannot often be done. In surgical or medical practice of the consulting class, it seldom happens that anything is known of the subsequent family history of a cancerous patient. The records of Life Assurance Societies are still less likely to be complete in this respect. The experience of family doctors ought to be able to furnish most valuable information, especially from country places, where the population is comparatively stable. But even a family doctor must be blessed with unusual longevity to be able to record the experience of two or three generations.

Family histories, compiled either by medical or laymen, are most valuable, but as yet, not made public in large numbers. So far as they go, they furnish striking evidence of heredity in Cancer; but to be impartial, we should remember that negative instances are less likely to be recorded than positive.

As instances of family histories of Cancer I will quote only two.

One is given by J. Collins Warren in his "Surgical Observations on Tumours" (*1839, p. 281.*)

A man died of Cancer of the lip, his son of Cancer of the breast, and two daughters also of Cancer of the breast. A daughter of the son, and a daughter of one of the daughters, both died of the same disease. Besides these, other members of the family were believed to be affected by the same disease, though the facts were concealed. Thus, at least six, probably more, members of the family died of the disease.

A still more remarkable history is given by Broca, which extends over four generations.

Madame Z. died of Cancer, and her four daughters all of the same disease. One of these daughters, A., had seven children, of whom five (four daughters and one son) died of Cancer. Another daughter, B., had five daughters, who all died of the same. One of B.'s daughters had a daughter dying of Cancer; after which the descendants were, so far as known, free from the scourge. In all, Cancer was fatal to 16 persons out of 26 in the family who lived to be over thirty; 15 of these 16 being females.

In a family spoken of by Sibley, a mother and five daughters all died of Cancer of the left breast.

Evidence of transmission in the *descending* line, as given in the above quoted cases, is, of course, the most satisfactory, but we generally have to be content with that derived from investigation in the ascending line, of which I have now to speak.

Antecedent Family History of Cancer as traced in Cancerous Persons.

On this point the results given by the experience of different observers are very divergent.

Some deny the influence of heredity altogether. Those who admit it, find hereditary influence in very different proportion of cases. I quote a few of them.

Sir James Paget, out of 322 cases ...	24	p. c.
Velpeau, one-third of all cases... ...	33	,,
H. T. Butlin	33	,,
S. W. Gross	10·3	,,
Lebert	10	,,
Sibley	11	,,
Parker	14	,,
Roger Williams...	24	,,
Statistics of British Medical Association		
(174 cases women)	33	,,
do. in direct line of descent	20	,,
do. from father and mother	16·8	,,

The lowest estimate is that given by (or quoted from) Winiwarter, who gives, for Mammary Cancer, family history as only 5·8 per cent.

Some figures, stated to give the experience of the London Cancer Hospital at Brompton, give, out of 26,638 cases, family history in 10·5 per cent.

In estimating the general resultant of the above figures, I am impressed with the fact, that in private practice a higher ratio of Cancer in the ascendants is found than in hospital practice. Now the information obtained from private patients belonging to the educated classes is certain to be more accurate than that

obtained from hospital patients; so that it would seem, the more careful the investigation, and the more trustworthy the materials, the more clearly does the hereditary predisposition come out.

Contrary Evidence as to Heredity.

Some of the contrary evidence comes, strange to say, from the experience of Life Assurance Offices, though this evidence is not, as yet, large in amount. It would be very instructive if more evidence of this kind were collected.

In the article by Le Gendre on Heredity in Bouchard's "Pathologie Générale" (*1895, p. 326*), is given the experience of the Washington Life Assurance Company as quoted by Brennan (I cannot trace the original account). Of 56 cases with family history of Cancer (41 having lost a parent), one only died of Cancer (1·79 per cent.), while of 1944 cases without such a family history, 67 (3·45 per cent.) died of Cancer. The number of cases, it should be observed, is small.

Mr. William Thorburn, of Manchester, gives the family history of 92 hospital patients with Cancer, compared with an equal number of other patients, selected as being of similar age. In the first cases there were seven in whose families deaths from Cancer had occurred (two fathers, five mothers). In the non-cancerous series there was an equal number of family histories of Cancer (*i.e.*, three mothers, one brother, three sisters).

(*The Policy Holder, April 21st, 1897.*)

Here also the numbers are small, and the comparisons with selected cases (instead of all cases) is not quite satisfactory.

With regard to the family histories recorded by Assurance Offices, some remarks should be made.

1.—At the age of which the majority of lives are insured, viz.: young adults, the parents will generally be, if living, more in middle life than in advanced life. Hence the cancerous disposition, if it exist, will not have had time to show itself in the parents, still less in brothers or sisters.

2.—The family history is limited, generally speaking, to that of parents, brothers, and sisters.

But the history of grandparents and collaterals of parents (uncles and aunts) is also very important in estimating heredity.

In certain hereditary diseases, *e.g.*, Hæmophilia, the transmission of the special abnormality is known to take place from males, through females, who do not show it, to their male children.

I myself have had a curious instance of this mode of transmission in another hereditary condition. A patient who consulted me for an entirely different matter, showed me a peculiar congenital malformation of the little fingers of both hands. This malformation, he said, came from his grandfather. This ancestor had sons who did not not show the peculiarity, and also three married daughters. Each of these daughters had one son who showed the malformation (my patient being one of them), and in each case, he said, it was the *second* son who showed it.

Now the ordinary family histories in Life Assurance records would have entirely missed this hereditary peculiarity, as they would in all probability have missed such a condition as Hæmophilia.

3.—Since veracity is not an universal virtue, even in persons desiring to insure their lives, we may always assume that family histories are likely to err on the side of deficiency, not of redundancy. Hence any evidence of hereditary disposition is likely to fall below the truth, rather than above it.

Life Assurance family histories, therefore, if accurate as far as they go, often imply something beyond what they actually record.

The same character of imperfection, rather than inaccuracy, belongs to all family histories of Cancer. In many cases the hereditary tendency to the disease is not manifested till after the time at which the history is enquired into. Sir James Paget has more than once referred to such cases. A well-known instance is that of an eminent surgeon, whose son died in middle life of Cancer, I think, of the larynx. He himself died, over seventy years of age, of the same disease affecting another part of the body.

On the whole, I should conclude that the hereditary factor in Cancer cannot be disregarded, even when studied in the imperfect way which alone is possible to us. It seems to me that

the occurrence of cases of Cancer in a family does imply a certain probability of the disease occurring in that family with greater frequency than in the general population.

Recent Views on the Pathology of Cancer.

An objection to the assumption of heredity as a factor in the production of Cancer has been deduced from certain recent views on the pathology of that disease. There is an increasing tendency to believe that Cancer is an infective disease, produced by some animal or vegetable parasite; though actual proof of this theory is, as yet, entirely wanting. If, then, Cancer is a parasitic disease, we are told it cannot be inherited. This conclusion seems to me very dubious. Heredity in disease may be of several kinds.

First, there may be a direct inheritance from either parent of the specific cause of disease, which might be called *Parental Infection*. This mode is the rule in Syphilis, and may occur in Tubercle, though, as regards the human subjects, very rarely.

Secondly, there may be an inheritance of some structural abnormality, such as supernumerary fingers, or conditions like that which I before alluded to. Possibly this applies to some actual diseases, *e.g.*, Cartilaginous Tumours.

Thirdly, there may be a transmission, not of actual disease, but of some peculiarity of the tissues—call it weakness or vulnerability—which makes the individual less able to resist either injuries in general or some special kind of injurious agent.

The facts of heredity in disease may be explained on any of these hypotheses. If the last, which seems to be the most widely influential, be adopted for any particular disease, then the proof that this disease is caused by any parasite or microbe entering from without, would not destroy the evidence of hereditary predisposition.

I do not think that the discovery of the tubercle bacillus has destroyed the evidence for hereditary predisposition in Phthisis. It only shows that what is generally inherited is not the tubercle bacillus itself, but a certain vulnerability of tissue which renders the individual less able to resist the attacks of the microbe.

So with Cancer. Even if the parasitic theory of this disease should be proved (which I for one do not expect), and it should be shown that Cancer may be acquired by direct infection, the evidence of heredity would still remain. We should only have to put it in this way: that there are certain individuals who inherit a peculiar susceptibility to the cause of Cancer, whatever that cause may be.

Before leaving the question of heredity, I should like incidentally to refer to one curious problem. M. Critzmann (quoted in Bouchard's "Pathologie Générale" *loc. cit*) has put forward a theory of Cancer which I cannot now criticize or even state; but which involves two remarkable conclusions. One is that Cancer occurs with special frequency in families which show a special proclivity to twin births. Another is that twins themselves cannot suffer from Cancer.

I only venture to suggest these two questions to members of this society. Can any one bring forward evidence of the coincidence of Cancer and twin births in a family history? Can any instance be brought forward of Cancer occurring in one or both of a pair of twins?

Any positive answers to these questions would, I think, be of great interest; and not without some bearing on Life Assurance.

Relation of Cancer to Longevity.

The importance of any disease in relation to Life Assurance obviously depends upon how far it tends to shorten life; that is, at what age death, if it should be caused by that disease, is likely to occur. In the case of Cancer we may dismiss the questions of general delicacy, or liability to other ailments, since it is generally admitted that the subjects of Cancer are not, as a rule, bad lives in other respects. It has even been said that cancerous families are notable for longevity, but to this statement I attach no importance. The *special* risk in accepting a life supposed to have a predisposition to Cancer is limited to the probability of his dying of that disease, and depends evidently upon the age at which that may be expected to carry him off, supposing the probability should be fulfilled.

It appeared to me at first that the best method of estimating this probability would be to establish the average at which death from Cancer occurs. But not only is such an average very difficult to establish, but I find that is not regarded by statisticians

as a satisfactory method of stating the problem. My friend, Dr. Tatham, of the General Register Office, informs me that such averages are not calculated in that office for any disease, since they are regarded as misleading.

It remains, then, to consider the proportion of persons dying of Cancer at particular ages. In estimating this proportion, it is, of course, necessary to take into account the estimated numbers of persons living at each age-period in the population.

Dr. Tatham has kindly furnished me with a table, here reproduced, showing the death-rates from Cancer at particular ages, corrected for the estimated age distribution, and compared with the corresponding rates for Phthisis.

Mortality from Cancer and from Phthisis in England and Wales, 1881-90.

Ages.	CANCER.		PHTHISIS.	
	Deaths.	Rate per Million.	Deaths.	Rate per Million.
All Ages	161,920	589	473,968	1,724
Under 5 years	712	20	18,950	536
5—10	332	10	9,502	290
10—15	332	11	15,680	521
15—20	563	20	42,471	1,545
20—25	859	35	57,802	2,324
25—35	5,221	128	118,508	2,901
35—45	18,315	584	98,178	3,132
45—55	36,069	1,545	63,913	2,737
55—65	45,761	2,868	34,606	2,169
65—75	38,318	4,160	12,485	1,355
75 and upwards	15,438	4,295	1,873	521

This table shows us that the chief mortality from Cancer takes place late in life. Nearly the whole, *i.e.*, about $\frac{12}{20}$ of the deaths

occur over 35 years of age; five-sixths over 45; and three-fourths between the ages of 45 and 75. The most fatal period is the decade 55—65, but the decade above falls not much below in mortality, and the decade below is little inferior to this. Even above 75 a large number of deaths are due to Cancer, and the number of persons living at this age being small, the rate of mortality goes on increasing up to the latest period recorded.

Supposing that a person is fated to die of Cancer, his death is most likely to take place between 55 and 65, while the chance is almost equal in the decade before or after. The chances are five to one that he will not die of Cancer before 45, and five to three not before 55.

These numbers show how largely predominant Cancer is in the later years. They will also correct a too prevalent impression that Cancer is not a frequent cause of death in old age, for the high mortality is continuous even up to advanced life.

A great contrast is shown by the deaths from Phthisis. Here the highest absolute mortality is in the decade 25—35; and the highest rate for population a decade later. More than one-half of the deaths (about $\frac{9}{16}$) occur under 35; and $\frac{3}{4}$ under 45. The mortality rapidly declines after 65, and is insignificant over 75.

The bearings of these numbers on risks in Life Assurance are obvious. Statistics thus formulated are not, however, satisfactory as indicating the relative mortality compared with that from other causes at the same period of life.

Dr. William Ogle makes the following criticism:—

"In simply saying that the liability to death from Cancer "increases with age, no more is said than may be stated with equal "truth of liability to death generally. The question is, does the "annual liability to death from Cancer increase more rapidly than "the annual liability to death of all kinds."

Dr. Ogle gives the following table, which, though not referring to the same years as that already given, indicates proportions which would probably be the same * in both cases.

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* Registrar-General's Report for 1884; see also Roger Williams, *op. cit.*, p. 240.

Ratio of Total Deaths from all causes to one from Cancer.

Age Period.	Males.	Females.	Persons.
20—25	262	248	255
25—35	131	49	71
35—45	57	15	24
45—55	28	9	14
55—65	22	10	14
65—75	27	17	21
75	56	44	48

We see that in persons generally the mortality from Cancer elatively to other diseases is highest from 45 to 65, at which age eriod it causes $\frac{1}{14}$ of the total number of deaths. In the decade 5—75, this proportion diminishes, but is still higher than in the ecade 35—45. After 75 the diminution is considerable.

The most striking point in this valuable table is the contrast etween males and females. For males the rate does not begin to e very high till after 45, but is maintained with undiminished orce up to the decade 65—75; the highest ratio being in the years 5—65.

For females, on the other hand, the risk begins earlier, a high atio being observed in the decade 35—45; while, in the next two ecades, it reaches the high figures of one-ninth and one-tenth of eaths from all causes. Even in the period 65—75, the rate is ardly less than in that of 35—45. It is right to remember that he discrepancy between male and female lives has, as formerly hown, considerably diminished since 1884.

It may be a question whether the method adopted in Dr. Tatham's table, or that in Dr. Ogle's, is the more correct for ur present purpose. I think that in relation to Life Assurance the

actual mortality at different ages is more important than t relative liability to death from Cancer as compared with t liability to death from all causes. Of course, Dr. Ogle's method the only accurate one, if we desire to know the relative mortal from Cancer, as compared with that from other diseases.

In estimating the liability of females to Cancer at different ag we have an important table by Mr. Nunn, shewing the frequency Cancer of the female breast at different ages.

MR. NUNN'S TABLE OF RELATIVE FREQUENCY OF CANCER OF THE FEMALE BREAST AT DIFFERENT AGES.

Age period.				
35—40	...	...	...	8·7 per cent.
40—45	...	...	...	12·3 ,, ,,
45—50	...	...	...	18 ,, ,,
50—55	...	...	...	16·1 ,, ,,
55—60	...	...	...	8·4 ,, ,,
60—65	...	...	...	9·7 ,, ,,
65—70	...	...	...	9·1 ,, ,,
70—75	...	...	...	5 ,, ,,

This confirms the conclusion arrived at from other data, t the period 45—55 is the most fatal, while more than half the ca occur under 55.

As regards the occurrence of Cancer in extreme old a Sir George Humphry's statistics of very old people show that rare. He found in 202 persons over 90, no case of Cancer; and 620 persons, aged 80—90, only 14 cases. But the causes of de in advanced life have little interest for Life Assurance purposes.

The most important inference from the statistics I h collected, seems to me that there is a far greater risk for fema than for males involved in death from Cancer.

The risk of females is greater in the following respects:—

1. Greater absolute numbers of deaths at all ages, a hig rate for population, and a higher rate in comparison w other causes of death.

2. The liability begins earlier, being noticeable even at the decade 25—35, and being then higher than that of males at 35—45.
3. The maximum liability occurs at an earlier age, 45—55, as against 55—65 in males.
4. A high rate of liability lasts even longer than in males; the total period of liability is therefore longer.

We may, therefore, conclude that a female who dies of Cancer is unlikely to fulfil the ordinary expectation of life. This is especially true of the commonest form, Cancer of the breast.

Conclusions.

The mortality from Cancer is likely to be an increasing one in the experience of Life Assurance offices, and the risk arising from it cannot, therefore, be neglected.

The occurrence of deaths from Cancer in a family indicates a greater liability to this disease in the descendants than in the average population. The evidence of heredity is stronger, and the risk from Cancer much greater, in females than in males.

In endeavouring to formulate practical rules on the subject, I have found that the practice of different Life Assurance Offices and their medical officers differs very widely on this point.

Some estimate the danger of hereditary predisposition in this disease so highly, that no person presenting a family history of Cancer is regarded by them as an absolutely first-class life. This was the opinion of my late colleague at the Economic Life Assurance Society, Mr. George Pollock.

Some regard no such history as of any importance, except a very strongly marked one, such as the death of both parents from Cancer, which they regard as dangerous, or even prohibitive. Some consider the risk in the two sexes as different: others do not.

The only definitely formulated rule on the subject, which I have met with, is that given by Dr. J. E. Pollock, in his valuable "Medical Handbook of Life Assurance" (*Second Edition, p. 51*). He says:—"The rule must be to reject the issue of two cancerous "parents, especially if it has shown itself in other members of the

"family. But a healthy person at 30 or 40, whose one parent had "Cancer, may be accepted. Some would add to the premium, but "we have not done so."

It appears to me that the risk in the case of the two sexes is so different that they must be considered separately.

Male Lives.—Death from Cancer occurs, as a rule, so late in males that the risk would be almost neutralized in the case of a policy calculated to mature and be payable at the age of 55. The limit of 60 would cut off a considerable portion of the risk. The death even of both parents from Cancer (a very rare event!) need not modify this rule, since it depends upon the expected age at death. In the case of a whole life policy, the life is, of course, expected, generally speaking, to live beyond these ages, in order to be profitable. Therefore, in some cases, an addition to the premium may be required. I suggest that one death from Cancer in the family may be neglected; but that two such deaths require an addition. A case calling for absolute rejection on this ground would hardly occur.

Female Lives.—Death from Cancer in females occurs, on the average, so early, that the expedient of a policy payable at a fixed age would not meet the case. In a whole-life policy the death of even one relative from Cancer must be taken into account. The death of the mother from Cancer requires a substantial addition. If one other female relative has died from the same disease, the risk is serious, and, in some cases, prohibitive.

There is a special risk in females arising from the frequency with which Cancer of the breast (perhaps of the uterine organs also) is transmitted by inheritance, as is shown by some of the histories recounted in this paper. Therefore, two female deaths in the family (including the mother) from Cancer of the breast make the life ineligible. I am inclined, with some hesitation, to say that this is equally true with regard to Uterine Cancer, but the point is less clearly made out.

The death of a male relation from Cancer is less serious; but I think that a female life with any well-established family history of Cancer should not be accepted at the ordinary rate.

The age at which any life is accepted must be taken into account. A young man with a predisposition to Cancer (even if he should ultimately die of it) will probably have paid premiums for a good many years, and thus the office may be guarded against serious loss. But in the case of those accepted in middle life, the cancerous age is so near at hand that some loss is inevitable if they die of that disease. In such cases, therefore, the precautions above suggested should be more rigidly enforced.

My object in these suggestions is not, however, to express any positive judgments, but to elicit discussion, in order that we may all profit by the opinions and conclusions of those whose experience is greater than my own.

Discussion.

The President: I am sure we are all very greatly indebted to Dr. Payne for the able and elaborate paper he has read, which brings the subject very fully and carefully before us for discussion. I see some members here who are well able to speak on the subject, and, therefore, I hope we shall have an interesting discussion.

Dr. Vivian Poore: With regard to the question which Dr. Payne raised in the beginning of his paper, the increase of Cancer at the present time, there is one point he omitted to mention, which seems to me to be of considerable importance. Of late years there has been a great decrease of mortality, but that decrease has been mainly, almost entirely, in the early periods of life. It is a decrease of mortality very largely of young children and in ages under 45. The mortality of males over 45 is greater than it was at the beginning of the century, and, except in this last decade, the mortality of females also. The main saving of life has been in the early periods of life, under five and young people. But we have got to die of something: although the public health is improved, we are not

making for immortality. We must make up our minds to that fact. The cause of the increase of Cancer seems to me to arise from the fact that there is a great saving in the early periods of life, and more people live on into what one may call the cancerous age. You have only to look at that table which is on the wall to see that Cancer is a disease of the last half of life mainly, and a disease which comes on when the body is beginning, so to speak, to degenerate. The marked contrast between Cancer and Tubercle comes out most beautifully in this table. I have added some of the figures together, and I find that, with regard to Cancer, out of the 161,000 or 162,000 deaths, very nearly 135,600 occurred over 45, and only 26,300 before 45; whereas in Tubercle it is all the other way about it is 361,000 before and 113,000 afterwards. So that Phthisis is a disease which makes very strongly for early death; but Cancer is a disease which, as a rule, does not kill until after the middle period of life. Of course, that is a very important thing when we come to deal with it practically as Life Assurance medical officers. Life Assurance is founded upon risk, and I must say that it seems to me an exceedingly difficult thing to estimate the risk in relation to Cancer. Dr. Payne is quite right when he warns us especially with regard to women, and women with a strong inherited tendency; but I confess to being still with a very open mind with regard to a man, say with a family history in one parent. Of course, with regard to the family histories of Cancer, we want to know something else. A man or a woman comes to us with a family history of Cancer in the father, mother, or grandmother, and what we really want to see, to be sure of our ground at all, is how many members of a family have escaped the inherited tendency. In large families I think you would very often find that one member of a family had been operated on for a tumour. You cannot get much further than that. When Cancer had declared itself, how many members had escaped? would be one of the questions to ask.

Sir Hugh Beevor, Bart., M.D.: I have heard with great interest Dr. Payne's paper, and my faith has been much shaken in my early teaching by looking up the question since I first saw the title of this

paper. I always thought there was no doubt whatever of there being painful and very marked evidence of inheritance of Cancer, but I could not find it on my bookshelf, and I regret above all things that in the valuable evidence that has come before us from Dr. Payne, he has not had the opportunity of gaining some evidence from his office. Mr. Francis Galton's "Natural Heredity" says, that information on this question ought to be given by the medical officers of Life Insurance Companies; and the next book I referred to, Ewald, on "Digestion," said exactly the same thing. So I consider it was evident that, prior to 1890, no satisfactory evidence was forthcoming. Then there are well-known clinical experiences. I think Mr. Hutchinson is not of opinion that there is much hereditary influence, and the same may be said of the late Sir William Gull. In Galton's evidence of 170 cases, where family history was carefully written out for three generations or more, and, thoroughly taken, marked evidence of a fraternity of disease in the case of Tubercle and in the case of heart disease was found, but not in the case of Cancer. I happened to see a similar table drawn out of a fraternity of three generations, with the full history of all the deaths, and there was a fraternity markedly affected with Cancer, but it did not show anything of Cancer in after generations. I am glad to have heard Dr. Payne's criticism of statistics of Life Assurance with regard to Cancer when the age of the parent is not included in it. It is certainly very important in future, in tracing statistics on this subject, that we should only take cases and select them all with the parents of a certain age at the time the proposer appears for insurance. For myself, I am not inclined, until I get further evidence, to lay any stress upon a case when it comes to me with a family history of Cancer, nor to say that it should be the cause of much addition.

Dr. Hingston Fox: There is only one point I wish to remark upon. In estimating the importance of a family history of Cancer, much depends on the ages at which death has taken place. Where the history merely shows a tendency to die of Cancer at advanced ages, say between 70 and 80 years, it is of very little importance,

and hardly worth considering. As Dr. Poore has said, we mus die of something; but, if near relatives had died from Cancer a comparatively early ages, that would be an important factor, an the rules which Dr. Payne had laid down for advancing lives woul then come usefully into play.

Dr. George Thin: I should be glad to know whether any of th gentlemen present can give us some information regarding the actua practice of offices as it now exists. I was much struck some time ago by a paper being brought before me, offering part of a larg assurance, and in reading the medical report of the office that ha offered this re-insurance, I found that the medical officer had pro posed a considerable increase, much more than I myself had bee in the habit of proposing, on account of deaths in the family fron Cancer. In practically dealing with those papers when they cam before me, I have observed a want of unanimity in Life Assuranc officers, in the importance of which they attach to instances o death from Cancer in families. I am disposed to think that as rule, not much weight is given to the fact of one, or perhaps tw members, certainly one member, of the family dying of Cancer. A far as my observation has gone, which is not very large, it seems t me that the death of one member of the family from Cancer i practically ignored as regards the putting on of an extra premium If I find there have been two deaths from Cancer in the family, always look upon that life with considerable suspicion, and some times, although not invariably, put on an extra. In addition t propounding that question, with regard to which I should ver much like some information, another view strikes me in regard t this subject in the sense referred to by Dr. Vivian Poore, and tha is, the greater number of children who now survive. It seems t me that this greater survival of children must indicate a greate survival of more or less delicately constituted children. Thi applies more to the easier than the poorer classes. This leads m on again to wonder whether it would be possible to get some figure showing the amount of Cancer that exists among the workin classes and the poorer classes generally, as compared with th amount of Cancer that crops up in the families of the well-to-d

because it is undoubtedly the fact that the children of the well-to-do survive in a much greater proportion than the children of the poor, and it seems to me highly probable that amongst these children of the poor who die under the age of five years, a number of individuals die who, if they had been better taken care of, and had survived, would have been more liable to Cancer and similar diseases. That, perhaps, is not a question practically coming before us in dealing with extras and matters of that kind, but it is a question which has a general interest.

Dr. de Havilland Hall: I only wish to refer to one very small point in Dr. Payne's paper, and that is with regard to the extreme difficulty of drawing our conclusion from a precancerous condition. This was forcibly brought before my notice by a gentleman who came to insure for a large sum in my office. The only thing I found against him was that he had a moderate amount of emphysyma. He was a man of 53 or 54. He was very hoarse, and he told me he had been hoarse for 15 or 20 years, and that the hoarseness was not getting worse, but he did not pay any attention to it. I was not satisfied with this, and I made him come to my house, and when he came I made a laryngoscopic examination, and I found he was suffering from laryngeal catarrh. I ended by recommending him for insurance, with a moderate addition for his emphysyma, and he was taken. I suggested that he should go under treatment, and advised him to consult Dr. Semon. Dr. Semon agreed with the diagnosis I had formed, but the patient would not carry out the treatment—he thought it was too much trouble. The thing gave him so little concern. Eighteen months later he came to me with malignant disease of his larynx, from which he died six months later. There was a case then, in which, when the patient presented himself for an insurance, there were only the conditions of ordinary chronic catarrh, which probably had existed for 16 or 21 years; and yet, within 18 months he gets malignant disease of his larynx. It was carefully considered in reference to this very point whether he was fit for insurance, and my opinion was confirmed by the perfectly independent opinion of Dr. Semon, who saw the man two

or three months after I did. I think this will be the case in all similar instances, and I, therefore, agree entirely with Dr. Payne, that we may practically disregard these precancerous conditions. The question of the influence of Cancer on Life Assurance, therefore, turns only on the question of heredity of Cancer.

Dr. C. E. Hoar: I should like to address a few words on the question of heredity, if I may be allowed to do so. The paper called up to my mind one individual, an individual, sir, whom you have seen and know something of. Dr. Payne suggests that we have more opportunity of seeing into the family history in our work in the country. I think that is perfectly true. We often get opportunities of knowing a great deal more of our patients' families and can trace them back. I do not pretend to know all the names of the members of a family that I know of, a considerably large family, but certainly many of them have lived to considerable longevity, and they are distinctly prolific. The elder members of the family are supposed to be scrofulous, whatever that may mean, but I do not think they have died of Phthisis. They have a very pale appearance, thick lips, and light hair. I am not referring to this elder branch, but the cousins of that branch were a family of several brothers; one of them died a little while ago at the age of 90, but of those several brothers living all were well and healthy and strong, except one. This one was a clergyman. He married a lady who was one of four sisters. She is supposed to have died in childbirth, but I know no more. She died before I remember anything about her. Three of her sisters I attended myself, as it so happened. One died of pleurisy at the age of 67, or something of that sort, one died just upon 80, and one, a very intelligent old lady, died of old age, but she had Epithelioma of the breast. She was seen by Paget, and he said: "That will never kill her; you need not bother about that; take care of her, keep it clean, and do not do anything." It did not kill her. I have gone rather fully into the details of the father and the mother. The father died, I do not know how old, but not at a very old age; and the patient whom I described, the lady, his sister-in-law, who had had the Epithelioma of the breast, told me, being the medical attendant of the family, that the father died of

Cancer of the kidney. None of the children knew that the father had died of Cancer of the kidney. It was hidden from them, because it was thought that it would be better they should not know it. This family consisted of a son—who, by-the-bye, was the youngest one—and four daughters. The eldest daughter is still alive, suffering very much from Asthma, and in weak delicate health. She is just over 50. One daughter has been married twice. Two or three years ago she had an operation for the removal of her breast for scirrhus, and, so far as I know, it has not returned. She was not a patient of mine, as she did not live anywhere near me. There were two other members of the family; one, unmarried, aged 35, was seen by Sir Spencer Wells in the year 1882, and was operated upon by him, and an annular stricture of the lower bowel was found, Cylindroma; she died within twenty-four hours of the operation. Another sister, who married a cousin (one of the strong members of the family), some ten years afterwards had a similar illness to her sister. She was seen by Mr. Treves, and operated upon by him, and exactly the same condition was found, Cylindroma of the lower part of the larger bowel. Her life was prolonged for three months, but she died. So that of the five children, where there appeared to be no Cancer in the family before, except in the father, two have died from Cancer, one has been operated upon for Cancer, and the male member, who is exactly my own age, and a great personal friend of mine, looks in very bad health. Bearing on this kidney trouble, it is very remarkable that a few years ago he began to have pain in his kidney, and passed blood, and I think you, Mr. President, saw him. He actually did pass a stone, which Mr. Henry Morris crushed in his bladder last Christmas 12 months. His general condition was very indifferent. You sent him abroad, sir, the winter before last, and he very nearly died in Madrid of Influenza and Pneumonia. He has come home again, and is rather better than usual. That man could not possibly be taken by any office by any conceivable chance. That is rather a remarkable history, and I think it bears very much on heredity. It is very odd that three members of a family of five with not much history of Cancer,

except in the father, should develop Cancer, and two of them die from it. May I mention another thing bearing on heredity? It has nothing to do with Cancer, but Dr. Payne mentioned a case of children having two double finger joints. My groom, who has been with me a good many years, ten or twelve years, has just recently lost a child, his fourth child, who had patent *foramen ovale*, evidently congenital. I asked him about this, and he said that when he was a boy he lost a brother who was always blue, and never could breathe. This child lived to the age of five or six, considerably longer than I ever thought he would. He died only a few weeks ago. But I do not know whether the father propagated the disease in that child in consequence of any weakness in his own system, but there is the fact, that he knows he had a brother who died of exactly the same thing.

The President: I think the value of Dr. Payne's paper, great as it is in itself, has been still farther increased by the discussion it has elicited. The strong point which seems to me to have come out, and which was alluded to by Dr. Pollock, is the importance of heredity as a main question at issue in dealing with cases in which there is a probability of Cancer. As Dr. Poore and another member have observed, we must all die of something. It seems to me that Cancer as a disease in the general public is dealt with in the life statistics on which Life Assurance business is founded, and that it is a way of dying in later life, which is reckoned for in the average mortality of people. But in families where there is a double heredity the effect is to hasten the tendency to death in that one direction, Cancer, and, therefore, it has to be rated for in Life Assurance work. I was rather surprised, however, at Dr. Pollock taking so severe a view of the question, but I think in all probability he may be right. I was greatly relieved at Dr. Payne's explanation of those last statistics tabulated in the later ages of life with reference to the rate per million of deaths from Cancer, and I think it would add greatly to the value of the table if that correction were inserted, because I must say when I looked at the table and saw those heavy figures in the latter decades of life as deaths from

Cancer, I was greatly surprised, because one's own experience, certainly my own experience, would be that if a man lives up to say 68 or 70, that is so far rather an argument against his dying of Cancer. That is the conclusion I have often adopted in practical work, and I was surprised to find that conclusion was entirely upset by these statistics, but I think Dr. Payne's further explanation rather helps one to preserve one's opinion in reference to that matter.

Dr. Payne: Would you mind telling us, sir, what the practice in your office is, as regards accepting lives with a history of Cancer?

The President: I could not state any statistics, but my feeling is very much that one member of a family dying of Cancer would not influence the rating-up, but that two members of the family would make some addition. But I may have misunderstood Dr. Pollock. I thought he said that he would either rate-up very heavily or reject an applicant who had two members, that is to say, a father and a brother, or a mother and a brother, in the family dying of Cancer. Was that so?

Dr. Pollock: I did say so, sir, if both parents had had it, which is a very rare event in Cancer, I should decline the life altogether.

Dr. Payne in reply said: I am very much obliged to the members of the Society for the remarks they have made. Dr. Poore made some very interesting observations about the probable cause of increase of Cancer. I did not enter into the question of cause, but only into the question of facts—whether the alleged increase of Cancer really exists. Very probably Dr. Poore's explanation is the right one; but I must say it is not approved of by Dr. William Ogle. He thinks that the saving of life from tubercular diseases is not enough to account for the increase of Cancer. I do not pretend for a moment to decide the point. Some other interesting

questions have been raised, particularly the age of the parents or other relatives alleged to have died of Cancer. That point I did not refer to, but probably it has some importance. The argument is that if parents have died of Cancer at quite an old age, it is of no consequence, but if you find an early death from Cancer in a family, it is a significant fact and indicates a bad prognosis. Now it has been said by some that the tendency of Cancer and perhaps other hereditary diseases is for the age of incidence in a succeeding generation to become lower. Supposing one generation died at a certain age, in the next generation, if they died of the same disease, they would die younger. I cannot find that that is at all proved, but, still, on the other hand, it is not at all certain that death from Cancer is likely to occur at the same age in successive generations.

Dr. Thin very properly asked what is the practice of offices in this respect? There is no doubt that the practice of different offices varies; but I think it is very desirable, if possible, that there should be an uniform practice in this matter. I am glad to find that Dr. Pollock, from his very large experience, supports to a considerable extent the suggestions that I made as to the practical rules to be followed, and especially the difference that ought to be made between male and female lives, which he has not noticed in his published work.

In consideration of his remarks and those of other members, I will revise my proposed practice rules before the paper is printed.

But I think there is another difficulty which was also referred to by Dr. Pollock, and that is that if rules of this kind were strictly carried out by one office, that society might lose business. In fact I have found that the opinion of the medical officer on this subject did not always agree with that of the directors or the actuary, and these gentlemen have brought forward the very objection to which I have referred. Therefore, if all could agree upon some general principle being correct, it would be much better, and there would be no temptation for any office to be too rigid, or to be too lenient. Some surprise has been expressed that the table furnished by Dr. Tatham shows so large a proportion of deaths from Cancer in old age, contradicting the general impression that after 70 few

people die of Cancer. Nevertheless we find that 15,000 deaths out of 161,000, very nearly $\frac{1}{10}$th of all deaths from Cancer, took place after 75. That is a very large number, and considering the small number of people who are living at 75 it naturally follows that the rate per million at that age is very high indeed, and contrasts remarkably with that from Tubercle. Still, the question raised by Dr. William Ogle—supposing a patient dies between the ages of 65 and 75, what is the proportion of death from Cancer to deaths from other diseases?—deserves consideration. There is an apparent discrepancy to which our President and others have drawn attention. I will look into this point, and give the results of a further comparison of Dr. Tatham's and Dr. Ogle's statistics in my paper, when it is printed.

The meeting then adjourned.