Observations on the Collection of Vital Statistics in the Province of Eastern Bengal and Assam, India.

A thesis submitted for the examination for the Degree of Doctor of Medicine, Glasgow University,

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ARRANGEMENT.

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Introductory.

The importance of accurate statements of Vital Statistics is so generally recognised that no apology is required for dealing with this subject. The subject has received great attention in European countries for many years, but in Tropical countries, while registration is carried on in many places, it has not in the past received so much consideration from the Medical Profession as it should, and there appear to be three reasons why the subject should receive attention at the present time.

In the first place, owing to the growing prominence of tropical diseases on the horizon of the medical world, there is an increasing demand for figures which admit of comparison in different areas. If throughout our colonies and dependencies, registration and compilation of Vital Statistics could be carried out on the same principles as are adopted at home, material of incalculable value would be collected. This ought to be the aim of our Tropical Administrations, but as it is not yet possible to do so, those who desire to utilise such statistics should understand clearly the system of collection and compilation adopted in each area with which they have to deal. For example, the deathrate from Respiratory Diseases in the Province of Eastern Bengal and Assam during 1909 was .15 per 1000, and in Scotland it was 1.28, but no comparison is justifiable, because the former figure is based on popular diagnosis and the latter on professional diagnosis, and professional experience in the Tropics shews that many deaths, really due to Respiratory Diseases are reported by the people as due to "fever".

In the second place, our warfare against disease is fought in several stages and accurate statistics are called for all through the fight.

(1) The stage of awakening. An alarm arises amid the public regarding

the damage done to human life and interests by a particular disease. This leads to the production of funds for its investigation.

(2) Stage of Investigation. Workers with special experience of research are appointed and their first problem is to find the best centre for material. To help them, statistics are required, but unfortunately such statistics as are available are generally too inaccurate to give any help, and a centre for work has frequently to be chosen on very general grounds. In my own experience, the history of Blackwater Fever in the Duars is a case in point. Several years ago, two men of considerable fame in research work went to the Duars (Jalpaiguri district) to investigate Blackwater Fever. In ignorance of the facts, they arrived at a season when cases were uncommon and after a stay of ten days, during which they saw no cases, withdrew under the impression that although the disease no doubt occurred there, it did not occur on a scale to make the Duars a suitable centre for research work. As a matter of fact, had there been statistics to shew the seasonal variation of diseases in the Duars, they could have chosen a different time of the year and found as much material as they could cope with. This was afterwards seen when, in 1907, a Commission was appointed to work there. In many cases, this stage of investigation is happily concluded with the discovery of the causation of the disease and the way is paved for the third stage.

(3) Stage of localised public experiment. Given the causation, men with medical training and minds in which the administrative faculty is predominant, are able to devise schemes for the prevention of the disease. In tropical countries where the Government is generally in advance of public opinion, such preventive schemes are sent to Government and the latter, as keeper of the public purse, replies by offering to try the scheme in a limited area in order to test its value. In practical terms, the value of a scheme depends on its power for a reasonable expenditure and

without undue disturbance of the people, to reduce the deathrate to a reasonable extent. Obviously, here again, accurate statistics are required. When the scheme has justified itself thus, the way is clear for the last stage.

(4) Stage of general application. Here, too, accurate statistics are required both before and during the operation of any scheme.—The Medical Profession knows how gigantic have been the strides in research work during the last two decades, but how slow, on the other hand, has been the application of our knowledge to the public good. There has been a hitch in the proceedings and the minds of many influential men are still in doubt as to the practical value of our much vaunted research.

In my experience in India, we have reached the third stage, that of localised public experiment in many diseases, but we have been unable to complete this stage, that is, we have been unable to show that for a reasonable expenditure we can produce a reasonable reduction of the deathrate. Take, for example, the Mian-Mir experiments which have led to so much discussion and have been said to have retarded the practical application of our knowledge of malaria to the public good by ten or twenty years, the chief difficulty arose from the inability to prove statistically that good had been done. In 1904, I was deputed to take part in a scheme of surface drainage and oiling of tanks in Berhampore (Bengal) with a view to seeing whether any reduction of malaria was to be expected from such measures. That experiment lasted through several fever seasons but nothing came of it because examination of the statistics showed no difference and all that could be said was that intelligent members of the community thought that Mosquitoes were less prevalent than formerly. In 1906-7-8, experiments were undertaken in the towns of Jalpaiguri and Dinajpur by the Government of Eastern Bengal and Assam. Again nothing has come of those

experiments, because nothing could be proved statistically. In his report on Mauritius, Major Ronald Ross particularly emphasises the necessity for gauging the amount of malaria before and during operations for its suppression. I hesitate to estimate what proportion of the time of the expert officers he proposed to employ in testing the value of the operations, but it was very considerable.

Enough has been written to shew that Vital Statistics as dealt within the tropics do not give that amount of help in the fight against tropical disease which they might and ought to do. This appears to be at least one of the factors which is retarding progress at the present time.—In the third place, the time has already come when large sums of money are available for tropical sanitation. For the last two or three years, the Province of Eastern Bengal and Assam has had a grant of ℛ 3,000,000 (£20,000) for sanitation - and much of this will be thrown away or possibly diverted into other channels if our statistics are not sufficiently accurate to show what schemes are good and what are futile. It seems, then, that some one must turn attention to the subject and bring statistical methods up to date.

With regard to my own connection with the subject, for nearly five years (1905-1909) as the only Deputy Sanitary Commissioner of the Province, I had opportunities of watching the registration and compilation of Vital Statistics of that population (30 millions) -- opportunities equalled only by those of the Sanitary Commissioner himself, and I have felt impelled to record the results of that experience, because the subject urgently requires attention and being generally considered a dry and unattractive one, is not likely to be taken up except by those whom circumstances have thrown against it.

Scope.

It is my intention to deal only with the statistics of the general population of the Province. The methods of registration and compilation are typical of those of all the Provinces of India. It is, however, necessary to explain that there are other vital statistics compiled in India viz: those of the European and Native Troops, and of the Jail populations. These are all based on facts recorded or at least verified by European Medical Officers, and are statistics of more or less high value, whereas the statistics of the general population are necessarily based on popular diagnosis, for the millions of India mostly die beyond the reach of medical skill. The following arrangement of the subject will be most suitable.

(1) A short description of the country, people and administration.

(2) A description of the methods of registration, verification and compilation of Vital statistics.

(3) A discussion of the defects of these methods and their working.

(4) A comparison of some figures with Scotland's statistics for 1909, the Registrar-General's Report for that year having just been published.

(5) Discussion of the possibility of gauging the degree of inaccuracy of those statistics.

(6) The conclusions based on the work done for this thesis.

(7) An appendix containing statements of figures for the past decade arrived at by calculations not officially employed.

The works to which I have had access are as follows:-

Newsholme's Vital Statistics (1899)
Farr's Vital Statistics (1885)
Hardy's Memorandum on the Age Tables and Rates of Mortality of the Indian Census of 1901.

The Census Tables of Bengal and of Assam for 1901.

The Sanitary and Immigration Reports of the Province of Eastern Bengal and Assam for the years 1901-1910.

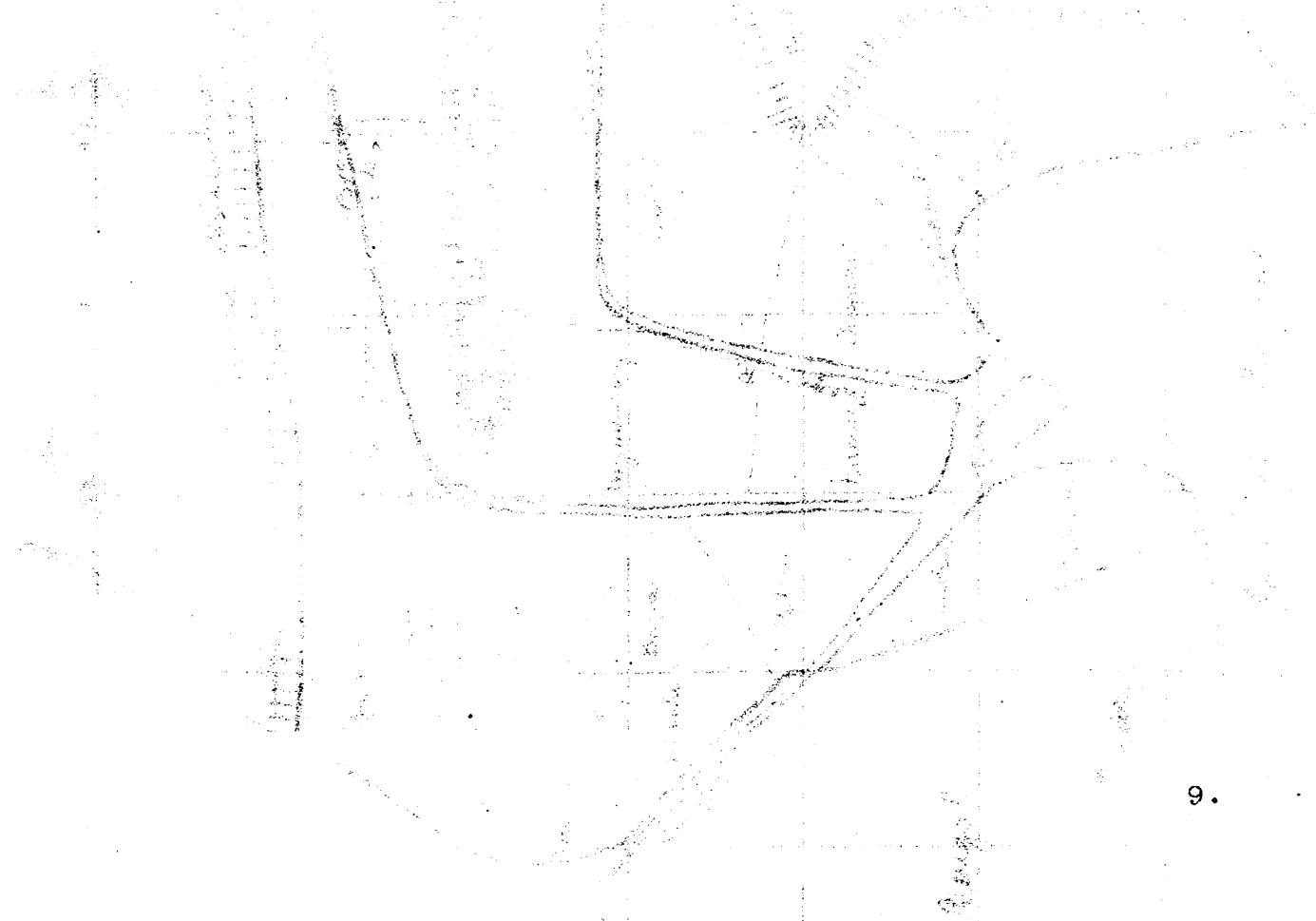
Some details of the Census of the Province (1911)

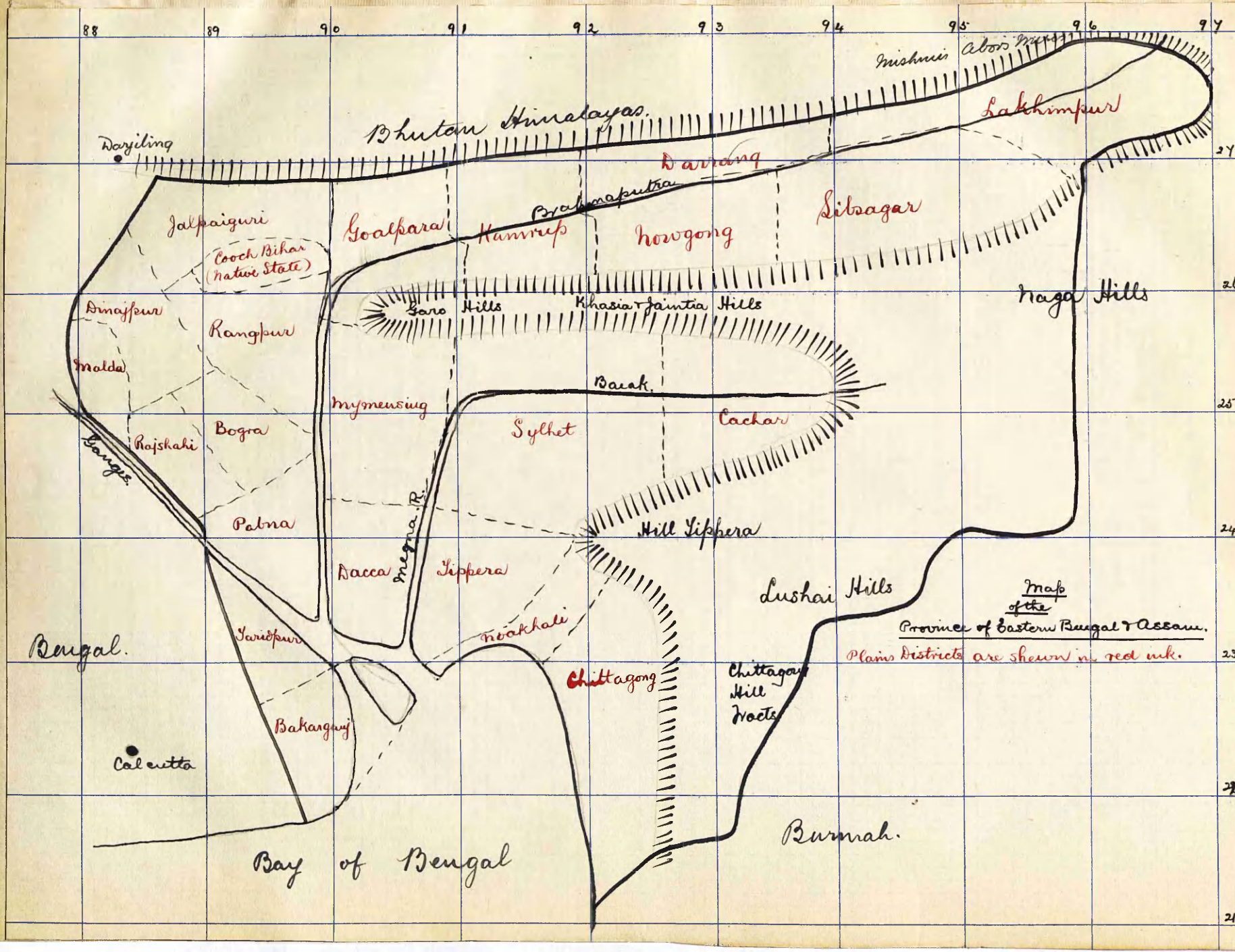
The calculations have been made with the aid of a Four figure Mathematical Table and a Faber's Calculating Rule.

I have to acknowledge my indebtedness to the Under-Secretary of State for India, to the Sanitary Commissioner of Bengal, to the Sanitary Commissioner ~~Assam~~ and to the Under-Secretary (Judicial Department) of Eastern Bengal and Assam, and to the Officer in Charge of the Census Enumeration of 1911 for supplying me with materials for this thesis.

1. Description of the Country, People, and Administration.

The Province of Eastern Bengal and Assam was constituted in October 1905, by the transfer from Bengal of 15 districts to the former Province of Assam. The Province lies between Latitude 21°N. and 28°N. and between Longitude 88°E. and 97°E. and occupies 106,130 square miles. Roughly speaking it is bounded on the west by a line drawn from Calcutta to Darjiling, on the north by the Bhutan Himalayas, on the south by the Bay of Bengal and Burmah, and on the east by Upper Burmah. The area contains extensive plains with a large tract of mountain in the eastern portion. It may best be described for the present purpose by reference to the accompanying rough map:

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Mishmis
Abors
Bhutan Himalayas.
Lakhimpur
Darjiling
Darrang
Brahmaputra
Sibsagar
Jalpaiguri
Goalpara
Kamrup
Nowgong
(Cooch Bihar (Native State))
Dinajpur
Rangpur
Garo Hills
Khasia & Jaintia Hills
Naga Hills
Malda
Barak.
Mymensing
Sylhet
Cachar
Bogra
Rajshahi
Ganges.
Patna
Hill Tipperah
Dacca
Megna R.
Tipperah
Lushai Hills
Map of the Province of Eastern Bengal & Assam.
Plains Districts are shewn in red ink.
Bengal.
Jessore
Noakhali
Chittagong
Chittagong Hill Tracts
Bakarganj
Calcutta
Burmah.
Bay of Bengal
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It will be seen that the eastern portion of the Province is occupied by a line of mountain running from north to south. From the main tract, two ranges extend towards the west, a northerly one ending in the Garo Hills and a southerly one ending in Hill Tippera. Between the Garo Hills range and the Himalayas which are outside British Territory, lies the Assam Valley with the Brahmaputra River flowing from east to west. Between the Garo Hills range and the Hill Tippera range, lies the Surma Valley through which the Barak River flows to the west to join the Megna River. These two Valleys with the intervening Hills formed the Province of Assam until 1905. The Assam Valley is divided into the following administrative districts: Goalpara, Kamrup, Darrang, Nowgong, Sibsagar, and Lakhimpur. The Surma Valley consists of the districts of Cachar and Sylhet. The rest of the Province is flat and consists of the 15 districts of Bengal which were transferred to Assam in 1905.

Population. The population varies somewhat in character. The Eastern Bengal districts are thickly populated. The people are Hindus and Mohammedans. The land owners and the upper classes generally are Hindus while the majority of the peasants are Mahommedans. They are on the whole intelligent and the Hindus, especially, grasp at educational advantages. In one district, Jalpaiguri (in the N.E. corner) the tea industry employs a large number of labourers who immigrate from Bengal for work. Some of these are Hindus but most of them have more primitive religions. Throughout Eastern Bengal, there is a considerable amount of temporary immigration during the harvesting season. Such immigrants are usually classed as Hindus but do not observe the principles of that religion at all strictly.

In the Assam Valley, the indigenous population is sparse.

The people are chiefly Hindus, and are lethargic, slow to learn, and quite wanting in enterprise. They are a peace-loving people and do not give occasion for much police work. In the Surma Valley the population of Sylhet is like that of an Eastern Bengal district, while that of Cachar conforms rather to the type of the Assam Valley. About one tenth of the population of Assam consists of coolies recruited for the tea industry from the same source as the coolies of Jalpaiguri district.—The mountainous country is peopled by various wild tribes of different origin from the plains people. They are only recently tamed savages, attempts at whose civilisation have been confined to the last thirty or forty years.

Towns. The population of the plains is almost entirely agricultural and towns are few in number. In 1911 the population under registration in the Province was 33,189,404 and of these only 700,117 lived in the 45 towns. From the Registrar General's Report on Scotland for the year 1909, it appears that 77.58% of the population live in towns, whereas in Eastern Bengal and Assam only 2.11% live in the towns. The towns of Eastern Bengal and Assam correspond fairly closely to the Scottish classification of Principal, Large, and Small Town districts. In 1911, there was only 1 town which would have been classified in the Principal Town Group of Scotland, there were 28 which would have been classified as Large Towns, and 18 as Small towns. In Dacca district, the town population amounts to 4.6% of the district population. This is the highest proportion of town population in any of the districts.

Occupation. In Eastern Bengal districts, the permanent population is occupied in growing rice and jute, with a little tobacco in Rangpur, and tea in Jalpaiguri and Chittagong. In Assam, the indigenous population is content to grow sufficient rice for domestic consumption and will do no further work, but all the districts except Goalpara produce large

quantities of tea. This, however, is worked by Europeans with imported labour.

From the statistical point of view, one may say that, the population to be dealt with in Eastern Bengal and Assam consists almost exclusively of peasants living on the produce of the land, whose increase from year to year is a natural increase, - dependent on the excess of births over deaths.

This statement must be qualified by three exceptions.

(1) The temporary labour force which floods Eastern Bengal at the time of the harvest is not present at the time of the Census enumeration, and births and deaths in this population would tend to make the rates of the districts in which they occur unduly high. Unfortunately no record of the number of such labourers can be obtained, as they travel into the Province without supervision and take work where they find it. At the same time, no effort is made to distinguish births and deaths among them from those of the permanently resident community. Hence the exact effect which this movement has on the birthrates and deathrates of Eastern Bengal cannot be defined. It is probably negligible, however, for the following reasons. With regard to births (a) a very small proportion of the immigrants are females, (b) the people who do come, only stop for four or five months and it is not probable that many women advanced in pregnancy will come. With regard to deaths, (a) The immigrants are chiefly healthy young males, whose deathrate would be small in any circumstances (b) they come into an area where, if disaster overtook them, it would be in the form of Malaria or Cholera. If overcome by Malaria, they are rendered incapable of work and leave the labour force for their own homes outside the Province, so that their fever deaths are not likely to be registered in the districts of this Province. If Cholera breaks out

among them, a panic arises and leaving their work, they rush home. Owing to Railway facilities, they can get out of the Province in anything from 8 to 24 hours, so that very few cholera deaths are likely to be added on their account.

(2) In Jalpaiguri district, work in the tea industry appears to be popular among the coolie classes and every year a large number of labourers troop in to make their own arrangements with the tea planters for daily, monthly, or the season's labour. Many of them settle down on the plantations while others go to their homes when the busy season is over. No records are obtainable of the numbers who come in or go out on account of the tea industry, and births and deaths among this class are included in the general statement of the district. Hence the births and deaths reported in a year in Jalpaiguri district, are those of the permanent population plus those of an unknown number of immigrants, minus an unknown number of emigrants. In this case, the amount of migration compared with the total population is so great that it is certain to affect the birth rates and death rates materially. There is not merely the natural increase to be considered, but an unascertainable amount of migration. Fortunately, Jalpaiguri is the only district in this position.

(3) The immigration of labour for the tea industry in Assam is on a scale sufficiently large to have an appreciable effect on the increase of population, but such immigration is carried on under strict Government supervision and hence separate statistics are available from which to gauge the exact effect of this factor.

Administration.

At the present time, the administration of the Province is not uniform The lack of uniformity depends on several conditions, such as the stage

of development of the people, the policy of Government with regard to different communities, and the varying ideals of officers who have left their mark on the administration. In order to realise the nature of the present administration of the Province, it is necessary to know that the Province of Assam at one time consisted of the Assam Valley with the neighbouring hills. At that time, Goalpara and Sylhet (which then included Cachar) were part of Bengal. Having received the stamp of Bengal Government, Goalpara and Sylhet were many years ago transferred to Assam and Sylhet was divided into Cachar and the present Sylhet. Finally, as recently as 1905, the remainder of the Province was transferred from Bengal. At the present time, therefore, there are really four types of administration, viz: that of the Assam plains, that of Bengal, and a mixture of the two in Goalpara, Sylhet, and Cachar, with a special type in the hill tracts.

Administration of the Hill Tracts. This may be dealt with in a word, as these tracts hardly come within the scope of this paper. The policy of Government has been primarily to keep these inhabitants to their own hills, to prevent them from raiding the plains and each other's villages. This has been done effectively by establishing military posts throughout the hills. The tribesmen have to pay a poll tax, and beyond suppressing murder and collecting the tax, there is little interference with the people. Of recent years, these tribesmhave settled down to a remarkable extent, and the influences of civilisation are beginning to tell upon them, but attempts at the registration of Vital Occurrences are only local and of the most primitive type. The results are carefully excluded from the returns of the Province which thus refer exclusively to the plains districts. In order to measure the extent of this exclusion, it will be sufficient to note that the population of the Province

In 1911 was 34,594,382 and of these 33,189,404 were under registration. There were, thus, 1,404,958 persons in hill tracts of whom no records were kept.

Administration in the Plains Districts. The business of the Provincial Government in India is to draw money from the land as rent, and to disburse the amount so collected as far as possible for the general good of the people from whom it has been drawn. The Government is like the valve in a pumping system. The Land Revenue Collecting system corresponds to the tube up which the water is drawn, and the Police, Educational, Engineering, Medical and Sanitary systems are the delivery tubes by means of which the money is redistributed where it is most required. For the present purpose, it is necessary to describe only the Revenue collecting, the Police and the Sanitary Systems.

Land Revenue Collecting System. The seat of the Provincial Government is Dacca where the chief Treasury is situated. For the purposes of administration, the Province is divided into 5 Divisions, viz: Dacca, Chittagong, Rajshahi, Surma Valley, and Assam Valley. In Charge of each Division is a highly-paid senior officer, designated the Divisional Commissioner. Each Division is subdivided into districts of which there are 19 in all. There are 4 in the Dacca Division, 4 in the Chittagong Division, 3 in Rajshahi, 4 in the Surma Valley, and 8 in the Assam Valley. In Chittagong Division, one of the districts is a hill tract, in the Surma Valley division, two, and in the Assam Valley two, are hill tracts. A plains district in any of the first three divisions has from 1 to 4 million people, but in the last two divisions where the population is scattered, only one district has over a million, the others have more or less half a million. The District is the unit of administration,

and is controlled by an experienced officer of the Indian Civil Service, whose duties are primarily those of Magistrate and Revenue Collector. For purposes of revenue collection smaller division of the districts are generally necessary. Experience in India taught the Moghul Emperors and later British Administrators that a multiplicity of petty revenue officials leads to abuse and corruption, hence a system of contracting for revenue collection has arisen within the districts.

In Assam, in accordance with this system, each district is plotted out into Mauzas. These are areas from which a rental of £2000 or £3000 is expected. Each such area is let out to a contractor who is called the Mauzadar. This man undertakes to collect the land-rents in return for a commission on the amount collected. He should be a local man of good position and if he proves worthy, the mauzadarship will pass down in his family, but if a mauzadar turns out to be corrupt, he is liable to lose his contract and be replaced by a better man at any time. Thus although he is not a paid official, he is under very considerable control from Government. Every Assamese village has its own village headmen, who are called "gaonburas". These men are appointed by the villagers subject to government approval, and act generally as the representatives of the village. The peasant pays his land-rent either directly or through the gaonbura to the mauzadar who hands his total collections to the District Magistrate and Collector. The latter then passes on the details of his collections through the Commissioner to the Provincial Government. In this system, it must be noted that the Mauza is a fixed area, while the mauzadar is liable to change.

In Bengal the system is different. Under the Permanent Settlement of Lord Cornwallis, portions of the districts were made over to certain

families for ever, on condition of their paying a fixed amount annually to Government. In course of time, these families have been allowed to buy and sell land to such an extent that now there is no permanent area corresponding to the Assam mauza, and the Collector receives the land-rent in a lump sum from the landed proprietor and has no concern with the question of whether the latter has succeeded in getting his rents from the peasants. Thus, while in Assam the Revenue Collecting Department penetrates to the peasant through the Mauzadar and the gaonbura, in Eastern Bengal it only reaches the pockets of the great landed proprietors. The following districts are of the Bengal type: Dacca, Mymensing, Faridpur, Bakarganj, Chittagong, Tippera, Noakhali, Rajshahi, Dinajpur, Jalpaiguri, Rangpur, Bogra, Pabna, Malda, Sylhet, and Goalpara. The remaining districts, viz: Cachar, Kamrup, Darrang, Nowgong, Sibsagar, and Lakhimpur are of the Assam type. In order to give an idea of the size of an Assam mauza, it may be said that a mauza consists of about 50 square miles of country, has about 18 villages each of which may have more than one gaonbura, and 1100 to 1200 inhabited houses. The district which is the smallest revenue collection unit in Eastern Bengal, has from 3000 to 8000 villages, and from 200,000 to 1700,000 inhabited houses.

Police System. In this department, Government retains full control of the establishment, and the officers down to the constable are paid servants of Government liable to transfer from one district to another. In each district, there is a superintendent of Police who works under the orders of the Magistrate and Collector. For Police purposes most of the districts are further ~~sub~~-divided into Sub-divisions. In each such Sub-division, there is an Inspector of Police who is subordinate to the

uperintendent. Each subdivision is then divided into thanas, that is, reas containing more or less ~~than~~ 100,000 inhabitants. In each "thana" here is a police office, with a varying number of Sub-inspectors and onstables, the senior sub-inspector being designated the "Officer in harge of the thana". In each Police station, one constable of better ducation than the rest, is detailed for office work under the designat-on of the "Writer-Constable". In Assam, a thana embraces a number of omplete mauzas, and no more detailed distribution of the police is ound necessary. Thus, in Assam, while the revenue collecting depart-ent has a unit of area comprising a gaonbura's circle, the police unit of rea is the thana, which is very much larger than the former. In East-rn Bengal on the other hand, where more police control is necessary, he thanas are further subdivided into "police unions", and Chowkidar's' eats. A chowkidar's beat consists of 100 houses, and a chowkidar or illage watchman is a person who is paid to walk through the village at ight and see that all is well. He must in addition, appear at the police tation once a week to report the state of his village. Ten chowkidar's eats form one "union," and in charge of the ten Chowkidars, there is a duffadar", who is a sort of sergeant of the chowkidars. He is responsi-ae for bringing his chowkidars to the weekly parade at the police office, nd if, from ill-health, any chowkidar is unable to attend the parade, the uffadar is expected to bring the report of that man's beat. Thus n Eastern Bengal, the Police Department controls units of rea comprising 100 houses, while the Revenue Collecting department has o smaller unit than the District. Again it will be observed that the olice unit in Bengal contains 100 houses or approximately 500 persons nd is more or less near to the size of a gaonbura's circle in Assam, which

has from 200 to 300 houses and 1000 to 1500 persons.

Sanitary System.-- The system of sanitary administration is not so simple and the direct control of Government is less than in either of the systems already described. Lord Ripon was a keen advocate of the doctrine of teaching local selfgovernment to the Indians, and since his time there have been Local Authorities who deal with such matters as education, communications, sanitation, and medical relief. The Chief Local Authorities which have been founded are Municipalities, Local Boards in Assam, and District Boards in Bengal. Municipalities or towns are areas containing a population of at least 3000 of whom two thirds are non-agricultural. These are controlled by Municipal Commissioners who are partly elected by the people and partly nominated by Gogernment. They raise funds partly from Government grants and partly by direct taxation for roads, education, sanitation and so on.

The Local Boards of Assam are practically equivalent to County Councils in this country and their boundaries are identical with those of the Sub-divisions. The members are elected as in a Municipality and the funds are expended on similar accounts.

The District Board of Eastern Bengal is similar to the Local Board of Assam, but the boundaries are those of the district.

At the headquarters of each district, there is a European Medical Officer, the Civil Surgeon, who is a paid servant of Government. His duties are primarily those of Government, i.e. the care of the health of officials, the performance of medicolegal work, and the control of the district Jail, but he is also detailed to manage the medical affairs and to advise on the sanitary affairs of every Local Authority in his district.

On the Staff of the Province, there are two Medical Officers, the Sanitary Commissioner and the Deputy Sanitary Commissioner, whose whole time is devoted to preventative medicine. The Sanitary Commissioner deals with all public health matters, and in fact corresponds to the Medical Officer of the Local Government Board in this country.

The Sanitary measure which has been worked out in greatest detail is vaccination. Here it has been felt that there is something tangible to go upon, and the Government and the Local Authorities have between them raised machinery for combating the ravages of smallpox. The Sanitary Commissioner in addition to his general duties, controls a special Vaccination Department. On his staff, there is a number of Inspectors and Sub-Inspectors of Vaccination. The strength of this service is sufficient to allow him to detail one Inspector to each district and one Sub-Inspector to each Sub-Division. The Civil Surgeon with the help of these men organises the work of his own district, each Local Authority supplying the funds necessary to carry on the work within its jurisdiction. The actual work of vaccinating is carried out by men who are enlisted for that particular purpose, not by qualified medical men. The work is carried on from the middle of October till the end of March, and the Inspecting staff is fully occupied from the beginning of September in organising the winter's work; from November till March, they are in the closest possible touch with the people, going from village to village and from door to door, checking the work of the vaccinators, and in April they are occupied in compiling returns of the season's work.

With these short notes on the country, people and administration, it will not be practicable to appreciate the details of the system of registration and compilation of Vital Statistics which has gradually been evolved in the Province.

II. Description of Methods of dealing with Vital Statistics.

Registration.

Up till the present time, the Vital Occurrences which have been dealt with are the births and deaths, Marriages among orthodox Hindus and Mahommedans are not registered. In fact, marriages are only registered when the parties desire to have them recorded, as being in accordance with some special form, as, for example, among some sects of reformed Hindus.

In the greater part of India as in Assam, the Land Revenue Collecting Department is the one which reaches most nearly to the people in their homes. There are the districts with the Collectors at their head, then the Mauzas with a Mauzadar resident in each, and lastly the gaonburas circles with a gaonburas permanently resident in each. The application of a registration system to this is simple. A "hathchit" (handbook) is placed in the hands of each Gaonbura, and he is instructed to note occurrences in his limited circle in this book from day to day, and to bring or send his book to the Mauzadar at the end of each month, to have the necessary entries made in the "Nominal Register". The Mauzadar is really the local Registrar of Births and Deaths, and the Nominal Register in his hands is the permanent record of the occurrences. A point to be noted is that there is no legal responsibility on the public to notify occurrences to the gaonbura. The latter is expected to keep his ears and eyes open and to make his notes after personal enquiry at the houses. A general calculation will give an idea of what is required of the gaonbura in practice. His circle contains/

contains 1000 to 1500 persons. Now, if it be granted that the Birth-rate is about 50 and the deathrate about 40 per mille, he should have from 90 to 135 occurrences to record in the course of a year. Thus the tax upon his services is small. The next step is to have the information passed on to Headquarters of the district for compilation. In those districts of the province to which this system applies, the mauzadars send monthly abstracts to the Civil Surgeon, in whose office/ district totals are made, and a copy forwarded to the Sanitary Commissioner for the Provincial returns. The Civil Surgeon/ has no staff to prepare ratios/ or elaborate calculations, but he is expected to study the returns as they come in, and call the Magistrate's attention to any abnormality which he notices.

In those districts where the Permanent Settlement of 1793 is in force, this system of working through the Revenue Department is not possible, but the Police Departmental system, on the other hand, is well adapted for the purpose. Inside the district, there is the Sub-division, inside the sub-division the thana, inside the thana the police Union, and inside the Union the Chowkidar's beat. The police department has accordingly been utilised. The hathchit or handbook is placed in the hands of the Chowkidar and he is instructed to note all the occurrences of his beat day by day, and bring his book to the Police Station when he attends the weekly parade. The Writer-constable collects these books from/

from all the chowkidars who are present and enters the details in the Nominal Register of the thana, returning the books to the respective chowkidars the same afternoon. Here, again there is no legal responsibility on the part of the public to record occurrences. The chowkidar has to make his own observations by personal inquiry at the houses. As his circle embraces about 500 people, he cannot have more than 45 or 50 occurrences to report in one year unless an epidemic occurs. The Officer in charge of the thana is really the local registrar and the writer-constable is his clerk. The officer in charge of the thana sends an abstract to the Civil Surgeon at the beginning of each month. The Civil Surgeon compiles a district return and forwards a copy to the Sanitary Commissioner as in Assam.

The following statement shews the districts in which these two systems are employed.

(1) The Nominal Register is maintained in the thana(police department) in:-

Dacca
Mymensing
Faridpur
Bakargany
Chittagong
Tippera
Noakhali
Rajshahi
Dinajpur
Jalpaiguri
Rangpur
Bogra
Pabna
Malda
Cachar
Sylhet
Goalpara.

(2) The Nominal Register is maintained by the Mauzadar in:-

Kamrup

Darrang

Nowgong

Sibsagar

Lakhimpur.

So far, the Systems of registration which apply to the vast majority of the population have been described, but there are 3 large groups and 3 small groups of populations which remain to be dealt with. These are (1) the imported labour of the Assam Tea Estates.

(2) the imported labour of Jalpaiguri Tea Estates

(3) the Municipal populations.

(4) the population on railway lands.

(5) the population on steamers plying on the great rivers.

(6) the population in institutions.

Registration of imported labour in Assam Tea Estates. Under the Assam Immigration Act VI of 1901, the Manager of a Tea Estate is compelled to arrange for the registration of all births and deaths in the cooli population of his estate. In the Assam districts, thana Officers and mauzadars have nothing to do with the registration of those portions of the thanas or mauzas which belong to tea estates. The Manager of the estate sends a monthly abstract to the Magistrate at the district head-quarters. In the Magistrate's Office, such compilation as is required by the Immigration Act is done, but a specially prepared abstract is forwarded by the Magistrate to the Civil Surgeon to be included in his statement for the Sanitary Commissioner of the Province. The Nominal Register of the tea estate is maintained by the Manager of the estate.

Registration/

Registration of imported labour on Jalpaiguri Tea Estates.

In this district, the system of unions and chowkidar's beats applies only to those portions of the district which are outside of the Tea estates. Thus the ordinary registration system of an Eastern Bengal district is not applicable. On the other hand, the labour force is recruited without the aid of the Immigration Act, so that the system of the Assam tea estates is not applicable. In order to meet this difficulty, the Managers agreed to collect the information on their respective estates and to send their own messengers with the details to the nearest thanas once a week. Thus, the figures for these tea estates come into the correct thana registers, but through an agency which is not directly under Government control. Recently occasion arose for testing these statistics, and it was found that they were very deficient, and steps are now being taken to get greater accuracy. In the meantime, as stated on page 13, the data available are not sufficient to calculate what has been going on during the past ten years but there is reason to believe that the deathrate has been very high.

(3) Registration in Municipalities. It is a matter of general experience that the population of a town is more enlightened than that of the rural tracts, and in the towns an effort has been made to secure accurate registration as in this country by throwing the onus of notifying events on to the public. The Act for the better registration of Births and Deaths (1873) is similar to the English Act, but the time limit within which an occurrence must be registered is 8 days. The Act has been applied only to particular areas, in which it has been considered that it could be efficiently utilised/

utilised.

In order to show the extent of the application of this Act, it will be necessary to describe some further details of Local Self Government. The Bengal Municipal Act of 1884 recognises only one Local Authority, namely, the Municipality. It is in force in all the Eastern Bengal and in one or two of the Assam districts. There are 36 Municipalities under this Act. The Bengal Municipal Act of 1876 which is in force in the remainder of the Province recognises three local authorities, viz:- Municipalities, Stations, and Unions. The Municipality is similar to that constituted under the more recent Act. The Station is a smaller area controlled by a Committee nominated by Government and with more restricted powers than a Municipality, while the Union is merely an area slightly more congested than an ordinary rural tract, such as arises around the headquarters of an out-lying Sub-division. The Sub-divisional Officer controls the affairs of the Union and has power to raise a little money to clean the main Street, provide a public privy, and so on. The Act for the better registration of Births and Deaths (1873), is at present applicable only to Municipalities, Stations, Unions, and one or two Sub-divisional headquarters which have not yet reached the dignity of Unions.

The following statement shews the areas in which registration is compulsory (that is, in which the onus of reporting occurrences rests with the public) with in most cases the 1911 Population.

Statement shewing the areas in which the onusm of reporting Vital occurrences is thrown on the Public.

Town.	Population 1911.	Town.	Population 1911.
Dacca	108,557.	Nattore,	8,251.
Marainganj,	27,876.	Dinajpur.	15,945.
Mymensing,	19,853.	Jalpaiguri,	11,469.
Muktagacha,	6,555.	Rangpur,	16,429.
Netrakona,	13,740.	Bogra,	9,113.
Jamalpur,	21,109.	Sherpur,	4,088.
Sherpur,	15,591.	Pabna,	19,274.
Kishorganj,	18,026.	Serajganj,	24,777.
Bogitpur,	10,833.	English Bazaar.	14,322.
Tangail,	16,362.	Malda (Old)	3,750.
Faridpur,	13,131.	Nawabganj.	23,322.
Madaripur,	19,073.	Silchar,	8,785.
Barisal,	22,473.	Hailakandi (U)	1,338 (1901)
Jhalakhati,	5,979.	Sylhet.	14,457.
Nalchiti.	1,953.	Karimganj (U)	5,692 (1901)
Pirojpur,	11,996.	Moulvi Bazaar.	2,481. "
Patuakhali.	6,217.	Habiganj (U)	5,286. "
Chittagong,	28,766.	Sunamganj.	3,530. "
Cox Bazaar.	4 378.	Dhubri.	5,808.
Comilla.	22,692.	Goalpara.	5,964.
Chandpur,	12,717.	Gauhati,	12,481.
Brahmanbaria,	22,235.	Barpeta.	10,739.
Noakhali,	7,009.	Tezpur,	5,355.
Rampur Boalia.	23,406.	Mangaldai.	4,711 (1901)
		Nowgong,	5,433.
		Sibsagar (S)	5,712 (1901)
		Jorhat,	5,231.
		Golaghat (U)	2,359 (1901)
		Dibrugarh	14,563.
		North Lakhimpur,	1,498 (1901)

A few words will show how the Act is worked in these different areas. In all Municipalities formed under the Act of 1884, there is a Police station (thana headquarters). The Nominal register of the Municipality is kept by the Writer - constable and the people either report directly or through the constable on the beat. Once a month, the writer-constable makes up an abstract and forwards it to the Civil Surgeon. This system of working through the Police was started in 1891, after a fair trial through the Municipal offices had been found unsatisfactory. In the case of Municipalities formed under the Act of 1876, a specially selected gaonbura is appointed for each ward of the town, and he is given a "hathchit" similar to that of the rural gaonbura or chowkidar. The public are expected to call at his house and report occurrences. At the beginning of each month, the gaonbura repairs to the Municipal office, where an Abstract by Wards is maintained, and a statement for the whole town is made up and forwarded to the Civil Surgeon. In this case, there is no Nominal Register except the hathchit of the gaonbura. In the case of a Station, Union, or Sub-divisional Headquarters, a similar arrangement is made but the gaonbura submits his book to the Sub-divisional Officer by whom the abstract for the Civil Surgeon is made.

(4) Registration on Railway Lands. The population living on railway lands are all railway employees and their dependents. Each Stationmaster keeps the Nominal Register for his own station-yard and the staff on the line up to a point midway between his station and the next. He submits a monthly abstract to the Chief Medical Officer of the Railway. The latter submits returns arranged according/

according to districts to the Sanitary Commissioner who re-distributes the facts to the respective Civil Surgeons. Generally speaking the number of railway servants per district is so small that even a considerable inaccuracy in these returns would not affect the district figures materially. Reference to Census Reports -- Table XV. Occupation, Part B, Details for districts, Class E, Order XlX, Transport and Storage -- Railways, will shew the number of railway employees per district at each Census, and by watching the proportion of these to the general population, it would be possible to see if in any Census year where Railway Registration was likely to affect materially the district figures of the ensuing ten years. The following statement taken from the 1901 Census figures shews that nowhere was the proportion of Railway servants greater than ·335 per cent of the district population.

District	Total Population 1901	Railway Population 1901	Proportion of Railway to total population.
Dacc.	2,644,435	1,210	.046 %
Mymensing	3,915,068	364	.009
Faridpur	1,947 733	1,511	.078
Bakarganj	2,291,752	24	.0001
Chittagong	1,353,250	2,080	.153
Tippera	2,117,991	181	.0086
Noakhale	1,141,728	66	.0058
Rajshahi	1,462 407	478	.033
Dinajpur	1,567 080	900	.057
Jalpaiguri	787, 380	1694	.216
Rangpur	2,154,181	5148	.240
Bogra	854,533	506	.059
Pabna	1,420,461	1426	.100
Malda	884,030	17	.002
Cachar	414,781	140	.034
Sylhet	2,241,848	566	.025
Goalpara	462,052	266	.058
Kamrup	589,187	792	.134
Darrang	337,313	127	.038
Nowgong	261,160	220	.084
Sibsagar	597,969	1,504	.252
Lakhimpur	371,396	1,242	.335
Province	29,812,735	20,525	.069

(5) Registration of occurrences on vessels plying on the great rivers of the Province. Rules have been framed for the notification of deaths from the infectious diseases on steamers at the nearest sub-divisional headquarters. Births, and deaths other than from Cholera are likely to be very few, so that this population may be neglected. There is also a considerable traffic in country boats, but here, again, Vital Occurrences are probably few, except in an outbreak of Cholera. In such cases, the bodies are probably thrown into the river and events not reported at all.

(6) Registration of occurrences in public institutions. The institutions of the Province are Jails, Hospitals, and Lunatic Asylums. Occurrences in these are simply registered in the town in which the institution is situated, and no distribution is carried out. Although this may not seriously affect the figures of the districts to which the individuals belong, it must vitiate seriously the statistics of the town in which they are recorded, because a Jail population is concentrated from a whole district, and in some cases from several districts, while Hospital and Asylum deaths are usually those of persons from without the town. In order to give some idea of the relative numbers registered by these various methods, the following statement has been constructed from official records:

Total/

Total population under registration in 1901	29,812,735
On Tea Estates in Assam	664,000
" Jalpaiguri, about	115,000
In Municipalities etc.,	636,000
On Railway Lands,	20,500
On Steamers etc.	unascertainable
In Institutions, probably about	10,000
General population registered through chowkidars and gaonburas, about	28,367,235

Verification. The various methods of registration being understood, the system of verification may be considered. Sufficient importance has not been given to the necessity for verification of the records. In that proportion of the population which is registered through the chowkidars and gaonburas, and in Municipalities, verifying officers are detailed to travel from house to house enquiring into all occurrences of the previous 12 months. These officers note in their books all the events of which they obtain particulars. They, then, proceed to the chowkidar's or gaonbura's house and compare the facts they have noted with the entries in the hathchit, marking those which have been omitted by the chowkidar or gaonbura. On returning to headquarters, these Officers prepare statements of all the omissions which they have detected and submit them to the Civil Surgeon, who keeps a record of the numbers of investigations made by each officer and forwards the detailed statements to the necessary authority in order to have the omissions made/

made good in the Nominal Registers. The officers who have been detailed to verify occurrences are the Inspectors and Sub-inspectors of Vaccination. They do this work only between April and September, when they are not required for the supervision of Vaccination work. In areas where the Nominal Register is kept by the Police and the reporting is done by the Chowkidar, the Civil Surgeon sends the detailed statement of omissions to the Superintendent of Police, and this Officer orders the insertion of the facts in the proper register and the punishment by a fine of the defaulting chowkidar. In an area where the mauzadar keeps the Nominal Register, the Civil Surgeon sends the detailed statement of omissions to the Magistrate and Collector. This Officer orders the insertion of the facts in the proper register and the punishment of the gaonbura who has failed to record the event. In Municipal and other compulsory areas, the detailed statements are sent to the Chairman of the Local Authority concerned and he should prosecute those members of the public who are in default.

Apparently there is no system of verification on the Tea Estates of Jalpaiguri or Assam, or in any of the minor populations already mentioned. In addition to the Officers of the Vaccination Department, the subordinate officers of the Revenue and Police Department are instructed to verify occurrences in the areas in which their respective departments are responsible, but the work is chiefly done by the Vaccination staff.

In order to give an idea of the amount of verification which is actually done, the following facts are taken from the Provincial Sanitary Reports of 1909 and 1910.

The total recorded occurrences in 1909 were 2,216,772, the number verified was 322,829, and the number of omissions detected was 6,729.

The total recorded occurrences in 1910 were 2,136,920, the number verified was 327,768 and "4% of omissions were detected."

Inspection. Every superior officer in inspecting his subordinates is responsible for seeing that they carry out the duties required of them in connection with registration/ and verification of Vital Occurrences.

Compilation. The foregoing description of the methods of registration has paved the way for the consideration of the nature of information recorded and compiled.

The "Hathchit" or handbook of the chowkidar, village gaonbura or specially selected gaonbura of the town ~~are~~ is essentially the same. The headings are printed in Bengali or Assamese so that each man may have a book in the language which he knows best. The information required of a birth/ is the date of occurrence, the name of the parent, and the sex. The book itself bears the name of the area to which it applies. Concerning a death, the information required is the date, name, age, sex, and religion of the deceased and the supposed cause of his death.

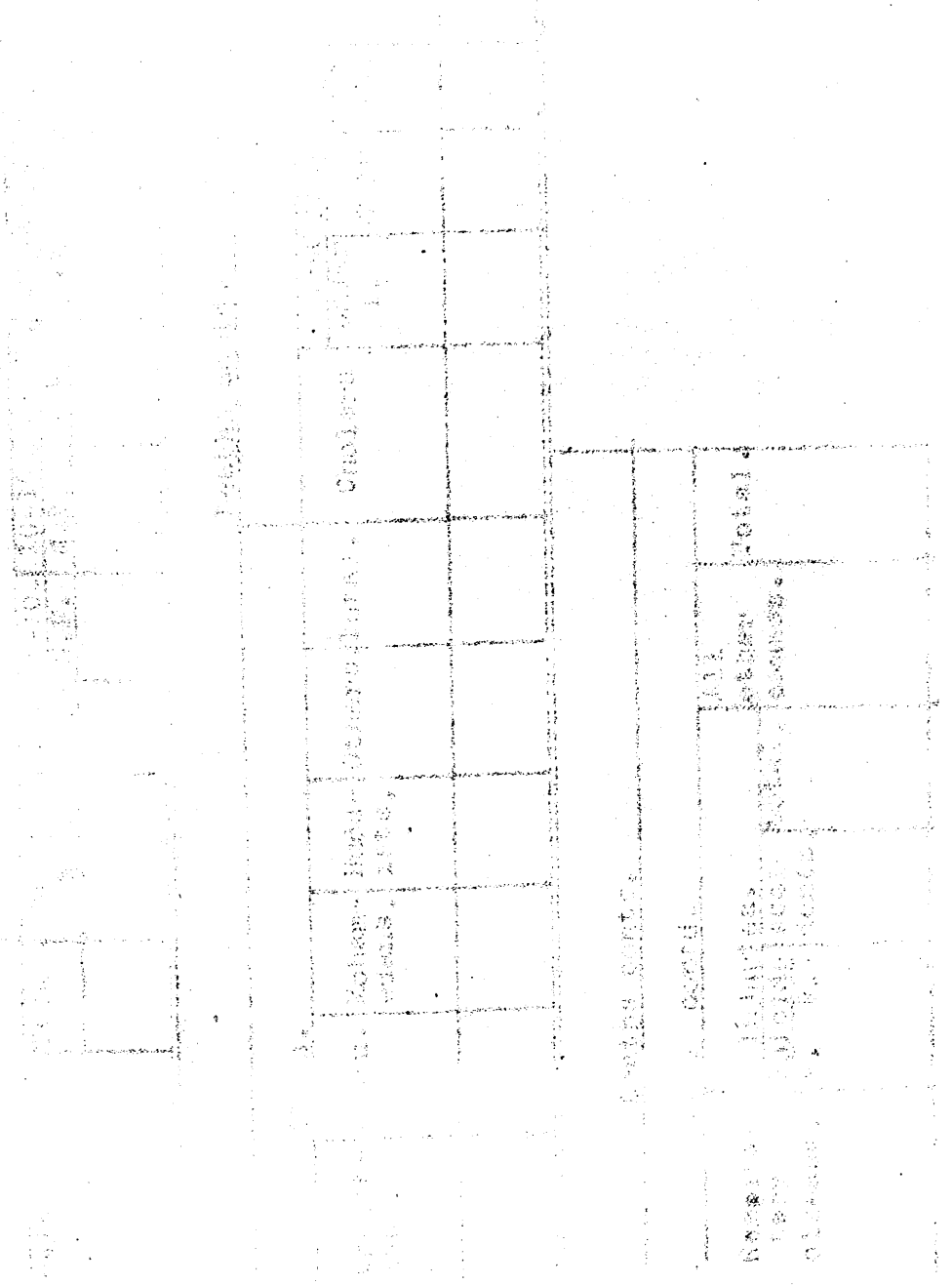
The "Nominal" Register of the Mauza, thana, or "1884" Municipality is filled from the hathchits. The same information is recorded, but there are additional columns for the name of the reporter and the exact area of the occurrence. The nominal register of a thana or mauza does not contain the events in their chronological order. If Monday is the Parade day for the chowkidars of Unions 1,3,5, etc., then Tuesday is the Parade day for those of Unions, 2,4,6, etc., and when the Writer-constable posts his register on Monday, he takes, first, the facts from the book of chowkidar No 1 of Union No.1 and posts a weeks' entries and so on. As a result, if one wants to examine the deaths of a particular Union, one does/

does not find them consecutively grouped together but, first a week's entries in one place, then another week's entries in another place, and so on. This is an inconvenience, but the only solution would be to have a Nominal Register for each Union. A Union has a population of about 5,000 and Union registers will one day be necessary, but at present the staff could not keep them, the Sanitary Department is not sufficiently developed to make regular use of them, and finally although Districts, Sub-divisions, thanas and mauzas have crystallised into definite areas which are unlikely to undergo changes, the Unions have not yet taken their permanent shape, and every year the boundaries of a number of Unions are altered. As every alteration means an alteration of the number of inhabitants, it would not serve any useful purpose to start separate accounts of Union figures ~~unless~~ until such alterations have practically ceased. In the case of a Mauza register one finds a group of one months' births or deaths of one gaonbura's circle followed by a group of another circle in the same way as in the thana register. The Register of an "1884" Municipality is posted in chronological order. In most Assam towns there is no Nominal Register. It is replaced by the Abstracts of Wards. For some reason, which is not clear, the towns in Sylhet and Cachar have one set of Registers in the Municipal Office and another set in the Police Office. In accordance with law the Public are supposed to report at the Municipal Office while the Police carry on a duplicate system of registration on information supplied by the constables on their rounds. The Nominal Register maintained by the Manager of a Tea Estate in Assam is prepared by the Immigration Department, and is fuller in detail than the others.

The/

The register maintained by the Railway Station-master is an English reproduction of the thana or mauza register.

Each Registrar, closes his book on the last day of the month and makes an Abstract of the month's occurrences to be sent to the District Headquarters. Forms of the abstracts from all these sources are similar, and a copy of it is reproduced below.



Month

Births.			Deaths.																	
			Age.																	
Male.	Female.	Total.	Under 1.		1-5.		5-10.		10-15.		15-20.		20-30.		30-40.		40-50.		50-60.		over 60.		Total.	
			M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.

Deaths contd.

Class.						Cause.							
							Smallpox.						
Christians.	Hindu.	Mohamedans.	Buddists.	Others.	Total.	Cholera.	under 1.	1-10.	over 10.	Plague.	Fever.	Dysentry & diarrhoea.

Deaths conts.

Cause contd.					
	Injuries.				
Respiratory diseases.	Suicide M.	Suicide F.	Accidents.	total.	All other causes.	Total.

As previously mentioned the Civil Surgeon merely enters the facts of each registering circle on a combined statement, makes totals for the district, and passes on this statement to the Sanitary Commissioner's Office at the Provincial Headquarters.

In the Sanitary Commissioner's Office, a separate register is kept for each district, and entries are posted month by month as the district statements are received. From these registers, this office can readily compile district statements of births and deaths, while by reference to the Civil Surgeons' monthly statements, it can also, when required, calculate rates for any individual registering circle. As a matter of practice, the Sanitary Commissioner publishes a monthly statement shewing the deaths of each district and of each of the Principal towns classified by cause. In the annual Return, he publishes the facts relating to births and deaths of each district, but not to separate registering areas.

Every Province of India publishes such returns, and it is from these that the statements for all India are calculated -- Statements which ultimately find their way into the Vital Statistical section of the Statistical Abstract of India.

III. Discussion of the defects of the Vital Statistics.

It is necessary to keep distinctly in one's mind the difference between faults in a system and weak points in the working of that system.

Registration.

So far as registration is concerned, the systems are on the whole well adapted to the circumstances. Government has to deal with an uneducated public who do not appreciate the necessity for giving information to the authorities, and hence is forced to send out agents to collect its information. In Assam, there is assuredly no one so well adapted to be the agent for collecting information of vital occurrences as the village gaonbura; and in Eastern Bengal, there is no one so well adapted for the purpose as the village chowkidar. In the Assam tea estates, the Immigration Act gives practically compulsory registration, and in Municipalities the Births and Deaths Registration Act of 1873 gives true compulsory registration. The only weak point of any magnitude lies in the want of a proper system in the Jalpaiguri tea estates. Here the question is not merely one of collecting information regardingbirths and deaths, but also of immigration and emigration. The practical solution of this problem appears to be that Government should place in the area a set of fairly educated registrars allotting to each a definite area in which to work. Such officers would require to find out and record daily the number of persons who came into their circles from beyond the Province, the number of persons who left their circles for destinations beyond the Province, and the particulars of all vital occurrences in their circles. These officers could send statements of the vital occurrences of their circles weekly to the proper thanas, and submit their migration statements monthly to the Civil Surgeon, or if they were of value for any other

administrative purpose, to the Magistrate, from whose office they could be obtained by the Sanitary authorities.

When we come to discuss the working of the various systems of registration, however, the impression is not so favourable. Obviously, the accuracy of the results must depend on the effieiency with which each individual officer performs his share of the work, and in India it is not too much to say that this ultimately depends on the amount of importance which the Local Government attaches to any particular piece of work.

In the rural areas of Assam, the human links in the chain of reporters are the gaonbura, who should write, or have the facts written, in his handbook from day to day, the mauzadar who should write up his Nominal register once a month, and at the same time submit his abstract to the Civil surgeon.

If a death reaches the Nominal register, it is improbable that it will be omitted from the abstract returns, because the man who is preparing the return has to check his own work by getting totals to agree as he classifies deaths by age, sex, cause, and religion. In the case of births, too, although he has only to classify by sex, he has a check in the fact that the events are serially numbered as they are entered. The important source of inaccuracy lies in the fact that some events never reach the Nominal Register at all. The explanations of this fact are as follows: (1) Gaonburas are frequently illiterate. In 1908, a special investigation was made in selected areas, and it is reported that 26% of the gaonburas were found to be illiterate. The illiterate gaonbura is expected to find out facts and proceed to his nearest literate neighbour and ask him to write up the entry for him. My experience of these people suggests that from the ready way in which they help one another, the goanbura will

have no difficulty in getting this help from his neighbour, but one can readily imagine that for various reasons the entry may not be made at the time and may afterwards be forgotten. It occasionally happens that there is no literate man in the village, and in that case the gaonbura will have to depend on his memory to give an accurate report to the mauzadar at the end of the month. This will lead to a certain amount of inaccuracy, though perhaps not so much as would at first sight appear, because one generally finds that persons who from want of education cannot make use of memoranda, have remarkably good memories. (2) The gaonbura may be lazy and not take any interest in such matters as the records of births and deaths. In this case his book will probably contain a modicum of, but not the whole truth of his circle. The verifying officers should find out such errors as occur in this way, and provision is made for the punishment of the defaulting gaonbura. In practice, however, the punishment seldom amounts to more than a warning to be more careful in future. It is clear that errors which arise from the illiteracy of the gaonburas are not immediately remediable, but can only be removed as the education of the people enables Government to secure the appointment, as gaonburas, of literate persons only. Errors which arise from carelessness and neglect of the work can only be removed by strict dealing with the offender, and there is practically no doubt that the inaccuracy from this source could be entirely removed at once, if defaulters were at all adequately dealt with. In the Rural Tracts of Eastern Bengal, the links in the chain of reporters are the chowkidar with his handbook, and the Writer-constable with the Nominal Register. As in Assam, if an entry is made in the Register, the event is not likely to be missed in compilation, but for various reasons, a considerable number of events never reach the register

(1) In Eastern Bengal probably a greater proportion of chowkidars ~~are~~ illiterate than of gaonburas in Assam, and this will account for some omissions. (11) The chowkidar may be lazy or careless, but when this is discovered, he is usually adequately punished by a fine, and the real reason of inaccuracy from this source is rather the insufficiency of the verification leading to the discovery of carelessness than the want of adequate punishment. (3) Another cause of inaccuracy, which I have found in Eastern Bengal, lies in the fact that a chowkidar may die and for some months no new appointment be made. In this case, the duffadar of the union ought to brigg the information, but frequently does not do so. In the district of Pabna, I found some cases of this kind where from several beats in the unions of a single thana, no births or deaths were reported for a matter of six months. (4) Although, generally, the chowkidar is a member of the village community, it occasionally happens that none of the villagers will accept the appointment and in the Serajanj subdivision of Pabna district, I found that there were whole villages, the individuals of which were the chowkidars of the neighbouring villages. In such circumstances, it is unreasonable to expect that the chowkidar is sufficiently in touch with his circle to give an accurate report of the births and deaths.

In Eastern Bengal, then, the immediate remedy for inaccuracy is more complete verification.

Of registration in Assam tea gardens, I have had no personal experience. When, however, one remembers how closely the Manager, his Assistant Managers and his overseers are in touch with the coolies, it is evident/

that accurate registration should be easily obtained.

In the Jalpaiguri tea estates, the system which has up to the present been in vogue is quite unsatisfactory, and when in 1906, I had occasion to visit that area, several of the Managers expressed their opinion that the figures obtained were of little value. In fact in many cases, the Native doctor was the collecting agent and as the people generally are adverse to the visits of the doctor, his account was liable to be limited to the occurrences of his own limited practice.

In Municipalities, throughout the Province, although the Act of 1873 gives sufficient powers for practical purposes, the results of registration have been very unsatisfactory. The public do not generally recognise their responsibility to notify occurrences. The amount of verification has been increasing of recent years, but apparently sufficient action is not taken on the reports so received. It appears to be quite clear that when an Act is introduced and has been widely circulated and is found to be ignored by the people, the next step is to put the punitive sections of the Act in force, in order to impress the public with the necessity of abiding by the law. In a matter of the kind which is here dealt with, it is not necessary in the first instance to inflict heavy penalties, but what is necessary is that all persons in default should be summoned before the Magistrates to explain why they have neglected the provisions of the Act, and if this were done for a year or two, the number of defaulters would be very much reduced because the public would learn that it was their business to report events, the statistics would then become reasonably accurate, and the few persistent defaulters might be more rigorously dealt with. In order to show the exact nature of the fault in compulsory registration, the following facts

are related. In the Sanitary Report of the Province for 1909, one reads- "The improvement of the collection of Vital Statistics in compulsory areas was a subject which was discussed at the Commissioners' Conference held at Shillong in October 1909. The conference advised that nothing be done to remove or weaken the obligations of the householder to report, that the registering agency whether the town Police, the Municipality or the special gaonburas of Assam, should remain unchanged, but that as the Sanitary Department was primarily interested in the accuracy of statistics, that Department should undertake the work of checking the lists, the agency employed being the Subinspector of Vaccination assisted by the Vaccinator, who would initiate prosecutions and be rewarded for each conviction obtained, the amount of reward being fixed at 4 annas". This advice was based on the assumption that the weak point was the absence of verification, a view which was not universally held. The advice was accepted by Government and certainly gave a stimulus to the work of verification, but that it did not reach the root of the matter is shewn by the following quotation from the Sanitary Report of 1910. "In a few instances, a great deal of trouble was taken by the vaccination staff to check vital occurrences in compulsory areas notably in Gauhati, Rangpur, Jalpaiguri and Dacca. The reward of 4 annas a head for each conviction, which was recommended by the Commissioners' Conference in 1909, has in some instances undoubtedly stimulated the enquiries; but on the other hand, complaints have not infrequently been made by Civil Surgeons, that the Inspectors cannot reap the reward of their labour, because the Magistrates do not take

action on their reports; and that even where action is taken, the number of prosecutions which are instituted are too small to be of much effect. This point is clearly seen in the following statement.

Compulsory Area.	Number of defaulters reported.	Number of prosecuted.	Number Convicted.	Fines.
Dacca.	42.	13.	8.	
Madaripur.	118.	15.	15.	
Brahuranbaria.	109.	nil.	nil.	
Jalpaiguri.	121.	36.	32.	
Bogra.	31.	1.	1.	
Pabna.	66.	6.	6.	
Sunramganj.	34.	nil.	nil.	
Ganhati.	90.	nil.	nil.	
Nowgong	15.	nil.	nil.	
Dibrugarh.	16.	4.	4.	

Some further particulars regarding the town of Gauhati will shew the amount of the deficiency. In 1910, verifying officers went from door to door throughout the town asking for details of all occurrences of the previous 12 months. They traversed more than ¾ of the town (about 12,000) and with their notes went to the special gaonbura's houses and compared the hatchhits, and brought to the Civil Surgeon a list of the omissions. As they had traversed almost the whole town, one felt justified in calculating a probable rate of error for that town from these reports. It appeared that 12.5% of the deaths and 25% of the births were not being reported. No doubt the absence of systematic checking in towns has something to do with the inefficiency of the registration, but it is obvious that failure to utilise the punitive clauses of the Act has a very great deal to do with the present state of affairs. Both of these faults are immediately remediable.

An example taken at random, will shew how necessary it is that individual reporters should be accurate. Dacca District had a population in 1911 of 2,961,849. On this population, 1 per mille represents 2,962 occurrences. Now, Dacca has 14 registering circles i.e. thanas, and each thana has about 20 unions and each Union about 10 chowkidars so that there must be about 2800 chowkidars in Dacca District. If each chowkidar misses one birth in the year, the result will be that the birth rate will be approximately 1 per mille short. It is obvious then, that it is absolutely essential to use every means possible to make the individual records complete.

Verification.

With regard to verification. The system is satisfactory in the general rural areas and in the Municipalities, but there is none in the two Tea

estate areas. In Jalpaiguri, if the suggestion of putting in reasonably intelligent registrars were adopted, probably a system of verification could be dispensed with and reliance placed on proper inspection by superior officers, but in Assam in view of the fact that the registration is carried out by private parties, it seems obvious that there ought to be some systematic verification by Government officers, similar to that done in the rural tracts by the Vaccination staff.

Turning now to the working of the system, one finds that there is great room for improvement.

No attempt is made to check completely the year's registration, and it is seldom even that one finds the district staff aim at checking a part of the work of every chowkidar or gaonbura. Further, what checking is done is confined to a comparison of the facts elicited from the public with the entries in the hathchit, and nowhere is any attempt made to compare the hathchit with the Nominal Register to see if that link in the chain is strong.

Clearly there ought to be (1) a comparison of the facts elicited from the public with the hathchit and (2) a comparison of hatchits with the Nominal registers, before the verification of these registers can be considered complete.

The aim of verification is to get the registers complete, and when this is not possible at least to give an indication of the shortage of registration. Such verification as is done is utilised from time to time to calculate the shortage of births or deaths throughout a whole district and even throughout the whole Province. The following statement has been made from the Sanitary Reports of 10 years. It shews the results

of verification in the Sibsagar district.

	Births.			Deaths.			
	No.of verification observations.	No.of omissions deleted.	Estimated shortage of registered events.	No.of verification observations.	No.of omissions detected.	Estimated shortage of registered events.	Estimated shortage on both classes of events.
1901.	2302.	92.	4%.	1,114.	65.	6%.	4.6%
1902.	2422.	254.	10.5% *.	1,644.	121.	7.35%.	9.2%
1903.	3379.	322.	9.5%	2,047.	138.	6.7%.	8.5%
1904.	2624.	161.	6. %	1,350.	74.	5.5%.	5.9%
1905.	not recorded.		19.73%.	not recorded.		19.22%.	19.5%
1906.	do.		—	do.		—	—
1908.	810. occurrences of both classes verified, 17% omission. 17.						
1909.	Not recorded.		—	not recorded.		—	—
1910.				7.22% omissions detected. 7.22.			

If these figures regarding the shortage of the recorded events are to be believed then the inaccuracy of the registration varies widely from year to year, but it is much more probable that the variations arise really because the deductions are made from insufficient data.

*The figures underlined have been calculated for this statement, the others are taken from Reports.

Were the distribution of occurrences similar to that of the ideal case of games of chance, one might apply Poisson's formula to find the mathematical error involved in assuming that a matter of 2000 or 3000 observations is sufficient to justify a generalisation on a whole district where the total number of births is about 16,000, and deaths 13,000. As a matter of fact the error would be small and the deduction would be justified, but vital occurrences have not get this ideal distribution and Poisson's formula forms an inadequate test of accuracy. In fact, unless every circle is more or less completely checked, no general statement of the shortage of the district can be based on the results of verification. The fact must be emphasised that the aim of verification is to check annually almost the whole of every gaonbura's or chowkidar's circle, in order that there may be a definite ground on which to estimate the deficiencies of Registration. So far the matter lies in the hands of the administration. The existing staff requires to be considerably increased and the work properly organised with this new aim.

There is, however, another factor in Verification which is not so easily remediable. Newholme, referring to the practice of making such deductions, remarks "the deduction is trustworthy in proportion as the observations are numerous, on the assumption that the latter are at the same time accurate and comparable." Now, there are indications in the reports that the observations are not all accurate. For example in 1903, some of the verification in Sibsagar was done by the Police Department and some by the Vaccinating Department. In the same district, in the same year, the Police work showed 1.18 % of births unreported and .9% of deaths unreported, while the vaccination staff's work shewed 27.24% of births unrecorded and 20.80% of deaths unrecorded. In the following year in the

same district the Police work showed omission rates of 2.29% and 1.89%, while the vaccination staff's work shewed 21.4% and 22.01%. The inference is that the latter officers were working more conscientiously than the former. To take another example of a similar nature from the 1909 report, one learns that in Bakarganj a staff of 5 inspectors reported that they had between them checked 116,739 occurrences and found .72% of omissions. Now, there were approximately 160 days available for this work (including Sundays and other public holidays) so that each man, on an average, must have checked 145 occurrences per day, an amount of work which it is difficult to believe possible, when one considers that for each event he would have to note all particulars and then compare his notes with two or three different chowkidar's hathchits. The inference which one would draw from such facts is that the accuracy of verification work cannot be taken for granted, and the indication is to make each officer liable to a severe penalty for every false statement which can be detected in his report. There is no danger of interfering with recruitment of Inspectors by demanding this high standard of work for at present the number of applicants for such posts exceeds the vacancies by about 100 to 1.

With regard to verification then, the weaknesses appear to be that (1) a sufficiently great degree of verification is not aimed at. For some years past the amount of verification has been about 10% of the total occurrences of the Province. The aim should be to have practically 100% verified.

(2) The inaccuracy of the verification work done is very great. This should be rectified by adding to the system of accurately recording the

work of individual verifying officers, a system of special investigation of cases where the records indicate the probability of inaccuracy, and severe punishment of the officers who are found to be sending in false statements.

From the foregoing analysis of registration and verification, it will be appreciated that the figures which reach the Sanitary Commissioner for compilation are unsatisfactory, but at the same time one must #conclude that the defects are much more in the working of the systems, than in the systems themselves.

COMPILATION.

A compilation of vital statistics should be so devised that it will shew information regarding the development and characteristics of the population concerned - information of a Sociological nature, and at the same time, it should yield accurate information whereby to measure the benefits of sanitary methods attempted, and to guide sanitarians to the means by which they can best promote the Public well-being. For example, a statement shewing the proportion of illegitimate births to the unmarried women of child-bearing ages is useful more particularly from the sociological point of view, while a corrected deathrate is of interest more particularly to the sanitarian. This paper deals purely with the interests of the sanitarian, and no criticism is offered on those points which are purely of sociological interest.

It is hardly possible to limit the variety of tables which may be of use to the Sanitarian in different circumstances, but there are certain tables which may be considered essential, and which therefore should find a place in every annual compilation. These are tables yielding certain information regarding births, tables yielding certain information regarding deaths, and finally a table yielding certain information regarding the verification work. The last table should be inserted so that any one who has occasion to utilise the statistics may have an opportunity of satisfying himself regarding the accuracy of the information recorded. Again, the methods of calculation should be uniform throughout the world so that international comparison may be possible, and they should be those which will give the nearest approximation to the truth.

With this object in view, it should be the aim of British colonies/

Colonies and Dependencies to follow as closely as possible the methods of compilation enployed at home. It may generally be left to the mother country to lead the way in altering methods so as to bring them as near to the truth as possible.

With these prelimary remarks, we may proceed to compare the compilations of Eastern Bengal and Assam with those of Britain.

The method of calculation of populations on which rates are to be based is a matter of fundamental importance. The method of the Registrars-General in this country is to calculate the rate of increase of population in geometrical progression from the two preceeding censuses and then to estimate the intercensal population of each year in the ensuing decade on the assumption that the rate of increase of the preceeding decade applies to that under consideration. Obviously this method is unlikely to be accurate but it has been found practically to be the most accurate method available. In order to correct any errors which arise, as soon as the decade is complete and another census enumeration is published, a new calculation of the rate of increase based on the census at the beginning and the census at the end of the decade is made, and the ratios of the 10 years are then corrected. Thus the finally recorded rates are only available after the end of the decade, but the rates so obtained are as nearly accurate as possible in the absence of annual enumerations of the population. In the Province of Eastern Bengal and Assam, as in all Indian Provinces, the population of the previous census is taken as remaining constant throughout the decade/

decade. For example, the birthrate of 1910 is obtained by dividing the recorded births of 1910 by the population of March 1901. This is obviously unfair. By comparing the Census returns of 1911 with those of 1901 it is seen that in only one district viz:- Pabna, did the population remain anything like constant. The increase in Pabna was only .1%. The following statement shews the amount of increase which occurred in the various district populations in the decade 1901 to 1911.

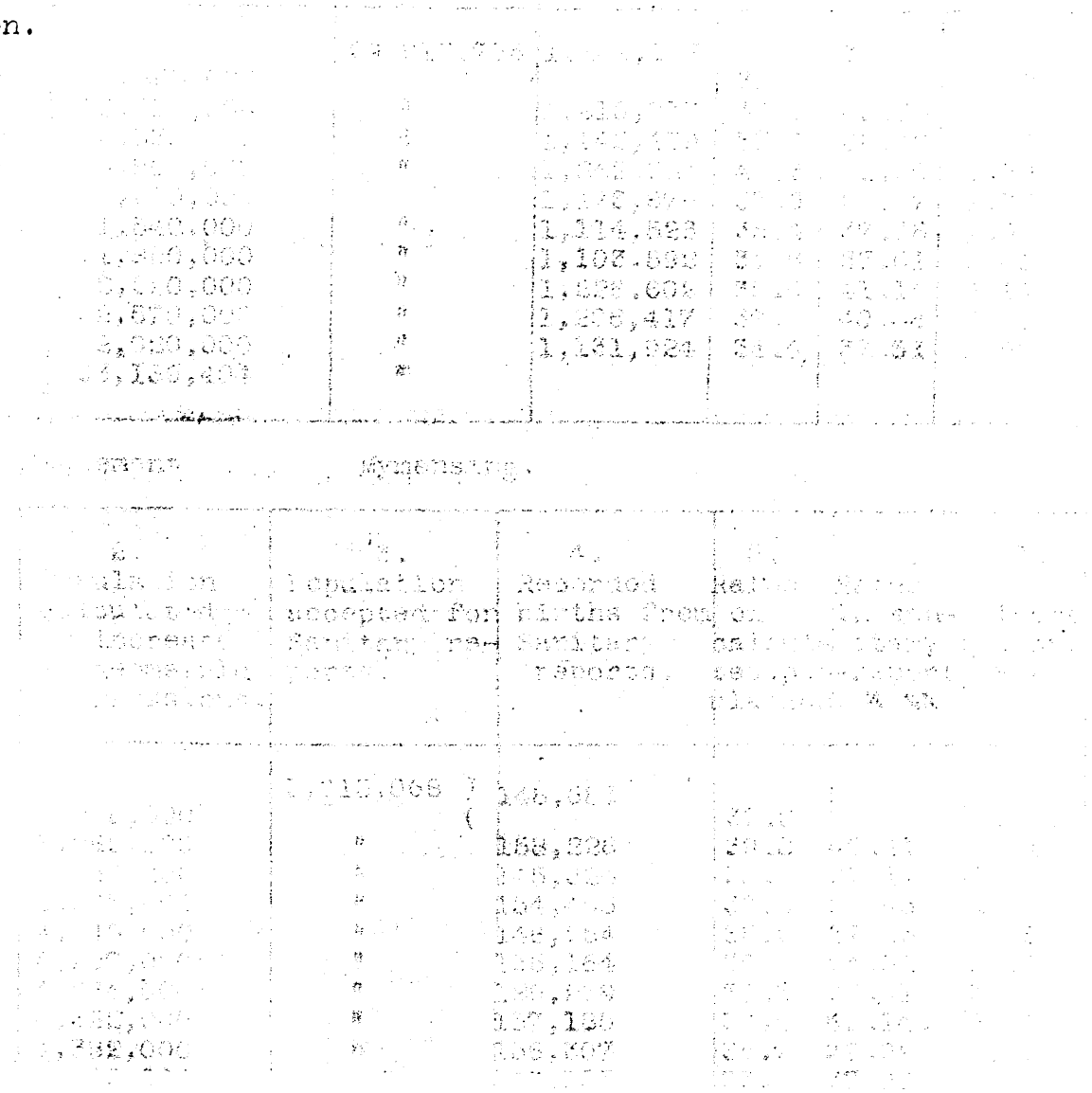
Increase. (percentage of 1901 population.)	District.
Under 5%	Pabna.1 Rajshahi 1.4* Sylhet 4*
Under 10%	Bakarganj Faridpur Dinajpur
Under 15%	Rangpur Chittagong Dacca * Darrang * Mymensing Noakhali Kamrup * Malda
Under 20%	Sibsagar * Bogra Jalpaiguri* Nowgong * Cachar * Tippera *
Over 20%	Goalpara 30.* Lakhimpur 26.3*
Province	11.3%

As far as one knows the districts marked * are affected by immigration, in the others the increase is a natural one. The figure given for the Province is more accurately that of those portions of the Province which/

which are under registration.

Now that the Census of 1911 has been taken, one can look back over the decade and calculate the probable populations of the intercensal years, and we can afterwards calculate birth and death rates on these. The difference between these rates and the official figures, will be the amount of error which arises from assuming the population of the 1901 census to hold good for the decade. I have calculated the populations of every district for the intercensal years by the Registrar Generals' method. This will generally be fairly accurate, but in those districts where immigration is great, it will be less so, because it is apparent from Immigration Department figures that the increase due to immigration varies considerably from year to year. This could be allowed for in most of these districts by separating the coolie population on the tea estates, calculating their annual increase from Immigration Department figures, and allowing the rest of the district an increase in geometrical progression. This I have done for one district to shew the method, but have not applied it generally because all the data are not yet available, and as will be seen in the example given, the difference is so small that it would serve no useful purpose to work out the point with only approximate figures for the last year. It is unnecessary to tabulate the details of each district, and three examples are therefore selected. The first statement shews the populations under registration in the Province as calculated from the Census of 1901 and 1911, the population officially used for the calculation of the crude birth and death rates, the numbers of/

of recorded births, the birthrates calculated on these figures and the amount of discrepancy. The second statement shews the same facts for Mymensing district in which the increase is almost entirely a natural one. The third statement shews these facts for Lakhimpur district in which the increase is in an considerable degree due to immigration.



1st Statement. The Province.

1. ~~Population Calculated.~~ Year	2. Population calculated on increase in geometric progression.	3. Population accepted for Sanitary reports.	4. Recorded births from Sanitary reports.	5. Rates on calculated population col 4 ÷ col 2 × 1000	6. Rates of Sanitary reports col 4 ÷ col 2 × 1000	7. discrepancy 6 - 5
Census 1901		29,812,735	1,161,147		39.	
Mid year 1901	29,890,000			38.8		.20
" " 1902	30,215,000	"	1,216,837	40.2	40.75	.55
" " 1903	30,535,000	"	1,142,439	37.4	38.40	1.00
" " 1904	30,860,000	"	1,242,753	40.3	41.60	1.30
" " 1905	31,200,000	"	1,173,879	37.6	39.37	1.77
" " 1906	31,540,000	"	1,114,526	35.4	37.38	1.98
" " 1907	31,880,000	"	1,103,592	34.6	37.01	2.41
" " 1908	32,220,000	"	1,226,602	38.0	41.14	3.14
" " 1909	32,570,000	"	1,206,417	37.	40.46	3.46
" " 1910	32,920,000	"	1,131,924	34.4	37.31	3.56
Census 1911.	33,189,404	"				

2nd Statement Mymensing.

1.	2. Population calculated on increase in geometric progressions.	3. Population accepted for Sanitary reports.	4. Recorded births from Sanitary reports.	5. Rates on calculated population.	6. Rates in sanitary reports.	7. discrepancy. 6 -5
Census 1901		3,915,068	148,683			
Mid year 1901	3,928,000			37.8		.17.
" " 1902	3,982,000	"	158,226	39.8	40.41	.61
" " 1903	4,037,000	"	145,324	36.	37.11	1.11
" " 1904	4,093,000	"	154,465	37.8	39.45	1.65
" " 1905	4,149,000	"	146,254	35.2	37.35	2.15
" " 1906	4,207,000	"	135,164	32.1	34.52	2.42
" " 1907	4,264,000	"	129,238	30.3	33.01	3.01
" " 1908	4,322,000	"	157,185	36.4	40.14.	3.74
" 1909	4,382,000	"	156,307	35.7	39.92	4.22
1910	4,442,000	"	146,105	33.	37.96	4.31
Census 1911	4,488,006					

Third Statement Lakhimpur.

1.	2. Population calculated on increase in geometrical progression.	3. Population accepted for Sanitary reports.	4. Recorded births from Sanitary reports.	5. Rates calculated on calculated population. 4 ÷ 2	6. Rates of Sanitary reports 4 ÷ 3	7. discrepancy.
Census 1901		371.396 ( )	9762.		26.28	
Mid year 1901	374,300	"		26.1		.18
" " 1902	383,175	"	9681	25.2	26.07	.87
" " 1903	392,450	"	10414	26.6	28.04	1.44
" " 1904	401,400	"	10543	26.3	28.38	2.08
" " 1905	410.200	"	11431	28.	30.78	2.78
" " 1906	428.800	"	12314	29.2	33.14	3.94
" " 1907	430.750	"	12878	30.	34.67	4.67
" " 1908	440,950	"	12914	29.4	34.77	5.37
" " 1909	451,450	"	11278	25.1	30.36	5.26
" " 1010	462,900	"	13196	28.6	35.53	6.93
Census 1911	469,198					

It will thus be seen that the Official birthrates shew a rise, especially towards the end of the decade which is not in accordance with fact, but is due to a faulty method of calculation. If the population of an area had been decreasing, as was the case is some of the districts during the decade ending 1900, the Sanitary report figures would shew birthrates lower than the true rates for the same reason.

It has been pointed out that in those districts where the increase is greatly influenced by immigration, a further correction of the population figures should be made, and can in most cases be made. In these cases, the following method would give as nearly as possible the correct figures.

1. From/

1. From Statement VIII of the Annual Resolution on Immigrant Labour in Assam, one can find the mean populations of the Immigration year i.e. from 1st July to 30th June. If one takes the mean populations of two succeeding years and divides by two, the result may be taken to represent the population of 1st July or the "midyear".

2. From the Census returns, one can obtain the total population of each district and also the tea garden cooli population of each district so that it is merely a matter of subtraction to find the non-cooli population of a district. By applying the formula $P' = P(1+r)^n$ to the non-cooli populations we can find the midyear populations of non-coolies for each year of the decade.

3. Then by adding the calculated non-cooli and cooli populations together, the nearest possible approximation to the true figure will be found.

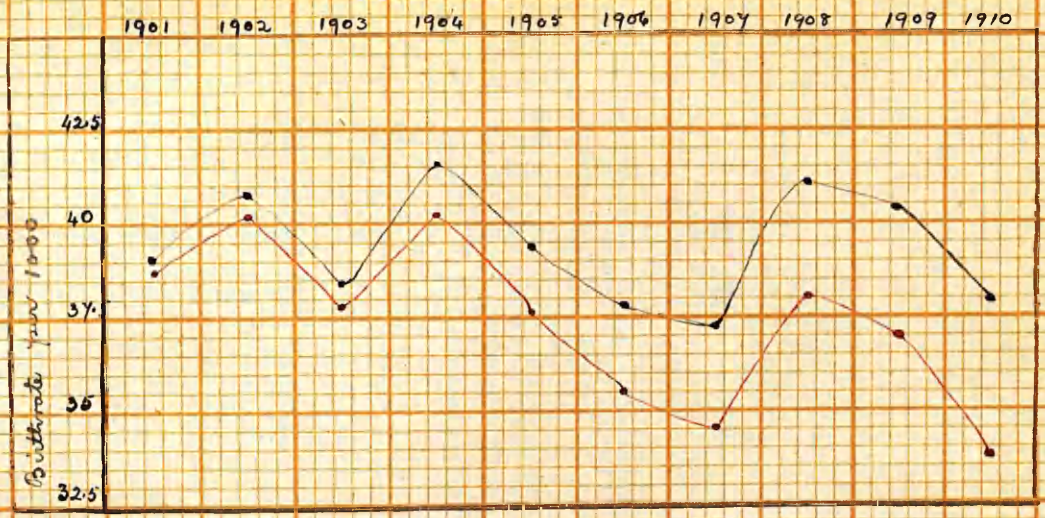
The following statement shews the results obtained for Lakhimpur in this way.

Lakhimpur

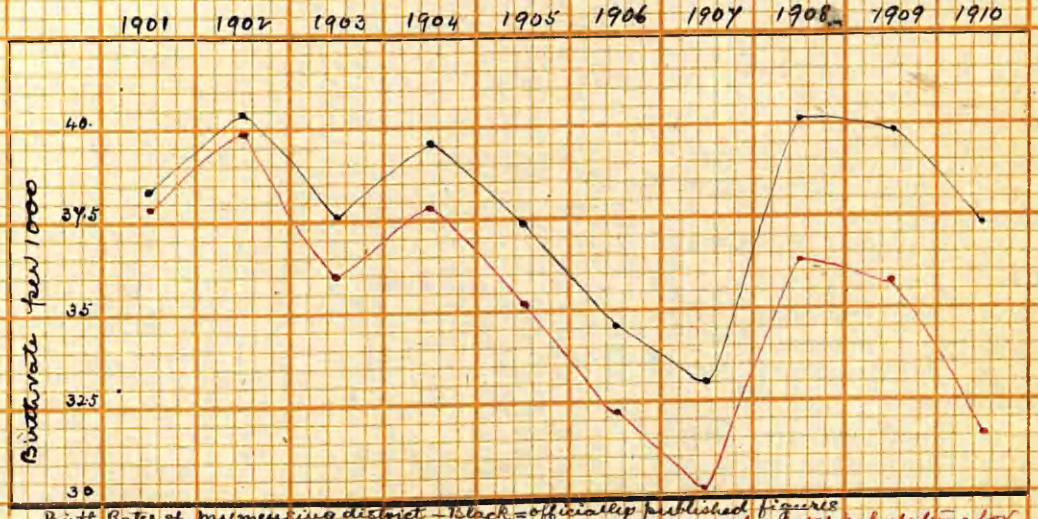
1.	Population of Tea garden Coolies 2.	Population outside of tea gardens 3.	Total population 2+3 4.	Recorded Births from Sanitary Reports 5.	Birth Rate calculated on Col. 4 6.	Birth rate of Statement III page 57 7.	Birth rate of Sanitary Report. 8.	Increase by immigration 9.	Total Discrepancy Col 8 – col 6 10.
Census 01.	130,256	241,140	371,396	(9762			(26.28→		
Midyear 01	136,316	242,300	378,616	)	25.7	26.1		.4	55
" 02	140,723	245,500	386,223	9681	25.	25.2	26.07	.2	1 07
" 03	146,289	248,850	395,139	10414	26.4	26.6	28.04	.2	1.64
" 04	149,793	252,300	402,093	10543	26.2	26.3	28.38	.1	2.18
" 05	153,503	255,700	409,203	11431	28.	28.	30.78	=	2.78
" 06	158,105	259,200	417,305	12314	29.5	29.2	33.14	.3	3.64
" 07	165,623	262,750	428,373	12873	30.	30.	34.67	=	4.67
" 08	177,266	266,300	443,566	12914	29.2	29.4	34.77	.2	5.57
" 09	185,845	269,900	455,745	11278	24.8	25.1	30.36	=	5.56
" 10	190,000*	273,600	463,600	13196	28.5	28.6	35.53	.1	7.03
Census 11	193,000*	276,198	469,198						

* These figures are not for the moment available to me, hence I have estimated them, but they are available to the Sanitary Department of the Province.

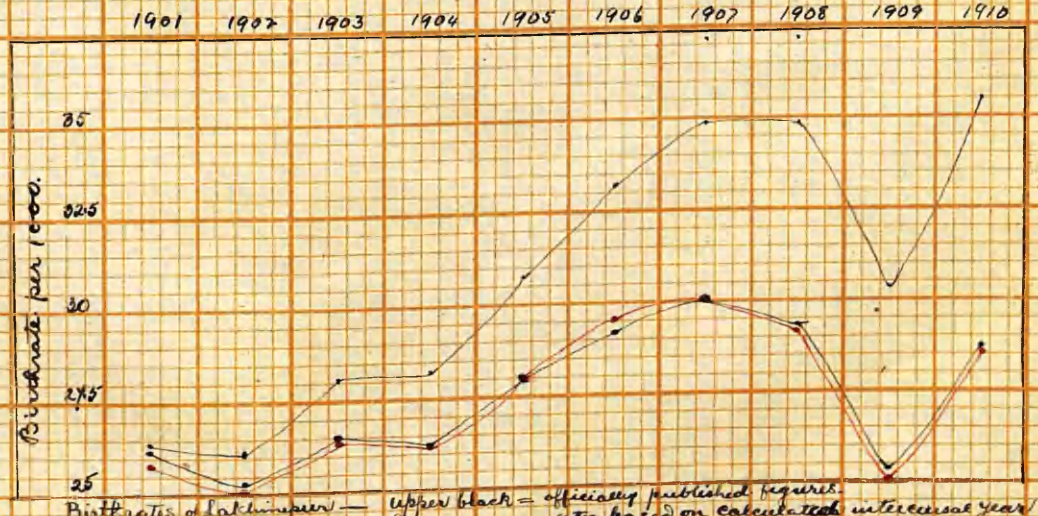
The discrepancies due to neglect of these two corrections in the calculation of populations will be more clearly appreciated on the following curves.



Birthrates of the Province
Black — officially published rates
Red — rates based on calculated populations for intercensal years.



Birth Rates of Mymensingh district — Black = officially published figures
Red = rates based on Calculated populations for intercensal years.



Birthrates of Sakhipur — upper black = officially published figures.
lower — = rates based on calculated intercensal year/ population without correcting for immigration.
Red = rates on calculated population allowing for immigration.

Obviously in Lakhimpur at any rate, the correction for immigration is of minor importance.

Using the same populations, the deathrates found are contrasted in the following statements.

Death rates of the Province.(i)

1.	2. Population calculated on increase in geometric progression.	3. Population accepted for Sanitary report	4. Recorded Deaths from Sanitary reports.	5. Rates calculated on estimated Population. $\frac{4}{2}$ x1000	6. Rates of Sanitary Report	7. discrepancy.
Census 01		29,812,735	864,242		28.9	
Mid Year 01	29,890,000			28.8		.1
" " 02	30,215,000	"	963,092	31.9	32.2	.4
" " 03	30,535,000	"	889,880	29.1	29.8	.7
" " 04	30,860,000	"	957,297	30.9	32.	1.1
" " 05	31,200,000	"	1,045,305	33.5	35.	1.5
" " 06	31,540,000	"	944,335	29.8	31.7	1.9
" " 07	31 880,000	"	873.752	27.2	29.3	2.1
" " 08	32,220,000	"	916,546	28.3	30.7	2.4
" " 09	32,570,000	"	1,010,355	31.0	33.9	2.9
" " 10	32,920,000	"	1,004996	30.6	33.71	3.11.
Census 1911.	33,189,404	"				
		Mymensing.(ii)				
Census 01		3,915,068	91457		23.36	
Mid Year 01	39,28,000			23.3		.06
" " 02	3,982,000	"	103,877	26.	26.53	.53
" " 03	4,037,000	"	96,705	23.95	24.70	.75
" " 04	4,093,000	"	98,782	24.05	25.23	1.18
" " 05	4,149,000	"	140,794	33.95	35.96	2.05
" " 06	4,207,000	"	100,238	23.85	25.70	1.85
" " 07	4,267,000	"	83,771	19.60	21.38	1.78
" " 08	4,322,000	"	78,213	18.10	19.97	1.87
" " 09	4,382,000	"	97,473	22.20	24.87	2.67
" " 10	4,442,000	"	115,572	26.	29.51	3.51
Census 11	4,488,003					

Deaths of Lakhimpur.(iii)

	Population calculated on increase in geometric progression	Population accepted in Sanitary report	Recorded Deaths from Sanitary Reports	Rates calculated on estimated population.	Rates of Sanitary report.	Discrepancy.
Census -01		371,396 (	8753		24.11	.16
Mid Year 01	373,600	)		23.95		
" " 02	382,400	"	8223	21.45	22.14	.69
" " 03	391,700	"	8254	21.05	22.22	1.17
" " 04	400,700	"	8734	21.75	23.52	1.77
" " 05	409,400	"	9899	24.10	26.06	1.96
" " 06	420,000	"	9878	23.40	26.49	3.19
" " 07	429,900	"	10940	25.50	29.45	3.95
" " 08	440,100	"	15144	35.00	40.77	5.77
" " 09	450,500	"	13004	28.85	35.01	6.16
" " 10	462,100	"	13478	29.20	36.29	7.09
Census 11						

Accepting the correction for Lakhimpur on birthrates page 58, we get the following table of death rates in Lakhimpur.

1.	Total population as calculated on page ~~47~~ & 58. 2.	Recorded deaths from Sanitary reports 3.	Death rate on Column 2 4.	Death rate of statement 111. 5.	Sanitary report Death rate ~~Dr~~. 6.	Discrepancy between 4 &5 7.	Discrepancy between 4 &6 8.
Census -01	371,396)	8953			24.11		.51
Mid Year 01	378,616 (		23.6	23.95		.35	
" " 02	386,223	8223	21.3	21.45	22.14	.15	.84
" " 03	395,139	8254	20.8	21.05	22.22	.15	1.32
" " 04	402,093	8734	21.7	21.75	23.52	.05	1.82
" " 05	409,203	9899	24.1	24.1	26.06	=	1.96
" " 06	417,305	9878	23.9	23.4	26.59	-.5	2.69
" " 07	428,373	10940	25.6	25.5	29.45	-.1.	3.85
" " 08	443,566	15144	34.2	35.0	40.77	.8	6.57
" " 09	455,745	13004	28.6	28.85	35.01	.25	7.41
" " 10	463,600	13478	29.1	29.20	36.29	.14	7.09
Census 11	469,168						

The Sanitary Report figures are thus untrue and except for the Census year, (when the error is negligible) are not comparable with any other set of rates. In the second place, the figures of different districts are not comparable with one another, because no account is taken of the fact that the rates of increase of populations vary in different districts (see page ~~49~~ 54) so that the populations do not maintain the same proportion to one another throughout the decade. In the third place, the ratios of succeeding years are not comparable for the same district, because if the actual deathrate is constant, it must appear on this calculation to be rising if the population is increasing, and falling if the latter is decreasing.

Although it would occupy too much space to give separate statements and curves for each district, it is worth while putting on record, the birthrates and death rates of the past decade calculated on properly estimated annual populations. For this reason, two statements have been added to this thesis. The corresponding official figures can be seen in the Appendixes of the Annual Sanitary Reports of the Province of Eastern Bengal and Assam.

The question then is whether some method, preferably, the Registrar Generals' method, would not enable a more accurate computation of the populations to be made annually at the time of writing the Sanitary report, so that more accurate birth and death rates might be published for each district. The ideal method appears to be that of adding the difference between the births and deaths and the difference between immigration and emigration since the previous census, to the population enumerated at the previous census. This involves not only registration of births and deaths but also of immigration and emigration to and from each district. It is not used in England because there is no hope that a time will ever come when it will be practicable to register the migratory movements from district to district. The same reasoning would apply to the Province of Eastern Bengal and Assam, for while there are details of immigration and emigration of tea garden labourers for every district concerned except Jalpaiguri, there is no record of the migratory movements of the rest of the population. On the other hand, the social conditions are such that interdistrict migration is probably very small, and neglect of this factor would probably not cause a serious error.

Another method which would probably give useful results would be that of ascertaining the number of inhabited houses from the Assessment authorities and multiplying this by the average number of inhabitants per house found at the previous census. This method would be most useful to check an area where a more general method failed.

Finally there is the Registrar General's method. The two chief weaknesses of the Registrar General's method are (1) that it assumes that the/

the rate of increase is regular throughout the decade and (2) that the rate of increase of one decade is applicable to the succeeding decade. In the Province of Eastern Bengal and Assam neither of these assumptions is quite justified.

With regard to the first assumption, it appears that of the 22 districts of the Province, only 11 shewed births exceeding deaths regularly during the decade. In the other 11 districts the deaths exceeded the births in one or more of the ten years. The following statement shews the facts.

Statement shewing the districts in which deaths exceeded Births in various numbers of years of the decade 1901-1910.

0 years	1 year	2 years	3 years	7years
Dacca Mymensing Bakarganj Chittagong Tippera Noakhali Rongpur Bogra Cachar Sylhet Lowgong.	Kamrup Goalpara Malda	Faridpur Rajshahi Dinajpur Sibsagar Lakhimpur	Jalpaiguri Pabna	Darrang.

In half of the districts then, the increase was interrupted by one or more years of decrease. Thus the assumption that the increase is steady is false. With regard to the second assumption, an investigation of the facts shews that the rate of increase of one decade is not applicable to the next. The following statement shews the increase per cent of the population of each district for the decades 1901-1910 & 1891-1900 respectively.

Statement shewing the increase of population of each district during the decades 1901-1910 and 1891 - 1900 respectively stated as percentages of the populations.

District	1901-1910	1891-1900.
Dacca	12%	10.6%
Mymensing	14.5	12.7
Faridpur	8.6	6.2
Bakarganj	6.2	6.4
Chittagong	11.5	4.9
Tippera	14.8	18.8
Noakhali	14.1	13.1

Statement shewing the increase of population of each district during the decades 1901-1910 and 1891-1900 respectively stated as percentages of the populations.

District	1901-1910	1891-1900.
Rajshahi	14.4	1.6
Dinajpur	7. 5	5.7
Jalpaiguri	14. 8	15.7
Rangpur	10..8	4.3
Bogra	15.3	11.8
Pabna	. 1	4.3
Malda	14.	8.5
Cachar	9.3	17.9
Sylhet	10.3	4.
Goalpara	30.	2.
Kamrup	13.3	-7.1 decrease
Darrang	11.8	9.7
Nowgong	15.8	24.8 decrease
Sibsagar	15.3	24.4
Lakhimpur	26.3	40.2

It appears then that in very few districts was the increase of the previous decade applicable to the succeeding decade. Except in Bakarganj and Rajshahi the rate of increase of the latter decade varied considerably from that of the former decade. Thus the assumption that the rate of increase is constant is not justified.

It will be well to compare the results obtainable by the method of adding excess of births over deaths and excess of immigration over emigration to the census figures and by the Registrar-General's method.

To compare the methods completely would mean calculating the populations of each district for ten years by each method, but a little consideration shews that the maximum error will occur in the populations of the last year of the decade, so that it will be sufficient to calculate this, by each method.

In order to fix a standard, I have taken the midyear population of 1910 calculated on the basis of the 1901 and 1911 census. This is as near the truth as we can get.

I have then shewn the population which was officially used, that which might have been used if calculated by the Register General's method and that which might have been used if the difference between births and deaths and between immigration and emigration had been added to the census figures of 1901.

Statement shewing comparison of figures for 1910 calculated.
(a) from $P' = P(1 + r)^n$ using census 1901 and 1911. Standard
(b) As the census population of 1901.
(c) from $P' = P(1 + r)^n$ using Census 1891 & 1901
(d) From addition of excess of births over deaths and known immigration over emigration to census population of 1901.

District	Method (a) Standard	Method (b)	Method (c)	Method (d)
Dacca	2937	2649.5	2907.5	2894.4
Mymensing	4442	3915.0	4373.	4355.7
Faridpur	2106	1942.7	2049	2021.
Bakarganj	2422	2291.7	2417.5	2416.2
Chittagong	1496	1353.2	1414.3	1468.4
Tippera	2406	2118	2384	2377.8
Noakhali	1290	1114.7	1282	1270.0
Rajshahi	1479.5	1462.4	1483.7	1491.1
Dinajpur	1675.	1567.1	1641.	1608.9
Jalpaiguri	894.3	787.4	900.6	791.3
Rangpur	2368.1	2154.2	2238.	2280.1
Bogra	973.6	854.5	948.	949.9
Pabna	1,422.3	1420.5	1476.	1412.5
Malda	995.3	884.	953.	973.5
Cachar	491.8	414.8	463.6	477.8
Sylhet	2,454.5	2,241.8	2,331.0	2,458.1
Goalpara	588.7	462.1	470.6	501.0
Kamrup	661.3	589.2	550.3	622.1
Darrang	374.1	337.3	367.5	393.2
Nowgong	299.3	261.2	200.5	294.3
Sibsagar	682.3	598.	732.	723.2
Lakhimpur	462.9	371.4	527.6	521.8
Province	32,920,	29,812.7	32,075.	32,193.3

N.B. 1,000's are omitted.

In order to bring out the significance of these figures the following statement has been made. It shews the amount by which the figures calculated by methods (b),(c), and (d), differ from those calculated by method (a). The difference is shewn as a percentage of the figure of the first column of the previous statement.

District.	Difference from → Standard of method (a)	Method (b)	Method (c)
Dacca	10 %	1.	1.5
Mymensing	11.8	1.5	5.
Faridpur	7.5	2.7	4.1
Bakarganj	5.2	.2	.5
Chittigong	9	3.3	1.9
Tippera	12	3.4	1.2
Noakhali	13.4	.1	1.5
Rajshahi	1.	.3	.8
Dinajpur	6.2	2.	4.
Jalpaiguri	12.	.75	11.5
Rangpur	9	5.5	3.7
Bogra	12.3	2.6	2.4
Pabna	.1	3.8	.7
Malda	11.2	4.2	2.2
Cachar	15.7	5.7	2.9
Sylhet	8.7	5.	.2
Goalpara	21.5	20.1	14.9
Kamrup	10.9	16.8	5.9
Darrang	9.8	1.8	5.1
Nowgong	12.7	33.	1.7
Sibsagar	12.4	7.2	6.
Lakhimpur	19.6	14 .	12.3
Province	9.4	2.6	2.2

Inspection of the first column of figures shews that the present official figure varies more or less by 10% from the standard while inspection of the second column shews that the method of applying the rate of increase of the previous decade to the decade under consideration would have given fairly accurate results except for 4 Assam districts viz:- Goalpara, Kamrup, Nowgong, and Lakhimpur. The explanations of those figures appear to be that in Goalpara, a railway opened up a large tract of uncultivated land and led to a great influx of population in the decade ending 1910. The increase of the decade ending 1910 was 30% while that of the former decade was only 2%. In Kamrup and Nowgong, Kalazar decimated the people between 1891 and 1901 so that the population decreased in that decade. In Lakhimpur, there was a very wide difference between the rates of increase in the two decades, due probably to greater activity in recruiting labourers in the earlier decade. Inspection of the third column shews that the method of adding the difference between births and deaths and between immigration and emigration gave more or less reasonable results except for three districts, viz: Jalpaiguri, Goalpara, and Lakhimpur. The explanations regarding Jalpaiguri and Goalpara, have already been given. In both cases there has been immigration of which there are no records. The Lakhimpur figure which is 12.3 in excess of the standard figure is not so easily explained. There is no reason to doubt the accuracy of the migration figures but both the birth and death rates are open to suspicion. The average rates of the past 10 years are 27 and 25 respectively. I think this error is probably due to very faulty registration. The same error is seen in a lesser degree in Sibsagar.

It appears then that either the method (b) or (c) would be a marked improvement/

improvement on the present method. For instance, the standard population shews that the recorded births of the Province gave a ratio of 34.4 per 1000 in 1910, the official figure of population gave a ratio of 37.96, while the figures arrived at by methods (b) and (c) give 35.3 and 35.17 respectively.

In view of the fact that there is apparently little difference between the two, it is evident that the Registrar General's method should be adopted. Cases where it is likely to go far wrong might be calculated temporarily by a reference to the Assessment department.
This point, the method of calculating populations on which to base the ratios having been made clear, the way is open to the discussion of the statistical tables compiled.

Essential statistics of Births.

The birth statistics which appear to be essential are, the number of births, a crude birthrate, and a birthrate based on the number of married women of child-bearing years and the legitimate births. The actual figures must in all cases be given as they form the data necessary for any subsequent calculations which may be required. Then a crude birthrate is necessary as a means of comparing the conditions of the same district from year to year, and on account of the influence of the birthrate on the age composition and subsequent deathrates of the community. When one wishes to compare two areas for the same year, however, it is desirable to eliminate such factors as the varying proportion of married women of childbearing ages, the varying degree of morality in different areas and to accept Newsholme's statement that "the only completely accurate way of stating the birth-rate is to subdivide the births into legitimate and illegitimate and state the former per 1000 married women of childbearing years and the latter per 1000 unmarried women of childbearing years.

In Eastern Bengal and Assam, the first two statements of the Appendix of an Annual Sanitary Report, shew the actual births recorded in each district and the crude birthrate calculated, however, on a wrong population, but the birthrate per 1000 Women of

childbearing ages is not shewn. In order to get a true comparison between the districts and at the same time to get a figure comparable with other areas, the latter figure is necessary. That this is so is shewn by the following facts. If one compares the number of married women of childbearing years in the different districts with the total populations of these districts, using the figures of the 1901 Census one gets the following result.

District	total population	married females aged 15-- 40	percentage of latter to former
Dacca	2,649,522	437,402	16.5
Mynensing	3,915,068	642,099	16.4
Faridpur	1,942,733	313,235	16.1
Bakarganj	2,291,752	387,390	16.9
Chittagong	1,353,250	225,818	16.7
Tippera	2,117,991	350,110	16.5
Noakhali	1,141,728	193,600	17.0
Rajshahi	1,462,407	245,941	16.8
Dinajpur	1,567,080	264,565	16.9
Jalpaiguri	787,380	124,688	15.8
Rangpur	2,154,181	345,653	16.1
Bogra	854,533	148,776	17.4
Pabna	1,420,461	231,618	16.3
Malda	884,030	140,581	15.9
Cachar	414,781	70,095	16.9
Sylhet	2,241,848	360,168	16.1

Goalpara	462,052	68,666	18.7
Kamrup	589,187	91,764	15.6
Darrang	337,313	55,154	16.4
Nowgong	261,160	36,518	14.0
Sibsagar	597,969	94,398	15.8
Lakhimpur	371,396	61,117	16.5
PROVINCE	29,812,735	4,889,354	16.4

It will be seen, then, that the proportion of married women of childbearing ages in different districts varies from 14% to 18.7% of the populations of these districts, so that the same figure of crude birthrate is not to be expected from all these districts.

For comparisons with other areas, one cannot use crude birthrates, because of this varying proportion of married women. For example, the proportion of married women between the ages of 15-45 in Scotland appears to be 10.2% of the total population, while in Eastern Bengal and Assam it is 17.8%.

It thus appears that for purposes of comparison between the districts and for comparison between the Province and other areas, a statement of the proportion of legitimate births per 1000 married women of child bearing ages should be added to the appendix.

In order to do this, two changes are necessary. In the first place, it would be necessary to instruct registrars to note whether births are legitimate or illegitimate. In the second place, the

census authorities would require to be asked to show the numbers of married women between 15-45 for each district. At present, their published figures only admit of classification from 15-40 or 60. The term "married women of child bearing years" is used in this country as equivalent to "the married women between 15-45" and this definition should therefore be accepted by the Indian Provinces.

In the third statement of the appendix an attempt is made to shew the proportion of births per 1000 married women of childbearing years for the past decade, but it must be noted that owing to the absence of any classification into "legitimate" and "illegitimate" in the returns, the total births have been taken, and owing to the failure of the Census returns to give the number of married women from 15-45, per district, the classification from 15-40 has had to be accepted.

In the meantime, the Provincial ~~statement~~ figures can be brought more nearly into line with home figures as shown in the following statement, in which the proportion of all births to the married women between 15 and 45 is shewn.

Married women		1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	Average.
1.	15-40	237	246	229	246	230	215	210	220	220	206	227
2.	15-45	222	230	215	230	216	202	197	214	206	193	213

No accurate comparison can be made because the illegitimate births are not excluded from the statement. The birthrate per 1000 married women in Scotland in 1909 was 248.8, and from the Registrar General's report, it can be calculated that if all births had been reckoned instead of merely "legitimate" ones, the figure would have been 268. This, then, is as nearly comparable as possible with the Eastern Bengal and Assam figure for 1909, viz. 206.

The possibility of gauging the accuracy of registration from these figures will be discussed further on.

In calculating such birthrates as these it is, of course, necessary to have a population calculation for each of the intercensal years. That this might safely be done by assuming that the proportion of married women to total population which held good in the Census year, holds good for subsequent years, is suggested by the fact that the proportion in the Province for 1901 was exactly the same as that found in 1911 viz. 17.8%.

Essential Statistics of deaths. Although as before remarked, there is no limit to the calculations regarding death which may be necessary in particular cases, the figures which are most commonly required and which should therefore find a place in Annual statements are the number of deaths, the crude death-rates, corrected death-rates, classification of deaths by cause, and by age, with a statement of infantile mortality rates.

The crude death-rates are useful for the comparison of the same district year after year, but the corrected death-rate is necessary for the comparison of the health of different districts in the same year. Comparison between different countries would appear to be obtainable only through a statement of the deaths of the sexes in age groups, while the statements of deaths by cause is the chief guide to the sanitary officer of the direction in which sanitary science is most required. A statement of infantile mortality is recognised as a very efficient gauge of the sanitary progress of an area. (Newsholme's Vital Statistics-page 120).

In the Appendix to the Annual Sanitary report of an Indian Province, the total deaths of each district are shewn, also crude deathrates calculated, however, on an erroneous basis, a classification of deaths by cause, season, age, and religion, but there is no statement of corrected deathrates and no statement of infantile mortality.

Before calculating corrected death-rates and infantile mortality rates, it is necessary to call attention to some features of the statements already in existence.

Statement III shews the seasonal distribution of deaths. This statement is fairly reliable. The remarks made about the populations

used in calculating ratios apply to the ratios of this statement also. There are two factors which may affect the accuracy of this statement. The amount of influence which these factors have on the distribution of the deaths is, unfortunately, not ascertainable, but it may be presumed to be small. The first point is that verifying officers collect in their work the omissions of the previous 12 months and these omissions are sent to the various places where the nominal registers are kept chiefly in the summer months, to be entered in the registers. There is, therefore, the possibility that such deaths are credited against the months in which they are registered and thus swell unduly the proportion of deaths in these months. The other point is that owing to the primitive nature of communications in the interior of most districts, and the liability of these communications to interruption in bad weather, it frequently happens that chowkidars and gaonburas do not succeed in reaching the thana regularly between July and November. This leads to a danger of an undue proportion of occurrences being registered at the end of the rainy seasons, occurrences which should have been registered in the earlier months, say, July, August, September, and October. Such an error can only be overcome as the country is developed, and communications improve.

Statement IV shews the proportion of deaths of the sexes by age groups. One very important use of this statement is to render possible comparison with other areas. Such tables are, however, affected by the tendency of the public to estimated ages in round numbers. In order to eliminate as far as possible, errors from this source, Dr. Farr grouped the English ages in quinquennial groups up to 25 and then in decennial groups. The Scottish figures, however, are still for the quinquennial groups up to 20, and then for decennial groups with the result that no comparison between the Scottish and the English figures is possible. The reasoning which led Dr. Farr to employ his particular classification /

in England applies with almost more force to the Indian People and /his classification would apparently give truer statements than the present, which are the same as the Scottish ones. Mr.G.F.Hardy in his Memorandum on the age tables and mortality rates of the Indian Census of 1901 (page 18 and 19) shews the number of persons living at each age out of a total population of 100,000 of each sex according to certain specimen schedules prepared for the purpose. In the table for Bengal this grouping in round numbers is very marked. The following statement is an abstract of the Bengal figures for males from Mr. Hardy's Memorandum:-

Age.	No. living	Age	No. living	Age	No. living	Age.	No. living	Age.	No. living	Age	No. living	Age	No. living	Age	No. living
0.	3022.														
1.	1440.	11.	1536.	21.	729.	31.	423.	41.	306.	51.	194.	61.	87.		
2.	3087.	12.	4109.	22.	2142.	32.	2266.	42.	952.	52.	513.	62.	247.		
3.	3021.	13.	1243.	23.	687	33.	394.	43.	163.	53.	101.	63.	37.		
4.	2939.	14.	2035.	24.	1194.	34.	520.	44.	423.	54.	166.	64.	90.		
5.	3694.	15.	2110.	25.	4182.	35.	2884.	45.	2124.	55.	1057.	65.	459.		
6.	2731.	16	2187.	26.	1155.	36.	1496.	46.	336.	56.	257.	66.	43.		
7.	3060.	17.	1004.	27.	934.	37	502.	47.	249.	57.	140.	67.	46.		
8.	3539.	18.	2404.	28.	1968.	38.	1109.	48.	526.	58.	259.	68.	90.		
9.	2341.	19.	857.	29.	592.	39.	338.	49.	170.	59.	92.	69.	30.		
10.	3756.	20.	2719.	30.	4234,	40.	3895.	50.	2821.	60.	2057.	70.	622.		
												71. — 79.	31. — 12.		
												80.	287.		
												81.	12.		

In this statement is seen a marked avoidance of the year one, then apparently children aged four and six have been included in the age 5. Age 10 probably includes some children aged 9 and some aged 11, and the ages 20,30,40,50 and 60 all contain a number of persons of the ages immediately above and below. The age 25 seems to be a popular one, while 35,45,55 and 65 are all about half as popular as 30,40 etc. Thus although the error due to mistatement of age cannot be eliminated until the education of the people is more advanced, it would appear that a change in age grouping to the English scale would greatly improve this statement.

Annual Statement V classifies deaths according to religion. The statement is probably fairly accurate, but that it serves any useful purpose is doubtful.

The rest of Appendix 1 is occupied with classification of deaths by causes. If statistics of the causation of disease are to be comparable it is necessary to have a standard classification of causes. The less advanced areas of the world cannot be placed in the same class as the more advanced areas, and a line of distinction must be drawn between those countries where the reported cause of death is based on the diagnosis of a qualified medical man and those countries where the reported cause is merely based on the opinion of the public. Further, to insure that no confusion arises, the terms of the more primitive classification should never be identical with those of the more advanced classification except, perhaps, in those diseased where there is no doubt that the public can make as accurate a diagnosis as the scientific observer. In Eastern Bengal and Assam, although most of the Municipalities have practitioners trained on the lines of European schools of medicine, the rural population is practically without qualified practitioners who can go to the houses of

the people. All that Government has yet been able to do is to place dispensaries in rural areas where those who desire medicine may come and take it, but the possibility of having the cause of death certified by European trained doctors is still very far distant. Eastern Bengal and Assam, then must be classed as one of those areas where the cause of death is based on popular diagnosis. In compiling the statistics of such an area, a classification of causes should be based deliberately on popular ideas, and no attempt should be made to introduce a scientific classification until the country has so far advanced on the scale of civilisation as to have properly trained persons to certify the cause of death.

What then are the classes of causation which should be utilised in such a case? The present classes of Eastern Bengal and Assam as laid down by the Government of India are-Cholera, Smallpox, Plague, Fever, Dysentery and Diarrhoea, Respiratory Diseases, Injuries, and All Other Causes. Of these, all except fever are terms belonging to the scientific classification of causes used in this country.

Cholera is recognised throughout the whole area, and it is doubtful whether with skilled diagnosis, any great difference in the number of cases classified in this group would occur. Possibly some of the cases are classified as diarrhoea, and, on the other hand, it is generally held by European Doctors in India, that a certain proportion of the cases reported as Cholera are really cases of ptomaine poisoning.

Smallpox is probably recognised as well by the public as it would be by medical practitioners, because it presents a cutaneous condition and is of frequent occurrence. Further in the Bengali language, there is a separate word for "chickenpox" which indicates that the people draw a

distinct line between smallpox and the only other disease with which it would be at all frequently confounded.

Plague. In Eastern Bengal and Assam there is almost no plague. From time to time, an outbreak of what has appeared to be pneumonic plague has occurred here and there. The total number of cases reported since 1896, when the disease became epidemic in India, is not more than 200 or 300. In several outbreaks of which I have had personal knowledge, the history as regards registration has been that the chowkidar had reported sudden deaths of a nature which the people did not recognise, and the thana officer has been the first man to suspect the cause of these deaths. They have all been confirmed by investigation by medical officers of superior grades. One of these outbreaks was reported by Professor W.R.Simpson, in his book on Plague .

Two other outbreaks reported by myself were published in the Supplement to the Sanitary Report of the Province, 1909. So that, in this Province, at least, the diagnosis of plague seems to be sufficiently reliable to warrant the use of the term in the classification by causes.

Dysentery and Diarrhoea. Obviously this group of cases, depends on the recognition of symptoms merely, and has no relation to any disease in a scientific classification. While the profession recognises dysentery as due to certain specific organisms, the public merely recognise a disease in which blood or mucous or both occur in the faecal discharges. Professional experience in India shows that many cases of neglect and starvation end in a dysenteric condition. These, one is accustomed to call "terminal dysenteries". They are probably not true dysenteries, but might be classified as dysentery by the Indian public. Again, chronic infections of Malaria and Kala-azar and septic conditions frequently end in a dysenteric condition. Any of these might

be included in this group. Diarrhoea is admittedly not a disease of itself, but in this case, all deaths prior to which it is a prominent feature may come into this group; for example, many cases of enteric fever. This group however, does not shew a very high figure in the tables, so that it appears as if the people do not really attribute many deaths to such causes.

Respiratory Diseases. This group has recently been added to the list, but respiratory diseases are not recognised by the public as a cause of death. They do not understand details of internal structure and such cases are ordinarily classed as "fever".

Injuries. This group is subdivided into suicidal wounds or accidents, and deaths due to snakebites or attacks by wild animals, and is probably as accurate as it would be with skilled diagnosis.

All other causes. In an enlightened community, this group would consist of all unclassified deaths, but in these statistics it is a very select group, because if the people do not know the cause of death they attribute it to fever, and this group, includes only those cases in which the cause is obvious and yet for which there is no separate class. For example, a death from drowning is obvious but there is no separate class. Again a death is reported from fever following childbirth. The thana officer knows that this is not malaria, so he puts it into "All other causes".

Fever. This is a good term, because it cannot be confused with anything in scientific classification except Pyrexia of uncertain origin, and this is practically what it represents. It includes malaria, kalazar, much Phthisis and Pneumonia, typhoid, measles and all unclassified fevers. As bearing on this point, the following quotation from Major Leonard Rogers' "Fevers in the Tropics" is given.

"Mortality from Malarial Fevers in India. The Vital Statistics of the civil population of India shew that 90% or more of the deaths are returned as being caused by fevers, and they have been quoted as an evidence of the enormous mortality from malarial fevers. As a matter of fact, they afford no indication whatever as to the real mortality from fevers in general, and still less of any particular kind, as the deaths are reported by ignorant village headmen and watchmen who return every kind of illness as fever. Some general ideas as to the principal causes of death may be obtained from the results of an enquiry into 1000 fatal cases in the very feverish district of Dinajpur in Lower Bengal, All the deaths returned as due to fever in one year in selected areas of the district were investigated by obtaining the history of the illnesses from the relatives of the deceased. I/ thus found that 1/3 of the deaths attributed to fever were due to disease such as dysentery, tumours, etc., in which fever was not even a marked symptom, another third were caused by such diseases as pneumonia, bronchitis, phthisis, (the last constituting 9% of the total), and typhoid, while the remaining third were probably due for the most part to malaria and kalaazar. We arrived at the conclusion, then, that, at any rate, in this specially malarious district the deaths due to malarial fever probably amounted to from 20 to 25% of the total fever mortality."

It will be useful to shew here statistics in the area based on varying degrees of accuracy of diagnosis. In the following statement, the first column shews the deathrates from various causes of the general

population for 1909. The second column contains the deathrates for coolies on teagardens for the same year and the third the ratios for the Jails. In the first case the diagnosis is popular, in the second it is chiefly that of native assistants working under European supervision, and in the third case it is usually that of a European medical officer.

Cause.	Deathrate per 1000. Province.	Deathrate per 1000. Coolies.	Deathrate per 1000. Jails.
Cholera.	2.29.	2.16.	1.60.
Plague.	-	-	-
Fever.	22.4.	-	-
Malaria.	-	3.29.	2.91.
Dysentery & Diarrhoea.	.78.	8.45.	8.59.
Respiratory diseases.	.15.	4.33.	8.45.
All other causes.	5.38.	10.10.	8.74.
All causes.	31.0.	28.40.	30.29.

In order to make these figures comparable they should be reduced to a common standard of total mortality, as is done in the following statement.- (as per enclosed)

Cause.	Province.	Tea Gardens.	Jails.
Cholera.	7.40.	7.80.	5.20.
Fever.	72.32.	--	---
Malaria.	---	11.60.	9.67.
Dysentery, and Diarrhoea.	2.50.	29.70.	28.27.
Respiratory Diseases.	.48.	15.40.	27.88.
all others causes.	17.30.	35.50.	28.88.
Total.	100.	100.	100.

The points that are made clear by this statement are, (1) that the public appear to have very much the same idea of cholera as the medical profession, because the percentage of total deaths reported by them as due to cholera is very similar to that in the tea estates, and rather over that in the jails, where better care of the water supply would lead one to expect a better result.

(2) The term "fever" in the general statistics is obviously not the same as malarial fever of the tea gardens and jails. If it were, one would have to allow that the better care of coolies and convicts had reduced their deathrate from malaria 7 or 8 times. This is not so. The truth is that the coolie and convict figures are some-where a little below

the true proportion of deaths from malaria, while the general figure includes many other causes of death.

(3) The total deaths from dysentery and diarrhoea are not reported under this head among the general population. Whereas, when there is a scientific diagnosis, this cause accounts for about 30% of the total deaths, it only accounts for 2.5% of the deaths based on popular diagnosis. Where then are the rest of the deaths from this cause in the general population? They cannot be in the group "all other causes" for this, too, is relatively low. They must be in the "fever" group.

(4) Respiratory diseases among the general public are obviously not fully reported. The bulk of these, too, must be in the "fever" group.

(5) Even the column "all other diseases" in the estimation of the public ~~is~~ accounts for little more than half the amount where skilled diagnosis is made, so that many of these cases also must have gone into the fever group.

It appears then that the use in this classification of Cholera, smallpox, plague and injuries, although these are terms belonging to a scientific classification, is not likely to lead to any great error, because the rates calculated on deaths reported from these causes are likely to be about equally accurate in either case. The terms "fever" "dysentery* and diarrhoea" "Respiratory diseases" and "all other causes" appear to lead to no useful differentiation, and the terms "dysentery and diarrhoea" and "respiratory diseases" are certain to lead to confusion on account of the fact that they may be taken to have the same meaning as they have in a scientific classification. In fact, it would be safer, after extracting deaths from cholera, smallpox, ~~and~~ plague, and injuries, to slump all the others under the head "all other causes"

until such times as the penetration of the Western system of medicine to the villages renders a classification based on medical diagnosis possible.

Corrected deathrates.

The calculation of corrected deathrates has not so far been made for the Province of Eastern Bengal and Assam, but it is necessary if there is to be any comparison of the statistics of the various districts. At first sight, it appears that what is required is correction for the age and sex distribution of the people, and such a correction would be very valuable, but in view of the fact that all the Assam districts except Goalpara contain a more or less considerable proportion of coolies who are under an efficient system of medical and sanitary supervision, it appears that if the condition of these people could be eliminated from the statistics, truer comparison of the conditions of the general public would be obtained, because the figures of the Assam districts would then represent the condition of those parts of the districts, which are occupied by and open to the general public.

Owing to the want of the necessary data I have not made the latter corrections. Only the corrections for age and sex have been attempted, and the corrected deathrates worked out for the past decade. The first step is to find out the mean average deathrates of the various age groups by sexes for the whole area. The deaths of the Province have been taken from Statement IV of the Appendices of the Annual Sanitary Reports from 1901 to 1910. The total population of the 10 years has been obtained by adding the estimated populations of the Province as shewn in the statement on page 5b. Assuming that the proportion of males did not vary during the decade, the number of males of the decade must be in proportion to the total population of the decade as the males of the 1901 census are to the total population of that census.

That the proportion of males did vary during the decade is shewn by the following figures. The total population in 1901 was 29,812,735

of whom 50.95% were males. The total population of 1911 was 33,189,404 whom 51.2% were males. In calculating the make and female populations of the decade, allowance has been made for this alteration in proportion by taking the males at 51.1% of the population of the decade. The population of the decade then was 313,830,000 of whom 160,300,000 were males and 153,530,000 were females.

Assuming that the proportions in the age groups did not change, the number in each age group for the ten years should bear the same proportion to the total number of the respective sexes as the numbers in the age groups of the 1901 census bear to the total numbers of the respective sexes in that census. Unfortunately, the figures by age groups for the districts have not yet become available so that one has no means of testing how far this assumption is correct.

On these premisses, the following tables of mean average death-rates have been constructed.

Mean average death rates of age groups for the decade 1901-10.

	Males.			Females.		
Age Group.	Total population of 10 years.	Deaths of 10 years.	Rate per 1000.	Total population of 10 years.	Deaths of 10 years.	Rate per 1000.
0- 5.	22,950,000.	1,963,001.	85.5.	24,260,000.	1744127.	71.9.
5-10.	25,900,000.	436,796.	16.7.	25,300,000.	336646.	13.3.
10-15.	19,600,000.	242,900.	12.4.	15,470,000.	175383.	11.3.
15-20.	13,000,000.	227,000.	17.5.	14,640,000.	296,323.	19.3.
20-40.	49,450,000.	938,000.	19.0.	47,650,000.	1006358.	20.6.
40-60.	22,600,000.	684,671.	30.6.	19,200,000.	531218.	27.6.
over 60.	6,800,000.	487,304.	71.7.	7,060,000.	404559.	57.2.
Total.	160,300,000.	4980,272.	31.1.	153,530,000.	4494609.	29.2.

By applying these deathrates to the age groups (male and female) in each district, as found in the Census of 1901, one can calculate the number of deaths which would have taken place in each of these groups had the Provincial rate held good for each district, and by adding these deaths together, multiplying the result by 1000, and dividing by the total district population, one arrives at the standard deathrate of each district. In this way the following standard deathrates for the districts have been found.

Having ascertained the standard deathrates, the next step is to calculate the factor of correction for each district. This is done by dividing the standard deathrate of the Province by the standard rate of each individual district. The factors of correction are also shewn in the following table.

District	standard death rate	factor of correction
Province	30.2	1
Dacca	30.5	.9887
Mymensing	29.95	1.00875
Faridpur	30.28	.9975
Bakarganj	30.15	1.00175
Chittagong	30.21	.9997
Tippera	30.08	1.00425
Noakhali	30.79	.9585
Rajshahi	29.52	1.0232
Dinajpur	29.62	1.0197
Jalpaiguri	29.51	1.0236
Rangpur	30.01	1.0045
Bogra	30.09	1.0038
Pabna	30.30	.9967
Maida	30.32	.9960
Cachar	29.21	1.0340
Sylhet	29.44	1.0260
Goalpara	31.06	.9722
Kamrup	31.28	.9655
Darrang	29.41	1.02725
Nowgong	30.70	.98365
Sibsagar	29.57	1.0215
Lakhimpur	29.26	1.03225

With these factors of correction it is now possible to correct for age and sex the deathrates shewn on page ~~59~~ 110. This is done by multiplying these rates by the factor of correction. The results are shewn in Statement IV. of the Appendix.

The comparative healthiness of the districts then may be compared on these tables. With regard to the past decade, however, it must be recognised that the registration has been lax, and with improved registration the figures of the next decade ought to be much more reliable.

Infantile Mortality.

Reference to Newsholme's chapter on infantile mortality makes it clear that in England the rate of infantile mortality is a most reliable test of the sanitary condition of a district. The factor which gives this figure its special value is that neither the population figure nor the deaths figure used in the calculation, is liable to approciable variation on account of migration. Migration affects the total population at all ages to an extent which it is not possible to gauge, but by taking the infantile mortality only, one eliminates as far as possible this factor.

For the purposes of the Province of Eastern Bengal and Assam, it appears that infantile mortality rates would be an important guide to the sanitary conditions for the same reasons, but so far, although occasional references are made to rates in the narrative portion of the report, no table of the rates has been published.

With regard to the calculation of such rates for Eastern Bengal and Assam, it should be remarked that (1) there is probably an understatement of the total births in the records.

(2) there is probably an understatement of the total deaths in the records.

(3) Mr.G.F.Hardy suggests that the understatement of deaths is probably very much greater in

the earlier years of life than among adults. This would be a very difficult thing to prove from any data which we have at present, but it would appear to be reasonable, because the deaths of adults are more noticeable in any community than those of young children who have never made their mark on the community as a whole.

For these reasons, in the calculation of infantile mortality, both the numerator and the denominator are actually short of the truth, but it is impossible to state whether they are proportionately short or not.

Statement V. of the appendix shews the infantile mortality rates of each district for the past decade, i.e. the "deaths under 1" multiplied by 1000 and divided by the births. As registration is improved, possibly, the first result will be to shew higher rates of infantile mortality, and in view of the importance of the test it is urgently necessary that registration should be so stimulated that it is made accurate and reliable.

Statistics of Verification.

As indicated on page ~~47~~ 52, it is very important that each set of statistics should contain a statement shewing the results of verification of the accuracy of the registration on which the ratios have been based. Such a statement should shew, regarding births and deaths separately, the number of verification observations contrasted with the number of recorded occurrences, the number of "Hathchits" checked, contrasted with the number of "Hathchits" in the area, and a calculation of shortage of registration based on the verification observations.

Comparison of Statistics of Scotland with those of Eastern Bengal and Assam for 1909.

It is of considerable interest to compare some of the facts regarding the Province ascertained by statistical methods with the facts shewn in the Register General's Report on Scotland. A point worthy of note is that none of these figures are taken directly from Sanitary Reports because as already shewn, the methods of compilation in the Province are not identical with those of Scotland.

In Scotland, the Birthrate for 1909 was 27.331 per mille, while that of Eastern Bengal and Assam, calculated by the same method was 37.00. The latter figure is probably considerably short of the truth.

In Scotland, the Birthrate per 1000 married women of the ages 15-45 was 248.8 while that of the Province was 206. and the latter figure includes illegitimate births.

The Crude deathrate of Scotland was 15.853, while that of the Province was 31. The averages of the previous 9 years were 16.751 and 30.16 respectively.

The deathrates according to cause are not comparable, because of the differences in classification.

The infant mortality rate of Scotland was 107.7, that of the Province was 192.

The respective mortality rates by age groups are best seen in a statement thus:

Age Group	Males		Females	
	Scotland	Eastern Bengal & Assam	Scotland	Eastern Bengal & Assam.
0 - 1	127.47	230.5	101.84	203.50
Under 5	42.14	84.4	35.70	72.00
5 and Under 10	3.98	16.55	4.30	12. 93
10 " " 15	2.39	11.90	2.88	10. 80
15 " " 20	3.56	16.65	3.55	19. 90
20 " " 30	4.95	18.00	4.79	21.67
30. " " 40	7.76	20.60	7.59	23.30
40. " " 50	12.50	27.70	10.92	26.00
50 " " 60	25.76	42.00	19.78	38.60
Total	16.24	31.60	15.48	30.10

heard, probable that they reach the climacteric p
so much as 10 years. Again, the birthrate at
account of the use of artificial means of pr
the people of this Province such practi
In fact large families are a matter of pride
Further it must be remembered that the figure
arrived at after including all births, legitima

V. The inaccuracy of the statistics of Eastern Bengal and Assam :

From the observations made regarding the defects of registration and verification on pages 39 to 51, it is evident that the statistics of the Province must fall short of the truth.

Personal knowledge of the conditions of the various districts suggests that the statistics do not agree with the facts. For instance, in the table of corrected deathrates for the decade, it appears that Nowgong, Sibsagar and Lakhimpur were among the healthiest districts of the Province— a statement which is certainly not backed by experience.

Again, if one compares the proportion of children born to married women between the ages of 15 and 45, found in the Province, with that found in Scotland,—206 with 248.8,—one would infer that the populace in Eastern Bengal was less prolific than in Scotland. When one asks one's self whether this is probable, the answer must be in the negative. In Scotland, the average age at which women are married and hence at which they are liable to begin having children is about 25, while in India it is 14 or 15, so that the mothers of India get a start of about 10 years. It is, on the other hand, probable that they reach the climacteric period earlier but not by so much as 10 years. Again, the birthrate at home is declining chiefly on account of the use of artificial means of preventing conception, while among the people of this Province such practise is almost unknown. In fact large families are a matter of pride rather than otherwise. Further it must be remembered that the figure 206 for Eastern Bengal is arrived at after including all births, legitimate and illegitimate, whereas the Scottish Rate cited is based on legitimate births only. The lowness of the rate suggests, that registration is

defective./

defective.

In the statistical table of Compulsory registration in the Annual Sanitary Reports of the Province, there is a column shewing the number of births which probably occurred in each registering area. This is based on the assumption that, for every 1000 married women of childbearing years in the town, there ought to be 286 births per annum. I have failed to discover authoritatively where this number has come from, but it appears probable that it has been taken from page 74 of Newsholme's "Vital statistics" where 285.8 is quoted as the rate per 1000 "married women between 15 and 45" found in England in 1881. It appears, however, unfair without further knowledge of the conditions affecting fertility to assume any fixed rate as applicable from one nation to another, and further each of the registering circles to which this standard is applied, contains a comparatively small number of married women so that it is very unlikely that the rate is at all constant.

In the 39th Annual Report of the Registrar-General of England, Dr Farr appears to have attempted to gauge the error in the statistics of England during the earlier years of the registration of births, but unfortunately the details of his method are not recorded, and from what is on record, it is difficult to see what method he adopted for this purpose.

Some idea of the state of registration in the Province may be gathered from the following reasoning. The populations of March 1901 and 1911 are/

are accurately known from the Census. The losses of the population are due to death and emigration. It is practically certain, that emigration from the Province is negligible, and the deaths are underestimated. Thus, the recorded deaths represent a low-reading of the losses of the Province. Now the gains of the Province are due to immigration and to births, and from Immigration Department figures, one can ascertain the number of immigrants with the exceptions of those going into Jalpaiguri district, so/ that by subtracting the deaths of 10 years from the 1901 population, and adding the immigration figure of 10 years, one would get a figure marked (a) below. If this figure is subtracted from the population of 1911, the result would be the births of the Province plus the Jalpaiguri immigration thus:-

1901 population of Province	28,812,735
Subtract the deaths of 10 years	9,469,800
	20,342,935
Add the known immigration of 10 years	460,000
	20,802,935 (a)
Population of 1911	33,189,404
Subtract (a)	20,802,935
	12,386,469
Allow for Jalpaiguri Immigration	50,000
	12,336,469

The last figure ought to approximately represent the births of 10 years, and is equivalent, to a crude birthrate of 39.40 per mille. That is, if we allow that the deaths were accurately recorded, then the recorded birthrate (37.4) was 2.00 per mille short of the truth, and for every unit per mille shortage of the deaths, an additional unit per mille/

mille shortage in the births must have occurred.

Again, if, as appears approximately true, the appreciable error is confined in Jalpaiguri district, a calculation from which the facts of this district are excluded ought to give a fairly clear idea of the condition of the Province as a whole during the past decade. Thus:-

1901 population less Jalpaiguri	29,025,355
10 years reported deaths less Jalpaiguri	9,181,566
	19,843,789
Add for immigration approximately	460,000
	20,303,789 (a)
1911 population less Jalpaiguri	32,285,819
Subtract (a)	20,303,789
	11,982,030
Population of 10 years less Jalpaiguri	305,418,200

Birthrate of the Province 39.24 per mille

That is, if Jalpaiguri is left out of account, the recorded birth-rate of the Province, which would have been 37.4 per mille was 1.84 per mille short of the truth, if the deaths were all reported, and for every unit per mille shortage of the deaths, an additional shortage of 1 per mille must have occurred in the births.

Although this reasoning may be applied to the figures of the Province as a whole, it would be unwise to apply it to the individual districts because the factor of migration from district to district would be introduced and although this is believed to be little, no definite knowledge of the amount of it can be had.

So far, then, one has only reached the fact that the shortage of births exceeds/

exceeds the shortage of deaths by about 1.8 or 2.0 per mille.

In the Memorandum on the Age Tables and Rates of Mortality of the Indian Census of 1901, Mr G.F. Hardy discusses the possibility of utilising the Census as a test of Death Registration. He arrived at the conclusion that the deathrate of males in Bengal for the previous decade had been 34.1 and the birthrate 43.9.

His method seems worthy of further examination. Mr Hardy remarks "from the known imperfection of these returns (the vital statistical returns) it results that all calculations as to increase of population based thereon are vitiated, and almost the only information derivable from these returns is the relative mortality of different years in the various Provinces". As shewn in previous pages, the figures do not appear to do even this accurately. The following description of Mr. Hardy's method of calculating the probable death rates from census figures will pave the way for an attempt to gauge the probable rate of the new Province during the past decade.

He took the population of 1891, and the population 10 years old and upwards in the 1901 census making a correction for the inaccuracy of the age returns. The latter population represents the survivors of the former population at the end of 10 years. He admits that migration is ignored. The difference between the two populations represents the deaths which have occurred in the 1891 population during the succeeding 10 years.

The total deaths of ten years, however, are those of this population plus the deaths of all children born during the 10 years.

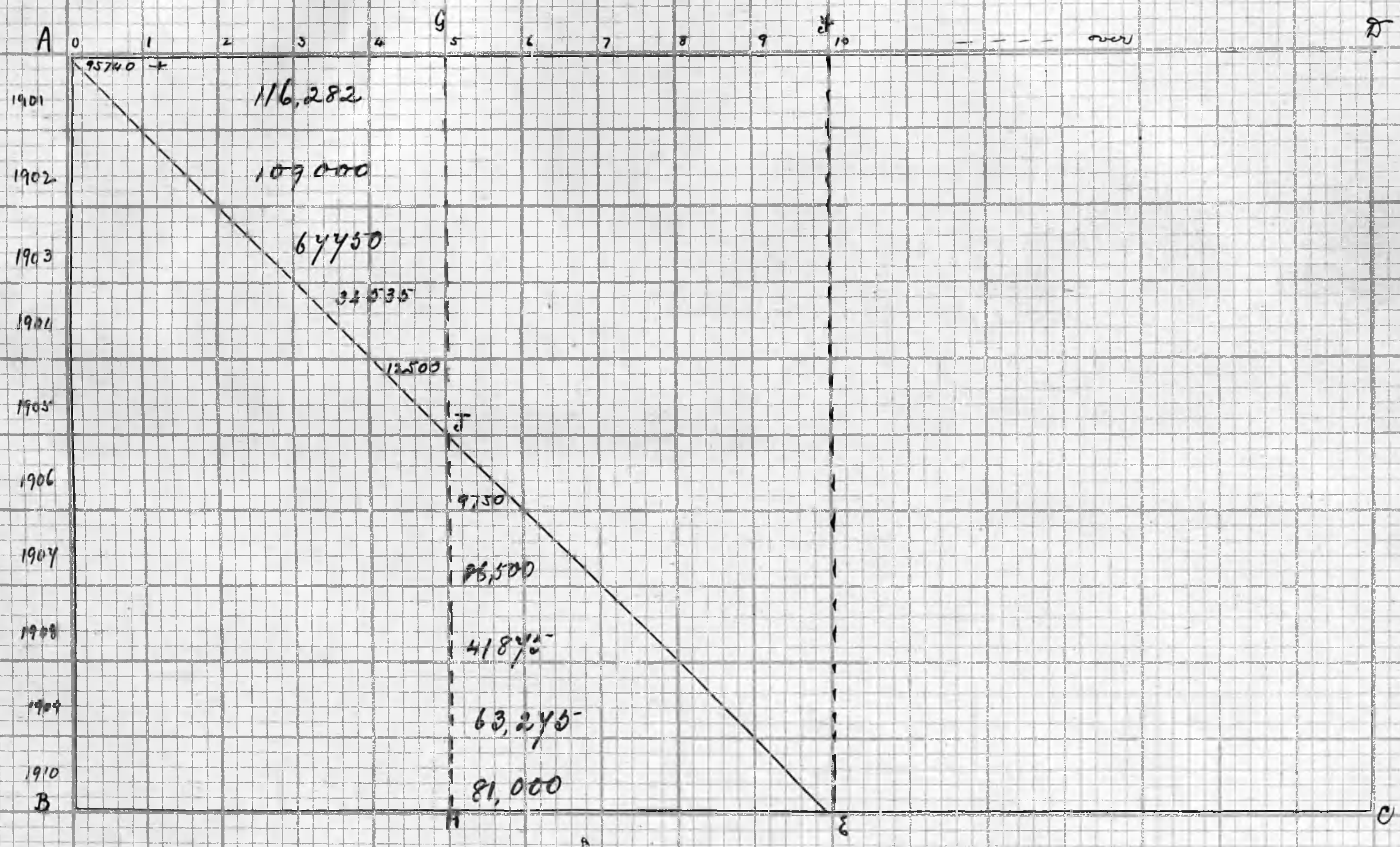
He then assumed that for practical purposes the number of deaths of children born during the decade corresponds with the number of children/

dying between the ages of 0 and 5 during the decade, and therefore the deaths of the 1901 population during the 10 years are the same thing as the deaths during the decade of the age groups over 5. He points out that this assumption would be accurate if the deaths were uniformly distributed over the first ten years of life, but that owing to the fact that there are proportionately more deaths in the very young, the assumption leads to too low as estimate of the deaths under 5 and too high an estimate over 5. On the other hand, he thinks that this tendency will be corrected by the fact that more of the deaths of very young children escape registration and that therefore the assumption may for practical purposes, be accepted.

He then takes the deaths of the age groups over 5 and the total recorded deaths from the Sanitary Reports and states that the total Deaths must bear to the Total Recorded Deaths the same proportion as the deaths in the 1891 population during the decade bear to the Recorded deaths in the age groups over 5.

Before applying this method to the figures of Eastern Bengal and Assam it is necessary to point out that the neglect of the factor of immigration will to some extent modify the accuracy of the result. Further the statement that the number of deaths of young children which escape registration will counteract the error of assuming that the deaths of the first 10 years of life are evenly distributed, requires examination. The accuracy of the statement may be tested in the following way. In the appended diagram, the deaths of a decade are graphically represented. The horizontal lines represent years of the decade and the vertical lines years of life. The figure ABCD represents the total deaths of the decade. The figure ABE must closely represent the deaths occurring

in/


A
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1903
1904
1905
1906
1907
1908
1909
1910
95740
116,282
109000
67450
32535
12500
9750
25,500
41845
63,245
81,000

in children born after the Census, because in 1901, of the deaths occurring in the first year of life only a portion could have been those of children counted in the Census. Similarly, in 1902, all those who died in the first year of life must have been born after the Census and approximately half of those dying in the second year of life will have been born after the Census and so on. If, then ABE represents the deaths of children born after the Census, AECD must represent the deaths of persons who were counted in the Census of 1901. The figure GHCD represents the deaths of the agegroups 5 and upwards, so that when Mr Hardy assumes that the deaths of the 1901 population during the 10 years are equivalent to the deaths in the population aged 5 and upwards, he is assuming that the figure AECD is equal to the figure GHCD. In order to test this, it is necessary merely to show that AJG is equal to HJE. In saying that this assumption is inaccurate because the deathrates in the earlier years of life are proportionately high, but that the greater tendency of the deaths of quite young children to escape registration will counterbalance the inaccuracy, he indicates that with our imperfect registration the values of AJG and HJE are equal.

In order to test this, the figures have been plotted in the following way from the Sanitary Reports, the number of deaths in each age group can be obtained, and by distributing the deaths against particular ages, one can obtain the numbers of deaths represented by each portion of the diagram. Calculated in this way, the value of the figure AJG appears to be the sum of :-

95,740
116,282
109,000
67,750
34,535
12,500
435,807.

The figure HJE appears to be the sum of:-

9,750
26,500
41,875
63,275
81,000
228,400

Thus the figure AJG is greater than HJE by 213,407 and therefore the figure AECD is greater than the figure GHCD by 213,407; that is, the tendency of the deaths of quite young children to escape registration is not sufficient to counterbalance the error caused by the higher rates of mortality in the young children.

In the case of the Province of Eastern Bengal and Assam, the assumption that the deaths of the 1901 population during the decade are equal to the deaths during the decade of the agegroups over 5 will lead too an overestimate of the deaths over 5.

The amount of the overestimate can be gauged by taking the proportion of the value of the figure ABCD to the value of the figure GHCD.

The figure AECD represents 5,978,586 and the figure GHCD represents 5,785,179, and

$$\frac{5,765,179}{5,978,586}$$ is equal to .9865

Then the number found to represent AECD must be multiplied by .9865 in order to be comparable with the figure found to represent GHCD.

If now these calculations are applied to Eastern Bengal and Assam, the result is as follows:-

Populations of 1901,	29,812,735 (a)
" " 1911,	33,189,404 (b)
" age 10 and upwards (1911) 22,565,000 (c)	
" " corrected for age inaccuracy,	22,345,000 (d)
Deaths in 1901 population during the decade, (a - d)	7,467,735

To make this number comparable with the number of deaths age 5 and upwards it must be multiplied by .9865, so that the figure for comparison will be:

7,365,000.

The recorded deaths age 5 and upwards during the decade were 5,765,179

The total recorded deaths were 9#474,881. Using Mr Hardy's proportion, the number of deaths which must actually have occurred was 12,100,000. This gives an average deathrate for the decade of 38.57 per mille. The recorded figures give a rate of 30.2. Thus the deathrates would appear to be about 8.37 per mille short of the truth. In other words 21.7% of the deaths are not registered.—In 1901 the population was 29,812,735. If during the decade there were 12,100,000 deaths, then the additions necessary to give 33,189,404 in 1911 were 15,476,669. This number would be made up partly by births and partly by immigration. If 460,000 is allowed for the addition due to immigration then the births amounted to 15,016,669. This gives an average birthrate for the decade of 47.87 per mille. The recorded figures gave an average birthrate of 37.4 per mille. Thus the birthrates appear to be 10.47 short. In other words 22.9% of the births are notrecorded. Although these rates can not be taken as absolutely accurate, they appear to be approximately so.

If the provincial Birthrate for the ten years was 47.87 the birth rate per 1000 married women between the ages of 15 and 45 must have been about 268, which is more nearly what one would expect.

VI. Conclusion.

In the introductory pages of this thesis, I stated my view of our present position in the fight against disease in the Tropics, and it is gratifying to find that a verysimilar view of the situation has recently been expressed by Professor W.J.R. Simpson, C.M.G. In the last number of the British Medical Journal (11th November, 1911) Professor Simpson,while speaking on Sanitation of Villages and Small Towns in the Tropics, is reported to have said,"In conclusion, I hope that the tendency to rest content with the brilliant discoveries of medical science without giving practical application to them will disappear. For the purpose of prevention of disease in the tropics, administration must go hand in hand with the established discoveries of research. Administration has hitherto lagged behind at an enormous distance, and if efficiency and cheapness are to be secured there must be much more than the mere awakening that has taken place during the past decade. We need a forward policy in sanitary administration of a more active and organised nature, based on the lines indicated, if the tropics are to be made healthy, and plague,malaria, yellow fever,dysentery,cholera,tuberculosis and other diseases whose causes are wellknown,are to be successfully combated."

A part of this forward policy must be the accurate registration of the facts necessary to gauge progress, and it is with a view to attaining this object that the work related in the foregoing pages has been done.

The practical points which appear to require emphasis,,can be divided into two groups. (1) those which apply generally to the vital statistics of areas in our colonies and dependencies and (2) those which apply more particularly to the Province of Eastern Bengal and

Assam.

In the first group may be placed the following statements:

(1) The methods of compilation of such statistics as can be gathered should be identical with the methods adopted at home, so that the results may be as nearly comparable as possible.

(2) A definite line can be drawn between those statistics whose accuracy depends solely on administration, and those whose accuracy involves the presence of skilled medical men thickly scattered throughout the population. Facts relating to total births, legitimacy and illegitimacy, total deaths, age at death, season of death, and religion of deceased, are all ascertainable by the general administration, whereas statistics of causation are not ascertainable without the help of a universally distributed medical profession.

(3) The statistics ascertainable without the presence of a medical profession form the basis of the birthrates, crude deathrates, corrected deathrates, infantile mortality rates, and deathrates by season and age. These are the most essential data for measuring sanitary progress, and the classification of deaths by causes, although of very great value, is not indispensable.

(4) In view of the facts that there is no wide distribution of the medical profession in the tropics and in its absence classification by cause is unreliable and in many cases misleading, a very great effort should be made to obtain accuracy in the statistics ascertainable by the general administration.

(6) In view of the extreme difficulty of gauging the degree of

inaccuracy of registration from internal evidence or from census enumerations, great importance should be attached to systematic verification of registers throughout the whole area concerned.

(7) Every compilation of Vital Statistics should include the following facts.

A. Total births, birthrate per 1000 of population, birthrate per 1000 married women of childbearing years.

B. Total deaths, crude deathrate, corrected deathrate, seasonal and age tables, infantile mortality rates.

C. A statement of the amount of verification done.

With regard to the Province of Eastern Bengal and Assam which may be taken as typical of the Indian Provinces as a whole, the following facts require emphasis.

(1) The method of calculating populations should be altered to that of the Registrar General at home.

(2) The registration of the past decade appears to have been inaccurate. The inaccuracy probably amounted to about 22% of the births and deaths.

(3) The inaccuracy is dependent on factors which the administration can control and is independent of the supply of skilled medical practitioners.

(4) The inaccuracy is chiefly due to causes which are immediately remediable, and only in a minor degree to such causes as faulty internal communications and want of education which can only be remedied with time.

(5) The remedies which are specially indicated are complete verification and strict dealing with all persons in default. ie, not only Gaonburas, Chowkidars and townspeople, but also inspectors,

and
police/revenue officers.

(6) In registration, it is necessary to add information regarding the legitimacy, or otherwise, of births.

(7) In compilation, it is necessary to add statements of the birthrate per 1000 married women of childbearing years, corrected deathrates, infant mortality rates, and a statement of the amount of verification done in each circle for which separate ratios are calculated.

VII. Appendix.

Statement 1. Birthrates per 1000 of population calculated by the Registrar-General's method, for the decade 1901 to 1910 (see page 67)

Statement 11. Crude deathrates calculated by the same method for the same period. (see page 67).

Statement 111. Birthrates per 1000 married females between the ages of 15 and 40 for the past decade. (see page 73)

Statement 1V. Corrected deathrates for the past decade (see page 90).

Statement V. Infantile Mortality rates for the past decade. (see page 91)

Statement 1.

Crude Birthrates of Eastern Bengal and Assam, obtained by calculations of intercensal populations from the formula $P' = P(1 \pm r)^n$ using census of 1901 and 1911 (see page 67).

District	Rate per 1000 of population									average of the decade ↓		average of Sanitary report rates of decade
	1901	1902	1903	1904	1905 ↘	1906 ↘	1907 ↘	1908 ↘	1909 ↘	1910 ↘		
Dacca	39.9	41.25	37.3	41.25	39.6	35.2	34.5	40.2	38.75	33.7	38.2	40.3
Mymensing	37.8	39.8	36.	37.8	35.2	32.1	30.3	36.4	35.7	33.	35.4	37.7
Taridpur	40.5	39.8	37.4	44.6	38.5	36.6	36.6	40.2	38.4	33.5	38.6	40.2
Bakarganj	41.5	43.6	42.8	44.5	42.5	37.2	36.3	37.5	35.4	31.4	39.2	40.4
Chittagong	36.2	41.2	39.4	36.4	39.0	39.0	39.2	39.1	37.2	34.7	38.1	40.3
Tippera	38	41.6	36.3	38.7	38.1	31.8	31.4	37.8	35.9	31.2	35.9	38.3
Noakhali	43.5	52.25	46.2	47.5	42.8	41.5	40.9	42.7	41.2	35.8	43.4	46.2
Rajshahi	43.2	44.1	39.9	49.6	39.2	38.0	37.5	39.7	44.6	40.7	41.7	41.9
Dinajpur	44.2	48.8	39.7	42.3	43.4	40.1	36.1	40.6	44.5	41.7	42.1	43.7
Jalpaiguri	34.	36.3	30.6	33.5	33.6	33.	36.4	37.7	35.	37.4	34.8	37.2
Rangpur	42	39.6	34.5	41.	36.7	36.9	36.2	40.4	37.6	36.5	38.2	40.3
Bogra	40.6	43.9	37.3	44.8	38.9	36.3	33.6	41.2	39.0	34.9	39.1	41.7
Pabna	34.9	30.2	36.	37.5	30.4	34.9	33.3	35.9	34.0	30.2	33.5	33.6
Malda	42.5	46.6	43.2	49.5	45.7	41.4	38.2	39.9	46.7	44.5	43.8	46.6
Cachar	35.2	35.	33.4	34.4	37.	34.3	3 .4	35.1	31.2	31.4	33.9	36.9
Sylhet	36.4	36.6	37.4	36.6	36.3	30.8	31.7	34.8	33.0	31.8	34.5	36.2
Goalpara	44.	43.7	41.	42.8	45.4	40.25	42.0	43.3	38.9	39.5	42.1	47.6
Kamrup	31.2	31.2	32.2	26.5	27.4	32.6	36.0	36.2	32.6	33.0	32.1	34.1
Darrang	31.2	33.	34.4	33.2	33.4	32.9	32.	33.6	32.4	33.3	32.9	34.8
Nowgong	29.6	27.2	34.	32.6	36.6	34.	33.6	36.4	31.9	33.	32.9	35.5
Sibsagar	26.2	24.1	27.	28.3	28.2	31.1	27.4	30.5	23.6	26.9	27.3	29.1
Lakhimpur	26.1	25.2	26.6	26.3	28.	29.2	30.	29.4	25.1	28.5	27.4	30.2
Province	38.9	40.2	37.4	40.3	37.6	35.4	34.7	38.0	37.0	34.4	37.4	39.3

Statement 11.

Crude Death Rates of Eastern Bengal and Assam obtained by calculations of intercensal populations from the formula $P' = P(1 \& r)^n$ using Census of 1901 and 1911.

District	Rate per 1000 of Population.										average of the decade	average of Sanitary report rates of decade.
District	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910		
Dacca	27.5	32.	28.6	31.8	35.2	28.7	22.5	22.2	29.5	27.8	28.9	30.5
Mymensing	25.3	26.	24.	24.X	34 05	23.9	19.6	18.1	22.2	26.0	24.1	25.7
Faridpur	31.5	42.7	31.5	38.4	40,3	27.8	24.9	27.2	36.0	35.6	33.6	35.
Bakarganj	30.2	33.8	35.3	34.1	32.6	35.2	35.5	36.4	33.1	29.9	33.6	34.7
Chittagong	29.9	27.2	34.8	29.5	29.3	27.9	30.2	27.4	29.6	31.8	29.7	31.3
Tippera	24.1	22.8	22.8	25.4	27.	26.9	20.6	21.7	24.	21.1	23.6	25.2
Noakhali	33.2	32.	28.5	31.2	29.5	28.4	29.2	26.6	33.6	24.8	29.7	31.7
Rajshahi	33.5	39.1	54.	42.6	41.6	34.2	48.	39.6	40.4	42.	39.5	39.
Dinajpur	38.	41.	39.9	39.8	38.8	42.1	40.7	37.7	37.7	37.2	39.3	40.8
Jalpaiguri	33.	33.	32.1	33.2	31.3	35.	31.6	39.	37.3	36.4	34.2	36.6
Rangpur	30.6	32.4	28.2	33.7	33.4	34.2	29.3	31.6	35.4	35.4	32.4	34.1
Bogra	27.1	32.8	26.3	26.9	35.6	24.9	24.6	22.9	31.4	27.2	28.	29.9
Pabna	29.4	39.6	30.	35.8	45.6	25.5	26.	31.	42 1	37.5	34.3	34.3
Malda	29.8	33.3	33.8	34.6	40.3	39.5	39.2	27.6	26.55	28.1	33.3	35.4
Cachar	29.8	28.2	26.8	20.9	23.2	24.8	19.5	28.9	26.4	22.5	25.1	27.3
Sylhet	28.8	33.4	26.6	26.8	25.	22.1	20.9	26.6	28.	32.4	27.	28.4
Goalpara	34.	32.0	30.6	28.6	39.9	42.6	30.2	35.1	34.9	31.9	34.	38.4
Kamrup	23.	2. 7	22.1	17.1	27.2	41.	25.3	30.6	27.2	29 7	26.6	28.3
Darrang	35.2	35.2	37.2	32.	32.6	45.2	33.	47.5	39.1	34.4	37.1	39.2
Nowgong	25.2	21.	27.	28.7	18.8	29.7	20.9	35.5	30.4	33.6	27.1	29.1
Sibsagar	21.6	17.8	17.7	20.2	23.3	24.8	22.6	40.1	27.8	23.2	23.9	25.7
Lakhimpur	24.	21.5	21.1	21.7	24.1	23.4	25.5	35.	28.9	29.1	25.4	28.6
Province	28.8	31.8	29.1	30.9	33.5	29.8	27.2	28.3	31.0	30.6	30.2	31.7

Statement 111.

Statement shewing the Birth Rates per 1000 married females between the ages of 15 - 40 in each district during the decade 1901-1910.

District	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	Average	range of variation
Dacca	242	250	226	250	239	212	208	244	232	207	231	43
Mymensing	230	242	220	232	215	196	184	222	217	200	216	58.
Faridpur	252	247	231	276	238	224	224	249	238	208	239	68.
Bakarganj	246	258	254	264	252	210	215	221	209	181	233	78.
Chittagong	217	238	236	219	234	234	235	235	226	208	228	30.
Tippera	229	252	219	232	218	191	190	228	216	188	216	64.
Noakhali	256	308	272	282	253	245	242	254	242	211	257	97
Rajshahi	257	262	236	294	232	226	222	235	264	240	247	72
Dinajpur	262	288	235	250	256	237	213	240	263	238	248	75
Jalpaiguri	215	230	192	212	212	208	225	239	220	236	219	47
Rangpur	262	248	214	260	229	230	238	254	234	228	240	48
Bogra	233	251	214	258	222	208	192	242	224	200	224	66
Pabna	212	193	221	230	187	214	208	212	213	185	208	45
Malda	267	283	272	311	288	260	240	250	294	279	274	71.
Cachar	208	206	199	203	212	205	192	206	183	184	200	29.
Sylhet	226	227	231	226	225	192	197	216	204	197	214	39.
Gcalpara	296	293	275	288	305	270	282	294	261	265	283	44.
Kamrup	201	200	207	182	176	208	230	232	209	212	206	56.
Darrang	191	202	210	203	204	201	195	209	198	203	202	19
Nowgong	212	190	243	240	263	245	240	260	228	236	236	69
Sibsagar	166	152	171	180	180	197	174	180	150	172	172	47
Lakhimpur	159	153	161	160	169	179	182	178	151	173	166	31
Province	237	246	229	246	230	215	210	226	220	206	227	40

Statement 1V.

Corrected death rates of the Province of Eastern Bengal and Assam by districts during the decade 1901 to 1910.

District	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	Average
Province	28.8	31.8	29.1	30.9	33.5	29.8	27.2	28.3	31.0	30.6	30.20.
Dacca	27.19	31.64	28.28	34.4	34.8	28.4	22.2	22.0	29.17	27.5	28.58.
Mymensing	23.50	26.22	24.2	24.3	34.3	24.1	19.8	18.3	22.39	26.2	24.30.
Faridpur	31.42	42.59	31.42	38.3	40.2	27.7	24.8	27.1	35.91	35.5	33.52.
Bakarganj	30.24	33.85	35.36	34.15	32.65	32.25	35.55	36.45	33.16	29.95	33.65.
Chittagong	29.90	27.2	34.8	29.5	29.3	27.9	30.2	27.4	29.69	31.8	29.70.
Tippera	24.20	22.89	22.89	25.50	27.11	27.01	20.68	21.79	24.10	21.19	23.69.
Noakhali	32.56	31.39	27.95	30.61	28.93	27.86	28.64	26.09	32.95	24.33	29.13.
Rajshahi	34.16	40.	34. 7	43.58	42.56	34.99	49.10	40.51	41.33	42.96	40.31.
Dinajpur	38.74	41.8	40.68	40.57	39.55	42.92	41.50	38.43	38.43	37.93	40.07.
Jalpaiguri	33.78	33.78	32.85	33.98	32.04	35.82	32.35	39.92	38.18	37.26	35.00.
Rangpur	30.75	32.54	28.32	33.87	33.55	34.35	29.43	31.73	35.56	35.56	32.54.
Bogra	27.20	32.92	26.40	27.00	35.72	24.99	24.69	22.97	31.52	37.30	28.11.
Pabna	29.30	39.47	30.90	35.69	45.45	25.42	25.93	30.90	41.87	37.18	34.19.
Malda	29.68	33.17	33.67	34.46	40.15	39.35	38.95	27.50	26.45	27.99	33.17.
Cachar	30.81	29.16	27.70	21.60	23.98	25.43	20.16	29.88	27.29	23.26	25.95.
Sylhet	29.54	34.26	27.29	27.49	25.65	22.67	21.44	27.29	28.72	33.24	27.70.
Goalpara	33.06	31.11	29.75	27.81	38.80	41.14	29.36	34.12	33.93	31.01	33.06.
Kamrup	22.20	21.91	21.36	16.51	26.26	39.58	24.14	29.54	26.26	28.67	25.68.
Darrang	36.28	36.28	38.20	32.86	33.49	46.42	33.89	48.79	40.17	35.33	38.11.
Nowgong	24.78	20.66	26.57	28.24	18.49	29.22	20.56	34.92	29.91	32.98	26.66.
Sibsagar	21.87	18.18	18.08	20.64	23.80	25.34	23.09	40.95	28.39	23.70	24.41.
Lakhimpur	24.77	22.19	21.77	22.40	24.87	24.15	26.31	36.13	29.83	30.04	26.21.

Statement V.

Infantile Mortality Rates of the Province of Eastern Bengal and Assam by districts during the decade 1901- 1910.

	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	Average
Dacca	169	178	183	189	204	202	149	160	177	182	179
Mymensing	155	181	170	179	152	181	153	147	161	190	167
Faridpur	167	223	190	205	240	183	161	183	201	223	198
Bakarganj	196	219	228	217	213	229	209	242	224	229	220
Chittagong	166	145	178	162	169	162	156	160	176	187	166
Tippera	164	162	169	169	183	186	136	145	159	156	163
Noakhali	147	144	145	143	154	150	132	148	176	152	149
Rajshahi	163	140	160	190	211	193	217	184	175	218	189
Dinajpur	225	238	251	246	224	276	263	234	211	230	240
Jalpaiguri	240	273	285	262	262	256	283	300	262	257	268
Rangpur	195	226	198	216	218	229	207	220	246	224	218
Bogra	166	199	177	182	197	187	179	157	168	179	180
Pabna	144	206	142	186	230	138	129	186	218	201	178
Malda	156	169	175	159	162	110	196	162	133	153	168
Cachar	185	205	195	169	177	173	148	172	187	172	179
Sylhet	231	244	218	235	201	201	160	190	202	210	209
Goalpara	237	238	245	216	230	286	224	250	256	228	241
Kamrup	134	147	143	141	160	108	171	191	168	158	158
Darrang	202	193	197	214	212	222	243	240	237	222	218
Nowgong	126	125	117	174	111	156	156	204	207	178	155
Sibsagar	125	104	103	119	119	131	137	190	145	129	130
Lakhimpur	102	101	104	119	120	103	130	149	158	151	124
Province					203	197	176	185	192	197	192.