# Chapter 8
# The Democratization of Longevity: How the Poor Became Old. Paris, 1880–1913

**Lionel Kesztenbaum and Jean-Laurent Rosenthal**

> "Mais comme il y a deux sortes de richesse, la richesse qui ne produit rien, et la richesse qui produit, que l'industrie sait partager pour l'accroître, j'ai été curieux de savoir si elles ont une influence également heureuse sur la durée de vie."[1]
>
> Louis-René Villermé, « De la mortalité dans les divers quartiers de la ville de Paris », *Annales d'hygiène publique et de médecine légale*, 1830



## 8.1 Introduction

In the 1860s, Parisians had a life expectancy at age five that was 4 or 5 years less than other French people. The gap did not begin to narrow until the 1880s and it did not close until the 1930s. Even in the 1890s, there were huge differences within Paris: the denizens of those neighbourhoods where life was long enjoyed an additional 14 years above what those in the worst neighbourhoods could expect (a difference that was almost twice as large as that between the best and worst departments within France). Those differences based on residence are also observable in differences in age a death between the bottom and the top part of the wealth distribution.

[1] "As there are two different forms of affluence, the one that don't produces anything, and the one that produces, and as industry knows how to share that one in order to increase it, I wanted to understand if they both positively influence the length of life."

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In nineteenth century Paris, life was both brutally short and massively unequal, yet each year the city attracted hordes of migrants and, over the century after 1850, completely overhauled its sanitary infrastructure. While differences remain based on wealth, or neighbourhood, their relative importance has massively diminished.

This synopsis of the Paris experience poses two questions, one about the sources of differential mortality, the other about how it changes over time. Scholars have identified two opposed forces that drove life expectancy before World War II: first, the negative impact of having an ever increasing proportion of the population living in crowded and adverse urban environments (among others, Preston and Van de Walle 1978 or Cain and Hong 2009); second, increases in income and knowledge that in the long run offset the negative effects of urban living (see for instance Floud et al. 2011). In their pure form, income and knowledge are quite distinct. Higher income allowed individuals to purchase goods and services that prolonged life (e.g. better nutrition, clothing, and housing) that they consumed privately. Save for possible epidemiological effects, the better housing of one family has little effect on the life expectancy of another. At the other extreme we can place pure knowledge effects (like home cleanliness or boiling milk), once the survival value of such techniques are known they can be adopted by everyone because their costs are low. Here we focus on the correlation between mortality and income because the results are very striking in a city as unequal as Paris.

Paris turns out to be a very good laboratory to study differential mortality because the municipal statistical office was dominated by individuals who were obsessed with collecting and publishing detailed demographic data. Beyond the contrast between Paris and France that we can estimate for two centuries, we can track the evolution of mortality on a smaller scale (in each of Paris's 20 districts (*arrondissements*)) from 1880 to 1940 and, between 1880 and 1913, for each of the 80 neighbourhoods (*quartiers*) of the city. The municipal statistical office produced these disaggregated reports to spur public action to reduce both mortality and morbidity in the city. Yet during this period (unlike the interwar period) their efforts did not lead to major changes in policy. Additionally, the treasury collected (even though it did not publish) information on direct taxation for the same 80 neighbourhoods, which were also the units for the census of housings. Finally individual data sets on wealth at death enable us to produce estimates of average wealth levels for the same neighbourhoods. As we will show, there is extraordinary stability in the ranking of these neighbourhoods in terms of their real estate stock, their average wealth levels and in their relative life expectancy.

This chapter documents the long term evolution of life expectancy in Paris and its extraordinarily marked spatial variation. It is no great surprise that the poorest neighbourhoods were the deadliest, but the extent of the mortality differential between rich and poor is striking. Second, convergence to the low mortality regime was slow: although over time the variation in life expectancy within Paris fell, it has not disappeared.

## *Data*

Paris has many advantages for studying differential mortality; the most straightforward of these is that the within Paris variances in incomes, wealth, and life expectancy were extremely large. There are some serious complications, however, the most obvious of these being that the individuals who were living in Paris at a point in time were not a randomly drawn sample. Thus, the choice of focusing on one large city rather than France as a whole as would be more conventional needs some defence.

The whole set of French localities would be an attractive laboratory for studying differential mortality because among the countries on both sides of the North Atlantic, France is the one with lowest levels of migration (either inward or outward). Hence, if one were to estimate differential mortality rates in a cross-section, one would not need to worry about the extent to which the individuals observed were selected, something that comes up if one deals with other countries that have high rate of emigration or immigration. However, scholars have long established that mortality rates varied by location (e.g. urban vs. rural) and we know that location was correlated with income. Hence in cross section it is difficult to separate income effects from other effects. Using time to help sort out these correlations reintroduces the thorny problem of endogeneity because even if French people did not often fall victim to the siren calls of North America, they moved around within their country quite a bit, and in particular cities were growing steadily since the beginning of the nineteenth century and the largest ones (Paris among them) fastest of them all (Guérin-Pace 1993). However, Paris also offers some important advantages to study mortality differentials.

Paris is obviously interesting in and of itself, but it presents a remarkable contrast with the country as a whole. In 1880, Parisians could expect to live 4 years (or nearly 10 %) less than French people as a whole (Fig. 8.1). Over the next three and a half decades, life expectancy in France increases by 4 years but that of Paris by nearly 7 years leading to a convergence that would turn into Paris' advantage in the interwar period. Thus, the patterns of spatial differential demography went through a great reversal. Yet at the same time the pattern of spatial differential demography changed very little before World War I.

As noted above and as we discuss below the difference between the worst and best decile of neighbourhoods is nearly 15 years in life expectancy, which is enormous. The distribution within the city highlights the large variations between neighbourhoods, even adjacent ones (Fig. 8.2). Furthermore, the spatial variation is stable over time and is measured after the city had provided broad access to clean water: building could connect to the water system to provide running water to each dwelling, a faucet at every floor or simply one on the ground floor, and there were also local fountains (Bocquet et al. 2008). It was in fact the other side of the water question: wastewater disposal that was going to occupy Parisians and mobilize investment in the half century following 1880. But the diffusion process favoured rich neighbourhoods over poor ones and thus actually further the spatial inequality within the city.

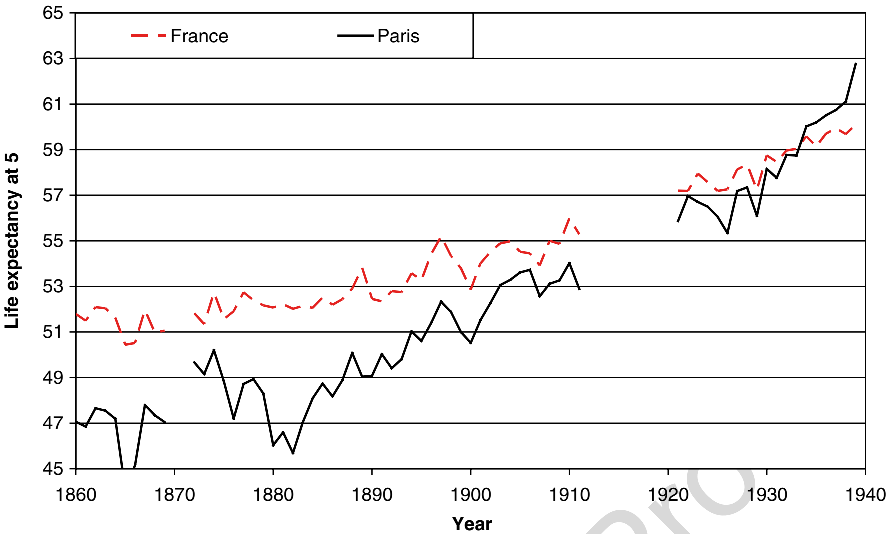


**Fig. 8.1** Life expectancy at age 5, Paris and France, 1860–1939


**Fig. 8.2** Life expectancy at age 5 in Paris by neighborhood, 1881

The main reason for focusing on Paris is that we can carry out our analysis at three level of aggregation over long periods of time: the city (1820–1939), its 20 districts (1880–1939), and its 80 neighbourhoods (1880–1913). We can do so because the statistical department of the Paris municipality under the lead of Louis-Adolphe and Jacques Bertillon produced a regular flow of statistics about mortality. Jacques Bertillon himself was concerned with reducing the impact of communicable diseases in the city and with establishing the causes behind the dramatic differences in life expectancy. In fact, Paris was the birth place of studies of the relationship between mortality and wealth, with the work of Louis-René Villermé at the beginning of the nineteenth century (Villermé 1823, 1830). Indeed, Villermé was certainly one the first – if not the first – to explore the link between affluence and life expectancy, breaking a long established belief that mortality risk was the same for all (Villermé 1828; Lécuyer and Brian 2000).

Since Villermé, many studies have explored the income gradient in mortality and its evolution over time – not to mention a wide range of works that focus on this gradient nowadays (Williams 1990; Hummers et al. 1998; Cambois et al. 2001). Some look at this relationship from a macro perspective in order to explain "the mortality transition" (Kingsley 1956; Preston 1975; McKeown 1976), others – probably most – look at specific times and places. Both macro and micro level studies, however, try to learn what produce a socio-economic gradient in mortality, whether it is better nutrition (Harris 2004), better housing, better hygiene, or better access to medical resources, among others. They try also to establish what may be called the historical origins of health inequality. Some think that the social gradient has always existed and stays more or less the same over time while others propose a divergence-convergence pattern with the gradient rising – for instance during the industrial revolution – and then declining (Haines and Ferrie 2011). According to the first hypothesis, the mechanisms that link a fundamental cause (wealth) and mortality may change over time (for instance lack of sanitation and bad housing in the nineteenth century, smoking and bad habits in the twentieth century) but the association stays the same. The second hypotheses postulates that mortality inequalities were small before the industrial revolution as both income inequalities and medical knowledge were limited. Then it rises with income inequalities and access to better quality medicine for the wealthiest before diminishing again as public infrastructure were developed on a large scale, therefore beneficiating disproportionately to the poorest part of the society.

In fact it is now clear that the income gradient in mortality did not appear with the industrial revolution and nor did it disappear with the diffusion of health infrastructure. This leads to rich and insightful debates but also tends to somehow reduce the importance of the socio-economic gradient in mortality analyses. Environmental effects were put forward: first with a simple rural-urban opposition, hence the "urban disamenity" effect (Szreter and Mooney 1998; Woods 2003; Cain and Hong 2009), second in relation with a more detailed account of living conditions (Brown 1989; Cain and Rotella 2001; Ferrie and Troesken 2008). As a result, most studies conclude there was a much weaker link between mortality and wealth than was assumed before, in favour of a strong environmental effect on mortality. In fact, more recent works are challenging the very existence of any causal relationship between income and mortality (Bengtsson and van Poppel 2011).

Our hypothesis lies somewhere between these two extremes. Indeed while money per se has no effect on either morbidity or mortality, it does influence consumption. More income affords people the option to live in better apartments, eat fresher food, wash themselves and their possessions more often, get better health care and so on and so forth. In the case of Paris the extraordinary variance in housing conditions lays bare these relationship which might not be so easy to pin down in small settlements where food and housing are cheap.

## From the Data to Life Expectancy

Starting in 1817, the city began to publish death by age totals for each gender by 5 year age intervals. Then from 1880 to 1913, the *Annuaire statistique de la ville de Paris* reports death totals for each sex broken down into six age categories for each neighbourhood. The statistical office also published a series of detailed abstracts for the city drawn from the national censuses from 1881 forward that give us the age distribution of the living by neighbourhood.[2] Taking these two datasets together allows us to compute life expectancy at the *quartier* level.[3]

Indeed, the ideal way to measure differential mortality is to break down life expectancy by class or place of residence. One might want to compute life expectancy at birth. For Paris, at least, this would, however, present insurmountable problems because of severe under counts of both infant deaths and infant population. To begin, there was a massive recourse to wet nurses who lived a distance from the capital until very late in the century (Rollet-Echalier 1982). Such wet nursing was associated with very severe mortality, but the deaths were not recorded in the capital, thus any computation of life expectancy in early years would suffer from massive undercounting. Moreover, still birth registration remains a problem until late with some newborns being reported as still born even though they may have lived for a very short moment after birth, and vice versa.

Thus, we prefer life expectancy at age 5 and for comparability with the estate tax data (that are censored to age 20 or higher), we also compute life expectancy at 20. Even then, both because the age categories reports at the *quartier* level are not stable over time and do not necessarily accord between the *Annuaires* and the Censuses, we have to make some corrections. We proceed in three steps.

First, we adjust both mortality and population reports in order to obtain the number of deaths and the number of living for the same six age intervals: before age one; between one and 4 years; between 5 and 19 years; between 20 and 39 years; between 40 and 59 years; and over 60 years old. In all cases, we have very detailed reports at

[2] Since the French Revolution, population censuses were performed every 5 years; they have been kept in the archives from 1831 on in most cases. Here we use data on censuses from 1881, 1886, 1891 and so on.

[3] The quartiers have a population of at least 10,000 and with these six age categories the number of empty cells is essentially zero.

the Paris level (reports every 5-year) so we take advantage of them to correct the report at the *quartier* level. Take for instance the death reports before 1893: instead of reporting deaths for 5–19; 20–39 and 40–59, they use the age intervals 5–14; 15–34; 35–59. So we estimate, from data pertained to Paris as a whole, the share of the deceased aged 15–19 among those aged 15–34. We apply this share to the groups defined at the *quartier* level and we get, for each *quartier*, the number of deaths between 15 and 19 years old. We add this number to the total number of deaths in the age group 5–14 and extract from it from the number of deaths in the age group 15–34. We proceed in the same way for the age groups 15–34 and 35–59.

Second, we estimate inter-census populations for every year. It is standard to do so by combining the effect of aging and net migration. If the population were closed, then a cohort-based analysis will do (a new cohort is born each year, all other cohorts age by 1 year and loose some members due to mortality). If the population is open and migration rates just depend on age, then one has to add that factor back in. In other words two elements influence the growth rate of the population between censuses: deaths and migrations within each age group. When the first are the most important one can follow the evolution of each 5 year cohort from one census to the next. Then, the number of individuals of age (a) in year t depends on the number of individuals of age (a-5) in year (t-5) and one must then simply allocate the variation between the two values to the intervening years. However, when migration is significant, then the size of the age group (a) in year t depends less on the size of the age group (a-5) at (t-5) than on migration. For Paris where migrations were very large, we estimate the size of an age group between census years from the variation between census years at age (a). In other words the size of the population of age (a) in year t is an interpolation of the size of that group in the two adjoining censuses.

Third, we compute a life table for each year and neighbourhood: to do so we calculate the age-specific mortality rate ($_nm_x$) for each age group by dividing the number of death in the age group by the number of individuals living in that age group for each year and neighbourhood. We can then produce death probabilities ($_nq_x$) where $q = n*m/(1 + (n - a)*m)$ where n is the length of the age group and a is the time lived by those who died within this age group. This last value is taken from Keyfitz and Flieger (1968:491) for individuals older than 5 and Coale and Demeny (1983) for ages 0–5 (but we focus here on life expectancy after 5 years old). Given death probabilities, we can immediately calculate mortality tables and life expectancy at each age (Preston et al. 2001: 42–50).

The assumptions we make in these computations do affect the results. In particular, the person-years lived by those who die in the oldest age group comes out at just under 8 years which is perhaps slightly optimistic. More importantly, it is quite realistic to think that this number is likely to have varied across neighbourhoods: it seems sensible to assume that mortality is more severe in the poorest parts of the city than in the richest parts. In this case the mortality differential would be even larger since mortality in the poorer neighbourhood is underestimated. Yet it seem logical, at least as a start, to make the same assumptions for all the neighbourhoods and avoid producing differential mortality by construction. It is also probably not true that migration affects all ages and neighbourhoods in the same way. It is more likely that migration is more intense in the poor neighbourhood –this would increase the population of rich neighbourhoods and thus reduce their mortality. Because our computations probably understate mortality differences across neighbourhoods this approach only strengthens our findings. After all the life expectancies we compute for the census years (when we have the exact population) are very similar to those for inter-census years. Varying the average life span per interval or the maximal age in the life table change very little on the between neighbourhoods differences in Paris.

Beyond these published data we have access to a series of cross section drawn from estate tax records that provide wealth, gender, and age for the entire population of decedents roughly once every 5 years from 1807 to 1937. To match the life expectancy by neighbourhood one would want to have life expectancy by wealth percentiles. We cannot, however compute such measures. Indeed we do not have an age distribution for the living that are in a given wealth percentiles. In particular at the top end of the wealth distribution, one has to worry about endogeneity. Indeed, we need to purge from the empirical age-wealth at death relationship the part that runs from age to wealth. To be sure, it is likely that wealth helps prolong life (thus distribution of ages for the top percentiles is likely to be to the left of the age distribution of lower percentiles), that is the phenomenon we would like to capture. It is also true that at high levels of wealth, the older an individual lives, the larger the estate that person will leave behind, first because of unrealized capital gains and because the likelihood that he or she will inherit from collateral lines increases with age. Because of the latter channel we cannot compute life expectancy by wealth percentiles without some joint distribution of wealth and age among the living. Thus here we will simply present age at death by percentile.

Finally, there exist four real estate censuses (1878, 1890. 1900, and 1910) that provide number of housing units as well breakdowns of these units by their fiscal assessment. The data are reported by household (*ménage*) and break down rents into up to nearly two dozen categories including one that are below the threshold at which one would be liable for the *taxe mobilière* (a direct tax assessed on the basis of the occupation of the household head and of the rental value of the household's dwelling). The largest category in 1890 included those 521 dwellings assessed at more than 16,000 francs in rent. We define three categories of households, the poor are those who pay less than 300 francs a year in rent, then comes the middle class which pays between 300 and 1000 francs (per capital income in the 1880s for France), the rich pay more than a 1000 francs.

The halcyon days of the statistical office ended abruptly in 1913. Afterwards, and despite a massive increase in the city involvement in sanitation and other life preserving activities, its expenditures on publishing the life outcomes of its inhabitants declined massively. After WWI, the demographic data are only given by arrondissement and there were no real estate censuses published. Now we focus on the period for which the most detailed data are available: 1881–1913.

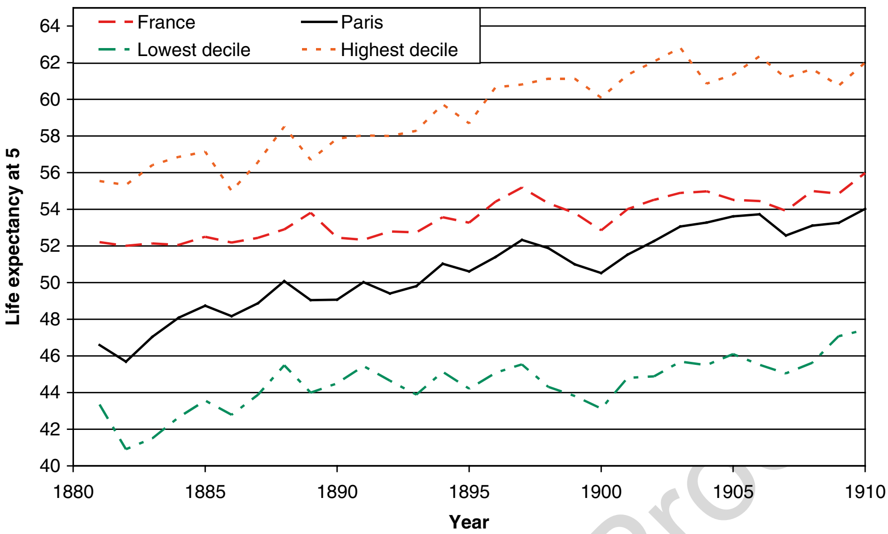


**Fig. 8.3** Life expectancy at age 5 within Paris, compared to France

## *Inequalities in Time and Space*

Figure 8.3 above presents mortality patterns across neighbourhoods within Paris compared with the average life expectancy for Paris (the plain black line) and for France (dotted line). The figure also shows the life expectancy for the best eight (dotted orange) and worst eight neighbourhoods (dotted green) in Paris. In this scale the difference between the average life expectancy in Paris and France do not seem so large any more. In fact, the worst neighbourhoods in Paris have a life expectancy that is always about 8 years less than the average in the city and 10–12 years less than all France. At the other end of the spectrum, in the early 1880s the best neighbourhoods in Paris had a 7-year advantage over the rest of the city and a 4-year advantage over the rest of France. Over the next three decades, life expectancy rose quickly and neared 62 years; over that time these neighbourhoods saw their differences with all other benchmarks increase. Economic growth did not translate into a reduction of life expectancy inequality.

The inequality in life expectancy within Paris is particularly striking because it was in fact much larger than the difference observed across departments.[4] As Fig. 8.4 shows, the gap between the nine departments with the highest and lowest life expectancy was about 12 years in the 1880s; by 1910 it had shrunk to seven. Most of the gain came from the worst departments where inhabitants experienced large (6 years) gains in life expectancy while those in the best departments only eked out a gain of about 1 year. This pattern of rough stability at the top and big gains at the bottom is the reverse of Paris, where the bottom managed at best a 3-year gain in life

[4] Life expectancy by *départements* are taken from (Bonneuil 1997).

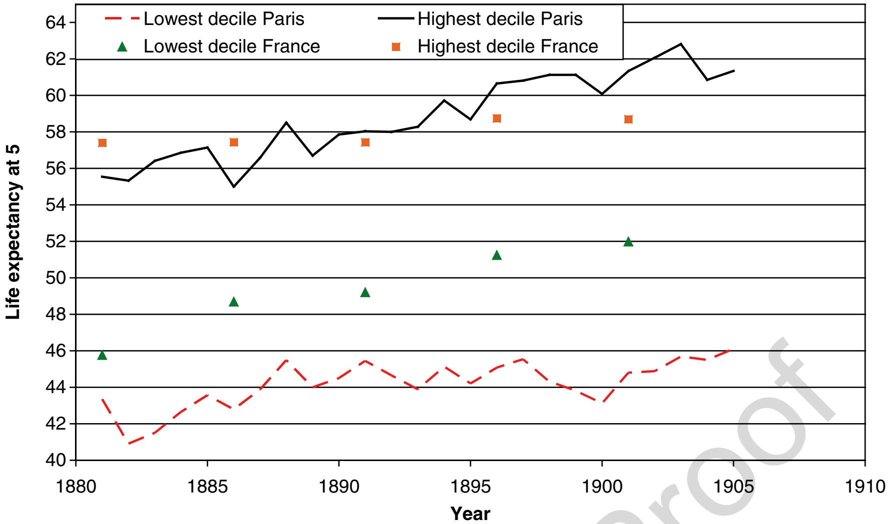


**Fig. 8.4** Life expectancy at age 5 within Paris and within France

expectancy when the top gained six. As a result the worst departments, which started out with higher life expectancy than the worst neighbourhoods in Paris pulled away with a difference that jumped from about 2 years to almost seven. At the top the capital's neighbourhoods with the lowest mortality experienced enough gains to become the healthiest areas of France.

This is not simply an effect of picking tiny populations with unusual life circumstances. Even as early as the 1870s, the rich neighbourhoods had, each, populations of about 20,000 and the largest of the poor neighbourhoods had a population above 35,000. The primary reason for these differences comes from deep difference in the material circumstances of the residents of these neighbourhoods.

## *Mortality and Wealth*

Looking at 1878, the city's income inequality becomes instantly obvious (Fig. 8.5). The share of rich (defined as paying at least 1000 francs in rents) was less than 10 %, and the poor (paying less than 300 francs in rent) made up 68 % of households. These different classes lived in different places. Twelve neighbourhoods (principally in the eastern edge of the city) had more than 90 % of their households paying less than 300 francs in rent, and in these neighbourhoods less than 0.7 % of households were rich. In contrast in five neighbourhoods more than 40 % of households could be classified as rich (all in the northwest), and in most of those the share of poor was less than half that of the city. Average rents reflect these contrasts and had been noted at the time. Rents in the Champs Elysées neighbourhood averaged 3400

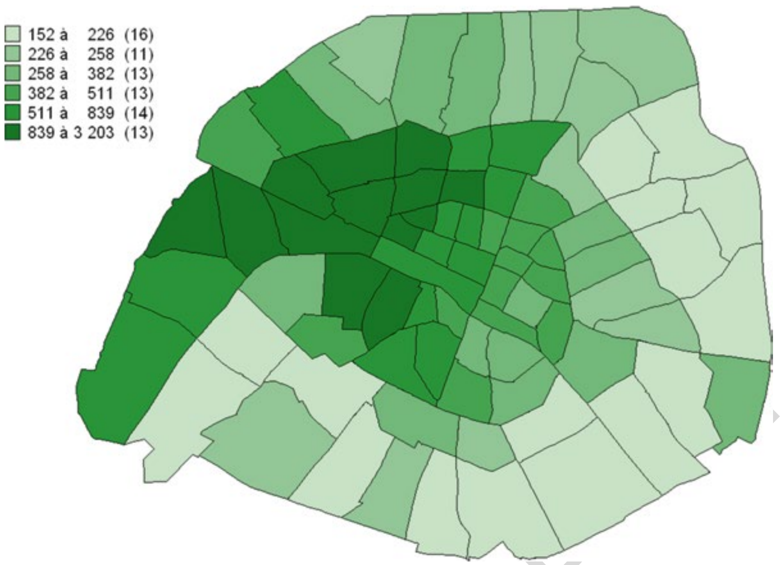


**Fig. 8.5** Average rents by quartiers in Paris, 1878



francs while in the Charonne neighbourhoods they were 179 francs; in our twelve poor neighbourhoods rents average 186 francs while in the five rich ones they average 2204 francs. This higher than ten to one difference in rents in part reflects the massive differences in the size of apartments (the census provides the distribution of apartments by number of rooms) in amenities like running water, toilets within the apartment rather than in the hallway or on the ground floor, in air quality (prevailing winds being from the west, the east end of Paris was more polluted than the west) but it is also clear that there were location rents, indeed the high rent districts are clustered around the financial centre (the Bourse) and its political counterpart (the Elysée).

To evaluate the role of wealth or income we proceed in two steps. First we explore the links between mortality and wealth within neighbourhood. To do so we use a panel regression with four observations that link housing census with its nearest mortality year (1878 with 1880, 1890 with 1890 mortality and so on). Because we only have four housing surveys our panel has four cross sections for a total of 320 observations (Table 8.1). The advantage of this approach is that it allows us to include fixed effects that absorb any constant characteristics of the neighbourhood (hence the estimates are based on the within neighbourhood change over time). Those regressions show that increases in a neighbourhood share of poor were strongly associated with mortality: an increase of one standard deviation of the share of poor reduces life expectancy in the neighbourhood of 3 years.[5] Increases in

[5] Both the share of poor and the share of rich are standardized and thus the coefficients can be directly expressed as variations in life expectancy, the constant measuring the life expectancy at the average value of the share of poor/rich.

**Table 8.1** Life expectancy, the rich and the poor

| | (1) | (2) | (3) |
|---|---|---|---|
| Share of poor | −3.08*** | | −2.95*** |
| | (0.29) | | (0.34) |
| Share of rich | | 4.12*** | 0.67 |
| | | (1.16) | (1.12) |
| Constant | 51.55*** | 51.91*** | 51.36*** |
| | (0.19) | (0.49) | (0.40) |
| $R^2$ | 0.81 | 0.72 | 0.81 |
| Neighborhood Fixed effects | Yes | Yes | Yes |
| N | 320 | 320 | 320 |

Note: Dependent variable is life expectancy at age 5, clustered standard errors in brackets



the share of rich were conversely good for life expectancy and the implied elasticity is actually slightly larger, with a one standard deviation change leading to more than 4 years of additional life expectancy. If we include both variables the effect of the share of rich declines dramatically and becomes statistically insignificant, but the coefficient on share of poor is essentially unchanged.

An alternative approach is to focus on the cross sectional variation and estimate the impact of the share of poor across neighbourhoods at each census date. Figure 8.6 shows the fitted values for regressions we do not report. The first set for 1881 shows a negative association between life expectancy and the share of poor, then with each decade the relationship steepens, in part because of increased in life expectancy in richer (fewer poor) neighbourhood and because the fraction of poor tended to decline over time even though their mortality patterns did not change much. The curve for 1911 is in fact the steepest, consistent with an increase in differential mortality as was suggested by Fig. 8.3.

To net out the effect of a decline in the share poor we re-ran the regressions from Fig. 8.6 but instead of using the contemporaneous survey, we used only the first census as an explanatory variable. Again the 1881 predicted mortality ranges from 45 to 54, then 1891 show both an increase in life expectancy everywhere and a steeper slope suggesting that part of the increase in life expectancy in 1891 was associated with a decline in the share of poor. The 1901 data is even steeper suggesting that while things continued to improve in the richer neighbourhoods, they had improved little in the poorer ones. 1911 is then flatter and higher with the richest neighbourhoods (as defined in 1876) having gained almost 7 years in life span since 1881 while the poorest ones had a gain of about 3 years or less than half. The timing of both increases is very different though: the wealthiest neighbourhoods gain a lot between 1881 and 1891 and again between 1891 and 1901 and then nothing up to 1911 whereas the poorest ones gain almost nothing before 1901 and then get better in the last period (Fig. 8.7).

Finally, we can turn to the analysis at the district (arrondissement) level in order to get a broader picture. At that level, we can extend the analysis up until WWII

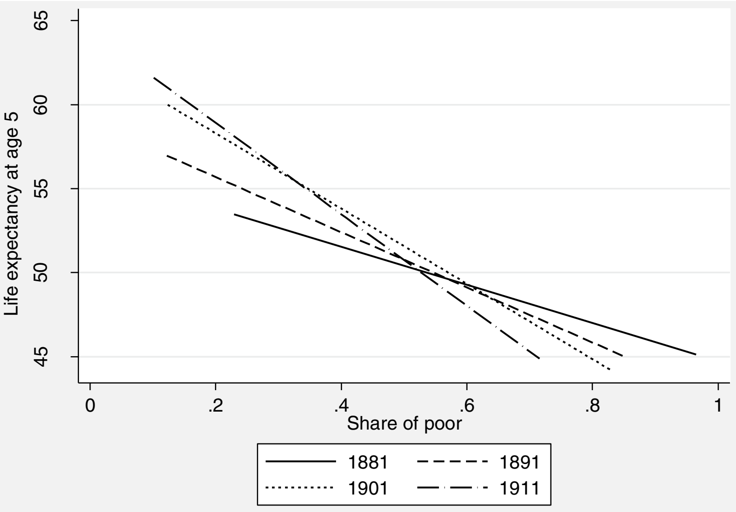


**Fig. 8.6** Life expectancy and the share of poor households

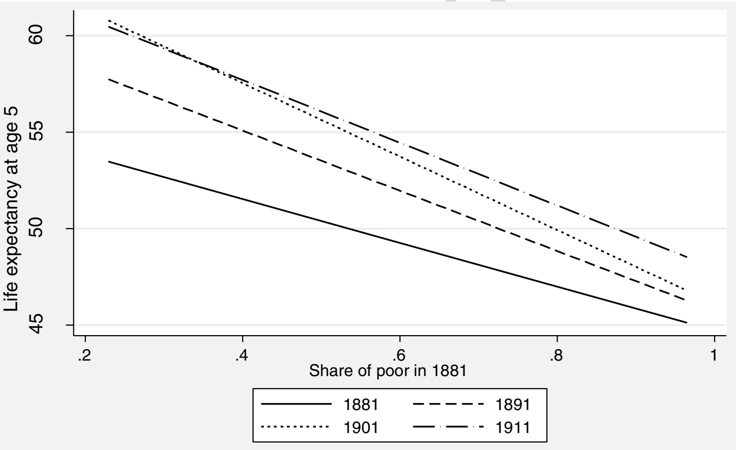


**Fig. 8.7** Life expectancy and the share of poor in 1876

(Fig. 8.8). The interwar period saw a relative convergence between the best and the worst neighbourhoods in Paris, although it is far from complete. Interestingly, the effect of income remains: as we regress the share of poors in 1878 on life expectancy in 1939, Overall, though, the importance of rents fell by half: on average in the 1880s one additional standard deviation of poor means 2.5 less life expectancy at age 5; in the 1930s it's down to 1.3. Since life expectancy also increased in that

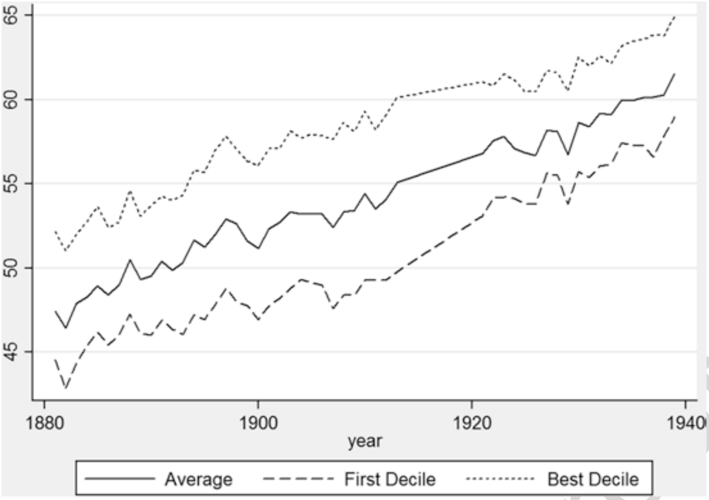


**Fig. 8.8** Life expectancy by district, 1880–1940

period, the relative gain is even stronger: from 5 % less life expectancy in the 1880s to 2 % in the 1930s. Differences remain, they remain linked to income, but less so.

## *Individuals and Neighbourhoods*

The analysis so far highlights the huge differences in life expectancy between neighbourhoods within Paris. It is clear that life expectancy in Paris was closely related to income, because income is what allows people to afford better living conditions including better housing. It also gives some clues about the evolution of mortality up to W.W. I which demonstrates an increase –and not a decrease– of inequality. It has one clear limitation however, which is that it does stay at the neighbourhood level. This may be a problem because people move between neighbourhoods and thus experience different mortality patterns (and people chose where to stay at least in part because of the living conditions in a given neighbourhood). And at the same time it does not link directly the wealth of the individual with their mortality.

A way to overcome this limitation is to use individual data. We can rely on an alternative dataset assembled to study wealth inequality in the city from 1807 to 1937 (Piketty et al. 2006; 2014). These data culled from estate tax records provide age, marital status, and wealth for all wealthy Parisian decedents once every 5 years. Using the decedents' addresses we can measure the share of wealthy individuals that live in each *arrondissement*. Because of small numbers problem we aggregate all the relevant data across the period 1872–1912 (6 cross sections). Not surprisingly, the residential patterns of the wealthiest Parisians are very similar to the resi-

**Table 8.2** Place of residence according to wealth (1872–1912)

| | Wealth > 4 million | 4 M > Wealth > 1 million | 1 million wealth > 500 K | 500 K > wealth > 250 K | 250 K > wealth > 125 K |
|---|---|---|---|---|---|
| N | 97 | 850 | 1040 | 1455 | 2091 |
| Richesse | 8 702 609 | 2 562 100 | 698 441 | 350 078 | 178 848 |
| | **Fraction that reside in what arrondissement** | | | | |
| 1 | 3.1 | 2.8 | 4.3 | 2.7 | 2.8 |
| 2 | 0.0 | 3.2 | 1.8 | 1.7 | 2.2 |
| 3 | 0.0 | 0.9 | 1.7 | 1.9 | 2.3 |
| 4 | 0.0 | 2.8 | 3.3 | 4.1 | 4.7 |
| 5 | 0.0 | 1.8 | 2.5 | 4.9 | 4.6 |
| 6 | 0.0 | 4.0 | 7.9 | 7.0 | 6.6 |
| 7 | 13.5 | 11.3 | 8.6 | 6.8 | 7.2 |
| 8 | 52.1 | 36.5 | 22.7 | 19.3 | 12.5 |
| 9 | 12.5 | 13.4 | 15.6 | 14.7 | 12.3 |
| 10 | 0.0 | 3.2 | 5.8 | 6.7 | 6.1 |
| 11 | 1.0 | 1.9 | 3.2 | 5.5 | 6.4 |
| 12 | 0.0 | 0.9 | 0.8 | 1.7 | 3.2 |
| 13 | 1.0 | 0.6 | 0.6 | 0.9 | 1.1 |
| 14 | 0.0 | 0.2 | 0.7 | 1.4 | 2.5 |
| 15 | 0.0 | 0.5 | 1.4 | 1.3 | 2.6 |
| 16 | 13.5 | 11.9 | 11.1 | 10.3 | 9.6 |
| 17 | 2.1 | 2.6 | 5.2 | 5.1 | 6.2 |
| 18 | 1.0 | 1.0 | 1.4 | 2.0 | 2.4 |
| 19 | 0.0 | 0.4 | 0.5 | 1.2 | 2.5 |
| 20 | 0.0 | 0.1 | 0.7 | 0.9 | 2.2 |



dential patterns given by the tax record (Table 8.2). And it reveals concentration indeed: of those who died with a half million francs or more with between a quarter and half of the wealthiest living in the 8th arrondissement alone. More surprisingly, even among the wealthiest, geographic concentration diminishes greatly as wealth declines, as people less wealthy are forced to live in adjacent neighbourhoods.

The same data allow us to study mortality at the individual level. Unfortunately no source would give the same data for the living and, as a result, we have to stay with the information on deceased only. As we noted previously, we cannot compute life expectancy by wealth percentile without additional data, which we do not have. Thus here we will simply present age at death by percentile (Table 8.3). This indicator is without doubt biased because we observe wealth only at death; it nonetheless go in the same direction as the results we have seen in the previous section, age at death being inversely related to wealth. And again the effects are incredibly strong. The differences in age at death between the wealthiest (the top 2 % among the deceased of a given year) and the poorest (the 86 % poorest among Parisians) come in at just under 17 years in 1872. And just as in the previous analysis, one striking

**Table 8.3** Age at death according to wealth at death

| | 1872 | 1877 | 1882 | 1887 | 1902 | 1912 |
|---|---|---|---|---|---|---|
| **Top 2 %** | 65.0 | 66.2 | 66.1 | 67.3 | 67.3 | 68.4 |
| **Next 4 %** | 61.2 | 62.5 | 62.5 | 63.1 | 63.6 | 65.6 |
| **Next 8 %** | 56.4 | 57.1 | 55.3 | 58.0 | 58.0 | 58.3 |
| **Rest** | 48.0 | 49.8 | 47.9 | 49.6 | 52.0 | 52.9 |
| **Av age** | 49.5 | 51.2 | 49.5 | 51.2 | 53.2 | 54.2 |
| **Total deaths** | 24,348 | 28,777 | 36,790 | 34,410 | 36,366 | 36,681 |
| **N with age and wealth** | 15,576 | 18,597 | 24,831 | 20,860 | 26,624 | 29,323 |

Note: The estate tax sample are comprised of all the individuals who died in a given year (e.g. 1872) and filed a return within 30 months of January 1 of that year, not all individuals with tax data have an age, we accordingly trim the population of no wealth individuals by the same proportion

feature is the stability of this pattern over time, the difference being roughly the same 40 years later.

## 8.2 Concluding Remarks

Why was it that Paris was so exceptional? It was, at the turn of the twentieth century, one of the major cities of the North Atlantic. As a metropolis Paris was a magnet for the rich. In fact, in this period, more than a quarter of the total French wealth was concentrated in Paris even only 5 % of the French population lived in the City (Piketty et al. 2004). At the same time, the city attracted large numbers of people who came to the capital to provide their labor and lived in very low quality housing. The result was extremely brutal: strong and persistent mortality inequalities, the wealthiest living on average almost a quarter longer than the poor (even when excluding infant mortality). As we show in a companion paper, it was not until the end of the period that the diffusion of infrastructure began to reduce these inequalities (Kesztenbaum and Rosenthal 2014). In this chapter, we take advantage of these data in order to build the first step towards exploring in details this health-wealth nexus and the urban mortality transition. We provide a whole set of results –at the neighbourhood or individual level, based on demographic or taxation data, and so on– that demonstrate the extent of the mortality inequalities in Paris before WWI.



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