

## THE INCIDENCE OF TUMOURS OF THE RESPIRATORY TRACT IN LEEDS.

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### INTRODUCTION.

THIS investigation of the incidence of tumours of the respiratory tract in Leeds was prompted by a paper read by Duguid before the Pathological Society of Great Britain and Ireland in January 1927, and published in the *Lancet* later in the same year. He analysed all the available *post mortem* records of the Manchester Royal Infirmary and showed that the incidence of intrathoracic cancer at autopsy in Manchester has steadily increased during the period of years 1886–1926 from 1·58 per cent. to 2·57 per cent.

An analysis was therefore made of all cases recorded at autopsy in the General Infirmary at Leeds during the years 1891–1927<sup>1</sup>. All cases which were conclusively considered to be cases of primary malignant disease of the respiratory tract have been noted and considered. It was decided to investigate cases of cancer of the upper respiratory tract as well as those occurring in the chest, as the factors which determine the incidence in the latter site must in all probability operate also upon the former. In support of this statement, it is shown in Tables IV and V that the age and sex incidence of the two types of disease are very closely related to one another. The sites included under the heading upper respiratory tract are lip, jaw, floor of mouth, tongue, tonsil, soft palate, nose, pharynx, pharyngo-oesophageal junction, larynx (extrinsic and intrinsic) and trachea (cervical). The histology and morbid anatomy of all cases of intrathoracic cancer have also been investigated.

<sup>1</sup> The records for the years 1892, 1893, 1897, 1898 and 1902 were not available.

INCIDENCE.

In the 32 years' records available, a total of 172 cases of intrathoracic malignant disease was found, together with 223 cancers of other parts of the respiratory tract. Table I shows the actual number of chest cancers, other respiratory tract cancers, cancers in all sites, total autopsies performed and total number of deaths in hospital in each year and in each period of 5 years.

Table I.

Year	Intra-thoracic cancers	Other respiratory tract cancers	Total cancers	Total P.M.'s	Total deaths in hospital
1891	2	3	28	226	330
1892	.— 2	.— 3	.— 28	.— 226	341— 671
1893	.	.	.	.	373
1894	2	7	43	313	371
1895	2	9	45	332	379
1896	6	3	44	293	396
1897	.—10	.—19	.—132	.— 938	363—1882
1898	.	.	.	.	419
1899	3	4	37	298	442
1900	5	2	67	350	440
1901	4	4	73	392	439
1902	.—12	.—10	.—177	.—1040	512—2252
1903	2	7	65	395	443
1904	3	9	76	417	477
1905	4	7	69	410	489
1906	2	8	78	455	492
1907	7—18	7—38	76—364	406—2083	472—2373
1908	4	6	70	499	535
1909	6	7	71	427	504
1910	9	8	83	468	506
1911	9	4	73	482	534
1912	3—31	7—32	78—375	517—2393	563—2642
1913	5	9	69	513	614
1914	4	7	91	507	622
1915	7	9	84	465	536
1916	7	13	80	484	575
1917	8—31	12—50	77—401	471—2440	609—2956
1918	4	4	62	455	587
1919	1	11	64	410	522
1920	4	10	86	519	604
1921	9	6	92	602	683
1922	6—24	6—37	85—389	652—2638	740—3136
1923	11	6	105	684	781
1924	4	3	92	703	790
1925	13	7	119	830	872
1926	8	10	122	802	824
1927	8—44	8—34	114—552	743—3762	840—4107
37	172	223	2418	15520	20019

In Table II these figures are expressed as percentages in periods of 5 years. Certain facts therein call for comment. In the last column, it is seen that a very high proportion (83.6 per cent.) of all deaths in hospital during the last 37 years have undergone *post mortem* examination, a fact which would answer the criticism that *post mortem* figures are unreliable owing to the tendency to select only certain cases for examination.

Table II.

Five-year period	% of cancers which were intra-thoracic cancers	% of cancers which were other respiratory tract cancers	% of total P.M.'s which were intra-thoracic cancers	% of total P.M.'s which were other respiratory tract cancers	% of total P.M.'s which were cancer	% of all deaths in hospital which were autopsied
1891, 1892	6.30	12.60	0.81	1.61	12.82	73.8
1893-1897	7.42	13.21	1.05	1.87	14.14	81.1
1898-1902	6.60	6.77	1.12	1.14	16.92	77.6
1903-1907	4.95	10.44	0.86	1.82	17.47	87.8
1908-1912	8.27	8.53	1.30	1.38	15.67	90.6
1913-1917	7.73	12.22	1.27	2.05	16.43	82.5
1918-1922	6.17	9.51	0.91	1.40	14.75	84.1
1923-1927	7.97	6.16	1.17	0.90	14.67	91.6

It is also noteworthy that although there is considerable variation in the actual number of respiratory tract cancers occurring from year to year (Table I), there is no evident percentage increase throughout the period under review. On an average, there were 7 intrathoracic cancers in every 100 cancers and slightly more than 1 intrathoracic cancer in every 100 autopsies. An actual decrease in the percentage of cancers occurring in parts of the respiratory tract other than the chest at *post mortem* is noted, possibly due to the fact that in recent years many of the patients who would previously have died in hospital are now discharged cured after operation.

The table also shows no increase at autopsy in the percentage incidence of cancer in all sites, which is an interesting fact in view of the marked increase noted in the Registrar-General's reports during this period<sup>1</sup>. It is not improbable that improved methods of diagnosis play a much greater part in determining such an increase than would be the case in an analysis of *post mortem* figures. As a means of testing this in the case of intrathoracic cancers, the case incidence in the wards of the General Infirmary at Leeds was also investigated.

Table III. *Intrathoracic neoplasms in the wards—14 years, 1914-27.*

Year	Intra-thoracic cancers	Total admissions	%	% of total admissions to hospital which were autopsied
1914	11	in 8,667	= .127	5.7
1915	7	8,872	= .079	5.2
1916	7	9,645	= .073	5.0
1917	6	10,917	= .055	4.3
1918	10	9,257	= .108	4.9
1919	11	9,082	= .121	4.5
1920	16	9,044	= .177	5.7
1921	13	9,242	= .141	6.5
1922	11	9,785	= .112	6.7
1923	35	10,778	= .325	6.3
1924	13	11,248	= .115	6.3
1925	24	12,083	= .199	6.9
1926	30	12,688	= .236	6.3
1927	33	13,048	= .253	5.7
	227	144,356	= .157	5.7

<sup>1</sup> It is hoped to publish a further report dealing with the incidence of cancer in other sites at a later date.

Here there is a steady increase in the number of cases diagnosed each year since 1914 and in the percentage incidence of cases in the wards. As the percentage of total infirmary admissions which come to autopsy varies very little from year to year (Table III), it seems reasonable to infer that there is some cause for the clinical increase, which does not operate upon *post mortem* cases. It is suggested that two factors may be responsible for this. Firstly, improved methods of diagnosis and, secondly, the greater clinical interest taken in lung cancers during recent years.

The unusually small percentage of cases diagnosed in the wards during the years 1915-17 is attributed to the altered conditions which prevailed during the war.

SEX AND AGE.

Most of the authors are agreed in finding that intrathoracic cancer is much more common in the male than in the female sex; Marchesani (1924) however found that the sexes were equally affected in his series of 13,367 *post mortem* examinations in Innsbruck, during the years 1887 to 1922. Neither in his nor in other papers is there a record of the proportion of male and female cases coming to autopsy, and therefore it is not possible to estimate the

Table IV.

Intrathoracic cancers		Other respiratory tract cancers	
Male	132 = 76.75 %	Male	176 = 78.93 %
Female	38 = 22.09 %	Female	47 = 21.07 %
Not known	2 = 1.16 %		
	172		223

actual preponderance of male over female cases. The figures in Table IV show that the proportion of male and female cases affected with intrathoracic malignant disease is roughly 3½ : 1, and are thus in general agreement with those of other authors. The proportion of male to female autopsies in Leeds from 1899 to 1927 is roughly 3 : 2. Thus it is apparent that the disease actually attacks the male sex more frequently than the female. As already noted the figures for cancers of other parts of the respiratory tract are almost identical.

Table V.

Ages	Intrathoracic cancers (where age was given— 170 cases)	Other re- spiratory tract cancers (total 223 cases)
Under 21 years	6	9
Between 21 and 25 years	4	0
"    26    "    30    "	7	1
"    31    "    35    "	14	4
"    36    "    40    "	21	10
"    41    "    45    "	17	22
"    46    "    50    "	22	20
"    51    "    55    "	24	48
"    56    "    60    "	22	32
"    61    "    65    "	15	47
"    66    "    70    "	11	20
"    71    "    75    "	6	9
"    76    "    80    "	1	1

## 344 *Incidence of Tumours of the Respiratory Tract*

In Table V the age incidence of the respiratory tract cancers is tabulated in 5-year periods. In the case of intrathoracic cancer, the highest incidence is between 46 and 60 years, 40 per cent. of all cases occurring at this age as compared with 44 per cent. of cancers of other parts of the respiratory tract. In the latter case the highest incidence occurs slightly later, 57 per cent. of all cases occurring between 51 and 65 years.

### OCCUPATION.

The occupation of the individual was recorded in 107 cases out of a total of 132 males in the intrathoracic series, and in 118 cases out of a total of 176 males suffering from cancer of other parts of the respiratory tract. There is no evidence in the figures to suggest that the occupation of the individual bears any relation to the incidence of the disease, a great variety of occupation being recorded. The numbers of indoor and outdoor workers are very nearly equal, there being 60 indoor and 47 outdoor workers in the intrathoracic series, and 55 and 63 respectively in the other respiratory tract series. The high incidence among transport workers (16.55 per cent.) cited by Duguid (1927) has not been confirmed, a total of 13 and 10 workers being recorded for the respective series (12 and 8 per cent.). Labourers and ironworkers are the next most frequently affected groups, both types of worker being numerous in the district surrounding Leeds. The occurrence in miners is noted fourthly in the list, 13 individuals in this class being affected (6 intrathoracic and 7 in other parts of the respiratory tract). In no other class do more than 4 cases occur in each series.

### MORBID ANATOMY.

#### (a) *Intrathoracic cancers.*

In most cases a fairly accurate description has been given of the naked-eye appearances of the tumour at *post mortem*. In general, the primary tumour is described as occurring either in the mediastinum, or in the root of one or other lung, or in the substance of one lung. Occasionally the primary site is given as the pleura or the thymus gland or the trachea. If the tumour arises in the mediastinum or the root of the lung, it appears to grow rapidly and to extend until it fills the mediastinum, pressing upon or invading neighbouring organs and structures. The number of cases in which invasion of these organs occurred is as follows: pericardium 56, pleura 41, left auricle 17, right auricle 14, oesophagus 14, superior vena cava 13, vertebrae 10, pulmonary vein 10, pulmonary artery 9, ribs 9, and intrathoracic nerves 6.

From the root, the growth may invade the lung by peribronchial infiltration or secondary deposits may be scattered throughout one or both lungs. Tumours arising in the substance of the lung may remain fairly circumscribed, or may grow through the pleura or hilum into the mediastinum. The right lung appears to be affected rather more frequently than the left (65 and 57 cases respectively), but the tumour was sometimes described as being completely confined to the

mediastinum, without extension to either lung (22 cases). In 28 cases both lungs were affected.

Dissemination to organs outside the chest occurred in a comparatively large number of cases and in various organs (Table VI).

Table VI.

Secondary deposits were found in			
Liver ... ..	43	cases	
Abdominal glands	38	"	
Kidneys ... ..	27	"	
Adrenals... ..	26	"	
Pancreas... ..	15	"	
Bones ... ..	7	"	
Brain ... ..	7	cases	
Ovary ... ..	3	"	
Spleen ... ..	3	"	
Thyroid ... ..	1	"	
Gall bladder	1	"	
Stomach ... ..	1	"	

The occurrence of three cases in which there were metastases in the spleen calls for comment in view of the fact that it is often difficult to differentiate intrathoracic cancer from Hodgkin's disease, especially when the disease is far advanced, and that involvement of the spleen is much more common in the latter disease than in the case of malignant disease. Two of these three cases were confirmed histologically, and in the other case the description of the primary growth was so obviously an accurate description of malignant disease of the root of the lung as to exclude any doubt as to its nature.

Evidence of old or active tuberculosis was found in the chest in 26 cases. In view of the rarity of the occurrence of multiple malignant tumours, it is interesting to note that malignant disease was only found in other sites in two cases—in one there was a myxo-sarcoma of the upper arm and in the other an epithelioma of the lip.

No definite opinion can be expressed as to the nature of the tumour from its naked-eye appearances. The consistency may vary from a soft brain-like mass to a firm fibrous growth, white, pink or pinkish grey in colour, with areas of softening and haemorrhage. Masses in the mediastinum may show evidence of glandular arrangement with carbon deposits.

(b) *Cancers of other parts of the respiratory tract* (Table VII).

Table VII.

Site	Number of cases
Tongue ... ..	70
Pharynx ... ..	27
Pharyngo-oesophageal junction	27
Jaw ... ..	26 (upper jaw 14, lower 12)
Larynx (intrinsic) ... ..	24
Floor of mouth... ..	16
Tonsil ... ..	12
Larynx (extrinsic) ... ..	10
Lip ... ..	7
Nose ... ..	2
Soft palate ... ..	2
Trachea (cervical) ... ..	1
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In one case the malignant disease occurred in both upper and lower jaws,

and in one case of epithelioma of the lip, there was also intrathoracic malignant disease.

The morbid anatomy in these cases presented no unusual features which would call for special description.

#### CLASSIFICATION AND HISTOLOGY OF THE INTRATHORACIC TUMOURS.

As already stated, it is impossible to classify these growths from their naked-eye appearances alone, and therefore only those cases of which histological sections are available are included here. Of these there are 60 in all. Formerly it was the custom to classify most of these tumours as lymphosarcomata, whereas the tendency during the last few years has been more and more to include them among the carcinomata. Barnard (1926) investigated the histology of a series of intrathoracic growths and showed that many tumours formerly regarded as sarcomata—particularly lymphosarcomata—were probably medullary cancers of bronchial origin.

It has been thought most convenient here, for the purposes of comparison, to use a modification of the classification suggested by Duguid (1927) who divided his 78 tumours, with 10 exceptions, into two groups:

*Group I.* Typical and long recognised carcinomata of the bronchi, either of alveolar or squamous type.

*Group II.* Oat-cell tumours of the mediastinum—consisting of solid masses of oval cells, surrounded by a framework of irregular bands of connective tissue, wherein lie the blood vessels of the tumour. A subgroup of these tumours contained seven exceptions, where the cells were round instead of oval and of smaller size, but where the general arrangement of the tumours was so similar to the oat-cell type as to warrant their inclusion in this group.

Using this classification, with the addition of a third small group of sarcomata, the 60 cases can be grouped as follows:

Table VIII.

Group I. Carcinomata of bronchial origin	Cases
(a) Adeno—or spheroidal cell carcinoma	19
(b) Papillary adeno carcinoma ... ..	2
(c) Squamous carcinoma ... ..	7
Group II. Oat-cell tumours ... ..	24
Group III. Sarcomata	
(a) Round cell sarcoma ... ..	6
(b) Hodgkin's sarcoma ... ..	2
	60

In studying the histology of these tumours, it is apparent that there is great diversity of cell type and development not only in different tumours, but in different parts of the same tumour. For this reason it is of great advantage to be able to examine several slides from one case and where only one slide has been available, it has usually been more difficult to classify the tumour. The differentiation of the frank carcinoma from the oat-cell tumour is often not an easy matter, and in some of the cases there is no doubt that it

is a matter of opinion under which group they should be included. The small round cell tumours described by Duguid have been placed with the sarcomata, as it is felt that they do not belong to the oat-cell tumours for two reasons. In the first place, the cell is of uniform shape and appearance throughout different parts of the same tumour and does not show transitions to oval and spindle-cell type, such as are found in the oat-cell tumours. Secondly, it has not been possible to demonstrate an alveolar arrangement of cells in any parts of these tumours. These are readily demonstrable in the oat-cell tumour. This type of small round-celled tumour found in another part of the body would without doubt be grouped as sarcoma. Two cases of Hodgkin's sarcoma have been included on histological grounds, as both cases were undoubtedly malignant.

DISCUSSION.

The general opinion held at the moment among pathologists is that there has been an increase in the incidence of intrathoracic cancer during the last 20-30 years. In the main, this is confirmed by statistics quoted in the literature of various European and other countries. An accurate comparison of percentage incidence is difficult to obtain, as there is not always any clear indication given as to whether all intrathoracic malignant new growths are included or only those diagnosed as lung carcinoma. Similarly the rate and extent of the increase reported by various authors cannot be accurately compared, as in some cases the figures are very incomplete and in others the total numbers are too small.

As an example of the difficulties encountered in assessing the value of the figures of two authors, those of Kikuth (1925) for the Eppendorf Hospital in Hamburg and of Breckwoldt (1926) for the Barmbeck Hospital are compared.

Table IX.

Author	Year	% of P.M.'s which were lung cancer	Total P.M.'s	Remarks
Breckwoldt	1914-1917	0.46	3,878	No increase in 11-year period
	1918-1921	0.14	4,163	
	1922-1925	0.52	4,391	
Kikuth	1914-1918	0.44	10,283	Doubling of % incidence in 10-year period
	1919-1923	0.86	8,560	
Joint Breckwoldt and Kikuth	1914-1918	0.43	15,394	Slight increase
	1919-1923	0.63	13,737	

Breckwoldt explains the apparent difference in his and Kikuth's figures for different hospitals in the same town by stating that the latter is dealing with larger numbers and therefore his results are probably more reliable. He did not suggest that there might be local conditions which would determine an increase in lung cancer in one part of the town.

An attempt is made here to summarise in tabular form the figures relating to autopsy records of other workers (Table X), but it is not proposed to discuss the various theories of causation and aetiology put forward in the literature, as this has been done previously by nearly all the authors quoted. It is



Table X.

Author	Town	Total number of autopsies	Year, usually in 5-year periods	% of autopsies which were intra-thoracic cancer	% of total cancers which were intra-thoracic	Remarks
de Vries (1926)	Holland	8,000 r.m.	1-2000 roughly 5-year periods 2001-4000 " 1914-17 4001-6000 " 1918-21 6001-8000 " 1922-25	0.15 0.4 0.45 0.95	Not given	Calculations based on consecutive 2,000 P.M.'s and not on yearly per
Brandt (1926)	Riga (Latvia)	13,179	1901-1905 1916-1920 1921-1925}	Not given	1-2 % 10-11 %	Accurate notes and sections made last six years
Wahl (1927)	Berlin (Urban and Moabit Hosp.)	25,134	1895-1900 (Feilchenfeld) 1900-1905 (Redlich) 1908-1913 (Bejach) 1917-1922 (Wahl) 1922-1927 (Wahl)	0.44 0.61 0.48 0.62 1.69	4.34 6.25 4.78 6.06 13.01	Author is satisfied that increase real one. Figures for earlier years compiled by Feilchenfeld, etc.
Biberfeld (1926)	Berlin (Friedrichstein Hosp.)	36,428	1897-1906 1907-1916 1917-1925	0.36 0.52 0.72	4.8 6.0 6.2	Also a considerable absolute increase in cancer of lung noted, but this masked by increase of all cancer
Hamf (1927)	Berlin (Charité Hosp.)	30,380	1903-1905 1906-1910 1911-1915 1916-1920 1921-1925	0.2 0.45 0.57 0.6 1.28	2.58 4.76 4.38 3.87 7.2	
Eichengrün and Esser (1924)	Cologne (Augusta Hosp.)	13,318	1902-1914 1914-1919 1919-1925	0.36 0.15 0.81	6.26 6.21 9.14	Total admissions to hospital 191925 = 163,525
Seyfarth (1924)	Leipzig (Path. Institute)	Not given	1900-1906 1907-1913 1914-1918 1919-1923 Jan.-July 1924	Not given	5.01 6.88 11.23 8.75 15.5	In 15 % of cases there was evidence of tuberculosis near the lung can
Rau (1921-1922)	Dresden (State Hosp.)	10,413	1909-1914 1914-1919	0.92 1.27	7.54 11.2	All tumours of lungs, air passages mediastinum included. Author considers that increase in both sexes real
Kikutá (1925)	Hamburg (Eppendorf Hosp.)	59,982	1889-1893 1894-1898 1899-1903 1904-1908 1909-1913 1914-1918 1919-1923	0.02 0.10 0.25 0.45 0.52 0.44 0.66	— 1.95 2.62 3.98 5.56 4.04 7.02	In 1923 lung cancer was one-third frequent as stomach cancer and the second most frequently affected organ. In 9 % of cases there co-existent tuberculosis of lung

Berblinger (1925) Bilz (1922-1923)	Jena (Path. Inst.)	8,056	1910-1914 1915-1919 1920-1924	0.34 0.30 0.99	2.2 2.9 8.3	Figures for 1910-1922 collected by Laeschke. Only actual lung cancers included. Figures for total cancers exclude sarcoma and glioma. These figures somewhat amplified by Bilz
Materna (1924)	Troppau (Silesia)	5,191	1912-1914 1915-1917 1918-1920 1921-1923	0.11 0.35 0.31 0.57	2.08 7.14 5.31 8.0	Hospital accommodates a fair number of lunatics. Figures for total cancers exclude glioma
Holzer (1925)	Prague (German Path. Institute)	29,762	1895-1899 1900-1904 1905-1909 1910-1914 1915-1919 1920-1924	0.19 0.26 0.42 0.30 0.45 0.70	2.62 3.41 4.74 3.81 6.62 9.23	
Ferencozy and Matolsy (1927)	Vienna (Path. Inst.)	62,802	1896-1901 1902-1907 1908-1913 1914-1919 1920-1926	0.15 0.35 0.3 0.35 0.71	5.4 5.02 5.02 6.36 10.3 (in 1924)	The figures are given in a small graph and can only be tabulated approximately
Staehelein (1925)	Basel (Path. Inst.)	16,759	Until 1906 (Kaufmann) 1900-1911 (Dynkin) 1912-1914 (Dynkin) 1915-1923 (Sachs) 1924 (Staehelein)	— 0.2 0.5 0.63 0.67	1.76 2.1 5.0 5.0 4.9	Figures from various hospitals and authors used. Author suggests that increase may be due to better diagnosis (both clinical and pathological) and to recognition of primary site in lung
Klotz (1927)	Toronto (Path. Dept. University)	Not given	1910-1920 1921-1927	0.5 1.0	Not given	Figures for 1910-1920 refer to hospital at Pittsburgh
Barron (1922)	Minnesota (Path. Dept. University)	4,362	1899-1911 1912-1918 1919-1921	0.0 0.2 0.9	Not given	Also quotes the figures of earlier workers in other towns (previous to 1907). Finds that percentage incidence is never greater than 0.46
Duguid (1927)	Manchester (Royal Infirm.)	10,780	Previous to 1885 1886-1890 1891-1895 1896-1900 1901-1905 1906-1910 1911-1915 1916-1920 1921-1925 1926	0.24 1.58 1.28 2.40 1.34 2.37 2.42 2.57 3.28	Not given	These are the highest figures of any recorded in the literature, 16.55% of all male cases occurred in transport workers

Table XI.

Author	Town	Total number of autopsies	Year, usually in 5-year periods	% of autopsies which were intra-thoracic cancer	% of total cancers which were intra-thoracic	Remarks
Boldt (1926)	Hamburg (Barmbeck Hosp.)	12,432	1914-1917 1918-1921 1922-1925	0.46 0.14 0.52	5.11 1.39 3.45	To be compared with Kikuth's figures (Table X)
Manni (1924)	Innsbruck	13,367	1887-1896 1896-1906 1906-1916 1916-1922	0.26 0.18 0.13 0.3	Not given	Cases equally divided between the sexes
Fry and Wolff	Budapest (St Stephen'spital)	19,908	1894-1898 1899-1903 1904-1908 1909-1913 1914-1918 1919-1922	0.11 0.14 0.27 0.34 0.32 0.25	Not given	Authors consider that cancer as a whole is increasing, especially during and since the war
Mer (1917)	Paris	Not given	1887-1917	Not given	10-12 %	Author states that percentage has not altered during 20 years. Does not think that reported increase is a real one
B (1928)	Leeds (General Inf.)	15,520	1891, 1892 1893-1897 1898-1902 1903-1907 1908-1912 1913-1917 1918-1922 1923-1927	0.81 1.05 1.12 0.86 1.30 1.27 0.91 1.17	6.30 7.42 6.60 4.95 8.27 7.73 6.17 7.97	

sufficient to state that the only aetiological factors known to be associated with a high incidence of lung cancer are the conditions prevailing in the cobalt mines of Schneeberg in Saxony (reported by Rostoski, Saupe and Schmorl (1927, 1928)). These authors found that in a total population of 516 persons, 154 were at work, or had worked, in the mines from which bismuth, cobalt and arsenic are extracted. Of 21 miners who died, autopsies were performed on 13, all of whom were found to be suffering from carcinoma of the lung. In the remaining 8 no *post mortem* examination was made, but 2 were diagnosed clinically as carcinoma of the lung. By contrast, the disease was only diagnosed twice in the non-mining population. Thus it is evident that carcinoma of the lung is unusually prevalent among the miners in this district.

In Table X are included the records which show an increase in the incidence of intrathoracic cancer, for comparison with Table XI, where the records which fail to show an increase are to be found. There is great variation in the number of autopsies quoted by each author and in the period of years recorded. Any stated differences in the method of compilation of the statistics are noted in the last column.

In addition to these figures, certain other recorded statistics, not given by the authors for the comparison of different year periods, must be considered. These are set forth in Table XII.

Table XII.

Author	Town	Total number of autopsies	Period of years	% of autopsies which were intrathoracic cancer
Shaw Dunn and Powell White (1928)	Birmingham (Gen. and Queen's Hosp.)	13,592	1903-1927	1.18
	Glasgow (Western Infirmary)	5,776	1903-1927	1.36
	London (Univ. Coll. Hosp.)	6,064	1903-1927	1.45
	Edinburgh (Royal Infirmary)	10,687	1903-1927	1.14
Playfair and Wakeley (1924)	London (King's Coll. Hosp.)	3,183	1901-1923	0.1
Lavrinovitch (1915)	Petrograd	16,047	1905-1915	0.38
Grove and Kramer (1926)	U.S.A. (Cook County Hosp.)	3,659	1917-1924	0.57
Shennan (1928)	Aberdeen (Royal Infirmary)	Not given	1914-1927	1.7

With the exception of the figures quoted by Playfair and Wakeley for King's College Hospital, London, where the incidence based on a small number of cases over a period of 22 years is only 0.1 per cent., all the British authors quoted record an incidence of more than 1 per cent., the Manchester figures attaining to 2.33 per cent. over a period of 25 years. In comparing this incidence with that of other countries, notably Central Europe, it is to be noted that only the figures of Rau, Hanf, and Wahl for Dresden and Berlin exceed 1 per cent., and then only in recent years (Table X). Taken as an average percentage incidence over the period of years quoted in each case, the figures

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given by Rau are 1.1 per cent. for 1909–19, those by Hanf are 0.6 per cent. for 1903–25 and those by Wahl are 0.8 per cent. for 1895–1927.

It seems worthy of comment that, although an increase in lung cancer during the last 30 years has been described by so many authors in other countries (Table X), the actual percentage incidence which they record has only begun to approach the British figure in recent years (in general since 1920). Thus the highest percentage quoted by any foreign author for the years previous to 1900 is by Wahl (1927) who found 0.44 per cent. of intrathoracic neoplasms in Berlin for the period 1895–1900, which figure increased to 1.69 per cent. during the years 1922–7 (Table X). In comparison, Duguid found a percentage of 1.21 from 1896–1900, while in Leeds from 1893–7 the figure was 1.05 per cent. Can it be that the conditions affecting *post mortem* statistics in other countries have not formerly been comparable with those in this country and that a change is now taking place, tending to bring them all into line, or can it be assumed that cancer of the lung is a more frequent occurrence in this country than abroad? The following statistics (some of which are taken from Barron's (1922) paper) tend to suggest that until 20 years ago the actual percentage incidence of intrathoracic cancer in *post mortem* records was of a lower order than that given in the later papers quoted above (Tables X and XI). The figures of Lavrinovitch (1915) and Playfair and Wakeley (1924) (Table XII) are exceptional in that the percentage incidence given by them for recent years is very low (0.38 and 0.1 per cent. respectively).

Table XIII.

Author	Town	Year	% of P.M.'s which were intra- thoracic cancer	Total P.M.'s
Fuchs and Perutz (1896)	Munich	1854–1896	0.08	21,034
Wolff (1895)	Dresden	1852–1894	0.22	20,116
Reinhard (1878)	Dresden	1852–1876	0.06	8,716
Pässler (1896)	Breslau	1881–1894	0.17	9,246
von Wiczkowski (1913)	Lemberg	Previous to 1913	0.21	58,497
Novicki (1903)	Lemberg	1896–1903	0.11	7,006
Briese (1920)	Chemnitz	1898–1916	0.46	12,971
Rolleston and Trevor (1903)	London	1890–1902	0.05	3,983

(St George's Hosp.)

Duguid suggests that many of the cases which come to autopsy in a teaching hospital are selected because they have presented unusual features during life. In this connection it is of significance that in Leeds a very large proportion (83.6 per cent.) of all the cases which have died in hospital since 1891 have been submitted to *post mortem* examination (Tables I and II) and, therefore, the question of selection of cases does not need to be considered. No note has been found in the literature as to what proportion of cases usually comes to *post mortem* in other hospitals.

CONCLUSIONS.

1. The incidence of intrathoracic cancer in *post mortem* statistics is not as high in Leeds as it is in Manchester (where air pollution is exceptionally great—Duguid).

2. There has been no increase in intrathoracic cancer at *post mortem* in Leeds during the last 35 years.
3. Intrathoracic cancer occurs more frequently in Leeds in men than in women in the proportion of  $3\frac{1}{2} : 1$ .
4. There appears to be no relation between occupation and the disease in Leeds.
5. Histologically, the majority of the tumours examined were carcinomatous, but 8 cases of sarcoma of the mediastinum were recorded.
6. A decrease in the percentage incidence of cancer occurring in parts of the respiratory tract other than the chest at *post mortem* is noted.

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