The birth of inequality? Variations in mortality in Paris during the transition

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Very preliminary. Do not quote

1. Introduction

The urban mortality experience is a key element of the historical evolution of mortality (Woods 2003). First, by definition large cities were (and still are) places where wealth, jobs, and young people congregate. Cities play a strategic role in business, politics and economic development. As such, their organization and evolution are essential to understanding demographic change. Second, even from a pure demographic point of view, the decline in mortality went hand-in-hand with increasing urbanization, fueling accelerated social change. Indeed, a striking feature of the decline of mortality in the past 200 years is the peculiar trajectory of large cities, often characterized by an initial strong disadvantage, gradually disappearing in the first part of the 20th century, before turning into a health advantage towards the end of the century. Paris, one the most populated cities in Western Europe at the turn of the 20th century, is no exception, with a life expectancy at age 1 inferior by around 15% from that of France as a whole at the end of the 19th century, before catching up in the first part of the 20th century (Figure 1).

Despite an increased interest and a growing literature, the evolution of urban mortality remains an open question. This paper studies the evolution of mortality in Paris, focusing on the period 1888-1943 (i.e., between the two vertical dotted lines in Figure 1), which includes the moment of convergence with national life expectancy. We characterize the change in mortality and its variations within the city, especially by gender and social class. In short, we do three things. First, we compute yearly mortality rates to observe changes in mortality by age and sex, both city-wide and within the city. Second, we analyze the main causes of death contributing to the change in mortality patterns. Third, we compute various economic indicators in order to assess the respective role of economic and non-economic factor in the long-term decline in mortality.

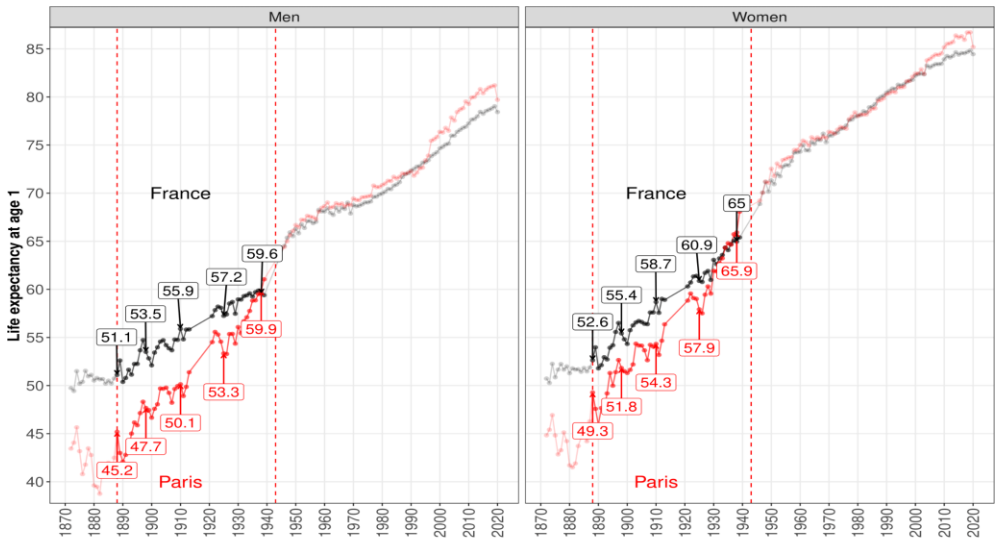

Figure 1. Sex-specific life expectancy at age 1 in Paris and the rest of France, 1872-2020.

2. Data and Methods

For Paris as a whole, we compute mortality rates, following the HMD protocol in the same way it was done in the French Human Mortality Database (Bonnet 2020). To do so, we rely on published data from the Statistical Yearbook of the city of Paris (*Annuaire statistique de la ville de Paris*) for both death counts and population enumerations. In addition, we take advantage of annual death counts disaggregated by sex, age group, and cause of death (from the same *Annuaire*), that were digitized and harmonized at Ined (Vallin and Meslé 2009). The harmonization consisted in "translating" the data by causes of death into a single classification (the 4th revision of the International Classification of Diseases, ICD-4), as our study period covers different revisions of the ICD for the production of cause-of-death statistics: the first ICD (1888-1900), ICD-1 (1901-1909), ICD-2 (1910-1924), ICD-3 (1925-1931) and ICD-4 (1932-1943). To decompose the contributions to life expectancy by age and cause of death, we apply the method proposed by Horiuchi et al. (2008), using the demodecomp R package (Riffe 2018).

In addition to mortality rates and causes of death for the entire Paris population, we use data at finer geographic levels for selected causes of death, as the Statistical Yearbooks include tables with the total number of deaths for an abridged list of causes, by neighborhood (*quartier*) and district (*arrondissement*). Although population increased during the study period, the configuration of the city remained the same. We use the death counts for the resident population in each of the twenty arrondissements for specific causes of death to investigate the spatial pattern of mortality.

For different reasons (the common practice of wet-nursing, sending children outside of Paris; bad registration of both births and small children in the census; undercounting of stillbirths), we focus on life expectancy at age 1.

3. Preliminary results

As expected for the period under study, substantial gains in life expectancy were related to a large decline in mortality from infectious diseases (Figure 2). In particular, large reductions in tuberculosis mortality contributed strongly to those gains in the first part of the 20th century. This contrasts with the 19th century, when tuberculosis mortality levels remained high in Paris (Preston and Van de Walle 1978), The latter authors observed that, unlike the English case – where the mortality decline during the period 1841-1900 was largely driven by substantial reductions in tuberculosis mortality – high tuberculosis mortality rates persisted in Paris during most of the 19th century. Instead, there were large reductions in mortality by water-borne infectious diseases like typhoid fever, diarrhea, enteritis and cholera in the three urban departments included in their analysis (Seine, Rhône and Bouches-du-Rhône, where the cities of Paris, Lyon and Marseille are located, respectively).

The chronology of the gain also matters, as the increase in life expectancy seen on Figure 1 is clearly related to two different phases: one before and one after WWI. These two phases can be linked to different sets of diseases (Figure 2): before WWI, most of the gains in life expectancy seem to come from the decline in mortality from "Other general infectious diseases", specifically diphtheria and typhoid fever on the one hand (both almost disappearing by the turn of the century), and measles on the other hand, which declined slowly but remained present all over our period. In the second phase, the gains are largely related to reduction in tuberculosis mortality and, by the end of the period, to the decline in infectious respiratory diseases such as bronchitis and pneumonia (included in the group "Other infectious diseases of the respiratory system" in Figure 2). These varying patterns allow for a deeper understanding of the transition and we will look more precisely into variations by sex, cause, and age.

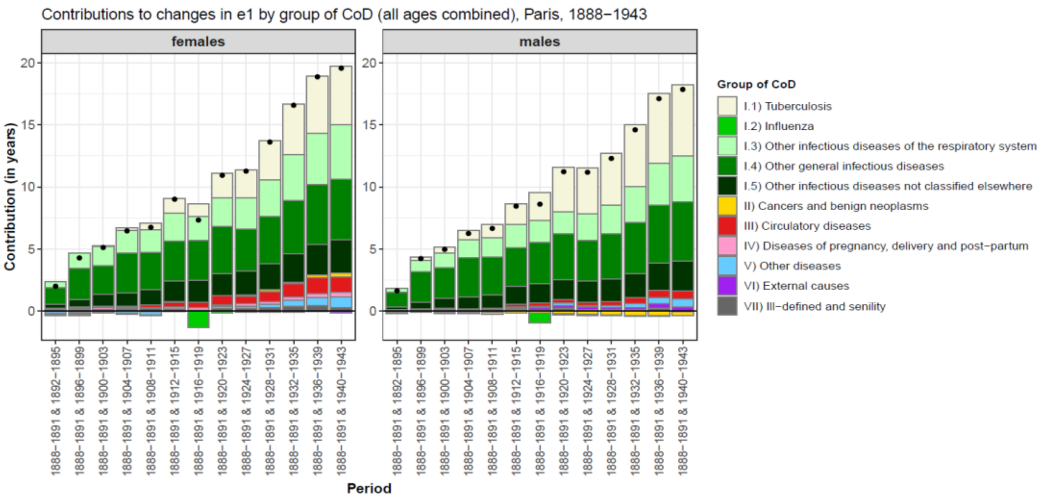

Figure 2. Contributions to changes in life expectancy at age 1 by group of causes of death (all ages combined), for females and males, Paris 1888-1943.

Sex-differences in life expectancy are particularly important in an urban setting (Torres, 2021). For Paris, decomposing the differences between men and women into the contributions by cause of death reveals both an increasing female advantage and the important role of tuberculosis and cardiovascular diseases in the sex-gap (Figure 3). Interestingly, at this scale, infectious diseases do not seem to matter at all (tuberculosis excepted). In other words, infectious diseases declined for both genders at approximately the same pace.

The decomposition by age provides a more precise picture (Figure 4), with modest differences between men and women at young ages, substantial and stable differences during adulthood (20-44), and important and increasing differences at older ages (45 years old and above). For adults aged 20 to 44, tuberculosis played an important role in the gap between men and women – to the clear disadvantage for men –, but causes of death possibly related to working conditions seem also to have played a role: separate analyses with more detailed data show that, within the wide category “external causes”, the group named “accidental trauma by falling, crushing” is twice higher for men than women, while “accidents” (admittedly a rather vague grouping) is rising strongly among men, while it remains low among women.

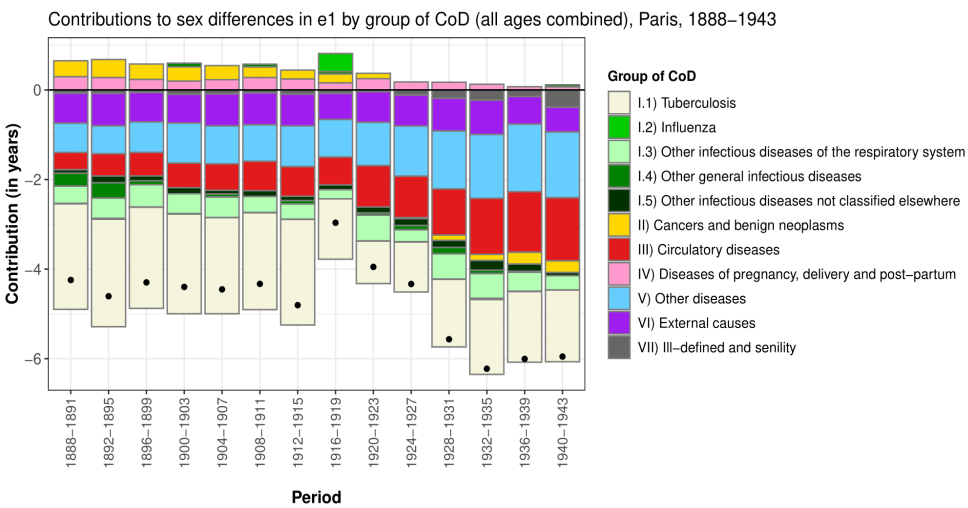

Figure 3. Contributions to sex differences in e1 by group of CoD (all ages combined), Paris, 1888-1943.

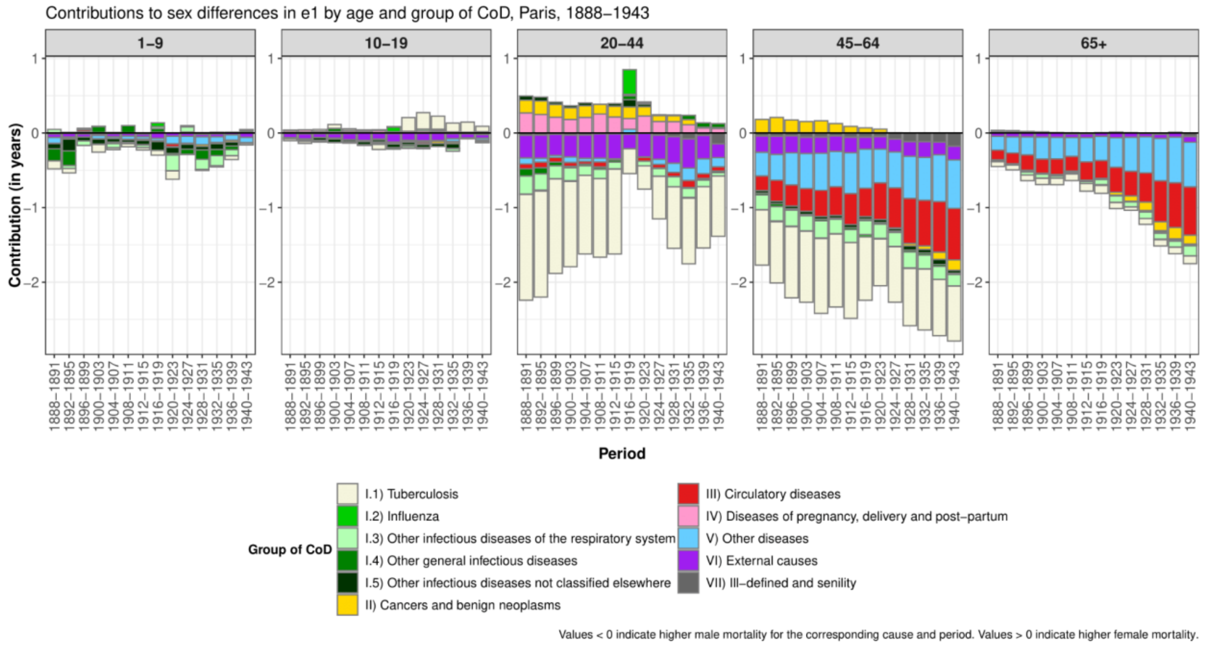

Figure 4. Contributions to sex differences in e1 by age and group of CoD, Paris, 1888-1943.

In the next steps of this work, we will add analyses at a finer geographic level in order to explore the differences in mortality between *arrondissements* within the city. This is quite relevant for a large city like Paris, because of the unequal exposition to risk factors between population subgroups according to their socioeconomic conditions. Therefore, we will link the observed variations in mortality with socioeconomic variables to try to better understand the factors associated with the health transition in Paris during the study period.

4. Discussion

Much is to be learned from analyzing urban demographic patterns in the long run, in particular to better understand the mortality transition which is, so far, mostly studied at a more aggregated level. This is also needed as today a huge (and growing) share of the world population is living in cities. In that sense, the sanitary conditions of these cities are a huge stake for the future.

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