

# Ghetto Medicine: The Special Case of Ghetto Lodz, 1940-44

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“ Today there is no doubt that the creation of conditions in the ghettos that would cause Jews to expire in masses ‘naturally’ – that is, without gas chambers and executions – was part of the Nazi plan to annihilate the Jewish population” [1]

The first Jewish ghetto in Poland, established soon after the German invasion in 1939, was perhaps the most hermetically sealed-off mass prison of World War II. As the living conditions deteriorated year after year, the depleted community was plagued by epidemics of infections and endemic diseases. The extermination process was completed with frequent “relocations to the East,” as the deportations to the death camps were euphemistically called. These started in mid-1942 and were concluded by 31 July 1944. What were the major diseases and their fatalities during this time? *The Chronicle of the Lodz Ghetto*, a precise daily record of life in the ghetto over 4 years that was never discovered by the Nazis, might provide the answers [2].

## HISTORICAL BACKGROUND

Lodz, in western Poland, was a large city in the early decades of the 20th century. According to the 1931 Polish census, the Jewish population numbered more than 230,000 out of the total population of 604,470. It was the home of a major textile industry complex. From a population of some 767 (with 259 Jews) in 1820, the city came to be known a century later as the “Polish Manchester.” The Jewish population lived in all quarters of the city, the community was prosperous and Jewish life was maintained [3].

On 8 September 1939, one week after the onset of World War II, the German Army occupied the city, later re-naming it Litzmannstadt in memory of a German general in the First World War. In December 1939, just 3 months after World War II erupted, Jews were ordered into a demarcated area of the city. By April 1940 the area was decreed a ghetto and was hermetically sealed off a month later. Unlike other ghettos in Poland, Ghetto Lodz had no contact with the external

world, no black market operated from outside, and bringing in clandestine food was not possible. Approximately 100,000 Jews escaped to the East before May 1940, only to be caught by the German occupiers at a later stage.

## THE HISTORICAL MATERIAL

The history of the Jewish ghetto can be reconstructed from the remarkable *Chronicle of the Lodz Ghetto*. This document, rescued by a courageous survivor, was recorded day by day from mid-1940 until 31 July 1944 [4].

The condition of the diminishing population was recorded daily by the Sanitary Section of the *Judenrat* (Jewish Council), which documented the morbidity and mortality in the hospital and in the general ghetto population, with each case having an established diagnosis. The documents were hidden in 1944 and remained undetected by the Germans who were themselves deserting in fear of the approaching Red Army.

The story of the *Chronicle* was given to the YIVO Archives by Nachman Zonabend, the rescuer of this document. He was one of a small group of Jews who were left behind by the occupiers in August 1944 for the purpose of cleaning up the ghetto. By October he managed to retrieve the numerous documents of the ghetto administration, first hiding and burying them, then safeguarding them, and finally transferring them initially to Sweden and eventually to New York. “An important record of the history of the Lodz Ghetto had been saved,” wrote Zonabend, as “I will never be able to describe the destitution, starvation, sickness, despair, injustice and loneliness which I saw there” [4].

*The Chronicle of the Lodz Ghetto*, recording the fate of over 200,000 Jews, was first published in four volumes in Polish (1948), then in English (1984) and German (2007), and finally published again in German in an extended and completed version of five volumes (2010). The publication is exceptional in the details provided, with only short gaps in the record that were filled in from the studies of the survivor/historian Isaiah Trunk. In total, however, it allows for a compilation and for conclusions to be drawn.

This document describes many aspects of daily life in the ghetto (births, illnesses, deaths, food supply, weather, marriages, concerts, suicides, deportations). The medical section has a precise, almost daily, diary from which diseases, epidemics and the mortality in the ghetto were extracted for

this article. Various other interpretations have been published from these documents, and indeed the library on Ghetto Lodz is voluminous [1,5-13].

## METHODS

Our study includes the total number of deaths reported in the *Chronicle* over 4.5 years. The illnesses recorded were counted, the figures obtained were tabulated, statistical representations were constructed, and conclusions were deduced. A review of the daily and monthly records over 4.5 years allowed for a compilation of the total number of disease-related deaths in the ghetto. The absolute numbers obtained were converted to per-thousands (‰) of the diminishing population. Infectious diseases were multiple, including typhoid fever, dysentery, scarlet fever, diphtheria, typhus exantematicus (spotted fever) and tuberculosis. The last two diseases were chosen for this study, being more devastating; and these together with heart disease were the main causes of death, other than killings, beatings and freezing. Suicide rates were also documented. Our figures might be somewhat different from official ones; this variation can be attributed to the fact that other studies may contain: a) data taken from a different publication reporting only figures from hospital cases; b) partial data only, for example covering 5 or 6 months in a year or ceasing in 1942; c) differences in statistical reporting such as the calculation of results in percentage figures rather than per-thousand of population; d) summation in averages of several years rather than separate individual years.

## RESULTS

The recorded decrease in the population is used as the basis for comparisons with the incidence of diseases [Figure 1] [14].

### SUICIDES

The *Chronicle* documented a low rate of suicides. Indeed, once tabulated, they indicate a fairly linear graphic representation of the number of people who succumbed: just a few cases per thousand each year.

### TYPHUS

Typhus exantematicus appeared as a high fever, malaise, skin spots, hemorrhages, kidney failure and encephalitis, the last two being the main causes of death, which was expected in up to 30% of those infected. The louse-transmitted minuscule *Rickettsia prowazekii* was the agent for this disease.

The absolute recorded figures in the *Chronicle* were related to the yearly changing population [Figure 2]. The disease was non-existent before the war and was recorded with 0.28/1000 mortality (28 cases) by the start of 1941, increasing to 4.0‰ in 1942. Surprisingly, the total number of mortality cases fell in

Figure 1. Ghetto Lodz population

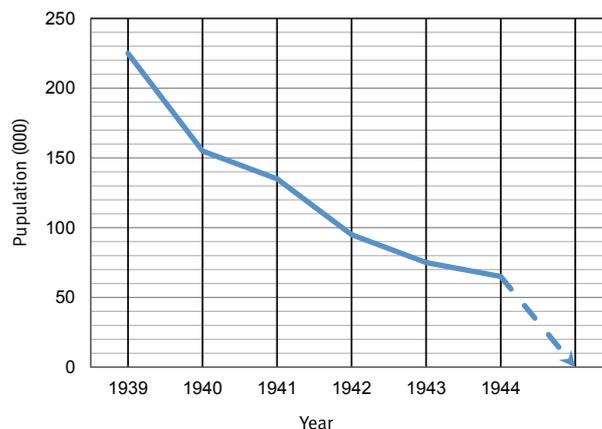
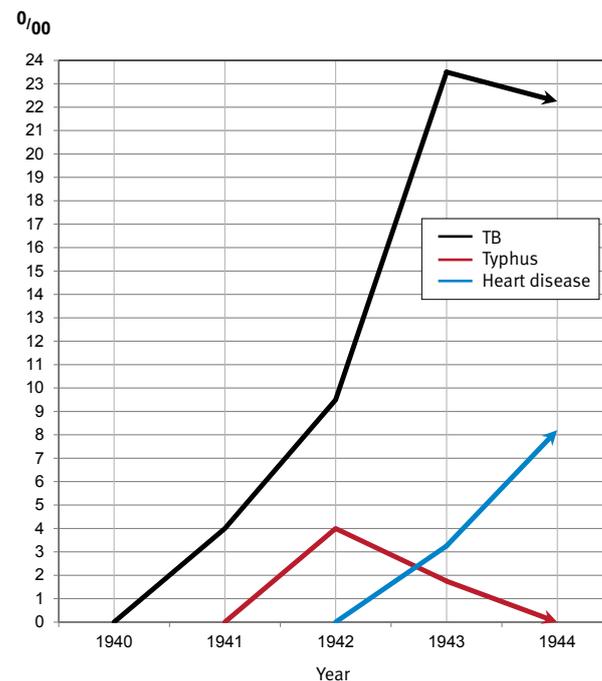


Figure 2. Ghetto Lodz mortality



1943 to just 1.57‰; by the end of the liquidation of the ghetto on 31 July 1944, with only sporadic cases it was equivalent to 0.02‰.

### TUBERCULOSIS

TB was the most devastating infectious disease in the ghetto, with the highest percentage of case fatalities. The disease was reported before the war in 8.2% of cases in the Jewish population of Lodz, extracted from an average of 5 pre-war years (1931–36) [1].

TB = tuberculosis

In our study, the absolute figures obtained from the *Chronicle* were converted to the relative figures per thousand of the shrinking population [Figure 2]. The statistics found a progressive, highly significant increase in the number of TB deaths per thousand of the population. These were recorded as 3.9‰ in 1941, 2.4‰ in the first 4 months of 1942 extrapolated to 9.2‰ by the end of the year. From that date on, despite a downturn in the population, a progressive increase in the total cases of TB death became evident, namely 23.65‰ in 1943 and 22.44‰ in the first 7 months of 1944. In our statistical summation all cases of TB were combined, unlike the statistics in other studies where lung, intestinal and brain disease from TB were separately categorized.

#### HEART DISEASE

The *Chronicle* data indicate that the incidence of death from heart disease was initially 0.04‰ of the population in 1942, followed by a sharp increase to 3.3‰ in 1943. As a result of a decrease in the general population, the per-thousand calculation of incidence becomes even more significant. Later on, during the first 7 months of 1944, the number of deaths from heart disease rose to 8.43‰.

## DISCUSSION

The Nazis' handling of Ghetto Lodz, the second largest concentration of Jews in Poland, was a clear example of an illogical political approach nurtured by the hatred of Jews. The ghetto was populated by a highly professional, experienced and motivated Jewish community with a depth of experience in the textile industry, ready under duress to organize and submit their expertise to the occupiers. It was not until late 1944 that the deportations to death camps ceased and the transfer of Jewish workers from other ghettos to Germany started. By that time, however, it was too late to save the Ghetto Lodz population as the last deportation on 31 July 1944 liquidated the entire ghetto, as had been demanded earlier by Himmler.

The exact size of the Jewish population and of the deportations varies slightly with each publication, but it was estimated to be around 230,000 in 1939. It is known that the ghetto was initially planned as a transit camp, but in fact its population was soon designated for extermination. It was totally isolated from the rest of the world, and this isolation contributed to overcrowding, filth and epidemics. Since the daily nutritional intake was gradually lowered by the German authorities to 900 calories, and then to 700 and less, this deprivation led to individual depletion of energy and lowering of immunological resistance; these factors, together with infectious diseases, were intended to cause a "natural mass extinction" [15-18].

Hunger, no doubt, was the main cause of death in the ghetto, whether directly or indirectly. The inability to fight disease was

the main indirect effect of inanition. In this study we analyzed three major illnesses, as well as suicide, as causes of death.

#### SUICIDE

The low figures in the daily and monthly records are rather surprising, as one would have expected a gradual increase, paralleling the grief and despair in the daily life of the ghetto [19]. In the past, studies of suicide among Jews discovered that an increase in the rate of self-harm coincided with pogroms or intense repressions. One explanation for the relatively low number of suicides could be the exhaustion and apathy of the inhabitants – a lack of physical and spiritual energy required for such an act. Another more positive explanation would be a strong desire to survive, particularly in view of the changing military situation, as well as a strong will to resist the occupiers. The downturn in the total number of victims after 1942 fits with this latter explanation.

#### TYPHUS EXANTEMATICUS

The statistics on typhus peaked in 1942 and leveled to almost zero by late 1944. As the lice infestation was neutralized either by sanitary measures or quarantine, it was sporadically reintroduced from outside. Typhus was brought into the ghetto from the neighboring Polish prisoners' camp and from the Roma (Gypsy) camp, negating the successful sanitary measures introduced by the ghetto health authorities.

The theoretical explanation, suggested by pathogenesis but not proven, holds that in the population that remained after the almost daily deportations to Chelmno's carbon monoxide gas chambers, typhus (with 30–60% case fatality) left the survivors with a lifelong immunity. This condition, even in the debilitated person, together with the sanitary measures adopted, could have offered an almost typhus-free period in the last 2 years of the ghetto.

Interestingly, there is no mention of any anti-typhus vaccination even though it was originally developed in Poland several years earlier. Also, a new vaccine was developed in Ghetto Lwow itself by Dr. Ludwik Fleck [20,21]. The knowledge might have been available but the facilities were not.

The exceptional dedication of Jewish doctors working in the Roma (Gypsy) camp must be mentioned. Such was the case of Dr. Duski, deported to Ghetto Lodz from Prague, who contracted typhus on 19 December 1941 while working in the Roma camp. An even greater sacrifice was made by Dr. Karl Boehm, also from Prague and also working in the Roma camp, who contracted typhus there and succumbed to it on 29 December 1941.

#### TUBERCULOSIS

TB was the highest per-thousand killer disease in Lodz. The disease was already widespread in Europe before the war. The statistics vary, but records suggest an incidence of about

8.2% (with a 10% yearly average case fatality in the period 1931–36). In an excellent previous analysis of the Lodz Ghetto, Trunk reported 24.2% in 1941 with a per-thousand incidence of 18.2‰ in the first half of 1942.

Treatment in the ghetto hospital comprised rest, slightly increased nutrition, and pneumothorax for compression of cavernoma – a triple treatment that briefly delayed the fatal outcome. During the later years of the ghetto, the lack of supplies and facilities forced the doctors in the hospital to make the terrible ethical decision to abandon the hopeless cases and focus the scarce available resources on the amelioration of others [1].

Trunk's figures were somewhat at variance with our total cases. We counted an increase in cases, climbing eventually to 23.65‰ in 1943 and 22.5‰ in the first 7 months of 1944. TB was devastating, with 60% of the population infected by 1943, high mortality, no cure, and climbing toward extermination [7]. People with TB were not isolated; they moved freely in the ghetto, they worked in the kitchen, the hospital and factories, and the disease spread with no restrictions [1]. This incidence of infection, much above the pre-war level, headed toward a total infection of the population. Even if the remaining inhabitants of the ghetto had not been deported by the Nazis in 1944, the majority would have perished eventually from TB.

Interestingly, the onset of increased mortality from TB in the ghetto was somewhat tardy to appear, reaching the highest figures only in 1942–43, namely several-fold the numbers per thousands in the pre-war population. The theoretical explanation suggested, based on pathogenesis but not proven, is that the disease appeared later because the incubation period in TB, and the time that the cavernomatous lung disease needs to spread, is longer than for many other diseases. Also, due to a diminished resistance, the incidence was affected by age. Young females are known to be more susceptible to TB, and since the proportion of non-working-age ghetto residents (the elderly and pre-adolescents) fell due to deaths and deportations, the proportion of young adults rose.

Once again, special mention is accorded to the exceptional commitment of the doctors working with expectorating patients. One such was Dr. Zdzislaw Swider, who died of TB on 23 February 1944.

#### HEART DISEASE

The analysis of deaths caused by heart diseases in the ghetto was the most difficult. Although the absolute numbers were recorded in the *Chronicle*, at least from mid-1942 onward the precise type of heart disease leading to death was not identified and neither was the age of the victims. Interpretation of this phenomenon must take into account the type of disease and the general nutritional conditions in the pre-war and wartime periods. It was presumed that the pre-war cases were of a hypertensive-arteriosclerotic type. The incidence

was recorded to be 23.0% on average for the years 1931–36. The figures in our study indicated, in per thousand of ghetto population, a significant increase to 3.3‰ by 1943 and even higher, to 8.15‰ by July 1944.

The exact nature of the “heart disease” recorded in the Lodz Ghetto was not identified. The cardiac diagnoses appearing in the *Chronicle* were “*choroba serce*” (heart disease), or later on “*herz schwach*” (heart weakness) or “*herz muskel schwach*” (heart muscle weakness), with no particular clinical or pathological specifications.

The relationship between the heart condition and starvation was clearly mentioned in several publications [1], being one of major interdependence. Based on calculations of the metabolic requirements, it was postulated that survival requires 2500–3000 calories a day. The decrease of nutritional intake to 900 and then 700 calories a day should have been sufficient only for 60–75 days of survival. Yet, the Jews in Ghetto Lodz survived much longer, even up to 2 years, on this semi-starvation diet, suggesting a decreased catabolism, a protective mechanism of preservation, a form of semi-hibernation. Gradually, functions were reduced to a minimal level in order to conserve energy [17,22–24]. What could explain this survival on such a reduced quantitative and qualitative diet?

Despite the excellent sanitary work in Ghetto Lodz and the exceptional dedication of the doctors, no research on cardiac disease was conducted. However, extensive research was conducted by Jewish doctors in Czyste hospital in the Warsaw Ghetto, undertaken as part of the work of the clandestine medical school that functioned there undetected by the Nazi authorities. The morbidity and mortality in the Warsaw and Lodz Ghettos have previously been compared [1,7]. The Warsaw Ghetto data reveal impressive ingenuity and professionalism on the part of the researchers, surprising for such conditions. The Warsaw researchers' discoveries were recorded, smuggled out or hidden, buried and retrieved after the war. They were published in a comprehensive book, first in Polish as *Choroba Glodowa* in 1945, then in French as *Maladie de famine* in 1946, and finally translated into English and published with commentaries in 1979 in New York. Commenting on the cardiovascular studies, Myron Winick, editor of the American version of the book *Hunger Disease*, states: “The studies described demonstrate what an imaginative and disciplined investigator can do, even with extremely limited equipment and supplies” [16].

The conditions in Lodz and Warsaw were indeed quite similar, regarding both the daily life and the diseases from which people suffered. Therefore, for the final conclusion, we propose to make use of the Warsaw study for the identification of the “heart muscle weakness” found in Lodz. Our review found a clear differentiation between the pre-war arteriosclerotic cardiac dysfunction found in Jews and the atrophic cardiac dysfunction encountered in the ghetto dur-

ing the last 2 years of its existence, which occurred in young and middle-aged people who were still alive because of their ability to work.

Table 1 presents the essential differences between the two syndromes of cardiac dysfunction. The anergic reaction, i.e., the preservation against “myocardial starvation,” allowed for a much longer survival compared with those with full metabolic expenditure. The syndrome of cachectic anergic cardiac dysfunction, appearing some 2 years into the life of the ghetto (with low caloric intake, a diet devoid of lipids, minimal protein addition, low levels of B-complex vitamins, trace elements and carbohydrates, with no diabetes diagnosed), is explained by the pathology found in macro- and microscopic studies of inanition.

The diagnoses of “heart failure” or “heart weakness” or “heart muscle weakness” are clarified by the autopsy findings: the size of the heart being “smaller than the person’s fist,” with atrophic cardiac walls and microscopic changes of fibers that are thin, with brown atrophy, lipofuscin pigmentation and interposition of connective tissue assumed to replace myofibrils. The theoretical explanation proposed for this cardiac dysfunction, based on pathogenesis but not proven, would be “myocardial starvation,” particularly related to protein deprivation and thiamin (B1) deficiency, both of which are required for myocardial fiber renewal [25].

Particular mention should be made of Prof. Wilhelm Caspari, a well-known cancer researcher, reported to have succumbed to “cardiac failure” in the ghetto.

**FINAL IMPRESSIONS**

The daily life and the medical services of the ghetto were detailed in the *Chronicle* and were analyzed by Trunk, Orbach and Sandhouse who commented on the various diseases and particularly on the mortalities in the ghetto. The hermetic isolation of the Jewish population in Lodz caused a growth of epidemics and diseases with high mortality. The total mortality in the population was 7.2/1000 in the years 1940–42, compared to 1.52 in the Polish population during the same years, and to 0.9 in the pre-war Jewish population in Lodz [9,10]. The mortality figures for the ghetto are even higher in the years 1942–44.

An interesting phenomenon is the critical turnaround in mortality in late 1942/early 1943. It is perhaps a sign of the exhausted energy syndrome in TB and cardiac conditions that led to the upsurge in mortality. The decrease in the incidence of typhus can be explained on immunological grounds, namely, the survivors obtained a lifelong immunity; the decrease in the rate of suicide could have been the result of a change in psychological reaction, i.e., from apathy to the desire to survive and defy the Nazis. This raises the question whether semi-starvation of 2 years duration is the period required for a multi-system collapse?

**Table 1.** Cardiac dysfunction

	Arteriosclerotic	Atrophic
Blood pressure	Hypertension	Hypotension
Pulse	Tachycardia	Bradycardia
Circulation time	Rapid	Prolonged
Ventricular stroke	Increased	Reduced, with Q-T wave elongation
Tissue oxygenation	Normal or increased	Reduced
Peripheral edema	Legs, increasing	Abdomen, legs, pale, unchanging
Response to stimuli	Increased cardiac work	Anergic reaction
Renal function	Increased urine output	Decreased urine output
Pulmonary function	Hyperventilation, dyspnea, congestion	Hypoventilation, shallow breathing, no congestion
Autopsy: macro	Ventricular hypertrophy (10–15 mm wall)	Ventricular atrophy (1–3 mm wall)
Autopsy: micro	Enlarged myocardial fibers	Atrophic myocardial fibers, brown pigmentation, lipofuscin, interposed connective tissue

In conclusion, the analysis of data obtained from the *Chronicle* yields the following impressions concerning the Lodz Ghetto:

- **Isolation and control:** The total isolation of the ghetto from the outside world, with the consequent deterioration of sanitary conditions and the authorities’ absolute control of the food supply, suggest that the general aim of the Nazis was the extermination of the Jews in Lodz.
- **Infectious diseases:** The imposition of starvation by progressive quantitative caloric reduction and qualitative limitation of the food supply established the conditions for energy depletion, for immunological depression, and for an almost exponential increase of infectious diseases in the ghetto population, checked only by survivors’ immunity in the case of typhus.
- **Heart disease:** Another result of starvation was the restriction of protein and thiamine content in the food supply, which could explain the macroscopic cardiac atrophy found in the ghetto and the lack of cardiac myofibrillar renewal, all resulting in myocardial “weakness,” i.e., a non-hypertensive, non-arteriosclerotic, non-hypertrophic heart dysfunction.
- Apart from the deportations to Chelmno and later to Auschwitz, the above features suggest a program of biological mass destruction of the Jewish population in the non-deported population of Ghetto Lodz.

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**Capsule****ABT-199, a potent and selective BCL-2 inhibitor, achieves antitumor activity while sparing platelets**

Inhibition of prosurvival proteins of the BCL family is a promising anticancer strategy; however, the similarities between the family members make the development of specific agents difficult. Current compounds have been designed to target BCL-2, which is frequently elevated in tumors and is an important prosurvival factor, but also inhibit BCL-XL, which is required for the survival of platelets; thus, thrombocytopenia is a limiting toxic effect in patients. Souers et al. have engineered

anti-BCL drugs to generate a more BCL-2-specific compound that has less affinity for BCL-XL and, therefore, reduced platelet toxicity. The compound is effective in several tumor models in vivo and had reduced toxicity in three patients with refractory leukemia, showing a promising activity and safety profile to refine and improve pro-apoptotic therapy in cancer.

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Eitan Israeli

**Capsule****Epithelial-mesenchymal transition cells may facilitate tumor cell dissemination in humans**

Epithelial-mesenchymal transition (EMT) is a developmental program that converts adherent epithelial cells to a migratory mesenchymal state. This cell-fate change has been linked to tumor metastasis in preclinical models. To investigate whether EMT occurs in human cancer, Yu et al. isolated circulating tumor cells (CTCs) from breast cancer patients and analyzed their expression of epithelial and mesenchymal markers by RNA in situ hybridization and RNA sequencing. Biphenotypic cells expressing both types of markers were rare in primary

breast tumors but were enriched among CTCs, as were cells expressing only mesenchymal markers. Serial blood samples from one patient revealed that CTCs in the mesenchymal state declined in number when the patient responded to therapy but rebounded when the disease began to progress – a pattern repeated when a different therapy was administered. Thus, EMT may facilitate tumor cell dissemination in humans.

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