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[Despatch Abstract.]

Bubonic Plague — Recording the joint report by Mons. W. M. Haffkine & Surg: Major Lyons on the epidemic of plague in Lower Damaun (Portuguese India) and on the effect of preventive inoculation there.

BACK PAPERS.

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

FURTHER PAPERS.

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

Government {1897} of Madras.

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G.O., No. 2621 M., 26th November 1897.

NOVEMBER.

Bubonic Plague.

Recording the joint report by Mons. W. M. Haffkine and Surgeon-Major Lyons on the epidemic of plague in Lower Damaun (Portuguese India) and on the effect of preventive inoculation there.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

Read—the following paper:—

From Mons. W. M. HAFFKINE, C.I.E., to the Secretary to the Government of Madras, Local and Municipal Department, dated Hardwar, 17th November 1897.

By order of the Government of India, I have the honour to forward, for the information of the Government of Madras, the adjoined report, by Surgeon-Major Lyons and myself, on the epidemic of plague in Lower Damaun and on the effect of preventive inoculation there.

Enclosure.

Joint Report on the epidemic of plague in Lower Damaun, Portuguese India, and on the effect of preventive inoculation there, by Monsieur W. M. Haffkine and Surgeon-Major Lyons, I.M.S., President, Government Committee for Investigation of the Bubonic Plague in Bombay.

The plague prophylactic referred to in the present report has been described by Monsieur W. M. Haffkine in the "British Medical Journal," May 1897, and in the "Indian Medical Gazette," June 1897.

The facts reported here have been collected by Professors Koch and Gaffky, the heads of the German Scientific Mission to Bombay, and Monsieur Haffkine, on a visit to Damaun on the 20th and 21st May last; at the end of the same month a house-to-house visitation at Damaun was undertaken and carried out, at Monsieur Haffkine's request, by Surgeon-Major Lyons, President of the Bubonic Plague Research Committee, in order to complete, by exact details, the information gathered on the first visit.

At the German Scientists and Monsieur Haffkine's inquiry at Damaun, their informants were—

His Excellency Colonel J. P. Kuchenbuck Villar, Governor of Damaun;
Mr. Judge, Assistant Collector, Salt and Revenue Department, in charge of the Preventive Police and the Plague Operations on the Damaun Frontier;
Shet Sorabjee Manockjee Damaunwalla, head of the Parsee Community, assisted by his Secretary;
Dr. Virgilio Poiares, Physician in charge of the Plauge Hospital;
Dr. Proenca, Health Officer;
Dr. Pinto, in charge of the Plague Operations in Damaun Town; and
Dr. Da Cunha, L.R.C.P. (Edinburgh),
Dr. Moniz, L.M.S., and
Dr. Fernandez,
} Medical Practitioners of Damaun.

The Medical Officers abovementioned were assembled, on the 20th May 1897, by His Excellency the Governor, who was also present, and to whom we are indebted for affording every facility for making the inquiry complete. The general information given below, in the preliminary part of this report, was reported at this meeting and was supplemented by documents from the respective offices.

The history of the Damaun epidemic appears to be as follows:—

The town of Damaun is divided by a river into two parts: Lower Damaun, the largest business part of the town; and the Fort, or Upper Damaun, where the Government house and the Government offices are situated. The plague attacked almost exclusively three of the villages which make part of Lower Damaun, namely, Lower Damaun proper, having, in ordinary times, a population of 5,000 inhabitants; Katheria, the property of Shet Sorabjee Damaunwalla, with a population of 4,700; and Khadiwadi, with a population of 1,200. This part of the town was in active business communication with the Bombay Presidency, and is densely populated, the inhabitants living in small houses crowded together. The Fort was cut off by a cordon from Lower Damaun as soon as the epidemic began to increase in proportion, and had only some half-a-dozen imported cases.

The first attacks came to notice in February last and occurred amongst new arrivals from Bulsar, a neighbouring town which was badly affected at the time, and amongst sailors from Kurrachee arriving at Damaun by sea, in native crafts. Before the end of the same month local cases began to appear among the fishermen, who have their *busti* close to the river, where crafts are moored, behind the Damaun Municipal school. In the last days of the month a hurried exodus of people began from Lower Damaun, increasing daily as the epidemic gained in intensity, until, on the 23rd of March, the Governor placed a cordon along the river, and stopped communication between the lower and upper parts of the town; while a week later, on the 30th March, the Bombay Government, on their part, closed British territory to the inhabitants of Damaun. By this time, it was estimated, over 2,000 people had quitted the place.

The worst period of the epidemic corresponded to the month following the closing of the Damaun frontiers. The climax was reached in the middle of April, when the daily number of deaths remained stationary for about eight days and then began to decline. The largest number of deaths which occurred in one day was 80.

Up to the 25th of April the daily mortality, which was closely watched by the Parsee Community who kept peons on the burial and burning grounds, was recorded officially from the information given by the inhabitants coming to the Registration office to declare cases of deaths in their families. On the 25th April, the Governor placed a guard of his own on the burial and burning grounds, and on that day, though the number of deaths reported by the inhabitants was 11, the number of bodies disposed of in the presence of the guard was 34. From the above date the Governor's guard was kept permanently on the grounds, and the official information became complete. The following is the number of bodies registered by this means from the 25th April up to the date of investigation:—

25th April 1897	..	..	34	8th May 1897	..	..	33
26th „	..	..	31	9th „	..	..	18
27th „	..	..	21	10th „	..	..	24
28th „	..	..	49	11th „	..	..	27
29th „	..	..	41	12th „	..	..	15
30th „	..	..	58	13th „	..	..	13
				14th „	..	..	17
1st May 1897	..	..	41	15th „	..	..	13
2nd „	..	..	22	16th „	..	..	20
3rd „	..	..	29	17th „	..	..	6
4th „	..	..	47	18th „	..	..	8
5th „	..	..	33	19th „	..	..	13
6th „	..	..	31				
7th „	..	..	31	25 days.			675 deaths.

Thus, during the 25 days preceding our visit, *i.e.*, between the 25th April and 19th May 1897, at a time when the population was considerably thinned by desertion and death, and when the mortality had dropped to 8 and 6 a day, the total number of bodies disposed of was 675, giving an average *of* 25 *deaths a day*. His Excellency the Governor and the medical gentlemen present at the meeting stated that they would be well within the real figure if they estimated the number of deaths which occurred in the fully populated town, in the first period and during the height of the epidemic, *i.e.*, up to the time of placing the guard, at an average *of* 30 *a day*, counting from the 1st March and neglecting the mortality before that date. This estimate gives a total of 2,325 deaths as having occurred in Damaun from the beginning of the epidemic up to the time of the Scientific Committee's visit. Of this number, 2,093 deaths were afterwards authenticated in the particular families where they had taken place, during a house-to-house enquiry instituted by Shet Sorabjee Damaunwalla, the owner of Katheria.*

As the immunity of the inoculated in Damaun will be estimated from a comparison with the mortality in the uninoculated population, it is essential, in order to avoid the possibility of exaggerating the power of inoculation, to take for guidance the lowest figure admissible as representing the real death rate in the place. In the following calculations, therefore, the number of deaths from plague which occurred in Damaun from the commencement of the epidemic up to the visit of the Scientific Committee is accepted as 2,093, which is the number authenticated by an enquiry in each of the affected families. This figure gives an average daily mortality from the commencement of the epidemic up to the time of placing guards on the burial and burning grounds, as being close upon 26 deaths a day. From the 21st of May up to the end of the same month, that is to say up to the date when Surgeon-Major Lyons concluded the additional inquiry, of which the details are given below, there occurred 96 deaths more, giving a total of 2,189 deaths from plague which took place in Damaun during the period under observation.

In this number of deaths there were 24 in those inoculated, personally observed by the Medical Officers of the place; *plus* a small number of others of which they knew, but which they had not seen personally. Fifteen deaths of the 24 were reported by Dr. Moniz, who was said to have treated the largest number of plague patients in the place; 4 by Dr. Poiares, who also saw 4 other cases which recovered; 3 cases by Dr. Proença, all of whom recovered (these had been seen also by Dr. DaCunha); 3 deaths were known to Dr. DaCunha, and 2 to Dr. Pinto (in addition to one mentioned by Dr. Moniz which Dr. Pinto had seen with him).

Considering the small extent of the town, the limited number of inhabitants, and the number of Medical Officers who were looking after the place, it appeared probable that not many attacks among the inoculated escaped their notice, as such attacks usually excite much comment amongst the inhabitants and attract general attention. Indeed, the gentlemen present at the meeting seemed to know between them every place in the town where inoculated people lived, and every house which had suffered from plague or happened to have escaped. As has been mentioned already, they

* The number of deaths from plague which took place during the *whole* epidemic up to the end of July, and a record of which could be obtained by an enquiry in the households, was 2,352 and was distributed amongst the different castes inhabiting Damaun as follows:—

Parsees	6	Tailors	48
Brahmins	26	Ghatis	21
Parbhus	4	Potters	16
Shrawaks	11	Portuguese	34
Banias	23	Bhandarees	22
Lohanas	4	Bhayas	5
Gujrathi Goldsmiths	15	Bhateli	1
Daxini Goldsmiths	80	Dhobies	16
Hindoo Barbers	27	Mochis	23
Khatris	87	Kolis	19
Coppersmiths	11	Borahs	5
Machis	600	Khojas	4
Carpenters	104	Lohars	13
Mussalmans	440	Mangelas	7
Golas	106	Hindoo Low Castes	351
Chhipas	23	Caste unknown	200
		Total	2,352

stated at the time that there was a small number of inoculated attacked whom they did not see, but of whom, they informed us, a record existed in the office of Shet Sorabjee Damaunwalla, where, during the plague, a dispensary was opened for distributing gratuitous medicines to the affected population.

It was on the initiative of that Parsee gentleman that the inoculations were introduced. He had a personal knowledge of the people who were inoculated, and kept a watch over the effect of the operation, collecting, with the help of his office establishment, a large number of details in this connection.

From his information it appeared that the total number of deaths amongst the inoculated was under 40, each of the cases being known to him; that amongst those inoculated in a first series of inoculation, done in March last, a smaller proportion got affected and died than amongst those done a month later; and that in a series of inoculations carried out by the Physician in charge of the Damaun Plague Hospital, with lymph supplied from our Bombay Laboratory, the number of attacks was larger than amongst those inoculated by Dr. Kalapesi, Dr. Haffkine's assistant, sent from the Laboratory. These details were found afterwards, in the course of the close investigation carried out by us, to be scrupulously correct.

Mr. Sorabjee had also a guard of his own kept on the burial and burning grounds, watching the course of the mortality, and his information concurred with the statements recorded above. The number of people inoculated up to the time of the Scientific Committee's visit was 1,645; over four times that number remained uninoculated. The latter had lost from plague close upon one-third of their number, and, he considered, there could be no doubt that the inoculated exhibited a most striking degree of immunity.

The effects of inoculation were closely watched by the inhabitants, as will be seen from the following observations which they brought to our notice.

There were altogether 306 Parsees in Lower Damaun, including males, females and children. Of these, 276 were inoculated twice, and one once, all the particulars being given in our inoculation register. The names and particulars of the 29 who remained uninoculated were supplied to us on the spot. The attacks and casualties from plague which occurred in the two groups after the introduction of inoculation are given below.* No deaths from any other cause occurred in the community from the beginning of the epidemic.

Occurrences of plague amongst the 277 *inoculated Parsees.*

(1) Jerbai, wife of Manekji Bacha, age 35, belonging to a well-to-do family; was five months pregnant; inoculated once on 17th April 1897, in the right arm. For about 24 hours before, she had fever and pain in the groin, but this was not known at the time of inoculation. Developed characteristic plague in the evening of the day of inoculation, had an abortion on 20th morning, died same day.

(2) Seven other Parsees inoculated were attacked, respectively, three days, one week, twelve days, a fortnight, one month, one month and five weeks after inoculation, but all these recovered.

Occurrences of plague amongst the 29 *uninoculated Parsees.*

(1) Nanabhai Jivajee, male, age 60, belonging to a well-to-do family, where all the other members (fourteen in number), except himself, were inoculated. Attacked on 16th April 1897; bubo in left groin; died on 20th.

(2) Merbai, daughter of Bairamjee, age 20 years, of a well-to-do family, where eight members were inoculated and four, including Merbai, were not inoculated; attacked about same time as Nanabhai Jivajee; bubo in right groin; died on 20th April.

(3) Ratanbai Ratanjee, female, age 35, of a well-to-do family; attacked and died in the first days of May 1897, having had fever and a bubo.

(4) An old women, Avabai, widow of Rustomjee, age about 75 years, of a well-to-do family, where fourteen others were inoculated, Avabai, and Gulbai, her daughter-in-law, being the only uninoculated. Avabai got attacked on 11th May, developed bubo two days later; died on the 13th.

* See also attached Rolls.

Thus in the 29 uninoculated Parsees there were 4 deaths from plague, or a mortality of 13·8 per cent., while in the 277 inoculated there were 8 attacks with only 1 death, the one who died being a woman attacked *before* inoculation, and the mortality thus produced in the inoculated being 0·36 per cent., or 38·3 times lower than in the uninoculated.

Another significant instance, in a limited number of people, was furnished by the servants belonging to Shet Sorabjee's house and to his garden. There are 50 servants in the house where he lives and about 150 in his garden, half a mile distant from the house. Round the garden the epidemic was raging violently. Of the whole number of servants one, a deformed individual, remained uninoculated, all the others were inoculated twice. Plague appeared among the servants on the 16th May when the only person uninoculated was attacked and succumbed on the 19th; the total number of inoculated lost also one, a child of 4 years.

The other instances given were in isolated families and referred to smaller numbers of people.

The German Commissioners completed this part of the inquiry by collecting information as to the soil of Upper and Lower Damaun, the hydrographic and climatic conditions obtaining in both, their comparative hygienic circumstances, &c. The facts supplied on these points were of an approximate character. The Committee returned to Bombay on the morning of the 22nd May.

Surgeon-Major Lyons went to Lower Damaun on the 26th May 1897, the object of his visit being to find out accurately, by a minute inquiry in each house, the number of deaths which occurred amongst those inoculated. For this purpose he divided the town into 4 sections, and during 4 days, between the 26th and 30th May 1897, visited all the houses, section by section. And as a number of dwellings had been vacated and the inhabitants encamped in the fields outside the town, Dr. Lyons visited them in their encampments and collected information from all of them. The frontier around the town being closed and guarded by a British and a Portuguese cordon, the conditions for collecting the necessary information were particularly complete.

In this manner Dr. Lyons collected the history of 33 deaths and 54 attacks with recovery which had occurred in the inoculated up to the 19th May (the time of the Scientific Committee's visit), and of 3 deaths * and 1 attack with recovery which occurred between that date and the 31st of May inclusive.

In the appendix are reproduced 88 "Investigation sheets" filled up by Dr. Lyons during the house-to-house visitation, as well as one sent afterwards by His Excellency the Governor. Each of the investigation sheets contains particulars of a house where inoculated people lived, and where cases of plague had occurred, either among the inoculated or the uninoculated members of the family. These sheets, therefore, do not make mention of the inoculated households where no cases of plague occurred, nor of any of the attacked houses where there were no inoculated persons.

Comparative Analysis of the Mortality from Plague in Lower Damaun, in the inoculated and uninoculated, between the 26th March and the end of May 1897.

The inoculations in Damaun were done in four series:

First Series.—Between the 23rd and 26th March 1897, 846 persons were inoculated by Dr. R. M. Kalapesi, who was sent from the Laboratory, and between the 4th and 7th April 171 persons by the Portuguese physician in charge of the Plague hospital in Damaun, Dr. Virgilio Poiares, who was supplied with material also from the Bombay Laboratory. The lymph used by Drs. Kalapesi and Poiares on that occasion, as will be described later on, was prepared from a strong virus, and produced a high febrile reaction when injected in the prescribed small standard doses. The operations of these two gentlemen differed in that Dr. Poiares gave doses much weaker than those given by Dr. Kalapesi, as is shown by the detailed records of their operations. It will be observed from the results given below that, though Dr. Poiares' patients appear to have given a considerable reduction of mortality when compared with the rest of the population, the results from his small doses were lower than those obtained from the same material given in larger doses.

* In this number of three deaths is included one additional, in the person of Ghopal Bicaria, 9 years, communicated by Dr. Fernandez through His Excellency the Governor of Damaun.

Second Series.—A few weeks after the first series, the demand for further inoculations coming from Damaun became exceedingly persitent, as was the case, after an interval, in the six other places where inoculations were performed,—in Bombay, Mora, Damaun, Poona, Balsar and Tarapore; and though the Laboratory had run short of strong material, Dr. Kalapesi was deputed again, with a much weaker lymph than that used on the first occasion, as will be detailed later on. Between the 17th and 27th April, *i.e.*, about a month after his first visit, he performed 529 fresh inoculations, and between the 24th April and 2nd May 1897, 99 more were done by Dr. Poiares with a similar material obtained for him from the Bombay Laboratory by the Bombay Portuguese Consulate. The lymph used on this occasion, even when injected in doses 2 to 3 times larger than the standard ones, failed to produce marked rise of temperature, though it caused considerable local reaction. As will be seen below, both Dr. Kalapesi's and Dr. Poiares' operations, on this occasion, gave a smaller lowering of mortality than those previously performed, though they had both been working with increased doses.

Third Series.—Between the 21st and 23rd of May Dr. Kalapesi inoculated 362 persons with a similarly weak lymph, while Dr. DaCunha, another Portuguese physician, who had been working in Damaun with Dr. Kalapesi, inoculated 190 persons with the same material.

Fourth Series.—Lastly, in August last, Dr. DaCunha inoculated over 100 persons with material supplied to him from the Bombay Laboratory.

Thus, altogether 2,297 persons were inoculated in Lower Damaun.

The visit of the Scientific Committee coincided with the time of the third series of inoculation, and Dr. Lyons' investigation extended to twelve days later, when the worst part of the epidemic was over, and the daily mortality had come down to below a dozen a day. The present analysis refers, therefore, to the occurrence of attacks and deaths amongst the 2,197 inoculated on the first three occasions, and is divided into three periods of observation, the first corresponding to the interval between the first and second series of inoculations, the second to the interval between the second and third series, and the third to the interval between the third series and the end of the month of May 1897, when the investigation was concluded.

First Period (between the First and Second Series of Inoculations).

At the time when the first series of inoculations was completed, the 26th March 1897, the total number of inhabitants in the affected villages of Damaun, namely 10,900, had been reduced by 670, who had died of plague before that time, and by about 2,000 who had left the place before the closing of the frontiers.

Of the 8,230 remaining, 846 were inoculated by Dr. Kalapesi and 171 by Dr. Poiares in their first series of inoculations, while 7,213 remained uninoculated.

From that time, up to the time when the second series of inoculations was completed, *i.e.*, the 23rd of April, the following were the occurrences in the respective groups of people:—

(*a*) Amongst the 846 inoculated by Dr. Kalapesi, there were 17 cases with 3 deaths.* (Total mortality 0·4 per cent.; case mortality, *i.e.*, percentage of deaths to attacks, 17·6 per cent.)

(*b*) Amongst the 171 inoculated by Dr. Poiares, there were 6 cases with 3 deaths.* (Total mortality, 1·8 per cent.; case mortality, 50 per cent.)

(*c*) Amongst the 7,213 uninoculated, there were 716 deaths.† (Total mortality 9·9 per cent.)

* See attached Rolls.

† As a matter of fact, much more than that, the figure 716 deaths, 9·9 per cent., implying that during the initial three weeks of the epidemic, before the introduction of inoculation and during the first period of four weeks after the inoculations, the worst period in the whole epidemic, the mortality was uniformly 26 deaths a day, which, of course, was not the case.

It will be seen that, if the 1,017 inoculated had exhibited the same susceptibility for plague as the uninoculated, and had had the same mortality of 9·9 per cent., the number of deaths amongst them would have been 101 instead of 6, a difference of 94·1 per cent.

Second Period (between the Second Series of inoculation and the Third Series, or the time of the Scientific Committee's visit).

By the time when the second series of inoculations was completed, the number of those inoculated by Dr. Kalapesi had decreased by the 3 deaths mentioned above, and increased by 529 newly inoculated, giving a total of 1,372.

The number of inoculated by Dr. Poiares had decreased by 3 deaths, and increased by 99 newly inoculated, giving a total of 267.

The number of uninoculated had decreased by 716 deaths and by the 628 newly inoculated, leaving a total of 5,869 uninoculated.

From the time of the second series of inoculations up to the time of the Scientific Committee's visit, viz., 19th of May last, the following were the occurrences in the three groups:—

(*a*) Amongst the 1,372 inoculated by Dr. Kalapesi, there were 52 cases with 18 deaths.* (Total mortality, 1·3 per cent.; case mortality, 34·6 per cent.)

(*b*) Amongst the 267 inoculated by Dr. Poiares, there were 12 cases with 9 deaths.* (Total mortality, 3·3 per cent.; case mortality, 75 per cent.)

(*c*) Amongst the 5,869 uninoculated, there were 674 deaths (Total mortality, 11·5 per cent.)

It will be observed that if during the second period of observation the 1,639 inoculated had had the same mortality as the 5,869 uninoculated, they should have lost 188 instead of 27, which represents a difference of 85·6 per cent.

Third Period (between the Third Series of inoculations and the end of May, or the time when Surgeon-Major Lyons concluded his investigation).

At the time of the Scientific Committee's visit to Damaun, the number of inoculated by Dr. Kalapesi had decreased by 18 deaths, and increased by 552 inoculated by him and Dr. DaCunha, giving a total of 1,906.

The number of inoculated by Dr. Poiares had decreased by 9 deaths, leaving a total of 258 inoculated.

The number of uninoculated had decreased by 674 deaths and by 552 who got themselves inoculated, leaving 4,643 uninoculated.

During the 12 days which elapsed till Dr. Lyons completed his investigation, these groups produced—

(*a*) The 1,906 inoculated by Dr. Kalapesi, 1 case with 1 death.* (Mortality 0·05 per cent.)

(*b*) The 258 inoculated by Dr. Poiares, 3 cases with 2 deaths.* (Mortality 0·8 per cent.)

(*c*) The 4,643 uninoculated—93 deaths. (Mortality 2 per cent.)

Calculating upon the death-rate amongst the uninoculated, the 2,164 inoculated should have had 43 deaths instead of the 3, which is a difference of 93 per cent.

During the three periods of observation put together, between the 26th March and the end of May, 6,033 uninoculated had 1,482 deaths (24·6 per cent.), while 2,197 inoculated had 36 deaths (1·6 per cent.). Calculating upon the death-rate among the uninoculated we have seen that the inoculated should have had altogether 332 deaths instead of 36. This represents a difference in mortality of 89·2 per cent.

* See attached Rolls.

Considering the large proportion in which the number of inoculated stands to the rest of the population (2,197 to 6,033), it is evidently impossible that the inoculated represented the upper, or any other particular, class of the population possessing a degree of personal or local immunity much different from that of the rest of the population, and to which their reduced death-rate could be ascribed.

This view is confirmed by the following comparison of the mortality which occurred in the inoculated and uninoculated persons belonging to the same families, who lived therefore under absolutely identical conditions of life.

In a large number of households the whole of the members of the family were inoculated, leaving none for comparison as regards susceptibility to the disease. This circumstance rendered it necessary to compare the whole inoculated population with the whole of the uninoculated population, as has been done above. However, in 62 of the inoculated families in which cases occurred, there were 124 persons who remained uninoculated, while the number of inoculated in these families was 250 (see attached Rolls). A comparison between this fraction of the inoculated population with their uninoculated relatives shows the following result:—

124 uninoculated had 54 cases (43·5 per cent.) with 37 deaths (29·8 per cent., case mortality 68·5 per cent.).

250 inoculated had 50 cases (20 per cent.), with 20 deaths (8 per cent., case mortality 40 per cent.).

The inoculated households lived, therefore, under no specially immune conditions, as the mortality among their uninoculated members, 29·8 per cent., was 5·2 per cent. higher than the mortality in the general uninoculated population. This must invariably be the case, as only people from badly-affected or particularly-threatened localities present themselves for inoculation. It will be noticed also that this small number of 124 uninoculated had a mortality higher by 1 death than the total mortality sustained by the 2,197 inoculated inhabitants of Damaun; and that a comparison between the inoculated and uninoculated members of these families shows that if the 250 inoculated had exhibited the same susceptibility as their 124 uninoculated relatives, they should have had 75 deaths instead of 20, a difference of 73·3 per cent.*

A similar conclusion is arrived at on comparing the mortality in the Parsee community quoted above, and which shows that the inoculated members gave a reduction of 97·4 per cent. of deaths when compared with the uninoculated of the same community.

It has been mentioned that the lymph used in Damaun in the first series of inoculations was of an active stock, prepared from a highly virulent microbe, and produced a brisk febrile reaction when used in relatively small doses. Owing to the great pressure of work during the epidemic, no method for keeping up the strength of the plague bacilli has been worked out, and the microbe from which the plague lymph was manufactured was allowed to gradually sink in virulence till it became almost harmless when inoculated into rodents. It was lymph thus weakened that was used in the subsequent inoculations.

A comparison between the first and second series of inoculations† done with the strong and with the weak vaccines, respectively, shows a difference in result in direct correspondence with the difference in the material used, as will be seen from the following table‡:—

1,017 inoculated on the first occasion had 49 cases (4·8 per cent.) with 15 deaths (1·5 per cent., case mortality 30·6 per cent.).

628 inoculated on the second occasion had 41 cases (6·5 per cent.) with 20 deaths (3·2 per cent., case mortality 48·8 per cent.).

* As far as the small numbers from which the figure 73·3 per cent. is obtained permit of drawing conclusions, the comparison between this figure and 89·2 per cent. by which the mortality in the *total* inoculated population differed from the mortality in the *total* uninoculated, would seem to indicate that the presence of uninoculated members in a family reduces the safety of the inoculated, and that, like in small-pox vaccination, the duty of the individual is to be inoculated for the safety of his neighbours in the community.

† The third series, done shortly before the conclusion of the observations, is left out of this comparison, only one death having occurred amongst those inoculated on the third occasion (see attached Rolls).

‡ See attached Rolls.

The total mortality and the percentage of deaths to cases amongst the inoculated on the second occasion, though they were exposed to the risk of infection during the milder period of the epidemic, was, respectively, 2·2 and 1·6 times higher than amongst those inoculated on the first occasion.

Also as mentioned already, Dr. Poiares in his operations used doses considerably lower than those given by Dr. Kalapesi. The difference in the results of these two groups of operations corresponded again to the difference in the method employed, as is seen below *:—

Amongst the 1,924 inoculated by Dr. Kalapesi, there were 70 cases (3·6 per cent.) with 22 deaths (1·1 per cent., case mortality 31·4 per cent.)

Amongst the 270 inoculated by Dr. Poiares, there were 21 cases (7·8 per cent.) with 14 deaths (5·2 per cent., case mortality 66·7 per cent.)

Thus, amongst the inoculated with reduced doses, small though their death-rate (5·2 per cent.) was when compared with the death-rate in the uninoculated population (24·6 per cent.), the total mortality was 4·5 times, and the case mortality 2·1 times higher than that amongst the inoculated with larger doses.

This variation of the results, answering faithfully to the variation in the strength of the lymph and in the doses given, shows the direct connection of cause and effect in the two series of facts, and makes it probable that it will be in our power to improve upon the results obtained in Damaun.

It also indicates, when the actual figures are examined, that the plague prophylactic has a greater influence upon the number of deaths than upon the number of attacks. This result repeated itself in all the observations collected up to the present on the plague inoculation, and seems to stand in a comprehensible connection with the plan followed in working it out.† If this surmise is correct, it will be in our will to effect a further reduction in the number of attacks by correspondingly modifying the composition of the plague prophylactic.

The above satisfactory results were obtained in one of the most virulent outbreaks that have been observed in India in the present epidemic, and during the 9 weeks which corresponded to the highest stage of that outbreak.

The question as to the final duration of the effect of the plague inoculation remains unsolved, but loses its urgent interest in view of the above results.

Bombay,
1*st November* 1897.

(Signed) W. M. HAFFKINE,
(,,) R. W. S. LYONS, M.D.,
Surgeon-Major, I.M.S.

Copies of this report are forwarded by Mons. W. M. Haffkine to—

The Secretary to the Government of India in the Home Department, Simla.
The Private Secretary to His Excellency the Governor of Bombay.
The Secretary to the Government of Madras, Local and Municipal Department.
The Secretary to the Surgeon-General with the Government of Bombay.
His Excellency the Governor of Damaun.
Professor Dr. R. Koch (Berlin).
Professor Dr. Gaffky (Giessen, Germany).
Shet Sorabjee Maneckjee Damaunwalla, Damaun.

* See attached Rolls.
† See W. M. Haffkine, "*The Plague Prophylactic*" *loc cit.*

APPENDIX.

LOWER DAMAUN.

Particulars of Households where Inoculation had been applied and Plague occurred afterwards.

I.—Attacks in those inoculated in March 1897, or in their relations.

Investigated by Surgeon-Major Lyons, I.M.S.

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack Name, sex and age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptams, issue.
Lower Damaun, Katriwad.	Laloo Muckla .. .. Male, 25 years .. Inoculated in March 1897. Guirdhar .. .. .. ,, 4 ,, .. ,, ,, Moti Bhicka .. .. Female, 60 ,, .. ,, April 1897. Pemi .. .. .. Male 22 ,, .. ,, ,, Guirdhar was attacked about 19th April. Had high fever and a cervical gland enlarged. Died after seven days.	
Lower Damaun, Rua Real.	Saurrah Lalla .. Male, 40 years .. Inoculated in March and April 1897. Argooan .. .. ,, 7 ,, .. ,, ,, ,, Rutton .. .. Female, 25 ,, .. ,, April 1897. Dhanki .. .. ,, 2 ,, .. ,, ,, Argooan was attacked 15 days after inoculation. Had high fever. Died on the second day after the attack.	
Lower Damaun, Braman Falia.	Pershotam Premanand .. Male, 55 years .. Inoculated on 23rd April 1897. Harishanker Pershotam .. ,, 28 ,, .. ,, 23rd March 1897. Amba Jeevanram .. .. Female, 50 ,, .. ,, 25th April 1897. Rami Rhapoo .. .. .. ,, 60 ,, .. ,, ,, Jeenah (*vel* Dyah) Ambaram. Male, 20 ,, .. ,, 23rd March 1897. Manee Ravishanker .. .. Female, ,, ,, Harkee Bhapoo .. .. ,, 25 ,, .. ,, ,, Jeenah (*vel* Dyah) Ambaram was attacked on the 3rd May 1897. Fever at the onset. Temp. 104°. Bubo ran to suppuration. General symptoms extremely mild. Recovered by the 10th May 1897.	Vijlee Atmaram .. Female, 45 years. Vijlee Atmaram had fever on the 5th April 1897. Buboees in both the groins which ran to suppuration. Symptoms not severe. Recovered by the 22rd April 1897.
Lower Damaun, Braman Falia.	Amrootrao Sakharam .. Male, 45 years .. Inoculated in April 1897. Govindrao Amrootrao .. ,, 20 ,, .. ,, March 1897. Madhavarao Amrootrao ,, 18 ,, .. ,, ,, Anandrao Amrootrao .. ,, 4 ,, .. ,, March and April 1897. Ganpatrao .. .. ,, 10 ,, .. ,, March 1897. Ganpatrao was attacked a month after inoculation. Bubo in right groin. Had fever, nausea and headache. Recovered.	Rookmani .. Female, 35 years. Vamanrao .. Male, 3 ,, Chimbai .. Female, 8 ,,
Lower Damaun, Kathiria.	Wallob Chenoy .. Male, 50 years .. Inoculated in March 1897. Canjee .. .. .. ,, 30 ,, .. ,, ,, Govan .. .. .. ,, 9 ,, .. ,, ,, Morar .. .. .. ,, 7 ,, .. ,, ,, Govan was attacked two and-a-half months after the date of inoculation. Femoral bubo (left). Fever and slight head symptoms. Recovered.	Dhanee Canjee .. Female, 20 years. Maneck .. .. ,, 2 ,,
Lower Damaun.	Chabeldas Lucmon .. Male, 45 years .. Inoculated in March 1897. Jeevy Callan .. .. Female, 35 ,, .. ,, ,, Annanjee .. .. Male, 18 ,, .. ,, ,, Ramjee .. .. .. ,, 15 ,, .. ,, ,, Hargovan .. .. ,, 13 ,, .. ,, ,, Parvati .. .. Female, 10 ,, .. ,, ,, Ranchore .. .. Male, 8 ,, .. ,, ,, Laroo Gopal .. .. Female, 13 ,, .. ,, ,, Bholy .. .. .. ,, 12 ,, .. ,, ,, Chabeldas Lucmon was attacked a month and-a-half after inoculation. Axillary bubo. High fever and delirium. Died four days after. Parvati attacked one and-a-half month after inoculation. Axillary bubo which suppurated. Fever and headache. Recovered. Laroo Gopal attacked one and-a-half month after inoculation. Femoral bubo and other symptoms of plague. Recovered.	
Lower Damaun, Rua Real.	Cooverjee Byramjee .. Male, 35 years .. Inoculated in March 1897. Dinbai .. .. .. Female, 30 ,, .. ,, ,, and April 1897. Perozbai .. .. ,, 10 ,, .. ,, ,, ,, Merbai .. .. .. ,, 6 ,, .. ,, ,, ,, Ruribai .. .. .. ,, 50 ,, .. ,, ,, ,, Dinbai was attacked on the 3rd May. Had fever 106·4°. Severe head symptoms and delirium. Femoral bubo (left) which suppurated and burst. Recovered.	

Attacks in those inoculated in March 1897, &c.—*cont.*

Full Adddress.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Braman Falia.	Hootamchand Dyah Male, 22 years .. Inoculated in March and April 1897. Bormany .. .. Female, 20 ,, .. ,, May 1897. Jeechand .. .. Male, 3 ,, .. ,, ,, Cubly .. .. Female, 5 ,, .. ,, ,, Kallan Ramji .. Male, 43 years .. Inoculated in Mar., April and May 1897. Ambu .. .. Female, 40 ,, .. ,, ,, ,, Ginah .. .. Male, 18 ,, .. ,, April 1897. Ladoo .. .. Female, 50 ,, .. ,, ,, Rami .. .. ,, 14 ,, .. ,, Jagjiwan Wallab .. Male, 24 years .. Inoculated in March and April 1897. Baglah .. .. ,, 44 ,, .. ,, ,, and May 1897. Eduljee Fakirjee Male, 21 years .. Inoculated in March, Apr. and May 1897. Ratanbai .. .. Female, 50 ,, .. ,, ,, Sonabai .. .. ,, 27 ,, .. ,, ,, Bachoobai .. .. ,, 26 ,, .. ,, ,, Virbaijee .. .. ,, 18 ,, .. ,, ,, Dunbai .. .. ,, 40 ,, .. ,, ,, Baijee .. .. ,, 11 ,, .. ,, ,, Faramjee .. Male, 7 ,, .. ,, ,, Dynbai .. Female, 8 ,, .. ,, ,, Doshibai .. .. ,, 5 ,, .. ,, ,, Ferosha .. .. Male, 3 ,, .. ,, ,, Morio .. .. ,, 12 ,, .. ,, ,, Divjee .. .. ,, 10 ,, .. ,, May 1897. Luckmi .. .. Female, 50 ,, .. ,, ,, Byramjee Nanabhoy. Male, 48 years .. Inoculated in March and April 1897. Sorabjee Byramjee.. ,, 25 ,, .. ,, ,, Bicai .. .. Female, 40 ,, .. ,, ,, Jahangir .. .. Male, 16 ,, .. ,, ,, Ruttonbai B. .. Female, 10 ,, .. ,, ,, Femina .. .. ,, 6 ,, .. ,, ,, Dinshaw .. .. Male, 7 ,, .. ,, ,, Ruttonshaw .. ,, 3 ,, .. ,, Dhanjee Bhickha .. Male, 30 years .. Inoculated in March 1897. Mockun .. .. ,, 10 ,, .. ,, ,, Gopy .. .. .. ,, 7 ,, .. ,, ,,	Daychand Panachand, Male, 51 years. Parwaty Varodman Female, 48 ,, Parwaty Varodman was attacked on the 15th April and died on the 20th of the same month. Had fever, headache, nausea and vomiting. Bubo in the right groin. Rama Keshadjee .. Male, 70 years. Keser .. .. Female, 60 ,, Rama Keshadjee was attacked 15 days after the date of the inoculation of the others. Had fever, headache and delirium. No bubo. Died after three days. Keser was attacked 12 days after inoculation of the others. Had fever and headache. Axillary bubo. Recovered: Anni Dallu .. Female, 40 years. Parwati .. .. ,, 20 ,, Divaly .. .. ,, 20 ,, Anni Dallu was attacked 15 days after the date when the others were inoculated. Had high fever, headache, femoral bubo (right). Was taken to the plague hospital and died on the same day. Parwati was attacked on the same day. Had fever, headache, delirium and femoral bubo (left). Was taken to the plague hospital and died the next day. Nanaboy Jewaji .. Male, 60 years. Nanaboy Jewaji was attacked on the 16th April. Had very high fever, nausea, vomiting, head and backache. Femoral bubo (right); suppression of urine. Died on the 20th April 1897. Merbai B. .. .. Female, 20 years. Maneckbai Dinshaw ,, 60 ,, Jamsetjee Dinshaw. Male, 37 ,, Jeevanbai Dinshaw. Female, 33 ,, Merbai B. was attacked about the 18th April. Had high fever, nausea, vomiting, head and back ache. Femoral (left) bubo. Died on the 20th April. Govan Bhickha .. Male, 20 years. Mangly .. .. Female, 40 ,, Govan Bhickha was attacked on the 10th May. Left axillary bubo. Fever and headache. Died on the 20th May. Mangly was attacked about 11th May. Had fever, head and back ache and delirium. Femoral buboes on both sides. Ill at time of investigation.

Attacks in those inoculated in March 1897, &c.—*cont.*

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Parboowad.	Jeenah Sadashiv .. .. Male, 55 years .. Inoculated in March 1897. Luckmi .. .. ,, 35 ,, .. ,, ,, Durgah .. .. Female, 30 ,, .. ,, ,, Shewkore .. .. ,, 50 ,, .. ,, ,, Gurgah Shanker .. Male, 18 ,, .. ,, ,, Divaly .. .. Female, 18 ,, .. ,, ,, Paly .. .. .. ,, 3 ,, .. ,, ,,	Jaikore Kashiram .. Female, 19 years. Manabi .. .. ,, 15 ,, Jaikore Kashiram was attacked 20 days after the date of inoculation in this house. Had fever, headache, delirium and femoral bubo (left). Died after four days. Manabi was attacked on the same day. Had fever, headache, nausea and vomiting. Femoral bubo (left). Died after six days.
Lower Damaun, Katheria.	Junjee Chamario .. .. Male, 40 years .. Inoculated in March and April 1897.	Mangli .. .. Female, 35 years. Sodkar .. .. Male, 20 ,, Coowardy .. Female, 18 ,, Maude .. .. Male, 10 ,, Coowardy was attacked about the 18th May. Had high fever, head and backache, nausea, vomiting, severe diarrhœa and delirium. No bubo. Ill at the time of investigation.
Lower Damaun, Parboowad.	Ranchorjee Aritram .. .. Male, 48 years .. Inoculated in March 1897. Nansi Wishwanath .. .. ,, 3 ,, .. ,, ,,	Wishwanath Aritram.. Male, 55 years Wishwanath Aritram was attacked on the 28th March. Recovered.
Lower Damaun, Rua Luiz de Camoens (Rua de M. S. Vaz.)	Jose Maria St. Anna .. Male, 22 years .. Inoculated in April 1897. Chariza .. .. Female, 13 ,, .. ,, in March and April 1897	Maria Francisca .. Female, 24 years. Maria Francisca was attacked on the 14th April. Had high fever, headache, nausea and delirium. Femoral bubœs on both sides. Recovered.
Lower Damaun, Rua Real.	Ruttonjee Cowasjee, Male, 52 years .. Inoculated in March, April and May 1897. Sorabjee .. .. ,, 30 ,, .. ,, ,, ,, Faramroj .. .. ,, 10 ,, .. ,, ,, ,, Nasvanjee .. .. ,, 10 ,, .. ,, ,, ,, Virbai .. .. Female, 44 ,, .. ,, ,, ,, Doshibai .. .. ,, 28 ,, .. ,, ,, ,, Aymai .. .. ,, 24 ,, .. ,, ,, ,, Syrinbai R. .. ,, 21 ,, .. ,, ,, ,, Sakerbai .. .. ,, 18 ,, .. ,, ,, ,, Cowerbai .. .. ,, 13 ,, .. ,, ,, ,, Banoobai .. .. ,, 6 ,, .. ,, ,, ,, Goolbai .. .. ,, 5 ,, .. ,, ,, ,, Fenima .. .. ,, 2½ ,, .. ,, ,, ,, Syrombai S. .. ,, 10 ,, .. ,, ,, ,, Dinshaw .. .. Male, 6 ,, .. ,, ,, ,, Aymai .. .. Female, 5 ,, .. ,, ,, ,, Peroshaw .. .. Male, 2 ,, .. ,, ,, ,, Syrinbai B. .. Female, 2 ,, .. ,, March 1897. Mahomed Cassam. .. Male, 25 ,, .. ,, ,, Roopabai .. .. Female, 30 ,, .. ,, ,, Jerbanoo S. .. .. ,, 4 ,, .. ,, Mahomed Cassan. was attacked a month after inoculation. Had very high fever, head and back ache and delirium. Left femoral bubo. Died three days after. Roopabai was attacked on the 19th April. Had fever, head and back ache. Left femoral bubo. Recovered.	Banio .. .. Male, 70 years. Jinky .. .. Female, 60 ,, Bavio .. .. Male, 12 ,, Bavio was attacked on the 14th April. Had fever, head and back ache, nausea and vomiting. Femoral bubo on left side. Died on the 18th April.
Lower Damaun, Rua Real.	Vithal Jeevan .. .. Male .. .. Inoculated in March 1897. Vithal Jeevan was attacked on the 17th May. Bubo in the left groin. High fever, nausea and vomiting. Recovered.	Kashi .. .. Female, 22 years. Banee .. .. ,, 75 ,, Kashi was attacked about a month after the date of inoculation. Left femoral bubo; high fever. Recovered in about eight days.

Attacks in those inoculated in March 1897, &c.—*cont.*

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Parboowad.	Harnee Rungopal .. .. Female, 26 years .. Inoculated in March 1897. Dhondee .. .. ,, 10 ,, .. ,, ,, Jaidoo .. .. Male, 3 ,, .. ,, ,, Sunder .. .. Female, 5 ,, .. ,, ,, Dinkore .. .. Male, 2 ,, .. ,, ,, Mardli .. .. ,, 5 ,, .. ,, ,, Mardli was attacked 12 days after the date of inoculation. Had fever, headache and femoral bubo (left). Died four days after the attack. Harnee and Dhondee were attacked eight days after the date of inoculation. Had fever and headache. The first had femoral bubo (right) and the second axillary bubo (right). Both recovered.	Govindrao .. .. Male, 36 years. Babajee .. .. ,, 50 ,, Gaobai .. .. Female, 40 ,, Govindrao was attacked 15 days after the date of inoculation of others. Had fever, headache and vomiting. Femoral bubo (right). Died. Babajee was attacked about the same date. Had fever and headache. No bubo. Died five days after the attack. Gaobai was also attacked about the same date. Had fever, head and backache. Died four days after the attack.
Lower Damaun, Kathriwad.	Pitambar Ragunah .. .. Male, 50 years .. Inoculated in March 1897. Luckmi .. .. Female, 45 ,, .. ,, ,, Arkore .. .. ,, 10 ,, .. ,, ,, Narayan .. .. Male, 5 ,, .. ,, ,, Arkore was attacked 20 days after inoculation. Had right femoral bubo which suppurated and fever. Recovered.	Somlah .. .. Male, 20 years. Manglu .. .. ,, 9 ,, Somlah and Manglu were attacked about the 25th March. Had fever, head and back ache, nausea and vomiting. Somlah had cervical bubo and died after ten days. Manglu had femoral (left) bubo. Died after four days.
Lower Damaun, Braman Falia.	Harishanker Purshotam Patack .. Male, 40 years. Inoculated on 25th March 1897. Harishanker Purshotam Patack was attacked on the 2nd April. Had high fever, severe head symptoms, nausea and vomiting. Femoral bubo in the left groin. Recovered after six days.	Nankore Devram .. Female, 37 years. Nankore Devram was attacked on the 10th April. Had high fever, head and back ache, nausea and vomiting. No bubo. Recovered after 15 days.
Lower Damaun, Rua de Macotinho.	Guella Wallob .. .. Male, 20 years .. Inoculated on 25th March 1897. Wallob Jeevan .. .. ,, 23 ,, .. ,, in April 1897. Dhanee .. .. .. Female, 18 ,, .. ,, ,, Divaly .. .. .. ,, 11 ,, .. ,, ,, Guella Wallob was attacked on the 10th April. Had very high fever. Was semi-conscious and delirious for three days. Bubo in the groin. Recovered.	Bulky Wallob .. Female, 35 years. Bulky Wallob was attacked on the 8th May. Had fever, nausea, delirium and submaxillary gland enlarged. Died eight days after.

II.—Attacks in those inoculated in April and May 1897, or in their relations.

Lower Damaun, Rua Quadrada. (Maneckjee Danjeebhoy Street).	Maneckjee Beckajee .. Male, 45 years .. Inoculated in March and April 1897. Bechoobai Maneckjee .. Female, 16 ,, .. ,, ,, ,, Bicajee Maneckjee .. Male, 12 ,, .. ,, ,, ,, Najambai .. .. Female, 6 ,, .. ,, ,, ,, Manecbai .. .. ,, 2 ,, .. ,, ,, ,, Jerbai Maneckjee .. ,, 35 ,, .. ,, ,, ,, Jerbai Maneckjee was attacked one day before inoculation and died three days later.	Sonabai Doranjee .. Female, 55 years.
Lower Damaun, Rua de Carpenteiros.	Gopal Narain .. .. Male, 32 years .. Inoculated in March and April 1897. Cashi Hari .. .. Female, 30 ,, .. ,, April 1897. Cashi Hari was attacked eight days after inoculation. Had high fever, severe head symptoms, nausea and vomiting. Femoral bubo (right). Recovered.	Jamna Lalljee .. Female, 55 years. Jamna Lalljee was attacked six days after the date of inoculation in this house. Femoral bubo (right). High fever, headache, vomiting and delirium. Died six days after the attack.
Lower Damaun, Chanta.	Balkrishna Hiraji .. Male, 24 years .. Inoculated in April 1897 .. .. Bicken .. .. ,, 17 ,, .. ,, ,, Haribao .. .. ,, 11 ,, .. ,, ,, Pandurang .. .. ,, 9 ,, .. ,, ,, Atmaram .. .. ,, 6 ,, .. ,, ,, Maneck .. .. Female 13 ,, .. ,, ,, Pandurang was attacked three days after inoculation and died on the fourth day. Had bubo in the left groin. Fever, nausea and headache.	Hiraji Callanji .. Male, 42 years. Nanabhai .. .. ,, 25 ,,

Attacks in those inoculated in April and May 1897, &c.—*cont.*

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Gathiwad.	Pershotam Morby .. Male, 16 years .. Inoculated in April 1897.	Morby Luckmon .. Male, 50 years. Pemi Nanabhoy .. ,, 45 ,, Jamma Morby .. Female, 20 ,, Morby Luckmon was attacked on the 10th May and died after seven days. Had fever, headache, and pain at the back. No gland enlarged. Jamma Morby was attacked on the 16th May and died on the 20th. Had left axillary gland enlarged. Fever and headache.
Lower Damaun, Rua de Macotinha.	Rani Gopal .. .. .. Female, 16 years .. Inoculated in April 1897. Divaly .. .. .. ,, 22 ,, .. ,, ,, Morar Bhagwan .. .. Male .. ,, March 1897. Divaly was attacked five days after the inoculation. Had femoral gland of the right side enlarged. Fever, headache, nausea and pain in the back. Recovered.	Pemi Cowasjee .. Female, 35 years. Pemi Cowasjee was attacked on the 5th April. Had axillary bubo (left side) fever and headache. Recovered.
Lower Damaun, Golwad.	Ramjee Lalloo .. .. .. Male, 45 years .. Inoculated in April 1897. Ramjee Lalloo was attacked three days after inoculation. Had fever, hœmoptisis and cough. Died.	Cower .. Female, 35 years. Chunia .. Male, 3 ,, Maneck .. Female, 55 ,,
Lower Damaun, Rua de Macotinha.	Dhulob Bhicu .. .. .. Male, 25 years .. Inoculated in April 1897.	Bhicu Vittoba .. Male, 55 years. Godavrybai .. Female, 35 ,, Sonabai Hirajee .. ,, 17 ,, Manky .. ,, 11 ,, Godavrybai was attacked about 12th May. Had bubo in the left groin. Very high fever, nausea, and vomiting for three days. Recovered. Sonabai Hirajee was attacked about the 15th April. Femoral bubo. High fever, nausea, headache and delirium. Recovered.
Lower Damaun, Rua Real.	Gopal Dhulob .. .. .. Male, 25 year .. Inoculated in April 1897. Rutton .. .. .. Female, 20 ,, .. ,, ,, Nandoo .. .. .. ,, 6 ,, .. ,, ,, Manky .. .. .. ,, 3 ,, .. ,, ,, Daily .. .. .. ,, 2 ,, .. ,, ,, Gopal Dhulob and Rutton were attacked 13 days after inoculation. Gopal Dhulob had very high fever with severe head symptoms. No bubo. Died four days after. Rutton had high fever. Bubo in the groin. Was taken to the plague hospital and died five days after.	Guirdhar Gopal .. Male, 5 years.
Lower Damaun, Kathiria.	Rama Dhulob .. .. .. Male, 20 years .. Inoculated in April 1897. Keshav .. .. .. ,, 5 ,, .. ,, ,, Nuthi .. .. .. Female, 35 ,, .. ,, ,,	Dajy Gonsal .. Male, 30 years. Dajy Gonsal was attacked 12 days after the date of inoculation. Had femoral bubo (right). Fever, headache, delirium and nausea. Died five days after the attack.
Lower Damaun, Rua Viscondi de Olerem (Ghatiwada).	Bhavani Dagroo .. .. .. Male, 35 years, .. Inoculated in April 1897. Sakoo Govind .. .. .. Female, 25 ,, .. ,, ,, Sucky Bawani .. .. .. ,, 6 ,, .. ,, ,, Gampoo Krishna .. .. Male, 5 ,, .. ,,	Dagroo Koosajee .. Male, 60 years. Mookty Bairoo .. Female, 30 ,, Dagroo Koosajee was attacked in April 1897. Died after six days. Had axillary bubo. Mookty Bairoo was attacked in April 1897. Died after seven days. No buboes, but other symptoms of plague.

Attacks in those inoculated in April and May 1897, &c.—*cont.*

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaon, Rua Real.	Guirdhar Gopal .. .. Male, 50 years .. Inoculated in April 1897. Motia, G. .. .. .. ,, 40 ,, .. ,, ,, Jugea .. .. .. ,, 10 ,, .. ,, ,, Bhicklu .. .. .. ,, 8 ,, .. ,, ,, Guirdhar Gopal was attacked 15 days after inoculation. Had fever, head and back ache. Femoral bubo (right). Died five days later. Motia, G., was attacked eight days after inoculation. Had fever and headache, but no bubo. Died three days later. Jugea was attacked ten days after inoculation. Had fever and headache. Femoral bubo (left) which was cauterized. Recovered.	Gungaoh .. Female, 30 years.
Lower Damaun, Kathiria.	Wallob Fakir .. .. Male, 40 years .. Inoculated in April and May 1897. Ditia .. .. .. ,, 15 ,, .. ,, ,, ,, Cower .. .. .. Female, 15 ,, .. ,, ,, ,, Jeevie .. .. .. ,, 12 ,, .. ,, ,, ,, Canjee .. .. .. Male, 7 ,, .. ,, ,, ,, Dhanu was attacked eight days after the date of inoculation in this house. Had femoral bubo (right). High fever, headache and delirium. Died after 15 days.	Dhanu .. Female, 35 years.
Lower Damaun, Rua de Macotinha (Causerwad), House No. 55.	Govan Ranchore .. Male, 30 years .. Inoculated on 21st April and 22nd May 1897. Guirdhar Govin .. ,, 5 ,, .. ,, 21st ,, 21st May 1897. Jamna Hirajee was attacked on the 29th April 1897. Temperature at the onset 104·6°. Bubo in the left groin. Died on the 4th May 1897.	Jamna Hirajee .. Female, 55 years.
Lower Damaun, Rua Real.	Hurgovan Dhulob .. ..Male, 40 years .. Inoculated in April 1897. Hurgovan Dhulob was attacked 15 days after inoculation. Had fever, headache and femoral bubo. Died five days after.	Gungey .. .. Female, 30 years.
Lower Damaun, Kathiria.	Ruttonjee Vital .. .. Male, 25 years .. Inoculated on 21st April 1897. Runchore .. .. .. ,, 16 ,, .. ,, ,, Jamna .. .. .. Female, 5 ,, .. ,, ,, Peni .. .. .. ,, 11 ,, .. ,, ,, Valy .. .. .. ,, 11 ,, .. ,, ,, Govan Chaba .. .. .. ,, 50 ,, .. ,, ,, Runchore Vital was attached on the 1st May. Axillary buboes both sides. High fever, head and back ache. Recovered.	Callan Rewah .. Male, 18 years. Bhicki .. .. Female, 35 ,, Pemah Chaba .. Male, 45 ,, Callan Rewah was attacked about the 6th May. Had very high fever, delirium, head and back ache, nausea and vomiting. No bubo. Recovered seven days after. Pemah Chaba was attacked on the 22nd April. Had high fever, nausea and vomiting, head and back ache. No bubo. Died on the 25th April.
Lower Damaun, Rua Real.	Bickla Cullan .. .. Male, 25 years .. Inoculated in April 1897 .. Daily .. .. .. Female, 20 ,, .. ,, ,, Gopal .. .. .. Male, 4 ,, .. ,, ,, Luckmi .. .. .. Female, 2 ,, .. ,, ,, Bickla Cullan was attacked nine days after inoculation. Had high fever, delirium, head and back ache. Right femoral bubo which was cauterized. Recovered ten days after.	Dajee .. .. Male, 19 years.
Lower Damaun, Rua Real.	Chabu Bagwan .. .. Male, 56 years .. Inoculated in April 1897. Vally Wallob .. .. Female, 22 ,, .. ,, ,, Ambi Vammally .. .. ,, 4 ,, .. ,, ,, Bhickli .. .. .. ,, 45 ,, .. ,, ,, Chabu Bagwan was attacked 15 days after inoculation. Had fever, head and back ache. Femoral bubo (right) which suppurated. Recovered. Bhickli was attacked ten days after inoculation. Had high fever. No bubo. Died three days after.	
Lower Damaun, Braman Falia, House No. 26 (South line).	Bai Parwati Baishanker ..Female, 20 years ..Inoculated on 23rd March 1897. Hoomabai Ramshanker .. ,, 7 ,, .. ,, on 24th April 1897. Girjashanker Pranshanker ..Male, 3 ,, .. ,, ,, Itchabai Harishanker was attacked on the 30th April 1897. Bubo in the left axilla. High fever, temperature 105·3° F.; delirious and unconscious for three days. Recovered by the 12th May 1897. At the time of investigation still under treatment for general debility.	Itchabai Harishanker. Female, 20 years.

Attacks in those inoculated in April and May 1897, &c.—*cont.*

Full Address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Kathiria.	Rajab Burh .. .. .. Male, 40 years .. Inoculated in April 1897. Sookly .. .. .. Female, 30 ,, .. ,, ,, Dherio .. .. .. Male, 7 ,, .. ,, ,, Dherio was attacked 15 days after the date of inoculation. Had femoral bubo (left). Fever, head and back ache and nausea. Died three days after the attack.	
Lower Damaun, Rua Real (Kathiria).	Ruttonjee Oamally ..Male, 30 years ..Inoculated in March and May 1897. Luckmon .. .. .. ,, 16 ,, .. ,, ,, Rami .. .. ..Female, 25 ,, .. ,, April 1897. Parwati .. .. .. ,, 10 ,, .. ,, ,, and May 1897. Mulchand .. .. ..Male, 4 ,, .. ,, ,, ,, Amba .. .. ..Female, 25 ,, .. ,, April 1897.	Bhulio Dhulob .. Female, 60 years. Bhulis Dhulob was attacked on the 13th May. Femoral bubo which was cauterized. Fever, headache, nausea and vomiting. Recovered.
....	Keshao Hiraji .. .. Male, 40 years ..Inoculated in April 1897. Morar .. .. .. ,, 45 ,, .. ,, ,, Bajwan .. .. .. ,, 18 ,, .. ,, ,, Dalia .. .. .. ,, 6 ,, .. ,, ,, Bhicky .. .. .. ,, 8 ,, .. ,, ,, and May 1897. Keshao Hiraji was attacked nine days after inoculation, Had high fever, head and back ache, nausea and vomiting. Femoral bubo (right side) suppurated. Recovered. Dalia was attacked 11 days after inoculation. Had fever, headache, nausea and vomiting. Cervical gland enlarged. Recovered.	Amba Jeewan .. Female, 16 years.
Lower Damaun, Kathiria.	Sucky Buna .. Female, 26 years .. Inoculated in April 1897. Lalla .. ..Male, 6 ,, .. ,, ,, Govan .. .. ,, 10 ,, .. ,, ,, Pemah .. .. ,, 4 ,, .. ,, ,, Sucky Buna was attacked 12 days after the inoculation. Had fever, head and back ache. Femoral bubo (left). Recovered. Govan was attacked eight days after inoculation. Had high fever and headache. Cervical buboes (left). Died three days after. Pemah was attacked nine days after inoculation. Had fever, headache and axillary bubo. Died three days after.	
Lower Damaun, Kathiria.	Govan Bicary .. Male, 38 years .. Inoculated in April 1897. Luckmi .. Female, 60 ,, .. ,, ,, Daily .. .. ,, 40 ,, .. ,, ,, Chipky .. .. ,, 8 ,, .. ,, ,, Luckmi was attacked 17 days after the date of inoculation. Fever and other symptoms mild. Femoral bubo (right) which was cauterized. Recovered. Daily was attacked 12 days after inoculation. Femoral bubo. High fever, headache, delirium and vomiting. Died three days after the attack.	
Lower Damaun, Kathiria.	Narain Kalibul .. Male, 48 years .. Inoculated in April 1897. .. .. Divly .. .. Female, 2 ,, .. ,, ,, Divly was attacked 16 days after inoculation. Cervical bubo, vomiting and convulsion. Recovered after 15 days.	Dhanby Sookly .. Female, 26 years. Dhanby Sookly was attacked 20 days after the date of inoculation. Had very high fever, delirium, head and back ache. Aborted after six days. Moribund when seen at the time of investigation.
....	Gopal Fakir .. Male, 40 years .. Inoculated in April 1897. Rami .. .. Female, 35 ,, .. ,, ,, Harjeevan .. Male, 9 ,, .. ,, ,, Naran Bagwan .. ,, 12 ,, .. ,, ,, Gopal Fakir and Rami were attacked a month after inoculation. Had fever, headache and vomiting. Gopal Fakir had axillary bubo and Rami femoral (left) bubo, both were cauterized. Recovered. Naran Bagwan was attacked nine days after inoculation. Had fever and headache. Femoral bubo, which was cauterized. Died after four days.	

Attacks in those inoculated in April and May 1897, &c.—*cont.*

Full Address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Rua Real.	Sucky Cullan .. Female, 50 years .. Inoculated in April 1897. Lucmon .. Male, 16 ,, .. ,, ,, Sucky was attacked on the 15th May. Femoral bubo (right side). High fever, nausea and vomiting. Recovered.	Sacoo Dajee .. Male, 75 years.
Lower Damaun, Rua Real.	Rahim Shamgee .. Male, 40 years .. Inoculated on 18th April 1897. Sonabai .. Female, 30 ,, .. ,, ,, Alli .. .. Male, 14 ,, .. ,, ,, Banjia Manglu .. .. ,, March 1897. Rahim Shamgee was attacked three days after inoculation. Had high fever, head and back ache. Femoral bubo (right side), which appeared six days after inoculation. Recovered. Alli was attacked 20 days after inoculation. Slight fever. Other symptoms also mild. Bubo in the left groin. Recovered.	
Lower Damaun, Rua de Fabrica.	Lewis de Silva .. Male, 45 years .. Inoculated on 7th April 1897. Maria Theresa .. Female, 33 ,, .. ,, ,, Patrocinia .. ,, 14 ,, .. ,, ,, Carolina .. ,, 10 ,, .. ,, March and April 1897. Anna .. .. ,, 7 ,, .. ,, ,, Francis .. .. Male, 2 ,, .. ,, ,, Patrocinia was attacked on 14th May. Had femoral bubo (right). High fever, head and back ache and nausea. Recovered.	
Lower Damaun, Rua Real.	Chuba Dallah .. Male, 32 years .. Inoculated in April 1897. Bhicky Wallab .. Female, 30 ,, .. ,, ,, Luckmi .. ,, 10 ,, .. ,, ,, Callam .. .. Male, 3 ,, .. ,, ,, Chuba Dallah was attacked 20 days after inoculation. Had femoral bubo in the left side. Recovered.	
Lower Damaun, Rua Real.	Hirajee Bhula .. Male, 39 years .. Inoculated on 21st April and May 1897. Nandi .. .. Female, 30 ,, .. ,, in April 1897. Awanjee .. Male, 62 ,, .. ,, on 21st April and May 1897. Morar .. .. ,, 8 ,, .. ,, ,, ,, Bhicky, W. .. ,, 55 ,, .. ,, in April 1897. Bhicky, W., was attacked twelve days after inoculation. Had fever, head and back ache. Femoral bubo (right). Recovered.	Bhicky, D. .. .. Female, 72 years.
Lower Damaun, Marwar.	Dheda Gopal Khalpa .. Male, 45 years .. .. Died of plague.	Shanti, wife of Gopal. Female, 40 years. Mangals Gopal .. Male, 24 ,, Somo Gopal .. ,, 20 ,, Ravi Gopal .. ,, 15 ,, Shami Gopal .. ,, 4 ,, Withal Gopal .. ,, 6 moths.
Lower Damaun, Forti.	Gopal Bhicara .. Male, 9 years .. Inoculated on 23rd May 1897. .. Gopal Bhicara was attacked on the date of inoculation. Fever gradually increased and was accompanied by nausea, vomiting and severe head symptoms. Bubo. Died four days after the date of inoculation.	Bhika Lackma .. Male, 40 years. Ratti Dhajee .. Female, 30 ,, Jamna Bhika .. ,, 4 ,, Bhika Lackma was attacked on the 26th May. Had very high fever, severe head and back ache and nausea. Right femoral bubo. Died seven days after the attack.

III.—Attacks in those inoculated with reduced doses of prophylactic; or in their relations.

Lower Damaun, Lane opposite Fish Market.	Maria Angelica dos Remedios..Female, 10 years .. Inoculated on 5th April 1897. Maria Angelica was attacked 10 days after inoculation. Had high fever, headache and delirium. Right axillary bubo. Died three days after.	Jotto dos Remedios.. Male, 30 years. Alchina .. .. Female, 26 ,, Candinha .. .. ,, 5 ,, Jono .. .. Male, 1 year.

Attacks in those inoculated with reduced doses of prophylactic, &c.—*cont.*

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Parboowad.	Mackan Jeevan .. Male, 55 years .. Inoculated on 6th April 1897 .. Withal .. .. ,, 9 ,, .. ,, ,, Withal was attacked 15 days after inoculation. Had axillary and cervical buboes. High fever. Died five days after.	Harki Jeevan .. Female, 15 years. Pemly Jeevan .. ,, 35 ,,
Lower Damaun, Rua dos Carniceiros.	Candenho Lopes .. Male, 20 years .. Inoculated on 25th April 1897 .. Daniel Pestana .. ,, 13 ,, .. ,, ,, Jesmina Lopes was attacked on the 18th May. Had high fever, head and back ache, nausea and vomiting and delirium. Axillary bubo (right). Died on the 24th May.	Raza Maria Lopes .. Female, 22 years. Jesmina Lopes .. ,, 40 ,, Justiniano .. .. Male, 6 ,, Monte .. .. ,, 5 ,,
Lower Damaun, Rua do Carpenteirous.	Narayan Bagwan .. Male, 40 years .. Inoculated on 7th April 1897. Kassan Narayan .. ,, 25 ,, .. ,, 6th ,, Ambah .. .. .. ,, 7th ,, Narayan Bagwan was attacked 15 days after inoculation. Had fever and delirium. No bubo. Died five days after the attack.	
Lower Damaun, Rua de Macotinha.	Bhicka Mackan .. Male, 24 years .. Inoculated on 6th April 1897 .. Bhicka Mackan was attacked 15 days after inoculation. Had fever, headache and vomiting. Bubo in the left groin. Recovered.	Mackan Lalla .. Male, 69 years. Luxmi .. .. Female, 2 ,,
Lower Damaun, Rua dos Carpenteiros.	Dyab Genah .. .. Male, 18 years .. Inoculated on 5th May 1897. Ranchore, B. .. .. ,, 40 ,, .. ,, March 1897. Rami .. .. .. ,, 15 ,, .. ,, ,, Dyab Genah was attacked on the 6th May. Had high fever (temperature 107°), severe head symptoms. Femoral bubo (left). Died on the 11th May 1897.	
Lower Damaun, Forte de S. Jeronimo.	Rev. Fr. Punenta .. Male, 47 years .. Inoculated on 6th April 1897. Bicuria Incharia .. ,, 60 ,, .. ,, 5th ,, Bicuria Incharia was attacked 20 days after inoculation. Had fever, head and back ache. Died on the 6th May.	
Lower Damaun, Rua Maneckjee Sorabjee.	Jeewan Pemah .. Male, 50 years .. Inoculated on 25th March and 8th April 1897. Bhiky Pershotam .. Female, 29 ,, .. Inoculated on 6th April 1897. Cassam Jeevan .. Male, 18 ,, .. ,, 25th March and 2nd April 1897. Pali Bhika .. .. Female, 4 ,, .. ,, 6th April 1897. Cashi Jeewan .. .. ,, 9 ,, .. ,, Collan Jeevan .. .. Male, 7 ,, .. ,, 25th March and 2nd April 1897. Bhiky Pershotam was attacked on the 25th April. Fever (temperature 103°) and slight headache. Had buboes in the right groin and two about the right side of the right mammary gland. Recovered completely on the 7th May 1897. Pali Bhika was also attacked on the 25th April. Fever temperature 104°. Bubo in the right groin with other symptoms which were mild. Recovered completely on the 5th May 1897.	
Lower Damaun, Rua de Caldereiros.	Withal Hary .. .. Male, 60 years .. Inoculated on 5th April 1897. Daya Naran .. .. Female, 45 ,, .. ,, ,, Withal Hary was attacked on the 29th April. Fever, headache and delirium. Bubo inguinal and axillary. Died three days after.	
Lower Damaun, Rua Angelica, Fish Market.	Camillo do Remedios Male, 37 years .. Inoculated on 23rd April 1897. Humiliano .. .. Female, 27 ,, .. ,, ,, Francis .. .. Male, 10 ,, .. ,, ,, Ludovina .. .. Female, 7 ,, .. ,, ,, Maria Eugenia .. ,, 5 ,, .. ,, ,, Vithal .. .. Male, 1½ ,, .. ,, ,, Bicaida .. .. ,, 15 ,, .. ,, ,, Francis was attacked on 5th May. Had fever, convulsion and femoral bubo (right). Died three days after the attack.	

No. 2621 M., 26TH NOVEMBER 1897.

ORDER—No. 2621 M., dated 26th November 1897.

Recorded.

(True Extract.)

H. TREMENHEERE,
Ag. Secretary to Government.

To all Collectors.
" all Presidents of District Boards.
" the President, Municipal Commission, Madras.
" all Chairmen of Municipal Councils.
" the Surgeon-General.
" Sanitary Commissioner.
" the Public Works Department (Railway Branch).
" the Marine Department.
Editors' Table.

Exd. Shaik Kareem.

Government {1897} of Madras.

LOCAL AND MUNICIPAL.

Recd. } 1897. *Enclosures*

Regd. } *Spare copies*

G.O., No. 2621 M., 26th November 1897.

NOVEMBER.

Bubonic Plague.

Recording the joint report by Mons. W. M. Haffkine and Surgeon-Major Lyons on the epidemic of plague in Lower Damaun (Portuguese India) and on the effect of preventive inoculation there.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following paper:—

From Mons. W. M. HAFFKINE, C.I.E., to the Secretary to the Government of Madras, Local and Municipal Department, dated Hardwar, 17th November 1897.

By order of the Government of India, I have the honour to forward, for the information of the Government of Madras, the adjoined report, by Surgeon-Major Lyons and myself, on the epidemic of plague in Lower Damaun and on the effect of preventive inoculation there.

ENCLOSURE.

JOINT Report on the epidemic of plague in Lower Damaun, Portuguese India, and on the effect of preventive inoculation there, by Monsieur W. M. Haffkine and Surgeon-Major Lyons, I.M.S., President, Government Committee for Investigation of the Bubonic Plague in Bombay.

The plague prophylactic referred to in the present report has been described by Monsieur W. M. Haffkine in the "British Medical Journal," May 1897, and in the "Indian Medical Gazette," June 1897.

The facts reported here have been collected by Professors Koch and Gaffky, the heads of the German Scientific Mission to Bombay, and Monsieur Haffkine, on a visit to Damaun on the 20th and 21st May last; at the end of the same month a house-to-house visitation at Damaun was undertaken and carried out, at Monsieur Haffkine's request, by Surgeon-Major Lyons, President of the Bubonic Plague Research Committee, in order to complete, by exact details, the information gathered on the first visit.

At the German Scientists and Monsieur Haffkine's inquiry at Damaun, their informants were—

His Excellency Colonel J. P. KUCHENBUCK VILLAR, Governor of Damaun;
Mr. JUDGE, Assistant Collector, Salt and Revenue Department, in charge of the Preventive Police and the Plague Operations on the Damaun Frontier;
Shet SORABJEE MANOCKJEE DAMAUNWALLA, head of the Parsee Community, assisted by his Secretary;
Dr. VIRGILIO POIARES, Physician in charge of the Plauge Hospital;
Dr. PROENCA, Health Officer;
Dr. PINTO, in charge of the Plague Operations in Damaun Town; and
Dr. DA CUNHA, L.R.C.P. (Edinburgh),
Dr. MONIZ, L.M.S., and
Dr. FERNANDEZ,
} Medical Practitioners of Damaun.

The Medical Officers abovementioned were assembled, on the 20th May 1897, by His Excellency the Governor, who was also present, and to whom we are indebted for affording every facility for making the inquiry complete. The general information given below, in the preliminary part of this report, was reported at this meeting and was supplemented by documents from the respective offices.

The history of the Damaun epidemic appears to be as follows:—

The town of Damaun is divided by a river into two parts: Lower Damaun, the largest business part of the town; and the Fort, or Upper Damaun, where the Government house and the Government offices are situated. The plague attacked almost exclusively three of the villages which make part of Lower Damaun, namely, Lower Damaun proper, having, in ordinary times, a population of 5,000 inhabitants; Katheria, the property of Shet Sorabjee Damaunwalla, with a population of 4,700; and Khadiwadi, with a population of 1,200. This part of the town was in active business communication with the Bombay Presidency, and is densely populated, the inhabitants living in small houses crowded together. The Fort was cut off by a cordon from Lower Damaun as soon as the epidemic began to increase in proportion, and had only some half-a-dozen imported cases.

The first attacks came to notice in February last and occurred amongst new arrivals from Bulsar, a neighbouring town which was badly affected at the time, and amongst sailors from Kurrachee arriving at Damaun by sea, in native crafts. Before the end of the same month local cases began to appear among the fishermen, who have their *busti* close to the river, where crafts are moored, behind the Damaun Municipal school. In the last days of the month a hurried exodus of people began from Lower Damaun, increasing daily as the epidemic gained in intensity, until, on the 23rd of March, the Governor placed a cordon along the river, and stopped communication between the lower and upper parts of the town; while a week later, on the 30th March, the Bombay Government, on their part, closed British territory to the inhabitants of Damaun. By this time, it was estimated, over 2,000 people had quitted the place.

The worst period of the epidemic corresponded to the month following the closing of the Damaun frontiers. The climax was reached in the middle of April, when the daily number of deaths remained stationary for about eight days and then began to decline. The largest number of deaths which occurred in one day was 80.

Up to the 25th of April the daily mortality, which was closely watched by the Parsee Community who kept peons on the burial and burning grounds, was recorded officially from the information given by the inhabitants coming to the Registration office to declare cases of deaths in their families. On the 25th April, the Governor placed a guard of his own on the burial and burning grounds, and on that day, though the number of deaths reported by the inhabitants was 11, the number of bodies disposed of in the presence of the guard was 34. From the above date the Governor's guard was kept permanently on the grounds, and the official information became complete. The following is the number of bodies registered by this means from the 25th April up to the date of investigation:—

25th April 1897	.. ..	34	8th May 1897	.. ..	33
26th "	.. ..	31	9th "	.. ..	18
27th "	.. ..	21	10th "	.. ..	24
28th "	.. ..	49	11th "	.. ..	27
29th "	.. ..	41	12th "	.. ..	15
30th "	.. ..	58	13th "	.. ..	13
			14th "	.. ..	17
1st May 1897	.. ..	41	15th "	.. ..	13
2nd "	.. ..	22	16th "	.. ..	20
3rd "	.. ..	29	17th "	.. ..	6
4th "	.. ..	47	18th "	.. ..	8
5th "	.. ..	33	19th "	.. ..	13
6th "	.. ..	31			
7th "	.. ..	31	25 days.		675 deaths.

Thus, during the 25 days preceding our visit, *i.e.*, between the 25th April and 19th May 1897, at a time when the population was considerably thinned by desertion and death, and when the mortality had dropped to 8 and 6 a day, the total number of bodies disposed of was 675, giving an average *of* 25 *deaths a day*. His Excellency the Governor and the medical gentlemen present at the meeting stated that they would be well within the real figure if they estimated the number of deaths which occurred in the fully populated town, in the first period and during the height of the epidemic, *i.e.*, up to the time of placing the guard, at an average *of* 30 *a day*, counting from the 1st March and neglecting the mortality before that date. This estimate gives a total of 2,325 deaths as having occurred in Damaun from the beginning of the epidemic up to the time of the Scientific Committee's visit. Of this number, 2,093 deaths were afterwards authenticated in the particular families where they had taken place, during a house-to-house enquiry instituted by Shet Sorabjee Damaunwalla, the owner of Katheria.*

As the immunity of the inoculated in Damaun will be estimated from a comparison with the mortality in the uninoculated population, it is essential, in order to avoid the possibility of exaggerating the power of inoculation, to take for guidance the lowest figure admissible as representing the real death rate in the place. In the following calculations, therefore, the number of deaths from plague which occurred in Damaun from the commencement of the epidemic up to the visit of the Scientific Committee is accepted as 2,093, which is the number authenticated by an enquiry in each of the affected families. This figure gives an average daily mortality from the commencement of the epidemic up to the time of placing guards on the burial and burning grounds, as being close upon 26 deaths a day. From the 21st of May up to the end of the same month, that is to say up to the date when Surgeon-Major Lyons concluded the additional inquiry, of which the details are given below, there occurred 96 deaths more, giving a total of 2,189 deaths from plague which took place in Damaun during the period under observation.

In this number of deaths there were 24 in those inoculated, personally observed by the Medical Officers of the place; *plus* a small number of others of which they knew, but which they had not seen personally. Fifteen deaths of the 24 were reported by Dr. Moniz, who was said to have treated the largest number of plague patients in the place; 4 by Dr. Poiares, who also saw 4 other cases which recovered; 3 cases by Dr. Proença, all of whom recovered (these had been seen also by Dr. DaCunha); 3 deaths were known to Dr. DaCunha, and 2 to Dr. Pinto (in addition to one mentioned by Dr. Moniz which Dr. Pinto had seen with him).

Considering the small extent of the town, the limited number of inhabitants, and the number of Medical Officers who were looking after the place, it appeared probable that not many attacks among the inoculated escaped their notice, as such attacks usually excite much comment amongst the inhabitants and attract general attention. Indeed, the gentlemen present at the meeting seemed to know between them every place in the town where inoculated people lived, and every house which had suffered from plague or happened to have escaped. As has been mentioned already, they

* The number of deaths from plague which took place during the *whole* epidemic up to the end of July, and a record of which could be obtained by an enquiry in the households, was 2,352 and was distributed amongst the different castes inhabiting Damaun as follows:—

Parsees	6	Tailors	48
Brahmins	26	Bhatis	21
Parbhus	4	Potters	16
Shrawaks	11	Portuguese	34
Banias	23	Bhandarees	22
Lohanas	4	Bhayas	5
Gujrathi Goldsmiths	15	Bhateli	1
Daxini Goldsmiths	80	Dhobies	16
Hindoo Barbers	27	Mochis	23
Khatris	87	Kolis	19
Coppersmiths	11	Borahs	5
Machis	600	Khojas	4
Carpenters	104	Lohars	13
Mussalmans	440	Mangelas	7
Golas	106	Hindoo Low Castes	351
Chhipas	23	Caste unknown	200
		Total	2,352

stated at the time that there was a small number of inoculated attacked whom they did not see, but of whom, they informed us, a record existed in the office of Shet Sorabjee Damaunwalla, where, during the plague, a dispensary was opened for distributing gratuitous medicines to the affected population.

It was on the initiative of that Parsee gentleman that the inoculations were introduced. He had a personal knowledge of the people who were inoculated, and kept a watch over the effect of the operation, collecting, with the help of his office establishment, a large number of details in this connection.

From his information it appeared that the total number of deaths amongst the inoculated was under 40, each of the cases being known to him; that amongst those inoculated in a first series of inoculation, done in March last, a smaller proportion got affected and died than amongst those done a month later; and that in a series of inoculations carried out by the Physician in charge of the Damaun Plague Hospital, with lymph supplied from our Bombay Laboratory, the number of attacks was larger than amongst those inoculated by Dr. Kalapesi, Dr. Haffkine's assistant, sent from the Laboratory. These details were found afterwards, in the course of the close investigation carried out by us, to be scrupulously correct.

Mr. Sorabjee had also a guard of his own kept on the burial and burning grounds, watching the course of the mortality, and his information concurred with the statements recorded above. The number of people inoculated up to the time of the Scientific Committee's visit was 1,645; over four times that number remained uninoculated. The latter had lost from plague close upon one-third of their number, and, he considered, there could be no doubt that the inoculated exhibited a most striking degree of immunity.

The effects of inoculation were closely watched by the inhabitants, as will be seen from the following observations which they brought to our notice.

There were altogether 306 Parsees in Lower Damaun, including males, females and children. Of these, 276 were inoculated twice, and one once, all the particulars being given in our inoculation register. The names and particulars of the 29 who remained uninoculated were supplied to us on the spot. The attacks and casualties from plague which occurred in the two groups after the introduction of inoculation are given below.* No deaths from any other cause occurred in the community from the beginning of the epidemic.

Occurrences of plague amongst the 277 *inoculated Parsees.*

(1) Jerbai, wife of Manekji Pacha, age 35, belonging to a well-to-do family; was five months pregnant; inoculated once on 17th April 1897, in the right arm. For about 24 hours before, she had fever and pain in the groin, but this was not known at the time of inoculation. Developed characteristic plague in the evening of the day of inoculation, had an abortion on 20th morning, died same day.

(2) Seven other Parsees inoculated were attacked, respectively, three days, one week, twelve days, a fortnight, one month, one month and five weeks after inoculation, but all these recovered.

Occurrences of plague amongst the 29 *uninoculated Parsees.*

(1) Nanabhai Jivajee, male, age 60, belonging to a well-to-do family, where all the other members (fourteen in number), except himself, were inoculated. Attacked on 16th April 1897; bubo in left groin; died on 20th.

(2) Merbai, daughter of Bairamjee, age 20 years, of a well-to-do family, where eight members were inoculated and four, including Merbai, were not inoculated; attacked about same time as Nanabhai Jivajee; bubo in right groin; died on 20th April.

(3) Ratanbai Ratanjee, female, age 35, of a well-to-do family; attacked and died in the first days of May 1897, having had fever and a bubo.

(4) An old women, Avabai, widow of Rustomjee, age about 75 years, of a well-to-do family, where fourteen others were inoculated, Avabai, and Gulbai, her daughter-in-law, being the only uninoculated. Avabai got attacked on 11th May, developed bubo two days later; died on the 13th.

* See also attached Rolls.

Thus in the 29 uninoculated Parsees there were 4 deaths from plague, or a mortality of 13·8 per cent., while in the 277 inoculated there were 8 attacks with only 1 death, the one who died being a woman attacked *before* inoculation, and the mortality thus produced in the inoculated being 0·36 per cent., or 38·3 times lower than in the uninoculated.

Another significant instance, in a limited number of people, was furnished by the servants belonging to Shet Sorabjee's house and to his garden. There are 50 servants in the house where he lives and about 150 in his garden, half a mile distant from the house. Round the garden the epidemic was raging violently. Of the whole number of servants one, a deformed individual, remained uninoculated, all the others were inoculated twice. Plague appeared among the servants on the 16th May when the only person uninoculated was attacked and succumbed on the 19th; the total number of inoculated lost also one, a child of 4 years.

The other instances given were in isolated families and referred to smaller numbers of people.

The German Commissioners completed this part of the inquiry by collecting information as to the soil of Upper and Lower Damaun, the hydrographic and climatic conditions obtaining in both, their comparative hygienic circumstances, &c. The facts supplied on these points were of an approximate character. The Committee returned to Bombay on the morning of the 22nd May.

Surgeon-Major Lyons went to Lower Damaun on the 26th May 1897, the object of his visit being to find out accurately, by a minute inquiry in each house, the number of deaths which occurred amongst those inoculated. For this purpose he divided the town into 4 sections, and during 4 days, between the 26th and 30th May 1897, visited all the houses, section by section. And as a number of dwellings had been vacated and the inhabitants encamped in the fields outside the town, Dr. Lyons visited them in their encampments and collected information from all of them. The frontier around the town being closed and guarded by a British and a Portuguese cordon, the conditions for collecting the necessary information were particularly complete.

In this manner Dr. Lyons collected the history of 33 deaths and 54 attacks with recovery which had occurred in the inoculated up to the 19th May (the time of the Scientific Committee's visit), and of 3 deaths * and 1 attack with recovery which occurred between that date and the 31st of May inclusive.

In the appendix are reproduced 88 "Investigation sheets" filled up by Dr. Lyons during the house-to-house visitation, as well as one sent afterwards by His Excellency the Governor. Each of the investigation sheets contains particulars of a house where inoculated people lived, and where cases of plague had occurred, either among the inoculated or the uninoculated members of the family. These sheets, therefore, do not make mention of the inoculated households where no cases of plague occurred, nor of any of the attacked houses where there were no inoculated persons.

Comparative Analysis of the Mortality from Plague in Lower Damaun, in the inoculated and uninoculated, between the 26th March and the end of May 1897.

The inoculations in Damaun were done in four series:

First Series.—Between the 23rd and 26th March 1897, 846 persons were inoculated by Dr. R. M. Kalapesi, who was sent from the Laboratory, and between the 4th and 7th April 171 persons by the Portuguese physician in charge of the Plague hospital in Damaun, Dr. Virgilio Poiares, who was supplied with material also from the Bombay Laboratory. The lymph used by Drs. Kalapesi and Poiares on that occasion, as will be described later on, was prepared from a strong virus, and produced a high febrile reaction when injected in the prescribed small standard doses. The operations of these two gentlemen differed in that Dr. Poiares gave doses much weaker than those given by Dr. Kalapesi, as is shown by the detailed records of their operations. It will be observed from the results given below that, though Dr. Poiares'

* In this number of three deaths is included one additional, in the person of Ghopal Bicaria, 9 years, communicated by Dr. Fernandez through His Excellency the Governor of Damaun.

patients appear to have given a considerable reduction of mortality when compared with the rest of the population, the results from his small doses were lower than those obtained from the same material given in larger doses.

Second Series.—A few weeks after the first series, the demand for further inoculations coming from Damaun became exceedingly persitent, as was the case, after an interval, in the six other places where inoculations were performed,—in Bombay, Mora, Damaun, Poona, Balsar and Tarapore; and though the Laboratory had run short of strong material, Dr. Kalapesi was deputed again, with a much weaker lymph than that used on the first occasion, as will be detailed later on. Between the 17th and 27th April, *i.e.*, about a month after his first visit, he performed 529 fresh inoculations, and between the 24th April and 2nd May 1897, 99 more were done by Dr. Poiares with a similar material obtained for him from the Bombay Laboratory by the Bombay Portuguese Consulate. The lymph used on this occasion, even when injected in doses 2 to 3 times larger than the standard ones, failed to produce marked rise of temperature, though it caused considerable local reaction. As will be seen below, both Dr. Kalapesi's and Dr. Poiares' operations, on this occasion, gave a smaller lowering of mortality than those previously performed, though they had both been working with increased doses.

Third Series.—Between the 21st and 23rd of May Dr. Kalapesi inoculated 362 persons with a similarly weak lymph, while Dr. DaCunha, another Portuguese physician, who had been working in Damaun with Dr. Kalapesi, inoculated 190 persons with the same material.

Fourth Series.—Lastly, in August last, Dr. DaCunha inoculated over 100 persons with material supplied to him from the Bombay Laboratory.

Thus, altogether 2,297 persons were inoculated in Lower Damaun.

The visit of the Scientific Committee coincided with the time of the third series of inoculation, and Dr. Lyons' investigation extended to twelve days later, when the worst part of the epidemic was over, and the daily mortality had come down to below a dozen a day. The present analysis refers, therefore, to the occurrence of attacks and deaths amongst the 2,197 inoculated on the first three occasions, and is divided into three periods of observation, the first corresponding to the interval between the first and second series of inoculations, the second to the interval between the second and third series, and the third to the interval between the third series and the end of the month of May 1897, when the investigation was concluded.

First Period (between the First and Second Series of Inoculations).

At the time when the first series of inoculations was completed, the 26th March 1897, the total number of inhabitants in the affected villages of Damaun, namely 10,900, had been reduced by 670, who had died of plague before that time, and by about 2,000 who had left the place before the closing of the frontiers.

Of the 8,230 remaining, 846 were inoculated by Dr. Kalapesi and 171 by Dr. Poiares in their first series of inoculations, while 7,213 remained uninoculated.

From that time, up to the time when the second series of inoculations was completed, *i.e.*, the 23rd of April, the following were the occurrences in the respective groups of people:—

(*a*) Amongst the 846 inoculated by Dr. Kalapesi, there were 17 cases with 3 deaths.* (Total mortality 0·4 per cent.; case mortality, *i.e.*, percentage of deaths to attacks, 17·6 per cent.)

(*b*) Amongst the 171 inoculated by Dr. Poiares, there were 6 cases with 3 deaths.* (Total mortality, 1·8 per cent.; case mortality, 50 per cent.)

(*c*) Amongst the 7,213 uninoculated, there were 716 deaths.† (Total mortality 9·9 per cent.)

* See attached Rolls.

† As a matter of fact, much more than that, the figure 716 deaths, 9·9 per cent., implying that during the initial three weeks of the epidemic, before the introduction of inoculation and during the first period of four weeks after the inoculations, the worst period in the whole epidemic, the mortality was uniformly 26 deaths a day, which, of course, was not the case.

It will be seen that, if the 1,017 inoculated had exhibited the same susceptibility for plague as the uninoculated, and had had the same mortality of 9·9 per cent., the number of deaths amongst them would have been 101 instead of 6, a difference of 94·1 per cent.

Second Period (between the Second Series of inoculation and the Third Series, or the time of the Scientific Committee's visit).

By the time when the second series of inoculations was completed, the number of those inoculated by Dr. Kalapesi had decreased by the 3 deaths mentioned above, and increased by 529 newly inoculated, giving a total of 1,372.

The number of inoculated by Dr. Poiares had decreased by 3 deaths, and increased by 99 newly inoculated, giving a total of 267.

The number of uninoculated had decreased by 716 deaths and by the 628 newly inoculated, leaving a total of 5,869 uninoculated.

From the time of the second series of inoculations up to the time of the Scientific Committee's visit, viz., 19th of May last, the following were the occurrences in the three groups:—

(*a*) Amongst the 1,372 inoculated by Dr. Kalapesi, there were 52 cases with 18 deaths.* (Total mortality, 1·3 per cent.; case mortality, 34·6 per cent.)

(*b*) Amongst the 267 inoculated by Dr. Poiares, there were 12 cases with 9 deaths.* (Total mortality, 3·3 per cent.; case mortality, 75 per cent.)

(*c*) Amongst the 5,869 uninoculated, there were 674 deaths (Total mortality, 11·5 per cent.)

It will be observed that if during the second period of observation the 1,639 inoculated had had the same mortality as the 5,869 uninoculated, they should have lost 188 instead of 27, which represents a difference of 85·6 per cent.

Third Period (between the Third Series of inoculations and the end of May, or the time when Surgeon-Major Lyons concluded his investigation).

At the time of the Scientific Committee's visit to Damaun, the number of inoculated by Dr. Kalapesi had decreased by 18 deaths, and increased by 552 inoculated by him and Dr. DaCunha, giving a total of 1,906.

The number of inoculated by Dr. Poiares had decreased by 9 deaths, leaving a total of 258 inoculated.

The number of uninoculated had decreased by 674 deaths and by 552 who got themselves inoculated, leaving 4,643 uninoculated.

During the 12 days which elapsed till Dr. Lyons completed his investigation, these groups produced—

(*a*) The 1,906 inoculated by Dr. Kalapesi, 1 case with 1 death.* (Mortality 0·05 per cent.)

(*b*) The 258 inoculated by Dr. Poiares, 3 cases with 2 deaths.* (Mortality 0·8 per cent.)

(*c*) The 4,643 uninoculated—93 deaths. (Mortality 2 per cent.)

Calculating upon the death-rate amongst the uninoculated, the 2,164 inoculated should have had 43 deaths instead of the 3, which is a difference of 93 per cent.

During the three periods of observation put together, between the 26th March and the end of May, 6,033 uninoculated had 1,482 deaths (24·6 per cent.), while 2,197 inoculated had 36 deaths (1·6 per cent.). Calculating upon the death-rate among the uninoculated we have seen that the inoculated should have had altogether 332 deaths instead of 36. This represents a difference in mortality of 89·2 per cent.

* See attached Rolls.

Considering the large proportion in which the number of inoculated stands to the rest of the population (2,197 to 6,033), it is evidently impossible that the inoculated represented the upper, or any other particular, class of the population possessing a degree of personal or local immunity much different from that of the rest of the population, and to which their reduced death-rate could be ascribed.

This view is confirmed by the following comparison of the mortality which occurred in the inoculated and uninoculated persons belonging to the same families, who lived therefore under absolutely identical conditions of life.

In a large number of households the whole of the members of the family were inoculated, leaving none for comparison as regards susceptibility to the disease. This circumstance rendered it necessary to compare the whole inoculated population with the whole of the uninoculated population, as has been done above. However, in 62 of the inoculated families in which cases occurred, there were 124 persons who remained uninoculated, while the number of inoculated in these families was 250 (see attached Rolls). A comparison between this fraction of the inoculated population with their uninoculated relatives shows the following result:—

124 uninoculated had 54 cases (43·5 per cent.) with 37 deaths (29·8 per cent., case mortality 68·5 per cent.).

250 inoculated had 50 cases (20 per cent.), with 20 deaths (8 per cent., case mortality 40 per cent.).

The inoculated households lived, therefore, under no specially immune conditions, as the mortality among their uninoculated members, 29·8 per cent., was 5·2 per cent. higher than the mortality in the general uninoculated population. This must invariably be the case, as only people from badly-affected or particularly-threatened localities present themselves for inoculation. It will be noticed also that this small number of 124 uninoculated had a mortality higher by 1 death than the total mortality sustained by the 2,197 inoculated inhabitants of Damaun; and that a comparison between the inoculated and uninoculated members of these families shows that if the 250 inoculated had exhibited the same susceptibility as their 127 uninoculated relatives, they should have had 75 deaths instead of 20, a difference of 73·3 per cent.*

A similar conclusion is arrived at on comparing the mortality in the Parsee community quoted above, and which shows that the inoculated members gave a reduction of 97·4 per cent. of deaths when compared with the uninoculated of the same community.

It has been mentioned that the lymph used in Damaun in the first series of inoculations was of an active stock, prepared from a highly virulent microbe, and produced a brisk febrile reaction when used in relatively small doses. Owing to the great pressure of work during the epidemic, no method for keeping up the strength of the plague bacilli has been worked out, and the microbe from which the plague lymph was manufactured was allowed to gradually sink in virulence till it became almost harmless when inoculated into rodents. It was lymph thus weakened that was used in the subsequent inoculations.

A comparison between the first and second series of inoculations† done with the strong and with the weak vaccines, respectively, shows a difference in result in direct correspondence with the difference in the material used, as will be seen from the following table‡:—

1,017 inoculated on the first occasion had 49 cases (4·8 per cent.) with 15 deaths (1·5 per cent., case mortality 30·6 per cent.).

628 inoculated on the second occasion had 41 cases (6·5 per cent.) with 20 deaths (3·2 per cent., case mortality 48·8 per cent.).

* As far as the small numbers from which the figure 73·3 per cent. is obtained permit of drawing conclusions, the comparison between this figure and 89·2 per cent. by which the mortality in the *total* inoculated population differed from the mortality in the *total* uninoculated, would seem to indicate that the presence of uninoculated members in a family reduces the safety of the inoculated, and that, like in small-pox vaccination, the duty of the individual is to be inoculated for the safety of his neighbours in the community.

† The third series, done shortly before the conclusion of the observations, is left out of this comparison, only one death having occurred amongst those inoculated on the third occasion (see attached Rolls).

‡ See attached Rolls.

The total mortality and the percentage of deaths to cases amongst the inoculated on the second occasion, though they were exposed to the risk of infection during the milder period of the epidemic, was, respectively, 2·2 and 1·6 times higher than amongst those inoculated on the first occasion.

Also as mentioned already, Dr. Poiares in his operations used doses considerably lower than those given by Dr. Kalapesi. The difference in the results of these two groups of operations corresponded again to the difference in the method employed, as is seen below * :—

Amongst the 1,924 inoculated by Dr. Kalapesi, there were 70 cases (3·6 per cent.) with 22 deaths (1·1 per cent., case mortality 31·4 per cent.)

Amongst the 270 inoculated by Dr. Poiares, there were 21 cases (7·8 per cent.) with 14 deaths (5·2 per cent., case mortality 66·7 per cent.)

Thus, amongst the inoculated with reduced doses, small though their death-rate (5·2 per cent.) was when compared with the death-rate in the uninoculated population (24·6 per cent.), the total mortality was 4·5 times, and the case mortality 2·1 times higher than that amongst the inoculated with larger doses.

This variation of the results, answering faithfully to the variation in the strength of the lymph and in the doses given, shows the direct connection of cause and effect in the two series of facts, and makes it probable that it will be in our power to improve upon the results obtained in Damaun.

It also indicates, when the actual figures are examined, that the plague prophylactic has a greater influence upon the number of deaths than upon the number of attacks. This result repeated itself in all the observations collected up to the present on the plague inoculation, and seems to stand in a comprehensible connection with the plan followed in working it out.† If this surmise is correct, it will be in our will to effect a further reduction in the number of attacks by correspondingly modifying the composition of the plague prophylactic.

The above satisfactory results were obtained in one of the most virulent outbreaks that have been observed in India in the present epidemic, and during the 9 weeks which corresponded to the highest stage of that outbreak.

The question as to the final duration of the effect of the plague inoculation remains unsolved, but loses its urgent interest in view of the above results.

BOMBAY,
1*st November* 1897.

(Signed) W. M. HAFFKINE,
(„) R. W. S. LYONS, M.D.,
Surgeon-Major, I.M.S.

Copies of this report are forwarded by Mons. W. M. Haffkine to—

The Secretary to the Government of India in the Home Department, Simla.
The Private Secretary to His Excellency the Governor of Bombay.
The ~~Chief~~ Secretary to the Government of Madras, Local and Municipal Dept.
The Secretary to the Surgeon-General with the Government of Bombay.
His Excellency the Governor of Damaun.
Professor Dr. R. Koch (Berlin).
Professor Dr. Gaffky (Giessen, Germany).
Shet Sorabjee Maneckjee Damaunwalla, Damaun.

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* See attached Rolls.
† See W. M. Haffkine, "*The Plague Prophylactic*" *loc cit*

Lower Damaun.

APPENDIX.

Particulars of Households where Inoculation had been applied and Plague occurred afterwards.

I.—ATTACKS in those inoculated in March 1897, or in their relations.

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. — Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. — Name, sex and age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptams, issue.
Lower Damaun, Katriwad.	Laloo Muckla .. .. Male, 25 years .. Inoculated in March 1897. Guirdhar .. .. .. „ 4 „ .. „ „ Moti Bhicka .. .. Female, 60 „ .. „ April 1897. Pemi .. .. .. Male 22 „ .. „ „ Guirdhar was attacked about 19th April. Had high fever and a cervical gland enlarged. Died after seven days.	
Lower Damaun, Rua Real.	Saurrah Lalla .. Male, 40 years .. Inoculated in March and April 1897. Argooan .. .. „ 7 „ .. „ „ „ Rutton .. .. Female, 25 „ .. „ April 1897. Dhanki .. .. „ 2 „ .. „ „ Argooan was attacked 15 days after inoculation. Had high fever. Died on the second day after the attack.	
Lower Damaun, Braman Falia.	Pershotam Premanand .. Male, 55 years .. Inoculated on 23rd April 1897. Harishanker Pershotam .. „ 28 „ .. „ 23rd March 1897. Amba Jeevanram .. .. Female, 50 „ .. „ 25th April 1897. Rami Bhapoo .. .. „ 60 „ .. „ „ Jeenah (*vel* Dyah) Ambaram. Male, 20 „ .. „ 23rd March 1897. Manee Ravishanker .. .. Female, „ „ Harkee Bhapoo .. .. „ 25 „ .. „ „ Jeenah (*vel* Dyah) Ambaram was attacked on the 3rd May 1897. Fever at the onset. Temp. 104°. Bubo ran to suppuration. General symptoms extremely mild. Recovered by the 10th May 1897.	Vijlee Atmaram .. Female, 45 years. Vijlee Atmaram had fever on the 5th April 1897. Buboees in both the groins which ran to suppuration. Symptoms not severe. Recovered by the 23rd April 1897.
Lower Damaun, Braman Falia.	Amrootrao Sakharam .. Male, 45 years .. Inoculated in April 1897. Govindrao Amrootrao .. „ 20 „ .. „ March 1897. Madhavarao Amrootrao „ 18 „ .. „ „ Anandrao Amrootrao .. „ 4 „ .. „ March and April 1897. Ganpatrao .. .. „ 10 „ .. „ March 1897. Ganpatrao was attacked a month after inoculation. Bubo in right groin. Had fever, nausea and headache. Recovered.	Rookmani .. Female, 35 years. Vamanrao .. Male, 3 „ Chimbai .. Female, 8 „
Lower Damaun, Kathiria.	Wallob Chenoy .. Male, 50 years .. Inoculated in March 1897. Canjee .. .. .. „ 30 „ .. „ „ Govan .. .. .. „ 9 „ .. „ „ Morar .. .. .. „ 7 „ .. „ „ Govan was attacked two and-a-half months after the date of inoculation. Femoral bubo (left). Fever and slight head symptoms. Recovered.	Dhanee Canjee .. Female, 20 years. Maneck .. .. „ 2 „
Lower Damaun	Chabeldas Lucmon .. Male, 45 years .. Inoculated in March 1897. Jeevy Callan .. .. Female, 35 „ .. „ „ Annanjee .. .. Male, 18 „ .. „ „ Ramjee .. .. „ 15 „ .. „ „ Hargovan .. .. „ 13 „ .. „ „ Parvati .. .. Female, 10 „ .. „ „ Ranchore .. .. Male, 8 „ .. „ „ Laroo Gopal .. .. Female, 13 „ .. „ „ Bholy .. .. „ 12 „ .. „ „ Chabeldas Lucmon was attacked a month and-a-half after inoculation. Axillary bubo. High fever and delirium. Died four days after. Parvati attacked one and-a-half month after inoculation. Axillary bubo which suppurated. Fever and headache. Recovered. Laroo Gopal attacked one and-a-half month after inoculation. Femoral bubo and other symptoms of plague. Recovered.	
Lower Damaun, Rua Real.	Cooverjee Byramjee .. Male, 35 years .. Inoculated in March 1897. Dinbai .. .. .. Female, 30 „ .. „ „ and -il 18 Perozbai .. .. „ 10 „ .. „ „ „ Merbai .. .. .. „ 6 „ .. „ „ „ Ruribai .. .. .. „ 50 „ .. „ „ „ Dinbai was attacked on the 3rd May. Had fever 106·4°. Severe head symptoms and delirium. Femoral bubo (left) which suppurated and burst. Recovered.	

Attacks in those inoculated in March 1897, &c.—*cont.*

Full Address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Rua Real.	Walab Withal .. .. Male, 43 years .. Inoculated in March 1897. Bani .. .. .. Female, 49 ,, .. ,, April 1897. Lalloo H. .. .. Male, 36 ,, .. ,, March 1897. Pemi .. .. .. Female, 30 ,, .. ,, Bani .. .. .. ,, 12 ,, .. ,, Kashi .. .. .. ,, 11 ,, .. ,, Bichi .. .. .. Male, 6 ,, .. ,, Walab Withal was attacked two months after inoculation. Femoral bubo which was cauterized. Fever, nausea and delirium. Recovered. Bani, aged 49, was attacked ten days after inoculation. Had high fever, head and back ache. Femoral (right) bubo cauterized. Recovered. Lalloo H. was attacked two months after inoculation. Had very high fever and severe head symptoms. Right femoral bubo. Died on the 15th May. Kashi was attacked ten days after inoculation. Had fever and vomiting. Femoral bubo (right) which suppurated. Recovered.	
Lower Damaun, Rua Real.	Sorabjee Nowrojee .. Male, 18 years .. Inoculated in March and April 1897. Rustomjee .. .. ,, 13 ,, .. ,, ,, ,, Frambai .. .. Female, 35 ,, .. ,, ,, ,, Frambai was attacked 12 days after the second inoculation. Had fever, nausea, headache and backache. Femoral bubo (right). Recovered.	
Lower Damaun, Causerwad, Rua de Caldereiros.	Callanjee Dyaljee .. Male, 35 years .. Inoculated in March 1897. Madaorao .. .. ,, 8 ,, .. ,, ,, Shakoo .. .. .. Female, 4 ,, .. ,, ,, Callanjee Dyaljee was attacked a month after inoculation. Had fever, nausea, headache and delirium. Had a boil on the right foot. Recovered.	
Lower Damaun, Rua Real.	Perozbai Rattonjee .. Female, 30 years .. Inoculated in March and April 1897. Syrikbai .. .. ,, 20 ,, .. ,, ,, ,, Virbaijee .. .. ,, 50 ,, .. ,, ,, ,, Nanabhai .. .. Male, 70 ,, .. ,, ,, ,, Janamjee .. .. ,, 11 ,, .. ,, ,, ,, Rustomjee .. .. ,, 8 ,, .. ,, ,, ,, Pirosha .. .. ,, 4 ,, .. ,, ,, ,, Bejanji .. .. ,, 3 ,, .. ,, ,, ,, Bejanji was attacked on the fifth day after the second inoculation. Had fever on the same day. Femoral bubo appeared on the sixth day, suppurated and burst. Recovered.	
Lower Damaun, Rua Real.	Gangadas Banah .. Male, 45 years .. Inoculated in March 1897. Bicu .. .. .. ,, 6 ,, .. ,, ,, and April 1897. Nano .. .. .. ,, 4 ,, .. ,, ,, ,, Navi .. .. .. Female, 28 ,, .. ,, ,, ,, Goolab .. .. .. ,, 1 ,, .. ,, ,, ,, Bicu was attacked 15 days after the second inoculation. Had fever and vomiting. Femoral buboes (both sides). Recovered.	
Lower Damaun, Rua de Carpenteiros.	Narsal Lulla .. .. Male, 42 years .. Inoculated in April 1897. Vamally .. .. ,, 18 ,, .. ,, March and April 1897. Ramjee .. .. ,, 11 ,, .. ,, ,, ,, Gomti .. .. Female, 15 ,, .. ,, ,, ,, Ramjee was attacked on the 16th May. Had fever, head and back ache; left axillary bubo. Recovered.	
Lower Damaun, Rua Real.	Nanabhai Rustomjee .. Male, 51 years .. Inoculated in March and April 1897. Hirjeeboy .. .. ,, 38 ,, .. ,, ,, ,, Rustomjee N. .. .. ,, 24 ,, .. ,, ,, ,, and May 1897. Pallonjee .. .. ,, 14 ,, .. ,, ,, ,, Cowasjee .. .. ,, 13 ,, .. ,, ,, ,, Pestonjee .. .. ,, 10 ,, .. ,, ,, ,, Nasarvanji H. .. .. ,, 12 ,, .. ,, ,, ,, Jahangir .. .. ,, 7 ,, .. ,, ,, ,, Navalsha .. .. ,, 6 ,, .. ,, ,, ,, Frambai .. .. Female, 50 ,, .. ,, ,, ,, Perozbai .. .. ,, 27 ,, .. ,, ,, ,, Dhanbai .. .. ,, 19 ,, .. ,, ,, ,, Merbai H. .. .. ,, 10 ,, .. ,, ,, ,, Goolbai H. .. .. ,, 30 ,, .. ,, May 1897. Nasarvanji H. was attacked 15 days after inoculation. Had fever, headache and vomiting. Femoral bubo right side. Recovered after seven days.	Avambai Rustomjee .. Female, 70 years. Avambai Rustomjee was attacked on the 11th May. Had high fever; femoral bubo (right). Died on the 13th May 1897.

Attacks in those inoculated in March 1897, &c.—*cont.*

Full Address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Vancavad.	Dipchchand Arichand .. Male, 42 years . Inoculated in March and April 1897. Virchand .. .. .. ,, 30 ,, .. ,, ,, ,, Navalchand .. .. ,, 15 ,, .. ,, ,, ,, Chunilal .. .. ,, 8 ,, .. ,, ,, ,, Camlah .. .. Female, 11 ,, .. ,, ,, ,, Monicore .. .. ,, 25 ,, .. ,, ,, ,, Omedkore .. .. ,, 7 ,, .. ,, ,, ,, Chimanlal .. .. Male, 3 ,, .. ,, ,, ,, Chunilal was attacked eight days after inoculation. Had fever, headache, nausea and femoral bubo (right). Recovered.	Oojambai Nemichand. Female, 55 years. Oojambai Nemichand was attacked about middle of May. High fever, headache, delirium, nausea and vomiting. Right femoral bubo. Recovered.
Lower Damaun, Rua Real.	Sorabjee Mancherjee .. Male, 54 years .. Inoculated in March and April 1897. Sonabai .. .. .. Female, 47 ,, .. ,, ,, ,, and May 1897. Jamshetjee .. .. Male, 14 ,, .. ,, ,, ,, Hormusjee .. .. ,, 12 ,, .. ,, ,, ,, Hormusjee was attacked on 2nd April. Had at the onset bubo in the left groin. Two days after high fever, temperature 104 2°, head and back ache and vomiting. Recovered after nine days.	Navajbai Nowrojee .. Female, 65 years.
Lower Damaun, Rua Real.	Bagwan Kushal .. .. Male, 26 years .. Inoculated in March and May 1897. Ambi Baj .. .. Female, 2 ,, .. ,, ,, Bagwan Khusal was attacked 16 days after the second inoculation. Had high fever, vomiting, head and back ache. Femoral bubo right side. Recovered.	Rutton Pemahin .. Female, 20 years.
Lower Damaun, Darjewad Wamawad.	Mangal Ooker .. .. Male, 25 years .. Inoculated in March 1897. Rutton Dulab .. .. Female, 19 ,, .. ,, ,, Bhicky .. .. .. ,, 9 ,, .. ,, ,, Rutton Dulab was attacked 15 days after inoculation. Femoral and axillary buboes; suppurated. Recovered.	Laroo Kirio .. Female, 55 years. Rutton Bagwan .. ,, 32 ,, Dhankore Vithal ,, 2 ,,
Lower Damaun, Kathiria.	Gungha Bhagwan .. Female, 40 years .. Inoculated in March 1897. Vanmally .. .. Male, 11 ,, .. ,, ,, Bhicky .. .. Female, 14 ,, .. ,, ,, Gungha Bhagwan was attacked 11 days after inoculation. Had fever, head and back ache, and nausea .. Femoral bubo left side. Recovered.	
Lower Damaun, Rua Real. House No. 46.	Maneckbai Nasvanjee .. Female, 38 years .. Inoculated in March and April 1897. Bicaijee .. .. Male, 6 ,, .. ,, ,, ,, Maneckbai Nasvanjee was attacked six days after the second inoculation. Had fever, headache, vomiting, and femoral bubo on the right side, which suppurated and healed. Recovered.	
Lower Damaun, Gathiwad.	Navrojee Dhunjeebhoy Male, 45 years .. Inoculated in March and April 1897. Kookibai Navrojee Female, 38 ,, .. ,, ,, ,, Kekobhai .. Male, 6 ,, .. ,, ,, ,, Perosha .. .. ,, 3 ,, .. ,, ,, ,, Kekobhai had high fever, headache, vomiting and femoral bubo three days after inoculation. Recovered.	
Lower Damaun, Vadi Falia.	Narayan Withal .. Male, 28 years .. Inoculated in March 1897.	Gungha Narain .. Female, 4 years. Daily I .. .. ,, 25 ,, Daily II .. .. ,, 17 ,, Daily I. was attacked on 10th April. Had high fever, head and back ache, no glands. Died four days later. Daily II. was attacked on the 30th March. Had high fever, headache and delirium. No glands. Died three days later.

Attacks in those inoculated in March 1897, &c.—*cont.*

Full Address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Braman Falia.	Hootamchand Dyah Male, 22 years .. Inoculated in March and April 1897. Bormany .. .. Female, 20 ,, .. ,, May 1897. Jeechand .. .. Male, 3 ,, .. ,, ,, Cubly .. .. Female, 5 ,, .. ,, ,, Parwaty Varodman was attacked on the 15th April and died on the 20th of the same month. Had fever, headache, nausea and vomiting. Bubo in the right groin.	Daychand Panachand, Male, 51 years. Parwaty Varodman Female, 48 ,,
	Kallan Ramji .. Male, 43 years .. Inoculated in Mar., April and May 1897. Ambu .. .. Female, 40 ,, .. ,, ,, ,, Ginah .. .. Male, 18 ,, .. ,, ,, ,, Ladoo .. .. Female, 50 ,, .. ,, April 1897. Rami .. .. ,, 14 ,, .. ,, ,, Rama Keshadjee was attacked 15 days after the date of the inoculation of the others. Had fever, headache and delirium. No bubo. Died after three days. Keser was attacked 12 days after inoculation of the others. Had fever and headache. Axillary bubo. Recovered.	Rama Keshadjee .. Male, 70 years. Keser .. .. Female, 60 ,,
	Jagjiwan Wallab .. Male, 24 years .. Inoculated in March and April 1897. Baglah .. .. ,, 44 ,, .. ,, ,, and May 1897. Parwati was attacked on the same day. Had fever, headache, delirium and femoral bubo (left). Was taken to the plague hospital and died the next day.	Anni Dallu .. Female, 40 years. Parwati .. .. ,, 20 ,, Divaly .. .. ,, 20 ,, Anni Dallu was attacked 15 days after the date when the others were inoculated. Had high fever, headache, femoral bubo (right). Was taken to the plague hospital and died on the same day.
Lower Damaun, Rua Real.	Eduljee Fakirjee Male, 21 years .. Inoculated in March, Apr. and May 1897. Ratanbai .. .. Female, 50 ,, .. ,, ,, Sonabai .. .. ,, 27 ,, .. ,, ,, Bachoobai .. ,, 26 ,, .. ,, ,, Virbaijee .. ,, 18 ,, .. ,, ,, Dunbai .. .. ,, 40 ,, .. ,, ,, Baijee .. .. ,, 11 ,, .. ,, ,, Faramjee .. Male, 7 ,, .. ,, ,, Dynbai .. Female, 8 ,, .. ,, ,, Doshibai .. .. ,, 5 ,, .. ,, ,, Ferosha .. .. Male, 3 ,, .. ,, ,, Morio .. .. ,, 12 ,, .. ,, ,, Divjee .. .. ,, 10 ,, .. ,, ,, Luckmi .. .. Female, 50 ,, .. ,, May 1897.	Nanaboy Jewaji .. Male, 60 years. Nanaboy Jewaji was attacked on the 16th April. Had very high fever, nausea, vomiting, head and backache. Femoral bubo (right); suppression of urine. Died on the 20th April 1897.
Lower Damaun, Kathiriwas.	Byramjee Nanabhoy. Male, 48 years .. Inoculated in March and April 1897. Sorabjee Byramjee.. ,, 25 ,, .. ,, ,, Bicai .. .. Female, 40 ,, .. ,, ,, Jahangir .. .. Male, 16 ,, .. ,, ,, Ruttonbai B. .. Female, 10 ,, .. ,, ,, Femina .. .. ,, 6 ,, .. ,, ,, Dinshaw .. .. Male, 7 ,, .. ,, ,, Ruttonshaw .. ,, 3 ,, .. ,, ,,	Merbai B. .. .. Female, 20 years. Maneckbai Dinshaw ,, 60 ,, Jamsetjee Dinshaw. Male, 37 ,, Jeevanbai Dinshaw. Female, 33 ,, Merbai B. was attacked about the 18th April. Had high fever, nausea, vomiting, head and back ache. Femoral (left) bubo. Died on the 20th April.
Lower Damaun, Katheria.	Dhanjee Bhickha .. Male, 30 years .. Inoculated in March 1897. Mockun .. .. ,, 10 ,, .. ,, ,, Gopy .. .. .. ,, 7 ,, .. ,, ,,	Govan Bhickha .. Male, 20 years. Mangly .. .. Female, 40 ,, Govan Bhickha was attacked on the 10th May. Left axillary bubo. Fever and headache. Died on the 20th May. Mangly was attacked about 11th May. Had fever, head and back ache and delirium. Femoral buboes on both sides. Ill at time of investigation.

Attacks in those inoculated in March 1897, &c.—*cont.*

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Parboowad.	Jeenah Sadashiv .. .. Male, 55 years .. Inoculated in March 1897. Luckmi .. .. ,, 35 ,, .. ,, ,, Durgah .. .. Female, 30 ,, .. ,, ,, Shewkore .. .. ,, 50 ,, .. ,, ,, Gurgah Shanker .. Male, 18 ,, .. ,, ,, Divaly .. .. Female, 18 ,, .. ,, ,, Paly .. .. .. ,, 3 ,, .. ,, ,, Jaikore Kashiram was attacked 20 days after the date of inoculation in this house. Had fever, headache, delirium and femoral bubo (left). Died after four days. Manabi was attacked on the same day. Had fever, headache, nausea and vomiting. Femoral bubo (left). Died after six days.	Jaikore Kashiram .. Female, 19 years. Manabi .. .. ,, 15 ,,
Lower Damaun, Katheria.	Junjee Chamario .. .. Male, 40 years .. Inoculated in March and April 1897. Coowardy was attacked about the 18th May. Had high fever, head and backache, nausea, vomiting, severe diarrhœa and delirium. No bubo. Ill at the time of investigation.	Mangli .. .. Female, 35 years. Sodkar .. .. Male, 20 ,, Coowardy .. Female, 18 ,, Maude .. .. Male, 10 ,,
Lower Damaun, Parboowad.	Ranchorjee Aritram .. .. Male, 48 years .. Inoculated in March 1897. Nansi Wishwanath .. .. ,, 3 ,, .. ,, ,, Wishwanath Aritram was attacked on the 28th March. Recovered.	Wishwanath Aritram .. Male, 55 years.
Lower Damaun, Rua Luiz de Camoens (Rua de M. S. Vaz.)	Jose Maria St. Anna .. Male, 22 years .. Inoculated in April 1897. Chariza .. .. .. Female, 13 ,, .. ,, in March and April 1897 Maria Francisca was attacked on the 14th April. Had high fever, headache, nausea and delirium. Femoral buboes on both sides. Recovered.	Maria Francisca .. Female, 24 years.
Lower Damaun, Rua Real.	Ruttonjee Cowasjee, Male, 52 years .. Inoculated in March, April and May 1897. Sorabjee .. .. ,, 30 ,, .. ,, ,, ,, Faramroj .. .. ,, 10 ,, .. ,, ,, ,, Nasvanjee .. .. ,, 10 ,, .. ,, ,, Virbai .. .. Female, 44 ,, .. ,, ,, Doshibai .. .. ,, 28 ,, .. ,, ,, Aymai .. .. ,, 24 ,, .. ,, ,, Syrinbai R. .. ,, 21 ,, .. ,, ,, Sakerbai .. .. ,, 18 ,, .. ,, ,, Cowerbai .. .. ,, 13 ,, .. ,, ,, Banoobai .. .. ,, 6 ,, .. ,, ,, Goolbai .. .. ,, 5 ,, .. ,, ,, Fenima .. .. ,, 2¼ ,, .. ,, ,, Syrombai S. .. ,, 10 ,, .. ,, ,, Dinshaw .. .. Male, 6 ,, .. ,, ,, Aymai .. .. Female, 5 ,, .. ,, ,, Peroshaw .. .. Male, 2 ,, .. ,, ,, Syrinbai B. .. Female, 2 ,, .. ,, ,, Mahomed Cassam. Male, 25 ,, .. ,, March 1897. Roopabai .. .. Female, 30 ,, .. ,, ,, Jerbanoo S. .. ,, 4 ,, .. ,, ,, Mahomed Cassan. was attacked a month after inoculation. Had very high fever, head and back ache and delirium. Left femoral bubo. Died three days after. Roopabai was attacked on the 19th April. Had fever, head and back ache. Left femoral bubo. Recovered.	Banio .. .. Male, 70 years. Jinky .. .. Female, 60 ,, Bavio .. .. Male, 12 ,, Bavio was attacked on the 14th April. Had fever, head and back ache, nausea and vomiting. Femoral bubo on left side. Died on the 18th April.
Lower Damaun, Rua Real.	Vithal Jeevan .. .. Male .. .. Inoculated in March 1897. Vithal Jeevan was attacked on the 17th May. Bubo in the left groin. High fever, nausea and vomiting. Recovered.	Kashi .. .. Female, 22 years. Banee .. .. ,, 75 ,, Kashi was attacked about a month after the date of inoculation. Left femoral bubo; high fever. Recovered in about eight days.

Attacks in those inoculated in March 1897, &c.—*cont.*

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Parboowad.	Harnee Rungopal .. .. Female, 26 years .. Inoculated in March 1897. Dhondee .. .. ,, 10 ,, .. ,, ,, Jaideo .. .. Male, 3 ,, .. ,, ,, Sunder .. .. Female, 5 ,, .. ,, ,, Dinkore .. .. Male, 2 ,, .. ,, ,, Mardli .. .. ,, 5 ,, .. ,, ,, Mardli was attacked 12 days after the date of inoculation. Had fever, headache and femoral bubo (left). Died four days after the attack. Harnee and Dhondee were attacked eight days after the date of inoculation. Had fever and headache. The first had femoral bubo (right) and the second axillary bubo (right). Both recovered.	Govindrao .. .. Male, 36 years. Babajee .. .. ,, 50 ,, Gaobai .. .. Female, 40 ,, Govindrao was attacked 15 days after the date of inoculation of others. Had fever, headache and vomiting. Femoral bubo (right). Died. Babajee was attacked about the same date. Had fever and headache. No bubo. Died five days after the attack. Gaobai was also attacked about the same date. Had fever, head and backache. Died four days after the attack.
Lower Damaun, Kathriwad.	Pitambar Ragunah .. .. Male, 50 years .. Inoculated in March 1897. Luckmi .. .. Female, 45 ,, .. ,, ,, Arkore .. .. ,, 10 ,, .. ,, ,, Narayan .. .. Male, 5 ,, .. ,, ,, Arkore was attacked 20 days after inoculation. Had right femoral bubo which suppurated and fever. Recovered.	Somlah .. .. Male, 20 years. Manglu .. .. ,, 9 ,, Somlah and Manglu were attacked about the 25th March. Had fever, head and back ache, nausea and vomiting. Somlah had cervical bubo and died after ten days. Manglu had femoral (left) bubo. Died after four days.
Lower Damaun, Braman Falia.	Harishanker Purshotam Patack .. Male, 40 years. Inoculated on 25th March 1897. Harishanker Purshotam Patack was attacked on the 2nd April. Had high fever, severe head symptoms, nausea and vomiting. Femoral bubo in the left groin. Recovered after six days.	Nankore Devram .. Female, 37 years. Nankore Devram was attacked on the 10th April. Had high fever, head and back ache, nausea and vomiting. No bubo. Recovered after 15 days.
Lower Damaun, Rua de Macotinho.	Guella Wallob .. .. Male, 20 years .. Inoculated on 25th March 1897. Wallob Jeevan .. .. ,, 23 ,, .. ,, in April 1897. Dhanee .. .. .. Female, 18 ,, .. ,, ,, Divaly .. .. .. ,, 11 ,, .. ,, ,, Guella Wallob was attacked on the 10th April. Had very high fever. Was semi-conscious and delirious for three days. Bubo in the groin. Recovered.	Bulky Wallob .. Female, 35 years. Bulky Wallob was attacked on the 8th May. Had fever, nausea, delirium and submaxillary gland enlarged. Died eight days after.

II.—ATTACKS in those inoculated in April and May 1897, or in their relations.

Lower Damaun, Rua Quadrada. (Maneckjee Danjeebhoy Street).	Maneckjee Beekajee .. Male, 45 years .. Inoculated in March and April 1897. Bechoobai Maneckjee .. Female, 16 ,, .. ,, ,, ,, Bicajee Maneckjee .. Male, 12 ,, .. ,, ,, ,, Najambai .. .. Female, 6 ,, .. ,, ,, ,, Manecbai .. .. ,, 2 ,, .. ,, ,, ,, Jerbai Maneckjee .. ,, 35 ,, .. ,, ,, Jerbai Maneckjee was attacked one day before inoculation and died three days later.	Sonabai Doranjee .. Female, 55 years.
Lower Damaun, Rua de Carpenteiros.	Gopal Narain .. .. Male, 32 years .. Inoculated in March and April 1897. Cashi Hari .. .. Female, 30 ,, .. ,, April 1897. Cashi Hari was attacked eight days after inoculation. Had high fever, severe head symptoms, nausea and vomiting. Femoral bubo (right). Recovered.	Jamna Lalljee .. Female, 55 years. Jamna Lalljee was attacked six days after the date of inoculation in this house. Femoral bubo (right). High fever, headache, vomiting and delirium. Died six days after the attack.
Lower Damaun, Chanta.	Balkrishna Hiraji .. Male, 24 years .. Inoculated in April 1897 .. .. Bicken .. .. ,, 17 ,, .. ,, ,, Haribao .. .. ,, 11 ,, .. ,, ,, Pandurang .. .. ,, 9 ,, .. ,, ,, Atmaram .. .. ,, 6 ,, .. ,, ,, Maneck .. .. Female 13 ,, .. ,, ,, Pandurang was attacked three days after inoculation and died on the fourth day. Had bubo in the left groin. Fever, nausea and headache.	Hiraji Callanji .. Male, 42 years. Nanabhai .. .. ,, 25 ,,

Attacks in those inoculated in April and May 1897, &c.—*cont.*

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Gathiwad.	Pershotam Morby .. Male, 16 years .. Inoculated in April 1897.	Morby Luckmon .. Male, 50 years. Pemi Nanabhoy .. ,, 45 ,, Jamma Morby .. Female, 20 ,, Morby Luckmon was attacked on the 10th May and died after seven days. Had fever, headache, and pain at the back. No gland enlarged. Jamma Morby was attacked on the 16th May and died on the 20th. Had left axillary gland enlarged. Fever and headache.
Lower Damaun, Rua de Macotinha.	Rani Gopal .. .. .. Female, 16 years .. Inoculated in April 1897. Divaly .. .. .. ,, 22 ,, .. ,, March 1897. Morar Bhagwan .. .. Male .. ,, Divaly was attacked five days after the inoculation. Had femoral gland of the right side enlarged. Fever, headache, nausea and pain in the back. Recovered.	Pemi Cowasjee .. Female, 35 years. Pemi Cowasjee was attacked on the 5th April Had axillary bubo (left side) fever and headache. Recovered.
Lower Damaun, Golwad.	Ramjee Lalloo .. .. .. Male, 45 years .. Inoculated in April 1897. Ramjee Lalloo was attacked three days after inoculation. Had fever, hæmoptisis and cough. Died.	Cower .. Female, 35 years. Chunia .. Male, 3 ,, Maneck .. Female, 55 ,,
Lower Damaun, Rua de Macotinha.	Dhulob Bhicu .. .. .. Male, 25 years .. Inoculated in April 1897.	Bhicu Vittoba .. Male, 55 years. Godavrybai .. Female, 35 ,, Sonabai Hirajee . ,, 17 ,, Manky .. ,, 11 ,, Godavrybai was attacked about 12th May. Had bubo in the left groin. Very high fever, nausea, and vomiting for three days. Recovered. Sonabai Hirajee was attacked about the 15th April. Femoral bubo. High fever, nausea, headache and delirium. Recovered.
Lower Damaun, Rua Real.	Gopal Dhulob .. .. .. Male, 25 year .. Inoculated in April 1897. Rutton .. .. .. Female, 20 ,, .. ,, ,, Nandoo .. .. .. ,, 6 ,, .. ,, ,, Manky .. .. .. ,, 3 ,, .. ,, ,, Daily .. .. .. ,, 2 ,, .. ,, ,, Gopal Dhulob and Rutton were attacked 13 days after inoculation. Gopal Dhulob had very high fever with severe head symptoms. No bubo. Died four days after. Rutton had high fever. Bubo in the groin. Was taken to the plague hospital and died five days after.	Guirdhar Gopal .. Male, 5 years.
Lower Damaun, Kathiria.	Rama Dhulob .. .. .. Male, 20 years .. Inoculated in April 1897. Keshav .. .. .. ,, 5 ,, .. ,, ,, Nuthi .. .. .. Female, 35 ,, .. ,, ,,	Dajy Gonsal .. Male, 30 years. Dajy Gonsal was attacked 12 days after the date of inoculation. Had femoral bubo (right). Fever, headache, delirium and nausea. Died five days after the attack.
Lower Damaun, Rua Viscondi de Olerem (Ghatiwada).	Bhavani Dagroo .. .. .. Male, 35 years, .. Inoculated in April 1897. Sakoo Govind .. .. .. Female, 25 ,, .. ,, ,, Lucky Bawani .. .. .. ,, 6 ,, .. ,, ,, Gampoo Krishna .. .. Male, 5 ,, .. ,, ,,	Dagroo Koosajee .. Male, 60 years. Mookty Bairoo .. Female, 30 ,, Dagroo Koosajee was attacked in April 1897. Died after six days. Had axillary bubo. Mookty Bairoo was attacked in April 1897. Died after seven days. No buboes, but other symptoms of plague.

Attacks in those inoculated in April and May 1897, &c.—*cont.*

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaon, Rua Real.	Guirdhar Gopal .. .. Male, 50 years .. Inoculated in April 1897. Motia, G. .. .. .. ,, 40 ,, .. ,, ,, Jugea .. .. .. ,, 10 ,, .. ,, ,, Bhicklu .. .. .. ,, 8 ,, .. ,, ,, Guirdhar Gopal was attacked 15 days after inoculation. Had fever, head and back ache. Femoral bubo (right). Died five days later. Motia, G., was attacked eight days after inoculation. Had fever and headache, but no bubo. Died three days later. Jugea was attacked ten days after inoculation. Had fever and headache. Femoral bubo (left) which was cauterized. Recovered.	Gungaoh .. Female, 30 years.
Lower Damaun, Kathiria.	Wallob Fakir .. .. Male, 40 years .. Inoculated in April and May 1897. Ditia .. .. .. ,, 15 ,, .. ,, ,, ,, Cower .. .. .. Female, 15 ,, .. ,, ,, ,, Jeevie .. .. .. ,, 12 ,, .. ,, ,, ,, Canjee .. .. .. Male, 7 ,, .. ,, ,, ,, Dhanu was attacked eight days after the date of inoculation in this house. Had femoral bubo (right). High fever, headache and delirium. Died after 15 days.	Dhanu .. Female, 35 years.
Lower Damaun, Rua de Macotinha (Causerwad), House No. 55.	Govan Ranchore .. Male, 30 years .. Inoculated on 21st April and 22nd May 1897. Guirdhar Govin .. ,, 5 ,, .. ,, 21st ,, 21st Jamna Hirajee was attacked on the 29th April 1897. Temperature at the onset 104·6°. Bubo in the left groin. Died on the 4th May 1897.	Jamna Hirajee .. Female, 55 years.
Lower Damaun, Rua Real.	Hurgovan Dhulob .. ..Male, 40 years .. Inoculated in April 1897. Hurgovan Dhulob was attacked 15 days after inoculation. Had fever, headache and femoral bubo. Died five days after.	Gungey .. .. Female, 30 years.
Lower Damaun, Kathiria.	Ruttonjee Vital .. .. Male, 25 years .. Inoculated on 21st April 1897. Runchore .. .. .. ,, 16 ,, .. ,, ,, Jamna .. .. .. Female, 5 ,, .. ,, ,, Peni .. .. .. ,, 11 ,, .. ,, ,, Valy .. .. .. ,, 11 ,, .. ,, ,, Govan Chaba .. .. .. ,, 50 ,, .. ,, ,, Runchore Vital was attached on the 1st May. Axillary buboes both sides. High fever, head and back ache. Recovered.	Callan Rewah .. Male, 18 years. Bhicki .. .. Female, 35 ,, Pemah Chaba .. Male, 45 ,, Callan Rewah was attacked about the 6th May. Had very high fever, delirium, head and back ache, nausea and vomiting No bubo. Recovered seven days after. Pemah Chaba was attacked on the 22nd April. Had high fever, nausea and vomiting, head and back ache. No bubo. Died on the 25th April.
Lower Damaun, Rua Real.	Bickla Cullan .. .. Male, 25 years .. Inoculated in April 1897 .. Daily .. .. .. Female, 20 ,, .. ,, ,, Gopal .. .. .. Male, 4 ,, .. ,, ,, Luckmi .. .. .. Female, 2 ,, .. ,, ,, Bickla Cullan was attacked nine days after inoculation. Had high fever, delirium, head and back ache. Right femoral bubo which was cauterized. Recovered ten days after.	Dajee .. .. Male, 19 years.
Lower Damaun, Rua Real.	Chabu Bagwan .. .. Male, 56 years .. Inoculated in April 1897. Vally Wallob .. .. Female, 22 ,, .. ,, ,, Ambi Vammally .. .. ,, 4 ,, .. ,, ,, Bhickli .. .. .. ,, 45 ,, .. ,, ,, Chabu Bagwan was attacked 15 days after inoculation. Had fever, head and back ache. Femoral bubo (right) which suppurated. Recovered. Bhickli was attacked ten days after inoculation. Had high fever. No bubo. Died three days after.	
Lower Damaun, Braman Falia, House No. 26 (South line).	Bai Parwati Baishanker ..Female, 20 years ..Inoculated on 23rd March 1897. Hoomabai Ramshanker .. ,, 7 ,, .. ,, on 24th April 1897. Girjashanker Pranshanker ..Male, 3 ,, .. ,, ,, ,, Itchabai Harishanker was attacked on the 30th April 1897. Bubo in the left axilla. High fever, temperature 105·3° F.; delirious and unconscious for three days. Recovered by the 12th May 1897. At the time of investigation still under treatment for general debility.	Itchabai Harishanker. Female, 20 years.

Attacks in those inoculated in April and May 1897, &c.—*cont.*

Full Address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Kathiria.	Rajab Burh .. .. .. Male, 40 years .. Inoculated in April 1897. Sookly .. .. .. Female, 30 ,, .. ,, ,, Dherio .. .. .. Male, 7 ,, .. ,, ,, Dherio was attacked 15 days after the date of inoculation. Had femoral bubo (left). Fever, head and back ache and nausea. Died three days after the attack.	
Lower Damaun, Rua Real (Kathiria).	Ruttonjee Oamally .. Male, 30 years .. Inoculated in March and May 1897. Luckmon .. .. .. ,, 16 ,, .. ,, April 1897. Rami .. .. Female, 25 ,, .. ,, ,, and May 1897. Parwati .. .. .. ,, 10 ,, .. ,, ,, Mulchand .. .. Male, 4 ,, .. ,, April 1897. Amba .. .. Female, 25 ,, .. ,, ,,	Bhulio Dhulob .. Female, 60 years. Bhulis Dhulob was attacked on the 13th May. Femoral bubo which was cauterized. Fever, headache, nausea and vomiting. Recovered.
....	Keshao Hirajee .. .. Male, 40 years .. Inoculated in April 1897. Morar .. .. .. ,, 45 ,, .. ,, ,, Bajwan .. .. .. ,, 18 ,, .. ,, ,, Dalia .. .. .. ,, 6 ,, .. ,, ,, and May 1897. Bhicky .. .. .. ,, 8 ,, .. ,, ,, Keshao Hirajee was attacked nine days after inoculation, Had high fever, head and back ache, nausea and vomiting. Femoral bubo (right side) suppurated. Recovered. Dalia was attacked 11 days after inoculation. Had fever, headache, nausea and vomiting. Cervical gland enlarged. Recovered.	Amba Jeewan .. Female, 16 years.
Lower Damaun, Kathiria.	Sucky Buna .. Female, 26 years .. Inoculated in April 1897. Lalla .. .. Male, 6 ,, .. ,, ,, Govan .. .. ,, 10 ,, .. ,, ,, Pemah .. .. ,, 4 ,, .. ,, ,, Sucky Buna was attacked 12 days after the inoculation. Had fever, head and back ache. Femoral bubo (left). Recovered. Govan was attacked eight days after inoculation. Had high fever and headache. Cervical buboes (left). Died three days after. Pemah was attacked nine days after inoculation. Had fever, headache and axillary bubo. Died three days after.	
Lower Damaun, Kathiria.	Govan Bicary .. Male, 38 years .. Inoculated in April 1897. Luckmi .. Female, 60 ,, .. ,, ,, Daily .. .. ,, 40 ,, .. ,, ,, Chipky .. .. ,, 8 ,, .. ,, ,, Luckmi was attacked 17 days after the date of inoculation. Fever and other symptoms mild. Femoral bubo (right) which was cauterized. Recovered. Daily was attacked 12 days after inoculation. Femoral bubo. High fever, headache, delirium and vomiting. Died three days after the attack.	
Lower Damaun, Kathiria.	Narain Kalibul .. Male, 48 years .. Inoculated in April 1897. .. .. Divly .. .. Female, 2 ,, .. ,, ,, Divly was attacked 16 days after inoculation. Cervical bubo, vomiting and convulsion. Recovered after 15 days.	Dhanby Sookly .. Female, 26 years. Dhanby Sookly was attacked 20 days after the date of inoculation. Had very high fever, delirium, head and back ache. Aborted after six days. Moribund when seen at the time of investigation.
....	Gopal Fakir .. Male, 40 years .. Inoculated in April 1897. Rami .. .. Female, 35 ,, .. ,, ,, Harjeevan .. Male, 9 ,, .. ,, ,, Naran Bagwan .. ,, 12 ,, .. ,, ,, Gopal Fakir and Rami were attacked a month after inoculation. Had fever, headache and vomiting. Gopal Fakir had axillary bubo and Rami femoral (left) bubo, both were cauterized. Recovered. Naran Bagwan was attacked nine days after inoculation. Had fever and headache. Femoral bubo, which was cauterized. Died after four days.	

Attacks in those inoculated in April and May 1897, &c.—*cont.*

Full Address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Rua Real.	Sucky Cullan .. Female, 50 years .. Inoculated in April 1897. .. .. Lucmon .. Male, 16 ,, .. ,, ,, Sucky was attacked on the 15th May. Femoral bubo (right side). High fever, nausea and vomiting. Recovered.	Sacoo Dajee .. Male, 75 years.
Lower Damaun, Rua Real.	Rahim Shamgee .. Male, 40 years .. Inoculated on 18th April 1897. Sonabai .. Female, 30 ,, .. ,, ,, Alli .. .. Male, 14 ,, .. ,, ,, Banjia Manglu .. .. ,, March 1897. Rahim Shamgee was attacked three days after inoculation. Had high fever, head and back ache. Femoral bubo (right side), which appeared six days after inoculation. Recovered. Alli was attacked 20 days after inoculation. Slight fever. Other symptoms also mild. Bubo in the left groin. Recovered.	
Lower Damaun, Rua de Fabrica.	Lewis de Silva .. Male, 45 years .. Inoculated on 7th April 1897. Maria Theresa .. Female, 33 ,, .. ,, ,, Patrocinia .. ,, 14 ,, .. ,, ,, Carolina .. ,, 10 ,, .. ,, March and April 1897. Anna .. .. ,, 7 ,, .. ,, ,, Francis .. .. Male, 2 ,, .. ,, ,, Patrocinia was attacked on 14th May. Had femoral bubo (right). High fever, head and back ache and nausea. Recovered.	
Lower Damaun, Rua Real.	Chuba Dallah .. Male, 32 years .. Inoculated in April 1897. Bhicky Wallab .. Female, 30 ,, .. ,, ,, Luckmi .. ,, 10 ,, .. ,, ,, Callam .. .. Male, 3 ,, .. ,, ,, Chuba Dallah was attacked 20 days after inoculation. Had femoral bubo in the left side. Recovered.	
Lower Damaun, Rua Real.	Hirajee Bhula .. Male, 39 years .. Inoculated on 21st April and May 1897. Nandi .. .. Female, 30 ,, .. ,, in April 1897. Awanjee .. Male, 62 ,, .. ,, on 21st April and May 1897. Morar .. .. ,, 8 ,, .. ,, ,, ,, Bhicky, W. .. ,, 55 ,, .. ,, in April 1897. Bhicky, W., was attacked twelve days after inoculation. Had fever, head and back ache. Femoral bubo (right). Recovered.	Bhicky, D. .. .. Female, 72 years.
Lower Damaun, Marwar.	Dheda Gopal Khalpa .. Male, 45 years .. .. Died of plague.	Shanti, wife of Gopal. Female, 40 years. Mangals Gopal .. Male, 24 ,, Somo Gopal .. ,, 20 ,, Ravi Gopal .. ,, 15 ,, Shami Gopal .. ,, 4 ,, Withal Gopal .. ,, 6 moths.
Lower Damaun, Forti.	Gopal Bhicara .. Male, 9 years .. Inoculated on 23rd May 1897. .. Gopal Bhicara was attacked on the date of inoculation. Fever gradually increased and was accompanied by nausea, vomiting and severe head symptoms. Bubo. Died four days after the date of inoculation.	Bhika Lackma .. Male, 40 years. Ratti Dhajee .. Female, 30 ,, Jamna Bhika .. ,, 4 ,, Bhika Lackma was attacked on the 26th May. Had very high fever, severe head and back ache and nausea. Right femoral bubo. Died seven days after the attack.

III.—ATTACKS in those inoculated with reduced doses of prophylactic; or in their relations.

Lower Damaun, Lane opposite Fish Market.	Maria Angelica dos Remedios..Female, 10 years .. Inoculated on 5th April 1897. Maria Angelica was attacked 10 days after inoculation. Had high fever, headache and delirium. Right axillary bubo. Died three days after.	Jotto dos Remedios.. Male, 30 years. Alchina .. .. Female, 26 ,, Candinha .. .. ,, 5 ,, Jono .. .. Male, 1 year.

Attacks in those inoculated with reduced doses of prophylactic, &c.—*cont.*

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Parboowad.	Mackan Jeevan .. Male, 55 years .. Inoculated on 6th April 1897 .. Withal .. .. ,, 9 ,, .. ,, ,, Withal was attacked 15 days after inoculation. Had axillary and cervical buboes. High fever. Died five days after.	Harki Jeevan .. Female, 15 years. Pemly Jeevan .. ,, 35 ,,
Lower Damaun, Rua dos Carniceiros.	Candenho Lopes .. Male, 20 years .. Inoculated on 25th April 1897 .. Daniel Pestana .. ,, 13 ,, .. ,, ,, Jesmina Lopes was attacked on the 18th May. Had high fever, head and back ache, nausea and vomiting and delirium. Axillary bubo (right). Died on the 24th May.	Raza Maria Lopes .. Female, 22 years. Jesmina Lopes .. ,, 40 ,, Justiniano .. .. Male, 6 ,, Monte .. .. ,, 5 ,,
Lower Damaun, Rua do Carpenteirous.	Narayan Bagwan .. Male, 40 years .. Inoculated on 7th April 1897. Kassan Narayan .. ,, 25 ,, .. ,, 6th ,, Ambah .. .. .. ,, 7th ,, Narayan Bagwan was attacked 15 days after inoculation. Had fever and delirium. No bubo. Died five days after the attack.	
Lower Damaun, Rua de Macotinha.	Bhicka Mackan .. Male, 24 years .. Inoculated on 6th April 1897 .. Bhicka Mackan was attacked 15 days after inoculation. Had fever, headache and vomiting. Bubo in the left groin. Recovered.	Mackan Lalla .. Male, 69 years. Luxmi .. .. Female, 2 ,,
Lower Damaun, Rua dos Carpenteiros.	Dyab Genah .. .. Male, 18 years .. Inoculated on 5th May 1897. Ranchore, B. .. .. ,, 40 ,, .. ,, March 1897. Rami .. .. .. ,, 15 ,, .. ,, ,, Dyab Genah was attacked on the 6th May. Had high fever (temperature 107°), severe head symptoms. Femoral bubo (left). Died on the 11th May 1897.	
Lower Damaun, Forte de S. Jeronimo.	Rev. Fr. Punenta .. Male, 47 years .. Inoculated on 6th April 1897. Bicuria Incharia .. ,, 60 ,, .. ,, 5th ,, Bicuria Incharia was attacked 20 days after inoculation. Had fever, head and back ache. Died on the 6th May.	
Lower Damaun, Rua Maneckjee Sorabjee.	Jeewan Pemah .. Male, 50 years .. Inoculated on 25th March and 8th April 1897. Bhiky Pershotam .. Female, 29 ,, .. Inoculated on 6th April 1897. Cassam Jeevan .. Male, 18 ,, .. ,, 25th March and 2nd April 1897. Pali Bhika .. .. Female, 4 ,, .. ,, 6th April 1897. Cashi Jeewan .. .. ,, 9 ,, .. ,, 25th March and 2nd April 1897. Collan Jeevan .. .. Male, 7 ,, .. ,, Bhiky Pershotam was attacked on the 25th April. Fever (temperature 103°) and slight headache. Had buboes in the right groin and two about the right side of the right mammary gland. Recovered completely on the 7th May 1897. Pali Bhika was also attacked on the 25th April. Fever temperature 104°. Bubo in the right groin with other symptoms which were mild. Recovered completely on the 5th May 1897.	
Lower Damaun, Rua de Caldereiros.	Withal Hary .. .. Male, 60 years .. Inoculated on 5th April 1897. Daya Naran .. .. Female, 45 ,, .. ,, ,, Withal Hary was attacked on the 29th April. Fever, headache and delirium. Bubo inguinal and axillary. Died three days after.	
Lower Damaun, Rua Angelica, Fish Market.	Camillo do Remedios Male, 37 years .. Inoculated on 23rd April 1897. Humiliano .. .. Female, 27 ,, .. ,, ,, Francis .. .. Male, 10 ,, .. ,, ,, Ludovina .. .. Female, 7 ,, .. ,, ,, Maria Eugenia .. .. ,, 5 ,, .. ,, ,, Vithal .. .. Male, 1½ ,, .. ,, ,, Bicaida .. .. ,, 15 ,, .. ,, ,, Francis was attacked on 5th May. Had fever, convulsion and femoral bubo (right). Died three days after the attack.	

Attacks in those inoculated with reduced doses of prophylactic, &c.—*cont.*

Full Address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if he is amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Rua dos Carniceiros.	Bibiana Falleiro .. .. Female, 43 years .. Inoculated on 25th April 1897. Theodoro .. .. .. Male, 25 ,, .. ,, ,, Helena .. .. .. Female, 30 ,, .. ,, ,, Ermelinda .. .. .. ,, 18 ,, .. ,, ,, Eliza .. .. ,, 10 ,, .. ,, ,, Athala .. .. ,, 4 ,, .. ,, ,, Maria Augusta .. .. ,, 8 ,, .. ,, ,, Francis .. .. Male, 2 ,, .. ,, ,, Helena was attacked on the 12th May. Had high fever, nausea and vomiting, head and backache. Femoral bubo on the right side. Died on the 15th May 1897.	Albino C. Falleiro.
Lower Damaun, Rua de Caldereiros.	Leopoldina Fernandes .. Female, 45 years .. Inoculated on 6th April 1897. Agostinho .. .. .. Male, 24 ,, .. ,, ,, Joaquim .. .. .. ,, 30 ,, .. ,, 25th ,, Nicolas .. .. .. ,, 1½ ,, .. ,, 2nd May 1897. Leopoldina Fernandes was attacked 15 days after inoculation. Had fever, nausea and delirium. Bubo in the right groin, suppurated. Recovered. Nicolas was attacked 29 days after inoculation. Had slight fever and nausea. Bubo in the left groin. Recovered.	Valentino Fernandes .. Male, 66 years. Estaphania .. .. Female, 20 ,, Valentino Fernandes was attacked on 12th April. Had all the symptoms of plague. Bubo left groin. Died on 23rd April 1897. Estaphania was attacked on 5th April. Had fever and headache. Aborted on the 18th April. Bubo in the left groin which suppurated and healed. Recovered.
Lower Damaun, Brahman Falia.	Baichand Virchand .. .. Male, 30 years .. Inoculated on 2nd May 1897. Melabchand .. .. .. ,, 22 ,, .. ,, ,, Dyakore Chunibai .. .. Female, 20 ,, .. ,, in March 1897. Mahanial Bhaichand .. .. Male, 2 ,, .. ,, ,, Baichand Virchand was attacked on the day of inoculation and died three days after. Had fever and enlarged glands in cervical region and in the groin of left side.	Virchand Nemchand .. Male, 60 years.
Lower Damaun, Kathiria.	Bena Narron .. .. Female, 13 years .. Inoculated on 28th April 1897. Bena Narron died of plague at the end of May 1897.	Debro Dhohirjan .. .. 12 years. Motis Radis .. .. .. 35 ,, Narron Debro .. .. 50 ,, Bajrodi Narron Debro .. 45 ,, Kali Narron Debro .. .. 22 ,, Moti Kolakhmis .. .. 35 ,,
Lower Damaun, Rua dos Caldereiros.	Diamantina Fernandes. Female, 60 years .. Inoculated on 5th April 1897. Dayana M. Fernandes. ,, 18 ,, ,, on 5th ,, Theodorico .. .. Male, 25 ,, ,, on 5th ,, Diamantina Fernandes was attacked on the 20th May. Had fever, headache and nausea. Femoral (right) gland enlarged. Recovered.	Aniceto do Rozario, Male, 30 years. Maria Luiza .. Female, 28 ,, Antonio .. Male, 5 ,, Aniceto do Rozario was attacked on the 30th April. Had high fever, head and backache. Femoral (left) bubo. Died on the 1st May. Maria Luiza was attacked about the 15th April. Fever, headache and nausea. Left femoral bubo. Recovered.
Lower Damaun, Rua dos Carpenteiros.	Naran Pemah .. .. Male, 18 years .. Inoculated on 5th April 1897. Naran Pemah was attacked on the 16th May. Had very high fever, nausea and severe head symptoms with delirium. Femoral bubo left side. Died on the 23rd May 1897.	Jamna .. .. .. Female 50 Maly .. .. .. ,, 16 Jamna was attacked about a month after the date of inoculation in this house. Had fever, but no bubo. Died five days after the attack.
Lower Damaun, Rua Real.	Jose St. Anna .. .. Male, 33 years .. Inoculated on 5th April 1897. Balbina Sta Anna .. Female, 35 ,, .. ,, on 2nd May ,, Verissuno .. .. Male, 9 ,, .. ,, in March ,, Nicolao .. .. ,, 6 ,, .. ,, on 2nd May ,, Jose Carimo .. .. ,, 3 ,, .. ,, in April ,, Jose St. Anna was attacked about the 15th April. Had high fever, head and backache. Femoral bubo, which was cauterized. Recovered.	Annanha Fernandes. Female, 25 years. Annanha Fernandes was attacked on the 26th March. Had very high fever, delirium, head and backache. Aborted on the 30th March and died on the 1st April.

Attacks in those inoculated with reduced doses of prophylactic, &c.—*cont.*

Full Address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Near Market.	Eufrazia do Rozario .. Female, 14 years .. Inoculated on 25th April 1897. Eufrazia do Rozario was attacked five days after the date of inoculation. Had high fever with severe head symptoms. Femoral bubo (right). Died on the 3rd May.	Alxendrina do Rozario .. Female, 45 years. Adelina Pereira .. Female, 30 years. Alxendrina do Rozario was attacked on the 15th April. Had very high fever, nausea, vomiting and severe head symptoms. Cervical buboes on left side. Died on the 26th April. Adelina Pereira was attacked on the 23rd April. Had high fever and head and backache; delirium. Was in an unconscious state for eight days. Femoral bubo (right). Died on the 8th May.
Lower Damaun, Rua Real.	Bagwan Naran .. Male, 33 years .. Inoculated in March and on 5th April 1897. Amba .. .. .. Female, 33 ,, .. Inoculated on 5th April 1897. Suckuri .. .. .. ,, 6 ,, .. ,, in March and May 1897. Mithi .. .. .. ,, 6 ,, .. ,, ,, in April and May 1897. Deobai .. .. .. ,, 3 ,, .. ,, on 6th April 1897. Maneck .. .. ,, 8 ,, .. ,, in March and May 1897. Persotam .. .. Male, 9 ,, .. ,, ,, Maneck was attacked about a month after inoculation. Had very high fever with axillary and femoral buboes, which were cauterized. Died on the 19th May 1897.	Jamna .. .. Female, 15 years. Jamna was attacked about the 24th April. Had fever, nausea and vomiting. Femoral bubo (left). Died on the 1st May 1897.

~~Particulars of Household where Inoculations had been applied and Plague occurred afterwards.~~

IV.—Reported attacks in inoculated which took place after conclusion of investigation and have not been included in the analysis.

Full Address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*: date of onset of disease, symptoms, issue.	Names, sexes and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaun, Moda (Rua de Faquir Cassom.)	Caetano Machado .. Male, 40 years .. Inoculated on 25th April 1897. Eugenia Machado .. Female, 13 ,, .. ,, on 25th ,, Joao Baptista .. Male, 15 ,, .. ,, on 25th ,, Theodomiro .. .. ,, 10 ,, .. ,, on 25th ,, Narcizo .. .. Female, 8 ,, .. ,, on 25th ,, Verediana .. .. ,, 85 ,, .. ,, on 28th ,, Sophia .. .. Male, 8 months. ,, on 28th ,, Jayme .. .. ,, 8 ,, .. ,, on 28th ,, Francisco .. .. Female, 55 years .. ,, on 28th ,, Flaviana .. .. ,, 28 ,, .. ,, on 25th ,, Maria Francisca .. Male, 37 ,, .. ,, on 25th ,, Vicente .. .. ,, 4 ,, .. ,, on 1st May 1897. Agestinho .. .. ,, Eugenia Machado was attacked on the 30th May. Had high fever, nausea, vomiting and severe head symptoms. No bubo. Died on the 1st June 1897.	

ORDER—No. 2621 M., dated 26th November 1897.

Recorded.

(True Extract.)

Ag. Secretary to Government.

To all Collectors.
" all Presidents of District Boards.
" the President, Municipal Commission, Madras.
" all Chairmen of Municipal Councils.
" the Surgeon-General.
" Sanitary Commissioner.
" the Public Works Department (Railway Branch).
" the Marine Department.
Editors' Table.

Exd. Shaik Kareem.

Local & Munl. (1897) Department.

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SUBJECT.

Forwarding for information copy of joint report on the Epidemic of plague in Lower Damaun (Portuguese India) and on the effect of preventive inoculation there by himself and by Surgeon-Major Lyons, I.M.S.

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BACK PAPERS.

G.O.	No.	Department.	Date.

FURTHER PAPERS.

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E

26-11-97

CHIEF SECRETARY
28 NOV. 1897
GOVERNMENT OF MADRAS

4081 M

From

Mons. W. M. Haffkine, C.I.E.,

To The Chief Secretary to the Government of Madras

Hardwar, the 17th November 1897

Sir,

By order of the Government of India, I have the honour to forward, for the information of the Government of Madras, the adjoined report, by Surgeon-Major Lyons and myself, on the epidemic of plague in Lower Damaon and on the effect of preventive inoculation there.

I have the honour to be,

Sir,

Your most obedient Servant

W. M. Haffkine

Date

First copy sent to Press. 26-11-97

28

Joint Report on the Epidemic of Plague in Lower Damaun, Portuguese India, and on the effect of Preventive Inoculation there.

BY

MONS. W. M. HAFFKINE

AND

SURGEON-MAJOR LYONS, I.M.S., *President,*

Government Committee for Investigation of the Bubonic Plague in Bombay.

The plague prophylactic referred to in the present report has been described by Mons. W. M. Haffkine in the "British Medical Journal," May 1897, and in the "Indian Medical Gazette," June 1897.

The facts reported here have been collected by Professors Koch and Gaffky, the heads of the German Scientific Mission to Bombay, and Monsieur Haffkine, on a visit to Damaun on the 20th and 21st May last; at the end of the same month a house-to-house visitation at Damaun was undertaken and carried out, at Monsieur Haffkine's request, by Surgeon-Major Lyons, President of the Bubonic Plague Research Committee, in order to complete, by exact details, the information gathered on the first visit.

At the German Scientists and Monsieur Haffkine's inquiry at Damaun, their informants were:

His Excellency Col. J. P. KUCHENBUCK VILLAR, Governor of Damaun;

Mr. JUDGE, Assistant Collector, Salt and Revenue Department, in charge of the Preventive Police and the Plague operations on the Damaun Frontier;

Shet SORABJEE MANOCKJEE DAMAUNWALLA, head of the Parsee community, assisted by his Secretary;

Dr. VIRGILIO POIARES, Physician in charge of the Plague Hospital;

Dr. PROENÇA, Health Officer;

Dr. PINTO, in charge of the Plague Operations in Damaun Town; and

Dr. DA CUNHA, L.R.C.P. (Edinburgh),
Dr. MONIZ, L.M.S., and
Dr. FERNANDEZ,
} Medical Practitioners of Damaun.

The Medical Officers abovementioned were assembled, on the 20th May 1897, by H. E. the Governor, who was also present, and to whom we are indebted for affording every facility for making the enquiry complete. The general information given below, in the preliminary part of this report, was reported at this meeting and was supplemented by documents from the respective offices.

The history of the Damaun epidemic appe to be as follows:—

The town of Damaun is divided b a river into two parts: Lower Damaun, the largest business part of the town; and the Fort, or Upper Damaun, where the Government house and the Government offices are situated

The plague attacked almost exclusively three of the villages which make part of Lower Damaun, namely, Lower Damaun proper, having, in ordinary times, a population of 5,000 inhabitants; Katheria, the property of Shet Sorabjee Damaunwalla, with a population of 4,700; and Khadiwadi, with a population of 1,200. This part of the town was in active business communication with the Bombay Presidency, and is densely populated, the inhabitants living in small houses crowded together. The Fort was cut off by a cordon from Lower Damaun as soon as the epidemic began to increase in proportion, and had only some ½ dozen imported cases.

The first attacks came to notice in February last, and occurred amongst new arrivals from Bulsar, a neighbouring town which was badly affected at the time, and amongst sailors from Kurrachee arriving at Damaun by sea, in native crafts. Before the end of the same month local cases began to appear among the fishermen, who have their *busti* close to the river, where crafts are moored, behind the Damaun Municipal School. In the last days of the month a hurried exodus of people began from Lower Damaun, increasing daily as the epidemic gained in intensity, until, on the 23rd of March, the Governor placed a cordon along the river, and stopped communication between the Lower and Upper parts of the town; while a week later, on the 30th March, the Bombay Government, on their part, closed British territory to the inhabitants of Damaun. By this time, it was estimated, over 2,000 people had quitted the place.

The worst period of the epidemic corresponded to the month following the closing of the Damaun frontiers. The climax was reached in the middle of April, when the daily number of deaths remained stationary for about 8 days and then began to decline. The largest number of deaths which occurred in one day was 80.

Up to the 25th of April the daily mortality, which was closely watched by the Parsee community who kept peons on the burial and burning grounds, was recorded officially from the information given by the inhabitants coming to the Registration Office to declare cases of deaths in their families. On the 25th April, the Governor placed a guard of his own on the burial and burning grounds, and on that day, though the number of deaths reported by the inhabitants was 11, the number of bodies disposed of in the presence of the guard was 34. From the above date the Governor's guard was kept permanently on the grounds, and the official information became complete. The following is the number of bodies registered by this means from the 25th April up to the date of investigation :—

25th April 1897			
26th	"	...	34
27th	"	...	31
28th	"	...	21
29th	"	...	49
30th	"	...	41
1st May 1897			
2nd	"	...	58
3rd	"	...	41
4th	"	...	22
5th	"	...	29
6th	"	...	47
7th	"	...	33
8th	"	...	31
9th	"	...	31
10th	"	...	33
11th	"	...	18
12th	"	...	24
13th	"	...	27
14th	"	...	15
15th	"	...	13
16th	"	...	17
17th	"	...	13
18th	"	...	20
19th	"	...	6
			8
			13
25 days.			675 deaths

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3B

Thus, during the 25 days preceding our visit, *i.e.*, between the 25th April and 19th May 1897, at a time when the population was considerably thinned by desertion and death, and when the mortality had dropped to 8 and 6 a day, the total number of bodies disposed of was 675, giving an average *of* 25 *deaths a day*. His Excellency the Governor and the medical gentlemen present at the meeting stated that they would be well within the real figure if they estimated the number of deaths which occurred in the fully populated town, in the first period and during the height of the epidemic, *i.e.* up to the time of placing the guard, at an average *of* 30 *a day*, counting from the 1st March and neglecting the mortality before that date. This estimate gives a total of 2,325 deaths as having occurred in Damaun from the beginning of the epidemic up to the time of the Scientific Committee's visit. Of this number, 2,093 deaths were afterwards authenticated in the particular families where they had taken place, during a house-to house enquiry instituted by Shet Sorabjee Damaunwalla, the owner of Katheria.*

As the immunity of the inoculated in Damaun will be estimated from a comparison with the mortality in the uninoculated population, it is essential, in order to avoid the possibility of exaggerating the power of inoculation, to take for guidance the lowest figure admissible as representing the real death rate in the place. In the following calculations, therefore, the number of deaths from plague which occurred in Damaun from the commencement of the epidemic up to the visit of the Scientific Committee is accepted as 2,093, which is the number authenticated by an enquiry in each of the affected families. This figure gives an average daily mortality from the commencement of the epidemic up to the time of placing guards on the burial and burning grounds, as being close upon 26 deaths a day. From the 21st of May up to the end of the same month, that is to say up to the date when Surgeon-Major Lyons concluded the additional inquiry, of which the details are given below, there occurred 96 deaths more, giving a total of 2,189 deaths from plague which took place in Damaun during the period under observation.

In this number of deaths there were 24 in those inoculated, personally observed by the Medical Officers of the place; *plus* a small number of others of

* The number of deaths from plague which took place during the *whole* epidemic up to the end of July, and a record of which could be obtained by an enquiry in the households, was 2,352 and was distributed amongst the different castes inhabiting Damaun as follows :—

Parsees	6	Tailors	48
Brahmins	26	Ghatis	21
Parbhus	4	Potters	16
Shrawaks	11	Portuguese	34
Banias	23	Bhandarees	22
Lohanas	4	Bhayas	5
Gujrathi Goldsmiths	15	Bhateli	1
Daxini Goldsmiths	80	Dhobies	16
Hindoo Barbers	27	Mochis	23
Khatris	87	Kolis	19
Coppersmiths	11	Borahs	5
Machis	600	Khojas	4
Carpenters	104	Lohars	13
Mussalmans	440	Mangelas	7
Golas	106	Hindoo Low Castes	351
Chhipas	23	Caste unknown	200
		Total	2,352

which they knew, but which they had not seen personally. 15 deaths of the 24 were reported by Dr. Moniz, who was said to have treated the largest number of plague patients in the place ; 4 by Dr. Poiares, who also saw 4 other cases which recovered ; 3 cases by Dr. Proença, all of whom recovered (these had been seen also by Dr. DaCunha) ; 3 deaths were known to Dr. DaCunha, and 2 to Dr. Pinto (in addition to one mentioned by Dr. Moniz which Dr. Pinto had seen with him).

Considering the small extent of the town, the limited number of inhabitants, and the number of Medical Officers who were looking after the place, it appeared probable that not many attacks among the inoculated escaped their notice, as such attacks usually excite much comment amongst the inhabitants and attract general attention. Indeed, the gentlemen present at the meeting seemed to know between them every place in the town where inoculated people lived, and every house which had suffered from plague or happened to have escaped. As has been mentioned already, they stated at the time that there was a small number of inoculated attacked whom they did not see, but of whom, they informed us, a record existed in the office of Shet Sorabjee Damaunwalla, where, during the plague, a dispensary was opened for distributing gratuitous medicines to the affected population.

It was on the initiative of that Parsee gentleman that the inoculations were introduced. He had a personal knowledge of the people who were inoculated, and kept a watch over the effect of the operation, collecting, with the help of his office establishment, a large number of details in this connection.

From his information it appeared that the total number of deaths amongst the inoculated was under 40, each of the cases being known to him ; that amongst those inoculated in a first series of inoculation, done in March last, a smaller proportion got affected and died than amongst those done a month later ; and that in a series of inoculations carried out by the Physician in charge of the Damaun Plague Hospital, with lymph supplied from our Bombay Laboratory, the number of attacks was larger than amongst those inoculated by Dr. Kalapesi, Dr. Haffkine's assistant, sent from the Laboratory. These details were found afterwards, in the course of the close investigation carried out by us, to be scrupulously correct.

Mr. Sorabjee had also a guard of his own kept on the burial and burning grounds, watching the course of the mortality, and his information concurred with the statements recorded above. The number of people inoculated up to the time of the Scientific Committee's visit was 1,645 ; over four times that number remained uninoculated. The latter had lost from plague close upon one-third of their number, and, he considered, there could be no doubt that the inoculated exhibited a most striking degree of immunity.

The effects of inoculation were closely watched by the inhabitants, as will be seen from the following observations which they brought to our notice.

There were altogether 306 Parsees in Lower Damaun, including males, females and children. Of these, 276 were inoculated twice, and one once, all the

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48.

particulars being given in our inoculation register. The names and particulars of the 29 who remained uninoculated were supplied to us on the spot. The attacks and casualties from plague which occurred in the two groups after the introduction of inoculation are given below.* No deaths from any other cause occurred in the community from the beginning of the epidemic.

Occurrences of plague amongst the 277 inoculated Parsees.

(1) Jerbai, wife of Manekji Bacha, age 35, belonging to a well-to-do family ; was five months pregnant ; inoculated once on 17th April 1897, in the right arm. For about 24 hours before, she had fever and pain in the groin, but this was not known at the time of inoculation. Developed characteristic plague in the evening of the day of inoculation, had an abortion on 20th morning, died same day.

(2) Seven other Parsees inoculated were attacked, respectively, three days, one week, twelve days, a fortnight, one month, one month and five weeks after inoculation, but all these recovered.

Occurrences of plague amongst the 29 un-inoculated Parsees.

(1) Nanabhai Jivajee, male, age 60, belonging to a well-to-do family where all the other members (14 in number), except himself, were inoculated. Attacked on 16th April 1897 ; bubo in left groin ; died on 20th.

(2) Merbai, daughter of Bairamjee, age 20 years, of a well-to-do family, where eight members were inoculated and four, including Merbai, were not inoculated ; attacked about same time as Nanabhai Jivajee ; bubo in right groin ; died on 20th April.

(3) Ratanbai Ratanjee, female, age 35, of a well-to-do family ; attacked and died in the first days of May 1897, having had fever and a bubo.

(4) An old woman, Avabai, widow of Rustomjee, age about 75 years, of a well-to-do family where fourteen others were inoculated, Avabai, and Gulbai, her daughter-in-law, being the only uninoculated. Avabai got attacked on 11th May, developed bubo two days later, died on the 13th.

Thus in the 29 un-inoculated Parsees there were 4 deaths from plague, or a mortality of 13·8 per cent., while in the 277 inoculated there were 8 attacks with only 1 death, the one who died being a woman attacked *before* inoculation, and the mortality thus produced in the inoculated being 0·36 per cent., or 38·3 times lower than in the uninoculated.

Another significant instance, in a limited number of people, was furnished by the servants belonging to Shet Sorabjee's house and to his garden. There are 50 servants in the house where he lives and about 150 in his garden, half a mile distant from the house. Round the garden the epidemic was raging violently. Of the whole number of servants one, a deformed individual, remained uninoculated, all the others were inoculated twice. Plague appeared among the servants on the 16th May when the only person uninoculated was attacked and succumbed on the 19th ; the total number of inoculated lost also one, a child of 4 years.

The other instances given were in isolated families and referred to smaller numbers of people.

The German Commissioners completed this part of the inquiry by collecting information as to the soil of Upper and Lower Damaun, the hydrographic and climatic conditions obtaining in both, their comparative hygienic circumstances, &c. The facts supplied on these points were of an approximate character. The Committee returned to Bombay on the morning of the 22nd May.

* See also attached Rolls.

Surgeon-Major Lyons went to Lower Damaun on the 26th May 1897, the object of his visit being to find out accurately, by a minute inquiry in each house, the number of deaths which occurred amongst those inoculated. For this purpose he divided the town into 4 sections, and during 4 days, between the 26th and 30th May 1897, visited all the houses, section by section. And as a number of dwellings had been vacated and the inhabitants encamped in the fields outside the town, Dr. Lyons visited them in their encampments and collected information from all of them. The frontier around the town being closed and guarded by a British and a Portuguese cordon, the conditions for collecting the necessary information were particularly complete.

In this manner Dr. Lyons collected the history of 33 deaths and 54 attacks with recovery which had occurred in the inoculated up to the 19th May (the time of the Scientific Committee's visit), and of 3 deaths* and 1 attack with recovery which occurred between that date and the 31st of May inclusive.

In the appendix are reproduced 88 "Investigation sheets" filled up by Dr. Lyons during the house-to-house visitation, as well as one sent afterwards by His Excellency the Governor. Each of the investigation sheets contains particulars of a house where inoculated people lived, and where cases of plague had occurred, either among the inoculated or the uninoculated members of the family. These sheets, therefore, do not make mention of the inoculated households where no cases of plague occurred, nor of any of the attacked houses where there were no inoculated persons.

Comparative Analysis of the Mortality from Plague in Lower Damaun, in the inoculated and uninoculated, between the 26th March and the end of May 1897.

The inoculations in Damaun were done in four series:

First Series.—Between the 23rd and 26th March 1897, 846 persons were inoculated by Dr. R. M. Kalapesi, who was sent from the Laboratory, and between the 4th and 7th April, 171 persons by the Portuguese Physician in charge of the Plague Hospital in Damaun, Dr. Virgilio Poiares, who was supplied with material also from the Bombay Laboratory. The lymph used by Drs. Kalapesi and Poiares on that occasion, as will be described later on, was prepared from a strong virus, and produced a high febrile reaction when injected in the prescribed small standard doses. The operations of these two gentlemen differed in that Dr. Poiares gave doses much weaker than those given by Dr. Kalapesi, as is shown by the detailed records of their operations. It will be observed from the results given below that, though Dr. Poiares' patients appear to have given a considerable reduction of mortality when compared with the rest of the population, the results from his small doses were lower than those obtained from the same material given in larger doses.

Second Series.—A few weeks after the first series, the demand for further inoculations coming from Damaun became exceedingly persitent, as was the case, after an interval, in the six other places where inoculations were performed,—in

* In this number of 3 deaths is included one additional, in the person of Ghopal Bicaria, 9 years, communicated by Dr. Fernandez through H. E. the Governor of Damaun.

First copy sent to Press. 26-11-97

Bombay, Mora, Damaun, Poona, Balsar and Tarapore; and though the Laboratory had run short of strong material, Dr. Kalapesi was deputed again, with a much weaker lymph than that used on the first occasion, as will be detailed later on. Between the 17th and 27th April, *i.e.*, about a month after his first visit, he performed 529 fresh inoculations, and between the 24th April and 2nd May 1897, 99 more were done by Dr. Poiares with a similar material obtained for him from the Bombay Laboratory by the Bombay Portuguese Consulate. The lymph used on this occasion, even when injected in doses 2 to 3 times larger than the standard ones, failed to produce marked rise of temperature, though it caused considerable local reaction. As will be seen below, both Dr. Kalapesi's and Dr. Poiares' operations, on this occasion, gave a smaller lowering of mortality than those previously performed, though they had both been working with increased doses.

Third Series.—Between the 21st and 23rd of May Dr. Kalapesi inoculated 362 persons with a similarly weak lymyh, while Dr. DaCunha, another Portuguese Physician, who had been working in Damaun with Dr. Kalapesi, inoculated 190 persons with the same material.

Fourth Series.—Lastly, in August last, Dr. DaCunha inoculated over 100 persons with material supplied to him from the Bombay Laboratory.

Thus, altogether 2,297 persons were inoculated in Lower Damaun.

The visit of the Scientific Committee coincided with the time of the third series of inoculation, and Dr. Lyons' investigation extended to twelve days later, when the worst part of the epidemic was over, and the daily mortality had come down to below a dozen a day. The present analysis refers, therefore, to the occurrence of attacks and deaths amongst the 2,197 inoculated on the first three occasions, and is divided into three periods of observation, the first corresponding to the interval between the first and second series of inoculations, the second to the interval between the second and third series, and the third to the interval between the third series and the end of the month of May 1897, when the investigation was concluded.

First Period (between the First and Second Series of Inoculations).

At the time when the first series of inoculations was completed, the 26th March 1897, the total number of inhabitants in the affected villages of Damaun, namely 10,900, had been reduced by 670, who had died of plague before that time, and by about 2,000 who had left the place before the closing of the frontiers.

Of the 8,230 remaining, 846 were inoculated by Dr. Kalapesi and 171 by Dr. Poiares in their first series of inoculations, while 7,213 remained uninoculated.

From that time, up to the time when the second series of inoculations was completed, *i.e*, the 23rd of April, the following were the occurrences in the respective groups of people:—

(*a*) Amongst the 846 inoculated by Dr. Kalapesi, there were 17 cases with 3 deaths.* (Total mortality 0·4 per cent.; case mortality, *i.e.*, percentage of deaths to attacks, 17·6 per cent.).

* See attached Rolls.

First copy sent to Press. 26-11-97

(*b*) Amongst the 171 inoculated by Dr. Poiares, there were 6 cases with 3 deaths * (Total mortality, 1·8 per cent.; case mortality, 50 per cent.).

(*c*) Amongst the 7,213 uninoculated, there were 716 deaths† (Total mortality 9·9 per cent.).

It will be seen that, if the 1,017 inoculated had exhibited the same susceptibility for plague as the uninoculated, and had had the same mortality of 9·9 per cent., the number of deaths amongst them would have been 101 instead of 6, a difference of 94·1 per cent.

Second Period (between the Second Series of inoculation and the Third Series, or the time of the Scientific Committee's visit).

By the time when the second series of inoculations was completed, the number of those inoculated by Dr. Kalapesi had decreased by the 3 deaths mentioned above, and increased by 529 newly inoculated, giving a total of 1,372.

The number of inoculated by Dr. Poiares had decreased by 3 deaths, and increased by 99 newly inoculated, giving a total of 267.

The number of uninoculated had decreased by 716 deaths and by the 628 newly inoculated, leaving a total of 5,869 uninoculated.

From the time of the second series of inoculations up to the time of the Scientific Committee's visit, *viz.*, 19th of May last, the following were the occurrences in the three groups:

(*a*) Amongst the 1,372 inoculated by Dr. Kalapesi, there were 52 cases with 18 deaths* (Total mortality, 1·3 per cent.; case mortality, 34·6 per cent.).

(*b*) Amongst the 267 inoculated by Dr. Poiares, there were 12 cases with 9 deaths* (Total mortality, 3·3 per cent.; case mortality, 75 per cent.).

(*c*) Amongst the 5,869 uninoculated, there were 674 deaths (Total mortality, 11·5 per cent.).

It will be observed that if during the second period of observation the 1,639 inoculated had had the same mortality as the 5,869 uninoculated, they should have lost 188 instead of 27, which represents a difference of 85·6 per cent.

Third Period (between the Third Series of inoculations and the end of May, or the time when Surgeon-Major Lyons concluded his investigation).

At the time of the Scientific Committee's visit to Damaun, the number of inoculated by Dr. Kalapesi had decreased by 18 deaths, and increased by 552 inoculated by him and Dr. DaCunha, giving a total of 1,906.

The number of inoculated by Dr. Poiares had decreased by 9 deaths, leaving a total of 258 inoculated.

* See attached Rolls.

† As a matter of fact, much more than that, the figure 716 deaths, 9·9 per cent., implying that during the initial 3 weeks of the epidemic, before the introduction of inoculation and during the first period of 4 weeks after the inoculations, the worst period in the whole epidemic, the mortality was uniformly 26 deaths a day, which, of course, was not the case.

68

The number of uninoculated had decreased by 674 deaths and by 552 who got themselves inoculated, leaving 4,643 uninoculated.

During the 12 days which elapsed till Dr. Lyons completed his investigation, these groups produced—

(*a*) The 1,906 inoculated by Dr. Kalapesi, 1 case with 1 death.* (Mortality 0·05 per cent.)

(*b*) The 258 inoculated by Dr. Poiares, 3 cases with 2 deaths.* (Mortality 0·8 per cent.)

(*c*) The 4,643 uninoculated—93 deaths. (Mortality 2 per cent.)

Calculating upon the death-rate amongst the uninoculated, the 2,164 inoculated should have had 43 deaths instead of the 3, which is a difference of 93 per cent.

During the three periods of observation put together, between the 26th March and the end of May, 6,033 uninoculated had 1,482 deaths (24·6 per cent.), while 2,197 inoculated had 36 deaths (1·6 per cent.) Calculating upon the death-rate among the uninoculated we have seen that the inoculated should have had altogether 332 deaths instead of 36. This represents a difference in mortality of 89·2 per cent.

Considering the large proportion in which the number of inoculated stands to the rest of the population (2,197 to 6,033), it is evidently impossible that the inoculated represented the upper, or any other particular, class of the population possessing a degree of personal or local immunity much different from that of the rest of the population, and to which their reduced death-rate could be ascribed.

This view is confirmed by the following comparison of the mortality which occurred in the inoculated and uninoculated persons belonging to the same families, who lived therefore under absolutely identical conditions of life.

In a large number of households the whole of the members of the family were inoculated, leaving none for comparison as regards susceptibility to the disease. This circumstance rendered it necessary to compare the whole inoculated population with the whole of the uninoculated population, as has been done above. However, in 62 of the inoculated families in which cases occurred, there were 124 persons who remained uninoculated, while the number of inoculated in these families was 250 (see attached Rolls). A comparison between this fraction of the inoculated population with their uninoculated relatives shows the following result:—

124 uninoculated had 54 cases (43·5 per cent.) with 37 deaths (29·8 per cent., case mortality 68·5 per cent.).

250 inoculated had 50 cases (20 per cent.), with 20 deaths (8 per cent., case mortality 40 per cent.).

* See attached Rolls.

The inoculated households lived, therefore, under no specially immune conditions, as the mortality among their uninoculated members, 29·8 per cent., was 5·2 per cent. higher than the mortality in the general uninoculated population. This must invariably be the case, as only people from badly-affected or particularly-threatened localities present themselves for inoculation. It will be noticed also that this small number of 124 uninoculated had a mortality higher by 1 death than the total mortality sustained by the 2,197 inoculated inhabitants of Damaun; and that a comparison between the inoculated and uninoculated members of these families shows that if the 2~~75~~ inoculated had exhibited the same susceptibility as their 1~~43~~ uninoculated relatives, they should have had 75 deaths instead of 20, a difference of 73·3 per cent.*

A similar conclusion is arrived at on comparing the mortality in the Parsee community quoted above, and which shows that the inoculated members gave a reduction of 97·4 per cent. of deaths when compared with the uninoculated of the same community.

It has been mentioned that the lymph used in Damaun in the first series of inoculations was of an active stock, prepared from a highly virulent microbe, and produced a brisk febrile reaction when used in relatively small doses. Owing to the great pressure of work during the epidemic, no method for keeping up the strength of the plague bacilli has been worked out, and the microbe from which the plague lymph was manufactured was allowed to gradually sink in virulence till it became almost harmless when inoculated into rodents. It was lymph thus weakened that was used in the subsequent inoculations.

A comparison between the first and second series of inoculations† done with the strong and with the weak vaccines, respectively, shows a difference in result in direct correspondence with the difference in the material used, as will be seen from the following table‡ :—

1,017 inoculated on the first occasion had 49 cases (4·8 per cent.) with 15 deaths (1·5 per cent., case mortality 30·6 per cent.).

628 inoculated on the second occasion had 41 cases (6·5 per cent.) with 20 deaths (3·2 per cent., case mortality 48·8 per cent.).

The total mortality and the percentage of deaths to cases amongst the inoculated on the second occasion, though they were exposed to the risk of infection during the milder period of the epidemic, was, respectively, 2·2 and 1·6 times higher than amongst those inoculated on the first occasion.

Also as mentioned already, Dr. Poiares in his operations used doses considerably lower than those given by Dr. Kalapesi. The difference in the results

* As far as the small numbers from which the figure 73·3 per cent. is obtained permit of drawing conclusions, the comparison between this figure and 89·2 per cent. by which the mortality in the *total* inoculated population differed from the mortality in the *total* uninoculated, would seem to indicate that the presence of uninoculated members in a family reduces the safety of the inoculated, and that, like in small-pox vaccination, the duty of the individual is to be inoculated for the safety of his neighbours in the community.

† The third series, done shortly before the conclusion of the observations, is left out of this comparison, only one death having occurred amongst those inoculated on the third occasion (see attached Rolls).

‡ See attached Rolls.

First copy sent to Press. 26-11-97

of these two groups of operations corresponded again to the difference in the method employed, as is seen below* :—

Amongst the 1,924 inoculated by Dr. Kalapesi, there were 70 cases (3·6 per cent.) with 22 deaths (1·1 per cent., case mortality 31·4 per cent.).

Amongst the 270 inoculated by Dr. Poiares, there were 21 cases (7·8 per cent.) with 14 deaths (5·2 per cent., case mortality 66·7 per cent.).

Thus, amongst the inoculated with reduced doses, small though their death-rate (5·2 per cent.) was when compared with the death-rate in the uninoculated population (24·6 per cent.), the total mortality was 4·5 times, and the case mortality 2·1 times higher than that amongst the inoculated with larger doses.

This variation of the results, answering faithfully to the variation in the strength of the lymph and in the doses given, shows the direct connection of cause and effect in the two series of facts, and makes it probable that it will be in our power to improve upon the results obtained in Damaun.

It also indicates, when the actual figures are examined, that the plague prophylactic has a greater influence upon the number of deaths than upon the number of attacks. This result repeated itself in all the observations collected up to the present on the plague inoculation, and seems to stand in a comprehensible connection with the plan followed in working it out.† If this surmise is correct it will be in our will to effect a further reduction in the number of attacks by correspondingly modifying the composition of the plague prophylactic.

The above satisfactory results were obtained in one of the most virulent outbreaks that have been observed in India in the present epidemic, and during the 9 weeks which corresponded to the highest stage of that outbreak.

The question as to the final duration of the effect of the plague inoculation remains unsolved, but loses its urgent interest in view of the above results.

W. M. Haffkine
R. W. S. Poiares. M.D.
Sen. Med. Off.

BOMBAY, 1*st November* 1897. by Hons. W. M. Haffkine

Copies of this report are forwarded to :—

The Secretary to the Government of India in the Home Department, Simla.
The Private Secretary to His Excellency the Governor of Bombay.
The Chief Secretary to the Government of Madras.
The Surgeon-General with the Government of Bombay.
His Excellency the Governor of Damaun.
Professor Dr. R. Koch (Berlin).
Professor Dr. Gaffky (Giessen, Germany).
Shet Sorabjee Maneckjee Damaunwalla, Damaun.

* See attached Rolls.

† See W. M. Haffkine, "*The Plague Prophylactic*" *loc. cit.*

TIMES OF INDIA PRESS—4016·97

First copy sent to Press. 26-11-97

8

APPENDIX.

LOWER DAMAON.

Particulars of Households where Inoculation had been applied and Plague occurred afterwards.

Attacks in those Inoculated in March 1897, or in their Relations.

Investigated by SURGEON-MAJOR LYONS, I.M.S.

4016-97

Occurrences of Plague in Houses inhabited by Persons inoculated against the Plague.

Full Address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaon, Katriwad.	Laloo Muckla ... ... Male, 25 years... Inoculated in March 1897. Guirdhar ... ... „ 4 „ ... „ „ Moti Bhicka ... ... Female, 60 „ ... „ April 1897. Pemi ... ... Male 22 „ ... „ „ Guirdhar was attacked about 19th April. Had high fever and a cervical gland enlarged. Died after seven days.	
Lower Damaon, Rua Real.	Saurrah Lalla ... ... Male, 40 years... Inoculated in March and April 1897. Argooan ... ... „ 7 „ ... „ „ Rutton ... ... Female, 25 „ ... „ April 1897. Dhanki ... ... „ 2 „ ... „ „ Argooan was attacked 15 days after inoculation. Had high fever. Died on the second day after the attack.	
Lower Damaon, Braman Falia.	Pershotam Premanand ... Male, 55 years... Inoculated on 23rd April 1897. Harishanker Pershotam ... „ 28 „ ... „ 23rd March 1897. Amba Jeevanram ... ... Female, 50 „ ... „ 25th April 1897. Rami Bhapoo ... ... „ 60 „ ... „ „ Jeenah (*vel* Dyah) Ambaram. Male, 20 „ ... „ 23rd March 1897. Manee Ravishanker... ... Female, „ „ „ Harkee Bhapoo ... ... „ 25 „ ... „ „ Jeenah (*vel* Dyah) Ambaram was attacked on the 3rd May 1897. Fever at the onset. Temp. 104°. Bubo ran to suppuration. General symptoms extremely mild. Recovered by the 10th May 1897.	Vijlee Atmaram ... Female, 45 years. Vijlee Atmaram had fever on the 5th April 1897. Buboes in both the groins which ran to suppuration. Symptoms not severe. Recovered by the 23rd April 1897.
Lower Damaon, Braman Falia.	Amrootrao Sakharam ... Male, 45 years... Inoculated in April 1897. Govindrao Amrootrao ... „ 20 „ ... „ March 1897. Madhavarao Amrootrao ... „ 18 „ ... „ „ Anandrao Amrootrao ... „ 4 „ ... „ March and April 1897. Ganpatrao ... ... „ 10 „ ... „ March 1897. Ganpatrao was attacked a month after inoculation. Bubo in right groin. Had fever, nausea and headache. Recovered.	Rookmani ... ... Female, 35 years. Vamanrao ... ... Male, 3 „ Chimbai ... ... Female, 8 „
Lower Damaon, Kathiria.	Wallob Chenoy ... ... Male, 50 years ... Inoculated in March 1897. Canjee ... ... „ 30 „ ... „ „ Govan ... ... „ 9 „ ... „ „ Morar ... ... „ 7 „ ... „ „ Govan was attacked two and-a-half months after the date of inoculation. Femoral bubo (left). Fever and slight head symptoms. Recovered.	Dhanee Canjee ... Female, 20 years. Maneck ... „ 2 „
Lower Damaon.	Chabeldas Lucmon ... Male, 45 years... Inoculated in March 1897. Jeevy Callan ... ... Female, 35 „ ... „ „ Annanjee ... ... Male, 18 „ ... „ „ Ramjee ... ... „ 15 „ ... „ „ Hargovan ... ... „ 13 „ ... „ „ Parvati ... ... Female, 10 „ ... „ „ Ranchore ... ... Male, 8 „ ... „ „ Laroo Gopal ... ... Female, 13 „ ... „ „ Bholy ... ... „ 12 „ ... „ „ Chabeldas Lucmon was attacked a month and-a-half after inoculation. Axillary bubo. High fever and delirium. Died four days after. Parvati attacked one and-a-half month after inoculation. Axillary bubo which suppurated. Fever and headache. Recovered. Laroo Gopal attacked one and-a-half month after inoculation. Femoral bubo and other symptoms of plague. Recovered.	
Lower Damaon, Rua Real.	Cooverjee Byramjee ... Male, 35 years ... Inoculated in March 1897. Dinbai ... ... Female, 30 „ ... „ „ and April 1897. Perozbai ... ... „ 10 „ ... „ „ „ Merbai ... ... „ 6 „ ... „ „ „ Ruribai ... ... „ 50 „ ... „ „ „ Dinbai was attacked on the 3rd May. Had fever 106·4°. Severe head symptoms and delirium. Femoral bubo (left) which suppurated and burst. Recovered.	

Occurrences of Plague in Houses inhabited by Persons inoculated against the Plague—*contd.*

Full Address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaon, Rua Real.	Walab Withal ... ... Male, 43 years ... Inoculated in March 1897. Bani ... ... Female, 49 „ ... „ April 1897. Lalloo H. ... ... Male, 36 „ ... „ March 1897. Pemi ... ... Female, 30 „ ... „ „ Bani ... ... „ 13 „ ... „ „ Kashi ... ... „ 11 „ ... „ „ Bichi ... ... Male, 6 „ ... „ „ Walab Withal was attacked two months after inoculation. Femoral bubo which was cauterized. Fever, nausea and delirium. Recovered. Bani, aged 49, was attacked ten days after inoculation. Had high fever, head and backache. Femoral (right) bubo cauterized. Recovered. Lalloo H. was attacked two months after inoculation. Had very high fever and severe head symptoms. Right femoral bubo. Died on the 15th May. Kashi was attacked ten days after inoculation. Had fever and vomiting. Femoral bubo (right) which suppurated. Recovered.	
Lower Damaon, Rua Real.	Sorabjee Nowrojee ... Male, 18 years ... Inoculated in March and April 1897. Rustomjee ... ... „ 13 „ ... „ „ „ Frambai ... ... Female, 35 „ ... „ „ „ Frambai was attacked 12 days after the second inoculation. Had fever, nausea, headache and backache. Femoral bubo (right). Recovered.	
Lower Damaon, Causerwad, Rua de Caldereiros.	Callanjee Dyaljee ... ... Male, 35 years... Inoculated in March 1897. Madaorao ... ... „ 8 „ ... „ „ Shakoo ... ... Female, 4 „ ... „ „ Callanjee Dyaljee was attacked a month after inoculation. Had fever, nausea, headache and delirium. Had a boil on the right foot. Recovered.	
Lower Damaon, Rua Real.	Perozbai Rattonjee ... ... Female, 30 years... Inoculated in March and April 1897. Syrikbai ... ... „ 20 „ ... „ „ „ Virbaijee ... ... „ 50 „ ... „ „ „ Nanabhai ... ... Male, 70 „ ... „ „ „ Janamjee ... ... „ 11 „ ... „ „ „ Rustomjee ... ... „ 8 „ ... „ „ „ Pirosha ... ... „ 4 „ ... „ „ „ Bejanji ... ... „ 3 „ ... „ „ „ Bejanji was attacked on the fifth day after the second inoculation. Had fever on the same day. Femoral bubo appeared on the sixth day, suppurated and burst. Recovered.	
Lower Damaon, Rua Real.	Gangadas Banah ... ... Male, 45 years... Inoculated in March 1897. Bicu ... ... „ 6 „ ... „ „ and April 1897. Nano ... ... „ 4 „ ... „ „ „ Navi ... ... Female 28 „ ... „ „ Goolab ... ... „ 1 „ ... „ „ Bicu was attacked 15 days after the second inoculation. Had fever and vomiting. Femoral buboes (both sides). Recovered.	
Lower Damaon, Rua de Carpenteiros.	Narsal Lulla ... ... Male, 42 years... Inoculated in April 1897. Vamally ... ... „ 18 „ ... „ March and April 1897. Ramjee ... ... „ 11 „ ... „ „ „ Gomti ... ... Female 15 „ ... „ „ Ramjee was attacked on the 16th May. Had fever, head and backache; left axillary bubo. Recovered.	
Lower Damaon, Rua Real.	Nanabhai Rustomjee ... Male, 51 years... Inoculated in March and April 1897. Hirjeeboy ... ... „ 38 „ ... „ „ „ & May 1897 Rustomjee N. ... ... „ 24 „ ... „ „ „ Pallonjee ... ... „ 14 „ ... „ „ „ Cowasjee ... ... „ 13 „ ... „ „ „ Pestonjee ... ... „ 10 „ ... „ „ „ Nasarvanji H. ... ... „ 12 „ ... „ „ „ Jahangir ... ... „ 7 „ ... „ „ „ Navalsha ... ... „ 5 „ ... „ „ „ Frambai ... ... Female 50 „ ... „ „ „ Perozbai ... ... „ 27 „ ... „ „ „ Dhanbai ... ... „ 19 „ ... „ „ „ Merbai H. ... ... „ 10 „ ... „ „ „ Goolbai H. ... ... „ 30 „ ... „ May 1897. Nasarvanji H. was attacked 15 days after inoculation. Had fever, headache and vomiting. Femoral bubo right side. Recovered after seven days.	Avambai Rustomjee ... Female, 70 years. Avambai Rustomjee was attacked on the 11th May. Had high fever; femoral bubo (right). Died on the 13th May 1897.

Occurrences of Plague in Houses inhabited by Persons inoculated against the Plague—*contd.*

Full Address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaon, Vancavad.	Dipchchand Arichand ... Male, 42 years... Inoculated in March and April 1897. Virchand ... ... „ 30 „ ... „ „ „ Navalchand ... ... „ 15 „ ... „ „ „ Chunilal ... ... „ 8 „ ... „ „ Camlah ... ... Female, 11 „ ... „ „ Monicore ... ... „ 25 „ ... „ „ Omedkore ... ... „ 7 „ ... „ „ Chimanlal ... ... Male, 3 „ ... „ „ Chunilal was attacked eight days after inoculation. Had fever, headache, nausea and femoral bubo (right). Recovered.	Oojambai Nemichand ... Female, 55 years. Oojambai Nemichand was attacked about middle of May. High fever, headache, delirium, nausea and vomiting. Right femoral bubo. Recovered.
Lower Damaon, Rua Real.	Sorabjee Mancherjee ... Male, 54 years... Inoculated in March and April 1897. Sonabai ... ... Female, 47 „ ... „ „ „ Jamshetjee ... ... Male, 14 „ ... „ „ „ and May 1897. Hormusjee ... ... „ 12 „ ... „ „ „ Hormusjee was attacked on 2nd April. Had at the onset bubo in the left groin. Two days after high fever, temperature 104·2°, head and backache and vomiting. Recovered after nine days.	Navajbai Nowrojee ... Female, 65 years
Lower Damaon, Rua Real.	Bagwan Kushal ... ... Male, 26 years... Inoculated in March and May 1897. Ambi Baj ... ... Female, 2 „ ... „ „ Bagwan Khusal was attacked 16 days after the second inoculation. Had high fever, vomiting, head and backache. Femoral bubo right side. Recovered.	Rutton Pemahin ... Female, 20 years.
Lower Damaon, Darjiwad, (Wamawad).	Mangal Ooker ... ... Male, 25 years... Inoculated in March 1897. Rutton Dulab ... ... Female, 19 „ ... „ „ Bhicky ... ... „ 9 „ ... „ „ Rutton Dulab was attacked 15 days after inoculation. Femoral and axillary buboes; suppurated. Recovered.	Laroo Kirio ... Female, 55 years. Rutton Bagwan ... „ 32 „ Dhankore Vithal ... „ 2 „
Lower Damaon, Kathiria.	Gungha Bhagwan ... ... Female, 40 years... Inoculated in March 1897. Vanmally ... ... Male, 11 „ ... „ „ Bhicky ... ... Female, 14 „ ... „ „ Gungha Bhagwan was attacked 11 days after inoculation. Had fever, head and backache, and nausea. Femoral bubo left side. Recovered.	
Lower Damaon, Rua Real. House No. 46.	Maneckbai Nasvanjee ... Female, 38 years... Inoculated in March and April 1897. Bicaijee ... ... Male, 6 „ ... „ „ „ Maneckbai Nasvanjee was attacked six days after the second inoculation. Had fever, headache, vomiting, and femoral bubo on the right side, which suppurated and healed. Recovered.	
Lower Damaon, Gathiwad.	Navrojee Dhunjeebhoy ... Male, 45 years... Inoculated in March and April 1897. Kookibai Navrojee... ... Female, 38 „ ... „ „ „ Kekobhai ... ... Male, 6 „ ... „ „ „ Perosha ... ... „ 3 „ ... „ „ „ Kekobai had high fever, headache, vomiting and femoral bubo three days after inoculation. Recovered.	
Lower Damaon. Vadi Falia.	Narayan Withal ... ... Male, 28 years... Inoculated in March 1897.	Gungha Narain ... ... Female, 4 years. Daily I. ... ... „ 25 „ Daily II. ... ... „ 17 „ Daily I. was attacked on 10th April. Had high fever, head and backache, no glands. Died four days later. Daily II. was attacked on the 30th March. Had high fever, headache and delirium. No glands. Died three days later.
Lower Damaon, Braman Falia.	Hootamchand Dyah ... Male, 22 years... Inoculated in March and April 1897. Rormany ... ... Female, 20 „ ... „ May 1897. Jeechand ... ... Male, 3 „ ... „ „ Cubly ... ... Female, 5 „ ... „ „	Daychand Panachand ... ... Male, 51 years. Parwaty Varodman ... ... Female, 48 „ Parwaty Varodman was attacked on the 15th April and died on the 20th of the same month. Had fever, headache, nausea and vomiting. Bubo in the right groin.
	Kallan Ramji ... ... Male, 43 years... Inoculated in March, April and May 1897. Ambu ... ... Female, 40 „ ... „ „ „ Ginah ... ... Male, 18 „ ... „ „ Ladoo ... ... Female, 50 „ ... „ April 1897. Rami ... ... „ 14 „ ... „ „	Rama Keshadjee... ... Male, 70 years. Keser ... ... Female, 60 „ Rama Keshadjee was attacked 15 days after the date of the inoculation of the others. Had fever, headache and delirium. No bubo. Died after three days. Keser was attacked 12 days after inoculation of the others. Had fever and headache. Axillary bubo. Recovered.

Occurrences of Plague in Houses inhabited by Persons inoculated against the Plague—*contd.*

Full Address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated* ; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
	Jagjiwan Wallab ... ... Male, 24 years... Inoculated in March and April 1897. Baglah ... ... „ 14 „ ... „ „ „ and May 1897.	Anni Dallu ... Female, 40 years. Parwati ... ... „ 20 „ Divaly ... ... „ 20 „ Anni Dallu was attacked 15 days after the date when the others were inoculated. Had high fever, headache, femoral bubo (right). Was taken to the plague hospital and died on the same day. Parwati was attacked on the same day. Had fever, headache, delirium and femoral bubo (left). Was taken to the plague hospital and died the next day.
Lower Damaon, Rua Real.	Eduljee Fakirjee ... ... Male, 21 years... Inoculated in March, April and May 1897. Ratanbai ... ... Female, 50 „ ... „ „ Sonabai ... ... „ 27 „ ... „ „ Bachoobai ... ... „ 26 „ ... „ „ Virbaijee ... ... „ 18 „ ... „ „ Dunbai ... ... „ 40 „ ... „ „ Baijee ... ... „ 11 „ ... „ „ Faramjee ... ... Male, 7 „ ... „ „ Dynbai ... ... Female, 8 „ ... „ „ Doshibai ... ... „ 5 „ ... „ „ Perosha ... ... Male, 3 „ ... „ „ Morio ... ... „ 12 „ ... „ „ Divjee ... ... „ 10 „ ... „ „ Luckmi ... ... Female, 50 „ ... „ May 1897.	Nanaboy Jewaji ... Male, 60 years. Nanaboy Jewaji was attacked on the 16th April. Had very high fever, nausea, vomiting, head and backache. Femoral bubo (right); suppression of urine. Died on the 20th April 1897.
Lower Damaon, Kathiriwad.	Byramjee Nanabhoy ... Male, 48 years... Inoculated in March and April 1897. Sorabjee Byramjee ... ... „ 25 „ ... „ „ „ Bicai ... ... Female, 40 „ ... „ „ „ Jahangir ... ... Male, 16 „ ... „ „ „ Ruttonbai B. ... ... Female, 10 „ ... „ „ „ Femina ... ... „ 6 „ ... „ „ „ Dinshaw ... ... Male, 7 „ ... „ „ „ Ruttonshaw ... ... „ 3 „ ... „ „ „	Merbai B. ... ... Female, 20 years. Maneckbai Dinshaw ... „ 60 „ Jamsetjee Dinshaw ... Male, 37 „ Jeevanbai Dinshaw ... Female, 33 „ Merbai B. was attacked about the 18th April. Had high fever, nausea, vomiting, head and backache. Femoral (left) bubo. Died on the 20th April.
Lower Damaon, Katheria.	Dhanjee Bhickha ... ... Male, 30 years... Inoculated in March 1897. Mockun ... ... „ 10 „ ... „ „ Gopy ... ... „ 7 „ ... „ „	Govan Bhickha ... Male, 20 years. Mangly ... Female, 40 „ Govan Bhickha was attacked on the 10th May. Left axillary bubo. Fever and headache. Died on the 20th May. Mangly was attacked about 11th May. Had fever, head and backache and delirium. Femoral buboes on both sides. Ill at time of investigation.
Lower Damaon, Parboowad.	Jeenah Sadashiv ... ... Male, 55 years... Inoculated in March 1897. Luckmi ... ... „ 35 „ ... „ „ Durgah ... ... Female, 30 „ ... „ „ Shewkore ... ... „ 50 „ ... „ „ Gurgah Shanker ... ... Male, 18 „ ... „ „ Divaly ... ... Female, 18 „ ... „ „ Paly ... ... „ 3 „ ... „ „	Jaikore Kashiram ... Female, 19 years. Manabi ... „ 15 „ Jaikore Kashiram was attacked 20 days after the date of inoculation in this house. Had fever, headache, delirium and femoral bubo (left). Died after four days. Manabi was attacked on the same day. Had fever, headache, nausea and vomiting. Femoral bubo (left). Died after six days.
Lower Damaon, Katheria.	Junjee Chamário ... ... Male, 40 years... Inoculated in March and April 1897.	Mangli ... ... Female, 35 years. Sodkar ... ... Male, 20 „ Coowardy ... ... Female, 18 „ Maude ... ... Male, 10 „ Coowardy was attacked about the 18th May. Had high fever, head and backache, nausea, vomiting, severe diarrhœa and delirium. No bubo. Ill at the time of investigation.
Lower Damaon, Parboowad.	Ranchorjee Aritram ... Male, 48 years... Inoculated in March 1897. Nansi Wishwanath ... „ 3 „ ... „ „	Wishwanath Aritram ... Male, 55 years. Wishwanath Aritram was attacked on the 28th March. Recovered.
Lower Damaon, Rua Luiz de Camoëns (Rua de M. S. Vaz.)	Jose Maria St. Anna ... Male, 22 years... Inoculated in April 1897. Chariza ... ... Female, 13 „ ... „ March and April 1897.	Maria Francisca ... Female, 24 years. Maria Francisca was attacked on the 14th April. Had high fever, headache, nausea and delirium. Femoral buboes on both sides. Recovered.

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Occurrences of Plague in Houses inhabited by Persons inoculated against the Plague—*concld.*

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaon, Rua Real.	Ruttonjee Cowasjee... ... Male, 52 years... Inoculated in March, April and May 1897. Sorabjee ... ... „ 30 „ ... „ „ „ Faramroj ... ... „ 10 „ ... „ „ „ Nasvanjee ... ... „ 10 „ ... „ „ „ Virbai ... ... Female, 44 „ ... „ „ Doshibai ... ... „ 28 „ ... „ „ Aymai ... ... „ 24 „ ... „ „ Syrinbai R. ... ... „ 21 „ ... „ „ Sakerbai ... ... „ 18 „ ... „ „ Cowerbai ... ... „ 13 „ ... „ „ Banoobai ... ... „ 6 „ ... „ „ Goolbai ... ... „ 5 „ ... „ „ Fenima ... ... „ 2¼ „ ... „ „ Syrombai S. ... ... „ 10 „ ... „ „ Dinshaw ... ... Male, 6 „ ... „ „ Aymai ... ... Female, 5 „ ... „ „ Peroshaw ... ... Male, 2 „ ... „ „ Syrinbai B. ... ... Female, 2 „ ... „ „ Mahomed Cassam ... ... Male, 25 „ ... „ March 1897. Roopabai ... ... Female, 30 „ ... „ „ Jerbanoo S. ... ... „ 4 „ ... „ „ Mahomed Cassam was attacked a month after inoculation. Had very high fever, head and backache and delirium. Left femoral bubo. Died three days after. Roopabai was attacked on the 19th April. Had fever, head and backache. Left femoral bubo. Recovered.	Banio ... ... Male, 70 years. Jinky ... ... Female, 60 „ Bavio ... ... Male, 12 „ Bavio was attacked on the 14th April. Had fever, head and backache, nausea and vomiting. Femoral bubo on left side. Died on the 18th April.
Lower Damaón. Rua Real.	Vithal Jeevan ... Male ... ... Inoculated in March 1897. Vithal Jeevan was attacked on the 17th May. Bubo in the left groin. High fever, nausea and vomiting. Recovered.	Kashi ... Female, 22 years. Banee ... „ 75 „ Kashi was attacked about a month after the date of inoculation. Left femoral bubo; high fever. Recovered in about eight days.
Lower Damaon, Parboowad.	Harnee Rungopal ... ... Female, 26 years... Inoculated in March 1897. Dhondee ... ... „ 10 „ ... „ „ Jaideo ... ... Male, 3 „ ... „ „ Sunder ... ... Female, 5 „ ... „ „ Dinkore ... ... Male, 2 „ ... „ „ Mardli, ... „ 5 „ ... „ „ Mardli was attacked 12 days after the date of inoculation. Had fever, headache and femoral bubo (left). Died four days after the attack. Harnee and Dhondee were attacked eight days after the date of inoculation. Had fever and headache. The first had femoral bubo (right) and the second axillary bubo (right). Both recovered.	Govindrao ... Male, 36 years. Babajee ... „ 50 „ Gaobai ... Female, 40 „ Govindrao was attacked 15 days after the date of inoculation of others. Had fever, headache and vomiting. Femoral bubo (right). Died. Babajee was attacked about the same date. Had fever and headache. No bubo. Died five days after the attack. Gaobai was also attacked about the same date. Had fever, head and backache. Died four days after the attack.
Lower Damaon, Kathriwad.	Pitambar Ragunah ... Male, 50 years... Inoculated in March 1897. Luckmi ... ... Female, 45 „ ... „ „ Arkore ... ... „ 10 „ ... „ „ Narayan ... ... Male, 5 „ ... „ „ Arkore was attacked 20 days after inoculation. Had right femoral bubo which suppurated and fever. Recovered.	Somlah ... ... Male, 20 years. Manglu ... ... „ 9 „ Somlah and Manglu were attacked about the 25th March. Had fever, head and backache, nausea and vomiting. Somlah had cervical bubo and died after ten days. Manglu had femoral (left) bubo. Died after four days.
Lower Damaon, Braman Falia.	Harishanker Purshotam Patack...Male, 40 years. Inoculated on 25th March 1897. Harishanker Purshotam Patack was attacked on the 2nd April. Had high fever, severe head symptoms, nausea and vomiting. Femoral bubo in the left groin. Recovered after six days.	Nankore Devram ... ... Female, 37 years. Nankore Devram was attacked on the 10th April. Had high fever, head and backache, nausea and vomiting. No bubo. Recovered after 15 days.
Lower Damaon, Rua de Macotinho.	Guella Wallob ... ... Male, 20 years... Inoculated on 25th March 1897. Wallob Jeevan ... ... „ 23 „ ... „ in April 1897. Dhanee ... ... Female, 18 „ ... „ „ Divaly ... ... „ 11 „ ... „ „ Guella Wallob was attacked on the 10th April. Had very high fever. Was semi-conscious and delirious for three days. Bubo in the groin. Recovered.	Bulky Wallob ... ... Female, 35 years. Bulky Wallob was attacked on the 8th May. Had fever, nausea, delirium and submaxillary gland enlarged. Died eight days after.

II.

LOWER DAMAON.

Particulars of Households where Inoculation had been applied and Plague occurred afterwards.

Attacks in those inoculated in April and May 1897, or in their Relations.

Investigated by SURG.-MAJ. LYONS, I.M.S.

Occurrences of Plague in Houses inhabited by Persons inoculated against the Plague. in April & May 1897 or in their relations

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaon, Rua Quadrada. (Maneckjee Danjeebhoy Street)	Maneckjee Beekajee ... Male, 45 years... Inoculated in March and April 1897. Bechoobai Maneckjee ... Female, 16 „ ... „ „ „ Bicajee Maneckjee ... ... Male, 12 „ ... „ „ „ Najambai ... ... Female, 6 „ ... „ „ „ Manecbai ... ... „ 2 „ ... „ „ „ Jerbae Maneckjee ... ... „ 35 „ ... „ „ Jerbai Maneckjee was attacked one day before inoculation and died three days later.	Sonabai Dorabjee ... ... Female, 55 years.
Lower Damaon, Rua de Carpenteiros.	Gopal Narain ... ... Male, 32 years... Inoculated in March and April 1897. Cashi Hari ... ... Female, 30 „ ... „ April 1897. Cashi Hari was attacked eight days after inoculation. Had high fever, severe head symptoms, nausea and vomiting. Femoral bubo (right). Recovered.	Jamna Lalljee... ... ... Female, 55 years. Jamna Lalljee was attacked six days after the date of inoculation in this house. Femoral bubo (right). High fever, headache, vomiting and delirium. Died six days after the attack.
Lower Damaon, Chanta.	Balkrishna Hiraji ... ... Male, 24 years... Inoculated in April 1897. Bicken ... ... „ 17 „ ... „ „ Haribao ... ... „ 11 „ ... „ „ Pandurang ... ... „ 9 „ ... „ „ Atmaram ... ... „ 6 „ ... „ „ Maneck ... ... Female, 13 „ ... „ „ Pandurang was attacked three days after inoculation and died on the fourth day. Had bubo in the left groin. Fever, nausea and headache.	Hiraji Callanji ... ... Male, 42 years. Nanabhai ... ... „ 25 „
Lower Damaon, Gathiwad.	Pershotam Morby ... ... Male, 16 years... Inoculated in April 1897.	Morby Luckmon ... ... Male, 50 years. Pemi Nanabhoy ... ... „ 45 „ Jamma Morby ... ... Female, 20 „ Morby Luckmon was attacked on the 10th May and died after seven days. Had fever, headache, and pain at the back. No gland enlarged. Jamma Morby was attacked on the 16th May and died on the 20th. Had left axillary gland enlarged. Fever and headache.
Lower Damaon, Rua de Macotinha.	Rani Gopal ... ... Female, 16 years... Inoculated in April 1897. Divaly ... ... „ 22 „ ... „ „ Morar Bhagwan ... ... Male, ... „ March 1897. Divaly was attacked five days after the inoculation. Had femoral gland of the right side enlarged. Fever, headache, nausea and pain in the back. Recovered.	Pemi Cowasjee ... ... Female, 35 years. Pemi Cowasjee was attacked on the 5th April. Had axillary bub (left side) fever and headache. Recovered.
Lower Damaon. Golwad.	Ramjee Lalloo ... ... Male, 45 years... Inoculated in April 1897. Ramjee Lalloo was attacked three days after inoculation. Had fever, hœmoptisis and cough. Died.	Cower ... Female, 35 years. Chunia ... Male, 3 „ Maneck ... Female, 55 „
Lower Damaon, Rua de Macotinha.	Dhulob Bhicu ... ... Male, 25 years... Inoculated in April 1897.	Bhicu Vittoba ... Male, 55 years. Godavrybai ... Female, 35 „ Sonabai Hirajee ... „ 17 „ Manky ... „ 11 „ Godavrybai was attacked about 12th May. Had bubo in the left groin. Very high fever, nausea and vomiting for three days. Recovered. Sonabai Hirajee was attacked about the 15th April. Femoral bubo. High fever, nausea, headache and delirium. Recovered.
Lower Damaon, Rua Real.	Gopal Dhulob ... ... Male, 25 years... Inoculated in April 1897. Rutton ... ... Female, 20 „ ... „ „ Nandoo ... ... „ 6 „ ... „ „ Manky ... ... „ 3 „ ... „ „ Daily ... ... „ 2 „ ... „ „ Gopal Dhulob and Rutton were attacked 13 days after inoculation. Gopal Dhulob had very high fever with severe head symptoms. No bubo. Died four days after. Rutton had high fever. Bubo in the groin. Was taken to the plague hospital and died five days after.	Guirdhar Gopal ... ... Male, 5 years.
Lower Damaon Kathiria.	Rama Dhulob ... ... Male, 20 years... Inoculated in April 1897. Keshav ... ... „ 5 „ ... „ „ Nuthi ... ... Female, 35 „ ... „ „	Dajy Gonsal ... ... Male, 30 years. Dajy Gonsal was attacked 12 days after the date of inoculation. Had femoral bubo (right). Fever, headache, delirium and nausea. Died five days after the attack.

Occurrences of Plague in Houses inhabited by Persons inoculated against the Plague—*contd.*

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated* ; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated* ; date of onset of disease, symptoms, issue.
Lower Damaon, Rua Viscondi de Olerem (Ghatiwada)	Bhavani Dagroo ... ... Male, 35 years... Inoculated in April 1897. Sakoo Govind ... ... Female, 25 „ ... „ „ Sucky Bawani ... ... „ 6 „ ... „ „ Gampoo Krishna ... ... Male, 5 „ ... „ „	Dagroo Koosajee ... ... Male, 60 years. Mookty Bairoo ... ... Female, 30 „ Dagroo Koosajee was attacked in April 1897. Died after six days. Had axillary bubo. Mookty Bairoo was attacked in April 1897. Died after seven days. No buboes, but other symptoms of plague.
Lower Damaon, Rua Real.	Guirdhar Gopal ... ... Male, 50 years... Inoculated in April 1897. Motia G. ... ... „ 40 „ ... „ „ Jugea ... ... „ 10 „ ... Bhicklu ... ... „ 8 „ ... „ „ Guirdhar Gopal was attacked 15 days after inoculation. Had fever, head and backache. Femoral bubo (right). Died five days later. Motia G. was attacked eight days after inoculation. Had fever and headache, but no bubo. Died three days later. Jugea was attacked ten days after inoculation. Had fever and headache. Femoral bubo (left) which was cauterized. Recovered.	Gungaoh ... ... Female, 30 years.
Lower Damaon, Kathiria.	Wallob Fakir ... ... Male, 40 years... Inoculated in April and May 1897. Ditia ... ... „ 15 „ ... „ „ „ Cower ... ... Female, 15 „ ... „ „ „ Jeevie ... ... „ 12 „ ... „ „ „ Canjee ... ... Male, 7 „ ... „ „ „	Dhanu ... ... Female, 35 years. Dhanu was attacked eight days after the date of inoculation in this house. Had femoral bubo (right). High fever, headache and delirium. Died after 15 days.
Lower Damaon, Rua de Macotinha, (Causerwad), House No. 55.	Govan Ranchore ... ... Male, 30 years... Inoculated on 21st April and 22nd May 1897. Guirdhar Govin ... ... „ 5 „ ... „ „ 21st „	Jamna Hirajee ... ... Female, 55 years. Jamna Hirajee was attacked on the 29th April 1897. Temperature at the onset 104·6°. Bubo in the left groin. Died on the 4th May 1897.
Lower Damaon, Rua Real.	Hurgovan Dhulob ... ... Male, 40 years... Inoculated in April 1897. Hurgovan Dhulob was attacked 15 days after inoculation. Had fever, headache and femoral bubo. Died five days after.	Gungey ... ... Female, 30 years.
Lower Damaon, Kathiria.	Ruttonjee Vittal ... ... Male, 25 years... Inoculated on 21st April 1897. Runchore ... ... „ 16 „ ... „ „ Jamna ... ... Female, 5 „ ... „ „ Peni ... ... „ 11 „ ... „ „ Valy ... ... „ 11 „ ... „ „ Govan Chaba ... ... „ 50 „ ... „ „ Runchore Vittal was attacked on the 1st May. Axillary buboes both sides. High fever, head and backache. Recovered.	Callan Rewah ... ... Male, 18 years. Bhicki ... ... Female, 35 „ Pemah Chaba ... ... Male, 45 „ Callan Rewah was attacked about the 6th May. Had very high fever, delirium, head and backache, nausea and vomiting. No bubo. Recovered seven days after. Pemah Chaba was attacked on the 22nd April. Had high fever, nausea and vomiting, head and backache. No bubo. Died on the 25th April.
Lower Damaon, Rua Real.	Bickla Cullan ... ... Male, 25 years... Inoculated in April 1897. Daily ... ... Female, 20 „ ... „ „ Gopal ... ... Male, 4 „ ... „ „ Luckmi ... ... Female, 2 „ ... „ „ Bickla Cullan was attacked nine days after inoculation. Had high fever, delirium, head and backache. Right femoral bubo which was cauterized. Recovered ten days after.	Dajee ... ... Male, 19 years.
Lower Damaon, Rua Real.	Chabu Bagwan ... ... Male, 56 years... Inoculated in April 1897. Vally Wallob ... ... Female, 22 „ ... „ „ Ambi Vammally ... ... „ 4 „ ... „ „ Bhickli ... ... „ 45 „ ... „ „ Chabu Bagwan was attacked 15 days after inoculation. Had fever, head and backache. Femoral bubo (right) which suppurated. Recovered. Bhickli was attacked ten days after inoculation. Had high fever. No bubo. Died three days after.	
Lower Damaon, Braman Falia, House No. 26, (South line.)	Bai Parwati Baishanker ... Female, 29 years... Inoculated on 23rd March 1897. Hoomabai Ramshanker ... „ 7 „ ... „ 24th April 1897. Girjashanker Pranshanker ... Male, 3 „ ... „ „	Itchabai Harishanker ... ... Female, 20 years. Itchabai Harishanker was attacked on the 30th April 1897. Bubo in the left axilla. High fever, temperature 105·3° F.; delirious and unconscious for three days. Recovered by the 12th May 1897. At the time of investigation still under treatment for general debility.

Occurrences of Plague in Houses inhabited by Persons inoculated against the Plague—*contd.*

Full Address	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaon, Kathiria.	Rajab Burh... ... ... Male, 40 years... Inoculated in April 1897. Scokly ... ... Female, 30 „ ... „ „ Dherio ... ... Male, 7 „ ... „ „ Dherio was attacked 15 days after the date of inoculation. Had femoral bubo (left). Fever, head and backache and nausea. Died three days after the attack.	
Lower Damaon, Rua Real (Kathiria).	Ruttonjee Oamally ... ... Male, 30 years.... Inoculated in March and May 1897. Luckmon ... ... „ 16 „ ... „ „ Rami ... ... Female, 25 „ ... „ April 1897. Parwati ... ... „ 10 „ ... „ „ and May 1897. Mulchand ... ... Male, 4 „ ... „ „ „ Amba ... ... Female, 25 „ ... „ „ Bhulis Dhulob was attacked on the 13th May. Femoral bubo which was cauterized. Fever, headache, nausea and vomiting. Recovered.	Bhulis Dhulob ... ... Female, 60 years.
	Keshao Hiraji ... ... Male, 40 years... Inoculated in April 1897. Morar ... ... „ 45 „ ... „ „ Bajwan ... ... „ 18 „ ... „ „ Dalia ... ... „ 6 „ ... „ „ Bhicky ... ... „ 8 „ ... „ „ and May 1897. Keshao Hirajee was attacked nine days after inoculation. Had high fever, head and backache, nausea and vomiting. Femoral bubo (right side) suppurated. Recovered. Dalia was attacked 11 days after inoculation. Had fever, headache, nausea and vomiting. Cervical gland enlarged. Recovered.	Amba Jeewan ... Female, 16 years.
Lower Damaon, Kathiria.	Sucky Buna ... ... Female, 26 years... Inoculated in April 1897. Lalla ... ... Male, 6 „ ... „ „ Govan ... ... „ 10 „ ... „ „ Pemah ... ... „ 4 „ ... „ „ Sucky Buna was attacked 12 days after the inoculation. Had fever, head and backache. Femoral bubo (left). Recovered. Govan was attacked eight days after inoculation. Had high fever and headache. Cervical bubocs (left). Died three days after. Pemah was attacked nine days after inoculation. Had fever, headache and axillary bubo. Died three days after.	
Lower Damaon, Kathiria.	Govan Bicary ... ... Male, 38 years... Inoculated in April 1897. Luckmi ... ... Female, 60 „ ... „ „ Daily ... ... „ 40 „ ... „ „ Chipky ... ... „ 8 „ ... „ „ Luckmi was attacked 17 days after the date of inoculation. Fever and other symptoms mild. Femoral bubo (right) which was cauterized. Recovered. Daily was attacked 12 days after inoculation. Femoral bubo. High fever, headache, delirium and vomiting. Died three days after the attack.	
Lower Damaon, Kathiria.	Narain Kalibul ... ... Male, 48 years... Inoculated in April 1897. Divly ... ... Female, 2 „ ... „ „ Divly was attacked 16 days after inoculation. Cervical bubo. High fever, vomiting and convulsion. Recovered after 15 days.	Dhanby Sookly ... ... Female, 26 years. Dhanby Sookly was attacked 20 days after the date of inoculation. Had very high fever, delirium, head and backache. Aborted after six days. Moribund when seen at the time of investigation.
	Gopal Fakir ... ... Male, 40 years... Inoculated in April 1897. Rami ... ... Female, 35 „ ... „ „ Harjeevan ... ... Male, 9 „ ... „ „ Naran Bagwan ... ... „ 12 „ ... „ „ Gopal Fakir and Rami were attacked a month after inoculation. Had fever, headache and vomiting. Gopal Fakir had axillary bubo and Rami femoral (left) bubo, both were cauterized. Recovered. Naran Bagwan was attacked nine days after inoculation. Had fever and headache. Femoral bubo, which was cauterized. Died after four days.	

Occurrences of Plague in Houses inhabited by Persons inoculated against the Plague.

Full Address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaon, Lane opposite Fish Market.	Maria Angelica dos Remedios...Female, 10 years....Inoculated on 5th April 1897. Maria Angelica was attacked 10 days after inoculation. Had high fever, headache and delirium. Right axillary bubo. Died three days after.	Jotto dos Remedios ... ... Male, 30 years. Alchina ... ... Female, 26 „ Candinha ... ... „ 5 „ Jono ... ... Male, 1 „
Lower Damaon, Parboowad.	Mackan Jeevan ... ... Male, 55 years... Inoculated on 6th April 1897. Withal ... ... „ 9 „ ... „ „ Withal was attacked 15 days after inoculation. Had axillary and cervical buboes. High fever. Died five days after.	Harki Jeevan ... ... Female, 15 years. Pemly Jeevan ... ... „ 35 „
Lower Damaon, Rua dos Carniceiros.	Candenho Lopes ... ... Male, 20 years... Inoculated on 25th April 1897. Daniel Pestana ... ... „ 13 „ ... „ „	Raza Maria Lopes ... ... Female, 22 years. Jesmina Lopes ... ... „ 40 „ Justiniano ... ... Male, 6 „ Monte ... ... „ 5 „ Jesmina Lopes was attacked on the 18th May. Had high fever, head and backache, nausea and vomiting, and delirium. Axillary bubo (right). Died on the 24th May.
Lower Damaon, Rua do Carpenteiros.	Narayan Bagwan ... ... Male, 40 years... Inoculated on 7th April 1897. Kassan Narayan ... ... „ 25 „ ... „ 6th „ Ambah ... ... „ 7th „ Narayan Bagwan was attacked 15 days after inoculation. Had fever and delirium. No bubo. Died five days after the attack.	
Lower Damaon, Rua de Macotinha.	Bhicka Mackan ... Male, 24 years... Inoculated on 6th April 1897. Bhicka Mackan was attached 15 days after inoculation. Had fever, headache and vomiting. Bubo in the left groin. Recovered.	Mackan Lalla ... Male, 69 years. Luxmi ... ... Female, 2 „

III.

LOWER DAMAON.

Particulars of Households where Inoculation had been applied and Plague occurred afterwards.

Attacks in those inoculated with reduced doses of prophylactic; or in their Relations.

Investigated by SURG.-MAJ. LYONS, L.M.S.

Lower Damaon, Rua dos Carpenteiros.	Dyab Genah ... ... Male, 18 years... Inoculated on 5th May 1897. Ranchore B. ... ... „ 40 „ ... „ March 1897. Rami ... ... „ 15 „ ... „ „ Dyab Genah was attacked on the 6th May. Had high fever (temperature 107°), severe head symptoms. Femoral bubo (left). Died on the 11th May 1897.	
Lower Damaon, Forte de S. Jerónimo.	Rev. Fr. Punenta ... ... Male, 47 years... Inoculated on 6th April 1897. Bicuria Incharia ... ... „ 60 „ ... „ 5th „ Bicuria Incharia was attacked 20 days after inoculation. Had fever, head and backache. Died on the 6th May.	
Lower Damaon, Rua Maneckjee Sorabjee.	Jeewan Pemah ... ... Male, 50 years... Inoculated on 25th March and 8th April 1897. Bhiky Pershotam ... ... Female, 29 „ ... „ 6th April 1897. Cassam Jeevan ... ... Male, 18 „ ... „ 25th March and 2nd April 1897. Pali Bhicka ... ... Female, 4 „ ... „ 6th April 1897. Cashi Jeewan ... ... „ 9 „ ... „ „ Collan Jeevan ... ... Male, 7 „ ... „ 25th March and 2nd April 1897. Bhiky Pershotam was attacked on the 25th April. Fever (temp. 103°) and slight headache. Had buboes in the right groin and two about the right side of the right mammary gland. Recovered completely on the 7th May 1897. Pali Bhika was also attacked on the 25th April. Fever temp. 104°. Bubo in the right groin with other symptoms which were mild. Recovered completely on the 5th May 1897.	
Lower Damaon, Rua de Caldereiros.	Withal Hary ... ... Male, 60 years... Inoculated on 5th April 1897. Daya Naran ... ... Female, 45 „ ... „ „ Withal Hary was attacked on the 29th April. Fever, headache and delirium. Bubo inguinal and axillary. Died three days after.	
Lower Damaon, Rua Angelica, Fish Market.	Camillo do Remedios ... Male, 37 years... Inoculated on 23rd April 1897. Humiliano ... ... Female, 27 „ ... „ „ Francis ... ... Male, 10 „ ... „ „ Ludovina ... ... Female, 7 „ ... „ „ Maria Eugenia ... ... „ 5 „ ... „ „ Vithal ... ... Male, 1½ „ ... „ „ Bicaida ... ... „ 15 „ ... „ „ Francis was attacked on 5th May. Had fever, convulsion and femoral bubo (right). Died three days after the attack.	

Occurrences of Plague in Houses inhabited by Persons inoculated against the Plague.—*contd.*

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if he is amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated*; date of onset of disease, symptoms, issue.
Lower Damaon, Rua dos Carniceiros.	Bibiana Falleiro ... ... Female, 43 years... Inoculated on 25th April 1897. Theodoro ... ... Male, 25 „ ... „ „ Helena ... ... Female, 30 „ ... „ „ Ermelinda ... ... „ 18 „ ... „ „ Eliza ... ... „ 10 „ ... „ „ Athala ... ... „ 4 „ ... „ „ Maria Augusta ... ... „ 8 „ ... „ „ Francis ... ... Male, 2 „ ... „ „ Helena was attacked on the 12th May. Had high fever, nausea and vomiting, head and backache. Femoral bubo on the right side. Died on the 15th May 1897.	Albino C. Falleiro.
Lower Damaon, Rua de Caldereiros.	Leopoldina Fernandes ... Female, 45 years... Inoculated on 6th April 1897. Agostinho ... ... Male, 24 „ ... „ „ Joaquim ... ... „ 30 „ ... „ 25th „ Nicolas ... ... „ 1½ „ ... „ 2nd May 1897. Leopoldina Fernandes was attacked 15 days after inoculation. Had fever, nausea and delirium. Bubo in the right groin, suppurated. Recovered. Nicolas was attacked 29 days after inoculation. Had slight fever and nausea. Bubo in the left groin. Recovered.	Valentino Fernandes ... ... Male, 66 years. Estaphania ... ... Female, 20 „ Valentino Fernandes was attacked on 12th April. Had all the symptoms of plague. Bubo left groin. Died on 23rd April 1897. Estaphania was attacked on 5th April. Had fever and headache. Aborted on the 18th April. Bubo in the left groin which suppurated and healed. Recovered.
Lower Damaon, Brahman Falia.	Baichand Virchand ... Male, 30 years... Inoculated on 2nd May 1897. Melabchand ... ... „ 22 „ ... „ „ Dyakore Ghunibai ... ... Female, 20 „ ... „ March 1897. Mahanlal Bhaichand ... Male, 2 „ ... „ „ Baichand Virchand was attacked on the day of inoculation and died three days after. Had fever and enlarged glands in cervical region and in the groin of left side.	Virchand Nemchand ... ... Male, 60 years.

38

Lower Damaon, Kathiria.	Bena Narron ... ... Female, 13 years... Inoculated on 28th April 1897. Bena Narron died of plague at the end of May 1897.	Debro Dhehirjan ... ... 12 years. Motis Radis ... ... 35 „ Narron Debro ... ... 50 „ Bajrodi Narron Debro ... ... 45 „ Kali Narron Debro... ... ... 22 „ Moti Kolakhmis ... ... 35 „
Lower Damaon, Rua dos Caldereiros.	Diamantina Fernandes ... Female, 60 years... Inoculated on 5th April 1897. Dayana M. Fernandes ... „ 18 „ „ „ Theodorico ... ... Male, 25 „ „ „ Diamantina Fernandes was attacked on the 20th May. Had fever, headache and nausea. Femoral (right) gland enlarged. Recovered.	Aniceto do Rozario ... ... Male, 30 years. Maria Luiza ... ... Female, 28 „ Antonio ... ... Male, 5 „ Aniceto do Rozario was attacked on the 30th April. Had high fever, head and backache. Femoral (left) bubo. Died on the 1st May. Maria Luiza was attacked about the 15th April. Fever, headache and nausea. Left femoral bubo. Recovered.
Lower Damaon, Rua dos Carpenteiros.	Naran Pemah ... ... Male, 18 years... Inoculated on 5th April 1897. Naran Pemah was attacked on the 16th May. Had very high fever, nausea and severe head symptoms with delirium. Femoral bubo left side. Died on the 23rd May 1897.	Jamna ... ... Female 50. Maly ... ... „ 16. Jamna was attacked about a month after the date of inoculation in this house. Had fever, but no bubo. Died five days after the attack.
Lower Damaon, Rua Real.	Jose St. Anna ... ... Male, 33 years... Inoculated on 5th April 1897. Balbina Sta Anna... ... Female, 35 „ ... „ on 2nd May „ Verissuno ... ... Male, 9 „ ... „ in March „ Nicolao ... ... „ 6 „ ... „ on 2nd May „ Jose Carimo ... ... „ 3 „ ... „ in April „ Jose St. Anna was attacked about the 15th April. Had high fever, head and backache. Femoral bubo, which was cauterized. Recovered.	Annanha Fernandes ... ... Female, 25 years. Annanha Fernandes was attacked on the 26th March. Had very high fever, delirium, head and backache. Aborted on the 30th March and died on the 1st April.

39

Occurrences of Plague in Houses inhabited by Persons inoculated against the Plague—*concld.*

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated* ; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated* ; date of onset of disease, symptoms, issue.
Lower Damaon. Near Market.	Eufrazia do Rozario ... Female, 14 years... Inoculated on 25th April 1897. Eufrazia do Rozario was attacked five days after the date of inoculation. Had high fever with severe head symptoms. Femoral bubo (right). Died on the 3rd May.	Alxendrina do Rozario ... ... Female, 45 years. Adelina Pereira ... ... „ 30 „ Alxendrina do Rozario was attacked on the 15th April. Had very high fever, nausea, vomiting and severe head symptoms. Cervical buboes on left side. Died on the 26th April. Adelina Pereira was attacked on the 23rd April. Had high fever and head and backache ; delirium. Was in an unconscious state for eight days. Femoral bubo (right). Died on the 8th May.
Lower Damaon, Rua Real.	Bagwan Naran ... ... Male, 33 years... Inoculated in March and on 5th April 1897. Amba ... ... Female, 33 „ ... „ on 5th April 1897. Suckuri ... ... „ 6 „ ... „ in March and May 1897. Mithi ... ... „ 6 „ ... „ „ „ „ Deobai ... ... „ 3 „ ... „ in April and May 1897. Maneck ... ... „ 8 „ ... „ on 6th April 1897. Persotam ... ... Male, 9 „ ... „ in March and May 1897. Maneck was attacked about a month after inoculation. Had very high fever with axillary and femoral buboes, which were cauterized. Died on the 19th May 1897.	Jamna ... ... Female, 15 years. Jamna was attacked about the 24th April. Had fever, nausea and vomiting. Femoral bubo (left). Died on the 1st May 1897.

IV.

LOWER DAMAON.

Particulars of Households where Inoculations had been applied and Plague occurred afterwards.

Reported attacks in Inoculated which took place after conclusion of Investigation and have not been included in the Analysis.

Full Address.	Names, sexes, and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, age of the attacked, if amongst the *inoculated* ; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, age of the attacked, if amongst the *uninoculated* ; date of onset of disease, symptoms, issue.
Lower Damaon, Moda (Rua de Faquir Cassom).	Caetano Machado ... ... Male, 40 years... Inoculated on 25th April 1897. Eugenia Machado... ... Female, 13 „ ... „ „ Joao Baptista ... ... Male, 15 „ ... „ „ Theodomiro ... ... „ 10 „ ... „ „ Narcizo ... ... „ 10 „ ... „ „ Verediana ... ... Female, 8 „ ... „ „ Sophia ... ... „ 35 „ ... „ 28th „ Jayme ... ... Male, 8 months. „ „ Francisco ... ... „ 8 „ ... „ „ Flaviana ... ... Female, 55 years... „ „ Maria Francisca ... ... „ 28 „ ... „ 25th „ Vicente ... ... Male, 37 „ ... „ „ Agestinho ... ... „ 4 „ ... „ 1st May 1897. Eugenia Machado was attacked on the 30th May. Had high fever, nausea, vomiting and severe head symptoms. No bubo. Died on the 1st June 1897.	

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