STUDY OF LOBAR PNEUMONIA IN PORTO RICO

PRELIMINARY REPORT

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In spite of the fact that lobar pneumonia as a cause of death, does not appear in the demographic statistics of our Department of Health until the fiscal year 1921–1922, we have no doubt that its sporadic or probably endemic and epidemic occurrence in Porto Rico dates back to a very remote epoch.

TABLE No. 1

DEATHS

Year	Broncho, Pneumonia	Unclassified Pneumonia	Lobar Pneumonia	Total
1914–15	749	638	.....	1,387
1915–16	822	569	.....	1,391
1916–17	1,198	837	.....	2,035
1917–18	992	770	.....	1,760
1918–19	1,646	1,878	.....	3,524
1919–20	1,008	1,254	.....	2,262
1920–21	1,271	1,379	.....	2,650
1921–22	1,467	1,509	6	2,982
1922–23	1,380	1,267	18	2,665
1923–24	964	867	51	1,882
1924–25	1,880	1,323	56	3,259
1925–26	1,370	1,150	61	2,581
1926–27	1,422	1,044	106	2,572
1927–28	1,509	890	112	2,511
1928–29	1,984	1,202	164	3,350

Population of Porto Rico: 1,472,755.

The classicism of the symptomatology and physical signs of the disease could not but make easy the clinical diagnosis of lobar pneumonia for our physicians, but we must admit that not until recently have the pathological(1) and etiological diagnoses been definitely established.

Even in countries where lobar pneumonia is the most important cause of death there are still a number of very interesting unsolved epidemiological and bacteriological problems. We should not wonder, therefore, that in Porto Rico where according to official figures, lobar pneumonia is a very insignificant health problem, its field has been almost entirely unexplored.

The prevalent idea among the medical profession of the Island is that lobar pneumonia is very rare with us. Some go so far as to deny its occurrence in Porto Rico. Others, while admitting it, ascribe to it an atypical or a benign course.

We have, therefore, besides the question of morbidity and mortality of lobar pneumonia, the very interesting question of its bacteriological diagnosis and the estimation of the relative predominance of each of the four different types of pneumococcus.

We shall endeavor to deal with some of these questions in this preliminary report based upon the study of 127 cases of lobar pneumonia admitted to the Municipal Hospitals of San Juan.

INCIDENCE

This study was started in January, 1929 and is being continued. Up to October 1st, 1930 there were 127 cases of lobar pneumonia, out of a total admission of 6,081. Of these, 3,245 were admitted to the medical wards, but allowing a deduction of 20 per cent to account for those cases which were eventually transferred to the surgical service, this figure is reduced to 2,597 strictly medical cases. Lobar pneumonia represents 4.8 per cent of this number.

The monthly admissions to the medical wards varied from 94 to 199. I wish to draw attention to the fact that the lowest number of admissions correspond to January, February and March, 1929. This should account for the low incidence of lobar pneumonia during those months as compared with higher figures for the same months during 1930.

TABLE No. 2

METEREOLOGICAL CONDITIONS IN PORTO RICO

1929–1930	Temperature		Relative Humidity		Percentage of Sunlight	Wind Velocity Miles per hour
	Maximum	Minimum	Maximum	Minimum		
January	80	70	79	72	72	12.8
February	81	69	78	69	73	11.4
March	80	70	78	73	68	13.5
April	82	71	70	67	73	12.4
May	81	72	78	76	57	13.4
June	84	74	78	77	64	12.1
July	84	76	75	74	71	15.0
August	84	75	78	78	62	11.7
September	85	75	80	77	58	8.0
October	85	75	79	76	78	8.5
November	82	73	81	78	70	11.6
December	81	71	80	74	77	12.5
January	79	69	81	76	72	12.3
February	80	69	82	71	67	8.5
March	82	70	79	71	78	10.1
April	82.6	71.6	78	73	74	12.4
May	85.1	74.2	75.3	70.2	60	9.9
June	84.5	75.0	74.5	73.4	53	11.6
July	84.9	75.8	80.4	75.4	77	13.8
August	86.0	76.2	76.9	75.4	85	10.7
September	85.2	76.0	78.4	76.4	73	10.4

In going over Chart I which represents the monthly incidence of lobar pneumonia in our series, we recognize the difficulty in

reaching any definite conclusions in view of the relatively small number of cases which have been so far studied by us, especially in this disease which has up to the present time deceived the most thorough and conscientious scientific investigators throughout the world.

TABLE No. 3

DEATHS DUE TO PNEUMONIA DURING THE YEAR 1929

Date	Broncho Pneumonia	Lobar Pneumonia	Unclassified Pneumonia	All causes Total deaths
January	183	13	98	4,070
February	161	10	101	3,294
March	193	14	90	3,455
April	162	10	73	3,051
May	167	17	65	3,148
June	165	9	95	3,234
July	166	10	84	3,370
August	148	13	62	3,048
September	141	10	60	2,992
October	160	7	69	3,146
November	143	10	84	2,914
December	135	14	78	2,812
Total	1,934	137	959	38,494

According to the mortality statistics (Table 3) of the Bureau of Statistics of the Health Department of Porto Rico there is no monthly nor seasonal variation in the number of cases reported as lobar pneumonia. On the other hand, if we add together the number of deaths from Bronchopneumonia, lobar pneumonia and unclassified pneumonia, this cipher is higher for January, February and March than during any other three months of the year. This also holds true in regard to the general mortality in the Island. The total number of deaths from lobar pneumonia during 1929 was 137, and the mortality from all causes was 38,494.

This year there was a higher incidence of lobar pneumonia during February, March, April, May and June. How may we account for it? It will be interesting to know that Dr. Morales Otero * who was making at the same time (in collaboration with Dr. Dochez of Columbia University) bacteriological studies of the throats of normal persons in Porto Rico, found a predominance of the streptococcus viridans and of gram negative micrococci during the autumn and winter months. The pneumococci and Pfeiffer bacilli made their appearance in cultures taken from the throats of normal persons during the first fortnight of February, coinciding with an increase in the number of cases of lobar pneumonia.

Of course, the presence of the pneumococcus would partially ac-

* Personal communication.

count for the higher incidence of the disease, but why were the throats of normal persons contaminated during February, March and April and not during July, August and September? This question, we fear, is apt to remain unanswered for some time.

Cold and humidity, especially abrupt changes of temperature, are considered important predisposing factors. Here we have also in Chart I, Table 2 the meteorological changes in Porto Rico during these twenty months. We are indebted, for this data, to Dr. Fassig, the former, and to Dr. Hartwell, the present director of the U. S. Weather Bureau in San Juan. You will notice, under the monthly columns, the average maximum and minimum temperatures, the relative humidity, the percentage of sunlight, the velocity of the wind and the amount of rainfall computed in inches.

In olden times they used to attribute some importance to westward winds in the causation of pneumonia. In Porto Rico the prevailing direction of the wind throughout the year is between east-northeast and east-southeast(2). The average velocity is remarkably constant, averaging eleven miles per hour. In our study it has ranged from eight miles per hour in September 1929 to 13.5 in March 1929.

The percentage of sunlight has shown only slight variation from fifty-three per cent in June 1930 to eighty-five per cent in August 1930.

The variations in the average humidity from month to month are not great. The average for the year is seventy-eight per cent; during the driest month, March, it is seventy-four per cent, and during the most humid months of October and November, it is eighty per cent. The relative humidity, of course, varies greatly during the course of the day and we have, in our series diurnal fluctuations between sixty-seven per cent at noon in April 1929 and eighty-two per cent at 9 A. M. in February 1930.

The small variations in the mean temperature noted in tropical localities is more evident in San Juan due to the fact that the city is almost surrounded by water, the ocean to the north and the harbor to the south. The difference between the mean maximum and the mean minimum temperature during these twenty months is almost uniformly 10°. Only in one month, February 1929, there is a difference of 12°.

As to rainfall. There are no well defined wet and dry seasons on the Island but according to Dr. Fassig(2), the minimum of 3.26 inches in February(3) increases steadily to a maximum of 8.69 inches in October, followed by a rapid decrease to January. A slight but

well marked drop occurs in the annual curve in June. Our curve on Chart I is very similar to this description with the only difference of a severe and prolonged drought this year which lasted up to September 1930.

In comparing the curves representing the monthly incidence of lobar pneumonia with the curve representing the rainfall in inches a most interesting fact is noticeable, which as far as we know, may be only a coincidence. We shall mention it without comment.

Excluding the readings of March 1930, we have almost exact timing between the peaks of increased number of cases of lobar pneumonia with the diminished rainfall. The peak in June corresponds exactly with the drop in rainfall which occurs annually in this month; again we see the same picture in December 1929 and a more decided one during April, May and June 1930. The reverse picture is seen during September 1929, and in January and September 1930.

Having in mind the importance played by "carriers" in the epidemiology of lobar pneumonia, we could speculate with the idea that a greater quantity of contaminated dust in the atmosphere would account for our higher incidence during the dry season. That dust may play a role in the causation of lobar pneumonia has been proven by the experiments of Stillman(4). Avery and his collaborators in their exhaustive study of lobar pneumonia in New York although assigning a minor role to dust as a causative agent, explain the mechanism of its action as an irritation or traumatism producing sneezing and rhinitis and consequently lowering the resistance of the mucous membrane of the upper air passages.

We should not forget that a greater number of tourists visit the island each year during January, February and March and that due to unemployment in New York City a greater number of Porto Ricans are returning home after a more or less prolonged residence in the States. In all probability "carriers" of the more virulent strains of the pneumococcus are more numerous in Porto Rico now than they used to be.

We had eighteen deaths in our series of 127 cases, a mortality of 14.2 per cent. In the hospitals of the larger cities of the world the mortality runs at an average of thirty per cent. In Pittsburgh it is forty per cent and in Bellevue Hospital of the City of New York it varies from thirty to fifty per cent. In private practice in the United States, the mortality as a rule, is twenty-five per cent and in children between two years and ten years of age it goes as low as ten per cent.

In the year 1917 there were 8,479 cases of lobar pneumonia in

the United States Army. Of these 952 died, a mortality of 11.2 per cent. After the mobilization for the world war in the winter of 1917–18 the mortality was 23.1 per cent, during the summer of 1918, 18.8 per cent, and in the autumn of the same year during the epidemic of influenza the number of cases of pneumonia rose to 61,197 with a mortality of 21,053 or 34.4 per cent.

That lobar pneumonia, contrary to current belief, may become a serious health problem even in tropical regions is seen by the reports given out yearly by the Medical Department of the United Fruit company. Lobar pneumonia causes more deaths in their tropical division than any other disease. The mortality used to be forty-three per cent, up to the year 1924 when they registered a mortality of 34.7 per cent and Dr. H. M. Walker of the Puerto Castillo Hospital, Honduras, reports lobar pneumonia as the cause of twenty-five per cent of total hospital mortality. Dr. Winn attributes their high mortality, to lack of racial resistance to pulmonary infections, especially in their Indian and Mestizo employees, to lack of personal hygiene and cleanliness, to debilitating co-existing diseases: malaria, hookworm and syphilis, to alcohol and undernourishment and for an increase in the number of cases in 1925 at the Santa Marta Hospital in Colombia Dr. Drennan blames the unusually heavy rainy season of the year.

The number of deaths from all causes which have occurred in the Municipal Hospital of San Juan during this period of twenty months was 270. Of this number eighteen or 6.6 per cent were cases of deaths from lobar pneumonia. Up to this time five per cent of the total number of autopsies performed at the School of Tropical Medicine have been cases of lobar pneumonia (twenty-one cases of lobar pneumonia in 411 autopsies).

In the Hospital at Ancón, lobar pneumonia is the cause of thirty-seven per cent of the total mortality. In Porto Rico as seen in Table 3, we had in the year 1929, 38,494 deaths, of which only 137 were reported as due to lobar pneumonia. If our number at the Municipal Hospital which is a general hospital, could serve as an index for the general mortality in the Island, the official statistics should have shown 2,540 deaths from lobar pneumonia instead of 137 deaths; that is, 6.6 per cent of the total mortality in the Island.

Even if we dismiss as untenable the assumption that the mortality in a general hospital should run hand in hand with the mortality in the region where it is located, we must admit, however, that the difference here in Porto Rico is so great in relation to lobar pneumonia that there is bound to be an error somewhere.

Mortality from lobar pneumonia which had been from 128 to 143 per 100,000 inhabitants in the State of Illinois has decreased to 87.5 per 100,000 since 1920. Assuming to be correct the statistics in Table I, and considering the population of Porto Rico to be 1,472,755, we would have only nine deaths from lobar pneumonia for every 100,000 people. We are firmly convinced that nine deaths do not represent the exact situation in Porto Rico and that a good number of cases of lobar pneumonia have been most certainly added to the column representing the unclassified pneumonias which is shown to be comparatively higher in Porto Rico than in any other part of the world.

AGE, COLOR AND SEX

The ages in our series vary from five months to 59 years. There were seventy-four patients over ten years of age. In this group the mortality was 18.9 per cent. Under ten years we had fifty-three cases with four deaths, a mortality of 7.5 per cent; forty-seven cases were white, thirty-four full-blooded negroes and forty-six mulattoes. It is interesting to know that while patients represent forty-eight per cent of the total admissions to the Municipal Hospital and only thirty-seven per cent of the cases of lobar pneumonia the number of male and female patients, both adults and children, was nearly equal.

DAYS SICK AT HOME BEFORE ADMISSION

The patients had been sick at their homes for a number of days varying from one to sixteen, with an average of five and a half days. Only seventeen cases came into the hospital within the first three days of the disease. As a general rule, it can be said that the great majority were admitted when the disease was already well advanced, during the period of red hepatization or just a few hours preceding crisis or death.

LEUCOCYTOSIS

Leucocyte or differential counts were repeatedly done by our resident physician Dr. García Estrada, on eighty per cent of the cases. The white blood cell counts varied from 5,600 to 32,000, the highest count. The average leucocytosis was 14,700 in the fatal cases and 16,500 in those that recovered. As a mere curiosity we mention the fact that both the highest and lowest counts were obtained in patients who eventually recovered.

LOBES INVOLVED

Only one lobe was affected in ninety-four cases and multilobular

pathology was diagnosed in nineteen. The former yielding a mortality of ten per cent, the latter of forty per cent. In fourteen cases no mention is made as to localization of the lesion.

The diagnosis was made by physical examination and in seventy per cent of the cases this was corroborated by X-ray pictures. These pictures were taken by Dr. Sierra and repeated on the same patient at three to six days intervals up to ten day, or two weeks after defervescence. The radiologic evidence of persistent pulmonary pathology and the electro-cardiographic study on 1,040 cases of lobar pneumonia by Dr. De Graff of Bellevue Hospital and New York City Medical College * definitely showing that the active changes in the heart do not terminate with the crisis, lead us to insist on the necessity of prolonging convalescence for at least two weeks.

We consider the X-ray study of utmost importance in the diagnosis of lobar pneumonia in babies and young children. Fortunately the mortality in the latter is very low and we have reasons to believe that some babies recover and a few die with a mistaken diagnosis of intestinal infection or meningitis. We venture to suggest that an X-ray study of the chest be made of all infants and babies, who, with no evident cause for it, are running a febrile course which has persisted over five days and is accompanied by a leucocytosis of over 15,000 even when cough and dyspnea be absent.

SPUTUM AND HERPES

Rusty sputum was reported in eleven cases and herpes in only six in our series.

TEMPERATURE

The temperature curve in the adults is the typical continuous high temperature with very slight, if any, morning remissions. (Charts 2 and 3.) On the other hand, in children (Charts 4 and 5) we frequently noticed not only marked remissions and irregularities in the curve but also such intermissions as we often see in malaria and pyelitis. For comparison we are presenting Chart 6 of an adult suffering from streptococcus pneumonia and Chart 7, also an adult patient who had a double infection of Pneumococci Type IV and acid bacilli in his sputum. Both cases recovered. Charts 8 and 9 belong to older children who ran a febrile course very similar to that of adults.

* Unpublished paper.

In our first sixty-three cases—defervescence occurred in five to eighteen days, as seen below:

Cases	*Days*
3	5
7	7
2	8
11	9
5	10
2	11
4	12
5	13
1	15
1	18

The highest number of cases correspond to the ninth day.

Of our complete series of 127 cases—sixty-three had defervescence by crisis, fifty-four by lysis and in ten cases the mechanism of recovery or defervescence could not be determined.

TYPE OF THE PNEUMOCOCCUS

The sputum has been typed in twenty-eight cases with the following results: Type I pneumococcus was found in one case, Type II in thirteen cases, Type III in six cases and Type IV in seven cases. It is noted that type I, which is probably the only one amenable to specific serum therapy, has been found but once in our series.

Avery, Chickering, Cole and Dochez in their monograph on Lobar Pneumonia attribute 33.3 per cent of all cases to Type I; 29.3 per cent to Type II; 4.2 per cent to the atypical Type II; 13 per cent to Type III and 20.3 per cent to Type IV.

The New York Pneumonia Commission found that from eighty to ninety per cent of normal persons harbored the pneumococcus, but in the year 1913 the Rockefeller Institute for Medical Research demonstrated the existence of four distinct types of the pneumococcus * and also proved that the pathogenic types I and II are very rarely found in the bucal secretions of normal persons, but that thirteen per cent of normal persons become carriers of type I and twelve per cent carriers of type II after being in contact with acute cases of lobar pneumonia.

The typing of the sputum in our cases as well as blood cultures which were taken in some of the most severe cases was done at

* Seventeen or eighteen varieties are described to-day.

first by Dr. McKinley and later by Dr. Morales Otero, both of the School of Tropical Medicine.

COMPLICATIONS AND SEQUELAE

Otitis media in two cases, mastoiditis in one, jaundice in eight cases, pleurisy with effusion in four, myocarditis in one, bed sores in two cases, cancrum oris (noma) in one, empyema in three cases and one positive Type III pneumococcus bacteremia (Case No. 3201).

AUTOPSIES

Postmortem examinations were performed on seven of the eighteen fatal cases. The outstanding pathological findings as reported by the pathologists of the School of Tropical Medicine are as follows:

Case No. 1688. N. V. (Autopsy No. 191)
1. Lobar pneumonia RUL.
2. Pulmonary edema.
3. Fibrinous pleurisy.
4. Jaundice.
5. Hypertrophy of the heart.
6. Uncinaria.
7. Monckeberg sclerosis of iliac arteries.

Case No. 1688. P. C. (Autopsy No. 199)
1. Lobar Pneumonia.
2. Fibrinous Pleurisy.
3. Acute Bronchitis and tracheitis.
4. Jaundice (Malarial pigmentation of liver).
5. Schistosomiasis of the Rectum.
6. Multiple hemorrhages into the renal tubules.

Case No. 2338. A. S. (Autopsy No. 238)
1. Lobar Pneumonia RUL, RML, RLL, LLL.
2. Bilateral Fibrinous Pleurisy.
3. Jaundice (Splenic tumor).
4. Chronic pulmonary T. B.
5. Secondary anemia.
6. Decubital ulcers of the sacrum.

Case No. 1430. J. R. (Autopsy No. 291)
1. Lobar Pneumonia LUL.
2. Fibrinous pleurisy.
3. Fusiform aneurysm of ascending portion of the aorta
4. Splenic tumor.
5. Uncinariasis.
6. Pneumococcus Type III.

Case No. 2711. R. G. (Autopsy No. 338)
1. Lobar pneumonia LLL, RLL.
2. Confluent lobular pneumonia RUL.
3. Fibrinous Pleurisy.

4. Bacteriology.
   (*a*) Lungs—pneumococcus II.
   (*b*) Spleen—sterile.
   (*c*) Gallbladder B. coli.

Case No. 3201. P. C. (Autopsy No. 369)
1. Lobar pneumonia RUL, RML.
2. Lobular pneumonia—left lung.
3. Acute Splenic tumor.
4. Parenchymatous degeneration of kidney.
5. Pneumococcus type III in blood and lungs.

Case No.—— M. C. (Autopsy No. 394)
1. Lobar pneumonia LLL, LUL.
2. Confluent Lobular Pneumonia.
3. Acute fibrino-purulent pleurisy.
4. Pericarditis.
5. Acute Splenic tumor.

CONCLUSIONS

1. Lobar pneumonia is more frequent in Porto Rico than the official figures might lead us to believe.

2. Judging from the mortality statistics the incidence of lobar pneumonia has been increasing in recent years. Although this is also the opinion of most clinicians in the island, further study and investigation is needed for corroboration.

3. A complete and thorough study of lobar pneumonia in Porto Rico can not be made unless the disease is included in the list of reportable diseases.

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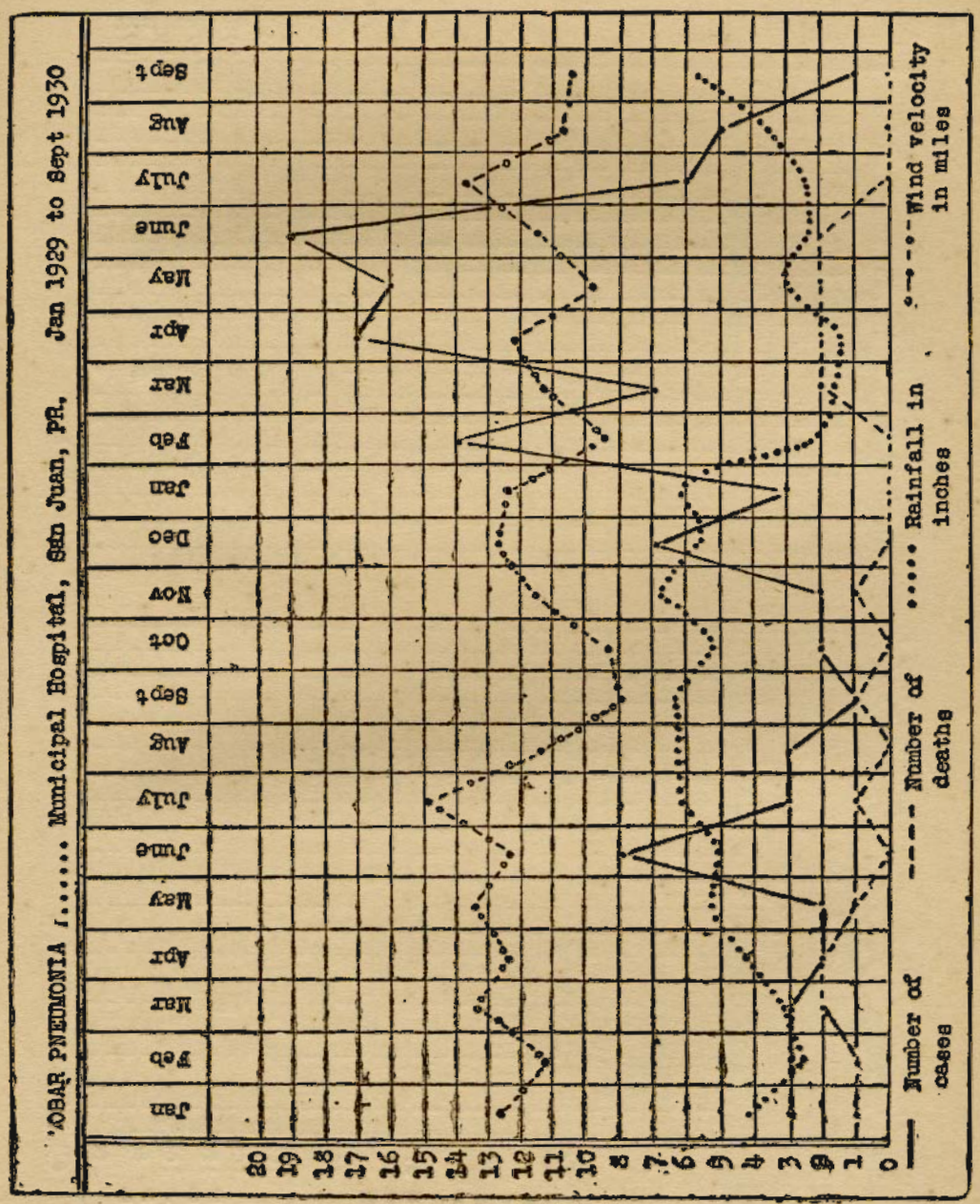
LOBAR PNEUMONIA (..... Municipal Hospital, San Juan, PR. Jan 1929 to Sept 1930
Jan
Feb
Mar
Apr
May
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20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
—— Number of cases
---- Number of deaths
..... Rainfall in inches
-·-·- Wind velocity in miles

CHART I

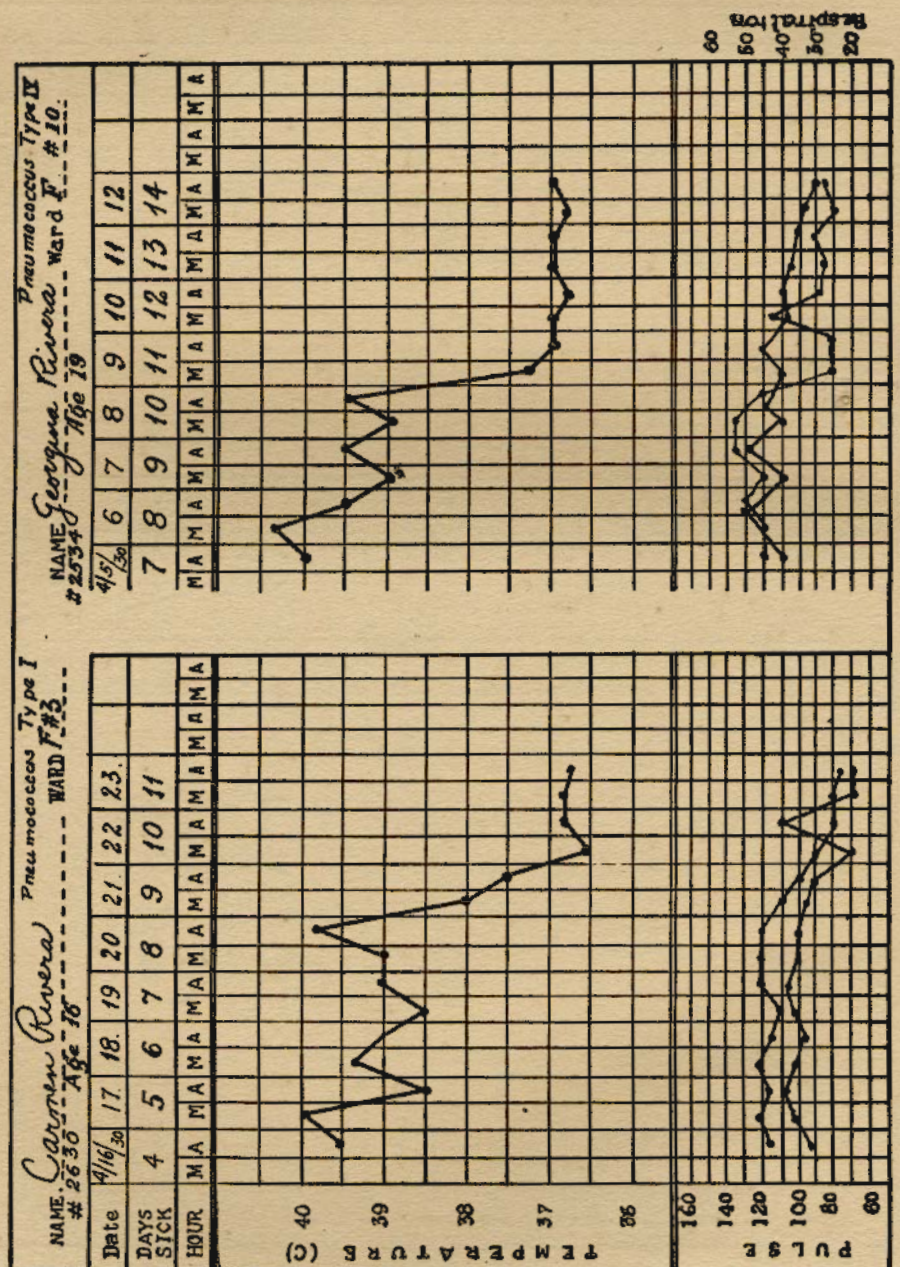

Chart II

Chart III

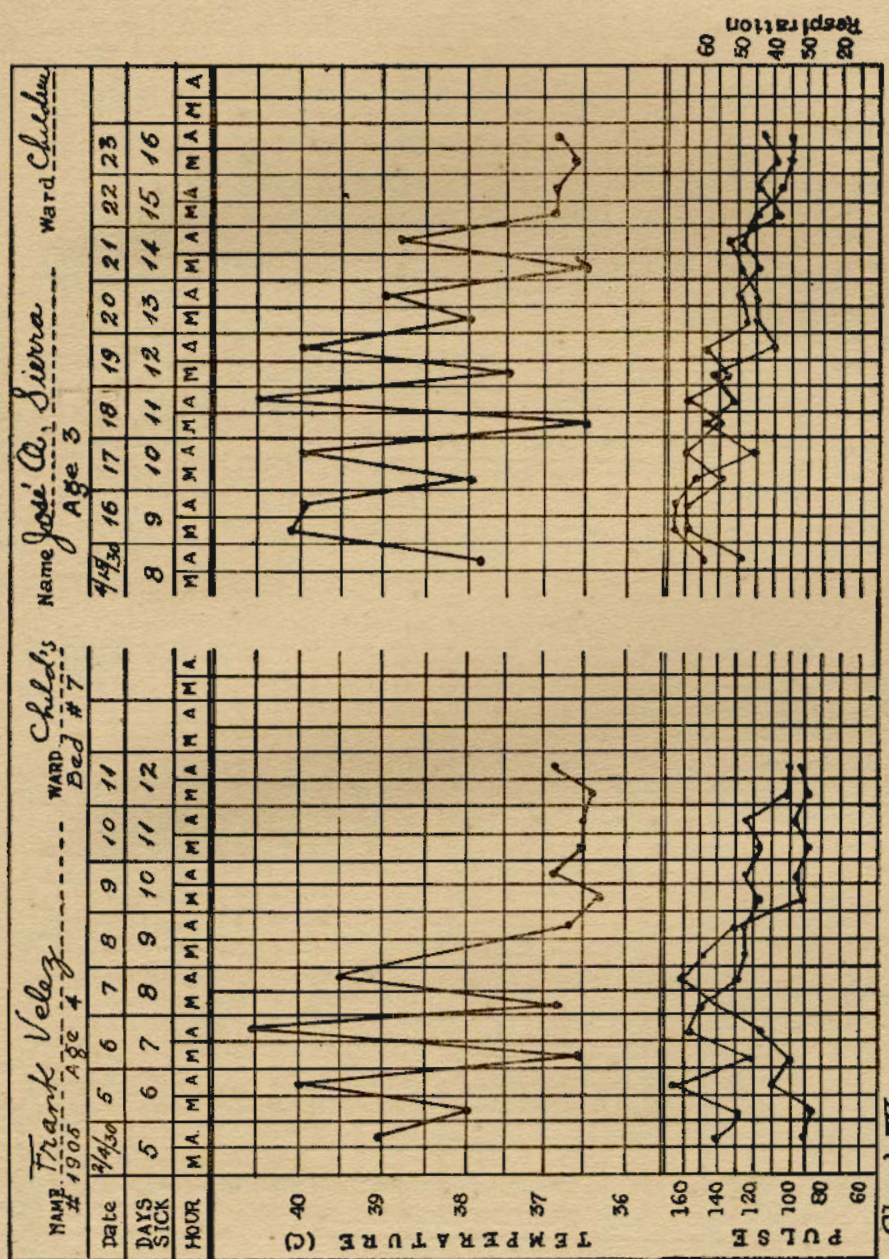

Chart IV

Chart V

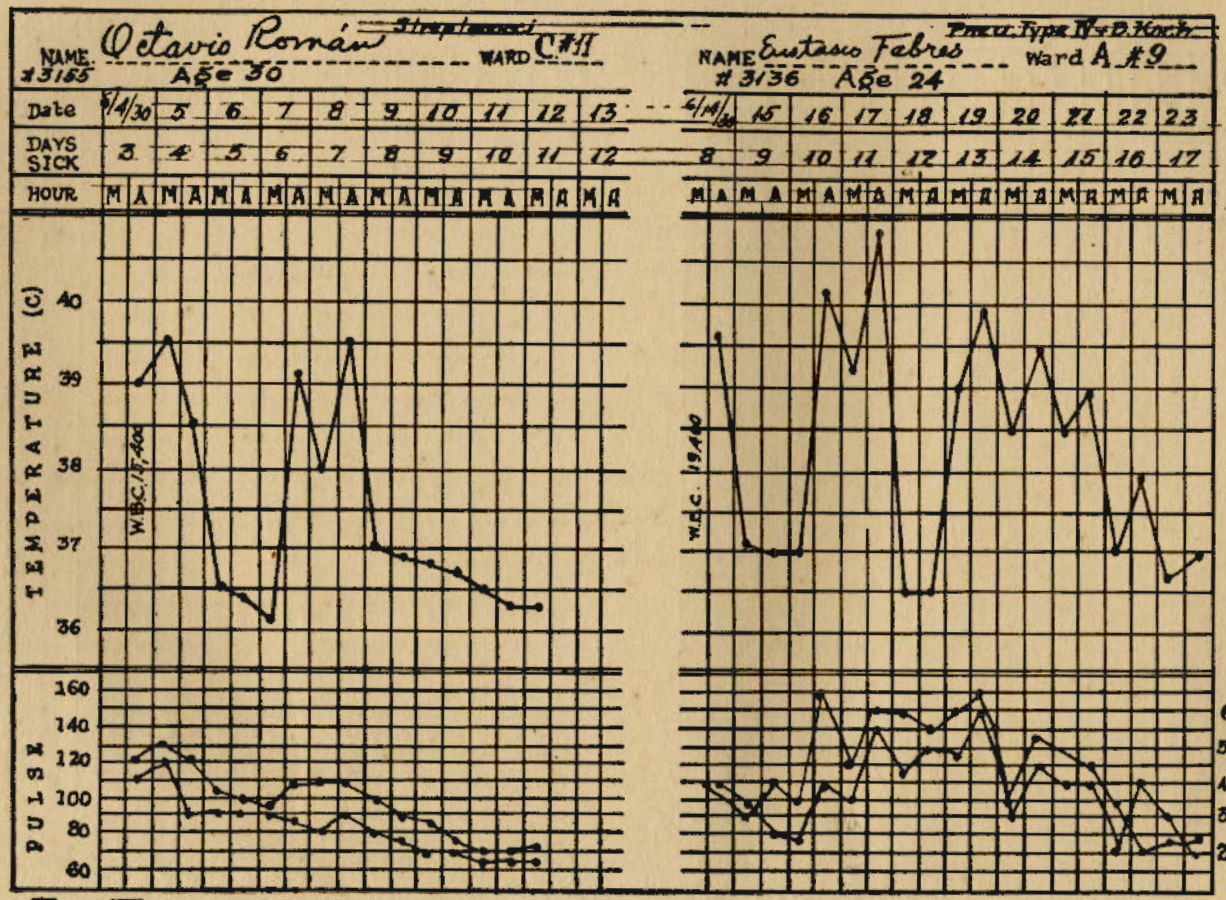

Chart VI.

Chart VII

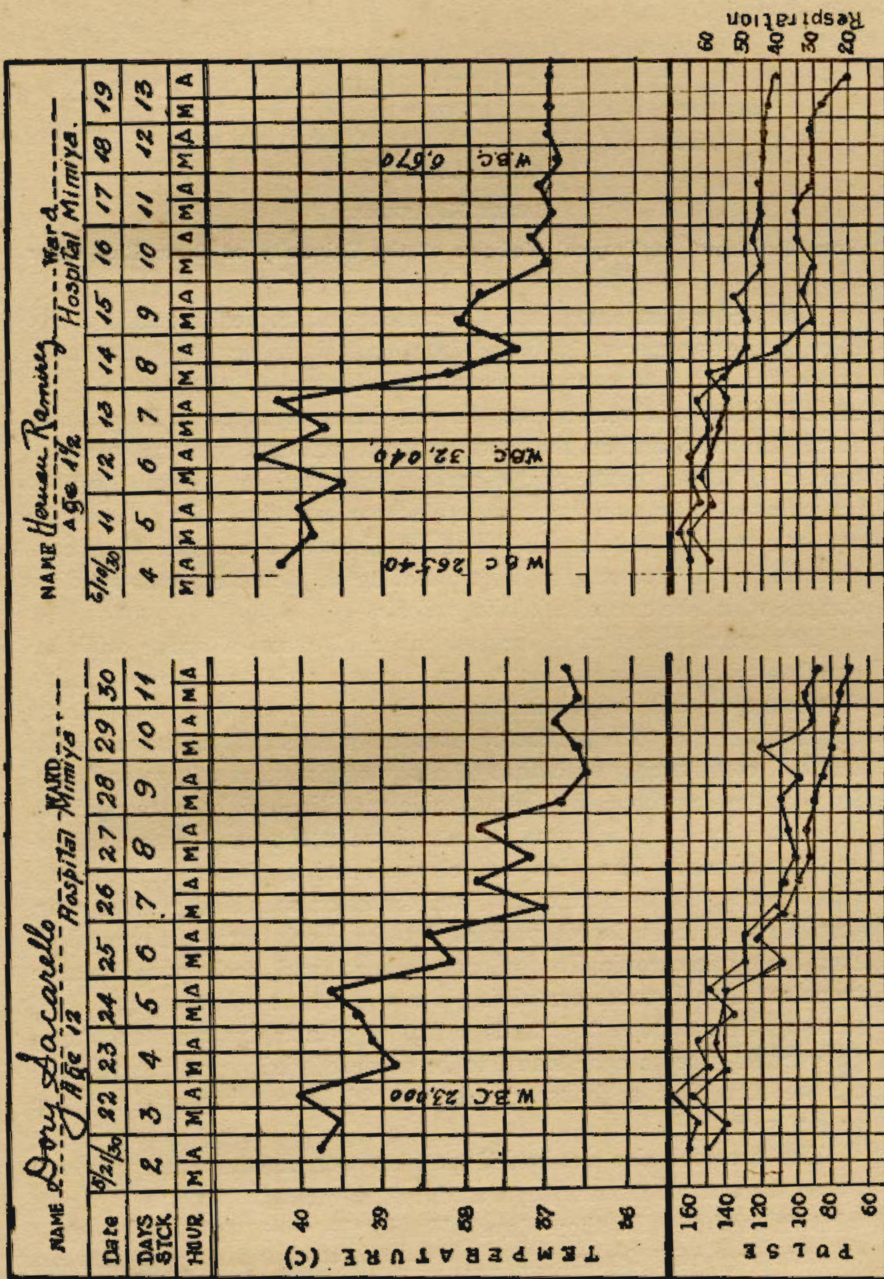

Chart VIII

Chart IX