

‘DO NOT EAT THOSE APPLES; THEY’VE BEEN ON THE GROUND!’: POLIO EPIDEMICS AND PREVENTIVE MEASURES, SWEDEN 1880S-1940S

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ABSTRACT

This article will address how Swedish scientists, physicians and public health officers tried to combat the polio epidemics in the pre-vaccine era. It shows that once polio was considered as an epidemic disease the preventive measures used were based on the hindrance of other infectious diseases. It also illustrates how epidemiological and laboratory studies to some degree affected the thoughts of how polio should be prevented, and that Swedish ideas and experiences differed from those put forward in the USA.

KEY WORDS: Polio epidemics. Sweden 20th century. Preventive measures.

**«NO OS COMÁIS ESAS MANZANAS; ¡HAN ESTADO EN EL SUELO!»: LA
EPIDEMIA DE POLIO Y LAS MEDIDAS PREVENTIVAS EN SUECIA, DESDE
LA DÉCADA DE 1880 HASTA LA DÉCADA DE 1940**

RESUMEN

Este artículo trata sobre cómo los científicos, médicos y funcionarios de la sanidad pública de Suecia intentaron combatir la epidemia de la polio en la era anterior a la vacuna y expone que en cuanto la polio fue considerada como una epidemia, las medidas preventivas que se aplicaron se basaban en las de otras enfermedades contagiosas. También ilustra en qué medida los estudios epidemiológicos y los análisis de laboratorio influyeron en la manera de prevenir la polio y también demuestra que las opiniones y experiencias en Suecia eran diferentes a las de los Estados Unidos.

PALABRAS CLAVE: Epidemia de polio. Suecia del siglo XX. Medidas preventivas.

The late summers and early autumns of the first half of the twentieth century was a time when piles of leaves and windfalls caused fear among Swedish parents that built up into loud words of warning; *Kids! Do not kick in the*

*leaves! Do not eat those apples; they've been on the ground!*¹ The reason for these alerts was that leaves and windfalls was linked to causing polio (or as it was labelled at the time; infantile paralysis) and children were the prime target for contracting the disease. That a polio infection could cause high fever, paralysis and sometimes even death was obvious to most people, but how to avoid being infected by the disease was long wrapped in obscurity. Before the introduction of the polio vaccine in the mid 1950s medical scientists and physicians had a difficult time understanding how the virus was transmitted, and consequently there was no clear-cut prevention to polio. Hence, the epidemics constituted a demanding challenge to medical science and public health institutions during the first five decades of the twentieth century.

This article will address how Swedish scientists, physicians and public health officers tried to combat the polio epidemics in the pre-vaccine era. The sources used for this study include contemporary journals of medical science, documents from the Royal Medical Board (Kungl. Medicinalstyrelsen), and different pamphlets concerning polio. In order to be able to understand the effect of polio epidemics in Sweden the first part of the article is devoted to describing the historical epidemiology of polio and relies heavily on the demographic records gathered by *Statistiska Centralbyrån* (Statistics Sweden) and the Royal Medical Board.

POLIO FROM ENDEMIC TO EPIDEMIC

Polio will forever be associated with one of the greatest successes in medical science —the polio vaccine. The first vaccine, the IPV, was developed by Jonas Salk and introduced in 1955. At the beginning of the 1960s the OPV vaccine was presented by Albert Sabin. Both these vaccines have been widely used and have helped in the efforts to eradicate polio from the world. Nevertheless, the history of polio reveals that the route to the vaccines was not a

¹ POLIOMINNEN, KU 13538, 13732, 13741, 13739, 13746, 13758, 13759, 13613, 13614, 13610, 13607, 13767, 13771, 13776, 13787, 13790, 13788, 13799, 13884, 13887, 13891, 13993, 13994, 13995, 14002, 14003, 14004, 14008. Archive of Nordiska Museet. In 1993 the Nordiska Museet together with The Swedish Association of Survivors of Traffic Accidents and Polio (RTP) asked Swedish polio survivors to send in letters to the museum, describing how polio came to affect themselves, their family and friends, and how it changed their lives. A total of 173 letters arrived at Nordiska Museet. The collection was named *Poliominnen*, and every letter has its own number.

straightforward path. When the first polio epidemics started to appear in Sweden at the late nineteenth and early twentieth century, epidemic diseases like smallpox, TB and measles had started to decline due to improved hygiene and sanitation, legislation, and vaccination. Polio epidemics, on the other hand, turned into an increasing problem. Polio transformed from an endemic, fairly unknown disease, to a fearful epidemic. Why?

It is argued that polio has accompanied humankind throughout history. Before the major improvements in hygiene and sanitary measures of the twentieth century, almost all children were exposed to the poliovirus during infancy. But owing to protection from maternal antibodies, infantile paralysis was rare even though polio was endemic. Thus, children acquired immunity against the disease through exposure at an early age. However, due to the major hygienic and sanitary improvements of the late nineteenth century, the transmission of the poliovirus was reduced. Hence, children were not exposed to the virus and did not gain immunity during infancy; these children remained susceptible to the poliovirus later in life. When a sufficiently large pool of older, unprotected individuals existed, epidemics could appear. Because improvements in hygiene and sanitation first took place in western countries polio is considered a disease caused by civilization.²

POLIO EPIDEMICS IN SWEDEN

The USA is today often considered as the country most severely hit and affected by epidemics of polio.³ There is no doubt that the USA was terribly affected by polio—the New York epidemic in 1916 struck 27.000 people—but there are also other circumstances that contribute to shaping polio epidemics as an American experience. Besides the numerous American polio victims and the ravaging epidemics; the Salk and Sabin vaccines were developed on the continent, and as historian David Oshinsky has put it «[i]t was Americas gift to the world;»⁴ they had the presence of the famous polio victim

² SMALLMAN-RAYNAYNOR, M.R. & CLIFF, A.D. (2006), *Poliomyelitis: A World Geography: Emergence to Eradication*, Oxford, Oxford University Press, p. 127.

³ ROGERS, N. (1992), *Dirt and Disease. Polio before FDR*, New Brunswick, Rutgers University Press, p. 10; OSHINSKY, D. (2005), *Polio. An American Story*, New York, Oxford University Press.

⁴ Oshinsky is referring to the good publicity and the positive effects of the Salk vaccine being developed in the USA, in the midst of the cold war and the fight against communism. OSHINSKY (2005), p. 215.

Franklin Delano Roosevelt; and created the world-renowned National Foundation for Infantile Paralysis (NFIP) and its March of Dimes. These and other events are manifested in the growing body of literature on experiences of polio in the USA, and contribute to the impression of polio being a peculiar American problem.⁵ Nevertheless, «statistically speaking», there are countries that suffered as much from the polio epidemics as the USA. Sweden is one of them, along with the other countries of the Scandinavian Peninsula. Especially Sweden had an early history of polio epidemics and during the 1911-1913 epidemic, 10.000 polio victims were reported in Sweden.⁶ Polio historian and virologist, Dr. John R. Paul addressed this epidemic in his monumental *A History of Poliomyelitis*:

The outbreak went far to strengthen the unsavoury and, I may say, unjust reputation that Scandinavia had already acquired, of being not only the original source of the disease but a continuing breeding place for large epidemics. This reputation was to endure from the 1880s on —for almost forty years.⁷

Even if the reputation may have ceased in the 1920s, Sweden continued to be struck by large epidemics until the introduction of the vaccine. The statistics in Figure 1, are dependent on how the countries handled the statistical reporting of polio. Nevertheless it is evident that Sweden, in relation to its small population, had a very high incidence rate, above both the USA and Canada.

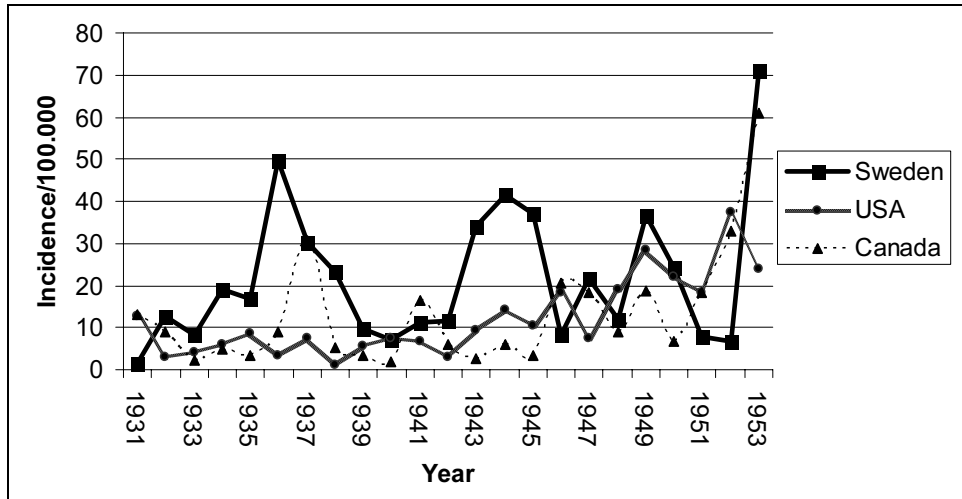
Swedish polio epidemics are said to have begun in 1881, when physician Nils August Bergenholtz diagnosed and reported the world's first epidemic of *poliomyelitis anterior acuta* in two small villages outside Umeå in the northern part of Sweden. The first account of an epidemic of *poliomyelitis anterior acuta* in Sweden was reported in the fall of 1881 by Nils August Bergenholtz (1816-1922) a provincial doctor in the province of Västerbotten. He reported that on August 10, eight persons had come down with the illness in the vicinity

⁵ For further discussions on the American experience of polio see for instance SHELL, M. (2005), *Polio and its Aftermath. The Paralysis of Culture*, Cambridge, Harvard University Press; SMITH, J.S. (1990), *Patenting the Sun. Polio and the Salk Vaccine*, New York, Anchor books; WILSON, D. (2005), *Living with Polio. The Epidemic and its Survivors*, Chicago and London, The University of Chicago Press; OSHINSKYY, D. (2005).

⁶ AXELSSON, P. (2004), *Höstens Spöke - De svenska polioepidemiernas historia*, Stockholm, Carlssons, (dissertation), chapter II.

⁷ PAUL, J.R. (1971), *A History of Poliomyelitis*, London and New Haven, Yale Studies in the History of Science and Medicine, p. 126.

FIGURE 1. POLIO INCIDENCE/ 100 000 IN SWEDEN, THE USA AND CANADA, 1931-1953



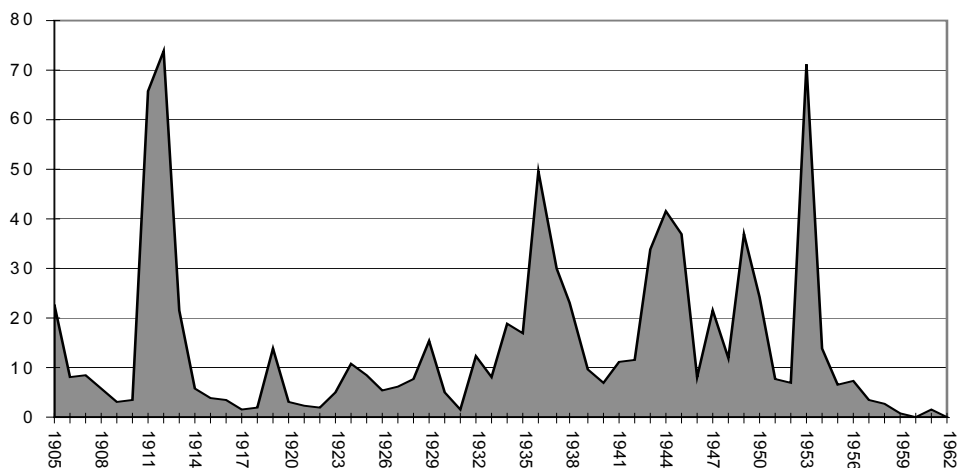
Sources: FREYCHE, M. & NIELSEN, J. (1955), Incidence of poliomyelitis since 1920. En *Poliomyelitis*, Geneva, World Health Organization Monograph series N° 26., p. 99.

of Sävar, about 30 km north of the city of Umeå. Six of them were young children, but the two others were 14 and 17. In addition, four cases had occurred in the iron manufacturing community of Hörnefors bruk, 30 km south of Umeå, and all were children. Bergenholtz also reported one case from the city of Umeå. He wrote, «I am of the opinion that the illness is Poliomyelitis anterior acuta and its appearance as an epidemic is because the same cause of disease has simultaneously affected several persons.»⁸ Sweden experienced several epidemics before the turn of the century. From 1905 Sweden, together with Norway, suffered a nationwide epidemic forcing physicians all over the country to send in reports on polio victims to the Royal Medical Board, something they have continued to do ever since. This leaves historians of today with

⁸ Unfortunately Bergenholtz's original reports nr 3696 and 4453 has not been returned to their original place in the Swedish National Archives (*Riksarkivet*), Stockholm. Bergenholtz' reports, however, were photographed and copied in their entirety and published in *Svenska Läkartidningen*. ANTONI, N. (1949), Barnförlamningen före 1905, *Svenska Läkartidningen*, 46, pp. 1181-1192; ANTONI, N. (1949), Det första bidraget till poliomyelitforskningen i Sverige. Ett meddelande från Kungl. Medicinalstyrelsen, *Svenska Läkartidningen*, 46, pp. 1193-1197.

good statistical material for understanding the demographic impact of the disease. Figure 2 displays the incidence rates of polio and shows that Sweden had no polio-free year during the pre-vaccine era. The disease has not been known first and foremost as a great killer, out of the 51.000 cases reported, between 1905-1962, there were 6.000 registered deaths.

FIGURE 2. POLIO INCIDENCE/ 100 000 SWEDEN, 1905-1962



Sources: Bidrag till Sveriges officiella statistik. serie: K1, A. 1905-1910. *Sveriges officiella statistik*. Serie: Folkmängden och dess förändringar: Befolkningsrörelsen. 1911-1962. *Sveriges officiella statistik*. Serie: Hälsa och sjukvården: Almän hälsa och sjukvård. 1911-1962.

The highest rates of incidence as well as mortality were reported in 1912. Case-fatality rates were between 15-20 percent until the 1930s when they started to decline partially because of the invention and use of the respirator⁹. More males than females died of polio but no suitable explanation has been put forward to explain this relationship. The material also shows that at the beginning of the 20th century polio primarily attacked children up to 10 years of age. At the end of the period polio found its victims in all age groups but mainly in the ages 15-39. Therefore, it can be assumed that Swedes born in the first decade of the 20th century always ran the risk of contracting polio.

⁹ AXELSSON (2004), p. 50.

IDEAS ABOUT POLIO EPIDEMICS

So how did Swedish authorities cope with the threat of polio epidemics? George Rosen wrote in his influential book on preventive medicine, «[u]nderstanding the nature of a disease and the casual elements involved in its occurrence can to a greater or lesser degree provide a basis for its prevention.»¹⁰ With Rosen's words in mind, to be able to give a satisfying answer to this question, it has been important to not only study arguments used in polio research but also the methods used by Swedish provincial physicians and public health officers in the period before the vaccine. Preventive methods changed over time and were based on how the medical authorities thought they best could fight back diseases in society. During the late nineteenth and early twentieth century, medical science became strongly affected by the establishment of bacteriology. It gave physicians and the public new ways to understand diseases. However, the change to a bacteriological view of disease did not take place over night. As late as 1911 some physicians in Sweden still argued that polio was a disease caused by miasma. The theory of miasma implied that disease was not caused by contagions but by putrefaction, i.e. «bad air» and should be combated with cleaner environments which often meant improved hygiene and sanitation.¹¹

During the 19th century discussions about the causes and prevention of diseases had mainly split physicians into two groups: miasmatics and contagionists. The advocates of the theory of contagion could not prove how diseases were transmitted but only that some influence increased in some way. However, as historian Margret Pelling points out, these two groups were not diametrically opposed and sometimes diseases were believed to have «miasmatic-contagious» explanations.¹² These theories had implications for how physi-

¹⁰ ROSEN, G. (1977), *Preventive medicine in the United States 1900-1975. Trends and interpretations*, New York, Prodist, Introduction.

¹¹ WENNERBERG, H. (1911), Ännu ett ord i poliomyelitfrågan, *Allmänna svenska läkartidningen*, 8 (48), p. 914; KLEFBERG, F. (1912), *Militärtjänst och barnförlamning*, Stockholm. Anne Hardy has pointed to the fact even though transmission of epidemic diseases could be explained by bacteriology from 1890 it was not before the turn of the century that the bacteriological perspective was implemented in the preventive measures in Britain. HARDY, A. (1993), *The Epidemic Streets*, Oxford, Clarendon Press, pp. 6-7. See also: ACKERKNECHT, E. (1948), Anticontagionism and 1867 between 1821, *Bulletin of the History of Medicine*, 22, pp. 562-593; HEAMAN, E.A. (1995), The Rise and Fall of Anticontagionism in France, *Canadian Bulletin of Medical History*, 12, pp. 3-25.

¹² PELLING, M. (2001), The meaning of contagion. Reproduction, medicine and metaphor. En BASHFORD, A. & HOOKER, C. (eds.), *Contagion. Historical and cultural studies*, London & New York, Routledge, pp.15-38.

cians and authorities tried to prevent epidemic diseases. If a disease was seen as contagious, quarantine and isolation of the sick was important. If it was perceived to be the result of putrefaction, preventive measures should be aimed at improving sanitation and hygiene. The hygiene movement in which many members were physicians, was a strong force in creating public health measures such as *Hälsovårdsstadgan* (1874) and *Epidemivårdsstadgan* (1875). These pieces of legislation attempted to improve the notification and control of disease. Due to polio's unconventional epidemiology it is important to study how researchers, physicians and medical authorities discussed the causes of the disease and how they acted to prevent it.

Sweden's early epidemics enabled Swedish medical science to become involved and the country early on acquired a leading role in international medical research on the disease. Karl-Oskar Medin, a pediatrician at the *Karolinska Institutet* in Stockholm, made the first scientific examination of an ongoing polio epidemic in 1887. Because Bergenholtz never published his findings from 1881, Medin became famous when he, at an international medical conference in Berlin in 1890, presented polio as an epidemic disease. Medin considered polio to be an acute infectious disease, affecting the nervous system, that could cause epidemics, but he did not consider it to be contagious.¹³ This may sound strange for us today, but it is possible to assume that Medin thought of polio as caused by miasmatic conditions. Medin presented no specific guidelines for how to prevent polio other than keeping healthy and sick people apart and some other very general comments based on advises for other infectious diseases.¹⁴

It was not until the first nation-wide epidemic in 1905 that the disease was established as a contagious epidemic infectious disease and submitted to *Hälsovårdsstadgan* and *Epidemivårdsstadgan*. Pediatrician Ivar Wickman carefully investigated and mapped the more than one thousand victims of the 1905 epidemic. He visited the homes of over 300 reported cases, and physicians throughout the country helped with information on the remaining victims. The epidemiological picture showed that polio cases often occurred miles apart, with no obvious connections. By mapping these cases of polio, Wickman concluded that polio was often spread by people who appeared to be healthy but nevertheless were affected by the disease. Wickman named

¹³ MEDIN, O. (1890), En epidemi af infantile paralyysi, *Hygiea*, bd 52, 9 (1890), pp. 657-668. See also: AXELSSON (2004), p. 73.

¹⁴ *Meddelanden från Kungliga Medicinalstyrelsen* [Messages from the Royal Medical Board], No 8 (1905), pp. 8-10. See also: AXELSSON (2004), pp. 116-117.

these «abortive cases» and added that polio was to be seen as an infectious epidemic disease. Wickman also established insights into the incubation period of polio. The course of a poliovirus infection is considered to have two main phases, a minor illness and a major illness phase. Wickman established that the time between contacts with an infected person and the development of clinical disease was three or four days (for minor illness) and eight to ten days (for major illness.) He became known worldwide for his conclusions and during the large epidemic of 1911-1913, Wickman's theory was largely accepted by medical science.¹⁵

The methods used to investigate polio's appearance were, until Karl Landsteiner and Erwin Popper's discovery of the filterable virus in 1908, mainly based on clinical observation and epidemiological mapping. From 1910 onwards, science turned to the laboratory, and monkeys were used to explore the characteristics of polio. Simon Flexner, the head of the Rockefeller Institute, became a central figure in polio research. He established a way of thinking, investigating and explaining polio, and introduced the concept of the «olfactory route». Flexner and his staff were early on sure that they would find the cure for polio. The Rockefeller Institute researchers saw the disease as caused by a virus that entered through the nose, traveled via the brain to the spinal cord, and left the body the same way it entered.¹⁶

Another way of thinking was established in Sweden during the epidemic of 1911-1913. Researchers Carl Kling, Wilhelm Wernstedt, and Alfred Pettersson at the State Medical Laboratory (SBL) suggested that the disease was an alimentary illness. Also using monkeys they discovered that the virus entered through the mouth, grew in the intestines, and left the body through the rectum, «the oral-fecal route». At a conference in Washington in 1912, the Swedish researchers presented their results but Flexner disregarded them. The American scientists could not repeat the Swedish tests and they discharged them as amateurish. The Swedish results were also overshadowed by American research on the biting stable fly as a likely animal for transmitting polio virus. Many years ahead, it would be discovered that the reason behind Flexner not being able to repeat the Swedish results was due to the use of different monkeys. The monkeys reacted differently when exposed to the virus. Earlier historical research has argued that Flexner's view on the epidemiology of polio dominated for a long time.¹⁷

¹⁵ SMALLMAN-RAYNOR & CLIFF (2006), pp. 95-102; AXELSSON (2004), pp. 78-80.

¹⁶ GRIMSHAW, M. (1995), Scientific Specialization and the Poliovirus Controversy in the Years before World War II, *Bulletin of the History of Medicine*, 69, pp. 44-65.

¹⁷ GRIMSHAW (1995), pp. 44-65; OSHINSKY (2005), pp. 124-127.

That may be true for the United States but research shows that in Sweden during the 1920s, Flexner's thoughts were mixed with those expressed at SBL. This is evident, as we later shall see, in the preventive measures taken against polio. For example, there were no preventive measures taken or discussed to stop poliovirus from entering through the nose. Instead the focus was on personal hygiene and whether the disease was transmitted directly (by contact) or indirectly. Moreover, after studies supported by l'Office International d'Hygiene Publique in Saxony, and in Romania, Carl Kling and Constantin Levidati put forward *l'hypothèse hydrique* in 1929.¹⁸ They used epidemiological studies to conclude that the majority of cases occurred close to watercourses. Kling, who at the time headed SBL, also used studies from Swedish epidemics in 1905 and 1911-1913 to state that polio must be seen as an alimentary illness. The theory did not gain general acceptance even among Swedish scientists, and as Margret Grimshaw has shown, Flexner's view on Poliovirus persisted until around 1940.¹⁹

In 1942, veteran polio expert Carl Kling, investigated the sewage systems in Stockholm. The impetus for his investigation was the findings of Trask and Paul of the Yale poliomyelitis research group in 1939. They had found traces of poliovirus in a sewage system and felt their study strongly supported the conception of polio as a disease of the alimentary tract. Kling wrote in the article that the gastro-intestinal theory «has now begun to be accepted also by leading experimenters in the USA.»²⁰

As we can see there have been different ways of understanding how polio was transmitted. The subsequent section will more closely focus on how these ideas of polio's transmission were implemented practically in Swedish preventive public health work.

PREVENTING POLIO IN THE PRE-VACCINE ERA

We do not know much of the efforts to prevent polio prior to 1905, when the disease became implemented into the *Hälsovårdsstadgan* and *Epidemivårdsstadgan*. At this point Medin wrote a specific guideline on how to

¹⁸ KLING, C. (1929), Recherches sur l'épidémiologie de la poliomyélite, *Svenska Läkarsällskapets Handlingar*, bd 59, pp. 23-48.

¹⁹ GRIMSHAW (1995), pp. 44-65.

²⁰ KLING, C., OLIN, G., FAHREUS, J. and NORLIN, G. (1942), Sewage as a carrier and disseminator of Poliomyelitis virus, *Acta Medica Scandinavica*, 112, pp. 218-263, p. 246.

deal with polio that was published by the Royal Medical Board. In the guideline it was stated that the public must keep themselves and their surroundings in the best hygienic condition to avoid being struck by polio. Adults should see to that they and their children were clean and that dirty hands never touched food. The premises should be very hygienic, household waste and slops should be taken to places where children could not reach them. If someone was struck with polio a doctor was to be summoned if the person showed symptoms of paralysis. He or she could be moved to another room where laxatives should be given.²¹ These advices do not differ from guidelines for other infectious diseases at the time.

During the first nationwide epidemic in 1905 it is obvious from the reports by provincial physicians that polio was only seen as an epidemic disease in counties that were severely stricken by the disease. Hygienic and sanitary measures and isolation of the sick was a rule in the five worst affected counties. In other counties no specific measures were taken.²²

By the great 1911-1913 epidemic, Ivar Wickmans theory of abortive cases was accepted by a majority of physicians in Sweden and elsewhere. By way of his extensive epidemiological investigations of the 1905 epidemic, regarding preventive measures, Wickman had emphasized that—in accordance with other epidemic infectious diseases—efforts to prevent polio should be directed to isolation of infected victims. Wickman pointed out that those abortive cases made it problematic but should, if possible, be isolated.²³ There were also instructions printed in Swedish medical journals on how to cope with epidemic diseases and polio, diphtheria, nerve-fever and scarlet fever, in particular. These read that persons infected by polio should be isolated and their homes and belongings should be cleaned. It was also added that people that felt and seemed healthy (abortive cases) but had visited places where the disease had occurred, had a duty to, live by alone for a longer period of time and pay attention to their personal hygiene.²⁴

²¹ *Meddelanden från kungliga medicinalstyrelsen*, No. 8 (1905), pp. 8-10.

²² This is based on evidence from reports that provincial physicians sent to the Royal Medical Board and available at the National Library of Sweden. During the 1905 epidemic, the five worst affected counties were Kronoberg, Skaraborg, Östergötland, Jönköping and Kalmar county. See also: AXELSSON (2004), p. 119.

²³ WICKMAN, I. (1906), *Om den s.k. akuta poliomyelitens uppträdande i Sverige 1905, Bilagor till Kungl. Medicinalstyrelsens berättelse för år 1905*, Stockholm. See also: AXELSSON (2004), pp. 78-84.

²⁴ WIRGIN, G. (1911), *Åtgärder vid smittosamma sjukdomar (Difteri, scharlakansfeber, barnförlamning och nervfeber, Hygienisk Tidskrift*, 4, pp. 295-314.

In the records of provincial physicians it is evident that districts handled abortive cases differently. A quote from a provincial physician referring to the 1911 epidemic in the northern part of the country read:

In general [infected persons were taken] to epidemic hospitals for a variety of time, 3-to 6 weeks —but the abortive cases, they have been handled differently; in some places they have zealously worked to isolate even these, and in other places they have been left alone; very likely it has been practically impossible to carry out isolation.²⁵

In another county the responsible physician was worried and thoughtful regarding the preventive measures of polio. He wrote that polio seemed to behave differently than other infectious diseases. Normally, he would have been able to, sooner or later, reveal the source of the infection and that other epidemics stopped when using the guidelines of the *Epidemivårdstadgan*. He also added that the populace had been so terrified of polio that they had, more carefully than ever, lived by the law and not only demanded that all sick should go to the hospital; they had refused to interact with people from places that had been affected by polio.²⁶ In other words we can conclude that the preventive measures regarding polio were based on guidelines made for other infectious diseases, and that they may have had little effect on the spread of polio. There were also reports sent to the Royal Medical Board that told of schools being closed, theatres shut down and that larger gatherings, like markets or funerals had been banned. Further, there are also some reports that speak of the good effect of the preventive measures, but they were not many.²⁷

In 1917 pediatrician Wilhelm Wernstedt published the results of a vast study of the 1911-1913 epidemic. He concluded that it had been very difficult to fight back the polio epidemic. It was not only time consuming, but also economically demanding to try and track down abortive cases of the disease.

²⁵ EDBERG, E. (1912), Om följderna af barnförlamningsepidemin i Norrland 1911, *Allmänna svenska läkartidningen*, 9, p. 7. [Offprint, available at the Royal Library, Stockholm].

²⁶ Förste Provincialläkarens Årsberättelse, Älvsborgs Län 1911, bilaga 1, National Library of Sweden. See also: AXELSSON (2004), pp. 93-94.

²⁷ Förste Provincialläkarens Årsberättelse Jämtlands Län 1911, p. 73; Förste Provincialläkarens Årsberättelse för Västmanlands län 1912, p. 18; Förste Provincialläkarens Årsberättelse Uppsala län 1912, p. 17; Förste Provincialläkarens Årsberättelse Västernorrlands län 1911; Förste Provincialläkarens Årsberättelse Kamar län 1911; Förste Provincialläkarens Årsberättelse Stockholms län 1911; Förste Provincialläkarens Årsberättelse Älvsborgs län 1911, National Library of Sweden. See also: AXELSSON (2004), pp. 120-128.

Wernstedt argued that once polio had started to spread to several places there were no use in performing preventive measures «that interrupted too much in the social and economic life of the society.»²⁸

Although Sweden reported polio cases and small local epidemics every year, after the 1911-1913 epidemic, there were no bigger epidemics until the 1930s. By that time Flexner's ideas were widespread internationally. In the USA, especially during the 1916 epidemic, preventive measures such as quarantine and isolation of victims were used. Historian Naomi Rogers has shown that, in the US during the 1920s, those responsible for medical care primarily associated polio with filth and immigrants and were opposed to quarantine measures²⁹. The major epidemic caused distrust among people and certain immigrant groups, mostly. Italians were blamed for being the cause of the epidemic³⁰. Pointing fingers at different ethnic groups had no effect in the long run, neither in the USA nor in Sweden. There is a note on Norwegian woodsmen as carriers of the disease into the county of Jämtland in 1911, but the ethnic origin can not be said to have caused any concern among physicians or the public in the pre-vaccine era.

In North America discussions on preventive measures were soon narrowed down to finding a vaccine and to find a way to stop the virus from entering the body. There were several tests carried out with serum, but after some years of optimism the serum seemed not to be the solution for the polio epidemics³¹. In addition there are numerous writings on the vaccine trail of Kolmer and Brodie in the mid 1930s, however they will not be further explored in this article. More interesting is the research on how to prevent the virus from entering the nose. Canadian historian Christopher Rutty writes that in the mid 1930s close to 150 different nose-sprays were tested on mice and monkeys. In 1935 in Alabama, USA, there were tests on humans. The results were difficult to interpret because there was no control group. In Ontario, Canada, in 1937, 5.000 children were «sprayed» (and they had a control group) in a trial followed closely by the Canadian press and radio. This trial showed clearly that the spray was ineffective and even gave rise to unwanted side-effects as many children lost their sense of smell and taste.³² There are

²⁸ WERNSTEDT, W. (1917), *Kliniska och epidemiologiska studier över den andra stora barnförlammningsepidemien i Sverige (1911-1913)*, Stockholm, p. 1258.

²⁹ ROGERS (1992), p. 29.

³⁰ SHELL (2005), p. 32, p. 212.

³¹ PAUL (1971), p. 197.

³² RUTTY, C. (unpublished doctoral thesis), *Do Something!... Do Anything. Poliomyelitis in Canada, 1927-1962*, University of Toronto, pp. 106-112.

also records from Australia describing how special nose-clips were designed and handed out in the community of Kew.³³

What we cannot see, in the case of Sweden, is that physicians tried to find ways to incorporate the ideas of Flexner and his olfactory route. In Sweden in the 1930s, no nose sprays were tested or evaluated. In the mid 1920s tests with were serum done in Sweden as well but at the start of the 1930s the discussions on the effects of serum became more discouraging. Instead physicians continued with the earlier known measures for infectious disease, but with the slight difference that they showed an increased interest in thorough investigations of creeks, wells and water systems when polio cases had occurred. There were special forms that were sent out in order to investigate the role of water for the spreading of the virus. The idea behind investigating water was of course encouraged by Carl Kling's and Constantins Levidati's *l'hypothèse hydrique*. It is clear that Swedish physicians, in all parts of the country throughout the 1930s, focused particularly on water and food as possible sources of infection. Reports from physicians provide a complex picture of the epidemiology of polio. Some district physicians denied having seen any correlation between water, food and victims of polio, while others confirmed such a correlation to a certain extent. Particular interest was paid to how people got their drinking water, thus to whether or not they had wells.³⁴ In certain places they chlorinated the water as a preventive measure.³⁵ During a polio epidemic outbreak in 1936, several provincial physicians expressed skepticism towards the preventive measures. One physician wrote that it seemed as research on polio on the whole was in a stage of searching without a proper system.³⁶ A physician in Western Sweden wrote in his report that he did not follow the *Epidemistadgan*. He claimed that it would be no use to isolate the sick or the healthy, to close down schools or forbid events as it not hindered the contagion but rather «contributed to fright the public and create panic».³⁷ Nevertheless, the majority of reports sent in by physicians from

³³ SMITH, B. (1990), The Victorian poliomyelitis epidemic 1937-1938. En CALDWELL J. et al. (eds.), *What we know about Helath Transition: Cultural social and behavioural determinants of health*, Canberra, Australian National University, pp. 868, 874.

³⁴ *Förste Provincial läkares årsberättelser, Göteborg-Bohus län 1936*, pp. 56-61. National Archives, *Nordisk Medicin*, 10 (1935), pp. 1456-1458.

³⁵ Medicinalstyrelsens arkiv, Hälsovårdsbyrån, E IIIb:1 Anmälningar om fall av barnförlamningar 1929-1945. National Archives.

³⁶ SÖDERBERG, B. (1938), *Om ett intressant urinfynd vid poliomyelit*, Allingsås, 4.

³⁷ *Förste Provincial läkares årsberättelser, Göteborg-Bohus län 1936*, p. 58. National Archives.

1920-1945 tend to have a rather analogous pattern. First and foremost the polio cases were taken to a hospital for epidemic diseases, sometimes family members were isolated and their households were disinfected. These methods, which focused on preventing the spread of polio, had been used since the implementation of the *Epidemistadgan*. Even after the introduction of the vaccine they continued to be of importance to prevent further spread of virus once polio cases had occurred.

CONCLUDING REMARKS

Support for Flexner dissolved around 1940 when John. R Paul and others used bacteriological and epidemiological studies to confirm the theory of the oral-fecal route. That it took more than a quarter of a century for this theory to be accepted was according to Kling because «one of the foremost poliomyelitis investigators, Simon Flexner, ever since the beginning of the experimental studies on infantile paralysis, has so one-sidedly maintained the role of the nasal mucosa as the portal entry of the infection, and that he has obtained so many adepts both in his own country and elsewhere».³⁸ As late as 1947, less than ten years before the introduction of the vaccine, the father of virology in Sweden, Sven Gard at the *Karolinska Institutet* wrote that the knowledge of the epidemiology of polio still was too uncertain to allow more concrete advice on prevention than general remarks of hygiene and sanitation.³⁹ The uncertainty among medical scientists was obvious among the public as well. Letters from polio victims state that personal and domestic hygiene was important to fight back polio, but because polio epidemics were most common in the autumn the seasonal pattern was attributed to decaying leaves and the consumption of rotten or unripe fruits.⁴⁰ The message was that to steer clear of polio these things should be avoided.

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³⁸ KLING (1942), p. 263.

³⁹ GARD, S. (1947), Barnförslamningens patogener och profylax, *Nordisk Medicin*, 34, p. 1399.

⁴⁰ AXELSSON (2004), p. 141. See also footnote 1 for details.