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HISTORICAL INQUIRY AS A METHOD OF ESTIMATING THE TREND OF LEPROSY

by

JAMES A. DOULL, RICARDO S. GUINTO, HULDAH BANCROFT,
and JOSE N. RODRIGUEZ*

In any area where leprosy is a significant problem, determination of its trend is a matter of great practical importance. This knowledge is essential for the satisfactory estimation of future needs, in terms of personnel, clinics and leprosaria.

Unfortunately there are few areas where leprosy is prevalent for which reliable incidence rates are available for a sufficient period. For an immediate answer it therefore becomes necessary to adopt the method of historical inquiry. There are fallacies in this method, some general and others peculiar to leprosy, which have been discussed in an earlier report (1). Nevertheless, the method can be of great value in determining trend in communities which have low rates of migration and are otherwise suitable for epidemiological studies. The purpose of this paper is to demonstrate its usefulness.

The data which are used were collected in the municipalities of Cordova and Talisay in the province of Cebu, Philippine Islands. These data have been the basis for a number of previous studies (1, 2, 3, 4, 5). In the areas of study, a detailed history was obtained for every household from the date of its establishment. Dil-

* The authors are respectively: Chief of the Office of International Health Relations, U. S. Public Health Service, and formerly Professor of Hygiene and Public Health, Western Reserve University; Epidemiologist, The American Leprosy Foundation (Leonard Wood Memorial Fund); Associate Professor of Biostatistics, Tulane University; and Medical Officer, Bureau of Health, Philippine Islands.

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igent efforts were made to include all births and deaths and all other entrances into and departures from the household. Equally intensive efforts were made to obtain information regarding the occurrence of leprosy. The most responsible available member of the household was the informant. Furthermore, all living patients from the areas who were at the time in leprosaria were questioned and the records of these institutions were carefully scrutinized.

As in certain previous studies of this series, a modified life table method was used in the analysis. This method involves determination of the number of years each person resided in the community, each year of life of an individual being regarded as a unit. Incidence rates are expressed as the number of cases per 1,000 person-years, which is regarded as equivalent to observation of 1,000 persons for one year.

For the benefit of those unfamiliar with the method, the following quotation from a previous publication (1) may be of value: "The population is expressed in person-years, that is, each year of life of each individual is regarded as a unit. For a whole community the sum of the years of life recorded on a schedule constitutes the denominator. This population can readily be broken down according to sex, age, calendar years bounding the life experience, or other limitations. Only persons developing the disease while resident in the community are counted in the numerator. The results are expressed as attack rates per 1,000 person-years, that is, as an average number of cases per 1,000 persons observed for one year. The schedules include individuals who were born 80 years or more before the enumeration and infants born only a day or two before. In the summation of the total experience, therefore, it should be borne in mind that the rates are not applicable to the present but are a statement of what has occurred during the life-experience of inhabitants of these communities whose households were represented by one or more living members at the time of enumeration."

In the present study the life experience is broken down according to sex, age, calendar years bounding the life experience, and type of leprosy.

Leprosy in the Community: Earlier vs. Later Period

Records of 3,204 families, including 21,791 individuals were considered sufficiently complete for the present analysis. The total life experience of these individuals was 335,016 years. During these years there occurred 402 cases of leprosy — lepromatous,

neural and mixed — an annual attack rate of 1.2 per 1,000 person-years. Considering the lepromatous type only, there were 261 cases, yielding an attack rate of 0.78 per 1,000.

As a first approach to the problem, the period of observation was arbitrarily divided into years prior and years subsequent to January 1, 1915 (table 1).

TABLE 1: Incidence of leprosy per 1,000 person-years of life for residents of Cordova and Talisay, P. I., in two chronological periods, by sex.*

Chrono- logical period	Male		Female		Total	
	All forms	Leproma- tous only	All forms	Leproma- tous only	All forms	Leproma- tous only
Prior to Jan. 1, 1915	1.5(1.6)	1.2(1.3)	0.8(1.0)	0.7(0.8)	1.1(1.3)	0.9(1.1)
Subsequent to Jan. 1, 1915	1.6(1.7)	1.0(1.0)	0.8(0.8)	0.4(0.4)	1.2(1.3)	0.7(0.7)

*Rates adjusted for age differences are given in parentheses.

Although the figures for total leprosy which are shown in table 1 do not indicate any reduction, it should be pointed out that the later period is not comparable to the earlier because of the inclusion in the later period of milder forms of macular and neural leprosy discovered by the prevalence surveys of the 1930's which are the basis for these studies. This is clearly evident from the fact that for the earlier period 81 per cent of the total cases included were of the lepromatous type and for the later period only 59 per cent (Appendix, table A). Limiting the comparison to the lepromatous type, and after adjustment for age differences between the earlier and later population groups, there is evidence of a downward trend. The ratio of the rate in the earlier to that in the later period is for males, 1.3:1; for females, 2.0:1, and for both sexes, 1.6:1.

In a disease with a long incubation period such as leprosy, a comparison such as that made in table 1 is perhaps not entirely valid. The later life experience of many persons exposed during the first period, in the household or elsewhere, is included in the second period. The incidence of leprosy in the first period thus directly influences the rates of the second.

To obtain a more definitive comparison, it was decided to select two groups of individuals in such a manner that the life experience of the groups would be mutually exclusive and be limited to the same number of years. For the earlier period, individuals born between 1896 and 1910 were selected and their life experience was

included only to the year 1920. For the later period, those born between 1911 and 1925 were chosen and their life experience was included to 1935. Thus all individuals in both periods, except those residing in the community less than ten years, had a minimum period of ten years and a maximum of twenty-five years of life included in the life experience subjected to analysis.

There were found to be 4,739 individuals with satisfactory records who were born between 1896 and 1910. These had a total life experience to 1920 of 68,368 person-years, or an average of 14.4 years for each person.

Likewise, there were found 6,927 individuals who were born between 1911 and 1925. These had a total life experience to 1935 of 95,786 person-years, or an average of 13.8 years (table 2).

TABLE 2: Incidence of lepromatous leprosy per 1,000 person-years, by sex, among individuals born 1896-1910 and followed to 1920 compared with individuals born 1911-1925 and followed to 1935.

Sex	Born 1896-1910 Life experience terminated in 1920	Born 1911-1925 Life experience terminated in 1935
Male	1.80(1.59)	0.91(0.78)
Female	1.04(0.78)	0.40(0.31)
Total	1.42(1.18)	0.66(0.54)

The downward trend of lepromatous leprosy indicated in table 1 is shown more strikingly when these limited groups and periods of observation are studied. After adjustments for age differences, the ratio of the rate in the first period to that in the second is, for males, 2.0:1; for females, 2.4:1, and for both sexes, 2.2:1.

Leprosy in the Household: Earlier vs. Later Period

The next question that arose was whether this downward trend occurred in leprous households as distinguished from the total population. The basic material for the study of the trend in leprous households was that used for the derivation of the figures given in table 2.

The material of table 2 was divided into three parts: First, the life experience of those individuals who had a history of household exposure to leprosy, only those persons for whom household exposure to lepromatous leprosy could be established being regarded as having such a history; second, the life experience of those individuals with no history of exposure, and third, the life experience of

those exposed in the household to cases of neural or unknown type. This last life experience was discarded.

The question is further complicated by the prolonged incubation period of leprosy and further restrictions had to be placed on the life experience which was classed as subjected to household exposure. This experience was split as before into two groups so as to constitute an earlier series including only years of life of persons born between 1896 and 1910 and a later series including only years of life of those born between 1911 and 1925. The length of observation, namely to 1920 and to 1935 respectively, was the same as in the previous analysis. But, for the first group, the only exposures to leprosy which were counted were those which occurred between 1896 and 1915; and, for the second group, only those which occurred between 1911 and 1930. Thus, the only exposures included in either period relate to individuals who had had a period of five years or more between exposure in the household and termination of observation in which to develop the disease.

TABLE 3: *Incidence of lepromatous leprosy per 1,000 person-years for individuals with history of household exposure to lepromatous leprosy as compared with that for individuals not exposed to leprosy in the household, by sex, for two chronological periods.*

History of exposure	Born 1896-1910 Experience terminated in 1920			Born 1911-1925 Experience terminated in 1935		
	Male	Female	Total	Male	Female	Total
Household exposure	17.5(12.8)	12.9(9.5)	15.4(11.3)	8.0(6.3)	4.1(3.0)	6.1(4.7)
No household exposure	0.85(0.80)	0.49(0.46)	0.67(0.63)	0.45(0.43)	0.20(0.19)	0.33(0.32)

Comparing the rates of the two periods again by the ratio of the rate in the earlier period to that in the later, it is seen that for the exposed group the ratio is for males, 2.0:1; for females, 3.2:1, and for both sexes, 2.4:1; whereas, in the non-exposed group the comparable ratio is for males, 1.8:1; for females, 2.4:1, and for both sexes, 2.0:1. These facts would indicate a definite reduction in the incidence of lepromatous leprosy and that this reduction was perhaps somewhat more marked in leprous households than among persons in the community who had not been subjected to household contact with the disease.

SUMMARY

The records of Cordova and Talisay, Cebu, Philippine Islands, which have been the basis of several previous studies, have been utilized to illustrate the value of the historical method (as opposed to prolonged observation) in determining trend. A modified life table method of analysis was used.

When the total experience of both communities was divided into years of life lived prior to and subsequent to January 1, 1915, and the study was limited also to the incidence of *lepromatous* leprosy only, it was found that there was evidence of a downward trend. The ratio of the incidence rate for the earlier to that for the later period was found to be, for males, 1.3 to 1 and, for females, 2.0 to 1.

Since in this comparison the later life experience of many persons exposed in the first period was included in the second, two groups of individuals were selected in such a manner that the life experiences of the groups were mutually exclusive. For the earlier period individuals born between 1896 and 1910 were selected and their life experience was included only to the year 1920. For the later period those born between 1911 and 1925 were chosen and their experience was included up to the year 1935. Thus, no individual in the first group was included in the second. Also all individuals, except those residing in the community less than ten years, had a minimum period of ten years of observation between entrance and termination of observation and none had more than twenty-five years of life experience.

The downward trend of *lepromatous* leprosy was more strikingly evident in this second comparison than in the first. The ratio of the incidence rate for the earlier period to that for the later is for males, 2.0 to 1, and for females, 2.4 to 1.

Evidently incidence had declined in the communities taken as a whole. The next question that arose was whether this downward trend could be detected in the experience of those who were known to have lived in the same household as a person with leprosy. Comparison was again made between the experience of those born between 1896 and 1910 and those born between 1911 and 1925. Only those who were known to have been living in household association with *lepromatous* leprosy were considered as exposed and their experience was contrasted with that of those for whom no history of exposure to any type of leprosy could be ascertained. To make allowance for the incubation period, exposures only to 1915 for the first group and only to 1930 for the second were counted. The

reduction in the exposed group was found to be perhaps somewhat greater than in those not known to have been exposed. The ratio of the incidence rate in the early period to that in the later was found to be, for the exposed group, 2.4 to 1, and for the non-exposed, 2.0 to 1.

Compulsory segregation was introduced in the Philippines in 1907. Any influence on incidence which this administrative procedure might have had would be expected to be evident at least from 1915. The lower rates observed are thus in accord with the view that segregation may have been a factor. This may be strengthened slightly by the fact that in leprosy families the rate declined as much or more than in the remainder of the population. The results, however, should not be thus interpreted. The whole experience is relatively small and should be confirmed by more extensive studies. Also, there were other environmental changes which took place during the periods studied. Chief among these was a general improvement in the economic status of the population and, consequent to this, a rise in the standard of living. The purpose of this paper is not to explain the decrease in incidence which has been demonstrated but rather only to illustrate that under favorable circumstances, the historical method can be of great usefulness in determining the trend of leprosy.

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APPENDIX: TABLE A. *Person-years of life experience in various age groups for males and females, together with the cases of all forms of leprosy and of lepromatous leprosy developing in the group in two chronological periods.*

Age in years	Period prior to Jan. 1, 1915						Period subsequent to Jan. 1, 1915					
	Person- years of risk		Cases of Leprosy				Person- years of risk		Cases of Leprosy			
			All forms		Lepromatous				All forms		Lepromatous	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
0-4	12691	12304	0	0	0	0	24161	23054	2	0	0	0
5-9	7329	7128	18	6	17	4	19167	18389	23	18	11	4
10-14	4391	4213	12	14	12	12	15686	15144	63	34	47	20
15-19	3222	4067	6	10	5	9	11839	12098	41	17	26	10
20-29	8462	9651	20	4	14	2	17938	20048	33	15	24	5
30-39	6221	6033	8	2	5	2	14032	14816	14	6	10	6
40-49	2623	2287	3	1	2	1	9804	10219	10	6	5	3
50 plus	909	771	1	1	1	1	8145	8176	7	7	3	0
Total	45848	46454	68	38	56	31	120772	121944	193	103	126	48

APPENDIX: TABLE B. *Person-years of life experience in various age groups for males and females, together with the cases of lepromatous leprosy developing in each group in two limited chronological periods.**

Age in years	Born 1896-1910, experience terminated in 1920				Born 1911-1925, experience terminated in 1935			
	Person-years of risk		Cases		Person-years of risk		Cases	
	Male	Female	Male	Female	Male	Female	Male	Female
0-4	10,554	10,650	0	0	15,445	15,263	0	0
5-9	9,739	9,970	24	6	13,859	13,733	12	3
10-14	7,847	8,095	26	22	10,821	10,793	27	11
15-19	4,268	4,268	9	8	5,986	6,236	4	5
20-24	1,484	1,493	2	0	1,755	1,895	1	0
Total	33,892	34,476	61	36	47,866	47,920	44	19

*For this tabulation, the experience of all individuals born within the specified dates was included, regardless of whether their family record was considered sufficiently complete for inclusion in the basic analysis.

