

STATISTIC REPORTS ON LEPROSY IN ESTONIA

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Estonia is a republic which became independent after the Great War. It is situated on the coast of the Baltic Sea, and its territory, 47,558 square kilometers, consists of the Estonian and half of the Livonian provinces formerly belonging to the Russian Empire. The population is 1,126,413, according to a census taken in 1934. The cultural level is rather high, nearly the same as in the better known Scandinavian States. It is an agricultural country; industry is only developing. Fishing as a livelihood is practised only on a narrow coastal strip and on the islands that belong to the republic.

HISTORICAL

Leprosy is known to have existed in Estonia in olden times, and the first written records of it date from 1237. During the 13th and 14th centuries the disease was indigenous, but towards the end of the 15th century it diminished and some authors assume that the endemic came to an end. Presumably the cases had decreased so much in number that no more attention was paid them, for which reason we have no records of leprosy in the present Estonian territory between 1394 and 1825. Early in the 19th century it seems to have reappeared, and cases of it occurred quite frequently. Kuppfer (8), who was leprosy inspector for 20 years in Northern Estonia, assumes that the infection was brought here in the war times by Russian soldiers, and especially by Cossacks. In the second half of the 19th century the disease spread to such a degree that leprosaria were established in which the patients are isolated and where they receive medical care. In 1901 systematic study of the spread of leprosy was begun by the leprosy inspectors, who were appointed on the same basis as in Norway. The work of these inspectors continued with success until 1922, when their duties were placed upon the sanitary physicians. Thereafter the examination of the families and of the household contacts of patients became less intensive. In 1902 systematic investigation revealed a total of 558 cases in the country (Erasmus 2, Kuppfer

7); in 1926 there had remained 236 cases (Paldrock 11) and in 1937 only 158, which shows a continual decline. The real number of cases may exceed the given one, for during the last decades compulsory isolation has not been accompanied by a satisfactory control of the leprosy foci, and some cases may remain undetected.

There are in this country four leprosaria for the isolation of patients. Muuli, established in 1891, with 14 patients, is near the University of Tartu and is used for study purposes. The more interesting cases from the other leprosaria are sent there, so that its patients are not from a definite territorial area. Audaku, with 33 patients, was founded in 1904 on the island of Saaremaa (Oesel); the patients there belong almost without exception to the people of the island. Tarvastu, with 56 patients, established in 1900, is in the southern part of the republic, and here too the patients come chiefly from that part of the country. For a long time Audaku and Tarvastu were asylums, but in 1924 they were transformed to settlements of the hospital type. The fourth leprosarium, Kuuda, with 55 cases, was founded in 1896; its patients come from the northern parts of the country. The settlement has been administered by a resident physician and has been of the hospital type from the beginning.

The records of this institution, which cover a period of forty years (1896-1936), furnish most of the statistic data on which the present article is based. For the cases elsewhere in the country we have been able to obtain information only of the sex of the patients and the type of the disease. Our records of Kuuda are taken in part from the reports of the settlement during the period mentioned (Parmakson 13). Some data were kindly placed at our disposal by the Statistics Bureau of the State, and by the directors of the leprosaria. Our data differ in several respects from those of other countries, which fact justifies the present article.

TYPE

The classification of leprosy used in Estonia is that recommended by Dehio (1), who distinguished two main forms of leprosy: *lepra tuberosa* and *lepra maculo-anaesthetica*, with clinical variations as follows: (1) *lepra tuberosa*, (2) *lepra tubero-anaesthetica* (mixta), (3) *lepra maculosa*, (4) *lepra maculo-anaesthetica* and (5) *lepra anaesthetica*. This nomenclature has often been applied in diagnosis of cases of leprosy, but it does not prove entirely satisfactory when comparing the reports of different authors. Instead of this classification we have used the one

suggested by the Manila Conference, which has been introduced into many countries. In doing so we have carefully controlled all cases at Kuuda with the clinical records, so that in this respect we hope to have avoided inaccuracy. As regards cases elsewhere in the country, some unimportant mistakes may have occurred. On the whole we recorded lepra tuberosa and lepra tubero-anaesthetica as of the C type, and lepra maculo-anaesthetica and lepra anaesthetica as of the N type. Some cases of lepra maculosa have been of the C type, but the majority had to be recorded as N.

In Table 1 is shown the distribution of type in 1902 and 1937. In the country as a whole the C type is prevalent, and during the last 35 years it has increased while the N type decreased accordingly.

TABLE 1.—*Sex and type of leprosy in Estonia.*

Territorial areas	1902 ^a			1937		
	Number of cases	Type ratio C : N	Sex ratio M : F	Number of cases	Type ratio C : N	Sex ratio M : F
Estonia in total	558	1:0.90	1:1.19	158	1:0.64	1:1.92
North Estonia	103	1:1.02	1:1.40	55	1:0.34	1:1.90
Saaremaa (Oesel)	109	1:0.64	1:1.59	33	1:0.74	1:3.10
South Estonia	346	1:1.00	1:1.06	56	1:1.15	1:1.33
Leprosarium Muuli	—	—	—	14	1:0.40	1:3.66

^a Erasmus (2), Kupffer (7)

To analyze more completely this change of type ratio more detailed accounts were collected from three territorial areas, North Estonia, the island of Saaremaa, and South Estonia. In the period referred to there has been a relative increase of N cases in Saaremaa and South Estonia, while in North Estonia the opposite change has taken place. The data for Muuli have not been taken into consideration, because the patients there are from various territorial areas.

It is thus seen that in limited territorial areas in Estonia the types of the disease vary and are changing in opposite directions. Examining this change in more detail in the reports of Kuuda, it was seen on comparing ten-year periods that there was a continuous relative increase of the C type. It is evident that its great preponderance in 1937 is not accidental. From the two other areas (Saaremaa and South Estonia) we have no accurate intermediate figures, but Kõrge (6) states that in Saaremaa during the last ten years the proportion of neural leprosy has been increasing. At the same time the laws pertaining to the isolation and control of leprosy have been the same throughout the country, and the social conditions have not differed enough to have had any influence on

the character of the disease. Talvik (18) attributes the increased proportion of neural leprosy to a more complete leprosy control, which discovers all the slightest cases. But that seems improbable because conditions were alike in all areas, and skillful leprosy inspectors have worked there for many years. The only really important difference seems to be in the manner and the extent to which the disease is affecting the various areas. It seems to have some connection with the question discussed.

The largest focus is in Saaremaa. The disease is not equally spread all over the island, the majority of cases coming from the little peninsula Sõrve and the adjoining narrow eastern coastal zone. In this limited part of the island the degree of infection was nearly the same at the beginning of the present century as in tropical leprosy countries. Communication between different parts of the island is not very active and therefore the disease has not spread to other parts of it, where only single cases occur. Almost the same condition exists in the south of Estonia near Lake Vitrsjärv in the parish Tarvastu, an old focus with frequent cases. In the north, from where come the patients of Kuuda, there was in the last century a focus in the district Harjumaa (near Tallinn); its spread has been less here than in other areas. This focus was eradicated comparatively soon, but it left single little new foci in many parishes. Foci of the same kind also arise all over North Estonia from other reasons, as for instance when the disease was introduced by workmen coming from Saaremaa (Kupffer 6). Those new little introduced foci have given rise to most of the cases in this area. As the social conditions are rather good, the disease does not spread and the cases remain single. So it is that the cases in Saaremaa and South Estonia originate chiefly from old leprosy foci, while in North Estonia they are mostly from new ones.

Many authors (Glück 3, Talvik 1 among others) are of the opinion that in severely infected old leprosy foci the proportion of neural leprosy increases. We might say that our data confirm this view.

With regard to tuberculoid leprosy, we may assume that it occurs comparatively rarely in Estonia, according to known data. At present we have in the Kuuda leprosarium two histologically diagnosed cases of this kind; in the records of Muuli only one has been recognized, and in the article of Pooman (14) concerning the treatment of leprosy one case is mentioned. We have recorded this form as of the N type. It is possible that it occurs more

frequently than is known, but as yet not much attention has been paid to it and histological examinations of skin lesions have been few. The cases in the Kuuda leprosarium will be reported in more detail in another article.

SEX

In Estonia leprosy is more frequent in women than in men. This preponderance of females was pointed out even in the earliest reports. According to Talvik, of 69 cases treated in the hospital of Saaremaa from 1828 to 1878, 28 were male and 41 female (1:1.46). The reports of an accurate leprosy census made in 1902 show a ratio of 1:1.19 (Erasmus, Kupffer 8); in 1926 the ratio was 1:1.59 (Paldrock), and in 1937 it was 1:1.92. Examining this ratio territorially (Table 1), the same preponderance of females is seen in all areas. Our figures prove fairly conclusively that the preponderance of females has been constant. During the last 35 years it has been increasing, and examining the reports of Kuuda by decades we see that this increase has been continual. It is noticeable that while the proportion of cases among females increases, all territorial areas of Estonia show a marked decline in total incidence. Since it is generally agreed that leprosy is more frequent in males than in females in almost all leprosy infested countries, this reversal of the relative sex incidence makes it necessary to analyze this question more closely.

Data similar in some respects to those of Estonia have been published about Norway. According to Sand (16), among the 1,978 cases treated in the hospital Reitgårdets Pleiestiftelse between 1861 and 1900 the relative sex incidence was 1.8 males to 1 female. These figures do not include all cases in the country and may therefore be inaccurate, but they at least show that during that period there was no preponderance of females in Norway. Later data, however, show an increased proportion of women. Lowe (10), who has thoroughly studied the sex incidence of leprosy, says that in 1910 there were 0.7 males to 1 female (in 323 cases); and in 1930, 0.5 males to 1 female (in 69 cases). It therefore appears that in Norway, as in Estonia, with a marked decline in total incidence the sex incidence has changed, with an increase in the proportion of females. Lowe tries to explain this change on the grounds of greater longevity of women, more of them remaining as the total incidence declines. He supposes that similar conditions may exist in Estonia.

To ascertain the probability of this supposition we have

tabulated the cases existing in Estonia in 1937 according to sex and age, comparing the sex ratio of each age group with that of the corresponding group of the general population (Table 2). The figures prove that Lowe's explanation cannot be applied in Estonia. He states that in Norway two-thirds of cases are over sixty years of age, whereas in Estonia patients of that age form only one-third (35.6 percent) of the total. On the other hand the more advanced age groups of our cases show no such marked predominance of women as in Norway. There is also a difference between Norway and Estonia in the ratio of newly admitted patients. In Norway there has been always a slight preponderance of men, whilst in Estonia of the 130 new cases reported during the last ten years 53 were males and 77 females (1:1.45).

TABLE 2.—Sex incidence of patients in Estonia in 1937, by age groups.

Age groups	Males		Females		Total		Ratio, males to females	
	Number	Percent	Number	Percent	Number	Percent	Cases of leprosy	General population
0-9	—	—	—	—	—	—	—	1:0.97
10-19	1	1.8	—	—	1	0.6	1:0.00	1:0.99
20-29	6	11.1	7	6.7	13	8.2	1:1.16	1:0.99
30-39	12	22.2	19	18.3	31	19.6	1:1.58	1:1.15
40-49	7	13.0	18	17.3	25	16.0	1:2.57	1:1.25
50-59	11	20.4	21	20.2	32	20.2	1:1.91	1:1.26
60-69	11	20.4	27	26.0	38	24.0	1:2.45	1:1.40
70-79	5	9.3	11	10.6	16	10.1	1:2.20	1:1.61
80-89	1	1.8	1	0.9	2	1.3	1:1.00	1:1.80
TOTAL	54	100.0	104	100.0	158	100.0	1:1.92	1:1.13

It is to be seen from Table 2 that in the general population males are slightly in excess below 30 years, after which females predominate, considerably so in the advanced age groups. Among the lepers no such continual change is seen, the female rate exceeding the male greatly in all age groups from 40 to 80 years. It is obvious, therefore, that the preponderance of female patients in Estonia cannot be due to the predomination of women in the general population in those age groups in which the proportion of leprosy females is the greatest.

Lowe, like many other authors, is inclined to consider the difference of the sex incidence due to environmental factors. Sand found that the men in Norway, living a poor life as fishermen and spending much time outside their homes, are more exposed to infection than the women who live at home and can get the infection only from their families, and believes that this accounts for the greater incidence of leprosy among males during the second half of the last century. Regarding Saaremaa, Talvik states that men there often work outside their homes in towns and therefore

do not frequently meet diseased persons, while the women, living at home and nursing leprosy members of family, are more exposed to infection; this causes a predominance of the disease in women in that region. At the same time the conditions in Saaremaa and in the old leprosy foci on the coast of Norway are quite similar. We cannot apply the hypothesis of Talvik to all of Estonia because in other parts of the country are no such peculiarities. Nor can we accept his views concerning Saaremaa itself, for during the last seventeen years the conditions there have changed and are now almost the same as on the continent. Furthermore, leprosy patients who require nursing are isolated in leprosaria. Nevertheless, the number of female patients on the island exceeds that of males and has been increasing markedly.

Considering other environmental factors which sometimes are taken into account, we find it difficult to trace one that might have any importance in Estonia. Concerning work, nourishment, clothes and habits both sexes are under nearly the same conditions. Various authors mention as possible cause of the difference in the sex incidence the greater promiscuity of the more infected sex. In Estonia nothing of that kind has been noticed, and there are no reasons to assume that in this country one sex may be worse than another in this respect. Lowe has made comparison between the sex incidence of leprosy and that of tuberculosis, showing that the development of tuberculosis is dependent on environmental factors. He is of the opinion that the more frequent incidence of these two diseases in males may be due to similar environmental factors. But in Estonia there is no analogy between the sex incidence of these maladies. In 1923-1925, 304 males and 174 females (1:0.57) have died of tuberculosis in Estonia; and the number of new cases registered in the period 1921-1928 is 12,737, with a sex ratio of 1:0.81. Since the differences in sex incidence are opposite, it would be difficult to believe that they can be due to similar influences.

The data concerning sex incidence and type of leprosy have been investigated, and we have found that males have been more affected by the cutaneous form than women. In the Kuuda leprosarium, from 1896 to 1936, 73.4 percent of males and 62.7 percent of females had that type. In 1926 the figures for all of Estonia were 66.0 percent of males and 63.4 percent of females (Paldrock); in 1937 they are 63.0 percent of males and 59.6 percent of females. One might assume that the prevalence of cutaneous leprosy in males influences the proportion of sex incidence; that the more severe type of the disease and, in consequence, a greater

mortality among males causing the increased proportion of women. But this supposition cannot be applied to Estonia. According to the records of Kuuda the average duration of the disease is the same for both types. On the other hand, when we consider the proportion of type and sex in the territorial areas we find that in North Estonia, in spite of the considerable relative decrease of neural leprosy, the proportion of female patients has been constantly increasing, while in South Estonia the prevalence of females is insignificant in spite of the predominance of neural leprosy during many years (Table 1).

Of some countries it is supposed that the disproportion in sex incidences is only a seeming one, leprosy affecting both sexes equally but not all cases among women (or men) being detected. In Estonia that cannot be the case because leprosy control in the country has been most satisfactory, and even if we assume that in consequence of the relaxing of control in recent years some cases remain undetected, we have no reason to assume that the undetected cases would be males. The latter have more contact with other people and therefore have less chances of avoiding compulsory isolation.

All of the above-mentioned attempts to explain the great female majority in our leprosy cases have proved unsatisfactory.

ONSET AND AGE AT TIME OF ISOLATION

To examine this question we have had at our disposal only the data of the Kuuda leprosarium, and for comparison those of Saaremaa collected by Talvik. In Table 3 are given the ages in decades of the patients at the onset of the disease. In the figures of Kuuda the incidence increases to a maximum in the 30-39 year group and declines after that group. But it is noteworthy that no less than 30 percent of all patients were over 50 years old when the first signs of the disease appeared. These findings seem to be in disaccord with those of other countries. According to Rogers (15), who in a recent article discusses the question of onset of leprosy in various countries, a large proportion of patients develop the disease in first decades of life. He states that in 72.5 to 92.0 percent of cases the onset occurred under 30 years, while in our given data the corresponding number is only 32.5 percent. Spindler (17) has pointed out this striking difference and tried to explain it. He adopted the view that a hereditary predisposition is required in order for infection to take place. In countries where leprosy

is widespread and the hygienic circumstances bad, persons with such a predisposition are exposed and infected in their childhood. In later years there remain few persons who have this predisposition and who have not become diseased. In Estonia, where the incidence of leprosy is comparatively low and the hygienic circumstances rather good, there are still persons of every age who are predisposed and therefore can be infected when there is a chance.

TABLE 3.—*Age at onset of the disease, Kuuda leprosarium and Saaremaa.*

Age groups	Kuuda leprosarium 1896-1935				Saaremaa 1903-1920			
					All cases		Cases from Sõrve	
	C	N	Total	Percent	Number	Percent	Number	Percent
0-9	10	10	20	4.4	9	4.1	8	6.5
10-19	41	13	54	11.9	44	20.1	32	26.2
20-29	52	17	69	15.2	37	16.8	27	22.1
30-39	71	25	96	21.1	32	14.7	15	12.3
40-49	49	30	79	17.4	41	18.7	17	14.1
50-59	45	19	64	14.0	40	18.3	13	10.7
60-69	33	21	54	11.9	14	6.4	8	6.5
70-79	6	11	17	3.7	2	0.9	2	1.6
80 and over	—	2	2	0.4	—	—	—	—
TOTAL	307	148	455	100.0	219	100.0	122	100.0

Adopting the view of Spindler, we could assume that in those parts of Estonia where leprosy is widespread the incidences of infection in the earlier years would be relatively high. To examine this supposition we will analyze the data of our largest focus, the Sõrve peninsula. These figures are available in Talvik's work and are given in Table 3. He found that the proportion of patients infected before their thirtieth year was comparatively high—41.0 percent. In the cases from the Sõrve peninsula we find it to be 54.8 percent. So it is seen that in this region where the leprosy rate is high the infection takes place earlier than elsewhere. This accounts for the higher percentages of early incidences in Talvik's reports, compared with ours in North Estonia where there are no such great foci of the disease as in Saaremaa. The comparison of the data under consideration confirms in some degree the supposition of Spindler concerning the difference of age at the onset of the disease in Estonia and in other countries.

It is generally acknowledged that children and young people are especially susceptible to the disease and that in advanced age the danger of infection is slight. It is supposed that the infection takes place in early childhood, the signs of the disease appearing at the juvenile age. But in Kuuda records there are 67.5 percent of

cases in which the infection occurred after 30 years, so that supposition cannot be accepted here. One has to assume that, at least in Estonia, the acquisition of leprosy by infection in early childhood is not common. It seems that age does not represent a decisive factor in the susceptibility to leprosy.

Distributing the 455 patients of Kuuda in groups according to their age at the time of isolation, we see that the numbers are almost equal in every age group, except that under 20 and over 70 years they decline rapidly. The average age of onset of the disease was 37.1 years, and the average age at isolation was 45.9. On the average, therefore, each patient had the disease for 8.8 years when he was isolated.

DURATION OF THE DISEASE

With regard to the duration of leprosy we have data on 238 patients who died in the Kuuda leprosarium, 78 who were paroled as arrested and who have remained without relapse, and 46 who left the settlement for various other reasons. The time and causes of death of the latter outside the settlement have been ascertained by Kupffer.

In cases which have ended in death, the duration of the disease has averaged 15 years in both types of leprosy. Several workers have observed a shorter average duration. Hopkins and Denney (4) found it to be 14.2 years; Sand, 11.2 years, and Hurwitz and Anderson (5) 8.4 years. Considering that in Estonia persons of advanced age form the majority of cases, we could assume that the course of leprosy in this country is comparatively chronic.

The duration of the disease in paroled patients without relapse depends on its type. On the average the cases of neural leprosy were treated 6 years—81.8 percent of them under ten years, 18.2 percent longer than that. In the few paroled cases of the cutaneous type the average duration of treatment was 15.6 years; but one of them required a period of hospitalization longer than ten years.

CAUSES OF DEATH

In the 238 cases that died in the Kuuda leprosarium and in 46 others which had been observed by the leprosy inspector after they left the settlement, the causes of death were determined according to clinical signs without postmortem examination. This method may have caused inaccuracies of diagnosis, and because of the lack of reliability of our data we have considered in detail only those deaths which can be attributed to leprosy. From Table 4 it can

be seen that leprosy and complications directly depending on it was the cause of death in 48.6 percent, exhaustion from leprosy being responsible for the majority. Complications in the throat were fatal only in cases of cutaneous leprosy. Tracheotomy has not been practised. In recent years there has been no case of death caused by complications of throat, because intravenous injections of calcium gluconicum, made in proper time, have always removed the danger (Parmakson 12). Gangrene as the cause of death is most frequent in neural leprosy. Three patients died of leptotic meningitis, but this diagnosis was not proved anatomically. Deaths not directly attributable to leprosy or its effects comprised 51.4 percent of the total.

TABLE 4.—*Causes of death.*

Diagnosis	Type of case		Total	Percent
	C	N		
Leprosy				
(a) Cachexia leprosa	82	10	92	32.1
(b) Stenosis laringis chronica.	7	—	7	2.5
(c) Oedema glottidis	20	—	20	7.0
(d) Gangraena	7	9	16	6.0
(e) Meningitis leprosa	3	—	3	1.0
Other diseases	100	46	146	51.4
TOTAL	219	65	284	100.0

TREATMENT

We can give here only the experiences of treatment in the Kuuda leprosarium, using the data in the reports of forty years of activity of the settlement (Parmakson 13). Of the 455 cases which have been treated in the period 1896-1935, 88 or 19.3 percent, have been paroled as free from all signs of leprosy activity (Table 5). Before 1925 recovered patients could leave the settlement by authority of the director physician; since then a special leprosy commission passes on arrested cases ready for parole. The following up of paroled patients has been well organized, for the late director of the leprosarium, Dr. Kupffer, was at the same time leprosy inspector in North Estonia. In this control work it was found that of the 88 paroled patients 78 (88.6 percent) have remained without relapse; 10 patients (11.4 percent) have been readmitted. The duration of the control is given in more detail in Table 5. Most of the paroled cases had neural leprosy; relapses are more frequent in cutaneous leprosy. We must point out that the

time of the relapse is in the majority of cases more than 5 years after parole. It is obvious that a prolonged close observation of paroled patients is necessary.

TABLE 5.—Arrested cases discharged from the Kuuda leprosarium in the period from 1896 to 1935.

Type of leprosy	Number of treated cases	Number discharged ^a	Results of control								
			No signs of leprosy; duration of control in years					Relapsed; year of relapse after parole			
			0-1	2-5	6-10	+10	Total	1-5	6-10	+10	Total
C	307	18	—	—	5	7	12	—	5	1	6
N	148	70	16	15	20	15	66	2	2	—	4
TOTAL	455	88	16	15	25	22	78	2	7	1	10

^a The 88 cases discharged represent 19.3 percent of those treated; 78, or 17.1 percent, have not relapsed.

In the leprosarium much attention is paid to the general treatment, and definite efforts have been made to improve the conditions of life of the patients. They are encouraged to do housework, to occupy themselves with agricultural labor in the fields of the settlement, and they are paid for their work. They are allowed to walk freely in the extensive fields and forests of the settlement. The rules governing compulsory isolation make it possible to allow patients who are considered of relatively low infectiousness and danger to the community to leave the settlement from time to time for periods of from one to seven days. There is, therefore, no need for the patients to leave without permission. Frequently paroled patients are unwilling to leave the leprosarium.

For special leprosy treatment all of the important antileprosy remedies that have been proposed for this purpose during the last decades have been tried out. Special attention has been paid to chaulmoogra oil and its derivatives. It has been used variously since 1901, at first per os and in ointments, later by subcutaneous and intramuscular injection. Some years ago intravenous injections of chaulmoogra esters were introduced, and quite lately intradermal injections. When Prof. Paldrock published his method of treatment with carbon dioxide snow, it also was applied. At present it is used in combination with chaulmoogra treatment and is found to be most satisfactory. Formerly gold preparations were used much, but now they are mostly reserved for complications of eyes.

SUMMARY

We have brought forward data concerning the history and

present status of the leprosy campaign in Estonia, and have given the total number of patients.

Cutaneous leprosy is more frequent than neural leprosy, the proportion of which has decreased during the last thirty-five years. This decrease has not been in all territorial areas; where the cases originate from large old foci, the proportion of the neural type has been increasing, whereas it has been decreasing when they arise from small new foci or occur accidentally. Only a few cases of tuberculoid leprosy are known.

Leprosy has been much more common among women in Estonia than among men. During recent decades the proportion of female patients has been increasing continually. Together with this prevalence of the disease among females, we can see a marked decline in total incidence. We have no explanation for this sex incidence, which is quite the reverse of that of other countries.

The time of onset of the disease has been investigated on 455 cases of the Kuuda leprosarium. It has occurred in all ages, the highest frequency being in the 30-39 year group. For comparison there are given data from Saaremaa, where the disease begins at an earlier age. This earlier onset can be attributed to the fact that most cases in Saaremaa come from a limited and severely infected focus. It seems that age is not a decisive factor in the susceptibility to leprosy.

The patients have been isolated, on the average, 8.8 years after the onset of the disease.

The average duration of the disease has been 15 years in 284 cases in which the time of death has been determined.

Of the cases of death, only 48.6 percent can be attributed to leprosy.

Of 455 patients, 19.3 percent recovered under treatment; 11.4 percent of the latter have shown a relapse. In 80 percent of these cases the relapse occurred more than five years after leaving the settlement.

Much attention has been paid to general treatment, and all of the more important antileprosy remedies of recent decades have been tried.

REFERENCES

- (1) DEHIO, K. *Internat. Leprosy-Conferenz*, Bd. II, 128. Berlin, 1898.
- (2) ERASMUS, E. F. [Statistical Data of Lepers in the Livonian Province.] Riga, 1900. In Russian.
- (3) GLÜCK, L. *Leprosy* 5 (1904) 13.

- (4) HOPKINS, R. AND DENNEY, O. E. *Jour. American Med. Assoc.* **92** (1929) 191.
- (5) HURWITZ, E. AND ANDERSON, H. *American Jour. Trop. Med.* **16** (1936) 353.
- (6) KÕRGE, K. *Eesti Arst* **13** (1934) 668.
- (7) KUPFFER, A. *Verbreitung und Bekämpfung der Lepra in Estland. Monografia, St. Petersburg, 1903.*
- (8) KUPFFER, A. *Lepra* **14** (1913) 14.
- (9) KUPFFER, A. *Beitr. Arch. Schiffs- u. Tropenhyg.* **36** (1932) 145.
- (10) LOWE, J. *Internat. Jour. Lep.* **2** (1934) 57.
- (11) PALDROCK, A. *Eesti Arst* **11** (1928) 393.
- (12) PARMAKSON, P. *Dermatol. Wehnschr.* **102** (1936) 199.
- (13) PARMAKSON, P. *Eesti Arst* **16** (1937) 127.
- (14) POOMAN, A. *Arch. Schiffs- u. Trop.-Hyg.* **40** (1936) 465.
- (15) ROGERS, L. *Internat. Jour. Lep.* **4** (1936) 469.
- (16) SAND, A. *Lepra* **3** (1902) 7.
- (17) SPINDLER, A. *Internat. Jour. Lep.* **3** (1935) 265.
- (18) TALVIK, S. *Die Lepra im Kreise Oesel. Dissertation, Tartu, 1920.*