IS CANCER MORTALITY INCREASING OR DECREASING?

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We have heard much in recent times of the decrease of tuberculosis and of the increase in mortality from cancer. I propose on the basis of data from some great cities and other areas of the German-speaking world to ascertain whether, if attention is paid to age distribution, cancer really presents so striking a contrast with other causes of mortality. With a view to solving the problem let us enquire whether the undoubted absolute increase may not be a mere function of the ageing of the population, a feature common to all civilised countries. Most weight will be placed upon the statistical data derived from cities because of the greater reliability of the diagnoses in hospitals, and because, as a rule, the death certificate is filled up by the practitioner who actually attended the patient.

A critical consideration of the data is the more desirable because there has been a steady increase in the actual number of deaths from cancer, and now in many countries the cancer deaths exceed those from tuberculosis. This holds for Germany, Great Britain, Denmark, Holland, Switzerland and Austria, whereas in Italy, France, Spain, Hungary and Finland the deaths from tuberculosis are still more numerous than those from cancer. It is singular that this should be so in France, the population of which long ago showed the characteristics of ageing in the statistical sense, *i.e.* the regressive type of population in Sundbärg's terminology.

Table I. *Deaths from cancer and tuberculosis in some European states in* 1932. *Absolute figures and rates per* 10,000 *of the mean population.*

States in order of the ratio Cancer : tuberculosis	Cancer and malignant growths		Tuberculosis		Ratio Cancer: tuberculosis
	Absolute numbers	Per 10,000	Absolute numbers	Per 10,000	
Denmark	5,239	14·7	2,462	6·9	2·13
The Netherlands	9,942	12·5	5,228	6·4	1·90
Great Britain	68,174	15·1	37,781	8·4	1·80
Germany	87,133	13·4	48,688	7·6	1·79
Switzerland*	5,976	14·7	3,969	12·1	1·51
Austria	11,549	17·1	8,754	13·0	1·32
Belgium*	8,150	10·0	7,675	9·5	1·06
Sweden*	8,020	13·0	7,746	12·6	1·04
Norway*	3,580	12·7	4,165	14·8	0·86
Czechoslovakia	17,746	11·9	22,275	15·0	0·80
Italy*	30,342	7·4	44,536	10·8	0·68
France*	40,148	9·7	63,451	15·2	0·63
Spain	15,797	6·6	28,050	11·8	0·56
Hungary	8,963	10·2	16,965	19·4	0·53
Finland†	2,626	7·1	8,771	23·8	0·30

* 1931. † 1930.

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We shall not discuss here whether, when age corrections have been applied, cancer is more and tuberculosis less widely spread in mainly German peoples than among Latin peoples (see Table I). It may be noted that in Sweden and Norway the tuberculosis mortality is high. This is equally true of the Magyar population of Hungary and her racial allies in Finland. In France, again, the tuberculosis mortality is quite high. It is not, therefore, surprising that in the last-named states as well as in Italy and Spain the ratio of cancer to tuberculosis mortality is less than 1. Italy and Spain are still countries of high birth-rates and have accordingly a relatively small proportion of aged persons (Sundbärg's progressive type of population; see Roesle, 1929). Therefore, it is only in France that the small number of deaths from cancer is remarkable, and owing to the large number of deaths from tuberculosis produces the low index of 0·63.

The contrast, however, between mortality from cancer and tuberculosis appears sufficiently great even in the crude figures of official statistics to justify a closer demographic study. The relation to race and inheritable constitution suggest themselves, but the conditions of life, social position, different methods of nourishment in different peoples cannot be put aside without consideration. There are also differences in the statistical material and records, including those relating to the age distribution of the population which play an important part in international comparisons, and are especially important in the study of cancer. It is not proposed to enter into a general discussion on these points because the possible sources of error are very numerous, but it may be noted that in the study of cancer distribution it would be very desirable to know whether the low rates of mortality in France (9·7 per 10,000), Italy (7·4), Spain (6·6) and Finland (7·1), when standardised for age and sex distribution can really be regarded as accurate measures of distribution of fatal malignant disease; for the contrast with the figures for English- and German-speaking peoples is very remarkable.

In view of the many possible sources of error the analysis is limited to data from Berlin and a few homogeneous districts. A study of the distribution of cancer in urban and rural districts, in different occupations, social strata, races, nations, or other demographic subject groups, would require special consideration. In any series it is the quality not the quantity of the data which must decide the scope of the investigation.

In Table II the actual deaths from cancer and tuberculosis in Greater Berlin, from 1924 to 1933 inclusive, are given, in which the opposite movements of the two series of figures are observable. Deaths from tuberculosis have fallen from 5860 in 1924 to 3835 in 1933, whereas deaths from cancer and other malignant growths have risen from 5752 to 7469. In 1924, then, the deaths were practically equal in number, while in 1933 almost twice as many deaths were attributed to cancer as to tuberculosis. It is not, therefore, surprising that considerable attention has been attracted by the increase. A great retrogression of mortality from tuberculosis, particularly since the War, in

Table II. *Deaths in Greater Berlin.*

	Tuberculosis	Cancer and other malignant new growths	Ratio Cancer: tuberculosis
1924	5860	5752	0·98
1925	5004	5935	1·19
1926	4488	6195	1·38
1927	4570	6443	1·41
1928	4367	6896	1·58
1929	4481	6986	1·56
1930	4060	7161	1·76
1931	4019	7353	1·83
1932	3734	7213	1·93
1933	3835	7469	1·95

itself gives more weight to cancer as a cause of mortality. It should be noted, however, that two causes have produced a larger and larger population in the middle-aged and old-aged classes, namely the increase in expectation of life which finds expression in an increase of the mean length of life by almost twenty years during the last 50 years (compare the German life table from 1871 to 1880 with that of 1924–6), and the decline of birth-rate since the beginning of the century. As the cancer mortality tends to increase with age it follows that the precise meaning of the increase in mortality from cancer cannot be grasped without a finer analysis of these population problems.

When this finer analysis is made with respect to the Berlin population it appears that, when allowance has been made for the increased ageing of the population, very little increase in the cancer mortality has occurred (Wolff, 1934). Perhaps the simplest way of bringing out the point is to relate the deaths in age groups to the respective populations living at these ages. Table III illustrates this. It is based upon the mortality data of the city of Berlin and the population data of the censuses of 1910 and 1925. Owing to internal migration of urban populations one has only an accurate knowledge of age distribution around the census years. The table shows also the standardised rates, taking the enumerated population of the Reich in 1910 as the standard. A triennium of deaths was used in order to reduce variations due to random errors, each triennium being centred on the census year.

Table III. *Mortality rate from cancer and other malignant new growths in Berlin* 1909–11 *and* 1924–6 *per* 10,000 *living in the same age and sex groups.*

	Age in years						Crude figures	Standardised on the population of 1910
	0–30	30–40	40–50	50–60	60–70	Over 70		
				(*a*) Males.				
1909–11	0·71	3·35	12·84	41·95	82·42	123·43	10·92	12·09
1924–26	0·64	2·49	8·87	31·96	76·02	119·75	13·20	10·40
				(*b*) Females.				
1909–11	0·77	6·56	19·58	40·69	66·95	87·43	13·85	13·03
1924–26	0·75	5·46	16·41	35·43	64·09	107·45	16·18	12·57
				(*c*) Persons.				
1909–11	0·74	4·98	16·34	41·24	73·12	99·22	12·44	12·43
1924–26	0·70	4·19	12·86	33·77	69·18	111·67	14·81	11·51

It can now be seen that for the male sex in each age group, even the oldest, the rate of mortality from cancer has declined; in the age groups 40–50 and 50–60 the magnitude of the decline is quite considerable. In the female sex too there has been a decline in all but the oldest age group, although the magnitude of the change is less than among males. It is worthy of note that, in the ages 30–40 and 40–50, the rate of mortality of women is much higher than that of men, which is, of course, due to the special incidence of malignant disease of the uterus and breast; in higher ages, on the other hand, the mortality rates of males from malignant disease are higher than those of females. At first sight, having regard to the points made in the last paragraph, it may be surprising that the unstandardised rate of mortality has increased between the two periods, in males from 10·92 to 13·2 per 10,000, and in females from 13·85 to 16·18. Taking the unstandardised rate from 1909 to 1911 as 100 we have for the years 1924–6 a figure of 121 for men and 117 for women. The percentage increase in the figure is, therefore, actually greater for males than for females in spite of the fact that the rate of mortality has declined in males in every age class. To the student of vital statistics there is here, of course, no paradox, since he is aware that the healthiest old people die at a higher rate than the least healthy young people and consequently the unstandardised death-rate of an aged population, however healthy, would be higher than the unstandardised death-rate of a young population. This principle applies in the present case since, on the whole, cancer is a fatal disease of late life. A change in the age constitution and in particular the increase in the numbers living at higher ages has been responsible in Berlin for the increase in the crude rate of mortality from cancer.

Table IV. *Crude and standardised cancer mortality figures in Berlin* 1909–11 *and* 1924–6 *per* 10,000 *living.*

	Crude mortality figures			Standardised mortality figures		
	Males	Females	Persons	Males	Females	Persons
1909–11	10·92	13·85	12·44	12·09	13·03	12·43
1924–26	13·20	16·18	14·81	10·40	12·57	11·51
	Relative figures—1909–11 = 100.					
1909–11	100	100	100	100	100	100
1924–26	121	117	119	86	96	93

The proof that it is really the altered age structure of the population that has caused the increase in the general rate of mortality from cancer is afforded by standardised mortality rates. These standardised rates, like the rates at different ages, show that there has actually been a slight decrease (see Table IV). No reference has hitherto been made to a fact that must be taken into consideration, namely, that there has been an improvement in the diagnosis of cancer, particularly in Berlin as in most cities, resulting in "senility" as a cause of death being replaced by a more precise diagnosis. It will be seen from Table V that in persons over 70, the age group when the mortality rate of cancer tends to be at its highest, the attribution of senility as a cause of death has diminished

Table V. *Mortality rate from senility in Berlin per* 10,000 *living.*

	Males		Females	
	60–70 years	Over 70	60–70 years	Over 70
1909–11	5·01	165·87	7·31	200·43
1924–26	3·41	80·83	3·23	99·28

by 50 per cent. There can be little doubt that the decline is mainly due to more accurate diagnosis, and it is probable that malignant disease has been frequently substituted for senility, as Koller (1933) has indicated in a recent study of Prussian data. Taking this factor into consideration in the general problem of mortality from cancer it may fairly be concluded that in Berlin the rate of mortality from cancer has declined. This is what a knowledge of the modern advances in therapeutics would lead us to expect and what is beginning to be manifest in official statistics of the general population. Nevertheless, a contrary opinion is often maintained in popular writings and even in medical journals. Precisely the same conclusion was arrived at by Burkhardt (1930) from an analysis of the statistics for Saxony (Table VI).

Table VI. *Mortality rate from cancer in Saxony per* 10,000 *living.*

	Age in years						
	20–30	30–40	40–50	50–60	60–70	70–80	Over 80
				(*a*) Males.			
1908–12	0·31	1·52	8·27	30·00	66·16	85·50	55·75
1924–26	0·22	1·50	6·73	24·14	59·55	86·55	76·66
1927–28	0·31	1·28	6·78	23·93	64·10	111·76	106·82
				(*b*) Females.			
1908–12	0·51	3·73	12·64	28·98	53·62	70·70	54·82
1924–26	0·40	3·13	11·87	25·72	50·31	75·70	72·82
1927–28	0·34	3·73	11·56	25·67	50·70	85·42	89·67
				(*c*) Persons.			
1908–12	0·41	2·64	10·51	29·46	59·06	76·64	55·16
1924–26	0·31	2·41	9·47	24·96	54·51	80·07	74·16
1927–28	0·33	2·64	9·37	24·83	56·84	96·17	95·66

In Saxony, the most industrialised of the German states, with a population of roughly five millions to which the principal contributors are the great cities of Dresden, Leipzig and Chemnitz, and industrial towns such as Plauen, Zwickau and Meissen, there is a considerable increase in the total number of deaths from cancer—an increase on the average from 4046 in the period 1908–12 to 5678 in 1927–8—and a corresponding increase in the unstandardised rate of mortality. A finer analysis by age class shows, however, a decline in the rate of mortality at all ages below 70 in both sexes and an increase in the oldest age group only. The figures for Saxony have, therefore, a strong general resemblance to those for Berlin, but the general level of the Saxony figures is somewhat lower, probably because in accordance with an altered nomenclature only deaths ascribed to cancer are reckoned, while the Berlin figures include other malignant growths. It is only since 1932 that in all territories of the German Reich causes of death have been notified according to the inter-

national list.[1] In Baden a decline in the mortality rate from cancer in the period 1910–25 has also been noted in approximately the same age classes, to which Kurt Weiss (1932) called attention, while in the census years 1881, 1891 and 1901 increases were observed. Böhmert (1931) has reported a similar decrease in cancer mortality from Bavaria, Hamburg and Bremen, when corrected rates are used. In large tracts of territory, however, errors in diagnosis are numerous, and consequently the general statistics of the Reich as a whole are unsatisfactory.

Table VII. *Deaths in Vienna from cancer per* 10,000 *in age groups.*

	Age in years						
	21–30	31–40	41–50	51–60	61–70	71 and over	All ages (crude figures)
			(*a*) Males.				
1901–05	0·89	3·6	16·4	43·5	90·6	122·0	11·4
1906–14	0·93	3·2	13·9	41·6	88·8	117·5	11·9
1919–23	0·97	2·9	11·4	39·9	85·6	124·7	13·7
1924–28	0·91	3·1	11·8	38·3	92·5	152·2	16·9
1929–31	1·00	3·2	12·4	41·3	102·0	162·9	20·7
			(*b*) Females.				
1901–05	1·03	6·4	21·1	45·3	72·9	102·2	13·5
1906–14	0·97	5·5	19·1	39·3	68·0	93·0	13·4
1919–23	1·15	4·9	16·8	37·0	68·3	99·4	15·0
1924–28	1·06	5·1	16·3	37·1	70·0	123·4	17·9
1929–31	1·38	4·9	17·5	37·4	71·9	139·0	21·1

Table VII is abstracted from the work of Peller (1934), the Viennese physician and statistician, who has devoted much attention to the problem of cancer mortality, particularly in Vienna.

Again we find a similar relation; a decrease is observed in the age classes from 30 to 60, but an increase in the seventh decade, which, however, is 10 years earlier than in Berlin or Saxony. The increase is, however, striking only in the oldest period. A small increase in the age group under 30 is probably without significance, for the rate is based upon small numbers and influenced by mere chance fluctuations.

In Vienna, as in Berlin, the unstandardised rates show considerable increases. In Vienna the ageing of the population, owing to the great decrease in births, is striking; consequently, the unstandardised mortality figure for cancer in Vienna, and indeed in the whole of Austria since the War, is particularly high. In 1932 the rate for Austria was 17·1 per 10,000, the highest in any European country. Although Peller does not specially mention the fact, it appears that in the Viennese statistics as well as in those of Austria other malignant new growths are included with cancer. Unfortunately, there have been no census figures for Vienna since 1923 (the results of the census of 1934 have not yet been published), so that we have no exact measurement of the present age distribution of the population, and consequently the rates of mortality

[1] *Statistisches Jahrbuch für das Deutsche Reich* 1934, Jahrg. 53.

in age groups may be fallacious. Peller's contention that in Vienna there has been no further fall in the last period, 1929–31, and that in some of the age groups there was a slight increase, requires consideration. His rather sweeping conclusion that there may be a reversal in the cancer mortality analogous to that in some other infective diseases, perhaps a wave-length from 6 to 8 decennia, is one which I cannot at present adopt, and I am doubtful whether his material is sufficiently extensive to justify any conclusion.

Another comprehensive study of cancer mortality in the German-speaking countries has been made in Zürich, where Schinz and Senti (1932) have examined the data from 1896 to 1931. The results are concordant with those relating to Berlin and other large German cities. The Zürich statistics relate to cancer alone, they do not include other malignant new growths. These, of course, are numerically less important, and only come into the picture in so far as sarcoma and cerebral tumours do not spare the younger age

Table VIII. *Deaths in Zürich from cancer* 1896–1905 *to* 1926–31 *per* 10,000 *living in the same age and sex groups.*

	Age in years								Standardised on the population of 1910
	Under 30	30–40	40–50	50–60	60–70	70–80	80–90	Over 90	All ages
					(*a*) Males.				
1896–1905	0·1	2·6	14·6	47·8	87·4	133·4	116·1	—	10·2	10·37
1906–1915	0·1	2·0	11·5	45·2	103·3	147·2	130·7	200·0	10·5	10·47
1916–1925	0·1	1·8	11·3	40·5	101·9	159·5	111·6	—	13·5	10·12
1926–1931	0·2	1·0	10·9	40·0	97·4	189·9	201·3	—	15·5	10·25
					(*b*) Females.				
1896–1905	0·2	4·1	19·1	36·5	78·4	111·2	172·4	—	12·0	12·70
1906–1915	0·2	3·1	13·6	38·0	74·6	130·7	135·9	—	12·0	11·99
1916–1925	0·1	2·7	13·3	33·6	68·9	115·1	135·2	129·0	13·0	10·96
1926–1931	0·2	3·3	12·1	32·0	68·3	106·4	199·7	307·7	14·5	10·82
					(*c*) Persons.				
1896–1905	0·2	3·4	17·0	41·5	82·0	119·1	154·1	—	11·1	11·57
1906–1915	0·1	2·5	12·6	41·2	86·1	136·7	134·2	55·6	11·3	11·25
1916–1925	0·1	2·3	12·4	36·7	82·4	130·4	127·4	114·3	13·2	10·55
1926–1931	0·2	2·3	11·6	35·6	80·1	136·3	200·2	242·4	15·0	10·54

classes. The Zürich statistics (Table VIII), like those of Switzerland as a whole, have over the German statistics this advantage, that the figures of mortality relate to the resident population. Strangers dying in Zürich are allotted to the place of habitual residence, and the deaths of Zürich inhabitants recorded in other places are included in the Zürich figures.

Roesle (1931), who noted the advantage of this method, examined cancer mortality in Basle and in Copenhagen. In Copenhagen a decrease in the rate of mortality in the age groups from 35 to 64 could be demonstrated between 1903–7 and 1928–9, but an equally distinct decline in the canton of Basle city was not demonstrated. As, however, the census figures for 1930 and consequently knowledge of the change of age distribution since 1920 were not then

available, this Basle enquiry has not the same importance as the work of Schinz and Senti for Zürich.

These Zürich figures present a similar picture to that of Berlin. The unstandardised rate of mortality has increased greatly in males from 10·2 to 15·5 and less in females from 12·0 to 14·5. On the other hand, the rate of mortality in the separate age groups from 30–40 to 60–70 decreased in both sexes, and in women even in the higher age group 70–80. Therefore, the increase in the unstandardised figure is satisfactorily explained by a change in the age structure of the population. If we had had to deal with a constant age distribution, then in Zürich as in Berlin the mortality rate would have fallen. This study of Zürich is of particular importance for our general theme, for it carries the study down to 1931 and produces results similar to those obtained from a number of cities in Germany for which census data are only available down to the year 1925. When the results of the census postponed to 1933 are available, it will be practicable to continue the investigation (Schmitt, 1931).

In order to make still more use of the Berlin material I have dealt with the deaths from cancer and other malignant new growths from the years 1924–32 according to three very broad age groups, 0–40, 40–60 and over 60. These are set out in Table IX (*Z.f. Krebsforsch.* **40**, 337).

Table IX. *Percentage distribution of cancer deaths in Berlin.*

Age	1909–11	1924	1925	1926	1927	1928	1929	1930	1931	1932
Males:										
0–40	9·2	5·4	6·2	5·0	4·2	5·1	5·5	5·4	5·2	3·6
40–60	43·9	38·9	40·5	40·2	35·7	36·8	36·7	34·4	35·2	34·5
Over 60	46·9	55·7	53·3	54·8	60·1	58·1	57·8	60·2	59·6	61·9
Total	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0
Females:										
0–40	11·0	9·0	8·4	8·4	8·2	8·3	7·7	8·3	7·3	6·8
40–60	44·4	40·5	40·3	40·2	40·6	39·2	40·6	38·7	38·1	37·1
Over 60	44·6	50·5	51·3	51·4	51·2	52·5	51·7	53·0	54·6	56·1
Total	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0

It will be observed that in males there is a slow decrease in the quota for the age groups under 60, 44·3 per cent. in 1924 to 38·1 per cent. in 1932; in the female sex from 49·5 to 43·9 per cent. and of course a corresponding increase in the proportion in the groups at ages over 60. If the years 1909–11 are included this movement is still more manifest. More than half of all deaths from cancer in 1909–11 came into the age groups under 60; in 1932 considerably more than half came into the age groups over 60. A similar calculation made by Schinz and Senti for Zürich leads to the same result.

What is the meaning of this steady movement in the age of death from cancer? Its interpretation is not so simple as those not familiar with the intricacies of the population statistics might suppose. Are we concerned here really with a movement of cancer deaths' age or is the beginning of the illness retarded as a result of some function of the uncontrollable factors of modern life? Or again, may it be a consequence of active therapeutic intervention?

Or again, can we exclude change in the fashion of diagnosis? From figures of deaths alone, unaccompanied by the indispensable knowledge of the population among which they occur, conclusions must be drawn with the greatest precaution.

It does not seem probable that in the period 1924–32 any essential alteration in the diagnosis of cancer and the resultant death certification in Berlin has occurred, as no doubt occurred when we compare the pre-War and post-War periods, having regard to the decreased use of the term "senility". Leaving out of account then the pre-War period, I am of opinion that the movement must be attributed to a definite transfer of deaths to a higher age class. This might be the result of modern therapy, or owing to ageing of population. It is not possible, with our present knowledge, to isolate the one effect from the other.

Table X. *Comparison of the mean after-lifetime of operated and not-operated patients as given in the Swiss experience of cancer of the breast.*

Comparisons	Operated	Not-operated
A. Available cases from 1911 to 1915	536	236
Surviving in year 1920	99 (=18 %)	4 (=1·7 %)
B. Average age when sickness is first observed	51·93	60·87
C. Average duration of life to 1920	3·92	2·71
D. Corrected duration of life with regard to survivors in 1920	5·72	2·765
E. Normal expectation of life at the same ages for females in Swiss life table	19·22	13·1
F. Quotient C/E	0·204	0·207
G. Corrected quotient D/E	0·298	0·211

If a decline in the mortality from cancer may be regarded as proven we must not exaggerate the effects of therapeutic measures. It is only too easy to understand how individually striking results of an operation are clear in the mind both of the operator and of the patient who has been saved. From the scientific point of view confidence can only be placed in averages based upon statistically sound data including the comparison of the duration of after-life in treated and untreated patients, other things being equal. In countries of German speech these requirements have been approximated to only by F. de Quervain[1] and his colleagues in their report upon the general results of the Swiss collective investigation of cancer of the breast between 1911 and 1915 (see Table X). From this it appears that in the most accessible localisation only very modest success can be claimed for treatment. The patients operated on had an advantage of practically three years of life over those who were not operated on, the reckoning being made from the date of first observation of the disease. One must bear in mind, however, that the operated women are on the average 51·93 years of age or nearly 9 years younger than those not operated upon, on the average 60·87 years. Consequently, a correct comparison would be between the observed duration of life of the

[1] *Gesamtergebnisse der schweizerischen Sammelstatistik über Brustkrebs von* 1911–1915, unter der Leitung von F. de Quervain (Bern) bearbeitet von G. Chatenay, M. Zisman, H. Rieder mit Unterstützung von E. Haemig. Hans Huber, Bern, 1930.

operated and unoperated persons in comparison with the expectation of life, normal to their respective ages as shown by the Swiss life table. Using this standard the operated patients lived approximately three-tenths, the unoperated only a little more than two-tenths, of the normal expectation of life. The advantage is, therefore, unmistakable even if not very large. It amounts to about 8·7 per cent. of the expectation of life (see Table X).

"In figures lie the inexorable test of our results, even if in individual cases other than only mathematical considerations will guide us," writes de Quervain in his critical and, from the point of view of the study of results, extremely important paper which has received far too little attention. If the surgeon, who is the most active of all therapeutists, is influenced by figures, naturally a statistician agrees with him. He might even add that the arithmetical results of statistics can show nothing but the sum of individual experience freed, so far as may be, of chance fluctuations. Until the general etiology of new growths is understood, treatment can be only symptomatic, and the cancer campaign can only still further reduce the contribution of the earlier age classes to mortality. Even now (see Table IX) in Berlin still nearly two-fifths of the deaths amongst males occurs at ages under 60 and among women still more, that is to say, among persons still of the productive ages of life. This mortality can be reduced by the means at present at our disposal.

We can, however, safely infer, from the demographic data of different peoples, that cancer is a disease far less sensitive to environmental, social, occupational and also infective influences than is tuberculosis. Also there can be no doubt that inborn racial factors are not of primary importance. Races of primitive peoples in the centre of Africa and other countries are little exposed to the various supposed degenerative influences of civilisation but are not free from cancer. Frederick L. Hoffman has long been of the opinion that the increase of cancer is associated with civilisation, but this view can hardly be maintained. Further differences in the localisation of cancer in Jews and non-Jews, as shown by data from European cities, cannot throw much light upon the cancer problem. In regard to the total incidence no clear distinction has been established. At the most there is some transfer from one localisation to another which may perhaps be referable to nutrition and other differences (Sorsby, 1931); I have discussed this matter elsewhere (Wolff, 1934 *a*). The problem of new growths in men and animals still awaits a definitive solution.

Conclusion

From analysis of such statistics relating to German-speaking countries as I have been able to obtain, I infer that, in these countries, age-standardised rates lead to the conclusion that the risk of dying from cancer is not increasing in the sense that the ordinary man attaches to the phrase. It is not true that an inhabitant of Berlin aged, say 50, is more likely to die of cancer before 60 than his father was; on the contrary, his real risk of dying from this cause is probably smaller.

The British figures appear to be somewhat less favourable, for the age-standardised rate of mortality from malignant disease in women was exactly the same in 1932 as it had been 10 years before, viz. 9·65 per 10,000 living, while the rate in males had increased from 9·58 in 1922 to 10·48 in 1932. Even here, however, there is evidently no striking change, a very different story from that told by the tuberculosis figures, where the standardised rate of males fell from 12·41 in 1922 to 9·13 in 1932 and of females from 9·85 to 7·26.

In fact, all reliable statistics point in the same direction, viz. that cancer is immensely less sensitive to those changes of environment which we associate with the phrases "civilisation", "modern life", etc., than tuberculosis.

I have deliberately abstained from a general discussion of the question of how far improvements in therapeutic procedures may have influenced the course of mortality, because I do not think we have material sufficient for an adequate statistical analysis. Sufficient data have been published by surgeons, who wisely collaborated with statisticians, to make it quite certain that early therapeutic intervention substantially prolongs the lives of those afflicted with some forms of cancer, notably cancer of the female breast. It follows that there are now in any population a considerable number of persons afflicted with cancer who will live longer than similar persons lived a generation ago. This factor must be one of those contributory to the increase in the mean age at death of cancer patients, a fact which most, and indeed all, collections of data show. Unfortunately, even in this surgically favourable localisation, the proportion of patients who are treated early enough to secure the most favourable results is not large. Further, this form of cancer does seem to be one in which the changing habits of the time have an unfavourable effect, in the sense that virgins are more liable to cancer of the breast than women who have been pregnant. Regarding the effects of therapeutic measures it is difficult to produce arithmetical data and therefore I can do no more than express my conviction that, even with our present knowledge, when treatment must be symptomatic rather than radical in the sense of striking at the biological root of the disease, much can be attained by therapeutic intervention.

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