CEYLON J. MED. SCI. (D) VOL. VII, PT. III and IV. (December, 1950).

An Analysis of the Vital Statistics of Ceylon

BY

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Introduction

The health of a population can be assessed in two main ways, namely, (i) in a negative fashion by studying the causes of illness and of death within the population and (ii) positively by defining the nutritional status, physique and functional capabilities of the people. The attempt at a positive assessment of the health of the people of Ceylon has already been described in previous papers from this department. In the following discussion the negative assessment is presented, using the Ceylon Registrar-General's statistics for the years 1937 to 1948 inclusive. This period avoids the major malaria epidemic in 1934-35 and covers about 10 years before D.D.T. was used in Ceylon and 2 years following its use. While the statistics were being collected, the 1949 report of the Registrar-General appeared and some relevant data from this source have also been included. Mortality rates for various diseases and occurring in both sexes and in the different ethnic groups and regions of Ceylon have been calculated for each year and then averaged for the period 1937-48. In some cases only the data for male subjects are given; where this is so, it can be assumed that the statistics for females are substantially similar. (Lack of space has prevented the reproduction of the standard deviations, etc. of many of the calculated figures).

It is not possible to judge the accuracy of these statistics given by the Registrar-General. Only about 15 per cent. of deaths are registered with medical registrars and a minority of all certifications are made by practitioners of ' western medicine '. For this reason groups of major diseases have been considered rather than specific causes. In any case, while it is usually agreed that Ceylon's vital statistics are more accurate than those of the rest of South-East Asia, they are all that are available to us at present.

The information about Ceylon has been compared with the latest statistics available from certain countries, and particularly Eire, in the Western hemisphere. Eire was chosen because it has a superficial resemblance to Ceylon. Not only has it a similar area but it has an agricultural economy and possesses only one city of appreciable size. There are more differences than resemblances between Eire and Ceylon, as we shall see, but a comparison between the two countries is helpful in assessing the mortality trends in Ceylon.

Other sources of information include the Census Reports for Ceylon, and especially that of the 1946 Census by Ranasinha, and the Administration Reports of the Director of Medical and Sanitary Services.

I am deeply grateful to my clerical assistants, Mr. V. Abeywardene and Mr. V. Somaskandan, who have helped in the laborious collection and compilation of the statistical tables.

PART I

Some Recent Population Trends

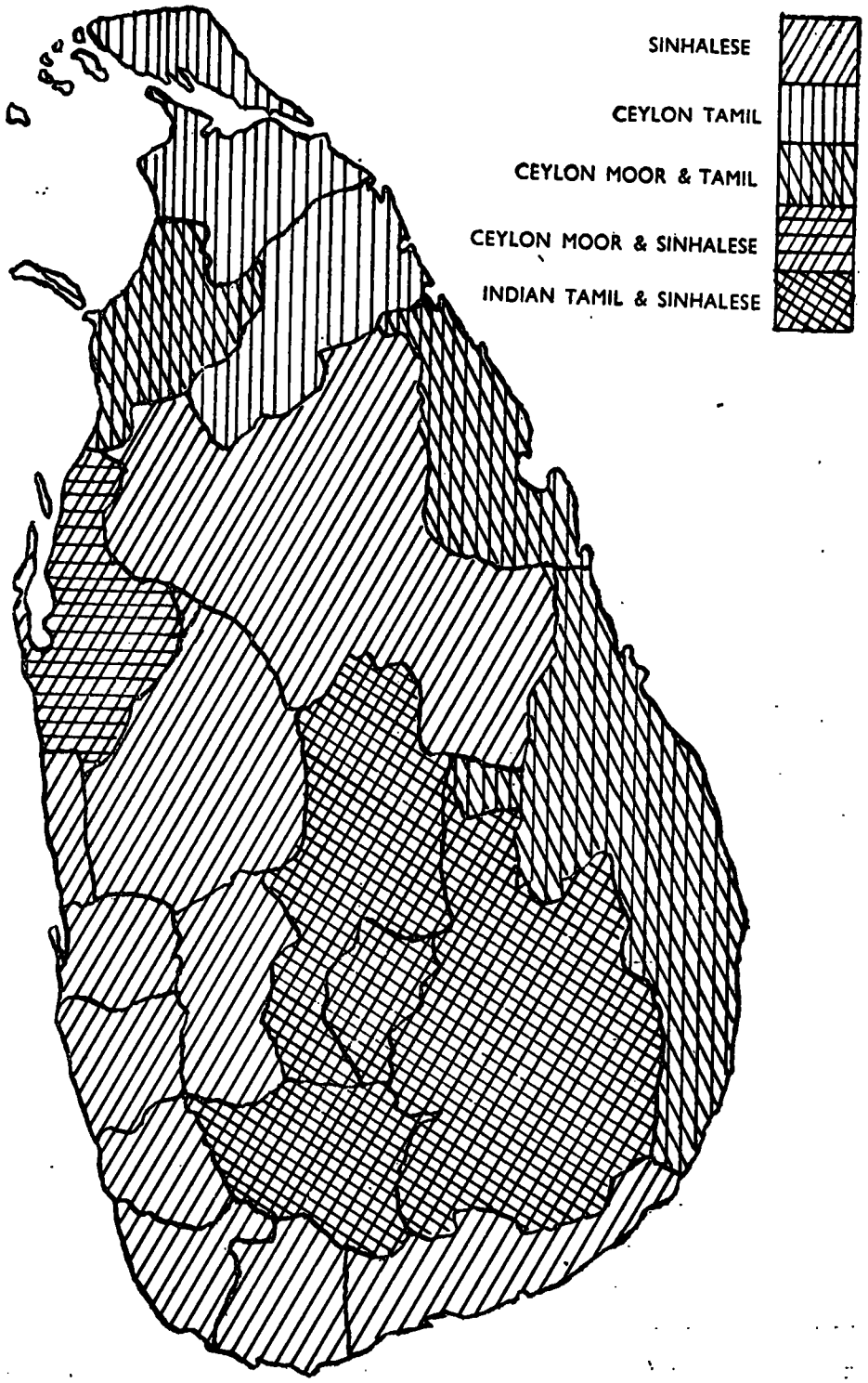
The Ceylonese nation is a composite of many ethnic groups and the distribution (see map I) of the several communities or racial groups in Ceylon reflects their past history.

The Sinhalese, who are the largest community, are to be found chiefly in the central, western and southern parts of the island. The Ceylon Tamils comprise the great majority of the population in the northern parts of Ceylon, although some have migrated south and to the Eastern Province. The Indian Tamils are more recent migrants, who have been introduced into Ceylon since the latter part of the nineteenth century to work on the tea and rubber estates. They are to be found, therefore, mainly in the estate area of the Central and Uva Provinces. The Ceylon Moors have a mixture of Tamil and Arabian blood and are said to be descendants from the ancient Arab traders. The Indian Moors are traders, temporarily domiciled in Ceylon for their business and commercial activities. The Malays are descendants of people from Malaya and the islands of Oceania, who were recruited as soldiers by the British, the Dutch and the last Kandyan Kings. The Dutch Burghers have a mixed Dutch and Sinhalese ancestry and the Europeans are, in general, British subjects temporarily resident in Ceylon as government officials, planters and commercial agents. The Veddhas are a primitive race having Australoid traits. They are a reminder of the pre-Sinhalese era of Ceylon's history and a few are said still to exist in the remote jungle areas.

TABLE 1

The Population of Ceylon by Race Groups, 1921-1946.

Race	POPULATION		Per cent Increase (+) or Decrease (−), 1921-46
	1921	1946	
Sinhalese	3,016,154	4,620,507	+53
Ceylon Tamil	517,324	733,731	+42
Indian Tamil	602,735	780,589	+30
Ceylon Moor	251,938	373,559	+48
Indian Moor	33,026	35,624	+ 8
Burghers & Eurasians	29,439	41,926	+42
Malays	13,402	22,508	+68
Veddhas	4,510	2,361	−48
Europeans	8,118	5,418	−33
Others	21,959	41,116	+87



Map 1.—Distribution of Ethnic Groups in Ceylon.

At the 1946 Census, the total population of Ceylon was enumerated as being 6, 693, 945 persons. This population is rapidly increasing, as the figures for the Census years 1921 and 1946 show (Table 1).

All the 'native' races (except the Veddhas who are now practically indistinguishable from their neighbours) have increased their numbers by about 50 per cent. during this intercensal period. This fast growing population is confined within an area of 25, 332 square miles. (Ceylon lies between 5° 55′ and 9° 50′ north latitudes, and 79° 42′ and 81° 53′ east longitudes. The greatest north to south length is 270 miles and the greatest breadth, east to west, is 140 miles). Not all this land is readily available for occupation or cultivation. The central area of the island is hilly and some peaks reach a height of over 7,000 feet. The rest of the island is for the most part flat and extensive portions of the north, central and eastern plains are still covered with jungle.

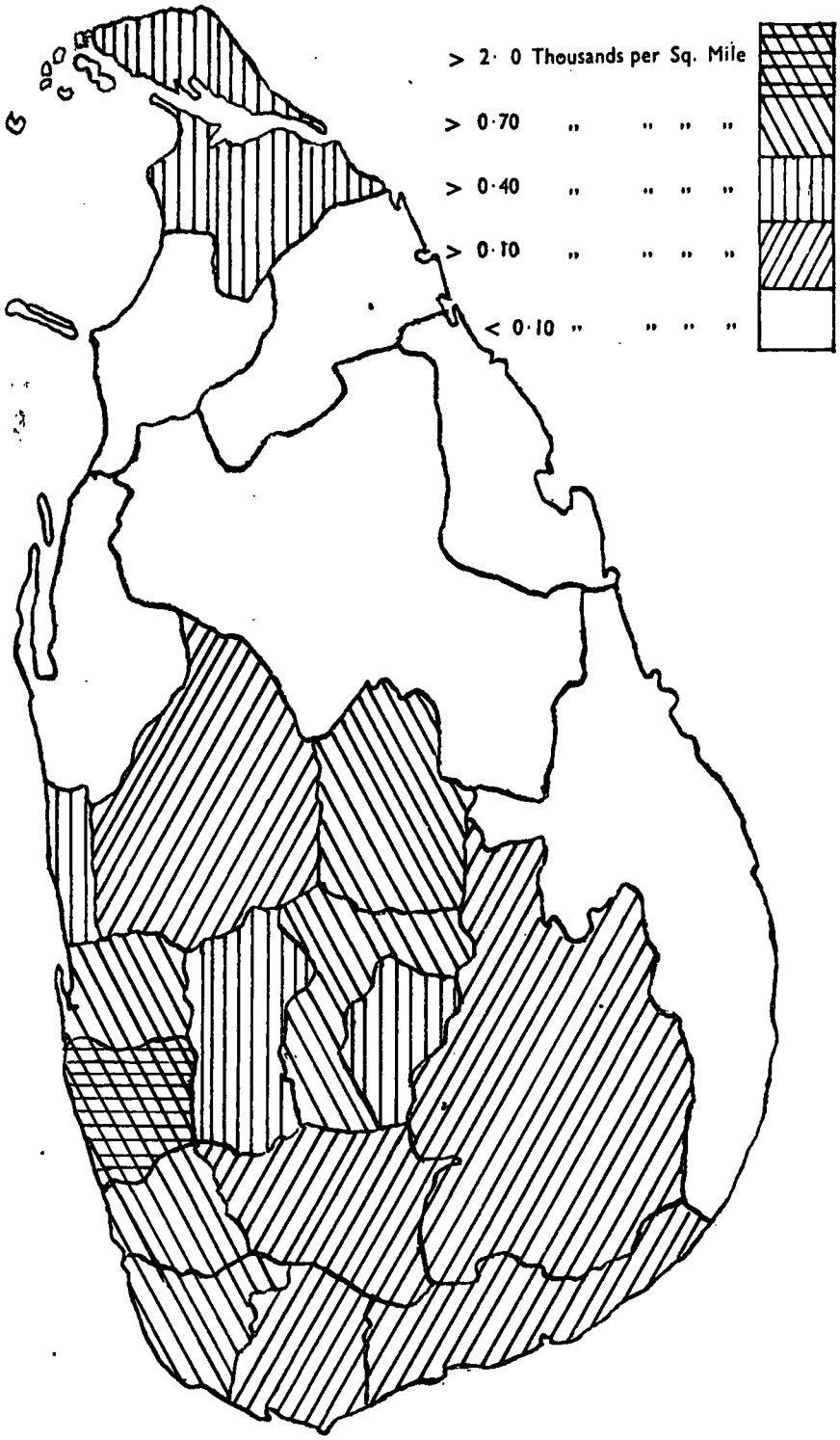
While history has largely determined the racial-distribution of Ceylon's people, it is the rainfall, influencing the fertility of the soil and the endemicity of malaria, which has largely determined the density-distribution of the population. The well-watered and fertile regions of the west and the south have the greatest concentration of people, while the dry lands of the north-central area are but sparsely occupied (Map II).

For administrative purposes, Ceylon is divided into 9 provinces and these are further sub-divided into a total of 21 Revenue or Administrative Districts (Map III).

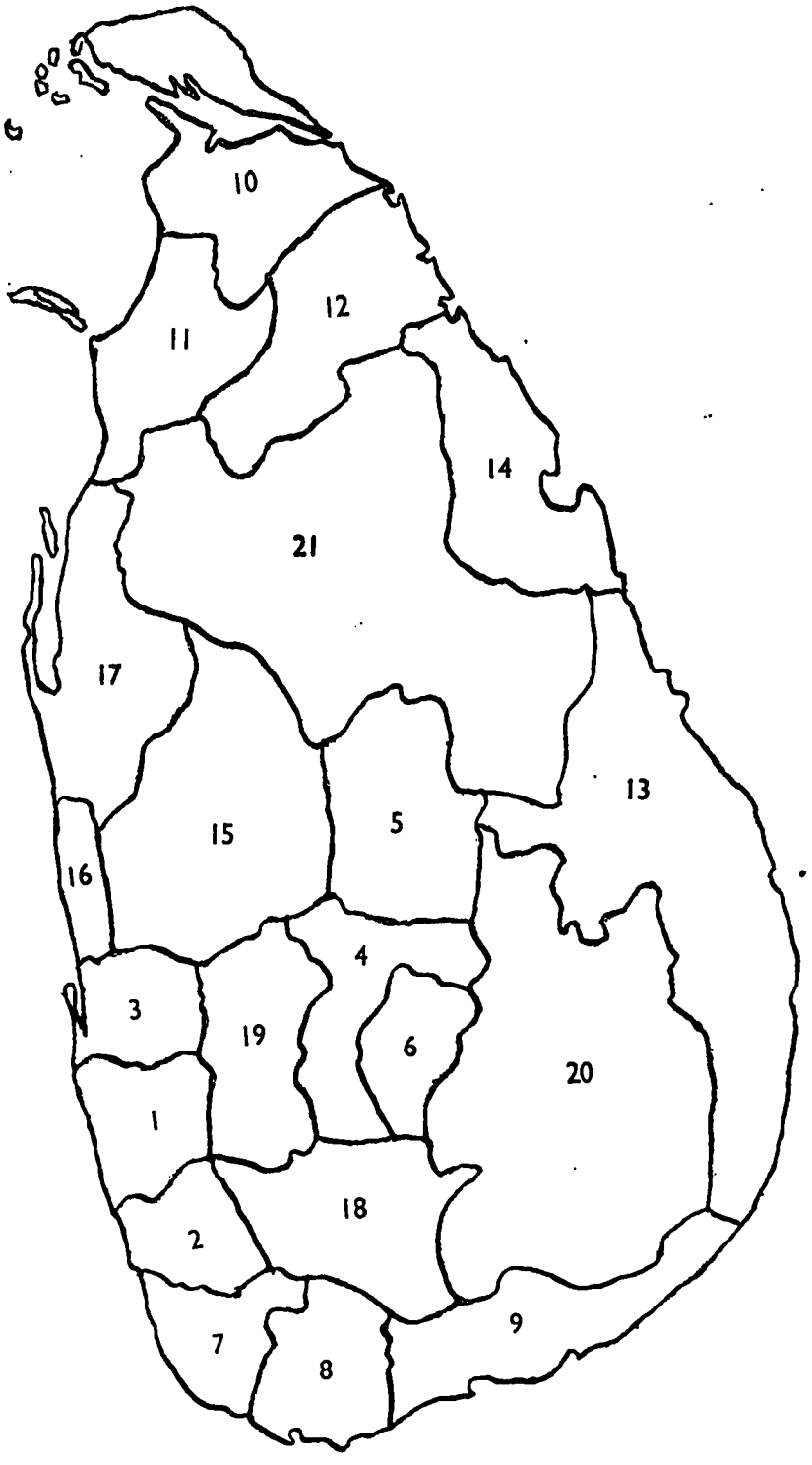
Province	*Districts*
Western	(1) Colombo, (2) Kalutara, (3) Negombo
Central	(4) Kandy, (5) Matale, (6) Nuwara Eliya
Southern	(7) Galle, (8) Matara, (9) Hambantota
Northern	(10) Jaffna, (11) Mannar, (12) Vavuniya
Eastern	(13) Batticaloa, (14) Trincomalee
North-Western	(15) Kurunegala, (16) Puttalam, (17) Chilaw
Sabaragamuwa	(18) Ratnapura, (19) Kegalle
Uva	(20) Badulla
North-Central	(21) Anuradhapura

Local administration functions through Village Committees (about 400 in 1946), Urban District Councils (38 in 1946) and Municipal Councils (at Colombo, Kandy and Galle in 1946).

The provinces and the districts differ in their population density and in the composition of their population (Tables 2 & 3), these differences merely illustrating the above remarks about density-distribution and the racial-distribution of the population.



Map 2.—Population Density in Ceylon.



Map 3.—Administrative Districts of Ceylon.

TABLE 2

The Population, Population Density and the Urban/Rural Population Ratio of the Districts of Ceylon at the 1946 *Census.*

Province	District	Total Population (thousands)	Population Density (thousands/ sq. mile)	Urban/Rural Population Ratio
Western	—	1876·9	1·311	0·577
	Colombo & Negombo	1420·3	2·400	0·650
	Kalutara	456·6	0·748	0·125
Central	—	1135·3	0·496	0·109
	Kandy	711·4	0·775	0·117
	Matale	155·7	0·173	0·099
	N'Eliya	268·1	0·564	0·038
Southern	—	961·4	0·448	0·122
	Galle	459·8	0·705	0·147
	Matara	351·9	0·732	0·112
	Hambantota	149·7	0·147	0·070
Northern	—	479·6	0·140	0·159
	Jaffna	424·8	0·426	0·146
	Mannar	31·5	0·033	0·218
	Vavuniya	23·2	0·016	0·221
Eastern	—	279·1	0·073	0·256
	Batticaloa	203·2	0·072	0·130
	Trincomalee	75·9	0·066	0·623
North-Western	—	667·9	0·221	0·055
	Kurunegala	485·0	0·264	0·033
	Puttalam	43·1	0·047	0·027
	Chilaw	139·8	0·533	0·069
Sabaragamuwa	—	745·4	0·394	0·030
	Ratnapura	343·6	0·275	0·037
	Kegalle	401·8	0·623	0·019
Uva	Badulla	372·2	0·114	0·046
North-Central	Anuradhapura	139·5	0·035	0·097

TABLE 3

The Racial Composition of the Population of each District in Ceylon.

District	Per Cent of Total Population who are					
	Sinhalese	Ceylon Tamil	Indian Tamil	Ceylon Moor	Indian Moor	Burghers and Eurasians
Colombo and Negombo	81·1	4·10	4·30	4·20	1·25	2·02
Kalutara	86·8	0·83	6·44	5·42	0·09	0·15
Kandy	57·8	4·20	29·2	6·79	0·65	0·53
Matale	68·1	3·14	21·9	5·24	0·66	0·30
N'Eliya	37·8	1·97	57·3	1·44	0·46	0·35
Galle	94·5	0·68	1·49	2·98	0·03	0·16
Matara	94·4	0·67	2·12	2·55	0·01	0·11
Hambantota	96·6	0·53	0·17	1·59	0·01	0·07
Jaffna	1·07	96·3	0·99	1·21	0·11	0·09
Mannar	3·82	51·0	11·2	30·2	2·87	0·13
Vavuniya	16·6	69·3	4·16	8·72	0·54	0·33
Batticaloa	5·83	49·7	0·59	42·0	0·21	0·57
Trincomalee	20·7	40·1	4·43	29·2	1·43	1·55
Kurunegala	92·2	1·52	1·60	3·85	0·36	0·14
Puttalam	52·0	12·8	2·13	30·8	0·81	0·23
Chilaw	87·0	5·17	3·31	2·92	0·32	0·16
Ratnapura	75·8	1·17	20·6	1·36	0·34	0·16
Kegalle	82·1	0·80	12·9	3·51	0·24	0·11
Badulla	57·4	4·18	34·2	2·72	0·47	0·30
Anuradhapura	79·7	6·67	2·22	10·1	0·65	0·16

It is not intended to discuss in detail the demographic position in Ceylon, but is necessary to indicate the present population distribution and rate of growth as a background to the mortality and morbidity figures. (A full discussion can be found in the General Report, Census of Ceylon, 1946).

The ancient records suggest that the population at the height of Ceylon's prosperity was many times greater than at present. If this be true then the Ceylonese must have approached near-extinction during the seventeenth and eighteenth centuries and have later apparently enjoyed a renascence during the prolonged period of British rule. Thus the population has been given at over 70 million persons at one period of the island's history (Denham; Ceylon at the Census of 1911, p. 9). Arunchalam calculated a population of at least 10 millions in the early 14th century A.D. (Census of Ceylon, 1901, p. 23) but the Census of 1827 enumerated only 889,584

persons. The accuracy of these figures cannot now be assessed and it is only since the first decennial census of 1871 that reliable data on the island's population are available.

These later figures show that, in common with the rest of the world, the population of Ceylon is increasing rapidly. In the countries of North-Western Europe (except Holland in which rapid growth is still continuing) and in those countries inhabited mainly by people of European descent (U.S.A., Australia, New Zealand, Canada) the rate of growth of the population is now declining. This is not true for Ceylon (Table 4), where the rate of growth seems to be still increasing.

The Western countries had their maximum rates of population growth in the 19th century ; Ceylon has probably still to reach her maximum rate.

TABLE 4

The Population of Certain Countries at Various Dates.

DATES	Total Population in Thousands			Increase (+) Decrease (–) or a Percentage of Population as 20 years before		
	Great Britain	Ceylon	Eire	Great Britain	Ceylon	Eire
1801	10,501	—	—	—	—	—
1821	14,092	—	—	34	—	—
1841	18,534	—	—	32	—	—
1861	23,128	—	4,402	25	—	—
1881	29,710	2,760	3,870	28	—	–12
1901	37,000	3,566	3,222	25	29	–17
1921	42,769	4,499	2,972	16	26	– 8
1941	46,605*	6,657†	2,992	9	48	0

* Estimated figures
† 1946 Census

The increase in population during the latter part of the 19th century was due largely to the immigration of Indian labourers first to coffee and then to the tea estates of Ceylon. More recently and for several reasons this immigration has been substantially reduced. The Indian immigrant labourers became resident on the estates and their descendants have formed a natural source of labour for replacement and expansion. In addition, further extension of the estates is not possible to any considerable degree so that the need for new immigrants is small. Moreover, in an effort to ' Ceylonise ' the local industries, in 1939 the Ceylon Government banned the immigration of labour from India. Despite this great reduction in the number of immigrants, the rate of growth of the population is still increasing (Table 5).

TABLE 5

The Recent Increase in the Population of Ceylon.

PERIOD	Natural and Actual Increase of Population 1871-46		
	Natural Increase (Excess of births over deaths)	Net Gain (+) or Loss (−) by Migration	Actual Increase
1871-1881	120	+240	360
1881-1891	144	+104	248
1891-1901	225	+333	558
1901-1911	362	+178	540
1911-1921	313	+ 80	393
1921-1931	663	+145	808
1931-1946	1,286	+ 64	1,350

A comparison of the rates of growth during the last two intercensal periods suggests, however, that the rate of growth may have passed its peak, e.g.

Years	Actual Increase per Year (Thousands)	Per cent. Increase per Year	Natural Increase per Year (Thousands)	Migration Increase per Year (Thousands)
1921-31	80·0	1·80	65·7	15·1
1931-46	90·0	1·69	85·4	4·6

The difference between the actual increases for these intercensal periods is due entirely to the greater number of births in the later period, e.g.

Years	Average Births per Year	Average Crude Birth Rate	Average Deaths per Year	Average Crude Death Rate
1921-30	194,612	39·8	128,917	26·5
1931-45	213,968	36·8	128,574	22·2

The average crude birth rate and death rate have decreased but, because of the different population sizes and the greater rate of decrease of the death rate, the average number of deaths per year is about the same while the average births per year have increased.

It is probable that migration will not affect, to any substantial extent, the population of Ceylon in the near future and that the rate of population growth will depend almost entirely upon the natural balance between births and deaths. It is only since the 1946 Census that the deaths in Ceylon have shown any marked

decrease so that it is only recently that the improved health of the people has influenced the rate of growth of the population. In Table 6 it will be seen that whereas the number of births per year has gradually increased during the last 20 years, the number of deaths has only declined during the last 3 years.

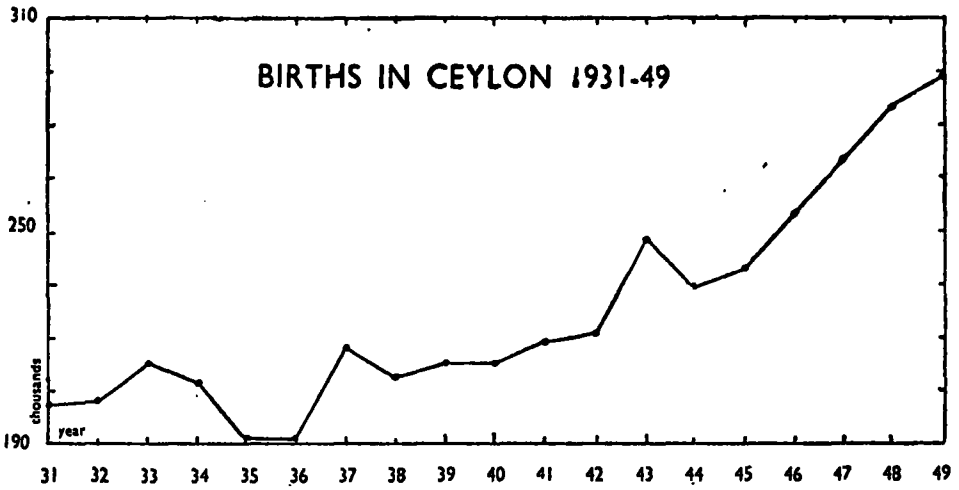
TABLE 6

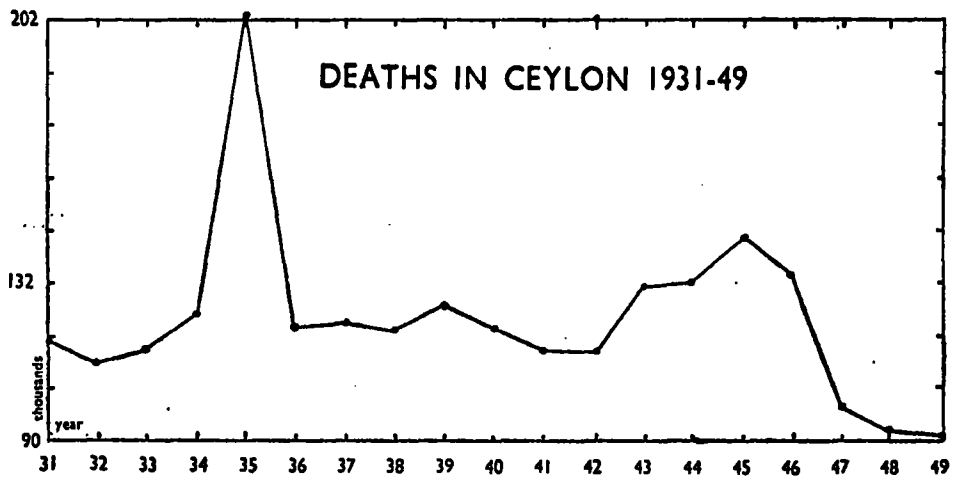
Annual Births and Deaths in Ceylon for the Period 1932-1949.

Year	Births	Deaths	Natural Increase (+) or Decrease (−)	Per cent. Natural Increase (+) or Decrease (−)
1932	199,370	110,649	+ 88,621	+1·66
1933	209,032	114,690	+ 94,342	+1·75
1934	206,512	127,069	+ 79,443	+1·46
1935	192,755	204,823	− 12,068	−0·22
1936	192,060	123,039	+ 69,021	+1·23
1937	216,072	124,210	+ 91,862	+1·63
1938	208,389	122,299	+ 86,090	+1·51
1939	212,111	128,611	+ 83,500	+1·44
1940	212,980	122,738	+ 90,242	+1·53
1941	219,864	113,003	+106,861	+1·79
1942	221,064	112,044	+109,020	+1·81
1943	248,820	131,061	+117,759	+1·95
1944	232,827	133,985	+ 98,842	+1·61
1945	238,494	142,931	+ 96,561	+1·54
1946	256,886	135,937	+120,949	+1·86
1947	271,191	98,544	+172,647	+2·58
1948	287,695	93,711	+193,984	+2·82
1949	291,191	91,889	+199,302	+2·82

In other words, we can distinguish 3 phases in the growth of the population of Ceylon, viz. (1) between 1871 and 1901 when emigration from India was the major contributory factor ; (2) between 1901 and 1946 when the increase depended mainly on the increase in the number of births ; and (3) a phase which is commencing and in which the death rate is declining rapidly. It is this recent new factor which complicates any estimates of Ceylon's future population. Until this trend can be studied over a period of years any population predictions must be looked upon with caution.

Ranasinha (Census of Ceylon, 1946) has estimated that the population of Ceylon will be nearly 11 million in 1981, but his estimates are derived from population trends existing before the death rate began to decline. His estimates are, therefore, probably too low and, indeed, whereas he estimated a population of 7,147,000 for 1951, the Registrar-General of Ceylon gives an estimated population 7,297,000 for


BIRTHS IN CEYLON 1931-49
310
250
190
thousands
year
31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49


DEATHS IN CEYLON 1931-49
202
132
90
thousands
year
31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49

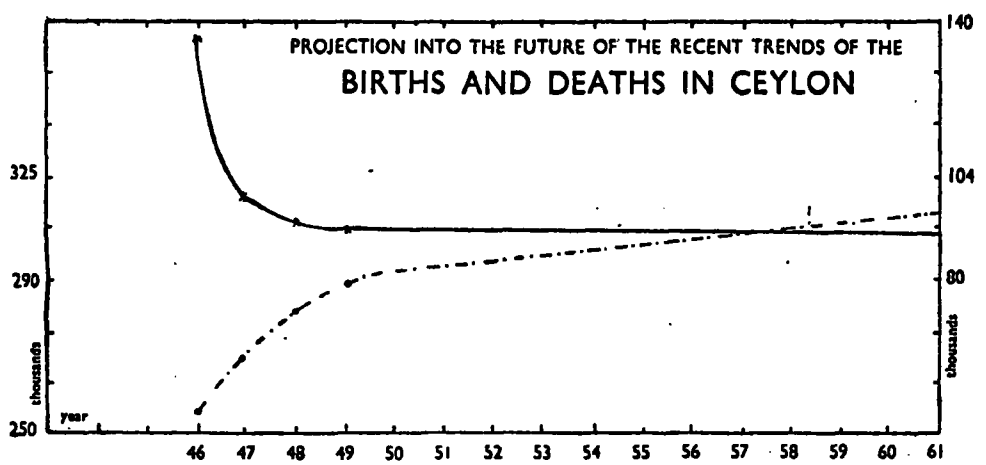
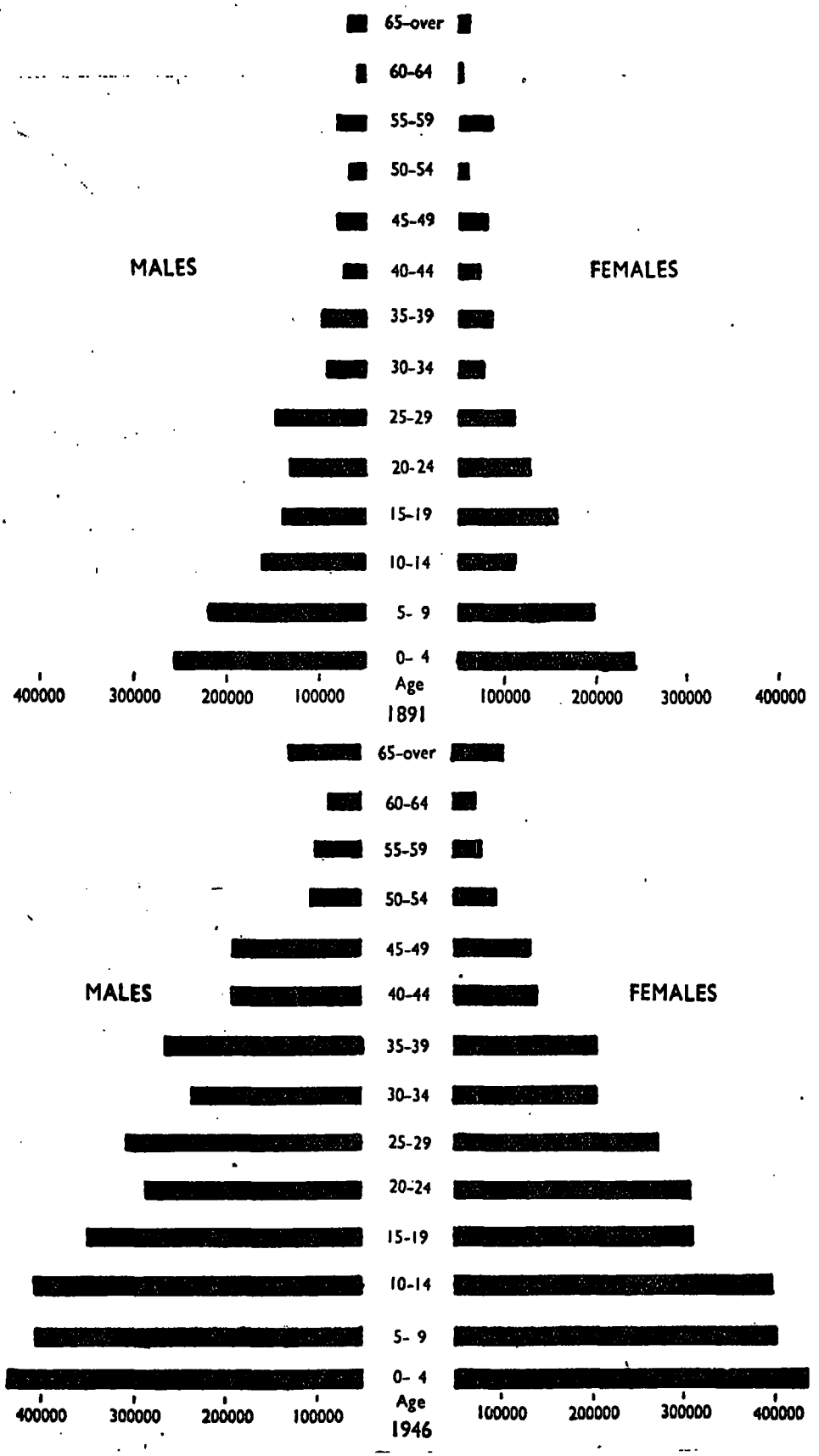

PROJECTION INTO THE FUTURE OF THE RECENT TRENDS OF THE
BIRTHS AND DEATHS IN CEYLON
325
290
250
thousands
year
140
104
80
thousands
46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61

Figure 1.

AGE PYRAMIDS FOR CEYLON. 1891-1946



1949. Assuming that the present trends in births and deaths continue (Figure 1), we can estimate the population as being 10,180,000 in 1961 (allowing 24,000 gain by migration each year, which is the average for 1946-49); Ranasinha estimates the 1961 population at 8,197,000. It is possible that our estimate is also too low since we have assumed only a very gradual rise in total births each year and an even slower fall in the number of deaths. For one thing the recent great reductions in infant and maternal mortality rates is going to increase the fertility of the Ceylon female population but it is not possible to estimate the increase accurately until the present mortality trends become stabilized.

The Change in Age Distribution :—

The Age Pyramids for the census years 1891 and 1946 are shown in Chart 1.

In the population of 1946 every age group is larger than the next older group and an age pyramid is obtained which is typical of those found in Western countries fifty years ago. The proportionate age distribution of the Ceylon population in 1946 is also very similar to that in Great Britain in 1891 (Table 7). However, the proportion of young people has fallen steadily during the past 65 years and, although this ageing process is not occurring as rapidly as in, for example, Great Britain, yet it will presumably be accelerated in the future owing to the greater expectation of life resulting from the recent decrease in the general death rate.

TABLE 7

The Age Distribution of the Population of Ceylon in Various Census Years.

Year	CEYLON (Thousands)							
	MALES				FEMALES			
	0-19	20-39	40-59	60 & over	0-19	20-39	40-59	60 & over
1881	774·2	451·9	190·1	50·2	725·0	386·4	143·8	32·1
1891	834·2	498·8	204·3	55·4	785·3	433·1	160·9	34·8
1901	972·0	624·5	239·5	58·0	917·8	528·3	184·9	38·5
1911	1050·4	717·5	306·8	100·3	976·2	627·1	·252·1	76·0
1921	1131·5	788·9	350·1	111·2	1053·7	695·2	281·1	84·8
1946	1628·3	1132·7	565·3	196·0	1530·6	994·6	435·8	164·0
	Per cent. of Total Population.							
1881	53	31	13	3	56	30	11	3
1891	52	31	13	4	56	31	11	2
1901	51	33	13	3	55	32	11	2
1911	48	33	14	5	51	32	13	4
1921	47	33	15	5	50	33	13	4
1946	46	32	16	6	49	32	14	5

Great Britain—Per cent. Distribution of Population (Males and Females).

Year	0-19	20-39	40-59	60 & over
1891	45	30	17	7
1947	21	30	26	15

The changes in the mortality rates for the past years can be seen by a comparison of the death rates at various ages for the years 1937 to 1948 (Table 8).

TABLE 8 (A)

Death Rates for each Age Period per 1,000 of the Population at the same Age.

ALL PERSONS

Age Periods	YEARS											
	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Under 5 years	65·2	63·2	65·6	59·3	52·7	49·0	62·7	63·4	62·2	61·1	47·9	46·4
5–	7·6	7·1	7·3	7·0	6·3	6·4	8·5	8·8	8·3	6·7	4·4	4·1
10–	3·8	3·5	3·8	3·8	3·6	3·5	3·8	4·0	4·0	4·0	2·2	1·9
15–	6·3	6·0	6·3	5·9	5·5	5·5	5·9	6·3	6·9	5·6	3·5	2·9
20–	9·4	9·1	8·9	8·2	7·9	7·7	8·2	8·1	9·2	6·7	5·9	5·0
25–	11·4	10·6	10·4	9·8	9·1	9·0	9·3	9·0	9·6	9·1	7·0	5·8
35–	14·4	13·9	13·9	13·7	12·3	13·1	13·5	12·7	13·7	12·4	8·2	6·9
45–	20·1	18·9	19·3	19·4	17·4	18·6	19·6	18·8	20·5	18·5	11·7	10·5
55 +	69·9	69·9	75·5	75·2	70·3	74·5	79·2	77·2	82·0	72·9	43·7	40·4

TABLE 8 (B)

Death Rates for each Age Period per 1,000 *of the Population at the same Age.*

MALES

Age Periods	YEARS											
	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Under 5 years	65·7	63·2	64·2	59·0	52·5	48·7	61·0	62·4	61·6	60·4	48·2	46·9
5–	7·12	6·36	6·76	6·40	5·90	5·85	7·75	8·18	7·71	6·20	4·20	3·80
10–	3·63	3·28	3·51	3·46	3·37	3·29	3·51	3·74	3·60	3·18	2·08	1·89
15–	5·58	5·06	5·75	5·22	4·88	5·02	5·65	5·93	6·49	5·10	2·93	2·60
20–	7·10	6·87	6·98	6·49	6·67	6·39	7·05	6·98	7·50	6·51	4·27	3·89
25–	9·03	8·33	8·27	8·04	7·43	7·73	8·32	7·84	8·07	7·34	5·44	4·45
35–	13·6	12·9	13·3	13·0	11·7	12·8	13·5	12·7	13·1	11·7	7·69	6·45
45–	21·8	20·9	21·3	21·3	19·3	21·0	22·8	21·5	23·4	20·8	12·6	11·3
55+	65·1	65·8	70·7	70·0	66·0	71·9	76·6	74·2	78·2	68·4	43·0	38·9

TABLE 8 (C)

Death Rates for each Age Period per 1,000 *of the Population at the same Age.*

FEMALES

Age Periods	YEARS											
	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Under 5 years	64·7	63·5	66·9	59·5	52·8	49·3	63·0	64·3	63·1	67·6	47·6	46·1
5–	8·00	7·80	7·83	7·71	6·71	6·97	9·17	9·40	8·98	7·11	4·70	4·30
10–	4·09	3·84	4·14	4·12	3·78	3·74	4·19	4·20	4·50	3·52	2·28	1·88
15–	7·05	7·08	6·95	6·53	6·26	5·99	6·22	6·65	7·31	6·10	4·18	3·36
20–	11·7	11·3	10·9	9·96	9·17	8·93	9·36	9·31	10·8	10·3	7·37	6·19
25–	14·1	13·1	12·8	11·8	11·0	10·3	10·3	10·4	11·3	11·2	8·78	7·35
35–	15·9	15·1	14·7	14·6	13·0	13·4	13·5	12·8	14·4	13·4	8·78	7·87
45–	18·0	16·5	17·0	17·1	15·2	15·6	15·8	15·8	17·2	15·5	10·5	9·45
55 +	76·6	75·7	82·3	82·3	76·4	77·9	82·8	81·8	90·1	78·9	44·6	42·4

These figures show that the improvement in the death rates has occurred with more or less equal emphasis at all ages and for both sexes, so that for all age-periods the expectation of life must have increased.

There are, at present, no official life-tables available for the Ceylon population and the data presented in the Registrar-General's Reports are not sufficiently detailed to allow accurate estimates to be made. The compilation of life-tables is an actuarial feat involving elaborate calculation, presumptions and deductions which the accuracy of the basic data available in Ceylon would hardly seem to justify. Some of the omissions from the Registrar-General's Reports which make life-expectancy calculations so difficult include the absence of information on births by sex for each quarter of the calendar year and the fact that deaths are not classified by each year of life. Despite these handicaps, it did seem necessary to make some assessment of the change in life expectancy which is occurring in Ceylon today as a result of the rapid alterations in the death rate.

The graduated rates of mortality at infantile ages and the average length of life experienced by those infants have been calculated by the methods detailed in the Registrar-General's Decennial Supplement, England and Wales 1931, the assumption being made that the sex-ratio at birth was the same for each quarter of the calendar year as that given for the whole year. It did not seem justifiable to continue this assumption into the calculations of the death rates for each year for the ages 1 to 5 years, so these rates were calculated direct from the recorded deaths for each year of life and the population for that age. For persons over 5 years of age, deaths are only enumerated for age-periods of 5 or 10 years so that here the assumption has been made that the death-rate calculated for each age-period was the same as that existing at each year of age of that period. In view of the possible errors in recording ages in Ceylon this assumption probably gives a fair estimate and certainly more elaborate procedures are not justified.

The Life-Tables cannot, therefore, be absolutely accurate but, since gross changes are being looked for, they probably give a reasonable estimate of the mortality experience in Ceylon.

For the whole of Ceylon, separate Life-Tables have been estimated for males and females and three such tables have been compiled for each sex. In the first one, the practice followed in compiling the English Life-Tables has been used and the death rates for the years, 1945, 1946 and 1947 have been applied to the 1946 Census data. However, it is since 1946 that the great reduction in mortality has occurred so that such a procedure, while having a sound statistical basis, will probably give erroneous estimates. To assess the alterations in life expectations that may have occurred recently, therefore, the death rates for the years 1946 and 1949 have also been applied to the 1946 Census. These Life-Tables are given in detail in the Appendix, but some of the more important estimated life-expectations are presented in Table 9.

Up to the age of 45 years, males have a longer expectation of future life than have females ; in late-middle life the females have a slightly greater expectation although this changes in old age to favour males again. The enormous difference which the new mortality rates have made to the average future life time is readily evident from the comparative figures for 1946 and 1949. At all ages, both males and females now have a chance to live longer, the increase in life-expectation being of

TABLE 9

Calculated Life-Expectations in Ceylon.

Age in Years	Expectation of Life in Years for the 1946 Population using the Mortality Rates for the Years.					
	1945-47		1946		1949	
	Males	Females	Males	Females	Males	Females
0	47·2	42·5	43·8	41·5	54·2	52·8
5	55·5	51·4	52·4	50·2	59·9	58·5
10	52·1	48·2	49·1	47·0	56·0	54·7
20	43·9	40·2	40·8	39·0	47·0	45·9
30	36·6	34·2	33·5	33·2	38·7	38·5
45	25·3	24·3	22·7	23·7	26·6	27·1
60	16·0	14·3	13·8	14·0	16·0	15·9

the order of 10 to 11 years. Even with the 1949 mortality rates males can still expect to live longer but the increase in future length of life has been greater for the females.

One result of this changing mortality risk in Ceylon is that the proportion of aged people in the population will increase. This 'ageing' has been progressing for some time in most countries and was even evident in Ceylon before the 1946 Census (Table 10). Ceylon's population is still younger than those in Eire and Great Britain but the proportions in the various age groups are altering and this alteration will be accelerated by the recent change in life-expectation.

TABLE 10

Changes in Age Distribution of the Population of Ceylon and the British Isles.

Country	Year	Proportion Per cent. of Total Population Aged—			
		0-19	20-39	40-59	60 & over
Ceylon	1891	54	31	12	3
	1946	48	32	15	5
Eire	1891	45	27	19	9
	1941	36	29	21	14
Great Britain	1891	45	30	17	7
	1947	28	30	26	15

Marriage:—

'Since nearly all births occur to married women it is obvious that the proportion of people who marry before they are too old to have children is a factor of basic importance to the trend of the population'. The proportion of people aged 45-54 who have been married may be taken as a reasonably good index of the marriage trend of the population, while the proportion of people aged 20-24 who are married may be taken to indicate changes in the ages at which the people are marrying (Table 11).

TABLE 11

Proportion of People of each Sex Aged 45-54 and 20-24 Years who were or had been married (Ceylon).

Year	Aged 45-54		Aged 20-24	
	Males	Females	Males	Females
1901	87·6	90·4	37·1	79·1
1911.	88·2	91·6	23·2	72·8
1921	89·0	92·6	18·6	69·0
1946	92·6	96·4	19·6	70·6

There has been a steady rise during the century in the proportion of both males and females, aged 45-54, who have been married. Part of this rise for females may have been due to the increased expectation of life of married women due to the falling maternal mortality rates, but a greater possibility is the improved method of enumeration of conjugal condition with each successive census. In the census reports of 1911 and 1921 it is stated that the parties to unregistered marriages were often recorded as 'unmarried'; it is claimed that this error was eliminated in the 1946 Census.

(There are three recognised systems of marriage in Ceylon. That for the general population recognises marriages solemnized by a Christian Minister or by the Registrar of Marriages. The Kandyan Sinhalese Marriages may be in *diga* (patrilocal marriage) or in *binna* (matrilocal marriage). Fraternal polyandry also occurred until recently among the Kandyans, but it is now believed to have died out. The registration of Muslim Marriages is regulated by a law passed in 1886. Limited polygamy is allowed but is said to be infrequent among Ceylon Muslims).

Too much stress must not, therefore, be placed upon the figures, purporting to marriages, in the previous census years. Probably the proportion of people marrying has not altered to any great degree. This is certainly true for example in Great Britain (Table 12).

TABLE 12

Proportion of People Aged 20-24 and 45-54 who were or had been married (Ceylon and Great Britain).

Year	Aged 20-24 years		Aged 45-54 years	
	Ceylon Per cent.	Great Britain Per cent.	Ceylon Per cent.	Great Britain Per cent.
1901	57·5	22	89·0	87·1
1911	48·1	19	89·9	85·5
1921	43·8	22	90·6	85·2
1946	44·3	32*	94·2	86·9*

* 1947 figures.

However, the figures for the population aged 20-24 years do indicate that females and especially males are marrying later than they did in 1901, although even this trend appears to be altering in 1946. Females marry much sooner than males and there is, in the general population, a larger proportion of married females than married males. (In Great Britain, at 45 to 54, there have always been a greater proportion of married males than married females but the influence of emigration, war, etc., complicates the picture there).

TABLE 13

The Marital Condition of Population of Ceylon (1901-46).

	1901		1911		1921		1946	
	Total	Per cent.	Total	Per cent.	Total	Per cent.	Total	Per cent.
Single	2132·4	59·8	2459·8	59·9	2691·6	59·7	3783·5	56·8
Married	1200·1	33·7	1378·2	33·6	1495·3	33·3	2498·5	37·6
Widowed	233·2	6·5	268·3	6·5	310·8	7·0	375·3	5·6

(Totals are in thousands)

TABLE 14

Annual Births, Marriages and Birth Rates in Ceylon 1933-1949.

Years	Total Births (Thousands)	Total Marriages (Thousands)	Total Persons Married (Thousands)	Marriage Rates
1933	209·0	27·2	—	5·02
1934	206·5	29·8	—	5·36
1935	192·8	25·0	—	4·46
1936	192·1	28·3	56·8	5·02
1937	216·1	34·8	69·4	6·07
1938	208·4	35·5	70·8	6·09
1939	212·1	32·6	64·8	5·51
1940	213·0	33·5	66·6	5·62
1941	219·0	36·5	72·8	6·04
1942	221·1	48·5	96·5	8·04
1943	248·8	50·2	100·2	8·18
1944	232·8	46·9	93·6	7·46
1945	238·5	44·3	87·9	6·82
1946	256·9	43·0	85·6	6·42
1947	271·2	42·4	84·4	6·15
1948	287·7	44·7	89·3	6·30
1949	291·2	45·7	91·3	6·26

We have already noted that the number of births occurring each year is steadily increasing (Table 6). This increase may be due to two factors, a change in the number of married couples or a change in the fertility of married couples. The number of married people in the population has increased steadily since 1901 (Table 13) though it is only since 1921 that the proportion of married people in the population has increased.

In other words the increasing numbers of people married reflects the increasing size of the population but, in the last intercensal period, there has also been a rise in the proportion of people married. This can be studied in more detail by comparing the annual total marriages and marriage rates since 1933 (Table 14).

The annual marriages have increased in a fluctuating manner. There was a high peak during the war (1943) and a fairly high rate has been more or less maintained up to the present time. The variation in the annual number of marriages is closely paralleled by the variation in the annual marriage rate, and we can conclude that a greater proportion of people are now marrying and this greater rate, together with the increasing size of the population, has produced a considerable (68 per cent.) increase in the number of annual marriages since 1933. This increase in the marriage rate would itself readily account for the increased number of annual births over the same period.

A comparison between the proportion of people in the various age groups who were or had been married in 1921 and 1946 is also of interest (Table 15).

TABLE 15

Proportion of People who were or had been married, by age, in Ceylon (1921 *and* 1946).

Age Group	1921 Per cent.	1946 Per cent.
15-19	13·9	12·1
20-24	43·7	44·5
25-34	73·0	77·3
35-44	86·8	91·9
45-54	90·7	94·3

It will be seen that people have been marrying slightly later and there would also seem to be more people eventually marrying. If the trend towards later marriages continues then this may become an important factor which may decelerate the rate of population increase.

Fertility :—

This is the second important influence affecting the number of births in a given population and it can be estimated in several ways. The crude Fertility Ratio (proportion of children under 5 years of age to the number of women aged 15 to 44 years inclusive) is the simplest measure and is sufficiently accurate for most purposes. When estimated in this way, the fertility of Ceylon women has apparently decreased

steadily over the past sixty years (Table 16). The ratio is, however, still greater than that found in Western countries, e.g. the British Isles.

TABLE 16

Fertility Ratios (Unstandardized) in Ceylon.

Years	All Ceylon	Sinhalese	RACES Ceylon Tamil	Indian Tamil	Moors	Burghers	Eire	United Kingdom
1881	882	923	644		1035	—	508	1871 / 580
1891	835	—	—		—	—	448	
1901	817	913	579		936	—	421	1901 / 460
1911	686	—	—	—	—	—	450	
1921	648	703	541	493	677	—	460*	1921 / 313
1946	594	525	511	644	624	473	427†	1946 / 339

* 1926

† 1941

The reasons for the decline in fertility are difficult to find. In the West it is known that urbanisation, improved education, increased incomes, etc., are factors which tend to reduce fertility by affecting the age of marriage, promoting birth control measures, and creating an awareness of social and personal responsibilities. These influences cannot, as yet, be accurately assessed, although it would appear that, as in Western countries, so in Ceylon the urban population has a lower fertility. This is true despite the smaller proportion of rural women who are in the reproductive age group (15-44 years), e.g.

TABLE 17

The Differential fertilities of Urban and Rural population in Ceylon, 1946.

	Average Number of children born per mother	Average Number of children living per mother	Proportion of Female Population in Reproductive Age Group	Proportion of women in Reproductive Age Group who had borne children
Rural—	4·4	3·2	50·2 per cent.	59·2 per cent.
Urban—	3·8	2·9	54·3 per cent.	49·0 per cent.

It has not been possible to make more refined estimates of fertilities since the births of children by age of mother are not available. The 1946 Census, however, does give estimated reproduction rates for Ceylon, these being a Gross Reproduction Rate of 2·302 per woman and a Net Reproduction Rate of 1·588 per woman. Again these rates are higher than those to be found among the population of England and Wales.

Sex Ratio :—

Ceylon in common with most other Eastern countries has a preponderance of males in all age-groups of the population. This is true for all the main ethnic groups in Ceylon too (Table 18). In the countries of Western Europe, due to the devastations of war, the hazards of industrial occupation, better maternal care and to migration, females exceed males in the populations.

TABLE 18

Ratio of Males and Females at Various Age-Periods in the Population of Ceylon.

Age	All Ceylon 1891	All Ceylon 1946	Sinhalese 1946	Ceylon Tamil 1946	Indian Tamil 1946	Ceylon Moors 1946
Birth	109	104	104	104	102	102
0–4	106	103	104	102	100	103
5–9	115	103	104	102	100	100
10–14	128	106	107	104	99	110
15–19	82	115	116	109	110	111
20–24	101	104	96	108	128	110
25–29	116	114	106	113	124	115
30–34	152	121	115	114	135	124
35–39	120	126	117	119	153	133
40–44	144	130	123	119	156	127
45–49	93	134	129	121	169	130
50–54	150	113	105	108	163	115
55–59	157	136	135	114	186	138
60–64	212	103	122	103	149	105
65–69	141	118	120	108	144	120

It is normal for the number of male births to be greater than the number of female births and, in Ceylon during the period 1937-45, there were 1,035 male live births to every 1,000 female live births. In most countries too, the male infant death rate exceeds that for females and, in Ceylon during the period 1937-45, 1,144 male infants died to every 1,000 deaths of female infants. In most countries in the West this higher male death rate persists throughout life but in Ceylon, after the first year of life, females have a consistently greater mortality rate. There has been a marked reduction in all the death rates in Ceylon since 1946 and this reduction has been proportionately similar for males and females in all age groups (Table 8). The absolute reductions for females have been greater than those for males and the maternal mortality rate has been markedly reduced. If these trends continue then the proportion of females to males in the population may be increased in the future and this, by providing more females in the reproductive ages, may produce a rise in the fertility of the population.

It is possible to conclude from this short analysis of the recent trends in the growth of the population of Ceylon :

(1) Because estate expansion is now negligible and because of recent legislation, immigration will not play an important part in determining Ceylon's future population.

(2) Since the beginning of this century, the increase in the size of the population has been due almost entirely to a rise in the number of births each year. This increase in births is caused by a rise in the number of marriages and also in the marriage rate. The process is a cumulative one. An increase marriage rate means increased births which cause an increased population. This in turn means even more people marry which produces still more births and so on.

(3) There are evidences of limiting factors to this process. People are beginning to marry later and the fertility rate is declining.

(4) During the last three years there has been a sudden decline in the general death rate and this is another process which is going to accelerate the growth of the population. Not only has the general expectation of life increased but the infant mortality rate has been reduced so that more people will now live to the ages of marriage. In addition, the maternal mortality rate has also been decreased so that more mothers can live to have further babies.

(5) As the trend is so recent in origin any population projections and predictions into the future would be mere guesses. It is important, however, to study in more detail the mortality experience in Ceylon.

PART II

The Mortality Pattern in Ceylon

One method of comparing the distribution of the pathology of disease in different countries is to study the proportion of deaths from the principal causes. The proportion of deaths from principal causes in Ceylon, Eire, the United States of America and England and Wales for certain years have, therefore, been detailed in Table 19.

TABLE 19

Proportions of Deaths from Principal Causes in 1948 *and for the period* 1937-1948 *for Ceylon.*

Causes of Death	PROPORTION PER 1,000 DEATHS				
	Ceylon		Eire 1947	U.S.A. 1947	England & Wales 1947
	1937-48	1948			
All causes	1,000	1,000	1,000	1,000	1,000
Enteric	9·1	9·2	—	0·2	0·06
Influenza	14·4	12·1	15·0	5·3	—
Dysentery	16·1	7·7	—	0·6	0·15
Phthisis	25·8	40·2	64·0	31·0	38·3
Other forms of tuberculosis	3·1	3·2	2·0	2·5	6·45
Malaria & Malarial Cachexia	56·2	35·7	—	0·1	0·02
Ankylostomiasis	12·5	9·9	—	—	—
Convulsions under 5 years	93·5	86·6	—	—	0·67
Cancer	6·5	9·8	90·0	132·4	154·5
Diabetes Mellitus	5·3	5·3	5·0	26·2	6·84
Intracranial lesions of vascular origin	17·7	23·3	69·0	91·4	132·1
Diseases of the heart	18·3	29·6	252·0	321·4	280·0
Other diseases of the circulatory system	5·5	5·8	20·0	19·0	37·7
Bronchitis	12·0	12·6	30·0	—	61·1
Pneumonia and Broncho-pneumonia	73·1	86·4	42·0	37·8	63·9
Diarrhoea and Enteritis	55·2	53·7	19·0	5·6	11·4

TABLE 19 (*Contd.*)

Proportions of Deaths from Principal Causes in 1948 *and for the period* 1937-1948 *for Ceylon.*

Causes of Death	PROPORTION PER 1,000 DEATHS				
	Ceylon		Eire 1947	U.S.A. 1947	England & Wales 1947
	1937-48	1948			
Nephritis	12·7	13·7	25·0	56·0	24·5
Deaths during puerperium and child-birth	28·7	25·4	3·0	3·5	1·78
Diseases peculiar to first year of life	108	154	57·0	45·5	30·2
Senility	58·6	73·8	147·0	19·2	30·0
Pyrexia	91·0	46·0	—	—	—

It is evident that tropical, agricultural Ceylon differs from Western countries with a more temperate climate in the following main aspects :—

(*a*) The main causes of death in Ceylon are the parasitic and infective diseases, which still account for about 1 in every 8 deaths. (Eire 1 in 12 ; U.S.A. 1 in 25). The main causes of death in Western countries are from diseases of the Cardiovascular system (with the accompanying or attendant dangers of vascular intracranial lesions and possibly nephritis), which there account for one in three to one in two of all deaths (Ceylon 1 in 20). These latter diseases occur mainly in the middle and later years of life and may possibly be more prevalent in Western countries because of the greater length of life there.

(*b*) Similarly, cancer, another hazard of the later years of life and which accounts for 9 to 15 per cent. of all deaths in Western countries, produces less than 1 per cent. of the deaths in Ceylon.

(*c*) By contrast the dangers to life during the first post-natal year are 3 to 4 times greater in Ceylon.

(*d*) Maternal risk of death during the puerperium and child-birth is 8 to 15 times greater in Ceylon.

(*e*) Other points to note are the similarity of the proportion of deaths due to phthisis and diabetes (except in U.S.A.) in all the countries, while bronchitis is more prevalent as a cause of death in Western countries and convulsions in children and pneumonia are commoner causes in Ceylon.

(*f*) Eire (temperate climate and agricultural economy) exhibits a distribution of causes of mortality which tends to be intermediate between that of Ceylon (tropical and agricultural) and those shown by America and Britain (mainly temperate and more industrialized).

(*g*) The crude death rate in Ceylon has dropped suddenly since 1946 to a level which is similar to that shown by Western countries (Table 20).

TABLE 20

Death Rates (per 1,000 of the Population) of Ceylon and Certain Other Countries.

(a) Year by Year Comparisons.

Years	Ceylon	Eire	Northern Ireland	England & Wales	Scotland	U.S.A.
1938	21·0	13·6	13·7	11·6	12·6	10·6
1939	21·8	14·2	13·5	12·1	12·9	10·6
1940	20·6	14·2	14·6	14·0	14·9	10·7
1941	18·8	14·6	15·2	12·9	14·5	10·5
1942	18·6	14·1	13·3	11·6	13·0	10·4
1943	21·4	14·8	13·4	12·1	13·3	10·9
1944	21·3	15·3	12·8	12·7	13·6	10·6
1945	22·0	14·5	12·3	11·4	13·2	10·6
1946	20·3	14·0	12·5	11·5	13·1	10·0
1947	14·3	14·8	12·6	12·0	12·9	10·1
1948	13·2	—	—	—	—	9·9*

* estimated

(b) Period Comparison.

Continent	Country	Period	Death Rate
Europe	United Kingdom,	1943-1947	11·8
	France	1943-1947	15·9
	Italy	1943-1947	13·6
America	U.S.A.	1943-1947	10·4
	Canada	1943-1947	9·6
	Venezuela	1943-1947	15·5
	Chile	1943-1947	18·7
Africa	South Africa	1943-1947	9·1
	Egypt	1938-1942	26·9
Australia	Australia	1943-1947	10·4
	New Zealand	1943-1947	9·8
Asia	Ceylon	1943-1947	19·9
	India	1943-1947	21·2
	Federated Malay States	1936-1940	18·9
	Japan	1943-1947	19·0

This sudden drop in the rate can be attributed almost entirely to the near-eradication of malaria following the successful use of D.D.T. as a control measure for mosquitoes. It is a remarkable achievement, and in the space of one year, the total mortality rate fell from one typical of Asian or backward countries in general to a level comparable with the more prosperous and advanced countries of the world. This reduction in general death rate has been accompanied by an alteration in the principal causes of deaths (see 1948 figures in Table 20). Although, one in every nine deaths are still due to parasitic and infectious diseases and only one in twenty to cardio-vascular diseases, there are definite signs that the mortality picture is becoming ' westernized '. The proportion of deaths due to diseases of the middle and later years of life is gradually rising and that due to infectious diseases is falling. (Figure 2).

Whether the Ceylon death rate will remain stabilized at the new low-level is going to depend upon the relative rapidity of these two trends. As the expectation of life increases so we can expect more deaths from heart disease, cancer, chronic, nephritis, etc. On the other hand, tuberculosis is a growing menace, while bowel infestations and diseases have still to be controlled.

Actually, the mortality rate from tuberculosis, and phthisis in particular, has remained fairly stable since 1941. These recorded mortality rates compare favourably with those of European countries but this may be accounted for by differences in the accuracy of diagnosis (Table 21).

TABLE 21

(*a*) *Mortality Rate per* 1,000 *of the Population from Tuberculosis.*

Years	Ceylon	Eire	Northern Ireland	England and Wales	Scotland
1938	0·618	1·09	0·92	0·64	0·69
1939	0·616	1·13	0·84	0·63	0·70
1940	0·619	1·25	0·98	0·70	0·82
1941	0·611	1·24	1·04	0·73	0·83
1942	0·569	1·47	0·97	0·66	0·80
1943	0·576	1·46	0·91	0·67	0·79
1944	0·593	1·30	0·89	0·63	0·82
1945	0·564	1·25	0·80	0·56	0·79
1946	0·598	1·14	0·83	0·53	0·79
1947	0·557	1·24	0·72	0·56	0·79
1948	0·574	—	—	—	—

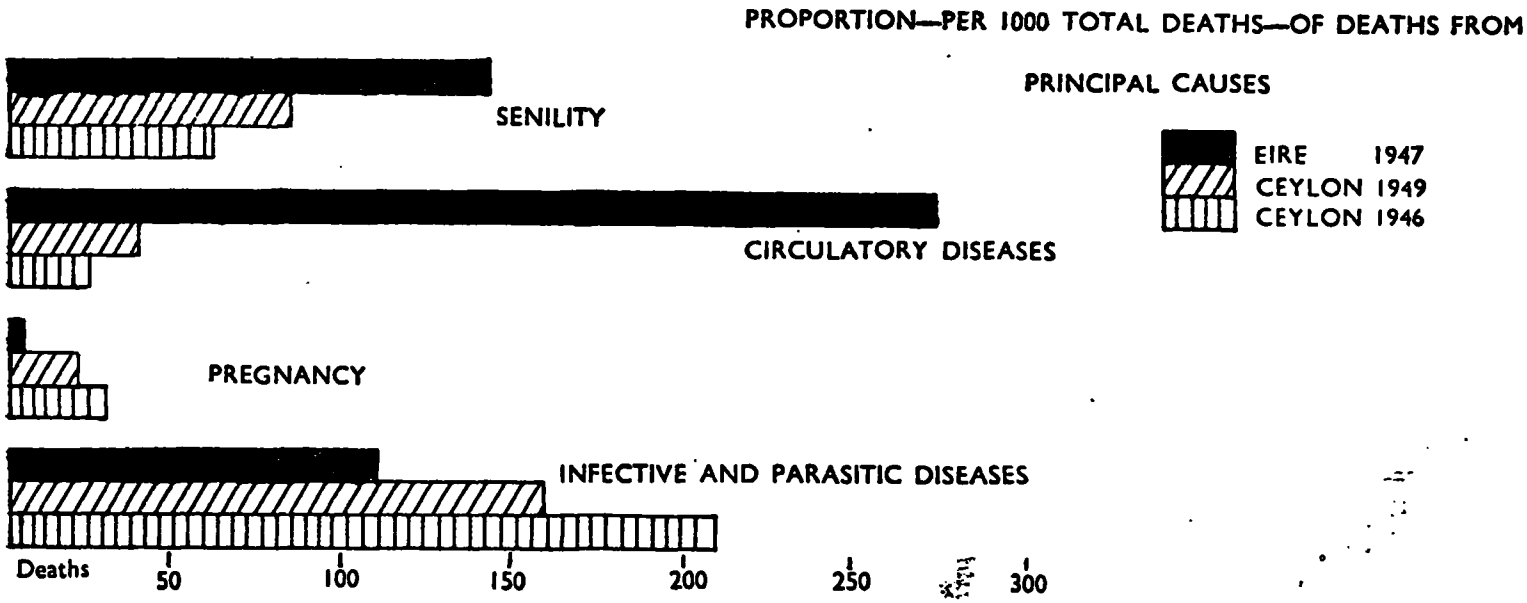

PROPORTION—PER 1000 TOTAL DEATHS—OF DEATHS FROM
PRINCIPAL CAUSES
SENILITY
CIRCULATORY DISEASES
PREGNANCY
INFECTIVE AND PARASITIC DISEASES
EIRE 1947
CEYLON 1949
CEYLON 1946
Deaths
50
100
150
200
250
300

Figure 2.

TABLE 21 (*Contd.*)

(*b*) *Mortality Rate per* 1,000 *of the Population from Tuberculosis of the Respiratory System.*

Country	1943	1944	1945	1946	1947	1948
Ceylon	0·517	0·500	0·503	0·542	0·510	0·532
Eire	1·15	1·00	0·94	0·87	0·95	—

The highest mortality rates for tuberculosis occur after the age of 20 and, if the age distribution of the population changes in the future, then a greater number of deaths from this cause can be expected. The age specific mortality rates of males from respiratory tuberculosis have not varied significantly during the past eleven years, but there is a suggestion that the mortality rates in the higher age groups of females have recently been reduced (Table 22).

TABLE 22

Mortality Rates per 1,000 *of the population at the same Age from Tuberculosis of the Respiratory System for Urban Areas.*

MALES

Years	All Ages	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55 +
1938	0·602	0·213	0·102	0·068	0·676	1·90	1·87	2·72	3·40	3·70
1939	0·619	0·090	0·034	0·166	0·644	1·61	1·36	2·77	3·49	4·12
1940	0·602	0·147	0·050	0·131	0·655	1·87	2·19	3·24	3·91	4·53
1941	0·635	0·161	0·080	0·082	1·04	2·51	2·42	3·53	3·82	4·47
1942	0·595	0·114	0·204	0·995	0·723	1·19	2·23	2·99	3·78	3·28
1943	0·596	0·308	0·173	0·203	0·685	1·64	1·92	2·97	3·66	3·52
1944	0·579	0·626	0·279	0·109	1·15	1·52	1·66	3·11	3·41	4·13
1945	0·600	0·617	0·212	0·252	0·634	1·08	1·95	2·58	3·45	4·57
1946	0·635	0·256	0·151	0·136	0·617	1·77	2·22	3·08	4·53	4·11
1947	0·593	0·255	0·213	0·056	0·432	1·45	1·90	2·44	3·12	5·50
1948	0·617	0·151	0·161	0·174	0·547	1·60	2·05	2·68	3·99	3·14

TABLE 22 (*Contd.*)

Mortality Rates per 1,000 *of the population at the same Age from Tuberculosis of the Respiratory System for Urban Areas.*

FEMALES

Years	All Ages	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55+
1938	0·504	0·227	0·191	0·299	1·67	2·71	2·70	3·32	3·36	3·01
1939	0·469	0·150	0·146	0·414	1·40	2·41	3·02	2·93	2·53	2·76
1940	0·499	0·260	0·208	0·417	1·65	2·62	3·29	3·73	3·18	3·88
1941	0·464	0·315	0·186	0·701	1·58	2·32	2·71	3·16	2·70	3·26
1942	0·443	0·328	0·121	0·311	1·32	2·31	2·38	2·71	1·78	1·94
1943	0·429	0·437	0·238	0·350	0·99	2·23	2·53	3·23	2·23	2·77
1944	0·413	0·729	0·296	0·562	1·48	1·95	2·31	2·93	2·97	3·05
1945	0·396	0·405	0·144	0·453	0·97	1·48	1·93	3·08	2·41	4·38
1946	0·439	0·281	0·175	0·210	1·31	2·46	2·46	2·81	2·54	2·13
1947	0·418	0·442	0·144	0·423	1·06	1·92	2·23	2·03	1·80	1·56
1948	0·436	0·209	0·221	0·313	0·76	2·17	2·59	3·08	2·14	1·82

The mortality rates from cancer are less than one-tenth of those reported from the British Isles (Table 23) but, again, part of the difference may be due to the fact that many cases go undiagnosed. There is no evidence of any great variation in the cancer mortality rate over the past few years.

TABLE 23

The Mortality from Cancer per 1,000 *of the Population.*

Years	Ceylon	Eire	Northern Ireland	England & Wales	Scotland
1938	0·103	1·26	1·32	1·67	1·62
1939	0·111	1·27	1·33	1·66	1·61
1940	0·121	1·28	1·36	1·72	1·70
1941	0·130	1·27	1·37	1·78	1·69
1942	0·131	1·37	1·41	1·83	1·71
1943	0·130	1·37	1·45	1·90	1·73
1944	0·127	1·42	1·41	1·90	1·86
1945	0·125	1·34	1·44	1·74	1·92
1946	0·116	1·36	1·42	1·77	1·80
1947	0·122	1·33	1·47	1·81	1·77
1948	0·130	—	—	—	—

Cancer is a disease of later life and it may be reasoned that the low mortality rate in Ceylon reflects merely the low expectation of life of the population. However, the age-specific mortality rates show that, for all age groups, the rates are lower than those occurring in Britain (Table 24).

TABLE 24

Deaths from Cancer per 100,000 *Living of the same Age.*

MALES

Ages at Death	Ceylon 1945-48	Ceylon 1948	Eire 1947	England & Wales 1947
Under 25 years	1·18	0·96	3·4	7·98
25 –	3·70	3·23	8·8	31·6
35 –	14·7	13·6	47·2	110·0
45 –	33·1	36·2	143·0	325·5
55 – (55 +)	77·4	17·7	366·7	728·0
65 –	—	—	746·2	1288·0
75 +	—	—	1014·2	1505·0

FEMALES

Under 25 years	1·19	1·43	2·0	6·30
25 –	5·04	5·54	13·3	36·8
35 –	24·4	20·0	29·2	129·5
45 –	52·9	60·7	104·1	281·5
55 – (55 +)	85·5	83·8	386·9	509·0
65 –	—	—	588·2	279·0
75 +	—	—	637·0	12·0

Age Specific Death Rates :—

The improvement in the death rate of Ceylon has occurred more or less equally at all ages and for both sexes. At all ages and for both sexes, however, the mortality rates for Ceylon are greater than those for the British Isles, indicating that, even with present medical knowledge and techniques, there are still grounds and hopes for improvement. Table 25 demonstrate the comparative age-specific mortalities.

The great death rate among infants and growing children (under five years) is striking for all countries. Infant deaths account for a large proportion of those early deaths and a comparison of the trends in infant mortality occurring in Ceylon and the British Isles has been made (Table 26).

TABLE 25

Death Rates per 1,000 *of the population at the same Age.*

(*a*) ALL PERSONS

Age Period	Average Rate 1937-1946			Rate 1947			Rate 1948
	Ceylon	Eire	U. K.	Ceylon	Eire	U. K.	Ceylon
Under 5 years	60·4	20·76	14·32	47·9	20·98	12·1	46·4
5 –	7·4	1·81	1·56	4·4	1·28	0·90	4·1
10 –	3·7	1·33	1·10	2·2	1·09	0·70	1·9
15 –	6·0	2·66	1·91	3·5	2·13	1·39	2·9
20 –	8·3	3·62	2·85	5·9	3·23	1·92	5·0
25 –	9·7	4·35	2·88	7·0	3·61	2·03	5·8
35 –	13·4	5·53	4·03	8·2	5·20	3·08	6·9
45 –	19·1	10·7	8·75	11·7	9·68	7·24	10·5
55 – (55+)	74·7	21·58	18·68	43·7	20·31	17·5	40·4
65 – (55+)	—	52·33	45·05	—	51·53	42·8	—
75 – (55+)	—	—	—	—	147·76	—	—
All ages (55+)	20·8	14·46	—	14·3	14·33	—	13·2

(*b*) MALES

Age Period	Average Rate 1937-1946			Rate 1947			Rate 1948
	Ceylon	Eire	U. K.	Ceylon	Eire	U. K.	Ceylon
Under 5 years	59·9	22·82	15·97	48·2	23·48	13·5	46·9
5 –	6·82	1·90	1·71	4·2	1·32	1·04	3·80
10 –	3·46	1·27	1·19	2·08	1·06	0·78	1·89
15 –	5·47	2·56	2·14	2·93	1·94	1·62	2·60
20 –	6·85	3·40	4·05	4·57	2·88	2·05	3·80
25 –	8·04	4·08	3·56	5·44	3·54	2·12	4·45
35 –	12·8	5·46	4·74	7·69	5·61	3·44	6·45
45 –	21·4	10·44	10·23	12·60	10·40	8·98	11·38
55 – (55+)	70·7	22·52	23·82	43·00	22·11	22·90	38·90
65 – (55+)	—	55·42	53·59	—	55·20	52·50	—
75 – (55+)	—	—	—	—	162·19	—	—
All ages (55+)	20·2	14·77	—	13·8	15·61	—	12·7

TABLE 25—(*Contd.*)

Death Rates per 1,000 *of the population at the same Age.*

(c). FEMALES

Under 5 years		60·9	18·63	12·58	47·6	18·39	10·6	46·1
5 –		7·97	1·72	1·41	4·70	1·24	0·75	4·30
10 –		4·01	1·40	1·00	2·28	1·13	0·61	1·88
15 –		6·61	2·76	1·73	4·18	2·32	1·21	3·36
20 –		10·2	3·86	2·37	7·37	3·60	1·82	6·19
25 –		11·6	4·63	2·49	8·78	3·68	1·94	7·35
35 –		14·0	5·60	3·44	8·78	4·79	2·74	7·57
45 –		16·4	9·69	6·77	10·50	8·93	5·72	9·45
55 –	55 +	80·5	20·58	14·90	44·60	18·44	13·10	42·40
65 –		—	49·13	38·19	—	47·68	35·20	—
75 –		—	—	—	—	135·55	—	—
All ages		21·4	14·14	—	14·9	14·02	—	13·8

TABLE 26

Infant Mortality Rates of Ceylon and Certain other Countries.

(a) Year by Year Comparisons.

Year	Ceylon	Eire	Northern Ireland	England and Wales	Scotland
1938	161	67	75	53	70
1939	166	66	70	50	69
1940	149	66	86	55	78
1941	129	74	77	58	83
1942	120	69	76	49	69
1943	132	83	78	49	65
1944	135	79	67	46	65
1945	140	71	68	46	56
1946	141	65	54	43	54
1947	101	68	53	41	56
1948	92	—	—	—	—

TABLE 26 (*Contd.*)

Infant Mortality Rates of Ceylon and Certain other Countries.

(*b*) *Period Comparisons.*

Continent	Country	Period	Rate
Europe	United Kingdom	1943-47	47
	France	1943-47	79
	Italy	1943-47	96
America	U. S. A.	1943-47	37
	Canada	1943-47	50
	Venezuela	1943-47	106
	Chile	1943-47	176
Africa	South Africa	1943-47	40
	Egypt	1941-45	157
Australasia	New Zealand	1943-47	28
	Australia	1943-47	31
Asia	Japan	1939-43	90
	Ceylon	1943-47	130
	Federated Malay States	1936-40	139
	India	1941-45	161

Again we may note that, just as for the general death rates, so here too there has been a sudden fall in the infant mortality rate since 1946. Before 1947, Ceylon possessed an infant mortality rate similar to that of other Asian and poorly developed countries. Now the rate is approaching those of Continental European countries but is still much higher than those possessed by the countries of the British Isles, North America and Australasia (see Table 27 where infant mortality rates for towns of comparative size in Ceylon and the United Kingdom are given).

The reported causes of Infant deaths in Ceylon are markedly different from those of Western countries. Most of the reported causes in Ceylon are vague and unsatisfactory. Thus 'convulsions', 'congenital debility', 'prematurity' and 'rata' each account for about one-fifth of the registered causes of infantile deaths in Ceylon (Table 28). Diarrhoea and enteritis are 3 to 4 times more frequent as a cause of these deaths in Britain than in Ceylon, respiratory diseases are at least twice as frequent and injury at births more than ten times more frequent. How accurate the differential diagnosis between congenital debility, prematurity and rata can be made in Ceylon it is difficult to say ; together they probably reflect the poor nutriture of the population and in this respect the differences between the causes of infantile deaths in Ceylon and in the British Isles is noteworthy.

TABLE 27

Infant Mortality Rates for the Major Towns in Ceylon, 1948 *with Comparative Rates for Towns of Approximately the same Population in the United Kingdom,* 1947.

Country	Towns	Population	Deaths of Infants under 1 year of Age per 1,000 live births
Ceylon	Colombo	373,900	120
U. K.	Belfast	450,000	60
	Bristol	425,600	29
	Leeds	495,300	50
	Sheffield	510,000	41
	Edinburgh	485,664	49
Ceylon	Moratuwa	52,000	187
	Dehiwela-Mount Lavinia	59,900	93
	Kotte	41,800	113
	Kandy	52,800	88
	Galle	50,600	111
	Jaffna	65,500	104
U.K.	Londonderry	48,920	68
	Burton-on-Trent	47,800	44
	Dewsbury	51,750	54
	Crewe	53,230	49
	Shrewsbury	43,920	33
	Lancaster	49,030	42
	Ayr	44,018	45
	Kirkcaddy	47,897	53

TABLE 28

Proportion of Infant Deaths from Principal Causes in 1948 *and for the period* 1944-48.

Causes of Death	Proportion per 1,000 Deaths			
	Ceylon 1944-48	Ceylon 1948	Eire 1947	U.K. 1947
All causes	1,000	1,000	1,000	1,000
Convulsions	226·5	198·9	43·1	8·2
Diarrhoea and Enteritis	35·0	50·1	152·2	125·0
Bronchitis	9·7	12·9	22·4	23·1
Pneumonia and Broncho-pneumonia	39·5	60·9	126·8	166·2
Congenital Debility	188·7	225·5	167·5	16·9
Prematurity	145·2	171·3	174·0	229·0
Injury at Birth	—	3·1	34·1	45·8
Rata	193·0	133·9	—	—
Other causes	—	—	279·9	365·8

TABLE 29

Deaths of Women per 1,000 *births, Caused by and Associated with Pregnancy, Child-birth and the Puerperal State.*

Year	Puerperal Infection		Other diseases of Pregnancy and Child-birth		Total Deaths caused by and associated with Pregnancy and Child-birth		
	Ceylon	Eire	Ceylon	Eire	Ceylon B	Eire A	Eire B
1937	6·83	0·90	13·1	2·71	19·9	4·19	3·61
1938	7·10	0·81	13·0	3·30	20·1	4·69	4·11
1939	5·85	0·68	12·4	2·71	18·3	3·89	3·39
1940	4·80	0·97	11·3	2·70	16·1	4·01	3·67
1941	4·98	0·76	10·3	2·45	10·3	3·68	3·21
1942	4·08	0·65	10·4	1·82	14·5	2·86	2·47
1943	3·62	0·56	9·3	1·69	12·9	2·51	2·25
1944	3·28	0·49	10·4	1·89	13·7	2·69	2·38
1945	3·87	0·52	12·7	1·85	16·5	2·63	2·37
1946	3·53	0·29	12·0	1·72	15·5	2·39	2·01
1947	2·44	0·45	8·1	1·44	10·6	2·15	1·89
1948	1·76	—	6·5	—	8·3	—	—

Maternal Death Rates :—

These are also higher in Ceylon than in Western countries and this is true for most of the principal causes of maternal mortality. In most countries the maternal mortality rates have been declining during recent years, one of the main causes of this being the introduction of the sulphonomides and the antibiotics in the treatment of puerperal infection. This decline has been seen in Ceylon too ; between 1933 and 1946 the death rate from puerperal infection was approximately halved (Table 29) and this reduction accounted for 75 per cent. of the reduction in maternal mortality over the same period.

Eire has a much smaller rate but here too there was a marked reduction during this period. The mortality rate from puerperal infection was reduced by two-thirds and the reduction was responsible for 38 per cent. of the total reduction in the puerperal mortality rate.

The general mortality rate and the infant mortality rates for Ceylon showed sudden falls after 1946, and the maternal mortality rate has exhibited a similar marked decline. This marked decline has occurred with equal emphasis in the case of deaths due to puerperal infection and those due to other diseases of pregnancy and child-birth. Thus, the mortality rate from puerperal infection was about halved between 1946 and 1948 and a similar reduction of about 50 per cent. occurred in the mortality rate from other diseases of pregnancy and child-birth. The better general health of the population since 1946 has increased the resistance of mothers to the hazards of pregnancy and child-birth and there are signs that the improved techniques of modern medical practice, applied to a population showing an increasing general standard of health and nutrition, may yet reduce the maternal mortality rates to levels approaching those possessed by the vigorous and more prosperous Western races.

Recent declines in the death rates from other causes have also occurred (Table 30). Thus, there has occurred a reduction in the mortality rates for enteric, dysentery, influenza, diarrhoea and enteritis, ankylostomiasis and other intestinal parasites, anaemia, bronchitis, pneumonia, and convulsions as well as from malaria and from the causes of infant and maternal deaths. Part of these reductions may be due to improved methods of control and, or therapy of particular diseases but the main factors, since the reductions have occurred suddenly since 1946, are probably the improved health and resistance of the population following upon the reduction in malaria morbidity or the destruction of other disease vectors consequent upon the widespread use of D.D.T. A more detailed study of the changes in malaria morbidity and mortality would seem, therefore, to be justified.

TABLE 30

Death Rates per 100,000 *of the Population from Various Causes, in Ceylon and Western Countries.*

Causes of Death	Ceylon				Eire			U.S.A.	England and Wales
	1945	1946	1947	1948	1945	1946	1947	1947	1947
All causes	2200·3	2030·4	1432·5	1322·5	1448·6	1399·6	1482·6	1007·8	1239·9
Enteric	22·8	19·4	15·7	12·1	1·1	0·9	0·5	0·2	0·1
Whooping cough	1·48	1·01	0·89	1·25	4·9	3·9	10·0	1·4	2·2
Diphtheria	1·93	2·19	1·65	2·03	8·0	4·7	1·9	0·6	0·66
Tuberculosis of respiratory system	50·3	54·2	51·0	53·2	94·1	87·2	95·3	31·0	47·3
All other forms of Tuberculosis	6·13	5·74	4·81	4·24	31·1	27·2	29·2	2·5	7·9
Dysentery	29·8	27·2	13·5	10·1	0·3	0·1	0·1	0·6	—
Influenza	25·8	23·4	19·0	16·0	10·4	26·0	21·9	5·3	7·9
Measles	0·62	0·16	0·65	0·82	1·4	1·6	3·6	0·3	1·5
Malaria and Malarial Cachexia	131·5	188·0	66·3	47·3	—	—	—	0·1	—
Diarrhoea and Enteritis	112·8	104·3	69·8	71·1	43·5	36·3	28·5	5·6	14·0
Ankylostomiasis	28·0	20·0	15·5	12·9	—	—	—	—	—
Diseases due to other intestinal parasites	66·1	55·1	40·3	43·7	—	—	—	—	—
Cancer	12·5	11·6	12·2	13·0	133·9	135·8	133·3	132·4	190·7
Anaemia	43·9	40·2	28·4	25·9	—	—	—	—	5·0
Diabetes Mellitus	9·73	8·15	7·60	6·97	7·5	8·4	6·7	26·2	8·4
Intracranial lesions of Vascular origin	35·6	30·0	28·3	29·5	91·1	91·7	101·7	91·4	139·3
Diseases of the heart	48·5	39·8	36·5	39·1	343·5	341·5	374·1	321·4	346·0
Other diseases of circulatory system	13·5	10·6	9·16	7·71	29·4	30·0	30·1	19·0	46·5
Bronchitis	22·3	22·6	15·1	16·6	46·4	41·3	44·3	—	75·3
Pneumonia	143·4	156·0	123·3	114·3	58·1	55·7	62·8	27·8	54·2
Other diseases of respiratory system	50·8	37·9	29·9	27·0	21·0	20·9	20·9	—	15·9
Peptic Ulcer	0·66	0·61	0·68	0·55	7·5	9·1	8·6	6·0	11·6
Appendicitis	1·40	1·19	1·00	0·71	3·9	3·6	3·1	3·3	3·6
Cirrhosis of the liver	2·85	2·59	2·06	2·43	2·2	1·6	1·9	10·4	2·0

TABLE 30—(*Contd.*)

Death Rates per 100,000 *of the Population from Various Causes, in Ceylon and Western Countries.*

Causes of Death	Ceylon				Eire			U.S.A.	England and Wales
	1945	1946	1947	1948	1945	1946	1947	1947	1947
Diseases of Liver and biliary passages	4·07	3·37	2·91	3·13	5·6	4·9	3·9	4·4	4·6
Other diseases of digestive system	129·7	122·7	86·3	85·8	18·8	17·1	17·6	—	14·6
Convulsions	197·6	192·6	118·8	114·5	—	—	—	—	—
Nephritis	28·3	21·9	18·9	18·1	37·6	34·7	36·9	56·0	30·2
Puerperal Eclampsia	59·0	57·3	34·2	25·9	—	—	—	0·9	0·01
Puerperal Septicaemia	29·5	28·5	20·4	15·2	1·2	0·7	1·1	1·1	0·02
Other Puerperal Diseases	38·8	39·5	34·0	30·3	—	—	—	1·4	0·99
Diseases peculiar to first year of life	281·7	282·3	216·0	203·1	80·5	77·7	84·4	45·5	—
Senility	143·6	125·0	102	97·5	213·3	200·4	217·0	19·2	37·0
Suicide	5·78	5·84	5·84	6·33	2·4	2·7	2·4	11·5	10·5
Other Violence	49·1	44·7	50·7	39·0	27·3	27·0	30·2	75·4	36·9
Other causes	292·6	205·0	157	91·3	117·0	101·2	105·1	56·1	—

CEYLON J. MED. SCI. (D) VOL. VII, PT. III and IV. (December, 1950).

PART III

Malaria in Ceylon

For centuries malaria has been the major single cause of death and illness in Ceylon. Endemic malaria has prevailed in about two-thirds of the island, while periodic epidemics have occurred at fairly regular intervals. The most severe epidemic of all those ever registered broke out in October, 1934 and swept over the south-western portions of the island. Starting in the valley of the Maha-oya it spread rapidly southwards into the Kegalla and Ratnapura Districts, northwards into Kurunegala, and then eastwards over the Kandy and Matale Districts. Those areas which are usually malarious were not appreciably affected and the epidemic was most severe in the valleys of the rivers Maha-oya, Deduru-oya and Kelaniganga and their tributaries. In all, about one-fifth of the island was affected.

The immediate cause of the epidemic was the prolonged drought in the affected areas due to the late arrival of the south-west monsoon. The shallow, isolated pools of water in the dried river beds formed excellent breeding grounds for mosquitoes. These multiplied rapidly with the onset of the rains in October and malaria began to spread.

The spread of the disease was hastened and favoured and its virulence and fatality magnified by the gross undernourishment of the population, consequent upon a depression in the rubber industry and the impossibility of cultivating paddy during the drought. Many rubber estates in the affected area had closed down, while the rice crop in the Kurunegala and Kegalla Districts had been destroyed by drought and the caterpillar disease.

The epidemic fell most severely on the old and the young and the expectant mothers. In 1934 the total deaths registered from malaria rose by 66 per cent. and in 1935 by nearly 3,400 per cent. compared with the 1933 deaths. Since that time, minor epidemics have occurred in 1939 and 1946.

In the past, the malarial control measures concentrated on anti-larval methods, which included sluicing of streams, oiling of rivers and streams, and training of rivers. Later the adult stage of the mosquito was attacked with pyrethrum. Commencing in 1946, residual spraying of D.D.T. in all areas where malaria was endemic was commenced.

This latter procedure has resulted in a considerable reduction in both the morbidity and mortality rates from malaria (Table 31).

The morbidity figures are based on clinical diagnosis and not on parasitological findings and it must be romembered that there is a tendency for doctors and apothecaries, especially in endemic areas, to diagnose every case of fever as malaria or label every case as malaria which is given quinine. The genuine cases of malaria attending dispensaries and hospitals are probably much fewer, therefore, than those

TABLE 31

Malaria Morbidity and Mortality in Ceylon 1933-1949.

Year	MALARIA MORBIDITY		MORTALITY			
			Malaria		Malaria and Pyrexia	
	Cases Treated (Thousands)	Rate per Thousand	Deaths	Rate per million	Deaths	Rate per million
1933	1117	206	1409	260	15185	2800
1934	2334	420	2332	420	17799	3210
1935	5459	976	47326	8460	69833	12500
1936	2948	523	7628	1355	22148	3930
1937	2309	404	4408	770	18326	3210
1938	2053	353	4778	821	16816	2890
1939	3211	544	10039	1700	22128	3750
1940	3414	574	9169	1540	20403	3460
1941	3220	535	7132	1180	17313	2880
1942	3225	536	5143	853	16057	2660
1943	2141	349	6765	1104	19972	3260
1944	1672	266	5604	894	19387	3080
1945	2540	391	8539	1316	23914	3680
1946	2768	413	12587	1880	23043	3440
1947	1351	196	4562	654	9873	1438
1948	775	109	3349	474	7682	1084
1949	681	93	2403	330	6584	904

indicated. (On the other hand, all cases of malaria do not necessarily attend dispensaries for treatment). The hospital and dispensary morbidity figures do give some indication, however, of the incidence of the disease.

The malaria mortality statistics alone are not sufficient to assess the incidence of malaria in Ceylon owing to the inaccuracy of returns from rural areas where deaths due to malaria may frequently be returned as due to pyrexia. Accordingly the deaths due to both pyrexia and malaria are given in Table 31.

Malaria control with D.D.T. has reduced the reported malaria morbidity rate by 77·5 per cent. between 1946 and 1949 (actual reduction in number of cases over 2,000,000 per year) and the mortality rate by 82·5 per cent. over the same period. Other evidence of the effectiveness of this control can be obtained from the Spleen Surveys of school children which are made biannually in March (at the end of the transmission season) and in September. The spleen rate is very good evidence of the degree of endemicity of malaria and these have been declining rapidly since 1946 (Table 32).

TABLE 32

(*a*) *Spleen and Parasite Rates for Ceylon.*

	March 1938	March 1941	March 1947	March 1948
Spleen Rate	21·2	18·4	10·3	5·2
Parasite Rate	4·5	3·7	—	0·6

Per cent. of positive specimens.

(*b*) *Spleen Rates of School Children in Certain Areas.*

Area	March 1938	March 1941	March 1947	March 1948	D.D.T. Spraying commenced
Anuradhapura	70·8	77·1	34·0	12·0	Oct. 1945
Mannar	13·1	16·2	16·9	7·1	Sept. 1946
Vavuniya	92·2	74·9	52·3	20·4	Sept. 1946
Puttalam	54·3	28·6	22·6	14·6	Sept. 1946
Hambantota	49·2	58·4	50·8	19·4	Sept. 1946
Urugala	34·4	8·9	0·2	0·2	Not sprayed
Kalutara	0·0	0·3	0·0	0·0	Not sprayed

Island wide Parasite Surveys have been carried out along with the Spleen Surveys and these also have shown that active transmission is being stopped (Table 32).

This is a creditable achievement by the Malaria Control Campaign. Even as recently as 1945, the Registrar-General in his report for that year proclaimed, 'The disease is now practically endemic in all parts of the island with the possible exception of some areas in the Colombo, Kalutara, Kandy, Nuwara Eliya and Galle Districts'. The reduction in the malaria mortality rates in the various districts is demonstrated in Table 33.

The mortality rates have decreased in all districts, though the degree of reduction does vary. Some of the previously highly-malarious districts are now as healthy as, and in some instances healthier than, some of the non-endemic areas.

Similar reductions are seen if we compare the rates for Urban, Estate and Rural populations (Table 34).

This reduction in the incidence of malaria since 1946 has been accompanied by a marked reduction in total deaths, infant mortality, maternal mortality and in some of the other major causes of death in Ceylon (Table 35).

The deaths in two years 1945 and 1946 have been compared with those occurring in 1949 because 1946 was a year when a small malaria epidemic occurred. It will be seen that all the causes of death listed have shown reductions since the introduction of D.D.T. spraying. The reductions have occurred so suddenly and coincidently that it is tempting to consider the reduction in the malaria incidence as the

TABLE 33

Malaria Mortality Rates in the Districts of Ceylon.

(Male subjects)

Rate per million of estimated population.

District	1940	1941	1942	1943	1944	1945	1946	1947	1948
Colombo	746	489	530	694	491	666	1017	363	193
Negombo	707	521	456	673	433	565	1224	455	467
Kalutara	793	405	383	455	374	435	708	241	190
Kandy	679	435	465	523	345	944	1235	323	218
Matale	764	786	934	946	953	1632	2671	540	432
N'Eliya	278	284	181	327	275	805	658	171	101
Galle	2193	1910	1006	992	788	676	944	297	177
Matara	5191	3461	2095	1632	1463	1186	1750	819	485
Hambantota	6981	4363	1799	1667	1297	1074	2043	732	725
Jaffna	877	1326	1068	1498	1331	876	835	456	301
Mannar	2972	6083	2680	3256	5712	2152	3131	2202	809
Vavuniya	1833	2517	1948	5515	4830	2388	1623	818	550
Batticaloa	2483	2187	1629	2655	2511	1408	3596	1330	1197
Trincomalee	1485	1945	2171	4600	2106	1092	783	350	284
Kurunegala	1765	1339	1225	1857	1564	2506	5079	1976	1274
Puttalam	1543	3196	3622	4132	2995	3012	1901	2073	1123
Chilaw	921	780	559	947	979	1374	1280	606	525
Anuradhapura	1537	2434	2017	2842	2741	2419	2275	1206	538
Badulla	1304	1137	1280	1464	1235	1740	1341	914	972
Ratnapura	1254	875	423	658	485	1360	1804	637	465
Kegalla	2224	1074	1551	1248	764	2908	2378	457	360

(The female mortality rates showed a similar variation and had similar magnitudes).

TABLE 34

Malaria Mortality Rates in Urban, Rural and Estate Communities.

(Male subjects)

Rate per million of estimated population.

Community	1940	1941	1942	1943	1944	1945	1946	1947	1948
Ceylon	1430	1150	898	1137	942	1279	1754	647	447
Urban	2660	2210	1540	2040	1630	1980	2040	690	509
Rural	1310	1050	850	1030	870	1170	1800	700	471
Estate	615	385	292	511	386	847	963	228	—

(The female mortality rates showed a similar variation and had similar magnitudes).

TABLE 35

Reduction in Deaths from various causes between 1945 *and* 1949 *and between* 1946 *and* 1949.

Cause of Death	Reduction for Period			
	1945-49		1946-49	
	Actual	Per cent. of Total reduction	Actual	Per cent. of Total reduction
All causes	51,042	100	44,048	100
Malaria and Pyrexia	17,330	34·0	16,459	37·4
Pneumonia	2,065	4·1	3,193	7·2
Influenza	703	1·4	588	1·3
Infant Deaths	7,968	15·6	10,755	24·4
Puerperal Deaths	2,034	4·0	2,081	4·7
Dysentery	1,230	2·4	1,116	2·5
Diarrhoea and Enteritis	2,256	4·4	1,913	4·3

major factor concerned although vectors of disease, other than the mosquito, may have been affected by D.D.T. spraying. Further evidence for the correlation between malaria mortality and other principal causes of death can be obtained. Figure 3 shows the variation of the mortality rates from various causes over a period of years.

The infant and maternal mortality rates show a very similar variation, year by year, to that of malaria. Although the death rates from pneumonia, bowel diseases, and influenza have all declined within the past three years and were all increased during the 1935 malaria epidemic, there is not the same degree of correlation between these death rates and that from malaria. Deaths from these causes were declining before 1947 and this decline has been continued or accelerated since that date.

The story can be elaborated further by comparing the various mortality rates for each Administrative District (Table 36).

The districts have been arranged according to the descending order of the malaria mortality rate and mortality rates for 1946 and 1948, that is immediately preceding and after effective D.D.T. spraying, have been given.

The maternal mortality rates for the districts are roughly in the same descending order as the malaria mortality rates, but there are exceptions such as the relatively high rates at Trincomalee, Chilaw, Vavuniya and the relatively low rates at Batticaloa, Kegalla, Ratnapura. In general, however, districts with a high malaria rate also have a high maternal mortality rate and *vice versa*. Closer correspondence between the rates could not be expected since one is not the direct cause of the other and we know that many other factors can be concerned in determining maternal mortality. Thus inferior social conditions and malnutrition are potent

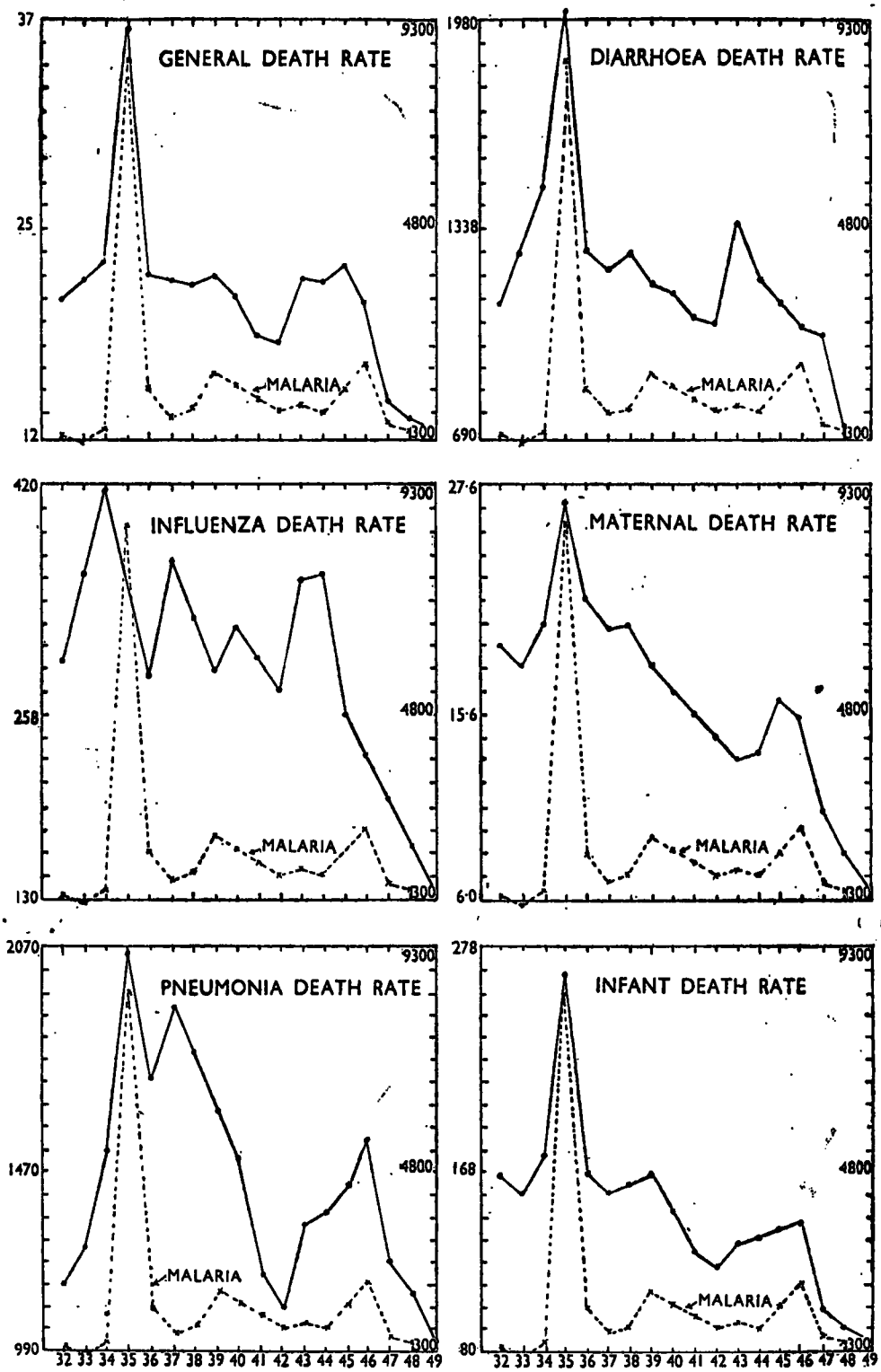


Figure 3.—Death Rates—All Ceylon—Years 1932-1949

TABLE 36

Death Rates from various causes occurring in the Districts of Ceylon before (1946) *and after* (1948) *commencement of D.D.T. Campaign.*

District	Malaria Rate		Maternal Rate		Infantile Rate		Pneumonia Rate		Diarrhoea and Enteritis Rate	
	1946	1948	1946	1948	1946	1948	1946	1948	1946	1948
Kurunegala	5079	1274	46·0	13·6	297	93	2517	1523	1016	335
Hambantota	4933	873	25·7	10·8	322	89	2690	922	2978	660
Batticaloa	3596	1197	18·8	10·8	201	128	3821	1690	1335	849
Mannar	3131	809	39·3	17·4	320	125	3009	1618	1842	520
Matale	2671	432	29·3	8·4	222	104	1841	1206	1636	523
Kegalla	2378	360	13·6	8·9	124	75	865	760	273	517
Anuradhapura	2275	538	42·5	17·5	207	102	2190	1131	1089	650
Puttalam	1901	1123	39·2	15·1	192	100	2290	1165	1680	915
Ratnapura	1804	465	8·7	7·2	127	84	1090	914	848	419
Matara	1750	485	11·6	4·7	105	69	1006	838	391	590
Vavuniya	1623	550	36·7	13·9	176	121	7601	2830	769	393
Badulla	1341	972	10·1	7·7	124	99	1299	1490	847	675
Chilaw	1280	525	20·3	8·7	144	68	2376	1025	594	275
Kandy	1235	218	12·4	8·1	140	97	1349	1235	882	615
Negombo	1224	467	10·5	4·4	134	85	910	583	811	445
Colombo	1017	193	12·9	7·4	107	100	1159	926	1689	1341
Galle	944	177	10·3	5·9	104	84	764	729	739	592
Jaffna	835	301	12·1	6·8	106	77	2924	1779	698	610
Trincomalee	783	284	30·8	9·4	201	120	5481	2133	496	332
Kalutara	708	190	8·1	6·9	90	77	768	603	595	371
N'Eliya	658	101	6·3	7·2	127	115	1743	1956	1400	911

The Maternal and Infant Mortality Rates are expressed as deaths per 1,000 live births.

The other mortality rates are expressed as deaths per 1,000,000 of the population and are for male subjects only. Female subjects gave similar rates.

factors in raising the maternal rate and these factors are to be found in malarious areas. The sudden drop in maternal mortality following D.D.T. spraying (there was a fall in all districts except Nuwara Eliya, where the rate was relatively good before) does stress that the debilitating effect of endemic malaria in a community has been an important factor in determining the high maternal mortality rates in the past.

It is of interest to see how the maternal death rate has been reduced. The rates for various causes have been calculated for each district and for all Ceylon (Table 37).

TABLE 37

Maternal Mortality Rates from various causes (deaths per 100,000 live births).

District	Toxaemia during Pregnancy		Toxaemia during Peurperium		Haemorrhage during Pregnancy		Haemorrhage during Peurperium		Puerperal Convulsions		Infection during child-birth and Peurperium		Peurperal Sepsis	
	1946	1948	1946	1948	1946	1948	1946	1948	1946	1948	1946	1948	1946	1948
All Ceylon	97	50	642	265	16	15	116	116	710	300	359	180	353	176
Kurunegala	400	108	2560	540	14	9	163	211	2910	634	759	233	753	233
Hambantota	73	108	1160	372	91	—	309	228	1160	480	582	180	582	180
Batticaloa	46	32	886	97	151	—	12	108	893	119	592	756	592	756
Mannar	515	66	618	133	412	66	309	332	515	133	1130	598	1030	531
Matale	249	25	1150	356	17	13	166	114	1260	340	614	165	614	165
Kegalla	84	31	705	413	—	6	91	105	782	444	209	93	209	86
Anuradhapura	419	30	2570	1120	—	15	200	163	297	1150	455	163	419	148
Puttalam	241	146	1690	—	—	—	121	293	1630	146	1030	490	1030	488
Ratnapura	103	25	303	300	—	19	110	100	386	307	131	63	124	63
Matara	76	31	554	124	14	12	145	106	630	149	210	87	235	81
Vavuniya	99	82	893	163	27	2	99	163	893	163	1690	571	1690	570
Badulla	87	58	415	341	—	10	54	58	503	399	255	131	241	131
Chilaw	—	89	877	249	21	—	150	160	877	338	514	125	514	125
Kandy	75	62	424	271	6	25	133	94	476	324	301	162	295	162
Negombo	27	37	630	197	27	—	55	86	644	221	137	49	137	49
Colombo	80	61	233	117	4	24	153	122	283	145	393	122	387	115
Galle	43	32	472	182	—	21	103	64	416	208	262	101	257	101
Jaffna	20	6	418	42	40	12	46	113	411	42	471	409	464	409
Trincomalee	136	36	1630	145	—	—	—	72	1630	145	1180	580	1180	580
Kalutara	28	12	345	217	17	18	85	94	362	217	153	123	147	105
N'Eliya	27	23	260	256	—	15	63	68	277	279	143	151	143	136

All the causes of death, except haemorrhage, have been reduced and this, with one or two exceptions, is true for all districts.

The districts with a high malaria mortality rate also tend to have a high infant mortality rate, though the correlation is by no means perfect. The infant mortality rate has also been markedly and suddenly reduced in all districts following the reduction in the malaria rate. Not all the causes of infantile deaths have been reduced, however (Tables 38 and 39).

TABLE 38

Infant Mortality Rates (per 100,000 live births) according to Cause and Age-period.

(ALL CEYLON)

Cause	Under 3 months		3 to 12 months		Total under 1 year	
	1946	1948	1946	1948	1946	1948
Convulsions	2130	630	1170	630	3300	1800
Diarrhoea	55	72	80	72	100	100
Bronchitis	53	60	50	60	100	100
Pneumonia	147	376	331	369	500	600
Enteritis	110	162	154	162	300	300
Debility	2250	1880	276	199	2520	2080
Rata	—	—	—	—	2760	1240
Prematurity	—	—	—	—	1990	1580
Other causes	—	—	—	—	2500	1300

TABLE 39

Infant Mortality Rates (per 100,000 live births) according to Cause and Age-period in the Principal towns of Ceylon.

Cause	1 week and under		Over 1 week and under 1 month		Total under 1 year	
	1946	1948	1946	1948	1946	1948
Prematurity	2410	1970	537	296	3660	2360
Debility	1420	1170	858	571	3200	2400
Convulsions	211	140	235	122	1050	713
Diarrhoea	0·8	12·2	28	53	173	304
Enteritis	1·9	26·4	150	195	1140	1210
Bronchitis	0·8	1·4	9	18	131	103
Pneumonia	30	79	67	82	1150	1080
Other causes	395	654	253	165	1990	2540

For all Ceylon the deaths due to prematurity, debility and convulsions have been reduced at all ages, but not the deaths due to diarrhoea, enteritis, bronchitis and pneumonia. The same is true for the principal towns of Ceylon, where the diagnoses will be much more accurate.

The correspondence between mortality rates from malaria and pneumonia in the various districts is not so clear. As will be seen later, deaths from respiratory diseases are characteristically high in the Northern and Eastern parts of Ceylon

where the population is predominantly Tamil. The death rates from pneumonia have been reduced, however, in all districts except the estate districts of Nuwara Eliya and Badulla. This reduction is probably again a reflection of the improved general nutriture of the people following the reduction in malaria morbidity and mortality.

Similarly in the case of deaths from diarrhoea and enteritis, some districts with relative low malaria rates have high death rates from these causes and *vice versa*, but in all but two districts the mortality rate has been reduced since 1946.

It is difficult to assess accurately the full implications of this reduction in malaria morbidity and mortality. Not only has the mortality from other major causes of death also been reduced and the expectation of life increased, but the land in the former endemic areas can now be cultivated fully. In the past, the cultivation of rice in the dry zone has been handicapped because the malaria season coincided with the period of greatest agricultural activity. In addition, the vitality of the people was so low that their working capacity was necessarily poor. Furthermore, the restoration and the construction of irrigation works in this zone was handicapped by the toll of malaria. Now these works can be pressed forward, the land can be cultivated and the people are fit to work. The paddy production should increase and hence the nutrition of the people should be further improved. On the other hand, because of the decrease in mortality, we must expect a steep rise in the total population in the near future.

The efficacy of D.D.T. is altering the mortality pattern of Ceylon from that typical of the tropics to one typical of the more advanced Western peoples living in temperate climates.

PART IV

The Mortality Zones of Ceylon

The Registrar-General's Reports contain information relating to the relative incidence of deaths by different causes in the main ethnic groups of Ceylon, the principal towns, and the 21 Administrative Districts of Ceylon. These causes of death are further arranged under group headings and we can distinguish nine such groups of causes which are of importance in determining the general mortality in Ceylon. These groups are—

I. Infective and Parasitic Diseases

II. Blood Diseases

III. Diseases of the Nervous System

IV. Diseases of the Circulatory System

V. Diseases of the Respiratory System

VI. Diseases of the Digestive System

VII. Diseases of the Genito-Urinary Tract

VIII. Deaths during Child-birth and Pregnancy

IX. Diseases Peculiar to the First Year of Life.

Using these general causes of death as a basis, it is possible to classify the Administrative Districts of Ceylon into four zones, according to the main cause of death (estimated from the average mortality rates from each group of diseases during the period 1937-48; see Table 40) in each Administrative District, e.g.—

Zone A :—Main Cause of Death—Infective and Parasitic Diseases :—
Colombo, Negombo, Ratnapura, Kegalla, Kurunegala, Puttalam, and Chilaw.

Zone B :—Main Cause of Death—Diseases of the Nervous System :—
Galle, Matara, Hambantota, Kalutara, and Badulla.

Zone C :—Main Cause of Death—Diseases Peculiar to the First Year of Life :—
Kandy, Matale, and Nuwara Eliya.

Zone D :—Main Cause of Death—Diseases of the Respiratory System :—
Jaffna, Anuradhapura, Batticaloa, Trincomalee, and Vavuniya.

TABLE 40

Averages Death Rates per Million Population from Principal Causes in the 21 Districts of Ceylon for the Period 1937-1948, Classified According to Sex.

Causes of Death	All Ceylon		Colombo		Negombo		Kalutara		Kandy		Matale		N'Eliya		Galle	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
I. Infective and Parasitic Diseases	3590	3620	4770	4350	2700	3010	2490	3060	2440	2630	3290	2910	2030	2300	3750	3660
1-2. Typhoid and Paratyphoid Fever	197	155·6	409	326	119	140	175	169	163	115	104	67·2	140	84·8	259	224
13. Tuberculosis of the Respiratory System	607·5	449	1490	1140	259	170	387	412	393	379	488	274	132	157	524	475
27. Dysentery	352	285	531	248	229	171	212	240	157	140	285	226	239	237	309	272
28. Malaria	1070	1134	582	550	603	612	429	444	595	609	1050	965	317	318	995	875
33. Influenza	263	307	375	460	83·7	87·5	148	187	214	242	151	129·5	472	534	188	235
40. Ankylostomiasis	209	287	197	242	128	203	190	289	255	434	260	342	257	471	334	379
42. Other Diseases due to Helminths	479	621	617	888	968	1320	744	1140	251	301	435	543	169	215	1010	1340
II. Cancer and other Tumours	119	133	287	330	76·1	67·9	92·7	124·0	108	110	77·7	77·1	65·3	109	80·7	102
45. Cancer of the Buccal Cavity	50·0	31·0	75·6	41·0	43·8	21·1	44·8	30·9	45·2	24·4	48·1	24·2	26·0	25·7	45·1	31·0
46. Cancer of the Digestive System	29·7	25·35	99·8	74·9	13·1	13·8	16·4	29·7	29·7	17·0	12·7	6·87	15·7	15·3	13·0	17·9
47. Cancer of the Respiratory System	4·47	2·42	18·0	9·5	1·3	0·73	3·2	1·7	3·65	0·98	2·14	—	1·11	—	1·21	1·20

TABLE 40 (*Contd.*)

Averages Death Rates per Million Population from Principal Causes in the 21 Districts of Ceylon for the Period 1937-1948, Classified According to Sex.

Causes of Death	Matara		Hambantota		Jaffna		Mannar		Vavuniya		Batticaloa		Trincomalee		Kurunegala	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
I. Infective and Parasitic Diseases	3490	3620	7940	7540	3550	3160	5700	4330	4250	2730	3380	3630	3700	2320	4920	5310
1-2. Typhoid and Para-typhoid Fever	130	105	136	102	248	241	175	76·4	—	17·5	65·7	69·9	288	131	106	80·5
13. Tuberculosis of the Respiratory System	374	227	718	269	799	583	724	199	749	208	215	104	443	150	454	236
27. Dysentery	273	255	550	390	657	588	1020	620	649	436	723	790	785	321	348	301
28. Malaria	2020	2370	2910	2780	924	883	3000	2530	2300	1490	1930	2290	1680	1150	2070	2430
33. Influenza	100	116	3260	3730	300	305	94·5	78·6	9·6	38·3	21·8	33·0	78·1	52·4	46·8	33·3
40. Ankylostomiasis	150	122	120	122	184	224	88	218	111	276	146	168	75·9	275	124	123
42. Other Diseases due to Helminths	289	337	34	38	57	86	57	100	6·6	17·5	34	41·6	40·1	67·5	678	857
II. Cancer and other Tumours	62·7	80·2	44·7	60·9	143	162	104	101	62·0	67·6	89·1	43·4	98·2	74·7	63·8	52·8
45. Cancer of the Buccal Cavity	34·3	20·3	26·5	5·8	94·2	89·4	50·8	69·45	35·3	19·6	68·1	21·9	49·3	25·2	34·7	11·7
46. Cancer of the Digestive System	12·4	28·0	9·7	14·0	14·4	13·8	17·1	7·20	—	10·1	9·01	1·91	27·4	7·16	7·53	8·36
47. Cancer of the Respiratory System	2·01	1·59	—	1·12	2·01	2·11	—	—	—	—	0·83	1·94	2·08	—	—	0·42

TABLE 40 (*Contd.*)

Averages Death Rates per Million Population from Principal Causes in the 21 *Districts of Ceylon for the Period* 1937-1938, *Classified According to Sex.*

Causes of Death	Puttalam		Chilaw		Anuradhapura		Badulla		Ratnapura		Kegalle	
	M	F	M	F	M	F	M	F	M	F	M	F
I. Infective and Parasitic Diseases	5490	4600	3930	3950	3940	3670	2740	2690	3000	3570	3290	3770
1-2. Typhoid and Para-typhoid Fever	142	145	163	157	128	72	109	64	160	116	113	64
13. Tuberculosis of the Respiratory System	456	197	422	260	553	213	228	199	436	339	453	325
27. Dysentery	532	302	533	446	347	322	289	227	207	187	121	89
28. Malaria	2730	2580	998	992	1885	2030	1170	1210	862	1020	1645	1970
33. Influenza	119	108	36·1	39·4	169	212	232	233	103	128	63·1	72·0
40. Ankylostomiasis	248	252	404	465	163	205	285	369	229	426	155	218
42. Other Diseases due to Helminths	354	361	875	1180	243	320	119	119	634	991	421	567
II. Cancer and other Tumours	109	58·7	117	139	53·6	42·0	60·7	89·4	74·3	100	71·7	68·6
45. Cancer of the Buccal Cavity	60·7	20·45	54·75	37·5	31·85	13·0	24·1	16·0	37·2	29·4	49·8	27·8
46. Cancer of the Digestive System	16·6	4·3	16·7	25·8	9·7	3·44	14·9	11·4	12·8	18·3	8·14	11·26
47. Cancer of the Respiratory System	4·7	—	1·13	2·6	—	—	1·74	0·48	0·85	0·49	—	0·52

TABLE 40 (*Contd.*)

Averages Death Rates per Million Population from Principal Causes in the 21 *Districts of Ceylon for the Period* 1937-1948, *Classified According to Sex.*

Causes of Death	All Ceylon		Colombo		Negombo		Kalutara		Kandy		Matale		N'Eliya		Galle	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
48. Cancer of the Uterus	—	31·7	—	86·3	—	7·03	—	19·0	—	32·4	—	14·4	—	33·6	—	18·0
49. Cancer of the Female Genital Organs	—	5·5	—	21·7	—	0·77	—	2·75	—	3·87	—	1·22	—	3·67	—	1·99
50. Cancer of the Breast	0·49	10·2	1·05	35·6	—	10·1	0·33	10·8	0·23	6·6	—	3·84	0·56	2·45	0·68	6·30
51. Cancer of the Male Genital Organs	5·9	—	20·2	—	3·35	—	2·17	—	6·63	—	4·53	—	3·73	—	2·39	—
53. Cancer of the Skin	5·52	4·74	12·1	6·9	5·13	—	1·84	4·99	5·57	6·50	5·28	8·28	2·21	6·09	3·51	3·63
58. Rheumatic Fever	339	356	222	262	361	428	502	610	354	352	300	282	174	158	517	608
61. Diabetes Mellitus	136	65·6	246	160	142	63·8	143	71·4	89·0	42·5	80·5	39·2	67·7	26·5	204	84·5
IV. Blood Diseases	421	356	350	335	736	584	525	498	236	176	327	149	90·6	77·6	710	717
73. Anaemia	386	329	331	305	734	582	507	493	227	169	289	130	82·6	72·1	682	689
XI. Diseases of the Nervous System	2360	2430	1780	1700	1330	1420	3060	3070	1380	1340	2180	2380	1500	1470	4830	4560
86. Convulsions in Children under 5 years	1776	1907	807	829	676	742	2200	2270	896	934	1740	1470	971	990	4170	4000
VII. Diseases of the Circulatory System	535	378	1230	874	436	256	996	297	513	401	386	262	480	452	693	448

TABLE 40 (*Contd.*)

Averages Death Rates per Million Population from Principal Causes in the 21 *Districts of Ceylon for the Period* 1937-1948, *Classified According to Sex.*

Causes of Death	Matara		Hambantota		Jaffna		Mannar		Vavuniya		Batticaloa		Trincomalee		Kurunegala	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
48. Cancer of the Uterus	—	15·2	—	23·5	—	15·1	—	17·7	—	—	—	7·6	—	32·2	—	12·2
49. Cancer of the Female Genital Organs	—	1·53	—	1·34	—	1·74	—	—	—	—	—	1·93	—	—	—	—
50. Cancer of the Breast	0·49	2·60	—	2·3	1·14	9·85	—	10·51	—	10·1	—	0·86	—	2·53	0·35	3·90
51. Cancer of the Male Genital Organs	149	—	2·38	—	3·36	—	4·82	—	—	—	1·53	—	11·7	—	3·16	—
53. Cancer of the Skin	2·49	2·85	—	1·36	9·48	6·17	—	—	13·1	6·8	10·0	5·2	—	7·44	3·87	1·42
58. Rheumatic Fever	289	233	405	336	489	519	835	609	532	699	806	994	1230	1040	126	119
61. Diabetes Mellitus	126	49	87·8	26·3	343	128	82·7	24·8	58·4	10·1	47·3	16·0	95·3	35·5	65·4	21·7
IV. Blood Diseases	723	593	1300	928	229	287	383	389	407	375	624	521	409	392	442	262
73. Anaemia	669	587	1290	925	170	237	242	199	267	230	198	229	104	104	435	258
XI. Diseases of the Nervous System	5210	5420	8090	8560	1550	1370	1660	1630	2050	1820	1270	1430	3090	3270	1840	2100
86. Convulsions in Children under 5 years	4660	4870	7310	7770	987	937	1200	1300	1580	1550	1030	1170	2530	3080	1460	1780
VIII. Diseases of the Circulatory System	271	167	312	266	267	207	479	240	497	412	163	172	366	193	297	242

TABLE 40 (*Contd.*)

Averages Death Rates per Million Population from Principal Causes in the 21 *Districts of Ceylon for the Period* 1937-1948, *Classified According to Sex.*

Causes of Death	Puttalam		Chilaw		Anuradhapura		Badulla		Ratnapura		Kegalle	
	M	F	M	F	M	F	M	F	M	F	M	F
48. Cancer of the Uterus	—	10·9	—	21·3	—	11·8	—	35·3	—	21·7	—	16·3
49. Cancer of the Female Genital Organs	—	5·26	—	—	—	1·47	—	5·33	—	3·32	—	0·43
50. Cancer of the Breast	—	5·2	—	17·1	1·51	—	0·47	3·73	—	4·35	—	0·96
51. Cancer of the Male Genital Organs	—	8·1	2·52	—	—	—	2·93	—	2·91	—	0·85	—
53. Cancer of the Skin	10·5	—	8·11	8·23	1·98	2·80	2·9	2·7	4·18	5·77	2·42	1·74
58. Rheumatic Fever	135	165	165	133	141	93·5	181	124	429	394	358	370
61. Diabetes Mellitus	114	34·8	125	65·7	50·7	19·8	43·4	19·5	59·9	28·4	55·3	16·7
IV. Blood Diseases	358	270	426	466	778	725	219	182	255	208	354	187
73. Anaemia	322	250	386	460	681	620	211	177	251	202	344	180
XI. Diseases of the Nervous System	2120	2460	1870	1910	1980	2550	3070	3370	2020	2130	1410	1470
86. Convulsions in Children under 5 years	1670	2130	1030	1150	1690	2240	2820	3020	1620	1810	980	1070
VII. Diseases of the Circulatory System	498	366	455	291	259	210	258	292	266	169	230	130

TABLE 40 (*Contd.*)

Averages Death Rates per Million Population from Principal Causes in the 21 Districts of Ceylon for the Period 1937-1948, Classified According to Sex.

Causes of Death	All Ceylon		Colombo		Negombo		Kalutara		Kandy		Matale		N'Eliya		Galle	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
91. Pericarditis	5·44	2·95	10·2	4·92	3·28	1·53	3·76	—	7·61	3·38	1·11	2·53	4·43	3·73	4·33	0·89
92. Chronic Endocarditis	31·5	38·3	57·05	65·8	15·7	12·6	19·0	31·2	41·5	54·3	29·3	19·7	44·1	46·0	18·1	17·1
93. Diseases of Myocardium	210	201	571	530	106	108	95·5	82·6	258	245	158	151	271	292	175	160
94 (a) Diseases of Coronary Arteries	58·5	13·6	235	58·8	17·9	9·1	26·1	4·64	42·1	9·76	26·2	—	32·3	1·62	15·1	6·1
94 (b) Angina Pectoris	5·77	1·82	11·7	3·50	7·74	3·70	4·82	1·94	9·86	0·56	4·76	—	4·14	—	1·64	—
VIII. Diseases of the Respiratory System	2240	2060	1670	1560	1060	888	1030	1210	1860	1800	2730	2290	2730	2980	1090	1100
106. Bronchitis	227	247	187	222	101	107	103	150	258	291	258	250	617	725	110	107
107-109. Pneumonia	1486	1360	1260	1140	778	592	855	868	1210	1100	1570	1180	1760	1870	795	738
112. Asthma	72·4	98·9	65·7	90·7	30·7	71·9	62·0	112·5	90·5	99·2	119	132	87·7	104	96·7	187
IX. Diseases of the Digestive System	1375	1340	1970	1740	855	860	799	888	1160	1175	1530	1400	1300	1320	1570	1850
117 (a) Gastric Ulcer	8·19	3·22	18·8	4·76	2·01	1·60	3·67	—	11·9	6·08	7·53	2·46	6·92	5·88	1·16	1·75
117 (b) Duodenal Ulcer	2·55	0·505	8·23	0·66	—	0·82	—	—	2·76	0·48	2·11	2·37	1·08	3·69	0·81	0·41

TABLE 40 (*Contd.*)

Averages Death Rates per Million Population from Principal Causes in the 21 *Districts of Ceylon for the Period* 1937-1948, *Classified According to Sex.*

Causes of Death	Matara		Hambantota		Jaffna		Mannar		Vavuniya		Batticaloa		Trincomalee		Kurunegala	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
91. Pericarditis	1·97	2·08	4·97	1·12	2·44	0·46	6·73	10·6	19·1	—	1·68	—	4·01	—	7·08	4·79
92. Chronic Endocarditis	10·05	9·0	23·7	47·9	4·6	11·3	63·8	48·3	139	149	19·0	29·0	24·2	15·1	20·8	31·0
93. Diseases of Myocardium	63·5	82·8	135	83·4	67·2	72·6	110	113	189	146	33·8	54·3	137	131	105	124
94a. Diseases of Coronary Arteries	13·5	4·44	16·7	8·64	21·0	3·8	23·8	—	40·1	—	7·2	4·34	36·8	—	6·8	1·76
94b. Angina Pectoris	1·10	1·20	5·12	—	3·92	2·00	—	—	—	17·7	10·9	10·7	8·96	—	0·74	—
VIII. Diseases of the Respiratory System	1240	1090	3310	2500	3750	3640	6950	5665	12090	9335	6060	5470	7625	7550	2270	1640
106. Bronchitis	95	84	383	323	210	184	201	124	367·5	167·5	700	790	238	256	67	55
107-109. Pneumonia	1030	862	2700	2010	3200	3100	3100	3250	10590	9170	2710	2840	6680	6720	149	1110
112. Asthma	60·4	102	64·9	73·6	171	189·5	94·9	101	130	88·3	61·0	59·5	74·6	48·1	27·7	39·6
IX. Diseases of the Digestive System	1470	1780	3100	3030	1355	1170	2030	1460	1890	1090	2120	2140	956	540	1000	758
117a. Gastric Ulcer	2·47	2·43	4·91	5·10	13·2	4·53	—	7·2	9·58	9·58	11·0	—	15·6	—	0·37	0·78
117b. Duodenal Ulcer	0·46	—	1·29	—	8·20	0·84	6·7	—	—	—	0·96	—	2·18	—	0·99	—

TABLE 40 (*Contd.*)

Averages Death Rates per Million Population from Principal Causes in the 21 *Districts of Ceylon for the Period* 1937-1948, *Classified According to Sex.*

Causes of Death	Puttalam		Chilaw		Anuradhapura		Badulla		Ratnapura		Kegalle	
	M	F	M	F	M	F	M	F	M	F	M	F
91. Pericarditis	3·69	10·9	1·26	2·94	4·44	3·47	6·62	7·18	3·38	1·72	3·95	2·41
92. Chronic Endocarditis	214·0	179·0	59·9	69·8	8·6	18·5	66·5	32·5	23·0	42·9	15·9	28·7
93. Diseases of Myocardium	99·0	101	46·5	37·5	142	148	159	138	86·4	62·8	54·4	39·9
94*a*. Diseases of Coronary Arteries	—	—	7·5	6·34	16·4	3·34	22·0	2·14	10·9	1·22	12·0	1·04
94*b*. Angina Pectoris	52·6	33·5	5·44	—	—	—	1·96	1·08	1·12	2·50	1·90	—
VIII. Diseases of the Respiratory System	5200	4360	2635	2210	5525	6000	3030	2900	1580	1490	1220	1120
106. Bronchitis	207	306	76	64	126	102·6	537	616	238	264	104	107
107-109. Pneumonia	2620	2350	2030	1730	1800	1580	1440	1270	1190	1055	887	793
112. Asthma	38·5	51·5	66·8	78·3	19·6	33·5	48·3	57·6	66·8	96·1	62·8	95·4
XI. Diseases of the Digestive System	3110	2890	932	735	1955	1990	1170	1170	1150	1240	668	616
117*a*. Gastric Ulcer	11·8	5·26	7·07	2·83	1·54	1·47	5·14	5·73	4·35	1·61	4·63	0·42
117*b*. Duodenal Ulcer	—	—	1·13	—	1·05	1·93	1·71	0·92	0·97	—	—	—

TABLE 40 (*Contd.*)

Averages Death Rates per Million Population from Principal Causes in the 21 *Districts of Ceylon for the Period* 1937-1948, *Classified According to Sex.*

Causes of Death	All Ceylon		Colombo		Negombo		Kalutara		Kandy		Matale		N'Eliya		Galle	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
120. Diarrhoea and Enteritis over 2 years	804	882	1300	1475	660	728	583	689	833	959	1200	1190	1000	1110	1290	1650
224. Cirrhosis of the Liver	44·2	17·2	92·1	25·5	31·5	8·0	29·9	13·7	41·7	26·8	45·7	17·3	30·3	16·4	27·4	10·2
X. Diseases of the Genito-Urinary System	270	326	389	350	137	188	166	203	388	489	359	479	547	829	224	241
XI. Diseases of Pregnancy, Child-birth and Peurperium	—	1200	—	871	—	727	—	707	—	1010	—	1900	—	839	—	746
XV. Diseases Peculiar to 1st Year of Life	2140	2040	1670	1635	1490	1440	861	805	3050	2895	3460	3470	3380	3100	604	501
158. Congenital Debility	1010	950	599	632	322	319	413	390	1685	1560	2035	1980	2040	1870	339	269
159. Premature Birth	593	554	611	587	355	361	359	325	868	770	570	590	1210	1150	237	212
160. Rata	908	904	574	575	1590	1540	131	131	1010	1040	1500	1590	98·6	139	9·2	13·0

TABLE 40 (*Contd.*)

Averages Death Rates per Million Population from Principal Causes in the 21 *Districts of Ceylon for the Period* 1937-1948, *Classified According to Sex.*

Causes of Death	Matara		Hambantota		Jaffna		Mannar		Vavuniya		Batticaloa		Trincomalee		Kurunegala	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
120. Diarrhoea and Enteritis over 2 years	1120	1540	2400	2490	918	920	1160	1130	1200	838	1340	1510	539	361	753	624
224. Cirrhosis of the Liver	24·7	15·6	61·5	22·3	23·8	3·9	80·6	12·3	63·3	10·1	28·1	4·8	28·2	2·5	37·6	20·0
X. Diseases of the Genito-Urinary System	151	171	252	273	163	167	401	482	249	216	114	189	218	354	177	192
XI. Diseases of Pregnancy, Child-birth and Peurperium	—	820	—	2390	—	1170	—	2260	—	4005	—	1510	—	2030	—	2540
XV. Diseases Peculiar to 1st Year of Life	565	459	2270	1995	2310	2040	5590	5240	4590	3875	2030	2030	3045	2985	3120	3190
158. Congenital Debility	353	306	1910	1720	1470	1260	5150	4540	3700	3130	394	390	2565	2440	853	814
159. Premature Birth	194	157	341	252	428	404	630	640	934	858	300	331	253	321	419	545
160. Rata	—	6·8	—	7·8	713	639	92	107·6	582	553	2350	2320	387	353	3360	3550

TABLE 40 (*Contd.*)

Averages Death Rates per Million Population from Principal Causes in the 21 *Districts of Ceylon for the Period* 1937-1948, *Classified According to Sex.*

Causes of Death	Puttalam		Chilaw		Anuradhapura		Badulla		Ratnapura		Kegalle	
	M	F	M	F	M	F	M	F	M	F	M	F
120. Diarrhoea and Enteritis over 2 years	2480	2210	539	530	1605	1810	880	963	910	1060	463	478
224. Cirrhosis of the Liver	44·2	29·8	42·5	6·9	28·7	10·3	48·1	24·7	37·3	17·9	19·5	8·5
X. Diseases of the Genito-Urinary System	461	546	163	192	169	188	405	536	293	361	149	202
XI. Diseases of Pregnancy, Child-birth and Peurperium	—	4130	—	1300	—	4270	—	1150	—	911	—	1000
XV. Diseases Peculiar to 1st Year of Life	3620	3600	1610	1540	3810	4660	2610	2520	2430	2330	1930	1870
158. Congenital Debility	1595	1270	701	633	1780	2220	1180	1130	1080	1050	732	694
159. Premature Birth	811	880	421	373	524	588	1400	1370	790	726	430	393
160. Rata	2180	2620	868	952	2310	3080	11·0	13·4	792	880	1420	1460

The geographical position of each of these zones is worthy of a moment's study on the map (Map IV).

It will be seen that each zone is a distinct and complete entity. Zone A is found along the Western coastal belt and in the neighbouring Provinces of the North-West and Sabaragamuwa. Zone B is situated along the Southern coastal belt and extends into the adjoining Province of Uva. Zone C is the hilly, Central Province, while Zone D comprises the Northern, North-Central and Eastern Provinces.

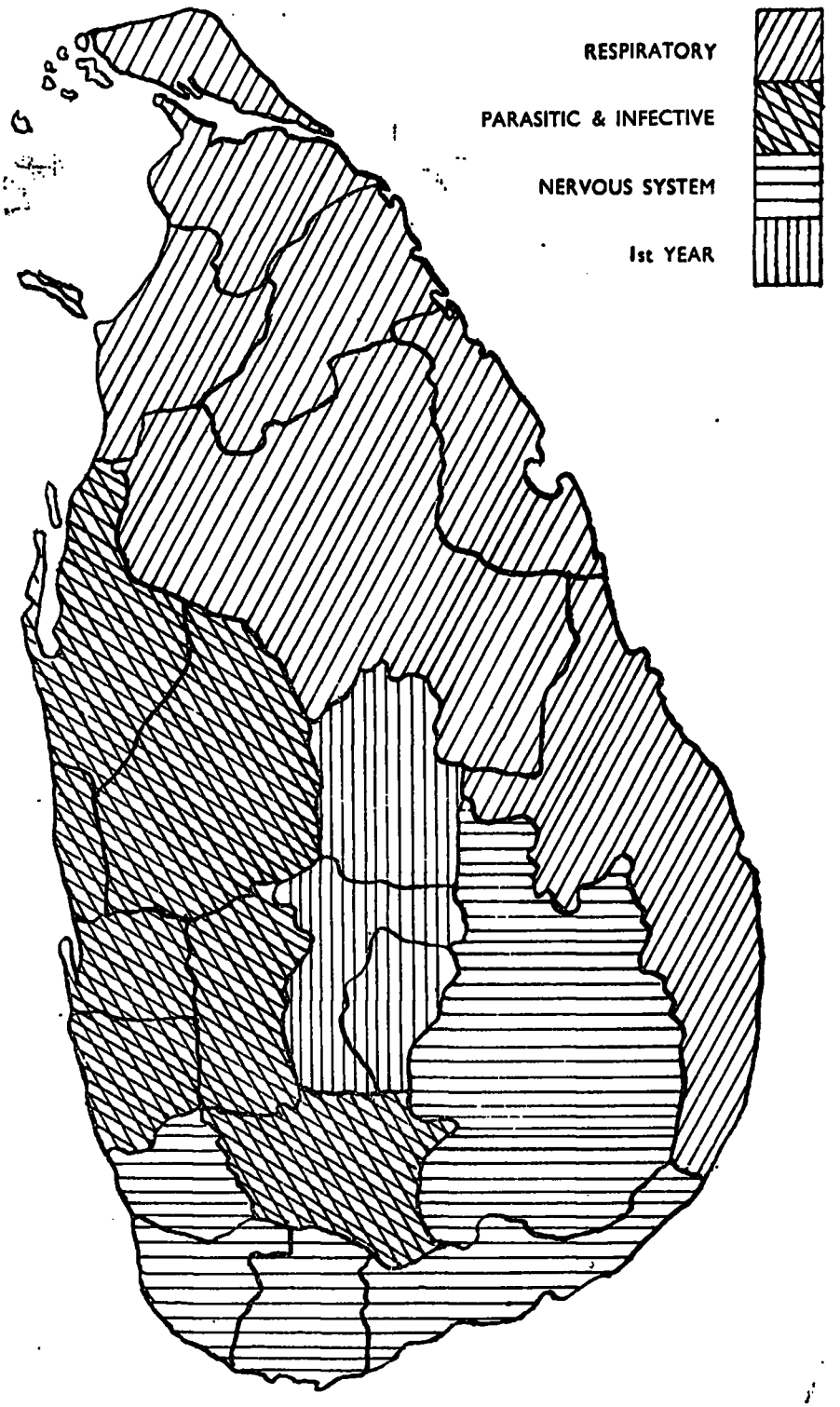
The population distribution according to racial groups in each of these zones is as follows (1946 Census) :—

	Zonal Populations			
	A	*B*	*C*	*D*
Total Population ..	2,833,603	1,600,743	1,159,000	795,485
Population Density (thousands/ sq. mile) ..	0·523	0·300	0·498	0·081
Sinhalese ..	2,332,781	1,351,207	618,565	148,301
Ceylon Tamils ..	86,017	137,217	40,063	582,048
Indian Tamils ..	197,339	54,123	395,728	16,370
Ceylon Moor ..	114,947	51,517	60,355	138,261
Indian Moor ..	22,459	1,798	6,887	3,910
Burghers and Eurasians ..	30,673	2,319	5,161	3,062
Malays ..	14,933	3,184	3,476	842
Europeans ..	3,204	596	1,376	211
Others ..	31,250	3,084	3,578	5,203

The populations of Zones A and B are predominantly Sinhalese. The latter are also the most numerous in Zone C but here there is a high Indian Tamil population too. The main ethnic group in Zone D is the Ceylon Tamil, but this zone also has the highest population of Ceylon Moors.

The zones also vary in the densities of their populations. Zone A is the most densely populated being followed closely by Zone C. Zone D has a relatively light population density.

There are other differences between zones which should be noted. Zone A spreads out from the great port and commercial centre of Colombo. It is heavily populated and urbanized and contains many of the coconut and rubber plantations of Ceylon. Zone C is the Kandyan Hill Country where many of the large tea and rubber estates, with their Indian Tamil labour population are situated. Zone B combines these characteristics of Zones A and C. Here we find a relatively dense population—area with some coconut plantations embracing the ancient port of Galle, plus a region with tea estates in the hilly regions of Uva. Zone D corresponds to almost the entire dry-region of the island. Here the predominantly Ceylon Tamil population struggles constantly to eke out a living from the arid soil. Apart from these differences in racial composition (and, therefore, cultural background) and population density, the zones differ markedly in their agricultural patterns. These differences can be well seen from the data in Tables 41-46 inclusive.



Map 4.—Mortality Zones in Ceylon.

TABLE 41

Production of Tea, Rubber and Paddy.

Group	Total Produced in Ceylon, 1946	Per cent. of Total Produced in Zone			
		A	B	C	D
Tea (thousand pounds)	297,147	18·5	24·9	56·5	—
Rubber (tons)	94,000	67·8	18·9	13·3	—
Paddy (thousand baskets)	11,433	35·0	20·1	12·8	32·2

TABLE 42

Paddy Yield per acre in Bushels.

		Ceylon	Zone A	Zone B	Zone C	Zone D
Maha	44-45	12·5	12·1	9·8	15·5	13·7
	45-46	12·9	12·2	11·2	14·9	14·1
	46-47	13·0	12·0	10·3	15·7	15·0
Yala	45	11·1	9·2	10·0	10·6	17·6
	46	11·0	9·0	9·8	12·0	17·6
	47	11·4	8·2	10·5	11·8	19·7
	48	12·7	10·9	10·8	13·1	17·6

TABLE 43

Acreage of Land.

(*Census of Agriculture*, 1946).

Zone	Total Land Area	Per cent. of total land which is—	
		Cultivable	Cultivated
A	4,030,080	51·4	42·7
B	3,372,160	25·1	18·7
C	1,465,600	50·4	38·7
D	7,068,800	8·3	4·2

TABLE 44

Acreage of Crops.

(*Census of Agriculture*, 1946).

Zone	Total Acreage	Per cent. of Total under—					
		Tea	Rubber	Coconut	Paddy	Chena	Other Cultivation
A	1,565,165	6·1	25·7	47·0	16·2	0·9	4·1
B	565,594	22·8	18·3	18·5	21·6	2·3	16·6
C	521,724	59·4	12·9	6·2	13·1	1·7	6·7
D	246,166	—	—	19·6	71·5	4·5	4·4

TABLE 45

Agricultural Holdings.

(*Census of Agriculture*, 1946).

Zone	Total Cultivated Extents	Per cent. of Total Cultivated Extents as—					
		'A' Estates	'B' Estates	Small holdings	Town and Village Gardens	Paddy Land	Chenas
A	1,718,861	24·6	15·7	35·5	8·9	14·5	0·8
B	630,393	29·3	9·6	29·8	10·3	19·0	2·0
C	567,785	62·5	2·7	13·4	8·1	11·8	1·5
D	290,991	3·6	8·3	9·8	15·4	59·1	3·8

TABLE 46

Asweddumized Paddy Lands in Ceylon 1946.

Regions	Number of holdings	Total Extent (acres)	Average Size (acreage)	Proportion per cent. of holdings—				
				Less than 1 acre	1-5 acres	5-10 acres	10 or more acres	Fully owned
Ceylon	771,908	899,970	1·17	64·3	32·1	2·6	1·1	48·3
Zone A	301,484	316,837	1·05	60·8	37·3	1·5	0·4	52·7
Zone B	115,851	169,945	1·47	54·9	40·4	3·2	1·5	55·7
Zone C	131,129	77,669	0·59	81·7	17·9	0·3	0·04	54·8
Zone D	223,444	335,520	1·50	63·7	29·0	5·0	2·3	34·7

Comparing the zones, Zone A produces most rubber and paddy and it also has the largest cultivable and cultivated areas. The highest proportions of land under rubber and coconut are to be found in this zone, in which, too, most of the cultivated land is in the form of small holdings. Zone B produces very similar proportions of the island's total output of tea, rubber and paddy, though tea is the major product, while the yield of paddy per acre is the lowest for any zone. Zone C consists mainly of large 'A' estates and three-fifths of the acreage is under tea, which is the main agricultural product. The yield per acre of paddy is good but most of the paddy lands are small, more than four-fifths of the holdings being under one acre in extent and the average size being only 0·59 acres. Zone D produces mainly paddy, where the greatest yields per acre are to be found. Although this region has the largest land area, it contains the smallest cultivable and cultivated areas. Most of the agricultural holdings are paddy-land or just town or village gardens. The paddy lands have the largest average size but only about a third of them are fully owned by the cultivators.

The classification into zones is made on the basis of male death rates. The classification according to female death rates is substantially similar, the principal complicating factor being variations in the relative importance of deaths during child-birth and pregnancy in the various districts.

The zones differ in their mortality rates from various causes and a short summary of the distinguishing mortality features of each zone can be given (Table 49).

Zone A :—This zone shows the greatest mean death rate for—

(*a*) Infective and Parasitic Diseases;

(*b*) Tuberculosis of the Respiratory System (due to the high incidence in the Colombo district);

(*c*) Diseases of the Circulatory System (due to the high incidence in the Colombo district);

(*d*) Rata.

(The Colombo district has the highest population density so that it is not surprising to find such high mortality rates for respiratory tuberculosis, influenza, bronchitis, diarrhoea and enteritis. It is also the most industrialized and westernized region of Ceylon and the high death rates from diseases of the circulatory, digestive and genito-urinary systems gives a 'western' pattern to the mortality picture).

Zone B :—Here are found the greatest death rates from—

(*a*) Diseases of the Nervous System;

(*b*) Diseases of the Blood;

(*c*) Anaemia;

(*d*) Convulsions in Children under five years of age.

Zone C :—This zone shows the greatest mean death rates from—

(1) Diseases peculiar to the First Year of Life;

(2) Prematurity;

(3) Congenital Debility;

(4) Bronchitis;

(5) Diseases of the Urinary and Genital Systems, and it also has the greatest mean birth rate of the four zones.

Zone D :—In this zone are to be found the greatest death rates from—

(1) Diseases of the Respiratory System;

(2) Pneumonia;

(3) Diseases of the Digestive System;

(4) Diseases of Pregnancy, Child-birth and the Puerperium;

(5) Malaria;

(6) Malaria and Rickets;

(7) Rheumatic Fever;

and this zone also has the highest—

(1) general death;

(2) maternal death rate; and

(3) infant mortality rate.

These differences will be discussed in more detail when the mortalities from the various diseases are analysed separately. The differences in specific mortality incidences between the zones are well illustrated by the mortality patterns (deaths from various causes per 1,000 total deaths) for the period 1937-48 (Table 47).

The populous, semi-commercialized and urbanized zone A has the greatest proportion of deaths from Infective and Parasitic Diseases, including Tuberculosis of the Respiratory System, and from diseases of the Circulatory System, while it shows the lowest proportion of deaths from Bronchitis, Mandama and Rickets and Rheumatic Fever. Zone B, Sinhalese, heavily populated, and with a mixed agriculture, presents the greatest proportion of deaths from malaria, influenza,

TABLE 47

The Proportion of Deaths from Various Causes per 1,000 *Total Deaths in each Mortality Zone of Ceylon* (1937-48).

(*a*) *MALES*	*ZONE*			
Causes of Death	A	B	C	D
All cases	1000	1000	1000	1000
Infective and Parasitic Diseases	226	181	151	146
Tuberculosis of the Respiratory System	47	22	20	24
Malaria	58	65	35	59
Influenza	11	22	16	9
Blood Diseases	22	32	6	17
Anaemia	21	31	12	10
Diseases of the Nervous System	93	230	100	66
Convulsions in Children under 5 years	58	197	61	49
Diseases of the Circulatory System	38	25	32	11
Diseases of the Respiratory System	93	91	182	204
Bronchitis	8	12	21	13
Pneumonia	68	54	83	130
Diseases of the Digestive System	74	73	87	66
Diarrhoea and Enteritis	54	52	55	45
Diseases of the Genito-Urinary System	15	13	37	7
Diseases of the First Year of Life	112	67	191	110
Premature Birth	30	29	54	18
Congenital Debility	39	36	109	60
Mandama and Rickets	29	31	53	41
Rheumatic Fever	14	21	18	22

TABLE 47 (*Contd.*)

The Proportion of Deaths from Various Causes per 1,000 *Total Deaths in each Mortality Zone of Ceylon* (1937-48).

(*b*) *FEMALES*	ZONE			
Causes of Death	A	B	C	D
All Causes	1000	1000	1000	1000
Infective and Parasitic Diseases	218	181	139	123
Tuberculosis of the Respiratory System	32	16	17	14
Malaria	62	63	32	54
Influenza	12	23	17	7
Blood Diseases	16	26	5	16
Anaemia	16	26	8	10
Diseases of the Nervous System	92	217	88	63
Convulsions in Children under 5 years	62	188	60	49
Diseases of the Circulatory System	25	15	28	8
Diseases of the Respiratory System	78	80	179	178
Bronchitis	8	12	22	12
Pneumonia	56	50	72	121
Diseases of the Digestive System	64	75	80	55
Diarrhoea and Enteritis	53	63	57	43
Diseases of the Genito-Urinary System	15	14	50	7
Diseases during Child-birth, Pregnancy and the Puerperium	64	48	59	67
Diseases of the First Year of Life	106	55	168	98
Premature Birth	27	24	47	16
Congenital Debility	37	30	93	52
Mandama and Rickets	41	40	74	44
Rheumatic Fever	14	20	16	22

anaemia, diseases of the nervous system (including convulsions in children under five years of age) and from diarrhoea and enteritis. By contrast, the fraction of the total deaths in the zone due to deaths occurring during pregnancy and the first year of life (including deaths from congenital debility) and from pneumonia are the least for all Ceylon. The estate hill-country, zone C, with its large Indian Tamil population, shows the greatest proportion of deaths from bronchitis, diseases of the digestive and genito-urinary systems, mandama and rickets and diseases of the first year of life including congenital debility and prematurity). In this zone about one in every five deaths occur during the first year of life. The proportion of deaths from tuberculosis, malaria and blood diseases, however, is small.

The dry zone D, sparsely populated, and with a large preponderance of Ceylon Tamils and Ceylon Moors, has most of its deaths occurring from respiratory diseases (including pneumonia) and during pregnancy. The proportion of deaths from infective and parasitic diseases, influenza, diseases of the nervous system, convulsions in children under five years, diseases of the circulatory, digestive and genito-urinary systems, diarrhoea and enteritis and from prematurity are the lowest in all Ceylon.

The mean death rates, analysed by sex and main causes, for the period 1937-48 are given for each zone in Table 49. The general death rates for each zone do differ but it was thought advisable to standardize these using the 1946 Census figures for all Ceylon as the standard population. The mortality figures for the year 1946 and 1949 have been dealt with in this way (Table 48).

TABLE 48

Standardized Death Rates for the Mortality Rates in Ceylon.

Zone	GENERAL DEATH RATES FOR THE YEARS									
	1937-48 (unstandardized)		1946 (unstandardized)		1949 (unstandardized)		1946 (standardized)		1949 (standardized)	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
A	18·2	19·0	19·7	21·6	12·1	11·7	19·9	21·8	13·5	14·1
A_1	18·3	18·0	18·4	18·7	14·7	14·4	18·5	18·6	15·8	15·6
B	18·6	20·4	18·2	19·5	11·9	12·8	17·9	19·2	12·7	13·8
B_1	18·3	19·7	17·2	17·9	12·1	12·6	21·9	24·9	16·8	19·0
B_3	18·7	20·4	17·2	18·2	13·2	14·4	17·0	18·9	14·2	16·2
C	16·6	18·1	18·5	21·1	12·6	13·9	18·3	21·6	13·5	15·5
D	24·5	26·5	22·0	24·7	12·9	13·6	23·3	25·4	15·1	15·1
D_2	26·1	29·1	26·5	33·1	14·2	15·6	29·4	33·8	17·1	17·5

A_1 = Colombo District
B_1 = Galle and Matara
B_3 = Badulla
D_2 = Batticaloa and Trincomalee

Zone B has the lowest death rate. In all zones it will be seen that the standardized mortality rate has been markedly reduced in the short period 1946 to 1949. Despite this, some areas still have high rates e.g. Colombo district, Galle and Badulla, Batticaloa and Trincomalee, Mannar and Vavuniya. The rates are falling rapidly, however, in the latter two areas and it is districts such as those of Colombo and Galle which have shown the least change. These districts are now becoming the regions with the worst death risks and it looks as if the health problems in Ceylon are being transferred from the stagnant river beds of the dry zone to the overcrowded towns of the wet zone with their inadequate sanitation, housing and water-supplies. This is a 'western' trend in the mortality picture that has mixed blessings.

TABLE 49

Average Death Rate per Million of the Population from Principal Causes in Mortality Zones for the Years 1937-48.

Causes of Death	All Ceylon		A		B		C		D	
	M	F	M	F	M	F	M	F	M	F
1. Infective and Parasitic Diseases	2590	3620	4150	4140	3530	3700	2440	2580	3650	3280
12. Tuberculosis of the Respiratory System	607·5	449	855	648	409	331	339	310	588	372
28. Malaria	1070	1134	1070	1180	1220	1300	554	582	1460	1440
33. Influenza	263	207	195	224	410	483	270	301	187	201
53. Rheumatic Fever	339	356	258	272	385	403	302	295	557	593
61. Blood Diseases	421	356	395	209	601	539	207	148	433	421
73. Anaemia	386	329	385	293	586	531	197	140	249	272
VI. Diseases of the Nervous System	2360	2430	1730	1750	4320	4450	1510	1510	1650	1675
86. Convulsions under 5 years	1776	1907	1060	1180	3700	3850	1020	1080	1220	1310
VII. Diseases of the Circulatory System	535	378	384	470	452	305	467	390	252	201
III. Diseases of the Respiratory System	2240	2060	1720	1490	1720	1660	2200	2180	4930	4640
106. Bronchitis	227	247	148	161	222	242	348	399	328	321
107-109. Pneumonia	1486	7360	1250	1055	1140	1015	1390	1300	3190	3200
IX. Diseases of the Digestive System	1375	1340	1340	1200	1330	1490	1220	1230	1560	1420
120. Diarrhoea Enteritis over 2 years	804	882	1010	1040	1050	1280	921	1040	1090	1150
X. Diseases of the Genito-Urinary System	270	326	272	276	232	284	421	572	162	193
XI. Diseases of Pregnancy, Child-birth and Puerperium	—	1200	—	1230	—	975	—	1090	—	1780
158. Congenital Debility	1010	950	718	701	674	622	1870	1730	1470	1390
159. Premature Birth	593	554	549	498	532	489	875	826	424	420
160. Rata	908	904	1330	1370	39	40	672	890	1320	1300

PART V

Differences in the Mortality Rates of the Ethnic Groups of Ceylon

It has already been remarked that the Ceylonese nation is a composite of ethnic groups, these groups differing in their religion, social structure and general site of residence in Ceylon. They also have differing mortality patterns.

The average mortality rates for each racial group in Ceylon have been calculated for the period 1937-48 and these averages have been compared with each other (Table 50). Very significant differences between the causes of death within each race are thereby revealed. The distinguishing mortality features of each ethnic group are detailed in the following pages.

The Sinhalese have the greatest death rates from—

(*a*) *Diseases of the Blood.*—The Sinhalese rate is greater than that of any other race. The rate for Moors is next highest, being greater than all the remaining rates. Tamils have a rate which is greater than that of Europeans, Malays and Burghers.

(*b*) *Diseases of the Nervous System.*—The Sinhalese have a greater mean rate than do all the other races. The Malays have a greater mean rate than the Tamils, the Burghers and the Europeans, while the mean rate for Moors is greater than that for Burghers and for Tamils.

(*c*) *Anaemia.*—Here the relative differences, as would be expected, parallel those indicated for rates from the group of blood diseases.

(*d*) *Helminths other than Ankylostomiasis.*—The Sinhalese rate is greater than that of any other race. In addition the Tamil rate is less than that of Moors, of Malays and of Burghers. The rate for Moors is greater than that for Burghers.

(*e*) *Mandama and Rickets.*—Here the Sinhalese, Moors and Malays possess similar death rates. The Sinhalese rate is greater than that of Tamils and Burghers. The rate for Moors is also greater than that for Tamils and Burghers and the Malay mean rate is greater than that of the Tamils. The Burghers have a smaller mean rate than the Tamils.

(*f*) *Rata.*—The Sinhalese and the Moors have mean rates which do not differ significantly. The Sinhalese rate is greater than that of the Burghers, the Tamils and the Malays, and the Moor rate is similarly greater. The rate for Tamils is greater than that for Burghers and Malays.

TABLE 50

Death Rates per million of the population from Principal causes among the different races in Ceylon for the period 1937-1948, *classified according to sex.*

Causes of Death	All Races		Europeans		Burghers		Sinhalese		Tamils		Moors		Malays		Others	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
I. Infective and Parasitic Diseases	3590	3620	2750	871	3490	2780	3740	3740	3080	3180	3840	4190	5460	5800	2510	4240
1-2. Typhoid and Paratyphoid fever	197	155·6	610	158	244·6	201	215	169	147	119·5	119·4	124·1	425	557	352	199
13. Tuberculosis of the respiratory system	607·5	449	444·5	87	1250	772	607·5	433	559	451	652	549	1570	1400	433	869
27. Dysentery	352	285	218	56·3	372	249	300	235	493	414	361	312	252	231	257	345
28. Malaria	1070	1130	584	176	539	523	1130	1220	833	834	1330	1275	1340	1270	544	668
33. Influenza	263	307	39	53	279	323	244·5	286	282	313	378	461	1020	1200	246	912
40. Ankylostomiasis	209	287	—	—	60·3	68·4	173	179	326·5	619	195	254	75·2	50·6	60·8	156
42. Other diseases due to helminths	479	621	—	—	255	261	625	790	107·5	151·4	441	641	346	625	122	680
II. Cancer and other Tumours	119	133	883	1150	558	506	107	116	136	178	94·2	86·5	171	152	—	—
45. Cancer of the buccal cavity	50·0	31·0	57·0	37·7	136	12·7	45·2	20·9	63·7	62·9	40·3	21·7	22·0	23·3	—	—
46. Cancer of the digestive organs	29·7	25·35	516	371	210	161	24·6	25·6	32·2	19·8	25·9	20·5	105	7·06	—	—
47. Cancer of the Respiratory System	4·47	2·42	175	136	69·0	33·25	3·88	2·08	3·40	2·84	3·06	2·38	15·4	7·06	—	—
48. Cancer of the Uterus	—	31·7	—	71·8	—	128	—	27·8	—	44·2	—	13·6	—	50·1	—	—

TABLE 50 (*Contd.*)

Death Rates per million of the population from Principal causes among the different races in Ceylon for the period 1937-1948, *classified according to sex.*

Causes of Death	All Races		Europeans		Burghers		Sinhalese		Tamils		Moors		Malays		Others	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
49. Cancer of the female genital organs	—	5·5	—	137	—	54·8	—	7·28	—	5·55	—	5·22	—	—	—	—
50. Cancer of the breast	0·49	10·2	—	173	4·48	70·9	0·41	15·2	0·52	8·2	0·38	10·3	—	19·5	—	—
51. Cancer of the male genital organs	5·9	—	27·2	—	52·5	—	6·01	—	5·6	—	1·88	—	—	—	—	—
52. Cancer of the skin	5·52	4·74	—	37·5	8·36	8·13	4·27	6·62	8·5	9·13	7·05	5·34	6·8	—	—	—
58. Rheumatic fever	339	356	15	19	87	54	374	379	237	267	415·5	515	151	63	44·5	15·7
61. Diabetes mellitus	136	65·6	95·2	68·3	301	302	131	65·5	135	58·2	167	74·5	298	181	81	14·7
IV. Blood diseases	421	356	93	19	68	120	517	410	185	214	393	360	95	84	76	180
73. Anaemia	386	329	14	—	59	94	501	399·5	116	157	304	282	70	84	43	180
VI. Diseases of the nervous system	2360	2430	1280	660	1530	1300	2760	2840	1510	1470	1810	1970	2070	1830	650	1950
86. Convulsions—under 5 years	1780	1910	30	53	433	391	2140	2280	1020	1040	1230	1440	1020	1030	319	1500
VII. Diseases of the circulatory system	535	378	2030	1010	1940	1580	509	345	482	418	742	437	1560	955	772	578
90. Pericarditis	5·44	2·95	—	—	17·6	8·69	5·20	2·70	6·66	4·19	2·74	—	—	—	2·76	—
92. Chronic endocarditis	31·5	38·3	182	103	69·6	94·0	25·9	32·4	39·5	56·6	33·2	26·0	85·1	28·8	46·9	74·3
93. Diseases of myocardium	210	201	699	492	875	975	195	160	238	241	383	309	911	762	315	274
94. (*a*) Diseases of coronary arteries	58·5	13·6	802	—	553	199	43·6	12·5	50·6	9·7	138	23·0	266	55·4	292	64

TABLE 50 (*Contd.*)

Death Rates per million of the population from Principal causes among the different races in Ceylon for the period 1937-1948, *classified according to sex.*

Causes of Death	All Races		Europeans		Burghers		Sinhalese		Tamils		Moors		Malays		Others	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
94. (*b*) Angina Pectoris	5·77	1·82	33·6	—	71·0	20·4	3·51	1·13	9·05	2·88	9·48	3·42	20	—	13·1	—
VIII. Diseases of the respiratory system	2240	2060	1330	585	1720	1550	1715	1500	3425	3410	3235	3200	3530	3676	1340	2340
106. Bronchitis	227	247	79·3	17·1	203	245	129·8	138	467	529	291	352	385	557	137	444·2
107-109. Pneumonia	1490	1360	737	469	1270	1040	1100	912	2540	2500	1750	1930	2930	2910	1050	1680
112. Asthma	72·4	98·9	120	31·3	81·2	67·6	56·7	85·0	110	127	92·5	92·4	117	91·9	25·6	121
IX. Diseases of the Digestive System	1375	1340	1580	334	1770	1230	1370	1370	1340	1280	1460	1430	2340	2165	943	1740
117. (*a*) Gastric Ulcer	8·19	3·22	55·7	—	17·7	7·86	3·44	1·54	16·9	7·21	17·9	5·50	32·6	—	25·1	12·0
117. (*b*) Duodenal Ulcer	2·55	0·505	15·0	18·8	4·48	—	1·55	0·369	4·31	0·94	4·68	—	8·83	—	8·18	12·0
120. Diarrhoea and Enteritis over 2 years	804	882	196	31	572	581	852	927	716	809	716	809	628	661	346	707
124. Cirrhosis of the Liver	44·2	17·2	174	18·8	145	50·9	40·3	13·4	56·9	29·8	20·3	8·22	33·2	19·5	36·8	13·8
X. Diseases of the Genito-Urinary System	270	326	637	290	442	384	197	200	477	678	309	336	889	670	261	394
XI. Diseases of Pregnancy, Child-birth and Puerperium	—	1200	—	86	—	559	—	1180	—	1160	—	1780	—	1160	—	723

TABLE 50 (*Contd.*)

Death Rates per million of the population from Principal causes among the different races in Ceylon for the period 1937-1948, *classified according to sex.*

Causes of Death	All Races		Europeans		Burghers		Sinhalese		Tamils		Moors		Malays		Others	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
XV. Diseases peculiar to the first year of life	2140	2040	325	186	1050	830	1820	1730	3015	2850	2220	2320	2040	1930	617	2550
158. Congenital debility	1010	950	77	—	417	255	707	671	1850	1740	1035	1090	933	1120	300	1520
159. Premature birth	593	554	164	169	488	414	497	453	909	869	431	425	940	683	202	819
160. Rata	908	904	—	—	58	93	1050	1050	419	494	1280	1430	61·4	107	152	341

(*g*) *Diarrhoea and Enteritis.*—Here the rate of the Sinhalese is not distinguished from those of the Moors, Tamils and Malays. The Europeans have a smaller rate than all other races, while the rate for Burghers is also less than that for Sinhalese, Tamils, and Moors.

(*h*) *Convulsions under five years of age.*—This is the main cause of deaths which are classified under diseases of the nervous system and, therefore, we find that the Sinhalese have the greatest mean rate. The rates for the Burghers and the Europeans are lower than those for other races. The mean Moor rate is greater than the Tamil rate and the Burgher rate is greater than the European rate.

(*i*) *Rheumatic fever.*—The Sinhalese and the Moors have the greatest mean rates, being significantly greater than the means of all other races. The mean Tamil rate exceeds that of the Burghers and the Europeans and the European rate is also less than that of the Malays and the Burghers.

The Sinhalese, in general therefore, can be distinguished from the other racial groups in Ceylon by their relatively high mortality rates from convulsions in children, and the deficiency syndromes (anaemia, mandama and rickets, rata). This does not mean that the Sinhalese are necessarily more susceptible to these diseases or have less resistance to them. Thus convulsions in children under five years are a common cause of death in the South-west of Ceylon (zone B) where the Sinhalese are the predominant ethnic group, but convulsions are also a major cause of death in infants living in Batticaloa and Trincomalee, which are in the East coast and where Tamils and Moors form the bulk of the population. The distinction between race and environment as a major predisposing factor cannot be made on the evidence at present available.

The Tamils :—The distinction between Ceylon Tamils and Indian Tamils has only been made during the last four or five years by the Registrar-General in his report on the vital statistics of Ceylon. Therefore, these two important sections of the population must here be considered together. The Tamils have the greatest death rates from :—

(*a*) *Diseases of the Respiratory System.*—Here the Tamils, Moors and Malays have similar death rates, which are greater than those for Europeans, Burghers and Sinhalese.

(*b*) *Pneumonia.*—The Tamils and the Malays also show the greatest mean death rate from pneumonia, these rates being significantly greater than those of all the other races. The Moors possess a mean rate which is greater than that of the Europeans, Sinhalese and of the Burghers. The Europeans have a smaller rate than the Sinhalese and the Burghers.

(*c*) *Bronchitis.*—Here too the Tamils and the Malays have the greatest rates. The Tamil rate is significantly greater than that for all other races. The

Malays and the Moors each have mean rates which are greater than those of the Europeans, Sinhalese and of the Burghers. The death rate from bronchitis for the Burghers is in turn greater than that of the Europeans or of the Sinhalese.

(*d*) *Diseases peculiar to the First Year of Life.*—The rate of the Tamils is much larger than that of any other race in Ceylon. The European rate is much less than that of any other race, while the Burgher rate is less than that of the Moors, Malays and the Sinhalese.

(*e*) *Congenital Debility.*—It is not surprising to find, therefore, that the death rate from congenital debility is greater among the Tamils than among the other racial groups, and that the European rate is the least. The death rate among the Burghers is less than that among the Moors, Malays and Sinhalese, while the Sinhalese mean rate is also less than that of the Moors.

(*f*) *Premature Births.*—Similarly, here too, the Tamil death rate is greater than that of the Europeans, Burghers, Sinhalese and Moors. The Malay rate does not differ significantly from that of the Tamils, but it is greater than that for the Europeans, the Burghers, the Sinhalese and the Moors. The European death rate is again the smallest.

(*g*) *Ankylostomiasis.*—The Tamil rate is greater than that for all races. The death rate of the Moors from this cause is greater than that of the Burghers and the Malays and the Sinhalese rate is also greater than that of the Burghers and of the Malays.

(*h*) *Diarrhoea and Enteritis.*—As already noted, this rate is similar to that of the Sinhalese, Moors and Malays, but greater than that of the Europeans and the Burghers.

The distinctive features of the mortality rate of the Tamils are, therefore, relatively high mortalities from respiratory diseases (and especially pneumonia and bronchitis), from diseases peculiar to the first year of life (and especially from congenital debility and prematurity) and from ankylostomiasis. This was to be expected since we have seen that zone D, the northern and eastern parts of the island where there is a large Ceylon Tamil population, has the greatest death rate from respiratory diseases, while zone C, the estate area where most of the Indian Tamils live, has the highest death rate from diseases peculiar to the first year of life.

The Moors :—This group, too, includes both Ceylon- and Indian-Moors. It has the greatest death rates from :—

(*a*) *Diseases of Pregnancy, Child-birth and the Puerperium.*—The rate here is greater than that of all other races. The rates for the Europeans and the Burghers are less than those of the Sinhalese, Tamils and Moors, the Burgher rate being greater than that of the Europeans.

(*b*) *Malaria.*—The rates for the Moors and the Malays are similar and are greater than those of the Burghers, the Europeans and the Tamils. The rate for the Sinhalese is also greater than that for the Burghers, the Tamils and the Europeans, while the Tamil rate is significantly greater than the Burgher rate.

(*c*) *Diseases of the Respiratory System.*—As stated the Moors, the Tamils and the Malays have similar death rates from these causes.

(*d*) *Rheumatic Fever.*—The Sinhalese and the Moors have the greatest rates.

(*e*) *Mandama and Rickets.*—The Moors, the Sinhalese and the Malays have the greatest rates.

(*f*) *Rata.*—The Moors and the Sinhalese have the greatest rates.

(*g*) *Diarrhoea and Enteritis.*—The Europeans and the Burghers have significantly lower mean rates than the other races.

The Moors have mortality rates, therefore, which indicate a relatively high number of deaths from diseases of pregnancy, child-birth and the puerperium, malaria, nutritional deficiencies, and respiratory diseases. The association between the high malaria rate and the high maternal mortality rate is to be particularly noted, since, as seen, there is a high degree of correspondence between malaria morbidity and maternal mortality. The high death rate from respiratory diseases is probably due to the fact that most Moors live in the respiratory—mortality—zone D of the island. The high incidence of deaths from nutritional-deficiency diseases is noteworthy. It is possible to postulate, but not to prove, that the high malaria rate, by reducing vitality and hence productive capacity, may have contributed to the high death rate from the deficiency diseases and that both may have assisted in determining the high maternal mortality rate.

The Malays :—Have the greatest mean death rates from :—

(*a*) *Infective and Parasitic Diseases.*—The rate is greater than that of the Europeans, the Burghers, the Sinhalese and the Tamils. The Moors also have a greater rate than the Europeans and the Tamils, as do the Sinhalese. The mean rate for the Burghers is greater than that for the Europeans. In conformity with this we also find that the Malays possess higher mortality rates for many of the individual infective and parasitic diseases, such as malaria, enteric fevers, respiratory tuberculosis and influenza.

(*b*) *Malaria.*—The Malays and the Moors have the greatest rates.

(*c*) *Enteric Fevers.*—The Europeans and the Malays have the greatest rates. The rate for the Malays is greater than that for the Burghers, the Sinhalese, the Moors and the Tamils. The rates for both the Burghers and the Sinhalese are greater than those for the Moors and the Tamils.

(*d*) *Respiratory Tuberculosis.*—The Malays have a greater mean death rate from this cause than the Sinhalese, Europeans, Tamils, Moors and the Burghers. The latter also have a greater rate than the Sinhalese, Europeans, Tamils and Moors. The Tamil rate is less than that of the Moors and of the Sinhalese, while the Moor rate is greater than the Sinhalese rate.

The relatively low death rate of the Tamils from tuberculosis of the respiratory system is interesting since it has been noted that they have a high death rate from other diseases of the respiratory system.

(*e*) *Influenza.*—The rate for the Malays is greater than that of any other race. The European rate, on the other hand, is less than that of all other races. The rate for Moors is high, being greater than that of the Sinhalese, the Burghers and the Tamils.

(*f*) *Diseases of the Respiratory System.*—The Malays, the Tamils and the Moors have the greatest mean rates.

(*g*) *Pneumonia.*—The Malays and the Tamils have the greatest rates, as they do also for

(*h*) *Bronchitis.*

(*i*) *Diseases of the Circulatory System.*—The Malays, the Europeans and the Burghers have greater rates than the Sinhalese, the Tamils and the Moors, while the rate for Moors is greater than that for the Sinhalese or the Tamils.

(*j*) *Diseases of the Digestive System.*—The mean death rate from these causes is greater for Malays than for Sinhalese, Tamils, Moors, Europeans and Burghers. The Burghers have a greater mean rate than do the Tamils, the Sinhalese or the Moors.

(*k*) *Diabetes Mellitus.*—Along with the Burghers, the Malays have the greatest mean death rate. The Malay rate is greater than that of the Europeans, Sinhalese, Tamils and Moors. The Burgher rate is greater than the rate for Europeans, Sinhalese, Tamils and Moors too and the Moor rate is greater than that for the Sinhalese.

(*l*) *Diseases of the Urinary and Genital System.*—The Europeans and the Malays here have the greatest death rate and the Sinhalese the smallest rate. The rate for Malays is significantly greater than that of the Sinhalese, the Moors, the Burghers and the Tamils. The European rate is significantly greater than the rate of the Moors and the Sinhalese. The rate of the Tamils is greater than that for Sinhalese and Moors and the Sinhalese rate is less than that for Burghers and Moors.

(*m*) *Mandama and Rickets.*—The Malays, the Moors and the Sinhalese have the greatest rates.

(*n*) *Diarrhoea and Enteritis.*—The Europeans and the Burghers have small rates.

(*o*) *Prematurity.*—The Malays and the Tamils have the greater rates.

The Malays obviously have a relatively poor mortality record and the reasons for this would well repay further study. The high mortality rates from infective and parasitic diseases, and diseases of the circulatory, digestive, genital and urinary systems are the main distinguishing items for this racial group, who are to be found mainly in zone A.

The Burghers and the Eurasians are distinguishable chiefly in a negative fashion. They do have relatively high death rates from—

(*a*) *Diseases of the Circulatory System*—(along with Europeans and Malays), and

(*b*) *Diabetes Mellitus*—(along with Malays).

The Europeans similarly have a good mortality record. They show the mortality record of Western civilized countries in that they have the greatest death rates from :—

(*a*) *Diseases of the Circulatory System.*—The Burghers and the Malays have similar death rates.

(*b*) *Diseases of the Genital and Urinary Systems.*—The rate does not differ significantly from that of the Malays.

(*c*) *Enteric Fevers (along with the Malays).*—This may be due to a deficiency of natural or acquired immunity on the part of the Europeans.

(*d*) *Cancer and other Tumours (all sites).*—The rate is greater than that of the Sinhalese, the Moors, the Tamils and the Malays. The Burgher rate is also relatively large being greater than that of the Sinhalese, Tamils, Moors and Malays. The rate for Sinhalese and Moors is less than that for the Tamils.

Since it can be anticipated that, with the gradual increase in the expectation of life in Ceylon, a greater mortality from Cancer may result in the future, an analysis of the relative mean racial death rates, over the past twelve years, from cancer occurring at various main sites may be of interest.

(i) *Cancer of the Buccal Cavity.*—The Burghers have the greatest rate, it being greater than that for Sinhalese, Tamils, Moors and Malays. The Tamil rate is greater than the rate for Sinhalese, Moors and Malays and the rate for Sinhalese is greater than that for Malays.

(ii) *Cancer of the Digestive System.*—The European rate is the highest; it is greater than the mean rate of the Sinhalese, the Tamils, the Moors, the Burghers and the Malays. The Burgher rate is the next highest being greater than the rates for Sinhalese, Tamils, Moors and Malays. The rate for Malays is greater than that for the Sinhalese, Moors and Tamils, while the Tamil rate is greater than the Sinhalese rate.

(iii) *Cancer of the Respiratory System.*—Here the Europeans and the Burghers have the highest rates. The European rate significantly exceeds those of the Sinhalese, Tamils, Moors and Malays. The Burgher rate is similarly greater than the rate of the Sinhalese, Tamils, Moors and Malays.

(iv) *Cancer of the Breast (females).*—For this too the Europeans and the Burghers have the greater rates. The Sinhalese rate is also greater than the Tamil rate.

(v) *Cancer of the Genito-Urinary Tract (males).*—The Burghers have the higher rate, it being significantly greater than that for Sinhalese, Tamils and Moors. The rate for Moors is significantly less than that for Sinhalese and Tamils.

(vi) *Cancer of the Genito-Urinary Tract (females).*—For this sex the Europeans show the greater mean rate. The rate is higher than that of the Sinhalese, Tamils, Moors and Burghers. The Burgher rate is in turn greater than the rates for Sinhalese, Tamils and Moors.

(vii) *Cancer of the Uterus.*—The Burghers show the greater mean rate, which exceeds that for the Sinhalese, the Moors, the Tamils and the Malays. The Tamil rate is greater than of the Sinhalese and the Moors and the Sinhalese rate, in turn, exceeds that of the Moors.

There are several obvious explanations which can be given for some of these differences. The European population is largely an adult one with a longer expectation of life and a greater awareness of the need for early diagnosis in cancer. Therefore, we should expect them to show a relatively greater diagnosed incidence of cancer. The Burghers, too, have a comparatively good health record in early life and they also tend to live in communities where diagnostic facilities are available. It is safe to say that the incidence of cancer among the other racial groups is higher than the mortality figures would suggest because many cases must die unrecognised as cancer cases. It is possible, too, that the apparent differences in the mortalities may be due to differences in the expectations of life of the various racial groups, i.e. to the different age distributions of these groups, but it is doubtful whether all the detailed differences can be so explained.

The same remarks apply to all the differences noted between the mortalities of the racial groups in Ceylon. True comparisons of death rates could only be made if the population were first standardized. However it is felt that the *first* essential is to discover what is actually occurring and not what would occur if the various racial groups all had the same age- and sex-structures.

Certainly the differences between the European population and the rest of Ceylon should not be over-stressed since the former has such an abnormal age and sex distribution and it tends to change rapidly by migration. The main points of interest are that the Europeans in the tropics tend to die from similar causes to those which predominate in Europe and the Burghers show a European-bias in their mortality figures.

The age-distribution of the various races in Ceylon have been compared by giving the population, for each race, aged 0-4 years a value of 100 and correcting the populations at other age-groups accordingly. (Table 51). This procedure simplifies comparison.

TABLE 51

The Age Distribution of the Various Races in Ceylon (1946 *Census*).

Age Period	Sinhalese		Ceylon Tamils		Indian Tamils		Ceylon Moors		Indian Moors		Malays		Burghers		Europeans	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
0-4	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
5-9	95·2	95·1	101	101	84·5	84·0	94·4	96·9	87·4	83·0	81·1	84·4	88·8	93·1	100·5	93·8
10-14	97·6	95·1	103·2	100·8	73·4	74·1	88·0	86·0	136·5	69·5	76·2	77·5	96·0	90·1	48·5	62·3
15-19	84·8	75·9	92·6	86·0	65·1	59·2	76·5	71·1	319	51·8	70·0	86·8	80·3	98·6	60·1	67·0
20-24	70·0	75·6	86·6	81·5	77·8	60·5	75·1	70·5	577	50·5	71·3	70·0	85·3	86·0	108	106·5
25-29	64·6	63·1	80·1	72·0	80·1	62·9	66·5	59·0	520	54·0	62·5	55·6	78·0	75·1	100	127
30-34	51·7	52·0	63·7	56·6	63·2	46·4	56·5	56·8	427	44·0	52·5	43·7	66·9	62·4	163	170
35-39	54·2	53·2	51·8	56·9	72·8	47·2	59·0	45·6	386	47·1	42·8	40·8	75·1	63·4	212	178
40-44	38·1	32·0	49·3	42·2	49·1	31·3	40·0	32·2	254	26·0	37·1	27·7	51·0	45·8	200	157·5
45-49	39·0	31·8	47·3	40·5	50·8	29·9	35·8	29·3	212	32·7	33·7	25·2	42·0	47·7	188	141·5
50-54	21·8	21·4	31·0	29·2	28·0	17·0	20·7	18·6	116·5	19·7	22·4	17·5	32·2	35·6	156	116
55-	68·0	51·9	82·0	79·7	46·0	28·0	54·2	47·8	150	45·0	48·8	44·6	77·6	90·4	334	291

The Ceylon Tamils have a relatively high proportion of children aged five to fourteen years and of old people, of over fifty-five years of age. Both the Indian and the Ceylon Tamils have relatively higher proportions of adults than the Sinhalese or the Ceylon Moors. The migrant groups, the Indian Moors and the Europeans, have proportionately large male adult populations.

In view of these differences in age-structure between the racial groups of Ceylon, it was decided to standardize the general mortality rates for the major groups, using the 1946 census figures for all Ceylon as the standard population. (Table 52).

Unfortunately, the Registrar-General does not distinguish between Indian and Ceylon Tamils or Moors in his mortality statistics so that all Tamils or all Moors must be grouped together.

The Moors have the greatest death rate among the three major communities and this is true, also, of the year 1949. Since 1946 the Sinhalese mortality experience has improved more than has that of the Tamils, so that, in 1949, the Sinhalese, males and females, have the lower general death rate.

Mortality Patterns for different racial groups have been compared with each other and with those for Eire (Table 53).

All the peoples indigenous to Ceylon, when compared with the Irish, show high proportions of deaths from—

(*a*) infective and parasitic diseases and especially from the enteric fevers, dysentery, malaria and ankylostomiasis;

(*b*) vitamin deficiency diseases;

(*c*) diseases of the blood;

(*d*) convulsions in children under five years;

(*e*) pneumonia;

(*f*) diseases of the digestive system and especially from diarrhoea and enteritis;

(*g*) diseases of pregnancy, child-birth and puerperium; and from

(*h*) diseases peculiar to the first year of life.

The people of Ceylon show a smaller proportion of deaths from

(*a*) tuberculosis;

(*b*) cancer and other tumours;

(*c*) intracranial lesions of vascular origin;

(*d*) bronchitis; and from

(*e*) diseases of the urinary and genital systems.

The Ceylonese die from diseases due to infection, infestation, malnutrition and low vitality. The Irish die from diseases occurring in the middle and later years of life. The Europeans in Ceylon show characteristics of both mortality patterns since they have a higher proportion of deaths than the Irish from infective diseases

TABLE 52

Standardized Death Rates for the Racial-Groups of Ceylon.

Race	GENERAL DEATH RATES FOR THE YEARS									
	1937-48 (Unstandardized)		1946 (Unstandardized)		1949 (Unstandardized)		1946 (Standardized)		1949 (Standardized)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Sinhalese	19·2	20·1	19·6	21·1	12·0	12·5	19·6	21·3	12·9	13·7
Tamils	18·4	20·1	18·4	20·7	12·7	14·1	18·9	21·0	14·4	15·6
Moors	20·8	23·7	22·3	26·9	13·5	15·8	23·7	26·8	15·8	17·2

(1946 All-Ceylon Population as the Standard).

TABLE 53

Proportion per 1,000 *Deaths at all Ages for Different Races* (1937-48).

Causes of Death	Eire		Sinhalese		Tamil		Moor		Burgher		European	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
All Causes	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
A—Infective and Parasitic Diseases	113	120	196	186	168	156	186	177	234	216	168	128
1. Enteric Fevers	0·4	0·2	11·2	8·5	8·0	6·0	7·4	5·3	16·4	15·5	32·4	20·3
2. Tuberculosis	81	87	35·8	25·3	32·4	23·9	40·7	30·3	89·5	67·7	28·2	—
3. Dysentery	0·1	—	15·4	11·4	26·7	20·5	17·3	13·0	24·7	19·5	15·7	—
4. Malaria	0·1	—	59·3	60·6	45·2	41·4	63·8	64·6	32·7	40·3	41·8	23·6
5. Influenza	14	16	12·6	14·1	15·3	15·7	18·3	19·4	20·1	25·1	2·1	13·5
6. Ankylostomiasis	—	—	8·9	8·8	17·7	30·6	9·3	10·6	4·0	5·3	—	—
B—Cancer and other Tumours	92	95	5·6	5·9	7·5	8·9	4·8	3·7	37·0	42·9	56·4	179
C—Vitamin Deficiency Diseases	0·5	0·5	38·7	53·7	26·3	28·3	42·9	49·9	8·0	10·9	2·1	—
D—Diseases of the Blood	7·2	10	27·0	20·5	10·1	10·7	19·1	15·2	4·6	9·2	6·3	3·4
E—Diseases of the Nervous System	84	99	143	141	81·9	73·2	87·5	83·1	102	101	65·8	94·6
7. Convulsions under 5 years	5·6	4·9	111	113	55·5	51·6	59·3	60·9	29·0	30·4	2·1	10·1
8. Vascular Intracranial Lesions	60	78	20·1	16·4	14·2	12·0	17·3	12·9	56·6	59·4	43·1	81·9
F—Diseases of the Circulatory System	275	270	26·9	17·4	26·4	20·9	36·3	18·6	130	123	123	166
G—Diseases of the Respiratory System	90	83	88·6	74·4	186	170	156	135	115	116	79·3	81·1

TABLE 53 (*Contd.*)

Proportion per 1,000 *Deaths at all Ages for Different Races* (1937-48).

Causes of Death	Eire		Sinhalese		Tamil		Moor		Burgher		European	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
9. Bronchitis	32	30	6·7	6·8	25·4	26·4	14·0	14·9	13·5	19·1	5·2	3·4
10. Pneumonia	43	41	57·6	45·5	138	124	84·9	82·1	85	80·5	44·9	64·2
H—Diseases of the Digestive System	50	35	71·2	67·4	73·4	63·6	71·6	60·3	118	96	101	57·4
11. Diarrhoea and Enteritis	21	17	44·2	45·5	39·0	40·3	34·6	33·8	38·2	45·2	13·6	3·4
I—Diseases of the Urinary and Genital Systems	43	24	10·2	9·9	26·0	33·7	14·8	14·2	29·6	30·4	40·7	47·3
J—Diseases of Pregnancy, Child-birth and Puerperium	—	6·3	—	58·4	—	57·5	—	74·9	—	43·2	—	10·1
K—Diseases Peculiar to First Year of Life	50	42	97·9	88·5	164	142	111	99·6	70·3	64·4	20·9	30·4

and a higher proportion than the Ceylonese of deaths from diseases occurring in middle age. (It must be remembered that most Europeans migrate to Ceylon in early adult life and return finally to Europe in late-middle life).

The individual racial-groups in Ceylon do show some differences in their mortality patterns. The Burghers have a high proportion of deaths from infective diseases, due chiefly to the high incidence of tuberculosis and influenza. The proportions of deaths from malaria and ankylostomiasis are relatively low. The Burghers, in fact, tend to have a more 'western' mortality pattern since, in addition, they show a relatively lower incidence of deaths from vitamin-deficiencies, diseases of the blood, convulsions in children under five years, puerperal diseases, and infantile diseases and a greater proportion of deaths due to cancer, intracranial vascular lesions, diseases of the circulatory and genito-urinary systems. They also have a relatively higher number of deaths from diseases of the digestive system.

The mortality pattern of the Sinhalese is distinguished by the higher proportions of death from malaria, blood diseases, convulsions under five years, and diarrhoea and enteritis, while the proportions of deaths due to diseases of the respiratory system (including bronchitis and pneumonia) and of the urinary and genital systems are relatively low.

The Tamils have high proportions of deaths from ankylostomiasis, diseases of the respiratory system, diseases of the genito-urinary systems, and of infantile deaths. The Moors show higher proportions of deaths from malaria and diseases of pregnancy, child-birth and puerperium.

The distinctions between the mortality patterns of the Ceylonese and of western peoples are due to the greater risks in the tropics of death from infective and parasitic diseases and from malnourishment with the resultant diminution in the expectation of life, so that relatively few people live to middle age to encounter the hazards of cancer, diseases of the circulatory system, etc. With the partial control of malaria since 1946 and the reduction in the mortality and morbidity from this disease, the mortality patterns of the races of Ceylon have changed. This can be seen readily from Table 54, where the average patterns for the ten years 1937-46 are compared with those for the latest year available, 1949.

For most races, the proportions of deaths from infective and parasitic diseases (including dysentery, malaria, influenza, and ankylostomiasis), diarrhoea and enteritis, and from diseases of pregnancy, child-birth and puerperium have been reduced, and while those due to cancer, tuberculosis, diseases of the circulatory, the digestive and the genito-urinary systems have been increased. The mortality patterns are becoming 'westernized', but not entirely so. Thus there have been increases in the proportions of deaths occurring in the first year of life; the infant mortality rate has been reduced but the proportions of infant deaths per 1,000 deaths in the population has risen. Similarly we find that the proportions of deaths from blood diseases (except for Burghers), from vitamin-deficiency diseases and from pneumonia (except for Tamils) have risen and the proportion due to bronchitis has fallen.

TABLE 54

Proportion per 1,000 *Deaths at all Ages for Different Races* (*Females*).

Causes of Death	Sinhalese		Tamil		Moor		Burgher	
	1937-46	1949	1937-46	1949	1937-46	1949	1937-46	1949
All Causes	1000	1000	1000	1000	1000	1000	1000	1000
A—Infective and Parasitic Diseases	187	163	163	117	178	174	227	156
1. Enteric Fever	8·3	8·1	5·5	7·2	5·4	4·8	17·2	18·9
2. Tuberculosis	23·7	39·2	23·7	29·1	30·9	37·7	68·4	66·0
3. Dysentery	12·3	4·9	22·5	11·8	13·8	10·6	19·9	9·4
4. Malaria	62·8	28·3	43·5	15·5	65·7	43·8	44·6	9·4
5. Influenza	14·3	10·5	16·4	10·6	19·1	16·3	25·4	9·4
6. Ankylostomiasis	9·0	6·9	31·3	23·8	10·9	6·4	5·4	—
B—Cancer and other Tumours	5·2	10·5	8·3	16·1	3·3	9·6	41·1	118
C—Vitamin Deficiency Diseases	51·5	80·1	28·7	24·6	47·6	70·7	10·6	23·6
D—Diseases of the Blood	19·9	25·2	10·4	16·1	14·9	21·4	9·4	4·7
E—Diseases of the Nervous System	142	127	72·5	77·3	82·6	90·2	102	127
7. Convulsions under 5 years	115	96·2	51·1	52·3	60·8	69·7	30·5	42·5
8. Vascular Intracranial Lesions	14·9	23·8	11·3	15·4	11·4	16·0	63·0	80·2
F—Diseases of the Circulatory System	16·2	28·9	19·5	35·5	17·7	24·6	117	146

TABLE 54 (*Contd.*)

Proportion per 1,000 *Deaths at all Ages for Different Races* (*Females*).

Causes of Death	Sinhalese		Tamil		Moor		Burgher	
	1937-46	1949	1937-46	1949	1937-46	1949	1937-46	1949
G—Diseases of the Respiratory System	72·5	85·9	168	164	132	140	113	99·1
9. Bronchitis	6·8	6·0	26·1	25·8	15·5	11·2	19·6	18·9
10. Pneumonia	33·6	61·9	123	118	78·0	94·1	79·4	66·0
H—Diseases of the Digestive System	68·5	64·9	62·4	77	58·4	87·7	90·3	94·3
11. Diarrhoea and Enteritis	49·9	32·6	40·1	44·8	34·5	26·6	44·4	23·6
I—Diseases of the Genital and Urinary Systems	9·8	10·6	33·2	38	14·3	16·6	32·5	18·9
J—Diseases of Pregnancy, Child-birth and Puerperium	58·6	42·6	58·7	41·3	76·0	51·8	45·7	—
K—Diseases Peculiar to First Year of Life	81·4	131	139	165	93·1	126	63·3	51·9

PART VI

Urban, Rural and Estate Mortalities

There are three main types of social organisation distinguishable in Ceylon, viz., the urban, the rural and the estate populations of the country. The relative sizes of these populations at the 1946 census are indicated in Table 55.

TABLE 55

The Urban, Rural and Estate Populations of Ceylon at the 1946 *Census.*

	Thousands
Ceylon	6,657·3
Urban	1,023·1
Rural	4,782·8
Estate	851·4

In 1946 there were 43 communities which were classified as urban areas; this number had risen to 46 in 1948 and to 47 in 1949. The distinction between an urban and a rural population is not as well marked as it is in Western countries; most urban areas have agricultural districts within their limits and only in the capital city of Colombo are people as densely packed as in the West. Ceylon lives by and on its agricultural produce so that there is no distinction into large groups of industrial and agricultural workers. The estate worker harvests mainly those agricultural products, such as tea, rubber and coconuts, which form Ceylon's main exports. The rural population and many of the urban workers produce those agricultural products (chiefly paddy) which are needed for internal consumption.

The standards of housing in the urban and rural areas differ markedly. Most of the rural houses have mud walls; those in towns are built of stone, brick or concrete. The rural dwellings have few rooms but proportionately less people to the household than the urban houses. Most of the latter are rented, in contrast to the houses in the rural areas which are usually owned by the occupier (Table 56).

Therefore, whereas the rural dwellings are small, mud-walled structures, the larger and better-constructed town houses tend to be more overcrowded and the rent for these is a constant call on the income.

On the estates, minimum standards of housing and of sanitation are laid down by law. The estate labourer is also provided with a standard minimum wage, free medical facilities on the estate and, for the female workers, leave with pay before and after child-birth, when the attention of a midwife is provided, usually in the estate hospital. The estate population is predominantly Indian Tamil (Table 56), and is to be found mainly in the hill-country of the Central Province (Zone C) and the Uva Province (Table 57).

TABLE 56

Distribution of types of dwelling within Urban and Rural areas.

Basis of classification	Percentage distribution of dwellings	
	Urban	Rural & Estates
(*a*) *Material of outer walls:*		
Cadjan	5·6	5·5
Mud	29·1	71·0
Wood	1·6	1·0
Zinc	0·9	0·1
Stone, brick or concrete	62·8	22·4
(*b*) *Number of rooms:*		
One	35·1	38·6
Two	32·0	35·7
Three	15·2	16·1
Four or five	11·6	7·5
Six or more	6·1	2·1
(*c*) *Tenure:*		
Owned	30·4	73·8
Free of rent	8·9	16·8
Rented	60·7	9·4
(*d*) *Persons in household:*		
One,	6·3	8·1
Two or three	22·4	26·0
Four to six	39·0	43·6
Seven to nine	21·4	18·0
Ten or more	10·9	4·3

TABLE 57

Proportion of Estate Population to Total Population of each Zone—(*Census*, 1946).

Zone	Proportion of Total Population %
A	7·3
B	11·8
C	39·3
D	0·98

They are hard workers but their standard of literacy is poor when compared with the rest of Ceylon (Table 58).

TABLE 58

Literacy in Ceylon (Census, 1946).

		Per cent of 'Literates' relative to population aged 5 years and over
All Ceylon	Males	70·1
	Females	43·8
Estate Population	Males	49·1
	Females	13·5

TABLE 59

Mean Birth and Death Rates (1937-48) from Certain Causes in Urban, Rural and Estate Populations.

Rate	Ceylon	Urban	Rural	Estate
Birth rate	37·5	30·2	38·1	44·9
Death rate (All Causes)	19·6	17·0	20·4	17·0
Maternal Mortality rate	15·2	22·4	12·8	10·9
Infant Mortality rate	136·5	130	135	139

(Death rates are given as deaths per million of the populations).

TABLE 60

(a) *Average Death Rates per* 1,000,000 *of the Population from Certain Causes in Rural, Urban and Estate Population for the Period* 1937-48, *Classified According to Sex.*

Causes of Death	TYPE OF POPULATION							
	All Ceylon		Urban		Rural		Estate	
	M	F	M	F	M	F	M	F
Tuberculosis of the Respiratory System	607·5	449·0	1520·0	1540·0	457·6	274·0	282·0	339·0
Pneumonia	1486·0	1360·0	2830·0	2525·0	1090·0	1010·0	2170·0	2190·0
Bronchitis	227·0	247·0	305·0	388·0	140·0	137·0	656·0	767·0
Influenza	263·0	307·0	300·0	431·0	245·0	279·0	314·0	333·0
Anaemia	386·0	329·0	108·0	219·0	500·0	388·0	41·9	74·5
Diabetes	136·0	65·6	332·0	226·0	107·0	43·8	47·6	26·1
Malaria	1070·0	1134·0	1790·0	1980·0	1000·0	1080·0	498·0	547·0
Ankylostomiasis	209·0	287·0	443·0	680·0	111·0	99·0	501·0	1000·0
Other Diseases due to Helminths	479·0	621·0	486·0	824·0	530·0	657·0	140·0	166·0
Enteric Fever	197·0	155·6	838·0	769·0	72·0	62·0	95·0	67·7
Dysentery	345·0	285·0	694·0	561·0	275·0	225·0	352·0	331·0
Cancer	119·0	133·0	348·0	475·0	69·4	64·7	110·0	175·0

TABLE 60 (*Contd*).

(*b*) *Death Rates per* 1,000,000 *of the Population from Certain Causes in Rural, Urban and Estate Populations for the period* 1948 *Classified According to Sex.*

Causes of Death	TYPE OF POPULATION							
	All Ceylon		Urban		Rural		Estate	
	M	F	M	F	M	F	M	F
Tuberculosis of the Respiratory System	617·0	436·0	1490·0	1420·0	458·0	287·0	294·0	224·0
Pneumonia	1120·0	1164·0	1530·0	1760·0	860·0	890·0	2220·0	2290·0
Bronchitis	152·0	182·0	173·0	241·0	69·0	73·0	687·0	836·0
Influenza	150·0	172·0	159·0	224·0	138·0	150·0	217·0	256·0
Anaemia	252·0	266·0	129·0	280·0	309·0	282·0	62·3	142·0
Diabetes	82·7	54·9	165·0	163·0	68·0	35·0	52·3	53·4
Malaria	447·0	500·0	509·0	575·0	471·0	529·0	179·0	222·0
Ankylostomiasis	104·0	156·0	164·0	321·0	44·0	43·0	413·0	710·0
Other Diseases due to Helminths	381·0	500·0	398·0	770·0	413·0	503·0	129·0	155·0
Enteric Fever	128·0	114·0	484·0	497·0	49·0	47·0	92·1	90·8
Dysentery	112·0	89·1	307·0	252·0	56·0	46·0	177·0	176·0
Cancer	447·0	500·0	359·0	599·0	63·0	65·0	132·0	222·0

The Registrar-General gives the deaths from some of the principal causes for the towns of Ceylon and separate mortality tables for estates. The rural deaths can be obtained, therefore, as the difference between those for All-Ceylon and those for estates plus the towns. In this way, it has been possible to compare the death rates, which have been averaged for the period 1937-48, among the rural, urban and estate populations (Tables 59 and 60).

Comparing these mean rates, it is evident that the Urban population has the greatest death rates from—

(1) Tuberculosis of the respiratory system (Urban mean rate significantly greater than those for Estates and Rural areas, and Rural rate greater than that for Estates);

(2) Pneumonia (Urban rate greater than Estate rate, which in turn is greater than the Rural rate);

(3) Malaria (Urban mean rate greater than the Rural rate, which is, itself, greater than the Estate mean rate);

(4) Enteric Fever (Urban rate greater than Rural and Estate rates);

(5) Dysentery (Urban mean rate exceeds that for the Rural population);

(6) Ankylostomiasis (here the Urban and Estate rates are both greater than the Rural rate);

(7) Infestations due to other Helminths (the Estate mean rate is here less than those for Urban and Rural areas);

(8) Causes arising during child-birth, pregnancy and the puerperium (the Urban mean rate is greater than that for Estate or Rural populations);

(9) Diabetes (Urban rate greater than Rural rate, and the latter is greater than the Estate mean rate).

The congested Urban population is distinguished, therefore, by its higher maternal death rate and its higher death rates from infective and parasitic diseases and from pneumonia. It should be remembered, however, that the deaths for urban areas are given by the Registrar-General as deaths occurring in urban areas and for persons not necessarily normally resident there. With the concentration of hospitals within the urban areas and the official encouragement to use maternity facilities, the differences in the maternal mortality rates may be due to these circumstances.

The Rural population has the greater death rates from—

(1) All Causes (mean general death rate greater than those for Urban and Estate areas);

(2) Anaemia (Rural rate greater than Urban, which itself is greater than that for Estates);

(3) Helminths other than Ankylostomiasis (along with the Urban area).

The Estate population has the greater death rates from—

(1) Bronchitis (mean rate for Estates being greater than that for the Urban population, and the latter is greater than the Rural rate);

(2) Ankylostomiasis (along with the Urban population);

(3) Diseases peculiar to the first year of life (although the differences are not significant);

(4) Influenza (here too the differences are not significant); and the Estates also have the greater mean birth rate (greater than those for Urban and Rural areas, while the rural rate is greater than the urban rate).

It is not possible to make further comparisons as the Registrar-General does not detail any further causes of death by Urban areas, but estate mortalities can be compared with those for All Ceylon (Table 60 for the mean rates for estates during the period 1937-48) and such a comparison is summarised in Table 61.

TABLE 61

Differences in Mean Mortality Rates (1937-48) *from Specific Causes between the Estate Population and all Ceylon.*

Mean Estate Mortality greater for	Mean all Ceylon Mortality greater for
Respiratory diseases	Infective and Parasitic diseases
Pneumonia	Diseases of the Blood
Bronchitis	Anaemia
Genito-Urinary diseases	Diseases of the Nervous System
Diseases of First Year of Life	Convulsions in children under 5 years
Congenital debility	Diseases of the Circulatory System
Premature Birth	Diseases of the Coronary Arteries
Ankylostomiasis	Diseases of the Digestive System
Influenza	Pregnancy, child-birth and the Puerperium
Diarrhoea and Enteritis	Helminths other than Ankylostomiasis
Gastric Ulcer	Malaria
Duodenal Ulcer	Enteric Fever
Chronic Valvular endocarditis	Tuberculosis of the Respiratory System
Myocarditis	Rheumatic Fever
Cirrhosis of the Liver	Diabetes
—	Mandama and Rickets
—	Asthma

The Estate population has the highest mortality rates from diseases of the respiratory system (including pneumonia and bronchitis), diseases peculiar to the first year of life (including congenital debility and premature birth), diseases of the genito-urinary system, peptic ulcer, cirrhosis of the liver, chronic heart affections (endocarditis and myocarditis), influenza, ankylostomiasis and diarrhoea and enteritis. These particular mortality rates are also typical of the Tamil population and of the estate regions (zone C). The question naturally arises as to how far this mortality picture for the Estate population is due to racial factors or to occupation and residence in the hill-country. The mortality data in the Registrar-General's reports do not distinguish between races in the same district but it is possible to calculate death rates for estates in the Kandy, Nuwara Eliya and Badulla districts and to compare these with the rates for the whole districts and the three principal towns in the districts (Table 62).

Deaths from pneumonia and bronchitis tend to be commoner in the town than in the neighbouring estates, thus suggesting that these diseases are not peculiar to Indian Tamils or to their occupation. (It has already been noted that pneumonia is a major cause of death in the dry zone, so that this cause is prevalent in the dry

TABLE 62

Death Rates from Specific Causes among different types of Community within the same District.

Mean Rates per million of the Population for Period 1937-48.

Causes of Death	Kandy Estates	Kandy Town	Kandy District	N'Eliya Estates	N'Eliya Town	N'Eliya District	Badulla Estates	Badulla Town	Badulla District
Pneumonia	2220	3430	1210	2640	3280	1760	1970	4640	1440
Bronchitis	592	315	258	1100	1350	617	642	699	537
Respiratory Tuberculosis	256	2380	393	155	620	132	210	1930	228
Influenza	338	396	214	548	272	472	289	169	232
Enteric Fever	111	1480	163	165	1200	140	77	1520	109
Dysentery	327	472	152	385	461	237	291	1050	284
Ankylostomiasis	567	613	255	419	224	257	307	858	285
Other Helminths	160	337	251	121	318	169	156	235	119
Diarrhoea	872	342	833	1030	419	1020	767	467	863
Malaria	344	2100	595	151	409	317	623	3330	1170
Convulsions under 5 years	952	55	896	677	181	971	1140	216	2820
Circulatory Diseases	645	2560	493	724	1910	465	375	2370	356
Diabetes	46	361	89	76	165	68	34	285	43
Anaemia	40	101	227	32	74	83	42	174	211
Diseases of First Year of Life	4880	—	3020	4910	—	3430	3560	—	2640
Congenital Debility	2980	—	1720	2750	—	2140	2330	—	1200
Prematurity	1920	—	860	2190	—	1170	1225	—	1420
Infective and Parasitic Diseases	2340	—	2440	2260	—	2030	2210	—	2740
Gastric Ulcer	27	—	12	14	—	6	8	—	5
Asthma	134	—	91	97	—	91	62	—	48

(The above rates are for males only; similar relationships hold for females).

plains as well as in the wet hill country). The estates do have the higher death rates from convulsions in children under five years, diseases of the first year of life (including congenital debility and prematurity), gastric ulcer and asthma. Infant deaths from congenital debility and prematurity also predominate in the estate zone and seem to be typical of the Indian Tamil population. The reasons for this would warrant further investigation. Convulsions as a cause of death are commonest in zone B and are probably typical of agricultural rather than urban populations. Deaths from infective and parasitic diseases, diseases of the circulatory system, anaemia and diabetes predominate, as already noted, among the urban populations.

TABLE 63

Death Rates (deaths per 1,000,000 male persons) from certain causes in Towns with different densities of population.

(*Means for period* 1937-48).

Town	Colombo	Negombo	Kalutara	Kandy	N'Eliya	Galle	Hambantota	Jaffna	Batticaloa	K'gala	Badulla	R'pura	Kegalla
Population Density	27·3	8·54	7·52	6·21	1·79	7·63	1·89	8·17	4·32	3·22	3·84	3·00	3·79
Typhoid and Paratyphoid Fever	740	991	1660	1480	1200	2000	665	458	565	2370	1520	2170	4250
Dysentery	467	1290	957	472	461	970	2120	1050	1110	2580	1050	1390	2305
Ankylostomiasis	183	537	1150	613	224	930	276	785	1140	1220	858	1160	1770
Other Helminths	319	788	1195	337	318	1570	214	264	174	438	235	644	2410
Phthisis	1550	1210	1280	2380	620	2660	10220	1290	1700	5220	1930	1880	4510
Other Tuberculosis Diseases	182	52	77	189	96	94	92	58	50	163	159	58	192
Diarrhoea	147	518	616	342	419	684	740	259	848	2500	467	502	845
Enteritis	846	1660	966	1080	1110	1170	4300	646	470	2010	1130	815	3250
Cancer	473	215	205	570	264	294	169	323	400	709	545	244	635
Malaria and Cachexia	622	2020	907	2100	409	3060	7850	1845	3960	8960	3330	3070	2530
Bright's Diseases and Nephritis	486	729	796	943	942	1110	1800	464	833	2980	1350	1140	2600
Bronchitis	209	334	394	315	1350	657	443	169	617	619	699	506	802
Influenza	441	89	159	396	272	112	143	464	26	386	169	106	387
Pneumonia	1515	2820	3566	3430	3280	2590	11450	2540	5290	19200	4640	4120	16100

TABLE 63 (*Contd.*)

Death Rates (*deaths per* 1,000,000 *male persons*) *from certain causes in Towns with different densities of population.*

(*Means for period* 1937-48).

Town	Colombo	Negombo	Kalutara	Kandy	N'Eliya	Galle	Hambantota	Jaffna	Batticaloa	K'gala	Badulla	R'pura	Kegalla
Other Diseases of the Respiratory System	331	147	337	417	240	654	538	317	325	995	346	368	927
Heart Disease	1820	1110	1110	2560	1910	1920	1010	581	1180	2450	2370	1260	3150
Convulsions	62	164	161	55	181	559	215	421	558	254	216	303	441
Anaemia	84	132	315	101	74	447	—	77	25	823	174	84	202
Diabetes Mellitus	355	240	314	361	165	605	553	623	216	348	285	214	410

(The rates for females showed similar variations).

TABLE 64

Birth Rates, Death Rates and Infant Mortality Rates during 1949 *for the Electoral Wards of Colombo Municipality.*

Electoral Ward	Population Density (persons per acre)	Birth Rate	Death Rate	Infant Mortality Rate
St. Pauls	469	16·6	8·4	153
Kochchikadda	367	46·1	8·3	40
Maligakande	177	22·9	9·2	148
Aluthkadde	164	23·6	8·4	150
San Sebastian	136	20·3	9·1	173
Grand Pass	130	20·6	8·9	134
Wekande	100	25·2	10·9	158
New Bazaar	81	58·6	20·0	126
Kotahena West	76	11·9	7·1	210
Maradana	75	26·2	9·8	147
Kotahena East	68	12·0	5·8	103
Pettah	64	1·6	1·8	133
Kuppiawatte	61	10·7	5·3	189
Dematagoda	55	16·4	9·6	104
Suduwella	53	14·6	7·2	134
Mutwal	53	17·4	10·0	156
Wellawatte South	49	18·5	5·2	92
Kollupitiya	47	9·7	5·6	105
Hunupitiya	47	20·3	9·0	84
Slave Island	42	23·9	10·8	157
Wellawatte North	40	20·4	6·7	108
Borella	36	7·2	5·2	196
Havelock Town	31	17·1	4·5	47
Modera	27	40·6	10·2	63
Bambalapitiya	27	18·1	6·5	65
Madampitiya	26	40·2	9·4	85

(The above figures were kindly supplied by Dr. F. N. Jayewardene, M.O.H., Colombo Municipality).

TABLE 64 (*Contd.*)

Birth Rates, Death Rates and Infant Mortality Rates during 1949 *for the Electoral Wards of Colombo Municipality.*

Electoral Ward	Population Density (persons per acre)	Birth Rate	Death Rate	Infant Mortality Rate
Maligawatte	25	34·6	17·8	147
Cinnamon Gardens	18	53·4	6·1	27
Timbirigasyaya	17	24·4	6·8	78
Fort	10	10·4	13·8	83

(The above figures were kindly supplied by Dr. F. N. Jayewardene, M.O.H., Colombo Municipality).

Although the death rates from these latter-named causes tend to be higher in the towns of Ceylon, there is no definite relationship with population density within towns (Table 63).

In the industrial countries of the West, analysis of vital statistics has revealed marked correlations between poverty and overcrowding and deaths from such diseases as tuberculosis, rheumatic, heart disease, etc. In Ceylon the problem is complicated by the differing standards of sanitation, water-supply, health services between towns and the varying degrees of endemicity from malaria in different regions.

Even within the same town, however, the general death rate and the infant mortality rate do not vary consistently with the population density over the various wards (Table 64—deaths from specific causes were not obtainable).

PART VII

The Influence of Sex and Age on Mortality

At nearly all ages females in Ceylon have a greater mortality rate than do males. The general implications of this differential mortality between the sexes have already been discussed and it now remains to see how the mortalities from various causes vary with sex. The mean mortality rates from the principal causes of death during the period 1937-48 have been calculated for each sex (Table 65) and some significant differences can be noted.

Male persons in Ceylon face a greater risk than do females of death from such causes as diseases of the circulatory system, enteric fever, tuberculosis of the respiratory system, diabetes and anaemia. By contrast, females have the greater mortality from diseases of the genito-urinary system, ankylostomiasis and other helminth infestations, and from mandama and rickets.

For both sexes, the greatest risk of death occurs in the younger age-periods but the mortalities from different diseases vary in their maximum age-incidence. It is possible to calculate the mean age-specific mortality rates for certain causes from the Registrar-General's data for urban areas and to note how the rates vary with the age of the population (Figures 4 to 14).

The highest death rate from pneumonia occurs among infants and young children below the age of 5 years. The lowest rate is during the age-period 10 to 14 years, after which there is a gradual rise in the death rate with increasing age and the rate for older people is nearly equal to that for early childhood. The mortality rates for males and females vary similarly with age, the female rate being slightly greater up to the age of 20 and the male rate the higher after 35 years of age (Figure 4).

The death rates from bronchitis show a similar age variation to those from pneumonia except that the maximum rates are found in old age and that females tend to have the greater rates at all ages (Figure 6).

Influenza produces its maximum mortality rates before the age of 5 years. Between 5 to 55 years of age the rate hardly varies, but there is a slight rise in the older age-group. Again females, at all ages, have the higher rates (Figure 12).

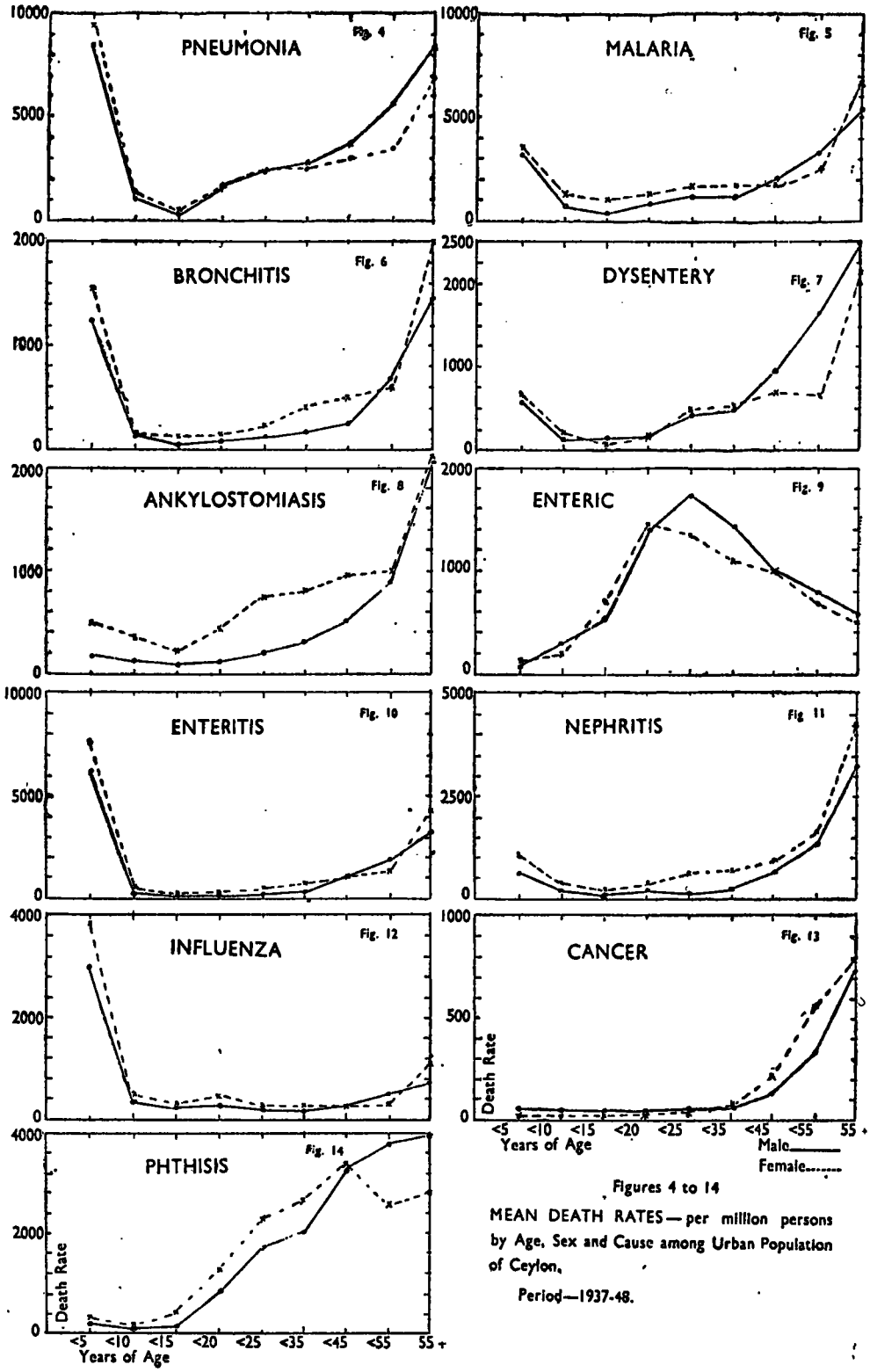
Tuberculosis of the respiratory system shows an ascending mortality rate from the age of 15 onwards. Among persons below 45 years of age the females have the greater rate, but above that age males die more frequently from this cause (Figure 14).

Malaria shows age-specific mortality curves similar to those for bronchitis, with a high rate below the age of 5, a minimum between 10 and 15 years and a maximum in old age. Here, too, females have the higher rate (Figure 5).

TABLE 65

Death Rates from Various Causes for Male and Female Persons in Ceylon (Mean Rates for Period 1937-48 *per million persons).*

Cause of Death	Mean Rate		Cause of Death	Mean Rate	
	Male	Female		Male	Female
Infective and Parasitic Diseases	3590	3602	Premature Birth	592	552
Diseases of the Blood	384	356	Rata	908	904
Diseases of the Nervous System	2360	2430	Convulsions in Children under 5 years	1776	1907
Diseases of the Circulatory System	535	378	Cancer (all sites)	119	133
Diseases of the Respiratory System	2240	2060	Cancer (Buccal Cavity)	50	31
Diseases of the Digestive System	1345	1320	Cancer (Digestive Tract)	30	25
Diseases of the Genito-Urinary System	276	323	Cancer (Respiratory System)	4·5	2·4
Deaths during Pregnancy and Child-birth	—	1201	Cancer (Breast)	0·5	10·2
Diseases of the First Year of Life	2070	1960	Cancer (Genito-Urinary)	5·9	5·5
Ankylostomiasis	209	287	Cancer (Uterus)	—	31·7
Other Helminths	479	621	Cancer (Skin)	5·5	4·7
Malaria	1070	1134	Gastric Ulcer	8·1	3·3
Enteric Fevers	197	156	Duodenal Ulcer	2·5	0·5
Tuberculosis of the Respiratory System	608	449	Pericarditis	5·6	2·8
Influenza	263	307	Chronic and Valvular Endocarditis	31	38
Pneumonia and Broncho-Pneumonia	1486	1360	Myocarditis	207	200
Rheumatic Fever	339	356	Coronary Diseases	59	14
Bronchitis	227	247	Angina Pectoris	5·8	1·8
Diabetes	136	66	Cirrhosis of the Liver	43	17
Mandama and Rickets	680	937	Asthma	173	100
Diarrhoea and Enteritis	718	793	Anaemia	386	329
Congenital Debility	932	960	—	—	—



Figures 4 to 14

MEAN DEATH RATES — per million persons by Age, Sex and Cause among Urban Population of Ceylon.

Period—1937-48.

The mortality from dysentery is also greater in old age, the rate rising steeply after the age of 35 years. After this age, males have the greater death rate (Figure 7).

By contrast the death rate from the enteric fevers, although in general higher in males than in females, is at a maximum during the age period 20 to 25 years (Figure 9).

The greatest risk of death from enteritis is in infants and young children and people aged 55 years and over also have a high death rate from this cause, females being more susceptible than males (Figure 10).

Deaths from ankylostomiasis are also commoner in females, the maximum death rates occurring after the age of 55 years (Figure 8). Nephritis and Cancer are also diseases of adult life and, from both causes, females are more liable to die than are males (Figures 11 and 13).

For deaths from all causes among the whole population the death rate falls from birth to reach a minimum at about the onset of adolescence, after which the rate gradually rises with increasing age. The various ethnic groups, however, do show different mortality rates within the same age-period (Table 66).

In the first five years of life the Moors have the highest death rate from all causes (Moor rate greater than that for all other races) and the Burghers the lowest rate. Similarly, for all age-periods, the Burghers have the lowest death rate. The Moors have the highest death rate up to age of 20 years and at ages from 55 years onwards. The Malays have the highest rate for age periods 20-24 years, and 35-54 years, the Sinhalese rate being the highest for the age 25-34 years.

TABLE 66

Age Specific Mortality Rates by Race and Zone in Ceylon
(*Mean Rate per* 1,000 *persons for Period* 1937-48).

Race or Zone	RATE FOR AGE PERIODS (YEARS)								
	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-55	55 & over
Sinhalese	63·4	7·80	3·83	4·84	8·19	9·73	11·6	16·1	59·4
Tamil	61·4	5·35	3·22	5·09	7·68	9·36	11·8	16·4	59·6
Moor	126·0	13·3	6·94	7·46	6·57	7·25	10·3	17·2	84·7
Malay	63·4	5·93	4·58	6·68	9·28	7·90	12·0	19·5	76·5
Burgher	33·1	3·84	1·50	2·94	4·75	5·90	7·55	14·4	57·7
Zone A	68·8	7·26	3·43	5·21	8·32	10·2	13·3	18·7	66·2
Zone B	58·8	7·40	3·73	4·97	7·96	9·59	11·4	15·2	59·6
Zone C	58·1	6·19	2·95	4·31	6·75	7·72	9·14	12·5	56·2
Zone D	93·3	8·15	4·92	7·90	11·6	14·0	17·1	26·6	82·8

The age-specific mortality rates for the zones also differ significantly (Table 66). At all ages Zone D has the highest death rate and Zone C the lowest, while at all ages, except the period 5 to 15 years, Zone A has a higher rate than Zone B. The hill-country region of the Central Province (Zone C) is, therefore, the healthiest part

of Ceylon for people of all ages and the higher the altitude the better the mortality record (Nuwara Eliya district, sub-zone C_2, has smaller death rates at all ages than the lower, Kandy and Matale districts). Living in the dry zone (D), in the north and the east of Ceylon, carries a greater chance of death for all age groups.

These varying mortality risks between the different communities and regions have produced differing life expectations. The average future life at each year of life has been calculated for the Sinhalese, the Tamils (Indian and Ceylon) and such areas as the Colombo Municipality, and the districts of Kalutara, Kandy, Kurunegala, Jaffna and Hambantota. (It was not possible to calculate similar predictions for the Moors because of the lack of detail in the Registrar-General's Reports.) These life expectations have been calculated by the method described in Chapter II, applying the 1945, 1946 and 1947 mortality data to the 1946 Census returns. A summary is shown in Table 67.

TABLE 67

The Expectation of Life among Various Communities in Ceylon.

(*a*) Males

Year of Age	All Ceylon	Sinhalese	Tamil	Colombo Municipality	Kalutara District	Kandy District	Kurunegala District	Jaffna District	Hambantota District
0	47·2	46·0	45·7	38·6	53·6	48·3	36·4	47·2	33·5
5	55·5	53·8	53·6	47·0	58·3	56·4	47·5	54·3	43·8
10	52·1	50·3	49·9	44·2	54·6	52·7	44·2	50·5	41·0
15	47·9	46·1	45·6	40·2	50·3	48·0	40·1	46·1	37·0
20	43·9	42·0	41·5	36·2	46·0	43·9	36·1	42·0	33·5
30	36·6	34·7	33·7	28·4	38·2	36·1	29·0	34·6	27·1
45	25·3	23·9	22·2	17·3	26·2	24·2	19·2	23·7	18·3
60	15·3	14·8	12·5	9·4	15·3	14·2	12·1	14·5	11·6

(*b*) Females

0	42·5	43·7	43·5	34·4	51·8	44·8	32·4	46·4	30·5
5	51·4	51·6	50·1	41·8	57·7	52·1	42·6	52·9	41·7
10	48·2	48·5	46·4	38·7	54·5	48·9	39·5	49·2	39·0
15	44·0	44·3	42·3	34·7	50·3	44·7	35·3	44·9	35·1
20	40·2	40·6	38·6	31·3	46·1	40·7	31·9	41·2	31·7
30	34·2	34·4	32·4	27·0	38·9	34·2	27·7	35·0	27·0
45	24·3	24·9	22·1	19·9	27·2	23·9	19·6	24·7	19·8
60	14·3	14·8	12·2	11·6	16·0	13·7	11·4	14·6	12·7

(The above figures were obtained by applying the 1945, 1946 and 1947 mortality data to the 1946 Census populations—see text).

At all ages and for both sexes the Sinhalese have a greater expectation of future life than do the Tamils in Ceylon. The districts of Hambantota and Kurunegala (both were highly malarious regions) and the town of Colombo (the most commercialized and heavily populated area in Ceylon) have poor life expectations. Kandy district (an estate area in the hills with a mixed Sinhalese and Indian Tamil population) and Jaffna district (in the dry zone and predominantly Ceylon Tamil) have longer expectations but the greatest chance of longevity lies with the people of the district of Kalutara (just south of Colombo and with a mainly Sinhalese population). The latter area has been the model region in Ceylon for public health activities and is a fine example of what the future may hold for the people of Ceylon, when the whole island can receive the same attention as this area. Thus, a male baby born in the Kalutara district can expect to live 15 years longer than one born in Colombo Town and 20 years longer than one born in the Hambantota district. Female infants in Kalutara have the chance to live over 17 years longer than those in Colombo and more than 21 years longer than those in Hambantota.

Now that malaria is being controlled in Ceylon, it may be possible to extend the standard of public health supervision, developed in Kalutara, to all Ceylon.

PART VIII

Some Important Causes of Death in Ceylon

(a) INFANT MORTALITY IN CEYLON

Except for a temporary halt in the mid-war period, the infant mortality rate has been falling since 1939, and as we have noted, there has been a marked reduction since 1946 (Figure 2). This latter reduction has been due to a decrease in the number of deaths registered as due to prematurity, debility and convulsions, a decrease which has occurred at all age periods. The reduction between 1939 and 1944-46 was caused by a smaller number of deaths from convulsions (all ages), debility (infants under 3 months), diarrhoea (all ages), bronchitis (all ages) and pneumonia (in infants over 3 months). Deaths from prematurity and enteritis seem to have increased during this period. (See Table 68, where average death rates for 1935-39, 1939, 1944-46 and 1948 are presented to illustrate the two types of change which have occurred in the infant mortality picture of Ceylon during the past 15 years).

TABLE 68

Principal Causes of Infant Mortality in Ceylon expressed as deaths per 100,000 *Live Births.*

(*a*) Age 3 months and under.

Cause	1935-1939	1939	1944-1946	1948
Convulsions	2884	2790	2147	630
Diarrhoea	64	80	50	72
Bronchitis	108	117	76	60
Pneumonia	114	136	135	376
Enteritis	69	59	109	162
Debility	3362	3190	2117	1880

(*b*) Age over 3 months and under 1 year.

Cause	1935-1939	1939	1944-1946	1948
Convulsions	1450	1440	1207	630
Diarrhoea	173	160	66	72
Bronchitis	101	105	55	60
Pneumonia	416	394	305	369
Enteritis	131	145	173	162
Debility	233	229	237	199

TABLE 68 (*Contd.*)

Principal Causes of Infant Mortality in Ceylon expressed as deaths per 100,000 *Live Births.*

(c) Age under 1 year.

Cause	1935-1939	1939	1944-1946	1948
Convulsions	4320	4200	3333	1800
Diarrhoea	240	200	100	100
Bronchitis	220	200	133	100
Pneumonia	540	500	467	600
Enteritis	200	200	300	300
Debility	3353	3420	2353	2080
Rata	5200	4100	3090	1240
Prematurity	1303	1430	1817	1580

The causes of infant mortality in Ceylon are given in more detail and with more accuracy for the towns of Ceylon, where all death certificates have to be signed by registered medical practitioners. A more reliable and detailed comparison can, therefore, be obtained by comparing the mortality pattern among infants for deaths registered in towns during 1939, which is typical of pre-war years, and 1948, when the mortality rate had been substantially reduced. A comparison with the infant mortality pattern in Eire, as representative of a small, agricultural country in temperate climates, can also be made. (Table 69 where the rates for various causes and age periods are given ; Table 70 where the proportion of deaths by principa causes and age periods are detailed. A similar analysis for all Ceylon, as well as for the towns of Ceylon, is given for 1948 ; such figures were not available until after the war and so cannot be given for the year 1939).

In the period 1939-48, the infant mortality pattern for all deaths under one year, has altered in emphasis. There are greater proportions of deaths attributed to prematurity, enteritis, and pneumonia and a smaller proportion from congenital debility, convulsions, diarrhoea and bronchitis. Further, the rise in the proportions of deaths from prematurity, enteritis and pneumonia is true for all the age-periods studied. The fall in the proportions attributed to debility and bronchitis is also consistent for all age-periods. The proportion of deaths from diarrhoea has risen in infants under 7 days, but decreased in infants over one month. Deaths from convulsions have decreased in proportion for infants under 3 months age and risen for infants over 6 months.

TABLE 69

Percentage of All Infant Deaths by Various Causes at Different Age-Periods (Towns of Ceylon).

Cause	7 Days and Under			7 Days to 1 Month			1-3 Months			3-6 Months			6-9 Months			9-12 Months		
	1939	1946	1948	1939	1946	1948	1939	1946	1948	1939	1946	1948	1939	1946	1948	1939	1946	1948
Prematurity	14·8	20·1	19·0	2·14	4·50	3·00	0·21	0·83	0·72	0·02	0·07	0·15	0·04	0·06	0·05	—	—	—
Debility	18·5	11·6	11·5	6·89	7·20	5·29	5·91	4·26	3·86	2·28	2·47	1·71	1·00	0·75	1·02	0·84	0·53	0·41
Convulsions	2·42	1·75	1·43	1·62	1·97	1·39	1·89	1·95	1·53	1·55	1·71	1·40	0·68	0·83	0·90	0·59	0·59	0·72
Diarrhoea	0·05	0·03	0·54	0·48	0·24	0·54	1·13	0·44	0·87	1·02	0·43	0·54	0·75	0·18	0·40	0·36	0·12	0·20
Enteritis	0·02	0·07	1·16	0·59	1·26	1·97	1·61	2·80	2·86	2·27	2·61	2·65	1·41	1·70	2·18	1·25	1·10	1·40
Bronchitis	0·09	0·03	0·06	0·30	0·07	0·18	0·77	0·33	0·14	0·55	0·30	0·34	0·58	0·19	0·14	0·32	0·18	0·18
Pneumonia	0·18	0·66	0·80	0·58	0·68	0·83	1·92	1·75	2·13	2·80	2·32	2·80	2·29	2·00	2·42	2·05	1·62	1·97

TABLE 70

Deaths of Infants under one year by certain causes and age-periods per 1,000 *Infant deaths for Eire and for Towns in Ceylon.*

(*a*) Total under one year.

Cause	Eire 1947	Ceylon 1939 Towns	Ceylon 1948 Ceylon	Ceylon 1948 Towns
All Causes	1000	1000	1000	1000
Prematurity	174·2	172	175·0	239·0
Debility	167·6	344	226·0	244·0
Convulsions	43·2	88	199·0	72·2
Diarrhoea	152·4	38	15·3	30·8
Enteritis		71	34·8	122·4
Bronchitis	22·2	26	12·9	10·4
Pneumonia	127·0	98	60·9	109·3
Rata	—	—	134·0	—

(*b*) under 7 days.

All Causes	1000	1000	1000	1000
Prematurity	468·0	380	353·5	489·0
Debility	138·2	475	319·0	283·5
Convulsions	11·0	62·1	132·3	34·8
Diarrhoea	2·8	1·4	5·4	13·1
Enteritis		0·5	8·6	28·5
Bronchitis	0·9	2·3	2·8	1·5
Pneumonia	10·0	4·6	7·9	19·5
Rata	—	—	124·0	—

(*c*) Age over 7 days and under one month.

All Causes	1000	1000	1000	1000
Prematurity	243·3	152·2	153·0	193·5
Debility	230	489	291·5	373·0
Convulsions	47·8	115·3	200·5	79·8
Diarrhoea	113·3	34·3	10·9	34·5
Enteritis		41·8	27·6	128·2
Bronchitis	13·3	21·6	13·3	11·8
Pneumonia	70·0	41·8	26·9	53·3
Rata	—	—	168·3	—

TABLE 70 (*Contd.*)

Deaths of Infants under one year by certain causes and age-periods per 1,000 *Infant deaths for Eire and for Towns in Ceylon.*

(*d*) Age 1-3 months.

Cause	Eire 1947	Ceylon 1939 Towns	Ceylon 1948 Ceylon	Ceylon 1948 Towns
All Causes	1000	1000	1000	1000
Prematurity	62·6	14·2	34·0	49·6
Debility	215·0	322	176·8	263·5
Convulsions	60·0	125	270·0	94·8
Diarrhoea Enteritis	242·0	74·3 106·1	21·2 55·2	60·1 197·0
Bronchitis	26·0	50·7	18·1	9·5
Pneumonia	145·0	127·5	81·0	146·5
Rata	—	—	176·8	—

(*e*) Age 3-6 months.

All Causes	1000	1000	—	1000
Prematurity	15·6	1·3	—	12·1
Debility	153·0	164·2	—	136·0
Convulsions	56·9	111·5	—	111·8
Diarrhoea Enteritis	276·5	73·2 163·0	— —	42·5 210·0
Bronchitis	37·9	39·8	—	26·7
Pneumonia	177·5	201·5	—	222·0

(*f*) Age 6-12 months. 3-12 months.

All Causes	1000	1000	1000	1000
Prematurity	5·8	2·0	7·4	2·8
Debility	74·0	102·8	80·0	87·5
Convulsions	42·1	70·8	251·5	108·0
Diarrhoea Enteritis	130·6	61·8 148·6	28·8 64·8	36·3 217·0
Bronchitis	40·7	50·3	24·2	19·5
Pneumonia	289·0	242·0	148·0	266·0
Rata	—	—	99·5	—

If we compare the Ceylon infant mortality pattern with that of Eire, we find that a relatively smaller proportion of these deaths in Eire are due to prematurity, congenital debility and convulsions, but relatively more are caused by bowel and respiratory infections. The change during the 1939-48 period except for the increase in the proportion of deaths due to prematurity has been in the direction of 'westernizing' the infant mortality pattern for Ceylon. The alteration in mortality is also, apparently, increasing the proportions of deaths occurring during the first month of life in Ceylon (Table 71).

TABLE 71

Percentage of deaths occurring at different age periods to total under one year (Towns of Ceylon).

Year	7 days and under	Over 7 days and under 1 month	1-3 months	3-6 months	6-9 months	9-12 months
1935	36·0	14·3	16·2	14·3	10·6	8·6
1939	39·0	14·1	15·1	13·9	10·0	7·9
1945	37·9	12·0	15·2	15·8	10·8	8·3
1946	37·2	18·3	15·2	14·1	8·7	6·5
1948	40·9	15·5	14·5	12·6	9·4	7·1

About half the infant deaths have always occurred during this first month but this proportion is now increasing. The mortality rates at all age-periods have been reduced but the reduction has been proportionately greater in the 1 to 12 months periods.

In 1948 over 40 per cent. of all infant deaths occurred during the first week of life and two-thirds of these were due to prematurity or congenital debility. In Eire about 60 per cent. of these very early deaths are due to the same causes. Prematurity, in both countries, naturally becomes a less important cause of deaths with increasing infant age, but debility is important at all age-periods of infant life. Convulsions are also an important cause of death in Ceylon throughout the first year of life though it is registered less frequently as a cause of death in the urban areas. Diarrhoea and enteritis are more important causes of infant deaths in Eire than in Ceylon, although the proportion of deaths due to these causes, especially in the older age groups, is high in the Ceylon towns. Pneumonia and bronchitis produce an increasing proportion of deaths as the infant age increases and, after the age of 3 months, pneumonia is the most important single cause of death in the towns of Ceylon (Table 72).

With the gradual reduction in infant mortality that has occurred since 1939, there has been a general decrease in the rate for all infant age-periods (except 7 days to 1 month period in 1946). The rate from deaths due to prematurity increased at all ages in 1946 and decreased for ages up to 1 month in 1948. The death rates from debility, convulsions, and bronchitis have consistently decreased but the rate from enteritis has increased in infants aged up to 3 months. After that age, there has been a decrease in the death rate and the death rate due to pneumonia has similarly decreased among infants aged over 7 days.

TABLE 72

Percentage of Infant Deaths by Various Causes at different Age-Periods (Towns of Ceylon).

Cause	7 Days and Under			7 Days-1 Month			1-3 Months			3-6 Months			6-9 Months			9-12 Months		
	1939	1946	1948	1939	1946	1948	1939	1946	1948	1939	1946	1948	1939	1946	1948	1936	1946	1948
Prematurity	38·0	54·2	48·9	15·2	24·3	19·3	1·4	5·5	5·0	0·1	0·5	1·2	0·4	0·7	0·5	—	—	—
Debility	47·4	31·2	28·4	48·8	39·2	37·2	32·5	28·1	26·8	16·5	17·5	13·6	10·0	8·7	10·1	10·6	8·2	5·8
Convulsions	6·2	4·6	3·5	11·5	10·7	9·0	12·5	12·9	10·6	10·5	12·2	11·2	6·8	9·5	9·7	7·5	9·1	10·2
Diarrhoea	1·3	0·7	1·3	3·4	1·3	3·5	7·4	2·9	6·0	7·3	3·0	4·2	7·5	2·0	4·3	4·5	2·1	2·8
Enteritis	0·4	1·9	2·8	4·2	6·9	12·7	10·6	18·4	19·7	16·3	18·5	21·0	14·1	19·6	23·3	15·8	16·9	19·7
Bronchitis	2·2	0·7	0·2	2·2	0·4	1·2	5·1	2·1	0·9	4·0	2·1	2·7	5·9	2·2	1·5	4·1	2·7	2·6
Pneumonia	4·5	6·7	1·9	4·2	3·1	5·3	12·8	21·1	14·7	20·2	22·4	33·6	22·8	26·4	25·9	25·1	24·0	27·7

TABLE 73

Infant Mortality Rates (per 1,000 Live Births) at different Age-Periods (Towns of Ceylon).

Cause	7 Days and Under			7 Days-1 Month			1-3 Months			3-6 Months			6-9 Months			9-12 Months		
	1939	1946	1948	1939	1946	1948	1939	1946	1948	1939	1946	1948	1939	1946	1948	1939	1946	1948
All Causes	60·7	44·6	40·3	21·9	21·9	15·4	23·5	18·2	14·3	21·6	16·9	12·5	15·5	10·4	9·2	12·3	7·8	7·0
Prematurity	23·1	24·1	19·7	3·33	5·37	2·96	0·33	0·99	0·71	0·03	0·09	0·15	0·06	0·07	0·05	—	—	—
Debility	28·8	13·9	11·4	10·7	8·59	5·72	7·63	5·10	3·81	3·55	2·96	1·69	1·55	0·90	1·01	1·30	0·64	0·41
Convulsions	3·77	2·09	1·41	2·52	2·36	1·38	2·94	2·34	1·51	2·41	2·05	1·39	1·05	0·99	0·89	0·92	0·71	0·71
Diarrhoea	0·08	0·04	0·53	0·75	0·28	0·53	1·75	0·53	0·86	1·58	0·51	0·53	1·16	0·21	0·39	0·56	0·16	0·20
Enteritis	0·03	0·09	1·15	0·92	1·51	1·95	2·50	3·35	2·83	3·52	3·12	2·62	2·19	2·04	2·15	1·94	1·31	1·38
Bronchitis	0·14	0·04	0·06	0·47	0·09	0·18	1·19	0·39	0·14	0·86	0·35	0·33	0·92	0·23	0·14	0·50	0·21	0·18
Pneumonia	0·28	0·30	0·79	0·92	0·67	0·82	2·99	2·14	2·10	4·35	3·79	2·77	3·55	2·75	2·39	3·19	1·86	1·94

These variations in the infant death rates have produced an alteration in the importance of the different causes of death (Table 73). Thus, prematurity at all age periods now produces a greater proportion of all infant deaths, while debility has become gradually less important at nearly all ages. A higher percentage of infant deaths are now due to enteritis, and to pneumonia (except after 9 months of age). The proportion of deaths from convulsions has decreased during the first week of life and bronchitis is now a less important cause of death after the age of 1 month. Diarrhoea is a negligible cause of infant deaths in Ceylon though even here there has been, in general, a decline in deaths due to this cause.

Ethnic Groups.—The Tamils have the greatest average infant mortality in Ceylon and the greatest rates from prematurity and congenital debility. The descending order of total rate for each race is Tamil, Moor, Sinhalese, Malay, Burgher and Eurasian, and European. If we look upon rata and congenital debility as being descriptive terms for a similar syndrome, then we find that the main cause for the difference in infant mortality between the Tamils and the Moors is the higher incidence of deaths from prematurity among the former (Table 74).

TABLE 74

The Average Infant Mortality Rates for Various Ethnic Groups in Ceylon during the Period 1937-48.

Race	All Causes	Prematurity	Congenital Debility	Rata
Europeans	18·9	12·2	2·36	—
Burghers and Eurasians	27·9	14·3	11·2	2·05
Sinhalese	44·1	12·5	18·2	26·9
Tamils	81·0	24·3	51·0	11·1
Moors	58·3	11,·7	29·5	35·2
Malays	41·6	16·8	21·0	1·9
Indian Estate Labourers	—	32·0	46·8	—

The Tamils here include both Ceylon Tamils and Indian Tamils and the latter too have a high death rate due to prematurity. As expected, therefore, we find that the estate zone C, embracing the Matale, Kandy, and Nuwara Eliya districts, has a significantly higher infant mortality rate than the other zones and has high rates due to prematurity and debility (Table 75).

TABLE 75

The Average Infant Mortality Rates for the Four Mortality Zones of Ceylon during the Period 1937-48.

Zone	All Causes	Prematurity	Congenital Debility
A	52·6	14·8	20·05
B	31·3	13·4	17·2
C	77·9	21·4	46·2
D	65·2	11·1	37·7

The estate population is predominantly Indian Tamil, but not entirely since some Sinhalese are also employed. The infant mortality rate for the whole estate population is greater than those occurring in urban and rural areas but the differences are not significant. Compared with urban populations, we find that the infant mortality rate from congenital debility and bronchitis is significantly greater on the estates while the rates from pneumonia, diarrhoea and enteritis are significantly less (Table 76).

TABLE 76

Average Infant Mortality Rates for Ceylon, Urban and Estate areas during period 1937-48.

Cause	All Ceylon	Urban Ceylon	Estates	Indian Estate Labourer
Prematurity	15·4	30·9	27·2	32·0
Debility	29·9	44·5	67·4	46·8
Convulsions	36·1	15·9	21·0	15·6
Diarrhoea	1·91	3·60	1·27	1·00
Enteritis	2·47	12·80	1·18	1·78
Bronchitis	1·68	3·07	4·64	4·78
Pneumonia	5·01	16·10	9·27	9·00
Rata	36·1	—	—	—
All Causes	136·5	130	139	—

Even within the same districts, the estate labour population tend to have higher infant death rates from debility than do the people living in the adjoining town. This is especially true of the predominantly Indian Tamil estates which are to be found in the Kandy, Matale, Nuwara Eliya and Badulla districts (Table 77).

TABLE 77

Infant Death Rates from Prematurity and Debility occurring on Estates and in Towns within the same Districts of Ceylon (*mean rate*, 1937–48).

District	Deaths per 100,000 live births from			
	Prematurity		Debility	
	Estate	Town	Estate	Town
Kandy	3640	3195	6820	4550
Matale	2260	3668	5880	4630
Nuwara Eliya	3800	3276	6550	3350
Badulla	2720	1921	5220	3370
Ratnapura	2770	2216	4200	4910
Kegalla	2550	2252	4270	5560
Kalutara	2330	2822	3900	2450
Galle	1890	2138	3080	3220
Matara	1930	1802	4200	3440
Kurunegala	2770	6453	6270	5350

The high infant death rate from debility is not peculiar to the Indian Tamil estate labour population but is shown by the Ceylon Tamils too. The mainly Tamil dry zone D, has such a high rate and especially Mannar and Vavuniya (Table 75). The towns in Tamil areas also have this high death rate from debility (Table 78).

TABLE 78

Infant Death Rate from Prematurity and Debility in Tamil Towns and Sinhalese Towns of Ceylon (mean rates, 1937-48).

Town	Deaths per 100,000 live births from	
	Prematurity	Debility
TAMIL		
Jaffna	2310	6770
Mannar	3616	8790
Vavuniya	6575	5050
SINHALESE		
Galle	2138	3220
Matara	1802	3440
Hambantota	2887	4600

The causes of death in Towns, as already stated, are given with more accuracy and in greater detail than for the rest of Ceylon. The main towns have, therefore, been ' zoned ' and the variations with environment of the infant mortality occurring in towns can thus be studied (Table 79).

(This zoning of urban areas, it must be remembered, not only eliminates the rural population but also the Indian Tamil estate population).

The major number of deaths due to prematurity occur during the first week of life and the death rate from this cause is significantly less in zone B than in the other zones, and the Tamil zone D, has the highest rate. After the age of 1 week, zone A has the highest death rate.

The Tamil zone D has the highest rate for deaths due to debility and this is true whether the deaths occur during the first 7 days or after the seventh day.

Zone D, we have already noted, is distinguished by the high general death rate from pneumonia. This cause of deaths is most important in infants aged more than 7 days, and, here too, zone D has the greatest death rate. Bronchitis, which also produces its greatest number of deaths in the later infant age-periods, causes higher death-rates in zones A and C.

Deaths from convulsions are a major feature in the mortality pattern of zone B and this cause produces its highest infant rates after the first week of life. In the latter period, the death rate due to convulsions is highest in this zone B. Among the older infants the death rates for zones B and D are significantly greater than the rates due to convulsions in zones A and C.

The general risk to deaths from pneumonia or convulsions which is typical of zones D or B, respectively, is present, therefore, even from birth. Zone A, which is noted for its high mortality from infective and parasitic diseases, similarly shows a high infant death rate from diarrhoea and enteritis.

TABLE 79

Infant Death Rates from Various Causes occurring in the Mortality Zones (Urban Population only) of Ceylon.
(Mean Rate, 1937-48).

ZONE	DEATHS PER 100,000 LIVE BIRTHS FROM											
	Prematurity		Debility		Convulsions		Bronchitis		Pneumonia		Diarrhoea	Enteritis
	a	b	a	b	a	b	a	b	a	b	b	b
Zone A	2540	630	1540	1850	189	643	—	289	34	1250	485	1660
Zone B	1980	306	1820	1400	767	1910	—	113	36	1060	152	411
Zone C	2435	483	2130	2060	80	431	—	226	39	1380	167	409
Zone D	2705	335	3550	3300	397	2060	—	—	17	1640	217	1130

a = Deaths occurring in first week of life.

b = Deaths occurring after 7 days and up to 1 year of age.

The reasons for this distributions of deaths by causes would, obviously, justify more detailed study.

Stillbirths.—Stillbirths are only registered in the urban areas of Ceylon and it is impossible to judge how accurate this registration is. Causes of stillbirths are not given by the Registrar-General so that only the urban stillbirth rates can be studied. The Central Province or zone C shows the greatest stillbirth rate, this being significantly greater than the rates for zone A, zone B or zone D. Zone B has the next highest rate, while zone A has the smallest rate.

TABLE 80

The Mean Stillbirth Rate for the Various Mortality Zones of Ceylon (Period 1937-48).

Zone	Stillbirths per 1,000 live births
A	54·5
B	72·9
C	81·0
D	62·3

The stillbirth rate has been gradually falling in Ceylon since 1945; but a similar decline occurred between 1935 and 1943 (Table 81). Without any data as to the causes of stillbirths, it is not possible to judge the factors concerned in these variations in rate. In any case, the rate is high when compared with European countries (e.g. England and Wales had a rate of 27 in 1946, and Scotland a rate of 32 in the same year).

TABLE 81

The Stillbirth Rate in the Urban Areas of Ceylon, 1940-48.

Year	Number of stillbirths	Stillbirths per 1,000 live births
1940	2,472	64
1941	2,429	61
1942	2,072	63
1943	2,359	55
1944	2,357	57
1945	2,698	63
1946	3,093	55
1947	3,180	54
1948	3,462	52

(b) DISEASES OF PREGNANCY, CHILD-BIRTH AND THE PUERPERIUM

In Part III, the variation of the maternal mortality rates in Ceylon over the past twelve years was discussed. It was seen that this death rate has been declining since 1937 ; the decline up to 1946 could be attributed merely to a reduction in the number of deaths occurring from puerperal infection, consequent on the introduction of improved techniques such as the sulphonamides and the antibiotics. A similar reduction of the maternal death rates occurred in other countries over the same period of time. In Ceylon, however, there has been a more rapid reduction in maternal deaths since the year 1946. Maternal deaths due to all the principal causes, except haemorrhage, have been reduced (see Part III) and the maternal mortality rate in Ceylon is now approaching that of Western countries.

Detailed statistics about the cause of maternal deaths are only available for the years following 1944 and these have been analyzed to provide information as to variation of maternal mortality with race, district, etc.

One of the most potent factors in determining maternal mortality in Ceylon would seem to be the ethnic group to which the mother belongs. The Ceylon Moors show a persistently higher maternal death rate than the other races, the descending order being Ceylon Moor, Ceylon Tamil, Sinhalese, Indian Moor, Malay, Indian Tamil, Burgher and European. Not only does the total maternal death rate vary between the communities of Ceylon but the principal causes of maternal death vary in their importance between the different races (Table 82).

Puerperal convulsions are the main cause of maternal deaths among the Sinhalese and the Ceylon Moor, while infection is the predominant cause of death among Burgher, Tamil or Malay mothers. The only cause of maternal deaths among the Europeans in Ceylon is apparently toxaemia during pregnancy, which is also the greatest cause of maternal deaths in the Indian Moor community. All the rates from the various causes are higher in Ceylon than those usually obtained in Western countries, e.g. Eire. In Eire, as in Ceylon, haemorrhage causes more deaths during the puerperium than during pregnancy, while toxaemia is a commoner cause of death, in both countries, during pregnancy than it is during the puerperium. Puerperal sepsis is given as a more frequent cause of death in Ceylon than are other types of infection ; the reverse is true for Eire. Puerperal convulsions does not occur as a cause of death in Eire, but it is the major registered cause of maternal deaths in Ceylon.

These racial differences in the causes of maternal deaths produced regional differences too ; Zone D, which is predominantly Tamil in its population, has infection as the greatest cause of death. In all the other zones and sub-zones, puerperal convulsions are the main cause. Zone D also has the greatest mortality rate from all causes of maternal death and this is in conformity with the large number of Ceylon Tamils and Ceylon Moors to be found in this region. This zone has higher death rates than the other zones from such causes as haemorrhage during pregnancy and infection, including puerperal sepsis. Zone A has the highest mean death rate from haemorrhage during the puerperium, toxaemia during pregnancy and the puerperium, and from puerperal convulsions. Zone B has the best maternal mortality record, due chiefly to the low death rates from toxaemia, sepsis and convulsions during the puerperium (Table 83).

TABLE 82

Mean Maternal Death Rates (for the period 1944-48) by Cause and Race.

Race	Mean Maternal Death Rate (per 100,000 live births) from							
	All Causes	Haemorrhage during		Toxaemia during		Puerperal Convulsions	Infection during	
		Pregnancy	Puerperium	Pregnancy	Puerperium		Child-birth and Puerperium	Puerperium Sepsis
All Races	1290	14·2	124·6	73·4	51·9	555	311	298
Sinhalese	1270	10·8	125·8	72·8	—	638	220	210
Ceylon Tamil	1530	21·8	125	87·8	—	309	789	754
Indian Tamil	886	19·0	104	53·8	—	183	280	271
Ceylon Moor	1920	15·5	136	120	—	888	602	582
Indian Moor	1140	—	137	767	—	134	340	162
Malay	919	18·8	170	38·4	—	209	353	186
Burgher	712	43·8	81·4	74·6	—	120	193	178
European	262	—	—	262	—	—	—	—
Eire (1947)	215	8·7	34·8	45	11·6	—	43·5	13·1

TABLE 83

Mean Maternal Death Rates (for the period 1945-48) by Cause and Locality.

Zone	Mean Maternal Death Rate (per 100,000 live births) from							
	All Causes	Haemorrhage during		Toxaemia during		Puerperal Convulsions	Infection during	
		Pregnancy	Puerperium	Pregnancy	Puerperium		Child-birth and Puerperium	Puerperium (puerperium sepsis)
A	1430	12·3	135	87·3	536	593	256	249
B	958	17·2	111	51·2	426	462	191	188
C	1100	11·9	97·8	68·1	435	464	254	247
D	1680	26·1	1065	104·5	517	578	711	667

The maternal mortality among the urban population is apparently higher than that for all Ceylon or for the Estate population. This is probably because the hospital facilities are concentrated in the towns and deaths are given for 'place of occurrence' rather than for 'place of residence'. On this basis the maternal death rate from each of the main causes is higher in towns than on estates (Table 84).

TABLE 84

The Maternity Mortality Rates from Various Causes among Urban and Estate Populations.

(Mean for Period 1944-48).

Cause of Death	Deaths per 100,000 live births among the—		
	All Ceylon Population	Urban Population	Estate Population
All Causes	1290	1900	798
Haemorrhage during (1) Pregnancy	14·2	23·4	19·8
(2) Puerperium	124·6	318	99·6
Toxaemia during (1) Pregnancy	73·4	140	49·7
(2) Puerperium	519	164	130
Puerperal Convulsions	555	224	159
Infective diseases (1) Child-birth and Puerperium	311	498	250
(2) Puerperium	298	487	246

Deaths from toxaemia during the puerperium and from puerperal convulsions must be commoner among the rural population than among the urban or estate populations since the rates from these causes are higher for all Ceylon than for the urban or estate areas.

(c) TUBERCULOSIS

It is almost impossible to give an accurate picture of the mortality from tuberculosis in Ceylon. There is a social stigma attached to a patient in Ceylon with tuberculosis and this stigma may be extended to his relatives and friends. People, therefore, have tended to refuse to visit Chest Clinics for diagnosis and to avoid treatment once they have been diagnosed. Even if diagnosed before death, efforts may be made by the relatives to have a vague or non-specific case reported in the death certificate. The lack of social responsibility on the part of many of the

population has been linked with inadequate diagnostic and therapeutic services for tuberculosis so that a true picture of the distribution of the disease in Ceylon cannot be presented.

Some indication of the inaccuracy of available statistics can be realised from the results of a survey, commenced in 1944, of a sample population in the Urban Council area of Kotte. This investigation revealed a morbidity rate from tuberculosis of 2·2 per cent. and a death rate of 4·7 per thousand of the population. The actual deaths notified in this area gave a rate of 0·7 per thousand!

Nearly 15,000 patients were treated for tuberculosis in the various medical institutions of Ceylon during 1948, and, for the same year, the Director of Medical and Sanitary Services estimated that there were at least 70,000 persons in Ceylon suffering from open tuberculosis, with a total of 100,000 cases for all types.

The figures which are available show that tuberculosis of the respiratory system accounts for 93 to 94 per cent. of all deaths from tuberculosis (Table 86), and the number of recorded deaths from this cause seems to be slowly increasing (Table 85).

The story of tuberculosis in Ceylon is, therefore, the story of the variation in mortality and morbidity of tuberculosis of the respiratory system.

The death rate from this cause is higher in males than in females and this is true for Eire too. The densely populated Colombo district has a far higher rate than any other area in Ceylon; the mean rate for Colombo over the period 1937-48 is more than ten times the mean rate for the Nuwara Eliya district, which covers the highest regions of Ceylon. The Colombo rate is also nearly double the next highest district rate in Ceylon i.e. that for Jaffna. In general the death rate is highest in Zone A on the West coast, followed by the Nothern Province and with decreasing rates as altitude increases in the centre of the island. The urban death rate exceeds that for the rural population, which in turn is higher than the rate for the estate population.

The Malays are the community with the highest death rate from respiratory tuberculosis and the Burghers have the next highest rate.

It has already been indicated that the recorded death rate from tuberculosis in Ceylon is much lower than that occurring in Western countries (e.g. Eire) and that the death rate in Ceylon is lower at all ages. In Ceylon, too, a far smaller proportion of tuberculosis deaths are recorded as due to disease of regions other than the respiratory system (Table 86).

TABLE 85

Deaths from Tuberculosis.

(*a*) All Forms.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	2092	2059	2148	2109	2221	2047	2141	2251	2271	2442	2351	2484
Deaths	Female	1460	1531	1482	1573	1457	1381	1394	1469	1395	1570	1491	1589
Rate	Male	692	669	688	669	697	642	659	677	666	695	644	661
Rate	Female	543	560	534	562	514	487	483	497	452	494	462	478

(*b*) Tuberculosis of the Respiratory System.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	1864	1852	1928	1900	2029	1901	1934	1923	2047	2228	2163	2319
Deaths	Female	1281	1376	1302	1399	1314	1256	1240	1218	1221	1399	1347	1452
Rate	Male	617	602	619	602	635	595	596	579	600	635	593	617
Rate	Female	477	504	469	499	464	443	429	413	396	439	418	436

(Rates are given as deaths per million of the population).

The morbidity and mortality from tuberculosis have not apparently, decreased in the past few years (Table 87); the increased health of the people consequent on the reduction in malaria morbidity has not altered their resistance to tuberculosis. It may be that an increase in the number of cases diagnosed is masking a fall in the tuberculosis rate, but there is no evidence for a direct relationship between malaria and tuberculosis mortalities. Districts with a high malaria rate do not necessarily have a high tuberculosis rate and *vice versa*.

TABLE 86

Proportion of Deaths due to Tuberculosis.

Site of Tuberculosis	CEYLON (1949)		EIRE (1947)	
	Male	Female	Male	Female
All Sites	1000	1000	1000	1000
Respiratory System	938	928	752	780
Meninges and C.N.S.	23	20	114	98
Intestines and Peritoneum	12	12	31	37
Vertebral Column	1	4	24	13
Other Bones	—	—	13	11
Joints	0·8	—		
Skin and subcutaneous cellular tissue	—	—	0·5	2
Lymphatic System	4	5	3	3
Genito-Urinary System	0·4	0·6	10	7
Disseminated— (*a*) Acute	4	5	50	48
(*b*) Chronic	—	0·6		

TABLE 87

Morbidity and Mortality Rates from Tuberculosis.

Site of Tuberculosis	IN-PATIENTS (CEYLON)				DEATHS (CEYLON)				DEATHS (EIRE)	
	Number		Rate		Number		Rate		Number	Rate
	1947	1948	1947	1948	1947	1948	1947	1948	1947	1947
All Sites	8,682	10,928	1,262	1,542	3,842	4,073	559	575	3,700	1,243
Respiratory System	7,814	10,014	1,136	1,413	3,510	3,771	510	532	2,831	951
Meninges and C.N.S.	178	146	26	21	61	82	9	12	294	133
Intestines or Peritoneum	156	136	23	20	63	56	9	8	125	42
Vertebral Column	38	35	6	5	15	10	2	1	69	23
Other Bones and Joints	79	81	11	12	7	5	1	0·7	45	15
Skin and Subcutaneous Tissue	32	23	5	3	4	—	0·6	—	4	1
Lymphatic System	229	268	33	38	11	19	1·6	3	12	4
Genito-Urinary System	31	24	5	3	9	1	1·3	0·1	32	11
Disseminated	79	130	11	19	10	23	1·5	3	182	61
Other Sites	47	47	7	7	152	106	22	15	—	—

(Rates are given as deaths per million of the population).

(d) CANCER

It has already been indicated (Part II) that the reported mortality rate from cancer is less than one-tenth of that in the British Isles and that this lower rate is true for all age groups. Part of this difference may be due to inaccurate diagnosis although there is evidence to suggest that even among the better educated classes in Colombo, where good medical facilities are available, the incidence of cancer is still low by Western standards.

The death rate from cancer has not varied significantly over the past twelve years, although the number of deaths recorded has been rising steadily (Table 88).

TABLE 88

Deaths from Cancer in Ceylon.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	304	318	356	350	377	450	437	446	420	420	396	454
Deaths	Female	308	318	326	373	408	382	366	388	427	609	685	520
Rate	Male	101	103	114	111	118	141	135	134	123	120	108	121
Rate	Female	115	116	121	133	144	135	127	131	138	129	150	156

(Rates as deaths per million persons).

Some of this rise in the number of deaths may merely reflect an increased awareness, on the part of the population, of the danger of cancer.

The major site for cancer in Ceylon is the buccal cavity, such cancer accounting for 42 per cent. of deaths from cancer in males and 23 per cent. in females. Cancer of the digestive tract is the second main cause of these deaths in males while, in females, cancer of the uterus has about an equal incidence to cancer of the buccal cavity (Table 89). In Eire cancer of the digestive tract (especially cancer of the stomach and of the rectum) is the main cause of death from malignant disease. The distribution of cancer varies, therefore, between Ceylon and Eire. Or, what

TABLE 89

Proportion of Deaths due to Cancer occurring at Various Sites.

Sites of Cancer	CEYLON (1937-48)		EIRE (1947)	
	Male	Female	Male	Female
All Sites	1000	1000	1000	1000
Buccal Cavity	420	233	94	24
Digestive Tract	249	191	572	508
Respiratory System	38	18	64	36
Breast	4	77	2	145
Genito-Urinary System	50	—	95	—
Uterus (Female)	—	238	—	94
Skin	46	36	27	25

is probably a more accurate statement, since cancer of the buccal cavity is an easily recognisable condition, more deaths from cancer in Ceylon are registered as due to this cause than to any other malignant growth.

For all types of cancer, even for that occurring in the buccal cavity of males (females have similar rates here), the death rates in Eire are much greater than those reported in Ceylon. The same differences between the rates for males and females are seen in Ceylon and in Eire (Table 90).

TABLE 90

Death Rate (per million) from Cancer occurring at Various Sites.

Sites of Cancer	CEYLON (1937-48)		EIRE (1947)	
	Male	Female	Male	Female
All Sites	119	133	1387	1333
Buccal Cavity	50·0	31·0	130	30·6
Digestive Tract	29·7	25·4	798	648
Respiratory System	4·5	2·4	88·5	45·6
Breast	0·5	10·2	3·3	185
Male Genito-Urinary System	5·9	—	132	—
Uterus (Female)	—	31·7	—	120
Skin	5·5	4·7	38·0	32·0

The differences in the mortality from cancer arising in the various ethnic groups of Ceylon have already been discussed and Table 91 summarises further data on the distribution of mortality from cancer.

TABLE 91

Communities with the highest Death Rates from cancer occurring at Various Sites.

Sites of Cancer	Highest Rate found in—		
	Race	Sex	District
All Sites	European	Female	Colombo, Jaffna
Buccal Cavity	Burgher	Male	Jaffna, Colombo
Digestive Tract	European	Male	Colombo, Kandy
Respiratory System	European and Burgher	Male	Colombo, Puttalam
Breast	European and Burgher	—	Colombo, Chilaw
Genito-Urinary System (Male)	Burgher	—	Colombo, Trincomalee
Genito-Urinary System (Female)	European	—	Colombo, Badulla
Uterus	Burgher	—	Colombo, Badulla
Skin	—	—	Vavuniya, Colombo

(e) DISEASES OF THE RESPIRATORY SYSTEM

With the reduction in the mortality from malaria that has occurred since 1946, diseases of the respiratory system have become one of the major causes of death in Ceylon, being responsible for about one in ten of all deaths. The number of registered deaths from these diseases has decreased each year since 1946, however, and so has the death rate. This trend is seen in all the races of Ceylon and in all the zones of the island (Table 92).

The major respiratory disease is pneumonia (including broncho-pneumonia, capillary bronchitis, lobar-pneumonia and pneumonia of unspecified type) and the second most important is bronchitis (including acute and chronic bronchitis, bronchiectasis and bronchitis of unspecified type). Deaths from pneumonia and bronchitis have shown parallel decreases to that shown by deaths from respiratory diseases in general during the last three years (Table 92).

The Tamils, the Moors and the Malays show the greatest death rates from diseases of the respiratory system and zone D, the northern and eastern parts of the island, where Tamils and Moors predominate, has the highest death rate from this cause for the whole island. The hill country and estate areas in the centre of Ceylon have the next highest rate and the Sinhalese, the Southern and Western regions of the island have the smallest rates. A similar distribution between communities and districts is seen in the case of deaths from pneumonia, although the rate for the Hambantota district is high.

The deaths from bronchitis also have a somewhat similar distribution but a few departures from the general pattern are seen. The Tamils and the Malays are the communities with the highest death rates from bronchitis, but the hill country regions, zone C, and especially the Nuwara Eliya district have the highest rates, while districts like Jaffna, Mannar and Anuradhapura, within zone D, tend to have low rates. The rate for Hambantota is again high although the rest of the southern and western parts of Ceylon have comparatively low rates.

In general, bronchitis would seem to occur most frequently in the higher and cooler regions of Ceylon while pneumonia has its greatest incidence in the dry areas. The Indian Tamils are concentrated in the hilly districts, where—men, women and older children—they form the labour-force on the tea estates. Tea-plucking is a more or less continuous business and goes on through all types of weather; in fact plucking is required more urgently during the rainy seasons. This constant exposure may be a contributory factor to the high incidence of bronchitis in the tea-estate districts.

The Ceylon Tamils and Moors are to be found chiefly in the North and the East, the dry regions of Ceylon, and presumably their high mortality from pneumonia is due to the environment in which they live. Other dry areas, e.g. Anuradhapura, Hambantota, which have a mainly Sinhalese population, also have comparatively high death rates from pneumonia.

There are no apparent and significant differences between the death rates from respiratory diseases, pneumonia and bronchitis of males and females in Ceylon but there are age differences in the death rates.

The major incidence of deaths from pneumonia occurs in infants and young children and it is significant to note that the number of deaths, registered in towns, from this cause has risen in children below five years although there has been a decrease for all other age-periods (Table 93).

TABLE 92

Deaths and Death Rates from Diseases of the Respiratory System.

(a) Males.

Community	NUMBER OF DEATHS						DEATH RATES (per million)					
	Respiratory Diseases		Pneumonia		Bronchitis		Respiratory Diseases		Pneumonia		Bronchitis	
	1937-46	1949	1937-46	1949	1937-46	1949	1937-46	1949	1937-46	1949	1937-46	1949
All Ceylon	7612	5227	5017	3764	783	522	2370	1360	1560	983	243	136
Sinhalese	3867	2771	2452	2110	302	161	1800	1040	1140	795	141	61
Tamils	2857	1854	2125	1284	388	308	3600	2080	2680	1440	488	346
Moors	728	503	384	307	68	39	3400	2000	1800	1220	319	155
Malays	37	40	31	29	4	6	3690	3150	3040	2290	446	473
Burghers	34	26	25	15	4	4	1790	1150	1310	665	220	177
Zone A	24191	1871	17549	1469	2151	134	1790	1110	1300	875	159	80
Zone B	15440	1118	9112	784	2047	157	1810	1100	1190	769	239	154
Zone C	13559	1052	8505	700	2168	171	2240	1610	1410	1075	356	262
Zone D	22423	1186	14129	823	1458	52	5550	2260	3430	1570	359	99

TABLE 92 (*Contd*).

Deaths and Death Rates from Diseases of the Respiratory System.

(*b*) Females.

Community	NUMBER OF DEATHS						DEATH RATES (per million)					
	Respiratory Diseases		Pneumonia		Bronchitis		Respiratory Diseases		Pneumonia		Bronchitis	
	1937-46	1949	1937-46	1949	1937-46	1949	1937-46	1949	1937-46	1949	1937-46	1949
All Ceylon	5952	4874	392	3484	731	503	2140	1410	1390	1000	262	145
Sinhalese	3058	2588	1419	1867	290	180	1560	1070	920	774	149	75
Tamils	2445	1777	1790	1273	380	279	3530	2310	2590	1650	548	363
Moors	558	438	329	294	65	35	3290	2210	1930	1480	382	177
Malays	33	24	27	21	5	3	3750	2120	3030	1860	561	265
Burghers	29	21	20	14	5	4	1580	935	1060	624	258	178
Zone A	18080	1615	12668	1235	2037	136	1530	1120	1070	860	173	95
Zone B	13465	1128	8185	787	2019	141	1120	1190	1050	831	257	149
Zone C	11768	1049	7039	663	2180	186	2170	1810	1300	1140	400	321
Zone D	18239	1082	12149	787	1284	39	5070	2360	3370	1720	355	85

TABLE 93

Deaths Registered in Towns from Pneumonia 1945-49 *According to Age Groups, and Proportion of the Deaths at each Age Group to* 100 *Deaths from this Cause at all Ages.*

Age Period	1945		1946		1947		1948		1949	
	Total Deaths	Per cent. of Deaths at all Ages	Total Deaths	Per cent. of Deaths at all Ages	Total Deaths	Per cent. of Deaths at all Ages	Total Deaths	Per cent. of Deaths at all Ages	Total Deaths	Per cent. of Deaths at all Ages
0-2	791	26·0	885	29·3	954	36·5	1061	42·3	1180	45·8
2-5	370	12·6	308	10·2	342	13·1	382	15·2	423	16·4
5-20	366	12·4	314	10·4	245	9·4	195	7·8	205	8·0
20-25	208	7·1	185	6·1	125	4·8	107	4·3	84	3·3
25-35	256	8·7	306	10·1	208	7·9	155	6·2	137	5·3
35-45	219	7·4	292	9·7	225	8·6	166	6·6	124	4·8
45-55	230	7·8	270	8·9	163	6·2	152	6·1	116	4·5
55 and over	501	17·0	465	15·4	352	13·5	289	11·5	307	11·9

The difference in the distribution of deaths from bronchitis and pneumonia is further emphasised by a comparison of the mean mortality rates, over the period 1937-48, for estate, urban and rural populations. The estate death rate is the highest in the case of bronchitis and the urban rate is greatest for deaths from pneumonia.

The Registrar-General has started recently to differentiate between Ceylon Tamils and Indian Tamils in his mortality figures and here again is to be found evidence for the comparatively high death rate from bronchitis among the Indian Tamil (estate) community, e.g.

TABLE 94

Death Rates per Million of the Population from Pneumonia and Bronchitis.

Year	Pneumonia						Bronchitis					
	Sinhalese		Ceylon Tamil		Indian Tamil		Sinhalese		Ceylon Tamil		Indian Tamil	
	M	F	M	F	M	F	M	F	M	F	M	F
1947	972	888	2223	2570	1640	1620	81	85	185	153	445	612
1948	873	840	1655	2033	1940	1974	68	83	228	178	597	742

Asthma is the only other respiratory affection causing a significant number of deaths in Ceylon, and here too the Tamils, the Moors and the Malays are the communities with the greatest death rates. The Sinhalese have a comparatively low rate [mean rate for 1937-48 being significantly less than that of Tamils, Moors and Malays]. The distribution of the mortality from asthma is somewhat similar to that for other respiratory diseases; the higher death rates are found in the north of Ceylon (Jaffna district has the greatest rate of all) and the central hills, although Galle district on the western coast also has a comparatively high rate (Table 95).

For asthma, the mortality rate for females is significantly greater than that for males (mean rate, 1937-48, greater than that of males for all Ceylon, the Sinhalese, the Tamils, and for many districts).

TABLE 95

Mean Death Rates from Asthma for the Period 1937-48.

District or Race	1937-48	
	Males	Females
All Ceylon	72·4	98·5
Europeans	120·0	31·3
Burghers	81·2	67·6
Sinhalese	56·7	85·0
Tamils	110·0	127·0
Moors	92·5	92·4
Malays	117·0	91·9
Colombo	65·7	90·7
Kalutara	62·0	112·5
Galle	96·7	187·0
Kandy	90·5	99·2
Matale	119·0	132·0
Nuwara Eliya	87·4	104·0
Puttalam	38·5	51·5
Badulla	48·3	57·6
Jaffna	117·0	189·5

(Rate is given as deaths per million of the population).

(f) DISEASES OF THE CIRCULATORY SYSTEM

Deaths from diseases of the circulatory system are assuming a more and more important place in the mortality picture of Ceylon. The number of deaths registered as due to this cause is rising each year. This rise has been proceeding for some time and reached a peak in 1945, since when there has began slight decline and this has been accompanied by a decrease in the death rate too (Table 96).

TABLE 96

Total Deaths and Death Rates from Diseases of the Circulatory System (Ceylon).

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	1263	1316	1440	1536	1575	1720	1992	2116	2430	2056	1908	1971
Deaths	Female	786	844	858	935	963	1034	1134	1389	1598	1324	1244	1351
Rate	Male	418	428	462	487	493	538	614	637	712	586	523	524
Rate	Female	292	309	309	334	340	365	392	471	518	416	386	405

The number of deaths is still much higher than pre-war and it is possible that a further rise may occur in the future as the expectation of life increases and more people live to adult ages. With a more rapid decline in the deaths from other causes, diseases of the circulatory system now account for a higher proportion of the total deaths than previously (see Table 19, Part II) and the proportionate increase may be expected to continue.

The variations in the mortality for each major community and zone of Ceylon are shown in Table 97, where the average mortalities for the period 1937-46 are compared with those for the most recently available year, 1949.

TABLE 97

Diseases of the Circulatory System.

(*a*) Males.

Community	Number of Deaths		Death Rate	
	1937-46	1949	1937-46	1949
All Ceylon	1744	2207	538	576
Sinhalese	1124	1417	516	534
Tamil	376	505	471	567
Moor	157	190	731	757
Zone A	953	1179	693	702
Zone B	400	488	464	479
Zone C	292	399	476	612
Zone D	102	141	255	269

TABLE 97 (*Contd.*)

Diseases of the Circulatory System.

(*b*) Females.

Community	Number of Deaths		Death Rate	
	1937-46	1949	1937-46	1949
All Ceylon	1087	1392	375	401
Sinhalese	682	871	343	361
Tamil	284	384	408	499
Moor	75	77	437	389
Zone A	562	710	458	494
Zone B	240	318	304	336
Zone C	209	275	381	474
Zone D	74	89	206	194

It has already been remarked that there are great differences in the death rates from diseases of the circulatory system among the various racial groups of Ceylon, the Europeans, the Burghers and the Malays showing the greatest rates. There is also a difference between the mean mortality rates for the two sexes for the period 1937-48, that for males being about 41 per cent. higher than that for females.

The districts with the denser population distributions tend to have the higher death rates from this cause (the only exceptions are Negombo and Matara, which have comparatively low rates, and Puttalam, which has a high rate). Therefore, as already noted, zone A and especially the Colombo district have high mortality rates. These areas are also the most industrialized in Ceylon and have the highest European and Burgher populations.

The proportion of these deaths from individual causes shows a similar distribution to that occurring in western countries, e.g. Eire (Table 98).

TABLE 98

Percentage of Deaths from Circulatory Diseases due to Various Causes.

Cause	Percentages for—			
	Ceylon (1937-48)		Eire (1947)	
	Males	Females	Males	Females
Diseases of the myocardium	38·7	53·0	57·4	61·1
Chronic diseases of valves and endocardium	5·9	10·1	11·5	11·5
Pericarditis	1·0	0·8	0·3	0·2
Diseases of the coronary arteries	11·0	3·6	12·9	7·0
High blood pressure	3·8	2·0	2·3	3·0

The death rates from all causes are, however, much lower in Ceylon than in Eire (Table 99).

TABLE 99

Death Rates per 100,000 *Population from Various Causes.*

Cause	Ceylon (1937-48)		Eire (1947)	
	Males	Females	Males	Females
All causes	53·5	37·8	430	377
Diseases of the myocardium	21·0	20·1	246	230
Chronic diseases of the valves and endocardium	3·2	3·8	49·4	43·5
Pericarditis	0·5	0·3	1·4	0·8
Diseases of the coronary arteries	5·9	1·4	55·5	43·5
High blood pressure	2·2	0·8	9·9	11·2

The difference in the death rates from high blood pressure is probably greater than these figures show, since the immediate cause of death in some of these patients may be an intracranial lesion of vascular origin or chronic nephritis and both these causes of death are much more common in Eire and other western countries.

The Registrar-General does not give details of deaths in Ceylon by cause and age-period so that the age-specific death rates from diseases of the circulatory system cannot be calculated. However, even if we assume that all such deaths in Ceylon occur during the age period from 55 years and upwards (nearly 90 per cent. of the deaths from circulatory diseases do occur in this age-period in Eire), the death rates for both sexes in Ceylon are less than those in Eire, e.g.

Death rate from circulatory diseases in males (Eire, 1947) aged 55 years and upwards 31·4 per thousand;

Death rate from circulatory diseases in females (Eire, 1947) aged 55 years and upwards 31·7 per thousand;

Death rate from circulatory diseases in males (Ceylon, 1949) aged 55 years and upwards 6·92 per thousand;

Death rate from circulatory diseases in females (Ceylon, 1949) aged 55 years and upwards 5·47 per thousand.

There is, therefore, a real difference between the incidence of deaths due to circulatory diseases in Ceylon and Eire.

The commonest cause of death in this group is *disease of the myocardium* and, of the communities in Ceylon, the Malays, Burghers and Europeans show the highest death rates from this cause. (The mean rate for Sinhalese and Tamils is less than that for Burghers, Europeans, Malays and Moors. The rate for Moors is also less than the mean rate for Burghers, Malays and Europeans, while the Burgher rate is higher than the European rate).

Colombo, Galle and the hill districts have the highest mean regional rates, the greatest being in Colombo, which has a mean death rate about 70 times greater than that found in the Anuradhapura.

There are no significant differences between the mean rates of the two sexes in any community or district of Ceylon.

Disease of the coronary arteries is given as the next most common cause of these deaths in male subjects, and here the mean rate for males is much higher than that for females.

Colombo again has the highest rate for any district, this being about 30 times higher than that for Kurunegala. In general, the port- and up-country areas have the higher rates, while those for the Southern, North-Central and North-Western provinces are particularly low.

In the case of females, chronic diseases of the valves and of the endocardium are the second commonest cause of these deaths and, in these cases, the mean female rate tends to be significantly higher than that of males. The Europeans tend to have the highest rate and the Sinhalese a low rate but there is no obvious distribution of the mortality from this cause between different regions.

Pericarditis is an insignificant cause of death, it being commonest among the Burghers and among male subjects.

(g) DISEASES OF THE DIGESTIVE SYSTEM.

These account for about one in every 14 of the deaths in Ceylon, the proportion being a little smaller for women than for men. The mean death rates from these causes for the two sexes, however, do not differ significantly.

There have been declines since 1946 in the total deaths and the death rates from these diseases and these declines can be accounted for by the decrease in the number of deaths from diarrhoea and enteritis (Table 100).

TABLE 100

(a) Deaths and Death Rates from diseases of the Digestive System.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	4352	4609	4535	4463	4394	4327	5543	5162	4918	4837	3439	3522
Deaths	Female	4251	4295	4185	3978	3889	3597	4630	4166	4088	3922	2968	3047
Rate	Male	1441	1498	1456	1415	1375	1354	1710	1554	1441	1379	942	937
Rate	Female	1581	1572	1507	1420	1373	1270	1600	1412	1325	1232	920	914

(b) Deaths and Death Rates from Diarrhoea and Enteritis (2 years and over).

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	2636	2787	2647	2646	2512	2707	3335	3047	3108	2890	1624	1571
Deaths	Female	2967	2925	2835	2623	2591	2517	3092	2653	2765	2562	1619	1613
Rate	Male	873	906	850	839	786	847	1030	917	911	824	445	418
Rate	Female	1104	1071	1021	936	915	889	1070	899	896	805	502	484

(Rates are given as deaths per million of the population).

Diarrhoea and enteritis account for 70-80 per cent. of all deaths from diseases of the digestive system in Ceylon. This should be contrasted with the mortality

distribution in Eire (Table 101), where a lower proportion of deaths from diarrhoea and enteritis is accompanied by a correspondingly greater proportion of deaths from peptic ulceration, appendicitis, hernia, intestinal obstruction and from diseases of the gall-bladder, bile-ducts and pancreas.

TABLE 101

Proportion of deaths due to diseases of the Digestive System.

Cause	Ceylon, 1949 Male	Ceylon, 1949 Female	Eire, 1947 Male	Eire, 1947 Female
All diseases of the digestive system	1000	1000	1000	1000
Diseases of the buccal cavity, etc.	21	21	13	13
Diseases of the oesophagus	1	1	4	3
Ulcer of stomach or duodenum	10	2	173	75
Other diseases of the stomach	78	89	73	63
Diarrhoea and enteritis				
(*a*) under 2 years	309	313	428	479
(*b*) 2 years and over	394	504		
Appendicitis	11	4	43	56
Hernia, intestinal obstruction	62	15	133	164
Other diseases of the intestines	8	5	20	18
Cirrhosis of the liver	41	15	33	25
Other diseases of the liver	40	23	18	17
Biliary calculi	—	—	23	45
Other diseases of gall-bladder and bile ducts	3	1	10	18
Diseases of the pancreas (other than diabetes)	1	1	12	8
Peritonitis without stated cause	13	10	16	17

The mortality from diarrhoea and enteritis is low among the Burghers and the Europeans and tends to be higher in the dry areas of Ceylon, although Colombo also has a comparatively high rate. The mean death rates of males and females over the past 12 years do not differ significantly.

The death rates from gastric or duodenal ulceration are very low, and there have been no consistant variations in the mortality from these causes in recent years (Table 102). Europeans in Ceylon would seem to have the highest death rates for both types of ulcer, and for all races the male rate is significantly greater than the rate for females. For both gastric and duodenal ulcer, the highest death rates are to be found around Colombo and Kandy and in the Northern and Eastern Provinces.

TABLE 102

Deaths from Gastric and Duodenal Ulcers.

(*a*) Gastric Ulcer.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	32	32	23	29	43	24	30	23	23	25	23	25
Deaths	Female	15	7	4	15	10	16	7	11	5	7	9	6
Rate	Male	10·6	7·2	7·4	9·2	13·5	7·5	9·2	6·9	6·7	7·1	6·3	6·7
Rate	Female	5·6	2·6	1·4	5·4	3·5	5·7	2·4	3·7	1·6	2·2	2·8	1·8

(*b*) Duodenal Ulcer.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	5	6	13	9	7	4	9	10	13	8	10	7
Deaths	Female	2	1	1	2	—	—	1	3	2	1	4	1
Rate	Male	1·7	2·0	4·2	2·9	2·2	1·3	2·8	3·0	3·8	2·3	2·7	1·9
Rate	Female	0·7	0·4	0·4	0·7	—	—	0·4	1·0	0·6	0·3	1·2	0·3

(Rates are given as deaths per million of the population).

Cirrhosis of the liver is a common cause of death and here, too, males have the greater death rate and Burghers and Europeans the highest incidence among the racial groups. The variation of the death rate during the period 1937-48 is shown in Table 103.

TABLE 103

Deaths from Cirrhosis of the Liver.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	135	114	170	166	164	152	181	136	141	137	107	137
Deaths	Female	53	38	61	61	58	65	'56	54	44	37	35	35
Rate	Male	44·7	37·1	54·6	52·6	51·3	47·6	55·7	40·9	41·3	39·0	29·3	36·4
Rate	Female	19·7	13·9	22·0	21·8	20·5	22·9	19·4	18·3	14·3	11·6	10·9	10·5

(Rates are given as deaths per million of the population).

Diabetes Mellitus.—There has been a steady reduction in the mortality from this disease for several years (Table 104). The death rate is significantly higher in males than in females and this is true for all races and for all the 21 districts. The Burghers and the Malays are the communities with the highest death rates from diabetes and the rate tends to be higher in the more densely-populated districts of Ceylon, although the Jaffna district shows the highest rate of all.

In Eire the death rate from diabetes tends to be higher in females than in males (e.g. 76 cf. 59 for 1947), and by comparison the rate for males in Ceylon is relatively high. How accurate the Ceylon figures are it is impossible to estimate ; if anything

TABLE 104

Deaths from Diabetes.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	498	494	491	513	490	490	435	432	441	374	349	311
Deaths	Female	185	189	202	194	207	199	207	198	191	173	175	183
Rate	Male	165	161	158	163	153	153	134	130	129	107	96	83
Rate	Female	69	69	73	69	73	70	·72	67	62	54	54	55

(Rates are given as deaths per million of the population).

they probably under-assess the mortality from diabetes, since cases may not be diagnosed in isolated regions of the island. The higher death rate in the more heavily-populated areas may be partly due to the better facilities for diagnosis in the larger hospitals, though these will carry better facilities for treatment too.

(h) DISEASES OF THE URINARY AND GENITAL SYSTEMS

Cause about one per cent. of all deaths in Ceylon (cf. about 3 per cent. in Eire) and a little over half of these are due to chronic nephritis (Table 105).

TABLE 105

Proportion of Deaths due to diseases of the Urinary and Genital Systems.

Cause	Ceylon (1949) Male	Ceylon (1949) Female	Eire (1947) Male	Eire (1947) Female
All Genito-Urinary Diseases	1000	1000	1000	1000
Nephritis-Acute	245	272	69	129
Nephritis-Chronic	577	571	594	733
Diseases of the Prostate	40	—	235	—
Diseases of Female Genital Organs	—	77	—	36

The low incidence of deaths from diseases of the prostate is especially noteworthy and the death rate figures illustrate this difference between Eire and Ceylon too (Table 106).

TABLE 106

Death rates from certain diseases of the Urinary and Genital Systems.

Cause	Death rate per 100,000 of the population			
	Ceylon		Eire	
	Male	Female	Male	Female
Acute nephritis	43	63	46	44
Chronic nephritis	101 (188)[1]	132 (259)[1]	395 (618)[1]	251 (886)[1]
Diseases of the prostate	7·9 +	—	8·2 +	—

1 deaths per 100,000 aged 20 years and over.

\+ deaths per 100,000 of the male population aged 55 years and over.

The death rates from chronic nephritis and from diseases of the prostate are greater in Eire than in Ceylon. These differences are not due to the difference in the age distributions of the populations of the two countries as the age-specific death rates show. (The distinctions are even marked than the figures would indicate. Deaths by age and cause are not obtainable for all Ceylon and, in the calculation of the age specific rates in Table 106, it has been assumed that all deaths in Ceylon from chronic nephritis occurred at 20 years and over, and all deaths from diseases of the prostate at 55 years and over).

The death rate from these diseases is greater for females in Ceylon than for males, while the reverse is true for Eire.

The Malays and the Europeans in Ceylon tend to have the highest death rates, while Zone C, the estate, up-country area, has the largest regional death rate.

The death rate from diseases of the genito-urinary systems has been falling over the last few years and this decrease is due mainly to a decline in the number of deaths attributed to chronic nephritis (Table 107).

TABLE 107

Deaths from diseases of the Urinary and Genital Systems.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	942	914	949	927	861	918	975	1050	1046	846	768	726
Deaths	Female	1007	1034	944	916	878	905	981	1089	1082	923	811	817
Rate	Male	312	297	305	294	270	287	303	316	306	241	210	193
Rate	Female	375	378	340	327	310	320	357	370	351	290	251	245

(Rates are given as deaths per million of the population).

(i) INFECTIOUS AND PARASITIC DISEASES

This group of diseases still predominated over the mortality picture in Ceylon accounting as they did for about 1 in every 6 deaths during 1949. The reduction in the deaths from malaria since 1946 has been discussed and so has the variation in the death rate from tuberculosis. Other individual diseases in this group are important causes of death in Ceylon and their variation and distribution will now be indicated.

The over all decrease of deaths and of death rates from infectious and parasitic diseases are shown in Table 108.

The Malays, followed by the Moors, have the highest death rate from these causes among the major communities and, in general, the districts in the dry zone, tend to have higher rates than districts elsewhere. There are important exceptions to this generalisation, however, since the Colombo and Galle districts have high death rates while those of Trincomalee, Jaffna and Batticaloa are comparatively low. Nuwara Eliya is the healthiest district from this point of view and Hambantota has had the highest mean death rate over the period 1937-48. Of our mortality-zones, Zone A has the worst record, due chiefly to the high death rate prevailing in the Colombo district.

TABLE 108

Deaths and Death Rate due to Infectious and Parasitic Diseases.

COMMUNITY	NUMBER OF DEATHS				DEATH RATE			
	1937-46		1949		1937-46		1949	
	M	F	M	F	M	F	M	F
All Ceylon	12392	11172	7784	6810	3830	3880	2030	1960
Sinhalese	8665	7904	5557	4913	4000	4000	2095	2040
Tamil	2630	2366	1476	1263	3305	3415	1660	1640
Moor	866	750	615	544	4050	4410	2450	2750
Zone A	6022	5275	4198	3465	4400	4420	2500	2410
Zone B	3272	3145	1749	1749	3825	4010	1715	1850
Zone C	1558	1472	988	924	2560	2710	1520	1590
Zone D	1605	1292	849	672	3970	3560	1620	1470

M = Males.
F = Females.

Enteric Fevers.—The number of deaths and the death rates from enteric were increasing up to 1945, but since that date there has been a steady fall.

TABLE 109

Deaths from Enteric Fever in Ceylon.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	536	543	616	594	688	587	654	944	828	734	587	481
Deaths	Female	344	377	359	395	434	395	496	629	650	562	691	379
Rate	Male	177	177	198	188	215	184	201	284	243	209	161	128
Rate	Female	128	138	129	141	153	139	172	213	211	177	152	114

(The rates are given as deaths per million of the population).

The death rate from enteric is greater in the Colombo district and, in general the rate is higher in Urban areas than among the estate and rural population. The Europeans and the Malays are the communities with the greatest mean death rates and males have a higher rate than females.

Dysentery.—This is one of the diseases which has shown a marked decline as a cause of death since 1946 :—

TABLE 110

Deaths from Dysentery.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	1065	1176	1180	1610	1405	1438	1397	1185	1191	1082	544	420
Deaths	Female	902	1052	916	1260	1141	837	820	740	747	742	387	297
Rate	Male	353	382	382	540	440	450	430	357	349	308	149	112
Rate	Female	336	385	330	450	403	296	284	251	242	233	120	89

(Rates are given as deaths per million of the population).

It is a commoner cause of death among the urban than among the rural population and the greatest death rates are to be found in the north and the east of the island.

Influenza.—Deaths from Influenza have been declining since 1944 :

TABLE 111

Deaths from Influenza.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	1015	931	740	937	871	827	1101	1136	785	776	623	544
Deaths	Male	1082	957	862	961	936	818	1052	1092	894	788	683	572
Rate	Female	333	303	238	297	273	259	339	342	230	221	171	150
Rate	Female	403	350	310	343	330	289	364	370	290	247	218	172

(Rates are given as deaths per million of the population).

The decrease in the death rate from influenza commenced, therefore, before the general decline in the total death rate due to the reduction in malaria mortality since 1946. It is difficult to assign a reason for this, although it must be noted that the influenza death rate has recently been declining throughout the world.

There is no obvious order about the distribution of the influenza—death rate throughout Ceylon. The rate for the Hambantota district in the south is extremely high but the hill districts, Jaffna and Colombo also have comparatively high rates. The distribution bears no clear-cut relationship with variations in the density of the population, in the incidence of malaria or in the climate of the various regions of Ceylon. Urban and estate areas have similar mean rates and so do males and females. Of the racial groups of Ceylon, the Malays and the Moors have the highest death rate from this cause.

Ankylostomiasis.—Deaths due to this infestation are commoner in females than in males and the highest death rates are to be found in estate areas and along the west coast of Ceylon. The rural population has a significantly smaller death rate than the urban and estate populations. The Tamils show the greatest death rate from this cause, this being due to the higher incidence among Indian Tamil labourers.

The number of deaths each year and the annual death rate have both been decreasing since 1945.

TABLE 112

Deaths from Ankylostomiasis.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	743	762	758	677	657	779	731	751	874	623	453	391
Deaths	Female	965	1046	981	929	799	917	730	817	945	714	612	521
Rate	Male	246	248	243	215	206	244	225	226	256	178	124	104
Rate	Female	359	383	353	332	282	324	253	277	306	224	190	156

(The rate is given as deaths per million of the population).

Diseases due to other Helminths.—Here, too, the death rate among females is greater than that among males. The distribution of deaths, however, is different from that noted for Ankylostomiasis. The west coastal region gives the highest death rates and the estate population has a lower death rate than either the rural or urban populations. In conformity with this distribution, it has already been noted that the Sinhalese have the greatest death rate of any community.

The annual number of deaths and the death rate have varied from year to year but there is evidence of some reduction since 1946.

TABLE 113

Deaths from Helminths.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	1628	1514	1418	1738	1260	1279	1709	2005	1929	1730	1269	1431
Deaths	Female	1874	1895	1795	1351	1551	1485	2027	2387	2362	1968	1513	1667
Rate	Male	539	492	455	551	394	400	526	604	565	493	348	381
Rate	Female	697	694	646	482	548	524	701	809	765	618	469	500

(Rates are given as deaths per million of the population).

The difference between tropical Ceylon and Western countries in the incidence of the various infective and parasitic diseases is too well known to be laboured here. Table 114 shows the relative importance of some of these diseases in Ceylon and Eire.

Some of these differences may be due to inaccurate diagnosis but all cannot be accounted for in this way.

TABLE 114

Proportion of Deaths from Various Infective and Parasitic Diseases.

Cause of Death	Ceylon 1949	Eire 1947
All Infective and Parasitic Diseases	1000	1000
Enteric Fever	60	2·9
Scarlet Fever	—	1·6
Whooping Cough	—	55
Diphtheria	5·1	11
Erisypelas	8·8	1·2
Tetanus	0·6	2·5
Tuberculosis	287	722
Leprosy	4·3	—
Purulent Infection and Septicaemia	5·2	8·8
Dysentery	49	0·6
Malaria	165	0·4
Syphilis	6·0	11
Influenza	67	117
Smallpox	—	—
Measles	1·8	21
Acute Poliomyelitis and Encephalitis	2·3	11
Acute Infectious Encephalitis	—	2·7
Rabies	7·6	—
Yellow Fever	—	—
Typhus	0·1	—
Ankylostomiasis	58	—
Other diseases due to Helminths	204	0·6
Thrush	35	0·4

(j) ANAEMIA

Mean death rates from anaemia over the period 1937-48 were 386 per million males and 329 per million females. In Eire, in 1947 the rates were 77·9 for males and 119·2 for females. Ceylon, therefore, has a higher death rate from anaemia than does Eire, and in Ceylon the male death rate is significantly greater than the female rate.

The deaths from anaemia have shown a sharp drop since 1946—

TABLE 115

Deaths from Anaemia.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	1136	1201	1221	1144	1128	1288	1481	1587	1607	1451	1025	949
Deaths	Female	852	925	832	828	865	952	948	1125	1244	1247	931	885
Rate	Male	376	390	342	363	353	403	456	478	471	414	281	252
Rate	Female	317	339	300	296	306	336	328	381	403	392	289	266

(Rates are given as deaths per million of the population).

The Sinhalese have a higher death rate from anaemia than the other races and in conformity with this we find that these deaths are most frequent in the south and south-western parts of the island. The rural population gives a higher death rate than the urban population and the latter have a higher rate than do the population on estates.

(k) CONVULSIONS IN CHILDREN UNDER FIVE YEARS

This is the commonest nervous disorder causing death in Ceylon, and it is responsible for about 1 in every 10 death from all causes. It accounts for about 70 per cent. of all deaths from diseases of the nervous system, in contrast with Eire, where intracranial lesions of vascular origin cause three-quarters of the deaths from diseases of the nervous system (Table 116).

TABLE 116

Proportion of Deaths due to Diseases of the Nervous System.

Cause	(Ceylon 1949)		(Eire 1947)	
	Male	Female	Male	Female
All Diseases of the Nervous System	1000	1000	1000	1000
Encephalitis	5	6	11	5
Meningitis	29	22	42	27
Diseases of the Medulla and Spinal Cord	2	—	32	22
Intracranial Lesions of the Vascular Origin	226	192	720	785
Mental Disorder and Deficiency	5	6	32	38
Epilepsy	22	15	31	30
Convulsions (under 5 years)	694	742	67	49

This condition is the major cause of death in the south and south-western parts of the island, while the Western Province and Central hill districts have relatively low death rates. Of the racial groups the Sinhalese have the highest mean death rate from this cause while the rates for males and females do not differ significantly.

Since 1946 the deaths from convulsions have decreased, e.g.

TABLE 117

Deaths from Convulsions in Children under 5 years.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	6269	6304	6943	6183	5214	5293	6101	6045	6490	6510	4206	4088
Deaths	Female	5746	6126	6860	6033	4954	4807	5726	5755	6345	6386	3946	4027
Rate	Male	2075	2049	2229	1960	1632	1657	1879	1820	1902	1855	1152	1087
Rate	Female	2138	2242	2470	2154	1749	1697	1981	1951	2056	2005	1223	1208

(Rates are given as deaths per million of the population).

TABLE 118 (*a*)

Deaths from Malaria, Pyrexia and Convulsions.

Year	Number of deaths in each year from		
	Malaria	Malaria and Pyrexia	Convulsions in Children under 5 years
1930	2,387	21,493	15,445
1931	1,661	18,214	12,135
1932	1,683	16,197	10,867
1933	1,409	15,185	11,666
1934	2,332	17,799	12,939
1935	47,326	69,833	16,501
1936	7,628	22,148	11,323
1937	4,408	18,326	12,015
1938	4,778	16,816	12,430
1939	10,039	22,128	13,803
1940	9,169	20,403	12,217
1941	7,132	17,313	10,168
1942	5,143	16,057	10,100
1943	6,765	19,972	11,827
1944	5,604	19,387	11,800
1945	8,539	23,914	12,835
1946	12,587	23,043	12,896
1947	4,562	9,873	8,152
1948	3,349	7,682	8,115
1949	2,403	6,584	7,809

That is, with the reduction since 1946 in the morbidity and mortality from malaria there has been a great reduction in the number of deaths ascribed as due to convulsions in infants and young children. Convulsions are only a symptom and there are many diseases which can produce this symptom. It is a pity that such a large number of deaths in Ceylon are certified as being due to such a vague cause. There is a relationship between the variation in deaths from malaria and the variation in deaths from convulsions (Table 118) but this is not evidence for malaria being the cause of convulsions; many other causes of death, as already noted, also produce death rates which parallel the variation in malaria rate.

TABLE 118 (*b*)

Death Rate from Malaria and Convulsions in Children under 5 years.

Districts	Malaria Death Rate		Convulsions in Children under 5 years	
	1937-48	1948	1937-48	1948
Colombo	557	191	755	567
Negombo	605	421	705	451
Kalutara	437	189	2210	1295
Kandy	606	220	914	900
Matale	1020	440	1850	1488
Nuwara Eliya	318	117	916	218
Galle	898	144	4080	2880
Matara	2180	604	4760	2192
Hambantota	2870	900	7300	2496
Jaffna	906	297	955	492
Mannar	2840	794	1250	676
Vavuniya	1920	440	1570	360
Batticaloa	2130	1390	1100	1079
Trincomalee	1440	182	2780	1351
Kurunegala	2250	1397	1610	596
Puttalam	2660	1178	1880	686
Chilaw	998	523	1060	631
Anuradhapura	1960	702	1800	1066
Badulla	1200	1008	2760	2280
Ratnapura	939	480	1610	1309
Kegalle	1770	410	1030	720

(Rates are given as deaths per million of the population).

(l) RHEUMATIC FEVER

Is another disease which has been producing less deaths since 1946 (Table 119).

TABLE 119

Deaths from Rheumatic Fever.

	Sex	1937	1938	1939	1940	1941	1942	1942	1944	1945	1946	1947	1948
Deaths	Male	1083	1103	1088	1056	1112	1250	1327	1069	1210	1214	954	886
Deaths	Female	1115	1049	1048	1057	1027	1022	1142	941	1130	1085	946	940
Rate	Male	359	359	349	335	348	391	409	322	355	246	261	236
Rate	Female	415	384	377	377	363	361	395	319	366	341	293	282

(Rates are given as deaths per million of the population).

It has been stated (Manson) that rheumatic fever does not occur in the tropics but the death rate from this cause in Ceylon appears to be higher than that in Eire (21 per million for males and 18 per million for females in 1947).

The Moors and the Sinhalese give the highest death rates but the highest district rates are to be found in the East (e.g. Trincomalee has the highest mean rate of all districts), and the North, so that Zone D shows the greater death rate among the mortality zones.

(m) MANDAMA AND RICKETS

These account for practically all the deaths from vitamin deficiency diseases. There was a rise in the number of deaths occurring from these causes during the difficult war years of 1942 to 46; since when there has been a steady fall (Table 120).

TABLE 120

Deaths from Mandama and Rickets.

	Sex	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Deaths	Male	1798	1655	1504	1535	1552	1680	2780	3971	3382	2705	2157	1985
Deaths	Female	2052	1864	1923	1770	1884	2174	3608	5011	4307	3359	2794	2605
Rate	Male	595	538	483	487	486	526	856	1195	976	771	591	528
Rate	Female	763	682	692	632	665	767	1248	1699	1396	1055	866	782

(Rates are given as deaths per million of the population).

The Sinhalese, Moors and Malays have the highest death rate from deficiency diseases and, it will be noted, that females have a consistently higher rate than have males. The north and the east of Ceylon (Zone D) show the greatest rate, but it must be remembered that the mortalities from this diseases are no indication of the true incidence and malnourishment will predispose to death from other causes.

The number of deaths attributed to these causes in Ceylon is, of course, far higher than those recorded in Eire (e.g. 7 per million for males and 7 per million for females) or in other Western countries. The accuracy of the diagnoses of these deficiency diseases in Ceylon is to be questioned. During two island-wide surveys a true case of rickets was never seen and it is probable that the terms mandama and rickets are used indiscriminately to describe the cause of death in undernourished persons.

PART IX

Concluding

This monograph has been compiled so as to present, in as concise a fashion as was practicable, the available data relating to the health status of the people of Ceylon. It seemed that this was a convenient time to collect together this information. A revolution is occurring in Ceylon that is going to have implications and to produce new problems as great as any created by the ideological or political revolutions that have occurred in other countries. The intelligent use of D.D.T., has reduced the mortality and the morbidity from malaria to remarkably low levels. This has brought, too, a decrease in the maternal and the infant mortalities, and a fall in the death rates from many other causes, such as pneumonia, dysentery, etc.

The general death rate has fallen precipitously and the expectation of life has risen in a corresponding fashion. The population of Ceylon, it can be safely predicted, is going to increase very rapidly.

Moreover, the whole mortality picture in Ceylon is changing from one typical of the tropics and of backward countries to one similar to those possessed by the more advanced peoples of the Western hemisphere, and this sudden improvement in the health of the people has moved the struggle for existence on to new territory.

In the past malaria sapped the vitality of the people and made impossible the cultivation of large areas of Ceylon. Now the jungles can be cleared, the dry zone can be irrigated and, moreover, the people, being healthier, can now work harder. The problem of the future is to balance the increasing size of the population with the improved productive potential.

A host of medical problems would repay further investigation. Why do Tamils in Ceylon die from respiratory disease ? Why do Moors have such a high maternal mortality rate ? Why do Malays have such a poor general health record ? What is meant by ' Convulsions in children under 5 years ' and why does this vague diagnosis of the cause of death predominate in the south-west of Ceylon ? How far will the ' westernization ' of the pathology of diseases in Ceylon go ?

Can the improvement in the health of the people be maintained ? What would happen, for example, if a future war prevented the importation of supplies of D.D.T. ? Has the reduction in the incidence of malaria created greater problems, by increasing the population pressure, than existed in the past ?

What has happened in Ceylon is also happening or can happen in the other countries of the East. There are hopes of improved health and of increased expectation of life for the swarming millions of Asia, but the difficulties due to population pressure will then be intensified. If these difficulties can be solved, then the ' new world ' of the future may be found in the East.

CEYLON J. MED. SCI. (D) VOL. VII, PT. III and IV. (December, 1950).

APPENDIX A

Some Further Facts about Ceylon and the Ceylonese

The island of Ceylon, situate at the tip of the Indian sub-continent and lying across the trade routes from the Mediterranean to the rich and fabulous East has been prized by many invaders. Greedy conquerors have swept down from the lands to the north, while European traders, supported by the persuasive powers of their military might, have crossed the seas to exploit the natural richness of this small country. From the beginning of Ceylon's known history, her people have suffered these recurrent incursions; armies have arrived to plunder and have stayed to cultivate the fertile plains. Therefore, today, the island is populated with a mixture of alien races, Sinhalese, Tamil, Moor, still distinguishable and, indeed, distinctive in their religions, languages and cultures.

It is recognised that the bulk of Ceylon's people are descended from the earliest invaders, who came down through India and across the narrow Palk Straits. The *Mahavansa*, written in the fifth century A.D., ascribes the founding of the Sinhalese race to the Bengali prince, Vijaya, who is said to have landed with his followers in Ceylon about 543 B.C. The invaders rapidly subjugated the native people, who are called 'Yakkas' in the Chronicle and who are believed by some to be the ancestors of the aboriginal Veddas still to be found in the Eastern part of the island. The invader named the island 'Sinhala' and an orderly civilization was rapidly established. Great irrigation works were constructed so that the seasonal rains could be conserved to feed the fertile plains. Cities were built, communities of towns and villages were organised and a new nation was created to prosper against the background of their imported Aryan cultures.

In the third century B.C., Mahinda the son of Asoka came as a missionary to Ceylon and converted the people to the Buddhist faith. Even today the majority of the people of Ceylon still adhere to the faith or philosophy of Buddha, whose doctrines have been preserved in their early purity.

Throughout the succeeding centuries, there were intermittant invasions by the Dravidian races from South India. Gradually, over a period of fifteen hundred years, the Sinhalese were pushed southwards and westwards and the Tamil invaders occupied the Northern Jaffna Peninsula and the eastern coast of the island. Today, the Ceylon Tamil with his Hindu religion, Dravidian language and culture, predominates in these regions of Ceylon.

The centuries of repeated invasion and war, aided possibly by epidemic diseases such as malaria, sapped the vigour of the Sinhalese nation. The country became divided and warring and intriguing factions dissipated their energies in internal strife.

It was such a devitalised nation that suffered the first major European invasion, when the Portuguese sailors came in 1505. The Western coastal belt was soon

placed under Portuguese control, but for the next 150 years bitter struggles between the European colonists and the Sinhalese chieftans and their followers from the Kandyan hills continued spasmodically. Christianity was introduced into Ceylon and converts were made among the people in the Maritime Provinces. (A Christian church is said to have been first established in the sixth century A.D., but, if true, its influence cannot have been long or extensive).

The Dutch finally came to the aid of the Kandyan Sinhalese and, after a prolonged struggle, the Portuguese power was finally eliminated in 1658. The Dutch occupied the former Portuguese possessions, the Maritime Provinces, and trade treaties were made with their allies of the Kandyan Kingdom. The alliance was an uneasy one and throughout the period of the Dutch occupation, successive Kandyan Kings plotted to overthrow the Dutch colonists. Open warfare commenced in the middle of the eighteenth century with a final victory for the Dutch. A new treaty was signed in 1766 and the Dutch commenced again to consolidate their gains.

Events in Europe now began to play their part in Ceylon's affairs. Holland and Britain were at war and, in 1788, a British fleet appeared off Trincomalee, which was occupied for a brief period. Holland meanwhile became weakened by internal strife, and finally the British invaded the Dutch territories in Ceylon. In 1796 the Maritime Provinces passed into the control of the British and the Dutch period in Ceylon's history was closed.

The British assayed an unsuccessful and costly invasion of the Kandyan Kingdom in 1803. However, intrigue among the Kandyan chieftans was weakening their kingdom and another British excursion in 1815 was more successful. The whole of Ceylon now came under the care of the British Crown. A few, small and abortive insurrections came later but gradually the country settled down as a peaceful unit of the British Empire.

For the first time for several hundred years Ceylon was unified under one power and the investment of British capital created a new and prosperous economy. Coffee and later tea, rubber and coconut plantations were opened and the pattern of present day Ceylon was created. As democratic ideals began to influence the outlook of British statesmen so the form of administration in Ceylon gradually changed, until on February 4th, 1948, Ceylon became an independent nation, a Dominion within the British Commonwealth of Nations.

This long and varied history of the country has produced within Ceylon a variety of cultures and customs. The aboriginal Veddah have been almost eliminated or absorbed by their Sinhalese and Tamil neighbours. The easy going, hospitable, leisure loving Sinhalese with their Aryan language and Buddhist philosophy live side by side with the Dravidian, thrifty and energetic Tamils. The Portuguese have left only their Roman Catholicism as a distinctive mark of their occupation. Descendants of the Dutch, the Burghers, are still an influential group in Ceylon while the Roman-Dutch law is the basis of the common law of the country. The British have established the commercial pattern of the life of Ceylon and instilled the principles of democratic government.

The climate of Ceylon is essentially tropical, without any marked seasonal variation. In the low country the annual mean temperature is about 80° to 83° F; at higher altitudes it falls off at a fairly steady rate of about 1°F for each 300 feet

rise in altitude. The relative humidity varies generally from about 70·1 per cent. during the day to about 90·1 per cent. at night, and it rises as the temperature falls.

The seasons of the year are distinguished chiefly by differences in rainfall rather than by pronounced variations in temperature. The South-West Monsoon period lasts from April to September and this is followed by the North-East Monsoon period from October to March. The annual average rainfall varies from about 40 inches in the north-west and the south-east to over 200 inches in some parts of the interior.

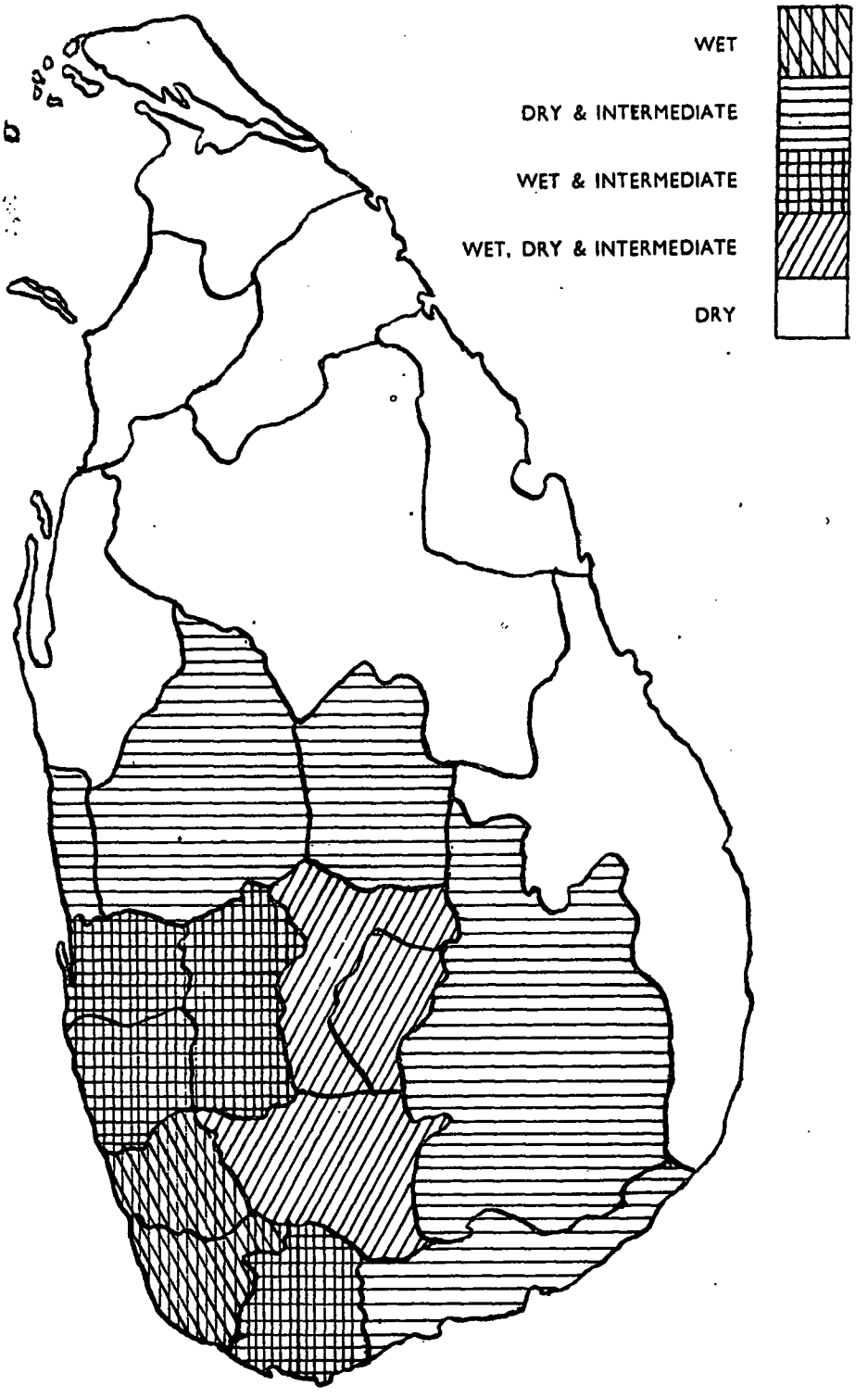
With such a rainfall it is not surprising to find that the island is well watered with numerous rivers, though most of them are too shallow for navigation. Indeed, the rivers of the northern, eastern and south-eastern plains are often reduced to sluggish streams during the prolonged dry seasons. It is only in the western and southern areas that the rivers maintain a considerable volume of water throughout the year.

In the earliest days of the Sinhalese kings successful efforts were made to conserve the rainfall and to irrigate the north-central plains of Ceylon. Artificial reservoirs or tanks fed ingenious irrigation systems, but, during the oft-repeated wars, the Sinhalese retreated and their skilful irrigation works were damaged. Today, they are gradually being repaired and the fertility of the ancient soil is being restored.

Compared with neighbouring Southern India, however, Ceylon is a very fertile land and, following nearly 450 years of European-domination, this fertility has been exploited to supply western markets. Coconuts, grown to supply copra, are cultivated in the humid plains of the west and the south ; tea is grown on estates in the hill-country of Central Ceylon, while rubber plantations flourish at more moderate altitudes between the coconut and the tea zones. The cultivation of paddy to feed the people has been restricted by the desire to supply the more-lucrative agricultural products to western markets and by the danger of malaria, which has prevented restoration of irrigation works and re-population of the central plains.

Ceylon can also be divided according to the average rainfall experienced by different regions during the South-West Monsoon (Map V). Such a division is often used in official health reports in Ceylon, since it is those areas with a relatively small rainfall which have suffered most from the effects of malaria. In these districts, the dried river beds, with their isolated, stagnant pools of water, form good breeding sites for mosquitoes and the latter multiply rapidly during the subsequent rains. It is usual therefore to distinguish dry, intermediate and wet zones in Ceylon, the distinction being based on a rainfall of less than 20 inches during the South-West Monsoon for the dry zone, and greater than 40 inches for the wet zone. On this basis the administrative districts of Ceylon can be classified as follows :—

Entirely Wet	Kalutara, Galle.
Entirely Dry	Jaffna, Mannar, Vavuniya, Batticaloa, Trincomalee, Puttalam, Anuradhapura.
Dry and Intermediate ..	Matale, Hambantota, Kurunegala, Chilaw, Badulla.
Wet and Intermediate ..	Colombo, Negombo, Matara, Kegalle.
Wet, Intermediate and Dry ..	Kandy, Nuwara Eliya, Ratnapura.



Map 5.—Meteorological Zones in Ceylon

APPENDIX B

The Medical Services in Ceylon

No description of the mortality and morbidity trends in Ceylon would be complete without some description of the medical services available to the population of Ceylon.

Originally the Medical Department, which evolved from a Military and Estate Medical Service, was concerned primarily with the care of the sick. Public health work was the responsibility of the District Medical Officer but he had no organization for the pursuit of such duties and he could do little more than organize emergency measures to deal with large scale epidemics. It was not until 1913 that a Sanitary Branch of the Medical Department was established and a staff of medical officers was then recruited to devote their full time to health work. Each health officer was placed in charge of a district (usually one of the nine Provinces of Ceylon) and he supervised the work of his Sanitary Inspectors. Because of the lack of suitably trained personnel such an organization could be established only gradually. A start was made in the Western Province, then the Central Province and finally the service was extended to cover the whole island.

In 1926 important changes occurred in both the organization and the policy of the medical services. The Curative and the Preventive Services were amalgamated under a single Director of Medical and Sanitary Services and an experimental Health Unit was established at Kalutara. The Health Unit is designed to undertake the health work of a community of 40,000 population, i.e. sanitation, control of communicable diseases, individual hygiene, maternity and child welfare and school health work. It carries a trained staff of 4 Public Health Nurses, 4 Sanitary Inspectors and 8 midwives. Because of the success of the Kalutara Health Unit eight similar units were later established in various parts of the island and then, in 1937, financial provision was made for the creation of a further 55 additional Health Units.

At the present moment, the Preventive or Health Services are in the care of 4 Headquarters Medical Officers, 5 Divisional Medical Superintendents of Health and a Field Staff comprising

104 Medical Officers of Health
590 Sanitary Inspectors
41 Public Health Nurses
918 Public Health Midwives
300 Apothecaries in Rural Hospitals and Dispensaries
75 Vaccinators
21 Ankylostomiasis Dispensers.

The Curative or Medical Services are staffed by

6	Headquarters Medical Officers
8	Divisional Medical Superintendents
563	Medical Officers
10	Dental Surgeons
321	Apothecaries
907	Matrons, Sisters and Nurses
350	Midwives
2,226	Male Attendants
1,940	Female Attendants
5,228	Other Minor Employees

There are also specialist personnel of all ranks for the Medical Research Institute in Colombo, the Judicial Medical Officer's Department (Colombo), anti-malarial duties, entomology, filariasis, tuberculosis, venereal diseases, leprosy, radiology and mental health.

The Medical Services provide free out-patient treatment to all people. In-patient treatment is also free to all people with an income of less than Rs. 50/- per mensem ; in-patients with a greater income than this pay a charge varying with their income. There are also paying-wards in some of the hospitals.

In addition there are private nursing homes in some of the larger towns and there are private or non-Government medical practitioners for those who wish to consult them. The Government medical officers are, in some cases, allowed private practice and most of the specialist-practitioners serve in this duel rôle.

In-patient treatment is provided by the Government in three types of institution. There is the Provincial Hospital, of 500 to 700 beds and capable of dealing with all types of diseases ; the District Hospitals are similar units of 50 to 200 beds and equipped for routine medical, surgical and obstetrical cases ; and finally there are the Central Dispensaries to which are attached, in each case, a Maternity Home for normal midwifery and a small hospital for minor medical cases. These latter Dispensaries are situated chiefly in the remoter parts of the island and they are primarily designed for the attention of out-patients. Branch Dispensaries and Visiting Stations are attached to the Central Dispensaries and these institutions provide only out-patient treatment. The more serious cases are transferred from the Dispensaries to the District or Provincial Hospitals and a Government Ambulance Service provides this co-ordination.

Some of these dispensaries and smaller hospitals are situated in estate areas for the benefit of the estate labour population but, in addition, many estates maintain their own hospitals and dispensaries.

In all, the medical institutions in Ceylon in 1948 could be classified as follows :—

Provincial and District Hospitals	..	98	providing 10,610 beds
Cottage and Rural Hospitals	..	119	providing 2,274 beds
Special Institutions	..	29	providing 5,938 beds
Central Dispensaries	..	225	
Branch Dispensaries	..	174	
Visiting Stations	..	502	
Estate Hospitals	..	95	

The general hospital bed strength for each province is detailed in Table 121.

TABLE 121

The General Hospital Bed Strength in Ceylon and its Provinces.

Area	Beds	Population (1948) Thousands	Bed/Population Ratio
All Ceylon	12,884	7,086	1/550
Western Province	2,991	2,001	1/668
Central Province	2,516	1,200	1/477
Southern Province	1,565	1,027	1/656
Northern Province	1,160	510	1/440
Eastern Province	489	292	1/597
North-Western Province	1,626	711	1/438
North-Central Province	337	151	1/448
Sabaragamuwa Province	1,387	798	1/575
Uva	815	396	1/486

It will be seen that not only is the bed strength provided very inadequate in relation to the population but the distribution is very uneven. The worst examples of this are to be found in the heavily-populated Western and Southern Provinces. The case of the Western Province is actually worse than these figures would indicate since Colombo, in this province, is the medical centre for the whole of Ceylon. 'The General Hospital, Colombo, is the best equipped and staffed of all the hospitals, although inadequate even in these respects'. (Dr. Chellapah, 1948). Because of the reputation of the better facilities that this institution offers, people will travel enormous distances to gain admission to it. As an example Dr. Cumpston classified the patients in the non-paying section of this hospital on September 21st, 1949, and he discovered that they came from all the 21 Administrative Districts of the island. There were 2,517 in-patients in the hospital (beds 1,448) on that date and, of these, 884 of them had come from districts outside Colombo. Some of the migration to Colombo may be necessary since certain facilities, e.g. deep ray therapy, are offered only by this hospital but not all these out-station patients can be so justified.

Another reason for overcrowding in all hospitals is the retention of chronic cases in the wards. Dr. Cumpston reported 995 chronic cases out of the total of 2,376 patients in the Colombo General Hospital on October 10th, 1949. As there are no hospitals in Ceylon for the chronically ill and most families cannot afford to maintain these people, they have to be retained in the general wards of the hospitals.

The overcrowding of the hospitals has become the accepted condition in Ceylon and the Minister of Health has officially sanctioned a degree of overcrowding not exceeding 100 per cent. in each of the wards of the Colombo General Hospital. The extra patients are called 'floor-cases'.

A further contributing factor is that many minor cases of illness (and especially minor surgical cases) are automatically admitted to hospitals. This is probably done because of the inadequate facilities in most districts for domiciliary treatment.

A major result of these extra patients is that the hospital staffs cannot give the care and attention that all cases require. This further decreases the adequacy of the hospital service. Since it is chiefly a question of reorganisation and as the medical authorities are aware of this, then it is possible to anticipate a substantial improvement in the efficiency of the hospitals in the future.

The number of qualified medical practitioners is, of course, also inadequate for the population of Ceylon. In 1949 there were 1,076 names on the Ceylon Register, of which about 900 were probably effective practitioners. This is equivalent to about one doctor for every 8,000 of the population. Increased numbers of students (now 120 per year) are being admitted to the Medical Faculty of the University of Ceylon but in view of (*a*) the rapidly increasing population and (*b*) the fact that modern advancements in medicine are demanding more and more medical manpower, and also allowing for annual 'wastage' of medical personnel, it is doubtful whether these present numbers of students will be sufficient for an adequate medical service in Ceylon.

The medical qualification in Ceylon is recognised by the General Medical Council in Great Britain and the standard of education and examination is maintained by having visiting external examiners from the United Kingdom. In addition, medical graduates are sent abroad (chiefly to the United Kingdom and America) for specialist studies at Government expense. In this way the specialised services are being expanded gradually.

Because of the scarcity of qualified medical personnel, a lower grade of practitioner called an 'apothecary' has been introduced. These apothecaries receive two years' training and they are in charge of the dispensaries and visiting stations in many parts of the island. The standards of diagnosis and treatment that they supply vary enormously but, in any case, they cannot be very high or satisfactory. This means, from the point of view of our present analysis, that morbidity and mortality statistics based on the diagnoses of apothecaries must be treated with some suspicion.

Just as the number of medical officers is deficient, so the number of nursing staff is very inadequate. The actual numbers have been quoted previously; efforts to increase these are being made.

The various specialist services provided by the Medical Department have been indicated when discussing organization, but a few words about some of them may be helpful.

Dental Care :—In 1948, there were only 11 Dental Officers in Government Service. There were a few more in private practice but their numbers are obviously inadequate. A Dental School in the University has now been established to meet at least some of the deficiency.

Infectious Diseases :—There is one Infectious Diseases Hospital, situated seven miles from Colombo and containing 192 beds and 108 rooms for contacts. This one hospital deals with both minor and major cases and serves the whole island.

Mental Care :—There is one Mental Hospital, at Angoda, with a patient population of 3,000 and a branch at Pelawatta (60 beds) where patients can engage in agriculture. Various other forms of occupational therapy are provided.

A Neuro-Psychiatric Clinic and a Child Guidance and Young People's Clinic have also been established in Colombo.

Tuberculosis.—Chest Clinics are open in Colombo, Jaffna, Kandy and Galle. There are five Tuberculosis Institutions and seven Central Hospitals also provide beds for tuberculosis patients. In all there are 1,685 beds available for such cases, i.e. only 1 bed for every 4,200 of the population. Fifteen medical officers are solely concerned with tuberculosis work.

Venereal Diseases.—V.D. Clinics are being run in 45 places, but only one is in the charge of a fully trained medical officer.

Maternity and Child Welfare Work:—This is being gradually expanded and, in 1948, there were 41 Public Health Nurses and 918 midwives in this service. The Health Nurses give their care and attention to expectant mothers, infants and pre-school children both at clinics and in the homes of the people. The midwives attend on the mothers in their homes before, during and after delivery. Both the nurses and the midwives are in attendance upon the mothers who are delivered in Maternity Homes. There are 602 Health Centres running clinics in this schemie and 80 Maternity Homes provide 895 beds. (The Hospitals, as already stated, also provide beds for obstetrical care). The births in Ceylon during 1947 and 1948 occurred in the following manner:—

	1947	1948
Total live births	271,177	287,695
Delivered by midwives at home ..	65,967 i.e. 24·4 per cent.	72,408 i.e. 25·2 per cent.
Delivered in Maternity Homes ..	10,710 i.e. 4·0 per cent.	16,277 i.e. 5·7 per cent.
Delivered in Hospitals ..	35,423 i.e. 13·0 per cent.	42,668 i.e. 14·9 per cent.
Mothers attending Ante-natal Clinics ..	109,300	104,696
Infants attending Clinics	199,141	236,894
Pre-School Children attending Clinics	76,200	72,861

School Health Work.—This is, at present, also very inadequate, chiefly because of the lack of personnel. The aim is to give three medical examinations during the school career of the child. In 1948 only about 10 per cent. of the school population was examined. Moreover, there seems to be a lack of liaison between the diagnostic and the curative sides of the organisation as only about 45 per cent. of the medical defects that were reported were eventually corrected.

Diagnostic Aid Services.—The detailed accuracy of diagnosis (and therefore the accuracy of morbidity and mortality statistics) depends to some extent on the auxiliary diagnostic services available to the clinician. It is necessary, therefore, to give some indication of the quality and coverage of these services.

Diagnostic X'Ray Departments are to be found at the General Hospital, Colombo, the two Tuberculosis Clinics in Colombo and at the Civil Hospitals in Kandy, Galle and Jaffna. Only the department at the Colombo General Hospital can be

considered to any degree as modern, but new apparatus is on order and new buildings are planned for all these institutions. Two other civil hospitals and two Tuberculosis Hospitals have only low powered X'Ray apparatus but here, too, modernisation is planned. Further, new X'Ray Departments are planned for another nine institutions in the near future. At the present, however, it is obvious that only a limited number of patients enjoy the facilities of an up-to-date X'Ray diagnostic service. This work is further handicapped by the fact that specialist medical officers for these services are available only in Colombo.

Adequate Pathology Departments are to be found only at the General Hospital, Colombo and in the University of Ceylon, Colombo. Bacteriology and Parasitology is only done at the Medical Research Institute, Colombo. The facilities offered by these departments are, of course, available to all institutions in Ceylon and the larger hospitals do have small laboratories where simple examinations of specimens might be made. However, the absence of adequate and readily-available laboratory diagnostic aids must be a great handicap to clinicians and to their patients.

The Ayurvedic Medical Services.—There are several indigenous systems of medicine still practised in Ceylon today. Since the advent of the Europeans these native systems have gradually lost official favour but, to many Ceylonese, ayurvedic practitioners are still the first choice for advice in times of illness.

There are three principal indigenous systems to be recognised in Ceylon, namely, the Ayurvedic system which was introduced by the followers of Vijaya from Northern India, the methods of Siddha brought by the Tamil invaders from Southern India, and Unani or Arabian medicine which came with the Moorish settlers. Practitioners of these ancient arts are to be found in all parts of the island and, though their actual number is not known, about 5,000 applications for registration with the Board of Indigenous Medicine have been made. This Board was established by the government in 1928 for the purpose of controlling and developing the local systems of medicine in Ceylon. A College of Indigenous Medicine, a hospital, a pharmacy and a dispensary are also now maintained as Government Institutions. Many local authorities and organisations have also established and financed Ayurvedic dispensaries for the treatment of the sick.

It is difficult to assess the value of these systems or to compare them with western medicine. Many of the inhabitants have great faith in them and there seems to have been a considerable increase in the number of patients seeking these forms of treatment. The Indigenous Hospital, for example, has increased the number of out-patients attending per year by over 500 per cent. since 1942.

The Ayurvedic system does not recognise surgical methods of treatment but many practitioners do not hesitate to prescribe and to dispense the latest synthetic drugs from the West. Others have faith only in the ancient remedies, though all are handicapped by the difficulties of obtaining these in sufficiently large quantities and by the lack of an Ayurvedic Pharmacopoea.

Expenditure

The expenditure in the service has increased from Rs. 9,805,528 in 1931-32 to the estimate of 73,321,061 in 1949-50. In 1937-38 the expenditure was Rs. 12,579,164 so that in the twelve years since then the expenditure has increased by 500 per cent. In 1937-38 the cost of the Medical Services represented 10·5 per cent. of the total Government expenditure; in 1949-50, the cost is 9·3 per cent. of the total. Therefore the cost of the Medical Services has not been increased in proportion to other Government expenditure. Moreover, the expenditure for 1949-50 on these services represents only Rs. 10 per head of the population per year.

Ceylon J. Med. Sci. (D) Vol. VII, Pt. III and IV. (December, 1950).

APPENDIX C

Hospital Morbidity in Ceylon

The Registrar-General's Reports deal only with births, marriages and deaths. Each of these events marks the termination of a physiological or pathological process which is said to transmute the organism to a higher plain of existence. To doctors, however, a death is merely the end-point of a particular disease, and it has a finality which bears no questioning. All diseases and all illnesses, it must be remembered do not necessarily end in death so that a study of only the deaths within a population may not give a true picture of the health—or ill-health—of the people. Deaths are the events which remove people from this life, but illnesses are the accidents which prevent persons enjoying full, productive careers during their lives. Different diseases vary markedly in their prognosis. If the diseases, which produce the greatest incidence of illness, are the same as those which produce the greatest incidence of deaths then a study of deaths will suffice to give a record of the health of a community. Where a disease like malaria is endemic throughout a country then mortality may reasonably reflect morbidity without too much distortion. But where the endemicity varies between different regions or if there are no major endemic diseases then mortality and morbidity may not be correlated. Thus, among the estate population in Ceylon, the common cold and influenza cause the greatest loss of working days by the labourers, but neither of these affections is a major cause of death on estates.

The study of morbidity in a community is much more difficult than the study of mortality. Deaths have to be registered by law so that their number can be readily determined. Illnesses carry no such responsibility and their incidence is a matter for speculation. A cause for death has also to be registered so that the certifier faces the necessity of making a diagnosis. The latter may be wrong but the onus of officially committing a professional opinion to paper induces a little extra thought and caution, and at least provokes some degree of wisdom after the event. An illness, on the other hand, may never be diagnosed though the patient, his friends, and his medical advisors are usually stimulated to tentative fancies.

The only morbidity statistics which are usually available and which possess any degree of accuracy in diagnosis are those from hospitals. These hospital figures do not necessarily bear any relationship to the actual incidence of disease or to the total deaths. As a rule, only certain cases are admitted to hospitals. These are usually the ones with the more serious prognosis or those which require skilled or technical treatment. The desires of the patient and the doctor, the availability of hospital beds, the degree of safety involved in moving a sick person and many other factors will influence the question of admission. The hospital statistics will indicate, however, the incidence of the major incapacitating diseases in a community and, remembering their limitations, should repay a little study.

In Ceylon the morbidity picture is further complicated by the hospitals not being evenly distributed throughout the island and by the fact that the more skilled medical facilities have tended to be concentrated in Colombo. Therefore, the hospital morbidity distribution over the country will not necessarily be related to the mortality distribution. This is readily seen from a study of Table 122, where hospital morbidity rates from various group-causes are given for the mortality zones of Ceylon.

These figures have been calculated from data supplied by the D.M. & S.S., Ceylon. Unfortunately only the hospital admissions for the years 1945, 1948, and 1949 could be traced in their archives and information as to the sex, race, and residence of the patient was not available.

Zone A, which includes Colombo, has the highest hospital morbidity rates from all the main groups of causes, except skin diseases, which predominate in Zone C. The distinctive patterns which distinguished the mortalities within the zones are not seen in the morbidity figures. Certainly Zone A has infectious diseases as its major cause of hospitalization, but so have Zones B, C and D. The second major group-cause are the diseases of the digestive system, followed by diseases of the skin and diseases of the respiratory system in that order.

The available data do permit, however, a comparison of morbidity before D.D.T. spraying (1945 figures) and after (1949 figures) and some of the principal causes of morbidity have been studied from this angle. The results again must be treated with some caution. A rise in the hospitalization rate from a particular disease may be due to several factors. There may have been an actual increase in the incidence of the particular disease or in the severity of that disease. A rise in the incidence-rate or the severity would be expected to cause a rise in the specific-mortality rate, unless new and effective therapeutic aids had recently become available. Or more hospital beds may have become available, either as a result of new buildings being erected or because a decrease in the incidence of another major disease has emptied previously occupied beds. The people, on the other hand, may have decided to avail themselves of hospital and medical facilities which they had previously refused. (This may be important where a national free medical service encourages, by propaganda, an ignorant population to seek medical aid for their ailments). Another possibility is that because of changes in life expectation, due to lessened risk of death from a previously major cause of death, the altered age distribution of the people may make them more susceptible to other causes of illness. This would be a special example of an actual rise in the incidence of a disease.

On the contrary a fall in the hospitalization rate from a specific disease may be due to lessened incidence, overcrowding of hospitals by patients with other diseases or a new reluctance on the part of the population to enter hospital.

An increase in hospitalization rate plus a corresponding increase in the general mortality rate from that cause will indicate an increased incidence of a disease and *vice versa*. An increase in hospitalization rate plus an increased death rate from that cause among actual hospital patients will indicate an increased severity of the disease or an increased incidence necessitating the admittance of only the severe cases; the variation in the general death rate will distinguish the two possibilities.

TABLE 122

Mean Hospital Morbidity Rates (1945, 1948, 1949) *from Various Group Causes in Ceylon.*

Zone	Infectious Diseases		DISEASES OF THE													
			Nervous System		Circulatory System		Respiratory System		Digestive System		Genito-Urinary System		Skin		Bones and Joints	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Ceylon	123973	18623	21616	3247	9251	1390	53483	8034	66281	9957	21501	3230	52771	7927	3323	499
A	59301	20993	10217	3617	5444	1927	25244	8936	31132	11021	11952	4231	20688	7324	1645	582
B	26986	15085	3997	2234	1748	977	12867	7193	14321	8005	4432	2477	14563	8141	614	343
C	21135	18683	5268	4657	1399	1237	9543	8435	12065	10665	3364	2974	10120	8946	736	651
D	16551	18537	2134	2390	660	740	5830	6530	8763	9815	1753	1963	7400	8288	328	367

Bearing these possibilities in mind, the hospital morbidity data for the years 1945 and 1949 in Ceylon will be examined.

To begin with there has been an actual increase in the hospitalization in Ceylon since 1945, although some diseases have caused fewer admissions and others more, e.g.

	Thousands of Patients	
Group of Diseases	*Increased Admission*	*Decreased Admission*
Infectious		51
Nervous System ..	9	
Skin		2
Circulatory System ..	4	
Respiratory System ..	28	
Digestive System ..	26	
Genito-Urinary System ..	7	

The fall in the admissions due to infectious diseases is due to a lessened incidence of these diseases since the hospital death rate has also fallen (from 42 per 1,000 patients in 1945 to 31 in 1949) while the hospital deaths still contribute about the same proportion to the fatal deaths in Ceylon from these causes (24·2 per cent. cf. 23·4 per cent.). It is, of course, the reduction in the morbidity from malaria which is responsible for this decrease. Between 1945 and 1949, the number of hospital patients suffering from malaria, in all its many manifestations, decreased by about 68,000 (Table 123). This is more than the total reduction for the whole group of infectious diseases. The hospitalization due to bacillary or amoebic dysentery has likewise decreased in this period and so have the hospital death rates from these causes. On the other hand, admissions due to the enteric fevers have increased but as this was accompanied by a reduction in the death rate among these hospital cases and as, also, the all-Ceylon death rate decreased then there is no evidence for an increased incidence of these diseases. Probably less severe cases were being admitted. The same remarks apply to the admissions due to ankylostomiasis which show an increased admission rate but a decreased death rate.

Tuberculosis, in all its forms, has produced more hospital patients but the hospital death rate has, in general, decreased, the all-Ceylon rate has hardly altered and the hospital deaths now contribute a smaller proportion to the all-Ceylon deaths. This suggests the possibility that tuberculosis is being detected earlier and, or more patients are being persuaded to seek early treatment. The death rates must be increasing among non-hospitalized cases, however.

Affections of the nervous system have caused more people to be admitted to hospital since 1945, but here, too, the death rate among these patients has decreased. The all-Ceylon mortality rate from these causes has also decreased, so that there is no evidence for an increased incidence of these diseases. It is striking what a small proportion of deaths from affections of the nervous system do occur in hospitals. As these diseases are the major causes of death in the south-west of Ceylon (zone B), increased hospitalization may help to improve the general mortality picture in this region.

TABLE 123

Admissions of Patients Suffering from Infective and Parasitic Diseases, Blood Diseases, Skin Diseases and Affections of the Nervous System to Hospitals Situated in—

Diseases	Year	All Ceylon		Zone A		Zone B		Zone C		Zone D		All Ceylon	
		Total	Rate	Total	Rate	Total	Rate	Total	Rate	Total	Rate	Death Rate of Hospital *Cases	Percentage of Hospital Deaths to all deaths from same causes
Enteric Fever	1945	5789	892	2967	1074	1540	878	937	844	345	396	191	74·8
	1949	6255	857	2859	918	2004	1018	970	788	422	430	112	80·6
Tertian Malaria	1945	99239	15283	48330	17495	20061	11435	16860	15191	13988	16047	16	
	1949	34771	4764	14207	4560	8962	4553	6610	5367	4992	5082	8	
Quartan Malaria	1945	92	14·2	72	26·1	20	11·4	0	—	0	—	87	
	1949	925	127	63	20·2	340	173	246	200	276	281	2	1945—25·7
Aestivo Autumnal Malaria	1945	0	—	0	—	0	—	0	—	0	—	0	1949—21·7
	1949	17	2·3	17	5·5	0	—	0	—	0	—	0	
Cerebral Malaria	1945	1128	174	603	218	227	129	157	141	141	162	270	
	1949	438	60·0	241	77·4	121	61·5	49	39·8	27	27·5	400	
Malarial Cachexia	1945	4253	655	1765	639	1043	595	680	613	765	877	62	
	1949	1954	268	596	191	222	113	594	482	542	552	32	
Blackwater Fever	1945	1531	236	1525	552	5	2·9	1	0·9	0	—	16	
	1949	627	85·9	625	201	2	1·1	0	—	0	—	2	

(Rates are given as cases per million of the population).

*Number of deaths per 1,000 cases.

TABLE 123 (*Contd.*)

Admissions of Patients Suffering from Infective and Parasitic Diseases, Blood Diseases, Skin Diseases and Affections of the Nervous System to Hospitals Situated in—

Diseases	Year	All Ceylon		Zone A		Zone B		Zone C		Zone D		All Ceylon	
		Total	Rate	Total	Rate	Total	Rate	Total	Rate	Total	Rate	Death Rate of Hospital *Cases	Percentage of Hospital Deaths to all deaths from same causes
Amoebic Dysentery	1945	5319	819	3172	1148	480	274	706	636	691	1102	87	1945—44·6
	1949	3656	501	2372	761	668	339	616	500	407	414	41	
Bacillary Dysentery	1945	4750	732	2262	819	1262	719	380	342	846	970	84	1949—34·2
	1949	1522	209	550	177	339	172	521	413	112	114	60	
Pulmonary and Laryngeal Tuberculosis	1945	5787	891	3744	1355	949	541	389	350	705	809	257	45·6
	1949	6388	876	3899	1252	1094	556	680	552	715	728	184	30·4
Tuberculosis of Meninges or C.N.S.	1945	103	15·9	46	16·7	32	18·2	2	1·8	23	26·4	252	52.0
	1949	109	14·9	85	27·3	4	2·0	15	12·2	5	5·1	487	58·3
Tuberculosis of Intestines or Peritoneum	1945	95	14·6	82	29·7	8	4·6	2	1·8	3	3·4	231	40·7
	1949	135	18·5	102	32·7	10	5·1	20	16·2	3	3·1	215	58·0
Tuberculosis of Vertebral Column	1945	33	5·1	31	11·2	0		1	0·9	1	1·1	61	20·0
	1949	110	15·1	87	27·9	11	5·6	9	7·3	3	3·1	36	40·0
Tuberculosis of Bones and Joints	1945	32	4·9	18	6·5	11	6·3	0	—	3	3·4	0	0
	1949	114	15·6	61	19·6	15	7·6	34	27·6	4	4·1	18	100·0
Disseminated Tuberculosis	1945	168	25·9	164	59·4	3	1·7	1	0·9	0	—	197	165·0
	1949	202	27·7	58	18·6	16	8·1	108	87·7	0	—	134	135·0

(Rates are given as cases per million of the population).

*Number of deaths per 1,000 cases.

TABLE 123 (*Contd.*)

Admissions of Patients Suffering from Infective and Parasitic Diseases, Blood Diseases, Skin Diseases and Affections of the Nervous System to Hospitals Situated in—

Diseases	Year	All Ceylon		Zone A		Zone B		Zone C		Zone D		All Ceylon	
		Total	Rate	Total	Rate	Total	Rate	Total	Rate	Total	Rate	Death Rate of Hospital *Cases	Percentage of Hospital Deaths to all deaths from same causes
Tuberculosis of Other Organs	1945	205	31·6	169	61·2	25	14·3	5	4·5	6	6·9	20	1·5
	1949	514	70·4	420	135	74	37·6	14	11·4	6	6·1	31	16·5
Ankylostomiasis	1945	10647	1640	4266	1544	2335	1331	2606	2348	1440	1652	45	26·1
	1949	13227	1812	3778	1213	4482	2277	3827	3108	1140	1161	16	24·4
Anaemia	1945	4368	673	2101	761	803	458	942	849	522	599	72	—
	1949	8714	1194	4227	1357	2086	1060	1573	1277	828	843	36	—
Diabetes	1945	489	75·3	217	78·6	112	63·8	105	94·6	55	63·1	74	—
	1949	1176	161	822	264	126	64·0	85	69·0	143	146	52	—
Chronic Rheumatism	1945	4360	671	1461	529	1089	621	1181	1064	629	721	1	1·4
	1949	12880	1765	5274	1693	2660	1351	2672	2170	2274	2315	1	30·0
Total Epidemic Endemic and Infectious Diseases	1945	150287	23144	76827	27811	29840	17009	23900	21534	19720	22619	42	24·2
	1949	109190	14959	48548	15584	27594	14018	21187	17204	11501	11708	31	23·4
Total—Affections of the Nervous System	1945	15946	2456	7191	2603	2882	1643	4422	3984	1451	1664	57	5·5
	1949	25186	3450	12061	3872	4947	2513	5828	4732	2350	2392	38	8·8
Total—Affections of the Skin	1945	52737	8121	18971	6868	13709	7814	10743	9679	9314	10683	15	49·8
	1949	50339	6896	20027	6429	15801	8027	9024	7327	5487	5586	6	50·8

(Rates are given as cases per million of the population).

*Number of deaths per 1,000 cases.

Admissions from affections of the skin have decreased by about 4 per cent. and the hospital death rate from these causes by about 60 per cent. Whether this is evidence of improved care and therapy or a lessened severity cannot be assessed.

Diseases of the Circulatory System have caused about 60 per cent. more hospital admissions in 1949 than in 1945. There is no evidence that this is due to a higher incidence of these diseases (caused, for example, by the ageing of the population). The death rate from all these causes, except angina pectoris, among hospitalized cases has decreased while the all-Ceylon death rate has not varied significantly and the hospital deaths still contribute about the same proportion to the total deaths (Table 124).

Hospitalization from diseases of the Respiratory System has increased by about 90 per cent. since 1945, the proportionate increases due to acute bronchitis and asthma being the greatest and that due to pneumonia (lobar and unclassified) the least (Table 125). The death rates in hospitals from all these diseases have, on the other hand, greatly decreased. The proportion of the total respiratory deaths in Ceylon produced by deaths in hospitals has remained roughly the same for lobar pneumonia, chronic bronchitis, pleurisy and asthma but has decreased for broncho-pneumonia and acute bronchitis. The all-Ceylon death rate from these diseases has decreased but not to the extent that the mortality rate in hospitals has been reduced. The inference is that there has been no increased incidence of respiratory diseases but rather that an increased number of less serious cases are being admitted and, or the treatment has become more effective.

Admissions to hospitals in Ceylon of patients suffering from diseases of the digestive system have likewise increased (in this case by about 52 per cent.) and this is true for all the major diseases of this type. The hospital mortality rate has again decreased from all causes, the reduction in the rate due to gastritis being particularly great. The all-Ceylon death rate from these causes has decreased and the hospital deaths contribute a slightly greater proportion to the total for the island than they did in 1945. Proportionately more deaths from peptic ulcer, appendicitis and hernia occur in hospitals now than previously, but the reverse is true for deaths from gastritis and diarrhoea and enteritis (Table 126).

The number of patients treated in hospital for diseases of the genito-urinary system has increased by about 40 per cent. between 1945 and 1949. This increase is due to the greater number of patients with pyelitis, the number of patients with acute or chronic nephritis having decreased slightly. The mortality among these patients has been more than halved during this period, although hospital deaths still contribute about the same proportion to the total deaths from these causes in the whole island. Since the all-Ceylon death rate has been reduced by about one-third during this period it is possible that more patients with less severe symptoms are being admitted. (It is interesting to note that the death rate from prostatic hypertrophy has increased among hospital patients).

The number of patients in Ceylon hospitals receiving treatment for complications of the puerperium has not altered to any material extent. There have been slight increases in the number with puerperal haemorrhage or peurperal eclampsia and a more marked reduction in those with puerperal septicoemia. The death rate from each cause among these hospital patients has been reduced considerably (Table 128).

TABLE 124

Admissions of Patients suffering from Diseases of the Circulatory System to Hospitals Situated in—

Diseases	Year	All Ceylon		Zone A		Zone B		Zone C		Zone D		All Ceylon	
		Total	Rate	Total	Rate	Total	Rate	Total	Rate	Total	Rate	Death Rate of Hospital *Cases	Hospital Deaths as Percentage of all Deaths from same causes
Pericarditis	1945	361	55·6	149	53·9	35	20·0	156	141	21	24·1	421	—
	1949	291	39·9	80	25·7	14·3	72·6	50	40·6	18	18·3	268	—
Acute Endocarditis or Myocarditis	1945	707	109	399	108	107	61·0	268	241	33	37·9	326	—
	1949	700	95·9	319	102	269	136	101	82·0	19	19·3	230	—
Coronary Thrombosis	1945	61	9·4	52	18·8	9	5·1	0	0	0	0	556	—
	1949	471	64·5	345	111	85	43·2	38	30·9	3	3·1	221	—
Angina Pectoris	1945	100	15·4	73	26·4	5	2·9	6	5·4	16	18·4	80	—
	1949	358	49·0	262	84·1	36	18·3	42	34·1	18	18·3	87	—
Other Diseases of the Heart	1945	1762	271	969	351	237	135	455	410	101	116	326	—
	1949	3471	476	2096	666	784	398	430	349	181	184	212	—
Diseases of the Arteries (aneurism, arteriosclerosis)	1945	180	27·7	101	36·6	23	13·1	27	24·3	29	33·3	128	—
	1949	236	32·3	119	38·2	53	26·9	28	22·7	36	36·6	89	—
All Diseases of the Circulatory System	1945	7278	1121	4040	1462	1242	708	1164	1004	832	954	237	—
	1949	11313	1550	6655	2137	2457	1248	1754	1424	444	452	162	—

(Rates are given as cases per million of the population).

*Number of deaths per 1,000 cases.

TABLE 125

Admissions of Patients Suffering from Diseases of the Respiratory System to Hospitals Situated in—

Diseases	Year	All Ceylon		Zone A		Zone B		Zone C		Zone D		All Ceylon	
		Total	Rate	Total	Rate	Total	Rate	Total	Rate	Total	Rate	Death Rates of Hospital *Cases	Percentage of Hospital Deaths to all deaths from same causes
Pneumonia—Lobar and Unclassified	1945	12898	1986	5870	2125	2332	1329	2691	2425	2005	2302	141	26·2
	1949	15453	2117	8539	2741	3732	372	2979	2419	1321	1345	67	23·2
Broncho-Pneumonia	1945	6037	930	2607	944	1522	869	1529	1378	377	433	145	37·3
Acute Bronchitis	1945	5703	878	1700	615	1348	1053	1501	1352	654	751	23	69·7
	1949	13990	1917	5865	1883	3991	2027	2582	2097	1552	1580	6	45·2
Chronic Bronchitis	1945	3434	529	1443	522	884	504	466	420	641	736	53	40·4
	1949	6711	919	2644	849	1998	1015	1202	976	867	883	16	30·2
Pleurisy	1945	1200	185	670	243	238	136	155	140	137	157	7	69·6
	1949	1837	252	1214	390	238	121	278	226	107	109	3	76·4
Asthma	1945	3517	542	1413	512	994	567	588	530	522	599	18	10·7
	1949	9308	1275	4063	1304	2463	1251	1407	1142	1375	1400	7	9·3
All Diseases of the Respiratory System	1945	35695	5497	15797	5719	8245	4700	7197	6484	4456	5115	93	23·7
	1949	63691	8726	29749	9549	16512	8388	11258	9141	6172	6283	75	23·6

(Rates are given as cases per million of the population).

*Number of deaths per 1,000 cases.

TABLE 126

Admissions of Patients Suffering from Diseases of the Digestive System to Hospitals Situated in—

Diseases	Year	All Ceylon		Zone A		Zone B		Zone C		Zone D		All Ceylon	
		Total	Rate	Total	Rate	Total	Rate	Total	Rate	Total	Rate	Death Rates of Hospital *Cases	Percentage of Hospital Deaths to all deaths from same causes
Gastric Ulcer	1945	163	25·1	104	37·6	14	8·0	31	27·9	14	16·1	62	35·7
	1949	434	59·5	266	85·4	68	34·5	58	47·1	42	42·8	35	48·5
Duodenal Ulcer	1945	126	19·4	96	34·8	8	4·6	13	11·7	9	10·3	71	60·0
	1949	206	28·2	166	53·3	13	6·6	23	18·7	4	4·1	44	75·0
Gastritis	1945	4194	646	1781	645	938	535	1146	1033	329	378	55	45·1
	1949	10435	1430	3958	1271	2219	1127	1924	1562	2334	2376	6	10·8
Diarrhoea and Enteritis	1945	11642	1793	5913	2141	2316	1320	1719	1549	1694	1945	139	22·5
	1949	13507	1850	6126	1966	3626	1842	1916	1556	1839	1872	58	15·7
Cirrhosis of the Liver	1945	520	80·1	290	105	69	39·3	114	103	47	540	350	—
	1949	766	105	406	130	186	94·5	136	110	38	38·7	172	—
Appendicitis	1945	1618	249	1025	371	136	77·5	289	260	168	193	30	54·0
	1949	2488	341	1746	560	230	117	280	227	232	236	15	71·7
Hernia	1945	1299	200	881	319	139	79·2	120	108	159	183	28	25·4
	1949	1531	210	1041	334	237	115	129	105	134	136	25	29·3
All Diseases of the Digestive System	1945	49981	7697	24502	8870	10078	5744	9379	8450	6022	6907	72	39·9
	1949	75708	10372	31605	11108	17275	8776	13843	11241	9985	10165	38	43·3

(Rates are given as cases per million of the population).

*Number of deaths per 1,000 cases.

TABLE 127

Admissions of Patients Suffering from Diseases of the Genito-Urinary System to Hospitals Situated in—

Diseases	Year	All Ceylon		Zone A		Zone B		Zone C		Zone D		All Ceylon	
		Total	Rate	Total	Rate	Total	Rate	Total	Rate	Total	Rate	Death Rates of Hospital *Cases	Percentage of Hospital Deaths to all deaths from same causes
Acute Nephritis	1945	2586	398	1069	387	647	369	678	611	192	220	107	60·6
	1949	2561	351	1066	342	896	455	469	381	130	132	85	56·4
Chronic Nephritis	1945	1753	270	664	240	404	230	507	457	178	204	174	30·6
	1949	1520	208	620	199	615	312	227	184	58	59·0	88	24·7
Pyelitis	1945	2193	338	1397	506	363	207	190	171	243	279	42	—
	1949	4749	651	2891	928	1007	512	586	476	265	270	18	—
Urinary Calculus	1945	1284	198	984	356	198	113	35	31·5	67	76·9	5	58·3
	1949	850	116	518	166	189	96·0	101	82·0	42	42·8	9	160·0
Hypertrophy of the Prostrate	1945	281	43·3	213	77·1	24	13·7	12	10·8	32	36·7	32	30·0
	1949	591	81·0	335	108	122	62·0	94	76·3	40	40·7	56	132·0
Uterine Tumours	1945	149	22·9	132	47·8	10	5·7	5	4·5	2	2·3	47	140·0
	1949	298	40·8	217	69·7	34	17·3	31	25·2	16	16·3	27	200·0
Cysts of the Ovaries	1945	153	23·6	49	17·7	24	13·7	57	51·4	23	26·4	26	—
	1949	248	34·0	197	63·2	19	9·7	22	17·9	10	10·2	12	—
All Diseases of the Genito-Urinary System	1945	17363	2674	9444	3419	3662	2087	2434	2193	1823	2091	51	42·0
	1949	24188	3314	13289	4266	5566	2828	2704	3008	1629	1658	24	39·9

(Rates are given as cases per million of the population).

* Number of deaths per 1,000 cases.

TABLE 128

Admissions of Patients with Affections Associated with the Puerperium to Hospitals Situated in—

Diseases	Year	All Ceylon		Zone A		Zone B		Zone C		Zone D		All Ceylon	
		Total	Rate	Total	Rate	Total	Rate	Total	Rate	Total	Rate	Death Rates of Hospital *Cases	Percentage of Hospital Deaths to all deaths from same causes
Puerperal Haemorrhage	1945	573	88·2	191	69·1	276	249	83	50·2	15	17·2	205	39·1
	1949	682	93·4	530	170	63	51·2	81	41·1	8	8·1	123	23·9
Puerperal Eclampsia	1945	613	94·4	286	104	94	84·7	178	101	55	63·1	300	10·8
	1949	711	97·4	403	129	140	114	115	58·4	53	54·0	156	21·2
Puerperal Septicaemia	1945	1808	278	931	337	331	298	361	206	185	212	206	40·5
	1949	1492	204	776	249	266	216	313	159	137	139	79	29·1
Other Accidents of Parturition	1945	968	149	506	183	132	119	243	139	87	99·9	252	—
	1949	970	133	399	128	170	138	327	166	74	75·3	172	—

(Rates are given as cases per million of the population).

*Number of deaths per 1,000 cases.

TABLE 129

Admissions of Patients with Cancer and other Tumours to Hospitals Situated in—

Diseases	Year	All Ceylon		Zone A		Zone B		Zone C		Zone D		All Ceylon	
		Total	Rate	Total	Rate	Total	Rate	Total	Rate	Total	Rate	Death Rates of Hospital *Cases	Percentage of Hospital Deaths to all deaths from same causes
Cancer of the Buccal Cavity	1945	507	140	759	275	101	91·0	20	11·4	27	31·0	105	35·3
	1949	1489	204	1282	412	53	43·0	102	51·8	52	52·9	74	39·1
Cancer of Stomach and Liver	1945	100	15·4	59	21·4	32	28·8	8	4·6	1	1·1	210	14·7
	1949	247	33·8	204	65·5	28	22·7	11	5·6	4	4·1	174	26·6
Cancer of the Peritoneum, Intestines and Rectum	1945	110	16·9	66	23·9	34	30·6	2	1·1	8	9·2	209	47·0
	1949	204	27·9	166	53·3	15	12·2	18	9·1	5	5·1	211	45·2
Cancer of the Female Genital Organs	1945	573	88·2	510	185	12	10·8	27	15·4	24	27·6	71	38·4
	1949	554	75·9	423	135	56	45·5	60	30·5	16	16·3	146	65·8
Cancer of the Breast	1945	125	19·3	107	38·7	1	0·9	6	3·4	11	12·6	80	20·8
	1949	184	25·2	109	35·0	56	45·5	11	5·6	8	8·1	49	18·0
Cancer of the Skin	1945	740	114	649	235	4	3·6	73	41·6	14	16·1	9	25·0
	1949	242	33·2	214	68·7	6	4·9	16	8·1	5	6·1	74	20·5
Cancer of Organs not Specified	1945	290	44·7	159	57·6	27	24·3	77	43·9	27	31·0	107	18·7
	1949	554	75·9	446	143	29	23·5	39	19·8	40	40·7	107	27·9
Non-Malignant Tumours	1945	802	124	556	201	7	15·3	144	82·1	35	40·2	14	30·6
	1949	1920	263	952	306	713	579	181	91·9	74	75·3	9	26·9

(Rates are given as cases per million of the population).

*Number of deaths per 1,000 cases.

Admissions of patients suffering from cancer or other malignant tumours has increased since 1945 (Table 129). This is true for all sites except the skin, where there has been a reduced incidence. The prognosis of these hospital cases has varied in a different manner for the tumours arising at various sites. Cancer of the buccal cavity, the stomach, liver and of the breast has caused a lower death rate in hospitals in 1949 than in 1945. Cancer of the female genital organs and of the skin has produced greater death rates, while cancer occurring in the peritoneum, the intestines, the rectum and in other unspecified organs has produced similar death rates. As the death rate from cancer in all Ceylon has not varied significantly between 1945 and 1949 and, in general, proportionately more cancer deaths are occurring in hospital, then probably the incidence has not varied significantly but more cases are being diagnosed and persuaded to receive early and effective treatment.

Therefore, except for patients suffering from infectious diseases, more people were being treated in Ceylon's hospitals for nearly all types of medical ailment in 1949 than in 1945. This, despite the reduction in the number of patients with malaria, has meant a greater total number of people have been admitted to these institutions. This has been possible only by allowing a greater degree of overcrowding. In most institutions 100 per cent. overcrowding is allowed by the Health Ministry (i.e all beds full and an equal number of patients accommodated on the

TABLE 130

Deaths from Principal Causes occurring in Ceylon Hospitals (1945-1949).

Diseases	Admissions and Deaths in 1945		1949	
	Admissions	Deaths	Admissions	Deaths
Infectious Diseases	150,287	6,359	109,190	3,415
Tuberculosis	6,433	1,577	7,473	1,306
Malaria	106,283	2,195	39,332	519
Dysentery	10,069	863	5,178	242
Enteric Fever	5,789	1,105	6,255	704
Cancer	2,845	228	3,474	357
Diseases of the Respiratory System	35,695	3,330	63,691	2,383
Pneumonia (all forms)	18,935	2,690	28,454	1,434
Bronchitis	9,137	312	20,701	184
Diseases of the Circulatory System	7,278	1,729	11,313	1,625
Diseases of the Genito-Urinary System	17,363	894	24,188	587
Diseases of the Digestive System	49,981	3,594	75,708	2,914
Diseases of the Nervous System	15,946	918	25,186	956
Diseases of the Skin	52,737	785	50,339	317

floor). In spite of these circumstances, which must be a great handicap to the nursing and medical staff in their efforts to provide adequate treatment, the death rate in hospitals from most causes has been reduced. Part of this reduction may be accounted for by the admission of earlier or less severe cases but the improved prognosis may also be due, to some extent, to better therapy since in many cases the actual numbers of deaths have decreased as well as the rates (Table 130).

If it is assumed that the death rate among hospital cases is the same as that among patients in their homes then estimates of the total incidence of disease states can be made. (Such an assumption has no basis of fact. Thus hospital cases are usually the more severe cases with the worse prognosis. On the other hand, they receive the more skilled attention. In any case, the assumption may, indicate the order of magnitude of illness in Ceylon but no more). The calculated incidence for the major groups of causes are given in Table 131.

TABLE 131

Calculated Incidence of Major Diseases in Ceylon (1945-1949).

Diseases	Incidence Years 1945		1949	
	Total	Rates	Total	Rates
Infectious Diseases	626,000	96,366	470,800	64,520
Tuberculosis	15,000	2,309	23,600	3,234
Malaria	406,600	62,592	184,800	25,326
Dysentery	22,500	3,464	15,000	2,056
Enteric Fever	7,740	1,191	7,790	1,068
Cancer	10,600	1,632	10,280	1,409
Diseases of the Respiratory System	151,200	23,276	273,000	37,413
Pneumonia	65,000	10,006	145,000	19,871
Bronchitis	42,600	6,558	114,000	15,623
Diseases of the Circulatory System	16,900	2,602	25,000	3,426
Diseases of the Genito-Urinary System	41,700	6,419	61,300	8,401
Diseases of the Digestive System	125,100	19,258	176,600	24,202
Diseases of the Nervous System	288,000	44,335	287,000	39,331
Diseases of the Skin	105,200	16,194	104,000	14,252

(Rates are given as cases per million of the population).

These figures would appear to indicate that the incidence of diseases of the respiratory, circulatory, digestive and genito-urinary systems has increased since 1945. Probably less serious cases are reaching hospital, however. The probable inaccuracy of the figures is indicated by small malaria morbidity rate calculated for 1945 (cf. Part III).