Studies on Syphilis in Puerto Rico[1]

III. SURVEY BASED ON THE RESULTS OF FLOCCULATION TESTS AMONG 19,395 SELECTEES AND VOLUNTEERS DURING THE YEAR 1941

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ONE OF THE AUTHORS (Costa Mandry) has for many years been interested in the incidence of syphilis in Puerto Rico, with special reference to the percentage of positive reactions among selected and nonselected groups of the island population. The results of his surveys have appeared from time to time in the regional literature.[2] Other investigators in Puerto Rico have also conducted surveys on this same subject with results similar, in many respects, to his.[3]

In 1941 the Selective Service Law, which made the registration of every American citizen between the ages of twenty and thirty-five compulsory, was extended to Puerto Rico. At the time of call, each of the men drafted was subjected to a physical examination by private physicians or by physicians of the public health units of the Department of Health, and a blood sample was obtained and sent to the corresponding public health laboratory, accompanied by the standard report form in quadruplicate recommended by the United States Public Health Service. Thus 19,395 blood specimens from selectees were sent for serological tests to the seven public health laboratories of the Department of Health of Puerto Rico. In the hope that these data might throw light upon the incidence of syphilis in the Island, the reports of these tests, as returned, were placed on punch cards for subsequent tabulation. They now form the basis of this paper. However, only the results of the first test performed were included, all subsequent tests being omitted.

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2. O. Costa Mandry, "Syphilis in Puerto Rico," *P.R.J.Pub.Health & Trop.Med.*, 7:209, 1931; "Annual Report of the Biological Laboratory, Health Department of Puerto Rico (1934–1935), Special Studies," *Bol.Asoc.Méd.P.R.*, 27:256, 1935; "Incidence of Syphilis in Puerto Rico," *P.R.J.Pub.Health & Trop.Med.*, 16:203, 1940; "Studies on Syphilis in Puerto Rico. I. A Review of the Literature of the Island and of Surveys Based on Blood Tests, with Comments," *P.R.J.Pub.Health & Trop.Med.*, 18:452, 1943; "II. Survey of 5,794 Blood Tests among Youths Employed by a Federal Agency," *P.R.Health Bul.*, 7:1, 1943.

3. E. García Cabrera, cited by O. Costa Mandry, *op. cit.* E. Koppisch, "Incidence of Syphilis in Puerto Rico," *P.R.Health Bul.*, 3:197, 1939. A. Serra, "La sífilis en Puerto Rico," *Bol.Asoc.Méd.P.R.*, 22:151, 1930.

Puerto Rico is a thickly populated island (562 estimated inhabitants per square mile for 1941), with about 70 percent of white population, 30 percent of nonwhite, and 65 percent and 35 percent, respectively, as regards distribution of inhabitants with respect to rural and urban (city) areas.

The outcome of the examinations performed on 19,395 blood samples of 1941 selectees and volunteers is herein presented.

INTERPRETATION OF THE DATA

Table 1 shows in detail the number of specimens received at each laboratory with the percentage of positive and doubtful reactions among the satisfactory specimens. It also demonstrates the number and percentage of unsatisfactory specimens received in each laboratory.

Table 2 shows the number of standard blood tests (Kahn and Kline) performed in each of the municipalities of the Island, together with the percentage of positive reactions, by both tests, in 18,603 blood samples that were considered satisfactory for one or the other test, or both. The number of tests and the incidence of positive reactions varies considerably in each town.

Table 3 points out detailed percentages of positive Kahn and Kline reactions by age groups, by residence, and by color in 14,836 specimens that were satisfactory for examination by either test, or both. Positive reactions were found decidedly higher in the nonwhite group and in urban dwellers than in the white and rural inhabitants, insofar as the Kahn and Kline tests were concerned. Positive percentages increased with age, the lowest being in the 15–19 year group and the highest, in that of 25 years, and over.

Other tests, such as Kolmer and Hinton, were not included in this survey because they were performed only on a limited number of blood samples and in a limited district of the Island. A subsequent paper dealing with the group of tests carried out in the San Juan Laboratory where Kolmer, Kahn, Hinton, and Kline tests were performed simultaneously on each specimen is to follow.

During 1934 one of the authors (Costa Mandry) conducted a survey among 7,453 agricultural workers in the rural zone of Puerto Rico, performing upon each blood sample obtained a complement-fixation and a flocculation test after satisfactory physical examinations had been completed on these workers who had been selected from groups of the P.R.R.A. (Puerto Rico Reconstruction Administration) and the C.C.C. (Civilian Conservation Corps) in Puerto Rico.[4] For purposes of comparison with the present study, the percentage of positive Kahn reactions among the agricultural workers and the 1941 selectees were as follows:

Age Groups	*White*		*Nonwhite*	
	1934 Survey	*Selectees*	*1934 Survey*	*Selectees*
15–19	4.1	6.2	3.1	7.8
20–24	3.9	8.6	4.5	10.5
25–29	7.1	10.0	6.7	13.1
30–34	7.8	15.2	6.7	23.1

Though the groups studied were similar as to age and residence, it is quite evident that the percentage of positive reactions in the study of 1941 was almost twice as high as in the survey of 1934, with the difference that the 1934 serological tests[5] were performed only if the physical examination were satisfactory, while the tests in the former group were made before the physical had taken place.

Table 4 is a comparative tabulation of the composition of the male population (15–44 years) of Puerto Rico by age groups, estimated as of July 1, 1941, and the cases studied in this survey. The differences are considerable. Twenty-three and eight-tenths percent of the male population corresponded to the age group 15–19, yet only 10.8 percent of the cases surveyed fell within this group. Twenty-four and four-tenths percent of the population fell within the age group 20–24, while 54.1 percent of the cases were found in this same group. In the age group 25–34, the corresponding relation of the cases surveyed to the population group was 32.4 percent and 29.3, respectively, which figures were somewhat similar. However, in the age group 35–44 the difference was again marked: 2.7 percent and 22.5 percent, respectively. This table likewise shows the percentage that the cases in each group represented in the estimated male population of Puerto Rico for the corresponding age group.

If one compares the present study with a similar study conducted in the United States on 1,051,965 Selective Service cases of the same year, reported by Vonderlehr and Usilton,[6] a striking difference is

4. O. Costa Mandry, *op. cit.*
5. *Ibid.*
6. R. A. Vonderlehr, and L. J. Usilton, "Syphilis among Selectees and Volunteers," *J.A.M.A.*, 117:1350, 1941.

found in the positive percentages for whites and nonwhites of these countries. Living conditions for whites and nonwhites are essentially the same in Puerto Rico as contrasted with the United States, where the socioeconomic status of the nonwhite (negro) is very much lower than that of the white. This difference is therefore markedly evident in the results of the tests carried out for the United States as a whole—especially for the Southern states—though not so apparent in Puerto Rico as is demonstrated by the following study:

	Percentage of Positive Cases			*Number of Tests*
	White	*Negro*	*Total*	
Alabama	2.4	19.3	8.9	17,613
Arizona	5.05	29.8	7.6	2,927
California	2.1	27.5	10.3	13,148
District of Columbia	2.14	26.3	10.3	10,615
Florida	4.68	40.2	17.01	17,900
Louisiana	3.2	24.7	12.6	24,344
Mississippi	2.9	28.4	14.4	22,059
New Mexico	4.4	36.4	5.2	7,261
South Carolina	4.4	29.6	15.6	12,503
Puerto Rico	11.5	14.8	12.1	14,833
U. S. A.	1.85	24.7	4.52	1,051,965

SUMMARY

1. Eighteen thousand six hundred and three flocculation tests were performed on satisfactory blood samples obtained from volunteers and selectees in Puerto Rico during the year 1941; of these, 12.3 percent gave positive reactions in the Kahn test and 13.8 percent, in the Kline.

2. As in previous studies carried out in the Island, the percentage of positive Kahn reactions was higher in the urban zone (15.6 percent) than in the rural zone (10.2 percent); for similar age and residence groups it was higher in the nonwhite (14.8 percent) than in the white (11.5 percent).

3. As regarded age groups, the percentage of positive Kahn and Kline reactions varied as follows:

Age Groups	*Kahn*	*Kline*
15–19	6.2	7.3
20–24	10.2	11.5
25–29	14.3	15.9
30–34	20.9	22.6
35 and over	24.3	23.3

4. In the rural zone, the percentage of positive reactions was higher in the present study than in a similar survey of corresponding age groups made up of 7,453 agricultural male workers and carried out in 1934. In the latter study all blood tests were performed only after the individuals had passed a rigid physical examination; in the former, a routine blood test was made before the physical examination.

5. No attempt has been made to correlate positive findings in either test with the results of the physical examinations, with malaria (a rather prevalent disease in the Island that often gives rise to positive flocculation reactions), or to other diseases that are known to give nonspecific positive reactions.

6. The positive serologic results obtained in Puerto Rico are higher in whites and in the total examined than in most states of continental United States, but they bear a similarity to the total positive percentages obtained in some of the Southern states. However, the percentage positive for nonwhites is much lower than that of the United States as a whole, or of most of the southern states, with which it is compared.

TABLE 1

Distribution of 19,395 Specimens Sent for Examination and Classified by Laboratories, with Percentages of Unsatisfactory Specimens and of Positive and Doubtful Reactions in Satisfactory Specimens

Laboratory	*Total Specimens*			*Specimens Satisfactory for Tests*					
	Number	*Unsatisfactory Percentage*		*Kahn*			*Kline*		
		Kahn	*Kline*	*Number*	*Percentage*		*Number*	*Percentage*	
					Pos.	*Doubt.*		*Pos.*	*Doubt.*
Aguadilla	1,105	2.3	2.3	1,079	10.7	1.8	1,080	11.1	1.5
Arecibo	3,512	5.1	5.1	3,331	7.5	1.2	3,333	8.5	2.3
Guayama	1,599	2.0	2.0	1,566	9.4	0.9	1,566	9.6	1.4
Humacao	3,177	3.0	3.1	3,082	20.5	2.7	3,079	20.2	4.5
Mayagüez	2,218	9.4	9.2	2,010	7.8	0.7	2,015	10.0	0.9
Ponce	3,106	3.1	3.1	3,008	13.0	1.8	3,009	19.2	2.1
San Juan	4,672	3.2	3.2	4,516	13.2	0.1	4,517	13.4	0.2
Not stated	6			3			4		
Total[a]	19,395	4.0	4.0	18,595	12.3	1.2	18,603	13.8	1.8

[a] Includes 6 specimens where laboratory is not stated, out of which 3 were satisfactory for the Kahn test and 4 for the Kline test.
Of the 3 satisfactory for Kahn, 2 gave positive and 1 gave negative reactions.
Of the 4 satisfactory for Kline, 1 gave positive and 1 doubtful reactions.

TABLE 2

Distribution by Municipalities of 18,595 Satisfactory Blood Specimens with Percentage of Positive Kahn and Kline Reactions

Town	Kahn		Kline	
	No. Tested	Percentage Positive	No. Tested	Percentage Positive
Adjuntas	376	12.2	377	24.4
Aguada	121	7.4	122	8.2
Aguadilla	274	14.6	274	15.3
Aguas Buenas	169	10.6	169	11.2
Aibonito	269	6.3	269	6.7
Añasco	129	7.8	129	8.5
Arecibo	1,030	10.3	1,031	11.6
Arroyo	123	10.6	123	9.8
Barceloneta	117	9.4	118	9.3
Barranquitas	191	5.2	191	7.3
Bayamón	416	16.3	416	18.5
Cabo Rojo	254	3.9	255	5.5
Caguas	366	23.5	364	22.5
Camuy	179	——	179	0.6
Carolina	195	13.8	195	14.9
Cataño	84	26.1	85	25.9
Cayey	250	8.8	250	10.0
Ceiba	91	20.9	91	22.0
Ciales	220	6.8	220	8.2
Cidra	234	8.6	234	8.5
Coamo	346	6.6	346	6.4
Comerio	138	6.5	138	6.5
Corozal	233	7.7	233	7.7
Culebra	4	50.0	4	50.0
Dorado	116	6.9	116	6.9
Fajardo	178	18.0	180	19.4
Guánica	160	7.5	160	12.5
Guayama	214	12.6	214	12.6
Guayanilla	112	12.5	112	16.1
Guaynabo	155	11.6	155	11.0
Gurabo	137	13.1	137	15.3
Hatillo	162	5.6	162	7.4
Hormigueros	75	2.7	75	4.0
Humacao	376	27.6	375	26.4
Isabela	225	8.0	225	8.0
Jayuya	116	9.5	116	12.1
Juana Díaz	235	14.5	236	21.6
Juncos	275	20.7	275	22.2
Lajas	127	3.9	127	6.3
Lares	275	8.0	275	9.8
Las Marías	91	4.4	91	5.5

TABLE 2

Distribution by Municipalities of 18,595 Satisfactory Blood Specimens with Percentage of Positive Kahn and Kline Reactions

Town	Kahn		Kline	
	No. Tested	Percentage Positive	No. Tested	Percentage Positive
Las Piedras	181	18.2	182	17.6
Loiza	238	9.7	238	9.2
Luquillo	153	26.8	153	20.9
Manatí	291	7.6	291	7.9
Maricao	111	5.4	111	5.4
Maunabo	162	15.4	162	22.8
Mayagüez	931	11.6	935	14.5
Moca	43	11.6	43	14.0
Morovis	75	4.0	75	5.3
Naguabo	356	27.5	355	25.4
Naranjito	114	5.3	114	5.3
Orocovis	134	9.0	134	9.0
Patillas	243	8.2	243	8.2
Peñuelas	61	6.6	61	13.1
Ponce	1,342	16.6	1,341	22.9
Quebradillas	106	0.9	106	0.9
Rincón	70	12.8	70	14.3
Rio Grande	195	12.3	195	11.8
Rio Piedras	612	15.4	612	15.4
Sabana Grande	62	1.6	62	4.8
Salinas	146	11.6	146	12.3
San Germán	257	4.3	257	7.0
San Juan	1,578	14.4	1,578	14.4
San Lorenzo	189	14.7	190	16.3
San Sebastián	271	9.2	271	9.2
Santa Isabel	96	13.5	96	14.6
Toa Alta	152	9.2	152	9.2
Toa Baja	88	13.6	88	13.6
Trujillo Alto	126	15.1	126	15.1
Utuado	234	5.6	234	6.4
Vega Alta	158	8.2	158	8.2
Vega Baja	231	8.6	231	9.1
Vieques	95	18.9	95	11.6
Villalba	68	5.9	68	10.3
Yabucoa	333	15.9	332	16.0
Yauco	253	10.7	253	17.0
Not Stated	2	50.0	1	——
Total	18,595	12.3	18,603	13.8

TABLE 3

Percentage of Positive Kahn and Kline Reactions in 14,836 Blood Specimens Distributed According to Age, Residence, and Color

Age Groups	Urban						Rural						Urban and Rural					
	White		Nonwhite		Total		White		Nonwhite		Total		White		Nonwhite		Total	
	Examined	Percentage Positive	Examined	Percentage Positive	Total Examined	Percentage Positive	Examined	Percentage Positive	Examined	Percentage Positive	Total Examined	Percentage Positive	Examined	Percentage Positive	Examined	Percentage Positive	Total Examined	Percentage Positive
KAHN																		
15–19	608	5.9	156	5.8	764	5.9	658	6.2	129	7.8	787	6.5	1,266	6.1	285	6.7	1,551	6.2
20–24	2,634	11.4	669	13.3	3,303	11.7	3,643	8.6	803	10.5	4,446	9.0	6,277	9.8	1,472	11.8	7,749	10.2
25–29	1,155	17.6	273	26.4	1,428	19.3	1,552	10.0	351	13.1	1,903	10.6	2,707	13.2	624	18.9	3,331	14.3
30–34	481	24.7	123	29.3	604	25.7	565	15.2	147	23.1	712	16.9	1,046	19.6	270	25.9	1,316	20.9
35 & over	119	26.0	48	35.4	167	28.7	176	18.8	39	30.8	215	20.9	295	21.7	87	33.3	382	24.3
Not Stated	153	13.7	46	13.0	199	17.6	237	13.9	68	8.8	305	12.8	390	13.8	114	10.5	504	13.1
Total	5,150	13.8	1,315	17.4	6,465	15.6	6,831	9.7	1,537	12.5	8,368	10.2	11,981	11.5	2,852	14.8	14,833	12.1
KLINE																		
15–19	608	7.6	156	7.1	764	7.5	658	7.1	129	7.0	787	7.1	1,266	7.3	285	7.0	1,551	7.3
20–24	2,636	13.0	669	15.1	3,305	13.5	3,644	9.7	803	11.5	4,447	10.1	6,280	11.1	1,472	13.1	7,752	11.5
25–29	1,155	18.8	273	27.8	1,428	20.5	1,551	12.0	350	14.3	1,901	12.4	2,706	14.9	623	20.2	3,329	15.9
30–34	481	25.8	123	31.7	604	27.0	565	17.3	147	24.5	712	18.8	1,046	21.2	270	27.8	1,316	22.6
35 & over	119	26.0	48	37.5	167	29.3	176	17.0	39	25.6	215	18.6	295	20.7	87	32.2	382	23.3
Not Stated	154	16.9	46	13.0	200		237	15.2	69	8.7	306	13.7	391	15.9	115	10.4	506	14.6
Total	5,153	15.3	1,315	19.1	6,468	16.1	6,831	11.0	1,537	13.2	8,368	11.4	11,984	12.8	2,852	15.9	14,836	13.4

TABLE 4

Comparative Percentages, by Age Groups, of the Male Population (15–44 Years) of Puerto Rico, Estimated as of July 1, 1941, and the Cases Studied in the 1941 Survey

Age Groups	Estimated Male Population July 1, 1941	Percentage of Total Population 15–44 Years	Cases Studied	Percentage of Total Number of Cases Studied	Percentage Which Cases Represent in Corresponding Age Groups of Population
15–19	101,420	23.8	1,551	10.8	1.5
20–24	103,647	24.4	7,749	54.1	7.5
25–34	124,884	29.3	4,647	32.4	3.7
35–44	95,665	22.5	382	2.7	0.4
15–44	425,616	100.0	14,329	100.0	3.4