

THE TREND OF CANCER MORTALITY IN AUSTRALIA

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(With 7 Graphs in the Text)

UNDER the title "Is Cancer Mortality increasing or decreasing?" Wolff (1935) has discussed a problem of world-wide interest. He comes to the conclusion that, in German-speaking countries the risk of dying from cancer is not increasing in the sense that the ordinary man attaches to the phrase. He enquires whether the undoubted absolute increase in cancer mortality may not be a mere function of the ageing of the population, a feature common to all civilised countries; and he concludes that, for Berlin, the altered age structure of the population has caused the increase in the general rate of mortality from cancer, and that—taking certain other factors also into consideration—it may fairly be concluded that in Berlin the rate of mortality from cancer has declined.

Wolff has used urban populations, preferring, in his data, quality rather than quantity; he also draws attention to the transfer of considerable numbers of deaths from "senility" to "cancer" in the records.

Previously, in this *Journal* (1931), attention has been drawn to the great fluctuations in the age constitution of the population of Australia and to the effect of these fluctuations upon the prevalence of certain diseases.

The examination of the position of cancer has been delayed until the age distribution of the population at the time of the census of 1933 was available. It is now possible to follow the course of cancer in Australia from 1881 to 1933, during which the amplitude of the population movements in Australia has been very wide.

As affecting the validity of the statistics, two developments must be mentioned.

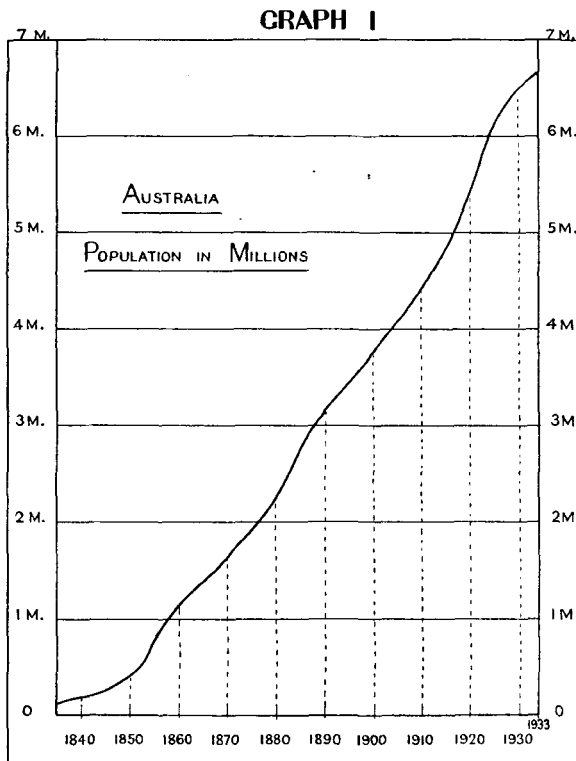
From 1881 to 1906 all statistics were collected, analysed, and published by the statisticians of the six States. From 1906 onwards the Commonwealth Statistician published vital statistics for the whole Commonwealth: the material used in this discussion was therefore derived from two sources affecting respectively the periods before and after the census of 1901. It cannot be said that any error arises from this fact.

Between 1881 and 1933 nosological classification evolved as it did in other countries. The classification of the Registrar-General of England and Wales was first followed, then the various stages of the international classification. Whatever error may be due to this evolution cannot now be corrected.

It must be stated that for the period under discussion in this article both the census figures and the records of death may be accepted as complete for Australia, embracing the whole population. As to the accuracy of certification of cancer as the cause of death the relative facts will be presently stated.

In this article the term "cancer" includes, except when otherwise so stated, all forms of cancer.

Graph I shows the growth of the total population in Australia. There has been a rapid rise in the total population with three periods in which the decennial rise has been especially notable—these are indicated on the graph at



1850, 1880 and 1910. These were periods of immigration—the migrants being almost exclusively young adults.

Graph II shows both this immigration and its natural and notable effect on the birth-rate at these periods. The departure and return of the expeditionary forces during the Great War accounts for the sweeping variations between 1915 and 1919.

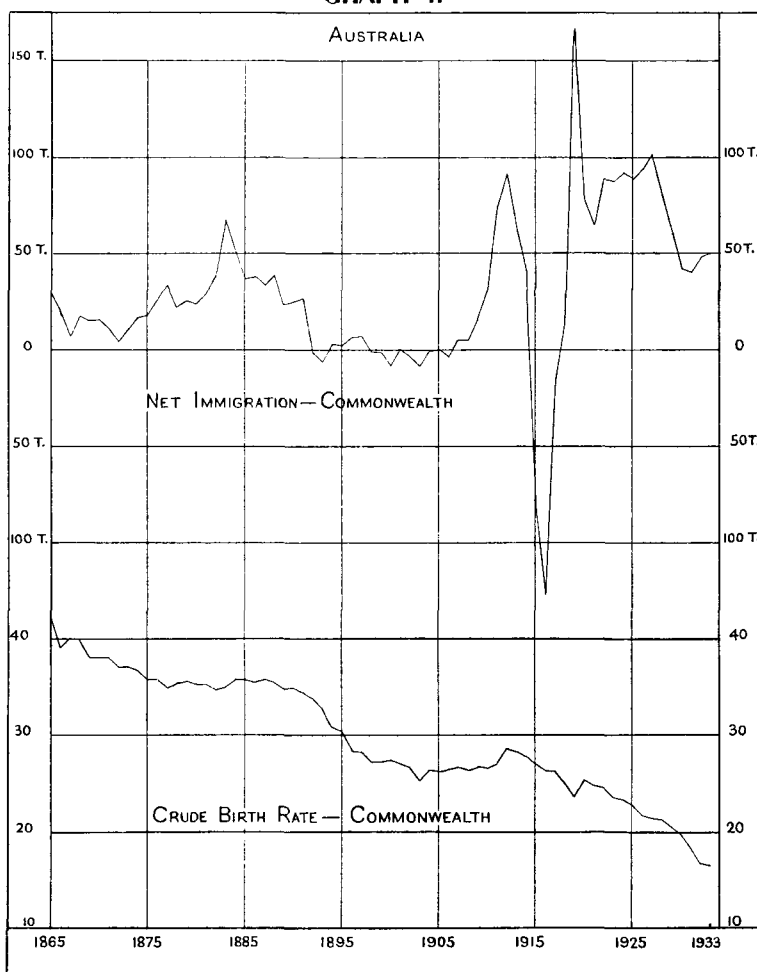
A discussion of the results of these movements as shown by variations in the age constitution is hardly necessary. It is expressed in Graph III.

In Graph III the course of each age group is followed throughout the fifty years, and for comparison a broken line is drawn straight throughout the

whole period representing the percentage for that age group in the "Standard population" adopted by the Commonwealth in 1926.

This standard population was that recommended by the International Institute of Statistics in 1926. The standard was compiled according to the age distribution of the population of nineteen European countries at their censuses nearest to the year 1900.

GRAPH II



Ordinate shows population in thousands.

The figures for this standard population are given in Table I.

Graph III shows clearly that the Australian population was, at the end of the nineteenth century, a very much younger population than the standard "European" population. The ageing of all these young people has, through the first thirty years of this century, thrown the balance the other way until now the Australian population is, at each age group from 35 upwards, in excess of the European percentage.

GRAPH III

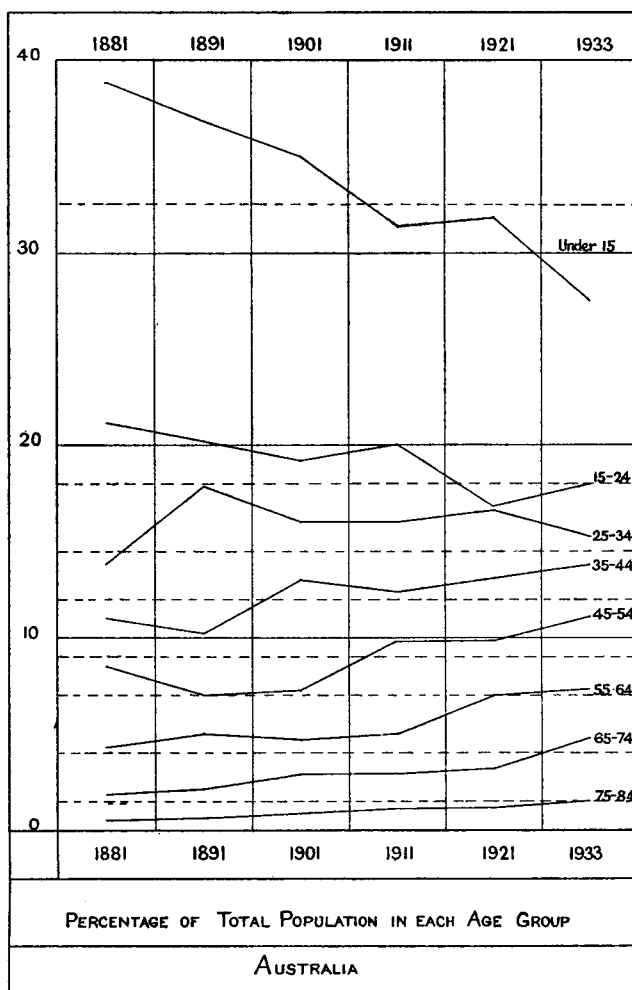


Table I. Standard population adopted at Statisticians' Conference, 1926

Age group	Males	Females	Total
Under 15	1638	1629	3267
15-24	905	927	1832
25-34	725	755	1480
35-44	593	613	1206
45-54	454	485	939
55-64	337	371	708
65-74	187	218	405
75-84	64	81	145
85 and over	7	11	18
	4910	5090	10,000

If the increase in total cancer mortality is due to the greater survival of the population to the cancer ages, as Wolff suggests, then possibly no country presents so definite or so rapid an ageing of the whole community, or, consequently, so favourable a field for the study of this aspect.

Table II. *Graduated numbers in Australia in quinquennial age groups per 100,000 of total population respectively at the censuses of 1891, 1901, 1911, 1921 and 1933*

Age group	Census of April 5, 1891	Census of March 31, 1901	Census of April 3, 1911	Census of April 4, 1921	Census of June 30, 1933
0-4	14,102	11,555	11,809	11,033	8,602
5-9	12,276	12,106	10,261	10,989	9,483
10-14	10,541	11,478	9,576	9,692	9,451
15-19	9,725	10,100	10,187	8,586	9,267
20-24	10,370	9,294	10,082	8,291	8,805
25-29	9,983	8,617	8,796	8,540	8,043
30-34	7,858	7,789	7,463	8,269	7,370
35-39	5,670	7,123	6,605	7,161	7,024
40-44	4,491	5,941	6,048	6,059	6,876
45-49	3,788	4,134	5,473	5,201	6,161
50-54	3,301	3,094	4,320	4,669	5,045
55-59	2,843	2,568	2,971	4,007	3,944
60-64	2,163	2,226	2,135	3,072	3,455
65-69	1,370	1,838	1,704	1,945	2,777
70-74	789	1,155	1,252	1,199	1,957
75-79	444	590	795	735	1,084
80-84	195	278	364	366	444
85-89	68	90	122	145	163
90-94	19	19	31	35	41
95-99	4	5	6	5	7
100-105	—	—	—	1	1
Total	100,000	100,000	100,000	100,000	100,000

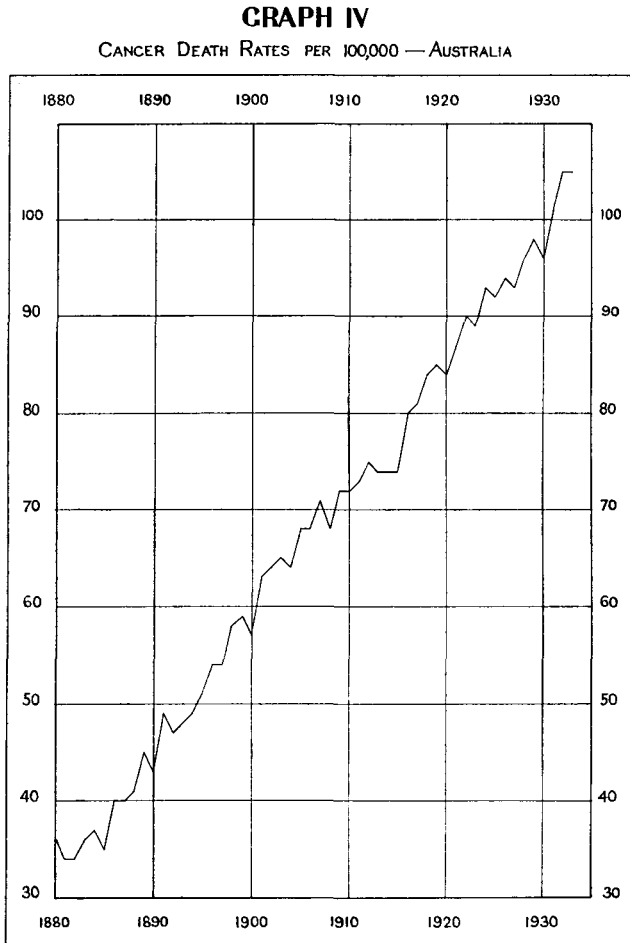
Table III. *Australia—Cancer death-rates per 100,000*

	Males			Females			Persons		
	1911	1921	1933	1911	1921	1933	1911	1921	1933
Under 15	2	3	2	1	2	1	2	2	1
15-19	4	3	3	2	4	2	3	4	2
20-24	4	2	8	3	3	3	3	2	5
25-29	6	6	8	9	8	11	7	7	9
30-34	14	11	13	21	20	18	18	15	15
35-39	19	28	21	42	42	44	30	35	33
40-44	55	47	43	80	87	86	67	66	64
45-49	99	102	75	159	153	133	126	126	104
50-54	192	177	141	239	220	215	213	197	177
55-59	281	309	251	314	310	286	296	309	268
60-64	472	489	473	402	445	378	440	468	426
65-69	760	680	729	532	584	502	652	635	617
70-74	698	938	1110	615	737	682	659	840	899
75-79	796	1085	1266	824	1056	952	809	1070	1108
80-84	942	869	1405	871	861	994	909	865	1187
85 and over	1283	966	1237	1094	955	1300	1186	961	1274

Table II shows the proportionate age grouping of the total population and Table III shows the death-rates from cancer in the Commonwealth in age groups for each of the census years. First the age groups up to 69 might be examined: it would not be justifiable to claim any decrease in the cancer

death-rates, but at least it may be said that cancer mortality has, at all ages up to 69, not shown any increase. At each age-group over 70 a definite increase is apparent.

It will seem desirable at this point to introduce Graph IV, which shows the course of the cancer death-rate over the whole community from 1880 onwards.



The effect of the introduction into the population of a large number of young adults after 1880, and after 1910 is seen in the temporary flattening of the otherwise uniform rise in the cancer death-rate from 1880 onwards.

Wolff takes up the position that, for Berlin, it is probable that malignant disease has been frequently substituted for "Senility" in diagnosis, and, therefore, in the mortality statistics.

Table IV gives the death-rates from "Senility" as a certified cause of death in Australia. There can be no doubt that a profound change is represented by

these figures. The death-rates from "Senility" are now at every age less than half the rates for 1911. It is obvious that for "Senility" of all causes of death, it is more probable that a decline in incidence represents more accurate diagnosis and certification.

No method of proof that the cancer death-rates have for this reason increased suggests itself; but it is not unreasonable to assume that two phenomena appearing at 65 years and logically related are, in fact, so related.

Table IV. *Death-rates* from cancer, senility and all causes in age groups 55 years and over for the years 1911, 1921 and 1933*

Age group	Cancer			Senility			All causes		
	1911	1921	1933	1911	1921	1933	1911	1921	1933
Males									
55-59	2.817	3.090	2.512	0.125	—	0.008	21.830	19.659	18.040
60-64	4.726	4.896	4.739	1.070	0.288	0.017	31.604	32.556	26.491
65-69	7.607	6.800	7.292	3.853	1.915	0.702	48.489	55.619	40.568
70-74	6.985	9.389	11.104	13.075	9.780	3.514	72.635	80.766	64.448
75-79	7.966	10.857	12.664	30.004	20.332	10.260	114.227	112.312	97.146
80-84	9.423	8.692	14.055	63.465	52.571	29.197	178.020	178.343	158.226
85 and over	12.832	9.669	12.377	145.815	117.318	67.235	293.672	282.338	249.875
Females									
55-59	3.145	3.105	2.866	0.035	—	—	15.301	13.568	11.613
60-64	4.025	4.450	3.785	0.569	0.026	0.088	21.877	22.377	17.568
65-69	5.320	5.849	5.024	2.880	1.252	0.455	36.200	40.493	28.991
70-74	6.152	7.378	6.823	9.151	6.590	2.685	58.215	59.122	46.589
75-79	8.242	10.567	9.523	23.938	15.924	7.225	98.782	90.234	78.122
80-84	8.714	8.616	9.949	53.323	43.272	23.533	148.523	161.375	124.362
85 and over	10.943	9.559	13.006	125.982	110.110	66.503	250.561	257.353	235.951

* Number of deaths per 1000 of population.

Table V. *Deaths from cancer and from all causes in Australia for the year 1933*

	Total deaths from cancer	Total deaths from all causes
0-19	53	8,510
20-29	86	2,602
30-39	230	3,237
40-49	718	5,049
50-59	1,291	7,226
60-69	2,099	11,390
70-79	1,964	13,518
80 and over	530	7,585
Total	6,971	59,117

One other question has to be asked. At what age does cancer begin to figure largely in the mortality returns?

Table V shows the deaths from cancer and the total deaths for the year 1933, which may be taken as typical of recent years.

From this it is clear that cancer begins to be a material factor in the causation of death at age 40. But, as has been shown, the cancer death-rates have remained stable up to age 69 and have only shown a definite rise at those age periods in which "Senility" as a cause of death has shown an even more pronounced fall.

In connection with this modification in the cancer death-rate Wolff asks several questions which are undoubtedly very pertinent. These questions may be stated thus:

Are we concerned with a real movement in the cancer death's age?

Is the beginning of the illness retarded as a result of some function of the uncontrollable factors of modern life?

Is the delay a consequence of active therapeutic intervention?

Can we exclude change in the fashion of diagnosis?

Concerning the first, second, and fourth of these questions, no reliable information is available from Australia. As to the third of these questions some useful information can be furnished. For the Sixth Australian Cancer Conference (1935) the following table had been compiled by Dr M. J. Holmes of the Commonwealth Department of Health from records carefully kept on a uniform basis over six years under the supervision throughout of this Department.

Table VI. *Summary of results of treatment with radium or radium combined with other methods in the special treatment centres in Australia, 1928-34. Period since treatment was given 1-6 years.*

Cancer group	Clinical character	Total cases treated	Apparently cured		Local improvement		Not improved alive		Died of cancer		No information	
			Number	%	Number	%	Number	%	Number	%	Number	%
Sarcomata (269)	Operable	88	45	51	30	34	1	1	13	15	7	8
	Borderline	63	14	22	36	57	3	5	15	24	2	3
	Inoperable	26	6	23	12	47	2	8	13	50	1	4
	Very advanced	92	16	17	32	35	2	2	53	58	6	6
Carcinomata (8002)	Operable	4125	2680	65	925	22	40	1	173	4	416	10
	Borderline	1198	465	39	525	44	39	3	206	18	95	8
	Inoperable	1679	314	19	797	48	63	4	604	36	163	9
	Very advanced	1000	100	10	341	34	53	5	723	72	76	8
Malignant disease (various)	Operable	5388	4189	78	672	12	21	0.4	23	0.4	499	9
	Borderline	244	122	50	85	35	4	2	13	5	28	11
Rodent ulcer (6023)	Inoperable	309	86	28	130	42	17	5	63	20	41	13
	Very advanced	82	20	24	32	40	3	4	26	31	10	12

This table serves to indicate the number of patients treated by means of radium in the several stages of the disease, and to give a summarised statement of the results obtained. In addition to the cases of malignant disease referred to in this table the treatment centres have treated a large number of cases of doubtful malignancy, and also of benign tumour and other disease conditions. The total number of patients treated with radium at the treatment centres in the six years 1928-34 was 18,604. Of these, 14,294, as indicated in this table, were treated for various forms of malignant disease.

In the "No information column" are placed all cases which have been lost sight of. These figures indicate that the great majority of patients (approximately 90 per cent.) are satisfactorily kept under observation so that the end results of treatment are ascertained.

In this table it will be found that the figures in the percentage columns will not if added together in the horizontal lines give 100 per cent. The reason is that a number of patients showed very definite improvement or even cure of the local lesion treated, but died of metastases. Such cases are credited to the "Local improvement" column, but also appear in the "Died of cancer" column, and therefore appear twice.

It is probable, therefore, that active therapeutic intervention has played a part—a part as yet unmeasured and not fully identified.

It may be objected that, with a continent like Australia almost as large as Europe and with a population of six and a half millions, perhaps statistical quality has been sacrificed for quantity. A useful check may be provided by taking the two oldest and the one youngest of the six States forming the Commonwealth of Australia.

The populations of these States at the census of 1933 were:

New South Wales	2,600,847
Victoria	1,820,261
Western Australia	438,852

There is some advantage in selecting these States for these reasons:

(1) While New South Wales has experienced a uniform development and increase in the numerical evolution of the population, both Victoria and Western Australia have had violent fluctuations in their populations.

(2) While the statistical systems of all three have been sufficiently uniform to provide reliable comparisons, there have yet been sufficient variations between them to provide useful control.

Graphs are provided in respect of each, which show for each age group the percentage of the population in that age group and the cancer death-rates for the same age group.

New South Wales (Graph V). The story of population movement through the 50 years does not differ essentially from that for the whole Commonwealth. The stability of cancer death-rates up to age 64 and the rise over 64 is also apparent.

Victoria (Graph VI). The story for Victoria is similar to that for New South Wales with differences in the population movements which become apparent on examining the graphs.

Western Australia (Graph VII). The violence of the fluctuation of the population movements is obvious from the graph. The tremendous influx of adults as shown by the great rise in 1901 at ages between 25 and 44 is reflected in the rise in 1921 at age 45–54 and in the rise in 1933 at ages over 55.

Table VII gives the death-rates for cancer for Western Australia for the only census years for which they are available.

In the Western Australian figures there is no indication that the cancer death-rate is rising.

GRAPH V
NEW SOUTH WALES

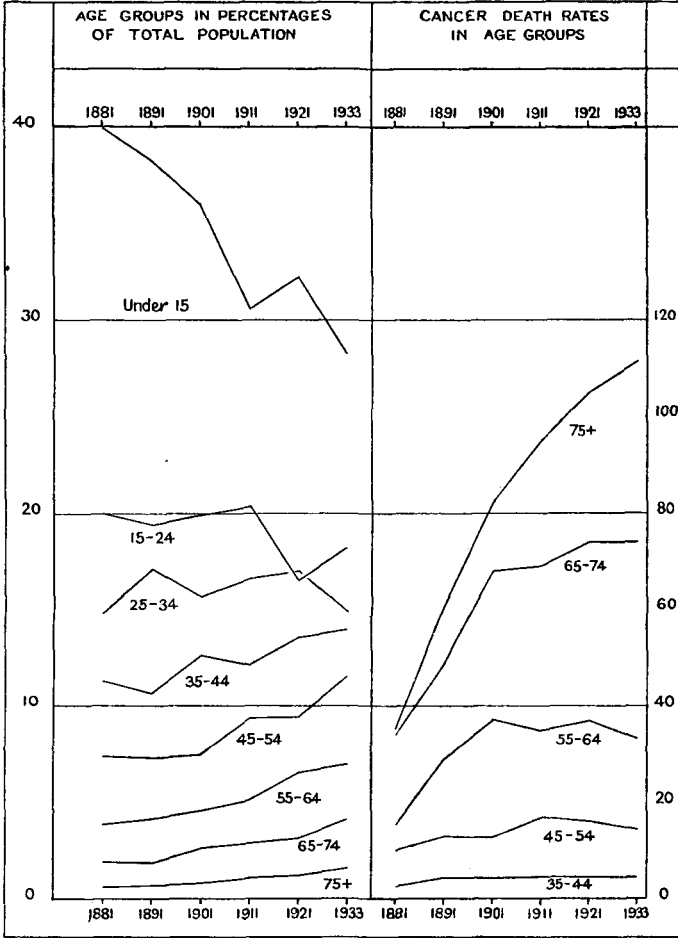
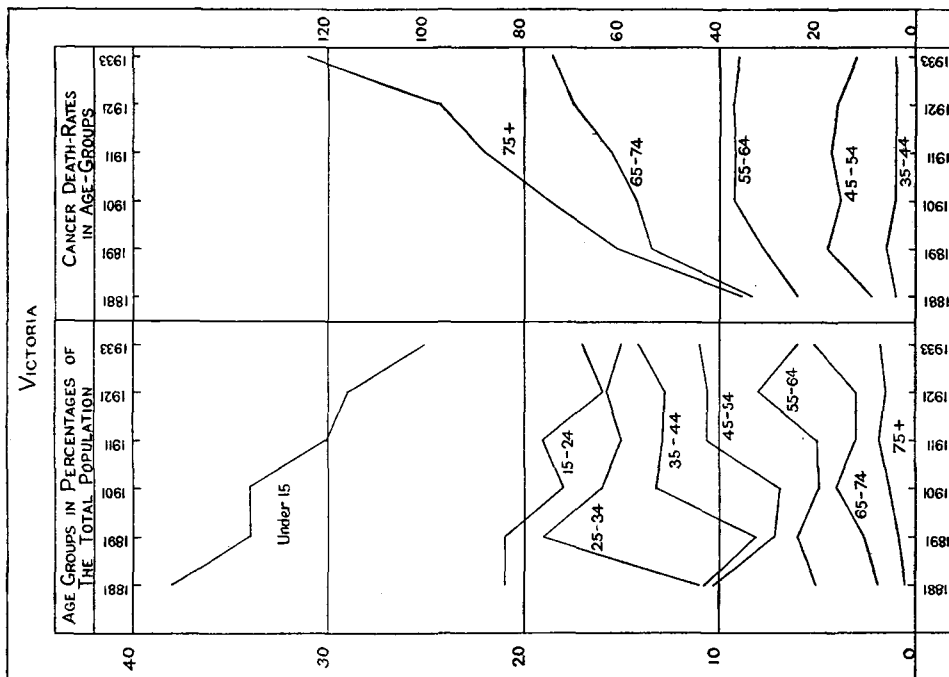


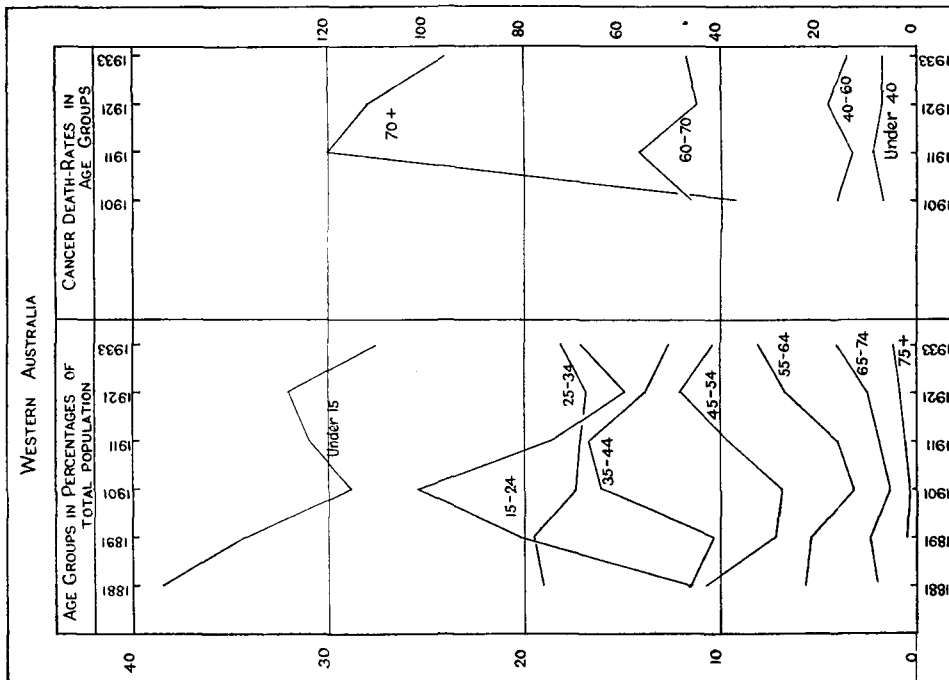
Table VII. *Death-rates from cancer, Western Australia*

	1901	1911	1921	1933
Under 40	7	9	7	7
40-60	160	138	187	148
60-70	465	577	457	475
Over 70	375	1029	928	760

GRAPH VI



GRAPH VII



An exception to the general principle which the figures given above seem to justify is provided by cancer of the breast.

Table VIII shows the death-rates from cancer of the uterus and cancer of the breast for each of the three census years. The table shows that for every age the death-rate from cancer of the breast seems to be increasing. No

Table VIII. *Australia. Death-rates from cancer of the uterus and cancer of the breast in the years 1911, 1921 and 1933*

Age group	Cancer of the uterus			Cancer of the breast		
	1911	1921	1933	1911	1921	1933
	Number of deaths					
15-19	—	—	—	—	—	—
20-24	—	1	1	1	—	—
25-29	1	1	5	2	4	3
30-34	9	12	13	4	7	7
35-39	15	25	22	10	23	27
40-44	30	42	45	21	34	64
45-49	40	50	64	29	46	72
50-54	55	60	71	25	71	73
55-59	39	67	66	19	50	82
60-64	29	63	62	17	44	88
65-69	21	37	59	20	28	72
70-74	17	20	43	15	16	65
75-79	8	15	32	12	29	36
80-84	7	9	13	10	12	18
85 and over	4	—	8	4	5	16
Total	275	402	504	189	369	623
	Rate per 1000 females					
15-19	—	—	—	—	—	—
20-24	—	0.004	0.004	0.005	—	—
25-29	0.005	0.004	0.020	0.011	0.017	0.012
30-34	0.056	0.054	0.055	0.025	0.032	0.030
35-39	0.107	0.132	0.093	0.072	0.122	0.114
40-44	0.241	0.261	0.199	0.168	0.212	0.284
45-49	0.369	0.370	0.322	0.267	0.340	0.362
50-54	0.649	0.502	0.438	0.295	0.594	0.450
55-59	0.685	0.675	0.514	0.334	0.504	0.639
60-64	0.659	0.803	0.547	0.387	0.561	0.776
65-69	0.576	0.759	0.654	0.548	0.575	0.799
70-74	0.654	0.631	0.671	0.577	0.505	1.015
75-79	0.485	0.737	0.886	0.727	1.425	0.997
80-84	0.910	0.871	0.829	1.301	1.162	1.148
85 and over	1.122	—	0.982	1.122	0.919	1.963
Average	0.191	0.221	0.214	0.132	0.203	0.264

explanation of this fact presents itself, other than the natural explanation, namely, that cancer of the breast is actually increasing.

CONCLUSION

It is justifiable to conclude that, in Australia, the cancer death-rates have not increased up to the sixty-ninth year of age, and that the apparent increase over the seventieth year is probably largely due to better diagnosis and certification resulting in the transfer of large numbers, previously certified as senility, to their proper place amongst the deaths from cancer. Whether this latter deduction is justified can be better judged after the next census in 1941.

In Western Australia, in the presence of a great movement during the last 30 years towards the later age groups, the death-rates from cancer at all ages show no tendency to rise.

An exception to this general principle is cancer of the breast, the death-rates from which cause show a tendency to rise.

My grateful acknowledgments are due to the officers of the Commonwealth Bureau of Census and Statistics who have supplied much of the statistical material in this article.

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