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A FIELD STUDY OF LEPROSY IN CORDOVA, PHILIPPINES RESURVEY IN 1941 AFTER EIGHT YEARS

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Following preliminary field work by Rodriguez, an intensive study of leprosy in Cordova, Cebu Province, was carried out in 1933 by Doull, Rodriguez, Guinto and Plantilla (2) as a joint project of the Philippine Bureau of Health and the Leonard Wood Memorial. This included (a) a detailed sociological census of the community, (b) enumeration and physical examination of the inhabitants, and (c) epidemiological study of all cases of leprosy. There were 6,063 persons in the enumerated population. Of these, 5,957, or 98.2 per cent, were examined at the time; 18 died during the period of the survey, while for various reasons 88 could not be examined. Rodriguez and Guinto (5) made a partial resurvey of the community in 1935, examining 62 of 84 surviving unexamined persons (bringing the percentage to 99.6), reexamining all residents who were known to have lived in household association with living or deceased persons known to have had leprosy, and continuing the investigation of the histories of more than 300 recorded cases.

Following the 1935 resurvey a clinic was maintained at Cordova for the supervision and treatment of unsegregated patients. The people were encouraged to come in for advice

regarding all skin conditions, and in this way new cases were discovered. Population figures for the community were kept up to date from the municipal and church registries of births, marriages, and deaths.

In 1941, a complete resurvey of Cordova was conducted by Guinto. A new census was made and 98.9 per cent of the enumerated population were examined; 9 individuals had died, 50 had left the community, temporarily or permanently, and 18 failed to report for examination. This work was interrupted by the war and some of the records were lost. Those which were saved, however, are sufficient to provide a picture of the leprosy history of the community during the eight years just preceding the war and to establish a basis from which the effect of the war on leprosy incidence may be estimated. To take advantage of this exceptionally advantageous situation, a third examination of the entire population was completed in 1948, the results of which will be reported in the near future.

Population changes, 1933-1941.—The enumerated population as of August 31, 1941, was 7,026, a net increase of 963 persons since September 1, 1933. The factors which resulted in this increase were as follows:

Population Sept. 1, 1933	6,063	
Births, 1933-1941	2,312	
Immigrants	419	8,794
<hr/>		
Deaths, 1933-1941	1,051	
Emigrants	717	1,768
<hr/>		
Population Aug. 31, 1941		7,026

Prevalence in 1933 and 1941.—In the report of the 1933 survey the number of living persons with leprosy was given as 104, a prevalence rate of 17.2 per 1,000 of the enumerated population. Subsequently, correction was made to include 4 other persons, 2 with lepromatous and 2 with nonlepromatous forms of the disease, who had been in hiding. There were also 6 cases in which the diagnosis was in doubt at the 1933 examination, but in which a diagnosis of macular leprosy was made later. Still another case was added in which there was a single atrophic lesion on the plantar surface of the foot which had undoubtedly existed but was overlooked in 1933. These cases increased the total number for 1933 to 115, and the prevalence rate to 19.0 per 1,000.

In 1941, a total of 126 cases were found among the 6,949 persons then examined, yielding a prevalence rate of 17.9 per

1,000. No cases are suspected to exist or to have existed among the 77 persons enumerated but not examined. In other words, the prevalence of the disease was almost exactly the same as it had been eight years before. The factors which resulted in a net increase of 11 cases during the interval were as follows:

Persons with leprosy in 1933	115
Newly developed in residents	49
Present in immigrants	4 53
	—
Total cases	168
Deaths, 1933-1941	35
Emigrants	7 42
	—
Total in 1941.....	126

Age, sex and type of disease, 1933 and 1941.—The age distribution of the enumerated population in 1941 was essentially the same as that in 1933. There was, however, a shift in distribution

TABLE 1.—Prevalence of leprosy per thousand in Cordova in 1933 and 1941, by age and type of case.

Age group	1933 Survey					1941 Survey				
	Popula- tion	Leproma- tous/a		All forms		Popula- tion	Leproma- tous/a		All forms	
		Cases	Rate	Cases	Rate		Cases	Rate	Cases	Rate
0-4	970	0	0	0	0	1192	0	0	0	0
5-9	894	2	2.2	2	2.2	967	0	0	3	3.1
10-14	723	0	0	8	11.1	818	1	1.2	11	13.4
15-19	640	11	17.2	24	37.5	726	8	11.0	16	22.0
20-29	1004	33	32.9	49	48.8	1132	19	16.8	40	35.3
30-39	701	12	17.1	19	27.1	856	22	25.7	36	42.1
40-49	518	3	5.8	6	11.6	551	4	7.3	12	21.8
50-59	281	1	3.6	5	18.0	422	0	0	3	7.1
Over 60	332	2	6.0	2	6.0	362	2	5.5	5	13.8
Totals	6063/b	64	10.6	115	19.0	7026/c	56	8.0	126	17.9

a Covers all cases found strongly bacteriologically positive, including a few of the atypical forms called "borderline" by some workers. Also includes lepromatous patients who were interned in leprosaria or who had been paroled.

b Eighty-eight enumerated persons not examined.

c Seventy-seven enumerated persons not examined.

of the disease towards the older ages, the peak of the prevalence rate moving from the age group 20-29 years to the age group 30-39 years. Prevalence rates by age groups as of Sept. 1, 1933, and Nov. 1, 1941, respectively, are shown in Table 1.

Although there was no appreciable reduction in total prevalence, there had occurred a slight reduction in the number of lepromatous cases and a corresponding increase in other forms. This was observed in both males and females, as shown in Table 2.

TABLE 2.—*Prevalence of leprosy per thousand in Cordova in 1933 and 1941, by sex and type of case.*

Type of case	1933 Survey/a						1941 Survey/b					
	Males (Pop. 2981)		Females (Pop. 3082)		Total (Pop. 6063)		Males (Pop. 3423)		Females (Pop. 3603)		Total (Pop. 7026)	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Lepromatous/c	51	17.1	13	4.2	64	10.6	44	12.9	12	3.3	56	8.0
Other forms	25	8.4	26	8.4	51	8.4	35	10.2	35	9.7	70	10.0
Totals	76	25.5	39	12.7	115	19.0	79	23.1	47	13.0	126	17.9

a Rates based on total population including 88 enumerated persons not examined.

b Rates based on total population including 77 enumerated persons not examined.

c Covers all cases found strongly bacteriologically positive, including a few of the atypical form called "borderline" by some workers. Also includes lepromatous persons who are interned in leprosaria or who had been paroled.

The well known excess prevalence of lepromatous leprosy among males is brought out in Table 2. In both surveys the prevalence of the lepromatous type was found to be about four times as high for males as for females, whereas the prevalence of other forms of leprosy was about the same for both sexes. This point was discussed by Doull, Guinto, Rodriguez and Bancroft (3), who demonstrated that the excess prevalence of lepromatous leprosy in males in Cordova was attributable to actually higher incidence of that type in males, and not to shorter duration of the disease in the female.

The clinical and isolation status of the 1941 patients as compared to those of 1933 were as follows:

<i>Clinical status</i>	1933	1941
Lepromatous ¹		
In segregation	44	43
Not in segregation (newly discovered)	5	6
Paroled	15	7
Other forms (tuberculoid and indeterminate; not segregated)		
Active	19	20
Quiescent or arrested	32	50
	<hr/> 115	<hr/> 126

Fate of persons who had lepromatous leprosy in 1933.—The status in 1941 of persons who were suffering from the lepromatous type in 1933 is given in Table 3. At that time there were 49 cases so classified in the Culion Colony or the Eversley Childs Treatment Station at Cebu, undergoing routine chaulmoogra treatment. In the interval 7 of them, or 14 per cent, became bacteriologically negative and were paroled during the eight-year period, but 2 of these relapsed and were readmitted both within two years after discharge, and 3 died in segregation. Of 15 who were on parole at the time of the 1933 survey, 4 relapsed; 1 moved away and 6 died, and it is not known whether they relapsed or not; the other 4 were still bacteriologically negative at the end of the period.

TABLE 3.—Status in 1941 of the lepromatous cases of 1933.

Status in 1933	Cases	Status in 1941				
		Living in segregation	Living		Dead	
			In Cordova	Moved away	While in segregation	At home
Segregated	49	25/a	1	1	19	3
Paroled	15	4	4	1	0	6
Totals	64	29	5	2	19	9

a Including 2 cases in which relapse occurred within two years after parole.

The mortality rate from all causes among the lepromatous patients, including paroled, was very high, being 44 per cent for the period. It is planned to examine the mortality of lepromatous patients more closely in a subsequent study.

¹ Includes all strongly bacteriologically positive cases, some of which are known to be of the atypical form called by some workers, "borderline."

Fate of persons who had nonlepromatous leprosy in 1933.—The status of persons who had other than the lepromatous type of leprosy in 1933 is shown in Table 4. In 1933 there were 51 cases which were classed as "neural" on clinical and bacteriological grounds, supplemented by biopsies in a number of cases. Of these, 37 were macular, clinically either tuberculoid or simple (now called "indeterminate"), and 14 had lesions predominantly trophic in character. The macular cases were subdivided into active, quiescent and arrested, according to their clinical appearance. Eleven persons in whom the disease was considered in 1933 as clinically arrested were known to have had active macular lesions prior to that date.

TABLE 4.—*Status in 1941 of nonlepromatous cases of 1933.*

Form of the disease in 1933	No. of cases	Status in 1941					
		Lepromatous		Other forms		Not observed	
		In segregation	Died in segregation	Active	Arrested	Moved away	Died
Macular, active							
Tuberculoid	12	0	1	2	5	4	0
Indeterminate	7	1	0	1	5	0	0
Macular, quiescent							
Tuberculoid	1	0	0	0	1	0	0
Indeterminate	6	1	0	0	3	0	2
Arrested	11	0	0	0	8	1	2
Trophic	14	0	0	0	12	0	2
Totals	51	2	1	3	34	5	6

From a practical standpoint it is important that in 1941 only 3 of 37 persons with macular lesions had suffered transition of the disease to the lepromatous type, and none of 14 with neuro-macular (trophic) lesions underwent that change. The lesions of one of the transformed cases were histologically tuberculoid in 1933, but frankly lepromatous four years later. This patient gave a moderately strong response to the lepromin test in 1935, two years before lepromatous lesions were detected. In the other 2 cases, the lepromatous development took place from the simple macular (indeterminate) class.

Lesions in 3 additional patients, classified as macular and

active in 1933, increased in number, size, and other signs of activity, but remained bacteriologically negative in 1941.

Excluding 4 patients who died of intercurrent illness and 5 who were lost from observation, there were thus 22 of 28 macular patients (82%) whose lesions either remained arrested throughout or became arrested and remained so to 1941.

Fourteen patients had lesions which were solely or predominantly trophic in 1933, with or without accompanying macules, enlargement of peripheral nerves, or anesthesia. All were bacteriologically negative. Lepromin tests of 13 of these patients, made in 1935, resulted in 10 markedly or moderately strong responses, 2 weak ones, and 1 doubtful. Omitting 2 individuals who died, the lesions in all remained stationary, or practically so, during the whole period.

Only 6 deaths occurred among 51 nonlepromatous patients during the period of observation, a mortality not appreciably higher than that of persons of similar ages in the general population.

New cases in the population.—In 1941, only 73 of the original patients of 1933 remained, 35 having died and 7 having moved away. On the other hand 49 new cases developed, 18 lepromatous and 31 tuberculoid or indeterminate. Four previously known patients (2 lepromatous, 2 neural) had moved into Cordova in the interval.

Of the 49 new cases, 17 lepromatous and 29 of other forms occurred in persons who had been examined in 1933 and recorded as free from leprosy; 1 lepromatous and 1 tuberculoid case occurred among those who had immigrated from other localities, and 1 tuberculoid case occurred in a child born in Cordova after 1933.

In 15 of the new lepromatous cases, the lesions developed with such rapidity that they must either have been directly lepromatous, or if they passed through an indeterminate stage that must have been of brief duration. The average duration of lesions on discovery was less than two years, and in one instance lesions were frankly lepromatous ten months after an examination at which nothing suspicious was recorded. Three other cases were observed in a bacteriologically-negative, nonlepromatous phase for more than a year before lepromatous changes became apparent. In 2 of these the disease started with ill-defined macular lesions; in the third there was an initial ichthyotic, anesthetic, nonmacular area on a lower extremity. Counting the 3 formerly macular patients who developed the

lepomatous type, there occurred 21 lepomatous cases during the period.

Of 29 nonlepomatous cases occurring in persons examined and found free from the disease in 1933, 25 were of the tuberculoïd type. In 4, anesthetic or trophic manifestations, without macules, were first noted. Unfortunately the outbreak of war precluded histopathological and immunological study of these cases.

There were 2,312 children born in Cordova during the period, of whom 483 died and 20 moved away before 1941. Since the oldest of the surviving children could not be more than 8 years of age, few cases were anticipated in this group and only one occurred. The history was as follows:

Ontong, I. (Family 949), male, born Oct. 19, 1934. Family history positive: one sister an antecedent lepomatous case. Both parents healthy. They state that the macule was noticed one year ago, when the child was 5 years old. Examination Oct. 21, 1941: On the posterior surface of the right upper arm, a fairly distinct, smooth-surfaced, hypochromic macule 1 inch in diameter. Borders flat but well demarcated. Tests for sensitivity unreliable, due to age of patient. Smears from lesion negative. (Subsequent examination of this case in 1947 showed multiple active macular lesions of the indeterminate form, still bacteriologically negative.)

Of interest also are three cases in which lesions apparently developed for the first time after the age of 50.

Ando, A. (Family 964), male, born May 10, 1880. In a previous examination on Aug. 8, 1933 the findings were negative, only a few impetigo scars. Second examination, Oct. 14, 1941: Large, slightly raised, erythematous area of infiltration covering the right elbow and adjacent areas of arm and forearm; anesthetic. Left ulnar not enlarged. Smears from lesion heavily positive. (This patient was an advanced lepomatous case when seen again in 1946.)

Cañete, B. (Family 903), female, born June 18, 1884. First examination, Aug. 31, 1933: Negative except for a few superficial pigmented scars on buttocks and thighs, and slight papular dermatitis on lower extremities. Examination July 5, 1941: On the posterior surface of the upper right arm, a small but distinct annular lesion 2/3 inch in diameter; center slightly atrophic, borders lined with thick, succulent-looking pinkish papules almost as large as heads of match sticks; a few isolated papules near the upper and lower poles. Central portion definitely anesthetic. Smears negative. (This lesion was almost 2 inches in diameter, still active, in 1946.)

Baguio, L. (Family 817), female, born 1885. Nothing considered suspicious was found at the first examination, Sept. 12, 1933. Second examination, June 28, 1941: On the left hip, a small macule 1/2 inch in diameter, completely lined with pinkish papules larger than pinheads. Center hypochromic, slightly atrophic, anesthetic to pain and touch. On the inner and anterior aspect of the right leg, a large scar 3 inches in diameter (stated to have been a macule), which patient burned with some

acid one year ago. Center of scar anesthetic to pain and touch, apparently an old tuberculoid lesion. The right saphenous nerve irregularly thickened, lumpy and easily palpated. Smears negative. (The macule on the hip was considered a clinically active, typical tuberculoid lesion on examination in 1947.)

Observed and expected cases in the general population.—The historical records collected in 1933 indicated a declining incidence of leprosy in Cordova, at least of the lepromatous type. It is of interest, therefore, to compare the actual events from 1933 to 1941 with the expectancy from the histories. To make this comparison, the actual attack rates for the 1933 Cordova survey and one made in Talisay in 1936 have been combined. Prevalence in these two municipalities was approximately the same at the time of the original studies. The expected cases, shown in Table 5, are estimated for a population of similar age constitution to that of Cordova in 1941.

TABLE 5.—*Actual and expected occurrence of leprosy in the general population of Cordova, 1933-1941./a*

Form of leprosy	Males	Females	Total
All forms			
Expected	41	24	65
Actual	35	14	49
Lepromatous			
Expected	28	13	41
Actual/b	14	4	18

a Expectancy is based on attack rates for the original Cordova and Talisay surveys, as explained in the text.

b The actual number of lepromatous cases would be 21 instead of 18 if 3 cases which developed from nonlepromatous forms were included.

As shown in the table, substantially fewer cases occurred during the period 1933-1941 than would have been expected had the rates prevailed which were derived from the histories obtained during the original studies. It is notable, however, that the reduction is attributable wholly to a decline in the incidence of the lepromatous type. Considered as a problem in random sampling, the standard errors of the total numbers of expected cases of all forms of leprosy would be approximately 8 cases, and the accepted range within the limits of three times the standard error would be 65 ± 24 . The actual number is 49, which frequency might be expected to occur fairly frequently by chance.

With regard to the lepromatous type, however, the accepted range in sampling problems would be approximately 41 ± 19 . The actual finding of 18 lepromatous cases (or 21 if the 3 developing from previously macular forms are counted) represents a number which would occur extremely rarely if, for example, one were to make successive drawings of 6,300 (approximate average annual population) from a thoroughly mixed bowl containing a very large number of marbles in which black, representing nonlepromatous persons, and red, representing lepromatous, were mixed in the proportion of 6,259 to 41.

By splitting the historical experience of Cordova and Talisay at the year 1915, Doull, Guinto, Bancroft and Rodriguez (4) showed that the incidence of lepromatous leprosy had been somewhat higher prior to 1915 than during 1915-1933. The rates for the period subsequent to 1915 and prior to the first survey computed by these authors were then used as a basis for determining the number of cases expected during the 1933-1941 period. It was found that 64 cases of all forms would have been expected against an actual occurrence of 49, and 37 cases of the lepromatous type against the 18 (or 21) which are known to have occurred. The latter difference is a significant one from a statistical point of view, and it is fair to conclude that the incidence of lepromatous leprosy during the period 1933-1941 was definitely lower than that which prevailed prior to 1933, as estimated from the historical studies.

Eight years observation of the population according to household exposure.—Of 5,948 nonleprous residents of Cordova examined in 1933, 690 moved away prior to 1941 and 528 died. In the original population there were 536 who had lived in a household with a lepromatous patient prior to 1933, and 265 who had had similar contact with a nonlepromatous patient. Fifteen of the former and one of the latter group developed the disease. In addition, 5 persons developed leprosy among 103 who had household contact only after 1933 with lepromatous leprosy, and none among 85 who had similar contact with nonlepromatous patients. There were 4,751 persons not known to have had household exposure, and among these persons 25 cases were observed during the period. The average annual attack rates per 1,000 person years for these various groups are given in Table 6.

Although the experience is small, it is clear that the findings are in agreement with those of the original study as regards the relatively high risk of attack when exposed in the household to patients with the lepromatous type and the lack of any ap-

preciable excess risk for household associates of patients with nonlepomatous leprosy.

TABLE 6.—*Person years of exposure, cases and attack rates, by sex, for all forms of leprosy, among persons exposed to lepomatous and other forms of leprosy and for those not exposed, September 1, 1933 to August 31, 1941./a*

Group	Person years		Cases		Rate per 1000 person years	
	Males	Females	Males	Females	Males	Females
With household exposure						
To lepomatous cases						
Before 1933	1872	1988	13	4	7.4	3.8
After 1933	315	299	5	1	11.4	3.9
To cases of other forms						
Before 1933	857	1033	0	1	----	1.1
After 1933	507	185	0	0	----	----
Without household exposure	21731	22911	17	8	0.7	0.3
Totals	25282	26417	35	14		

a Rates shown are adjusted to the age distribution of the combined populations of Cordova and Talisay. Eight males with a total of 67 person years and 23 females with a total of 158 person years exposed to leprosy of unknown type prior to 1933 are omitted; no cases occurred among them.

Observed and expected cases in exposed and non-exposed.—

It is of interest also to approach the problem of household exposure to lepomatous leprosy by a comparison of the observed occurrence from 1933 to 1941 with that which might have been expected had the attack rates prevailed which were derived from the records of the original studies of Cordova and Talisay. This expectancy is based on what happened prior to 1933 (1936 for Talisay) over the lifetime of the individuals tested on the original schedules. The expected and actual cases for exposed and nonexposed persons, by sex, are given in Table 7.

Among household associates of lepomatous cases there would have been expected 25 cases of all forms of leprosy if no reduction in the disease had occurred. Actually there were 23 cases. Among the nonexposed population there might have been expected 38; only 25 occurred. It is notable that the apparent reduction, already shown to have been caused by the occurrence of fewer cases of the lepomatous type than were expected,

should be about equally evident among those exposed in the household and those not exposed. Among the exposed, 16 lepromatous cases would have been expected and only 7 occurred. Among the nonexposed the expectancy is 25 and the actuality is 11. It should be added that an indication of a decline affecting both the exposed and nonexposed had been obtained in the trend study (4) mentioned above. Further observations should be sought on this interesting epidemiological point.

TABLE 7.—*Actual cases of leprosy occurring among household associates of lepromatous patients and among nonexposed individuals, Cordova, 1933-1941, compared to numbers expected at rates obtained from histories./a*

Exposure	Person years of life experience, 1933-1941		Cases, 1933-1941							
			Lepromatous				All forms			
			Males		Females		Males		Females	
	Males	Fe-males	Ex-pected	Actual	Ex-pected	Actual	Ex-pected	Actual	Ex-pected	Actual
Exposed	2187	2289	11	5	5	2	15	18	10	5
Not exposed	21731	22911	17	9	8	2	25 or 26	17	13	8

a For Cordova and Talisay combined. The actual lepromatous cases occurring would be 21 (instead of 18) if 3 cases are included which were previously nonlepromatous.

Leprosy in parents of leprosy patients.—Among the 126 Cordova patients of 1941 there were 14 children under 15 years of age and 16 adolescents of 15 to 19 years. Living parents had been examined first in 1933, and again in 1935. In 1941, both parents of 12 of the younger patients and one parent of each of the others were examined. In the two instances in which only one parent had survived there is satisfactory evidence that the deceased parent did not have the disease. Leprosy was discovered in the father in 2 instances and in the mother in 2, that is, in one parent of each of 4 of 14 patients, or 29 per cent. Both parents of 13 of the 16 older patients were examined in 1941; the parents of the other 3 had died or moved away. Only one parent was found to have leprosy, and in 12 families both parents proved nonleptous. Thus, the parents of about 80 per cent of these patients under 20 years of age were nonleptous.

The observation is pertinent in relation to control measures. The removal of children of leprosy patients to preventoria, even if completely effective in preventing the disease in the children,

apparently could have only a limited effect on the total incidence of the disease in Cordova.

Relationship of first to later patients in the household.—In a preliminary approach to the question of relationship of primary to later patients in households, Bancroft, Guinto, Rodriguez and Marques (1) noted that the attack rates for lepromatous leprosy were approximately the same for household associates exposed respectively to father, mother, brother or sister. The material available was limited and only tentative conclusions were drawn. In that study a modified life table procedure was used which took into account not only the number of persons exposed to leprosy in various relatives in the household, but also the period elapsing after exposure took place.

Of the 126 Cordova patients in 1941, 52, or 41 per cent, had a history of exposure to an antecedent case in the household. In 12, or 23 per cent, of the secondary cases the first patient was a father or mother, and in 28, or 54 per cent, a brother or sister. It should be borne in mind that lepromatous leprosy is much the more frequent in males and that more persons are therefore exposed to males than to females. In 9 of the 52 cases, or 17 per cent, the antecedent patient was either not a blood relative or was only distantly related. For the remaining 3 secondary cases the primary cases were respectively, a son, a grandfather and a grandmother.

Conjugal exposure.—Among the 6,063 persons examined in 1933 there were 33 wives and 12 husbands whose spouses had developed leprosy. In some instances, the exposure dated back to 1898. In 1941, 26 of these spouses were examined, 11 having died and 8 having moved away. In addition, 34 conjugal partners who were exposed for the first time to leprosy in the other spouse between 1933 and 1941 were examined. No case of leprosy was discovered among these 60 spouses.

SUMMARY

1. In 1933, a field study of leprosy was made in Cordova, Cebu, during which 99.6 per cent of the enumerated population of 6,063 inhabitants were examined. This includes 62 missed in the first survey but examined during a follow-up in 1935. Including patients already in segregation, the total prevalence in 1933 was found to be 19.0 per 1,000. For lepromatous leprosy alone, the prevalence rate was 10.6 per 1,000, 64 or 57.7 per cent of the 115 cases being of that type.

2. In 1941 after an eight-year interval, during which the

population was kept under observation, a resurvey of the same area was made along lines similar to those followed in the first survey. Of an enumerated population of 7,026, 98.9 per cent were examined. For total leprosy the prevalence rate was found to be 17.9 per 1,000, but for lepromatous leprosy it had decreased to 8.0 per 1,000, and lepromatous cases constituted only 44 per cent of the total of 126 cases found.

3. Of 49 patients with active lepromatous lesions in 1933, in segregation at the start of the study or found in the survey, 7 or 14 per cent became bacteriologically negative and were paroled during the eight-year period between the two surveys. Of 15 paroled before 1933, 4, or 27 per cent, lapsed during the same period, and 2 others of the 7 paroled after 1933 are known to have relapsed before 1941. The rate at which paroled lepromatous patients relapsed thus appears to be higher than the rate of parole over the same length of time.

4. The mortality rate in lepromatous patients was observed to be much higher than for the rest of the population, 28, or 44 per cent, of 64 such patients having died in eight years. The average age at death was 34.5 years, with 90 per cent dying between the ages of 20 and 49. For neural cases, the mortality during the same period was only 11.7 per cent, not appreciably higher than that of the general population of similar ages.

5. Of 51 patients with nonlepromatous lesions, 37 of which were called "macular" and 14 "trophic," only 3 underwent change to the lepromatous form. In one case the lesions had been tuberculoid and in the other two they had been of the simple macular or "indeterminate" type. The most common outcome in the nonlepromatous cases was regression towards a clinically arrested state.

6. Forty-nine new cases were found to have developed during the 8-year period. Of these, 18, or 36.7 per cent, were of the lepromatous type, and 31 were nonlepromatous. Of the 49 new cases, 46 were in the residents who were living in Cordova and were examined in 1933, one was a child born in 1934, and 2 were former nonresidents who moved to Cordova after the first survey.

7. Reduction in prevalence of lepromatous leprosy was due to a high mortality rate among lepromatous patients, together with a decline in the incidence of this type of the disease. From the historical incidence rates prevailing over the whole period covered by the records collected in 1933 (and in Talisay in 1936), the number of new lepromatous cases expected during the eight-

year period was 41, and from the rates prevailing in the period 1915-1933 (Talisay, 1915-1936), the number expected was 37. Actually only 18 occurred. The excess of expected over actual lepromatous cases was of about the same order among those exposed to lepromatous leprosy in the household and among those not so exposed.

RESUMEN EN ESPAÑOL

1. En 1933 se practicó un estudio de la lepro en el poblado de Córdova, Cebú, I. F., durante el cual se pudo examinar el 99.6% de la población total de 6,063 habitantes. Esto incluye 62 casos que no fueron examinados en la primer ocasión pero que fueron examinados durante un segundo exámen en 1935. Incluyendo los pacientes segregados la prevalencia de la lepra fué, en 1933, de 19.0 por 1,000. Del tipo lepromatoso hubo un 10.6 por 1,000, o sea 64 (57.7%) del total de 115 casos.

2. En 1941, despues de 8 años, durante los cuales se mantuvo a la población bajo observación, se repitió el estudio en forma similar al anterior. De un total de 7,026 sujetos enumerados, el 98.6% fué examinado. La prevalencia de la lepra fué de 17.9 por 1,000, pero la lepra lepromatosa había bajado a solamente el 8.0 por 1,000, o sea el 44% de un total de 126 casos.

3. De un total de 49 pacientes con lesiones lepromatosas activas en 1933, 7 de ellos (el 14%) se tornaron bacteriológicamente negativos y fueron dados de alta durante el período de 8 años entre los dos exámenes. De 15 pacientes dados de alta antes del 1933, 4 (el 27%) sufrieron recidivas durante el mismo período, y 2 más de los 7 dados de alta desde 1933, han vuelto a ser positivos antes del 1941. Por tanto la proporción de pacientes con recidivas es mayor que la de pacientes dados de alta durante el mismo período de tiempo.

4. La mortalidad de pacientes leprosos es más alta que la de la población general, 28 (el 44%) de los pacientes murieron durante los 8 años. La edad promedio al morir fué de 34.5 años, y el 90% murió entre las edades de 20 y 49 años. Para los casos del tipo neural, la mortalidad fué de 11.7%, no mucho mayor que la de la población general de edad semejante.

5. De 51 pacientes que fueron clasificados no-lepromatosos, 37 "maculares" y 14 "tróficos," solamente 3 sufrieron el cambio al tipo lepromatoso. El resultado más frecuente entre los casos no-lepromatosos fué la regresión clínica al estado "arrestado."

6. Cuarenta y nueve nuevos casos se desanollaron durante

los 8 años. De estos, 18 (36.7%) fueron del tipo lepromatoso y 31 no-lepromatosos. De los 49, 46 eran residentes de Córdova durante 1933, 1 era un niño nacido en 1934, y 2 eran no-residentes, que vinieron a Córdova después de 1933.

7. La reducción en la prevalencia de la lepra lepromatosa se debió a la alta mortalidad entre los pacientes lepromatosos, acompañada de una disminución en la incidencia de los casos de éste tipo. El número de nuevos casos, de acuerdo con los estudios estadísticos, debió haber sido 41 y solo fué 18.

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APPENDIX A.

Prevalence of lepromatous and nonlepromatous leprosy by sex and age.
Cordova survey, September 1, 1933.

Age group	Sex	Population	Cases			Rate per 1,000		
			Lepro- matous	Non- lepro- matous	All forms	Lepro- matous	Non- lepro- matous	All forms
0-4	Male	485						
	Female	485						
	Total	970						
5-9	Male	435	2	----	2	4.6	----	4.6
	Female	459	----	----	----	----	----	----
	Total	894	2	----	2	2.2	----	2.2
10-14	Male	370	----	4	4	----	10.8	10.8
	Female	353	----	4	4	----	11.3	11.3
	Total	723	----	8	8	----	11.1	11.1
15-19	Male	326	8	8	16	24.5	24.5	49.1
	Female	314	3	5	8	9.6	15.9	25.5
	Total	640	11	13	24	17.2	20.3	37.5
20-29	Male	473	27	6	33	57.1	12.7	69.8
	Female	531	6	10	16	11.3	18.8	30.1
	Total	1004	33	16	49	32.9	15.9	48.8
30-39	Male	355	9	3	12	25.4	8.5	33.8
	Female	346	3	4	7	8.7	11.6	20.2
	Total	701	12	7	19	17.1	9.9	27.1
40-49	Male	269	3	2	5	11.2	7.4	18.6
	Female	249	----	1	1	----	4.0	4.0
	Total	518	3	3	6	5.8	5.8	11.6
50-59	Male	123	1	2	3	8.1	16.2	24.3
	Female	158	----	2	2	----	12.7	12.7
	Total	281	1	4	5	3.6	14.4	18.0
60 and over	Male	145	1	----	1	6.9	----	6.9
	Female	187	1	----	1	5.3	----	5.3
	Total	332	2	----	2	6.0	----	6.0
Totals	Male	2,981	51	25	76	17.1	8.4	25.5
	Female	3,082	13	26	39	4.2	8.4	12.6
	Total	6,063	64	51	115	10.6	8.4	19.0

APPENDIX B.

Prevalence of lepromatous and nonlepromatous leprosy by sex and age.
Cordova resurvey, August 31, 1941.

Age group	Sex	Popula- tion	Cases			Rate per 1,000		
			Lepro- matous	Non- lepro- matous	All forms	Lepro- matous	Non- lepro- matous	All forms
0-4	Male	577						
	Female	615						
	Total	1192						
5-9	Male	495	----	2	2	----	4.0	4.0
	Female	472	----	1	1	----	2.1	2.1
	Total	967	----	3	3	----	3.1	3.1
10-14	Male	406	----	7	7	----	17.2	17.2
	Female	412	1	3	4	2.4	7.3	9.7
	Total	818	1	10	11	1.2	12.2	13.4
15-19	Male	343	6	5	11	17.5	14.6	32.1
	Female	383	2	3	5	5.2	7.9	13.1
	Total	726	8	8	16	11.0	11.0	22.0
20-29	Male	546	14	11	25	25.6	12.2	45.8
	Female	586	5	10	15	8.5	17.1	25.6
	Total	1132	19	21	40	16.8	18.5	35.3
30-39	Male	416	20	5	25	48.1	12.0	60.1
	Female	440	2	9	11	4.8	20.2	25.0
	Total	856	22	14	36	25.7	16.4	42.1
40-49	Male	269	2	3	5	7.4	11.2	18.6
	Female	282	2	5	7	7.1	17.7	24.8
	Total	551	4	8	12	7.3	14.5	21.8
50-59	Male	207	----	----	----	----	----	----
	Female	215	----	3	3	----	14.0	14.0
	Total	422	----	3	3	----	7.1	7.1
60 and over	Male	164	2	2	4	12.2	12.2	24.4
	Female	198	----	1	1	----	5.1	5.1
	Total	362	2	3	5	5.5	8.3	13.8
Totals	Male	3,423	44	35	79	12.9	10.2	23.1
	Female	3,603	12	35	47	3.3	9.7	13.0
	Total	7,026*	56	70	126	8.0	9.9	17.9*

* 77 non-examined persons are included: See Text.

APPENDIX C.

Population* of Cordova (as of August 31, 1941) classified by age, sex, and type of exposure to leprosy in the household, including leprosy cases **.

Age Group	With household exposure to lepromatous leprosy			With household exposure to neural leprosy			No household exposure		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-4	12	19	31	42	29	71	523	567	1090
5-9	23 (2)	17	40 (2)	27	16	43	445	439 (1)	884 (1)
10-14	28 (3)	22 (4)	50 (7)	18	18	36	360 (4)	374	732 (4)
15-19	23 (7)	21 (1)	44 (8)	26	25	51	294 (4)	337 (4)	631 (8)
20-29	59 (7)	71 (5)	130 (12)	35	42	77	452 (18)	473 (10)	925 (28)
30-39	51 (9)	51 (4)	102 (13)	20 (1)	26 (1)	46 (2)	345 (16)	363 (5)	708 (21)
40-49	35 (3)	39 (3)	74 (6)	9	13	22	225 (1)	230 (5)	455 (6)
50-59	37	39	76	13	13	26	157	163 (3)	320 (3)
60 and over	32 (2)	40	72 (2)	11	14	25	121 (2)	144 (1)	265 (3)
Total	300 (33)	319 (17)	619 (50)	201 (1)	196 (1)	397 (2)	2922 (45)	3088 (29)	6010 (74)

* 77 nonexamined persons are included: See text.

** Cases of leprosy in parenthesis.