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## **EPIDEMIOLOGY OF TUBERCULOSIS IN PORTO RICO <sup>1</sup>**

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The mortality from tuberculosis in Porto Rico is and always has been high. It has shown variations from year to year, but no definite tendency to come down. In the last nineteen years, the highest tuberculosis mortality rates have been 267 in the year 1927, 240 in the year 1926, 235 in the year 1928, and 222 in the year 1911. The lowest rates were 134 in 1914, 148 in 1913, and 161 in 1915.

The comparatively low tuberculosis death rates from 1912 to 1916 correspond to a period of very low general death rates in the island, the exact causes of which would be difficult to point out.

The high death rates from 1925 to 1927 might be ascribed to better diagnosis and more general reporting of cases of tuberculosis to the Health Department, as a result of the anti-tuberculosis campaign of the Department, which began in 1924.

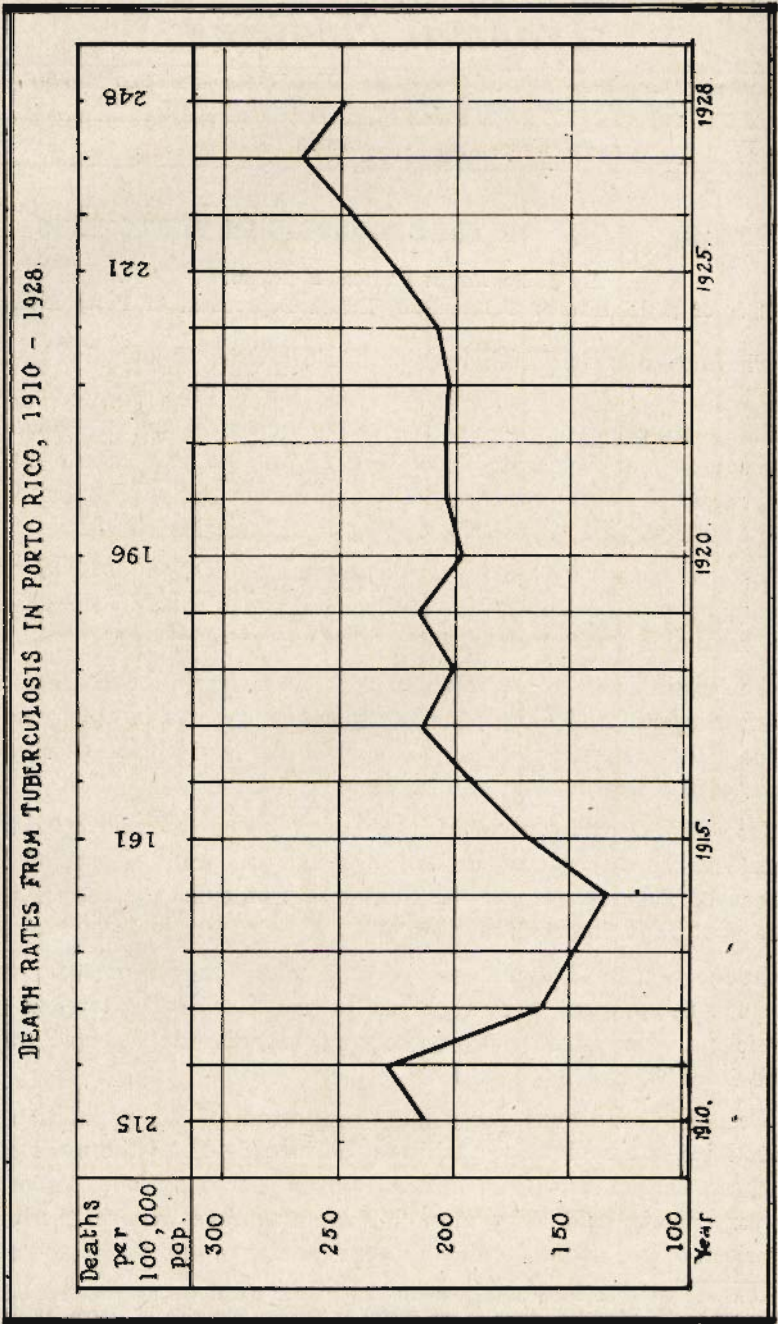
How the Department of Health has succeeded in securing better reporting of cases of tuberculosis, through the joint efforts of the Bureau of Tuberculosis and the Bureau of Epidemiology, can be seen from the graph inserted on page 433.

In the year 1923, 1,629 cases of tuberculosis were reported, while in 1928, 5,190 cases were reported to the Health Department by physicians. The number of deaths from tuberculosis reported were, 2,689 in 1923, and 3,607 in 1928.

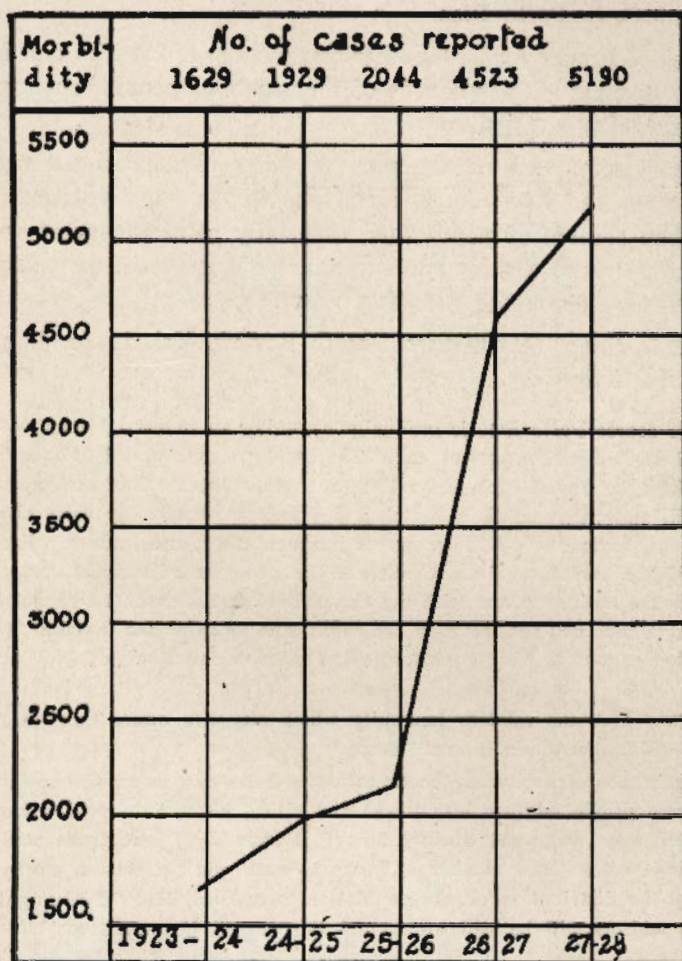
Economic conditions, for a large proportion of the population of Porto Rico, are such as to facilitate the inroads of all those diseases which are caused directly or indirectly by a poor nutrition. Laborers are very poorly paid (75 cents a day as an average, even in the huge American-owned sugar factories, where the net profits of the absentee

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<sup>1</sup> One of a series of studies made under the direction of Dr. Haven Emerson in a course on "Public-Health Problems" given at the School of Tropical Medicine in March, 1928.



PROGRESS IN THE REPORTING OF CASES OF TUBERCULOSIS IN PORTO RICO FROM 1923 TO 1928.



owners amount to several million dollars a year) and work is unstable. There is a season of the year when the laborer can find work nowhere. This season will last six months in some places.

Desperate economic conditions create overcrowding and very low standards of living in the poor *barrios* of all the towns. Overcrowding is undoubtedly one of the most important predisposing causes of tuberculosis in Porto Rico.

Lack of proper food is another cause. Large families and extremely low incomes keep hundreds of thousands of people continually on the verge of starvation.

Recent migration of the peasants from the mountain regions—where they had lived for a long time in comparative isolation—to the urban centers of population, especially after the great war, has been set forth as a theory to explain the increase in mortality from tuberculosis during the past few years.

Fernós Isern, (Porto Rico Health Review, Vol. 1, No. 4, page 3) states the following:

“Of course Porto Rico is gradually becoming an industrial country. It has always been and is now agricultural. The country people called ‘*jibaros*’—meaning bashful, backward, hick—have lived for generations widely scattered up and down hill and valley in their thatched hut and surrounded by their own minor plantations, having very little contact with each other, and leading a life of toil and hardship. Because of an ill-balanced diet, because of their intimate association with the hookworm and with the plasmodium of Laveran, the former thriving in the highlands and the latter in the sugar-cane fields of the lowlands, the rural population cannot be very resistant to the massive infections of the bacillus of Koch.”

“They lack the relative immunity which city life offers through repeated contact with tuberculosis in small doses.”

“Is it then strange that the tuberculosis death rate is on the upward trend when these people migrate into towns and cities, locate into poor surroundings and enter upon shop and factory labor? Personally I anticipate still higher tuberculosis rates for a number of years to come until a certain steady equilibrium in the distribution of our population is reached. But if the fight is not kept up matters will be still worse, and this cannot be permitted.”

The cyclone which swept over Porto Rico on the 13th of September, 1928, has brought about a tremendous increase in mortality in the months following. The total number of deaths from all causes in Porto Rico in the fiscal year 1927-28 was 29,682. In the first nine months of 1928-29, the number of deaths from all causes

TUBERCULOSIS DEATH RATES PER 100,000 POPULATION, IN PORTO RICO.  
 (Averages of 5 years, 1923-1928).



White: less than 100; Dots: 100 to 150; Lines: 150 to 250; Squares: 250 to 350;  
 Black: over 350.

amounted to 31,466. This means that the death rate will increase this year from 20.4 to 26 per 1,000 population, approximately.

Tuberculosis mortality has shown a corresponding increase. Whereas the total number of deaths from tuberculosis in 1927-28 was 3,607, in the first nine months of 1928-29 it has been 3,205. This will bring up the tuberculosis mortality this year from 248 per 100,000 population to something like 270 per 100,000 population—an alarming proportion, to be sure, which we hope will come down rapidly after the conditions created by the cyclone have ceased to exist.

#### Distribution of Deaths.

The distribution of deaths from tuberculosis during the past five years, is fairly well shown by the map on page 435:

As shown here, the lowest tuberculosis death rates are to be found in the mountain municipalities of Maricao (24), Barros (78), Jayuya (80), Las Marías (87) and Adjuntas (95). In all these municipalities, the population is over 90 per cent rural, and over 80 per cent white.

The highest tuberculosis death rates are in the coast municipalities of Río Piedras (494), Mayagüez (453), San Juan (423), Guayama (416), Aguadilla (397), Ponce (377) and in the municipality of Caguas (362). The high death rate from tuberculosis given by Río Piedras must be attributed largely to the fact that the Insular Tuberculosis Hospital is located here.

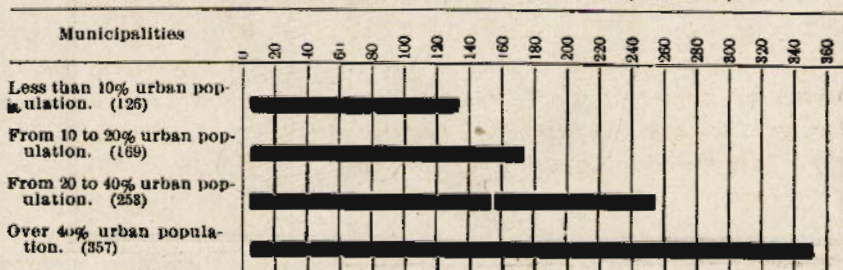
In San Juan, Ponce, Mayagüez and Caguas, a large proportion of the population lives in urban conditions.

#### Death Rates According to Density of Population.

The following graph seems to show some relation between the density of population and the tuberculosis death rate in Porto Rico.

#### TUBERCULOSIS MORTALITY IN PORTO RICO IN URBAN AND RURAL AREAS

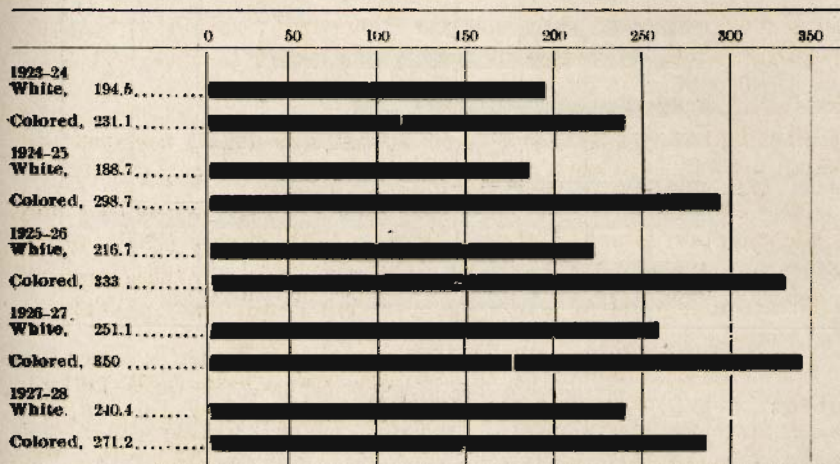
(Based on Average Death Rates of Five Years, 1923-28)



**Death Rate According to Race.**

The tuberculosis mortality in Porto Rico is higher among the colored population than among the whites. The following graph illustrates this:

**TUBERCULOSIS MORTALITY IN PORTO RICO ACCORDING TO RACE (1923-1928)**



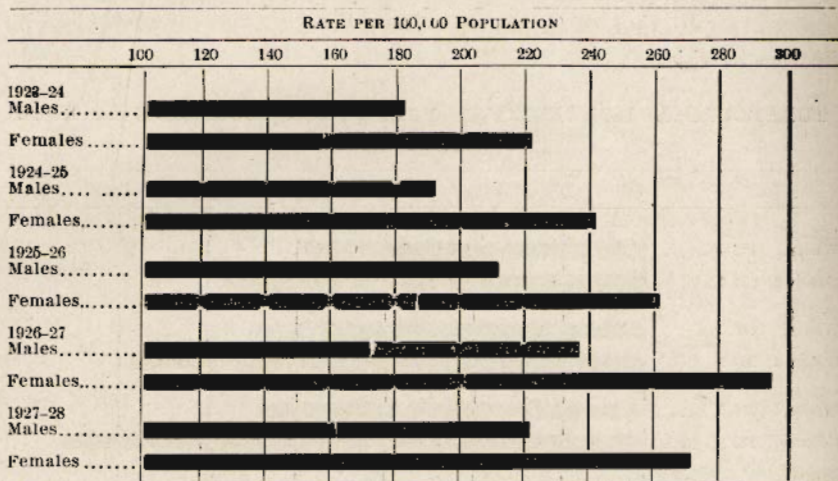
As shown in this chart, the reduction in tuberculosis mortality in the year 1927-28, was mainly due to a great reduction (22.5 per cent) in the tuberculosis death rate among colored people. The tuberculosis death rate seems to be more variable from year to year among the colored than among the white part of the population.

The high tuberculosis death rate among colored people might be due to the fact that they are usually among the poorest classes in all communities.

**Mortality According to Sex.**

The incidence of tuberculosis in Porto Rico seems to be greater in the female than in the male sex. Tuberculosis mortality statistics during the past five years, showed that the number of deaths from tuberculosis occurring among females was from one and a half to two times greater than the number of deaths from the same cause among males. The following graph illustrates this:

## DEATH RATES FROM TUBERCULOSIS IN PORTO RICO, ACCORDING TO SEX 1923-1928



In the United States, tuberculosis mortality is higher in males than in females, when all ages are considered. The following table gives an idea of the prevalence of male over female deaths from tuberculosis, in the United States Registration Area, in the years 1923, 1924 and 1925.

**TUBERCULOSIS DEATH RATES PER 100,000 POPULATION, BY SEX, IN THE UNITED STATES REGISTRATION AREA**  
(1923-1924-1925)

	1923	1924	1925
Males.....	95.2	92.1	87.2
Females.....	89.8	86.9	82.4

The higher tuberculosis death rates among females in Porto Rico could be attributed to the indoor life usually led by the women, especially in the towns, and to the fact that it is the woman of the house who usually takes care of the tuberculous patient, and thus has the most opportunities for contagion, from personal contact.

Frequent pregnancies and the care of large numbers of children are other causes which predispose women to diseases such as tuberculosis.

The frequency of illegitimate unions, where the father has no legal obligations and often abandons mother and children to their fate, constitutes another possible cause for the high incidence of diseases



such as tuberculosis among young women. Mere girls are often seen with two or three children depending on them for subsistence. The burden is oftentimes too much for them, especially since work for uneducated women is very scarce, and very poorly remunerated when found. Working women in Porto Rico rarely get more than fifty cents a day in factory or field.

#### Mortality According to Age.

Tuberculosis mortality statistics according to age alone in Porto Rico, show that the highest mortality occurs in the age-groups 20 to 25 and 30 to 40, and the lowest in the age-group 0 to 15.

#### NUMBER OF DEATHS FROM TUBERCULOSIS IN PORTO RICO, ACCORDING TO AGE (1923-1925)

	1923-24	1924-25	1925-26
Under 15 years .....	160	198	238
15 to 20 .....	311	349	370
20 to 25 .....	558	595	605
25 to 30 .....	446	513	541
30 to 40 .....	595	662	778
40 to 50 .....	400	404	456
Over 50 years.....	338	374	425

In the United States, according to age alone, the highest mortality from tuberculosis occurs during the age groups 20 to 24, 25 to 29 and 30 to 39. During the years, 1923, 1924 and 1925, the deaths from tuberculosis in the age-groups 20 to 24, 25 to 29 and 30 to 39 comprised 46.2 per cent of the total number of deaths from tuberculosis. In Porto Rico the number of deaths in these three age-groups during the same years, was 56.8 per cent of the total number of tuberculosis deaths.

The deaths occurring in the age-groups under 20 comprised 21.1 per cent of the total number of tuberculosis deaths in the United States during the years 1923, 1924 and 1925, and 17.4 per cent in Porto Rico; while in the age-group above 40, the number of deaths occurring in the United States comprised 32.6 per cent of the total number of deaths in that country, and 25.7 per cent in Porto Rico.

#### Mortality According to Age and Sex.

Tuberculosis mortality statistics according to different age groups in the male and female sexes, are lacking in Porto Rico except for the first semester of the fiscal year 1927-28. Statistics during this semester seem to show that tuberculosis mortality in the female sex is higher than in males in all age-groups except above the age of 50.

**NUMBER OF DEATHS FROM TUBERCULOSIS IN PORTO RICO, FROM  
JULY TO DECEMBER, 1928, ACCORDING TO AGE AND SEX**

Age	Male	Female
Under 15 years	70	79
From 15 to 19 years	78	154
From 20 to 24 "	163	221
From 25 to 29 "	169	193
From 30 to 39 "	165	256
From 40 to 49 "	125	133
Over 50 years	135	113

The estimated male population in Porto Rico in 1928 was 747,188. The female population was 742,331.

Children below one year of age rarely die from tuberculosis in Porto Rico, according to our mortality statistics. The tuberculosis death rate among infants in the year 1927-28, was .07 per cent. The actual number of deaths was 38. Of these 27 were pulmonary, 6 were intestinal, and 5 were classified as "of other organs." Doubtless many deaths occurring in children from tuberculous meningitis, miliary tuberculosis, etc., are wrongly classified among the deaths from "diarrhea and enteritis," "congenital debility," etc.

According to age and sex, tuberculosis mortality in the United States is higher in males in all age-groups before 10 and after 35.

**TUBERCULOSIS DEATH RATES PER 100,000 POPULATION IN THE  
UNITED STATES REGISTRATION AREA, ACCORDING  
TO SEX AND AGE**

Age	1923		1924		1925	
	Males	Females	Males	Females	Males	Females
Under 1 year	91.3	79.1	86.8	74.7	76.5	66.4
1 to 4 years	37.7	35.4	36.9	32.6	32.7	29.0
Under 5 years	47.8	43.7	46.3	40.6	41.2	36.2
5 to 9 years	15.1	12.7	12.7	13.9	11.2	11.5
10 to 14 years	13.5	24.6	14.6	23.8	14.6	23.3
15 to 19 years	59.2	115.6	63.2	112.7	57.2	101.8
20 to 24 years	128.9	164.1	127.0	167.8	108.6	151.5
25 to 29 years	135.2	186.6	130.6	181.2	119.7	127.5
30 to 34 years	141.4	100.8	134.1	97.0	132.1	94.3
35 to 44 years	140.9	83.2	133.6	82.2	135.2	78.6
45 to 54 years	151.4	92.1	144.9	84.2	142.8	87.5
55 to 64 years	173.8	131.3	165.1	115.7	170.9	119.8
65 to 74 years	189.4	133.9	136.2	120.9	133.7	112.3

**Tuberculosis Morbidity in Porto Rico, According to Age and Sex.**

The following table is based on reports of cases of tuberculosis, sent by physicians to the Health Department of Porto Rico, for a period of two and a half years (from July 1926 to December 1928). In that time 9,363 cases were reported. Of these, 4,189 were male, and 5,174 (55%) were female patients. As shown by this table, the number of cases of tuberculosis reported among females was larger than those among males, at all age-groups, except above the

age of fifty. The greatest difference is found in the age-group 15 to 19, where female cases comprise sixty two per cent of the total of cases reported:

**TUBERCULOSIS MORBIDITY IN PORTO RICO, ACCORDING TO AGE AND SEX**

Cases Reported by Physicians From July 1926 to December 1928

Age-Groups	Male	Female	Total	Per Cent Female
0 to 14 years.....	313	422	735	57
15 to 19 .....	441	725	1,166	62
20 to 24 .....	782	987	1,769	55
25 to 29 .....	654	841	1,495	56
30 to 39 .....	911	1,171	2,082	56
40 to 49 .....	588	604	1,192	51
50 and over.....	500	424	924	46

The cases falling into the age-group 0 to 14 were further subdivided, for the period from July 1926 to December 1927, into the following smaller age-groups. Under one year; 1 to 4 years; 5 to 9 years and 10 to 14 years. The following table shows the relative incidence of tuberculosis in these age-groups below 15, as gathered from the reports of physicians during the period from July 1926 to December 1927:

**TUBERCULOSIS MORBIDITY IN PORTO RICO ACCORDING TO AGE AND SEX**

Cases Reported by Physicians From July 1926 to December 1927

Age-Groups	Male	Female	Total	Per Cent Female
Under 1 year.....	11	9	20	45
1 to 4 years.....	39	32	71	45
5 to 9 years.....	42	42	84	50
10 to 14 years.....	67	124	191	65

As seen from the above, the largest preponderance of females over males is found in the age-group 10 to 14, where female cases comprise 65 per cent of all the cases reported. In the age-groups under one year, and from 1 to 4 years, males are more numerous than females, comprising 55 per cent of the total number of cases; while in the age-group 5 to 9, both sexes have exactly the same number of cases.

**Tuberculosis According to Age and Sex, Among the Patients of the Tuberculosis Dispensaries of the Health Department.**

During the years 1925-26, 1926-27 and 1927-28, 5,837 persons were diagnosed in the tuberculosis dispensaries of the Health Department of Porto Rico as having tuberculosis. These diagnoses were based upon clinical, X-Ray and laboratory findings.

Doubtful cases were kept under observation for 15 days or one month (sometimes longer). During this period of observation, temperatures were taken at regular intervals, and diagnoses were definitely made only after a reasonable amount of clinical evidence had been gathered.

Among the 5,837 patients thus diagnosed as having tuberculosis, 2,350 were males and 3,487 were females.

The greatest preponderance of female over male patients, during the year 1927-28, occurred at the age-groups 10 to 15, 15 to 20, 20 to 25, 25 to 30, 30 to 40 and 40 to 50. The number of male patients exceeded that of females in the age-groups 0 to 1, 2 to 5, 5 to 10, 50 to 60 and over 60.

#### Von-Pirquet Tests.

Von-Pirquet tests were made in 732 children under fifteen in the tuberculosis dispensaries of the Health Department, during the fiscal year 1927-28. 338 or 46% of the children tested, gave positive Von-Pirquet. The percentage of positive and negative Von-Pirquet, at different age-groups in male and female children, are shown in the following table:

**RESULTS OF 732 VON-PIRQUET TESTS IN CHILDREN**

Age	Positives		Negatives	
	Males	Females	Males	Females
0 to 1 year.....	2	3	.....	.....
1 to 2 years.....	8	4	10	5
2 to 5 years.....	15	9	17	16
5 to 10 years.....	41	59	72	86
10 to 15 years.....	85	112	79	109
Total.....	151	187	178	216

As seen in the above table, female children gave a larger proportion of positive Von-Pirquets at the age-groups 0 to 1, 5 to 10 and 10 to 15, while the proportion of positive Von-Pirquets in male children, was larger at the age-groups 1 to 2 and 2 to 5. However, the number of positive Von-Pirquets in this series was far too small to guarantee any definite conclusions.

#### SUMMARY

Mortality and morbidity statistics in Porto Rico point to a greater incidence of tuberculosis in females than in males. Tuberculosis seems to be more common in females between the ages of 10 and 50, and more prevalent in males in the first 10 years of life, and after

50. In the United States, tuberculosis is more prevalent in males than in females.

The mortality statistics available at the present time in Porto Rico do not give any data as to the classification of tuberculosis deaths by age and sex, except for the first semester of the fiscal year 1928-29.

The highest mortality from tuberculosis is found in the larger urban centers, such as San Juan, Ponce, Mayagüez, Caguas and Guayama. Overcrowding is a factor of importance in the causation of tuberculosis, and a direct ratio is noted between the tuberculosis mortality and the density of population of different parts of the Island.

Extreme poverty is an important cause of tuberculosis in Porto Rico. Large families, very low salaries and the scarcity of work bring about conditions which favor the spread of the disease.

Tuberculosis mortality is higher in the colored than in the white race, in Porto Rico.

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