The Incidence of Syphilis in Puerto Rico*

SURVEY BASED ON THE RESULTS OF COMPLEMENT FIXATION AND FLOCCULATION TESTS IN UNSELECTED AND SELECTED GROUPS OF THE GENERAL POPULATION

By O. COSTA MANDRY

From the Biological Laboratories, Department of Health of Puerto Rico; and the School of Tropical Medicine, Puerto Rico; and the Health Division of the Puerto Rico Reconstruction Administration

Outline of Contents

* Received for publication March 9, 1940.

INTRODUCTION

SYPHILIS has been a problem of paramount health importance in Puerto Rico since the days of the colonization of the Island by the Spaniards. The first mention of the disease "morbus gallicus" appeared in historical documents in the early part of the sixteenth century, when Captain Salazar, right-hand man of Ponce de Leon, died as a result of syphilis.[1]

Controversy as to the actual incidence of the disease in the Island has arisen on account of reports emanating from Public Health or other laboratories, based on standard tests from selected groups, but tabulated without regard to the age, color, sex or residence of the cases studied.

We have been interested in the incidence of syphilis in Puerto Rico for some time. In 1931[2] we published our first study in which the regional literature was reviewed as to previous contributions dealing with this particular phase of the problem, and citing historical references.

The data obtained and analyzed at the time might be briefly summarized as follows, noting the number of tests performed and the per cent of positive reactions obtained:

	Per cent of positive reactions
17,530 blood tests performed in applicants for health certificates in Puerto Rico	16.04
2,955 tests on prenatal cases at the Health Units	13.6
264 cases of childbirth taken care of at the Municipal Hospital of San Juan	15.5
392 Young men comprising the Citizens Military Training Camps	5.1
498 men from the National Guard of Puerto Rico	8.63
1,905 cases selected at random in seven rural districts of Puerto Rico	5.03

	Per cent of positive reactions
654 tests from the Insular Penitentiary	26.6
905 tests from the Insane Asylum	16.68
259 cases from the Girls' Charity School	5.79
356 cases from the Boys' Charity School	7.02
138,644 routine serological tests performed at the Biological Laboratories	18.9
51,692 routine blood tests from 14 municipalities with Health Units	17.47

The conclusion arrived at was that, after making due allowance for age groups not included in the figures analyzed; for the age and geographical distribution of the population, and for the difference in results obtained in the urban and rural zones, "5% is about as accurate a figure as can be determined at present in view of the data available and the lack of more definite basis for computation."

In 1933[3] we published new data, more or less along the same lines as our communication of 1931[2], which may be abridged as follows:

	Per cent of positive reactions
11,426 blood tests performed at the Biological Laboratories classified as to age, sex and race	17.47
8,259 tests on applicants for health certificates during a period of 22 months	13.5
59,114 routine blood tests performed at the laboratories in San Juan and Ponce	16.97
590 cases from the Insular Penitentiary	24.49
868 cases from the Insane Asylum	18.06
411 cases from the Boys' Charity School	7.3
261 cases from the Girls' Charity School	3.08
394 auxiliary midwives of the Health Department	14.46
286 female workers in the needlework industry	14.63

Following the study of the new data analyzed, it was concluded that 5% was a fair percentage incidence for the whole Island and about 10% for the urban population.

Our last report[4] relating to the incidence of syphilis in Puerto Rico was published in the annual report of the Biological Laboratory of the Department of Health of Puerto Rico, fiscal year 1934–35, and consisted of the following figures:

	Per cent of positive reactions
1,212 mothers attending the milk stations of the Health Department including urban and rural zones	7.1
521 women employed in the needle industry in San Juan	8.8

The conclusions drawn from this study coincide more or less with those obtained in 1931[2] and 1933.[3]

Since 1935 nothing appeared in our regional literature regarding the incidence of syphilis in our Island until 1939, when Koppisch[5] published a very interesting study on the incidence of syphilis in Puerto Rico, based on a review of the findings in 1,000 consecutive autopsies performed by the Pathology Department of the School of Tropical Medicine, Puerto Rico. This study showed 8.1 per cent of anatomic evidence of syphilis and 13.9 per cent of previous positive serologic tests, but no anatomic evidence. Thus a total of possible syphilitics of 20.9 per cent was obtained for the whole series. The author, in determining the incidence of syphilis in Puerto Rico by studies of unselected groups of the population, emphasizes the value of exact composition as regards residence, urban or rural, and the actual status of the groups studied. Basing his figures on the estimate of Costa Mandry[2, 3, 4] and his own,[5] he places the percentage of possible syphilitic infection in Puerto Rico as 7 to 8 for the entire population; 12 to 15 for those living in the larger urban centers, and about 20 for the city of San Juan.

Relevant to the above, García Cabrera[6] presented the results of a large series of blood tests made by him and his associates* in different groups of persons as follows:

	Per cent of positive reactions
Private patients (3,402) including males, females, white and colored	8.8
Government employees (3,203) including males, females, white and colored	11.3
Laborers from the Workingmen's Compensation Commission Camps (1,998) mostly males of both races and of low economic and social status	17.4
Laborers from the Puerto Rico Reconstruction Administration (832) mostly males	14.25
Total of 9,435 cases studied	12.9

* Data presented at the Seminar of April 27, 1939, at the School of Tropical Medicine during the discussion of a paper of Koppisch on the Incidence of Syphilis in Puerto Rico.[5]

Costa Mandry[2, 3, 4], Koppisch[5] and García Cabrera,[6] agree more or less on general principles. The difference in the final figure estimating the possible per cent of positive blood tests for Puerto Rico depends almost entirely upon the percentage distribution of the cases surveyed as regards residence, color, sex, age and social status as compared to that of the composition of the population in Puerto Rico.

PROCEDURE

All the data herein presented, with very few exceptions, has been collected from 1936 to the present time and consists exclusively of the results of serological blood tests (complement fixation and flocculation) performed in the great majority of the cases in one or another of our Biological Laboratories in San Juan, Ponce or Aguadilla.

As regards the selection of the different groups of cases which comprise this study, the following detailed outline gives an idea of the type of cases utilized:

A. *Unselected Groups.*	*Number*
1. Urban zone	14,710
Cities of more than 25,000 inhabitants, San Juan, Ponce and Bayamón	8,684
Towns between 10,000 and 25,000 inhabitants, Caguas, Arecibo and Aguadilla	1,041
Towns of less than 10,000 inhabitants, Humacao and Manatí	2,394
2. Rural zone	19,540
Cases (males) from 20 Workingmen's Compensation Commission Camps (P.R.R.A.) located in 15 different municipalities	4,711
Cases from 20 rural medical dispensaries of the P.R.R.A. covering 60 barrios in 51 different municipalities	12,403
Cases (males) from 18 Workingmen's Compensation Commission Camps of the U.S. Forestry Service in Puerto Rico located in 14 different municipalities	2,832
B. *Selected Groups.*	
Employees and their families in the Lafayette Cooperative	1,903
Insular homes for Boys and Girls	531
Boys' Reform School	103
Insular Penitentiary and District Jails	753
Consecutive admissions during three years to the Psychiatric Hospital at Río Piedras	914

Consecutive male admissions to a private hospital	979
Consecutive admissions to the Tuberculosis Hospitals at Río Piedras, Ponce, Mayagüez and Guayama	2,629
Consecutive admissions to the wards of the University Hospital	2,382
Special group comprising routine tests performed at our government laboratories	20,648

In some cases only one test was performed; in others, two or three tests were carried on simultaneously, as may be seen from the tabulated data.

TESTS EMPLOYED

We have employed either complement fixation, flocculation, or both tests. Among the flocculation tests we have performed the Kahn standard technic[7] and the Kline[8] diagnostic test. In the former, results were read immediately after the shaking period.

As a complement fixation test we have employed a modification of the Wassermann technic[9] which has been in use in our laboratories for the past eight years.

1.—Saline solution: Tap water (760 c.c.) is placed in alkali proof bottles with bakelite screw caps and sterilized in the autoclave for 15 minutes at 15 pounds pressure. Enough bottles are prepared to last for a week. Before use, 40 c.c. of the following stock solution are added to each bottle and a normal buffered saline of pH 7.4 is obtained.

STOCK SOLUTION

Sodium chloride c.p.	170.0 gms.
Potassium acid phosphate	13.6 gms.
Sodium hydroxide	3.0 gms.
Distilled water qs.	1,000 c.c.

This stock buffered saline solution is prepared in small bottles of 100 c.c. capacity.

In the performance of the test 0.5 c.c. of the final buffered saline is added to each tube.

2.—Serum: It is inactivated at 56° C for ½ hour. If the serum has been inactivated the previous day it is reinactivated for 10 minutes previous to the performance of the test. 0.05 c.c. of this serum is employed in the test.

3.—Antigen: An alcoholic extract of beef heart fortified with 0.4% cholesterol is employed. The antigen is carefully titrated for anticom-

plementary, lytic and antigenic properties and tested with a number of positive and negative serums before use. It is so diluted that the proper dose employed in the test is contained in 0.1 c.c. which is added to the front tube only.

4.—Amboceptor: The amboceptor is added in a fixed dose, two units (determined by titration) in a volume of 0.1 c.c.

5.—Complement: Blood is obtained from 5 to 10 male guinea pigs under fasting. The serum is mixed 1 in 20 in normal saline solution and is titrated daily and diluted so that two units are contained in 0.1 c.c.

6.—Sheep Cells: A 5% solution of sheep red blood cells in normal saline is prepared. Equal parts of this and of the diluted amboceptor are mixed and sensitized for 10 minutes in the water bath at 37° C. 0.2 c.c. of this sensitized mixture is used in the test.

THE TEST PROPER: Two tubes are used, one a control which contains all the ingredients except antigen, the total volume in each tube being about 1 c.c.

Fixation is accomplished in the ice box for four hours followed by ½ hour in the water bath at 37° C.

Results: Results are read immediately and noted as follows:

NEGATIVE: Those tubes in which there is complete hemolysis or less than 10% of inhibition of hemolysis.

DOUBTFUL: Those in which there is between 10 and 20% of inhibition of hemolysis.

POSITIVE: Those in which there is inhibition of hemolysis of 20% or more.

SURVEY

A. Unselected Groups

In planning the survey, two groups of cases were outlined; the unselected group where specimens were taken from the general population including all ages, sex and races of both the urban and rural zones of the island, and from selected cases, which were those in government institutions, people living under a common roof and similar conditions, and other special groups, as will be seen later on.

1. Urban Zone: The survey on the urban zone includes eight towns with a total of 14,710 cases (2.3% of the urban population of Puerto Rico) in which are included 2,584 where the town was not specified but which were definitely of the urban zone. Figure 1 shows the geographical location of the towns where the cases were selected.

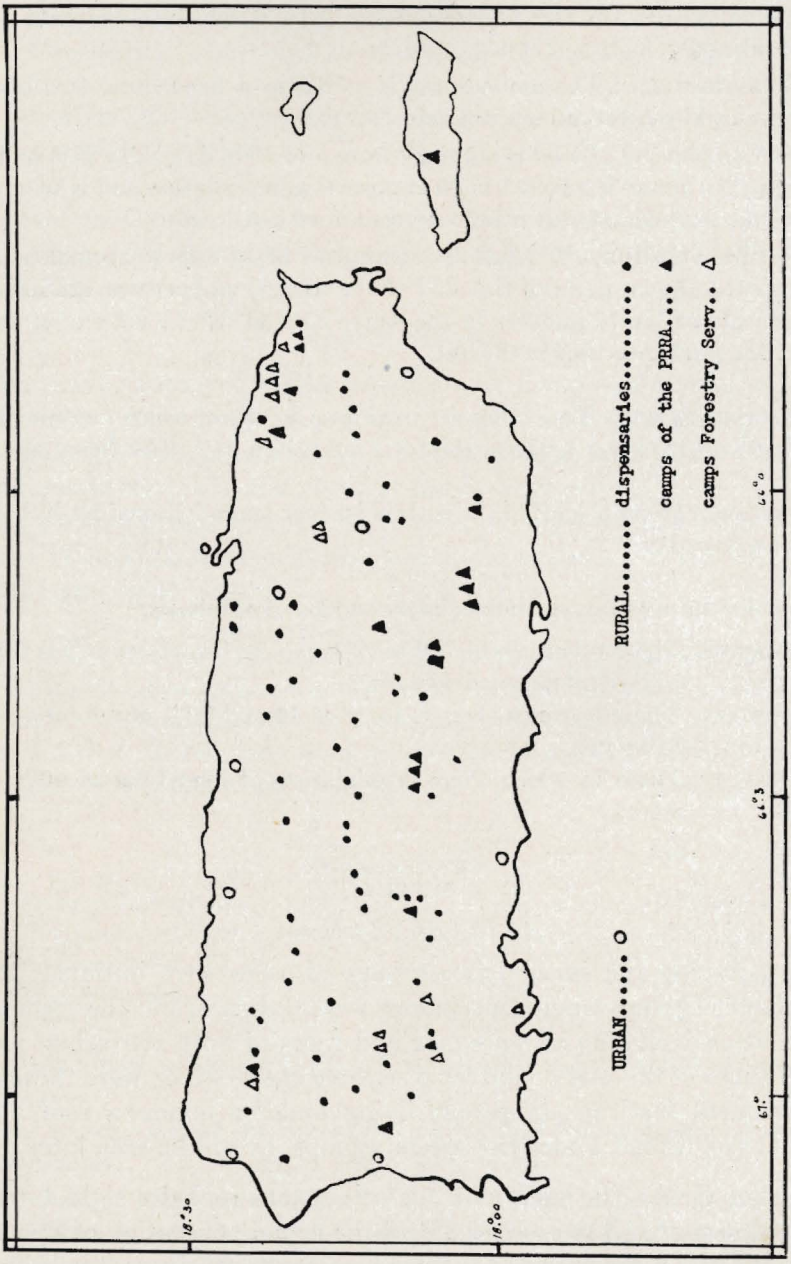

FIGURE 1: Map of Puerto Rico showing location of cases surveyed

The cases comprising the urban group include children attending the public schools in seven towns of the Island; cases attended at the urban dispensaries of the Puerto Rico Reconstruction Administration; women visiting several maternal dispensaries of the health department and applicants for health certificates.

Table I (See Appendix) shows the number of cases surveyed in each town with the per cent of positive blood tests obtained in each group. The lowest per cent (1.9) was from the city of Bayamón, among 663 cases, mostly school children. The highest was Arecibo (9.3), among 332 cases. San Juan with 6,471 cases showed a positive percentage of 7.5. For the total urban group of 14,710 a positive percentage of 7.1 was obtained. This figure is much lower than the one obtained in the group of 12,765 cases of the urban zone which were studied as to age groups, color and sex in which a positive percentage of 8.6 was obtained.

a. School Children: A survey of the school population in several towns and cities was carried out. Blood was obtained as a representative sample from schools, and an endeavor was made to include children of different social and economic strata.

A total of 6,155 was tested in the whole Island during 1939. Of these, there were 3,062 males and 2,600 females; 4,543 white and 1,612 colored. Table No. II gives in details the positive percentage of blood tests by age groups and by race and sex. Of the total number examined, 3,699 were from San Juan, 757 from Ponce, 977 from Manatí, 122 from Humacao and 363 from Bayamón. The results of these examinations are rather interesting. Taking the whole group, which includes persons under 20 years of age only, the positive percentage of 5.6 obtained is rather high, if one considers that out of a total of 6,155 studied, 5,354 were under 15 years of age.* In our survey of 1931[2] a positive percentage of 3.1 was obtained in the case of the girls and 7.0 for boys in the Charity Schools, all ages being under 20 years. In the Citizens' Military Training Camps[2] a positive percentage of 5.1 was obtained. Both these percentages are more or less similar to those obtained in the group of unselected school children throughout the Island. The lowest percentage (1.6) was obtained among 122 from Humacao, the highest (8.9) among 67 from Arecibo, followed by 6.5 from 170 cases in Aguadilla and 5.5 from 3,699 cases of San Juan. It is interesting to note that the percentage

* The fact however that this age group constitutes about 45 to 50% of the actual population of the island must be borne in mind.

of positive results in the age group 15–19 was lower than in the age group 7–14 years.

b. Prenatal Cases: The Department of Health of Puerto Rico maintains at each of the Health Units a clinic in which pregnant women are given advice and are thoroughly examined. We have selected for our group only those units—i.e. those of Aguadilla with 315 cases, Ponce with 1096, Manatí with 500, Arecibo with 265 and Humacao with 237—in which a routine blood test is performed on every woman (usually of the poorer class) who attends the clinic. Table V shows in detail the results of positive blood tests in percentage by age group and by race. The lowest percentage of positives obtained was from the city of Aguadilla (6.3), the highest, from Ponce (10.6). These figures are not comparable with those of previous surveys[2] where all cases attending the Health Units were used, inasmuch as in most towns the examinations were done only on selected cases.

c. San Juan Slums Survey: The Health Division of the Puerto Rico Reconstruction Administration during 1937 carried out a survey in the slums of the city of San Juan and blood for serological examination was obtained from 706 persons. The results classified by age groups, race and sex can be seen in table number III. The per cent of positive results obtained (12.2) for the whole group varied with the ages of the individuals, being lowest in the young and highest in the late adult or middle ages. This survey represents people of the lowest social strata who live under very depressing economic conditions favorable to the existence of syphilis. Although the number of 706 is rather small, it may be used to represent a group of that particular class of individuals.

For a waterfront city, like San Juan, we expected a higher percentage of positive results.

d. Urban Dispensaries: In this group are surveyed all the cases of the urban dispensaries of the Puerto Rico Reconstruction Administration, including the three modern suburbs of Eleanor Roosevelt at Rio Piedras, Mira Palmeras and the Phalanstery in San Juan. Taking the group as a whole, 2,816 persons were studied.

In table IV are detailed the results of the percentages of positive blood tests by age group, and by sex and race. Taking all the cases as a group, a total percentage of 9.2 of positive blood tests was obtained. The percentage was higher in the colored race (15.7) than in the white (8.4), and in the males (12.6) than in the females (6.9). The

range of positive blood tests in the different age groups varied from 3.3 to 18.3.

e. Health Certificates: A total of 2,450 applicants for health certificates was included in our series. We selected these cases from Health Units which performed a routine blood test on all applicants, eliminating those where tests were performed only in a certain number of cases. In the previous studies which we have published[2, 3] the record of applicants for health certificates comprised all the cases, selected and unselected, so that the positive percentage was not truly representative of the group and cannot be compared with the series presented herein.

Of a total of 2,450 cases studied, 10.3 per cent gave a positive result. These tests included 1,888 from San Juan, 217 from Manatí and 345 from Humacao. Table VI gives the results in detail as regards to the sex and color of the age groups.

2. Rural Zone: A total of 19,540 unselected persons residing in the rural zone and drawn from practically every municipality of the Island, has been included in this group, with a representative number of the various age groups, sex and races. This number represents 1.7 per cent of the total rural population of the Island. The cases came from three sources: (1) The Rural Medical Dispensaries; (2) Workingmen Reconstruction Camps of the P.R. Reconstruction Administration and (3) the Civilian Concentration Camps of the United States Forestry Service in Puerto Rico.

Figure 1 shows the location of the Rural Medical Dispensaries and Camps where the cases were obtained. Comprehensive selection presupposes a representative sample of the rural inhabitants of the Island of Puerto Rico. A positive percentage of 5.7 in complement fixation and 6.6 on flocculation was obtained for the whole group.

a. Rural Medical Dispensaries: There were 60 rural medical dispensaries scattered throughout the rural zone of the Island, covering 48 municipalities (figure 1). These dispensaries gave medical services to the workers of the P.R. Reconstruction Administration and their families or to any individuals applying for them. During a period of about one year, 12,403 persons were examined as to the presence or absence of syphilis, substantiated by the results of complement fixation or flocculation tests.

In table number VII can be seen in detail the results of all blood tests performed in the rural medical dispensaries* by age groups,

* The group represents persons physically below par, suffering from various ailments.

color and sex. The total positive percentage obtained in this group at the rural medical dispensaries was 7%, the lowest percentage was 3.2 in the age group 7–14 years, and the highest 10.9 in the age group 50 years or more.

b. Agricultural Workers: Both the Forestry Service of the United States in Puerto Rico and the Puerto Rico Reconstruction Administration maintained a number of civilian concentration camps for the laborers employed by these two federal agencies. All of these laborers were adult males and the great majority came from the rural zones of the Island. The Forestry Service maintained 13 camps in 10 different municipalities, the Puerto Rico Reconstruction Administration had 20 camps distributed in 14 different municipalities. Figure 1 shows the location of these camps. A total of 7,453 persons were examined in all camps, with a positive per cent of 4.7 by complement fixation and 5.7 by flocculation (Kahn). Table VIII shows details by age groups and race as regards the results obtained in all blood tests corresponding to the whole group. Of these 7,453 male laborers 2,832 were from the Forestry Service and 4,711 from the Puerto Rico Reconstruction Administration. The survey was carried out during 1936. Of the 2,832 adult males from the Forestry Service 4.3 gave a positive complement fixation and 6.1 a positive Kahn test; the lowest positive per cent (3.5) was in the age group 20–24 years while the highest (10) was in the group over 45 years.

Of the 4,711 cases from the Puerto Rico Reconstruction Administration, 4.9 per cent gave a positive complement fixation and 5.8 a Kahn test, the lowest figures (3.9) belonging to the age group 20–24 years; the highest (7.4), to the group 40–44 years.

Both groups represent adult males subjected to and having passed a physical examination.

B. *Selected Groups*

Under selected groups* we have included 32,586 blood tests from five different sources as follows:

1. Central Laffayette survey.
2. Hospital admissions to:
   (a) Psychiatric hospital
   (b) Four tuberculosis hospitals

* We have grouped these as selected because in it are included institutions for medical care and homes for destitute children, penitentiaries and routine laboratory examinations.

(c) General hospital
(d) Male admissions to a private hospital.

3. Insular homes for boys and girls.
4. Penitentiary and district jails.
5. Routine public health laboratory tests.

1. Laffayette Survey: During the year 1936 the Health Division of the Puerto Rico Reconstruction Administration made a health and socio-economic survey on a sugar cane plantation owned by that Federal Agency in the south eastern part of the Island.[10] This survey included serological blood tests of a large proportion of the persons living in that area. The sugar cooperative comprises a sugar mill and pasture lands extending to the municipalities of Patillas, Arroyo and Maunabo. The "Central", or sugar mill is composed of a number of "Colonias" or farms, of which there are 8. There were 860 families living in the surveyed area with an aggregate population of 4,400 inhabitants, giving an average of 5.1 persons per family. In 1,903 persons a blood test was performed, that is, in 43.2% of the total population. The survey comprised both urban, semi-urban and rural districts. In table number IX are given in detail the positive percentages by age group and by race and sex of all the cases surveyed.

A positive percentage of 6.7 for the total number surveyed was obtained. The percentage of positive results was higher in the white (6.8) than in the colored (6.6), while in males and females it was similar (6.7 and 6.8).

2. Hospital Admissions: Consecutive admissions to four different types of hospitals were studied, the first blood test performed being utilized in our survey. These institutions were the Psychiatric Hospital at Rio Piedras, the four Tuberculosis Hospitals at Rio Piedras, Ponce, Mayagüez and Guayama, a private hospital (Mimiya) where only a specially selected group of male admittances was included, and a diagnostic hospital owned by the Government. Table X shows details of the 6,904 cases comprising the group with the per cent of positive blood tests by age groups and by institutions. The percentage of positive reactions for the whole group was 13.1; the lowest (7.3), for the Psychiatric Hospital; the highest (19.8), for the private hospital.

a. Psychiatric Hospital: The Psychiatric Hospital of Puerto Rico is an insular institution which accommodates about 1,000 patients

suffering from different diseases of the central nervous system. The histories of 914 consecutive admissions to the hospital during 3 years (1936–1939) were studied and the results of complement fixation or flocculation tests upon the admission of the patient to the hospital were studied and analyzed.

Of these, 7.3% gave a positive complement fixation test and 6.9% a positive flocculation. Table X (in the appendix) shows the positive percentage classified by age groups. Of these 914 cases a positive complement fixation or flocculation test in the spinal fluid was obtained in 3.6% while the colloidal gold test of Lange showed a typical paretic curve in 2.6%. A final diagnosis of syphilis of the central nervous system based on serologic and clinical findings was made in 6.8%; of paresis in 3.5%, and of neurosyphilis in 3.4%. It is noteworthy to observe the low percentage of cerebrospinal syphilis (6.8%) as compared to that recorded for psychiatric hospitals in the United States.

In Figure 2 can be seen in graphic form the positive percentage of blood tests in admissions to the Psychiatric Hospital by age groups as compared to other hospitals.

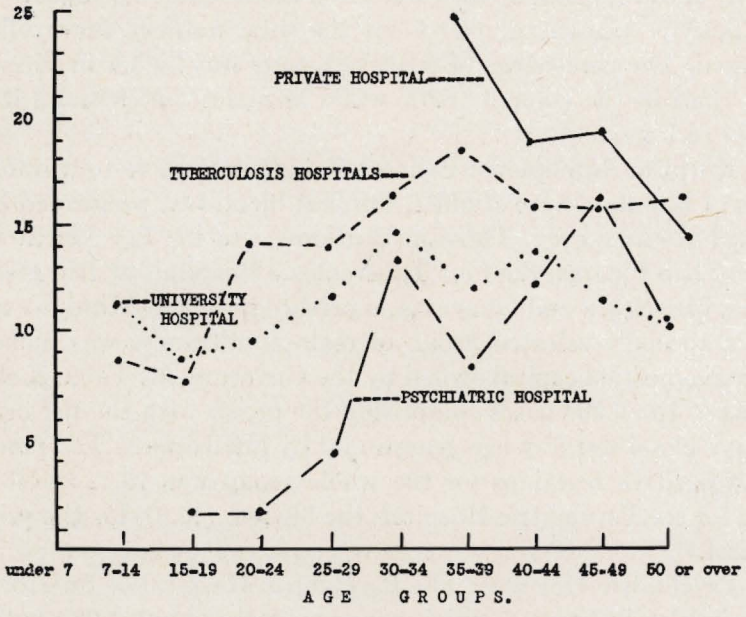

FIGURE 2: Per cent distribution of positive blood tests in different hospitals in Puerto Rico by age groups.

In our study in 1931[2] a positive percentage of blood tests of 16.68 was obtained while in 1933[3] it was 16.58. However, our cases at these periods consisted of the records on file at our laboratory and many cases have two or more positive tests during different periods of their stay in the hospital. In our present series the blood test at the time of admission of the patient was recorded only. Out of 914 there were 67 positive complement fixation, or flocculation reactions while if the record of all the tests performed was considered, the number would be 110 or 12%. It must also be remembered that positive results are repeated with more frequency than negative results.

From reports in the medical literature it can be estimated that from 5 to 15% of the admissions to hospitals for mental diseases suffer with general paresis.[11, 12, 13, 14]

One can see at a glance that the percentage of possible syphilitics in admissions to the Insular Psychiatric Hospital is rather low and the percentage of these with general paresis is very low. This is a subject which needs considerable study and investigation in our Island. We are not now in a position to discuss this phase of syphilitic infection and have merely presented our data to show that the results obtained in Puerto Rico are no higher than those obtained in other places.

b. Tuberculosis Hospitals: A total of 2,629 consecutive admissions to the four tuberculosis hospitals of Puerto Rico located at Rio Piedras, Ponce, Mayagüez and Guayama were analyzed. In table X can be seen in detail the percentage positive blood tests obtained by age groups. Of 2,629 cases surveyed 14.2 gave a positive blood test. The percentage positive in the different age groups ranges from 8.9 in the age group under 15 years to 16.0 in the age group 45 years and over. Of the total, 695 belonged to the Río Piedras Hospital, 799 to the Ponce, 414 to the Mayagüez and 717 to the Guayama. It must be recalled, however, that the majority of the persons hospitalized in these institutions are adults.

c. University Hospital: The University Hospital is a diagnostic hospital and at the time of the survey had a capacity of about 50 beds. A total of 2,382 consecutive admissions were analyzed. In table number 10 can be seen the results of positive blood tests by age groups. The hospital, however, gets its patients from the neighborhood of San Juan. A positive percentage for the whole group of 11.2 was obtained.

d. Private Hospital: The consecutive admissions of 979 patients

was studied. In this particular private hospital this group included only males over 30 years of age who are United States War Veterans on whom a blood test is routinely performed. A positive percentage of 18.8 was obtained. Most of these men obtain free hospital services and if they suffer from syphilis they naturally are hospitalized. This may explain the high incidence of positive blood tests in this group.

e. Insular Homes for Boys and Girls: The Insular Homes for Boys and Girls are open to orphan children from all over the Island. The first blood test upon admission of the children to the institutions was analyzed. A total of 531 cases was studied with a positive percentage of 6.2 for the Wassermann reaction and 4.1 for the Kahn. Of these 267 were males with a positive complement fixation reaction of 4.11 and Kahn 3.0 and 264 females with a positive Wassermann reaction of 8.3 and Kahn of 5.3%. Table number XI gives these details by age groups, and by sex and race. The percentage obtained on the girls was higher (8.3) than in the cases of the boys (4.1).

f. Penitentiaries: during the year 1938–39 a survey of the insular penitentiary at Rio Piedras, and the seven district jails at San Juan, Ponce, Arecibo, Humacao, Guayama, Aguadilla and Mayaguez (including the Reformatory) was made. A total of 2,497 cases was studied. Table number XII shows in detail the per cent of positive reactions obtained (24.9). The lowest per cent (8.7), as one would expect, was among the Boys at the Reform School of Mayagüez, the highest (34.7), among the prisoners of the jail of Humacao. One must call attention to the district jail of Arecibo which includes both men and women. Most of the latter are prostitutes, and this probably accounts for the high percentage of positive reactions among women in this group.

g. Routine Laboratory Tests: Beginning July 1st, 1938, a consecutive number of laboratory report histories from our Biological Laboratories in San Juan, Ponce and Aguadilla were obtained and analyzed. A total of 20,648 tests comprising nine of the largest towns of the Island was studied. Of these, 2,000 belonged to San Juan with a positive percentage of 21.1; 3,754 to Ponce with 10.4%; 3,295 to Mayagüez with 11.9%; 2,000 to Caguas with 15%; 1,500 to Guayama with 15.3%; 2,535 to Arecibo with 16.4%; 2,100 to Aguadilla with 13.6%; 2,000 to Humacao with 13.6% and 1,464 to Manatí with 12.5%. Of the total of 20,648 tests performed, 13.1% gave a positive complement fixation test and 13.8 a positive flocculation test (Kahn).

GENERAL ANALYSIS OF DATA

Our study is based on the results of complement fixation and flocculation tests on blood of individuals in selected and unselected groups of the population of Puerto Rico including all ages, sex, and races among urban and rural residents, and is a continuation of our surveys of 1931, 1933 and 1935.

We fully realize that positive complement fixation or flocculation tests in different groups of the population are not a true or infallible index as to the incidence of syphilis in a community. There is a certain per cent of cases of early and late syphilis which show negative results to the various blood tests in use today. There is likewise a

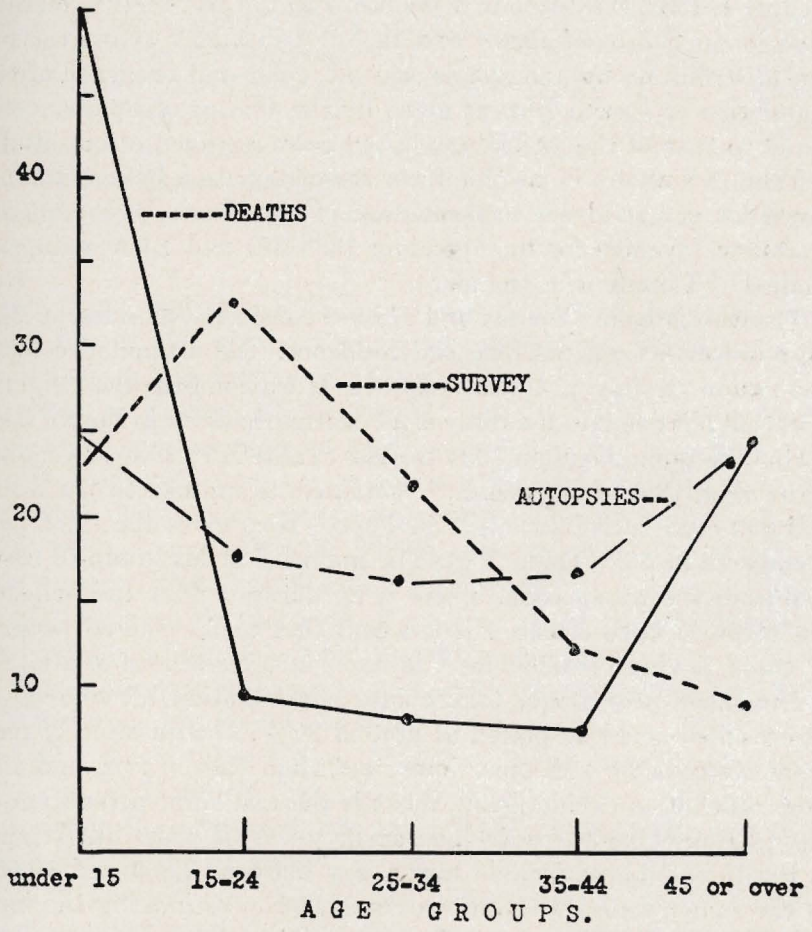

FIGURE 3: Per cent distribution by age groups of the average annual deaths, the cases surveyed and 1000 consecutive autopsies.

certain proportion of cases suffering from diseases other than syphilis, such as yaws, malaria, infectious mononucleosis, tuberculosis and others that may give rise to positive tests. All these factors must be borne in mind in interpreting these results in an attempt to figure in terms of general use the various aspects of syphilis as a public health problem in our Island.

The whole question of determining the incidence of syphilis in Puerto Rico from the results of surveys of blood tests in different groups of the population depends to a great extent upon the actual composition of the population as regards to age, sex, color and residence (whether in strictly rural regions, semi-rural, or urban centers).

In table XIII is given the population of Puerto Rico as estimated on July 1, 1938, the estimate being based on the arithmetical method used in the census of 1930[15] and 1935.[16] Table XIV shows the per cent distribution by age groups and sex, color and residence of the population of Puerto Rico as given by the Census of 1935 as compared to that of the 32,305 unselected cases included in our study.

Table XV shows in graphic form the distribution by age groups, sex, color and residence in percentage of total cases, of the annual mortality (average for quinquenium 1934–39) and 1,000 autopsies studied by Koppisch (see figure 3).

The census figures for sex and age are considered as reliable. Not so, however, as regards race and residence. The estimated colored population on July 1, 1938[17] is 23.1%. If we compare these figures with that obtained from a study of all deaths occurring in Puerto Rico during the quinquennium 1934 to 1938 (Table XV) 26.0%, a higher figure than that of the census is obtained. Koppisch[5] in his study of 1,000 consecutive autopsies in Puerto Rico gives the color percentage as 35.5% (Table XV). The majority of his group of cases was from the urban zone. There is no question that the percentage given in both censuses is low and that many colored persons or those having colored blood in them are classed as white. An approximate percentage, taking into consideration all sources of information, could be placed at around 30%. The question of residence we consider still more important than that of race and still more difficult to decide upon. What is the real rural population of Puerto Rico? Should we include small towns of 2,500 inhabitants as rural? Should we include towns, say between 2,500 and 10,000 on the same ground with cities over 25,000 in estimating the incidence of syphilis in Puerto Rico?

It is generally accepted that in large cities, specially sea ports, vice is greater and syphilis abounds more than in smaller cities. In the true rural areas where distances between the various dwellings are long, naturally the percentage of syphilis would be smaller. Thus, in attempting to analyze all our data we would have to establish different groups and estimate the probable percentage in each before attempting to arrive at a figure indicative of the percentage of incidence for the whole Island.

The census of Puerto Rico in 1935 gives the following classification as regards residence:

1.—Urban	*Per cent*	*Aggregate Population*
A—Three cities of 25,000 or more	14.1	254,572
B—Six cities of 10,000 to 25,000	5.5	99,301
C—Thirty nine towns of 2,500 to 10,000	11.3	204,019
Total urban	30.0	557,892
2.—Semi-urban, including twenty-nine towns and eight villages under 2,500	3.8	68,608
3.—Rural zone of the seventy-six municipalities	65.3	1,178,978

On these figures will be based our percentage incidence. Any variation in this composition of the population would naturally influence our final figures.

Table XVI shows the per cent of positive blood tests in 32,305 unselected cases comprising 42.9% from urban and 57% from rural residence by age groups, race and sex. Fig. 2 shows the percentage distribution by age groups of the average annual mortality in Puerto Rico as compared with the 32,305 cases surveyed by us and the 1,000 consecutive autopsies done by Koppisch.

Fig. 4 shows the per cent of positive blood tests among males and females, white and colored, and urban and rural.

Figs. 5 and 6 show the per cent of positive blood tests by age groups and residence, and by sex and race.

Fig. 7 shows the per cent of positive blood tests by age groups.

Table XVII shows the results of positive blood tests in 12,765 cases from the urban zone and table XVIII from 19,540 cases in the rural zone of Puerto Rico.

If we consider the 12,765 cases surveyed in the urban zone, the percentage of positive blood tests was 8.6 (using the highest percentage regardless of the test employed); for colored, 11.4 as com-

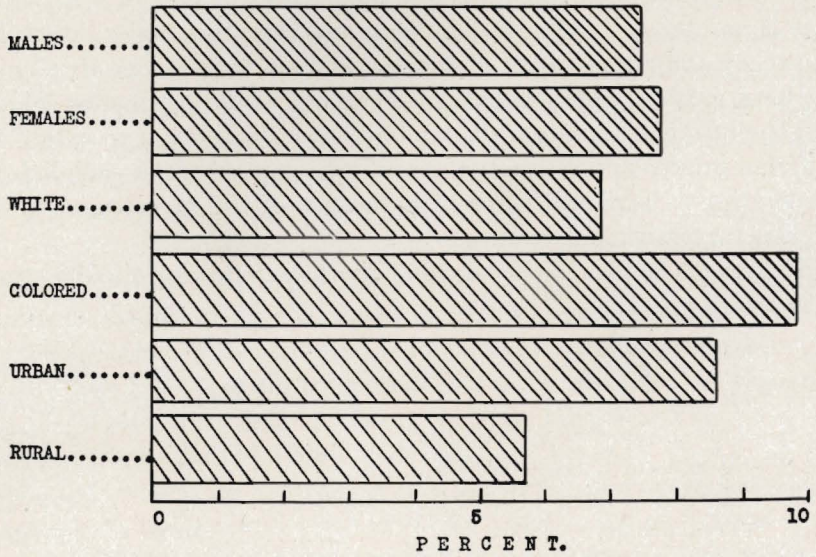

FIGURE 4: Per cent of positive blood tests by sex, color and residence among 32,305 unselected cases studied.

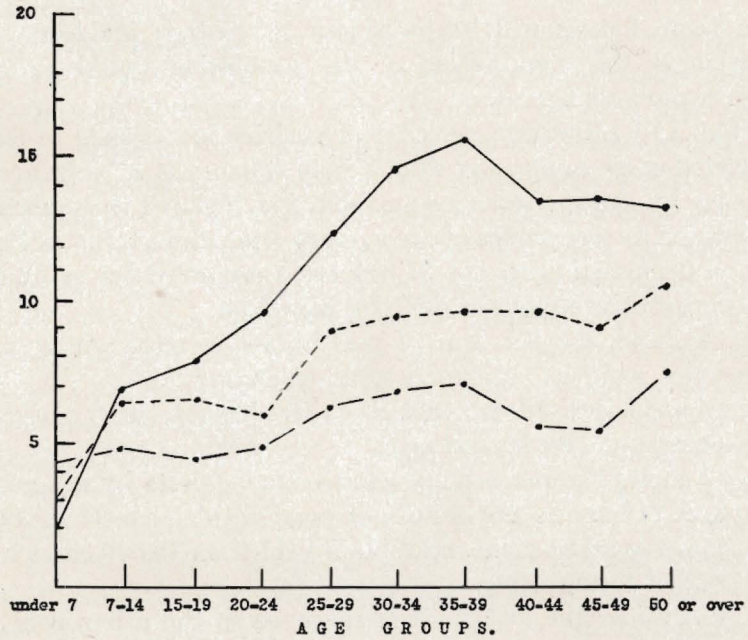

FIGURE 5: Per cent of positive blood tests by age groups and by residence among 32,305 unselected cases studied.

pared to 9.1 for white, and for males, 9.1 as compared to 9.2 for females. As regards age groups the lowest percentage (2) was in the group under 7, the highest (15.2) in the group 35 to 39.

As regards the rural zone which included 19,540 unselected cases the positive percentage was 5.7 for complement fixation and 6.6 for the Kahn test. The results were likewise higher in the colored race and in females. Considering the unselected group of 32,305 from all geographical locations and including all ages, sexes and races the per cent positive was 6.7.

The selected group comprised 32,536 cases from various sources and may be itemized to indicate the source of the cases and the per cent (highest) of positive blood tests obtained.

	No. of cases	*% positive*
Lafayette survey	1,903	6.8
Insular Homes for Children	531	6.2
Reformatory	103	8.7
Penitentiary and jails	2,497	24.9
Psychiatric Hospital	914	7.3
Tuberculosis Hospitals	2,629	14.2
General Hospital	2,382	11.2
Private Hospitals	979	9.6
Routine laboratory tests	20,648	13.8

The positive percentage varied with the type of the cases, being highest among the convicts in the Penitentiaries (24.0) and lowest among the children of the Insular Homes (6.2). The routine laboratory tests which were selected showed a lower percentage of positive reactions (13.8) than that obtained in previous studies, but this can be accounted for by the fact that these were consecutive tests and probably performed in a very short period of time eliminating to a great extent many repetitions.

SUMMARY AND CONCLUSIONS

1.—All opinions and conclusions have been based exclusively on the results of serological tests on blood (complement fixation and flocculation) on a large group of the population of Puerto Rico, which included 32,305 unselected cases of which 12,765 (57%) were of the urban zone and 19,540 (42.9%) of the rural zone. A selected group of 32,536 cases was also included and obtained from different institutions, hospitals and routine laboratory tests.

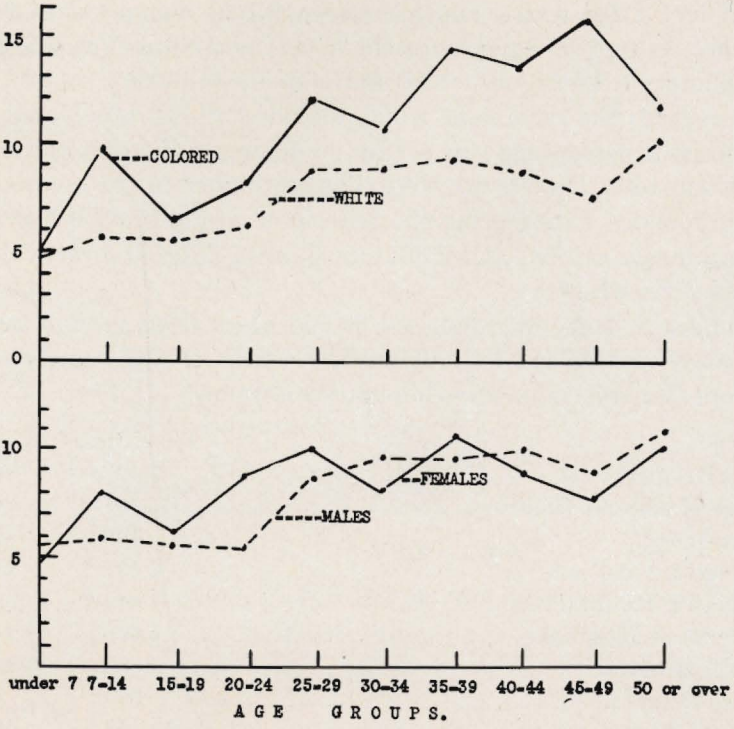

FIGURE 6: Per cent of positive blood tests by age groups, by color and by sex, among 32,305 unselected cases studied.

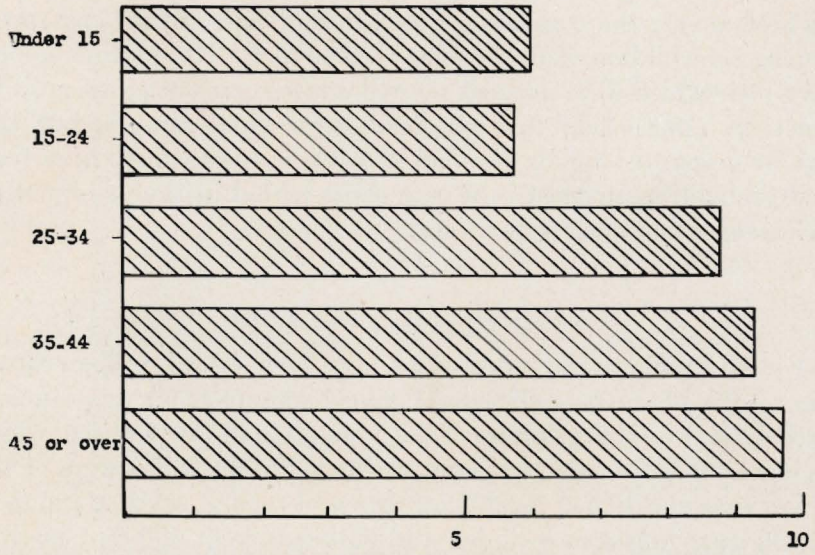

FIGURE 7: Per cent of positive blood tests by age groups among 32,305 unselected cases surveyed, of which 42.9% were of urban and 57% of rural residence.

2.—The actual percentage of positive blood tests as obtained in the whole group surveyed by us was 6.7%. The figure given was the highest obtained with either of the tests performed regardless of the number.

3.—The per cent of positive tests in the colored (9.9) was higher than in the white (6.9).

4.—For persons living in the urban zone the per cent of positive tests was 8.6 as compared to 5.7 in the rural.

5.—As regards to sex, the per cent of positives including all ages was higher in females (7.8) than in males (7.3). In the age groups under 30 years the per cent was consistently higher for females while above that age, males showed a higher incidence of positive tests.

6.—As regards age, the highest percentage of positives was obtained in the group above 45 years (9.7%) the lowest in the group 15 to 24 years (5.8). The age group under 15 was the next lowest (6%) while the age groups 25 to 34 and 35 to 44 followed (8.8 and 9.2 respectively).

7.—Among 6,155 children and young adults in the public schools of Puerto Rico, picked at random, the positive per cent of blood tests was 5.6.

8.—Of 706 persons selected from the slums of the city of San Juan including all ages, 12.2% gave positive blood tests.

9.—Of 2,357 women attending the Health Units of the Department of Health of Puerto Rico during the year 1938, 10.3% gave a positive blood test. In the group was included only Health Units where a routine blood test is performed on all cases.

10.—Of 2,450 health certificates in Health Units where blood tests are routinely performed a positive percentage of 10.3 was obtained.

11.—Of a total of 12,765 blood tests performed from cases in the cities of San Juan, Ponce, Aguadilla, Arecibo, Humacao, Caguas, Bayamón and Manatí, 8.6% gave a positive blood test.

12.—Of 7,543 agricultural workers of the U. S. Forestry Service in Puerto Rico and the Puerto Rico Reconstruction Administration 5.7% showed a positive blood test. Of these 2,832 belonged to the United States Forestry Service with 6.1% positive while 4,711 were from the Puerto Rico Reconstruction Administration with 5.8% positive.

13.—Of 12,403 persons including all ages which were obtained at the rural medical dispensaries of the Puerto Rico Reconstruction Administration 7.0% gave a positive blood test.

14.—From a total of 19,540 unselected cases in the rural zone 5.7% gave a positive complement fixation test and 6.6 a positive Kahn test.

15.—Of a total of 32,305 unselected cases of which 42.9% belong to the urban zone and 57.0% to the rural zone, 6.7% gave a positive blood test.

16.—Among 32,536 selected cases from institutions, hospitals, penitentiaries and others, the per cent of positive blood tests varied from 4.1 to 24.9. The lowest percentage (4.1) was obtained from the Boys' and Girls' Charity School, the highest (24.9%) from the jails and insular penitentiary; other positive percentages were 19.7 for male admittances under 30 years in a private hospital; 14.2 for the four Tuberculosis Hospitals and 7.3 for cases admitted to the Psychiatry Hospital at Rio Piedras.

17.—In concluding and taking into consideration the per cent of positive blood tests obtained for the various age groups, residence (urban and rural) and race (white and colored) and the age and geographical distribution of the population of Puerto Rico, we can figure the percentage of possible positive blood tests for the whole island at 5 to 6%. For the rural zone we can place the figure at around 5%; for the urban, at around 10%. In the larger urban centers the per cent of positive results might be slightly higher.

Acknowledgements: The author is particularly indebted to Mr. Manuel Pérez, Chief of the Statistical Section of the Health Units of the Puerto Rico Reconstruction Administration for help in the compilation and analysis of many of the data presented, to his assistant Mr. Mario Marrero; to the Chief of the Venereal Division of the Health Department, Dr. E. Quintero for placing facilities at our hands and for advice rendered, to Dr. P. Morales Otero of the Health Division of the Puerto Rico Reconstruction Administration for advice and help in the planning of the survey and for helpful suggestions in the final preparation of this paper; and to the Commissioner of Health of Puerto Rico, Dr. E. Garrido Morales for placing all facilities of the Department of Health at our disposal in carrying out this study.

REFERENCES

1. Brau, Salvador, Puerto Rico y su Historia Cap. VI: 185; Cap. X; 321—Imp. F. Vives Morak, Valencia.
2. Costa Mandry, O. Syphilis in Puerto Rico. I. Its prevalence as shown by the Wassermann Reaction, P. R. Jr. Pub. H. and Tr. Med. Dec. 1931, 7:209–231.
3. Costa Mandry, O. La Sífilis en Puerto Rico. Bol. As. Méd. de P. R. July 1933, 25:411.
4. Costa Mandry, O. Annual report of the Biological Laboratory of the Health Department of Puerto Rico (1934–1935). Special studies. Bol. As. Méd. de P. R. Oct. 1935, 27:256.
5. Koppisch, Enrique. Incidence of Syphilis in Puerto Rico. Puerto Rico Health Bulletin. May 1939, 3:197.
6. García Cabrera, E. Data presented at School of Tropical Medicine on Seminar of April 27, 1939.
7. Kahn, R. The Kahn Tests, A Practical Guide. Wm. Wilkins Co., Baltimore 1928.
8. Kline, B. S. Microscopic Slide Precipitation Tests for the Diagnosis and Exclusion of Syphilis. Am. Soc. Chm. Lab. Tech. (Official publication) Nov. 1934. Vol. 1, No. 1.
9. Wadsworth, A. B. Standard Methods of the Division of Laboratories and Research of the New York State Department of Health. Wm. Wilkins, Baltimore 1937.
10. Morales Otero, P., Pérez, Manuel A., Ramírez Santos, R., Espino, Rafaela., Ramú, Adriana., Fuster, J. L., González, Dolores and Marrero, Mario. Health and Socio-economic studies in Puerto Rico. I. Health and socio-economic conditions on a sugar cane plantation. P. R. Jr. P. H. and Tr. Med. June 1937; 12:405.
11. Furbush—"General Paralysis in State Hospitals for Mental Disease." Mental Hygiene, 1923, 8: 565.
12. Jones, S. E. Etiological Relationships of Syphilis to the Psychosis. Medical Journal of Australia, 1926; 2, 441.
13. Watson, H. F. Syphilis and Mental Disease—Journal Ment. Science, 1926: 72:573.
14. Lilley and Hopkins—Notes on Wassermann Reaction in Blood Serum on Male Admissions to Hanwell Hospital—Journal Ment. Science, 1927: 73, 108.
15. U. S. Department of Commerce. 15th. Census of U. S. A.—Puerto Rico—1930. Govt. Printing Off. Wash. 1932.
16. Census of Puerto Rico, 1935 (PRRA) U. S. Govt. Printing Off. Wash. 1938.
17. Bureau of Epidemiology and Statistics. Department of Health of Puerto Rico. Official records.

APPENDIX

TABLE I

Summary of Results of Blood Tests with Per Cent of Positive Reactions in the Urban Groups Surveyed

Towns	*Number Examined*	*Percentage Positive*
Total	14,710	7.1
San Juan	6,471	7.5
Ponce	1,853	7.0
Aguadilla	485	6.4
Arecibo	332	9.3
Humacao	704	8.9
Caguas	224	4.9
Bayamón	363	1.9
Manatí	1,694	5.8
Unspecified	2,584	—

TABLE II

Per Cent of Positive Blood Tests in 6155 Persons Attending Public Schools in Puerto Rico

Age Groups	*Total Examined*			*White*		*Colored*		*Males*		*Females*	
	No.	*Wass.*	*Kahn*	*Wass.*	*Kahn*	*Wass.*	*Kahn*	*Wass.*	*Kahn*	*Wass.*	*Kahn*
All ages	6155	5.6	4.1	4.3	3.7	9.2	6.3	5.4	4.0	6.3	5.5
Under 7	326	0.9	0.3	5.2	5.2	5.3	1.8	6.8	6.8	6.7	3.3
7–14	5028	6.5	4.6	5.1	3.8	10.1	6.7	6.1	3.9	7.1	5.7
15–19	755	2.6	2.6	2.5	2.5	3.1	3.1	2.9	3.6	4.4	4.4

TABLE III

Per Cent of Positive Blood Tests in 706 Persons Examined in the Slum Area of San Juan, by Age, Sex and Race

Age Group	*Total*	*White*	*Colored*	*Males*	*Females*
All ages	12.18	10.16	16.5	12.7	11.9
Under 7	—	—	—	—	—
7–14	4.47	2.6	6.9	6.5	2.7
15–19	8.54	6.4	12.8	5.5	9.9
20–24	16.6	12.8	23.8	12.0	17.7
25–29	15.3	12.9	26.3	16.0	15.2
30–34	15.1	18.6	5.0	23.1	11.3
35–39	17.5	8.3	33.3	15.0	18.9
40–44	6.6	6.4	7.1	15.3	3.1
45–49	4.7	3.7	6.7	—	7.1
50 or over	13.2	9.1	20.8	23.1	10.9
Not specified	25.0	25.0	—	100.0	—

TABLE IV

Per Cent of Positive Blood Tests on 2818 Persons Examined at the Five Urban Dispensaries of the Puerto Rico Reconstruction Administration, by Age, Race and Sex

Age Groups	*Total*	*White*	*Colored*	*Males*	*Females*
All ages	9.2	8.4	15.7	12.6	6.9
Under 7	8.3	8.7	—	7.1	10.0
7–14	5.9	6.0	5.3	5.3	6.4
15–19	3.3	3.6	—	4.6	2.6
20–24	7.7	7.2	12.5	11.3	6.2
25–29	9.7	8.3	25.6	13.7	7.1
30–34	13.1	12.7	16.1	14.8	11.1
35–39	17.0	15.7	26.9	22.9	11.1
40–44	9.1	5.9	25.0	13.8	4.8
45–49	18.3	17.2	23.8	28.6	9.4
50 or over	8.9	8.4	14.3	11.2	7.7
Not specified	11.1	—	50.0	—	16.7

TABLE NO. V

Per Cent of Positive Blood Tests in 2357 Prenatal Cases from the Health Units by Age and Color

Age Groups	*Total*	*White*	*Colored*
All ages	10.3	9.6	12.9
Under 7	—	—	—
7–14	—	—	—
15–19	8.1	1.8	9.2
20–24	12.5	11.6	15.2
25–29	10.1	8.3	16.0
30–34	7.3	8.4	2.4
35–39	12.6	12.5	12.9
40–44	4.5	6.3	—
45–49	20.0	—	33.0
50 or more	—	—	—

TABLE NO. VI

Per Cent of Positive Blood Tests in 2450 Persons Applying for Health Certificates in the Public Health Units by Age, Color and Sex

Age Groups	*Total*	*White*	*Colored*	*Male*	*Female*
All ages	10.3	9.8	12.2	10.9	9.0
Under 7	14.3	14.3	—	20.0	—
7–14	6.7	7.5	3.8	6.1	7.4
15–19	7.3	7.0	8.2	7.0	7.8
20–24	8.2	8.8	5.6	8.7	6.8
25–29	11.3	9.8	16.3	10.1	14.6
30–34	11.0	9.3	17.4	10.9	11.1
35–39	15.6	15.2	17.3	20.9	6.7
40–44	15.0	11.2	27.0	17.1	9.5
45–49	10.8	11.4	8.7	11.7	8.0
50 or more	13.9	13.5	15.4	14.0	13.5

TABLE NO. VII

Per Cent of Positive Blood Tests on 12,403 Persons Attending the Rural Medical Dispensaries of the Puerto Rico Reconstruction Administration by Age, Race and Sex

Age Group	*Total*		*White*		*Colored*		*Males*		*Females*	
	Wass.	*Kahn*	*Wass.*	*Kahn*	*Wass.*	*Kahn*	*Wass.*	*Kahn*	*Wass.*	*Kahn*
All ages	6.3	7.0	5.9	6.6	8.9	10.7	6.2	7.7	6.3	6.5
Under 7	4.4	3.8	4.4	4.1	4.7	1.5	4.1	3.2	4.9	4.6
7–14	4.9	3.2	4.5	4.8	8.3	8.1	5.1	5.5	4.8	4.9
15–19	4.4	5.0	4.4	4.6	4.8	8.8	5.5	6.3	4.0	4.4
20–24	7.0	6.3	6.5	5.6	11.2	13.3	5.9	6.7	7.9	6.0
25–29	5.9	8.1	5.6	7.8	8.0	11.4	5.7	8.7	6.0	7.7
30–34	7.2	7.5	7.3	7.2	6.3	11.4	7.3	9.6	7.0	5.8
35–39	7.5	8.3	7.0	8.0	11.6	11.8	7.0	7.5	8.0	9.1
40–44	6.9	8.6	6.8	8.5	7.8	9.9	6.4	7.4	7.6	9.9
45–49	6.0	7.6	5.6	6.8	9.3	16.0	6.7	8.1	5.1	6.9
50 or more	7.9	10.9	7.2	10.6	13.2	12.9	7.7	11.7	8.4	9.3

TABLE NO. VIII

Per Cent of Positive Blood Tests in 7453 Male Agricultural Workers in the Camps of the Puerto Rico Reconstruction Administration and the U. S. Forestry Service in Puerto Rico by Age and Race

Age Groups	*Total*		*White*		*Colored*	
	Number Positive		*Number Positive*		*Number Positive*	
	Wass.	*Kahn*	*Wass.*	*Kahn*	*Wass.*	*Kahn*
All ages	4.7	5.7	4.4	5.4	5.6	6.4
15–19	4.0	4.0	4.1	4.1	3.1	3.1
20–24	3.2	3.8	2.9	3.7	4.0	4.5
25–29	6.4	7.0	6.3	7.1	6.7	6.7
30–34	5.7	7.6	6.0	7.8	4.4	6.7
35–39	5.2	6.6	4.2	5.9	10.1	10.1
40–44	5.1	7.5	5.5	6.1	4.0	12.1
45–49	6.1	7.2	4.4	6.3	15.5	12.1
50 or over	6.0	6.3	6.3	7.0	4.2	12.1
No age	5.7	7.7	—	—	—	—

TABLE NO. IX

Per Cent of Positive Blood Tests in 1903 Persons Examined in the Lafayette Survey by Age, Sex and Race

Age Groups	*Total*	*White*	*Colored*	*Male*	*Female*
All ages	6.7	6.8	6.6	6.7	6.8
Under 7	5.6	—	10.2	2.5	9.4
7–14	2.5	2.9	2.2	0.4	4.7
15–19	2.8	3.2	2.4	3.1	2.5
20–24	4.5	5.9	3.3	5.0	4.0
25–29	11.0	13.0	9.0	12.5	9.1
30–34	11.3	8.3	14.1	14.0	7.8
35–39	12.7	11.2	15.5	11.0	14.4
40–44	11.0	10.2	11.8	13.2	6.8
45–49	9.1	6.4	13.3	5.8	16.0
50 and over	8.2	8.9	7.3	7.2	9.8
Not specified	25.0	33.3	—	33.3	—

TABLE NO. X

Per Cent of Positive Blood Tests in Consecutive Admissions to Various Hospitals, Classified by Age, Sex and Race

Institutions	*All Ages*		*Age Groups*			
	Number Examined	*Percentage*	*Under 15*	*15–24*	*25–44*	*45 or over*
			Percentage	*Percentage*	*Percentage*	*Percentage*
All Hospitals	6,904	13.1	10.2	10.7	14.9	13.5
Psychiatric Hospital	914	7.3	——	5.3	8.8	8.9
Tuberculosis Hospital	2,629	14.2	8.9	12.4	15.9	16.0
University Hospital	2,382	11.2	10.7	9.3	13.0	10.6
Private Hospital	979	19.8	——	——	20.3	19.4

TABLE NO. XI

Per Cent of Positive Blood Tests in 531 Cases from the Insular Homes for Boys and Girls by Age, Sex and Color

Age Group and Sex	*Total*		*White*		*Colored*	
	Wass.	*Kahn*	*Wass.*	*Kahn*	*Wass.*	*Kahn*
Total	6.2	4.1	6.4	4.2	5.06	3.79
7–14	6.9	3.9	7.26	3.8	6.66	5.0
15–19	4.62	4.62	5.19	5.19	—	—
Males	4.11	3.0	3.75	2.34	5.5	5.5
Females	8.3	5.3	8.78	5.85	4.0	—

TABLE NO. XII

Per Cent of Positive Blood Tests in 2497 Persons in the Penitentiary, District Jails and Reformatory by Age, Race and Sex

Age Groups	*Total*	*White*	*Colored*	*Male*	*Female**
All ages	24.9	20.8	32.0	22.8	58.0
Under 7	—	—	—	—	—
7–14	11.1	12.5	9.5	11.4	—
15–19	16.5	10.3	25.7	11.6	62.5
20–24	24.1	20.6	30.8	21.6	67.4
25–29	26.6	23.3	32.1	25.5	44.4
30–34	28.4	23.0	39.0	27.3	50.0
35–39	33.0	29.7	38.3	30.9	72.7
40–44	33.0	30.4	38.5	32.3	50.0
45–49	29.4	24.5	42.1	28.4	100.0
50 or more	28.0	21.0	39.5	27.8	33.0
Not specified	25.0	27.3	23.1	25.0	—

* 85% prostitutes.

TABLE NO. XIII

Population of Puerto Rico Estimated as of July 1, 1938 by Age Groups, Sex, Residence and Race in Per Cent of Total*

Age Groups	Total		White	Colored	Urban	Rural	Males	Females
	Number	Percentage						
All ages	1,805,480	——	76.9	23.1	33.6	76.4	50.0	50.0
Under 1 year	57,747	3.2	2.4	0.8	2.7	3.5	1.6	1.6
1– 4 years	197,793	11.0	8.3	2.3	9.0	12.0	5.6	5.4
5– 9 years	246,044	13.6	10.5	3.2	11.5	14.8	6.9	6.8
10–14 years	236,387	13.1	9.9	3.1	12.5	13.4	6.6	6.5
15–19 years	181,623	10.0	7.7	2.4	10.7	9.7	4.9	5.2
20–24 years	230,516	12.8	9.9	2.9	13.6	12.3	6.2	6.5
25–34 years	223,083	12.4	9.5	2.8	13.7	11.6	6.0	6.3
35–44 years	188,815	10.4	8.1	2.3	11.5	9.9	5.2	5.3
45–54 years	122,481	6.8	5.2	1.5	7.5	6.4	3.6	3.2
55 yrs. or over	120,991	6.7	5.2	1.5	7.4	6.3	3.4	3.2

* Estimated by the arithmetical method on the basis of the last census for Puerto Rico taken on December 1, 1935 under the auspices of the P. R. Reconstruction Administration under the direction of the Census Bureau, and the census taken by the Census Bureau on April 1, 1930.

TABLE NO. XIV

Percentage Distribution of the Population of Puerto Rico by Age, Sex, Color and Residence as Compared to the Percentage Distribution of 34,250 Cases Studied in Our Survey*

Age Groups	Total		White		Colored		Males		Females		Urban		Rural	
	Census	Survey	Census	Survey	Census	Survey	Census	Survey	Census	Survey	Census	Survey	Census	Survey
Under 15	41.2	23.5	40.8	22.1	42.4	30.5	41.7	20.5	40.7	26.0	35.7	41.0	43.8	10.3
15–24	22.6	34.6	22.5	34.8	22.6	32.0	21.9	13.6	23.1	35.1	24.1	30.1	21.7	37.5
25–34	12.4	20.7	12.5	21.2	12.0	18.2	12.1	21.2	12.8	20.5	13.8	16.1	11.7	24.1
35–44	10.5	12.3	10.6	8.9	10.2	11.6	10.5	14.0	10.5	10.8	11.6	7.2	10.0	16.1
44 or more	13.4	9.0	13.5	9.3	12.8	7.5	13.8	10.9	12.8	6.9	14.8	20.9	12.6	11.9
All ages	——	——	76.2	82.8	23.8	17.2	50.0	55.8	50.0	44.2	32.7	42.9	67.3	57.05

* Census of 1935.

TABLE NO. XV

Percentage Distribution by Age of the Annual Deaths in Puerto Rico (Average for Quinquenium 1934–1939) as Compared with the Deaths Studied (1000 Consecutive Autopsies) by Koppisch

	Per Cent of Total	
	Annual Mortality	*Autopsies*
Total	100.0	100.0
Under 15 years	50.7	25.0
15–24	9.2	17.0
25–34	7.7	16.6
35–44	7.0	17.1
45 or more	25.4	24.3
Males	52.0	68.9
Females	48.0	31.1
White	73.8	66.6
Colored	26.2	33.3
Urban	40.4	85.0*
Rural	59.6	15.0*

* Assumed figures.

TABLE NO. XVI

Per Cent of Positive Blood Tests in Unselected Groups Comprising 32,305 Cases of which 42.9% Belonged to the Urban Zone and 57.0% to the Rural Area, by Age, Race and Sex

Age Groups	*Total*	*White*	*Colored*	*Male*	*Female*
All ages	6.7	6.9	9.9	7.3	7.8
Under 7	3.2	4.7	5.0	5.5	4.4
7–14	6.4	5.3	9.7	5.8	8.0
15–19	6.4	5.2	6.1	5.4	5.8
20–24	5.7	6.0	8.1	5.2	8.4
25–29	8.9	8.7	12.0	8.8	9.8
30–34	9.3	8.7	10.3	9.5	7.9
35–39	9.4	9.0	14.5	9.4	10.6
40–44	9.4	8.3	13.5	9.6	8.5
45–49	8.9	7.5	15.8	8.7	7.7
50 or over	10.4	10.2	11.4	10.6	9.7

TABLE NO. XVII

Summary of Results of Blood Tests in Per Cent of Positive Reactions in 12,765 Persons from the Urban Zone, by Age, Color and Sex

Age Groups	*Total*	*White*	*Colored*	*Male*	*Female*
All ages	8.6	8.6	11.4	9.1	9.2
Under 7	2.0	6.0	5.3	9.8	3.7
7–14	6.9	5.7	10.0	6.3	7.4
15–19	7.9	5.9	6.7	5.7	7.6
20–24	9.5	10.4	12.4	9.7	11.4
25–29	12.1	10.8	17.4	12.7	12.1
30–34	14.6	12.3	11.4	14.2	11.0
35–39	15.2	14.5	21.0	21.1	12.5
40–44	13.6	10.5	21.5	18.5	6.0
45–49	13.7	11.6	14.0	15.2	8.3
50 or more	13.1	11.8	18.3	15.6	10.7

TABLE NO. XVIII

Summary of Results of Blood Tests in Per Cent of Positive Reactions in 19,540 Cases of the Rural Zone

Age Groups	*Total*		*White*		*Colored*		*Males*		*Females*	
	Wass.	*Kahn*	*Wass.*	*Kahn*	*Wass.*	*Kahn*	*Wass.*	*Kahn*	*Wass.*	*Kahn*
All ages	5.7	6.6	5.4	6.3	7.3	8.3	5.2	6.6	6.3	6.5
Under 7	4.4	4.0	4.4	3.9	4.7	4.7	4.1	3.1	4.9	5.1
7–14	4.9	4.5	4.5	4.5	8.3	7.2	5.1	4.1	4.8	9.9
15–19	4.4	4.6	4.4	4.5	4.5	5.4	5.0	5.2	4.0	4.2
20–24	4.9	4.9	4.7	4.6	6.2	6.3	3.9	4.6	7.9	5.8
25–29	6.1	8.0	5.9	7.9	7.2	8.7	6.2	8.1	6.0	7.8
30–34	6.6	7.7	6.8	7.6	5.3	10.0	6.4	8.6	7.0	6.0
35–39	6.7	8.2	6.0	7.6	10.9	11.8	5.1	7.5	7.7	9.7
40–44	6.3	8.5	6.4	7.9	5.9	11.1	5.8	8.0	7.6	9.6
45–49	6.1	7.8	5.2	6.7	12.0	16.7	6.4	7.7	5.1	7.8
50 or more	7.5	9.8	8.2	9.9	10.8	9.1	7.1	9.9	8.4	9.4