Children of occupied Warsaw 1939 – 1945

Jacek Rudnicki

Contens

Preface

Jacek Rudnicki

War is part of human history. It seems that they are the result of human genetic determination. This phylogenetic determinant can enhance the ontogenetic one and *vice versa*. Children adopt life without critical analysis but suffer. Young people are more critical.

How did the children of Warsaw perceive war? Did parents sense the anxiety? How to respond to the bombing, shelling of cannons, and firearms? Were they hungry? Were they sick or injured? My Dad came into the bomb crater and broke his thigh. To this day, has a scar on his thigh after surgery. He lost his parents at the age of fifteen during the Warsaw Uprising. As it turned out, his dad, an insurgent in Warsaw interned by the Germans in a camp in Sachsenhausen, near

Lübeck, and when he fell ill was placed in a hospital where he died in Neustadt. He was buried on the area of the hospital garden. Information was maintained in the Red Cross, and after years he could visit the grave of his father. The war made him an orphan. Warsaw was destroyed, and a house on ul. Miodowa was the reason he joined the Polish Army, having overstated his age. He served in the Engineer Battalion 2 Division II as a minesweeper. He was still a child, *"Son of the Regiment"*. After the war, she took her two-year-younger sister from the Mazovia countryside Bikówek family, and boarded the train, heading to Szczecin. There was live and work. These events have an impact on his psyche in a way that he feels like he has become an adult immediately.

They were less fortunate children of the Warsaw Ghetto. Shielding their children remained unconscious, and people like Dr. Janusz Korczak. There is a picture in which the children move in the direction of their tragic destiny, unaware of it, yet they laugh and jump. Korczak knows it, but his anxious face is facing away from the children. Not all children of the ghetto in this series go; earlier, some died due to hunger in the center of rich cultural traditions, also in Europe.

The war also resulted in accidental implications as that resulting from the *"play at war"*. He took part in it, Krzysztof Trzcinski. He saw the word "Komęda". Later took the nickname as a musician Komeda. War remembered well, sometimes it can be heard in his compositions. In

this work, I omitted the mental effects of war.They are beautifully described and illustrated in the book "War in the eyes of the child", National Publishing Agency 1983 Iwanicka K., M. Dubas (Eds.), The Warsaw Uprising of 1944. I did not write about injuries because I did not find comprehensive data on the subject.

This work is a historical analysis based on archival sources and relationships of participants. In addition to the knowledge of those times can be a contribution to the shaping of political views for those who caused the war, lead and participate in them. Will there be an effective warning? I doubt that some time will pass before people realize that they are much better and more interesting matters than war.

The initiator of this work was prof. Tadeusz Brzezinski my mentor and friend, for whom not only I miss.

Non-infectious diseases

Physical development of children

The biological development of man, as well as its genetic and environmental determinants and stimulators remain the object of research and observations in the field of development anthropology and developmental medicine. In 1903, Paul Godin, a physician and anthropologist, introduced the concept of developmental age as a measure of biological maturity of the organism and an object of interest of auxology, which studies the variability of individual and population norms of biological development, its controlling laws, and modulatory effects of the environment less evident during peacetime and potent during wars. Auxologic diagnostics is a tool for anthropologists and physicians to monitor and study the developmental dynamics of traits during ontogenesis of an individual in relation to the environment, i.e. dietary habits, diseases, and conditions of living. All these factors exert an influence on development, sexual dimorphism, and constitutional differentiation of the human body.

The weight and length at birth depend on genetic factors (male neonates are usually heavier and larger), and on environmental factors which affect the health and nutrition of the population. Wars usually have a negative effect on living conditions: children and other weakest layers of the society are the first to suffer. The children of Warsaw were chosen for this study in recognition of the fact that the capital of Poland was the

scene for the most dramatic developments of the war, among them the defense of the city in September 1939, the tragedy of the Ghetto, and the Warsaw Uprising. This large city was particularly exposed to the scarcity of provisions. In spite of the devastation, we could find fragmentary statistical data from the Nazi occupation and relatively complete data from pre-war times. Data collected from archives and publications were first subjected by us to a critical analysis and were next used to reconstruct the situation during the war. Our findings were confronted with data from the prewar period and the first years after the war. We attempted to achieve a factual reconstruction whenever data were lacking. The time frame of the present study does not coincide with the time of the war and ends with the Warsaw Uprising after which data ceased to be collected due to the immense destruction of the city.

Wars, occupations, and economic crises are associated with lack of food and deterioration in living conditions. The trend toward greater height and weight of the population comes to a halt or reverses downwards as exemplified by the falling birthweight during the occupation in comparison to peacetime, although there was no change in the duration of pregnancy. Dr. T. Kopeć working at the Charles and Mary Hospital in Warsaw during the First World War noticed that metric data of children visiting the hospital's clinic were markedly reduced in relation to pre-war values. Infants were relatively least affected probably because breast-feeding protected them from dietary deficiencies: their weights and heights were normal. The content of nutrients in human milk is best suited to the developmental needs of the child and moreover, milk contains antibodies, complement system proteins, and cells like macrophages and B and T lymphocytes participating in immune resistance of the neonate. After six months of life, however, the mother's milk is no longer sufficient and children begin to starve. It is a known fact that the status of the immune system is a sensitive indicator of the quality of nutrition. Moreover, diseases and living conditions exert an impact on metabolic processes and modify the turnover of dietary components. As a result, the weight of children at the age of one year and 2–3 years was reduced by 20 % and 33 %, respectively. Children were seen weighing just 5 kg at the age of 3-4 years. Cachexia was so severe that only half of three-year-old children were able to walk and every third child at the age of five years did not walk due to weakness. Disorders appearing during infancy may persist for years particularly when the diet after the deficiency period is not sufficient for compensatory growth.

Malnutrition was accompanied by famine edema observed by Dr. T. Kopeć in 13 % and by severe rickets in 44 % of children visiting his clinic. The Second World War was no exception as to consequences. The spread of hunger during the siege of Leningrad which increasingly affected pregnant women pushed the rate of prematurity from the pre-war 8.7 % to 29.6 % and decreased the weight of neonates by 600 g. During this year of 1942, the length of neonates decreased by 2 cm. The weight and length of neonates in Leningrad returned to pre-war values in 1944 – 1945, i.e. after the blockade. In Warsaw, prematurity increased from the pre-war 7.7 % to 10.6 % during the occupation. Malnutrition among pregnant women was reflected by birthweight: neonates were lighter by approximately 0.11 kg.
We present the weight and height of children aged 0–2 years by comparing measurements of R. Barański in 1938 with those of T. Chrapowicki after 1940. The values reported by these authors are comparable as measurements were done in children of the same age residing in the city center. Tables 1, 2, 3, and 4 show differences in weight and height to the disadvantage of occupation-time children; the weight at birth was lower by 200 g in boys and by 240 g in girls during the occupation (Tab. 1). Somewhat different birthweights were given by T. Chrapowicki for 1939 and for post-1940. Here, the difference was 130 g for boys and 110 g for girls: lower weights were noted after 1940 (Tab. 2). The difference increased with age. The height of boys and girls aged 0–2 years found by both authors did not change significantly during the war. It can thus be concluded that malnutrition primarily affected weight and to a lesser extent height. Nevertheless, the difference in height to the disadvantage of occupation-time children is a fact. In the case of 0–2 year-old children, there was a decrease in their weight and height during the occupation.

Figure 1. Weight of 0 – 2 year-old children in Warsaw in 1938 and 1940.

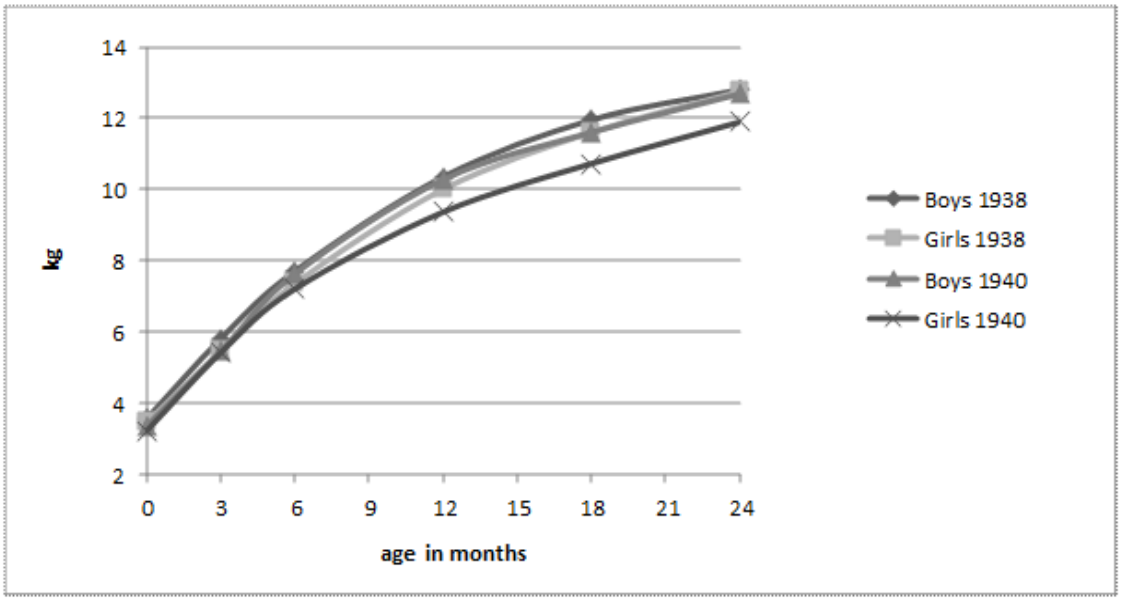


Table 1. Weight of 0 – 2 year-old children in Warsaw in 1938 and 1940.

Age (months)	1938		1940	
	Boys	Girls	Boys	Girls
0	3.55	3.45	3.35	3.21
1	4.10	4.00		
2	5.00	4.65		
3	5.80	5.45	5.45	5.41
4	6.50	6.15		
5	7.15	6.75		
6	7.70	7.35	7.62	7.20
7	8.20	7.95		
8	8.70	8.45		
9	9.20	8.90		
10	9.60	9.30		
11	10.00	9.65		
12	10.35	10.00	10.27	9.63
13	10.65	10.30		

14	10.95	10.60		
15	11.25	10.85		
16	11.50	11.10		
17	11.75	11.35		
18	11.95	11.60	11.60	10.72
19	12.15	11.85		
20	12.30	12.10		
21	12.45	12.30		
22	12.60	12.45		
23	12.70	12.60		
24	12.80	12.75	12.63	11.89

Figure 2. Weight of 0–2 year-old children in Warsaw until 1939 and after 1940.

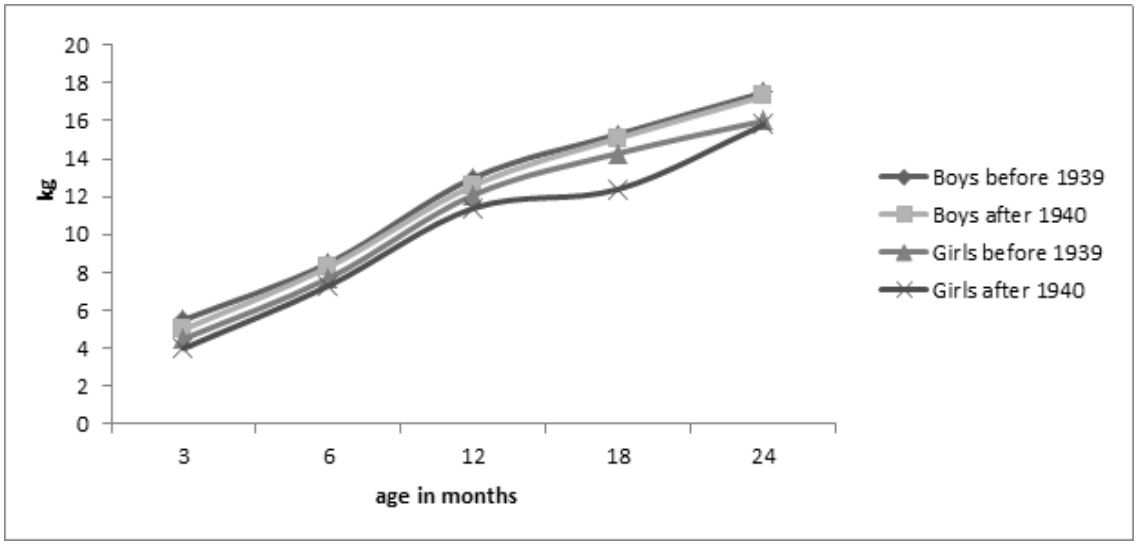


Table 2. Weight of 0 – 2 year-old children in Warsaw until 1939 and after 1940

Gender	Age (months)	Weight (kg; mean ± SE)

		Pre-1939	Post-1940
M	At birth	3.47 ± 0.03	3.35 ± 0.02
	3	5.92 ± 0.05	5.74 ± 0.04
	6	7.88 ± 0.06	7.67 ± 0.05
	12	10.42 ± 0.10	10.27 ± 0.08
	18	11.63 ± 0.15	11.6 ± 0.15
	24	12.9 ± 0.18	12.68 ± 0.16
F	At birth	3.32 ± 0.03	3.21 ± 0.02
	3	5.53 ± 0.04	5.41 ± 0.04
	6	7.46 ± 0.06	7.20 ± 0.05
	12	9.85 ± 0.11	9.63 ± 0.08
	18	11.0 ± 0.17	10.72 ± 0.11
	24	12.20 ± 0.20	11.89 ± 0.14

Figure 3. Height of 0 – 2 year-old children in Warsaw in 1938 and 1940.

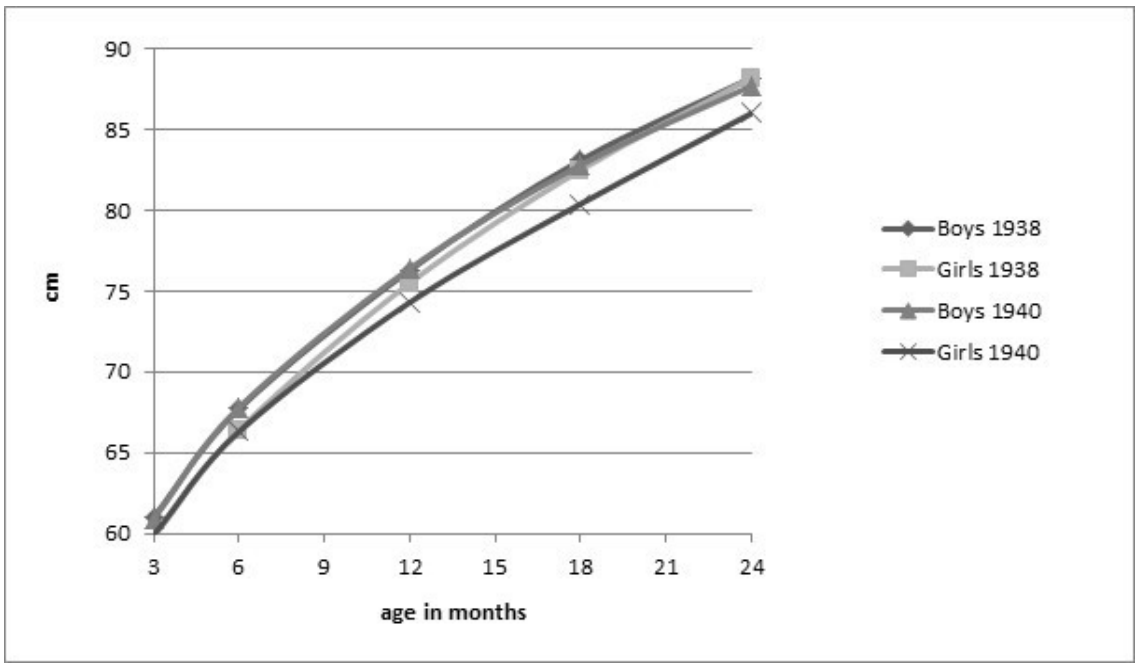


Table 3. Height of 0 – 2 year-old children in Warsaw in 1938 and 1940.

Age (months)	1938		1 140	
	Boys	Girls	Boys	Girls
1	54.7	54.2		
2	58.2	57.0		
3	61.0	59.8	60.9	59.9
4	63.6	62.4		
5	65.8	64.5		
6	67.7	66.4	67.8	66.3
7	69.4	68.2		
8	70.9	69.7		
9	72.4	71.2		
10	73.7	72.7		
11	75.0	74.1		
12	76.3	75.5	76.1	74.3
13	77.6	76.7		
14	78.8	77.9		
15	79.9	79.1		
16	81.0	80.3		
17	82.1	81.4		
18	83.1	82.5	82.8	80.4
19	84.1	83.6		
20	85.0	84.6		
21	85.9	85.6		
22	86.7	86.6		

23	87.5	87.4		
24	88.2	88.2	87.7	86.0

Table 4. Height of 0 – 2 year-old children in Warsaw until 1939 and after 1940.

Gender	Age (months)	Height (cm; mean ± SE)	
		Pre-1939	Post-1940
M	At birth		
	3	61.1 ± 0.2	60.9 ± 0.1
	6	67.9 ± 0.2	67.8 ± 0.2
	12	76.2 ± 0.2	76.1 ± 0.2
	18	82.4 ± 0.4	82.6 ± 0.4
	24	87.6 ± 0.4	87.7± 0.4
F	At birth		
	3	59.9 ± 0.2	59.9 ± 0.1
	6	66.9 ± 0.2	66.3 ± 0.1
	12	74.9 ± 0.2	74.3 ± 0.2
	18	80.6 ± 0.4	80.4 ± 0.3
	24	86.6 ± 0.4	86.0 ± 0.4

Data on the weight and height of school-age children before the war (1938), during Nazi occupation (1943), and after the war (1958) were compared. The study of R. Barański based on the records of the Mother and Child Clinical Care Station in 1938 was done in completely healthy children. All children with doubts as to their state of health were excluded, as were children with syphilis, tuberculosis, inborn defects, mental retardation, dystrophy, obesity, hematologic disease, recurrent infections

of the upper airways, rickets, and prematurity. Physical development of children aged 0–2 years recorded at the Mother and Child Clinical Care Station. Ped. Pol. 1938, 18, 63). These inclusion criteria resembled those used in the study of schoolchildren in 1943 when children with physical disabilities, thyroid diseases, and grave sequellae of rickets were excluded. The criteria in these and other studies, although not identical, served to exclude sick children whose weight and height could deviate from normal. The criterion of age may be questioned. Full years were always recorded but months were sometimes omitted causing errors in interpretation. In spite of these doubts, these are the only sources of data which were available for our comparative analysis.

The decrease in weight and height of children during four years from 1938 to 1943 reveals inferior dietary and living conditions of children in Warsaw. Weight diminished by 2 – 3 kg and height by 3 – 4 cm in all age groups. This finding may be attributed to the deteriorating quality of life during the Nazi occupation. Significant shortages of food, poor living conditions, and stress could have contributed to this situation.

Figure 4. Weight of boys in Warsaw in 1938, 1943, and 1958.

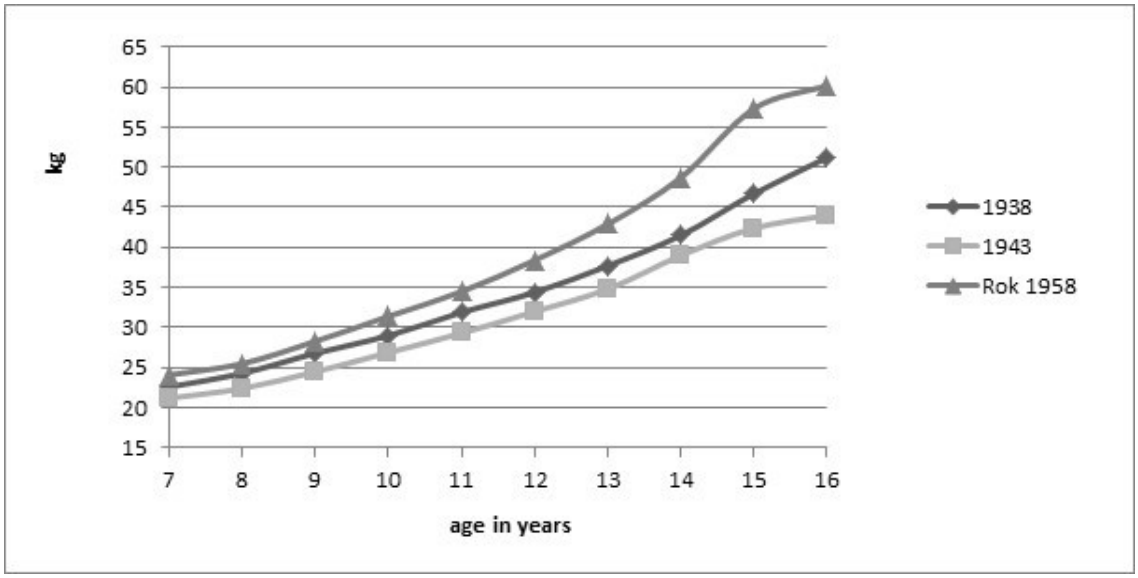


Figure 5. Height of boys in Warsaw in 1938, 1943 and 1958.

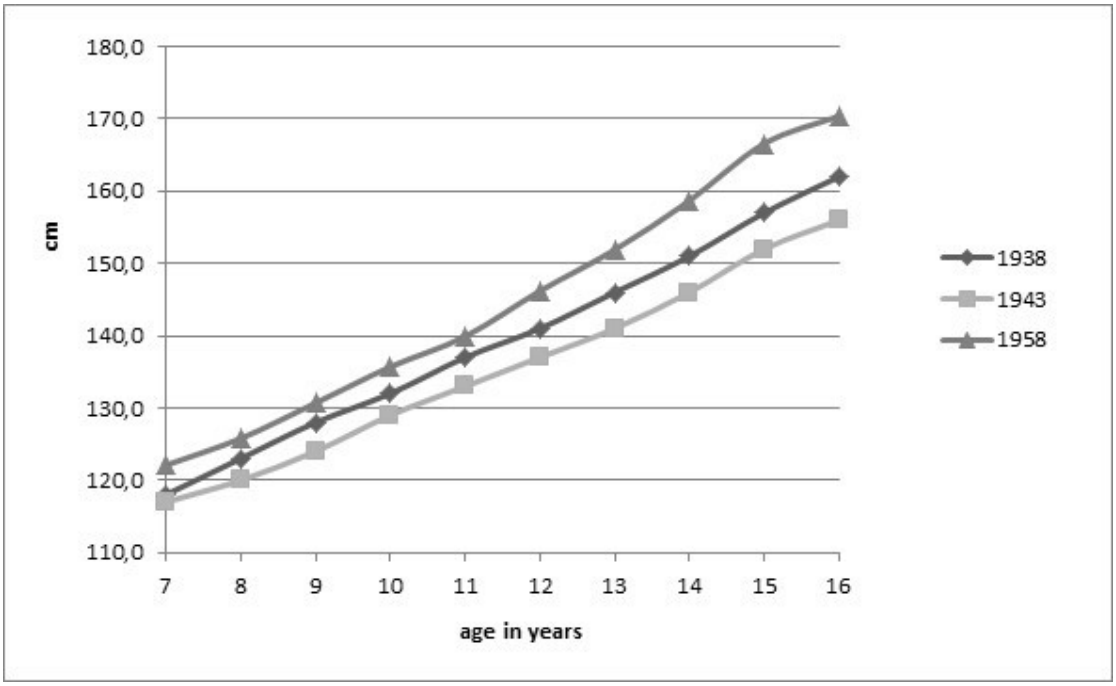


Figure 6. Weight of girls in Warsaw in 1938, 1943, and 1958.

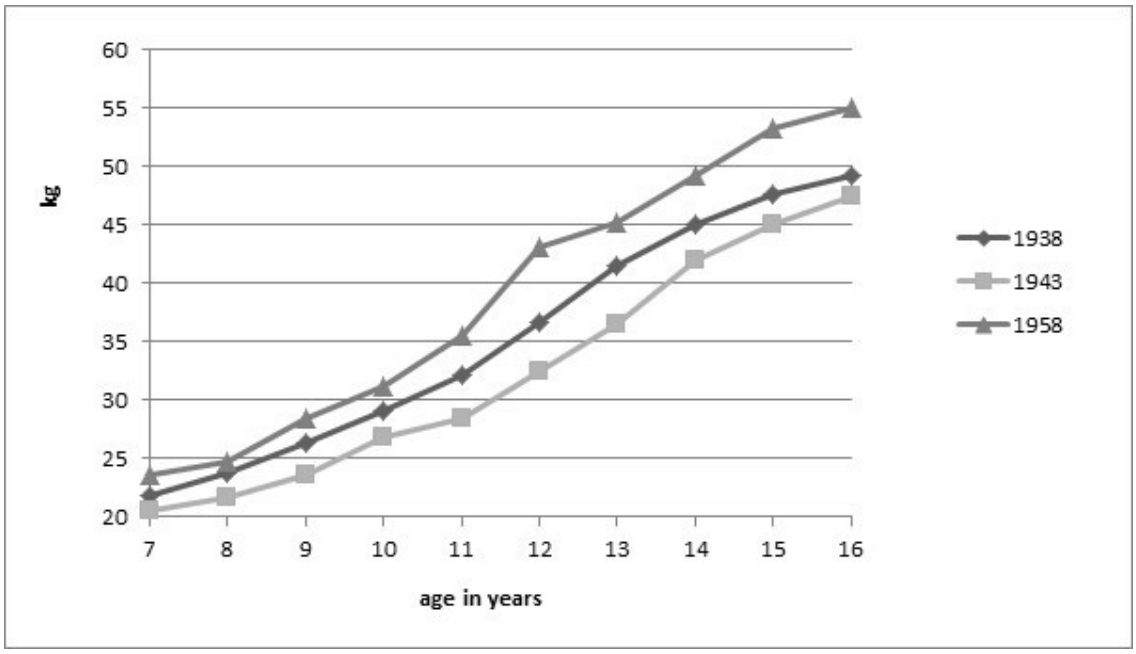
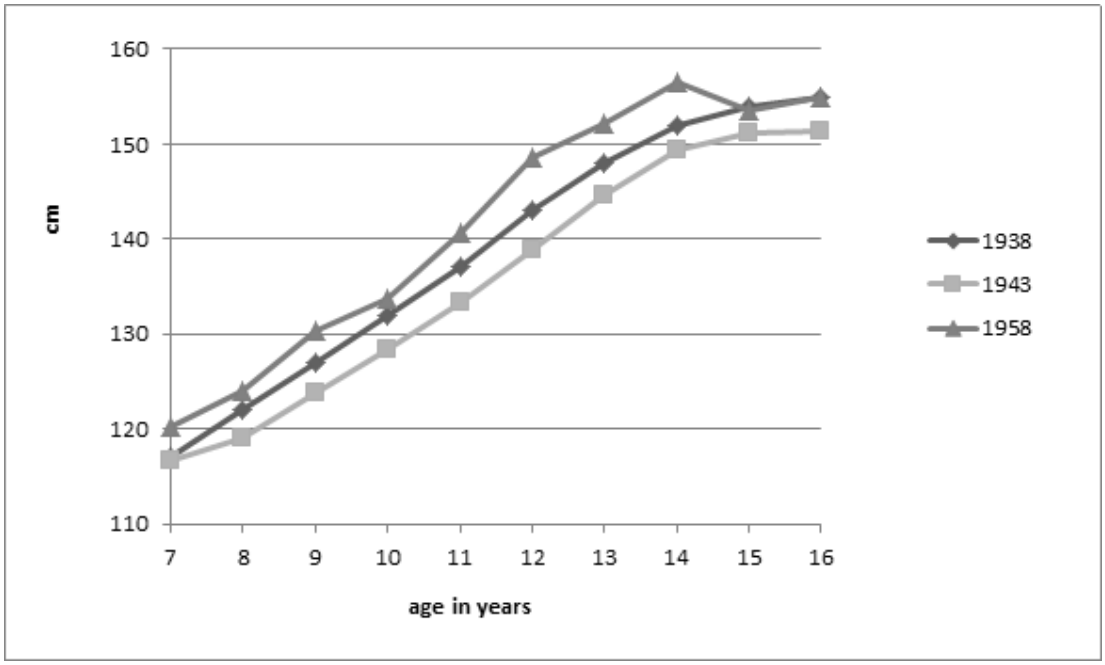


Figure 7. Height of girls in Warsaw in 1938, 1943 and 1958.



Deficiency diseases

Rickets

Rickets is a systemic disease caused by a diet deficient in vitamin D, protein, fat, and calcium, and by limited exposure to sunlight. The disease is prevalent in areas where living conditions of children are particularly harsh. Deformation of bones is observed in infants; in older children rickets takes the form of starvation osteopathy. If rickets is treated early, deformation of bones is reversible, otherwise deformations become permanent.

Rickets was widespread in Europe during and long time after the First World War. It was so universal during the winter of 1919 that people in the streets were able to recognize it, calling the disease *„Marmalade Beine”*. This endemic developed because of diets deficient in fat and excessive in marmalade. Rickets subsided with the coming of summer of 1920 but intensified again in winter of that year. The endemic finally disappeared thanks to beneficial changes in the diet and with improved hygiene. Symptoms included pain in the lower limbs, difficulties in walking, antalgic/spastic gait, epiphyseal pain of long bones, pain in the knees and spine, osteomalacia of pelvic bones, tetany, and scoliosis.

During the Second World War, food shortages produced early rickets of infants and osteomalacia of older children seen over large areas of the Soviet Union, in besieged cities and villages. Symptoms were not limited to the skeleton, the whole organism was affected. Growth retardation, lower weight gain, muscle flaccidity, bad posture, and psychiatric disorders were common. Similar observations were made in Polish children during the Nazi occupation. The prevalence of rickets increased in Poland from the pre-war 15–33 % to as much as 80%. The starvation of children in Warsaw when they were deprived of fat, protein, carbohydrates, milk, and vitamins led to this tragic situation. Moreover, quartz lamp therapy was suspended because of insufficient supplies of fuel to healthcare institutions and very low temperatures outside. Cod-liver oil was regularly prescribed before the war to 35 % of children: it was hardly available during the occupation. In 1939 and in the beginning of 1940, pediatricians saw a gloomy increase in the incidence of rickets among the children in Warsaw. On a call from W. Chodźko, an anti-rickets campaign with a single high dose of vitamin D 2 was undertaken in

Warsaw and regular health checkups were carried out in nurseries and schools to document the condition of children before and after the campaign. The goal was to treat all children up to two years of age registered at infant clinics. Every child seen at mother and child care stations, hospitals, and nursing homes received an ampoule of Vigantrol forte from Bayer or Witowit from Spiessa containing 75 mg of vitamin D2 in 1 ml.

Table 5. Number of shock doses of vitamin D2 administered to children in Warsaw in 1941 – 1944

	1941 – 1942	1942 – 1943	1943 – 1944
Single dose	6,320	7,500	8,731
Two doses	1,071	1,200	1,437

Altogether, 22,551 children received one and 3,708 children received two high doses of vitamin D2 (Tab. 5). In general, the high dose campaign produced good results and improvement in the skeleton was noted in 49.7 % of children.

It would be difficult to believe that administration of vitamin D2 alone, even with repetitive high doses, could solve the problem of rickets

among children in Warsaw. Firstly, the campaign was able to reach only 30 % of the population of infants and young children at risk of rickets. Secondly, it did not resolve the basic causes of rickets, such as food shortages, deficiencies in fat and protein, and poor living conditions with limited exposure to sunlight and excessive population density. Rickets is clinically most evident during dynamic growth and weight gain. Vice versa, symptoms of rickets are less noticeable in children with growth retardation.

So far as the anti-rickets campaign with high doses of vitamin D2 was able to reach most of the population in 1940–1943 and produced good results, there was much less success during subsequent years. In 1944 and 1945, there was extensive migration of the populace after the Warsaw Uprising which ended for many with austerity, prison camps, shortage of food, and lack of medical aid. Exceptions to this rule did happen as in the case of a group of 120 children who were led by T. Chrapowicki from the Warsaw Uprising to Bukowina Tatrzańska in December 1944 where they lived under relatively good conditions in a large building with enough food. "The weather was beautiful and sunny. The children recovered quickly and those who did not walk, started again".

The rebuilding of the totally devastated city started in 1946 and continued during subsequent years. There were no houses, no food or drugs. Instead, there was a frightening outspread of active rickets among children born during the toughest time of the occupation. In 1949, as much as 81 % of children in Warsaw had rickets. The clinical picture of rickets in children of Warsaw recorded by M. Łącki in 1941 was as follows: rachitic rosary – 64 %, Harrison's groove – 47.6 %, protruded frontal tubers – 35.65 %, craniotabes – 9 %, no lesions – 30 %. In 1942, T. Chrapowicki and W. Krupkowska studied 262 children in Warsaw nurseries and found normal metacarpal ossification in just 25 % of them, almost complete resolution of rickets in 67 %, and significant lesions in 10 % of these children. Clinically, rickets was present with residual signs of undetermined type in 25 %, cranial lesions in 6 %, thoracic lesions in 49 %, caries in 52 %, and scoliosis in 6 %: there were no lesions in 17 % of the children.

It is worth noticing that rachitic lesions were frequent in the youngest age group and slowly subsided with time. This finding can be attributed to food shortages and poor living conditions under the Nazi occupation. T. Chrapowicki performed a scrupulous analysis of rachitic

lesions and their causes among 513 boys and 403 girls treated at the mother and child care station, the rickets clinic, and the pediatric ward of the Warsaw Hospital for Children in 1940 – 1943. Three stages of rickets were analyzed. (Tab. 6)

Table 6. Stages of rickets in Warsaw in 1940 – 1943.

Total			1940/41 Station		1940/41 Clinic		1940/41 Hospital	
	513	403	93	83	38	38	41	31
I	385	311	69	53	26	24	23	17
II	112	67	29	22	8	13	16	6
III	23	27	2	8	1	6	-	8

Total			1941/42 Station		1941/42 Clinic		1941/42 Hospital	
	513	403	54	56	31	28	59	28
I	385	311	38	44	18	23	37	17
II	112	67	16	10	12	5	15	5
III	23	27	-	2	-	-	7	6

Total			1942/43 Station		1942/43 Clinic		1942/43 Hospital	
	513	403	59	55	49	32	94	54
I	385	311	56	53	47	30	76	50
II	112	67	3	2	2	2	15	2
III	23	27	-	-	-	-	-	2

I light stage of rckets., II milde stage of rickes., III severe stage of rickets

With each year, the number of children with the most severe (stage III) rickets declined but the number of cases of mild rickets (stages I and II) increased, indicating that high doses were effective in severe rickets but failed to stop the spread of the disease, probably because living conditions and nutrition did not improve. This problem in infants was also studied by the same author who took into consideration the diet, housing conditions, and exposure to sunlight. Severe rickets was seen among artificially-fed children and twice as often in overcrowded houses (Ibid, s.165, 160). Rickets was present in children of large and small apartments alike but was more severe in the case of one- and two-room apartments. (Tab. 7)

Table 7. Stage of rickets and size of the apartment in Warsaw in 1940 – 1942.

Apartment size	Number of cases per stage				Percentage of cases per stage			
	Total	I	II	III	suma	I	II	III
1 room	147	102	31	14	100	69	21	10
2 rooms	141	88	41	12	100	62	29	9
3 rooms	125	91	31	3	100	73	25	2
4 rooms	96	64	28	4	100	67	29	4
No data	71	37	22	12	100	52	31	17

The percentage of severe rickets was lower in sunny apartments; no difference was noted between damp and dry apartments. (Tab. 8)

Table 8. Stage of rickets and insolation of the apartment.

Apartment	Number of cases per stage				Percentage of cases per stage			
	Total	I	II	III	Total	I	II	III
Damp	127	84	33	10	100	66	26	8
Dry	219	141	60	18	100	65	27	8
Sunny	161	118	38	59	100	73	24	3

After the war in 1949, T. Chrapowicki and W. Krupkowska searched for signs of rickets among 340 schoolchildren (mean age 8.8 years) in Warsaw. Normal ossification was noted in just 19 % of them – only 46 children had no signs of rickets. (Tab. 9)

Table 9. Bone deformations in children living in Warsaw in 1949.

Deformation	Number of children				
	Total	7 years	8 years	9 years	10 years
Total	296	89	59	74	74
Flat feet	279	85	53	69	72
Chest	234	68	51	57	58
Lower limbs	178	63	36	42	37
Teeth	126	35	20	34	37
Spine	55	19	3	16	17
Abdomen	46	18	5	15	8
Sweating	33	7	3	7	16

The number of rachitic lesions was large. In comparison with 1942, the variety of lesions increased and new clinical forms were identified. (Tab. 10)

Table 10. New clinical forms of rickets in children living in Warsaw in 1949.

Form	(%)
Chest retracted at base	56
Scaphoid chest	16
Asymmetric chest	14
Chicken chest	7
Other	7
Total	100

Delayed eruption of teeth was disclosed in 37 % of children. Only 6 % of children had normal teeth. Deformations of the spine were varied. Kyphosis was seen in 42, lumbar hyperlordosis in 22, and scoliosis with elevated scapula in 12 out of 55 children. The mean age of these children exceeded 8 years and most of them were born during the Nazi occupation. As 81 % of the children had symptoms of past rickets, their cause was traced to the occupation and to the conditions which existed at that time. Rachitic lesions were disclosed in 70 % of children in 1941, 83 % in 1943, and 81 % in 1949. In contrast, clinical symptoms of rickets during the interwar period were noted in 15–30 % of children. The spread of rickets reflected malnutrition, poor living conditions, and limited access to medical aid during Nazi rule. Things could have been much worse if not efforts of Polish physicians and nurses to stop rickets and fight its symptoms with every means available. Nevertheless, not everything was within their reach. In 1949, symptoms of rickets as a leftover of the Nazi occupation could not be cured solely by administration of vitamin D2. Perfect nutrition, good housing conditions, and cooperation between specialists in orthopedics, rehabilitation, etc. were needed. It took a long time before the Polish healthcare system could free itself of the burden of rickets among Warsaw children who survived the Nazi occupation.

Hunger disease

No cases of hunger disease were reported in Warsaw before the war and Warsaw statistics reveal no case of death due to malnutrition or hunger. In Warsaw, as everywhere, even in highly developed countries today malnutrition and its sequella cachexia were sporadic at that time. The mean weight and height of Warsaw children markedly increased between 1930 and 1938. Things took a turn for the worse during the war when malnutrition was common due to rationing and inferior quality of food. Mean weight and height decreased, hunger disease appeared in the Jewish borough where food shortages were greatest. No healthcare system is capable of bringing relief to children stricken with hunger disease. Food was needed, and this was lacking.

Prof. H. Hirszfeld worked at a pediatric ward treating children between 5 and 18 years of age. This ward with some 160 beds was supposed to treat contagious diseases but in fact its patients, not to mention a few cases of typhus fever and dysentery, suffered from hunger disease and tuberculosis. She wrote about children with hunger disease:

cit. *"... their faces were marked with apathy or immense sadness, but more than that, their faces looked senile. The skin was dry, rough, and desquamating. The adipose tissue was atrophic, muscles were hypertonic and atrophic. There was hypotonia, edema, ascites, osteoporosis, osteomalacia, tetany, and neurodynia. Bradycardia was common"*. Such an accumulation of hunger cases was the result of deliberate acts by the Germans to exterminate the inhabitants of Warsaw in general, and the Jews in particular. The widespread prevalence of hunger disease motivated a group of Jewish physicians to undertake research on its pathology. Nowhere in the world were there so many sources of data and so favorable circumstances. This study on clinical and pathomorphologic aspects of hunger disease was done in 1940 – 1942. Its motto was Horace's *"Non omnis moriar"* proposed by Dr. I.Milejkowski. A few dozen researchers inspired by their belief in humanity set off to describe what they saw, and to perish one by one, leaving their final testimony to future generations of physicians. The organizing committee was formed in 1941 and research work was allocated as follows: Dr. I.Milejkowski and Dr. B.Raszkes – the skin in cachexia: Dr. J.Fliederbaum – clinical aspects of hunger in adults and biochemistry of hunger; Dr. A.Braude-Heller – clinical aspects of hunger in children; Dr. E.Apfelbaum – cardiovascular function tests in hunger; Dr. T.Goliborska – blood cell morphology in starving children; Dr. M.Kocen – bone marrow tests in hunger. The group was headed by Dr. J.Rotbalsam and later by R.Elbinger (medical statisticians). Separate hospital rooms in the Berson and Bauman Memorial Hospital were allocated to children with hunger disease. Tuberculin reactivity was studied at the ward of Dr. J.Wohl.

Laboratory equipment was purchased and the organizing committee planned to investigate the clinical picture and biochemical disorders in children between the age of 6 and 12 years, so as to exclude early childhood and puberty when metabolic changes are greatest. "Pure" cases of hunger, free of any complications (tuberculosis, avitaminoses, starvation diarrhea) were referred to the hospital by doctors working at refugee centers. It later became necessary to invite ophthalmologists to the team, among them Dr. Fajgenblat and his wife. Dr. J.Fuswerk a neurologist, Dr. I.Blacher, who studied coagulation and plateletgrams, Dr. MPłońskier a child anatomist, and Dr. M. Szejnman, who was responsible for blood hematology, also joined. The laboratory became operational in 1942 and research work began, only to be interrupted on July 22, 1942 when the Germans began their displacement action. Foreseeing the quick

end to the Ghetto's remnants, the team decided to accelerate work and to send the manuscripts to Prof. W.Orłowski, head of the Second Department of Internal Medicine at the Warsaw University, attempting in this manner to save the findings and to present them to the world. The final liquidation of the Ghetto started shortly thereafter, on April 19, 1943. This collaborative work was published in 1946 and included a chapter on children written by Dr. A.Braude-Heller with J.Rotbalsam and R.Elbinger. We find there the following passage: cit. *"… Children were the first victims of the starvation disaster which hit the Jewish community during the war".* The Berson and Bauman Memorial Hospital treated several hundred children with hunger disease of varying severity. Age ranged from a few months to 14 years, with clustering which changed during the war. Initially, in the end of 1939 and beginning of 1940, patients with malnutrition were recruited mainly from among infants. The short period of hunger during the siege of Warsaw had the gravest impact on the nourishment of infants who developed symptoms collectively known as the atrophy syndrome. Edema was rarely seen. The next wave of patients with starvation came at the end of 1940 when migrants from provincial towns began pouring into Warsaw. The closed Jewish borough formed by the Nazis was cut off from food supplies, sparking a horrible spread of hunger disease. The age of children referred to the hospital between the end of 1940 and the beginning of 1941 ranged from 2 to 5 years. The youngest children constituted the group which was most prone to symptoms of hunger with edema as the leading one. When older children began to suffer, the younger ones were already dead. In effect, children with hunger disease treated at the hospital in the end of 1941 and the beginning of 1942 were usually older than 8 years. Apart from generalized edema, there were cases of terminal cachexia without body swelling, for which the term „dry cachexia" was coined. Children under the care of refugee centers received food rations never exceeding 800 calories per day, almost completely devoid of fat and with only minimal amounts of plant-derived protein.

A description of the most important symptoms of hunger disease was made. The children were unable to sit or to stand by themselves. They remained recumbent, lying characteristically on their side with legs drawn up forming a coil. Muscle contractures developed limiting active and passive movements. Edema of the face, feet, or the whole body was striking. Frequently, pudendal lips or the scrotum were swollen. Involuntary positioning of the body produced asymmetric positional

edema. Children were seen with dry cachexia (without edema). The skin was changed, often being very pale with patchy discolorations and hyperpigmentation of scars and sites where clothes compressed on the body. There were many cases of purulent and inflammatory lesions and furfuraceous desquamation. The adipose tissue was atrophic, there were striate over the rectus abdominis muscles, and muscular atrophy was so severe that the bones seemed to be covered only by the skin. The children complained of insomnia and were feeling cold, covering themselves with blankets even though it was summer. Psychic disorders took the form of apathy, low mood, sluggishness, loss of interest in games, sometimes irritability and other changes in behavior. They appeared overmature with the impression, however, that their intellectual development was retarded to the point of oligophrenia.

Weight loss in most of the children reached 50 % and this was sometimes masked by edema. Growth retardation was less evident but very common. There was a tendency to hypothermia so that fever in measles, diphtheria, chickenpox, and tuberculosis was greatly reduced. Pulmonary emphysema with hyperresonance and decreased breath sounds was frequent. Diaphragmatic excursions were limited and sometimes the diaphragm and the chest appeared to hold the inspiratory position. According to J. Stein, the prevalence of emphysema as a sequella of cachexia was 5.4 % in children before the age of 20 years. Hypotension, bradysphygmia, reduced tone of superficial veins, and thrombi were signs of cardiovascular disorders. The capillary system was affected with livedo and coldness of the extremities and the children were prone to circulatory collapse. Myocardial lesions were frequent, presenting with soft heart sounds, extrasystoles and arrhythmias resembling atrial fibrillation. The autopsy material of J. Stein revealed that 85 % of children had myocardial atrophy. Mild anemia was the rule, with the red blood count between 3 and 3.5 x $10^6/mm^3$, falling to 2 x $10^6/mm^3$ in many children. In most cases, the color index was 1.0. The leucogram was normal but leukopenia with relative lymphocytosis was frequent. Lowered hematocrit was a permanent finding. Non-infectious diarrhea caused by pseudodysenteric lesions in the intestinal mucosa was a common sign of gastrointestinal disorders. Hypochlorhydria persisted even after alcohol provocation. The reaction of the vegetative nervous system to adrenaline and pilocarpine was abnormal: the adrenaline-induced rise in blood pressure was small or absent. Pilocarpine was without a major effect on heart rate and blood

pressure. Sexual maturation was retarded with lack of pubic hair, amenorrhea, and small breasts in girls.

Hunger disease in the Ghetto was the cause of significant mortality. Severe malnutrition left the child defenseless against a host of diseases. It is now difficult to determine how many Jewish children died of starvation and how many of a disease in which starvation was a compounding factor. Malnutrition was so common that hunger certainly played a great role in the general mortality of children and youth. Those of them who were “late” to die from hunger and disease were taken from the Ghetto and perished in concentration camps.

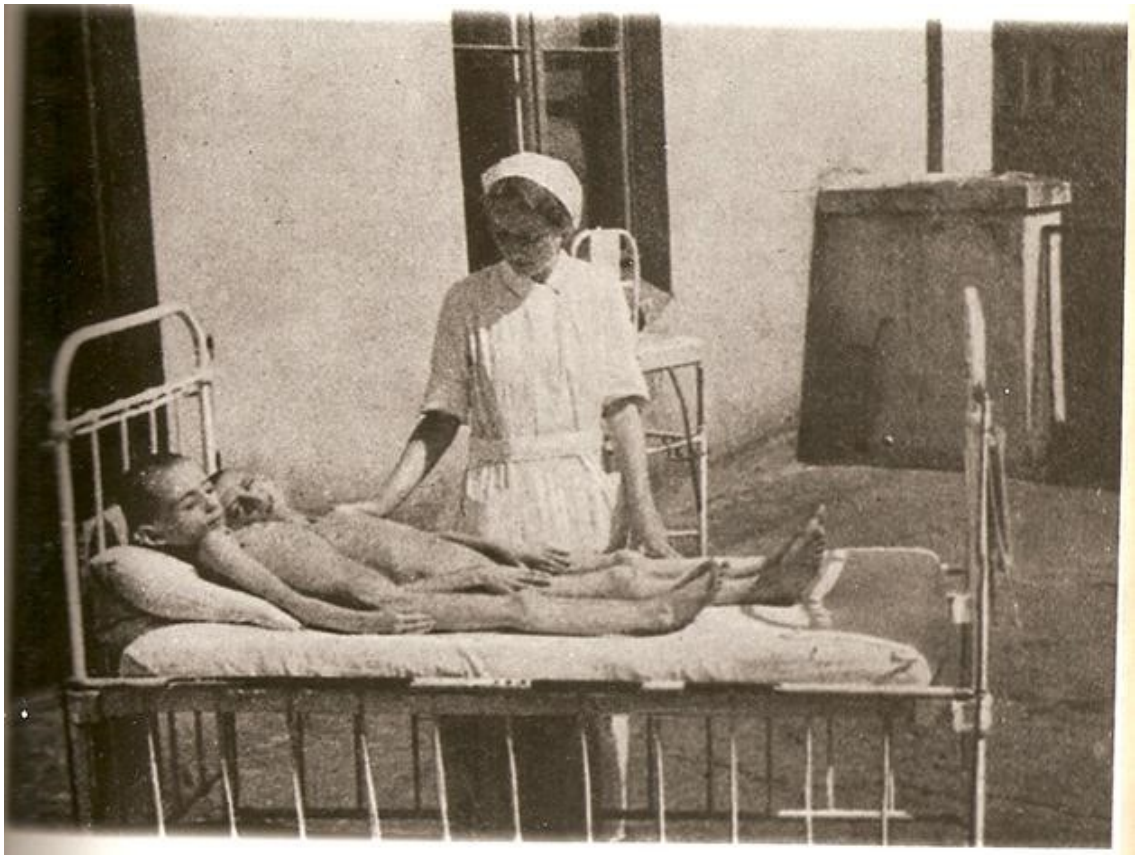


Photo 1. Period of dying (photo) in: Apfelbaum E. (eds.) Hunger disease, Warszawa 1946. Hunger disease, hunger dry cachexy , period of dying.

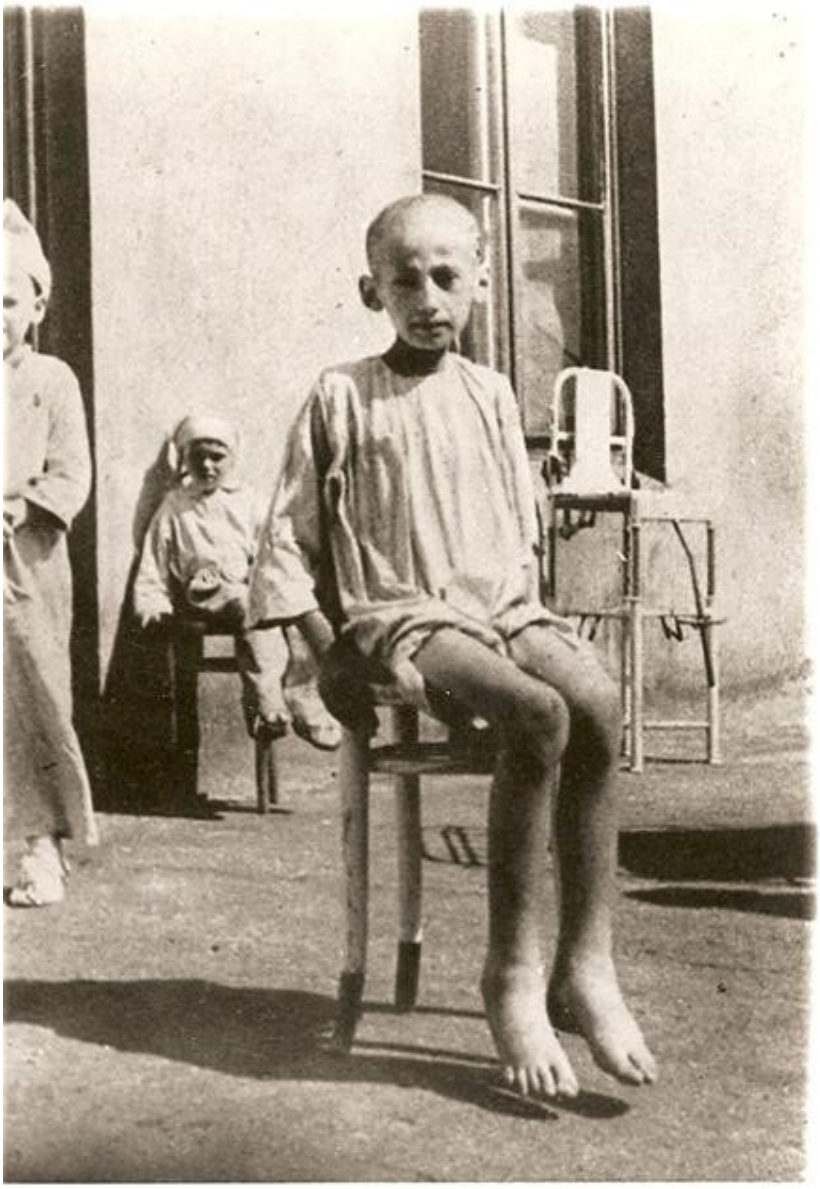


Photo 2. Form of edema, in: Apfelbaum E. (eds.) Hunger disease, Warszawa 1946. Hunger disease, edema of the lower limbs.

Photo 3. Emaciation with contractures in: Apfelbaum E. (eds.) Hunger disease, Warszawa 1946. Hunger disease, enduring contractures and muscle atrophy.

Infectious diseases

The first known children's health study in Warsaw during the World War II took place during the Nazi occupation 1939-1945. It was a joint study by Jewish doctors addressing starvation in the Warsaw Ghetto in 1942, done on the initiative of J. Milejkowski and published by the American Distribution Joint Committee in 1946 in Warsaw. M. Łącki's work on tuberculosis in Warsaw from 1934 to 1947 is also another valuable contribution from that period. In the post-war period, a number of studies emerged, all indispensable for conducting a health analysis of the children of occupied Warsaw. Among these is a joint study edited by S. Tazbir that describes the living conditions, the children's needs, and the efforts of some Polish children's organizations to improve the living conditions of Warsaw's youngest inhabitants. For many reasons, the archival data are incomplete or do not correspond to contemporary reality. This first factor is the result of war losses, which were particularly extensive during the Warsaw Uprising 1944, and the result of war conditions, which led to gaps in reporting or to incomplete data. The second factor arises from purposeful activities, such as the cover-up of a person's death to allow others to retain the deceased's food rations, or to claim an infectious disease such as spotted fever or gastric fever as a means to personal inviolability.

Objective

The present investigation involves an analysis and description of infectious disease epidemics among the children of Warsaw in the years 1939–1945.

Detailed Objectives

- To determine the pace and epidemic waves of infectious diseases in children.
- To estimate the fatality rate, incidence, and mortality rate of infectious diseases in the children of occupied Warsaw.

Materials

The sources of archival data used in this study were the collections of the State Archives of the Capital City of Warsaw, Polish New Archives, Central Statistical Archives, the former Archives of the Main Commission for the Investigation of Nazi Crime in Poland, the former Central Archives of the

Committee of the Polish United Workers' Party, and the Central Archive of Audio-Visual Records in Warsaw.

Methods

The collected archival materials and the data obtained in the research were analysed in an attempt to reconstruct the factual circumstances. Material collected in this process was compared with data from before the war and from the first years after the war. When such a comparison was not possible, an attempt to reconstruct the facts was made. The research involved only the period before the Warsaw Uprising, not the whole period of World War II. Collecting data from the period following the Warsaw Uprising was impossible because of war damages. In this study, statistical (mean alue) and descriptive methods (mortality rate, morbidity rate) were used.

Findings

Scarlet fever

About 80% of scarlet fever incidence occurred in children aged 1–14, primarily in children aged 5–9. Scarlet fever showed an increased incidence every 5–8 years and was characterized by a distinct seasonal autumn–winter rhythm. In the period 1920–1930, scarletfever was considered a very serious disease because of mortality rates. Later, although the incidence stayed the same, there was a drastic decline in the death rate.

The fact that the scarlet fever agent did not become weaker could be attributed to the production of a new type of a non-invasive streptococcus. After an epidemic outbreak in 1926 in Warsaw, there was an attempt to inoculate children against scarlet fever. The undertaking involved 4000 people, mainly school-age children, and continued until the war broke out. The vaccinations could not have significantly influenced incidence and fatality rate because no scarlet fever vaccination has proved effective enough, and the risk of post-vaccination complications was high. According to estimates, scarlet fever in Warsaw in the years preceding the occupation exhibited an increase in epidemic factors (Figures 1, 2, 3, 4).

Figure 1. The incidence of scarlet fever in Warsaw, 1935–1938.

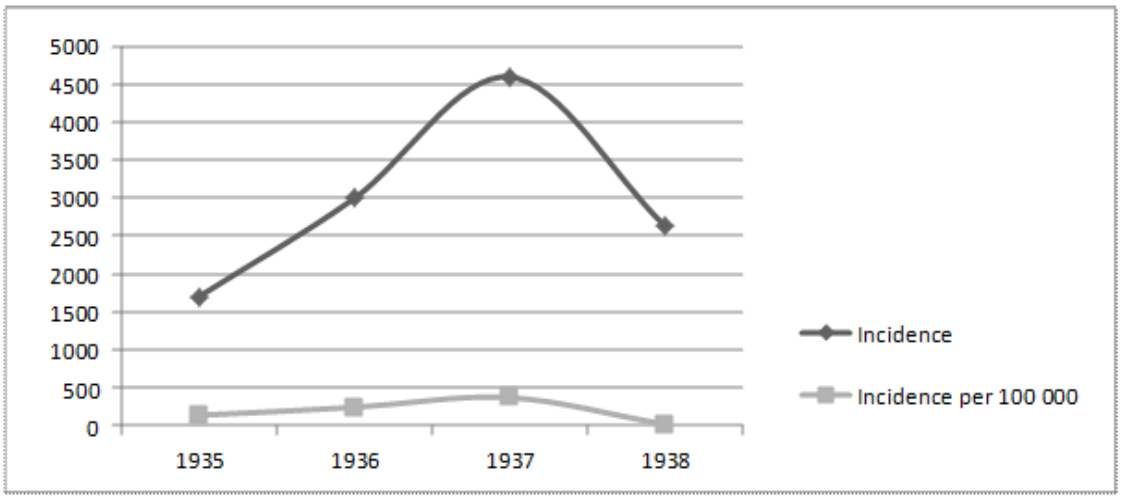


Figure 2. The mortality of scarlet fever in Warsaw, 1935–1938.

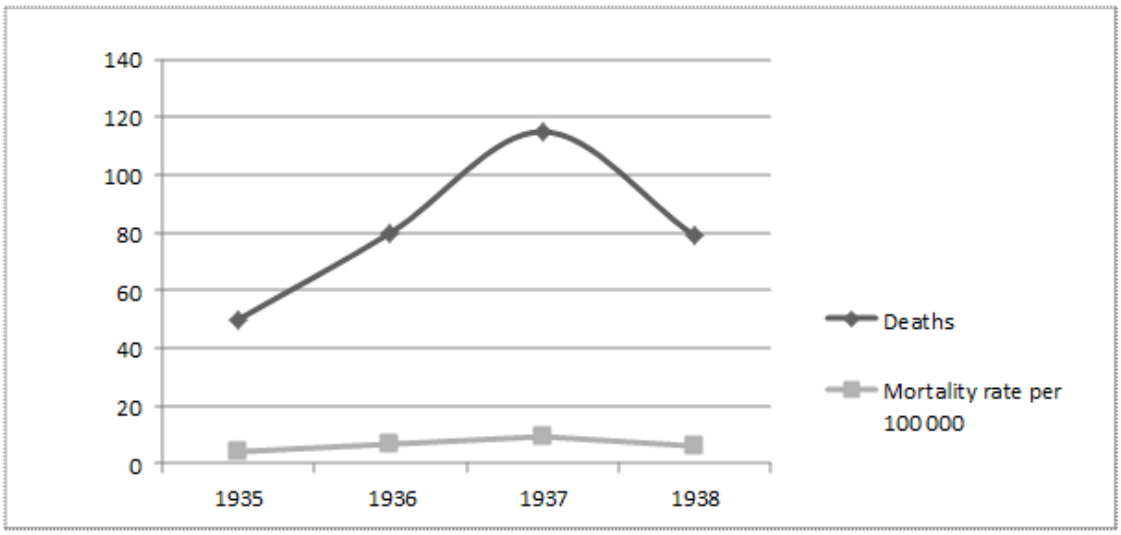


Figure 3. Scarlet fever incidence rates in Warsaw, 1939–1944.

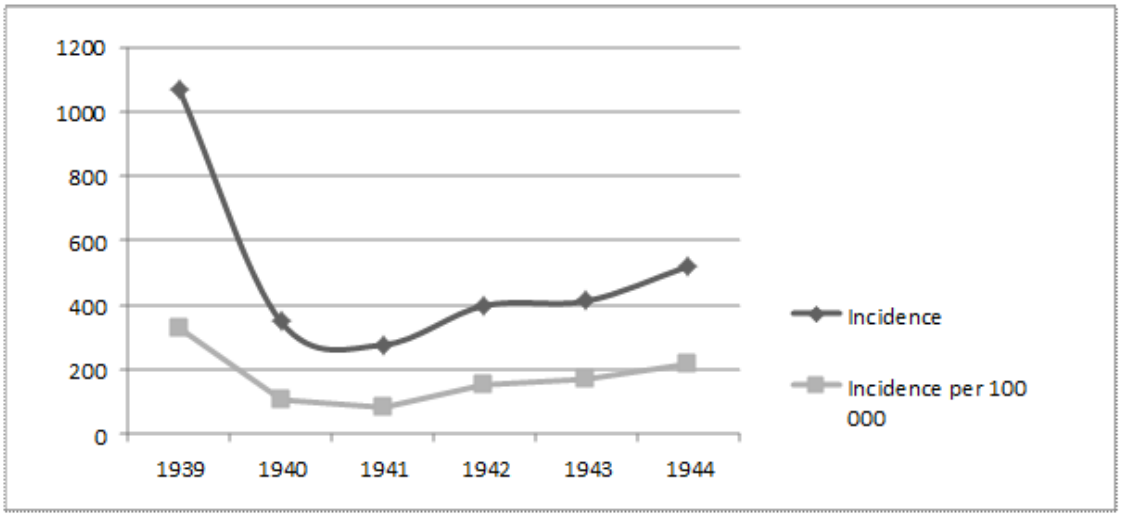
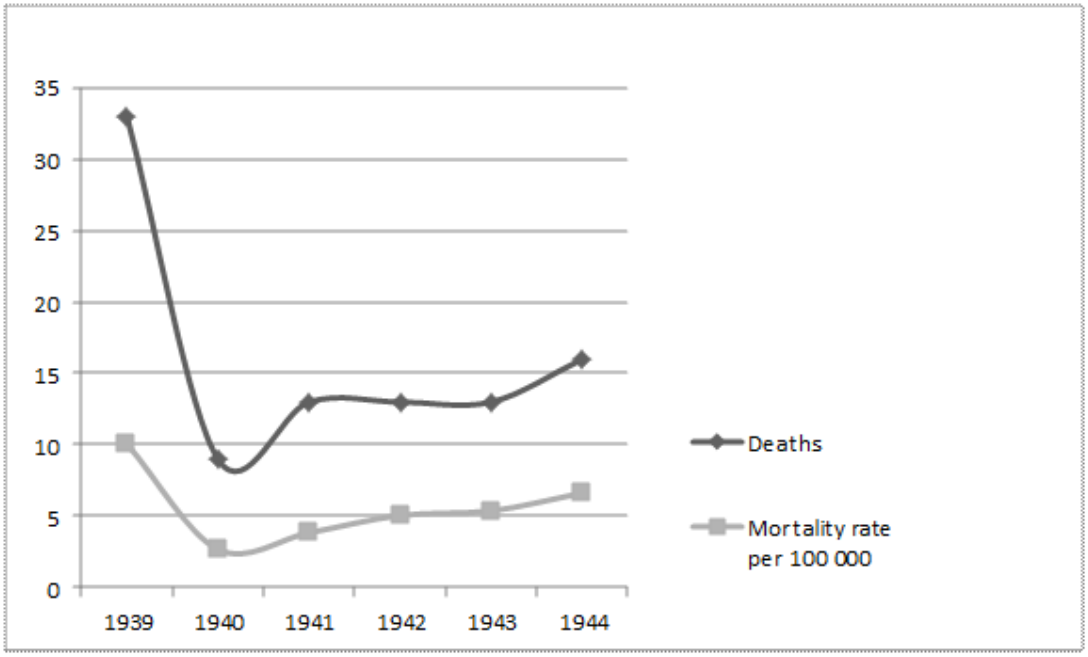


Figure 4. Mortality rate of scarlet fever in Warsaw, 1939–1944



In Warsaw during the occupation, in 1942–1943, there was an increased scarlet fever

incidence. However, this rise was slight when compared to the epidemic wave of 1936–1938; (Figures 5, 6). The data for scarlet fever incidence and death rate in 1936–1938 are incomplete, involving only the first 6 months of the each year . Thus, determining the estimated data for the whole year has only an indicative value.

Figure 5. Scarlet fever incidence in children and youth under age 20 years in 1935 and 1944.

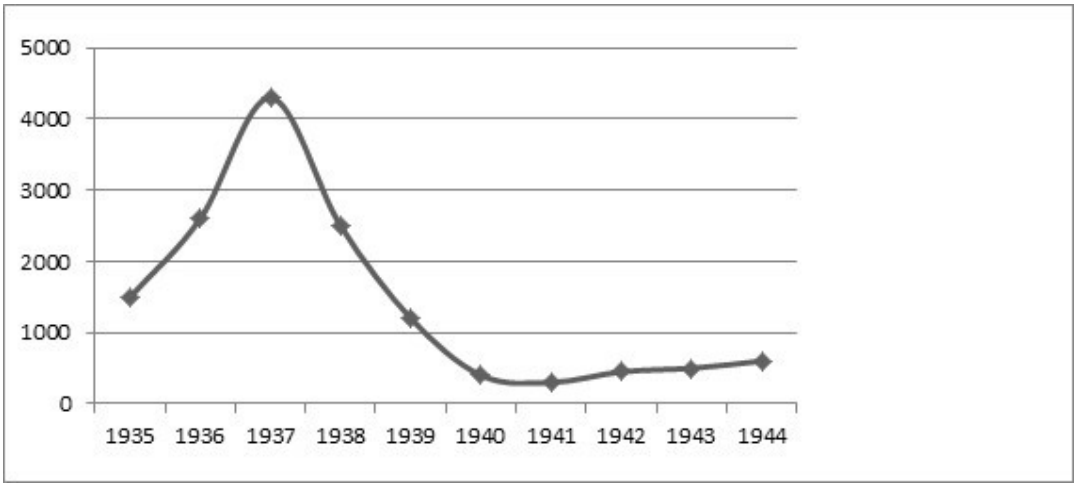
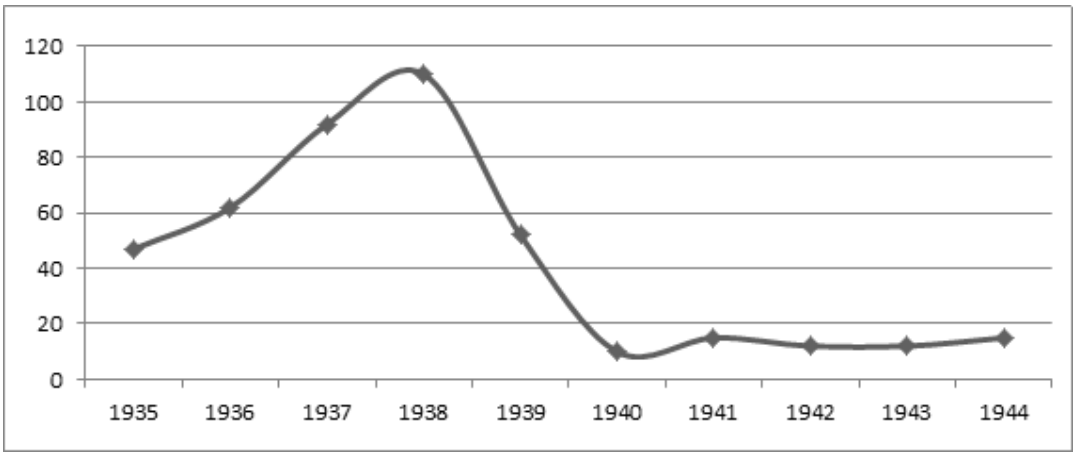


Figure 6. Scarlet fever–related deaths in children and youth under age 20 years in 1935–1944.



Figures 3 and 4 show that the period of Nazi occupation carried slightly increase in scarlet fever incidence and death rate, possibly because of a natural increase in the epidemic wave. The Jewish population was, however, exceptional because its death rate increased seven times during that period when compared with the previous years. This phenomenon resulted from poor sanitary and hygienic conditions in the Jewish ghetto and serious malnutrition among Jewish children, which led to immune system impairments. When we examine deaths in particular age groups in 1936 and 1937, and similarly in 1941 and 1942, we find that the

percentage of deaths among children and youth under age 19 increased during the years of Nazi occupation (Fig. 3, 4).

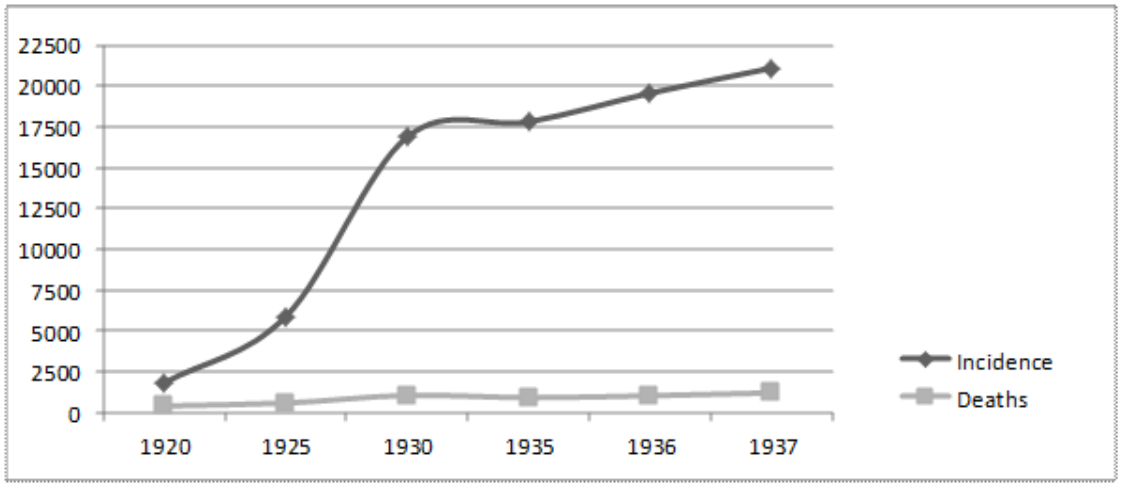
Theoretically, the years from 1939–1945 were a period when the expectation would be to see a decrease in the scarlet fever epidemic wave according to natural rhythm. The epidemic data from 1939–1942 confirm this expectation. Considerable doubts arise about 1943 and 1944 because of the lack of epidemic data from the second half-year of each of those years. Thus, an estimated slight increase in the incidence and deaths in these years could have been higher.

In 1941 and 1942, there was an increase in the percentage of deaths among children and adults, caused by an extension of epidemic data for the 19–20 age group and immune system weakening during the war and occupation (Figure 4).

Diphtheria

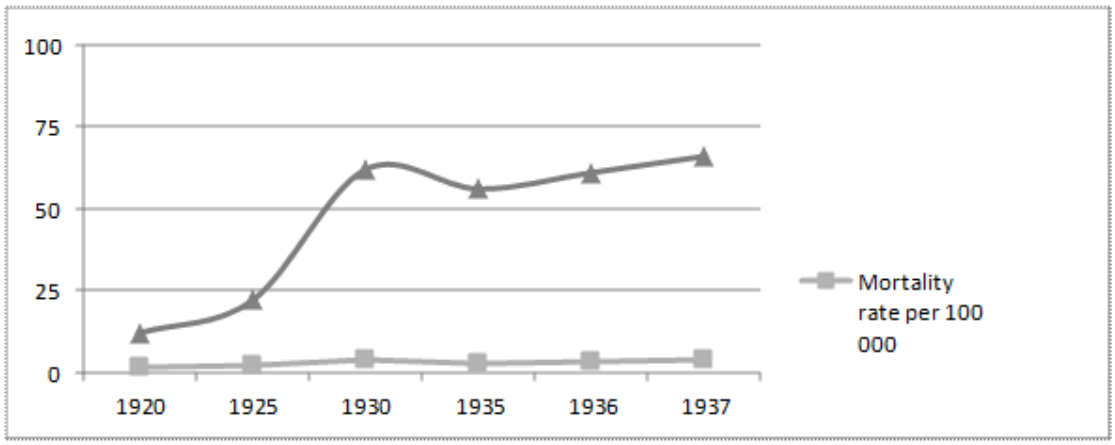
Diphtheria is a dangerous infectious disease, especially in the paediatric population, with an incidence during the study period of about 90% of children and youth [5]. Before the vaccination era, diphtheria affected mainly children aged 2–7 years (Table7) When vaccines were introduced, the incidence shifted in specific age groups. More and more frequently, older children and even adults contracted this disease The introduction of antidiphtheria serum to treatment approaches contributed to a decrease in the death rate by the end of the 19th century. Since the beginning of the 20th century, there has been a continuous improvement in the epidemic status of diphtheria in Europe, although both world wars aggravated the situation.

Figure 7. Epidemiology of diphtheria in Poland, 1920–1937.



In Poland, the pre-war period was characterized by a constant increase in the incidence of diphtheria and associated with unchanged death mortality (Fig. 7, 8). Compared with other European countries, Polish epidemic rates were within typical limits. The highest numbers of diphtheria deaths and incidence in the period of 1925–1937 occurred in Warsaw, Łódź, and Cracow. In Warsaw, an epidemic wave occurred in 1929–1931 that gradually decreased until 1936. Crucial to controlling the 1929–1931 epidemic was preventive vaccination, launched in 1930 in Warsaw, where an anti-diphtheria antitoxin was being used. By the end of 1934, 130,875 children had been vaccinated in Warsaw.

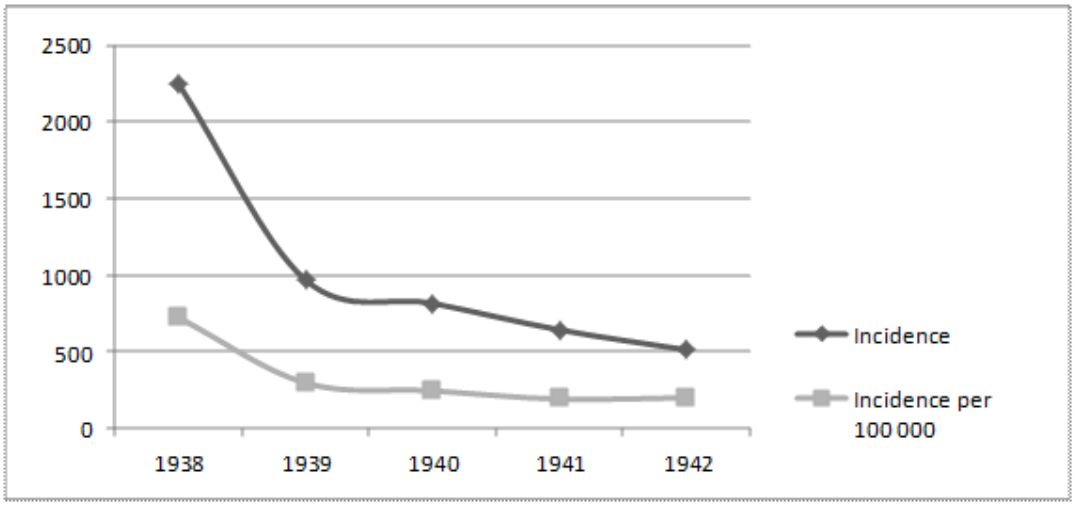
Figure 8. Epidemiology of diphtheria in Poland, 1920–1937.



In the years 1935–1937, a new diphtheria epidemic wave occurred, although it was less intense than in the previous years (Figure 7). The final year of the epidemic wave that began in 1936 was 1938. During the years of occupation, the epidemic faded completely. Figures 9 and 10 show the distinct decrease in incidence and deaths related to diphtheria during the Nazi occupation.

Figure 9. Diphtheria-related deaths and incidence in Warsaw, 1920–1945.

Figure 10. Epidemic rates of diphtheria in the under-20 age group in Warsaw, 1938–1944.



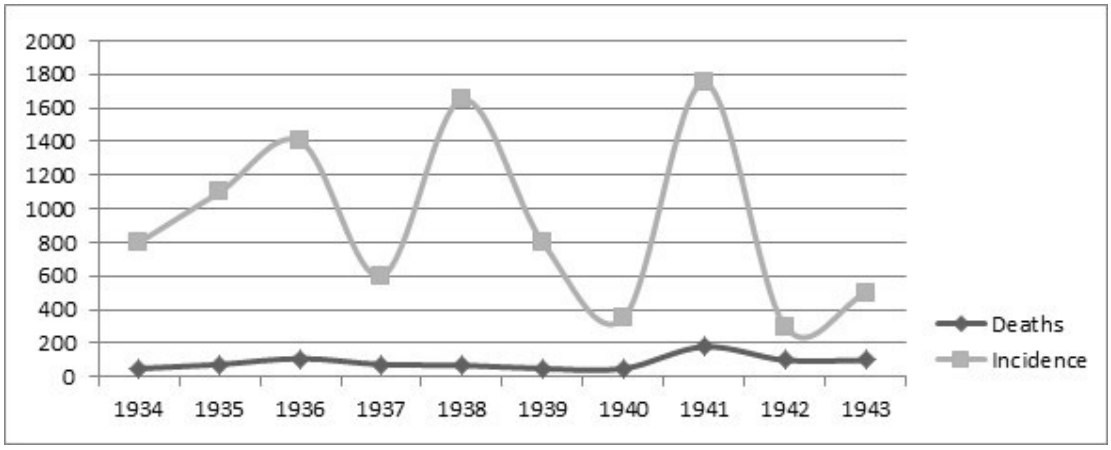
In 1930–1934, when anti-diphtheria vaccinations were administered, diphtheria incidence in following years dropped in the youngest age groups when compared to older paediatric populations.

Figure 11. Epidemic rates of diphtheria in the under-20 age group in Warsaw,
1938–1944

Pertussis

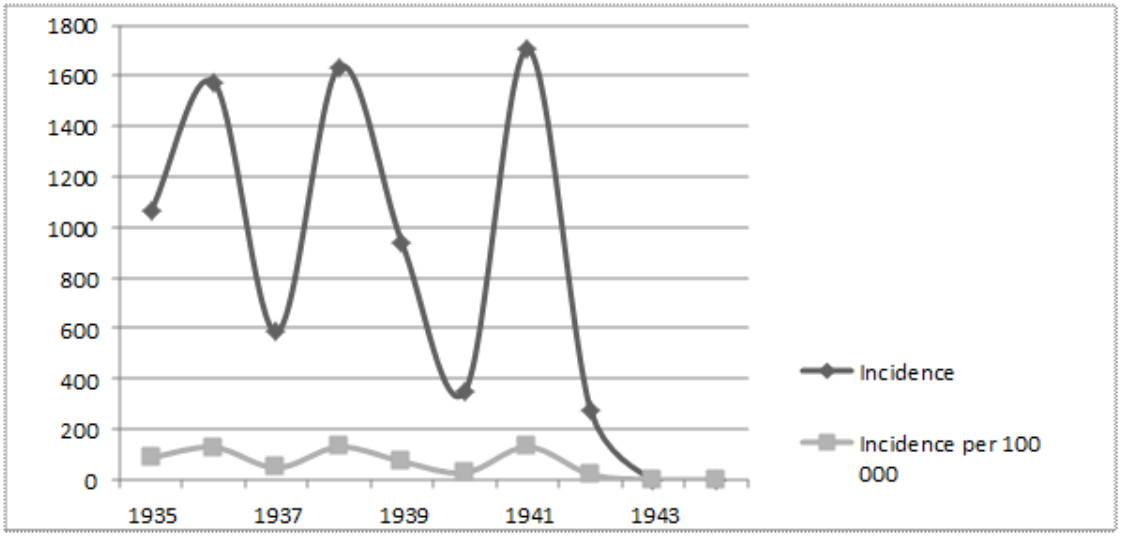
Pertussis affects mainly children. The highest incidence is between 0–4 years. A slightly lower incidence occurred between 5–9 years, dropping drastically in older patients in unvaccinated populations. Of the total number of morbidity from pertussis in the Polish population 99,14% occurred in the 19-year-old age group. In the inter-war period, Poland had low epidemic rates when compared to other European countries. Data on Poland incidence have been kept since 1925, and in comparing average incidence per 100,000 citizens in 1925–1937, Warsaw has the highest averages, 76,6/100 000, Łódź 44,3/100 000. In 1937, vaccinations against pertussis were begun, but the campaign must have been only sporadic because these vaccinations were not recorded in the statistical yearbook for Warsaw and Poland from the pre-war period. Passive immunity obtained by hyperimmunised sera was not used on a wide scale in Poland. In the inter-war period, 1925-1938 the pertussis incidence exhibited a cyclic pattern, appearing on a regular basis every 2–3 years (Fig. 12)

Figure 12. Incidence and number of deaths from pertussis by age group in Warsaw 1934–1943.



That cyclic pattern persisted into the occupation period 1939-1943. After an incidence peak in 1936 and another in 1938, 1941 saw another peak, and this tendency to increase. (Fig.13). In the occupation period, the peak incidence in 1941 was higher than it had been in 1933 or 1936.

Figure 13. The incidence of pertussis in Warsaw in 1935–1944.



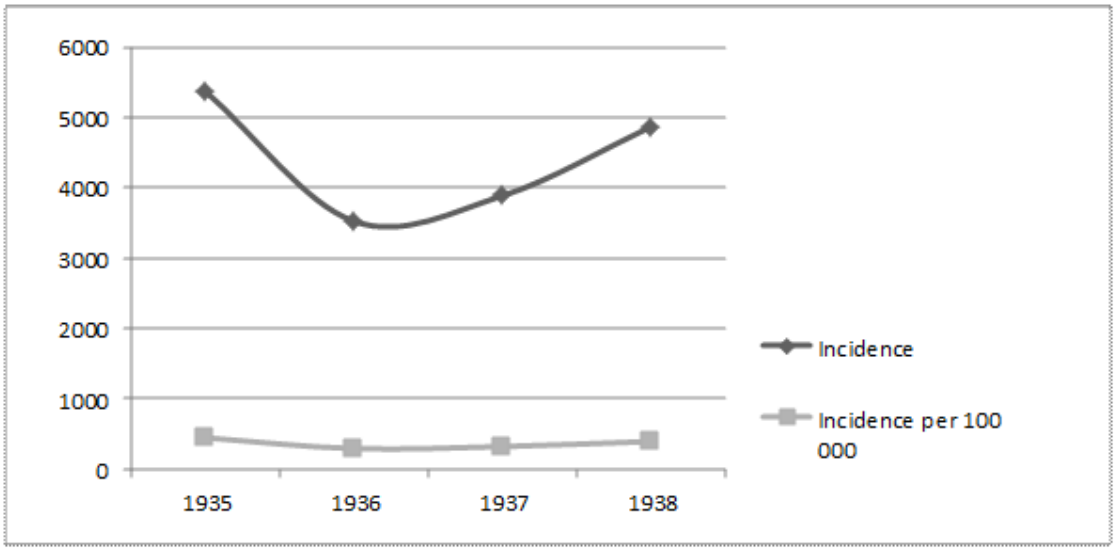
Measles

Measles is usually a paediatric disease affecting 50–70% of children under the age of 4 and approximately 95–97% of children under the age of 15 in unvaccinated populations. Sensitivity to infection is common, and in case of infection, there is an approximately 100% chance of showing symptoms of illness.

The national average measles incidence from 1925–1937 per 100,000 population was 60.8 cases; thus, all data from Warsaw are dramatically higher. Taking into consideration that almost all children by age 15 years were expected to have had the measles, the expected annual incidence was about 18,000. The official data, however, point to numbers around 4000 to 5000 annually, or only 25% of the predicted incidence. Furthermore, the postwar statistics in Poland in 1956–1960 showed only 10% incidence of morbidity probably due to vaccination procedures.

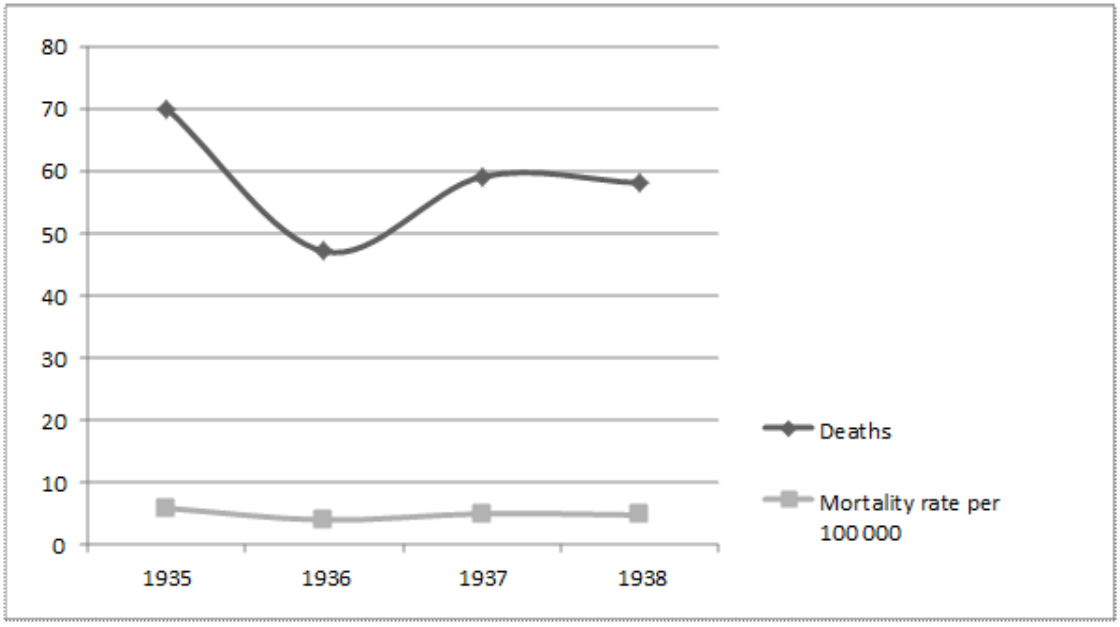
Owing to a lack of measles vaccinations before World War II in children by age 3 years, there was an increase in the measles incidence simultaneously with a temporary drop in the number of measles-sensitive individuals. In the 1930s, a treatment for measles with a normal or condensed serum was introduced. It cannot have been used on a mass scale but likely decreased the number and severity of measles complications among hospitalized patients.

Figure 14. The incidence of measles in Warsaw, 1935–1938.



There is no expected seasonality to measles infections, given the lack of indication of viral mutation and inborn immunity. Therefore, if any appearance of seasonality emerges, it is likely connected with children's camp trips in summer or to a high concentration of children in nurseries, kindergartens, and schools in autumn and winter. The spectacular decrease in measles incidence seen in 1939 in Warsaw, especially after September, may have been the result of a decrease in the pre-occupation epidemic wave but also from the worsened state of patient registration under the conditions of warfare.

Figure 15. The death and mortality from measles in Warsaw, 1935–1938.



In the years 1940–1941, there was a considerable increase in measles incidence in Warsaw because of a natural 2–3-year epidemic cycle. When the epidemic intensified, there was a slight shift in the incidence age group to the age group over age 10 years.

In 1942, there was a five-fold drop in measles incidence because of the fading epidemic wave and the closing down of the Jewish ghetto in Warsaw. In 1941 and 1942, however, the percentage of hospitalized children rose considerably, which might have resulted from a higher number of severe and complicated measles cases.

Figure 16. Measles incidence among the non-Jewish and Jewish population

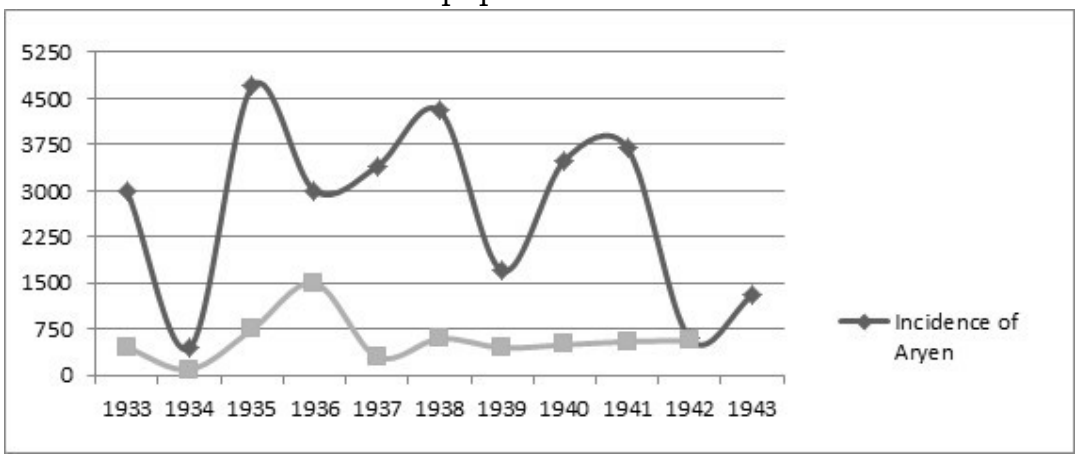


Figure 17. Measles epidemic indicators in the under-20 age group in Warsaw, 1939–1944.

The data for 1943 and 1944 are estimates and may vary considerably from what actual conditions were; unfortunately, complete epidemic data for these years were not included in the source materials.

Typhus

Typhus is a severe infectious disease influenced by socioeconomic status and standard of living, civic and economic development, and lifestyle habits. It has been a constant in almost all European countries and occurred during almost every war or period of social unrest. The most severe European typhus fever epidemic occurred during World War I, when millions of people suffered from the disease. In Russia alone, approximately 10 million people contracted typhus fever, and hundreds of thousands died from it. According to some estimates, in concentration camps in Germany and Austro-Hungary, 750,000 prisoners-of-war died from typhus fever.

World War II brought a typhus fever pandemic that was most deadly in Poland, Romania, Yugoslavia, and other German-occupied countries. The largest epidemic in the history of Poland began in 1914, in a region of the former Congress Kingdom. In 1919 in the whole of Poland, 219,088 typhus cases and 18,641 deaths were recorded. From 1920, the incidence decreased gradually, reaching 1963 cases at its lowest point in 1930. In the following years the incidence rose again. Until the outbreak of World War II, the incidence rate was approximately 3000–4000 a year. This epidemic dynamic was also characteristic of other European countries haunted by this disease in World War I. In 1936–1938, the seasonal

pattern of typhus fever in Poland was characteristic of epidemic typhus fever in temperate

climate countries. The peak intensity came at the end of winter and the beginning of spring. Typhus fever is not a characteristic childhood illness. In children, the disease is usually milder and has fewer typical symptoms than in adults. Mortality increases with age and is higher in women than in men. Prevention of typhus fever dates back to 1919 with the creation of the central committee for its eradication. Its duties were taken over by the Central Special Office for Epidemic Control. The Polish Red Cross was also involved in the campaign, as was the military health system. In 1934, mass vaccinations with Weigl's vaccine, based on lice midguts, were started, with 8000 people vaccinated. Through 1938, 667,893 people had been vaccinated in Poland. Those vaccinated were primarily sanitation personnel and people inhabiting focal pockets of infection.

Figure 18. Typhus fever in Warsaw. Incidence in World War I and World War

II.

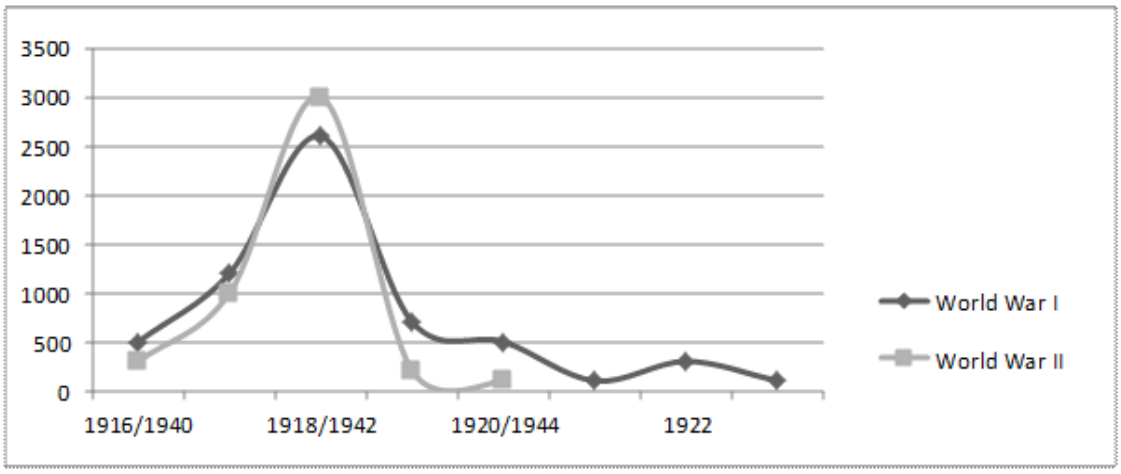
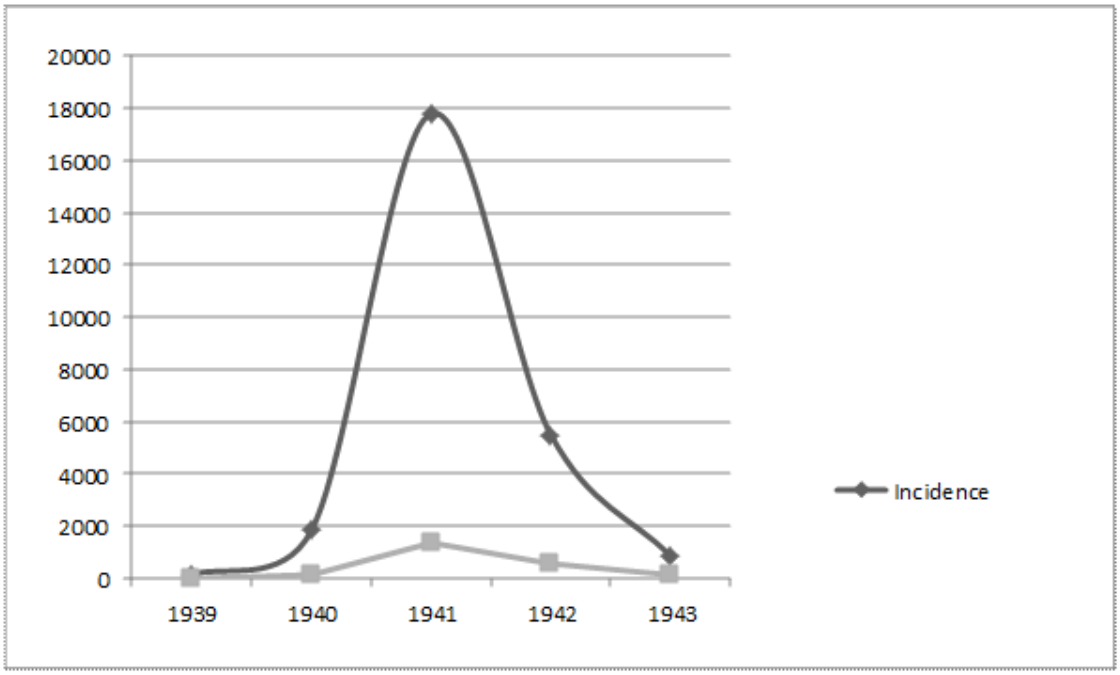


Figure 19. Epidemiology of typhus fever in Warsaw, 1939–1944.



Under the Nazi occupation of Warsaw, Weigl's vaccine was also used, as was another preparation produced by the Germans in the National Institute of Hygiene. However, the effectiveness of this latter vaccine was doubtful. In the face of a rapidly increasing epidemic wave in 1940 and 1941, anti-typhus vaccines came into high demand. First, they were used among the Germans, medical personnel, sanitation forces, and other risk groups. They were traded illegally and reached high prices on the black market. The struggle against pediculosis and poor hygiene together with vaccinations became the basic approach to fighting typhus fever, including delousing and bathing campaigns. Columns of sanitation workers were responsible for disinfestations of the homes of typhus fever sufferers. These actions did not prevent the outbreak of typhus fever in occupied Warsaw.

The intensification of incidence and deaths due to typhus focused in the enclosed Jewish area, which contributed to conditions with a high population density, starvation, and poor sanitary conditions. The first so-called "small epidemic" broke out in January 1940 and lasted until June. At that time 10,000 people were suffering from typhus fever. By the end of 1940, the ghetto had been surrounded by a wall and more people had come to live there. The increasing poverty and hunger were the cause of the "Great Epidemic" outbreak that occurred in the spring of 1941 and lasted until April 1942. The epidemic involved 100,000 people, and it was impossible to delouse more than 200 patients a day. The outpatient

personnel and the majority of other medical staff also suffered from typhus fever. In hospitals, there were 2 to 3 patients to one bed. The fatality rate during the first epidemic was 10%; during the second, it was 20%. J. Penson writes about a very low fatality rate and abortive forms of typhus fever in the Jewish ghetto. We cannot, however, ignore the fact that in the presence of such widespread epidemics, the absolute incidence was likely even higher when asymptomatic conditions are taken into consideration. J. Kostrzewski notes that the typhus is milder in children than in adults, and one inference is that paediatric cases may have been overlooked. He presents the death rate in relation to the number of typhus fever patients hospitalized in the Infectious Diseases Hospital in Chocimska Street and the Infectious Diseases Hospital in Grochowska Street in 1940–1943.

After the destruction of the ghetto and the removal of the inhabitants to concentration camps, the number of recorded cases decreased. This phenomenon partly resulted from a decrease in the epidemic wave but was primarily the result of eradication of the infection pocket, which was centred in the Jewish ghetto.

During the Warsaw occupation, typhus fever incidence in children and youth dropped from 45.23% in 1939 to 28.27% in 1942. This trend continued in Warsaw even after the war.

Thus, the outbreak of a massive typhus fever epidemic in Warsaw during the occupation should be attributed to the living conditions. The intensification of the epidemic in the Warsaw ghetto area was a result of lack of space and of the filth and hunger that haunted the ghetto.

Typhoid fever

In the inter-war period, Poland was among those countries where the typhoid fever incidence ranged between 38 to 70 cases per 100,000 population. In 1925–1937, the highest typhoid fever and paratyphoid fever incidence occurred in the cities, particularly in Warsaw and Łódź. Warsaw, where under particular conditions typhoid fever would break out in an epidemic, had been an area of high concentration of typhoid fever for a long time. The incidence during 1921–1938 ranged between 90–160 per 100,000 patients, and the mortality rate ranged between 7–17 per 100,000 patients.

Figure 20. Epidemic rates of typhoid fever in 1938–1945.

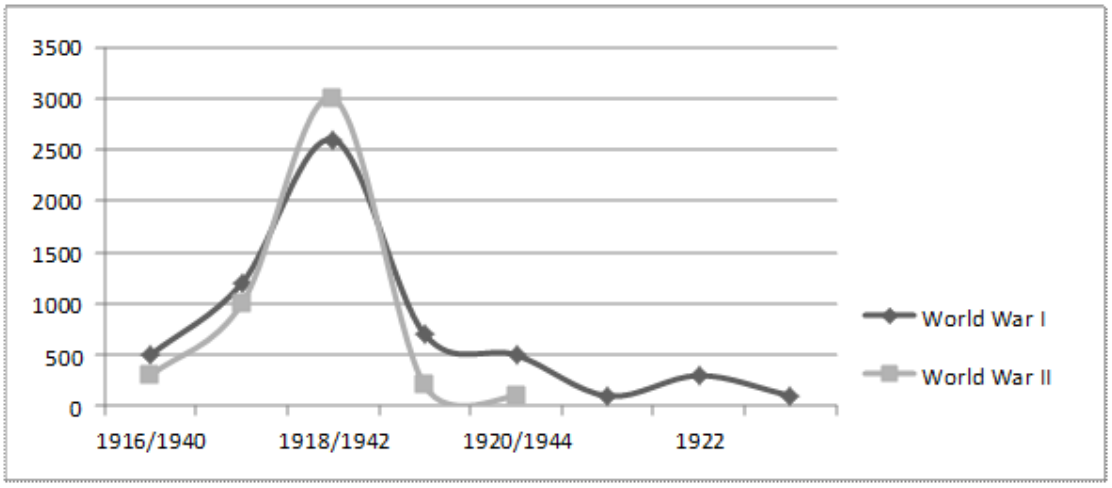
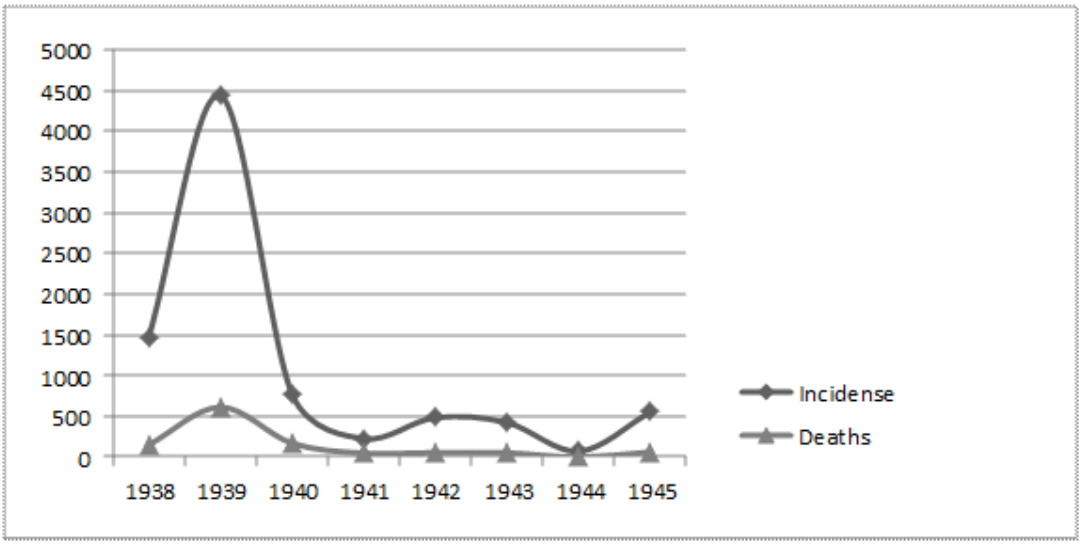


Figure 21. Epidemic rates of typhoid fever in 1938–1945.



The history of typhoid fever in Warsaw can be divided into three periods. In the so-called "pre-waterworks" period up to 1886, the typhoid fever mortality rate in Warsaw was approximately 80 per 100,000 inhabitants. In the "waterworks" period, dating from 1886 until World War I, the mortality rate ranged from 18 to 25 per 100,000 population. World War I was the period during which 30 of 100,000 inhabitants died; afterwards, a gradual improvement in the epidemic factors occurred simultaneously with the improvement of sanitary conditions and the introduction of vaccinations. The mortality rate fell to 10 per 100,000.

Vaccinations against the typhoid fever in Warsaw were launched in 1924; first vaccinations were administered orally and later given subcutaneously. Individuals whose daily practices brought them near a sufferer of typhoid fever, those in risk groups, or those from a potential

epidemic focus were inoculated. Often, the inhibitions of both doctors and patients had to be overcome.

Altogether, more than 10% of Warsaw's inhabitants were vaccinated over a five-year period, but it was too little to have any serious effect on the typhoid fever incidence. Apart from vaccinations, propaganda campaigns, sanitary inspection, and supervision over typhoid carriers were used to fight typhoid fever.

The war conditions during Warsaw's defence 1939 led to a serious deterioration in the city's hygienic conditions. Lack of water forced the inhabitants to use random, unmonitored water sources. Demolished houses and the resulting high population density, severe psychological stress, and malnutrition led to an epidemic of typhoid fever in 1939 in Warsaw.

The percentage of children and youth with typhoid fever decreased in the period of 1939–1940, whereas in 1942 it substantially increased from 34% in 1941 to 56.7% in 1942. This phenomenon might have been influenced by the fact that at that time, two-year-old and three-year-old children were affected. These were the same children who at the turn of 1939 and 1940 were not vaccinated as infants and were not vaccinated in the following years, either. It is possible that there was a mechanism of deteriorating immunity among children living under the hard conditions of the Warsaw occupation.

In the face of an intense epidemic wave of typhoid fever, a vaccine campaign was launched in Warsaw. The inoculation process took place in two basic stages. In the first period, which lasted from 15 Nov 1939 to 31 Mar 1940, altogether 1,107,298 children over age one year were vaccinated. This number includes single and double vaccinations. A total of 80% of Warsaw's inhabitants were inoculated. There was also the penal law sanction, administered in the form of withholding ration cards carrying a seal from a health centre/health establishment confirming a vaccination. Patients who had had typhoid fever in the previous two years and those who suffered from diseases that contraindicated vaccination (e.g., patients with severe/acute medical conditions, uncompensated heart defect, kidney diseases, and infants) were excluded from the programme. To preserve the population's immunity, additional preventive vaccinations were administered to the whole population the following year in a campaign

lasting from 16 Dec 1940 to 31 Mar 1941. As before, the infants were not inoculated. A total of 762,103 vaccinations among the non-Jewish Polish population were administered; with the 344,661 vaccinations administered in the Jewish population, there were a total of 1,106,764 vaccinations carried out. Vaccination campaigns against typhoid fever were still in progress, but their scope was not so widespread as previously. In 1942, as many as 883,083 patients were vaccinated, whereas in 1943, the number was 923,571 patients.

The epidemic wave subsided largely because of these vaccinations. This change did not, however, influence the peak of the epidemic wave in 1939. (Fig. 20, 21)

Figure 4. Citizens of the capital during the Warsaw Uprising in 1944.

Figure 5. Refugees after the Warsaw Uprising in 1944.

Figure 6. Barber on a street of the destroyed capital, Warsaw, 1944.

Dysentery

Dysentery is mainly a children's disease. The highest incidence in Poland was noted among the youngest children ages 0–4 years, constituting almost a half (43–45%) of all dysentery incidence in Poland.. Another incidence increase occurred in the 20–45-year age group. Dysentery manifested a high seasonal incidence after World War I; Poland, unlike other countries with high dysentery incidence, such as Hungary, Romania, and Russia, saw a decreased incidence a few years following the war.

In the inter-war period in Poland, a dysentery diagnosis consisted of a clinical criterion, and the registration of cases was incomplete. Only in 1935 did dysentery notification become obligatory. Before World War II, dysentery was almost endemic to the eastern areas of Poland. Despite inadequate case recordings, the incidence in the eastern parts was 100 times higher than in the western parts of Poland. Mortality rates showed similar patterns. Dysentery incidence in the war period according to official data was low . One might assume, however, that the level of incidence and deaths was actually higher owing to the fact that the case recording process had only just started.

During the September Campaign in 1939, dysentery was a serious epidemic problem in the German army although Germany had a low epidemic incidence of dysentery. In Poland, however, from 1931 until World War II, these indicators slightly increased. Reports from the occupation period suggest that in Łódź, Warsaw, and Cracow, the dysentery incidence was particularly high. Epidemic data for occupied Warsaw show a considerable increase as compared with the pre-war period; however, the data refer to the population as a whole with no differentiation for children and youth below the age of 20 . This increase in epidemic rates resulted from the deterioration of sanitary conditions and nutrition and improvement of case recording.

Poliomyelitis

Poliomyelitis is a severe infectious disease that affects mainly children between the ages of 4 months to 4 years in unvaccinated populations. The fatality rate is highly influenced by age, and the highest incidence occurs from June to October.

A total of 166 cases of poliomyelitis were recorded in 1911 in Warsaw and its vicinity, mainly in June and July. In 151 cases out of 161, children ages 0–5 years were affected. The majority of the affected were boys (98 cases), and the mortality rate was 3.1%. Spinal poliomyelitis was prevalent (103 cases; bulbar polio, 54 cases).

An order to report polio cases was issued in 1927. The registration up to the year 1950 involved only paralytic cases and was not precise; regardless, the highest polio incidence was noted in cities. Out of 22 deaths in the whole country in 1936, two cases were recorded in Warsaw (ages 0–4 years). In 1937, 12 deaths resulting from polio were noted, but in Warsaw there were none.

A total of 19 cases of the disease were recorded in Warsaw in 1938, indicating that the incidence in Warsaw was three times higher than in the rest of the country. The number constituted a 1.5 incidence factor, compared with a national average of 0.4.

The poliomyelitis incidence rate in occupied Warsaw (1939-1945) did not change drastically in relation to the pre-war period; even considering the relatively high incidence in 1940–1942 cannot support a conclusion that it was an epidemic. A few paralytic poliomyelitis cases were still reported. Because of the scarcity of data, classification of incidence and death rates by age groups in 1941–1942 precludes any firm conclusions.

Overall, poliomyelitis incidence in Warsaw stayed at pre-war levels through the occupation. The number of reported cases was not high, and there was not an epidemic.

Epidemic cerebrospinal meningitis

Epidemic cerebrospinal meningitis affects mainly children and youth. The most prone are children 0–5 years old, and cases in children younger than three months are rare. The mortality rate peaks in the 5-year age group and is 56%; later, the mortality rate decreases with age. The epidemic wave peak occurred in Warsaw in the war period as a result of population migration, population density, and the deterioration of sanitary conditions. Before the war, Poland was among the countries with average epidemic indicators. Cities such as Warsaw and Łódź manifested the highest incidence in the country, exceeded only in the eastern districts of Poland. War caused intensification of the epidemic wave in Cracow from

1940–1942, in the Nowogródek district where the epidemic peak occurred in 1940.

Out of 24 deaths in Warsaw 1936, 15 occurred in children in the first year of life, and three were 14-year-old patients, amounting to 75% of deaths among children and youth. In 1937, out of a total number of 25 deaths, 22 were in the 0–19 years age group: 14 deaths were children age one year or younger; 13 deaths were children ages 1 to 4 years; two deaths were children aged 5–9 years; and three deaths occurred among 10–15-year-olds. In 1936 and 1937, infant deaths were the majority.

Epidemic data for occupied Warsaw for the years 1939–1945 showed a tendency to increasing incidence, particularly in 1940 and 1941. Incidence and death rate percentage according to age in 1941 and 1942 are shown in.

In occupied Warsaw, an epidemic wave occurred between 1940 and 1942, with a peak in 1940. In the following years, the incidence level considerably decreased. The incidence and death rate occurred mainly the 0– 20-year age group.

Conclusions:

An incidence increase in typhus, typhoid fever, and dysentery was noted, fitting a pattern that also occurred in adults.
Incidence increased for infectious diseases that are highly influenced by sanitary and economic conditions: spotted fever, typhoid fever, dysentery, pertussis and diphtheria. The remaining children's infectious diseases in the occupation period showed an epidemic cycle/periodicity with no increase in incidence.

There was considerable increase in epidemics of children's diseases in the extremely overpopulated Jewish ghetto, an increased fatality rate was recorded there.

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