SYPHILIS IN PORTO RICO

I. ITS PREVALENCE AS SHOWN BY THE WASSERMANN REACTION*

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That syphilis is not a problem of such great magnitude from the social or public health standpoint in the island of Porto Rico as a whole, as many try to make it appear, is the logical conclusion reached according to the facts we have been able to gather. Not so in the cities, especially the large industrial centers along the coast where the disease may be classed as a problem of sufficient importance to be given careful consideration and attention, but certainly so in the rural zone of Porto Rico, where the percentage of infection among the population appears rather low.

Our lack of definite figures indicating the actual amount of syphilis in Porto Rico has been due in part to the absence of any dependable method of reporting the disease to public health authorities for the collection of reliable statistics.

It is a prevalent idea among physicians, scientific observers and the laity in continental United States and even in Porto Rico, that syphilis is more widely spread in this tropical island than in the United States or other parts of the world.

In the report of the survey on prevalent conditions in Porto Rico, carried out by the Staff of the Brookings Institution([38]) during 1930, it is stated, in regard to syphilis, that: "Conditions are perhaps rather loosely reported to be similar to those in the British West Indian Islands where, according to a recent report, a very considerable percentage of the population is infected with hereditary or contracted syphilis."

The scientific evidence in support of this general idea is very scant; as far as we have been able to find, it limits itself to two statements both proceeding from members of the War Department of the United States.

Vedder([41]) in 1915, in the examination of 531 soldiers in a Porto Rican regiment, obtained 37.4 per cent positive Wassermann reactions and estimated the incidence of probable syphilitics as 45 per cent, and

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in commenting on the results of the study stated that: "if the facts presented and the deductions drawn from them are correct, they can only be explained on the supposition that syphilis is extremely common among the civil population of the island since syphilis in soldiers can only be acquired from the civil population and that sexual morality is probably on a lower plane than among enlisted men in the United States."

In 1930, that is, fifteen years later, Vedder([42]) states that "it is not to be supposed that syphilis is more of a sanitary problem in Porto Rico than in other countries, but that the problem exists, no one denies." Commenting on the results of his examinations in 1915, he says that "this was by no means to be taken as a general rate for the community, but was fair evidence that the problem of syphilis existed at that time and unless Porto Rico is very different from the United States, that it still exists today though perhaps to lesser extent than formerly."

In a study showing the incidence of syphilis during the World War([39]) by countries of occurrence, for officers and men enlisted in the U. S. Army, it was found that the morbidity of syphilis for Porto Rico was higher than for other countries.

The following is the morbidity rate per 1,000 as found for different groups of individuals:

Porto Rico	25.69
Hawaii	8.68
Philippine scouts	10.50
Panamá	14.07
U. S. Army in Philippines	35.06
U. S. Army in other countries	53.40
Total U. S. Army	24.21

The high percentage of positive Wassermann reactions in bloods sent routinely to the Biological Laboratory of the Department of Health([13]) may to some extent account for the idea as to the high prevalence of syphilis in Porto Rico. However, most of these bloods came from the urban population; from the social classes where syphilis is known to abound most; the majority belonged to adults; a large number came from governmental institutions for public charges; some of them were repetitions of the same examination, and a great proportion came from suspects. The figures as such have not been compared with other American or foreign states in order to find out if the positive percentage *per se* was higher or lower in Porto Rico.

The opinion among the medical profession in regard to the amount of syphilis prevalent in the island of Porto Rico is varied, the majority

think that there is no more syphilis here than in the United States or elsewhere and consider the percentage of incidence around 10 per cent, while others claim that there is a great deal of it; some even estimating the prevalence at around 25 per cent. Such estimates, however, are based on individual personal observations in the general or specialized practice of the profession.

Before venturing any conclusion, all figures available and data collected during a number of years should be carefully analyzed.

The question as to whether the aboriginal race was infected with syphilis before the discovery of the Island by Columbus in 1493, is only of historical interest and import and it is difficult to answer with certainty until it was decided definitely as to whether the disease originated in the old world and was introduced by Columbus and his men into the new world, or whether the opposite was true. Since there has been so much argument as to the origin of syphilis, and the question has not been solved yet to the entire satisfaction of everyone we will only mention one or two historical incidents intimately related with the disease in Porto Rico.

Much confusion arises from the name "Bubas" by which syphilis was known in the early days of the Spanish domain in Santo Domingo (Hispaniola) because after the introduction of yaws (framboesia tropica) into the new world with the importation of African slaves this disease, which was similar in many respects to syphilis, was also given the name of "Bubas" and has kept it ever since.

Soon after the first settlement of Porto Rico, in 1508, by the Spanish, an epidemic of "Bubas"[1-14] (syphilis) broke out in the island and was attributed by many to punishment of God for the immoral conduct of the Spanish with the Indian women.

Syphilis, (*Morbus Gallicus*) raged in the island of Porto Rico in an epidemic form producing disastrous results among the natives and Europeans about the year 1511. Among the first victims was Diego de Salazar, (Captain and right-hand man of Ponce de León in his war against the Indians of Porto Rico, 1511) whom the Indians said to be invulnerable to the action of their arrows but was an easy prey to the disease.[14] Since then, the disease has been known to exist in Porto Rico up to the present time.

The Indian race has long been extinct on this island. The present population is chiefly of European origin with certain proportion of African or mixed descent. It would not help the matter much to elucidate the above historical question to trace the origin of syphilis in the present population of Porto Rico.

Of paramount importance in any study of syphilis in a community

is its prevalence or distribution among the public as well as the incidence of new infections.

There is only one way to understand syphilis and help us solve it as a social problem in Porto Rico, and that is to give it proper consideration and open discussion by public health officials as an individual disease, and for the medical profession to cooperate with health authorities and civic organizations in a campaign of public education that will instruct the people as to the nature and characteristics of the malady.

The Wassermann reaction is of decided value in the diagnosis and in guiding the treatment and prophylaxis of the disease.

Since the technique and interpretation of complement fixation and precipitation reactions have gained such a firm basis in late years, these tests are extremely valuable in demonstrating the extent to which the disease has permeated society, an extent unsuspected before these reactions were used for this purpose.

DATA AND METHODS USED IN THE PRESENT STUDY

The scope of the present work consists mainly of an analytic study of a large group of Wassermann reactions performed at the Biological Laboratories of the Department of Health of Porto Rico, and a large number of tests from groups of individuals from whom blood was taken personally by us and immediately examined by the routine techniques employed at the Biological Laboratory.

During the fiscal year 1930–31 the Kahn test has also been used (in 26.35 per cent of all the cases) as a check; only the clear serums in sufficient amounts were used. All tests in which results differed, were repeated before reporting. A slightly higher percentage of positives was obtained with the Kahn tests. We are giving the Wassermann figures only. In the blood collected by us both Wassermann and Kahn tests were performed simultaneously on each sample and both results are presented.

The Wassermann technique employed, has been modified as follows:

Previous to the performance of the test both the amboceptor and the complement are titrated.

The incubation time for the titrations is half an hour at 37° C.

The antigen is 0.4 per cent cholesterinized alcoholic beef heart extract(44) and is so diluted that 0.1 cc. contains the proper amount necessary for the test.

Complement (fresh pooled guinea-pig serum from at least 8 healthy male animals) diluted 1:15. Two units are used in the test.

The patient's serum is inactivated at 55°C. for half an hour on the day the test is to be made. If serum is to be tested 24 hours or more after, this inactivation is again repeated for 5 minutes previous to the performance of the test.

The hemolytic anti-sheep amboceptor is so diluted that 0.1 cc. contains the proper amount.

A 5 per cent washed sheep red blood cell suspension is used. 0.2 cc. of the red cell suspension and 0.1 cc. of the amboceptor are well mixed and sensitized for 10 minutes in a water bath at 37°C.

The TEST—(The control tube contains the same ingredients excepting antigen which is substituted by the same amount of saline solution.)

Saline solution	1.0 cc.
Patient's serum	0.1 cc.
Antigen	0.1 cc.
Complement	2 units.

Well mixed by gentle shaking and placed in a water bath at 37°C. for half an hour.

Sensitized amboceptor blood cell mixture	0.3 cc.

Well mixed by gentle shaking and placed in a water bath at 37°C. for half an hour with frequent gentle shaking of tubes.

At the end of the half-hour incubation the tubes are removed, centrifuged for 3 minutes and the results read.

In the performance of the Kahn test we have followed the technique described by Kahn.[25]

ANALYSIS OF ROUTINE EXAMINATIONS PERFORMED AT THE BIOLOGICAL LABORATORY

During a period of 20 years, 1911 to 1931, out of 138,644 Wassermann reactions performed on routine blood specimens from all over the island the positive percentage was 20.

For the fiscal year 1929 to 1930 out of a total of 19,970 examinations performed at the San Juan laboratory 18.9 per cent were positive and of 5,873 at the Ponce laboratory 13.26 per cent were positive. In these figures are included suspected cases of syphilis sent by physicians, and the cases from the venereal diseases clinic of the Department of Health of Porto Rico and from the United States Public Health Service station. Logically the cases sent by these clinics would be suspects. By classifying these 19,970 examinations into groups, we have the following positive percentages:

Males	21.5	White	17.8
Females	17.6	Colored	22.7

A comparison of the results of the Wassermann tests performed in the laboratory during the first three-year period since the reaction was introduced as a routine technique with the results of the last two three-year periods shows a great difference in the positive percentage. The reason for this is obvious: undoubtedly in the early days only blood from suspicious cases was sent for examination. In later years, after the establishment of free dispensaries and clinics, and the compulsory Wassermann tests in individuals applying for health certificates, a very large unselected group was obtained. The positive percentage in the early years as one would expect was much higher than in the latter years and the number of tests was much smaller.

Blood samples received from municipalities where well organized health offices are operated, pertaining to persons applying for health certificates or other individuals, show that out of 17,530 applicants for health certificates 16.04 per cent gave positive results. Out of a total of 51,692 examinations from the same municipalities 17.47 per cent gave positive results.

In the analysis of these blood tests we find a higher percentage of positive reactions among males than females and among colored people than in whites. Tables 1, 2, 3 and 4 give details on this point. These findings agree with those of investigators in other countries as shown in Table 14.

HEALTH CERTIFICATES

The Wassermann reactions of 17,530 individuals applying for health certificates in Porto Rico resulted in 16.04 per cent positive tests. This group, an unselected sample of the adult population of Porto Rico, comprises people over 15 years of age engaged in the manufacture or sale of cigars or foodstuffs, from whom the Health Department requests a Wassermann test before the certificate is issued. The blood is collected by a physician or nurse and if the test is repeated for some reason, it is recorded in the patient's card so that in this group there are no repeated tests. The figure, although representative of adult ages, is too high for the entire urban population as a whole. Table 4 gives details.

PRENATAL CASES

The results of Wassermann tests performed on women registered at the prenatal clinics of the Department of Health of Porto Rico and the Municipal Hospital located at San Juan, are presented in table 5. All these women belong to the poorer social classes, all live in cities and in this group are included white, colored, and mixed-blooded individuals. Out of 2,955 cases examined at the prenatal dispensaries

of the Health Department of Porto Rico located at San Juan, 13.6 gave a positive Wassermann reaction, while of 264 cases studied at the Municipal Hospital in San Juan, 15.5 per cent were positive. If we compare these figures with those obtained in similar cases in other countries we find that our percentage positive is higher than some and lower than a good many others. Belding and Hunter([10]) in an analysis of the work of various authors comprising 19,739 pregnant women obtained 9.8 per cent positive Wassermann reactions. The results vary from 3.05 per cent to 31.11 per cent depending upon the social status of the patients. In their own study of 5,198 pregnant women at the Evans Memorial Hospital in Boston, Mass., they obtained 7.8 per cent positive Wassermann reactions. Table 17 shows results of the various authors enumerated in their paper.

SPECIAL STUDY

In a series of previously selected groups, blood was taken personally and the examinations were performed by us within 24 hours after the collection of the specimens. The serums, after being separated were kept in the ice box until used. In all the specimens, both Wassermann and Kahn tests were performed. Every positive test which did not agree as to its results in both techniques was repeated.

Group A.—Military Training Camps.

The Citizens' Training Camp is composed chiefly of school boys ranging between the ages of 16 and 23 years, all of whom have to pass a rigid physical examination before admittance. They are selected from the general population, the choice depending upon moral, physical and educational qualifications. They remain in camp only one month. Blood was obtained by us from all the members of the camp during June 1931. There were boys from 54 towns of the island. Blood from a total of 392 individuals was obtained with a positive percentage of 5.10. Of these individuals 83 per cent were under 20 years of age and 18 per cent were between the ages of 20 and 23. There were among the latter about 3 or 4 which were a little older. The age groups were composed as follows:

20 years	17.4 per cent
19 years	15.5 per cent
18 years	27.7 per cent
17 years	37.7 per cent
16 years	1.4 per cent

The National Guard consists of about 1,400 adults who enlist vol-

untarily. They go to training camp once a year for a period of 15 days and assemble once a week for exercises during the rest of the year. They have to pass a rigid physical entrance examination and are selected from the general population. Blood was taken by us from 498 out of the total of men in the July–August 1931 training camp, with 8.63 per cent positive reactions. These 498 men came from 12 towns of the island, including San Juan, Ponce and Mayagüez, the three main cities of Porto Rico. The men in both the Citizens' Training Camp and the National Guard belong in the majority of the cases to the middle social classes. See table 6 for details of examinations on members of Military Training Camps.

Group B.—Rural Zone.

From the rural zone of Porto Rico specimens were collected by us. The samples were unselected, that is, on the day previous the people were notified of our visit by a field inspector and blood was taken from every one that appeared. Children under 7 years were as a rule exempted due to the difficulty in most cases of obtaining the sample with reasonable ease. Care was taken that these people were from places far from the towns, and represent our true rural zone, living in small houses quite distant one from the other. However, as a rule each house is occupied by a large family. Of a total of 1,905 cases selected the results can be summarized as follows: The positive percentage for all was 5.03. A higher percentage of positive tests was obtained in male and colored individuals. The lowest percentages were obtained in the early ages. Tables 7, 8 and 9 give detailed results on this group.

Group C.—Governmental Institutions.

In the case of the Penitentiary and Insane Asylum (Table 11) the results of routine tests made in the laboratory during the fiscal year 1930–31 were used, but due care was exercised in that no test from the same individual appeared more than once.

Of 654 cases studied from the Penitentiary, 26.6 per cent gave positive reactions.

In the Insane Asylum a total of 905 cases was studied with 16.68 per cent positive. From these figures, 56.24 per cent were males with 15.13 per cent positive results; 43.75 per cent females with 18.69 per cent positive results; 75.36 per cent white with 15.25 per cent positive, and 24.64 per cent colored with 21.08 per cent positive results. See table 10.

The Charity Schools are composed of poor orphan children who have no one to care for them. In the Girls' Charity School we

examined a total of 259 cases, 5.79 per cent of which were colored, giving a positive Wassermann reaction in 3.08 per cent.

In the Boys' Charity School, 356 cases were studied, of which 12.88 per cent were colored, with 7.02 per cent positive reactions. The children in both of these orphan institutions enter before the age of 10 and can only remain until 18 years of age, when they are discharged.

Table number 11 gives detailed results of the examinations performed at these institutions.

Table number 12 gives the composition of the population of Porto Rico according to the census of 1930.

DISCUSSION

In interpreting results of surveys of Wassermann tests as indicative of the prevalence of syphilis in a community, one may ask: "Does a positive Wassermann test (complement fixation or precipitation test) necessarily mean the existence of syphilis?"

Craig([17]) states that, while it is admitted that the Wassermann reaction when positive is not absolutely specific of syphilitic infection for positive results have been obtained at times with other diseases, the fact remains, that a positive reaction with this test indicates syphilis in so large a proportion of individuals giving it, that the practical value of the reaction in the diagnosis of syphilis is hardly at all decreased by the comparatively very few instances in which such result is obtained in other conditions. From a practical standpoint it is doubtful if a more specific test is employed in medicine, the margin of error appearing to be less than five-tenths of one per cent.

The League of Nations([35]) at its second laboratory conference on the Serodiagnosis of Syphilis held at Copenhagen in 1928, reiterated with particular emphasis:

1. That in spite of the increased sensitiveness which the various serodiagnostic methods have shown at the present conference, serological results may, not withstanding the presence of a syphilitic infection, be negative in certain cases.

2. That a positive reaction, in the absence of a clear history or of signs of syphilis should, if only to exclude all possibility of error, never be accepted until a test of at least one more specimen has afforded the same results.

3. That, except in the case of a few defined pathologic conditions, syphilis is indicated with a degree of probability which closely ap-

proaches certainty when several tests according to different methods give a positive result.

Accepting the conclusions of the conference, Vedder([42]) states that "in the Philippines, Porto Rico, and other tropical countries, the Wassermann test must always be interpreted in view of the possibility of antecedent yaws which is the one and only pathologic condition known to give a positive reaction with much the same certainty as syphilis. In other conditions, including leprosy, when a proper technique is used, positive reactions occur only in a relatively small percentage of cases, not higher than the percentage of unsuspected syphilis or yaws in the community as a whole. With these conclusions, few will today differ. I must, however, disagree with those clinicians who maintain that the Wassermann reaction must be verified by clinical examinations or that the Wassermann reaction should not be performed except in a syphilitic clinic where the results can be verified."

Yaws exist in Porto Rico([24]) but the cases are few and the disease is found chiefly in an endemic form in two small rural sections of the municipality of Isabela and now and then a rare case in Loíza, Peñuelas and Coamo. Recently a new endemic focus was discovered at Río Abajo, a rural district of Utuado located in the mountains in the centre of the island. About 180 cases of the disease, or with a history of having suffered with it, were located and studied by the Municipal Health Unit of the Department of Health located at Utuado.

This focus has existed for over 10 years according to information given by the inhabitants of the rural settlement. (Table No. 13 gives a résumé of the results of studies made at the Biological Laboratory on blood from individuals living in this rural section.) The study of this focus, which will be the subject of an extensive paper later on by members of the Staff of the Health Department of Porto Rico, is being made under the guidance of Dr. George C. Payne, representative of the Rockefeller Foundation in this island.

Blood specimens for Wassermann reactions in cases of yaws, we can say are very limited, so much so, that the disease can be excluded as being in part responsible for the positive figures presented. Symptoms would be so clear that the comparatively few samples sent to the laboratory would come with a history and tentative diagnosis of the condition which is easily recognized in Porto Rico.

It is generally accepted by scientific investigators that positive complement fixation or precipitation tests are often met with in cases of leprosy, especially so in the nodular type. Whether this is due

to serum changes in the blood of lepers, to concomitant syphilitic infection or to other factors, is still a debated question.[17-26-29-31-37] In any case, we do not think, even admitting that lepers give a positive Wassermann reaction, that the small number of cases of this disease found in Porto Rico has any direct bearing on the results we have presented.

Palacios[30], in an extensive survey of leprosy in the island, is supposed to have located 137 cases of the disease and as he says, accepting that for every case recognized there are two unrecognized; we may add that there are no more than 400 lepers in Porto Rico, 50 being isolated at the leper colony and an estimate of 350 officially unrecognized cases scattered among the one and a half million inhabitants of the island.

In an article entitled "Syphilis in Porto Rico, Its Incidence," Serra[36] makes an analysis of the results of 6,070 Wassermann reactions practised at the Biological Laboratory at Ponce. The Ponce laboratory makes the examinations coming from the south of the island, and serves 23, or 19.7 per cent of the municipalities of Porto Rico, with a population of 429,789, or 29 per cent of the inhabitants of the whole island. His figures can not be considered as representative for the island as his title implies, although the author explains clearly in his study that his conclusions refer to a certain group of southern Porto Rican municipalities only. His results agree with ours in some respects although our positive percentages are higher. We have analyzed the examinations proceeding from the northern part of the island which comprises 71 per cent of the population (1,114,124) and 80.1 per cent of the municipalities. We have also included the work of the Ponce laboratory in our study.

Serra obtained his highest incidence of positive reactions in the 40 to 50-year group, while ours fell in the 20 to 30-year age group.

It is a known fact that in a majority of the cases syphilitic changes in the organs are demonstrable beyond doubt at autopsy. Different authors disagree as to the percentage of positive syphilitic findings in their autopsies. Table 15 shows the results of the work of some of these authors as compared with the findings obtained in Porto Rico. Koppisch[27] in a study of the first 400 routine autopsies performed by the Department of Pathology of the School of Tropical Medicine found syphilitic changes of one nature or other in 37 (9.02 per cent) of them. In 81 per cent of these 37 cases, the syphilitic lesions consisted of a syphilitic aortitis. Again, we must note that the large majority of these autopsies are from

San Juan or large cities of Porto Rico, there being few, if any, from the true rural zone.

TABLE 15

INCIDENCE OF SYPHILIS AS FOUND AT AUTOPSY

	Number	Percentage Positive
Hala (23)	1,088	21.41
Symers (23)	4,880	6.5
Warthin (17)	750	40.0
Koppisch (27)	400	9.02

The exact rate of annual deaths from syphilis cannot be definitely established because of the fact that the cause of death is not always properly reported. The disease when present is frequently unrecognized and often plays an important part in the etiology of a great number of cases such as circulatory and nervous conditions which are given as the actual cause of death.

From a study of the vital statistics of Porto Rico ([15]) during the five-year period 1925-30 it was found that syphilis was the cause of death in 0.7 per cent of all deaths giving a rate of 16 per 100,000 population from this specific cause. (See Table 16). In the U. S. Registration Area the death rate from syphilis is 8.7 per 100,000 population (1928) representing 0.72 per cent of all deaths.

At the Presbyterian Hospital located at San Juan, which runs a very large free dispensary clinic, out of the first 8,376 Kahn tests performed, 20.7 per cent were positive.([32]) This percentage is decidedly lower than that obtained by Rosenberger([17-18]) at the Philadelphia General Hospital when in 1916, out of 5,106 routine Wassermann reactions, 27 per cent showed a positive result and in 1917, out of the same number of tests 25.9 per cent were positive.

García Cabrera([22]), in a recent editorial of the *Boletín de la Asociación Médica de Puerto Rico,* estimates the number of syphilitics in the island of Porto Rico at about 25 per cent. His own statistics or 19 years' experience as urologist and syphilologist give him a percentage of syphilitics of 29 for Porto Rico. In the same article he quotes the writer as estimating the number of syphilitics in Porto Rico at 20 per cent. There was a misinterpretation in that respect, since the figures we gave him at that time referred to the percentage of positive results on Wassermann reactions performed at the Biological Laboratories of the Health Department since the reaction was first routinely introduced at that institution, and under no circumstances to the actual number of syphilitics in the island of Porto Rico.

Ferrer([21]) in a study of syphilis presented before the Porto Rico Medical Association in 1926 estimated the percentage of syphilitics at about 10 per cent, basing these figures on his own records as a urologist and syphilologist of San Juan and on the fact that for the year 1923 about 18 per cent of the Wassermann reactions performed at the laboratory of the Health Department gave positive results, and that these bloods came from the lower and poorer classes of the urban zone, among whom the incidence of syphilis is much greater. He still maintains the opinion that there is no more than 10 per cent syphilitic infection in Porto Rico.

It would be unfair to estimate the amount of syphilis in Porto Rico taking the routine examinations on blood (Wassermann), performed at the Biological Laboratory of the Department of Health as a basis and without carefully analyzing said data.

If we compare the results of routine Wassermann tests in the laboratories of the Health Department of Porto Rico with those of other similar public health laboratories in different states of America, as shown in table 18, we find that the percentage positive for Porto Rico is no higher than those for the American States. Out of 11 states picked at random with which we compared the results obtained in Porto Rico, the percentage positive in our island is lower than in 7 of these states. Similarly the percentage for Porto Rico is lower than the average for the eleven states.

In attempting to estimate approximately the percentage of syphilis in Porto Rico we shall make use only of those examinations of unselected groups which represent unselected samples of the population. Among these are included:

1. Candidates for health certificates.
2. Pregnant women attending prenatal clinics.
3. Members of military training camps.
4. Rural groups.

In interpreting the results of these examinations with the view of estimating the amount of syphilis in Porto Rico we must bear in mind several facts:

1. Practically all the people seeking health certificates and the pregnant women included in this study belong to the poorer social classes.
2. The samples from the training camps represent young adults or men of the middle social classes.
3. According to the last official census (1930) only 31.3 per cent of the population of Porto Rico lives in the urban zone and 72.7 per cent in the rural zone.
4. The first two groups are urban and do not include children

under 15 years of age in whom it is a known fact that syphilis occurs to a much lesser degree than in adults. Forty-two and one-tenth per cent of the total inhabitants of the island are children under 15 years of age.

5. That our figures for the rural population are based on blood tests on people over 7 years of age and therefore do not represent approximately 15 per cent of the total rural population of the island.
6. In the study presented are included as positive all positive results, no matter whether they showed a weak or a strong reaction.

If candidates for health certificates show 16.04 per cent positive reactions, and women attending prenatal clinics show 13.6 per cent positives, and 42 per cent of the population of Porto Rico is under 15 years, it would mean that about half the population (children and well-to-do classes) would not be included in the figures. The average figure of 14 per cent is too high for the whole urban population of the island. Children have practically only one way of becoming syphilitic—heredity. Adults have sexual relations as a more important source of infection. Well-to-do classes are less promiscuous, take better care of themselves and can afford better treatment. At any rate, 10 per cent would be the highest acceptable figure for the whole urban population, taken as a rough estimate, or about 42,000 syphilitics in our towns and cities.

Five and three hundredths per cent of 1,905 rural samples gave positive results. This group represented 85 per cent of the total rural population; 15 per cent representing children under 7 years of age are not included in this group. On this basis we could estimate the percentage of infection at about 4 per cent for the whole rural population. This would give a rough acceptable estimate of 44,667 syphilities among the 1,116,692 rural inhabitants of the Island.

In all, it means about 86,000 syphilitic cases in the whole island. The writer still believes this estimate too high considering the fact that the figures for the urban zone are based on cases from the largest population centers. Small towns and villages resemble more rural conditions that urban; however, the figures presented show an average percentage for the entire island of 5.6. Roughly, about 5 per cent may be considered an apt reference figure representing the percentage of syphilitic infection in the island of Porto Rico, regardless of sex, race or social status.

SUMMARY AND CONCLUSIONS

1. The study of a large group of Wassermann reactions on blood

specimens sent routinely to the Biological Laboratories of the Department of Health from people living in Porto Rico are here presented. Comparisons of the results obtained are made with those of similar institutions in the United States and elsewhere.

2. The positive percentage in routine Wassermann tests in Porto Rico is not materially higher than those figures obtained at public health laboratories of various states employing more or less the same methods. In fact the percentage positive for Porto Rico is lower than the average obtained for a Canadian province and for eleven American states selected at random, but slightly higher than Hawaii.

3. The evidence on which statements to the effect that syphilis is very prevalent in Porto Rico has been based on partial observations which do not represent the true state of conditions prevailing in the island at present.

4. The highest percentage of positives among the tests performed was found in the male sex, in the colored race and in persons living in urban districts.

5. Of a total of 138,644 routine Wassermann examinations performed on blood specimens from all over the island received at the Biological Laboratory during a period of 20 years (1911–1931), the percentage positive was 20, while the percentage in 19,970 examinations made during 1929–30 was 18.9.

6. Of 51,692 routine specimens sent from 14 municipalities with health units or well organized health offices, the percentage positive was 17.47.

7. Of 17,530 blood Wassermann tests in individuals applying for health certificates in 13 municipalities with well organized health centers, the average percentage positive was 16.04. This includes mostly people from the larger urban centers and over 15 years of age.

8. Out of 2,955 pregnant women of the poorer classes, seeking medical attention at the dispensaries of the Health Department at San Juan, 13.6 per cent gave positive Wassermann reactions, while of 264 attended at the Municipal Hospital at San Juan, 15.5 per cent gave positive results.

9. Of 392 young adults in the Citizens' Military Training Camp, 5.1 per cent showed positive Wassermann reactions and of 498 men from the National Guard 8.63 per cent were positive.

10. In the Governmental Institutions the percentage of positive reactions varied, with 26.6 per cent at the Penitentiary, 16.68 per cent at the Insane Asylum, 3.08 per cent at the Girls' Charity School, and 7.02 per cent at the Boys' Charity School.

11. Out of 1,905 examinations in specimens from the rural zone, including all ages above 7 years, 5.03 per cent showed positive results.

12. We estimate, after due allowance to age groups not included in the figures analyzed; to the distribution of population, and the difference in results obtained in the urban and rural zones, that 5 per cent 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.

TABLE 1

WASSERMANN EXAMINATIONS PERFORMED (In three-year periods) AT THE LABORATORY

	San Juan Laboratory		Ponce Laboratory		Total	
	Number	Per cent	Number	Per cent	Number	Per cent
1911-14	644	44.5	.....	.....	644	44.5
1924-27	47,504	18.1	6,211	23.8	54,148	18.8
1927-30	55,730	19.42	13,259	14.68	69,989	18.51
Total in 20 years (1911-1930)	118,505	20.5	20,139	17.5	138,644	20.

TABLE 2

WASSERMANN REACTIONS ON BLOOD SPECIMENS RECEIVED AT THE SAN JUAN LABORATORY DURING THE FISCAL YEAR 1929-30

	WHITE				COLORED				Total*	
	Males		Females		Males		Females			
	No.	% Pos.	No.	% Pos.	No.	% Pos.	No.	% Pos.	No.	% Pos.
Under 9 years	139	12.9	200	8.5	33	12.1	41	14.6	420	10.9
10-14 years	170	10.0	249	15.27	45	6.66	109	11.92	583	12.69
15-19 years	702	14.52	1,610	9.49	244	16.39	649	17.56	3,280	16.15
20-29 years	1,748	21.22	3,142	19.47	722	30.19	1,226	23.08	7,067	21.32
30-39 years	1,198	26.04	1,674	14.51	488	26.63	605	20.99	4,132	19.91
40-49 years	723	21.43	861	14.16	263	25.47	225	24.44	2,139	19.02
50 and over	448	16.29	333	15.31	129	27.13	98	21.42	1,048	17.27
Total	5,521	20.3	8,416	15.19	2,034	25.56	3,047	20.90	19,970	18.90

* Specimens unclassified as to color, age and sex also included in the total.

TABLE 3

RESULTS OF WASSERMANN EXAMINATIONS CLASSIFIED BY SEX AND COLOR

	Number of examinations Performed	Percentage Positive
Males	7,555	21.5
Females	11,463	17.6
White	13,837	17.8
Colored	5,081	22.7

TABLE 4

WASSERMANN REACTIONS ON BLOOD RECEIVED FROM TOWNS HAVING MUNICIPAL HEALTH UNITS OR WELL ORGANIZED LOCAL HEALTH OFFICES

	Total Samples Examined		Samples from Applicants for Health Certificates only	
	Number	% Positive	Number	% Positive
San Juan	17,242	18.43	3,513	15.4
Ponce	1,948	13.65	443	11.96
Guayama	1,306	12.40	497	9.25
Caguas	7,030	21.26	2,942	19.98
Río Piedras	6,882	15.78	2,317	12.7
Cataño	2,625	23.69	1,279	20.87
Yabucoa	2,174	14.16	372	15.59
Adjuntas	829	5.43	.....	.....
Cayey	1,513	14.87	139	14.38
Juncos	3,466	15.06	.....	.....
Aguadilla	1,123	28.49	.....	.....
Mayagüez	2,898	10.97	388	9.02
Humacao	2,184	17.53	618	12.29
Arecibo	472	21.82	.....	.....
Bayamón	.....	.....	3,073	17.21
Manatí	.....	.....	1,651	16.29
Barceloneta	.....	.....	298	13.75
Total	51,692	17.47	17,530	16.04

TABLE 5

WASSERMANN REACTIONS IN PREGNANT WOMEN IN SAN JUAN

Prenatal Dispensaries of the Health Department	Years	Number of cases	Percentage Positive
Monserrate dispensary	1923–31	2,439	13.6
Barrio Obrero dispensary	1929–31	359	14.2
Puerta de Tierra	1929–31	157	12.8
Total	1923–31	2,955	13.6
Municipal Maternity Hospital	1929	264	15.5

TABLE 6

RESULTS OF EXAMINATIONS ON MEN IN MILITARY TRAINING CAMPS

Age Groups	Citizens' Training Camp			National Guard		
	Number of examinations	Percentage Positive		Number of examinations	Percentage Positive	
		Wass.	Kahn		Wass.	Kahn
15–19	326	3.68	4.29	143	2.79	2.79
20–44	66	12.12	13.63	351	11.11	11.39
45 and over	.....	.....	.....	4	*25	0
Total	392	5.10	5.86	498	8.63	9.03

* Number of specimens too small, making probable error too large to be taken into consideration.

TABLE 7

POSITIVE WASSERMANN AND KAHN TESTS AMONG THE RURAL POPULATION OF PORTO RICO

Municipality	Rural District	Number of tests	Percent. Positive	
			Wass.	Kahn
Aguadilla	Aguacate	208	5.28	7.21
Arecibo	Esperanza	322	5.90	4.96
Caguas	Borinquen	279	6.09	6.09
Adjuntas	Guayabo Dulce	327	2.44	2.75
Humacao	Candelero	203	5.91	6.40
Río Piedras	Quebrada Arenas	337	4.45	4.74
Loíza	Medianía Alta	229	6.11	6.55
Total		1,905	5.03	5.30

TABLE 8

POSITIVE WASSERMANN AND KAHN TESTS IN THE RURAL ZONE CLASSIFIED BY AGE GROUPS

Age Groups	Number of examinations in each group	Percentage Positive	
		Wass.	Kahn
7–14 years	521	1.72	2.30
15–19 years	353	3.96	4.24
20–44 years	773	6.59	6.46
45 and over	258	8.13	8.91
Total	1,905	5.03	5.30

TABLE 9

POSITIVE WASSERMANN AND KAHN TESTS IN THE RURAL ZONE BY COLOR AND BY SEX

	Number of tests	Percentage Positive	
		Wass.	Kahn
Males	1,113	6.19	6.28
Females	792	3.40	3.91
White	1,525	4.59	4.78
Colored	380	6.84	7.36
Total	1,905	5.03	5.30

TABLE 10

WASSERMANN TESTS IN THE INSULAR PENITENTIARY AND INSANE ASYLUM

Age	Penitentiary		Insane Asylum	
	Number of tests	Percent. Positive	Number of tests	Percent. Positive
Under 15 years	.....	.....	4	50.00
15 to 19 years	117	26.49	37	8.11
20 to 44 years	491	26.27	583	15.09
45 years and over	41	31.70	151	19.86
Unclassified	.....	.....	130	21.53
Total	654	26.60	905	16.68

TABLE 11

RESULTS OF TESTS IN INSULAR CHARITY SCHOOLS

Age Groups	Girls' School			Boys' School		
	Number of tests	Percentage Positive		Number of tests	Percentage Positive	
		Wass.	Kahn		Wass.	Kahn
Under 15	184	3.26	3.26	260	6.15	5.
15–19	75	2.66	2.66	96	9.37	5.20
Total	259	3.08	3.08	356	7.02	5.05

TABLE 12

COMPOSITION OF THE POPULATION OF PORTO RICO (16)

	Percent.
Urban	27.7
Rural	72.3
Males	49.9
Females	50.1
White	74.3
Colored	25.7
Age groups:	
Under 5 years	14.7
Under 10 years	29.2
Under 15 years	42.1
15–19 years	12.1
20–44 years	33.
45 years and over	13.

TABLE 13

RESULTS OF WASSERMANN AND KAHN TESTS FROM RIO ABAJO (Utuado)

Age Group	Number of Tests	Percentage Positive	
		Wass.	Kahn
Under 15 years	167	27.54	25.74
15–19 years	26	19.23	19.23
20–44 years	68	14.70	14.70
45 and over	28	17.85	21.42
Unclassified	11	36.36	36.36
Total	300	23.33	22.66

TABLE 14

POSITIVE RESULTS OF WASSERMANN TESTS, AS FOUND BY DIFFERENT INVESTIGATORS

	Males		Females		Sex or Color not Specified
	White	Colored	White	Colored	
Mc Lester (18)	.....	.....	.....	.....	18.8
Vedder (17–18–41)	.....	.....	.....	.....	7.75
Day and Mc Nitt (18)	20	48	16	40	.....
Levin (28)	13.8	24.1	.....	.....	.....
Carley and Wenger (18)	.....	19.3	.....	18	.....
Felsen and Christina (20)	.....	.....	.....	.....	6
Walker and Haller (18)	.....	.....	.....	.....	12
Mc Neil (18)	.....	.....	.....	.....	18
Ecker (18)	23.7		24.99		
Day and Mc Nitt (18)	20		16		23

TABLE 16

AVERAGE NUMBER OF DEATHS IN PORTO RICO FROM CERTAIN CAUSES REGISTERED DURING 1925-1930

Cause of Death	Annual Average Number of deaths	Rate per 100,000	Percent. of Total Deaths
Diarrhea and enteritis	6,583	409	13.9
Tuberculosis	3,932	264	12.0
Malaria	1,969	132	6.0
Uncinariasis	710	48	2.0
Cancer	576	39	1.7
Syphilis	245	16	0.7

TABLE 17

WASSERMANN REACTIONS ON PREGNANT WOMEN (10)

Author	Place	Total Number Examined	Percentage Positive
Vedder	Washington	662	31.11
Vedder	Washington	201	17.06
Kilduffe	Pittsburg	201	5.
Commiskey	Brooklyn	1,822	15.5
Goodman	New York	1,320	6.7
Losse	New York	2,000	3.05
Ottenberg	New York	2,183	10.7
Hashimoto	Japan	50	30.
Hinton	Boston	172	4.7
Noblecourt and Bonnet	Paris	1,185	10.7
Williams	Baltimore	4,000	11.2
Young	Louisville	267	25.
Yerrington	San Francisco	168	17.2
Stuhmer and Dreyer	Berlin	240	6.7
Ross and Wright	England	300	3.5
Pedrini	Italy	200	10.7
Goodman	London	677	3.9

TABLE 18

RESULTS OF WASSERMANN REACTIONS IN DIFFERENT PUBLIC HEALTH LABORATORIES

State	Year	Tests Performed	
		Total Number	Percent. Positive
Delaware (41)	1928-30	5,567	22
Virginia (43)	1929	41,809	14.4
New Hampshire (39)	1929-30	10,937	17.4
Tennessee (11)	1926-27	9,309	23.89
Maryland (4)	1928	10,093	17.09
Ohio (5)	1928	73,204	19.28
	1929	80,502	14.0
Connecticut (6)	1928-29	28,187	11.83
Indiana (7)	1928-29	32,638	24.28
	1927-28	31,273	28.3
Louisiana (12)	1927	6,961	20.01
California (9)	1927-28	32,427	21.71
New York City (8)	1928	23,309	22.14
	1929	26,601	21.81
New York State (Albany) (8)	1928	50,122	16.22
	1929	47,373	18.05
Total 10 states	.....	510,912	18.9
Nova Scotia (34)	1928-29	4,494	31.6
Hawaii (3)	1929-30	1,717	15.1
Porto Rico (2)	1927-28	21,668	15.23
	1928-29	19,701	21.99
	1929-30	27,620	18.59
Total	.....	68,989	18.51

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