[S. & M. 2,000—4-5-97.]

Local & Munl. (1897) Department.

MISCELLANEOUS.

G.O., No. 1917 M.

DATED 1-9-97

INDEXED.

DESPATCHED

[Despatch Abstract.]

Mortality from fever in the City of Madras.

Communicating to the Municipal Commrs of Madras, Gd Public Departt, recording a report from the Sanitary Commrs on the increase of ——; drawing their special attention to his remarks in the latter part of paragraph 12 of the report.

60

BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

2722 M

Government {1897} of Madras.

PUBLIC.

Recd. 28 JUL 1897 } 1897. *Enclosures*

Regd. *Spare copies* 4

G.O., No. 672, 28th May 1897.

MAY.

Order. No. 1917 M. misc. of 1897.
Communicated to the municipal Commissioners of Madras, whose attention is drawn to the remarks of the Sanitary Commissioner in the latter part of paragraph 12 of his report.

especially

28/8/97

To The President, Municipal Commission Madras.

Mortality from Fever in the City of Madras.

Recording a report from the Sanitary Commissioner on the increase of —.

GOVERNMENT OF MADRAS.

PUBLIC DEPARTMENT.

Read—again the following papers :—

G.O., No. 850, Public, dated 11th August 1896.

Official Memorandum, No. 1771, Public, dated 3rd September 1896.

With reference to the statement of mortality in the City of Madras embodied in paragraph 3 of the report which is dealt with in G.O., No. 850, Public, dated 11th August 1896, the Sanitary Commissioner is requested to report whether he can offer any explanation of the extraordinary increase in the number of deaths from fever since 1891, inclusive.

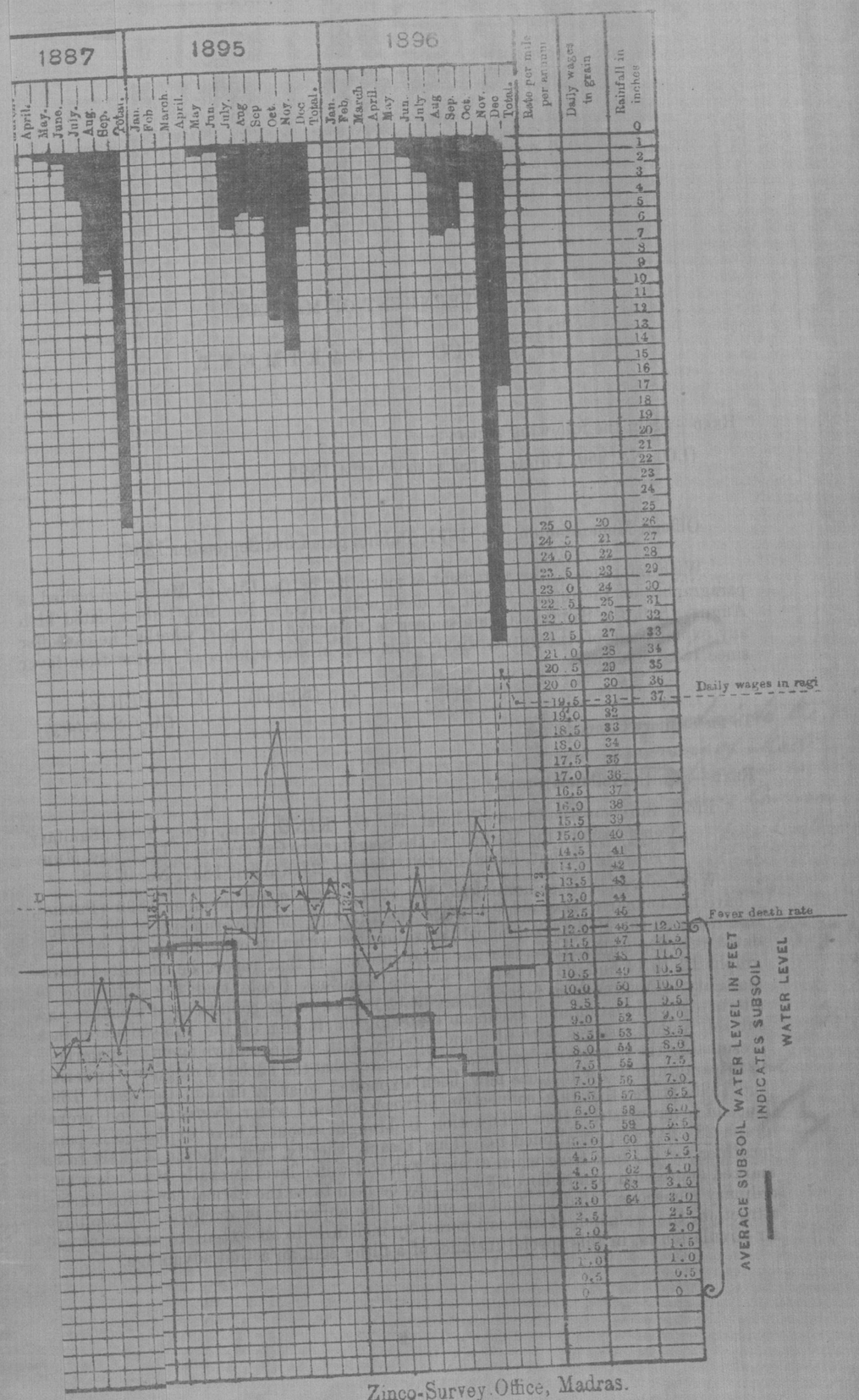
(Signed) J. F. PRICE,
Chief Secretary.

To the Sanitary Commissioner.

Read—also the following paper :—

From Surgeon-Lieutenant-Colonel W. G. KING, M.B., C.M., D.P.H., Sanitary Commissioner for Madras, to the Secretary to Government, Local and Municipal Department, dated Fort St. George, 28th April 1897, No. 971–S.

With reference to memorandum, No. 1771, dated 3rd September 1896 (Public), I have the honour to respectfully invite the attention of Government to my inspection notes on the Madras Municipality, submitted with this office letter, No. 2159–S., dated 12th December 1894, for its information. If that report be consulted (paragraphs 12 to 14 and 26 to 31), it will be seen that I hold that the difference in mortality in Madras from fever from year to year is due to conditions of moisture and alternate air admission and exclusion following fluctuation of the sub-soil water in a sub-soil highly charged with filth and infected with the causative agent of malaria—presumably the *plasmodium malariæ*. I consider that the enclosed diagram J, referred to in paragraph 32, which has now been expanded so as to include the years 1895 and 1896, proves that this connection between sub-soil water *fluctuation* and prevalence of fever exists. How this action is brought about I have explained in paragraph 28 of the report alluded to. This means, shortly, that Madras is likely to be healthier *for the time being* when a high sub-soil water-level prevails than when any marked depression occurs beyond what may be held to be the normal condition during ordinary monsoons ; that is, that in spite of the objection to dampness by capillary attraction, the occlusion of the soil pores by moisture to an extent to interrupt soil air circulation is, in this special instance of a filthy soil, an actual advantage.



Zinco-Survey Office, Madras.
1897

en completed in a shorter time than anticipated.

2. In paragraph 26 of my report, I have pointed out that the so-called "fevers" of Madras are not solely of the malarial variety, and, indeed, where the malarial germ is concerned, I have preferred to believe that it has been much influenced by its environment as to its virulence and specific action upon man; that is to say, I consider that, given the germ of malaria, its virulence is liable to undergo modification owing to its propagation under conditions that vary with the extent of organic filth and moisture available for its pabulum, and this to an extent that inhabitants of one part of the town subjected to malaria may exhibit a greater percentage of severe cases than those of other parts.

3. I have also pointed to the prevalence of low forms of lobular pneumonia in the badly nourished of the lower classes subjected to evil sanitary surroundings. I have further suggested "when it is possible to register deaths in Madras correctly in accordance with medical nomenclature, I have no doubt that a very 'great deal of the so-called 'fevers' from which persons die in Madras will be found to be due to phthisis—this fatal disease being very frequent among those of the poorer classes who are subject to sedentary occupations in ill-ventilated dwellings and foul surroundings." Phthisis is not a disease that busy hospitals are likely to tolerate in their wards longer than necessary to secure some amelioration of the patient's condition; hence, *mortality* from phthisis in Madras hospitals is trivial. But, if admissions be taken, the following results are secured, showing that this cause has to be reckoned with in Madras:—

Madras General Hospital, 1894.

Europeans.

Total medical admissions—1,550.

Of these—	
Phthisis	1
Chronic pulmonary phthisis	1
Pulmonary tuberculosis	26
Tuberculosis	1

Natives.

Total medical admissions—3,962.

Of these—	
Acute pneumonic phthisis	1
Chronic do.	1
Pulmonary tuberculosis	153

4. Taking into consideration the frequency with which cows suffering from glandular enlargements are to be found in the streets of Madras, an inquiry as to the possible existence of tuberculosis amongst them is desirable. With the aid of "tuberculin" this point could be readily put beyond doubt, irrespective of cases where infected milk would yield microscopic evidence. I have directed Surgeon-Major Bannerman's attention to the matter, and he will investigate the subject on arrival of apparatus from England. Granted, however, that these and other causes go to swell the roll of "fever" mortality, the chances are decidedly that the majority of deaths so registered are due directly or indirectly to the influence of malaria.

5. Since writing the report (1894) which forms the basis of these remarks, the medical profession has made considerable advances in the study of the supposed immediate causative agent of malaria, namely, the *plasmodium malariæ*. Its recognition in the blood of patients has become a matter of frequent clinical research. Thus Surgeon-Lieutenant-Colonel Sturmer has made a constant study of the matter at the Royapettah hospital and elsewhere during the last two years, during which he has examined some thousands of blood specimens. Lately, twenty-nine cases of indubitable local origin and presenting symptoms of malarial fever were systematically investigated, with the result of his demonstrating *in each instance the plasmodium malariæ*. This fact suffices to prove that true malaria exists in this city.

6. A further, and as yet an incomplete, advance has been the suggestion, made by Dr. Manson and relied upon by Surgeon-Major Ronald Ross in the course of numerous experiments, that there exists a close connection between mosquitoes and the prevalence of malaria. This theory would provide a refuge for those who hold that malaria is air-borne, yet have to acknowledge that the malarial germ has not been found in air; but the theory by no means aids the explanation of malaria being—as it undoubtedly is—water-borne, as it suffices to admit that the germ is obtained direct from the soil. That the *plasmodium* may be transferred with the blood of a patient affected with malaria to the stomach of the mosquito, which subsequently dying upon water *may* yield to it the *plasmodium* as such, or in some form modified to suit, or in consequence of, its altered environment, seems also probable; but, to confirm this, further research is requisite, as up to date the malarial germ has not been identified in water in any form. It might, therefore, be held by those who are inclined to this theory that, the existence of the *plasmodium malariæ* in the locality being granted, increase of fever in Madras must have been synchronous with increase of mosquitoes; and some colour is given to this by the statement which occurs in Surgeon-Lieutenant-Colonel Sturmer's report on the Royapettah hospital in discussing the prevalence of filariasis (p. 156, Annual Report on Medical Institutions, 1895). A census of mosquitoes being impossible, such an argument could only be decided by the opinion of inhabitants, that must vary according to personal experience. Thus, it could be claimed that on the sinking of the sub-soil water and absence of rain, there was also concentration of sewage in the town gutters and elsewhere, and that mosquitoes have bred under more favourable circumstances than usual. Against this, however, must be balanced the fact that the poor monsoons received must have been a decidedly unfavourable factor to their propagation in respect to general soil dampness, although favouring the dried remains of germ-bearing mosquitoes * being transferred by wind. But, in any case, this theory would demand that the extent to which drinking-water is exposed to the falling in of mosquitoes has undergone increase in the town, or that, at least, this condition having undergone no change, the water has been subject to more complete contamination than usual owing to a great increase of mosquitoes. The former contention cannot, however, be conceded, whilst the unusual scantiness of the monsoons must have been unfavourable to the latter. The water open to contamination, if the Red Hills channel be excluded from consideration, is that contained in wells at the back of houses, small service reservoirs in streets and the carelessly-protected household chatties. The water from wells is unfortunately largely used, but still it must be held that the tendency is to a decrease—pipe-water being yearly more depended upon. Indeed, as shown in table B, the number of house connections with the Red Hills water has undergone a considerable increase during the period fever has become more prevalent, and it may well be that this very fact has had not a little to do also with the increase of fever irrespective of the sub-soil water fluctuation, in that the superficial soil in the neighbourhood of dwellings has undergone saturation in a but partially drained town, and this has favoured the propagation of the malarial germ, and, it may be, of its possible carrier—the mosquito. With reference to the latter possibility, it is necessary to remember that evidence should equally be forthcoming as to exacerbation of filariasis and of one of its more readily discernible sequelæ—elephantiasis; whereas there is reason to believe the opposite. It is true one breed of mosquitoes may be peculiarly fitted for conveying the *filaria sanguinis* to water and another for the *plasmodium malariæ*, but it would be a premature refinement to believe that the meteorological and local conditions which favour the development of one breed of mosquitoes do not favour another, although this is quite within the bounds of probabilities. Moreover, if mosquitoes had it all their own way as to malaria—as they apparently have in respect to filariasis—existence in certain parts of Royapettah would be impossible; as here the malarial germ has been demonstrated ready for transport, whilst the locality is, and *always has been, notorious* for the prevalence of these insects. Yet, this locality is in the 8th Division, which, as the accompanying table will show, has exhibited less disturbance from fever mortality than any part of the town:—

* Manson.

Table A.

Divisions.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.
1st Division	12·8	12·0	12·8	9·3	11·5	11 4	11·7	11·0	9·7	11·1	12·4	19·6	16·0	15·4	14·8	15·2
2nd ,, ...	9·3	8·7	9·0	9·3	9·7	8·2	8·9	9·3	8·1	10·5	11·0	15·4	20·0	19·7	16·3	15·4
3rd ,, ...	7·7	7·7	7·7	8·2	8·4	7·9	9·2	8·2	6·5	9·2	10·3	15·9	18·9	18·5	16·8	15·1
4th ,, ...	8·8	8·7	8·6	7·8	11·4	7·8	6·6	7·1	6·4	8·2	12·3	13·5	13·9	9·6	10·9	12·6
5th ,, ...	7·1	7·8	7·4	7·7	7·9	7·7	7·5	8·9	6·5	9·3	10·1	11·6	12·4	10·6	10·3	11·3
6th ,, ...	4·0	4·8	4·6	4·3	4·3	4·9	4·1	6·7	7·0	5·4	6·5	13·5	9·1	8·8	9·5	11·6
7th ,, ...	8·0	8·6	8 7	7·3	7·8	8·3	8 3	9·4	7·7	8·2	9·7	12 7	12·1	11·5	10·3	11·2
8th ,, ...	11·1	13·5	11·1	11·4	10·4	9·1	10·5	10·8	8·0	9·1	9·0	14·5	10·8	11·0	9·6	9·0

7. I enter thus far into the "mosquito theory" as it is one that has popular approval, and, like all things new, is liable to be received unquestioned. It is, however, necessary to remember that, although the theory is "taking," there still exists in practice a very decided blank, which, it is to be hoped, Surgeon-Major Ross and other earnest workers in this special subject will be able to fill in the near future. Till then it seems to me unsafe to believe in this hypothesis further than that it is probable mosquitoes are carriers of the malarial germ—although the chances are that their rôle is of a limited and incidental nature—and that, taking the broad view requisite in judging as to causation of malarial prevalence in various countries and under varying circumstances, we must still ascribe to the soil containing the malarial germ and its direct connection with air and water the chief conditions favouring its propagation and the infection of man.

8. It is necessary to allude to another theory as to prevalence of fever in Madras, namely, that it is due to "chills" owing to fluctuation of temperature acting on a population subjected to privation consequent upon high price of food. As a fact, in Madras, in common with other parts of the Presidency, food-grains have been above normal rates during the period discussed; but there is no reason to believe that there has been a general increase of fever in the Presidency, nor that distress of a nature likely to *seriously* affect the general health of the population, or any special section of it, has been felt in the town of Madras. Even granting this were so, the utmost that could be ascribed to such influence would be the general statement that a badly nourished population would be less capable of resisting infection by the specific organism of malaria—not that it would succumb to chills. In any case, diagram J will show that fever prevalence and dearness of food by no means necessarily accompanied each other *, although, as drought and dearness of food are closely allied factors in this country, sub-soil water sinking and increase of price of food are in certain parts of the diagram apparent; but it is still more apparent that a return of normal monsoon, and a resulting normal level of subsoil water, even in the presence of increased price of food, mean a decrease of fever. I may here explain that the "price of food line" exhibits the total spending power of the cooly gaining Rs. 6 per month in Madras as expressed by the quantity of the cheapest grain (ragi) procurable at different periods. I need hardly remark that the expression of data by this method is a mere matter of statistical convenience, and has nothing to do with the fact that the cooly of Madras eats rice by preference to ragi.

* Recent statistics of mortality in the famine affected Ceded Districts show that, notwithstanding food dearness, drought has been favourable to decrease of deaths under "fevers".

(Intld.) W. G. K.

9. Lastly, it is necessary to ascertain whether the land-locked condition of the open sewer known as the Cooum had any influence in the matter. A joint consideration of its position and of table A will show that divisions in its vicinity did not suffer more than those at distances from it. It, however, cannot be conceived that the foul gases emitted did not prove a predisposing cause to those subjected to their influence. Possibly, also, mosquitoes had a "good time" during the period of drought in the Cooum; but, as already remarked, there is no evidence of their being more numerous than usual.

10. The following table B has the disadvantage of not referring to exactly the same period as the mortality exhibited in diagram J—that being for the calendar year as against the official year—but it will suffice to illustrate the fact that, whilst increase of fever occurred all over Madras, the divisions receiving marked increase of house-connections were decidedly at a disadvantage :—

Table B.

Table showing the number of house-connections added in each division per annum, with mortality rates from fever.

Divisions.	1878.	1879.	1880.	1881.	1882.	1883.	1884–85.	1885–86.	1886–87.	1887–88.		1888–89.	
	Number.	Number.	Number.	Number.	Number.	Number.	Number.	Number.	Number.	Number.	Rate of mortality.	Number.	Rate of mortality.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1st	1	..	..	..	4	40	32	12	14	18	10·8	19	10·1
2nd	112	80	105	83	199	158	139	132	137	98	9·8	215	8·4
3rd	59	33	63	82	74	157	95	98	110	106	8·1	117	6·8
4th	4	2	1	1	..	21	12	12	20	37	6·9	64	6·7
5th	52	15	27	25	47	46	72	41	52	71	8·5	71	7·3
6th	28	9	11	2	9	11	8	10	7	8	7·1	9	6·8
7th	40	18	30	28	48	45	76	41	82	106	9·6	153	7·4
8th	3	1	4	6	15	33	15	15	8	19	10·3	44	7·8

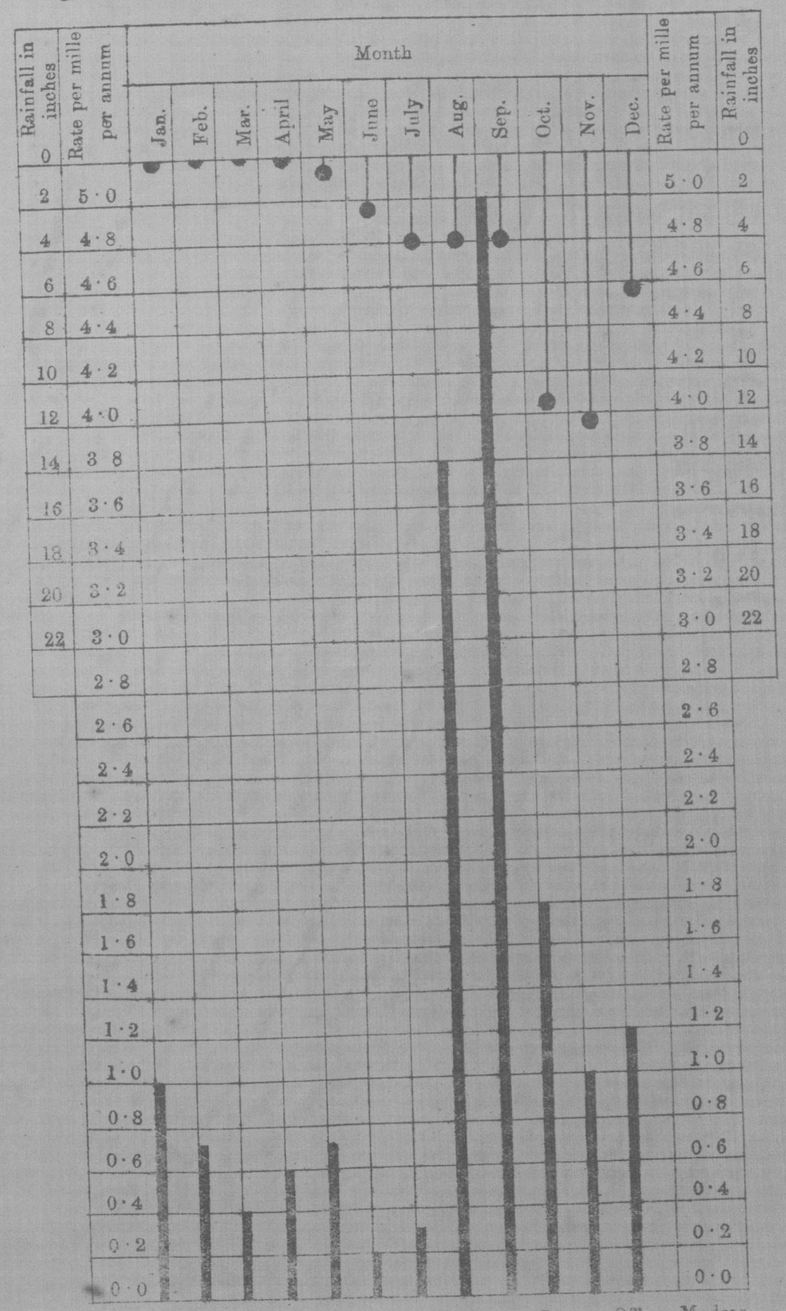
Divisions.	1889–90.		1890–91.		1891–92.		1892–93.		1893–94.		1894–95.		1895–96.	
	Number.	Rate of mortality.	Number.	Rate of mortality.	Number.	Rate of mortality.	Number.	Rate of mortality.	Number.	Rate of mortality.	Number.	Rate of mortality.	Number	Rate of mortality.
1	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1st	8	10·7	12	11·9	3	21·4	35	15·4	43	15·9	53	13·8	41	16·0
2nd	290	10·1	244	11·2	119	17·3	414	20·0	478	19·7	285	15·7	385	15·3
3rd	179	9·0	215	10·2	59	18·0	187	18·8	355	18·4	239	16·4	214	14·8
4th	98	8·8	60	11·8	36	14·1	71	13 0	111	10·8	110	11·2	125	11·0
5th	118	8·6	52	10·1	47	12·1	133	12·2	124	10·8	140	10·5	164	10·9
6th	10	4·5	9	7·7	8	14·0	24	8·0	19	8·9	28	10·9	29	11·1
7th	156	8·3	193	9·1	73	14·3	217	11·6	282	12·0	271	9·9	221	11·9
8th	38	8·8	35	9·3	17	14·8	66	10·3	61	11·6	67	8·6	62	9·5

11. Putting aside, then, the mosquito, the chill and food, and Cooum theories as having decidedly the balance of evidence against them as chief factors, there remain two solid facts, namely, fluctuation of the sub-soil water owing to a series of abnormal monsoons, and increase of house-connections in a town site whose soil contains the malarial germ. Hence it is that the advent of a better approach to normal meteorological conditions in 1896, and consequently to normal sub-soil water-level, was immediately followed by an amelioration of fever prevalence, which might have been more complete were it not that the minor disturbing factor of increased house-connections in an imperfectly-drained city still continued. Having regard to the fact that the 1896–97 rainfall was, however, in excess, the chances are that if the south-west monsoon (1897) be normal, or less than normal, the sinking of sub-soil water immediately before the burst of the north-east monsoon will be followed this year by an exacerbation of fever, in that the sub-soil water-level having been raised a greater fluctuation (and within a more superficial layer of the soil) than usual must then be brought about. This statement of conditions that have rendered the propagation of the malarial germ in a soil already infected with it markedly active, is in accordance with acknowledged opinion as to causation of malaria, but it leaves open to doubt the mode of conveyance to man. Hence, until the mosquito theory can be completed,

DIAGRAM ILLUSTRATING THE MONTHLY FLUCTUATIONS OF THE SUB SOIL WATER IN MADRAS.

F

AVERAGE MONTHLY DEATH RATE FROM CHOLERA CALCULATED FROM THE STATISTICS OF 1882-92.

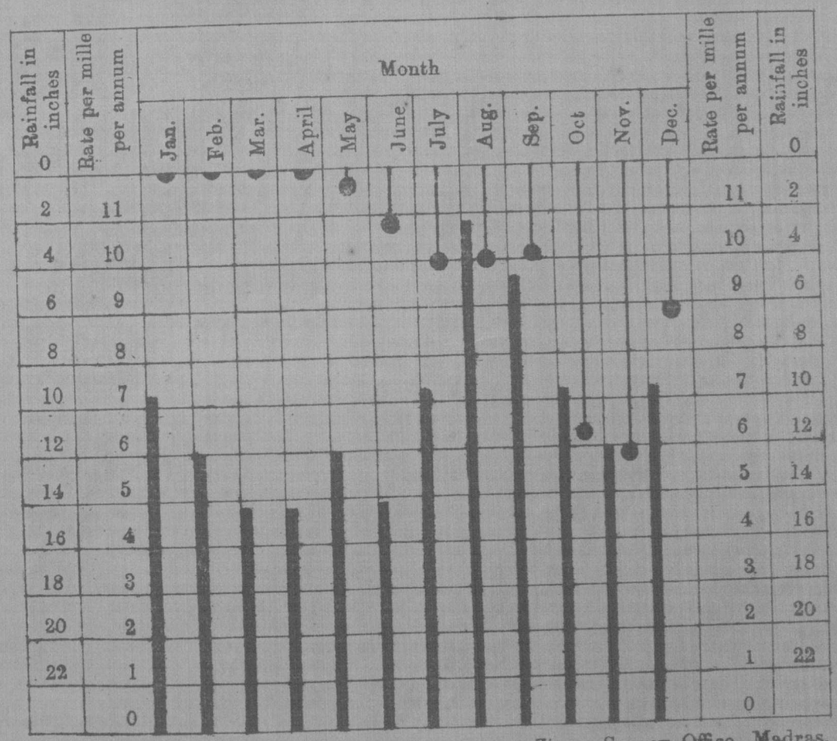


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1897

G

AVERAGE MONTHLY RATE FROM DYSENTERY & DIARRHŒA CALCULATED FROM THE STATISTICS OF 1884-93.

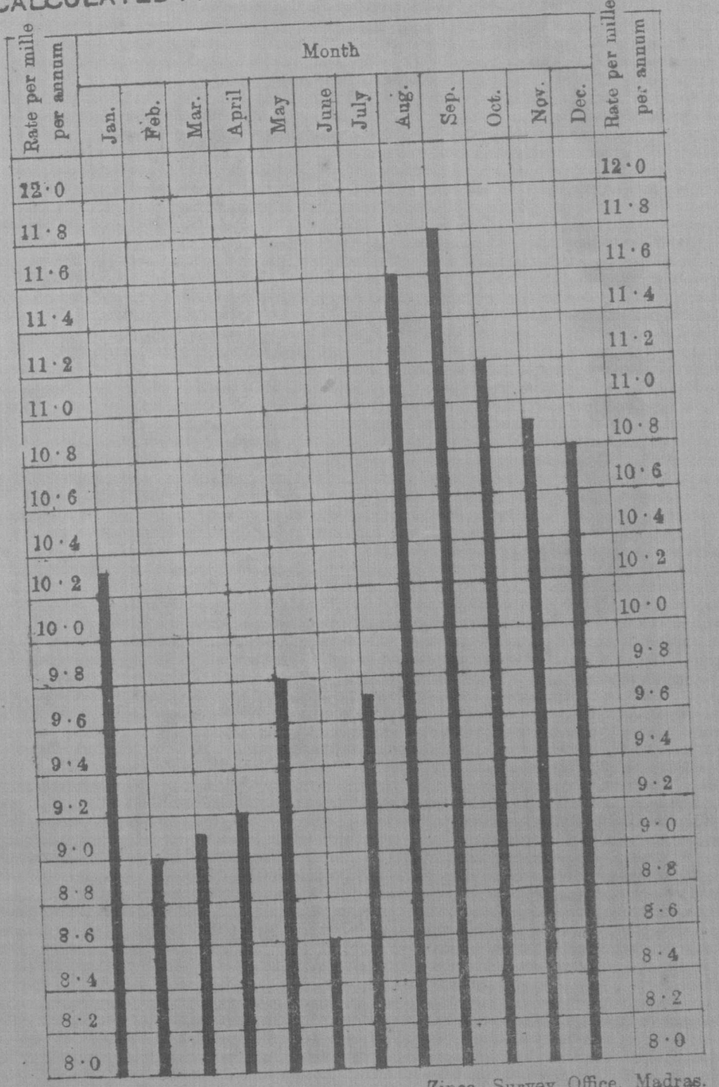


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1897

H

AVERAGE MONTHLY DEATH RATE FROM FEVERS
(CALCULATED FROM THE STATISTICS OF 1882-92.)



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1897

we must believe with the old school that the malaria thus produced has been conveyed to the sufferers by medium of water (in this case, presumably well water) and by air displaced from the soil and sub-soil.

12. To sum up, therefore, I hold that the soil of Madras contains the malarial germ; that propagation of this germ is favoured by organic matter in the presence of oxygen and moisture and moderate heat; that the soil of Madras is rich in filth (organic matter) and has in normal seasons a high sub-soil water-level; that a departure from its normal level of the sub-soil water, and fluctuation due to scanty monsoons from 1889 to 1895, resulted in inducing air circulation in soil usually filled with water, and thus placed the malarial germ under favourable conditions for propagation; that the increased introduction of "house-connections" with the public water-supply in imperfectly-drained premises, and in an imperfectly-drained town, has favoured moisture of the superficial soil and consequent growth of the malarial germ.

The remedy lies in starving the malarial germ existing in the soil of Madras by depriving it of its pabulum of organic matter, and of moisture. The first condition would be met by requiring correct rubbish and night-soil conservancy, and especially cessation of additions of raised mounds of filth composed of town rubbish and human fæcal matter to form sewage farms within the inhabited areas; the second, by the endeavour to bring the fluctuation of the sub-soil water under control within a reasonable limit, by abolishing tanks that arrest the surface-water flow situated above the town-level, and combining a system of sub-soil drainage with pipe sewerage of the town. The cost of pumping might render a sub-soil drainage system that would be really effective out of the question, having regard to the financial condition of Madras, but the other measures should *in course of time* be fulfilled.

13. I enclose for reference, with the hope that it will strengthen my arguments, diagram C, that may be regarded as giving an idea of the normal fluctuations of sub-soil water in Madras town. A reference to diagrams F, G, H, also enclosed, will show how closely in the town of Madras the incidence of fever, diarrhœa and dysentery, and cholera are influenced by sub-soil water fluctuation—more especially during the stage of depression.

No. 554.

Transferred to the Public Department.

OOTACAMUND,
5*th May* 1897.

(Signed) G. S. FORBES,
Secretary to Government.

ORDER—No. 672, Public, dated 28th May 1897.

Recorded.

(True Extract.)

for Chief Secretary.

To the Sanitary Commissioner.
" Surgeon-General.
" Local and Municipal Department.
" Financial Department (for information).
Editors' Table.

Ed. A. Raitt.

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...r G.O., No. DATED
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