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A FIELD STUDY OF LEPROSY IN CEBU[1]

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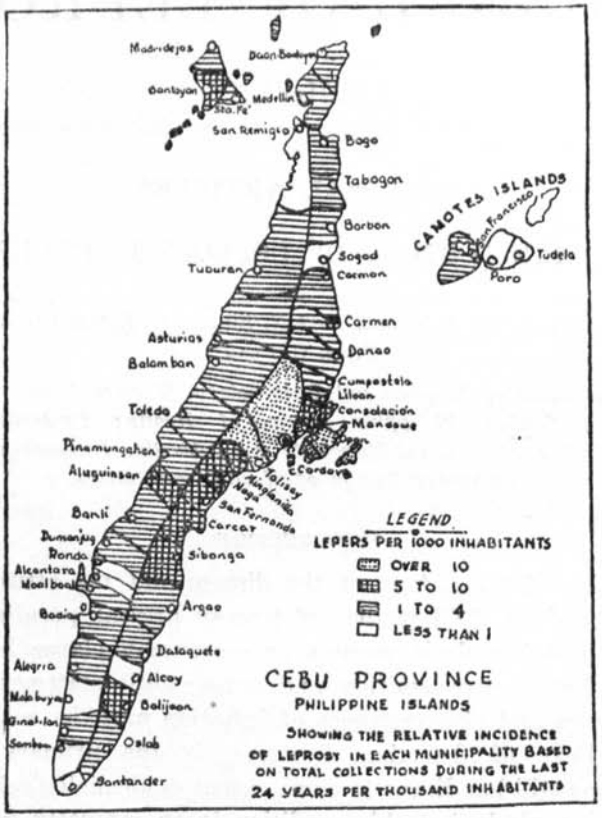
INTRODUCTION

Because of the nature of the disease and the attitude of the public towards it, field studies of leprosy present peculiar difficulties. As in tuberculosis, months or years may elapse between infection and clinical recognition, and consequently statements relating to the source and circumstances of infection must be accepted with caution. Fear of detection, however, is the primary obstacle. Similar fear still handicaps to some extent epidemiological investigation of tuberculosis, but this condition is an infinitely greater barrier in leprosy, the very name of which has for centuries been associated in the public mind with disfigurement, incurability and social ostracism.

With more humanely conducted institutions and a more widespread belief in the value of therapeutic measures, a belief which gains concrete support from the increasing numbers of cases released from the leprosaria under parole, some change of sentiment

[1] This study was carried out by cooperation of the Leonard Wood Memorial (American Leprosy Foundation) and the Bureau of Health of the Philippine Government.

may be expected. In certain localities this has already taken place. Experience in at least some parts of the Province of Cebu, in which as a whole leprosy is unusually prevalent (Text-fig. 1), has shown that the attitude of the people is far from being prohibitive to field studies. Because of certain advantages which it was believed this



TEXT-FIG. 1. Map of Cebu Island, showing the relative incidence of leprosy in the different municipalities, based on the total numbers recorded during 24 years per thousand inhabitants. Cordova is shown on the island off the east coast, near Cebu city.

region offered for such studies (in preparation for which the Leonard Wood Memorial constructed at Cebu, in 1928-1930, the Eversley Childs Treatment Station and the Cebu Skin Dispensary building for operation by the Philippine Health Service), the Memorial and the Philippine Government joined in an experimental study during

the period from July to November, 1933, with the hope of laying the foundation for more extensive work in the future. To assist in this study the services of one of us (J. A. D.) were loaned by the School of Medicine of Western Reserve University, Cleveland, Ohio. Another of us (R. G.) was engaged by the Memorial especially for this work.

The specific questions on which it was hoped to gain information included the following:

1. What is the true frequency of leprosy in a selected locality, and what ratio does this bear to the number of cases previously known?

2. What is the clinical status of newly discovered patients? What proportion are of the bacteriologically positive, clinically active type which existing regulations require to be segregated?

3. What is the present condition of paroled patients resident in the locality?

4. Taking all cases of leprosy into consideration, and checking carefully all available sources of information, in what proportion can intrafamilial or extrafamilial contact with a previously existing case be established? The higher this proportion the less likely it is that insect transmission, or any source of infection other than human, is a factor in leprosy. The proportion of patients in which intrafamilial association with prior cases can be established is of great importance to the administrator. If it is high, major efforts at control should be directed specifically towards the leper family. If it is low, the problem is obviously one of greater difficulty and higher cost.

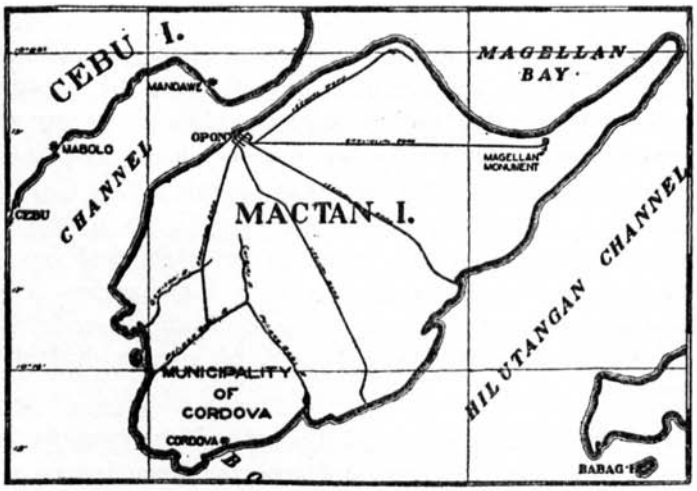
5. Is it possible to obtain statistical evidence on the relative infectiousness of patients known to have had open lesions as compared to others?

6. Do the findings in patients with solitary lesions support the opinion that primary lesions usually occur on the surface of those parts of the body most exposed to injury?

7. Is a high incidence of leprosy associated with (a) insanitation, (b) overcrowding, (c) unusual prevalence of diseases of parasitic nature, especially those in which the portal of entry is percutaneous, (d) unusual prevalence of debilitating diseases such as hookworm or malaria, or (e) some apparent deficiency in diet?

AREA OF STUDY

The municipality of Cordova, on Mactan Island (Text-fig. 2), was selected for study, chiefly because of the cooperative attitude of local officials but also because of the relative remoteness of its position and the stability of its population. Mactan Island, which lies about one mile east of the city of Cebu (lat. 10° N.; long. 124° E.), is divided into two municipalities. Opon, the larger and more populous, includes a small industrial center, while the people of Cordova, which occupies the more remote southern portion of the island, depend chiefly upon fishing and agriculture. Strictly speaking, Cordova is itself an island, being separated from Opon by two small tidewater channels that connect. The municipality of Cordova includes several smaller islands, but of these only two, Gilutongan and Gapas-gapas, are inhabited. In the last official census, that of 1918, Cordova had a population of 5,798.



TEXT-FIG. 2. Map of Mactan Island, showing the Municipality of Cordova, bounded inland by the two arms of the tidewater Pilipog-Gabi "river."

Like the remainder of Mactan, Cordova is low-lying and of coral formation. Coral rock crops out everywhere, making cultivation impossible save with hand implements and then only in small patches. (Plate 33, Fig. 5.) In these, some corn is cultivated and a very few vegetables. There are many coconut palms, which serve as a source not only of copra but also of *tuba*, the popular native bever-

age. The district produces remarkably few edible fruits, relatively large areas being devoid even of banana plants. Fruit trees scattered sparsely through the municipality include the jack fruit, papaya and mango. There are many trees of the kind called *kamungay* (*Moringa oleifera,* Lam.) the young leaves of which are quite generally eaten.

The maguey (agave) plant was introduced about twenty years ago, and it now covers extensive areas. Obtaining hemp from this plant is the chief occupation of the people, fishing excepted. Persons of both sexes and of all ages, save young children, are engaged in the beating of the "retted" maguey, an occupation which requires them to stand in salt water for hours at a time.

Fish of many varieties are abundant in the shallow waters surrounding Mactan, and are caught by many types of traps, by hook and line, and even by the hands. They constitute the chief article of diet.

The climate is humid, but the rainfall is less than that of Manila and more evenly distributed throughout the year. There is, in fact, no very pronounced maximum rain period and the dry season is short. April and May are the hot, dry months. For a detailed description of the climate the reader is referred to Rodriguez (5).

As will be inferred from this description, the municipality is economically poor; in fact it is one of the poorest in the whole province. Aside from a small amount of fish sold in the Cebu market, practically the only sources of cash income are copra and maguey hemp, chiefly the latter. In recent years the prices of both of these commodities have fallen to a very low level; so low, for example, that in 1933 an able-bodied man working on maguey for a full month had difficulty in earning eight pesos (four dollars, U. S. currency).

METHODS OF STUDY

The survey consisted essentially of three parts, namely: (1) physical examinations of the inhabitants; (2) epidemiological investigations of known and newly discovered patients; and (3) a detailed sanitary and sociological census of the municipality.

(1) Physical examinations. To facilitate the examination of the population a branch of the Cebu Skin Dispensary was established in the central barrio (the poblacion) of Cordova; for this a small disused school house (Plate 32, Fig. 2) was made available by the local authori-

ties. The examinations were detailed insofar as the skin is concerned, the whole body being inspected except the pubic region in the female. As a check on the nutritional state of the subjects, the height and weight of each individual were obtained, and the total number of teeth and the number showing caries were also recorded. A rough test of the hemoglobin was made with the Tallqvist scale as a rapid means of detecting severe anemia, possibly due to ankylostomiasis. Laboratory facilities at the clinic were sufficient for qualitative chemical tests and microscopic examination of urine and feces. Microscopic examinations of smears for acid-fast organisms were made at the Cebu Skin Dispensary. Biopsy specimens were forwarded to Dr. H. W. Wade at Culion for histological study.

With the aid of the presidente and other municipal officers and some fifty barrio lieutenants and assistants, a campaign was carefully organized to induce the people to attend for examination, but it was emphasized that attendance was not compulsory. Certain inducements were offered, including free treatment of yaws and of various skin diseases, and a gratuity of rice was also given after all members of a family had been examined. To excite popular interest several small lottery prizes were awarded at intervals, each patient being represented in the drawing by a permanent number given him on registration. Moving pictures, chiefly of an educational nature, were shown in the evenings. During the last two months of the survey a bus service was operated to and from the dispensary, and this proved to be an important factor in the success of the work. The dispensary was operated ten hours daily, including Sundays, with a professional staff of three physicians and two nurses.

(2) Epidemiological records of patients at the Culion colony were secured by one of us (R. G.), through the cooperation of Drs. Raymundo, Lara and Wade. Histories of patients in the Eversley Childs Treatment Station at Cebu were available (J. R.). These records were all checked against information obtained from relatives living in Cordova. Since change of name on admission to a leprosarium is sometimes mentioned as a bar to identification of a patient's family, it is of interest that all patients stated by their families to be in institutions were identified without difficulty. Only one Culion patient had adopted another name, and this fact was

known not only to the patient's family but also to neighbors. Patients resident in Cordova, and the families of institutional patients, were interviewed by one of us (R. G.), assisted by our chief nurse.

(3) Census enumerators were chosen by competitive examination from among the young men of the town, high school education being requisite. These men, after a period of field training, secured comprehensive data from each family, using the schedule reproduced in the appendix to this report. To assist in the construction of a map of the municipality, showing the location of each residence, well, and various topographical features, two surveyors and a draughtsman of the Bureau of Public Works, granted leave of absence from their regular duties through the courtesy of the provincial engineer, were employed for several weeks. The original map, being in great detail, is not reproduced. It was, however, of great use in the study and served as the basis of the spot map reproduced with this report (Text-fig. 3.)

FREQUENCY OF LEPROSY

Cebu is one of the most heavily infected provinces of the Philippines; with only one-twelfth of the total population it has produced about one-quarter of the registered lepers. Judging from the sources of the patients collected in the twenty-five years prior to 1933, the disease is very irregularly distributed throughout the province, being particularly prevalent in the city of Cebu and its environs, and also on Mactan (Text-fig. 1). The number of cases from Cordova alone during this period was approximately 200. Of these, 59 were known to have been living on July 1st, 1933; 32 of them were at Culion, 11 at the Eversley Childs Treatment Station, and 16 had been paroled and were at home in Cordova. There were also known to be 17 lepers with "closed" lesions [2] living in Cordova, who at one time or another had been dispensary patients in Cebu. Two of these were found to have moved away before the census was made.

The total population of the municipality (as of September 1st, 1933) was found to be 6,063, a very slight increase over that of

[2] The term "closed" leprosy as used in this report refers to cases diagnosed clinically as leprosy but consistently negative by the standard bacteriological examination. This group includes "incipient" and neural cases, whether active, quiescent or apparently arrested.

1918. The present census included all heads of families, even if they were employed elsewhere and returned home at infrequent periods; likewise all sailors and all students in local schools and colleges, irrespective of the frequency of their return; all other persons employed elsewhere who visited their homes at least once weekly; and also all patients from Cordova under treatment at Culion or at the Eversley Childs Treatment Station.

In calculating the incidence of leprosy, difficulty was experienced in assigning institutional patients to their proper place of residence. On this point certain arbitrary rules were followed strictly: (1) If the patient was still a minor (i. e., under 21 years of age) when his family moved from Cordova the patient was regarded as a nonresident, but if removal of the family took place after the patient reached the age of 21 years he was regarded as a resident. (2) The residence within the municipality of institutional patients was regarded to be that of the nearest relative, and in most instances this was the actual house in which the patient previously resided. In one instance no relatives could be discovered, but the barrio from which this patient came was determined beyond doubt.

Attendance at the dispensary exceeded all expectations, and 5,957 persons, or 98.3 per cent of the enumerated population, were examined. Careful inquiry was made regarding the 106 persons who were not examined: 18 of these had died after enumeration but before examination was possible; 26 were temporarily absent from home, the majority being engaged in the cultivation of land on the neighboring island of Bohol; 4 had moved to take up permanent residence elsewhere; 15 were sailors working for the most part on coastal or interisland vessels; 10 were attending schools or colleges; and for 33 no adequate reason for nonattendance was obtained. Five paroled patients were not examined, three of whom were stated to have taken residence elsewhere. Included among those not examined were two who refused examination, one of whom is suspected of having leprosy; also an individual who was stated by neighbors to have the disease but who could not be found; and two others who were regarded as "incipients" when examined some years ago. The effort to reach all nonexamined persons is being continued.

There were also recorded on the census cards, but not included in the population, the names of 116 persons who were stated to have

taken up permanent residence elsewhere in 1933, before enumeration. Many of these now reside in the city of Cebu, and 44 of them came to the clinic for examination; one incipient case was discovered among them. Among those remaining there were two persons diagnosed as "incipients" some years ago at the Cebu Skin Dispensary. It is believed that at least some of these individuals who were not seen can be induced to report to the Cebu Skin Dispensary.

At the conclusion of the survey the total number of cases of leprosy regarded as belonging to the municipality of Cordova was found to be 104, an incidence rate of 17.2 per 1,000 inhabitants. Excluding 23 with apparently quiescent or arrested lesions, this rate is reduced to 13.4. Of the total, 30 (29.0 per cent) were previously unknown officially to the Bureau of Health, but these included only 3 bacteriologically positive cases. Furthermore, two of these three were known to the local sanitary inspector; one of them he had been injecting as a suspicious case (see Case 7 below) and the other he had endeavored to persuade to report to the Cebu Skin Dispensary. An additional 9 persons, who are still under observation, were found to have lesions suspicious of leprosy, and information was obtained that two probable cases were in hiding outside of Cordova.

BACTERIOLOGICAL AND CLINICAL FEATURES

The known Cordova patients, both old and newly-discovered, may be classified according to bacteriological findings and residence, as follows:

1. Positive for *Mycobacterium leprae.*	
(a) At Culion or the Cebu leprosarium	43
(b) At home (newly discovered)	3
2. Negative for *Mycobacterium leprae.*	
(a) At home, paroled (formerly positive)	16
(b) At home, incipient (including 23 quiescent)	42
Total	104

Clinical classification of patients.—Excluding the 43 institutional patients, all of whom are bacteriologically positive and presumably clinically active, and excluding also the 16 paroled patients, the remaining 45 Cordova patients have been classified according to clinical condition as follows:

Classification	*No. of patients*
A. Clinically active	
Cutaneous	3
Macular	15
Neural	4
Total	22
B. Quiescent or arrested[3]	
Macular	16
Neural	7
Total	23

In the above classification the group called "macular" comprises those cases in which the only apparent manifestation of leprosy consists of one or more circumscribed areas of skin showing change in color, sometimes with slight elevation or depression. They are thus set apart from the frank neural-type cases, not because they are considered as of a third type of the disease, but because the neural manifestations are not conspicuous and it is uncertain whether or not typical cutaneous-type lesions may develop later.

While the physical appearance of these lesions may deceive the clinician, yet it is of great interest that such a high percentage of patients were regarded as "arrested" or "quiescent." Omitting the paroled cases, 23 out of 88 cases (approximately one-fourth of the total) were so classified:

Active, in institutions	43	(49 per cent)
Active, at home	22	(25 per cent)
Quiescent, at home	23	(26 per cent)
Total	88	

Biopsies were made on nine patients that were classified as "active macular" but were found negative bacteriologically by the usual examination. In eight instances Dr. Wade reported tuberculoid changes in the skin, and in one of these a few acid-fast bacilli were found. The remaining specimen showed only round-cell infiltration. On the other hand, of seven biopsy specimens from macular cases in which the disease was apparently quiescent, only one showed tuberculoid changes while the other six showed round-cell

[3] There is, of course, no assurance that lesions classified as quiescent will remain so; in fact, one patient in this group has since become positive bacteriologically.

infiltration alone. Thus tuberculoid changes in the skin were associated with macroscopic evidence of active leprosy.

The Cordova patients at Culion and at the Eversley Childs Treatment Station, and also those paroled, are of the usual types found in the Philippine leprosaria, and clinical description is unnecessary here. However, the other patients are of unusual interest since they probably represent the varieties of the disease to be found in any Philippine community. Consequently, brief histories of several cases representative of the different varieties met are given here.

REPRESENTATIVE CASE REPORTS

CASE 1.—(458-4961, M. B.) Male, 14. Family history negative. Mother states that she noticed lesion on right elbow when patient was 8 years old. Examination Sept. 13, 1933: On left thigh there is a faintly visible, somewhat depigmented macule about 6 cm. in diameter, anesthetic. On right buttock a smaller atrophic depigmented macule, anesthetic to light touch but not to pain or to temperature changes. On right elbow a faintly visible macule with ill-defined borders, dotted with scars, anesthetic. Smears from all these macules and from both sides of the nasal septum negative.

Biopsy, inner third of macule on right buttock. Epidermis rough, of irregular surface, somewhat hyperplastic. Some round-cell infiltration, not restricted to the perivascular areas. No acid-fast bacilli found.

Diagnosis: Leprosy, macular, quiescent. Histologically, small round-cell infiltration only.

CASE 2.—(982-5837, B. P.) Female, 23. Family history negative. First examination Oct. 8, 1928: On right forearm, extensor surface, about midway between wrist and elbow, is a slightly raised, pinkish, oval patch about 2.5 cm. in diameter. Just above it, but separated by normal-looking skin, is a similar though slightly smaller area; between them and medially is a pea-sized pinkish macule. All these macules are hypoesthetic.

Examination Oct. 17, 1933: The three macules described are now hazy, partially depigmented. Sensation to light touch normal, but anesthesic to superficial pain and temperature. Smears from the lesions and from both sides of the nasal septum all negative.

Biopsy, upper portion of uppermost macule. Superficial connective-tissue proliferation at one end of section. Here and elsewhere some round cell accumulation. About the accessory structures there is some connective tissue increase. No acid-fast bacilli found.

Diagnosis: Leprosy macular, probably arrested. Histologically, fibrosis, moderate, and small round-cell infiltration, moderate.

CASE 3.—(246-2563, M. D.) Female, 13. Family history negative. Pale patch on left buttock, stated to have been discovered about one year ago. Examination Oct. 7, 1933: A roughly circular macule, 3.5 cm. in diameter, on left buttock. Borders distinctly raised, surface not scaly, no papules, normal

skin ridges rather prominent. Sensation of light touch and pain normal, but hot and cold cannot be distinguished readily, though heat can be felt after a lapse of 5 or 6 seconds. Repeated examinations gave identical results. Smears negative.

Biopsy, upper border of macule. Tuberculoid, slight. Superficially there is moderate round-cell infiltration, more diffuse than usual; there are two rather doubtful small tuberculoid areas. Rest of section normal save that at the edge there is an unusual single lesion, a small "cord" of round cells with epithelioid cells in groups, in a coil-gland area. No acid-fast bacilli found.

Diagnosis: Leprosy, macular, clinically active. Histologically, beginning tuberculoid change.

CASE 4.—(373-551, P. M.) Female, 13. Family history negative. A patch on the back was noticed at the age of seven. Examination Oct. 7, 1933: Solitary macule 3 by 2 cm. in left suprascapular area, only slightly depigmented save in lower portion of lateral border; here are distinct papules over which skin is markedly depigmented. Area completely anesthetic to pin point and to changes of temperature, and part of area to light touch (dissociated anesthesia). Smears from macule and septum negative.

Biopsy of lesion described. One end of section fairly normal, with apparent fibrosis about one hair follicle. Superficially are two foci, definitely tuberculoid (photomicrograph, Plate 34, Fig. 10); deeper are two larger tuberculoid areas. No acid-fast bacilli found.

Diagnosis: Leprosy, macular, active. Histologically, tuberculoid.

CASE 5.—(161-3333, C. J.) Female, 50. Family history negative save that a nephew is a paroled case. Patient claims disease of only one year's duration, first noticed as numbness of left thigh, followed by appearance of faint pinkish discoloration in same area. Examination Oct. 7, 1933: A large atrophic area covering the entire anterior surface of the upper third of left leg and lower third of left thigh. The upper borders on both sides gradually approximate posteriorly, and finally converge about 10 cm. above upper border of popliteal space; lower borders meet at about same distance below. The popliteal space itself, however, is not involved. The upper border is distinctly raised, irregular and pinkish in color; the lower border, though distinct, is not raised or appreciably changed in color. Whole area anesthetic to light touch, pin point and changes in temperature. Smears from thigh and septum negative.

Biopsy, upper border of lesion. Tuberculoid foci, both superficial and deep. The former are small, found throughout length of section; the latter are large, mostly in coil gland areas. No acid-fast bacilli seen.

Diagnosis: Leprosy, macular, active. Histologically, tuberculoid, fairly marked.

CASE 6.—(978-5764, F. P.) Male, 12. Family history negative. First lesion said to have been on right thigh, discovered two years ago. Examination Oct. 17, 1933: Roughly circular area on left buttock, diameter 3.7 cm., depigmented but otherwise normal in appearance save for partial depilation; borders although distinct are not raised. Definite anesthesia to heat and cold and to pin point; light touch normal. On the left loin is a larger but fainter macule, 10 by 7.5

cm., with less definite borders, sensitive to pain and light touch but temperature sense impaired. On anterior aspect of right thigh, commencing at about the upper border of middle third and extending to upper border of patella, is a superficial scar apparently due to cauterization; this is definitely anesthetic to light touch, pain and temperature. Smears from all macules and nasal septum negative.

Biopsy, lower border of macule on left buttock. Lesion tuberculoid, but unusual in that no foci occur superficially; all are in the reticular layer, and mostly about nerves. Four acid-fast bacilli seen in the connective tissue at one place.

Diagnosis: Leprosy, macular. Histologically, tuberculoid (deep only), positive for acid-fast organisms.

CASE 7.—(187-5574, A. P.) Male, 17. Three older brothers have been positive cases; one is now in Culion, two have been paroled. Pinkish macule on right buttock, said to have been observed ten years ago. Examination Oct. 18, 1933: An extensive anesthetic macule covers nearly all the inner surface of left thigh; portions of the border are dull red, raised. Small reddish macules are distributed down the inner surface of the left thigh and leg. A large macule on buttocks shows interlacing raised reddish infiltrations enclosing islands apparently not involved but pigmented from subcutaneous injections of iodized esters of Wightiana oil. A few papular and papulosquamous lesions on extensor surfaces of arms. Smears from right buttock, left thigh and left forearm positive; bacilli numerous in all smears.

The cases given above illustrate successive stages of progression of the macular lesions of leprosy from the earliest recognizable patches, characterized histologically by round cell infiltration, to the marked tuberculoid variety of lesion in which small numbers of bacilli can sometimes be demonstrated. One of the three cases that were found bacteriologically positive in standard smears is included, but no biopsy was made in any of these positive cases because the lesions were typical lepromata of cutaneous-type leprosy.

In Cases 1 and 2 the lesions biopsied were small hypopigmented macules the borders of which were not raised; there was no papulation, nor any pinkish or reddish coloration anywhere on the surface of the lesions. Usually such lesions show dissociation of sensibility. There was somewhat more connective tissue proliferation in Case 2 than usual, the lesion being apparently older; it was diagnosed clinically as probably arrested.

Case 3 showed a somewhat more advanced lesion, the borders being raised and showing exaggerated skin furrows and ridges. Histologically there was moderate round cell infiltration with two "doubtful" tuberculoid areas superficially, but in the reticular layer a small, compact "cord" of round and epithelioid cells was seen. This

lesion represents a transition form or stage from that of simple round cell infiltration to the frank tuberculoid granuloma.

Cases 4 and 5 showed signs of "activity." In the former there were distinct papules, while in the latter the border from which the biopsy material was removed was raised and pinkish in color. Histologically both showed typical tuberculoid architecture.

The lesion of Case 6 was thought to be quiescent at the time of the first examination; the marginal surface was smooth, with none of the characteristics usual to active lesions. Sections proved the lesion to be frankly tuberculoid but with changes confined entirely to the deeper layers of the skin, none being in the papillary layer; a few bacilli were found in one section. Since the time of the survey this patient has been re-examined twice. The lesions are actively spreading, but they are still bacteriologically negative in smears.

Location of first lesions.—Several authors have attempted to determine from the histories of their patients the location of first lesions, and these have been stated most frequently to have been on the extremities. This fact has been regarded as additional evidence that *My. leprae* usually gains entrance to the body through wounds or abrasions, at least in tropical countries.

TABLE 1.—*Location of first lesions in 76 Cordova patients for whom satisfactory histories were obtained.*

Site of first lesion	Examination and history	History only	Total	Per cent
Arm (including hand, elbow)..	6	14	20	26.3
Leg (including knee, foot) ...	2	16	18	23.7
Thigh (including hip, buttock)	9	23	32	42.1
Back (suprascapular region)..	1	—	1	1.3
Pectoral region	1	—	1	1.3
Epigastric region	—	1	1	1.3
Face	—	3	3	4.0
Total	19	57	76	100.0

In Cordova it was possible to determine by actual examination the location of lesions on a small number (19) of patients who, in all probability, had never had any other manifestations than single macules. The data in Table 1 show that a considerable proportion of such lesions occur on the extremities. The records of the physical

examinations agree with the histories secured from a somewhat larger number of lepers who now have multiple lesions.

Further data of this nature are obviously desirable, and the information should be obtained definitely and exactly. However, it should be borne in mind that such a distribution of lesions could be satisfactorily explained by assuming a portal of entry other than the skin, with a tendency to localization of the infection wherever the resistance of tissues is lowered by inflammation or injury.

SPECIAL EPIDEMIOLOGICAL FEATURES

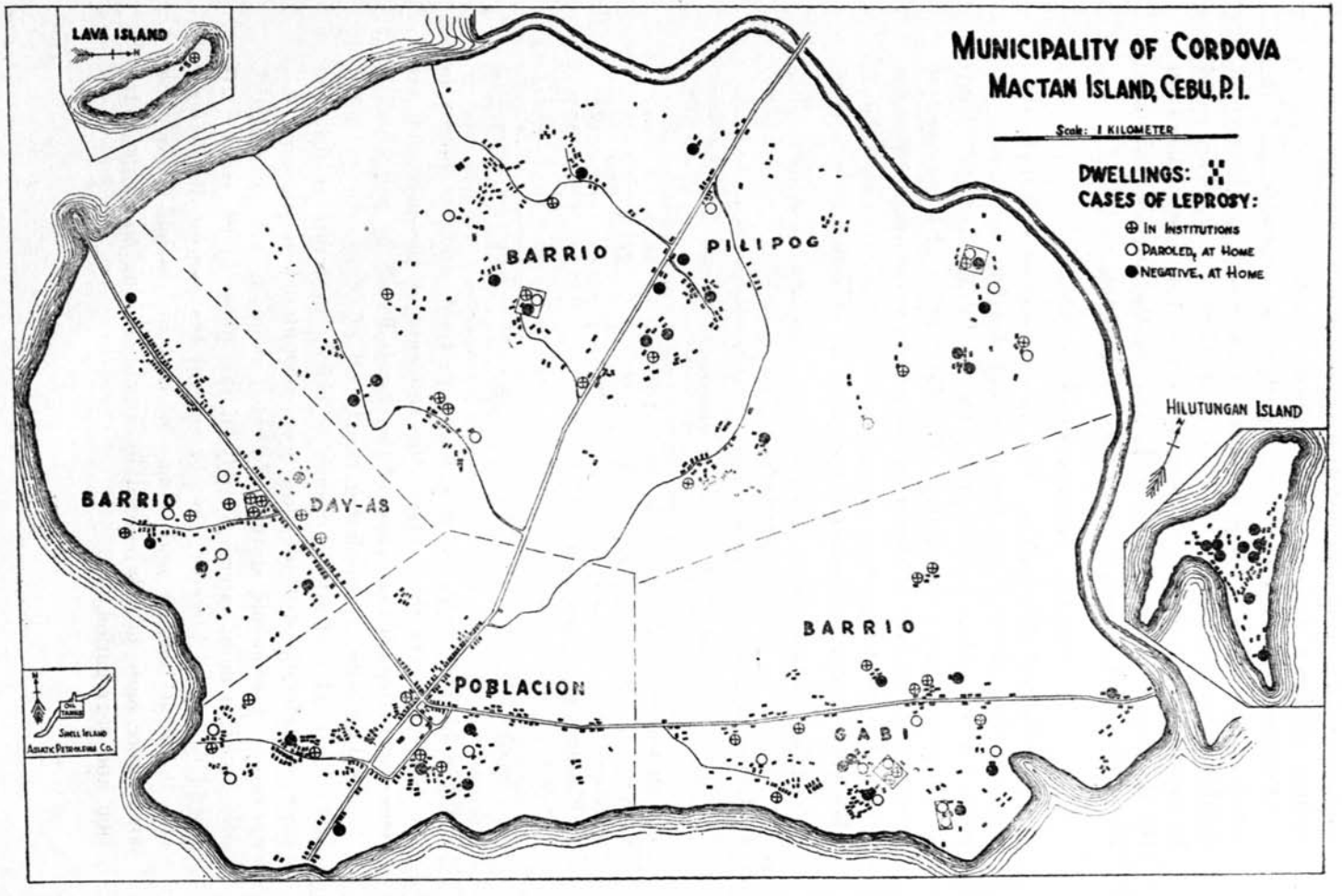
Geographical distribution.—For the purposes of this study Cordova has been divided into five principal districts, or barrios: the poblacion (the village proper), Gabi, Day-as, Pilipog, and the islands of Gilutongan and Gapas-gapas. The distribution of houses and of persons with leprosy is shown in the accompanying map (Text-fig. 3), and the incidence of the disease by barrios is given in Table 2. All known lepers are counted, including 23 classified as quiescent.

TABLE 2.—*Incidence of leprosy in Cordova, according to districts, September 1, 1933.*

District	Population	Cases	Incidence per 1,000
1. Poblacion	1,657	15	9.1
2. Day-as	1,093	17	15.5
3. Pilipog	1,821	35	19.2
4. Gilutongan and Gapas-gapas	415	10	24.1
5. Gabi	1,077	27	25.1
Total	6,063	104	17.2

The highest incidence was found in Gabi, and the lowest in the poblacion. On the average, the residents of the poblacion are somewhat better off than those of the remainder of the municipality.

Dealing with a population nearly all of whom are on a low economic level and whose income is chiefly in terms of fish and crops, considerable difficulty has been encountered in making a fair appraisal of economic status. Collected data, as yet untabulated, will permit a more extensive study of this phase of the matter. It should be stated, however, that in general the poorest districts are also the most isolated, and it may be that in previous years these areas were more heavily seeded by lepers wishing to escape detection and segregation.



TEXT-FIG. 3. Spot map showing the distribution of residences in Cordova, and of cases of leprosy.

Age and sex distribution.—Frequency of the disease among males and females of various age groups in Cordova is shown in Table 3. Incidence increases to a maximum at 20 to 29 years, and rapidly declines after 30 years of age. Such an early peak, in a disease in which the incubation period is usually a matter of years rather than of months, points to an early age of infection.[4] The fact that in our survey so few persons over 40 years of age were found to have lesions, although all recognized quiescent or arrested cases were included, indicates that leprosy is a potent factor in shortening the span of life.

TABLE 3.—*Incidence of leprosy in Cordova by age and sex, September 1, 1933.*

Age group	Population			Cases of leprosy			Incidence per 1,000		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
0- 4 years.	485	485	970	0	0	0	—	—	—
5- 9 "	435	459	894	1	0	1	—	—	—
10-14 "	370	353	723	4	4	8	10.8	11.3	11.1
15-19 "	326	314	640	13	8	21	39.9	25.5	32.8
20-29 "	473	531	1,004	30	12	42	63.4	22.6	41.0
30-39 "	355	346	701	13	7	20	36.6	20.2	28.5
40-49 "	269	249	518	6	1	7	22.3	4.0	13.5
50-59 "	123	158	281	3	2	5	24.4	12.7	17.8
Older	145	187	332	0	0	0	—	—	—
Total	2,981	3,082	6,063	70	34	104	23.5	11.0	17.2

[a] Of this total 26 patients were in the age group 20-24 years.

Statistical tabulations usually give only the numbers or percentages of lepers falling in various age groups and do not take into consideration the age-constitution of the population from which they are derived. However, the general picture as indicated in such statistics is in agreement with findings in Cordova. McCoy (2), for example, for the period 1901 to 1909 tabulated the ages of 1,058 lepers at the time of admission to the Molokai Settlement and found the peak to be in the 16-20 year period.

Distribution of the patients according to the age at which the first lesion is stated to have been observed gives support to the view that early infection is the rule rather than the exception. For 93 patients for whom apparently reliable histories were obtained, the distribution according to age of onset and sex is shown in Table 4.

[4] It may be recalled that McCoy and Goodhue (3) have observed leprosy in a child as early as 19 months of age, and suspicious lesions have been reported by Gomez et al (1) at the age of one year.

Similar data have been published by several authors. Rogers and Muir (6), in a tabulation of Indian asylum patients and Calcutta out-patients (p. 217) found that the age at which the first lesions were stated to have been noticed was, most commonly, 21 to 25 years; and, in a review of the literature (p. 74), reached the conclusion that infection occurs between the first and twentieth year of life in approximately one-half of the cases. In the limited experience at Cordova the proportion of patients infected under 20 years of age was apparently much higher (85 per cent), although no allowance has been made for the period of incubation.

TABLE 4.—*Age at which first lesion was noticed, 93 cases.*

Sex	0-5 years	5-9 [a] years	10-15 years	15-19 years	20 years and over	Total
Males	3	15	19	17	7	61
Females	0	7	14	4	7	32
Total	3	22	33	21	14	93

[a] Two are included here who are stated to have had lesions as "little children."

It is generally agreed that leprosy is more frequent in males than in females. In many countries, however, it is difficult to subject females to physical examination. As expressed by Rogers and Muir (pp. 215-216);

> This disproportion, almost 3 of males to 1 of females, is partly accounted for by the greater seclusion of women in India and the greater difficulty in finding out facts with regard to them when collecting census statistics. Still, there must undoubtedly be far more male than female lepers.

These authors go on to say that it is difficult to suppose that there can be much actual difference in the number of infections in childhood, as between the sexes. Statistical support for this opinion is found in the reports of Gomez et al (1) and Rodriguez (4), which show for children born at Culion, an incidence among females approximately equal to that among males.

As is shown in Table 3, of the total in the present series there were 70 males and 34 females, the incidence rates being 23.5 and 11.0 per 1,000. The numbers involved are small, but it is of interest that there is no appreciable difference between the sexes in childhood. At 15 to 19 years the incidence among females reaches its peak, and remains more or less stationary to 40 years of age, declining thereafter.

As a possible explanation of the disparity in incidence of leprosy between the sexes Rogers and Muir suggest (p. 216) that female lepers die at an earlier age than males. That is, they assume that, infection having taken place, the female is less resistant than the male to the progress of the disease. If this be the case a complete survey of all lepers in a population would be expected to reveal relatively more severe and advanced cases among females than among males. In the Cordova series, including paroled patients with the positives, the incidence of bacteriologically-positive leprosy was for males 16.4 per 1,000 and for females 4.2 per 1,000. "Closed" leprosy, including arrested and quiescent forms, was of equal frequency in males and females (Table 5). Approximately 40 per cent of the female cases were or had been bacteriologically positive, as contrasted with 70 per cent of the males.

TABLE 5.—*Incidence of leprosy in Cordova, by sex and bacteriological classification.*

Bacteriological classification	Males (Pop. 2,981)		Females (Pop. 3,082)	
	Leprosy cases	Incidence per 1,000	Leprosy cases	Incidence per 1,000
Positive [a]	49	16.4	13	4.2
Negative [b]	21	7.0	21	6.8
Total	70	23.5	34	11.0

[a] Includes 16 paroled cases, formerly positive.
[b] "Closed" cases, including 23 quiescent and arrested.

Unfortunately, the numbers of cases are too small to justify detailed analysis by sex, age and type of disease. However, it would not appear that a larger proportion of female lepers than of male were, at the time of the study, in more active stages of the disease; in fact, the reverse is indicated.

The difference between the sexes could be explained in other ways than that which has been referred to. If, for example, it be assumed that males are less resistant than females, and supposing the number of males and females who are infected to be approximately equal, then it might be argued that the disease more frequently remains latent in the latter. But if in childhood there is little difference in the frequency of frank disease, any greater resistance of the female must be exhibited only in adolescence or adult life. This hypothesis is therefore unnecessarily complex. The

assumption that after childhood the male is more exposed to leprosy than is the female would seem a simpler and more reasonable hypothesis. Excess exposure of the male may be brought about by some peculiarity of occupation. However, the solution of this problem must be one which will be quite generally applicable, since higher male incidence seems to be the rule in all parts of the world.

History of contact.—The history of exposure of each leper to an antecedent case was inquired into with great care. Such histories are much more valuable when obtained in early, recent cases than in older ones in the later stages of the disease. Thus a series in which only children were included would be of great interest. Unfortunately, the present series is too limited to justify detailed analyses of this kind. Of the total, it was found that there was known to have been contact, at least as intimate as sleeping in the same house, with an antecedent case in 40 instances, or 38.5 per cent.[5] Excluding those with such a history who were not members of the same family as the antecedent case, it was found that 27 patients, or 26 per cent, gave a history of *family* contact with a previous leper. In all save two instances the antecedent leper is known to have been bacteriologically positive (Table 6). This

TABLE 6.—*History of contact with antecedent cases, by bacteriological classification.*

Bacteriology of cases studied	Bacteriology of antecedent cases			No familial contact	Total	Per cent with familial contact
	Positive	Negative	Unknown			
Positive	18	0	0	45	63	28.6
Negative	7	0	2	32	41	22.0
Total	25 [a]	0	2 [a]	77	104	26.0

[a] Of these, 15 related their disease to "brother" or "sister," to "father and grandfather," and 6 to "other relatives" living in the home.

latter proportion is lower than has been previously reported by authors who had access only to institutional patients. It may perhaps be that less intimate and less prolonged contact may be a factor in determining the milder clinical course of the less progressive types of disease which constitute a significant part of the total included in the Cordova survey.

[5] Continued studies of these and additional cases, to be reported later, indicate a higher percentage of house contact with antecedent cases.

Of dubious value are statistics from patients or their relatives regarding contact *outside* the home. In an area such as the one under consideration, with a relatively high incidence of the disease, these statements may be worth little. It would be of great interest, however, to obtain such histories for an area in which the disease is thin in occurrence, again preferably including only children in the series.

Risk of exposure to positive and negative patients.—With sufficient data it should be possible to determine the risk of attack of individuals exposed to bacteriologically positive and negative cases, respectively. In making the present tabulation it was assumed that other individuals in the home were exposed either from birth, or from the date of onset as estimated from the statements of the patient and his relatives, whichever was the later date. It was regarded that exposure of all contacts ceased whenever the patient was institutionalized, and that that of any individual ceased when he went to reside elsewhere. Of the present material, sufficiently reliable data are believed to be at hand for only 71 patients, 34 of whom are positive and 37 negative, numbers much too small to give significance to the results shown in Table 7.

TABLE 7.—*Illustrative data showing risk of attack for family contacts of positive and negative cases.*

Bacteriological classification	Number of patients	Number of contacts	Person-years of exposure	Secondary cases	Attack rate per 1,000 person-years [a]
Positive	34	162	1,082	7	6.5
Negative	37	197	1,221	3	2.5

[a] Not adjusted for age differences between the two groups.

SANITATION, OVERCROWDING AND GENERAL HEALTH

An incidence of leprosy as high as was found in Cordova at once raises questions regarding the mode of living of the people, their general nutrition, and the prevalence of other diseases.

Water supply.—Fresh water is secured from six public driven wells, each about 30 feet in depth, and from numerous private dug wells and a large public rain-water cistern. The municipal wells

are used as a source of drinking water by 75 per cent of the population, private wells by 22 per cent, and cisterns by 3 per cent. Before the municipal wells were driven (about 1926), the problem of a sufficient supply of fresh water for drinking and bathing was a serious one, and even yet the nearest source for many families is more than a kilometer from their homes. On Gilutongan the inhabitants depend upon rain water collected in crude fashion from the trees, and when this source fails they are obliged to sail to Mactan or to the city of Cebu for their supply.

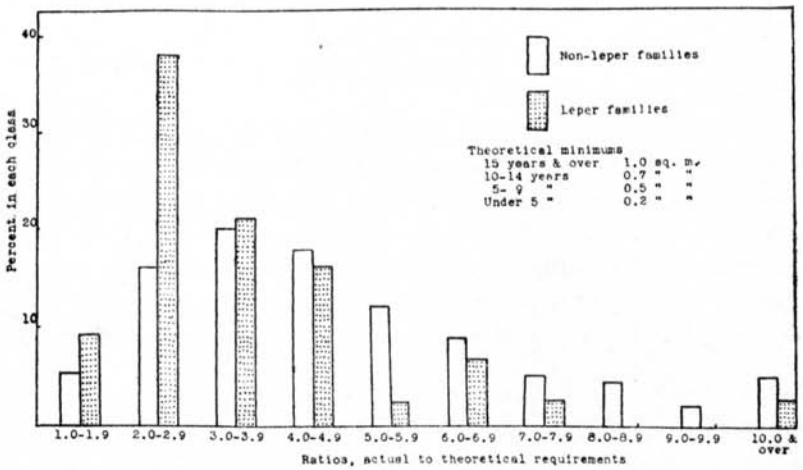
Use of soap.—An effort was made to determine the frequency of the use of soap for bathing. The great majority of families (95 per cent) were found to use soap, usually a small quantity per month. In Gabi the proportion of families not using soap (14 per cent) was higher than in any other barrio.

Disposal of excreta.—As in most villages in the Visayan region of the Philippines, the great majority of houses are but huts of one or two rooms, elevated on posts, and with roofs of nipa thatch. The problem of excreta disposal is a serious one. Pits can be dug in the coral only with difficulty unless explosives are used, and the cost of building sanitary latrines is therefore a factor which has blocked the efforts of the sanitary officers. The proportion of the population not using privies of any sort was found to be 33 per cent in Gabi, 47 per cent in the poblacion, 78 per cent in Pilipog, 81 per cent in Day-as, and 100 per cent in Gilutongan and Gapas-gapas.

Overcrowding.—The available sleeping space of each family was measured and recorded. To obtain a roughly equivalent index of crowding for all families, persons of 15 years and over were arbitrarily assigned 1.0 sq. m. of space, those from 10 to 14 years, 0.7 square meters, those from 5 to 9 years, 0.5 square meters and those under 5 years, 0.2 square meters. Thus, a family consisting of three persons over 15 years, one child 5 to 9 and one infant was regarded as requiring 3.7 square meters; and if the actual available space was 10 square meters the index number (crowding ratio) for the family would be $10/3.7=2.7$.

It was found that overcrowding was the rule in all of the barrios. With regard to the comparison of this condition in the houses of

nonleper families and those in which there were cases [6], the number of the latter that could be included in this analysis (42) is small. However, the comparison brings out the interesting fact that the leper families were much the more crowded in their sleeping space. (Text-fig. 4). Age distribution and sanitary status did not differ materially as between the two groups.



TEXT-FIG. 4. Crowding ratios for families in Cordova; comparing those with and without cases of leprosy actually in the household at the time of the survey.

Diet.—An extensive study of the diet of the people was not possible. As already stated, fish of a great variety are to be had in abundance. Corn is available to most of the people. In better times rice was imported, but it is now a luxury. It is believed that a considerable proportion of the population rarely have fruit, even bananas being scarce in certain districts. No milk of any kind is consumed, after weaning. The popular beverage *tuba* (fermented sap from the flowering fronds of the coconut palm), is a source of vitamins, as are also the *kamunguay* leaves which are eaten by the majority of the people. That there is no serious deficiency of

[6] "Leper families" have been limited here to those in which the patient has never been in an institution. This was done because the number and ages of the persons in the family at the time the segregated patient developed the disease cannot always be accurately determined afterward, and in many instances the orginal houses, being chiefly of bamboo, are replaced or extensively modified within a few years. However, a separate inquiry into this matter by one of us (J. R.), that comprised all leper families, has given practically the same results.

vitamin B is shown by the relative infrequency of beri-beri. There may, however, be a lack of certain minerals, particularly calcium, although it may be that this element is supplied to some extent by the bones of small fish. An exhaustive study of the diet would seem to be worth while.

State of nutrition.—An estimate of the state of nutrition was made for each individual by the examining physician. Of the total, 60 per cent were classified as "good," 28 per cent as "fair" and 12 per cent as "poor." Malnutrition was apparent chiefly in children of the preschool age.

The mean weight-height ratio (weight in pounds divided by height in inches), age for age, for Cordova as compared to other Philippine areas will, it is hoped, be made the subject of a later report.

Dental caries.—Since there is some evidence that the incidence of dental caries is related to the state of nutrition, a careful record was kept of the number of teeth and the number showing caries in

TABLE 8.—*Incidence of dental caries by sex and age in persons belonging to leper and nonleper families.*

Age group	Percentages with dental caries			
	Leper group		Nonleper group	
	Male	Female	Male	Female
12-14 years	38.1	29.6	26.6	32.4
15-19 years	25.0	29.5	26.3	30.3
20-29 years	43.2	42.3	34.9	46.5
30-39 years	40.0	56.5	44.3	59.4
40-49 years	34.5	79.3	40.2	64.9
50 years and over	51.2	58.3	51.3	66.0
Total	38.2	47.4	37.4	50.7

each individual examined. Eliminating children under twelve years of age, it was found that the proportion with one or more carious teeth was somewhat higher for females (50.7 per cent), than for males (37.4 per cent). This was true for all ages included, but was not especially conspicuous in those under 20 years of age. Caries was found to be of about the same frequency in nonleper as in leper families (Table 8).

Hemoglobin.—The hemoglobin percentage for each person examined was determined with the Tallqvist scale. Admittedly not absolutely accurate, this scale serves sufficiently well for comparative purposes within one universe, in the hands of a single observer. Taking all ages together, 92 per cent of males and 88 per cent of females had percentages of 85 or above. Of children 0-4 years, however, only 59 per cent of the males and 54 per cent of the females reached this standard. Three children with ankylostomiasis, all members of a family recently arrived in Cordova, were found to have severe anemia. Excluding these, ratios of 60 and under were found in 3 males and 2 females, all under five years of age. Similar low ratios were found in only 9 other persons, 8 of these being females of child-bearing age. This distribution is suggestive of "nutritional anemia," but it was not possible to make the more exhaustive examinations necessary to determine the cause of the condition in each individual case.

Incidence of yaws.—Yaws is very prevalent in Cordova, and occurred as a small epidemic in one of the barrios during the survey. Since *Treponema pertenue* is believed to gain entrance through the skin, it was thought that there might be some association between the incidence of yaws and leprosy. However, no difference was found between leper and nonleper families in this respect (Table 9).

TABLE 9.—*Incidence of yaws in persons belonging to leper and nonleper families.*

Classification of cases according to the existing lesions of yaws	Incidence per 1,000	
	Leper group	Nonleper group
Primary or secondary lesions	5.3	8.3
Keratosis (palmar and plantar)	28.4	24.4
Leucodermic patches	7.1	6.1
Juxta-articular nodules	15.9	8.1
Scars of yaws	63.8	72.1

Skin diseases.—It was rare to find a child of school age in Cordova whose body did not exhibit numerous scars, especially on the extremities. While many of these scars were undoubtedly due to injury, it is believed that many were due to repeated scabies and impetigo. Active parasitic skin conditions were very common, but not more frequent in leper than in nonleper families, with the ex-

ception of tinea flava; but in this instance the difference is too small to be of significance since the number of individuals in the leper group is relatively small. Scabies was somewhat more frequent in the nonleper families (Table 10).

TABLE 10.—*Incidence of various skin diseases in persons belonging to leper and nonleper families.*

Diagnosis of skin disease	Incidence per 1,000	
	Leper group	Nonleper group
Scabies	111.7	159.4
Impetigo	46.1	66.8
Tinea flava	182.6	159.6
Ringworm	23.5	20.0
Seborrhea	47.9	33.3
Pityriasis	15.9	14.2
Molluscum contagiosum	10.6	13.7
Tropical ulcer	1.8	3.7
Dermatitis [a]	69.1	68.9
Icthyosis	42.5	61.2

[a] Chiefly due to irritation produced by maguey and seaweed.

Frequency of other diseases.—Eight persons were discovered to be suffering from beri-beri of the rudimentary type, and other cases of this disease may have been overlooked. However, it is improbable that this condition is common, for if it were the infant mortality would be much higher than it is.

Undoubtedly cases of pulmonary tuberculosis were overlooked, as it was detected in only 12 instances. This is true also of malignant disease, since only those with a visible tumor or with marked anemia would be discovered in such a survey. Only 5 persons were recorded as suffering from malignant disease, including one with carcinoma of the uterus and one with carcinoma of the breast.

Eighteen persons (16 females and 2 males), were noted to have marked enlargement of the thyroid, none of them exhibiting obvious toxic or pressure symptoms.

Malaria is not indigenous in Cordova (there are no running fresh-water streams there) nor is ankylostomiasis. No cases of scurvy or typical pellagra were seen.

SUMMARY

In the municipality of Cordova, Mactan Island, Province of Cebu, Philippine Islands, a field study of leprosy was found to be entirely practicable. At the commencement of the study certain questions were propounded on which it was hoped to gain information. Certain of these were very definitely answered, and the data collected indicate that most of the others could be satisfactorily settled in a more extensive study.

1. In a population of 6,063 persons, 104 cases of leprosy were found, including 43 that were already in segregation and 16 others on parole. Of the remaining 45 cases, 15 were "closed" cases already on the register of the Cebu Skin Dispensary. The total incidence was 17.2 per thousand, but excluding 23 cases regarded as "arrested" or "quiescent" the rate is reduced to 13.4 per thousand.

2. If the same ratio between segregated and nonsegregated cases be assumed to hold throughout the Philippines, on the basis of the total number now in segregation (approximately 8,500), the total number of all cases of leprosy of all varities, active and quiescent, would be 20,000 more or less.

3. Of the 30 newly discovered cases, only three were of the bacteriologically positive, cutaneous type.

4. Contact with an antecedent case, at least as intimate as sleeping in the same house, could be established in 38.5 per cent. Excluding those with such a history who were not members of the same families as the antecedent cases, it was found that 27, or 26 per cent, gave a history of family contact. To obtain these histories with accuracy and in sufficient detail is costly and time consuming, particularly in an area where the disease is frequent. Studies of these and other families are being continued and it is probable that these percentages will be materially raised.

5. In a high proportion of a limited series of patients the primary lesions were situated on those parts of the body most exposed to injury.

6. The incidence of leprosy in the area studied was not associated with an unusual incidence of any other infectious disease, save that yaws and certain parasitic skin diseases are highly prevalent. There was no obvious deficiency of diet in Cordova, but on this matter no definite opinion can be expressed without further study.

7. A suggestive association was found between the occurrence of leprosy and overcrowding of the home.

8. Detailed findings on paroled patients will be given in a later report.

APPENDIX

LEPROSY CENSUS SCHEDULE, FAMILY CARD[7]

Heading.—Family number, municipality, barrio, enumerator, date. Head of family: name, position in family. Year of establishment of family. Exact address (and names of nearest neighbors). Informant.

Main tabulation.—(a) First division (lines for 12 persons, a column for each of the following items). Names in full; birth: date and place (municipality and barrio); age; sex; civil condition; relationship (with head of family); literacy: English, Spanish, Visayan, illiterate; occupation or school (including address); health: good, bad, skin disease present; years in: house, barrio, municipality; wages: average for three months and last month; frequency of bathing; physical examination: date, result, made by.

(b) Second division (lines for 5 persons). Members of family living elsewhere. Data same as above except that after "occupation or school" the following is substituted: date left, address, present health.

(c) Third division (lines for 5 persons). Members deceased. As (b), except that the substitution provides for age at death and date and place of death.

Further family data.—Name and address of father and mother of: (1) husband: father living or dead; mother living or dead; (2) wife: father living or dead; mother living or dead.

Supplementary leprosy data.—Leprosy in father or mother of anyone included in list; in other relatives of anyone included in list. (Names, relationship, data.)

House.—Bamboo, wooden, mixed, wood and stone. Type of floor, walls, roof. Approximate age. State of repair. If owned, rental value. Number of rooms (excluding kitchen). Floor area. Diagram of floor space. (On the card is a rectangle ruled in squares in which to draw in a diagram of the floor space, to show the sleeping plan.)

Furniture.—Beds, chairs, tables, other.

Ground floor.[8]—Cement, wood, earth. Walled or open. Used for bodega (storage), tienda (small retail store), living quarters, garage, chickens, pigs, horse, goat, other purposes. Excreta seen: human, animal.

[7] The summary here given shows the data provided for in the census card used, which it is to be understood is for families rather than individuals. It measures 11 x 17 inches and is folded in the middle, the upper half containing the heading and the main ruled tabulation, to be filled out in columns. It is not practicable to reproduce the card here in its actual form, nor would it be satisfactory to reduce it to a convenient size. A copy of the card as recently revised will be sent to anyone interested, on request addressed to the Cebu Skin Dispensary, Cebu, P. I.

[8] This refers to the space which, in the usual construction of the simpler Philippine houses, exists betwen the ground and the actual floor of the house (see Plate 32, Fig. 2, and Plate 33, Fig. 4).

Yard.—Very small, small, medium, large. Fenced or not. Hectares owned (approximate). Banana plants (number). Kamungay: small, large (number); used for food? Maguey: income last year (approximate). Kapok trees (number). Jackfruit trees (number bearing, total). Mango trees: small, medium, large (numbers). Papaya trees (number bearing, total). Coconut trees (number bearing, total). Garden: none, small, medium, large. Type of crop. Owner's estimate of annual value. Paid for seed last year. Corn: number of crops, amount of seed annually, number of sacks expected annually. Camotes (sweet potatoes): amount annually. Other fruits, vegetables.

Animals owned.—Carabao, horses, cows, pigs, goats, sheep, chickens, other. Paid for feed (yearly).

Excreta disposal.—Water closet with cesspool. Privy: "antipolo" type, pit, surface. Used; not used. Defecate in yard; in sea or stream. Excreta seen: human, loose pig.

Drinking water.—Rain, how collected. Artesian well, where located. Dug well: where located, how deep, covered or not, subject to surface drainage or not. How water conveyed from source to house; type of container. Public water supply, location of outlet. Other sources of water: for household use, for bathing.

Miscellaneous.—Statement concerning rats, mice, bedbugs, cockroaches. Kind of soap used for bathing, laundry; amount expended annually. Is charcoal or firewood bought? Fishing equipment used.

Annual family income.—Wages, interest on bank deposits or investments, crops, tuba, chickens, eggs, goats, pigs, fish, boarders, help received (from relatives, others), other income, total. (One corner of the chart is set aside for this summarization of the family income in tabular form.)

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DESCRIPTION OF PLATES

PLATE 32

FIG. 1. Cebu Skin Dispensary, on the outskirts of the city of Cebu, Philippine Islands.

FIG. 2. Cordova branch of the Cebu Skin Dispensary, established temporarily for the purposes of the survey.

FIG 3. Temporary clinic established on Gilutongan Island for the survey work there.

PLATE 32

PLATE 33

FIG. 4. Typical nipa hut of the Cordova region. This one was the home of a newly discovered case of cutaneous-type leprosy.

FIG. 5. Tilling the shallow soil on the coral base, Cordova.

FIG. 6. Retting maguey in one of the tidewater streams, Cordova.

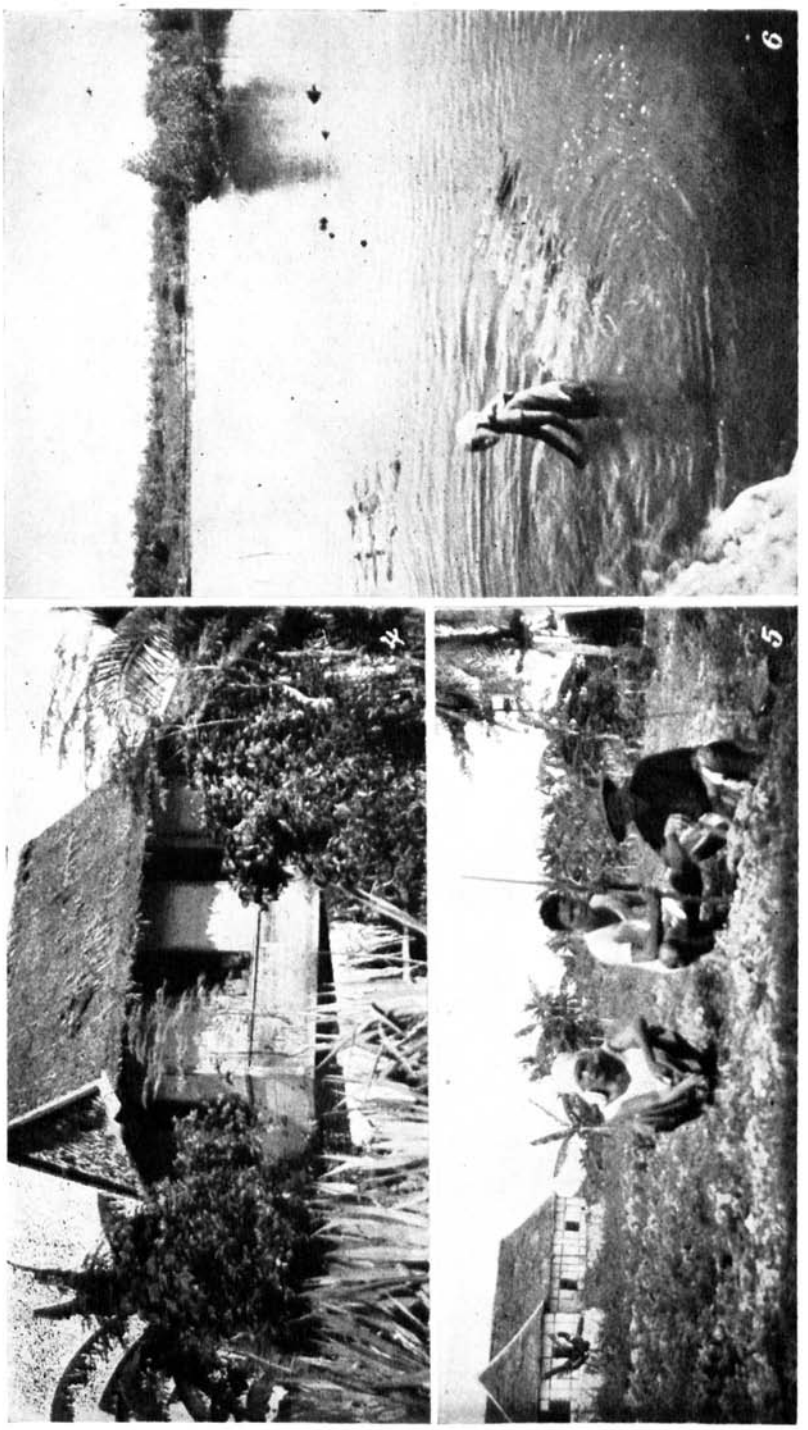


PLATE 33

PLATE 34

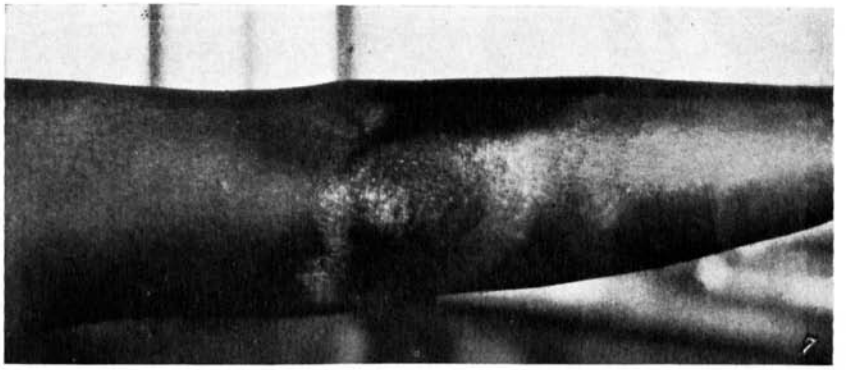
FIG. 7. Macule on elbow, of four years duration. (Case in the Cebu Skin Dispensary.)

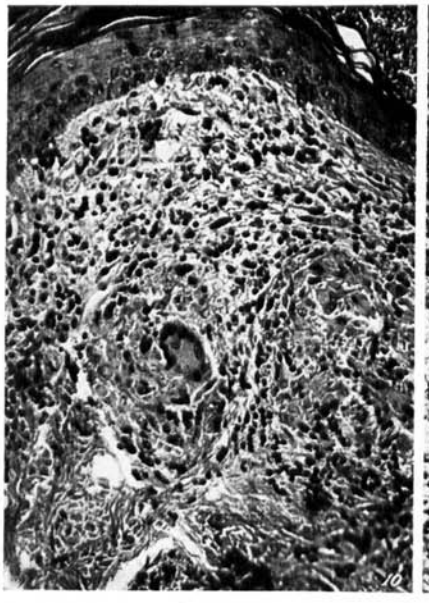
FIG. 8. Macule on abdomen. (Case in the Cebu Skin Dispensary.)

FIG. 9. Extensive frank tuberculoid lesions on the back. (Cordova case.)

FIG. 10. Tuberculoid lesion of leprosy, showing epithelioid foci and typical Langhans cells. From Case 4 400×. (Photomicrograph by Dr. Alan Moritz.)

FIG. 11. Tuberculosis of the skin, showing an epithelioid focus and typical Langhans cells. 400×. From the collection of the Institute of Pathology, School of Medicine, Western Reserve University. (Photomicrograph by Dr. Alan Moritz.)





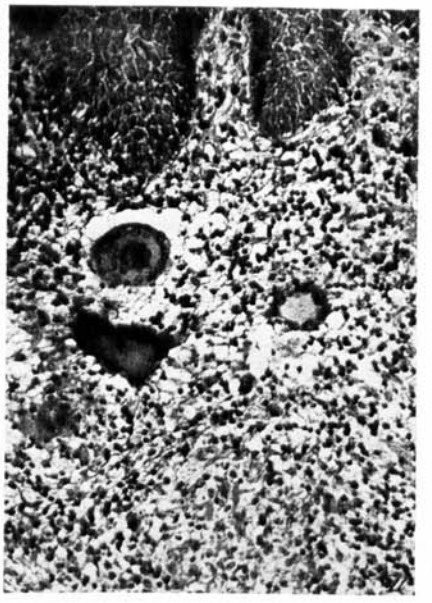


PLATE 34