Mortality Transition in Moscow Population: Disentangling the Epidemiological Transition and Societal Change

Alex Shpenev

Extended Abstract

Background

The population of the Russian empire reached 126 million in 1987, making it account for almost 8% of the world population. However, despite its absolute and relative magnitude, the lack of data sources prevents detailed analysis of population dynamics of Russia prior to the second half of the 20th century. Moreover, when data on demographic processes are available, they are rarely region specific. Thus, the demographic history of Moscow remains largely unstudied.

While contemporary analysis reveals a uniquely low mortality in Moscow compared to the rest of Russia (Kvasha and Kharkova 2009), historically cities suffered from excess mortality due to overpopulation, low levels of sanitation and high levels of migration, which facilitated the spread of infections and increased socioeconomic inequality. The crossover of urban and rural mortality happened in Russia somewhere in the first half of the 20th century, although precise dating is complicated due to data quality limitations.

Studies in developed countries (Haines 2001, Ferrie and Troesken 2008) revealed a drastic effect of water and sanitation on health and mortality trends. While Moscow experienced the development of the sewer system in the late 19th century, mortality declines are not explained uniquely by this factor. Moscow has long been a center of attraction for orphaned children, given the presence of the Moscow Orphanage. While it was probably the only chance for survival for many of the abandoned children, survival was low, which accounted partly for low life expectancy in the city. The orphanage was shut down immediately following the Revolution, which could potentially explain a sudden drop in mortality in the city.

However, the societal changes in that period were much more dramatic than this. World War I, the Revolution and the Civil War drastically changed the population composition of Moscow, which coincided with the onset of the epidemiological transition and resulted in a redistribution of deaths from infectious diseases to cardiovascular mortality and cancers, but also in a drastically higher levels of homicides and alcohol poisonings.

Finally, the so called “Russian Mortality Type”, which is characterized by extremely high numbers of deaths in infancy and early childhood and extremely low numbers of deaths in later life appeared to have disappeared shortly after the revolution.

While these phenomena have sometimes been described in the literature, very little is known about the specifics of this intertwined process of societal and demographic change in Moscow. This study aims at overcoming this lack of information

Data and Methods

The calculation of mortality rates requires the knowledge of population composition. While the first Census in the Russian Empire did not happen until 1897, local Moscow censuses were conducted in 1871, 1882, 1897, 1902, 1912, 1917, 1920 and 1926. Population estimates by age and gender were interpolated for all the years from 1871 to 1926.

Mortality registration in Moscow also started before the system was established for the country. In 1872 the Russian Medical Society appealed to the Governor of Moscow with a request to establish a city wide civil death registration system. Due to the lack of manpower (with the Statistical Committee being busy processing the 1871 census), such a system was not then possible. Subsequent attempts were also complicated due to the lack of financing. At that time, a Russian Doctor V. Ostroglazov agreed to establish such a system himself with a relatively modest support from the government. The first statistical tables containing the information of causes of death by age and gender were published in 1877.

In 1978 Russia established its first classification of diseases (well before the implementation of ICD in Russia in 1924). This classification was revised every 5 years, so analysis of time series required reclassification of causes of death using the method similar to the one developed by Mesle and Vallin (1996).

After reconstruction of death rates by age and cause, cause-specific life tables were constructed for each group of causes of death (water-borne infectious diseases, other infectious diseases, neoplasms, cardiovascular diseases, and external causes of death).

Infant mortality dynamics was analyzed separately due to the effect of the Moscow Orphanage. The paper attempts to estimate mortality trends “in the absence” of the orphanage to give a better understanding of the speed of mortality decline in Moscow.

Finally, the estimates of the effect of the establishment of the sewer system on Mortality from both water-borne and other diseases in Moscow will be provided. This will allow to shed light on the presence of Mills-Reincke phenomenon in Moscow (a situation when due to either misclassification of causes of death or an interaction of water-borne diseases with other causes of death, the latter seemingly unexpectedly decline with improved water quality, (Fink 1917)).

These results will shed light onto the process of mortality transition in Moscow.

Preliminary Results.

Figure 1 presents the age pyramids of Moscow by place of birth in 1902. As can be seen, the two populations are drastically different. Native born population demonstrates a typical pre-transitional distribution. Non-locals, on the other hand, are concentrated in the working ages. Two peculiarities of the data are evident: a sudden drop in native born population right after infancy and a high level of age heaping for non-locals. The first can be explained by unusually high mortality in Moscow Orphanage as well as a tradition to send the children away from the city right after the end of breastfeeding. The second is a consequence of social inequality between locals and non-locals and can be reflective of differential levels of education by place of birth.

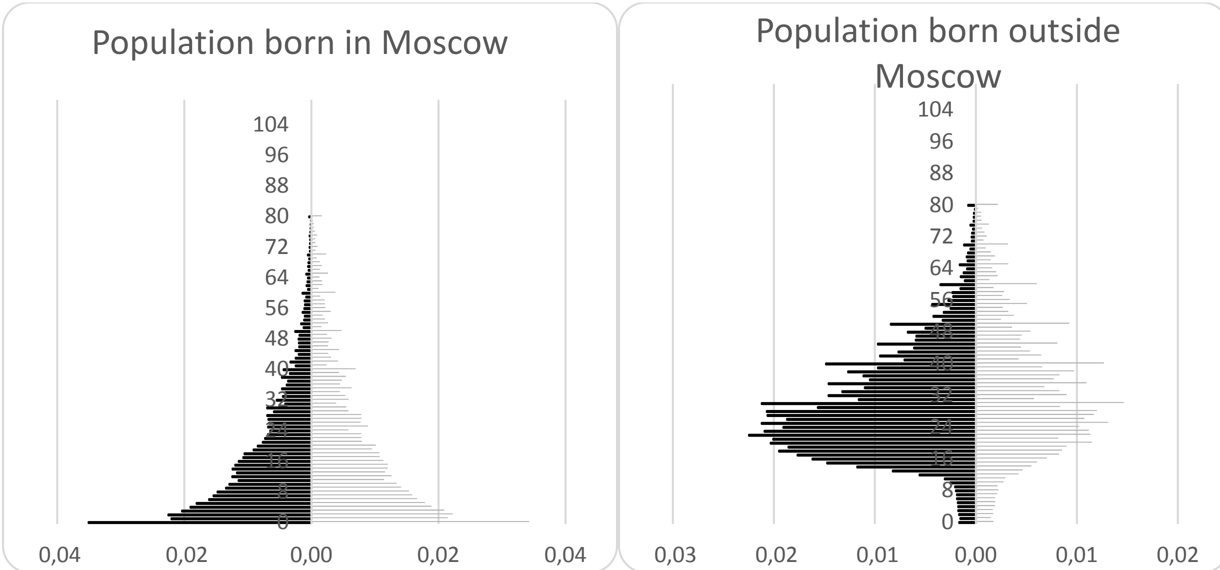

Figure 1. Age Pyramids in Moscow by place of birth, 1902 (Source: Moscow Population Census 1902)

Figure 2 shows life table numbers of deaths (ndx) from all causes in 1878 and 1926. Apparent is the drastic change in the age pattern of mortality. While in 1878 mortality was extremely high in infancy and unusually low in old ages, mortality in 1926 is more consistent with the patterns observed in other populations and signifies the end of the “Russian mortality type”.

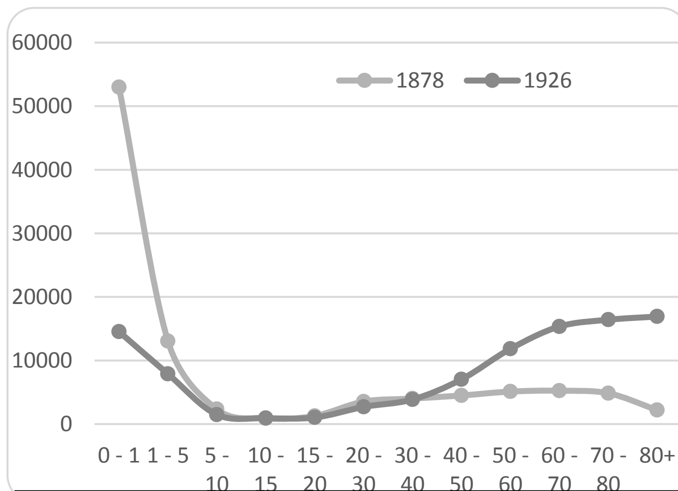

Figure 2. Life table numbers of death (ndx) by year.

Figure 3 presents numbers of deaths for some of the causes.

As can be seen, endogenous causes appear to take a larger share of deaths, while infectious diseases declined predominantly for infants and young children.

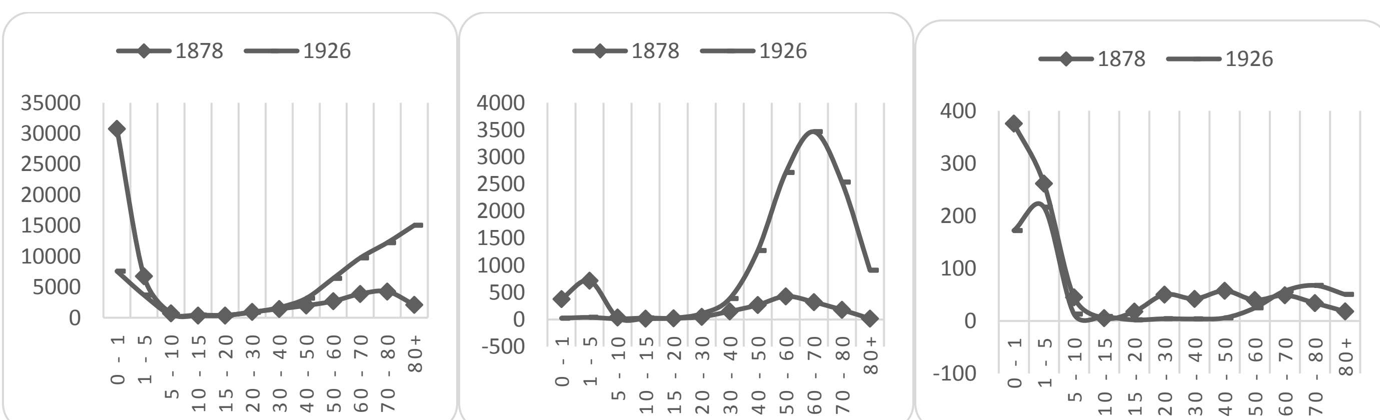

Figure 3. Life table numbers of deaths from endogenous causes (left), cancers (center) and dysentery (right).

Table 1 presents the information on average life expectancy for individuals dying of certain causes of death (with certain categories not matching contemporary classifications due to differences in medical knowledge and reporting). The progress is most noticeable with neoplasms and certain infectious diseases.

	Infant and childhood diseases	Typhoid and typhus	Influenza	Dysentery	Other Infectious Diseases	Neoplasms and certain other diseases	Diseases of internal organs and unknown causes	Alcoholism	External Causes of Death
1878	1.72	36.95	-	16.29	21.90	31.15	19.63	44.54	31.79
1882	1.86	38.32	-	15.21	19.77	28.37	14.21	43.00	31.49
1889	1.47	31.55	-	20.15	30.56	44.29	19.82	45.45	33.60
1914	1.54	34.57	19.97	19.41	36.13	57.60	35.17	47.67	32.29
1917	1.64	33.71	24.90	22.55	34.43	55.21	31.46	47.40	33.85
1920	1.88	37.83	19.15	13.02	31.12	42.78	23.61	31.22	26.25
1923	1.45	43.69	40.59	16.57	36.23	60.15	51.12	43.50	35.34
1926	1.68	39.95	41.26	25.14	41.57	62.19	55.58	49.51	36.59

Table 1. Average life expectancy for individuals dying of certain causes base on multiple decrement life tables.

Overall, Moscow population demonstrates a pattern consistent with the epidemiological transition. At the same time, drastic social changes in 1914 – 1920 affect the process of the transition in non-trivial ways. The increase in life expectancy is to a large extent attributable to the closing down of the Moscow Orphanage. Sanitary improvements in Moscow and the introduction of the sewer system affect both mortality from water-borne and other causes, hypothetically due to the Mills-Reincke phenomenon. While the data for this time period are scarce, they shed light onto the complex history of Moscow in the early 20th centuty.

References:

Ferrie Joseph P., Troesken Werner, Water and Chicago’s mortality transition, 1850-1925//Explorations in Economic History 45, 2008.

Fink, Emanuel B. American Mortality Statistics and the Mills-Reincke Phenomenon. // The Journal of Infectious Diseases, 21, 1917.

Haines, Michael R., The Urban Mortality Transition in the United States, 1800-1940, NBER Working Papers, Historical Paper 134, 2001

Kvasha E., Kharkova T. Russians and Moscovites are not equal in the Face of Death. Demoscope weekly, № 369 – 370, 2009

Meslé, F., & Vallin, J. (1996). Reconstructing long-term series of causes of death. Historical Methods, 29 (2), 72–87.