T H E S I S

B Y

R O B E R T D O U G L A S M.A. M.B. Ch.B., D.P.H.

P R E S E N T E D T O

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SUBJECT OF THESIS.

CANCER

IN THE COUNTY

OF

MORAY.

SECTIONS OF THESIS.

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MAPS IN THESIS.

I. INTRODUCTION.

The Cancer Problem is still one of the most urgent questions of the day, and one of the most obscure. This does not arise from the want of investigators or interest in the causation and treatment of the disease, for many of the most eminent medical men have given their undivided attention to it, but rather from the fact that very few theories, when put to the test, have proved absolutely feasible.

My own interest was first turned in the direction of Cancer by the fact that such well-known authorities as Doctor Kenwood of London and Doctor Beatson of Glasgow have both within recent years urged the importance of a careful study of the statistical side of the problem on the part of Medical Officers of Health and others similarly situated. Although statistics alone would have a very limited value when confined to such a small area as the County of Moray, which it is my lot to supervise medically, there were other reasons that made me feel impelled to investigate the subject of cancer as it occurred in Morayshire.

In the first place, in my capacity of Medical Officer/

Officer of Health for the County, I had regularly placed before me the number of deaths from cancer in the various districts, and from a mere interested observation of the fact that there were more deaths from cancer in some parts of the County than in others, I arrived at the desire to have exact details of its distribution and set about gathering statistics on the subject.

There was, however, another factor which influenced my decision and that was, that, in a survey of some comparatively recent returns of the Registrar General for Scotland, it was noted that in the neighbouring County of Nairn, the death-rate from Cancer was by far the highest in Scotland.

Nairnshire is geographically and in social circumstances so much akin to the County of Moray, that a superficial observer could find no apparent reason for such a difference in mortality. The two counties border on one another for some distance. They are both largely pastoral and agricultural areas. The southern parts are both hilly, while towards the north, they are more or less level. Both County towns are situated in the flat part and on rivers, and the two counties have scattered throughout them rural villages or small towns of a similar kind. The population is mainly agricultural, the people living in the same way and having common interests, while the soil in each county is richer in the low-

lying/

lying parts and light in the southern hills. The resemblance being so great, the necessity for probing beneath the surface for some explanation of the higher mortality in the one county than in the other makes itself felt. It may, however, also be stated that, although the Counties of Banff and Moray show a lower death-rate than that of the neighbouring county of Nairn, they are among the highest in Scotland.

It is now generally recognised that the problem of Cancer has an important bearing on Public Health, as it is well known that it is on the increase in this country as well as in many others. Any measures, therefore, that would tend to lessen the incidence of the disease would be a forward step in the administration of Public Health, and it is in the hope that it may help in this direction, and throw some light on the natural history of the dread disease, that I have endeavoured to show how Cancer as it occurs in Morayshire conflicts or agrees with other statistics concerning it, and to make observations thereon. The various merits or demerits of cancer theories I am not in a position to discuss, but it may not be out of place to briefly mention some of them.

1. The hypothesis of Thiersch and Waldeyer. They held that cancer was caused by the loss of restraining influence of the connective tissues, making the group of cells so liberated independent for the future/

future, while the power of continuous growth was believed to be inherent in the cells themselves and to show itself when free from the restraint of the connective tissues.

2. Cohnheim supposed the origin to be from isolated embryonic cells which were not used in the building up of the body andhad a latent power of growth.

3. Ribbert's Hypothesis. This in substance is very similar to that of Cohnheim, but he seemed to hold that the rudiments of the disease may originate from the normal tissues by inflammatory processes.

4. The fourth hypothesis, however, is of a very different nature, and treats cancer as an infectious or parasitic disease. A belief that cancer was caused by a parasite has come down to us through all the ages just as the disease itself has come. That belief was embodied in the very name "cancer", and still is in the present day when convenience is the main reason for its retention in use. This idea was quite familiar to those to whom we owe our knowledge of malignant growths. To-day, one belief is that cancer is caused by the entrance of a parasite into an epithelial cell, thereby conferring on the cell or cells affected the powers of proliferation which are recognised as characteristic of malignant new growths. Nothing, however, has yet been brought forward/

forward which could justify a close analogy between cancer and any of the other infectious diseases. The question at issue would seem to be whether cancer arises through a modification of the formative process or whether it is a result of stimulation by a parasite. If it be due to the first theory, why is it that cancer occurs more frequently in some trades or districts than in others; and if it be due to the second, then it would seem to point to the fact that there is some element in the environment of the sufferer which causes the disease.

This brings us to another suggestion, based on a parasitic or fungoid origin, viz: Green's[1], and which, as it applies to rural areas, is worthy of some description. Briefly, Green's observation, based on the local and occupational incidence of cancer is that the disease is caused, or at least promoted, by certain environmental conditions which favour the growth of cancer. This condition he further shows by bringing forward many interesting facts to be the presence of sulphur or its compounds in the air, causing a dryness of the skin with absorption of oxygen and thereby favouring the attack of a cancer parasite or fungus. It is a well-known fact that plants treated with sulphurated manure are extremely liable to contract tumours/

[1] "The Cancer Problem". 2nd Ed. 1912 by C.E. Green

tumours which in many respects resemble those of man. Moreover, Mr. Green states also that, almost without exception, so far as his investigations have gone, houses in which cases of cancer have occurred have had badly-drawing chimneys or were exposed to smoke from outside chimneys. The products of coal combustion, as is well known, are largely made up of sulphurous acid, sulphur dioxide and sulphur trioxide. In the event of smokey or badly working chimneys, much of these products, instead of being carried off, remains in the room and impregnates the air.

Dr. Beatson of Glasgow holds that cancer is allied to reproductive tissue, that some stimulus modifies the cells and that they consequently proliferate.

From a consideration of the various theories that have been put forward to account for the origin of cancer, it seems to me that sufficient distinction has not been drawn between what one might term the predisposing or exciting causes, and the direct cause. As I have just said, the predisposing causes are likely to be numerous, for example, all forms of irritation, chemical and physical; heat, light, injuries, X-rays, dietary, &c. are merely factors which may predispose to the disease, and as such would be unable alone to produce malignancy. The very fact that, in certain districts, instances of/

of which I hope to give in Moray, there is a marked difference in the prevalence of cancerous growths, is to my mind an indication that the origin may yet prove to be an external one. From want of opportunity, it is impossible for me to enter into the many prevailing ideas which have been demonstrated chiefly by experiments and laboratory methods, but I hope my study of the distribution and incidence in my own area will show that they can only be properly accounted for on the assumption that we are dealing with some external causative factor.

II. THE GEOGRAPHICAL DISTRIBUTION OF CANCER THROUGHOUT THE WORLD.

Before discussing cancer as it occurs in Morayshire, however, it may be of some interest and utility to survey briefly its distribution and occurrence throughout the world generally.

The following Table shows the death-rate from cancer throughout the world, calculated per 1000 of the population.

Country	Av. 1901-05.	Year. 1909.
England and Wales	0.86	0.95

Scotland/

Country.	Average. 1901-05.	Year. 1909.	
Scotland	0.83	0.94	(1908)
Ireland.(1900)	0.61	-	
Switzerland	1.10	1.11	
Netherlands	0.85	0.90	
Prussia	0.64	0.74	
Austria	0.69	0.72	(1908)
Belgium	0.49 (3 yrs.)	?	
Italy	0.45	0.53	
Spain	0.38	0.44	
Hungary	0.38	0.43	
Servia (crude)	0.10	?	
France	0.98	-	towns only
Denmark	1.28	-	towns only
Norway	0.80	0.90	
New South Wales	0.80	0.90	
Victoria	0.76	0.82	
South Australia	0.76	0.86	
Queensland	0.76	0.83	
West Australia	0.74	1.09	
All Australia (Av.)	0.74	0.90	
Tasmania	0.68	0.82	
New Zealand	0.75	0.82	
Japan (1901-03)	0.52	-	
United States (registration area)	0.68	-	
Jamaica (av.1895-04)	.16	-1	

[1] Rollo Russell's "Preventable Cancer" pp 30 and 31.

TABLE SHOWING MORTALITY FROM CANCER

IN TOWNS OF EUROPE.

calculated

per 1000 of the population

England			Marseilles	(1900)	0.69
Canterbury	(1891-90)	1.13	Germany		
Chichester	"	1.18	Berlin	"	1.09
Durham	"	0.32	Strassburg	"	1.18
Derby	"	0.52	Hamburg	(1898)	0.97
Bolton	"	0.40	Dresden	(1900)	1.25
Blackburn	"	0.38	Munich	"	1.21
London	"	0.68	Stuttgart	"	1.27
Birmingham	(1900)	0.85	Switzerland		
Manchester	"	0.78	Geneva	"	1.77
Liverpool	"	0.77	Lucerne	"	2.04
Scotland			Denmark		
Aberdeen	"	0.95	Copenhagen	"	1.39
Glasgow	"	0.82	Norway		
Edinburgh	"	1.16	Christiana	"	0.66
Ireland			Sweden		
Kerry	"	0.26	Stockholm	"	1.10
Armagh	"	1.04	Russia		
France			Petersburg	"	1.00
Paris	"	1.05	Austria		
Rouen	"	1.73	Prague	"	0.85
Lyons	"	1.53			
Bordeaux	"	0.97			

Italy/

Italy		Belgium		
Rome (1900)	0.77	Brussels	(1900)	0.44
Florence"	1.37	Spain		
Milan "	1.01	Seville	"	0.85
Venice "	1.03	Barcelona	"	0.53
Naples (1899)	0.56	Madrid	"	0.78 1

From a survey of statistics, it would appear that the countries with the HIGHEST cancer death-rates in the world are Great Britain, Switzerland, Holland, Sweden, Norway, and Denmark, while the States of Baden, Bavaria, and Wurtemburg are also unusually high.

On the other hand, the countries with the LOWEST death-rates are, or rather have been, Italy, Hungary, Spain, Portugal, Turkey, while Roumania, Dalmatia, Sardinia, Corsica, Sicily, and The Faroe Islands are very low. There is, however, a large number of countries with native populations, especially tropical countries, where the cancer death-rate is far below these, and in some cases, it has been so small, that many medical officers have never seen a case. Countries of immunity or rarity are the greater part of Northern, Central, East, and West Africa where the natives have not adopted European customs to any extent: large parts of India, China, Siam, and Burmah as well as many of the islands in Oceania:

parts/ [1] Russell's "preventable Cancer" p.p. 27 & 28.

parts of the West Indies, Brazil and Mexico, and in regions in Asia where habits are frugal.

Distribution of Cancer in Europe.

England.- In England, as in the majority of countries, the highest rates have been in the rich, residential districts, in the large cities, where the wealth of the nation is chiefly found; and the lowest in mining and industrial districts. Cambridgeshire, Huntingdonshire, Peterborough, Stamford, Spalding, and Bourn were found to be included in an area of special cancer prevalence in two successive decennial periods. Huntingdon, Cambridgeshire, and Sussex are the highest counties, Monmouth and Derbyshire the lowest, while Cornwall, Dorsetshire, Wiltshire, and Devonshire are fairly low. Cancer also seems to be prevalent in North Wales. The highest rate was found in London, but probably this was due, partly at least, to the large proportion of cases dying in hospitals.

Scotland.- In Scotland, cancer has been found to be as prevalent, if not more so, in towns as in the rural districts.[1] It is least prevalent in the western islands where the conditions are purely rural and the people very poor. The mortality was found to be highest in such counties as Nairnshire, Forfarshire, Dumbarton, Wigtown, and Dumfries, and of the towns, Edinburgh has shown the largest proportion/

[1] William's "natural History of Cancer" p. 28

proportion. The table given will more fully illustrate this.

Ireland.- Ireland, which is the poorest of the three countries forming the United Kingdom, seems to be the least prone to cancer. The death-rate is especially low in the poor counties of the south and west, and high in the well-to-do province of Ulster which comprises the important city of Belfast. The highest cancer death-rate, however, was found in the district of Armagh. Next in order came the counties of Dublin and Londonderry, while the lowest rates were in the desolate and poverty-stricken counties of Clare, Mayo and Kerry.

France.- French statistics would appear to illustrate similar conditions. The highest death-rates from cancer were found in Paris and its neighbourhood, and the lowest in the impoverished provinces of Brittany and the Mediterranean coast. It is also interesting to note that in districts where wine and spirits were drunk, the rate was much lower than in those areas where beer and cider were the staple drinks. Another very striking fact is, that in France the disease does not appear to be more rampant among the rich than it is among the poor. This may perhaps be explained by the fact that the poorer classes have a very strong predilection for harmful liquors such as absinthe, while the/

the rich are more inclined to frugality and daintiness than to excess.

Belgium.- In Belgium there does not appear to have been any marked peculiarity of distribution, while the average rate for the country has been only moderately high. According to Clive Holland[1], the people live more frugally than those of corresponding classes in Britain.

Germany.- Here again, the large towns would seem to show a much higher death-rate than the smaller towns and the rural districts. There has also been a remarkable difference in the rates of the prosperous district of the west and the poor provinces and villages bordering on Poland. The highest rates for Germany, and also among the highest in Europe, according to the Hon. Rollo Russell[2], have been found in the beer-consuming provinces.

Austria.- The same authority states that the mortality from cancer in Austria has been much higher in prosperous provinces than in poor.

Italy.- In Italy, the same state of matters has been observed, Florence having a markedly high rate, although in many parts a low death rate has/

[1] "The Belgians at Home"

[2] "Preventable Cancer"

has been recorded.

Switzerland.- In Switzerland, Lucerne was found to have the highest death-rate from cancer and Valais the lowest, the former being the richest and the latter among the poorest, if not the very poorest district in that country. It may also be worthy of note that Lucerne, lying to the east of Switzerland, is a beer and cider-drinking district; also that the mortality for Switzerland as a whole is the highest for any country in Europe. There are no millionaires in Switzerland, but at the same time, there are no paupers, and wealth is on the whole evenly distributed. The population shows a steady increase and a diminishing death-rate, while the consumption of meat would appear to be considerable.[1]

Denmark.- "Next to Switzerland, Denmark is reputed to have the highest cancer death-rate in Europe", says Williams in "The Natural History of Cancer". Statistics, however, are only available for the towns, and it is probable that the actual figures are somewhat lower than those generally quoted for this country. Denmark is a country mainly engaged in agriculture, and like Switzerland, although there has been no development of great industries, the population has nevertheless within comparatively recent years experienced a change from poverty/

[1] William's "Natural History of Cancer" p.

poverty to prosperity.

Scandinavia.- In the countries of Norway and Sweden, the death-rate from cancer has been fairly high. A curious feature observed in Sweden is that in the smaller towns the death-rate from cancer appears to have been higher than in the large. In Norway, however, the highest mortality has been found in the larger shipping centres where the people are most prosperous.

Holland.- In Holland, consisting of a fertile plain traversed by many canals and rivers, the cancer mortality is high. Agriculture is the main occupation of the population. In the unproductive province of Drenthe where large pauper colonies have been established, the lowest death-rate has been found.[1]

DISTRIBUTION OF CANCER IN ASIA.-

All indications would seem to point to the fact that cancer is much less prevalent in Asia than it is in Europe. Especially has this been the case in those parts which are remote from European supremacy.

China.- The above fact has been abundantly borne out in the case of China where the civilising customs of Europe have penetrated almost less than in any other/

[1] William's "Natural History of Cancer" p. 74

other country. Hong-Kong, however, must be taken as exception, but then it is not a true specimen of China, its population being largely made up of immigrants and the town largely subject to European customs, especially those of a lower order.

According to Doctor Brunet[1], cancer is comparatively little known in those parts of China where the people live on a simple diet of rice or millet and are too poor to buy flesh. In some of the large towns, however, such as Pekin and Shanghai, cancer is fairly common. Here the staple food comprises fish, pork and fowl, for it is by no means the case that all Chinamen live on rice.

Japan.- In Japan, cancer is also less frequently met with than in the majority of countries. The people are of a very frugal and temperate disposition and live mainly on a vegetarian diet.

No reliable statistics can be obtained for the northern part of Asia, but in Asia Minor, Arabia and Persia, cancer would seem to be rare. For India also, a country of such vast extent, and with a population so huge, statistics must be of a more or less problematic nature. As far as can be ascertained, however, cancer would seem to be very much less prevalent than it is in Europe, although it attacks Hindu and Mohammedan alike. In the high-lying province of Kashmir, with the exception of cancer/

[1] "Revue d'Hygiene XXVII Nos. 2 & 3, 1905

cancer of the "kangri-burn" variety, the disease has been exceptionally rare. In Assam, according to Dr. Dalgetty[1], malignant tumours have been rare, only eight cases of cancer and sarcoma having occurred in five years in a large Hindu population at Adampore. In Bengal and Madras, cancer would seem to have been more prevalent. Many of the cases in Madras have been found to be cancer of the mouth and tongue, possibly attributable to the habit of "betel"-chewing, this composition having a peculiarly irritating effect during chewing. In Ceylon, malignant tumours seem to have been very rare, and in Burmah and Siam, although they have perhaps been slightly more common, the same state of things has prevailed.

DISTRIBUTION OF CANCER IN AUSTRALASIA AND OCEANIA.-

Throughout the entire territory covered by Australasia and Oceania cancer has been found to be most prevalent among the white population. Authorities on the subject have stated that malignant tumours are practically unknown among the native inhabitants.

Australia.- In Australia, the great bulk of the white population is to be found in the large coast towns in the temperate regions where the style of living is very much like that adopted in large European/

[1] "Journal of Tropical Medicine" Ap.15th, 1902.

European cities. Immigration does not take place to any great extent. The people are on the whole prosperous and live well. Consequently we find that the cancer mortality has been on the increase. In Australia, as in Europe, the death-rate in the large town districts has been much greater than in rural areas. A curious fact which may be observed in all the states forming the Union is, that men seem to have been more prone to cancer than women, a reversion of the usual state of matters. Another noteworthy fact is that the Australian aborigines are practically immune from cancer[1], although they now form but a very insignificant fraction of the population.

New Zealand.- Here the social conditions of existence resemble in great part those of Australia. The people are prosperous and much given to the eating of meat. As in Australia, cancer has been more prevalent among males than among females.

South Sea and Fiji Islands.- In the South Sea and Fiji Islands malignant tumours have been found to be rare. This also has been the case in the other islands comprised in Oceania.

DISTRIBUTION OF CANCER IN AMERICA.

United States.- In consequence of the inadequate system of compulsory death registration in the/

[1] G.C. Adams Lancet. Vol. I., 1904.

the United States, the cancer mortality must necessarily be somewhat inaccurate and unreliable. It would appear, however, to have been much the same as in Europe, and to be on the increase. In large cities, especially in those where there is a mixture of various races, the mortality has been high. The consumption of meat in the United States is considerably larger than in Europe. The highest cancer rates have been found in the Northern part of the States, especially in the wealthy city districts of the Atlantic coast. The lowest rates have been in the southern localities and above all in those districts where the population is mainly negro.

British North America.- Here cancer has been found to be fairly common among the white population but of very rare occurrence among the aborigines.

In the States of Central America the disease has been comparatively rare, but in Mexico in the high-lying parts, it is fairly common. In the Bermudas and Bahamas cancer has been met with but not with notable frequency, and in the West Indies generally it has been distinctly rare.

South America.- In Uruguay and Argentina cancer has been fairly common, but in Brazil, especially in those regions lying near the Equator, the disease has been of comparatively rare occurrence/

occurrence.

DISTRIBUTION OF CANCER IN AFRICA.-

Africa as a whole is believed to be more immune from malignant diseases than any other part of the world, but especially does this apply to its northern territories, e.g. Egypt, Algeria, &c.
"The consensus of opinion among medical men in Egypt "is that cancer is never found either in male or in female among the black races of that country"[1]
Among the Arabs, however, whose mode of living and eating somewhat resembles that of Europeans, cancer has been fairly often met with. In many of the towns in Algeria, no cases of cancer have been recorded. It Tunisia, also, it is extremely rare. This also applies to Morocco, Sudan and Somaliland, while in most of the parts of Central Africa the disease, according to the "Report on Cancer in British Colonies," 1905, has been but infrequently met with. In Mashonaland, Bechuanaland, Natal, and other parts, where natives are numerous, the same state of matters prevails. In South Africa, however, among the Boer and European populations, cancer is common, but here again among the natives, who are for the most part vegetarians, malignant tumours have been practically unknown.

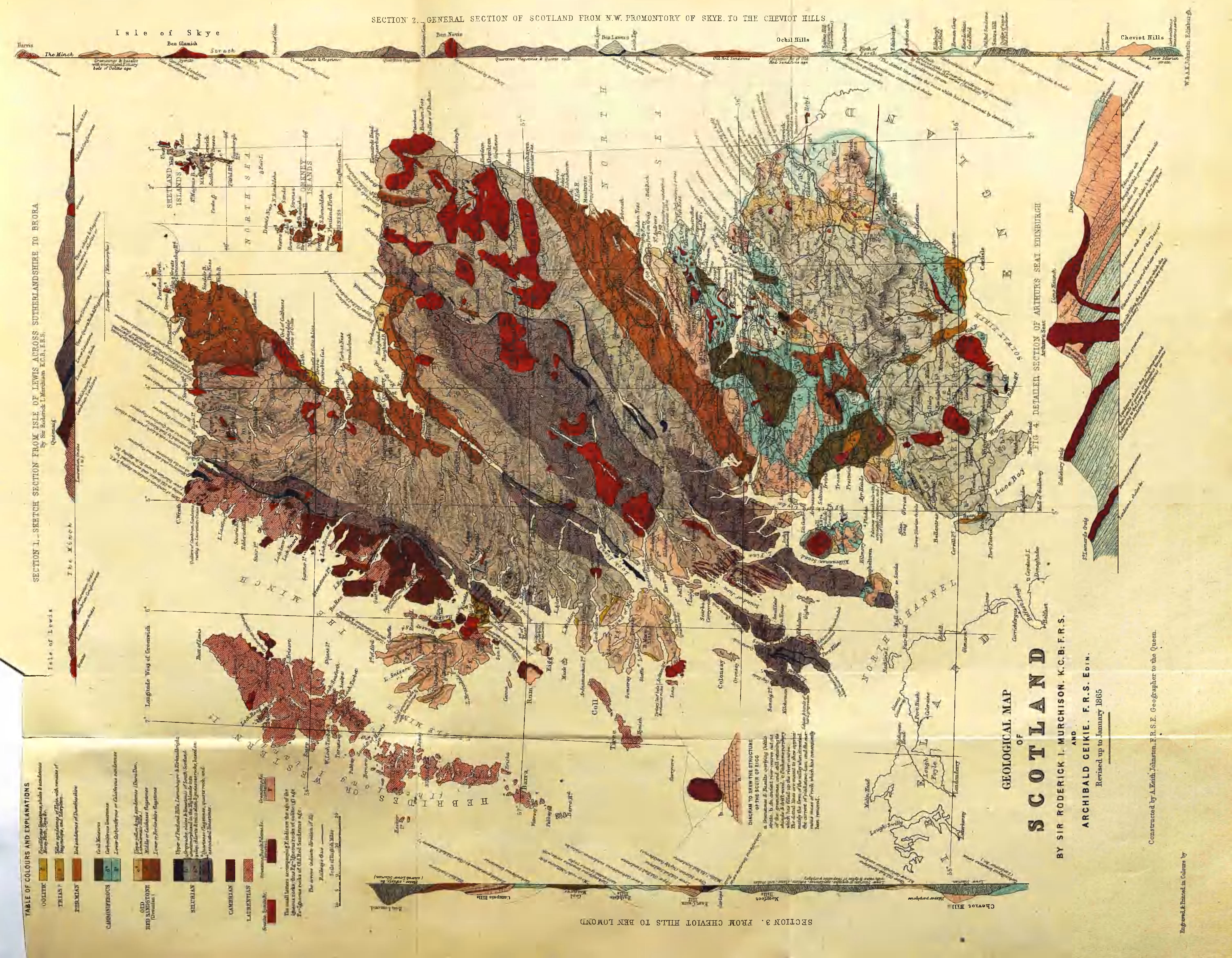
For most of the facts given above, I am indebted/

[1] Dr. F.C. Madden, Brit. Med. Journal Vol II, 1902.

indebted to the works of Doctor Roger Williams and the Honorable Rollo Russell.

On reviewing the incidence of cancer in the various countries throughout the world, it will be seen that several facts stand out clearly and emphatically. The most outstanding of these is that in the majority of countries, the prosperous districts are much more subject to the disease than are the poor. Then again, the facts detailed above would seem to indicate that poor countries where fare is frugal and largely vegetable in nature are less subject to the disease than those where much meat is consumed and the mode of living richer. Moreover, races and people which have not hitherto been subject to cancer become subject to the disease when they adopt European or American customs with regard to food.

All this would seem to point to the fact that, in producing cancer, food is one of the chief, if not the chief factor. This, however, does not account for the disease being more prevalent in one district than in another only a little way removed from it where the mode of living is practically identical, and I therefore hope to show that other factors such as climate, soil, &c. may play some part in the production of the disease.



SECTION 2. GENERAL SECTION OF SCOTLAND FROM N.W. PROMONTORY OF SKYE. TO THE CHEVIOT HILLS
Isle of Skye
Ben Glamich
Ben Nevis
Ben Lawers
Ochil Hills
Cheviot Hills
SECTION 1. SKETCH SECTION FROM ISLE OF LEWIS ACROSS SUTHERLANDSHIRE TO BRORA
By Sir Roderick I. Murchison K.C.B, F.R.S.
Isle of Lewis
The Minch
SHETLAND ISLANDS
ORKNEY ISLANDS
NORTH SEA
GERMAN OCEAN
NORTH CHANNEL
HEBRIDES
FIG 4. DETAILED SECTION OF ARTHURS SEAT EDINBURGH
TABLE OF COLOURS AND EXPLANATIONS
OOLITIC
TRIAS
PERMIAN
CARBONIFEROUS
OLD RED SANDSTONE (Devonian)
SILURIAN
CAMBRIAN
LAURENTIAN
DIAGRAM TO SHEW THE STRUCTURE OF THE SCUIR OF EIGG
GEOLOGICAL MAP OF SCOTLAND
BY SIR RODERICK I. MURCHISON. K.C.B; F.R.S.
AND
ARCHIBALD GEIKIE. F.R.S. EDIN.
Revised up to January 1865
Constructed by A. Keith Johnston, F.R.S.E. Geographer to the Queen.
Engraved & Printed in Colours by W. & A.K. Johnston, Edinburgh.
SECTION 3. FROM CHEVIOT HILLS TO BEN LOMOND

III. GEOLOGICAL DISTRIBUTION OF CANCER IN SCOTLAND.

According to the table given by Green[1] the highest average percentages of cancer deaths in Scotland for the years 1895-96-97 were found in the following counties. (The average for the whole of Scotland for these years was 4.023 per cent.)

County	Per cent of total deaths
Nairn	9.73
Forfar	7.73
Dumbarton	7.37
Roxburgh	7.05
Dumfries	6.70
Wigtown	6.67
Banff	6.63
Selkirk	6.60
Berwick	6.40
Elgin	5.96
Kinross	5.96
Caithness	5.84
Kircudbright	5.84

A survey of the Geological Map by Sir Archibald Geikie indicates that the chief geological features/

[1] "Cancer Problem" p. 43.

features of these counties are as follows:-

Nairn.- The rock formation is chiefly of a gneissic nature with large tracts of red sandstone in the Croy, Cawdor and Auldearn districts. There are also some patches of granite in the Ardclach district. An entire absence of lime may be noted.

Forfar.- Mainly composed of red sandstone with small patches of basalt and some tracts of porphyrite along the coast. There are tracts of clay along the river courses and round Montrose.

Dumbarton.- Mainly composed of upper and lower red sandstones with someporphyrite and patches of calciferous sandstone.

Roxburgh. Upper red sandstone with some stretches of porphyrite and upper silurian.

Dumfries.- Composed mainly of upper silurian with patches of red sandstone and alluvium round Dumfries and Thornhill districts.

Wigtown.- Mainly upper and lower silurian with small patches of felsite quartz and granite scattered throughout. There is a very small patch only of red sandstone otherwise this formation is notably absent in this county.

Banff.- Very mixed formation. Red sandstone near Fochabers and at Tomintoul. There is also a large tract of a certain kind of schist which is only found in any great quantity in the neighbouring

county/

county of Aberdeen. Patches of quartzite schist are also scattered throughout the county, also mica and graphite schists. There is a considerable extent of limestone intermixed with calciferous sandstone.

Selkirk.- Almost entirely covered with rock of a silurian nature. There is an entire absence of red sandstone.

Berwick.- Upper red sandstone is present in considerable abundance. Also a good deal of calciferous sandstone. Some patches of silurian in the neighbourhood of the coast.

Elgin.- Chiefly old red sandstone with gneiss in the upper regions.

Kinross.- Some upper old red sandstone and porphyrite with alluvium round Loch Leven.

Caithness.- Composed principally of old red sandstone with patches of gneiss and granite.

Kircudbright.- Chiefly silurian with patches of granite.

We see also that there are certain counties in which limestone is present. These are:- Renfrew, Ayr, Stirling, part of Midlothian, Linlithgow, Haddington, Coast part of Fife, Wester Ross and Cromarty.

Again, the counties with the lowest death-rates/

rates are as follows:-

County	Per cent of total deaths.
Inverness	2.93
Ayrshire	3.15
Ross & Cromarty	3.20
Stirling	3.90
Lanark	4.18
Renfrew	4.40
Linlithgow	4.49
Kincardine	4.54
Midlothian	4.95[1]

From the above facts, it will be seen that in seven out of thirteen counties with high cancer mortalities, red sandstone is prevalent to a fairly large extent, in other two of these it is found, although not in great bulk, and in Selkirk it seems to be entirely lacking, although the death-rate is fairly high.

Again, if we look at the counties with low death-rates from cancer we see that, with the exceptions of Ross and Cromarty, Kincardine and Lanark, where red sandstone is present to some extent, the main rock formations in these counties sre limestone or rocks of a carboniferous nature. Limestone, however, is almost absent in Inverness shire./

[1] Green's "Cancer Problem" pp. 44 & 45.

shire.

According to Haviland[1], a high mortality from cancer is found on tertiary formations where there are recent clays, and retentive soils, and alongside rivers which seasonally flood the adjacent districts. On the other hand, a low mortality from cancer is found on elevated land composed of Cambrian silurian, and also where we find carboniferous and limestone formations. In the low mortality districts, also, the same authority says the rivers are not liable to flood the adjacent districts, and are inclined to be rapid in their course rather than sluggish. In other words, cancer would seem to be most frequently found on the more recent geological formations and least on the oldest.

Haviland, in his investigations into the distribution of cancer in Cumberland found that the cancer fields followed the course of the river Eden and the valley of the Derwent. The Eden runs through new red sandstone formations and in the neighbourhood of Carlisle the soil is alluvial.

The same authority is also of opinion that the direction of the prevailing winds is a considerable factor in determining a high or low mortality district. According to him, places that are exposed to the full force of the winds such as open flats, where the wind blows over the area or valleys/

[1] "Geographical Distribution of Disease" p. 38

valleys that are well-ventilated by the wind blowing either up or down them, are found to have a lower death-rate than valleys that are lying at right-angles to the prevailing winds and where the air is more or less stagnant.

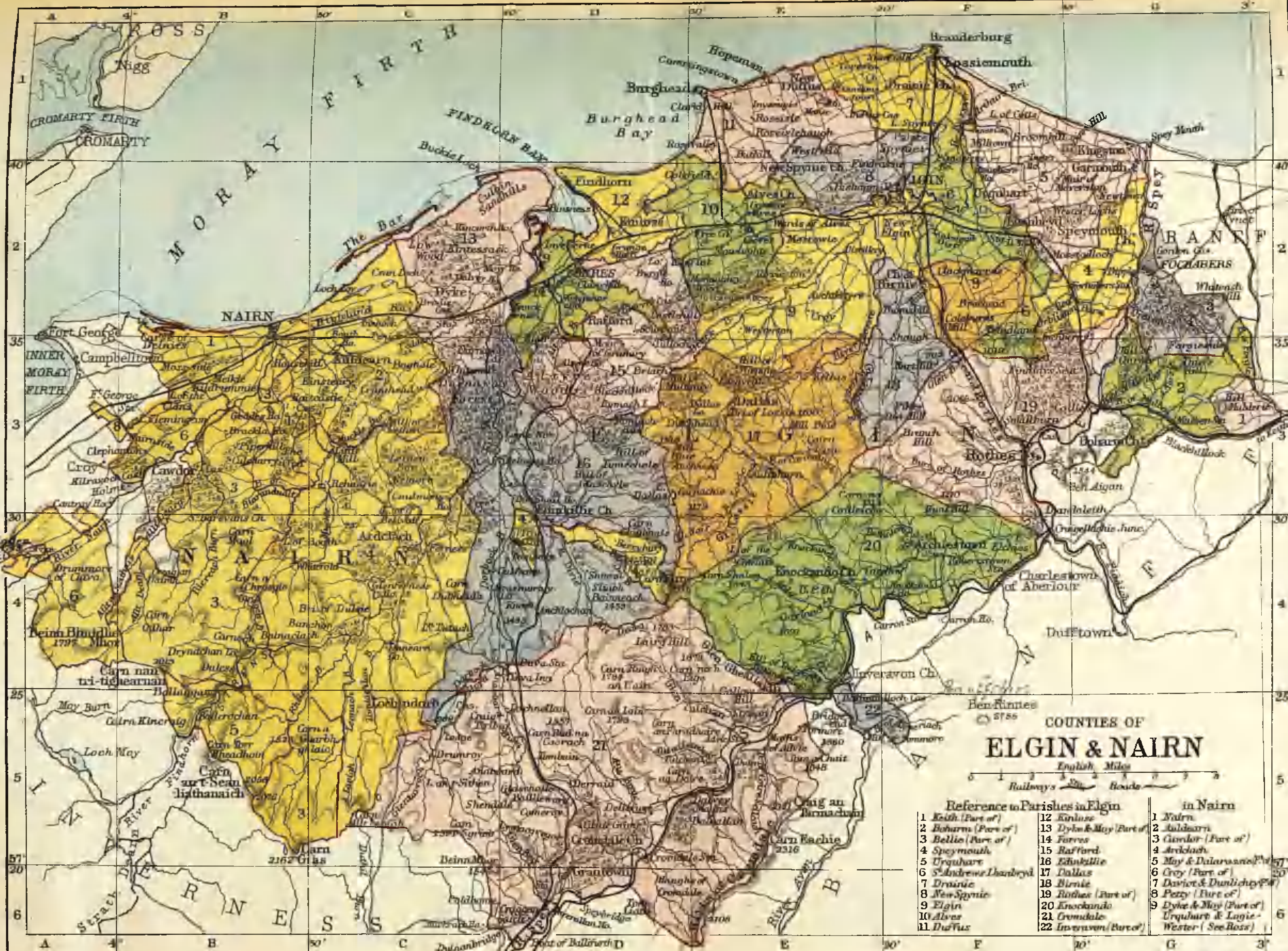
We now come to consider in detail the geological and geographical formation of Morayshire and Nairnshire.

IV. REMARKS ON THE GEOLOGY & GEOGRAPHY OF MORAYSHIRE & NAIRNSHIRE.

M O R A Y.

Area and Boundaries.- The County of Elgin, or Morayshire, the name by which it is otherwise known, is roughly of a triangular shape, the apex of the triangle lying towards the south in the Grantown District, and the base to the north along the shores of the Moray Firth. On the east, it is bounded by Banffshire, on the west by Nairnshire, on the north by the Moray Firth, and on the south by the counties of Inverness and Banff.

It is situated between the 57th and 58th degree of north latitude. It extends twenty-four English miles from east to west, and a straight line stretching from the shores of the Moray Firth at Lossie-



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mouth to Dulnain Bridge gives it a mean length of about thirty-two miles, and a superficial area of approximately eight hundred square miles. About six hundred square miles of this area is hilly. The longitude is 0.12 West of the meridian of Edinburgh.

The only rivers of any importance in Morayshire are the rivers Findhorn, Lossie, and Spey; the Findhorn and the Spey forming roughly the eastern and western boundaries of the County, while the Lossie runs almost mid-way between. All three have their source in the south-west and run in a northerly or north-easterly direction to the sea.

Geological Strata.- For the purpose of geology, the County may be divided into three districts, viz: the Western, Eastern, and Southern.

Western District.- The Western District is chiefly occupied by four ridges, viz:- Covesea Hill of yellow sandstone; Quarry Wood Hill, composed of Old Red Sandstone; Pluscarden Hill chiefly of a gneissic formation with superficial layers of old red sandstone in one or two places; and Dallas Hill, also gneissic in character. Generally speaking, the Western District, with the exception of Dyke, is a sandstone district. The parish of Dyke is mainly situated in the valley of the Findhorn where traces of limestone and oolitic drift are found.

Eastern/

Eastern District.- In this district, there are small patches of limestone and oolitic drift, with old red sandstone in the valley of the Spey. It is generally considered an old red sandstone district.

Southern District.- The Southern District is very hilly in character with rocks of a gneissic formation.

Climate and Soil.- The climate which prevails generally throughout Morayshire is the fair weather which is felt all along the eastern coast of the kingdom. The clouds are borne aloft upon the winds from the mountains of Sutherlandshire to those of Banffshire and Aberdeenshire and thus they pass over the intervening plain. This circumstance, together with the proximity of Morayshire to the sea, must account for the falls of snow being less frequent and of shorter continuance on the low ground than is the case in the more mountainous parts of the country. In the warm seasons, the heat is often lessened by a gentle breeze which arises about noon from the sea. The most uncomfortable weather is experienced towards the end of spring when a frosty east wind often prevails for several weeks, making in the hilly districts the seasons rather later and the harvests more precarious. Agricultural operations are often long suspended in winter/

winter by frosts and snow which often encroach upon the spring, while frequent mists and damp foggy weather in the autumnal months retard the harvest and injure the crops. The prevailing winds, however, are from the west and south-west, and the general tendency of the climate is more genial than that usually found in northern lands.

The soil of the greater portion of the lowlands of Moray is a deep rich clay. In some parts black loam is found, while the remainder may be considered as light and sandy. The soil in the low ground of the various hilly districts has been probably formed by the washings of the streams which more or less participate of the qualities of the various soils. In the hill districts, also, soil composed of a mixture of earth and sand is often found. The loam is usually of a reddish colour while the sandy soil is greatly mixed with gravel and large pebbles which in many places abound in that part ~~part~~ of the country where cultivation has taken place on the sides of the hills. In the still higher regions, the soil may be described as moorish, more or less blended with moss.

The following are particulars of the climate and soil of each parish:-

Alves. The soil is a deep fat loam incumbent on clay.

Birnie/

Birnie. The soil is chiefly sandy in character resting on a bed of rock or much concreted gravel. The soil in several of the fields on the banks of the Lossie is loam incumbent on sand or clay. Over the whole parish, stretches of moorish or peat soil are found. The air is moist and cold in the hills with more rain and snow than on the plain.

Bellie. Upon the banks of the river Spey, the soil is thin upon a sole of gravel, the bottom either of a shifting river or of a retiring ocean. Near the coast it is a deep and fertile loam. Upon the higher flats it is a kindly mould, except in the hills where it is moorish, wet and spongy. In some places, it is of a deep red colour caused by the streams from the hills which in this quarter, under their moorish surface, are composed of a deep bed of clay gravel of that quality and colour. The air is rather cold and dry, yet temperate in the winter and generally mild.

Cromdale. The soil is generally thin and dry with the exception of the plains and the banks of the river Spey. The climate is rather cold but dry and healthful.

Dallas. The plain on which the village stands is pure peat earth, and the fields on the banks of the Lossie are sandy. The soil is generally moorish and not very fertile. The air is cold and often moist/.

moist.

Drainie.- This parish is low, flat and sandy with a mild and wholesome climate.

Duffus. The soil in the western part is a deep rich clay, but towards the sea it is sandy and rather poor. At the extreme western end it is composed of black earth and is very fertile.

Dyke. In Dyke the soil is a light but fertile loam generally incumbent on sand. In some places the soil is of sand concreted with some mineral substances, probably water surcharged with iron ore. Along the seashore it is pure sand. The air is healthful and dry and the climate genial.

Edinkillie. The soil in the lower parts of the River Findhorn is sandy and of a light dry quality but a great proportion is moorish.

Elgin In the Pluscarden district, the soil may be described as a sandy, fertile loam. In some places it is a rich clay. The climate is warm and drier than the more hilly parts of the county.

Forres. The south and south-eastern parts of the parish are hilly and the soil is generally light and rather sandy. The climate is dry and very mild.

Kinloss. In some places the soil is a light sand, in others a rich clay and fertile loam.

Many/

Many of the springs have a mineral taste. The air is dry and sharp.

Knockando. The soil is rather light and stony while the climate is dry, cold, and wholesome.

New Spynie. The air is mild but on the northern side it is not so pleasant. The soil is wet and clayey and the adjoining low lands are often foggy.

Rafford. In the parish of Rafford, the soil for the greater part is a deep fertile clay while in some parts it is a light sand. In the higher parts, the soil is moorish.

Rothes. The soil along the banks of the river is a fertile loam. In some places it is pure clay, in others surcharged with sand superinduced by the floods. Along the bottom of the hills it is a sharp gravelly mould. In the hilly district it is moorish, in some parts inclined to clay, in others to sand.

Speymouth. The arable land is a shallow gravelly soil partly a light fertile loam and partly sand. The climate is temperate and mild.

St. Andrews. In this parish the climate is healthy and dry. The soil is generally sandy yet fertile, while it is light and not damp.

Urquhart. The sea coast land is low and sandy. Further inland, especially towards the north-east/

north-east the soil may be accounted loam. The land is generally low and flat.

N A I R N.

Auldearn. In the eastern quarter, the soil is a strong clay of a red colour. Towards Ardclach, it is a black mould, while the northern part of the parish is a heavy clay loam. The climate is healthy and dry, but a little colder and harder in the higher parts.

Nairn. In the environments of the town and along the coast the soil is sandy. The same kind of soil is continued on the banks of the river Nairn, but is greatly mixed with clay. On the southern side, it is a rich heavy mould.

Croy. The soil along the river Nairn is a fertile loam, but in a great part of the parish, it is poor and thin on a cold hard sole.

Cawdor. The soil in this parish is neither wet nor deep but is a kindly, sharp and diversified earth in the lower part with flats of moorish or rocky ground. The air is agreeable and salubrious.

Ardclach. The soil is shallow on a hard gravelly sole much encumbered with stones. The air is healthy but rather cold.

V. CANCER IN MORAYSHIRE.

In the preceding pages, I have passed in brief review the Geographical Distribution of Cancer throughout the world, its Geological Distribution in Scotland, and the geology and general features of Morayshire. I now come to consider cancer as it is distributed in Morayshire. How it compares with the incidence in other countries, and agrees with or departs from the facts already stated will further be seen.

Through the courtesy of the various Registrars in the county, I have been enabled to search personally all registers in the area for deaths from cancer from the year 1855 to the year 1912 inclusive, a period of fifty-eight years. The numbers and results are tabulated and classified below, but in giving these figures I would like to point out that numerous fallacies and inaccuracies have to be allowed for. Chief among these are:-

(1) In certain districts, and more especially in the earlier years of the period dealt with, many of the deaths recorded by registrars were uncertified, no medical man having been in attendance on the case. This state of things was most frequently met with in outlying districts where there was no resident medical practitioner, and where the inhabitants seldom called in a medical man. This

was still more common when people were advanced in years and when old age was generally assumed to be the cause of death. In many cases, malignant disease of an internal type may have been present, but when we remember the signs of gradual weakening and decay that the patient would probably have shown, it is not to be wondered at that friends or relatives erroneously ascribed the cause of death to senility rather than to some definite organic disease.

(2). I must also point out that I have taken records only of such death returns as were definitely stated to be due to cancer, malignant disease, epithelioma, &c. Many deaths, however, even when certified, were so indefinitely stated that it was doubtful whether they were cancer cases or not. I refer to such causes of death as "internal tumour", "Enlarged liver with jaundice", "Organic disease of the stomach", "Intestinal Obstruction", &c. Many of these were no doubt cases of cancer, but I have not included them in my records.

These two circumstances would be sufficient to falsify the incidence of cancer as collected by me, so that in all probability the mortality rate from cancer has been greater than that/

that recorded.

(3) In a great many cases cancer was given as the cause of death without any statement as to the site of the disease. These cases I have recorded separately, and in consequence, the death rates, as tabulated for certain specific sites ought probably to be somewhat higher than those given. The total death rate for the County, has, however, not been affected.

(4) The place of death did not always correspond to the person's usual residence, but I have endeavoured to correct this as far as possible. All cases dying in institutions within the county, such as the general hospitals, the asylum and the poorhouse, have been transferred to their usual parish of residence. This, however, was not always ascertainable, and in this connection, I have to point out that thirteen cases dying in the Morayshire Union Poorhouse which is situated in the parish of New Spynie, have been credited to that parish, as the parish to which they were chargeable was unknown.

In the course of my investigations I have also found that elderly people in their final illness were occasionally transferred from the place where they were attacked by the disease to the home of relatives in some other part of the country/

country for the purpose of being nursed and cared for. I have allowed for these transferences where known, but I have no doubt that there were many which I was unable to correct.

The following table gives the number of deaths and the death rate per ten thousand living in the county of Moray for each year from 1855 to 1912 inclusive.

Year.	No. of Deaths.	Death rate per 10000 living
1855	8	1.98
1856	15	3.68
1857	9	2.18
1858	23	5.54
1859	17	4.30
1860	13	3.08
1861	21	4.66
1862	18	4.20
1863	21	4.89
1864	14	3.25
1865	12	2.78
1866	14	3.26
1867	16	3.72
1868	18	4.15
1869	21	4.14
1870	25	5.97
1871	22	5.04
1872	33	7.33
1873	25	5.73
1874	29	6.64
1875	18	4.12
1876	16	3.66
1877	23	5.26
1878	20	4.57
1879	16	3.65
1880	20	4.23
1881	23	5.25
1882	23	5.25
1883	28	5.40
1884	28	6.40
1885	24	5.49
1886/		

Year	No. of deaths	Death rate per 10000 living
1886	32	7.33
1887	27	6.20
1888	30	6.26
1889	31	7.11
1890	37	8.49
1891	34	7.82
1892	26	5.96
1893	28	6.40
1894	41	9.56
1895	35	7.94
1896	34	7.95
1897	28	6.30
1898	42	9.42
1899	37	8.28
1900	31	6.91
1901	28	6.25
1902	38	8.40
1903	37	8.28
1904	32	7.43
1905	34	7.68
1906	45	10.22
1907	51	11.60
1908	54	12.32
1909	47	10.82
1910	33	7.59
1911	43	9.90
1912	50	11.51

TABLE II GIVING COMPARISON IN DEATH RATES PER 10000 LIVING FOR THE COUNTY OF MORAY, SCOTLAND, AND ENGLAND AND WALES.

Year.	Morayshire	Scotland [1]	England & Wales. [2]
1861 to 1870	4.17	4.16	3.84
1871 to 1880	5.03	4.86	4.68
1881 to 1890	6.41	5.78	5.89
1891 to 1900	7.47	7.39	8.28
1900	6.91	8.00	8.28
1901	6.25	8.20	8.42
1902	8.40	8.30	8.44
1903	8.28	8.40	8.72
1904	7.43	8.50	8.77
1905	7.68	8.90	8.85
1906	10.22	-	-
1907			

[1] Modified from William's "Natural History of Cancer"
[2] From Russell's "Preventable Cancer" p. 53

Year.	Morayshire	Scotland	England & Wales.
1907	11.60		
1908	12.32		
1909	10.82		
1910	7.59		
1911	9.90		
1912	11.51		

During the period under consideration, from the year 1855 to the year 1912, inclusive, a period of fifty-eight years, sixteen hundred cases of cancer have been registered in the county of Moray. This figure, however, when one considers the possible fallacies already mentioned, is probably an under estimate.

Table No. I, giving the number of deaths for each year and the death rates per 10,000 living for Morayshire has been calculated as nearly as possible on the estimated populations for the years under consideration and based on the census returns for the whole county. The population has remained fairly constant during the last fifty years, notwithstanding some alterations in parish boundaries that have taken place.

From a survey of this Table it will be noted that there is no remarkable increase or decrease when looked at from year to year, but looked at over a period of years, it will be distinctly seen that there is a decided increase in the number

of cases. This probably is more evident from an examination of Table II where the rate per 10,000 living is given for four decennial periods beginning with the year 1861. It is there indicated that the death-rate rose from 4.17 per 10,000 living in the first period to 7.47 in the fourth period. Table II also gives a comparison between the death rates for the County of Moray and those for Scotland and England and Wales. It also illustrates that while the death rates for Scotland, and for England and Wales are fairly constant, there is a slightly decreased mortality rate in Morayshire as compared with those countries generally for the first five years of the fifth decennial period. Where a comparison can be made between this county and Scotland and England, there is a tendency for the county figures to be a little under the Scottish and English figures in some years, but in all probability, judging from the rapidly increasing rates from 1904 onwards, if figures for Scotland and England were available to me, we would find that Morayshire would surpass these in its rate of mortality.

TABLE III. SHOWING NO. OF CANCER DEATHS IN MORAYSHIRE IN QUINQUENNIAL PERIODS.

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5 year periods.	No. of deaths.
1857 to 1862..	.. 92
1863 to 1867..	.. 77
1868 to 1872..	..119
1873 to 1877..	..111
1878 to 1882..	..102
1883 to 1887..	..139
1888 to 1892..	..158
1893 to 1897..	..168
1898 to 1902..	..176
1903 to 1907..	..199
1908 to 1912..	..227

From Table III. the increase in the number of cases in the County will be more readily appreciated. A very decided increase during the last thirty years is shown. In this period the death rate has more than doubled itself. In the previous twenty-years, however, from 1857 to 1877, it does not show any decided increase or decrease, but varies only a little from year to year.

VI. INITIAL SITES OF CANCER IN MORAYSHIRE.

It has always been observed that there is a certain proclivity of particular regions to malignant disease, but the fact that even in certain organs the disease varies in certain districts and countries has not come so much under observation. This point, however, is an important one, in so much that it may ultimately be one of the clues to the elucidation of the cancer problem. There must be a reason for this variation, and the reason will probably be found in the environment or habits of the people affected. The comparisons given below between the County of Moray, the 61st Annual Report of the Registrar General for England and Wales, and the Twelfth Census Report of the United States will indicate how the figures differ or agree. Generally speaking, there is a somewhat wonderful similarity between them.

LIP.

No. of cases in County	Mortality per cent County of Moray	Mortality per cent England & Wales.[1]
Males 11	1.98	1.6
Females 5	.47	.2

These figures, although too few to base reliable statistics on, are remarkably close to

[1] 61st Annual Report of the Registrar General.

the figures for England and Wales, as given in the 61st Annual Report of the Registrar General. In hospital statistics[1] the number of cases of cancer of the lower lip in females as compared to males, was as 1 to 1.08. A comparison with Morayshire figures shows a much higher number for females, but it must of course be remembered that in hospitals there is a certain selection of cases, and it is to be noted that in Morayshire, we are dealing with mortality statistics. In the case of hospitals, there must be many cases of lip cancer cured by operation.

TONGUE AND MOUTH

	Cases in Moray. in 58 years.	Mortality % in Morayshr.	Mortality % in Eng. & Wales.[2]	Mortality% U.S.A.1900[3]
Males	34	6.13	6.4	9.5
Females	12	1.14	0.6	1.6

THROAT.

	Cases in Morayshire in 58 years.	Mortality% in Morayshr.	Mortality per cent in Eng. & Wales.
Males	12	2.1	2.0
Females	10	.95	-

In 1900 the mortality rate in the United States/

[1] Williams '"Natural History of Cancer" p. 382

[2] 61st Annual Report of the Registrar General

[3] Williams's "Natural History of Cancer" p. 380

States is given in the Twelfth Census Report including throat with tongue and mouth. The following are the figures:-

Males	9.5%
Females	1.6%

Comparing the figures for tongue, mouth, and throat, the percentage in Morayshire is extremely close to that of England and Wales, while the numbers for the United States exceed the others by 1% It is noteworthy that in Morayshire only one case is recorded as occurring in the palate, and that case was in a female.

It is not quite easy to explain the greater proclivity of men to cancer of the lips, mouth and throat than of women. It is reasonable to infer that the irritating effect of smoking on these parts is one of the predisposing causes, smoking being indulged in more frequently by men than by women. In this connection, it is significant that, according to the Fourth Report from the Cancer Research Laboratories of the Middlesex Hospital, pp. 51 and 52, the percentage occurrence of cancer at these sites in women during the last quarter of a century has shewn a diminution. There is reason to believe that smoking in women was more prevalent among the rural population previous to

that period than in later years.

OESOPHAGUS

Cases in Morayshr. in 58 years.		Mortality % in Elginshr.	Mortality % in Eng. & Wales.
Males	9	1.64	6.0
Females	7	.66	1.5

A comparison of the Morayshire precentages with those of England and Wales, shows a marked inequality in both males and females, both being very much lower, but especially males. I can suggest no reason for this, unless that certain cases which really began in the pharynx have been erroneously ascribed to the oesophagus and vice versa, on account of the difficulties in diagnosing the exact site in these regions.

This would seem to be borne out by a comparison between the percentages for pharynx and oesophagus combined as shewn in the following table for both sexes.

Morayshire.	Middlesex Hospital [1]	Mayo Hospital [1]
5.31	5.1	6.8

STOMACH.

Cases in Morayshr. in 58 yrs	Mortality % in Moray.	Mortality % Eng. & Wales.	Mortality % U.S.A. 1900
Males/			

[1] 3rd Report Cancer Research Laboratories of the Middlesex Hospital, p. 96

Cases in Moray. in 58 years.	Mortality % in Moray.	Mortality % Eng. & Wales	Mortality % U.S.A. - 1900.
Males 151	27.25	21.4	43.0
Females 213	21.32	13.2	24.4

This comparison indicates that cancer of the stomach is considerably in excess in Moray as compared with England and Wales. It is noteworthy that this increase applies to both males and females almost in the same proportions. These figures, however, are very much lower than those for the United States, as a glance at the table will show. In Morayshire, as in many other districts, it has been found that cancer is situated in the stomach far more frequently than in any other site.

In surveying the number of cases in which the pylorus was stated as the exact site of the disease, I found that there were in males fifteen cases or 9.9 per cent, and in females eighteen or 8.4 per cent. 66.3% of the stomach cases of Brinton and Welch were located in the pylorus[1]. It is not stated if these cases were based on surgical or post-mortem observations, but probably they were. The difficulty in the exact definition of a stomach site in general practice must be considerable, and it is not surprising that one finds/

[1] Williams's "Natural History of Cancer" p. 384

finds great disparity in percentages.

INTESTINES (ex. RECTUM).

Cases in Moray in 58 yrs.	Mortality % in Moray.	Mortality . Eng. & Wales.	Mortality% U.S.A.- 1900
Males 48	8.6	6.1	9.2
Females 73	6.9	5.2	-

The first point that strikes one on looking at these figures is, that those for Morayshire are much higher than those denoting the average for England and Wales. Thus it is seen that the increase noted with regard to the stomach in the preceding paragraph is continued, although to a less extent in the figures for the intestines. The increase applies to both males and females. It is also interesting to note that the incidence of cancer of the intestines in females is approximately 1% less than that in males in both the County of Moray and in England and Wales.

The figures for the United States do not give a true comparison, as the percentage given, viz:- 9.2 refers to the abdomen, and under this heading might be included cases of cancer of the pancreas, peritoneum, &c. No percentages are given for females. The number of cases of cancer of the rectum will be considered in a separate paragraph.

The one hundred and twenty-one cases tabulated under/

under Intestines were made up as follows:-

Males.		Females.	
Bowels or Intestines -	32	Bowels or Intestines -	63.
Duodenum - - - - - - - -	3	Duodenum - - - - - - - -	3
Sigmoid - - - - - - - -	-	Sigmoid - - - - - - - -	2
Caecum - - - - - - - -	2	Caecum - - - - - - - -	-
Iliocaecal valve - - -	3	Iliocaecal valve - - -	-
Colon - - - - - - - - -	8	Colon - - - - - - - - -	5
	48		73

RECTUM.

Cases in Moray in 58 years	Mortality % in Moray.	Mortality % Eng. & Wales.	Mortality % U.S.A. 1900.
Males 55 - -	9.9 - - - - -	9.6 - - - - -	5.4
Females 57 - -	5.4 - - - - -	5.3 - - - - -	3.5

The above figures give statistics of mortality from cancer of the rectum. The closeness of the figures for England and Wales to those for the county of Moray is remarkable, especially so when, as has been before stated, the numbers for the stomach and other parts of the intestines are higher than those of that country. It is also remarkable that the percentage for the United States is distinctly lower than that found either in England and Wales or this county. It is by no means/

means easy to account for this disparity, especially when one considers that we are dealing with a well-defined site, and one in which diagnosis is a good deal more certain than many other parts of the alimentary tract. This would naturally lead one to believe that percentages for these parts would be less liable to fallacy than some of the others we have been considering. It is difficult to give any explanation as to why the rectum should be such a prolific seat of cancer in Great Britain compared to what it is in America. Can it be explained on the assumption that constipation, with its consequent irritation of the rectum, is more frequent in Great Britain than in the United States? I have no reason to believe that this is really the case, but merely put it forward as a possible explanation.

LIVER AND GALL BLADDER.

Cases in Moray. in 58 years.	Mortality % in Moray.	Mortality % Eng. & Wales.	Mortality % U.S.A. 1900.
Males 48	8.6	13.4	14.5
Females 65	6.21	13.5	12.5

Although in the above table, the figures for England and Wales correspond closely to those of America, there is a marked reduction in the percentages in Morayshire.

PANCREAS/.

PANCREAS.

Cases in Morayshire.	Cases on Metropolitan Hospitals[1].
Males 3. - .54%	.64%
Females 3. - .28%	.13%

These figures show that in Morayshire the proportion of deaths from cancer of the pancreas is lower for males and very much higher for females than the proportion of cases in metropolitan hospitals.

OMENTUM, MESENTERY AND PERITONEUM.

Cases in Morayshire	Cases in Metropolitan Hospitals[1]
Males 2. - .36%	.69%
Females12. - 1.14%	.67%

Under this heading, it will again be seen that the figures for Morayshire are lower for males and much higher for females.

ABDOMEN & PELVIS.

Cases in Morayshire	Cases in Metropolitan Hospitals[1]
Males 9 - 1.6%	.69%
Females 16 - 1.5%	.17% (pelvis alone)

PAROTID & THYROID GLANDS

Cases/

[1] Williams's "Natural History of Cancer" pp.394-99.

Cases in Morayshire		Cases in Metropolitan Hospitals[1]
Males	.36%	.21%
Females	.28%	.06%

SUMMARY OF CASES IN THE ALIMENTARY TRACT.

In summarising the above cases, for the sake of clearness the following table may be useful.-

MALES.

Morayshire		England & Wales.
Lip	1.98%	1.6 per cent
Tongue & Mouth	6.13 per cent	6.4 " "
Throat	2.1 " "	2.0 " "
Oesophagus	1.64 " "	6.0 " "
Stomach	27.25 " "	21.4 " "
Intestines (ex rectum)	8.6 " "	6.1 " "
Rectum	9.9 " "	9.6 " "
Liver & Gall Bladder	8.6 " "	13.4 " "
Pancreas	.28 " "	-
Omentum, Mesentery & Peritoneum	.3 " "	-
Abdomen & Pelvis	1.6 " "	-
Parotid & Thyroid glands	.3 " "	-

FEMALES.

Morayshire/

[1] William's "Natural History of Cancer" pp. 394-399.

Morayshire.	(per cent)	England & Wales.	(per cent)
Lip	.47		.2
Tongue & Mouth	1.14		.6
Throat	.95		-
Oesophagus	.66		1.5
Stomach	21.3		13.2
Intestines (ex rectum)	6.9		5.2
Rectum	5.4		5.3
Liver & Gall Bladder	6.2		13.5
Pancreas	.5		-
Omentum, Mesentery & Peritoneum	.1		-
Abdomen & pelvis	1.5		-
Parotid & Thyroid	.2		-

It is not necessary to make any clear distinction between the alimentary tract proper and the glands and organs accessory to it, as most of these glands and organs are directly concerned in the process of digestion. The cases tabulated under the abdomen and pelvis are probably cases where a clear diagnosis as to the exact site could not be made. In working out the percentages for the alimentary tract, the results arrived at are as follows:-

Morayshire/

Morayshire		England & Wales.		United States.[1]
Males	69.4%	. . 70.6%	. . . . .	81.6 %
Females	45.5%	. . 43.3%	. . . . .	51.8%
Both Sexes	53.4%	. . 54.0	. . . . .	66.7%

A comparison of these figures for the whole alimentary tract shows a remarkable similarity between the figures for England and Wales and those for Morayshire, the difference in the individual groups comprising the tract, lying chiefly in the oesophagus, stomach, and liver. The figures for the oesophagus and the liver are much below and those for the stomach much above those recorded for England and Wales. The final result of these statistics is that there is a fairly clear indication that cancer is chiefly located in the alimentary tract.

RESPIRATORY SYSTEM

Morayshire.		Metropolitan Hospital Statistics.	
Lungs.		Lungs.	
Men	1 -.18 %	Men	.3%
Females	5 -.4%	Females	.07%
Larynx		Larynx.	
Males	4 - .74%	Males	1.1%
Females	5 - .47%	Females	.07%

It is interesting to note the low incidence

of/ 1 Twelfth United States Census Report, 1900

of cancer of the respiratory system. In Moray shire the incidence in this site seems to be somewhat high when compared with metropolitan hospital statistics, but it is doubtful whether a reliable comparison can be made between hospital statistics and mortality statistics. It is worthy of note that there were no cases in the trachea either among men or women.

HEAD, FACE & NECK

The following table shows how the cases under head, face and neck are made up:-

HEAD AND NECK.

Males.		Females.	
Ear	2	Middle ear	1
Side of head.	2	Scalp	3
Neck.	20	Neck	16
	24		20

FACE.

Males		Females.	
Nose.	2	Nose	-
Cheek	3	Cheek.	2
Eyelid.	1	Eyelid	-
Forehead.	2	Forehead	-
Eyes	7	Eyes	3
	38		29

JAWS.

Males		Females	
Jaw	11	Jaw	4
Upper Jaw	6	Upper Jaw	3
Lower Jaw	6	Lower Jaw	2
	23		9

COMPARATIVE TABLE.

Morayshire			Mortality %	Mortality % in Eng. & Wales.
Face.	Males	38	6.8	2.0
	Females	29	1.8	.6
Jaw.	Males	23	4.15	2.7
	Females	9	.86	.8

COMPARATIVE TABLE.

Morayshire			Mortality %	U.S.A. Mortality %
Head, Face & Neck	Males	85	15.3	10.4
	Females	58	5.5	3.1

The above comparative tables show that cancer of the Head, Face and Neck seems to be more frequent in Morayshire than in England and Wales generally or in the United States. This applies to both males and females. The greatest increase seems to be connected with the prevalence of the disease in the face. and jaw. It is difficult to account for this. The increase, however, may be due to the presence of rodent ulcer which attacks the face more frequently than almost any other site. Cases of rodent ulcer found in the County, I have put under a separate heading, but it is not unlikely that they were frequently certified as cancer of the face.

BREAST.

Cases/

Cases in Moray in 58 years	Mortality % in Moray	Mortality % Eng. & Wales	Mortality % U.S.A. - 1900.
Males 0	0	0.2	0.7
Females 183	17.49	15.8	15.7

This table indicates that there is a higher percentage of cases of cancer of the breast among females in Morayshire than there is in England and Wales or in the United States. It is worthy of note that among males, no case has been recorded in Morayshire.

UTERUS

Cases in Moray in 58 years	Mortality % in Moray	Mortality % Eng. & Wales.	Mortality % U.S.A. - 1900.
Females 163	15.58	23.5	27.6

Contrary to what was found in the figures for cancer of the breast, the mortality percentage of cancer of the uterus in Morayshire is much lower than that found in England and Wales or the United States.

GENERATIVE & URINARY ORGANS.

Cases in Morayshire in fifty-eight years.	Mortality per cent in Morayshire
Males 20	.3.61
Females 10	.09

Included in this percentage are six

cases/

cases or 1.0 per cent of cancer of the prostate. This exactly compares with the figures for England and Wales.

Of the one hundred and sixteen cases included under "Other forms", the following table gives the details of where the cancer is situated.

Males.		Females.	
leg	2	leg	19
groin	2	groin	3
thorax	2	thorax	3
spine	1	-	
rodent ulcer	2	rodent ulcer	3
side	1	side	2
arm	1	arm	1
Axilla	1	axilla	3
Shoulder	1	-	
-		Hand	3
-		thigh	4
-		ribs	1
-		chest	2
-		back	1
-		knee	1
-		Undefined	10
Undefined	47		
TOTAL	60	TOTAL	56
	10.8%		5.35%

I regret that I am unable to give a comparison with these figures from any other source, as it is impossible to know what sites or localities may or may not have been included under the term "All other forms".

The following table indicates approximately the increase or otherwise of cancer at the various sites/

sites during the period of years under consideration. This table was compiled before all the records were to hand, but I think it is sufficiently complete for the purpose.

	1855-62	1863-72	1873-82	1883-92	1893-02	1903-12
Breast	20	25	25	21	27	37
Uterus	14	15	24	35	33	44
Intestines	8	17	26	46	67	95
Stomach	35	52	49	93	105	105
Mouth and throat	9	17	22	30	31	41

From the above table it will be observed that the figures for the stomach and intestines when taken together show the most marked increase. The figures for the breast and the uterus show no great increase from one period to another, although the increase is more marked in the last ten years. The same may be said of the numbers for mouth and throat.

VII. SEX AND AGE INCIDENCE

Sex and age are very important factors in any calculations that may be made into the prevalence of cancer in any locality. The reason for this is almost self-evident. It is known that cancer is a disease associated with advancing years, and that it usually attacks in greater proportion persons of the female sex. This is almost entirely due to the frequency with which cancer occurs in the breast and uterus in females. This being so, it is important to correct for the age and sex distribution when investigating the cancer incidence in any community. It is well known that the numbers at different ages readily alter, and that at certain periods, the number of males and females also alter. To prevent errors as far as possible, I have based my percentages on the age and sex distribution as given in the Census reports dealing with the period under investigation, viz:- 1855 to 1912. Of the sixteen hundre d cases considered

554 were males

1046 were females.

The formation of these totals will be better understood from the following table:-

Year	Males	Females	Ratio Males to Females
1855 .57	8	24	1 to 3
-	.44%	1.1%	-

Year	Males	Females	Ratio Males to Females.
1858-62	29	63	1 to 2.1
-	1.39%	2.67%	-
1863-67	34	43	1 to 1.2
-	1.63%	1.83%	-
1868-72	42	77	1 to 1.8
-	1.99%	3.25%	-
1873-77	36	75	1 to 2.0
-	1.7%	3.17%	-
1878-82	36	66	1 to 1.8
-	1.68%	2.77%	-
1883-87	54	85	1 to 1.5
-	2.53	3.5%	-
1888-92	51	107	1 to 2
-	2.50%	4.63%	-
1893-97	70	98	1 to 1.2
-	3.43%	4.24%	-
1898-02	59	107	1 to 1.8
-	2.79%	4.51%	-
1903-07	54	145	1 to 2.7
-	2.55%	6.12%	-
1908-12	83	144	1 to 1.7
-	4.05%	6.27%	-
1855-1912	554	1046	Av. 1 to 1.8

In the following table, a comparison is made between the Morayshire figures and other statistics.

Sex Ratio - Males to Females.

Morayshire . . . . . 1 to 1.8

Hospital Statistics[1] . . . . 1 to 1.75

63rd/

[1] Williams' "Natural History of Cancer" p. 312.

SEX RATIO. MALES TO FEMALES.

63rd Report of the
Registrar General, 1900 . . . . . 1 to 1.5

United States, 1900, ... 1 to 1.5

While we know that cancer is increasing, it is of importance to ascertain if the increase is marked in males or in females or equally in both. A remarkable thing in the figures for Morayshire, and one which may be a mere coincidence, is a periodicity in this subject which we are now considering. On looking at the table above, it will be seen that the ratio of males to females has not varied much for fifty-five years, but the ratio is greatest every fifteeh years, viz:-

The quinquennial period 1858-62
" " " 1873-77
" " " 1888-92
" " " 1903-07

It will further be observed that during the last thirty-five years, while the numbers of females were increasing, the males were decreasing, and vice versa, the change taking place at the end of each fifteen year period. It would be interesting to know whether cancer may not be a disease increasing in both sexes, but following a definite cycle as above mentioned. Further observations will be necessary to determine this.

The/

The results indicated above have not been found as a general rule. In the Registrar General's Reports, there seems to be evidence that the sex ratio is becoming less, and that there is a tendency for the disease to become equally prevalent in both sexes. The following table[1] will illustrate this.

Period	Sex Ratio
1851 to 1860	1 to 2.2
1861 to 1870	1 to 2.1
1871 to 1880	1 to 1.9
1881 to 1890	1 to 1.7
1891 to 1900	1 to 1.5
1901 to 1905	1 to 1.3

Although the sex ratio for the county of Moray compares closely with those of the United States and of England and Wales, a similar ratio is not found in all countries. In Australia and New Zealand, the mortality in males has been greater than that in females for many years - almost since 1870. The above table shows no evidence of any gradual equality of ratio in the county of Moray, females being distinctly in excess.

The following table shows the age incidence in the county of Moray.

1855-1862/

[1] Williams' "Natural History of Cancer" p. 57

Age-Group	1855-1862		1863-1872		1873-1882		1883-1892		1893-1902		1903-1912	
	No	Per 1000 of Popul^n	No	Per 1000 of Popul^n	No	Per 1000 of Popul^n	No	Per 1000 of Popul^n	No	Per 1000 of Popul^n	No	Per 1000 of Popul^n
Below 35	7	·24	10	·33	8	·26	6	·20	7	·12	7	·42
35 - 45	9	2·1	12	2·64	12	2·70	17	3·84	24	5·08	28	5·65
45 - 55	17	4·76	38	9·93	36	9·21	53	13·91	50	13·06	63	15·06
55 - 65	36	13·09	44	14·07	47	14·68	74	22·79	76	23·81	101	31·3
65 - 75	32	18·13	57	29·75	72	36·64	88	41·62	123	55·45	142	62·3
75 - 85	20	23·89	30	33·59	35	39·06	52	57·01	47	49·68	76	76·69
85 - 95	3	19·86	5	33·04	3	23·77	6	42·55	15	100·	9	55·170
95 & up.	-	-	-	-	-	-	1	-	2	-	-	-
	124	-	196	-	213	-	297	-	344	-	426	-

From the above table it would seem that on the whole, it is in the age period, 75 to 85 years that the cancer mortality is heaviest, as in five out of the six ten year periods, the mortality rate at that age isheaviest.

in the first period of eight years, the rate at the 75-85 age period is highest. Then comes the 85-95 period and then the 65-75, followed by the 55-65 group. The lightest rate is below 35. The same may be said of the second group of ten years, while in the third group, the mortality at 65-75 is greater than at 85-95. years. In the fourth group, viz: 1883 to 1892, the mortality occurs in the same sequence as in the first. In the fifth ten year group, the highest mortality is found at 65-75 years. Here also the mortality at from 35-45 years shows a decided increase. In the last group, the highest mortality is again at from 75-85 years, while the 65-75 year period comes second.

Taking the age groups individually, it will be seen that the age group below 35 years has varied but little in the period under consideration. The mortality at 35-45 has increased from 2.1 in 1855-62 to 5.08 in the ten years 1893.02, and to 5.63 in 1903-12. The age group 45-55 shows a considerable/

considerable increase, being only 4.76 for the first eight years, increasing to 9.93 for the second group of ten years, 13.9 in the fourth and 15.06 in the sixth. The 55-65 age group shows very little difference for the first twenty-eight years, but in the fourth ten-year period, it increases from 14.68 to 22.79, and in the last year period it rises to 31.3 The next age period, viz 65-75 shows the greatest increase. Between 1855 and 1872 it rose from 18.13 to 29.75. The next ten-year period shows a rise of 6.8 on the last; the next period a rise of 15.0, the next a rise of 13.8, and between the last two year periods a rise of 6.9 is observed. From 1855 to 1912 there is a rise in the mortality of 44.2 The next age period, 75-85, does not show such a great increase between the decades, but from 1855 to 1912 the mortality rose from 23.89 to 76.69. In the 85-95 age period the increase is again considerable, the mortality in the first period of eight years being 19.86 and in the last decade, 55.90.

VIII. OCCUPATIONAL INCIDENCE OF CANCER IN MORAYSHIRE.

M A L E S.

Occupation	Mortality
Farmers, crofters, dairymen	1 in 645
General & Agricultural labourers	1 in 1535
Carpenters, cabinetmakers	1 in 1004
Fishermen	1 in 1472
Masons, builders, feuars	1 in 1041
Gardeners	1 in 1004
Shoemakers	1 in 1459
Drapers, tailors, and clothiers	1 in 1976
Grocers	1 in 984
Blacksmiths	1 in 1340
Shepherds	1 in 1334
Carters, weighmen	1 in 1373
Licensed Trade	1 in 857
Pedlars, hawkers, &c.	1 in 520
Bakers	1 in 1630
Railway officials	1 in 1120
Gamekeepers	1 in 990
Coalmerchants	1 in 300
Weavers	1 in 1186

General merchants/

General Merchants. . . . . 1 in 600

Excise. . . . . 1 in 914

Foresters, woodmen, sawmillers . . . 1 in 1750

Butchers . . . . . 1 in 1251

Meal or flour millers.... . . . . 1 in 790

Hairdressers. . . . . 1 in 290

Coachmen. . . . . 1 in 3467

Shipbuilders. . . . . 1 in 1987

Sailors. . . . . 1 in 2266

Platelayers & surfacemen. .. . . . 1 in 718

Coachbuilders. . . . . 1 in 1253

Plasterers. . . . . 1 in 1653

Watchmakers. . . . . 1 in 2250

Ministers. . . . . 1 in 1250

Doctors, surgeons. . . . . 1 in 977

Cabmen. . . . . 1 in 1890

painters, plumbers, glaziers. . . . . 1 in 2660

Schoolmasters. . . . . 1 in 3690

Coopers. . . . . 1 in 4265

Dyers. . . . . 1 in 505

Photographs. . . . . 1 in 530

Booksellers and binders. . . . . 1 in 967

Commercial travellers. . . . . 1 in 1205

Reporters. . . . . 1 in 390

Army . . . . . .1 in 2955

Grain and corn merchants. . . . . 1 in 437

Clerks/

Clerks . . . . . 1 in 3675

China merchants. . . . . 1 in 415

Butlers, waiters, &c. .. . . . . 1 in 3000

These ratios have been obtained from calculations based on the census reports giving the average number of persons in the respective occupations and from the number of deaths in these occupations during the period from 1855 to 1912.

The occupation of chimney-sweep, which elsewhere has been found with the greatest mortality from cancer, is absent from my list for the county of Moray, no cancer deaths in connection with this occupation being recorded.

The following are the occuptions with a ratio of one in less than 500:-

Coalmerchants
Hairdressers
Reporters
Grain and corn merchants
China merchants

In the above list one is struck with the large number of merchants noted, as having a high cancer mortality rate. Are we to infer that these people are prosperous and well-to-do, and more likely to be attacked with this fell disease?

I/

I hardly think so, for along side we have the occupations of hairdressers and reporters, both classes of whom are less likely to belong to the prosperous part of the community. All are more or less indoor occupations. The occupation of hairdresser stand at the top of the list.

Of the occupations with mortality rates between 1 in 500 and 1 in 1000 are the following:-

Farmers, crofters, &c.
Grocers,
Licensed trade,
Pedlars, hawkers, &c.,
Gamekeepers,
General merchants,
Excise,
Meal and flour millers,
Platelayers and surfacemen,
Doctors, surgeons,
Dyers,
Photographers,
Booksellers and bookbinders.

This list of occupations does not suggest to one's mind any reason why they should have a comparatively high death rate from cancer. It has been pointed out by many observers that the licensed trade has a high cancer incidence. Reasons innumerable for this have been mentioned, chief among them being the fumes and emanations in connection with the manufacture and sale of beer, whiskey, and other alcoholic substances. But there seems to be more than this, for publicans, excisemen, hawkers, suffer similarly, the probability being that/

that these persons often become addicted to alcohol, and that indirectly makes them a prey to cancer. Further, hotel servants often occupy cellar and underground rooms where there is dampness and stagnation of the atmosphere, and where mould prevails. Bookbinders, another of the above group, are often compelled to work in rooms badly ventilated and pervaded with fumes. Photographers and dyers work among chemical irritants which might readily pre-dispose to malignant disease. Gamekeepers and farmers lead an open air life and are more or less working with the soil, which more than one observer has associated with a high cancer mortality. Millers have a cancer death rate above the average.

The following is a group of occupations with a mortality rate between 1 in 1000 and 1 in 1500:-

Carpenters, cabinetmakers, &c.
Fishermen,
Masons, builders,
Gardeners,
Shoemakers,
Blacksmiths,
Shepherds,
Carters,
Railway officials,
Weavers,
Butchers,
Coachbuilders,
Ministers,
Commercial travellers,

This/

[1] Rollo Russell's "Preventable Cancer", p. 89

This group is remarkable for the variety of the occupations contained in it. The building trades are fairly well represented. Gardeners, besides working much among the soil, are also subjected to the action of soot which they use generally in considerable quantities. Shoemakers are to some extent workers in mineral oils, pitch, benzine, tallow and animal oils. They are also in the habit of irritating the mouth by holding nails it in while working.

The following group comprises those occupations with a ratio between 1 in 1500 and 1 in 2000.-

General and agricultural labourers,
Drapers, tailors, and clothiers,
Bakers,
Foresters, woodmen and sawmillers,
Shipbuilders,
Plasterers,
Cabmen.

These occupations seem to have nothing in common and call for no particular remark. When gathering my statistics, I was rather inclined to think that those engaged among wood, such as sawmillers, foresters, &c. and their wives had an unusually large incidence of cancer, but this is not borne out by the above figures for men.

The following occupations had a ratio of 1 in more than 2000:-

Coachmen,
Sailors/

Watchmakers,
Painters,
Schoolmasters,
Coopers,
Army,
Clerks,
Butlers, waiters, &c.

These give the lowest death rates. It is interesting to note that the cases of cancer among hairdressers in my list occur in the region of the mouth and throat. Barbers as a class would be much in contact with incipient cases of cancer of the head and neck. The same might be said of doctors and nurses who appear from my list to have a high mortality.

The occupations of grain and corn merchants, and millers have a high mortality. This would be in harmony with the idea of a fungoid disease that would be associated with grain and likely to attack those working with it. The same might be said of farmers and crofters who have a fairly high mortality. It has been pointed out by some authorities that those engaged on the soil seem to have a high mortality from cancer. This is in accordance with my own figures, farmers and crofters being somewhat higher than gardeners. In my investigations I have also noted that those especially associated with the lower animals have a somewhat high mortality. In this group I place gamekeepers/

gamekeepers and along with them molecatchers. When one considers the very small number following the latter occupation, it is interesting to note that among my statistics for Moray, I have records of two molecatchers and one molecatcher's wife dying from malignant disease. In my figures also appears a rat destroyer who succumbed to cancer of the stomach.

The following table gives the cancer mortality among the various occupations engaged in by females. It, however, must here be stated, that in the returns from which the number of deaths from cancer were compiled, the occupation was not given in many cases, so that the following figures are probably below what they ought to be.

Occupation.	Mortality
Domestic servants, housekeepers.	1 in 1462
Outworkers,	1 in 2175
Dressmakers,	1 in 2023
Teachers,	1 in 2357
Lodging house keepers.	1 in 1126
Merchants,	1 in 821
Post office service.	1 in 866
Music teachers,	1 in 605
Laundresses, washerwoman,	1 in 561
Tailors,	1 in 550

Governesses/

Governesses . . . . . 1 in 58o

Seamstresses. . . . . 1 in 533

Nurses . . . . . .1 in 463.

Wives or widows. . . . . 1 in 924.

From the above table, it will be seen that the highest mortality is among nurses. Seamstresses and governesses come next. General merchants and those of the post office service would seem to be moderately high, while dressmakers, outworkers, teachers and lodging house keepers are among the lowest. The mortality rate for married women would also seem to be moderately high, but if trustworthy figures were available, it would probably prove to be much higher than is here stated.

The figures for the county of Moray give no special indication that certain occupations are much associated with a high mortality from malignant disease. At the same time, I wish to point out that, on account of the difficulty in obtaining the lists of occupations from the census reports, my statistics are approximate only and I am not surprised that they do not agree more closely with those of the list of the Registrar General for England.

IX.

DISTRIBUTION OF CANCER ACCORDING TO PARISH.

Having considered the incidence of cancer as concerns the county of Moray generally, I will now give a detailed statement of the Mortality as it occurs in the various parishes, together with notes on particular cases or peculiarities of incidence.

The tabular statements on the following pages give a general idea of the cancer mortality in the county of Moray, (1) in five year groups, according to parish, (2) in five year groups according to sex, (3) totals in twenty-nine years according to parish.

Showing number of cases in each parish in periods of five years.

	1855-57	1857-62	1862-67	1867-72	1872-77	1877-82	1882-87	1887-92	1892-97	1897-02	1902-07	1907-12	Totals
Alves	1	1	2	2	1	1	1	2	3	1	4	3	22
Bellie	1	11	9	11	9	4	12	7	10	12	11	5	105
Birnie	-	-	-	-	1	1	-	-	1	2	1	-	6
Cromdale	3	6	5	13	12	18	11	20	21	16	8	15	148
Dallas	1	5	2	4	2	-	2	8	2	5	3	-	34
Drainie	3	6	4	7	5	3	10	15	13	9	18	13	106
Duffus	2	3	4	7	7	4	10	11	15	10	20	23	116
Dyke	2	1	2	2	7	2	7	6	3	6	6	5	49
Edinkillie	-	3	3	7	5	3	3	2	8	3	4	10	46
Elgin	9	21	22	34	24	29	36	38	40	44	56	52	405
Forres	5	15	6	16	13	11	13	18	17	27	27	40	208
Kinloss	-	1	1	3	4	1	6	3	5	7	4	3	38
Knockando	1	2	3	4	7	9	5	7	7	4	10	6	65
Speymie	1	3	1	-	-	2	3	4	1	7	1	9	32
Rafford	1	1	-	-	3	2	4	3	3	3	2	1	26
Rothes	1	1	2	2	3	6	13	7	5	6	11	9	66
St Andrews Lhn	-	4	1	3	5	2	-	4	6	5	3	5	38
Speymouth	1	-	3	-	-	-	2	-	4	2	5	6	23
Urquhart	-	8	7	4	3	4	1	3	9	7	5	16	67
Totals for County	32	92	77	119	111	102	139	158	168	176	199	227	1600

Table II Showing cancer deaths according to sex in five year periods

	1855-57		1857-62		1862-67		1867-72		1872-77		1877-82		1882-87		1887-92		1892-97		1897-02		1902-07		1907-12		Totals	
	m	f	m	f	m	f	m	f	m	f	m	f	m	f	m	f	m	f	m	f	m	f	m	f	m	f
Alves	-	1	-	1	1	1	-	2	-	1	1	-	1	-	-	2	1	2	1	-	1	3	-	3	6	16
Bellie	-	1	6	5	3	6	1	10	4	5	-	4	3	9	2	5	2	8	3	9	3	8	2	6	29	76
Birnie	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	1	-	2	1	-	-	-	1	5
Cromdale	1	2	1	5	3	2	6	7	2	10	7	11	4	7	9	11	9	12	6	10	2	6	7	8	57	91
Dallas	-	1	2	3	2	-	2	2	-	2	-	-	1	1	4	4	-	2	-	5	1	2	-	-	12	22
Drainie	1	2	3	3	3	1	3	4	-	5	-	3	7	3	6	9	6	7	4	5	4	14	4	9	41	65
Duffus	1	1	1	2	3	1	2	5	2	5	1	3	5	5	5	6	8	7	3	7	6	14	9	14	46	70
Dyke	-	2	-	1	1	1	2	-	5	2	-	2	3	4	2	4	2	1	4	2	-	6	1	4	20	39
Edinkillie	-	-	1	2	1	2	3	4	4	1	2	1	2	1	1	1	2	1	1	2	3	1	7	3	27	19
Elgin	4	5	7	14	8	14	11	23	5	19	10	19	12	24	12	26	17	23	21	23	12	44	14	38	133	272
Forres	1	4	2	13	1	5	8	8	4	9	3	8	5	8	3	15	7	10	6	21	7	20	11	29	56	153
Kinloss	-	-	-	1	1	-	1	2	2	2	-	1	1	5	1	2	2	3	2	5	1	3	1	2	12	26
Knockando	-	1	-	2	2	1	-	4	3	4	5	4	3	2	1	6	4	3	-	4	3	7	5	1	26	39
Spynie	-	1	-	3	1	-	-	-	-	-	1	1	2	1	1	3	1	-	1	6	1	-	6	3	14	18
Rafford	-	1	1	-	-	-	-	-	1	2	1	1	2	2	1	2	1	2	-	3	2	-	3	1	12	14
Rothes	-	1	1	-	-	2	-	2	1	2	2	4	2	11	-	7	1	4	2	4	3	8	5	4	17	49
St Andrews Lhanbryd	-	-	3	1	-	1	2	1	2	3	1	1	-	-	2	2	1	5	1	4	1	2	3	2	16	22
Speymouth	-	1	-	-	-	3	-	-	-	-	-	-	1	1	-	-	2	2	1	1	1	4	2	4	7	16
Urquhart	-	-	1	7	4	3	1	3	1	2	2	2	-	1	1	2	4	5	3	4	2	3	2	13	22	45
Totals for County	8	24	29	63	34	43	42	77	36	75	36	66	54	65	57	107	70	95	59	107	54	145	83	144	554	1046

TABLE III.

	No. of cases 1855-83		No. of cases 1884-1912.	
Alves	8	- 1 in 3683	14	- 1 in 2251
Bellie	47	- 1 in 976	58	- 1 in 892
Birnie	2	- 1 in 5727	4	- 1 in 2704
Cromdale	59	- 1 in 1645	89	- 1 in 1005
Dallas	14	- 1 in 2228	20	- 1 in 1148
Drainie	30	- 1 in 2940	76	- 1 in 1620
Duffus	29	- 1 in 3498	87	- 1 in 1362
Dyke	19	- 1 in 1927	30	- 1 in 1043
Edinkillie	21	- 1 in 1763	25	- 1 in 1119
Elgin	146	- 1 in 1904	259	- 1 in 1222
Forres	68	- 1 in 1865	140	- 1 in 1021
Kinloss	13	- 1 in 2714	25	- 1 in 1104
Knockando	29	- 1 in 1983	36	- 1 in 1393
New Spynie	7	- 1 in 3035	25	- 1 in 754
Rafford	8	- 1 in 3832	18	- 1 in 1561
Rothes	16	- 1 in 5147	50	- 1 in 1464
St.Andrews	15	- 1 in 2612	23	- 1 in 1613
Speymouth	4	- 1 in 7025	19	- 1 in 947
Urquhart	26	-1 in 2333	41	- 1 in 1301

I now come to consider cancer as it is distributed in each parish.

Alves. The parish of Alves with a death-rate

of/

of 1 in 3683 from 1855 to 1883 and of 1 in 2251 from 1884 to 1912, is among the lowest in the County.

It is traversed from east to west with a ridge of old red sandstone and by means of a gradual slope has two somewhat low lying districts, on the north and south sides. Most of the parish is under 200 feet above sea level.

The first noticeable feature is that in the village of the Crook, two deaths only from cancer have been registered in fifty-eight years. One of these came from another district. Several of the houses lend themselves to dampness. The water supply of the village is almost entirely obtained from a single well, known as the Carse Well, the water being of good quality with a considerable degree of hardness.

Three cancer deaths were registered in Coltfield, a small hamlet with a poor water supply. Two of the cases obtained their water supply from the same well - a shallow dip well liable to pollution from surface contamination and drainage from the outhouses. Both dwelling-houses were thatched and said to have been a little damp. They were only a few yards from each other. The interval between the deaths was less than three years. The third case at Coltfield was also in an neighbouring

cottage/

cottage, but the water in this case was obtained from an open ditch liable to pollution and stagnation.

Two deaths occurred at Greenhaugh and were peculiar in so much that they were husband and wife. The interval between their deaths was less than two years, the disease in the wife's case attacking the stomach and in the husband the neck. The cottage in which they lived was a thatched one in an exposed situation and on sandy soil. The water supply was a surface well with a considerable degree of stagnation.

Four cases occurred fairly close to each other, viz:- New Alves, 2; Lachlanwells, 1; Cloves, 1; the water supply in all these is not of the best quality.

Three cases occurred at Earnside which has a low situation and a poor water supply, although markedly windswept.

The death rate from cancer in Alves has scarcely varied at all, and no doubt the low mortality in this disease is due to the fact that, during the period 1855 to 1912, there has been a very large proportion of the inhabitants under thirty-five years of age - an age when cancer is uncommon. The population of the parish is mainly composed of farm servants and

other/

other agricultural workers and the proportion of people advanced in years is a small one.

Bellie.- The parish of Bellie with a death rate of 1 in 976 for the first half of the period under consideration, and of 1 in 892 for the second half, has the highest mortality from cancer in the County.

The parish as a whole is somewhat flat and sandy, with a little red sandstone towards its western extremity where the village of Fochabers is situated. Here naturally the majority of the cases are situated. It is worthy of note that there has been no marked increase in the number of cases in thisdistrict, the numbers from year to year remaining about the same. It is rather peculiar, however, that in the years 1879, 1880, and 1881, immediately following the introduction of a new water supply into the village, there were no cases of cancer. This sequence is not found at any other time in the years under survey.

The population of Fochabers is mainly composed of retired people, small tradesmen, and employees on the Gordon-Richmond estates. There is a fairly large proportion of people up in years.

There is some reason for believing that part of the high mortality rate in Bellie may be due to the/

the increase in the age groups at the cancer period of life. There is, however, no evidence that Bellie has an excess of females sufficient to influence the cancer rate.

Of the seven cases recorded at Bogmoor, two were in the year 1898, and one in 1897. In another instance, two deaths occurred with an interval of two years between them. This interval of two years between cases I find rather a common one between husband and wife, or when two deaths take place with a close association in time and place. Are we to infer that there is some mode of infection from the one to the other or are the predisposing factors more prevalent at one time than at another ? Illustrations of such cases are also given in my description of other parishes..

In the town of Fochabers, it was impossible for me to locate the cases as no address was given in most of those occurring there. Four cases were given as in Huntly Lane, a somewhat sheltered part of the town. One occurred in 1903, another in 1908, another in 1909, and another in 1910.

A somewhat similar series of cases occurred in South Row, viz:-

1 case in 1878
1 " " 1882
1 " " 1885
1 " " 1897
1 " " 1900
1 " " 1904

In the isolated hamlet of Auchenhalrig, one case occurred in 1904, and another in 1906.

Two cases (females) occurred at Wellheads in the same year, the one being the sister-on-law of the other.

Three cases occurred at Saughwells, viz:-

1 in 1858
1 in 1873
1 in 1874.

At Ordiquish, where no cases have occurred for twenty-seven years, five cases occurred as follows:-

1 in 1863
1 in 1877
1 in 1878
1 in 1884)same name, probably sisters.
1 in 1885)

It is noteworthy that between 1861 and 1886 five cases of cancer of the leg occurred in the town of Fochabers.

Birnie.- This parish shows a remarkable freedom from cancer, so much so that, for the second half of the period under consideration, it has/

has the lowest mortality rate. It is a small parish facing north and is considerably on the slope. Four of the six cases recorded were located in Thomshill, a small hamlet mostly occupied by workers in a neighbouring distillery and situated on rising ground.

Cromdale.-The parish of Cromdale, which is made up chiefly of the three districts of Inverallan, Cromdale, and Advie has a comparatively high mortality rate from cancer. This rate has increased in recent years but not to the same extent as in many other parishes in Morayshire. Of the 148 cases recorded, 66 occurred in the Burgh of Grantown-on-Spey. They were very evenly distributed in point of time and even in their distribution in the Burgh little of interest was noted. There were nine located in the Square in the middle of the Burgh, eight in South street, and fourteen in the West End.

Of the cases outside the Burgh, there is a remarkable location of them in the Lethendry and Cullinduim districts. The characteristics of this area are largely those already noticed in other suspected cancer districts, viz:- an area more or less in a hollow surrounded on several sides with rising ground. This area is also marshy and

damp/

damp. Several of the cases in this locality occurred in the face.

Another interesting feature in this parish is the considerable number of cases in the valley to the north of Grantown, through which the Highland Railway runs. This is a valley sheltered from the prevailing winds and richly wooded. In this valley, at a place known as Huntly's Cave, in 1893 a surfaceman died of cancer of the stomach, while in 1894 his wife died at the same place of cancer of the rectum. At Dava in 1889, there also died of cancer of the stomach and liver another surfaceman, in all probability a brother of the case mentioned above.

A fairly large number is also to be noted in and around Dulnain Bridge, a part also wooded and sheltered.

At Advie, it is worthy of note that several cases have occurred in a low marshy part between the station and the River Spey. This area is occasionally flooded by the river Spey, but it is naturally of a wet and marshy character, in fact it has long borne the name of "The Bog". One case is recorded as dying in 1900 of cancer of the stomach while another, possibly in the same house, died of cancer of the uterus in 1909. In close

proximity/

proximity to these two cases were several others.

Dallas.- Dallas has a comparatively low mortality from cancer, especially in the earlier years of the period under consideration. The cases throughout the parish present several peculiarities. In the valley of the Lossie and its tributaries, lying higher up than the village only two cases have occurred. In the valley below the village we find quite a string of cases, several of them in close proximity to one another. Between The Park and Dell, the uppermost ones, there is a round swampy piece of ground into which the Lossie frequently overflows. The water supply here was of doubtful purity. Dell and Mossend draw water from the Lossie.

As one descends to Kellas, there are three cases close to each other, one of them drawing water from a ditch liable to pollution.

The distribution of the cases in the village of Dallas shows a remarkable feature. Of the eleven cases, seven were found towards the east end where the houses are most sheltered and where the site is lowest. In addition, these cases used, for the most part, the same well which was in one of the properties. This well was liable to pollution. Here also we have an instance of husband and wife

both dying in the same house from cancer of the stomach and liver respectively, with an interval of eleven years between their deaths. A case in the same block of houses recently suffered from the same disease. Since 1907 no cancer death has been recorded in Dallas. A new water supply for the village has been available for most of that period.

Drainie.- The parish of Drainie, like that of Dallas, has a very low mortality from cancer, especially in the first half of the period under consideration. Nevertheless, the parishes are in most respects totally different. Drainie is for the greater part very low-lying, being partly occupied by marshy ground. Towards the sea at Covesea it is higher. At its western end is found one of the most fertile parts of the district, known as the "Laich of Moray", but towards the east it again becomes very sandy and of little fertility. On the north side is the Burgh of Lossiemouth and here the great majority of the cancer cases were found, there having been only nine cases in the landward portion of the parish. Three of these cases, of which one was in 1856, one in 1857 and one in 1890, were situated at Covesea, the highest part of the parish, and one badly supplied with pure water.

In/

In the Burgh of Lossiemouth the most cases were found to have occurred in the Seatown, the oldest part of Lossiemouth. Several cases occurred there in succession, viz: two in 1876, two in 1890, one in 1886, one in 1887 and two in 1910. In the higher parts of the town also, it has been even more prevalent. Fishermen as a class - and it is of these that the Burgh of Lossiemouth is mostly composed - are not unduly prone to cancer, and in Stotfield, a part given over to visitors and residents of the wealthier class, a fairly large proportion of cases has been found.

The distribution of the cases in Lossiemouth, as in the smaller burghs and villages elsewhere throughout the county I have found impossible to investigate owing to the fact that in a large proportion of cases, no street was given or no number in a street. The following are some of the numbers in several of the streets and they are given chiefly to indicate how cases group themselves, especially as regards time.

Clifton Road 5. (2 in 1904)

Kineddar Street 9, 5 of them being in Nos. 9, 12, 16, 40, and 44 and occurring in 1884, .1886, 1888, 1906, 1908.

Queen Street, 3. 1 in 1892 and 1 in 1893

King/

King Street 4, 1 in 1901, 1 in 1902, 1 in 1905.

Commerce Street, 4. 1 in 1886, and 1 in 1888

Moray Street3, two of these being in 1898.

Elgin Road, 3.at Nos. 18, 20, and 24. One occurred in 1892 and 1 in 1893.

Wood Street, 2. Nos. 3 and 4. 1 in 1903 and 1 in 1911,

Gregory Place, 2. Nos. 7 and 9.

Duffus.- For the first half of the period 1855-1912, the parish of Duffus has a very low mortality from cancer. In the second half a slight rise is shown. The parish is a large one bordering on the shores of the Moray Firth. The southern half is occupied by the "Laich of Moray", and as the name indicates, is very low-lying as well as being very fertile. Towards the north it rises and terminates in a rocky barren coast. The parish falls naturally into three divisions, viz:- New Duffus and district, Hopeman and Cummingston, and Burghead.

1. New Duffus District. Of the one hundred and sixteen cases in the parish of Duffus, thirteen were in New Duffus and Keam. Of these, two were in 1883, two in 1907, one in 1908 and one in 1909. The others had mostly some years between them. This is the agricultural part of the parish and the inhabitants of the hamlet of New Duffus and of the immediate district, are mostly a pastoral community/

community.

(2) The villages of Hopeman and Cummingston. The population of the village of Hopeman is almost exclusively composed of fishermen. This is also the case in the smaller village of Cummingston, but in addition, there is a sprinkling of quarry-workers from the quarries nearby. Thirty-three of the one hundred and sixteen cases were found in Hopeman, and it is noticeable that there were mostly from 1891 onwards. In the village of Cummingston, seven cases were found and of these only one occurred before 1891. Two cases occurred in the year 1906. Both villages are situated on rising ground, although Hopeman is sheltered by a hill to the south-east and Cummingston is absolutely without shelter and very windswept.

(3) Burghead and District. Forty-one cases were found to have occurred in the Burgh of Burghead. Here, as in Hopeman, fishing is the only industry. The town occupies a rocky headland jutting out into the sea, and although it does not stand very high, it is extremely windswept. The inhabitants number about fifteen hundred, and it will thus be seen that the mortality from cancer is not heavy, there being no cases at all in some years. Some of the cases were distributed as follows:-

Dunbar/

Dunbar Street, 6 1 in 1874, 1 in 1879, 1 in 1880, 1 in 1896, 1 in 1905, 1 in 1912.

King Street, 9 Nos. 21, 22, 32, 40, 48, 79. and occurring in 1884, 1 in 1888, 2 in 1890, 1 in 1896, 1 in 1900, 1 in 1907, 1 in 1908 1 in 1912.

Grant Street, 8 Nos. 41, 47, 51, 77. 1 in 1875, 1 in 1881, 1 in 1885, 1 in 1887, 1 in 1904, 1 in 1909, 1 in 1911, 1 in 1912..

Young Street, 6. Nos. 1, 3, 16, 32, 56. and occurring in the years 1899, 1900 (2) 1906, 1912(2).

Forteath Street, 3. Nos. 42, 43, 47. and occurring 1 in 1890, 1 in 1909 and 1 in 1912.

Brander Street 2. Nos 16 and 21. 1 in 1905 and 1 in 1906.

These cases again illustrate in some degree a close association in locality, but more especially a close association in point of time. Five cases occurred at Roseisle, a district near Burghead.

Dyke.- The parish of Dyke has a moderate cancer mortality, but like most other parishes, it has shown an increase in later years, although not to the same extent as some other parishes.

The most marked peculiarity in the Dyke cases is that they occur in associated groups at different localities and that the groups referred to have been closely allied in point of time. This will be clearer if the cases are now briefly referred to.

In the village of Dyke, there were five cases recorded between 1855 and 1891 and after 1891 there were/

were none. Five cases for the village seems a small rate. Four of the cases occurred in the eighties with the usual year or two between them viz: 1882, 1883, 1885 and 1888. The fifth case occurred in 1873. All four cases were likely to have been visiting each other frequently, as is the custom in rural villages. At that time the domestic water supply for the village was a burn, liable to pollution. In recent years a pump has been in use in the village.

A close parallel to the village of Dyke is the hamlet of Whitemire in the same parish. Five cases also occurred in it, and all between 1855 and 1891, viz: two in 1877, 1 in 1867, 1 in 1884 and 1 in 1886. The same association in time is here shown.

A glance at the map with the cases marked on it will indicate that two small streams unite in the Darnaway Forest to run past Darnaway Castle and the Bogs of Dalvey. On One of the streams stands Whitemire, on the other Conicavel and Cooperhill, to which I shall refer in my notes on the parish of Edinkillie. The first-mentioned stands in a very sheltered situation and derived its water supply mostly from the stream.

As the stream emerges from Darnaway wood and before it crosses the railway there is a knoll known/

known as Bogs of Dalvey. There are only about five houses here, but there have been three cancer cases, 1 in 1882, 1 in 1889, and 1 in 1890, with a space of one year between the last two cases. The only water supply is from the burn which runs right through the forest and is liable to pollution at almost any point.

Kintessack is another hamlet in Dyke parish. It is much sheltered from the west winds and is composed of old thatched cottages. Its water supply is chiefly from shallow wells. The cases there occurred as follows:-

1 in 1869	1 in 1904
1 in 1874	1 in 1905
1 in 1890	1 in 1908
2 in 1897	1 in 1909
1 in 1899	

This list again shows the marked association in time, cases occurring together or within a year or two of each other. Kintessack gives a higher cancer death-rate than other parts of the parish.

Broom of Moy[1], another hamlet closely resembling Kintessack in number and construction of houses gives three cases only. It lies close to the banks of the river Findhorn and differs from Kintessack in that it is windswept and has, I believe, a better water supply.

Two cases occurred at Bankhead which is also supplied with water from surface wells. These two/

[1] Vide Map of Forres and District

two cases were relatives.

Edinkillie.- Edinkillie has the reputation among its inhabitants of being a distinctly cancerous parish. My statistics do not quite bear this out, although of late years there has been a fairly high death rate from the disease, as can be seen from Table III. For some unknown reason the records for this parish show an unusually large proportion of uncertified deaths. In some of these cases, I have made enquiries and find that the cause was cancer, so that my figures for Edinkillie may still be a low estimate.

The area of the parish which seems to produce the greatest number of cancer cases is the valley of the Divie. This is a stream with a good fall which joins the river Findhorn. The valley of its course is somewhat narrow in its lower parts and from the fact that it is well wooded, the houses in close proximity to the stream are well sheltered. In some cases they are protected from the sun and inclined to be damp. These are conditions that have elsewhere been associated with the distribution of cancer. It also conforms to Haviland's observation as given elsewhere in this thesis that cancer is more prevalent in sheltered valleys at right angles to the prevailing winds. From

information/

information gathered there was evidence that many of the cases of cancer in this valley were related to one another. In one case, the father died of cancer of the abdomen, while the daughter suffered from cancer of the bowel. In another instances, two brothers and a daughter died from cancer. Perhaps the most interesting family in this connection is one where two brothers, a sister, and the wife of one of the brothers all died from the disease. All lived in the same house except the sister. The situation of the house was low-lying, damp, and surrounded by trees, while it was sheltered from both wind and sun. In yet another case, husband and wife both died from cancer with an interval of eleven years between them the husband having the disease in the rectum, while the wife suffered from malignant disease of the breast.

At Cooperhill, where there is a row of cottages in the shelter of the wood, there have been five cases, while the more exposed cottages of Conicavel on the opposite side of the stream have given two cases only.

Elgin.- The parish of Elgin has only a moderately high mortality from cancer although it contains the largest Burgh in the County. It is a fairly large parish of about nineteen hundred acres. It/

It lies towards the centre and northern side of the county and is composed of many gentle slopes and dales. Towards the north and south the land rises considerably leaving an extensive hollow between in which lies the City and Royal Burgh of Elgin. Towards the west, the valley is continued in the sheltered vale of Pluscarden. In the low-lying lands, the soil is rich and fertile, but in the upper parts, it is sandy and somewhat unproductive.

Landward Portion.- Ninety of the four hundred and five cases found in the parish of Elgin were situated in the landward part. Of these the greatest number, viz: seventeen were situated at Mosstowie, a bare and exposed but damp district to the west of the parish. In this district, I found two cases quite close to each other, both situated in the shelter of the wood, and both using the same water supply. In line with these two houses, but at a considerable distance further down the hollow, another case occurred, the water supply being a shallow dip well in the field. In this district, two cases occurred in close proximity to a marsh with a water supply liable to pollution. In another instance a case occurred beside a pond with trees overshadowing the house. Two cases

were/

were found in close proximity to each other with a long interval between them, the only association observed being that the water supply was obtained from an open ditch liable to pollution and inclined to be stagnant.

Eight cases were found at or near the distillery of Miltonduff. Two of the deaths occurred in the year 1864 and one in 1865. Twelve deaths occurred in the sheltered and fertile valley of Pluscarden. Three of these deaths occurred in or around Torriston, but with a good many years between them. One death occurred at Rosehill and another at Thistleflat, two farms which are not far from each other, but there was a considerable period of years between them. In the Longmorn district, there were nine deaths, two of these occurring at Whitewreath, but with a long time between them. On the Blackhills estate, Clackmarras and Tiendland, twelve deaths were found to have occurred in the period under consideration. This district lies on rising ground and is very little sheltered except by the low hills to the south. Very little connection could be traced between the cases. Three of them occurred in the year 1907 and one in 1908. Several other cases had only a short time between them, viz:- 1 in 1882, 1 in 1883, 1 in 1887, 1 in 1888, 1 in 1897 and 1 in 1899.

Immediately/

Immediately to the south of the Burgh of Elgin lies the village of New Elgin. It is partly situated on rising ground and partly in a hollow which was at one time a marsh. The tendency of the village, however, is to spread upwards towards the rising ground. The inhabitants are almost exclusively of the working class, being composed chiefly of carters, labourers, surfacemen, and officials on the railway which runs near by.

In this village, twenty-seven deaths from cancer were found. Four of these were in Main Street, the principal street in the village. Two of these deaths occurred in 1910 and one in 1911. Three were in Nicol street, a street in the lower part of the village, but the time between them was long. Three were found in Queen Street, one occurring in 1904 and another in 1905. The others were distributed throughout the other parts of the village, the street of residence not being given in many cases. This fact has prevented me from indicating the exact site of the cases but a general idea of them can be obtained by examining the map of Elgin.

Elgin Burgh.- In the Burgh of Elgin where the greater part of the population of the parish/

parish is found, the great majority of cancer cases were found. The town lies mainly in a hollow, but for the last twenty years or more, it has been gradually spreading towards the higher ground on the west. On the extreme east, it lies very low and is sheltered by many fine trees of great age. The ground here was once very damp and marshy. At this end of the town the houses are of an older type.

The principal thoroughfare is High Street, at one time the chief street of residence, but now mostly given over to houses of the poorer class. Here are found the slum and most congested regions of the town. For some time past, the houses at the east end of the street have been very dilapidated and tumble-down, but these are gradually being demolished, although the narrow arched close with the houses in close proximity to one another are still to be seen. Although for a long time past, citizens of the wealthier class have been leaving High Street for the more modern villas of the west end, it is worthy of note that for the first half of the period under consideration, when the inhabitants of High street were of a wealthier class than they are now, the number of deaths from cancer was thirty-seven, and for the second half, when the population was of a poorer order, the number of cancer deaths was thirty-nine.

The/

The following list indicates the distribution of the cases in High Street.

Name of Street	Number of Cases	Number of Street.
High Street	2	5
"	2	17
"	1	23
"	1	26
"	1	27
"	1	34
"	1	37
"	1	41
"	2	44
"		From No. 1 to No.
"		50 = 12 cases
"		
"	2	55
"	2	63
"	1	78
"	1	86
"	1	90
"	1	92
"	1	95
"	1	96
"	1	99
"	1	100
"		From No. 51 to No.
"		100 = 12 cases
"	1	
"	1	
"	1	114b
"	/	117
"	/	125
"		From No. 101 to
"		No. 150 = 3 cases
"	2	174
"	2	184
"	1	185
"	1	187
"	1	189
"	1	190
"		From No. 151 to
"		No. 200 = 8 cases
"	2	201
"	1	203b
"	1	205
"	1	206
"	1	210
"	2	211

Name of Street	Number of Cases	Number of Street.
High Street	1	213
"	1	214
"	1	223
"	3	209
"	2	230
"	1	233
"	1	237
"	2	238
"	2	241
"	3	249
"		From No. 201
"		to 250 = 25
"	1	253cases
"	1	257
"	5	259
"	1	261
"	1	266
"	1	267d
"	1	272
"	1	281
"	1	287
"	1	297
"	1	305
		From No. 251
		to 305 = 15
		cases

Thirty-five of these cases occurred on the northern side of the street and twenty occurred on the southern side.

Next to High Street, South College Street, a very old part of the town, has the highest mortality from cancer. In the year 1868, two cases occurred there, one at 21 South College Street and the other at Number 33. One case occurred in 1869 and the other in 1870, while one case occurred in 1901 and another in 1902. The greatest number of cases occurred in the first half of the period under consideration. Many of the houses

in/

in this street are extremely old and at that time few improvements had been carried out.

Abbey Street, Greyfriars Street, King Street, Queen Street, and North College Street, all lying towards the east end of the town have all had a good many cases, many of them occurring in close proximity to one another, as will be seen from the map with cases marked on it. These are old streets containing but few modern houses. South Street, where many old houses are also to be found had ten deaths from cancer situated there. Two of the deaths were in the same house, the cases being husband and wife. The wife died in 1897 of cancer of the bowel, and the husband in 1902 of cancer of the liver.

A statement of the cases in these streets would be as follows:-

Abbey Street.- 2 cases at No. 2,
2 cases at No. 6
1 case at No. 18
1 " " No. 22

2 of these were in 1862 and
2 in 1895.

Greyfriars Street.
1 case at No. 1
2 cases at No. 7
1 case at No. 8
1 case at No. 15
1 " " No. 17
2 cases at No. 23
1 case at No. 32

2 of these were in 1907, 1 in 1894,
1 in 1895, 1 in 1865 and 1 in 1868.

King Street.- 1 case at No. 13
1 " " No. 20
1 " " No. 21

South Street.- 1 case at No. 4
1 " " No. 5
1 " " No. 43
1 " " No. 53
1 " " 68
2 at a private residence. No. number.

1 of these was in 1876, 1 in 1877,
1 in 1880 and 1 in 1882.

North College Street. 1 case at No. 35 in 1886
1 case at No. 49 1 in 1882
1 case at No. 51 in 1883

South College Street.

1 case at No. 2
1 " " No 9
1 " " No. 12
L " " No. 16
L " " No. 17
1 " " No. 20
1 " " No. 21
1 " " No. 26
1 " " No. 33
1 " " No. 35

Batchen Lane
1 Case at No. 7
2 cases at No. 14 (same family)
1 case at No. 21.

Batchen Street
1 case at No. 17
1 " " No. 22
1 " " No. 26

Lossie Wynd
1 case at No. 17
1 " " No. 27
1 " " No. 33
1 " " No. 50

2 of these occurred in 1906 and 1 in

1908.

In Francis Place, a short street containing only some half dozen houses, two deaths from cancer occurred in the same house, a sheltered, close and musty dwelling, but there was an interval of ten years between the deaths.

In Academy Street, a more modern street, seven cases were situated. Two cases occurred here in the same house, one in 1863 and one in 1890. In 1889 a case occurred in the house opposite. The following table shows the distribution of the cases in South Guildry street which runs parallel to Academy Street:-

1 case at No 10
1 " " No 13
1 " " No. 24½
1 " " No. 25
1 " " No. 42
1 " / No. 44
2 cases at No. 43

Of these 2 occurred in 1872, 2 in 1887, 1 in 1900 and 1 in 1901.

Coming to the streets on the western side of the town, comparatively few cases are met with. It must be remembered, however, that these streets are of fairly recent construction. In West Road, two deaths occurred in the same house, one in 1900 and one six years later. In Hawthorn Place, containing only a few houses, three deaths occurred, but these were not near each other in years.

Bishopmill. To the north of the city of Elgin/

Elgin lies Bishopmill forming a sort of suburb. Nearly the whole if it comes under the jurisdiction of the Burgh, only a small part belonging to the parish of New Spynie. It is separated from the Burgh by the river Lossie, and although a small part of it lies along the banks of the river, it is for the most part situated on a fairly steep slope. It is mostly inhabited by the labouring class. From 1855 to 1912 there were forty-nine deaths from cancer in this district. East and West Back Street, High Street and North Street seem to have had the greatest cancer incidence, thirty-four of the forty-nine deaths being situated there.

The following table indicates the distribution in a number of the cases:-

East Back Street.

No 2 in 1891
No. 6 in 1911
No. 7 in 1899
No. 9 in 1908
No. 14 in 1875
No. 22 in 1884 and 1870
No. 24 in 1885
No. 29 in 1871

West Back Street

No. 2 in 1897
No. 3 in 1895
No. 12 in 1882
No. 26 in 1894

North Street

No. 8 in 1872
No. 13 in 1896
No. 21 in 1872
No. 24 in 1872
No./

No. 29 in 1903
No. 31 in 1909
No. 44 in 1878
No. 59 in 1898
No. 60 in 1897
No. 63 in 1873
No. 66 in 1881

Lamb Street

No. 2 in 1889
No. 5 in 1907
No. 7 in 1881
No. 9 in 1912

High Street.-

No. 12 in 1885
No. 13 in 1864
No. 30 in 1871
No. 34 in 1876
No. 41 in 1874
No. 42 in 1873
No. 55 in 1875

Note. Association in time and place frequent.

Looking generally at the cases in the Burgh of Elgin one is struck with the number of cases located to the east side of Ladyhill, a site more or less sheltered from the western winds. The tabular statement on page 98 indicates eighteen cases in this area between numbers 230 and 260. In one or two instances it was found that houses where there had been cases of cancer were surrounded by high walls or were otherwise sheltered. In two such houses two deaths from malignant disease occurred.

Green[1] refers to the frequency with which cancer occurs in corner houses in towns. This is fairly well/

[1] Cancer Problem, p. 56

well illustrated in my own statistics for the Burgh of Elgin where this feature will be observed on looking at the map of Elgin with cases marked. It is specially noticeable in connection with the cases at the corner of Abbey Street and Greyfriars Street and also the corner where North Guildry Street joins Murray Street. Although I have referred more particularly to these, it is a frequent occurrence, as a glance at the map of Elgin will show.

Forres.- Forres district has the reputation of having one of the best climates in the north of Scotland. The soil is largely of a sandy nature. Forres has also an excellent water supply, and although some parts ofthe Burgh have a low situation, nevertheless a good part of the town is on the slope and admits of good drainage.

Forres is one of the districts which have shown a noted increase in cancer mortality during recent years. There is not much to point out with regard to the landward cases except that several have occurred along the side of the River Findhorn. On the eastern side, the parish runs in a point to Califer Hill, where there have been several cases. The other parts of Califer are in the parish of Rafford and have also had a number of cases. Califer Hill is a rising slope but is somewhat protected from the west winds by trees.

If/

If one examines closely the Burgh of Forres, it will be seen that the two most populous streets run east and west, viz: High Street and North Back Street. These streets contain the oldest houses and also the largest number of cancer cases. There is a curious arrangement of the houses in Forres along these streets, the ends of the houses being mostly towards the street. This arrangement also prevails in most of the intersecting streets. This must lead to a marked stagnation of the atmosphere near the doors and windows of the houses. Many of the houses are old and thatched.

A noteworthy feature in Forres was the gradually increasing number of cases in High Street as one travels from west to east. The numbers of the houses were changed a number of years ago and I have therefore been unable to mark the cases as I should have wished. I have however, marked them in sections (Vide map). The increase towards the east end would agree with the cases in the village of Dallas, where the east or sheltered end has a proportionately large number of cases of cancer.

The following tabular statement will be sufficient to explain the distribution of many of the cases in the Burgh of Forres:-

Street/

Street	No. of Street	Year.
Urquhart St.	9	1911
"	10	1908
"	13a	1911
"	17	1912
"	21	1899
"	23a	1911
"	24	1907
"	29	1860
"	34	1860

Note. 3 cases occurring in 1911
2 " " in 1860
1 case occurring in 1907
1 " " " 1908

Street	No. of Street	Year.
South Back Street	1	1880
	3	1858
"	16	1870
"	21	1871
"		
Caroline St.	14	1865
"	17	1890
"	20	1906
"	27	1870

Note. These cases present very little in the way of association.

Street	No. of Street.	Year.
Tolbooth	19a	1912
"	23	1911
"	25	1888
"	25	1892
"	29	1882
"	23	1882

Note the close proximity of these cases in number and year.

Street	No. of Street	Year.
Batchen St.	26	1887
"	33	1899
"	14	1903
"	14	1872

Note. two cases in No. 14.

Street/

Street	No. of Street	Year.
High Street	4	1902
"	4a	1902
"	14g	1887
"	18a	1896
"	18b	1901
"	19a	1910
"	23a	1911
"	23b	1908
"	33i	1911
"	34c	1912
"	38s	1910
"	41b	1910
"	49	1880
"	59c	1911
"	70	1906
"	70a	1909
"	71	1893
"	77	1891
"	88e	1903
"	97i	1898
"	98	1872
"	103	1906
"	109	1874
"	113	1862
"	139e	1903
"	139c	1906
"	147e	1912
"	170	1903
"	192a	1893
"	195	1863
"	237	1886
"	208	1874
"	251	1856
"	260	1884
"	272	1887
"	286	1896
"	345	1868
"	359	1877
"	360	1881
"	369	1861
"	391	1862
St. Leonard's Rd.	9	1894
"	9	1909
"	15	1912
"		
North Back St.	7	1898
"	13	1876
"	24	1905
"	26b	1899
"	31a/	

Street	No. of Street		Year.
North Back Street	39		1870
	42		1907
	49		1898
	51		1910
	54		1862
	60		1885
	84		1881
	87		1890
	95		1894
	103		1879
	105		1889
	112		1898
	119		1858
	125		1862
Thomson Place	1	in	1882
	1	in	1885

On account of the change in street numbers, there is little benefit to be derived from a close study of these cases, but I think one cannot help observing that there is often a period of from one to three years between cases situated near to each other. This occurs too frequently throughout my statistics to be a mere coincidence.

Kinloss. The parish of Kinloss lies on the western side of the County, stretching northward as far as the shores of the Moray Firth. It is generally flat and low-lying, one part of the parish being occupied by the western end of the "Laich of Moray". The soil is very sandy, especially near the sea, and not of very great fertility.

On the sea-coast at the mouth of the

River/

River Findhorn lies the little village of Findhorn, once a flourishing seaport, but since the blocking of its harbour with sand, even fishing has declined and it is now chiefly the resort of summer visitors.

In this village twenty-five cases were found from 1855 to 1912. The oldest part of the village lies to the north from Number 102 onwards. Here many of the cancer cases were found. There were two cases in No. 182 and two in No. 113. One case was found at No. 102, one at No. 113, one at No. 114, one at No. 115, one at No. 4, one at No. 6, and one at No. 11. Many of these cases, it will be seen are in close proximity. The houses are old, and for the most part thatched, and they are sheltered from the west winds by the houses in front. Until the water supply was introduced, about 1902, they had to depend on water of a very doubtful purity. Of the two cases occurring at No. 182, the name in both cases was the same, but one case occurred in 1885 and the other in 1897. Of the two cases occurring at No. 113, one was in the year 1883 and the other in 1903, so that there was possibly no connection between them.

Several cases occurred in other parts of the parish, viz: two at Newton of Struthers, one at Damhead, one at Doonpark, and one at Hatton. The water supply at these farms is a rather doubtful one/

one, being from ditches and shallow wells liable to pollution. Three cases occurred at East Grange cottages, although they are not near to each other in years. The situation of these cottages is damp and sheltered by trees.

The mortality for the parish generally is only moderately high. As in the majority of cases, it is lower from 1855 to 1883 than from 1884 to 1912.

Knockando.- The parish of Knockando lies on the southern border of the County of Elgin. It lies among the hills, and consists of many sheltered valleys, bare uplands and wild stretches of moor. The mortality rate from cancer in this parish has been fairly high, and a slight increase has been shown in the latter half of the period under consideration.

In or near the village of Archiestown which is situated on a slope, thirteen cases were found. Three of these were before the year 1879 in which a water supply was introduced. Previous to that time, the water for the village was got from three wells of doubtful purity. Two cases occurred at Robertstown, but there was a long period of years between them. Around Croftmore, lying on the hillside, four cases were found, but they were not very/

very near to each other in years. At Tomindougle Cottage, an old thatched house, two cases were found. The water supply for this cottage is good, but it is got by means of an open ditch. At Leakin, three cases occurred, all between relatives, the deaths occurring as follows, viz:-

1 in 1864 from cancer undefined

1 in 1870 " " "

1 in 1891 from cancer of the ovary.

The first case was a male and the other two females.

In the Cardow district ten cases occurred. Two of these occurred at Bruntlands, one at Newlands, one at Drumpark, one at Crossroads, one at Cardoch-head, all of which are in the same vicinity. Of these, the case at Bruntlands and that at Cardochhead occurred in the same year. Two cases occurred at Strathandean with a long number of years between them. Further down the stream from these we come to Mains of Knockando where two cases occurred but with ten years between them.

Most of the above mentioned farms lie up on the hillside above the river Spey and are in a more or less exposed situation, one or two being sheltered by trees. At Dalmunach, which lies in a low sheltered situation by the river, two cases were/

were found, with only a short period between them, viz:- one in 1879 and one in 1881.

Seven cases were found in the Easter Elchies district on the east side of the parish. It may be mentioned that comparatively few cases are found on this side of the parish, the majority having been situated more towards the western side. Of these cases, one was at Whitehillock, one at Whiteacne, one at Blackholes, one at Overton, one at Hawthorn Cottage, Elchies, one at Kennels, Elchies, and one at Catherinebraes. None of these have a very short time between them. One case occurred at Tombreak, and another at Wester Tombreck, also in the valley of the Spey.

New Spynie.- The parish of New Spynie is one of the smallest in the County, containing only 5859 acres. It lies for the most part rather high, a small portion only stretching down into the low plain known as the Laich of Moray. A considerable part of the parish is occupied by woods.

For the first half of the period, 1855 to 1912, the mortality from cancer was very low, having been only one in 3035, but during the second half, the actual number of deaths was more than trebled and the deathrate rose to one in 754.

This/

This parish contains the Morayshire Union Poorhouse, where a considerable number of deaths were found to have taken place, Viz: thirty-one. Many of these deaths, however, belonged to different parts of the County, and where the usual place of residence was known, they were transferred. In thirteen cases, however, the usual place of residence was not ascertainable, and these have been credited to the parish of New Spynie. The majority of those deaths occurred in the latter half of the period dealt with, so that the high death-rate for the parish during this period is probably accounted for in this way. The average number of residents in the Poorhouse is about sixty, and the average number of deaths from cancer there in a year would only be about .5.

Of the deaths in other parts of the parish, three were at Findrassie, a small estate situated in the part of the parish looking north. Although it lies fairly high, it is nevertheless much wooded and sheltered. Two deaths occurred at Westfield which lies in the low part of the parish. Three deaths occurred at Quarrywood, one in 1861, one in 1889, and the other in 1891. Two deaths - sister and brother - occurred at Croft of Loanhead, one in 191 0, and one in 1911. In this parish also, I found/

found that a farmer and his son both died of cancer although the addresses were not the same.

Rafford.- This parish is one with a comparatively low mortality rate, but like many others it has shown a distinct increase during recent years. The cases in Rafford mostly group themselves into two areas. One of these is at Altyre, where there were many cases situated very close to each other. The position is a low-lying one and from the close nature of the wood is sheltered and damp. Several cottages close to the public road leading from Forres to the south have had cancer cases located in them. A burn runs through the Altyre woods close to these cottages. Another small stream or ditch runs in a more easterly direction and flows close to Stoneyford and Marcassie, where cases have also frequently occurred.

Another area in Rafford more or less identified with cancer is the Califer and Burgie districts where several cases have occurred. There is little indication of any close association in point of time with the cases in Rafford.

Rothes.- As a parish Rothes has the lowest mortality rate in the Morayshire side of the valley of the Spey especially as regards the early period of my investigations. It is difficult to offer

any/

any explanation of this as Rothes, from its situation, would seem to indicate a different result.

On looking more closely into the facts, it has to be obse rved that the landward part gives a small number of cases, thirteen only occurring here in fifty-eight years.

Even after taking this into account, I find that fifty-three have to be credited to the Burgh of Rothes. This cannot be considered high when we compare it with two Burghs of similar populations, viz: Grantown-on-Spey and Burghead, the one giving sixty-six cases and the other forty-one. Rothes has a low situation and is placed at the foot of hills lying to the west and north of it. At the same time, lying as it does in the open valley of the Spey, there is frequently a breeze blowing down the stream.

A peculiarity about Rothes cases is that the disease occurs in females nearly three times as frequently as in males.

Here, as already explained, few street numbers are given, but the following table indicates the street distribution in some of the cases:-

Breich Street..... 5 cases

New Street.....16 cases

Green/

Green Street.....	3	cases
Old Street.....	2	"
Back Street.....	2	"
Land Street.....	3	"
High Street.....	6	"
Burnside Street.....	7	"
North Street.....	3	"

At No. 90 New Street, two cases occurred - husband and wife- with an interval of two years between their deaths, the wife dying of cancer of the oesophagus, while the husband died of cancer of the caecum. At 13 Burnside Street there died in 1904, a female from cancer of the liver and in 14 Burnside Street there died in 1902 a male with cancer of the bowels. At 96 New Street in 1894 there was a case of cancer of the rectum and at 94 New Street in 1912 there was a case of cancer of the caecum. New Street, where the greatest number of cases have occurred, is one of the most sheltered parts of the Burgh.

From want of exact location of many of the cases in the Burgh, a proper comparison is impossible.

St. Andrews-Lhanbryd. The death-rate in this parish has risen from one in 2612 to one in 1613, indicating/

indicating on the whole period a moderate mortality rate.

The village of Lhanbryd which is pleasantly situated with a stream running through its centre, had sixteen cases occurring as follows:-

1 case in 1859
1 " in 1860, both of the same name
1 " in 1863
2 cases in 1874.

Then for a period of eighteen years, no case of cancer occurred in the village. In the nineties, there were five cases with the usual one or two years between them, viz:-

1 in 1892
1 in 1894
1 in 1895
1 in 1896
1 in 1898.

There is also a further similar series, viz:

1 in 1909
1 in 1910
3 in 1912.

The natural drainage of the village is good and the soil is sandy and porous. In 1909 a new water supply was introduced, the previous supply being from one or two wells on the edge of the stream. The other cases in the parish are widely scattered with the exception of Barmuckity and Coxton district where seven cases are recorded.

This/

This area is somewhat low and damp and in proportion has a much higher mortality rate than the village just referred to. Two cases - probably brothers - in close proximity to each other, died one in 1882, and the other in 1890. They were both farmers, and derived their water supply from surface wells. These cases were at Redbog and Clattering-briggs and also close to another case in the parish of Speymouth. This case also draws its water supply from a surface well in a wood liable to surface pollution. All three houses were protected from the prevailing west winds and it isinteresting to note that two other cases occurred further down in the same valley.

Speymouth.- The parish of Speymouth lies in the valley of the Spey. It is low-lying and sheltered and the geological formation is red sandstone. For the first half of the period under consideration, Speymouth has the lowest mortality from cancer in the County, and in the second half it is among the highest. This difference is somewhat difficult to account for. In the small village of Mosstodloch, mostly inhabited by those engaged in salmon fishing in the Spey, there was only one case before 1883. Between 1883 and 1912 there were six cases.

These/

These occurred in the following years, 1895, 1902, 1903, 1906, 1908, and 1911. With the exception of the first two, there is only a few years between the cases. The Mosstodloch cases were largely made up from two families, three of the one, and two of the other being affected in different regions, although it was the intestines that were chiefly concerned.. Mosstodloch is a fairly sheltered village and has a water supply derived from surface wells.

At Crofts of Dipple, there were two cases (husband and wife) in the same house, one in 1897 and the other in 1904.

There were two cases near Orbliston station. The water in both cases was obtained from an open ditch liable to pollution. This also, I believe, is the same water as supplies Trochelhill where a case of cancer occurred in 1906.

One case of cancer was found at Dykeside and another at Deanshillock. The two houses are situated one above the other and both obtain water from surface wells liable to run dry during the summer months.

There were two cases at Muir of Stynie both in the same year, viz: 1864.

Urquhart. This parish is a fairly large one and/

and includes the district of Garmouth which is a separate registration district. The death-rate in the last twenty-nine years is nearly double that recorded in the previous twenty-nine.

The village of Urquhart itself has a low mortality, nine cases being recorded there. The village is chiefly made up of old clay-built, thatched houses, but it is situated in a fairly high exposed situation and for a good many years has had a good gravitation supply of water.

Of the sixty-seven cases recorded in the parish, thirty-two or almost half have occurred in Garmouth and Kingston. Of these thirty-two, ten have to be credited to Kingston which is a hamlet built on the shingle by the sea-shore somewhat sheltered from the west winds. There is a swampy marshy hollow immediately behind it.

Of the cases in Kingston,
2 occurred in 1861
1 " " 1862
1 " " 1907
2 " " 1908
1 " " 1902
1 " " 1911
1 " " 1912
1 " " 1893.

One case died of cancer of the stomach in 1908 and his son-in-law died of cancer of the rectum in 1912. Garmouth is a decaying village. Many of the houses are old. The streets are very irregular/

irregular and narrow. The drainage is defective. A new water supply was introduced about 1900 and since that date about eleven cases have occurred. Formerly, one half of the inhabitants drew water from the River Spey and the other half from a well in the upper part of the village and from an open ditch, all sources being liable to pollution.

Of the twenty-two cases found in Garmouth,

3	occurred	in 1863
1	"	" 1866
1	"	" 1867
1	"	" 1880
3	"	" 1889
1	"	" 1871
1	"	" 1872
1	"	" 1900
1	"	" 1903
1	"	" 1894
1	"	" 1895
2	"	" 1908
1	"	" 1909

Two cases occurred in a house and were peculiar in that they were husband and wife, the husband dying in 1898 and the wife in 1899. This is a noteworthy instance, because they built the cottage and were the first to occupy it, a marked peculiarity being that the garden and house were surrounded by a high wall, preventing free circulation of air. Two cases occurred at Whinniehall, one in 1878 and one in 1897, and three cases at Maverston, one in 1893 and one in 1909, while/

while one occurred in 1911.

These tabulated cases again illustrate the close association in point of time between cases of cancer occurring near to each other.

Y.

SOME CONDITIONS AND DISEASES ASSOCIATED WITH THE PREVALENCE OF CANCER.

The topographical distribution of cancer has been held not to have given anything more conclusive than, that while some cases occur in valleys, others occur on hills, that while some are found on moist situations, others occur in dry situations. Admitting that this is the case, it is not the exception that I should like to note in connection with the distribution of cancer cases, it is the general rule.

H. C. Ross[1] states: "If cancer be due to putrefaction in a chronic healing site there may be something in the view held by many that the disease runs frequently in certain localities or even in certain houses". Whatever the ultimate cause of cancer may prove to be, certain localities or sites are so frequently associated with malignant disease that to my mind a purely intrinsic cause is not sufficient to account for cancer as we find it distributed.

I have given many examples of cancer in Morayshire specially located in damp sites and more especially situations which are sheltered by trees, hills,/

[1] "Induced Cell Reproduction and Cancer."

hills, walls, &c. in other words where the air is more or less stagnant. Green[1] explains this on the ground that these sites have frequently smoky chimneys and that this is an associated factor.

Diabetes and Cancer.

In the records for the County district of Elginshire from the year 1891 to the year 1912, I collected 21 cases of diabetes the ages ranging from 4 to 78. It is interesting to observe the large proportion which occurred in females. Five cases being in males while there were sixteen in females.

They were distributed as follows, viz.

Alves	1
Bellie	2
Duffus	1
Drainie	1
Elgin	4
Kinloss	2
Knockando	3
New Spynie	1
Rothes	1
St. Andrews-Lhanbryd	1
Speymouth	1
Urquhart	3

In/

[1] 'The Cancer Problem.'

In the above list Knockando and Urquhart seem to give a high number.

In one instance, the father was recorded as having died of cancer at the age of 72 while the son died of diabetes at the age of 22.

There was one case where a lorryman at the age of 46 died from cancer of the stomach associated with diabetes, the duration of the disease being given as one year.

Insanity and Cancer.

It has several times been pointed that cancer is not common among the Insane.

In the 55th. Report of the Lunacy Commissioners for the year 1900, it was stated that the ratio of cancer deaths among the insane was 1 in 45.

The deaths recorded in the Elgin Asylum which has a daily average number of patients of 150 was 8 only for 58 years or approximately 1 in 1100 of a population per annum. This small percentage is in accordance with the figures given above.

Poorhouse Inmates and Cancer.

In the Morayshire Combination Poorhouse which is situated in the Parish of Spynie and has approximately 60 inmates as a daily average, there were

twenty-three deaths from cancer for a period of 58 years.

This must be regarded as high. The ages of the inmates range from infants upwards but in all probability there is a fairly large number of people up in years.

Cancer and Sarcoma.

In reading the literature of cancer, I have been surprised to find that frequently no distinction seemed to be made between cancer and sarcoma, diseases which I have always regarded as quite distinct in almost every particular, except in their malignant character. I have therefore excluded cases of sarcoma from my statistics and now make a short reference to them.

I have collected from the Morayshire records, 50 cases of sarcoma as occurring in the period 1855 to 1912. Of these, 9 were of school age or under.

When a comparison is made between the figure for adults and the number of cases of cancer, viz. 1600 we have a ratio of 1 to 38. In a record of Hospital cases by Williams[1] the ratio is given as 1 to 5.8. The figures are not quite comparable as we are dealing with deaths in the County of Moray and/

[1] 'Natural History of Cancer.' Page 376.

and, on the other hand, with Hospital statistics.

Of the 50 cases, 23 were in males and 27 in females. This shows that the sex incidence of sarcoma in the Morayshire cases are fairly close although the females are slightly in excess. In Williams Hospital figures above referred to the sexes are also fairly equally affected although the males are somewhat in excess.

The distribution of the 50 cases throughout the County of Moray was as follows:

Alves	1
Bellie	2
Cromdale	4
Dallas	1
Drainie	6
Duffus	2
Dyke	1
Edinkillie	1
Elgin	17
Forres	6
Kinloss	1
St. Andrews-Lhanbryd	1
Speymouth	1
Rafford	1
Rothes	2
Urquhart	3

This list calls for no remark.

The/

The initial sites of the 50 cases were given as follows:-

Jaw	4
Neck	2
Eye	2
Skull	1
Chest	1
Pelvis	1
Femur & humerus	1
Scapula	1
Thigh	2
Kidney	2
Pancreas	2
Liver	3
Testicles	3
Uterus	2
Breast	3
Stomach	2
Spleen	1
Intestines	3
Peritoneum	1
Multiple Sarcoma	1
Lymphatic Sarcoma	1
Melanotic Sarcoma	1
Sarcoma	10
	50

I have carefully examined the distribution of the 50 cases of sarcoma in the County and as far as I have been able to discover 6 cases occurred in close association in point of locality but not in point of time with cases of cancer. Generally speaking I could detect nothing of much interest between the two diseases as they have occurred in the County of Moray.

Water Supplies.

It has long been believed that water was a potent/

potent factor in the spread of cancer. More than a century ago it was stated that arsenic in water was the cause of cancer.

The presence or absence of lime in water was also said to have a marked effect on the incidence. A good deal has been noted in the direction of proving that cancer was less liable to occur in limestone districts where presumably the water used by the inhabitants was of a hard character due to the presence of lime in solution. The opposite condition of softness has also been mentioned as a factor in the causation of malignant disease. Recently Dr. Thresh of Essex, a well known authority on water, made some investigations into this subject but came to the conclusion that there was not evidence in his district to support the statement that soft water was a cause of cancer. If, as I have already tried to explain, there is some truth in my statement that cancer is frequent in old red sandstone districts then this may be closely associated with the softness of the waters usually found in such areas. This softness is shown in the results of water analyses given by Dr. Thresh.[1]

I have searched a number of water analyses made in connection with the County of Moray at various periods but so little was found having any definite bearing/

[1] The Examination of water & water supplies. Page 486.

bearing on this thesis that I did not think it necessary to give them in detail.

Some points however, seem to be worthy of note, viz:-

In the Burgh of Grantown-on-Spey which is supplied with a soft water there is a fairly high percentage of cases of cancer. In the village of Hopeman where the water- especially the gravitation supply - is hard there is a somewhat low death rate from cancer. I have already made reference to the village of the Crook of Alves supplied from a village well of hard water and where the inhabitants are remarkably free from cancer.

Behla[1] writes as follows:-

"From various researches about the supposed cause of cancer suspicion has been thrown upon the water in stagnant pools, ponds and ditches which are surrounded by wood and bushes on their banks and this may with great probability be regarded as the bearer of the cancer germ. The author bases his conviction on frequent outbreaks of cancer which cannot be accidental and he considers that the cancer germ resides in the house or in its near neighbourhood and that it will be eventually shown to be a plant fungus."

I quote this statement in full as my own observations in the County of Moray are very much in agreement with it. I have been especially struck with the/

[1] Deutsche Medizinal Zeitung. No.45. 1900.

the following observations of the water supplies of isolated houses in the County where cases of cancer have occurred.

(1) The absence of a strong flowing pure spring.

(2) The large number of such houses which draw their water supplies from shallow surface wells more or less liable to pollution.

(3) The large number with wells of a more or less stagnant nature.

(4) The large number that draw water supplies from ditches or streams liable to pollution.

This observation more particularly refers to the water supply used for drinking purposes, but my observations also agree with Behla's account of the proximity of stagnant ponds and ditches.

A number of such examples are to be noted in my description of the distribution of cases according to parishes.

XI.

CONCLUSIONS.

A review of the foregoing observations into the incidence distribution and peculiarities of cancer in the County of Moray would seem to indicate that the following are the most noteworthy features in connection with cancer in this County.

1. That in Morayshire as has been found elsewhere cancer is markedly on the increase. From 1860 to 1910, a period of 50 years, the mortality rate from cancer in Morayshire rose from 4.17 per 10,000 to 9.59 per 10,000. In other words the death rate from cancer in Moray has more than doubled itself in 50 years. Almost all this increase has taken place within the last 30 years.

2. That the cancer mortality rate for Morayshire is somewhat in excess of the average for Scotland, and that the cancer deaths have been unequally distributed throughout the County.

3. That the parishes and districts in the valley of the Spey with the exception of Rothes have generally a higher mortality rate than is found elsewhere throughout the County.

4. That valleys, districts, or houses that are sheltered from the prevailing winds and where the air is more or less stagnant, have a higher number of cancer cases than those that are windswept./

swept.

5. That houses in low situations or houses that are damp or surrounded by trees and where the sun's rays do not penetrate have a higher number of cancer cases in them than in those where opposite conditions prevail.

6. That the observations under items 4 and 5 apply to towns or villages as much as to isolated rural instances.

7. That it was common to find that a series of cases occurred in the same place more or less about the same years and that this was often followed by a period where none or very few cases were found.

8. That it was extremely common to find that a period of 1 to 3 years was found between cases in husband and wife or where two or more cases occurred about the same time and at or near the same place.

9. That the water supply for houses in which cancer cases were frequent was very seldom a strong and clear spring, the well being usually a shallow one more or less stagnant and liable to pollution.

10. That cancer cases were often found in houses near to stagnant ponds, marshes or other places where water lay and which did not allow of good/

good drainage.

11. That cancer in Morayshire is chiefly located in the alimentary tract and in this situation is a half more frequent in males than in females.

12. That cancer of the stomach and breast in Morayshire is found to be higher than the average for England and Wales.

13. That the higher incidence in the stomach is continued in the intestines with the exception of the rectum which has the same rate.

14. That cancer of the uterus, liver and gall-bladder is less frequent in Morayshire than in England and Wales.

15. That cancer of the head, face and neck seems to be more frequent in Moray than in England and Wales generally, and that three times more males than females suffer from the disease in these regions.

16. That the cancer sex-ratio of males to females in Moray being almost 1 to 2 differs from that of England and Wales and the United States of America where the males and females are more equally affected.

17. That the cancer sex-ratio in Morayshire varies with a fairly constant periodicity every 15 years and that while an increase is taking place/

place in one sex there is a tendency for a decrease to occur in the other sex.

18. That the cancer mortality at the age period 75 to 85 is the heaviest in the County of Moray.

19. That the greatest increase in cancer mortality in Moray over the period 1855 to 1912 has taken place at the age periods 65 to 75 and 75 to 85.

20. That persons specially occupied on the soil seem to have a high death rate from cancer.

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