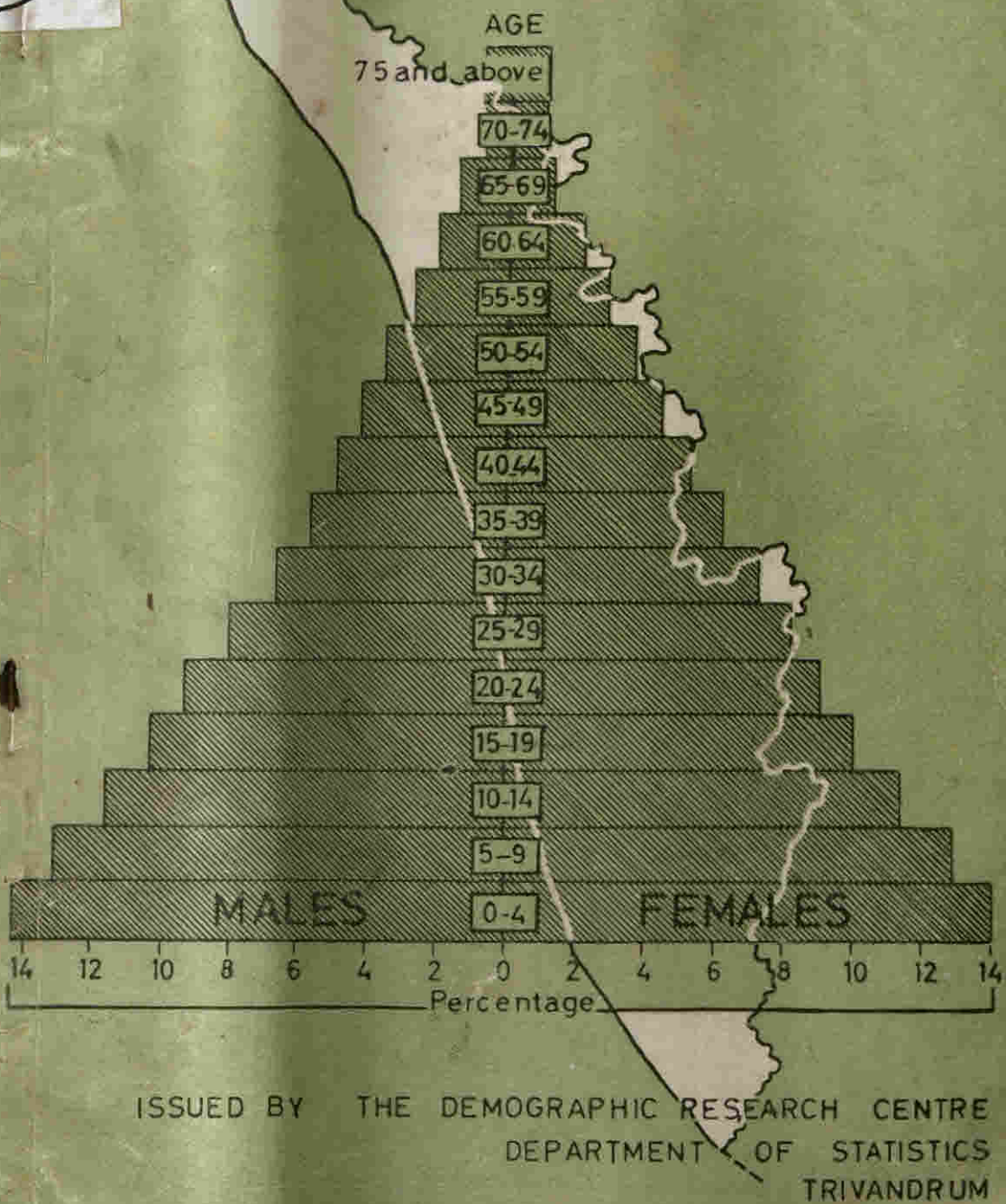
GOVERNMENT OF KERALA

STUDIES IN DEMOGRAPHY

VOL. I



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(Vol I)

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A note on vital events in the Residuary Travancore-Cochin part of Kerala State.

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STUDIES IN DEMOGRAPHY

VOL. I

PAPER No. 1

A note on vital events in the Residuary Travancore-Cochin
part of Kerala State.

1. A NOTE ON VITAL EVENTS IN THE TRAVANCORE COCHIN PART OF KERALA IN 1956

1. INTRODUCTION

This note presents the results of a Survey on births and deaths conducted by the Department of Statistics in the residuary Travancore-Cochin areas of Kerala State in 1957. The period of reference was the year 1956. The Survey was conducted in the rural and urban areas of the region with differing sampling designs. In the rural areas all the households located in the plots selected for land utilisation survey during the period were visited by the Investigators of this Department and the number of births and deaths enumerated. Auxiliary information on the demographic particulars of household members was also collected. A five percent systematic sample of clusters of 10 plots was selected in each village.

In the urban areas also a systematic cluster sampling method was adopted. A cluster consisted of 5 consecutive households. The sampling fraction varied according to population; in the Cities with population over 1 lakh, 1% of households were selected; in towns with population over 50000 but below 1 lakh, 2·5% of households were selected and in towns with population less than 5000, 5% of the households were selected.

As the Survey was conducted along with Land Utilisation Survey no separate cost was involved. The data were analysed by the Demographic Research Centre attached to the Department of Statistics. Besides working out the net increase in population, the population of Kerala was projected to 1961 by fitting a logistic curve to the populations for the years 1901, 1911, 1921, 1931, 1941, 1951 and 1961. For 1961 the population of Kerala was obtained by estimating with the net increase obtained through the survey. The projected populations are given for each five-year period.

2. ANALYSIS

The information obtained through the Survey on births and deaths was compiled stratum-wise, the strata being the Districts (rural) and the individual municipal towns. The crude birth and death rates were calculated as ratio-estimates, the population in the sample for each stratum being considered as the auxiliary variable. The standard error of the rates was worked out using the formula $V(R) = \frac{N-n}{nN} R^2 (Cyy + Cxx - 2 Cyx)$ where R is the estimate of the ratio R, Cyy, Cxx are the squares of the coefficients of variation of Y and X respectively, and Cyx is the relative covariance. Here N represents the total population size and 'n' the sample size; 'y' is the observed variable (birth or death) and 'x' is the auxiliary variable (population). As the selection was made in clusters (a household is a cluster of persons) N and 'n' represent the number of households.

Besides calculating crude birth and death rates and their respective standard errors, the average household size in each stratum and the sex ratios were also calculated. The sex ratio is equal to the number of women per 1000 men. A classification of persons according to religion was also made for each stratum.

Simple tests of significance on the rates were performed to find out rural – urban differentials and inter-district variations. A combined test on the effect of urbanisation and effect of Districts was made by analysing the variance. While the test in the former case was performed on the lines of testing difference between constants calculated from a variable following normal distribution, the latter was done by the F-test or variance ratio test.

The net increase obtained from the analysis is assumed to be the net increase for Kerala State. Using this increase the population in 1961 was estimated by compound interest formula. With the aid of the Census Populations for 1901 to 1951 and the present estimated population for 1961 a curve of the form $P_t = Ae^{Bt}$ was fitted. Here Pt denotes the population at time 't', and 'A'

and 'B' are the constants to be estimated. The constants were estimated by the method of least squares.

Here it may be remarked that the growth of population is measured in three ways ; (i) as an observed change in the total number of persons, (ii) as a current process of replacement, or (iii) as a change in the size of some sections of the population such as age-groups or l velihood classes. The first of these, which is admirably simple and straightforward is a comparison of two successive figures of total population. The only criterion which this approach should conform to is that the figures must be comparable in scope, completeness and geographical area. In the present analysis they satisfy this criterion being census populations. The amount of growth is represented by the difference between the populations : (P_2-P_1). The ratio P_2/P_1 measures the relative size and $\left(\frac{P_2}{P}-1\right)100$ is the percentage growth. As the time interval between censuses is constant (10 years) the growth of population for different periods can be compared.

The second approach is concerned with the process of replacement in the population, observed from the registration of vital events. Natural increase, the change due to the net effect of fertility and mortality, is measured directly from the records. Even considering the population of Kerala as 'closed' (without any migration) the natural increase in Kerala could not be found as the registration is far from complete. The under-registration is not found out systematically through sample surveys as the latter are not conducted regularly. Thus this approach cannot be adopted for Kerala.

The change in particular categories which grow unevenly with the population alters the structure of the population. This approach the third one in the series, can therefore be adopted if changes in the categories are known. But at present the data in hand are too scanty to recommend the procedure.

Thus the first approach though crude is adopted here. As already detailed the logistic curve is fitted to the data obtained from census and the estimated population for 1961. The population for 20 years hence (from 1961) has been worked out from this curve.

3. RESULTS

Table I presents the birth and death-rates in the strata together with their standard errors, the average size of household and sex-ratio. Columns 1 and 2 give respectively the name of the stratum and the estimated population in the stratum. Figures for the State, rural strata and urban strata are not given here separately as the whole State was not covered by the survey. Columns 3 to 10 give the figures of number of households, population (male and female) and number of births (still, live) and deaths (below 1 year and 1 year and above) obtained from the Survey.

3. 1. *Average household size:* The size of the households varies from 5.5 to 7.0. The lowest value is in Chittur–Thathamangalam and the highest in Kottayam town. Most of the other strata have the average size as 6 (correct to the nearest integer). This is in agreement with the household size obtained during 1951 census (5.98 in 1951). There is not much difference between rural and urban households in this aspect.

3. 2. *Sex Ratio:* Per 1000 males the number of females is lowest in Neyyattinkara (962) and highest in Parur (1192). During the 1951 Census there were 1008 females for 1000 males in Travancore–Cochin. From the survey the sex-ratio is found to be 1022. Kottayam District had 977 females and Trichur 1045 in 1951. According to the present survey the sex ratio for Kottayam District rural is 975 while for Trichur District rural the sex-ratio is 1090. It is evident that though there is a small change in favour of females, the results are comparable.

For persons below 15 years of age the sex–ratios are equal (978) for State and rural and urban regions. Regarding persons of age equal to or greater than 15, the ratios are 1056, 1055 and 1064 respectively. This may be because of a low sex-ratio at birth and proportionately high male mortality.

3. 3. *Marital Status*: In the State 379 femaels out of 1000 are married; in rural areas the number is 830 and in urban 371. According to 1951 census, in Travancore-Cochin 39 percent of females were married. It is apparent therefore that the percentage of married per-

TABLE I

BIRTH & DEATH RATES, THEIR STANDARD ERRORS, AVERAGE SIZE OF HOUSEHOLD AND SEX RATIOS

NAME OF STRATUM	SAMPLE								
	Estimated population 1957	Number of house holds	Population	Males	Females	BIRTHS Still	BIRTHS live	DEATHS Below 1 yr.	DEATHS 1 yr. & above
(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	
STATE TOTAL ...	...	...	...	...	...	...	...	...	...
RURAL TOTAL ...	...	...	...	...	...	...	...	...	...
Trivandrum District ...	1233421	5610	32846	16170	16676	16	1188	38	212
Quilon District ...	1582246	4647	26282	13003	13279	13	717	18	170
Alleppey District ...	1474010	4208	25208	12467	12741	5	692	42	164
Kottayam District ...	1162771	3415	21423	10846	10577	4	658	31	125
Ernakulam District ...	1504352	4955	31443	15699	15744	20	787	49	242
Trichur District ...	1084762	4593	27527	13171	14356	15	895	67	203
URBAN TOTAL ...	...	...	...	...	...	...	...	...	...
Neyyattinkara Municipality ...	18265	147	883	450	433	...	31	3	5
Trivandrum Corporation ...	208493	819	5080	2537	2543	1	150	11	19
Attingal Municipality ...	20821	152	980	479	501	...	32	3	3
Quilon Municipality ...	73754	395	2397	1188	1209	...	70	4	15
Kayamkulam Municipality ...	14697	255	1619	810	809	...	61	...	18
Alleppey Municipality ...	129691	180	1058	504	554	...	27	1	20
Shertallai Municipality ...	28237	240	1333	652	681	...	41	2	12
Changanacherry Municipality ...	40475	334	2225	1099	1126	...	59	1	18
Kottayam ...	49303	170	1187	578	609	1	30	1	7
Vaikom ...	17451	85	522	254	268	1	14	1	2
Alwaye ...	18240	249	1630	816	814	...	39	...	13
Parur ...	12167	155	1071	493	578	...	39	1	6
Irinjalakkuda ...	22088	178	1219	582	637	...	32	2	4
Chittur-Thathamangalam ...	26485	224	1236	578	658	...	35	2	12

TABLE I (*Contd.*)

BIRTH & DEATH RATES, THEIR STANDARD ERRORS, AVERAGE SIZE OF HOUSEHOLD AND SEX RATIOS

NAME OF STRATUM	Birth rate	S. E.	Death rate	S. E.	Average household size	Sex Ratio
	(9)	(10)	(11)	(12)	(13)	(14)
STATE TOTAL	28·21	...	8·91	...	...	1022
RURAL TOTAL ...	28·19	...	8·85	...	...	1021
Trivandrum District ...	36·17	0.9115	7·61	0·5084	5·9	1031
Quilon District ...	27·28	0·9250	7·15	0·5341	5·7	1021
Alleppey District	27·45	0·9915	8.17	0·1795	6·0	1022
Kottayam District ...	30·90	1·0790	7·28	0·1797	6·3	1975
Ernakulam District ...	24·52	0·8204	9·25	0·5337	6·3	1003
Trichur District	32·51	1·0420	9·77	0·2009	6·0	1090
URBAN TOTAL ...	28·46	...	9.64	...	...	1028
Neyyattinkara Municipality	35·11	5·3365	9·06	3·5561	6·0	1962
Trivandrum Corporation ...	29·53	2·3300	5·91	1·1262	6·2	1002
Attingal Municipality ...	32.65	4·9856	6·12	2·3492	6·4	1046
Quilon Municipality	29·20	3·0793	7·93	1·9029	6·1	1018
Kayamkulam Municipality	37·68	3·9493	11·12	3·2284	6·3	999
Alleppey Municipality ...	25·52	4·4386	19·85	4·3186	5·9	1099
Shertallai Municipality ...	30·76	4·1600	10·50	3·3480	5·6	1044
Changanacherry Municipality ...	26.52	3.0718	8·54	1·9265	6 7	1025
Kottayam	25·27	4·1694	6·74	2·2833	7·0	1054
Vaikom ...	26·77	6·0240	5·74	3·2412	6·2	1055
Alwaye	23·93	3·7270	7·98	2·0909	6·5	998
Parur ...	36·41	5·2965	6·54	2·9345	6·9	1172
Irinjalakkuda ...	26·25	4·1622	4·92	1·9493	6·8	1095
Chittur-Thathamangalam ...	28·32	4·5818	11·33	2·3853	5·5	1138

sons has decreased. This may be due to the fact that while the age-structure of the population remains almost the same, the age at marriage of females has been on the increase. The percentages of females of age less than 15 are 41·22, 41·41 and 40·11 for the State, rural areas and urban areas respectively. The corresponding percentages for males work out to 43·10, 43·26 and 42·17 respectively for the three areas. During 1951 for males and females together the percentage was 39·3 while from the survey it is 42·15 in the State, 42·32 in rural areas and 41·13 in urban areas. This shows that the percentage of children is increasing. In a way, it proves that infant mortality is on the decline.

3·4. *Birth Rate*: The birth rate for the State (for regions covered by the survey) is obtained as 28·21. This is a weighted rate, the weights being the population in the strata. This was done as the sampling fractions varied from stratum to stratum. The rate is greatest in Kayamkulam Municipal town (37·68), Parur Municipal town (36·41) and in Trivandrum District (rural) 36·17 while it is low in Alwaye (23·93) and in Ernakulam District (24·52). The State rate, the rural rate and urban rate are almost equal. It may be seen from column 12 that the standard error varies from ·8 to 6. For low values of the birth rate the error is high except in a very few cases. Though the rates in most cases are low, they may be taken as more or less reliable from the stand point of sampling as the standard errors are not abnormal. For example the rate in Alwaye may be conceived as lying between limits 23·93 + 7·4540 with 95 percent confidence ie. the rate can take a value upto 31·3840. Similar confidence interval statements can be made for the other strata as well.

3·5 *Death rate.* The death rate varies from 4·9 (Irinjalakkuda) to 19·85 (Alleppey). The State rate is obtained as 8·91. The standard errors vary from ·18 to 4·3. Though some of the rates in this table are unreliable the State rate may be considered as more or less accurate from the point of view of standard error. Here also 95% confidence interval statements can be made as R $\pm$ 2 S. E. of R, when R is the rate in question.

3·6. *Statistical Tests:* Though between individual strata there is significant difference as revealed by tests

of significance, an attempt at analysing the variance between Districts and between rural and urban areas showed that the variance ratios are not significant for birth rate and death rate. It therefore seems that there is no significant rural urban differential in fertility and mortality.

3. 7. *Limitations.* Though the Survey was intended to throw light on the amount of under-registration of vital events, the results do not conform to that aim. While the net increase can be taken to measure approximately the rate of growth for the State as a whole the individual values of birth and death rates cannot be considered as the true ones. This is mainly due to the lack of response from the people. Only with the closest co-operation from the informants can such surveys succeed. The information sought in the survey is an item on which most people are not inclined to give correct information even in a State like Kerala which leads other States in literacy. The figures given in Table I may therefore be used with caution

4. POPULATION PROJECTION

As detailed in Section 2 the population of Kerala for 5 quinquennial periods beginning with 1961 have been projected. The details are presented in Table II along with the per capita land in cents and the total cereal requirement in tons. The cereal requirement is calculated at the rate of 12 oz., 14 oz. and 1 oz., per adult per day. For calculation of the adult equivalent it is assumed the 81 of the total population will be adults.

TABLE II

	YEARS				
	1961	1966	1971	1976	1981
Population (Lakhs)	161·80	168·86	182·85	197·39	224·38
Per capita land (Cent)	59	57	52	48	45
Cereals requirement (Lakh tons) @* 12 oz. per adult	16·02	16·72	18·04	19·60	21·22
,, 14 oz.	18·68	19·50	21·12	22·86	24·76
,, 16 oz.	21·36	22·29	24·13	26·13	28·29

* at the rate of

Table II reveals that the population in 1981 will be a little over 1½ times that in 1951. The net increase in population from 1956 to 1961 was assumed as 19·3 per 1000. This rate is less than the mean decennial growth rate according to 1951 census which is 21·22 per cent. The percapita land in 1981 will be only 45 cents. The total requirements of cereals in 1981 will be about 21·22 lakhs tons even at the rate of 12 oz. per day per adult. The estimate of production of rice during 1956-57 is only 8·73 lakhs tons.

5. CONCLUSION

From the foregoing paragraphs it is clear that in 1959, 1211 children will be born per day which comes to nearly 50 per hour. Thus one extra mouth opens in a little more than a minute (in 72 seconds). 382 persons die in a day which works out to nearly 16 per hour. In each month, therefore, the equivalent of a new town of 25,000 inhabitants springs up. This presumably is not a happy state of affairs. Only less than 60 per cent of the requirements of food (at the rate of 12 oz. per day per adult) is at present available. Thus along with stepping up production of food, efforts should be made to curb reproduction. This points to the need of increased attention to Family Planning Methods.

STUDIES IN DEMOGRAPHY

VOL. I

PAPER No. 2

Trend in Registered Births and deaths in the Travancore-Cochin part of Kerala State

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2. TREND IN REGISTERED BIRTHS & DEATHS

1. *Introduction.* This note presents the results of an analysis of births and deaths registered in the residuary Travancore-Cochin State. Data in regard to Kerala for a sufficiently large number of years are lacking. Hence the data for the residuary Travancore-Cochin State are analysed here. The State is considered as closed against migration. Though this is not wholly true, for all practical purposes it is not wrong to make this assumption.

It is a fact that the registration of births and deaths in the State is far from complete. The ignorance of the people regarding this piece of legislation and their inability to report during the prescribed period combine to make it a difficult task for the authorities to get at a true picture of the vital events that occur in the country. The fate of the Demographer is all the more pitiable; with this incomplete information he is to build up the structure of the population. In an era of planned development the importance of correct information on the population and its growth hardly needs emphasis. It is all the more important for Kerala. Development of a Statistical sense and registration consciousness in the people at large is of supreme importance.

A search of the available information has yielded crude birth and death rates as obtained from registration. A research has been made to throw light on the salient features of the vital events taking place around us. With incomplete information, valid conclusions on general trend are possible if the incompleteness in reporting is uniform. But on comparing the data obtained from registration with that from sample surveys it is seen that in rural areas there is uniformity in under-reporting. In the urban areas, however, the proportion of under-reporting should decrease with the increase in urbanisation. As the most urbanised region forms only a very small part of the State, the combined data may be made use of to draw valid conclusions regarding the trend of the events in urban areas also. As the improvement in

literacy and living standard have been more or less of identical pattern in the residuary Travancore-Cochin State through the years, the incomplete data may well serve our purpose.

2. *Source of data.* The Department of Health Services is the agency for collection of data in the rural areas and the Municipalities and Corporation in the urban areas. The Health Inspectors and Municipal and Corporation Commissioners send the data to the Office of the Director of Statistics for compilation and reporting. Together with registration of the events, separate birth and death cards are also filled-in and sent to the Department of Statistics. These cards contain information on the nature of birth (still or alive) sex, age of the mother at the birth of the child, age at marriage and order of birth in regard to birth and age, sex, occupation of the deceased and cause of death in regard to death. Besides, the religion of the mother of the child and the deceased person is also entered in the cards. The births and deaths occurring in a particular month are reported normally after 2 or 3 months. To add to this difficulty, the incomplete information regarding births and deaths is entered in the cards without any consideration of the use to which this will be put. Most of the cards will not contain all the required entries and in some, the entries do not conform to instructions. In the present context, however, this limitation cannot affect the results of the analysis as we are concerned with the number of births and deaths registered and reported.

Month-wise figures on registered births and deaths from 1953 to 1957 are considered for study. The period of 5 years for which alone data are available is in fact too short a period for drawing firm conclusions. The conclusions drawn herein, though logical and valid mostly may have however to be viewed in the context of these limitations.

3. *Analysis:* The number of births (deaths) for different months may be considered as a series over time. Hence, the techniques developed in the analysis of time

series may be employed to analyse the data of registration.

Time series (Y) usually consists of four components, viz. (1) long term trend, T (2) oscillation or cycle, C, (3) seasonal fluctuation, S and (4) random irregular fluctuation, I. The series may be represented as the product of the four different factors.

$$Y = TCSI$$

Our problem is the separation of the different components. In a monthly series like the present one, the usual procedure is to compute 12 month moving averages. The 12 month moving average is a rough estimate of $T \times C$ since periods of both seasonal and random movements will be smaller than 12 months. Therefore on dividing the original series by the 12 months moving averages, we have an estimate of the seasonal and irregular movements combined.

$$\frac{T \times C \times S \times I}{T \times C} = S \times I$$

Expressing the quotient of actual values by moving average as percentage and taking a suitable measure of central tendency for the different months, we get crude seasonal indices. These averages are then adjusted so that their total for 12 months is 1200. Dividing the value for a month by this adjusted index for the month, gives deseasonalised data.

The trend can be fitted by moving averages or a mathematical equation.

4. *Results*: In the following pages the results of the analysis are presented.

4. (1) *Seasonal Index*. One of the most important aspects to be considered is whether seasons have any effect on the fertility or mortality of human beings or in their actual registration. Table I gives the adjusted seasonal Indices for the 12 months.

TABLE I

Adjusted seasonal Indices of live-births and deaths registered in Residuary Travancore-Cochin during the years 1951, '52, 1957

Months	Live Births			Deaths		
	State	Rural	Urban	State	Rural	Urban
January	101·37	100·00	103·79	96·00	95·17	107·79
February	94·88	97·50	90·79	81·00	81·17	82·29
March	105·37	108·00	95·29	87·00	85·16	91·29
April	95·88	90·50	105·29	80·50	80·17	79·79
May	100·87	101·50	109·79	95·50	93·17	100·79
June	109·38	109·00	109·80	109·50	112·16	100·79
July	103·87	105·00	106·29	129·00	129·67	126·29
August	88·38	91·00	82·29	116·00	117·17	108·29
September	96·87	94·50	106·79	110·00	111·16	109·79
October	95·88	97·50	90·29	97·50	98·17	96·79
November	99·87	97·50	105·29	98·00	95·67	103.30
December	104·38	108·50	94·30	100·00	101·16	92·80

On looking closely at the seasonal indices for live-births for the State, rural and urban, we discern certain features. During the quarter May, June and July the seasonal indices show values above 100, the peak month being June. This seems to indicate that for all the years there is either a large number of births or a larger number of registrations during this season. But the increase in the number of registrations may be ruled out because heavy rains begin by the middle of May in almost the whole of our State and the down-pour continues throughout June and July. So it is highly improbable that the people would be more eager for getting births and deaths registered during the season, especially with their low level of registration-consciousness. The only other alternative seems to be greater natality during the season. Even admitting one or two months lag between actual birth and registration, the inference that there is a 'seasonal effect' on natality seems to be strong. The question now to be answered is whether there is any reason for this seasonal effect.

Harvest in the State begin by the last week of June. August–September season is considered to be very

prosperous for the people of Kerala when they celeberate Onam. It is a time of happiness and enjoyment. We may correlate the high natality during May–July season with the festivities of the Onam.

Turning to the indices of deaths for the 12 months, it is found that during the July–September period there is greater mortality compared to the other months of the year. The data reveal the effect of seasons on deaths also. Taking into consideration nearly two months lag, in reporting, the greater mortality during June–September may be explained by the extreme heat in April–May and excessive rains during June–July which give rise to a season of diseases. The period coincides with Karkadagom, the last month of the Malabar year.

4. 2– *Rural–urban differentials:* Table II gives the birth rates for the State, rural areas and urban areas separately for the years 1951 to 1957. It is a usually accepted theory in demography that urban population have a lower birth-rate compared to their rural counterpart. Various explanations like industrialisation, more wealth, better knowledge of family planning methods and migration of urban mothers to rural homes to await the arrival of the baby are offered to justify this. But Table II reveals that in the urban areas the birth-rate is more than in rural areas in the State. This is mainly due to the fact that a large number of exceptant women from sub-urban rural areas move to hospitals in the urban areas and register the briths in the Municipal Registration Offices. This in effect increases the birth rate in urban areas compared to rural areas. The lower level of registration in rural areas also contributes to the rural–urban differential.

TABLE II

Year	Birth rates (per 1000)		
	State	Rural	Urban
1951	23·68	22·52	33·25
1952	23·72	22·17	36·61
1953	22·39	21·01	33·71
1954	19·25	17·90	29·97
1955	22·39	20·90	34·24
1956	20·78	19·42	31·72
1957	23·84	22·73	34·29

4. 3- *The Trend:* The trend in birth and death rates requires careful study and can be very useful in population projection. The variable birth (or death) rate may be expressed as a function of time, say in the form,

$$Y = a + bt$$

The constants can be determined by the method of least squares. The closeness of fit should be tested before any reliable projection is attempted with the help of this equation. If Yt is the theoretical value of the variable and Y, the given value then

$$\Sigma \frac{(Y-Yt)^2}{Yt}$$ is distributed as a X^2 (chi square) in large Samples

If this X^2 obtained is not significantly different from the theoretical X^2 tabled, the fit is said to be close. (X^2 test is usually adopted for testing frequencies and not individual values, where it is values for testing individual values also the absence of exact test.)

The limitations of trend fitting for our series of only seven values is again emphasised here. Table III gives the birth rates for the years 1951-1957.

TABLE III

Year	Birth rate y	Theoretical Birth rate Yt	$\frac{(Y-Yt)^2}{Yt}$
1951	23·68	22·87	0·029
1952	23·72	22·68	0·048
1953	22·39	22·49	0·000
1954	19·25	22·29	0·415
1955	22·39	22·10	0·038
1956	20·78	21·91	0·058
1957	23·84	21·71	0·297
			0·797

The least squares fit for the birth rates is:

Yt=22·293—0·193t. On the whole birth rates show a declining trend over the seven years. The X^2 calculated is 0·797 with 6 degrees of freedom, comparing this

value with tabled X^2 it is seen that the straight line is a good fit.

The urban and rural birth rates too show a tendency for decline, a higher rate of decline being that of urban.

The least squares fit for urban rates is

$Yut = 33{\cdot}403 - 0{\cdot}218t$

For the rural birth rates, the line of fit is

$Yrt = 20{\cdot}950 - 0{\cdot}178t.$

The table of death rates during the years 1951-1957 is given below:—

TABLE IV

Year	Death rates		
	State	Urban	Rural
1951	6·70	8·41	6·37
1952	6·12	9·45	5·72
1953	6·52	9·90	6·11
1954	5·83	8·88	5·44
1955	6·29	9·05	5·94
1956	5·79	7·90	5·53
1957	9·57	12·57	9·25

For the State death rates, the equation of close fit tested by X^2 is,

$Y = 6{\cdot}689 + 0{\cdot}276\ t$ which shows that there is a rising trend.

For urban death rates, the line fit, is

$Y = 9{\cdot}451 + 0{\cdot}269\ t$ and for rural rates,

$Y = 6{\cdot}337 + 0{\cdot}289\ t.$

The line for rural rates is steeper, thus showing a greater rate of increase in death rate in rural areas compared to urban areas. This increasing death rate with all the expansion of medical facilities and improvement of sanitation and public health seems an anomaly. One explanation would be that registration from year to year is not uniform. Again it would be too rash to draw any conclusion-least of all any projection of later years-based on so short a series.

5. *Conclusion:* Based on statistics of 7 years of brith and death registration, an average growth rate for the population would be 15. 61 per 1000 for the State (residuary Travancore-Cochin State). Certainly this has to be corrected for under-registration and also for net migration.

To sum up, the trend in brith rates is found to be decreasing which shows that the number of briths is decreasing through the years. Though no definite causes for this decreasing trend can be specified, the family planning activities may have some bearing on this in the later years. While improvement in prevention and curing of diseases, envioronmental sanitation and the like is going on so as to lessen the toll of death, the rates are found to have an increasing trend. This is due either to the increase in registration or due to the insufficiency of health programmes for the common man.

The months of May and June stand conspicuous for briths while July and August are the months of maximum mortality. The former phenomenon can be ascribed to the tendency of people to enjoy during Onam festival days which form a speciality for Kerala. The latter on the other hand is a natural phenomenon occurring due to climatic changes.

STUDIES IN DEMOGRAPHY

VOL. I

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On the incidence of small-pox in the Travancore-Cochin part of Kerala State.

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3. ON THE INCIDENCE OF SMALL-POX IN THE TRAVANCORE-COCHIN PART OF KERALA STATE

1. *Introduction.* This note presents the results of an analysis of attacks and deaths due to small pox in the Travancore-Cochin part of Kerala State. Monthly data from 1951 January to 1959 December are made use of for the present study. A like series could not be built up for the reorganised State of Kerala. Thus the study is confined to the Travancore-Cochin part only. The data have been collected by the health staff in the State. It is well known that there is under-reporting of number of births, deaths and attacks of diseases. Consequently the data which have been analysed and presented here cannot be claimed to reveal the true picture regarding the incidence of small-pox. However salient features of the data can be detected by a time series analysis if the under-reporting is uniformly found during the period for which the data are available.

2. *Source of data.* In the rural areas the staff of the Department of Health Services is responsible for furnishing the data while in the urban areas the Municipal Commissioners supply the same. Attacks of small pox in any area should be reported to the health staff as notified by Government. These together with the detected cases are reported by them to the Director of Statistics. Deaths due to these attacks are also reported as and when details are obtained.

3. *Analysis.* The number of persons attacked and the number of persons who succumbed to the attacks per lakh of population are given in Table (I).

TABLE (I)

RATES OF ATTACK OF & DEATH DUE TO SMALL-POX

Sl. No.	Year	Attacks (per lakh persons)	Deaths (per lakh persons)
(1)	(2)	(3)	(4)
1	1951	18	6
2	1952	9	3
3	1953	17	6
4	1954	19	8
5	1955	11	3
6	1956	6	3
7	1957	11	4
8	1958	19	7
9	1959	25	11

An increasing trend is observed in the incidence of small-pox as shown by these figures except for one or two years which show figures with an opposite trend. This may be either due to a true decrease in the attacks and deaths consequent on eradication measures adopted or to more pronounced under reporting in those years. In the following paragraph the seasonality in the number of attacks and deaths is analysed and presented.

4. *Seasonality.* That there is seasonality in the incidence of erruptive diseases is well known. The truth of this could be ascertained by a detailed analysis of the data in hand. The number of attacks and deaths could be considered as a series over time.

Time series (y) usually consists of four components, viz.

(1) long term trend, T
(2) oscillation or Cycle, C
(3) Seasonal fluctuation, S and
(4) Random irregular fluctuations, I

The series may be represented as the product of the four factors.

$$Y = TCSI.$$

The task before us is to separate out the different components of the time series and make a detailed study of each. In a monthly series like the one under study, we compute 12 month moving averages. By this process we eliminate the contribution due to seasonal and irregular fluctuation because the periods of both seasonal

and irregular movements will be smaller than 12 months. Thus the 12 month moving averages give an estimate of T x C and the quotient got by dividing the original series by the moving averages gives an estimate of the seasonal and irregular movements.

$$\frac{T \times C, \times S \times I}{TC} = SI$$

Expressing this quotient as percentage and taking a suitable measure of central tendency for different months, we get crude seasonal indices. These averages are then adjusted so that their total for 12 months is 1200. On dividing the value for a month by this adjusted index for the month, we get de-seasonalised data.

Table (II) gives the seasonal indices for attacks and deaths due to small-pox. For attacks, we observe that the seasonal indices for the first four months January, February, March and April attain values above 100, the index for February being the highest. The December index is 100. The reason is obvious. The climatic conditions – extreme heat during the day and the cool nights – obtained in the State may be the reason for the incidence and spread of the disease. The seasonal indices in respect of deaths, naturally, tell the same story – high seasonality during January – April, February showing the highest index. By the middle of May, rain-fall sets in and the disease subsides.

TABLE II

SEASONAL INDICES

Sl. No.	Month	Seasonal indices	
		Attack	Death
(1)	(2)	(3)	(4)
1	January	157	170
2	February	214	231
3	March	182	180
4	April	121	100
5	May	66	80
6	June	55	64
7	July	62	43
8	August	51	55
9	September	64	62
10	October	66	81
11	November	62	59
12	December	100	75

5. *The trend.* The study of the trend over time of the incidence of the disease and the deaths occuring due to it will be useful to gauge the effect of the measures taken by public health authorities to counter the disease. The ratio, y of deaths to attacks in a particular year, is expressed as a funection of time, in the form,

$$Y = a + bt.$$

The constants 'a' and 'b' can be determined by the method of least squares.

The least squares line fitted to the ratio of death to attack is $Yt = \cdot0003t + \cdot354$.

The line has a small but positive gradient which shows that the ratio of death to attack or death rates to those attcked is increasing through the years. However on tesing it is seen that the gradient is not significant. Hence it may be remarked that though there is an increasing trend it is negligible. In this connection, it may be recalled that the ratios of attacks and deaths to the population have shown an almost similar trend. From the nature of the ratios it is also seen that they are affected by cyclical fluctuations having a period of about 2 years. The trend can therfore be analysed if the cyclical variation is eliminated which however is not attempted in view of the meagre size of data available.

6. *Summary.* Based on the data for the nine years from 1951 to 1959 in the State, the average rate of incidence is nearly 15 per lakh persons varying from 6 to 25. The average of the death rates for the years due to small-pox is 5·4 varying from 3 to 11 per lakh persons. Considering the death rates among those attacked by small-pox it is seen to be ·37. The range of variation is from ·28 to ·43. The trend in these rates is not a declining one over the years. The cure rate or recovery rate from disease is 63% on an average. The rate however could not be taken as the true one in view of the under reporting of deaths and attacks which may not be the same in both cases.

There is definte seasonality in the incidence of the disease, January to April being the peack period. Deaths also show the same sesonal nature.

STUDIES IN DEMOGRAPHY

VOL I

PAPER No. 4

Mortality Tables for Kerala
(1941—1950)

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4. MORTALITY TABLES FOR KERALA STATE

1. *Introduction*—The State of Kerala was formed on 1-11-1956 by integrating the State of Travancore-Cochin (with the exception of the four southern Taluks of Thovala, Agastheeswaram, Kalkulam and Vilavancode and part of the Shencottah Taluk transferred to Madras State) with the Malabar District (less the islands of Lacadive and Minicoy) and Kasargode Taluk of South Canara District, both of former Madras State. The present State of Kerala combines the characters of Travancore-Cochin and Malabar. All India life tables and tables for the five zones were constructed by the Census Actuary subsequent to 1951 Census. Kerala State is a part of the South zone. In view of the fact that Kerala is different from other States as regards population structure and other characteristics, the life table for the South Zone cannot represent Kerala with full justice. Hence an attempt is herein made to construct and represent life tables for the State of Kerala for the decade 1941-50.

2. *Symbols of the Life Table*—The following symbols are used in the Life Table :

l_x denotes the number of persons living at age x.

d_x denotes the number dying between ages x and x+1.

q_x represents the probability of an individual who has attained age x, dying within 1 year.

p_x denotes the probability that an individual who has attained age x will survive to age x+1.

L_x denotes the number of persons living between ages x and x+1.

T_x denotes the number of years lived by all the lx individuals together, before all of them die out.

$e'x$ denotes the average number of years of life remaining to persons aged x or expectation of life at age x.

3. *The Method*—The method adopted is the same as that adopted by the Census Actuary for the construction of mortality tables for India. It is based on the

tracing of cohorts living at one point of time to their survivors at another point of time. Details of the method are given in the following paragraphs.

3. 1: *Smoothing of age tables*—The age returns of 1941 and 1951 Censuses have been smoothed by the following procedure. The population according to the complete count of T-C region and for Madras State are given for individual ages 0; 1, 2, 3, 4 and quinquennial groups thereafter 5–9, 10–14 etc., in the relevant 1941 Census reports of Travancore and Cochin and Madras respectively. By applying Dr. Kozakeiwicz's osculatory interpolation formula to these group populations, population for the single year ages for T-C State and Madras State have been calculated and given in "census of India Paper No. 3 1954." For Malabar region age returns in quinquennial age groups are not given in the 1941 Census Report. Using the single year age returns of Madras, for the total 1941 population of Malabar region, break-up for single year ages has been computed. From the single year age tables of T-C State the corresponding figures for the residuary T-C has been obtained. Combining these two, single year age figures of Kerala State for 1941 have been prepared. The populations by individual year of age are combined to give population in quinary age groups 3–7, 8–12, 13–17 etc. As the data showed minor fluctuations of a wavy nature the method of moving averages with weights 1:2:1 has been applied to smooth them.

The single year age tables of Malabar District and South Canara District given in the 1951 Madras tables have been used to get the single year age tables of the present Malabar region. In the 1951 Part II tables of T-C State the single year age tables of T-C State have been given. From these the relevant population in single year ages for the residuary T-C Region has been computed. By combining these two, the single year age tables for Kerala State for 1951 have been prepared. From this, population in quinary age groups 3–7, 8–12 etc. have been obtained.

But it is well known that the age returns are marked by sharp lumps at preferred ages and hence necessary corrections have to be carried out in the age returns before using them for the construction of mortality tables. The methods which the Census actuary has devised to make corrections in the age tables of 1951 census have been adopted to make corrections in the 1951 age tables of Kerala. The features of the Indian age returns, the various problems of analysis concerned therewith and the manner in which group populations have been corrected for systematic bias are fully discussed in "Census of India Paper No. 3 of 1954 entitled Age Table 1951 Census". After making the necessary corrections in the age returns for mis-statement of age, the group populations are smoothed by the method of moving averages, the weights being 1:2:1. No correction has been made in the group populations for the effects of migration.

3. 2: *Calculation of Px for ages 5 to 55.* From the group populations thus obtained the population at mid-age is calculated with the help of Dr. Kozakeiwicz's Osculatory interpolation formula. The formula involve five group totals, two on either side of the group concerned. The formula which gives the population at the mid-ages are;

U5 = 0·1840 W5 + 0·0400 W10 — 0·0320 W15 + 0·0080 W20
U10 = —0·0080 W5 + 0·2160 W10 — 0.0080 W15
U15 = 0·0066 W5 — 0·0344 W10 + 0·2556 W15 - 0·0344 W20 + 0·0066 W25 etc.

By this method populations as at the two Censuses at pivotal ages 5, 10 etc. are obtained. The ratio of the population at age x+ 10 in 1951 to that at age x in 1941 gives the probability of survival for 10 years for the population at age x in 1941. Let P_{x+10} be the population at the age X+10 as at 1951 Census and Px the population at age x in the 1941 Census. The ratio $\frac{P_{x+10}}{Px}$ gives $10\ P_{x\ +\frac{1}{2}}$ which is the probability that a person exactly aged $x+\frac{1}{2}$ will survive to the age $x+10+\frac{1}{2}$. The value of $10\ P_{x\ +\frac{1}{2}}$ has been found out for x = 5, 10, 15 to 55.

Log 10 $P_{x+\frac{1}{2}}$ is reduced to log 5 $P_{x+\frac{1}{2}}$ by the following relationship $\frac{1}{4}$ (log 10 $P_{x+\frac{1}{2}}$ + log 10 $P_{x+5+\frac{1}{2}}$) = log 5 $P_{x+\frac{1}{2}}$ (vide Census of India Paper No. 2 1954). From log 5 $P_{x+\frac{1}{2}}$ the values of log P_x have been obtained by applying osculatory interpolation formula. Anti-log of the interpolated values give $P_{x+\frac{1}{2}}$ the probability of surviving 1 year for individual half ages. By simple interpolation, values of Px are obtained from $P_{x+\frac{1}{2}}$ and $P_{x+1+\frac{1}{2}}$. Values of Px for x=5, 6, 7 to 55 can be obtained by this method.

3. 3: *Extension to ages over 55.* To derive values of Px for ages beyond 55 a Gompertz curve has been fitted at ages 40, 45, 50 and 55 by the method of moments using the relation $\text{colog}_e Px = Bc^x$.

ie. log (colog Px) = log B + X log C.
ie. log 10 (– $\log_{10}$ Px) = $\log_{10}$ B + X $\log_{10}$ C.
ie. Y = 1 + mx. (say)

For females the equation is Y = – 3·3432104 + 0·0280421 x
For males „ Y = – 3·1790817 + 0·0258664 x

Using these equations the values of Px for ages beyond 55 have been found out. Then the number of persons living at the various ages has been found out by taking radix l_5 = 100,000 and using the formula $l_{x+1} = l_x P_x$

3. 4: *Extensions to ages below 5.* Value of lx for ages below 5 are obtained by using the equation

$$lx = A + Hx + BC^x + \frac{m}{nx+1}$$

as was used by the Census Actuary for constructing life tables for India. The values of C calculated by the Census Actuary for males and females are adopted here also. For males C=0·450 and for females C=0·474.

The values of A, H and B have been determined separately for males and females from the equation

$lx = A + Hx + BC^x$ using l_5, l_6 and l_7 already obtained.

For males the equation is $lx = 103649 - 794x + 17377(0{\cdot}450)^x$

For females the equation is $lx = 104707 - 83x + 8693\ (0{\cdot}474)^x$

From these the values of l_0, l_1, l_2, l_3, and l_4 are obtained.

To these values the value of $\frac{m}{nx+1}$ has been added to get the number surviving (lx) for ages below 5. For this 'n' is taken to be 20, and the value of 'm' is calculated by the following method.

$$l_x = A + Hx + BC^x + \frac{m}{nx+1}$$

$$l_0 = A + B + m$$

$$l_1 = A + H + BC + \frac{m}{n+1} = l_0 P_0 = l_0 (1 - q_0)$$

For males q_0 is taken to be 0·160 and for females q_0 is 0·145. By solving these two equations the values of m for females and males have been found out.

For males m = 11375

females m = 14700

As n is taken to be 20 the additive term $\frac{m}{nx+1}$ becomes negligible by the age 5 and thus the values of lx for ages below 5 are calculated.

From the values of Px and lx the other functions of the life table can be found out by the following relationships.

$$d_x = l_x - l_{x+1} \qquad q_x = 1 - P_x$$

$$L_x = \frac{l_x + l_{x+1}}{2} \text{ for ages 55 and above.}$$

For ages below 5 the values of Lx are obtained by the integration of the expression for lx adopted in its calculation.

$$\text{i.e.,}\quad lx = A + Hx + BC^x + \frac{m}{nx+1}$$

$$Lx = \int_x^{x+1} lx\,dx = \int_x^{x+1} \left(A + Hx + BC^x + \frac{m}{nx+1}\right) dx$$

$$= A + Hx + \frac{H}{2} + \frac{BC^x}{\log_e C}(c-1) + \frac{m}{n}\log_e \frac{20x+21}{20x+1}$$

The figures in the Tx column are obtained by summing the entries in the Lx column from age x downwards to the end of the table.

i.e. $Tx = \sum_{t=x}^{w} L_t$ where w is the last age in the table.

Then expectation of life at age x i.e. e_x° is calculated from the relationship $e_x^{\circ} = \frac{Tx}{lx}$.

4. *The results:* In this paragraph the results obtained for Kerala are compared to those in the All India life table and the life table for the south zone published by the Census Actuary. Broadly the life tables for Kerala show a distinctly lower level of mortality compared to others.

According to the All India Life Tables and the life tables for South zone the expectations of life at birth for males are 32·45 and 36·22 respectively. For Kerala the expectation of life at birth for males is 39·89. The corresponding figures for females are 31·66, 37·23 and 42·34 respectively. It needs hardly be mentioned that the lighter is the incidence of mortality; the greater the expectation of life. Hence the conclusion is that the infant mortality rate in Kerala is less when compared to India and South zone. Since the rates of mortality relating to very young ages are not entirely dependable, it will be better to draw conclusions by comparing the expectation of life at age 5 or preferably age 10. All India expectation of life is 40·86 for males and 40·91 for females at age 5, 38·97 for males and 39·45 for females at age 10. For south zone the expectation of life is 44·26 for males and 45·47 for females at age 5 and 42·04 for males and 43·32 for females at age 10. For Kerala the figures are 47·51 for males

and 48·98 for females at age 5 and 44·37 for males and 46·34 for females at age 10. Clearly both for males and females the expectations at the age 5 and 10 for Kerala are higher than those for All India and South Zone.

In countries like U. K. the expectation of life decreases from its value at birth as age increases because of the low infant mortality. In the life table for Kerala expectation of life increases from its value at birth upto the age 3 and then begins to decrease.

This may be seen from the figures given in the table No. 1 and 2. In the life table for India the expectation of life at age 20 exceeds that at birth. In the life table for south zone the expectation of life at age 18 exceeds that at birth. While in the life table for Kerala the expectation of life at age 15 exceeds that at birth. This also indicates that the infant mortality is lighter in Kerala.

Table No. 3 &4 give for males and females respectively the number of persons that die in a year out of 1000 observed at each quinquennial age. When compared to India the rate of mortality is lighter in Kerala for all ages. It will be seen that in India before age 5 is reached nearly 29952 males out of 100,000 males born and 31925 females out of 100,000 females born lose their lives. But in Kerala before age 5 is reached only 24484 males out of 100,000 males born and 21937 females out of 100,000 females born lose their lives.

Table No. 5 shows the expectation of life at various ages taken from the Demographic year book 1951 issued by the United Nations compared to India and Kerala. The expectation of life is least in India for all ages. The people of Kerala and the south zone have an expectation of life which is greater than that for India as a whole but less than in other countries (except Egypt at age 5). The expectation of life is greater in Kerala in the initial ages (upto age 25 for males and age 37 for females). It may be noted that Netherlands tops the list.

Graphical representation of the expectation of life in India, south zone and Kerala is given in graphs I and II appended for males and females separately. The graph for Kerala cuts across the corresponding graph for South Zone.

TABLE No. I

MALES — Life Table (1941–50)

Age	Living at age 'x' 'lx'	dx	qx	Px	Living between ages x & x + 1 Lx	Living above age x, Tx	Mean after life time at age x, e°x
1	2	3	4	5	6	7	8
0	132401	21184	0·16000	0·84000	116943	5281999	39·89
1	111217	5350	0·04819	0·95181	108220	5165056	46·44
2	105858	2822	0·02666	0·97334	104312	5056836	47·77
3	103036	1711	0·01661	0·98339	101140	4952524	48·07
4	101325	1325	0·01308	0·98692	100692	4851384	47·88
5	100000	970	0·00970	0·99030	99515	4750692	47·51
6	99030	873	0·00882	0·99118	98594	4651177	46·97
7	98157	783	0·00798	0·99202	97766	4552583	46·38
8	97374	704	0·00723	0·99277	97022	4454817	45·75
9	96670	634	0·00656	0·99344	96353	4357795	45·08
10	96036	574	0·00598	0·99402	95749	4261442	44·37
11	95462	523	0·00548	0·99452	95201	4165693	43·64
12	94939	480	0·00506	0·99494	94699	4070492	42·87
13	94459	447	0·00473	0·99527	94236	3975793	42·09
14	94012	422	0·00449	0·99551	93801	3881557	41·29
15	93590	404	0·00432	0·99568	93388	3787756	40·47
16	93186	395	0·00424	0·99576	92989	3694368	39·65
17	92791	392	0·00423	0·99577	92596	3601379	38·81
18	92399	405	0·00438	0·99562	92197	3508783	37·97
19	91994	429	0·00466	0·99534	91780	3416586	37·14
20	91565	461	0·00503	0·99497	91335	3324806	36·31
21	91104	497	0·00545	0·99455	90856	3233471	35·49
22	90607	534	0·00589	0·99411	90340	3142615	34·68
23	90073	570	0·00633	0·99367	89788	3052275	33·89
24	89503	604	0·00675	0·99325	89201	2962487	33·10
25	88899	639	0·00719	0·99281	88580	2873286	32·32
26	88260	677	0·00767	0·99233	87922	2784706	31·55
27	87583	716	0·00818	0·99182	87225	2696784	30·79
28	86867	756	0·00870	0·99130	86489	2609559	30·04
29	86111	797	0·00926	0·99074	85713	2523070	29·30
30	85314	839	0·00983	0·99017	84895	2437357	28·57
31	84475	882	0·01044	0·98956	84034	2352462	27·85
32	83593	925	0·01106	0·98894	83131	2268428	27·14
33	82698	963	0·01165	0·98835	82187	2185297	26·43
34	81705	999	0·01223	0·98777	81206	2103110	25·74
35	80706	1035	0·01283	0·98717	80189	2021904	25·05

Table I (Contd.)

1	2	3	4	5	6	7	8
36	79671	1073	0·01347	0·98653	79135	1941715	24·37
37	78598	1115	0·01418	0·98582	78041	1862580	23·70
38	77483	1152	0·01487	0·98513	76907	1784539	23·03
39	76331	1194	0·01564	0·98436	75734	1707632	22·37
40	75137	1238	0·01647	0·98353	74518	1631898	21·72
41	73899	1283	0·01736	0·98264	73258	1557380	21·07
42	72616	1330	0·01832	0·98168	71951	1484122	20·44
43	71286	1382	0·01938	0·98062	70595	1412171	19·81
44	69904	1437	0·02055	0·97945	69186	1341576	19·19
45	68467	1493	0·02181	0·87819	67721	1272390	18·58
46	66974	1552	0·02317	0·97683	66198	1204669	17·99
47	65422	1609	0·02460	0·97540	64618	1138471	17·40
48	63813	1668	0·02614	0·97386	62979	1073853	16·83
49	62145	1726	0·02777	0·97223	61282	1010874	16·27
50	60419	1782	0·02950	0·97050	59528	949592	15·72
51	58637	1837	0·03133	0·96867	57719	890064	15·18
52	56800	1889	0·03326	0·96674	55856	832345	14·65
53	54911	1939	0·03531	0·96469	53942	776489	14·14
54	52972	1984	0·03746	0·96254	51980	722547	13·64
55	50988	2022	0·03966	0·96034	49977	670567	13·15
56	48966	2052	0·04191	0·95809	47940	620590	12·67
57	46914	2084	0·04443	0·95557	45872	572650	12·21
58	44830	2111	0·04709	0·95291	43775	526778	11·75
59	42719	2132	0·04991	0·95009	41653	483003	11·31
60	40587	2147	0·05289	0·94711	39514	441350	10·87
61	38440	2154	0·05604	0·94396	37363	401836	10·45
62	36286	2155	0·05938	0·94062	35209	364473	10·04
63	34131	2147	0·06291	0·93709	33058	329264	9·65
64	31984	2131	0·06664	0·93336	30919	296206	9·26
65	29853	2107	0·07058	0·92942	28800	265287	8·89
66	27746	2074	0·07474	0·92526	26709	236487	8·52
67	25672	1987	0·07741	0·92259	24679	209778	8·17
68	23685	1985	0·08379	0·91621	22693	185099	7·82
69	21700	1925	0·08870	0·91130	30738	162406	7·48
70	19775	1856	0·09388	0·90612	18847	141668	7·16
71	17919	1780	0·09934	0·90066	17029	122821	6·85
72	16139	1696	0·10510	0·89490	15291	105792	6·56
73	14443	1606	0·11118	0·88882	13640	90501	6·27
74	12837	1510	0·11759	0·88241	12082	76861	5·99

Table I (Contd.)

1	2	3	4	5	6	7	8
75	11327	1408	0·12434	0·87566	10623	64779	5·72
76	9919	1304	0·13144	0·86856	9267	54156	5·46
77	8615	1197	0·13892	0·86108	8017	44889	5·21
78	7418	1089	0·14679	0·85321	6874	36872	4·97
79	6329	981	0·15506	0·84494	5839	29998	4·74
80	5348	876	0·16376	0·83624	4910	24159	4·52
81	4472	773	0·17288	0·82712	4086	19249	4·30
82	3699	675	0·18246	0·81754	3362	15163	4·10
83	3024	582	0·19250	0·80750	2733	11801	3·90
84	2442	496	0·20303	0·79697	2194	9068	3·71
85	1946	417	0·21405	0·78595	1738	6874	3·53
86	1529	345	0·22559	0·77441	1357	5136	3·36
87	1184	281	0·23764	0·76236	1044	3779	3·19
88	903	226	0·25022	0·74978	790	2735	3·03
89	677	178	0·26336	0·73664	588	1945	2·87
90	499	138	0·27704	0·72296	430	1357	2 72
91	361	106	0·29130	0·70870	308	927	2·57
92	255	79	0·30612	0·69388	216	619	2·43
93	176	57	0·32151	0·67849	148	403	2·29
94	119	41	0·33747	0·66253	99	255	2·14
95	78	28	0·35400	0·64600	64	156	2·00
96	50	19	0·37108	0·62892	41	92	1·84
97	31	13	0·38873	0·61127	25	51	1·65
98	18	8	0·40692	0·59308	14	26	1·44
99	10	5	0·42564	0·57436	7	12	1·20
100	5	3	0·44485	0·55515	4	5	1·00
101	2	1	0·46455	0·53545	1	1	0·50
102	1	...	0·48470	0·51530	...	...	...

TABLE No. II

FEMALES — Life Table (1941–50)

Age	lx	dx	qx	Px	Lx	Tx	e°x
0	128100	18574	0·14500	0·85500	111725	5423143	42·34
1	109526	4473	0·04084	0·95916	106440	5311418	48·49
2	105053	2128	0·02026	0·97974	103807	5204978	49·55
3	102925	1530	0·01487	0·98513	102048	5101171	49·56
4	101395	1395	0·01376	0·98624	100693	4999123	49·30
5	100000	1092	0·01092	0·98908	99454	4898430	48·98
6	98908	1035	0·01046	0·98954	98391	4798976	48·52
7	97873	971	0·00992	0·99008	97388	4700585	48·03
8	96902	898	0·00927	0·99073	96453	4603197	47·50
9	96004	819	0·00853	0·99147	95595	4506744	46·94
10	95185	735	0·00772	0·99228	94818	4411149	46·34
11	94450	651	0·00689	0·99311	94125	4316331	45·70
12	93799	568	0·00606	0·99394	93515	4222206	45·01
13	93231	489	0·00524	0·99476	92987	4128691	44·28
14	92742	415	0·00448	0·99552	92535	4035704	43·52
15	92327	347	0·00376	0·99624	92154	3943169	42·71
16	91980	283	0·00308	0·99692	91839	3851015	41·87
17	91697	234	0·00255	0·99745	91580	3759176	41·00
18	91463	218	0·00238	0·99762	91444	3667596	40·10
19	91245	234	0·00257	0·99743	91128	3576152	39·19
20	91011	267	0·00293	0·99707	90878	3485024	38·29
21	90744	302	0·00333	0·99667	90593	3394146	37·40
22	90442	344	0·00380	0·99620	90270	3303553	36·53
23	90098	390	0·00433	0·99567	89903	3213283	35·66
24	89708	439	0·00489	0·99511	89489	3123380	34·82
25	89269	491	0·00550	0·99450	89024	3033891	33·99
26	88778	550	0·00619	0·99381	88503	2944867	33·17
27	88228	605	0·00686	0·99314	87926	2856364	32·37
28	87623	647	0·00738	0·99262	87300	2768438	31·59
29	86976	674	0·00775	0·99225	86639	2681138	30·83
30	86302	699	0·00810	0·99190	85953	2594499	30·06
31	85603	725	0·00847	0·99153	85241	2508546	29·30
32	84878	754	0·00888	0·99112	84501	2423305	28·55
33	84124	792	0·00941	0·99059	83728	2338804	27·80
34	83332	837	0·01004	0·98996	82914	2255076	27·06
35	82495	884	0·01072	0·98928	82053	2172162	26·33
36	81611	931	0·01141	0·98859	81146	2090109	25·61
37	80680	978	0·01212	0·98788	80191	2008963	24·90

Table II (Contd.)

1	2	3	4	5	6	7	8
38	79702	1024	0·01285	0·98715	79190	1928772	24·20
39	78678	1070	0·01360	0·98640	78143	1849582	23·51
40	77608	1118	0·01440	0·98560	77049	1771439	22·83
41	76490	1168	0·01527	0·98473	75906	1694390	22·15
42	75322	1217	0·01616	0·98384	74714	1618484	21·49
43	74105	1254	0·01692	0·98308	73478	1543770	20·83
44	72851	1276	0·01752	0·98248	72213	1470292	20·18
45	71575	1303	0·01820	0·98180	70924	1398079	19·53
46	70272	1339	0·01905	0·98095	69603	1327155	18·89
47	68933	1383	0·02007	0·97993	68242	1257552	18·24
48	67550	1437	0·02128	0·97872	66832	1189310	17·61
49	66113	1501	0·02271	0·97729	65363	1122478	16·98
50	64612	1577	0·02440	0·97560	63824	1057115	16·36
51	63035	1663	0·02639	0·97361	62204	993291	15·76
52	61372	1762	0·02871	0·97129	60491	931087	15·17
53	59610	1872	0·03140	0·96860	58674	870596	14·60
54	57738	1991	0·03449	0·96551	56743	811922	14·06
55	55747	2107	0·03779	0·96221	54694	755179	13·55
56	53640	2044	0·03810	0·96190	52618	700485	13·06
57	51596	2094	0·04059	0·95941	50549	647867	12·56
58	49502	2140	0·04324	0·95676	48432	597318	12.07
59	47362	2181	0·04606	0·95394	46272	548886	11·59
60	45181	2216	0·04905	0·95095	44073	502614	11·12
61	42965	2244	0·05224	0·94776	41843	458541	10·67
62	40721	2265	0·05562	0·94438	39589	416698	10·23
63	38456	2277	0·05922	0·94078	37318	377109	9·81
64	36179	2281	0·06304	0·93696	35039	339791	9·39
65	33898	2275	0·06710	0·93290	32761	304752	8·99
66	31623	2259	0·07142	0·92858	30494	271991	8·60
67	29364	2231	0·07599	0·92401	28249	241497	8·22
68	27133	2194	0·08085	0·91915	26036	213248	7·86
69	24939	2145	0·08601	0·91399	23867	187212	7·51
70	22794	2085	0·09147	0·99253	21752	163345	7·17
71	20709	2014	0·09727	0·90273	19702	141593	6·84
72	18695	1933	0·10341	0·89659	17729	121891	6·52
73	16762	1842	0·10991	0·89009	15841	104162	6·21
74	14920	1743	0·11680	0·88320	14049	88321	5·92
75	13177	1635	0·12408	0·87592	12360	74272	5·64
76	11542	1521	0·13179	0·86821	10782	61912	5·36
77	10021	1402	0·13993	0·86007	9320	51130	5·10

Table II (Contd.)

1	2	3	4	5	6	7	8
78	8619	1280	0·14854	0·85146	7979	41810	4·85
79	7339	1157	0·15762	0·84238	6761	33831	4·61
80	6182	1034	0·16721	0·83279	5665	27070	4·38
81	5148	913	0·17731	0·82269	4692	21405	4.16
82	4235	796	0·18795	0·81205	3837	16713	3·95
83	3439	685	0·19914	0·80086	3097	12876	3·74
84	2754	581	0·21092	0·78908	2464	9779	3·55
85	2173	485	0·22329	0·77671	1931	7315	3·37
86	1688	399	0·23627	0·76373	1489	5384	3·19
87	1289	322	0·24988	0·75012	1128	3895	3·02
88	967	255	0·26413	0·73587	840	2767	2·86
89	712	199	0·27903	0·72097	613	1927	2·71
90	513	151	0·29459	0·70541	438	1314	2·56
91	362	113	0·31082	0·68918	306	876	2·42
92	249	82	0·32772	0·67228	208	570	2·29
93	167	58	0·34529	0·65471	138	362	2·17
94	109	40	0·36419	0·63581	89	224	2·06
95	69	26	0·38242	0·61758	56	135	1·96
96	43	17	0·40196	0·59804	35	79	1·84
97	26	11	0·42212	0·57788	21	44	1·69
98	15	7	0·44288	0·55712	12	23	1·53
99	8	4	0·46419	0 53581	6	11	1·38
100	4	2	0·48604	0.51396	3	5	1·25
101	2	1	0·50835	0·49165	2	2	1·00
102	1	...	0·53109	0·46891	...	...	...

TABLE No. 111

MALES

Annual rate of mortality per 1000

Age	India	South Zone	Kerala
0	190·00	170·00	160·00
5	17·10	14·46	9·70
10	13·08	10·51	5·98
15	10·64	8·30	4·32
20	10·49	9·01	5·03
25	11·97	11·35	7·19
30	14·13	12·98	9·83
35	17·04	14·34	12·83
40	20·20	16·18	16·47
45	24 82	19·17	21·81
50	32·32	24·36	29·50
55	42·22	32·89	39·66
60	57·26	46·88	52·89
65	77·45	66·58	70·58
70	104·39	94·26	93·88
75	139·94	132·52	124·34
80	186·27	184·65	163·76
85	245·62	254·07	214·05
90	319·78	343·53	277·04
95	409·57	453·60	354·00
100	...	...	444·85

TABLE No. IV

FEMALES

Annual rate of mortality per 1000

Age	India	South Zone	Kerala
0	175·00	155·00	145·00
5	20·58	15·17	10·92
10	13·10	9·33	7·72
15	8·36	5·86	3·76
20	7·84	6·32	2·93
25	11·42	9·74	5·50
30	16·73	13·23	8·10
35	21·36	16·00	10·72
40	24·28	18·48	14·40
45	27·35	20·78	18·20
50	31·33	23·44	24·40
55	37·49	28·42	37·79
60	49·96	41·81	49·05
65	66·48	61·31	67·10
70	88·16	89·46	91·47
75	116·50	129·60	124·08
80	153·06	185·90	167·21
85	201·20	262·62	223·29
90	264·59	363·21	294·59
95	397·59	487·52	382·42
100	...	...	486·04

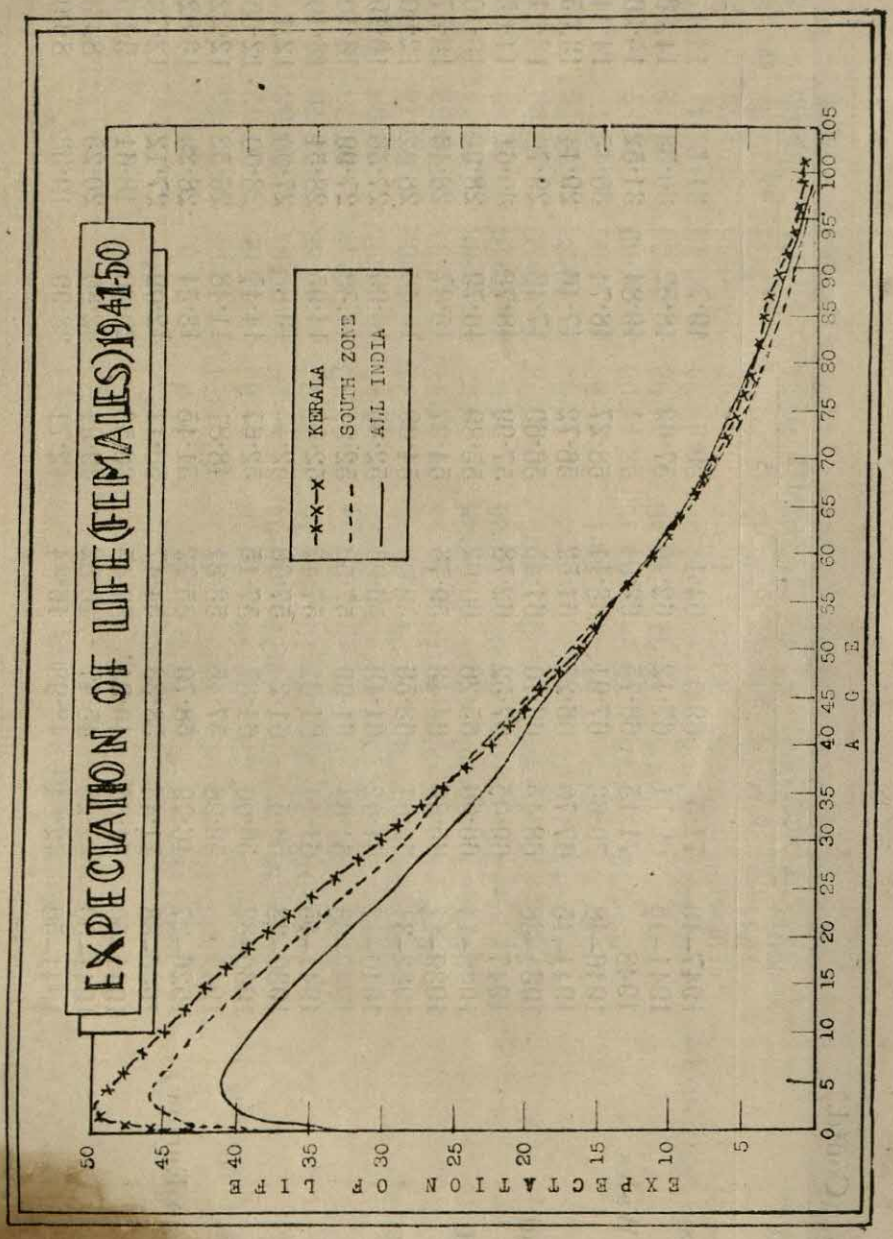
TABLE No. V

EXPECTATION OF LIFE AT VARIOUS AGES

COUNTRY	PERIOD	AGE MALES						
		0	5	10	15	25	45	65
Netherlands	1947-49	69·4	67·4	62·7	57·9	48·5	30.0	13·9
Sweden	1941–45	67·06	95·07	60·45	55·74	46·98	29·25	13·68
England & Wales	1948	66·39	64·49	59·76	54·94	45·66	27·42	12·75
Australia	1946–48	66·07	63·77	59·04	54·28	45·04	26·83	12·25
Denmark	1941–45	65·62	65·16	60·46	55·71	46·68	28·76	13·20
New Zealand.	1934–38	65·46	63·70	59·11	54.42	45·43	27·78	12·76
Canada	1947	65·18	64·43	59·79	55·07	45·95	28·03	13·25
Switzerland	1939–44	62·68	61·64	57·08	52·41	43·62	26·15	11·60
U. S. A.	1939–41	61·60	60·76	56·12	51·43	42·51	25·52	12·07
Germany	1932–34	59·86	61·70	57·28	52·62	43·83	26·61	11·87
Ireland	1940–42	59.01	60·68	56·25	51·60	43·10	26·47	12·31
France	1933–38	55·94	57.06	52·57	47·94	39·59	23·99	11·05
Finland	1941–45	54·62	55·41	51·27	46·87	39·23	23·76	11·11
Austria	1930–33	54·5	58·3	54·1	49·5	41·00	24·7	11·2
Italy	1930–32	53·76	59·68	55·46	50·98	42·69	26.37	11·92
Japan	1947	50·06	53·61	49·49	44·93	37·60	23·12	10·16
U. S. S. R. (in Europe)	1926–27	41·93	54·72	51·65	47·34	39·46	24·41	12·07
Egypt	1936–38	35·65	49·75	46·86	43·53	36·35	22·71	10·47
India	1941–50	32·45	40·86	38·97	36·24	29·78	17·63	8·18
South Zone	1941–50	36·22	44·26	42·04	38·97	32·21	19·63	8·73
Kerala	1941–50	39·89	47·51	44·37	40·47	32.32	18·58	8·89

Table No. V (Contd.)

COUNTRY	PERIOD	AGE	FEMALES					
		0	5	10	15	25	45	65
Netherlands	1947–49	71·5	69·0	64·1	59·3	49·7	31·1	14.4
Sweden	1941–45	69·71	67·12	62·40	57·62	48·52	30·53	14.33
England & Wales	1948	71·15	68·75	63·94	59·11	49·84	31·52	15·26
Australia	1946–48	70·63	67·91	63·11	58·27	48·74	30·45	14·44
Denmark	1941–45	67·70	66·27	61·52	56·72	47·46	29·44	13.55
New Zealand	1934–38	68·45	66·10	61·45	56·69	47·48	29·70	13·91
Canada	1947	69·05	67·52	62·78	57·99	48·73	30·61	14·65
Switzerland	1939–44	66·96	65·26	60·62	55·89	46·79	28·93	13·10
U. S. A.	1939–41	65·89	64·43	59·73	54·97	45·87	28·46	13·57
Germany	1932–34	62·81	63·56	59·09	54·39	45·43	28·02	12·60
Ireland	1940–42	61·02	61·43	56·94	52·35	43·99	27·56	13·19
France	1933–38	61·64	61·99	57·50	52·91	44.59	27·99	13·10
Finland	1941–45	61·14	61·61	57·42	52·98	44·95	28·51	13·10
Austria	1930–33	58·5	61·2	57·00	52·4	43·8	27·00	12.1
Italy	1930–32	56·00	61·37	57·15	52·67	44·47	28·00	12·66
Japan	1947	53·96	57·45	53·31	48·81	41·48	26·52	12·22
U. S. S. R. (in Europe)	1926–27	46·79	58·79	55·72	51·45	43·54	28·29	13·82
Egypt	1936–38	41·48	58·33	54·47	50·11	42·09	27·12	12·78
India	1941–50	31·66	40·91	39·45	36·56	29·30	18·61	9·29
South Zone	1941–50	37·23	45·47	43·32	39·94	32·30	20·25	8.99
Kerala	1941–50	42·34	48·98	46·34	42·71	33·99	19·53	8·99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KERALA
SOUTH ZONE
ALL INDIA
EXPECTATION OF LIFE
AGE
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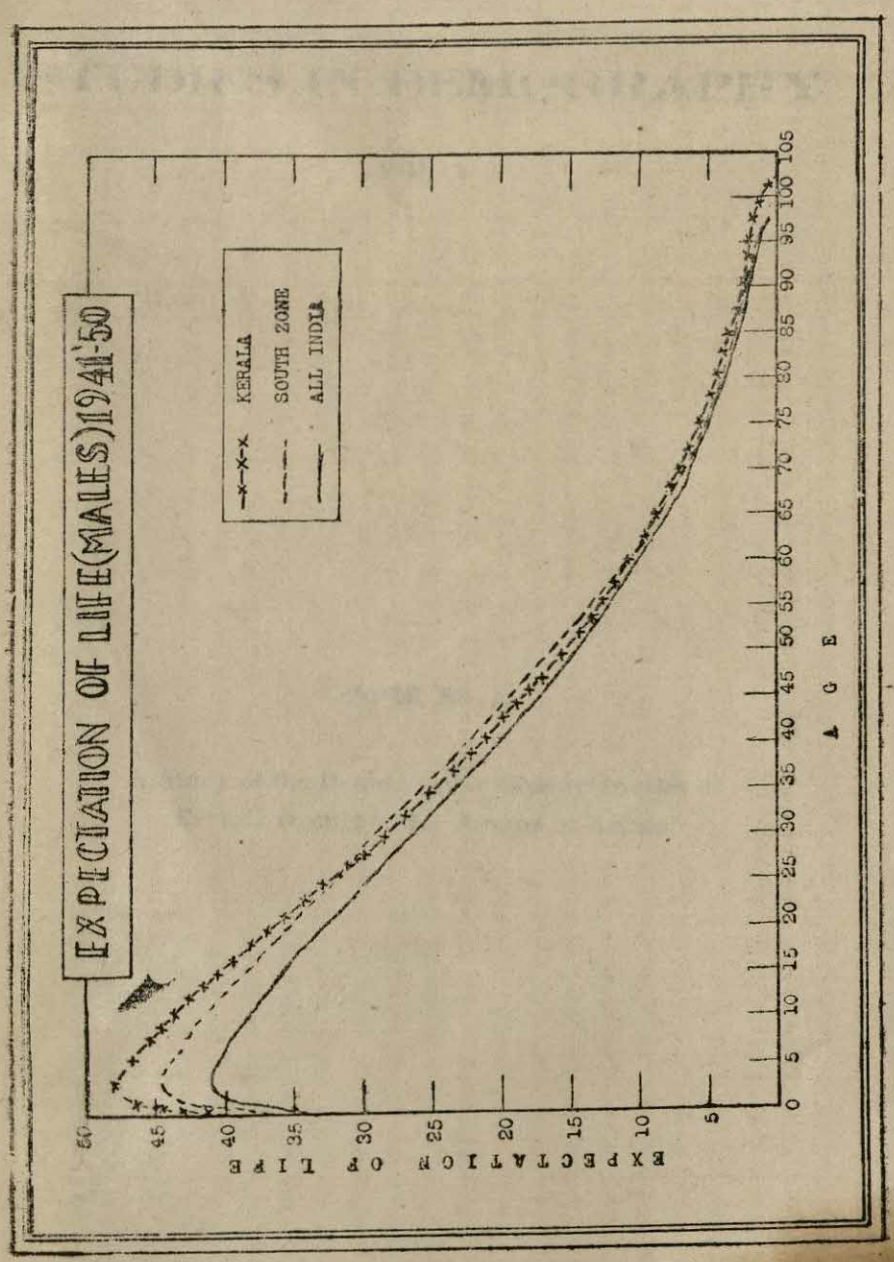
5 10 15 20 25 30 35 40 45 50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KERALA
SOUTH ZONE
ALL INDIA
EXPECTATION OF LIFE
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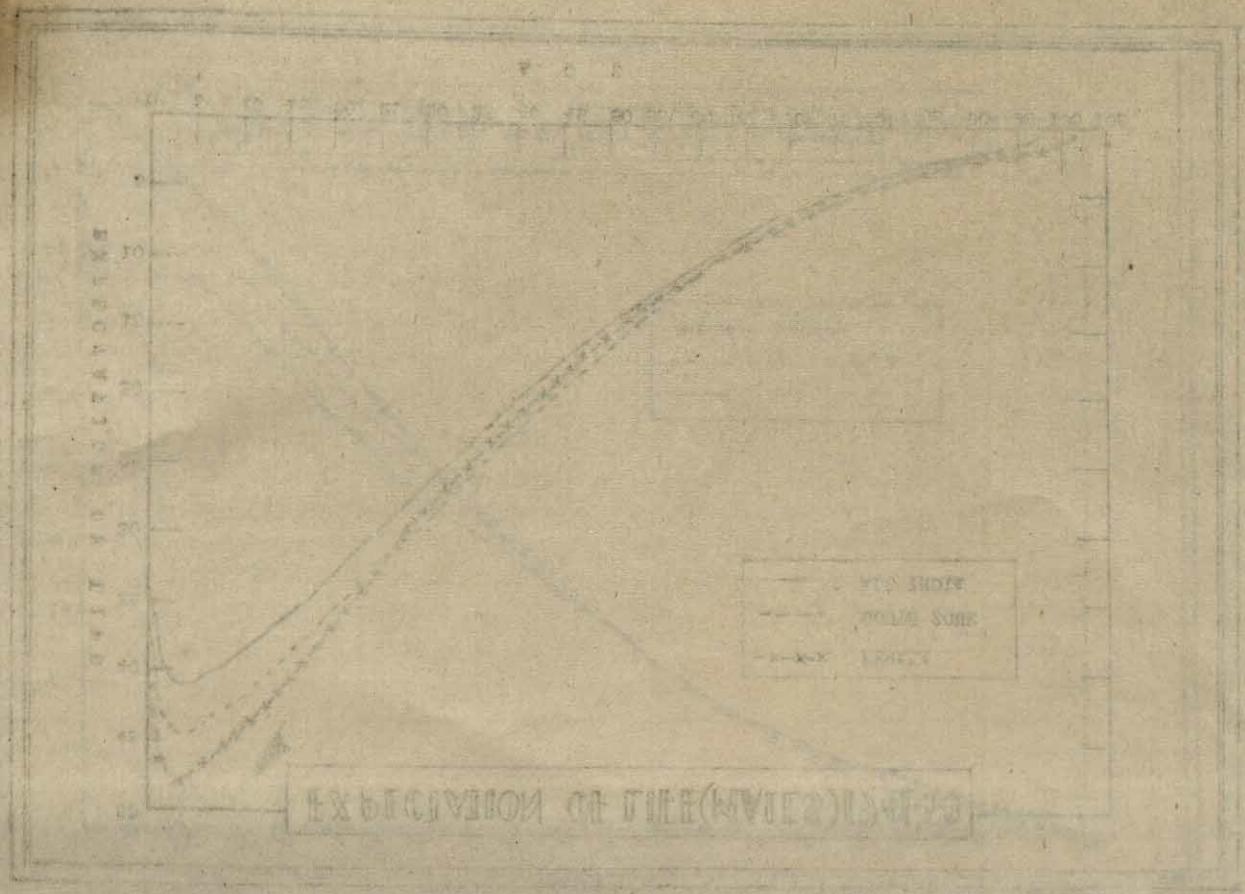

STUDIES IN DEMOGRAPHY

VOL. I

PAPER No. 5

A Study of the Demographic Characteristics of Certain Occupational Groups in Kerala

Issued in
DECEMBER 1960

A STUDY OF THE DEMOGRAPHIC CHARACTERISTICS OF CERTAIN OCCUPATIONAL GROUPS

1. *Introduction*: One of the important problems facing society today is the problem of increasing population. Studies on fertility and rate of growth of population are under-taken with increasing interest. In this context a study on the demographic characteristics of some of the major occupational groups of the population is not out of place. Data regarding some groups like toddy tappers, plantation labourers, agricultural labourers, general agricultural class and non-agricultural class obtained through sample surveys conducted by the Department of Statistics which are available have been processed to yield results for a comparative study of their demographic characters. The present study is only a preliminary one and will be supplemented when more data become available. The general population characteristics as revealed through 1951 census have been considered as norms for comparision.

2. *Available Data:* The available data consist of the size and composition of households, age, sex, marital status, economic status and number of children collected through the following surveys (1) Prohibition survey (2) Toddy tappers survey (3) Nutritional diet survey of plantation workers (4) Unemployment survey and (5) National Sample Survey 11th and 12th rounds. In the following paragraphs the sampling designs of these surveys are briefly indicated.

2. 1. *Prohibition Survey:* The survey was conducted in Kerala State during November 1957 to study the effect of prohibition on the economic, cultural and moral aspects of the life of the people. 2053 households were selected for enumeration. Of these, 573 were in dry area (dry households) and 1480 in wet area equally distributed between those with persons addicted to alcoholic drinks (drinking households) and those in

which none partook these drinks (non-drinking households). Details of size and composition of households, marital status of the members, their educational attainments, expenditure, indebtedness and views on prohibition were collected.

2. 2. *Toddy Tappers Survey:* The survey was begun towards the end of December 1957 and completed by the middle of January 1958. 755 households distributed over the taluks which are considered important in respect of toddy tapping activity were enumerated. The actual selection was done with reference to a list of toddy tappers kept with the trade unions. Nearly 10% of the households were selected though in some cases only less than 10% were surveyed due to incidental difficulties. Information on size and composition of households, economic status, employment, assets and liabilities of members and household expenditure were collected.

2. 3. *Nutritional Diet Survey of Tea Plantation Labourers:* The survey was conducted in March 1958. 19 tea estates were selected at random scattered over the five districts, Trivandrum, Quilon, Kottayam, Trichur and Palghat. From each of the selected estates a sample of ten worker's households, were randomly selected. Demographic and occupational particulars, information on earnings and expenditure, particulars of loans, and details of housing and sanitation conditions were collected from the households.

2. 4. *Unemployment Survey*: In the Travancore-Cochin area the survey was conducted in April-May 1956. In each District the low-land, midland and highland were considered as the strata. A five percent sample of households were enumerated in each municipal town. 10% of the total number of villages was also selected and in each village 50 households were selected and enumerated.

A similar survey was conducted in the Malabar and Kasargode areas of the State in February-March 1957. The information collected was similar to that in the Travancore-Cochin areas. The three districts were considered as the main strata and within each district, rural and urban areas were sampled separately.

Approximately 6% of the households in urban areas and 1% households in the villages were selected for the survey.

2. 5. *National Sample Survey 11th & 12th Rounds:* The 11th round of the NSS (state sample) was conducted in the T. C. State from August 1956 to January 1957. An agricultural labour enquiry formed part of the survey. The enquiry was conducted in 48 rural samples and 28 urban samples. Information on general demographic particulars of households, household income and expenditure, employment and unemployment were collected during the enquiry. On an average 2 agricultural labour households in rural samples and one agricultural house-hold out of the total of 5 in the urban samples were selected for income and expenditure schedules. Along with collection of information from agricultural labour households, information from other households were also collected.

During the 12th round NSS, the survey was conducted in 96 rural samples and 28 urban samples on lines similar to the 11th round.

3. *Demographic Particulars of Various Occupational Groups*: In the following paragraphs the various occupational groups will be compared with respect to the following characteristics (1) size of household (2) age and sex composition (3) Marital status (4) Economic status (5) Literacy (6) Earnings (7) Expenditure (8) Elasticity of expenditure and (9) Debt position Though some of these characteristics are not demographic they are also considered here in view of their importance.

3. 1. *Size of Households*: The following table gives the size of households for the various occupational groups.

TABLE 3. I.

Year	Source	Average household size
1951	Population census	
	Travancore-Cochin ...	5·98
	Malabar ...	5·78
1956	Unemployment survey	
	Travancore-Cochin ...	5·80
1956	N. S. S. 11th round	
	Agricultural labour ...	5·51
1957	Unemployment survey	
March	Malabar ...	5·77
1957	Prohibition survey	
	Agricultural households ...	6·02
	Non-Agricultural households ...	6·01
1958	Family Budget Survey of Toddy	
January	tappers' households ...	6·35
1958	Nutritional diet survey of	
March	Tea plantation workers' households	4·9

The household size is about 5 in all occupational groups except those of tea plantation workers where, it is seen to be less than 5. Compared to the general population, tea plantation workers and agricultural labourers have smaller households, while toddy tappers have larger households. Again though not with conclusive evidence it may be remarked that the difference in sizes of Travancore-Cochin and Malabar households has narrowed down very much.

3. 2. *Composition of households according to age and sex:* The following table gives the percentage distribution of persons according to age and sex as obtained from the various surveys.

TABLE 3. 2.

1. 1951 CENSUS—KERALA

Age groups	
0— 4	14·20
5—14	24·30
15—24	20·50
25—34	14·10
35—54	18·70
55 and above	8·20
All ages	100·00

Sex Ratio 1028

2. UNEMPLOYMENT SURVEY MALABAR AND KASARGODE 1957 MARCH

Age group	Males	Females	Total
0—14	19·0	17·9	36·9
15—34	15·2	17·7	32·9
35—54	10·5	10·4	20·9
55 and above	4·5	4·8	9·3
All ages	49·2	50 8	100·0

3. NATIONAL SAMPLE SURVEY 11th ROUND AGRICULTURAL LABOURERS

Age group	Males	Females	Total
0—6	11·93	9·58	21·51
7—14	10·10	9·06	19·16
15—21	6·53	8·23	14·76
22—61	21·20	20·38	41·58
62 and above	1·49	1·50	2·99
All ages	51·25	48·75	100·00

4. N. S. S. 12th ROUND (AGRI. LAB.)

Age group	Percentage
0—6	21·49
7—15	22·80
16—21	11·27

Age group	Percentage
22—26	8·60
27—36	12·47
37—46	10·48
47 and above	12·89

5. PROHIBITION SURVEY 1957—AGRICULTURAL HOUSEHOLDS

Age group	Percentage	Dry	Non-drinking	Drinking
0—4	14	12	13	13
5—14	27	27	25	29
15—19	10	10	11	10
20—24	9	10	10	9
25—34	13	12	14	12
35—54	18	19	17	19
55 and above	9	10	10	8
All ages	100	100	100	100

NON-AGRICULTURAL HOUSEHOLDS

Age group	Dry	Non-drinking	Drinking
0— 4	16	14	14
5—14	24	27	28
15—19	9	10	10
20—24	10	9	9
25—34	14	14	14
35—54	17	18	18
55 and above	10	8	7
All ages	100	100	100

6. TODDY TAPPERS' SURVEY 1958

Age group	Male	Female	Total	
Below 5	8	8	16	Standard error 0·789
5—14	14	13	27	
15—24	9	10	19	

Age group	Male	Female	Total
25—44	13	11	24
45—64	5	5	10
65 and above	2	2	4
All ages	51	49	100

7. NUTRITIONAL DIET SURVEY OF TEA PLANTATION WORKERS

Age group	Male	Female	Total	
Below 5	8·0	10·4	18·4	Standard error 1·602
5—14	14·0	12·1	26·1	
15—24	7.0	11·0	18 0	
25—44	14·9	12 9	27 8	
45—64	4·4	4·3	8 7	
65 and over	0·8	0 2	1·0	
All ages	49·1	50·9	100 0	

The sex ratio for Kerala is 1028 (1028 females per 1000 males) according to 1951 census. Sex ratio is 1033 according to unemployment survey in Malabar and according to N.S S. 11th round it is 951 in agricultural labour households. The sex ratio is 960 which is significantly less than 1951 census figures in the case of toddy tappers and 1038 for tea plantation workers which is not significantly different from 1951 census figure. In the high lands of Travancore–Cochin the sex ratio was 936 according to 1951 census. It is therefore clear that the workers in Tea plantations have proportionately large number of females. Agricultural labourers and toddy tappers have proportionately small number of females.

The percentage of persons in the tender age group 0-14 is about 40 in all these cases. It is 38·5% according to 1951 census. In all other cases except that of unemployment survey it is greater than this. The greatest is in the case of Tea plantation workers (44·5%) The percentage is significantly higher than 1951 census figures in the case of toddy tappers and Tea plantation workers.

The toddy tappers and tea plantation workers have proportionately more persons outside the labour force.

Those in the age group 55 and above form 8·20% in the general population according to 1951 census. The percentage is about 9 according to unemployment survey and prohibition survey Toddy tappers and tea plantation workers have 14% and 9·7% persons above 45 years. Tea plantation workers have thus proportionately less persons in the later age groups. In the age group 65 and over the percentage of males is 4 times that of females in households of tea plantation workers.

3. 3. *Marital Status*: Persons are classified according to marital status into 3 groups. (1) Single, (2) Married, (3) Widowed, divorced or seperated. The percentage distribution according to this classification is given below.

TABLE 3. 3.

PERCENTAGE DISTRIBUTION OF PERSONS ACCORDING TO MARITAL STATUS

Year & Source	Single			Married			Widowed		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
1951 Census Kerala	60·25	48·15	54·11	37·14	39·33	38·25	2·61	12·52	7·64
1957 prohibition survey	...	...	57	...	...	37	...	...	6
1957 N. S. S. 12th Round	...	...	58·91	...	...	34·80	...	...	6·29
1958 Nutritional diet survey	...	...	54·5	...	...	38·9	...	...	6·6
(Standard error)			(1·640)			(1·600)			(0·874)

In the general population about 60% are single (1951 census). It may be remembered that about 40% of the population is below 15 years in all groups. In the case of Tea plantation workers the percentage does not show any significant difference with that of 1951 census general population.

3. 4. *Economic status*: The percentage distribution of the population accord ng to economic status (earner, earning dependant; non-earning dependant) is given below.

TABLE 3. 4.

Percentage distribution according to economic status.

	Year and source	Earner	Earning depen-dant	Non earn-ing depen dant
1951	Kerala			
	Agricultural	26·17	6·00	67·83
	Non-agricultural	29·41	5·56	65·03
1956	N.S.S. 11th Round			
	Agricultural labourers	26·20	8·29	65·51
1957	N.S.S. 12th Round	23·60	5·26	70·08
1958	January-Toddy tappers survey	21	10	69
	(Standard error)	(0·713)	(0·385)	(0·758)
1958	Nutritional diet survey	42·0	6·3	51·7
March	(Standard error)	(1·447)	(0·782)	(1·537)

From the table shown above, it is seen that the tea plantation workers have the lightest burden of dependancy. Including earning dependants, the percentage of dependants is 58 which means that 10 earners have to support nearly 14 dependants. In the case of agricultutal labourers 10 earners have to support 28 dependants including earning dependants. The toddy tappers who have the heaviest burden of dependancy, have 38 dependants against 10 earners. The percentage of earners is significantly less in the case of toddy tappers and significantly higher in the case of Tea Plantation workers compared to 1951 census figures.

3. 5. *Literacy Standard.* According to 1951 census in T. C. State, the percentage literacy was 45·8, 54·8 for males and 43·2 for females. In Malabar the percentage was 36·3, 41·3 for males and 21·7 for females. For Kerala the percentage was 40·5. The literacy percentage among the various occupational groups are given below.

Year and source	Dry.	Non-drinking	Drinking
1957 Prohibition survey			
Agricultural	69	88	81
Non-agricultural	71	83	82
1958 Nutritional diet survey		37·6	
(Standard error)		(1·616)	

The percentage figures obtained by the prohibition survey are very high compared to 1951 census figures. It may be due to the increase in the percentage literacy from that of 1951 or due to bias in selection as the house holds were selected purposively. The percentage literacy of tea plantation workers is poor compared to the general population. But there is no significant difference from 1951 census figures. Out of the 37·6% who are literate, a considerable proportion (30·7% of total population) have studied only below primary.

3. 6. *Earnings.* The average earnings of plantation workers per day worked out on the basis of data collected for a month previous to the date of survey and for an year previous to the date of survey for the various types of work are given below.

	Month	Year
Plucking	1·49	1·50
Field work	2·16	2·05
Factory labour	1·87	2·17
Others	1·51	1·33
Average	1·61	1·91

The average earning of toddy tappers is given below for the various centres.

	Karunagappally	Ambalapuzha	Kuttanad	Sherthalai	Meenachil	Thodupuzha	Trichur	Quilon
Tapping	2·54	2·24	2·34	1·94	1·63	1·69	2·76	
Agriculture	1·80	1·29	1·34	2·26	1·42	2·01	...	
Others	0·72	0·65	0·65	1·26	0·94	1·46	...	

The average earnings of a toddy tapper stand higher than those of a plantation worker.

3. 7. *Expenditure Pattern:* The monthly average household expenditure (in Rupees) for the various groups is given below.

TABLE 3. 7. 1.

Occupational group	Total	Food	Cloth-ing	Hous-ing	Miscella-neous
Toddy tappers	137	86	8	16	27
Tea plantation workers	139	96	14	9	20

The total expenditure for the 2 groups are more or less equal. But the amount spent on various items are different. It is seen that the tea plantation workers spend proportionately more on clothing and toddy tappers spend proportionately more on housing.

The following table gives the percentage expenditure on the various items by the different occupational groups.

TABLE 3. 7. 2.

		Food	Hous-ing	Cloth-ing	Miscella-neous	All
Toddy tappers		62·77	11·68	5·84	19·71	100·00
Tea Plantation workers		69·06	6·26	10·07	14·61	100·00
*All workers with income less than Rs. 200/ per month.	Munnar	59·73	11·00	11·11	18·16	100·00
	Alleppey	57·69	16·64	5·09	20·58	100·00
	Quilon	67·23	11·66	6·46	14·65	100·00
	Trichur	65·04	21·09	4·72	9·15	100·00
	Palghat	56·27	16·25	12·28	15·20	100·00

* Source: Family budget survey of workers.

The tea plantation workers spend proportionately less for housing. This may be due to the fact that tea plantation workers live in quarters provided by estate

owners. Workers in Tea plantations and workers at Munnar and Palghat spend proportionately higher amounts for clothing. About 60% is spent on food. A higher percentage is noticed (about 70) in the case of tea plantation workers, and all workers at Quilon and Trichur.

3. 8. *Elasticity of Expenditure:* Assuming the relation between the total expenditure, expenditure on the particular group and family size to be of the form $y = c\, x^a z^b$, where y is the expenditure on the particular group, x the total expenditure and z the family size. a; b; c, being constants, the partial elasticities on food and clothing are found for toddy tappers and tea plantation workers (a and b are the partial elasticities).

		Toddy tappers	Tea plantation workers
Food	a	1·0222	1·0079
	b	0·0083	0·0124
Clothing	a	0·3701	0·8953
	b	0·1219	0·3775

The elasticity of expenditure on food with respect to increase in total expenditure, is almost the same for the 2 occupational groups and greater than one. This means that increase in total income increases the proportion spent on food, which may be due to the fact that income of these groups of workers is insufficient to meet the expenditure even on necessaries. The coefficients of elasticity with respect to household size (b) are found to be small. This is positive in the case of toddy tappers and negative for tea plantation workers. This is because b represents the combination of two effects *ie*, increase in need when family size is increased and the decrease in per capita income when family size is increased. b is positive or negative according as the first effect is stronger or otherwise.

In respect of clothing, with total expenditure increasing, the expenditure on clothing increased at a very low rate. This is smaller in the case of toddy tappers. As in the case of expenditure on food, the elasticity with respect to average size is positive in the case of toddy tappers and negative for tea plantation workers.

3. 9. *Debt Position*: It is seen that the households in the various occupational groups had outstanding loans. According to N. S. S. 11th round 66·9% of agricultural labour households were with debt. 67% of tea plantation workers had also outstanding loans against them. Table 3.9 gives the percentage distribution of loans according to the purpose and average value of loans.

TABLE 3. 9

TEA PLANTATION WORKERS

Purpose	Percentage No.	Percentage amount	Average value per loan Rs.
Consumption expenditure	66	55·7	106
Capital expenditure	5	8 6	206
Education	2	0·9	66
Medical	8	6·8	105
Ceremonial	6	18·2	376
To repay loan	3	1·4	53
Others	10	8·4	108
Total	100	100·0	125

The average amount of loan in toddy tappers' households is Rs. 278·49. Loans are taken more frequently to meet houeshold expenses. Loans to meet medical expenses come next in order.

4. *Summary of findings*: The occupational groups toddy tappers, tea plantation workers and agricultural

workers are dissimiliar as regards the characteristics considered. Their occupation, enviornment and ways of life are entirely different.

The household size of agricultural labourers and tea plantation workers is less than that of the general population while that of toddy tappers is greater. In 1951 there was some difference between Tranvancore-Cochin and Malabar households which has narrowed down through the years. Though there is no conclusive evidence the survey results indicate that the size of the Malabar households has gone up.

Percentage of females is less than the percentage of males in agricultural labour and toddy tappers' households. The tea plantation workers have higher percentage of females as in the case of general population. The percentage of persons is above 40 in the age group 0-14 years in all these cases, the greatest being found in households of tea plantation workers. This incidently shows that the birth rate is also above 40. The fact that the percentage has increased slightly from its 1951 value indicates the decrease in infant mortality. There is no indication of any decrease in fertility in these groups or in the general population but there might have been some increase which is reflected in the proportion of children below 15 which can only be partially explained by a possible decrease in infant mortality due to improvements in medicine and public health.

The sex composition shows that there is proportionately large number of females in the households of tea plantation workers. This is in consequence of or antecedence to the fact that there are many female employees in tea plantation. There is sex selectivity in the occupations. The child-woman ratio (child below 5 to women 15 to 44) which approximately measures the fertility rate is nearly 800 per 1000 for toddy tappers and tea plantation workers. This is very large compared

to the general population which is nearly 666 per 1000. In the context of family planning these groups especially, the tea plantation workers and toddy tappers should be specially attended to.

The percentage of earners in agricultural labour households is almost the same as in the general population. 42% tea plantation workers are earners. Among toddy tappers only 21% are earners. There is thus a large burden of dependency on the latter group.

Only about 38% tea plantation workers are literate. Data are not available for other occupational groups about literacy.

The average earnings of toddy tapper is better than that of a tea plantation worker but the former has a large burden of dependency also.

The average expenditure for toddy tappers and tea plantation workers are almost equal. But the amounts spent on each item of expenditure are considerably different. The elasticity of expenditure shows that as more income is obtained, more is spent on food. This is against Engel's law and may be explained as due to the fact that these groups do not still have enough for their maintenance.

The two groups have outstanding loans. The average value of loans is greater in the case of toddy tappers than tea plantation workers.

To conclude it may be remarked that the main groups of workers considered here have a large dependency which is only increased by the decrease in mortality and the increase in fertility (in any case non-decreasing fertility).

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