

# ACTA MEDICA SCANDINAVICA

SUPPLEMENTUM 316

## THE POLIOMYELITIS EPIDEMIC IN STOCKHOLM 1953

EPIDEMIOLOGICAL, CLINICAL  
AND LABORATORY INVESTIGATIONS

EDITED BY  
*JUSTUS STRÖM*

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STOCKHOLM 1956

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## FOREWORD

Scandinavia is one of the portions of our globe that is severely afflicted by polio. The disease is becoming increasingly common, it attacks the adult population to a growing degree and is assuming more severe forms. Its social repercussions have become of increasing importance.

The Danish epidemic of 1952 was on a wide scale, but the Swedish outbreaks in the following year were also very heavy; only the epidemic of 1911 to 1913 has taken greater tolls. But as regards the Swedish capital, Stockholm, the incomparably most serious visitation hitherto has been the epidemic of 1953.

Necessity is the mother of invention; and our Danish colleagues proved themselves masters of improvisation in the application of the modern methods for treating polio in its most acute forms. By the use of tracheotomy, bag ventilation and an intensive programme of physiotherapy, a very considerable measure of success was achieved in improving the results of treatment.

In Stockholm, too, we had been working for some years on modern methods of therapy and had devoted much attention to the development of new types of respirator for mechanical positive pressure ventilation. At the outbreak of the 1953 epidemic, therefore, we were already to some extent equipped, yet the situation was extremely critical on several occasions. We did nevertheless manage to muster sufficient numbers of respirators and, as time went on, of improved quality. A series of scientific studies was also instituted, some of the results of which have already been published, regarding the ventilatory and circulatory efficiency of the respirators.

This was the first severe epidemic which we have been able to meet with modern technical methods and in which we have been substantially able to provide the extremely high staff requirements that the new forms of treatment necessitate. The laboratory control has also been organized on modern principles.

This book gives an account of the various scientific investigations that have been conducted — epidemiological, virological, chemical, clinical, pathophysiological and pathoanatomical — and of the principles of our treatment and the results of our efforts, viewed from the perspective of a year later.

Grants for the scientific work has been made by the Swedish State Council for Medical Research, The Thule Insurance Company, and the Stockholm City Council. The Swedish National Polio Association and the Royal Medical Board have defrayed the translation and printing costs. I take this opportunity of expressing my hearty thanks for their assistance in our efforts.

Stockholm, January 1956

*Justus Ström*



THE POLIOMYELITIS EPIDEMIC IN STOCKHOLM 1953

## I. Epidemiological Survey

By

*Justus Ström*

The first occasion on which polio invaded Sweden's capital on an epidemic scale was in 1887, when there were 43 cases. It returned eight years later, but only 21 cases then occurred. These two epidemics were described by *Medin* in his papers from 1891 and 1896.

Scandinavia suffered its first severe epidemic in 1905, the Swedish share of which was described by *Wickman*. No less than 886 cases of paralysis occurred. Stockholm, however, was again let off lightly, with only 10 cases of paralysis.

Even during the violent attacks in Sweden from 1911 to 1913 with a total of 6,764 cases of paralysis, the number of cases in the capital was comparatively small. *Wernstedt* has given an exhaustive account of the epidemic in its clinical and epidemiological aspects alike. Among other factors he pointed to the higher incidence in country districts compared with towns, and the remarkable age distribution — since it was mainly children who were attacked in the towns. *Wernstedt* considered the explanation to be the greater immunity of adults due to earlier infection in the towns. Similar observations have since been made in several other countries.

The comparatively sharp rise in the number of cases of paralysis in Stockholm during the last decades provoked the question as to whether the circumstances had changed. For this reason I have made an analysis of the material at the Stockholm Hospital for Infectious Diseases from 1910 to 1953. All cases of poliomyelitis are treated at this hospital (the only exception being in 1911 when one ward of a children's hospital was used for 30 cases). All records have been perused to ensure that the material comprised only paralytic cases and only residents of Stockholm. Unfortunately the official statistics often include non-paralytic cases, which leads to very great uncertainty. As regards the whole country, moreover, all cases are included in the statistics. For certain periods, however, a division has been made, viz. in *Wernstedt's* account of the 1911—1913 epidemic, by *Olin-Heinertz* for the period 1925—1944, and from 1947 onwards by *Bergman* in the annual publications of the Swedish Medical Board.

From these sources I obtained figures of the cases of paralysis in the country during certain periods and compared them with my own figures from Stockholm.

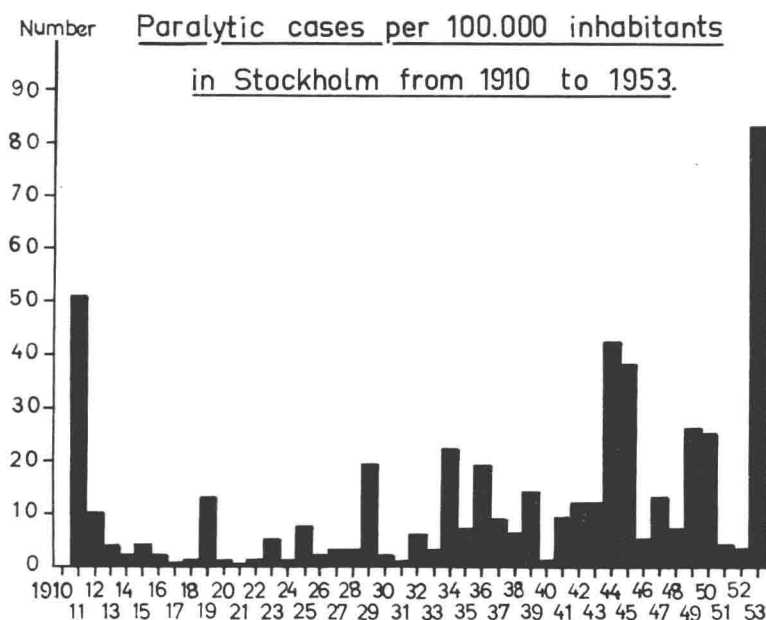


Fig. 1.

I also selected years in which there were epidemics in Sweden. A calculation has been made of the average number of cases per annum in these epidemic years, as also of the annual incidence per 100,000 inhabitants. The results are shown in Table 1. The figures of course do not distinguish between town and country, since towns are included under the heading "Rest of Sweden".

It is clear that a substantial change has taken place. From its earlier low rate in comparison with the rest of Sweden Stockholm drew level in the 1940s, and from then on took the lead. During the first decades of the century the rate in

*Table 1. Incidence of polio in Stockholm compared with rest of Sweden*

Year	Mean number cases per annum in		Mean number cases per 100,000 popul. and year		Ratio of Stockholm to rest of Sweden
	Stock-holm	Rest of Sweden	Stock-holm	Rest of Sweden	
1911—13	73	2,255	21	43	0.49
1936—38	60	1,590	11	28	0.40
1943—44	171	1,714	27	29	0.93
1947—50	127	1,055	18	17	1.06
1951—53	227	1,149	30	16	1.87

## Paralytic cases in Stockholm.

Average number per annum in five-year periods.

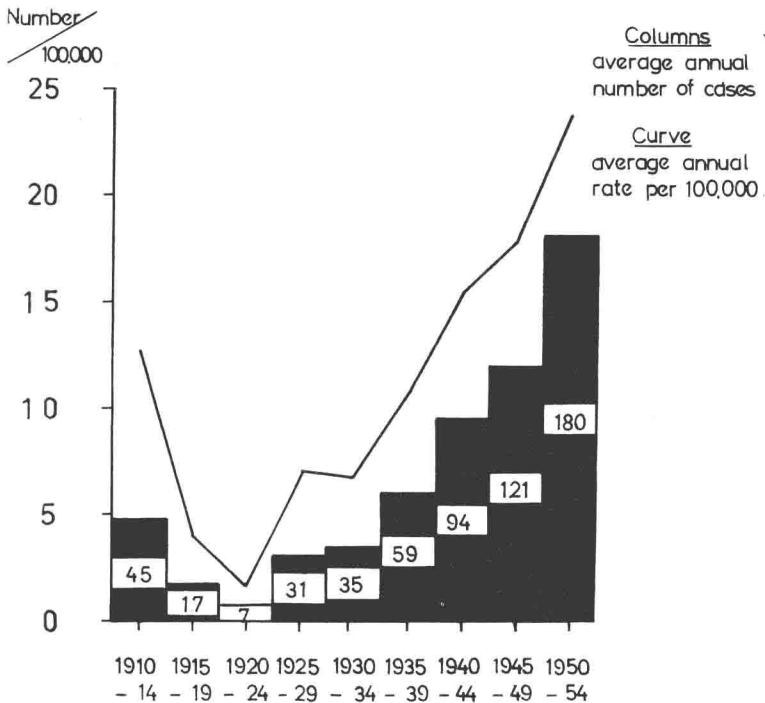


Fig. 2.

Stockholm was roughly half of that in the rest of the country, whereas the capital 1951—1953 had nearly twice as high a rate as the rest of the country.

The incidence of polio in Stockholm during the years 1910—1953 is further illustrated in Fig. 1, which shows the number of paralysed cases per 100,000 of population. The figure 51 was reached in 1911, but is far surpassed by the figure of 83 in the epidemic year 1953. Despite the great variations between different years, the picture is one of a steady rise of the disease among the population of Stockholm. The peaks become higher and higher, and the lapse of time between epidemics shorter and shorter.

In order to obtain a smoother curve, and thus a clearer picture of the rising rate of polio in Stockholm, I have made up the material into five-year periods from 1910—1914 to 1950—1954, and calculated the average number of cases per annum and the average annual rate per 100,000 of population during those periods. This is shown in Fig. 2. After a decline from the beginning of the 1910 to the beginning of the 1920 period, when the lowest figure of 7 cases per annum was recorded, a sharp rise took place during the following thirty years up to 180 per annum for 1950—1954. At the same time the figures per 100,000 inhabitants

# Paralytic cases during four epidemics in Stockholm.

## Sex and age.

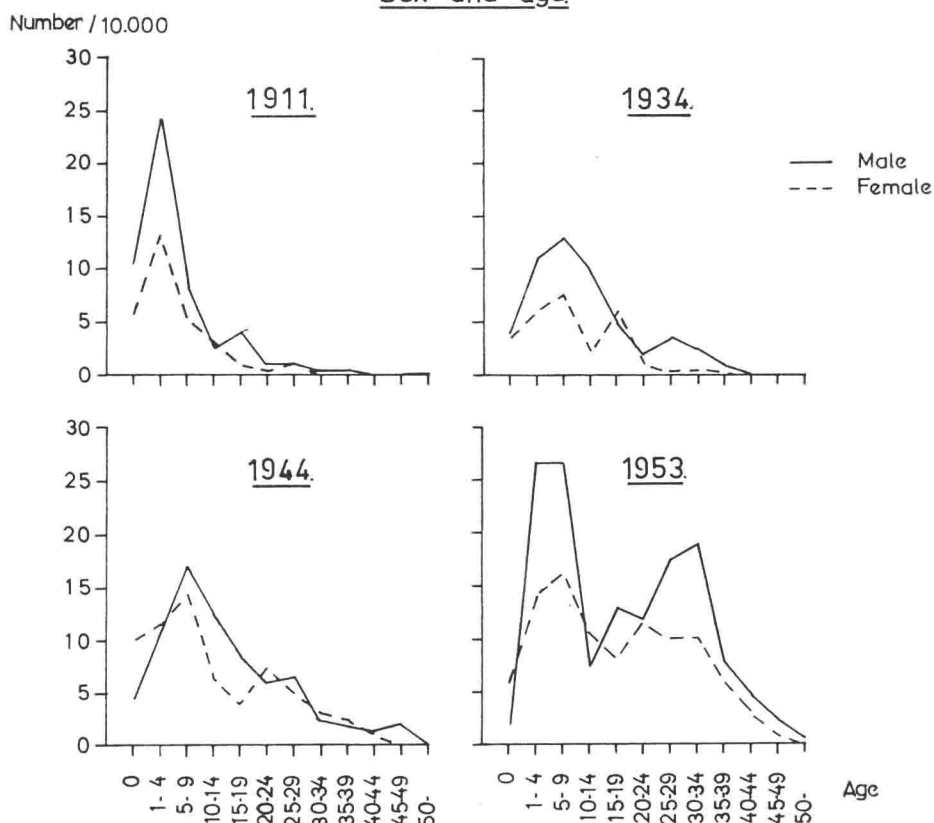


Fig. 3.

rose from 1.7 to 23.8. The number of cases per annum has thus risen nearly 26-fold (25.7) and the rate exactly 14-fold.

An analysis of the age and sex distribution has been made for four different epidemic years, as shown in Fig. 3. As regards *age* it is first seen that the incidence among infants has been fairly low throughout. The year 1911, moreover, still represents the primitive type which has been considered characteristic of thickly populated areas with poor hygiene and thus subject to rapid spread of infection. The great preponderance of cases was among children under five years of age. By 1934 a shift had occurred to the 5—9 age group, and the 10—14 group also showed a high incidence. In 1944 the incidence increased — in terms of actual figures as well as percentually — in the 20—24 and 25—29 age groups. In 1953 the incidence was, in the first place, very high at all ages. The 1—4 age group had again risen to the same level as the 5—9 group. The most remarkable feature, however, was the sharp rise in the ages 25—34 years. The intermediate ages on

the other hand were attacked to a lesser extent, which gives the curves a two-humped appearance. This was particularly marked as regards males.

The age distribution in 1953 compared with 1911 shows that the primitive type had now entirely receded in Stockholm and been replaced by the type associated with improved hygiene and sanitary conditions, with consequently lower immunity among the adult population, which is more liable to paralytic polio than children. The situation is beginning to resemble that previously prevailing in the country districts where the thinner population and rarer occasions of infection caused impaired immunity and thus an increased number of cases, particularly in older people. A comparison between the Stockholm age curve in 1953 and the findings of *Olin-Heinertz* in respect to country districts from 1925 to 1944 shows that the incidence of the disease among the elderly is even more pronounced in Stockholm. In 1911, out of all cases of polio in Stockholm 54 per cent were children under 5 years of age and 12 per cent adults above 20 years, while in 1953 the corresponding figures were 15 and 52 per cent.

*Table 2. Per cent distribution of cases by age groups*

Year	Age groups				
	0—9	10—19	20—29	30—39	40—
1911	73	15	9	2	1
1934	39	30	17	13	1
1944	35	17	29	14	5
1953	36	12	23	23	6

Table 2 shows the age distribution in 10-years age groups. Apart from the great change that has taken place since 1911, the obvious feature is the upward shift of the high incidence group by roughly 10 years age in each decade from 1934 onwards. It appears at the same time, however, as though the percentage of cases among the 0—9 age group had remained remarkably constant from 1934 to 1953. In this connection account must be taken of the considerable rise in nativity since 1934, so that the proportion of 0—9 year olds in the population has increased from 9.1 per cent in 1934 to 11.4 per cent in 1944 and 15.4 per cent in 1953. Had the proportion of children in this category been the same as in 1934, the figures would have been 28 per cent in 1944 and 22 per cent in 1953. Thus, in reality, there has been a *progressive decline of the infection index in the small child age*.

The *sex distribution* of the material is also remarkable. In 1911, as seen in Fig. 3, there was a definite preponderance of males, which is also noticeable in 1934 and to some extent, too, in 1944. But in 1953 the preponderance is again extremely striking. The curve has a strange two-humped shape, with the male predominance concentrated to the 1—9 and 25—34 age groups. The differences are here statistically established.

In this connection I would point out that the predominance of males applies equally to the non-paralytic cases, in the range 1 to 14 years. On the other hand



### Paralytic cases in Stockholm in 1953.

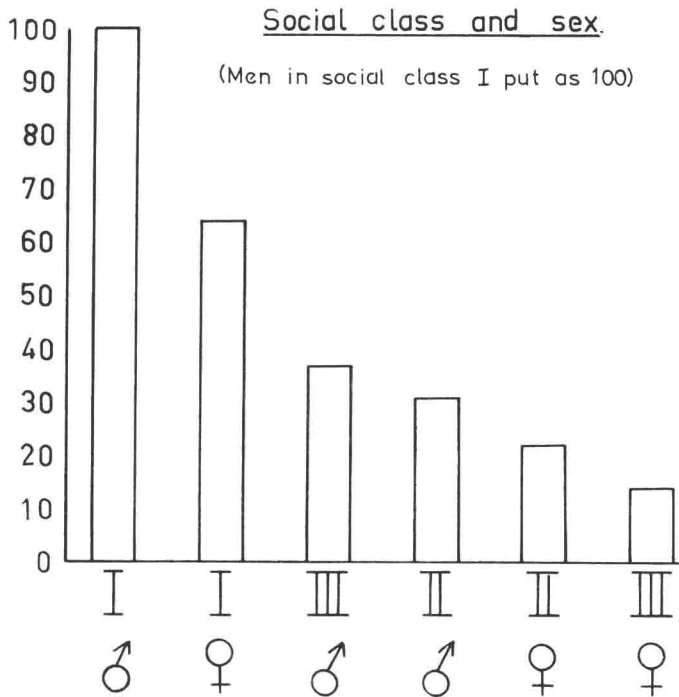


Fig. 4.

no predominance is found among adult males. Whether this circumstance is an expression of the high incidence of paralysis in polio infections among adult men is perhaps questionable. Another explanation is that men who are diagnosed merely as serous meningitis are not hospitalized to the same extent as boys.

I have also analysed the occurrence of polio in different social classes. Patients have been grouped in three classes, following the standards adopted in political elections. During the 1953 epidemic 299 cases occurred in the voting ages (21 years and above). Fig. 4 illustrates the *incidence by social class and sex*, men in the highest social class I being put as 100 (corresponding to 148.7 per 100,000). The figure shows in the first place that male cases predominate over female in all social classes. The difference between male and female cases is relatively greatest in class III. As regards male cases alone, the only unusual feature is their greater number in class III than in class II, possibly attributable to the harder manual labour in class III.

The difference between social classes and sexes can at least to some extent be explained as an expression of dissimilarity in immunity. In social class I there is the least risk of infection during childhood and adolescence. Women in all social classes would be expected to be much more liable to infection than men owing to their greater contact with children. It would be natural to expect that the greatest