

Studies on Syphilis in Puerto Rico¹

A REVIEW OF THE LITERATURE OF THE ISLAND AND OF SURVEYS BASED ON
BLOOD TESTS, WITH COMMENTS

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SYPHILIS is a disease of continuing interest to any civilized community. In the Island of Puerto Rico it has been the subject of many surveys, investigations, lectures, and comments, acquiring outstanding importance as one of the most complex public health problems of the present.

Puerto Rico is a small island with special and peculiar problems of its own: an extreme density of population (estimated at 572 inhabitants per square mile for the year 1942 and most evident in the larger coastal towns), which goes hand in hand with an extremely low economic level for the greater part of its population. With the selection of Puerto Rico as an outpost in the defense of our nation and with the implantation and execution of plans to prepare it for the present war emergency, large numbers of men were brought from the continental mainland—soldiers, civilian workers, and skilled laborers—and distributed throughout the Island. This last fact has undoubtedly an important bearing on the problem of syphilis as regards both the armed forces and public health officials in Puerto Rico.

For this reason we have decided to review the insular literature having reference to the incidence of syphilis in the Island, based on the results of blood tests (complement fixation or flocculation).

First mention of syphilis in the history of Puerto Rico dates back to 1511, eighteen years after the discovery of the Island by Columbus and three years after Ponce de León began its colonization.² During the war against the Indians, this disease, known as *morbus gallicus*, raged among both Indians and Spaniards. Its mention is rather infrequent from then on until the twentieth century; other diseases of epidemic nature, which caused havoc among the colonizers, seem to have taken a place of more prominent importance. With the occupation of the Island by American forces in 1898, a

military government was established under the command of General George W. Davis.³ His official report makes no specific mention of the incidence of syphilis on the Island; there is, however, reference to "venereal diseases," to their widespread prevalence among the American troops, and to the special orders and instructions given for their prevention and for controlling prostitution in garrison towns.

TABLE 1

Incidence of Syphilis in Puerto Rico According to Various Authors

Author	Year	Percent of Incidence	Remarks
Vedder	1915	37.4	531 soldiers
Ferrer	1926	10	Routine tests
Serra	1930	12.6	6,074 routine tests
García Cabrera	1939	12.9	9,435 tests
Koppisch	1939	13.9	243 autopsies
Costa Mandry	1931	5	Large groups of different cross-sections of the population
	1933	5	
	1935	5	
	1940	5-6	
	1942	7.5	5,794 youths
Costa Mandry & Janer	1942	12.1	14,833 selectees

In 1915 Vedder⁴ found a positive percentage of 37.4 among 531 soldiers of a Puerto Rican regiment whose blood was tested by complement fixation reactions and, on these data, estimated a probable incidence of 45 percent for the entire Island. However, this small number of cases did not warrant such a conclusion for an island with a population of 1,196,333 inhabitants (1914-15). In 1930 Vedder⁵ corrected his previous assertion by stating that "it is not to be supposed that syphilis is more of a sanitary problem in Puerto Rico than in other countries, but that the problem exists . . ., no one would deny." Commenting on his findings of 1915, he furthermore states: "While this was by no means to be taken as a

3. George W. Davis, *Military Government of Puerto Rico, October 18, 1898 to April 30, 1900* (Washington: U. S. Government Printing Office).

4. E. B. Vedder, "The Prevalence of Syphilis in the Army," *Bul. 8, 1915* (Office of the Surgeon General, War Department. Washington: U. S. Government Printing Office).

5. E. B. Vedder, "The Application of Serological Tests for Syphilis," *P.R.J. Pub. Health & Trop. Med.*, VI (1930), 194.

1. Received for publication January 12, 1943. Conference presented before the Faculty of the School of Tropical Medicine, December 10, 1942.

2. S. Brau, *Puerto Rico y su historia* (Valencia: Imp. F. Vives Mora, 1894). *La Colonización de Puerto Rico* (San Juan: Heraldo Español, 1908).

general rate for the community, it was fair evidence that the problem of syphilis existed at that time and, unless Puerto Rico is very different from the United States, that it still exists today, though perhaps to a lesser extent than formerly."

In 1926, Ferrer⁶ presented a study of syphilis in Puerto Rico and estimated at 10 percent the incidence for the whole Island, based on the results of a limited group of routine blood tests performed in the Department of Health of Puerto Rico during the fiscal year 1923-24. Ferrer considered this figure rather high, due to the probably large number of inhabitants from San Juan included among the figures selected for study.

Serra,⁷ in 1930, presented a study entitled, "Incidence of Syphilis in Puerto Rico," based on a statistical study of a number of routine blood specimens sent to the Ponce Public Health Laboratory for seradiagnostic examination. Of 6,074 samples examined by a modified Wassermann technique, 12.65 percent gave positive results. A higher percentage of positives was obtained for the colored race, male sex, urban residents, and coastal towns. No estimate of an incidence of syphilis for Puerto Rico was made, however, the author merely concluding that the percentage of incidence, if not equal to, was only slightly higher than that of continental United States or Europe.

In 1931 García Cabrera,⁸ in an editorial comment in the *Bulletin* of the Puerto Rico Medical Association, figured syphilis incidence for Puerto Rico at 25 percent. He based his estimate on the statistics gathered during a nineteen years' practice as a specialist in venereal diseases, which showed 29 percent of his patients with evidence of disease. In this editorial García Cabrera stated that "Costa Mandry believes there is about twenty percent of syphilis in the Island." No such statement was ever made by us. García Cabrera probably obtained his figures from the percentage of positive tests among routine blood specimens examined at the laboratories of the Department of Health of Puerto Rico and published in the annual reports of these laboratories.

In 1939 Koppisch⁹ presented before the Faculty of the School of Tropical Medicine a review of the protocols of one thousand consecutive autopsies performed by members of the Department of

6. J. C. Ferrer, "Estudio de la sífilis en Puerto Rico," *Bol. Asoc. Méd. P.R.*, XX (1926), 7.

7. A. Serra, "La sífilis en Puerto Rico, su incidencia," *Bol. Asoc. Méd. P.R.*, XXII (1930), 151.

8. E. García Cabrera, "Editorial," *Bol. Asoc. Méd. P.R.*, XXIII (1931), 71.

9. E. Koppisch, "Incidence of Syphilis in Puerto Rico," *P.R. Health Bul.*, III (1939), 197.

Pathology of that institution between the years 1926 and 1938. In 8.1 percent of these autopsies Koppisch found definite anatomic evidence of syphilis. Two hundred and forty-three ("a selected group"), excluding those with anatomic evidence, showed record of serology with a positive test in 13.9 percent. The author summarized his findings by stating that 20.9 percent of the cases showed either anatomic evidence or positive serology ("either recorded or estimated"), but took the figure to be too high to apply to the general population. As a final comment, based on his findings and on those of our 1931 study, Koppisch estimated the incidence of syphilis as 7 or 8 percent for the entire Island, 12 to 15 percent for the general urban population, and 20 percent for the City of San Juan.

During the discussion following the paper by Koppisch,¹⁰ García Cabrera presented the statistics collected through a number of years on the results of blood tests among different groups of his patients. No detailed data as to age, sex, color, or residence were given. These figures, however, did not warrant his previous statement of a syphilis incidence for the whole Island of 25 percent.

CASES STUDIED BY GARCÍA CABRERA

	Blood Tests	
	Number	Percent Positive
Private Patients	3,402	8.8
Government Employees	3,203	11.3
Workmen's Compensation Commission Cases	1,998	17.4
Laborers P.R.R.A. (Puerto Rico Reconstruction Administration)	832	14.2
Total	9,435	12.9

We have probably written more than any other author on the incidence of syphilis in the Island of Puerto Rico. All of our surveys, bearing on the probable incidence of the disease, have been based on the results of blood tests (complement fixation and flocculation) in selected and unselected groups of the population over a period of eleven years. These tests were performed (with the exception of special instances) in the laboratories of the Department of Health

10. *Ibid.*

of Puerto Rico. Our papers herewith reviewed appeared in 1931, 1933, 1935, 1940,¹¹ and 1942.¹²

In our first three studies we concluded that 5 percent for the whole Island and 10 percent for the urban zone were figures of incidence as accurate as could be estimated on the data available. These figures took into consideration the lack of a more definite basis for computation and made due allowances for those age groups not represented in the surveys, for the geographical distribution of the population, and for the differences of positive percentages by race and sex.

Our study of 1940¹³ was better planned and more extensive in every respect than the previous ones, and included cross-sections of different levels of our inhabitants, even a large rural group. This study was conducted as a coöperative investigation between the Medical Division of the P.R.R.A. (Puerto Rico Reconstruction Administration) and the Department of Health of Puerto Rico. Taking into consideration the percentages of positive blood tests obtained for the various groups according to age, residence (urban and rural), race (white and colored), and the geographical distribution of the population, we estimated that the percentage of positives for the entire Island could be figured at 5 to 6 percent. For the rural zone the figure would be about 5 percent and for the urban, 10 percent; in the larger urban centers the percentages would be higher.

During 1942 we¹⁴ finished a survey comprising 5,794 blood tests among youths of urban residence of both sexes employed by a Federal agency working in Puerto Rico, mostly persons between the ages of fifteen and twenty-four years. A positive percentage of 7.5 by the Kahn test and 9.6 by the Kline was obtained. The results for males were 8.6 percent by Kahn and 10.2 percent by the Kline; for females, 4.3 percent and 7.8 percent, respectively. As regarded race, among whites 7.1 percent were positive by the Kahn and 9.2

11. O. Costa Mandry, "Syphilis in Puerto Rico: Its Prevalence as Shown by the Wassermann Reaction," *P.R.J. Pub. Health & Trop. Med.*, VII (1931), 209; "La sífilis en Puerto Rico: estudio estadístico de las reacciones de fijación del complemento y de precipitación practicadas en el Laboratorio Biológico durante los años 1931-32 y 1932-33," *Bol. Asoc. Méd. P.R.*, XXV (1933), 411; "Annual Report, Biological Laboratory, Department of Health of Puerto Rico, 1934-1935," *Bol. Asoc. Méd. P.R.*, XXVII (1935), 250; "The Incidence of Syphilis in Puerto Rico: Survey Based on Results of Complement Fixation and Flocculation Tests in Unselected and Selected Groups of General Population," *P.R.J. Pub. Health & Trop. Med.*, XVI (1940), 203; "Studies on Syphilis in Puerto Rico: Survey of 5,794 Blood Tests among Youth Employed by a Federal Agency," *P.R. Health Bul.*, VII (1943), 1.

12. O. Costa Mandry and J. L. Janer, "Studies on Syphilis in Puerto Rico: Survey on the results of flocculation tests among selectees and volunteers during 1941." (In Press.)

13. O. Costa Mandry, *op. cit.*

14. O. Costa Mandry, *op. cit.*

percent by the Kline; among non-whites, 8.9 percent and 11 percent, respectively. By age groups, the percentage of positives by the Kahn and Kline tests was 6.5 and 7.98, respectively, for the group fifteen to nineteen years, and 8.2 and 11.09, respectively, for the group twenty to twenty-four years.

In 1942 and in collaboration with Janer,¹⁵ we completed a study including the results of 14,833 selectees and volunteers¹⁶ whose blood was tested during the year 1941 by flocculation tests at the various laboratories of the Department of Health of Puerto Rico. Accurate records as to age, race, and residence were kept. A positive percentage of 12.1 by the Kahn test was obtained for all the specimens tested. A higher percentage of positives was obtained in the non-whites—14.8 as compared to 11.5 for the whites. The percentage was also higher in urban dwellers—15.6 as compared to rural inhabitants with 10.2. As regarded age, the percentage of positive results varied as follows: 6.2 in the age group fifteen to nineteen years, 10.2 in the group twenty to twenty-four, 14.3 in the group twenty-five to twenty-nine, 20.9 in the group thirty to thirty-four, and 24.3 in the group thirty-five years or over.

The results of this survey were compared with a similar study conducted in the United States by Vonderlehr and Usilton,¹⁷ comprising 1,051,985 tests in forty-four states and the District of Columbia, with 4.52 percent positive results. In whites the percentage positive was 1.85; in Negroes, 24.77.

Tables 2, 3, 4, and 5 analyze the results of each of our studies in those groups that bear comparison.

15. O. Costa Mandry and J. L. Janer, *op. cit.*

16. Although this study comprised 19,395 persons, records as to age, race, and residence were taken of 14,833 only.

17. R. A. Vonderlehr and L. J. Usilton, "Syphilis among Selectees and Volunteers; Prevalence in First Million Men Examined Under Selective Service Act of 1940," *J.A.M.A.*, CXVII (1941), 1350.

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TABLE 2

Results of Surveys by Costa Mandry and Costa Mandry and Janer of Groups of the Population Classified According to Sex

	Year	No. of Tests	Positive Kahn Percent	Remarks
Females				
Pregnant Women	1923-31	2,955	13.6	San Juan
Maternity Cases	1929	264	15.5	San Juan Municipal Hosp.
Auxiliary Midwives	1933	394	14.4	Urban & rural
Needleworkers	1933-35	1,006	11.3	San Juan
Prenatal Cases	1940	2,357	12.9	Urban
School Children	1940	2,600	5.3	Urban
Federal Agency Youths	1942	1,387	4.3	Urban
Males				
C.T.C. Youths	1931	392	5.8	Urban
National Guardsmen	1931	498	9.03	Urban
School Children	1940	3,062	4.0	Urban
Agricultural Laborers	1940	7,453	6.3	Rural
Selectees	1941	14,833	12.1	Urban & rural
Federal Agency Youths	1942	4,406	8.6	Urban

TABLE 3

Results of Surveys by Costa Mandry and Costa Mandry and Janer of Groups of the Population Classified According to Race

	Year	No. of Tests	Positive Kahn % Tests		Remarks
			White	Non-white	
General Population	1931	1,905	4.78	7.36	Rural
Needleworkers ^a	1940	1,006	7.8	13.0	Urban
School Children	1940	6,155	3.7	6.3	Urban
P.R.R.A. Dispensaries	1940	2,818	8.4	15.7	Urban
		12,403	6.6	10.7	Rural
Slum Survey (San Juan)	1940	706	10.16	16.5	Urban
Central Lafayette Workers	1940	1,903	6.8	6.6	Urban & rural
Agricultural Laborers ^a	1940	7,453	5.4	6.4	Rural
Selectees ^a	1941	14,833	11.5	14.8	Island
Federal Agency Youths	1942	5,794	7.1	8.9	Urban

^a Only one sex represented.

TABLE 4

Results of Surveys by Costa Mandry of General Population Groups

	Year	No. of Tests	Positive Kahn	Remarks
Health Certificates	1930	1,138	10.9	Serra
	1931	17,530	16.04	13 towns
	1933	8,259	13.5	20 towns
	1940	2,450	10.3	Urban
General Population	1931	1,905	5.03	Rural
1000 Autopsies	1939	243	13.9	Koppisch
Central Lafayette Workers	1940	1,903	6.8	Urban and rural
School Children	1940	6,155	4.1	Urban
P.R.R.A. Dispensaries	1940	2,818	9.2	Urban
		12,403	7.0	Rural
Slum Survey (San Juan)	1940	706	12.1	Urban
Federal Agency Youths	1942	5,794	7.5	Urban

TABLE 5

Results of Surveys of Island Institutions

Institution	Year	No. of Tests	Percentage of Positive Kahn Tests
Presbyterian Hospital	1930	3,000 ^a	11
	1931	905	16.6
	1933	868	16.5
	1940	914	7.3 ^b
	1942	2,808	18.2
Insular Penitentiary	1931	654	26.6
	1933	590	24.4
	1942	819	25.2
	1942	259	3.08
Girls Charity School	1931	261	3.06
	1940	264	5.3
	1942	427	11.7
	1942	356	5.05
Boys Charity School	1931	411	5.8
	1940	267	3.0
	1942	439	10.5
	1942	2,629	14.2
Insular Tuberculosis Sanatorium	1940	2,382	11.1
University Hospital	1940	979	18.8 ^c
Private Hospital	1940	2,497	24.9
Insular Penitentiary and Jails	1940		

^a Serra, *op. cit.*

^b First test on admission.

^c Only males over 35 years of age.

COMMENTS

The results of blood tests in large unselected groups of the population, representing cross-sections of a community, are often used as an index to determine the incidence of syphilis. These, however, must be analyzed carefully by age groups, sex, race, and residence to prevent incorrect interpretations and misleading findings.

The percentage of positive tests among routine blood specimens sent to public health laboratories is often used as an index to the probable syphilis incidence in a community. As a general rule and when used for such purposes, these data are often misleading and conducive to incorrect conclusions. These specimens are generally from selected groups of the population in which syphilis is more prevalent; a considerable number of specimens are sent for confirmatory purposes, and many are repeats during the course of treatment of syphilitic infection.

Table 6 shows the number of tests (one only) with the corresponding percentage of positive results (with no attempt at classification of any sort) of all blood specimens, examined at the public health laboratories of the Department of Health of Puerto Rico between the fiscal years 1911 and 1942. This table shows that during the first fifteen years, when the number of specimens was small and probably

TABLE 6

Percentage of Positive Blood Tests in Public Health Laboratories by Fiscal Years

<i>Year</i>	<i>No. of Tests</i>	<i>Percent</i>	<i>Year</i>	<i>No. of Tests</i>	<i>Percent</i>
1911-12	51	15.4	1927-28	17,610	15.1
1912-13	119	42.8	1928-29	16,373	23.2
1913-14	432	42.8	1929-30	21,747	20.03
1914-15	367	47.9	1930-31	26,863	22.6
1915-16	121	59.5	1931-32	39,287	18.5
1916-17	228	46.9	1932-33	39,108	17.01
1917-18	337	47.5	1933-34	34,287	18.5
1918-19	583	46.3	1934-35	60,084	13.7
1919-20	793	59.0	1935-36	61,820	14.3
1920-21	1,374	45.3	1936-37	53,533	15.2
1921-22	1,990	37.3	1937-38	57,404	14.4
1922-23	3,120	34.6	1938-39	106,061	17.2
1923-24	6,764	35.02	1939-40	202,498	17.2
1924-25	1,254	32.5	1940-41	208,687	16.3
1925-26	2,428	26.3	1941-42	256,256	13.8
1926-27	2,529	21.4			

from suspects, the percentage of positives was higher. In the last sixteen years the number of specimens has been higher and the percentage of positives lower, the differences being less from year to year.

A good deal of the controversy on the estimated percentage of syphilis incidence in Puerto Rico hinges around the differences of opinion as regards the interpretation of the findings obtained (much of the data on hand agree in many respects, if compared and analyzed properly), and on the actual percent composition of the population of the Island by age groups, sex, race, and residence (urban or rural).

The question of economic status is of importance and must be kept in mind when arriving at an estimate of the syphilis incidence in Puerto Rico. It has been generally accepted that the lower the socioeconomic status, the higher the incidence of syphilis. The economic status of our population is extremely low. During September, 1942, there were 240,000 unemployed persons in the Island, 12.33 percent of the population (1,944,915) estimated for that year. The census of 1935¹⁸ showed an average of 5.4 individuals per family for the Island, another factor which must be considered in estimating such incidence for Puerto Rico.

Mountin, Pennell and Flook,¹⁹ in their survey of illness and medical care in Puerto Rico, state that the inhabitants are very poor when compared with those of continental United States. A representative study (1934) of 6,000 families showed that the average income per family was \$230 per year. Ninety percent had annual incomes of less than \$500, while only 4 percent had yearly incomes of \$1,000, or more. We may add to this that the cost of living in Puerto Rico is as high, or higher, than on the mainland, bringing into play a lower level of nutrition among the people of the Island.

The composition of our population is different from that of continental United States as regards race, residence, and age groups. In the latter there are 10.2 percent non-white and 56.5 percent urban residents in contrast to 23.5 percent and 34.1 percent, respectively, for Puerto Rico. There is a very high percentage of young individuals in the Island, the census of 1940 showing a percentage of 40.6 under fifteen years of age, 45.5 between fifteen and forty-four, and only 13.9 forty-five years and older, as compared with percentages of

18. No figures for the 1940 census are yet available.

19. J. W. Mountin, E. H. Pennell, and E. Flook, "Illness and Medical Care in Puerto Rico," *Public Health Bulletin* 237 (Washington: U. S. Government Printing Office, 1937).

25, 48.4, and 26.5 for the same age groups in continental United States. This age distribution plays its role in the estimation of an incidence of syphilis for Puerto Rico since the disease is more prevalent in age groups of more than twenty years.

In like manner, there are other factors to be considered: the prevalence of certain pathologic processes that produce reagin-like substances in the body fluids and often give positive complement fixation or flocculation tests. Among those processes known are three that must receive special consideration in Puerto Rico: leprosy, yaws, and malaria. The first two do not play such an important role in altering survey figures, if the groups studied are unselected and large enough, because they occur either localized in special areas or their incidence is too small to produce any noticeable differences. Malaria, however, is rather prevalent in the Island and may play an important part in producing positive reactions, either during acute attacks or during, and after, convalescence.

The official records of the Bureau of Vital Statistics and Epidemiology of the Department of Health of Puerto Rico show average annual morbidity rates for malaria for the three quinquenniums of 1927-31, 1932-36, and 1937-41 of 1,512.5, 1,766.4, and 1,450.8 per 100,000 population, respectively. The corresponding average annual mortality rates for the same quinquenniums are given as 147.3, 159.2, and 109.8, respectively.

Technical factors and errors also have to be considered when results of blood tests are employed as an index of the prevalence of syphilis in a community. A certain number of cases of syphilis give negative results to complement fixation and flocculation tests; some cases react positive to complement fixation and negative to flocculation, or vice versa. There are other conditions that may alter the results of a blood test, all of which must be given careful and serious consideration. Notwithstanding all of these difficulties, blood tests, complement fixation and flocculation are extremely valuable in demonstrating the probable incidence of syphilis in a community.

We have commented in our brief review on the data presented by different authors as regards the incidence of syphilis in our Island. On the basis of these findings, of the summary of our surveys, and of Janer's and ours as regards age, sex, race, and residence (Table 7), of the percent composition of the population by age groups and by sex, race, and residence, the differences of opinion as to composition by race of our inhabitants, the incidence of diseases liable to give positive complement fixation and flocculation tests, the economic

status of the population and the technical and biologic factors which may alter the true results of blood tests, let us consider these factors all together and answer the following three questions:

1. Are the data presented sufficient to warrant an estimate as to syphilis incidence in our Island, or are other surveys along different lines necessary before a final determination can be made?
2. Is syphilis on the increase in Puerto Rico?
3. What is an appropriate estimate of the probable percentage of occurrence of syphilis in the island inhabitants as a whole, in the urban dwellers, in the rural residents, and for large urban centers, such as San Juan and Ponce?

TABLE 7

Estimated Incidence of Positive Blood Tests in Puerto Rico Based on Percent Composition of Population and Cases Surveyed

	Population Census 1940		Cases Surveyed			Estimated Population Giving Positive Kahn Tests ^a
	Number	Percent	Number	Percent	Positive Percent	
Males	938,280	50.2	38,339	70.5	9.1	
Females	930,975	49.8	16,023	29.5	7.5	
White	1,430,744	76.5	43,893	80.3	8.2	
Nonwhite	436,511	23.5	10,781	19.7	10.7	
Rural	1,232,613	65.9	27,789	52.6	6.9	
Urban	636,642	34.1	25,085	47.4	9.7	
Under 7 years	431,432	23.1	944	1.7	3.6	15,532
7-14 years	327,757	17.5	7,903	14.5	6.3	20,649
15-24 years	412,475	22.1	26,640	48.8	7.4	30,523
25-34 years	250,604	13.4	11,537	21.1	11.3	28,318
35-44 years	187,110	10.0	4,499	8.2	9.6	17,963
45 or over	259,877	13.9	3,096	5.7	8.2	21,310
All age groups	1,869,255	100.0	54,619	100.0	7.1 ^b	134,295

^a Only cases with records as to age, sex, race, and residence are included.

^b Estimated percentage.

DISCUSSION

Drs. Joseph Bolten, W. A. Glines, R. M. Suárez, E. Garrido Morales, E. García Cabrera, and O. Costa Mandry participating.

DR. BOLTEN: I was much interested in the difference between the white and the colored selectees examined in continental United States and those examined in Puerto Rico. I would like to know if Dr. Costa can give reasons for this difference. As to the three questions with which his paper closes, I hope he will answer them.

DR. GLINES: The figures given by Dr. Costa Mandry cover a large

range of population, but exclude prostitutes, which directly affect the Defense Program, the Army, and the Navy. I hope he will be able to tell us what is the incidence of syphilis among the prostitute population of our Island.

DR. SUÁREZ: As a matter of information, we want to state that we recently finished a study of over six hundred cardiovascular cases and, in this series, we found an incidence of cardiovascular lues of 7 percent, of rheumatic fever around 20 percent, and of senile degenerative changes in over 60 percent. In this series our findings, as regards positive blood tests, apparently agree with the figures offered by Dr. Costa. In going over this very interesting paper, it strikes us that with an estimated percentage of five to six for the entire population and of 10 percent in the urban zone, we must take into consideration those conditions which give non-specific positive results in blood tests. Dr. Costa mentioned malaria, leprosy, and yaws among those giving positive reactions. There are others such as lymphogranuloma inguinale, infectious mononucleosis, rat-bite fever, Mal del Pinto, Weil's disease, etc., not at all uncommon in the Island. Any of the many diseases exhibiting a high blood globulin, which incidentally are more frequent in the tropics, may give rise to non-specific positive blood tests. Our impression is that these figures are very interesting and illuminating. They give a pretty exact idea of the real incidence of syphilis in Puerto Rico which, in my opinion, is probably a little bit lower than these figures might seem to establish.

DR. GARRIDO MORALES: As an epidemiologist, I would like to state that I do not think the figures of Dr. Ferrer, Dr. García Cabrera, or even those of Dr. Costa Mandry, are a representative sample of the population of this Island. Pearl states that a representative sample is best taken at random so that it will include attributes with regard to age, sex, residence, and economic status, as well as other factors. The best way to determine the true incidence of syphilis in Puerto Rico would be by taking blood specimens from all the members of, say, every tenth house of representative communities, both urban and rural. This would give us a fair representative sample of the population. The figures presented by Dr. Costa Mandry are of interest because they are the most complete as yet available for Puerto Rico. However, they include a large group of indigent persons, a fact which undoubtedly influences the results.

DR. GARCÍA CABRERA: Dr. Costa's estimated percentage of positive blood tests is from five to six for the entire population, and ten percent for the entire urban zone. My percentage in a group of 18,840 cases examined is 12.9 percent. This group was composed of 9,600 government employees, including people of high and low salaries in urban zones, of a large number of school teachers, janitors, policemen, clerks, road and construction inspectors, and also a large number of *peones*, of 2,400 cases, mostly laborers from the waterfront and piers of San Juan, 600 laborers in W.P.A. projects working around San Juan and neighboring towns, 640 maternity cases from the Maternity Section of the San José Hospital, where we perform routine blood tests in all cases, and 5,600 cases of private practice in well-to-do people. I consider this a representative cross-section of the adult population above twenty years of age from the urban zone. Costa's figure of ten percent therefore comes well near my estimate of 12.9 percent. I think that if we make a large survey taking towns like Mayagüez, Ponce, Arecibo, etc., which are commercial towns, the percentage of positive findings will not be any higher. My figure of 25 percent in 1930 represented only waterfront laborers of San Juan and comprised a group of about two thousand. I think that a percentage of twelve to thirteen is about the average for adult urban dwellers.

The point brought out by Dr. Glines about the prostitutes cannot be considered; it is a too selected group to be included in any of these surveys.

DR. COSTA MANDRY: We expected a good deal more discussion about this very interesting problem.

To the first question of Dr. Bolten's, we can say that there are several factors that may play a part: first, there are perhaps among the selectees many that appear white and should be classified as non-white; that a large portion of the selectees and volunteers of 1941 (of both races) are of low economic status, where syphilis is more abundant, and that in Puerto Rico living conditions for whites and non-whites are very much alike in contrast to continental United States where the social status of the negro is much lower than that of the white.

In answer to Dr. Glines, we can only offer 146 Kahn tests made in 1940 on the inmates of the Arecibo Jail for Women (85 percent are prostitutes) with a positive percentage of fifty-eight.

As regards Dr. Suárez' statement, we are glad the clinical findings in his series agree with our estimates.

We do not agree with Dr. Garrido Morales. Fifty-four thousand six hundred and nineteen cases, studied by age groups, by sex, by color, and by residence, can be used as a fair index to determine the probable incidence of positive blood tests in the Island. In the figures we have presented, there is a large group in which the sample is very representative. In the Lafayette study, for example, forty-five percent of the entire population of the area surveyed was taken in a systematic way, and everyone in the house selected was examined. In the rural dispensaries of the P.R.R.A., we took every member of the families of the persons that came to the dispensary. In the urban dispensaries of the P.R.R.A., we selected everybody that came to the dispensary.

It is true that in 54,619 cases, summarized in Table 7, there should be included larger numbers of certain representative groups. Of the cases studied, 70.5 percent were of the male sex as compared to 50.2 percent in the actual composition of the population of the Island. Eighty and three tenths percent were presumably white in contrast to 76.5 percent in the total island population for 1940. As regards residence, 52.6 percent of our surveyed cases were of urban residence as compared to 65.9 percent in the composition of the total population.

As regards age, the difference in percent composition between our surveys and the actual population was marked, especially in the younger groups where syphilis is less prevalent. Our surveys of the age groups under seven years of age comprised 1.7 percent in contrast to 23.1 percent for the general population. In the age group fifteen to twenty-four, where syphilis is more prevalent, our surveys comprised 48.8 percent, while the general population only shows 22.1 percent. Fifty-four thousand six hundred and nineteen cases (about 2.91 percent of the total island population) is a fair sample of the general population and can be used tentatively as an index figure on which to base an estimate of positive blood tests for the Island. Of these tests, 8.2 percent give a positive result, regardless of any classification whatsoever. Estimating the probable number of inhabitants with syphilis on the basis of the percentage of positive tests in each age group, we would have 134,295 (Table 7) for the whole Island (7.1 percent). The number of positive percentages by sex, race, residence, and age groups can also be seen in Table 7. Our surveys comprised more persons of the age groups and sex where

syphilis incidence is higher. The positive percentages in Table 7 as regards race, sex, and residence are not computed on the basis of age groups and include all cases studied, therefore the figures are higher than if otherwise estimated on the basis of age groups.

In closing we shall answer the three questions with which we concluded our paper:

1. The data presented, although comprising a large enough series on which to base an estimate, are not complete for all cross-sections of our population. It would be interesting to obtain a large series of children under seven years of age. Since it is compulsory in Puerto Rico to have a blood test before marriage, this data should be collected and interpreted. The results of blood tests on prostitutes should also be collected and studied. The study on selectees for 1942 is already under way. All these new data will give a clearer picture of the situation.

2. The trend of positive blood tests, as determined by different authors, seems to remain more or less stable in Puerto Rico. The population, however, increases by 32,000 every year²⁰ and, since the percentage of incidence remains more or less the same, there is an actual increase in the number of possibly infected persons, but not in the apparent rate of infection.

3. Taking into consideration all of the factors that may give rise to positive blood tests and the percentage of positive tests in the various groups, according to race, sex, and residence, comprising our surveys, we would estimate the percentage of positive blood tests in the urban population at ten percent and for rural inhabitants, under five percent. If we consider that ten percent of 636,642 urban inhabitants (census of 1940) and five percent of 1,232,613 rural inhabitants comprises 125,294 persons, this figure represents a total percentage of positive blood tests of 6.7. In view of this, we estimate a percentage of positive tests of five to six for the entire Island.

When other data under study, or future studies, show different trends, the percent incidence of positive blood tests for Puerto Rico will have to be changed but, until different figures for computation are available, we shall have to take as a basis the estimated figures presented herein. We must all admit, however, that syphilis is a problem of paramount importance to our Island and one that re-

20. Average during the past ten years.

quires careful and whole-hearted attention on the part of those insular and federal agencies, interested in health and social problems.

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