FACTORS CONTRIBUTING TO A HIGH DEATH RATE IN PUERTO RICO

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Puerto Rico's death rate of more than 20 per 1,000 population is striking when compared with the lower rates of the U. S. Registration Area, but a comparison of these with the still lower mortality rates of Canada, Denmark, Australia and New Zealand, suggests that the ideal level has not yet been reached and that countries which have sufficient economic resources and well organized Public Health Departments may attain still lower figures. It is not generally understood, however, that regardless of the money to be spent or of the organization to be had, there may exist a number of causes exercising great influence on the mortality curve. The purpose of this paper is to point out certain factors which keep our death rate high and prevent a rapid and spectacular reduction of the mortality in Puerto Rico. This does not imply that our death rate cannot be materially reduced. It has been considerably lowered in the course of the last few decades and will be reduced even more. But we want to make it clear that many of the factors contributing to our high mortality are of a social and economic character; others arise from causes quite uncontrollable by man, and still others arise from problems which may be subjected to human control but need time and persistent effort to solve them.

DENSITY OF POPULATION

Puerto Rico is one of the most thickly populated countries of the world. On an area of only 3,435 square miles there were living 1,543,913 persons in 1930, giving a density of population of 449.0 inhabitants per square mile. The estimated density for 1932 is 466 inhabitants per square mile. Only four other countries in the world, Java and Madura (734), Belgium (680), the Netherlands (614), and Great Britain (485), have higher densities of population. In 1930 the population density in Puerto Rico was more than ten times as great as that of the United States. It has increased

384.5% in a century and has more than doubled its number in the 45 years which have elapsed from 1887 to 1932. (See Table I.) In the absence of a heavy immigration during the last 30 years, it is evident that this rapid growth has been the combined result of an increased birth rate and a decreased death rate.

TABLE I

GROWTH OF THE POPULATION OF PUERTO RICO: 1832–1932

Census Year	Population	Increase	% of increase by decade
1832	330,051	109,159	27.4
1846	447,914	117,863	23.8
1860	583,308	135,394	21.6
1877	731,648	148,340	14.1
1887	798,565	66,917	9.1
1899	953,243	154,678	16.1
1910	1,118,012	164,769	17.3
1920	1,299,809	181,797	16.3
1930	1,543,913	244,104	18.8
1932 (*)	1,599,142	.....	.....

(*) Estimated population.

This marked increase of the population, plus the introduction of machinery in agriculture, is responsible for a surplus of labor and consequently a shortage of means of subsistence. Clark (1[a]) states that the population has multiplied to the subsistence limit as determined by the relatively low living standards of the tropics. He adds, "So long as the population to be supported increases more rapidly than the means of subsistence, there can, of course, be no permanent improvement of Puerto Rican living conditions. The enduring economic problem in Puerto Rico, as elsewhere, is to determine and secure the best balance between resources and productive equipment on the one hand and the population to be supported on the other. In Puerto Rico the best balance does not now exist, for the population has outrun the capacity of the present economic resources and organization to furnish full employment and satisfactory living conditions."

SOCIAL AND ECONOMIC

(*a*) The Island is mainly agricultural and the principal sources of wealth and income are those derived from agri-

cultural pursuits. The principal agricultural products or cash crops are sugar cane, tobacco, coffee and fruits, a limited extension of the poorer lands being left for the cultivation of food products. The bulk of the foodstuffs, clothes and other commodities necessary for life have thus not only to be imported, but imported from the United States, an expensive market strongly protected by a high tariff. Clark (1[b]) states: "Since the larger proportion of the foodstuffs and clothing required by the people of the Island is imported from the United States and other countries, the prices of most of the basic commodities of life are not articulated with Island wage rates but are determined by cost factors in other countries."

(*b*) Wage rates are lowered by the constant seasonal unemployment which is a result of the seasonal activity of local agriculture and the excess of hands. The adult workers usually have four or five days of work per week in the seasons when they are employed and the annual wage incomes are estimated at $169 in sugar and fruit and $135 in coffee and tobacco. (2)

(*c*) Seasonal employment brings about a great mobility of work and while workers from the coast regions move temporarily to work in the mountainous sections of the interior with a certain degree of safety for their health, for this part of the Island is relatively healthful, the workers from the interior who go to the coast in search of work contract malaria very easily. They go back home to recover or die, but in the meanwhile they become a source of infection for those at home. During the year 1931 a relatively large number of deaths from malaria was recorded in many municipalities of the interior of the island, where the number of cases of this disease was formerly small. Similarly, open cases of tuberculosis move from one place to another spreading the disease, both because the number of isolation hospitals is inadequate, and because they have to work to make a living, no matter how precarious is their health.

Low living standards and the consequent increase of both the natality and the mortality are the combined results of a dense population, of the scarcity of work to employ the whole or a majority of the people of working age and capable of working, and of the low wages received by those who have the fortune to find a job.

Topographical and Meteorological

(*a*) The Island of Puerto Rico has a rectangular shape of about 100 miles long from east to west and 35 miles wide from north to south. A mountain range crosses the island from northeast to southwest with ramifications at the extreme west end to the north. The rich lowlands of the coast are used for the cultivation of sugar cane; on the mountainous sections of the interior are found the coffee and tobacco plantations. Fruits are raised on several sections of the interior and on the coast, especially on the north central coast. The mountainous sections of the interior are comparatively healthful, recorded death rates being of from 11 to 17 per 1,000 population, and excepting the municipalities of Caguas, Juncos and Comerío, in the tobacco zone, where there is a heavy mortality from tuberculosis, the public health problems on this part of the island are of little importance if compared with the problems of the coast sections. On the coast, the situation is different. The highest death rates are recorded in this portion of the island, and in some municipalities like Santa Isabel on the south, and Añasco on the west, the annual death rate has fluctuated from 30 to 35 per 1,000 population for many years. Tuberculosis and malaria, the interrelation of which as certified causes of death in Puerto Rico has not been sufficiently studied, are problems of tremendous importance here. With respect to malaria, the problem has been aggravated by the use of artificial irrigation for the cultivation of sugar cane which has increased the number of mosquito breeding places. Thus, while the productivity of the lands has been increased, a concomitant increase of mortality has been brought about.

(*b*) The temperature of Puerto Rico is almost uniform throughout the year. Quoting from Fassig (3): "Puerto Rico, in common with all islands within the areas swept by the northeast and southeast trade winds, has a warm but equable and comfortable climate. The small extent of the Island, with its moderate elevations above sea-level, insures a uniformity of temperature characteristic of marine climates in all latitudes. . . . . A record covering a period of more than 30 years at over forty selected stations shows a mean annual temperature for the Island, combining the records at all stations, of 76°F. and during the warmest month of the summer it is 79°F. . . . . The lowest temperatures are nat-

urally those experienced along and near the summit of the main divide, at elevations varying from 2,000 to 3,000 feet; here the mean annual temperature falls below 72°F. At Aibonito the mean temperature for the year is 71°F., with a January mean of 68°F. and mean for July of 74°F.; the highest mean temperature for July was 77°F. and the lowest January mean was 66°F."

Although it has not been conclusively proved that climatic factors alone affect human health, it is a well known fact that human mortality in the tropics is much higher than in the temperate countries, among other things due to favorable conditions for the development of pathogenic microorganisms.

(*c*) The periodic occurrence of hurricanes in this part of the world is of paramount importance in regard to mortality, as these meteorological phenomena, though not increasing appreciably the mortality in direct form, bring about a temporary general disorganization of living conditions and of economic and public health activities with their inevitable sequelae of disease, misery and hunger which last for long. Moreover, the economic structure of the country is so upset that in some cases it is only the fighting spirit of the human race and its capacity to endure hardships which will count for the ultimate recovery.

Puerto Rico has had a number of hurricanes during the last 35 years but two of them, those of August 8, 1899, and of September 13, 1928, have been particularly devastating. The hurricane of September 13, 1928, was responsible for a loss of over eighty-five million dollars of capital (4) and took a toll of over 10,000 lives which was the increase in the number of deaths above the normal figures during the year, considering as normal the average number of deaths recorded during the five preceding years. The year following the hurricane of August 8, 1899 the death rate rose to 45.5 per 1,000 population: the year following the hurricane of September 13, 1928 the death rate recorded was 25.3 per 1,000 population.

Nutrition

A glance at the statistics of foreign and domestic commerce published by the Department of Commerce of the United States, will reveal that most of the food used for

our daily diet is imported and that among the most important items on the list of imported foods are rice, beans and codfish. A detailed account of the food consumed by our population and of its dietary habits would be out of place here. However, for a better understanding of the problem of nutrition in Puerto Rico and of its possible relation with mortality in the sense that a poorly fed body will be less resistant to disease, we may quote from Cook, (5): "One of our major problems in Puerto Rico is the one of nutrition. We import half or more of the food we eat and rice and beans make up 47 per cent of the energy of imported foods. This would lead us to believe that these two articles make up a major portion of the diet here. Now rice, though it is the staple cereal of more people of the world than any other grain, is not a complete food in the requirements quoted above (from Sherman) viz. (1) sufficient of the organic nutrients (proteins, fats, carbohydrates) in digestible forms to yield the needed energy; (2) protein, sufficient in amount and appropriate kind; (3) adequate amounts and proper proportions of the various ash constituents or inorganic foodstuffs; (4) sufficient of each of the essential vitamins. In the first place it (rice) is low in protein; secondly, it lacks an adequate supply of mineral salts, and, thirdly, the polished variety used here in Puerto Rico is deficient in the antineuritic factor of vitamin B. Although red kidney beans are on the whole good sources of protein and mineral salts, in the dried condition they lack vitamin C, are low in vitamin A, and possibly in vitamin B. When mixed with rice in the diet they would tend to supplement the protein and mineral deficiencies of the latter, but even then the mixture can not be considered a complete food."

Medical Attendance

Of the deaths occurring in Puerto Rico it is probable that a large number are due to insufficient medical care. There are 375 physicians authorized to practice the profession in Puerto Rico, including about 50 physicians in charge of government work in the Department of Health, who directly or indirectly do medical work in the prevention of disease and the promotion of health. Therefore, the average number of persons to be attended by each physician is 4,264, as compared with a maximum of 1,336 in the United States. Considering

TABLE II

DISTRIBUTION OF THE POPULATION OF PUERTO RICO ACCORDING TO THE NUMBER OF PRACTICING PHYSICIANS

Municipalities	Number of municipalities	Aggregate population	Number of physicians	Persons per physician
PUERTO RICO	77	1,599,142	375	4,264
CITIES				
San Juan	1	124,218	112	1,264
Ponce	1	91,151	31	2,940
MUNICIPALITIES OF MORE THAN 25,000 POPULATION				
Aguadilla, Arecibo, Bayamón, Caguas, Cayey, Humacao, Lares, Manatí, Mayagüez, Río Piedras, San Sebastián, Utuado, Yauco	13	478,643	123	3,891
MUNICIPALITIES OF 15,000 TO 25,000 POPULATION				
Adjuntas, Aguada, Aibonito, Barceloneta, Barranquitas, Cabo Rojo, Camuy, Carolina, Ciales, Cidra, Coamo, Comerío, Corozal, Fajardo, Guayama, Gurabo, Hatillo, Isabela, Juana Díaz, Juncos, Loíza, Moca, Morovis, Naguabo, Orocovis, Salinas, San Germán, San Lorenzo, Vega Baja, Yabucoa	30	569,090	63	9,033
MUNICIPALITIES OF 10,000 TO 15,000 POPULATION				
Aguas Buenas, Añasco, Guánica, Guayanilla, Guaynabo, Jayuya, Lajas, Las Piedras, Naranjito, Patillas, Peñuelas, Quebradillas, Río Grande, Sabana Grande, Toa Alta, Toa Baja, Trujillo Alto, Vega Alta, Vieques, Villalba	20	247,283	26	9,511
MUNICIPALITIES OF LESS THAN 10,000 POPULATION				
Arroyo, Cataño, Ceiba, Culebra, Dorado, Hormigueros, Las Marías, Luquillo, Maricao, Maunabo, Rincón, Santa Isabel	12	88,757	5	17,751

that 112 of the physicians are working in San Juan and 31 in Ponce, the second largest city of the Island, the average number of persons per doctor for the rest of the Island is 5,964. These figures do not tell the whole story, for in some municipalities a physician is in charge of a population of more than 15,000 people. At the present time there are a few of the smaller and poorer municipalities which have only a part-time physician who visits the town two or three times in the week. The reason for this scarcity of physicians is probably that the profession is not sufficiently attractive economically to induce a larger number of persons to enter it.

An apportionment of the number of persons per doctor in the different municipalities is shown in Table II.

The Birth Rate

Another important factor contributing to the high death rate in Puerto Rico is its high birth rate, which has the effect of keeping a high proportion of infants and children in the population, in which ages, as it is well known, the mortality is high.

It is difficult to ascertain the exact birth rate of Puerto Rico, on account of the poor registration existing in the past. Examining the birth rates from 1888 to 1931 (see Table III) an apparent upward trend in the natality is observed. Whether this increase is real is very doubtful, if the inadequacy of the registration law in effect until the middle of the year 1931 is considered. On July 21st, 1931, a new registration law adapted from the Model Law for the Registration of Births and Deaths of the United States entered into effect. The results were seen immediately and the recorded birth rate rose from 35.2 per 1,000 population in 1930 to 41.7 per 1,000 population in 1931.

The Composition of the Population

Every student of elementary Vital Statistics knows that the death rate of a community may be high or low according merely to the composition of its population as to age, sex and race. If there is an unduly large proportion of people in the ages in which mortality is high, or if there are in the population large groups of racial strains recording a high mortality,

TABLE III

BIRTHS AND BIRTH RATE PER 1,000 POPULATION IN PUERTO RICO DURING THE YEARS FROM 1888 TO 1931

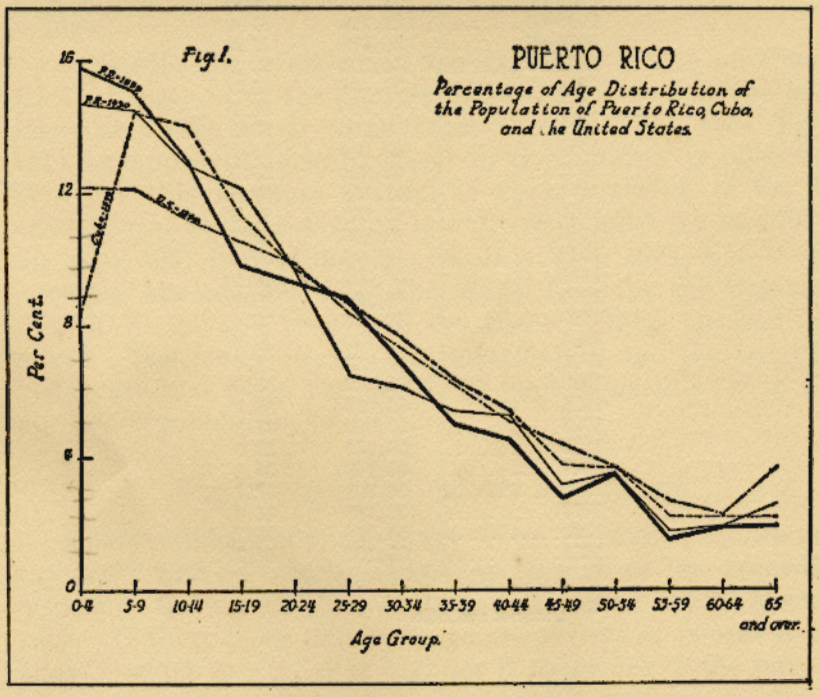
Year	Births	Birth rate
1888	27,401	33.7
1889	25,113	30.4
1890	24,231	28.9
1891	23,496	27.6
1892	25,302	29.3
1893	25,457	29.0
1894	24,548	27.6
1895	25,090	27.8
1896	26,270	28.7
1897	25,827	27.8
1898	19,719	19.9
1899	(*)	
1900-01	19,930	20.4
1901-02	25,898	26.3
1902-03	30,123	30.3
1903-04	40,053	39.9
1904-05	28,472	28.0
1905-06	32,226	31.4
1906-07	34,778	33.6
1907-08	34,701	33.2
1909	37,444	35.5
1910	37,706	33.7
1911	39,106	33.0
1912	40,708	35.1
1913	42,994	35.5
1914	47,578	39.8
1915	45,268	37.2
1916	43,360	35.1
1917	44,396	35.4
1918	52,003	40.9
1919	46,285	35.9
1920	50,416	38.4
1921	51,190	38.3
1922	50,830	37.4
1923	51,162	37.0
1924	53,876	38.3
1925	53,059	37.1
1926	56,675	39.0
1927	50,746	34.3
1928	56,708	37.7
1929	52,468	34.4
1930	54,574	35.2
1931	65,700	41.7

(*) Data not available.

TABLE IV

AGE DISTRIBUTION OF THE POPULATION OF PUERTO RICO, 1899 AND 1930, CUBA 1899 AND UNITED STATES 1890

Age	Puerto Rico		Cuba	United States
	1930	1899	1899	1890
ALL AGES	100.0	100.0	100.0	100.0
0—4	14.7	15.8	8.3	12.2
5—9	14.5	15.1	14.4	12.1
10—14	12.9	13.0	14.0	11.2
15—19	12.1	9.8	11.3	10.5
20—24	9.7	9.3	9.7	9.9
25—29	6.5	8.8	8.7	8.4
30—34	6.1	6.8	7.6	7.3
35—44	10.7	9.6	11.7	11.3
45—54	6.7	6.3	7.5	8.1
55—64	3.7	3.5	4.4	5.0
65—74	1.7	1.3	1.6	2.7
75 and over	0.9	0.7	0.8	1.3



the death rate will be high. Similarly, if the proportion of the two sexes is altered so as to have an equal or higher number of males than females, the death rate will tend to increase.

AGE.—Since the time of Graunt, late in the 17th century (6), the high rate of mortality in the earliest years of life is a demonstrated fact. It was further discovered that the death rate is highest at the two extremes of life; but, as expressed by Newsholme,(7) "the very high death rate at ages under 5 has greater importance than the death rate at ages 65 and over, for two reasons: (1) the child population is much larger than the population surviving to ages over 65, and (2) the possibilities of each person have not been reached in childhood, while at ages over 65 they are approaching their end."

The age distribution of the populations of Puerto Rico and Cuba in 1889 and the age distribution of the population of the United States in 1890 together with the age distribution of the population according to one of Farr's Life Tables are given in percentage form, in the volume of the Census of Puerto Rico (8) of 1899, taken under the direction of the Department of War. The table (see Table IV) is reproduced here eliminating the English data and using instead for comparison the age distribution of the population of Puerto Rico in the census of 1930 taken by the federal Bureau of the Census. Figure I illustrates the age distribution of these populations.

It is clearly seen that the age composition of the population of Puerto Rico is favorable for a high mortality owing to the unduly large number of people in the ages 0–4 years in which the mortality is high.

On examining this table it is worth noting that the population in the younger ages has decreased in 1930 as compared with 1899, while the population in the ages above 15 years has increased with the exceptions of the groups 25–29 and 30–34 which have decreased in 2.3 per cent and 0.7 per cent respectively. This reduction in the population of the younger ages and the consequent increase in the population of the adult and advanced ages is evidence of the gradual ageing of the population. That is, the span of life of the population in general has been extended due to the reduction of the mortality during the thirty odd years which have elapsed from 1899 to 1930. The decrease of the population in the age groups 25–29 and 30–34 is probably due to the excessive mortality from tuberculosis which has its peak at the group of ages 25–29 years.

RACE.—The population of Puerto Rico is fairly homogenously constituted as to race. The white population is of Spanish ancestry, the Spaniards having discovered and settled the Island at the end of the fifteenth century and early in the sixteenth century. Some of the Spanish colonizers mixed with the aborigines and later on with the negroes which began to be brought in as slaves from Africa in the 17th century. In the course of time this racial intermixture has continued and to-day three main racial groups are distinctly recognizable: white, negroes and mulattoes. It is very doubtful if there remain any pure Indians at the present time, though types of the white-Indian, negro-Indian and probably white-negro-Indian combinations may be frequent.

The census of 1930 gives a white population of 1,146,719 or 74.1 per cent of the total, and a colored population including negroes, mulattoes and a few of other races considered as colored in the United States, of 397,194, or 25.9 per cent of the total. It is possible that the number of colored people has been understated in the census returns, as there is a natural tendency in this as in any other country in which the color line has not been drawn and strictly observed, of stating as white the color of a certain number of persons, whatever this number may be, with a slight or even a pronounced admixture of colored blood. This should be born in mind in the interpretation of the statistics offered in this paper, although it is considered that the information gathered through the registrars in the registration of births and deaths is similarly defective.

This relatively high proportion of colored people within the population helps to increase the death rate, as the mortality among the colored is generally higher than among the whites.

SEX.—A peculiarity of the population of Puerto Rico is the even distribution of the two sexes. It is a well known fact that in a population normally constituted the number of females exceeds the number of males except in countries receiving a large amount of immigration, in which the males always predominate. The distribution of sexes in the population of Puerto Rico has apparently not changed in the last three decades as may be seen in Table V.

Taking into account that the mortality among females is as a rule lower than among males, this reduced proportion of

females in the population is another factor tending to increase our death rate.

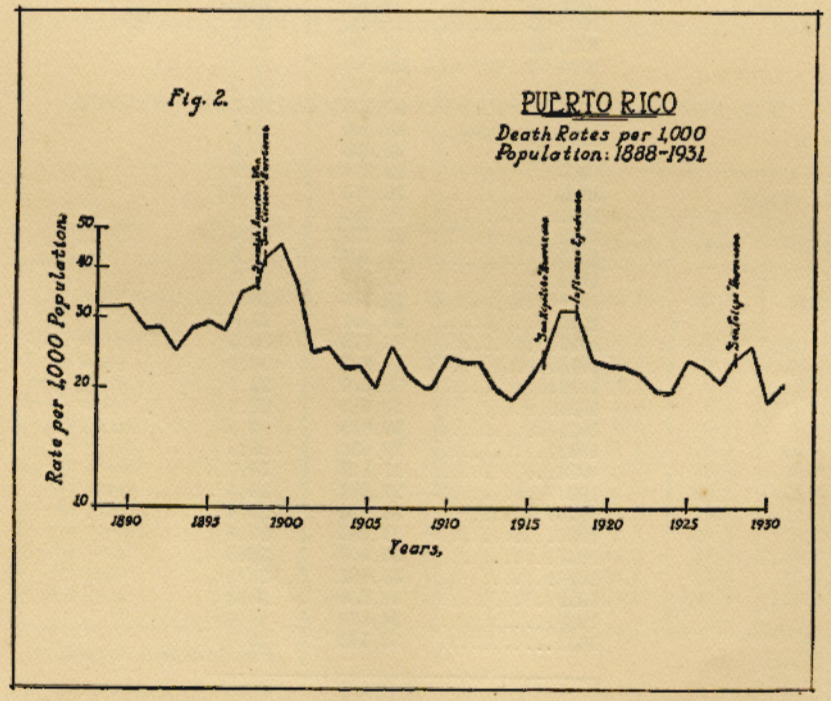
TABLE V

PERCENTAGE OF SEX DISTRIBUTION OF THE POPULATION OF PUERTO RICO: 1899, 1910, 1920, AND 1930

Census Year	White		Colored	
	Male	Female	Male	Female
1899	30.9	30.9	18.7	19.5
1910	32.8	32.8	17.1	17.4
1920	36.4	36.5	13.4	13.6
1930	37.2	37.1	12.8	12.9

THE DEATH RATE

Now that we have reviewed the most important factors which in our opinion are responsible for our high mortality, let us examine more closely the death rate and see how it is made up.



The crude death rates registered from 1888, which is the earliest year for which data is available, to 1931, are shown in Table VI and Figure 2.

TABLE VI

DEATHS AND DEATH RATE PER 1,000 POPULATION IN PUERTO RICO DURING THE YEARS FROM 1888 TO 1931

Year	Deaths	Death rate
1888	25,568	31.5
1889	26,255	31.8
1890	26,955	32.1
1891	24,089	28.3
1892	24,474	28.3
1893	21,616	24.6
1894	24,896	28.0
1895	26,284	29.1
1896	25,435	27.8
1897	31,980	34.4
1898	33,614	35.7
1898–99	39,918	41.9
1899–1900	44,023	45.5
1900–01	35,800	36.4
1901–02	24,500	24.5
1902–03	25,553	25.2
1903–04	23,100	22.5
1904–05	23,700	22.7
1905–06	21,100	19.9
1906–07	27,125	25.3
1907–08	23,500	21.6
1908–09	22,000	19.9
1909	22,274	20.2
1910	26,675	23.8
1911	26,579	23.3
1912	27,152	23.4
1913	23,307	19.8
1914	22,343	18.7
1915	25,115	20.7
1916	29,491	23.9
1917	38,675	30.9
1918	39,299	30.9
1919	30,570	23.7
1920	29,918	22.8
1921	30,015	22.5
1922	29,666	21.8
1923	27,143	19.6
1924	27,332	19.4
1925	33,519	23.4
1926	32,946	22.6
1927	30,500	20.6
1928	35,467	23.6
1929	38,534	25.3
1930	28,870	18.6
1931	32,146	20.4

The peaks of 1898–1900, correspond to the Spanish American War period (1898), and to the San Ciriaco hurricane of August 8, 1899 and its effects; the peaks of 1917 and 1918, correspond to the San Hipólito hurricane of August 22, 1916, and to the influenza epidemic of 1918; the peak of 1928–29 corresponds to the San Felipe hurricane of September 13, 1928. Comparing the rate of 1888 (31.5) with that of 1931 (20.4) the reduction amounts to 33.1 per cent.

The downward trend of the mortality is evident, though it is difficult to calculate a trend line which would convey absolute accuracy, due to the abrupt fluctuations registered in the years of hurricanes and epidemics.

Specific Death Rates

The specific death rates by age, sex and color for 1931 are presented in Table VII and Figures 3, 4 and 5. Inspection of this table and graphs will bring out some points of interest. The general trend of mortality conforms to the normal distribution of deaths according to age, i.e. high death rates during the early stages of life (under one year and 1–4 years); low death rates during childhood and the younger ages, reach-

Table VII

SPECIFIC DEATH RATES PER 1,000 POPULATION BY AGE, SEX AND COLOR: 1931

Age	Total	Male	Female	White		Colored	
				Male	Female	Male	Female
All Ages....	20.4	21.0	19.8	20.8	19.8	21.6	19.9
Under 1 year (*)....	130.0	138.0	121.4	143.0	126.0	125.0	110.0
1—4 years.....	29.3	29.4	29.2	30.1	30.1	27.4	26.8
5—9 years.....	6.6	6.6	6.6	6.6	6.4	6.6	7.1
10–14 years.....	3.5	3.3	3.7	3.4	3.4	3.1	4.5
15—19 years.....	6.3	5.9	6.7	5.6	6.6	6.7	7.1
20—24 years.....	12.1	11.8	12.4	11.2	11.8	13.7	14.1
25—29 years.....	13.3	12.3	14.3	11.5	13.7	14.7	16.0
30—34 years.....	12.7	11.1	14.2	10.3	14.2	13.6	14.4
35—44 years.....	14.2	13.8	14.5	13.1	14.2	16.1	15.4
45—54 years.....	21.4	22.4	18.2	21.2	18.1	26.3	18.6
55—64 years.....	32.5	36.1	28.5	34.9	28.3	40.1	29.2
65—74 years.....	64.1	74.6	54.0	74.5	54.1	74.8	53.9
75 and over.....	160.3	164.9	156.6	163.3	159.4	169.9	149.1

(*) Rates per 1,000 living births.

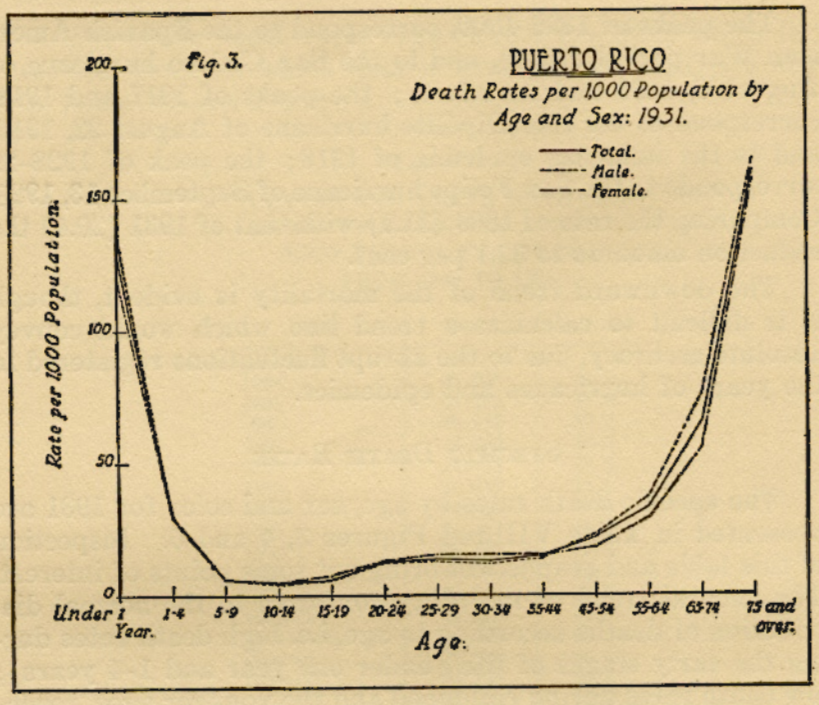


Fig. 3.
PUERTO RICO
Death Rates per 1,000 Population by Age and Sex: 1931.
Total.
Male.
Female.
Rate per 1,000 Population.
200
150
100
50
0
Under 1 Year.
1-4
5-9
10-14
15-19
20-24
25-29
30-34
35-44
45-54
55-64
65-74
75 and over.
Age.

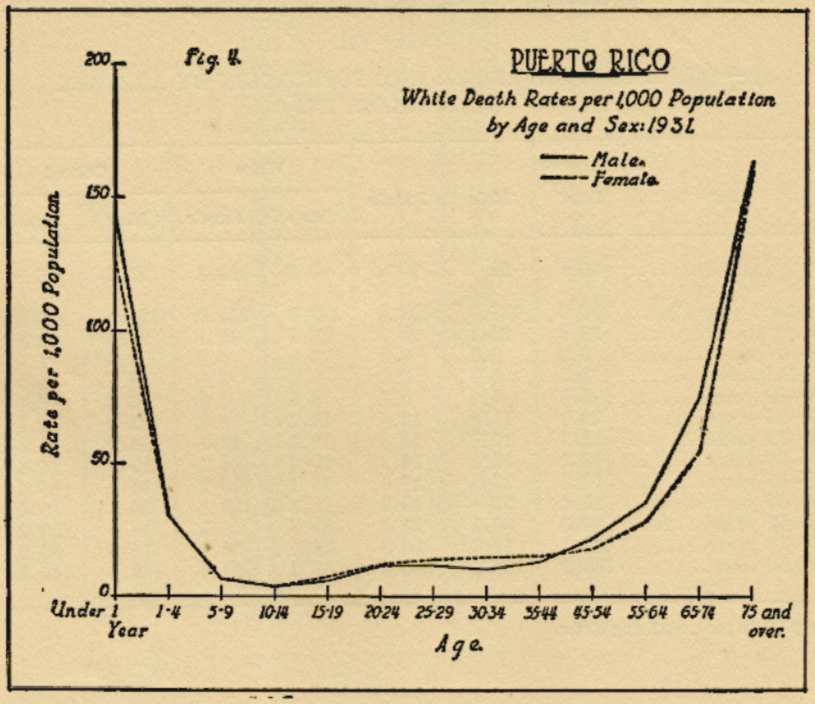
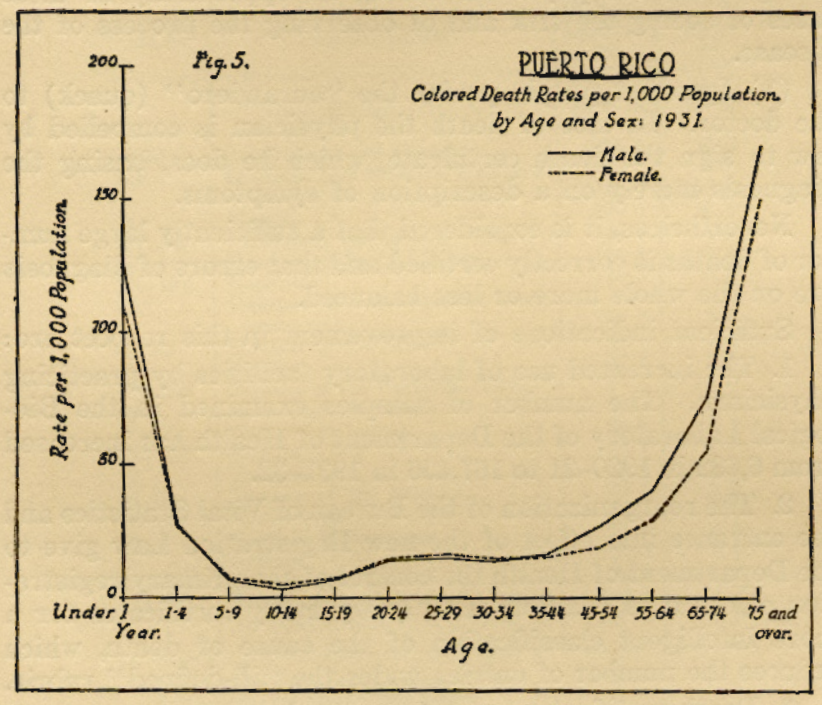


Fig. 4.
PUERTO RICO
White Death Rates per 1,000 Population by Age and Sex: 1931.
Male.
Female.
Rate per 1,000 Population.
200
150
100
50
0
Under 1 Year
1-4
5-9
10-14
15-19
20-24
25-29
30-34
35-44
45-54
55-64
65-74
75 and over.
Age.

ing a minimum at ages 10–14; death rates ascending with age to a maximum at 75 years and over, for all ages from 75 years up have been grouped together. Although the total death rate is higher for the colored population as compared with the white in both sexes, infant death rates and rates in the group 1–4 years are considerably lower among the colored than among the white, in both sexes. The female rates in the age group 25–29 years are higher than the male rates in both the white and the colored races. From 45 years up, the rates for males are generally higher than the rates for females.



That infant death rates are lower among the colored than among the whites may be a chance result this year, or it may be that the white infant rates are influenced by misstatements of color, to which discrepancies reference has been made.

The rates in every group are almost double those usually encountered in the United States. Note the very high infant mortality rate (130 per 1,000 living births for the total) which in the light of what has been said, and especially of a birth rate of 41.7 per 1,000 population, is not surprising.

Causes of Death

An inquiry into the causes of death will naturally bring out the question of diagnostic accuracy. It is true that in a large number of cases diagnoses are necessarily faulty for a diversity of reasons:

(1) One physician is in charge of so many people that it is very difficult to give due study to every case.

(2) Among country people, the custom of sending one of the relatives for the prescription and medicines is more or less general, the physician having no opportunity in these cases of seeing the sick and of observing the process of the disease.

(3) Ignorant people prefer the "curandero" (quack) to the doctor. In case of death the physician is compelled by law to sign the death certificate, which he does, basing the diagnosis merely on a description of symptoms.

Nevertheless, it is considered that a sufficiently large number of deaths is correctly certified and that errors of diagnosis are on the whole more or less balanced.

Sufficient indications of improvement in this respect are:

1. The increased use of laboratory facilities by practicing physicians. The number of samples examined in the Biological Laboratory of the Department of Health has increased from 6,682 in 1920–21 to 167,456 in 1931–32.

2. The reorganization of the Bureau of Vital Statistics and the entrance into effect of the new Registration Law give to the Department of Health the control of the primary registration offices thus enabling it to query many certificates for a more intelligent classification of the cause of death, which reduces the number of entries under the "ill-defined" rubric.

3. Death certificates are not classified as to cause of death unless the certificate is signed by a physician. Deaths not so certified are entered under the rubric "cause not specified".

To illustrate the importance of the various causes of death and their relation to the general mortality, Table VIII is inserted, showing the death rates in descending order from all those diseases resulting in one per cent or more of all deaths in 1931.

It will be noticed that the majority of communicable dis-

eases, and particularly those which are commonly considered as highly prevalent in the tropics as plague, small pox, yellow fever etc., are conspicuous by their absence. Again, diphtheria, scarlet fever, acute anterior poliomyelitis and other transmissible diseases which take a heavy toll in other countries are similarly absent, either because they never occur here

TABLE VIII

DEATH RATES FROM IMPORTANT CAUSES AND PER CENT OF EACH CAUSE TO TOTAL DEATHS: 1931

Int. List No.	Causes of Death	Death rate per 100,000 population 1931	Per cent of all Deaths 1931
	ALL CAUSES	2,041.6	100.0
23–32	Tuberculosis (all forms)	275.5	13.5
119	Diarrhea and Enteritis (under 2 years)	221.6	10.8
38	Malaria	203.7	10.0
107–109	Pneumonia (all forms)	199.0	9.7
158–161	Diseases of Early Infancy	124.8	6.1
130–132	Nephritis	124.5	6.1
120	Diarrhea and Enteritis (2 years and over)	116.7	5.7
90–95	Diseases of the Heart	93.1	4.6
162	Senility	62.4	3.1
140–150	Diseases of the Puerperal State (*)	53.0	(**) 1.3
106	Bronchitis (all forms)	51.9	2.5
45–53	Cancer (all forms)	42.9	2.1
176–198	Accidents (all)	31.1	1.5
22	Tetanus	27.1	1.3
96–99	Diseases of the Arteries	26.5	1.3
40	Uncinariasis	25.2	1.2
82	Cerebral Hemorrhage	23.8	1.2
34	Syphilis	21.6	1.1
163–171	Suicides (all)	19.9	1.0
199–200	Ill-defined and not specified causes	103.6	5.1
	All other causes	220.2	10.8

(*) Rate per 100,000 female population.
(**) Per cent of death rate among females.

as in the case of scarlet fever, or because the number of deaths registered from them is relatively low. Most of the latter diseases really constitute problems of minor importance in Puerto Rico.

On the other hand, the tremendous importance of tuberculosis, gastrointestinal disorders, malaria and the diseases of early infancy as public health problems, is evident. For

lack of space, only tuberculosis, diarrhea and enteritis (under two years and two years and over) and malaria will be considered here. These three causes of death combined make up 40 per cent of the mortality in Puerto Rico.

Tuberculosis has taken the lead among all causes of death during the last three years and was responsible for 13.5 per cent of all deaths registered in 1931. Table IX and Figures 6, 7 and 8 give the specific death rates from this cause in 1931 by age, sex and color. Inspection of this table and graphs

TABLE IX

SPECIFIC DEATH RATES PER 100,000 POPULATION FROM TUBERCULOSIS BY SEX, AGE AND COLOR: 1931

Age	Total	Male	Female	White		Colored	
				Male	Female	Male	Female
ALL AGES	275.5	252.6	298.7	239.6	287.2	292.2	331.7
Under 1 year (*)	65.4	68.6	62.2	69.4	64.0	66.2	57.4
1— 4 years	42.0	49.3	34.7	53.7	35.5	36.8	32.5
5— 9 years	28.6	31.2	25.8	26.1	20.7	45.4	40.0
10—14 years	63.0	35.8	91.1	40.3	70.3	22.8	150.5
15—19 years	248.1	218.0	275.1	199.0	259.8	271.2	318.9
20—24 years	551.8	513.4	465.1	467.6	537.0	641.9	746.3
25—29 years	590.7	498.7	674.9	465.0	627.3	599.2	823.3
30—34 years	519.9	443.2	595.0	423.7	586.6	504.6	621.8
35—44 years	454.4	417.0	492.6	395.3	497.3	484.8	478.7
45—54 yeras	431.4	405.4	460.3	370.4	443.3	519.8	509.2
55—64 years	409.1	432.7	382.5	422.3	415.0	467.7	283.3
65—74 years	410.9	553.2	273.9	530.3	272.4	628.7	278.8
75 and over	366.3	407.3	333.8	379.2	319.5	485.4	370.5

(*) Rates per 100,000 living births.

will show the exceedingly high rates in ages 20–24, 25–29 and 30–34. According to the experience of 1931 the female rates are considerably higher than the male rates in all ages from 10 to 55 years among white persons, and in all ages from 15 to 35 years among colored persons. The peak of the mortality is at the ages of from 25–29, all deaths considered, and at the same group of ages for both white and colored females; for white and colored males the peak is reached earlier, at ages from 20–24 years.

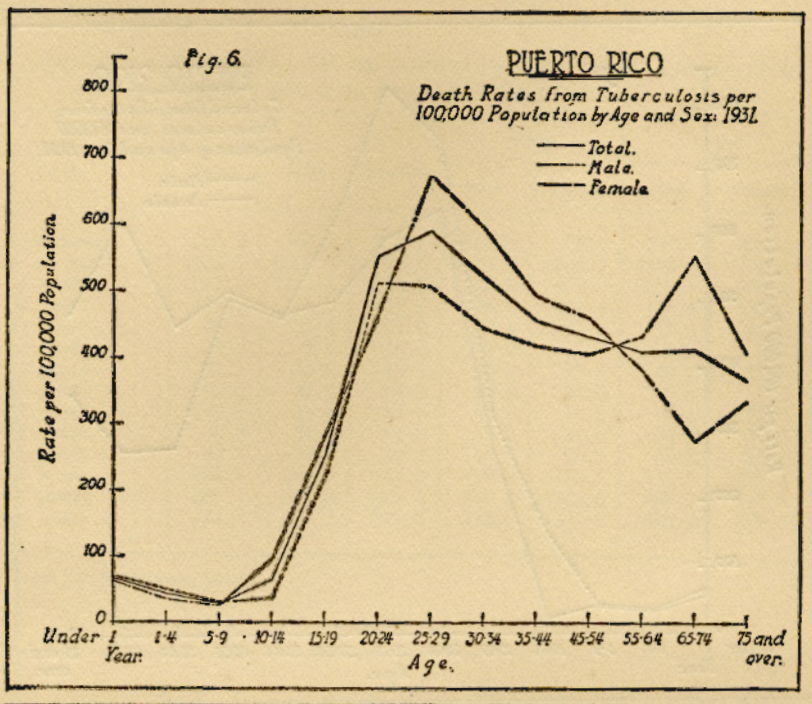


Fig. 6.
PUERTO RICO
Death Rates from Tuberculosis per 100,000 Population by Age and Sex: 1931.
Total.
Male.
Female.
Rate per 100,000 Population.
800
700
600
500
400
300
200
100
0
Under 1 Year
1-4
5-9
10-14
15-19
20-24
25-29
30-34
35-44
45-54
55-64
65-74
75 and over.
Age.

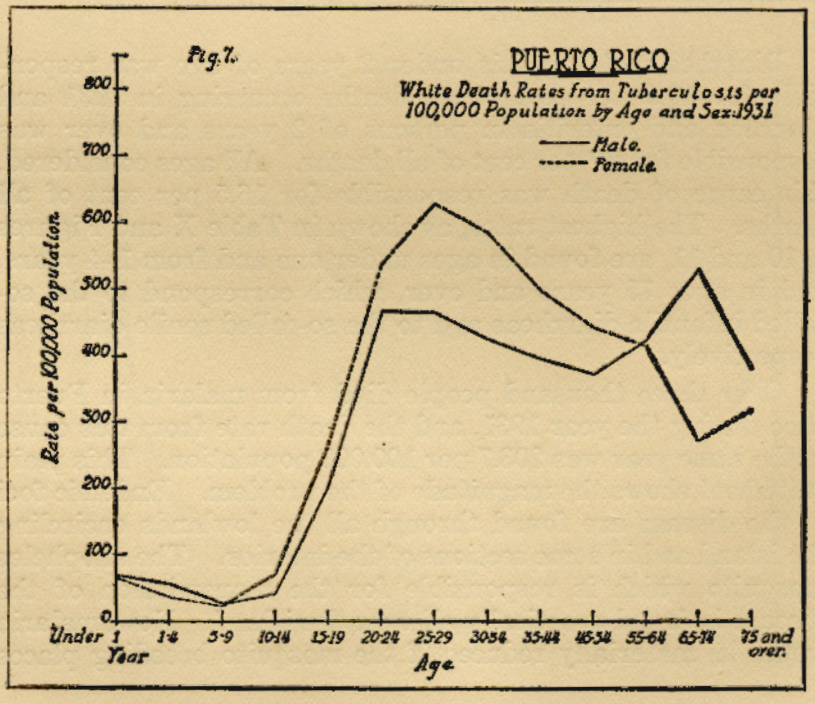
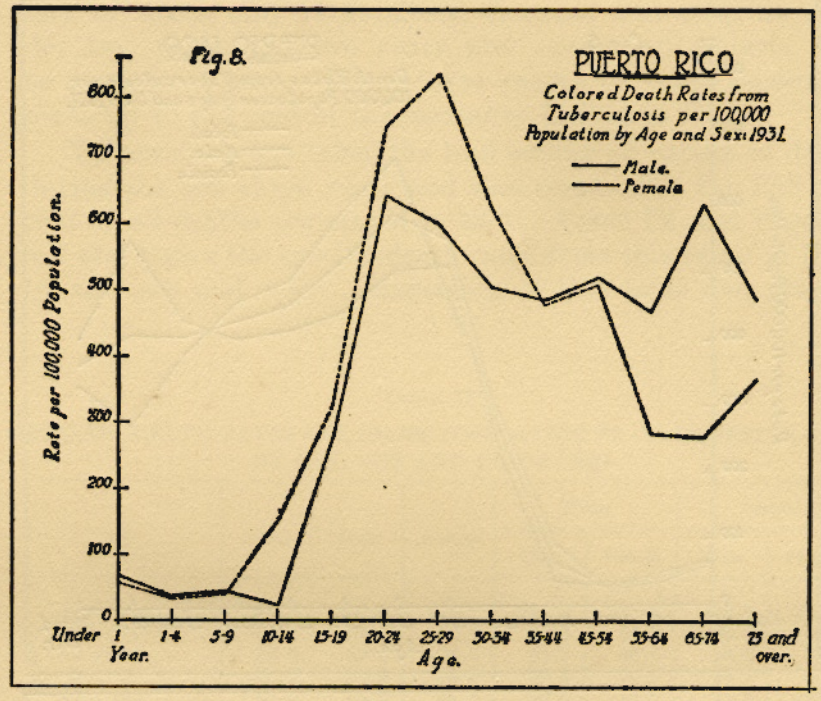


Fig. 7.
PUERTO RICO
White Death Rates from Tuberculosis per 100,000 Population by Age and Sex: 1931.
Male.
Female.
Rate per 100,000 Population.
800
700
600
500
400
300
200
100
0
Under 1 Year
1-4
5-9
10-14
15-19
20-24
25-29
30-34
35-44
45-54
55-64
65-74
75 and over.
Age.



Diarrhea and enteritis under 2 years of age was responsible for 10.8 per cent of all deaths occurring in 1931 and diarrhea and enteritis in persons of 2 years and over was responsible for 5.7 per cent of all deaths. All ages considered, this cause of death was responsible for 16.5 per cent of all deaths. The highest rates, as shown in Table X and Figures 9, 10 and 11, are found in ages under one and from 1–4 years, and in ages 75 years and over, which correspond to the so-called infantile diarrheas and to the so-called senile diarrheas respectively.

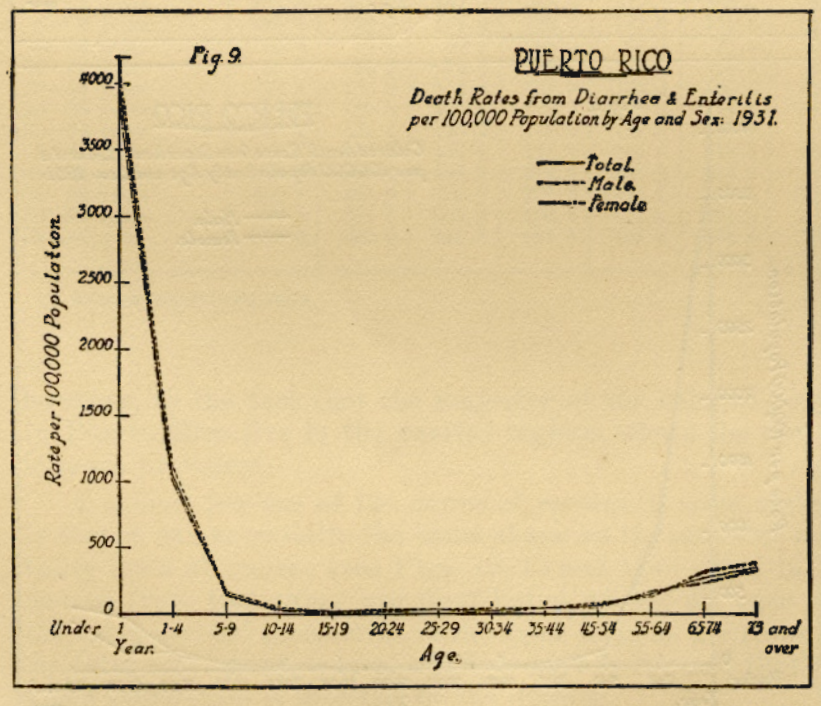
Over three thousand people died from malaria in Puerto Rico during the year 1931, and the death rate from this cause in the same year was 203.7 per 100,000 population. This plain statement shows the magnitude of the problem. Endemic foci of the disease are found through all the lowlands encircling the island and in some sections of the interior. The anopheles mosquito which is responsible for the transmission of the disease is found practically all over the island. Now, malaria would be materially reduced if the mosquito breeding places

TABLE X

SPECIFIC DEATH RATES PER 100,000 POPULATION FROM DIARRHEA AND ENTERITIS BY AGE, SEX AND COLOR: 1931

Age	Total	Male	Female	White		Colored	
				Male	Female	Male	Female
ALL AGES.....	338.2	357.7	319.1	365.6	316.0	336.6	328.3
Under 1 year(*)....	3955.8	4083.9	3822.2	4271.8	3830.7	3576.2	3799.4
1— 4 years.....	1051.6	1107.8	994.8	1135.0	993.5	1030.8	998.5
5— 9 years.....	143.7	151.8	135.4	156.3	137.4	139.4	130.0
10—14 years.....	22.2	17.4	27.0	20.8	21.6	7.6	42.4
15—19 years.....	9.3	7.7	10.8	7.4	13.2	8.3	3.8
20—24 years.....	21.1	29.0	13.2	25.0	12.4	40.1	15.5
25—29 years.....	23.9	27.1	21.0	30.6	25.3	16.6	7.8
30—34 years.....	22.7	33.4	12.3	38.5	10.8	17.4	17.0
35—44 years.....	33.9	31.8	36.0	34.2	37.0	24.2	33.2
45—54 years.....	49.7	58.2	40.4	61.7	50.0	46.5	15.7
55—64 years.....	138.7	124.6	154.5	128.0	156.2	113.4	149.1
65—74 years.....	267.7	307.3	229.5	280.2	262.6	397.1	123.9
75 and over.....	344.8	374.7	320.9	334.6	301.8	485.4	370.5

(*) Rates per 100,000 living births.



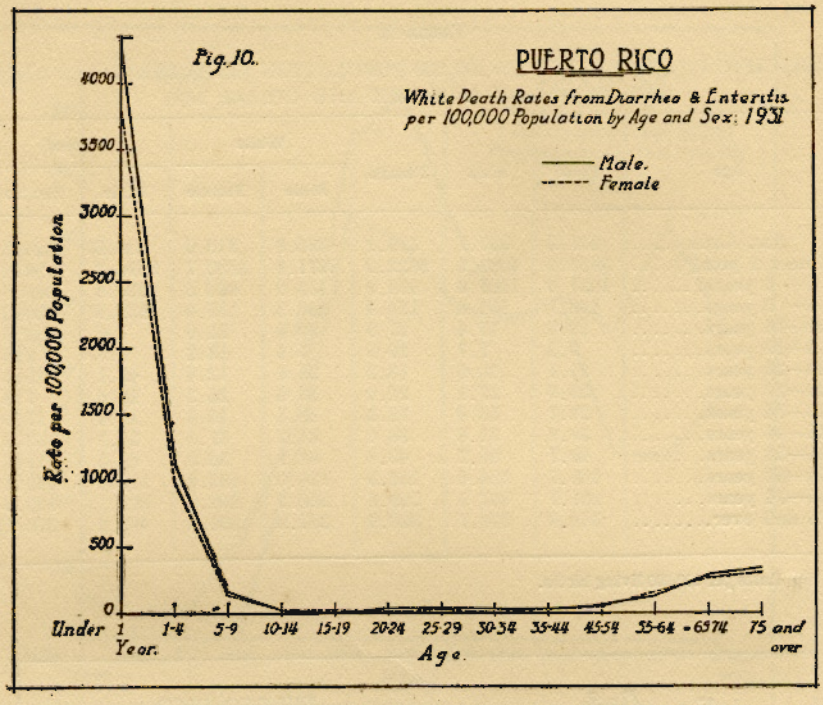


Fig. 10.
PUERTO RICO
White Death Rates from Diarrhea & Enteritis per 100,000 Population by Age and Sex: 1931
Male.
Female
Rate per 100,000 Population
4000
3500
3000
2500
2000
1500
1000
500
0
Under 1 Year.
1-4
5-9
10-14
15-19
20-24
25-29
30-34
35-44
45-54
55-64
65-74
75 and over
Age.

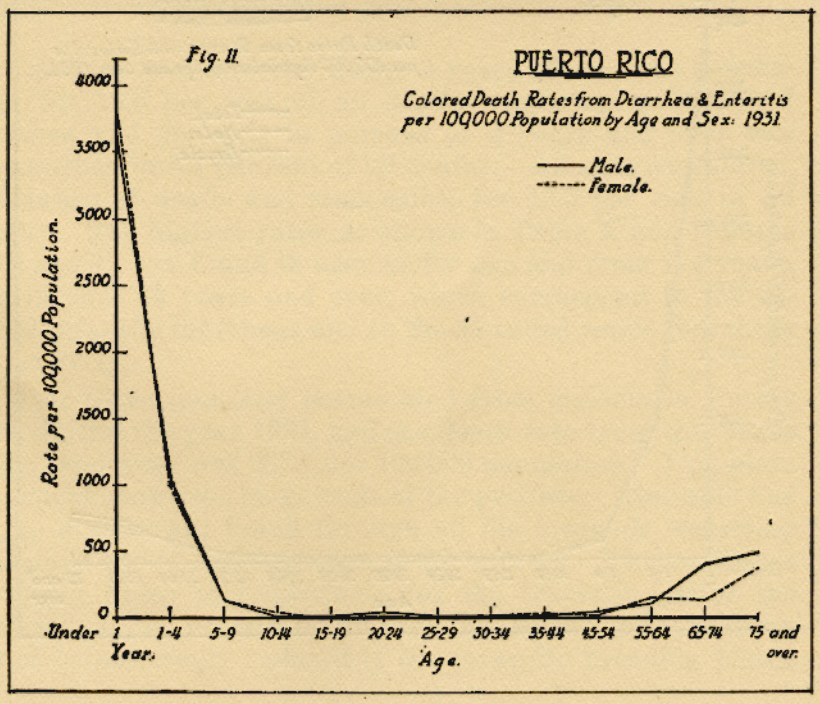


Fig. 11.
PUERTO RICO
Colored Death Rates from Diarrhea & Enteritis per 100,000 Population by Age and Sex: 1931
Male.
Female.
Rate per 100,000 Population.
4000
3500
3000
2500
2000
1500
1000
500
0
Under 1 Year.
1-4
5-9
10-14
15-19
20-24
25-29
30-34
35-44
45-54
55-64
65-74
75 and over.
Age.

were to be diminished. To do this, however, it would be necessary to spend an enormous amount of money, which is beyond the present economic possibilities of the Island.

Table XI and Figures 12, 13 and 14 show the specific mortality from malaria during the year 1931. It will be noticed that the rates are uniformly higher among the colored than among the whites in all ages, which would be strongly suggestive of a higher racial susceptibility to the disease on the part of the colored race. Due consideration should be given,

TABLE XI

SPECIFIC DEATH RATES PER 100,000 POPULATION FROM MALARIA BY AGE, SEX AND COLOR: 1931

Age	Total	Male	Female	White		Colored	
				Male	Female	Male	Female
ALL AGES....	203.7	203.0	204.8	193.6	190.7	230.6	245.4
Under 1 year (*)...	782.3	792.9	771.3	796.4	738.0	783.7	860.9
1— 4 years.....	391.3	361.0	422.0	344.0	413.1	409.0	446.5
5— 9 years.....	146.4	122.3	171.0	126.7	141.0	110.2	253.3
10—14 years.....	75.3	70.7	80.1	68.9	74.4	75.9	96.5
15—19 years.....	83.7	94.2	74.4	81.7	69.9	129.4	87.3
20—24 years.....	123.8	132.9	114.6	133.9	102.4	130.4	150.3
25—29 years.....	131.7	139.8	124.3	128.1	111.3	174.8	164.6
30—34 years.....	134.4	123.3	145.2	115.6	148.0	147.9	136.3
35—44 years.....	148.7	144.9	152.6	121.4	144.8	218.2	175.4
45—54 years.....	215.2	229.1	199.9	218.5	198.5	263.8	203.7
55—64 years.....	305.1	318.0	290.6	277.2	258.7	453.5	387.7
65—74 years.....	482.6	614.7	355.3	600.4	311.3	661.8	495.7
75 and over.....	653.6	668.0	641.8	691.5	585.8	606.8	787.4

(*) Rates per 100,000 living births.

however, to the fact that the majority of the colored people in Puerto Rico live in the coastal regions where the disease is more prevalent.

A salient feature of the curve of mortality from malaria is that it has essentially the same shape as the curve of mortality from all causes (see Figs. 12, 13 and 14). That is, the deaths from this cause are distributed among all ages and the rates present themselves in the same form as the rates for the total number of causes, which is sure indication that the whole population is affected by the disease.

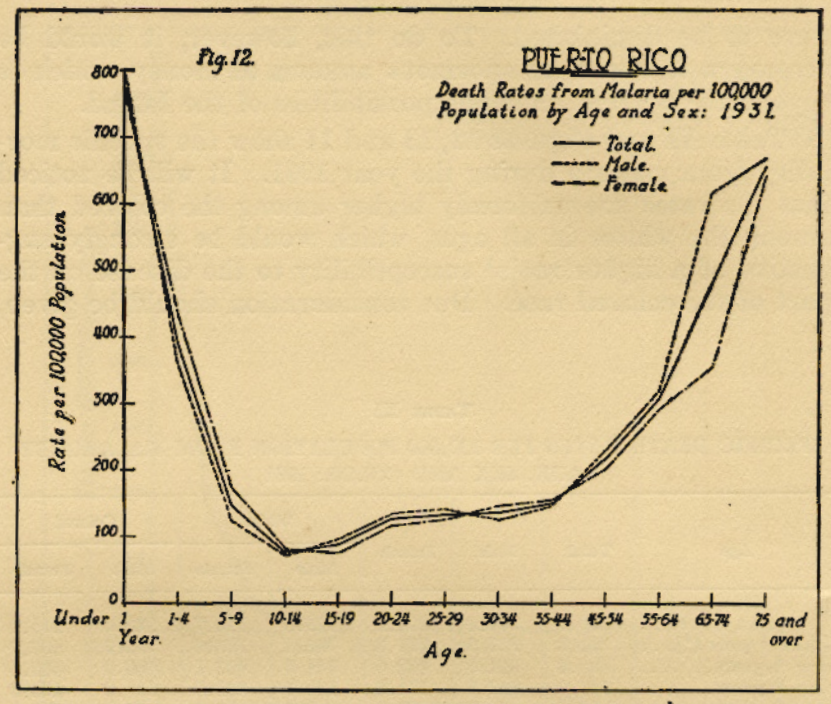


Fig. 12.
PUERTO RICO
Death Rates from Malaria per 100,000 Population by Age and Sex: 1931.
Total.
Male.
Female.
Rate per 100,000 Population.
800
700
600
500
400
300
200
100
0
Under 1 Year.
1-4
5-9
10-14
15-19
20-24
25-29
30-34
35-44
45-54
55-64
65-74
75 and over
Age.

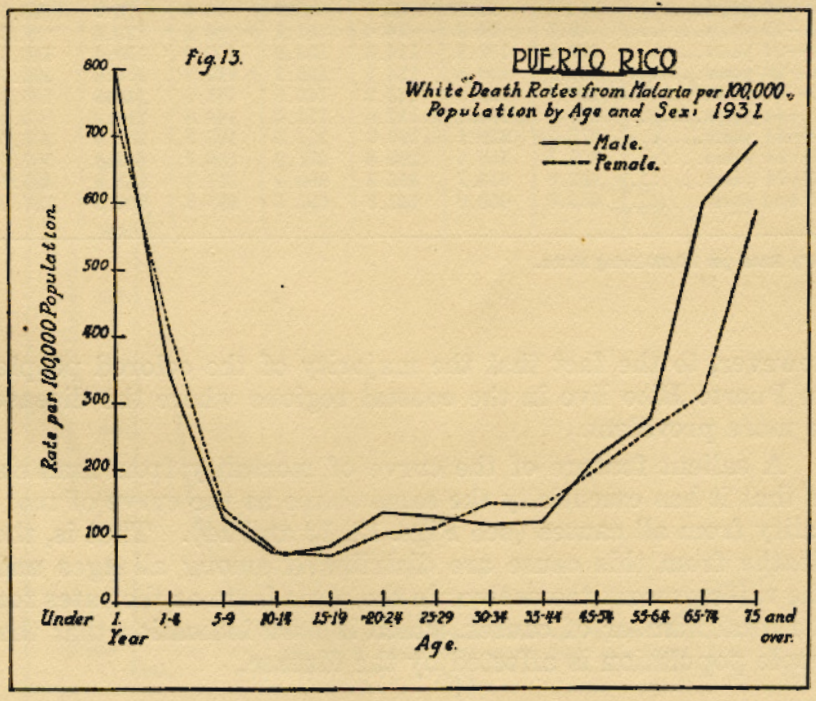
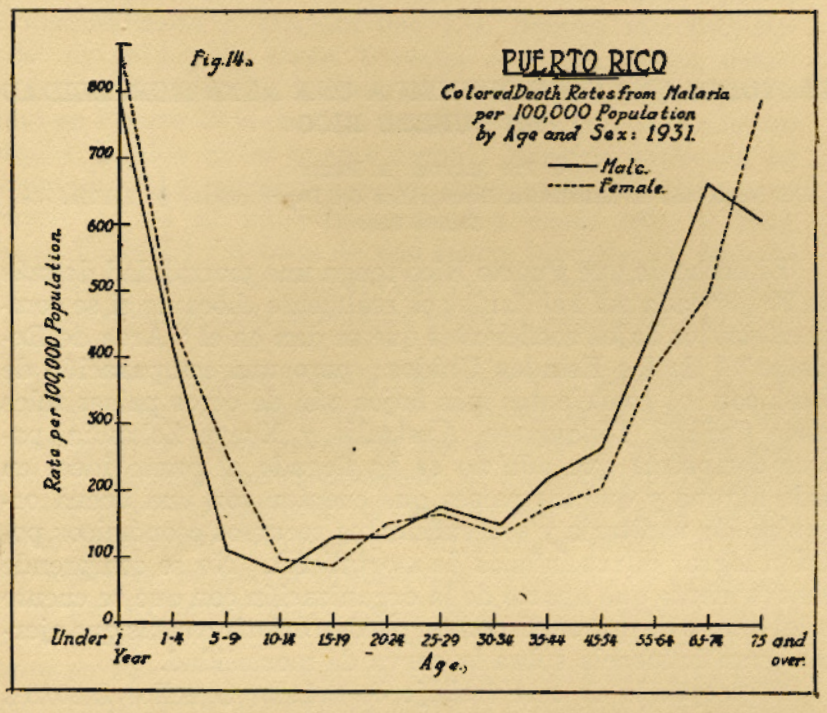


Fig. 13.
PUERTO RICO
White Death Rates from Malaria per 100,000 Population by Age and Sex: 1931.
Male.
Female.
Rate per 100,000 Population.
800
700
600
500
400
300
200
100
0
Under 1 Year
1-4
5-9
10-14
15-19
20-24
25-29
30-34
35-44
45-54
55-64
65-74
75 and over.
Age.



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