

The life expectancy of medical professionals in the Netherlands, sixteenth -twentieth centuries

Abstract

Rising life expectancy has been suggested as one of the determining factors of the start of modern economic growth. On the basis of information relating to elite groups, economic historians have thereby questioned the idea, prevalent among most demographers, that life expectancy was rather stable until around 1800. There still is a scarcity of data on the long-term evolution of life expectancy that can support this claim. We present data on medical professionals in the Netherlands to study the evolution of life expectancy at age 25 in birth cohorts from the sixteenth till the beginning of the twentieth centuries. We compare the medical professions with groups without formal medical knowledge, - clergymen, visual artists, notable Dutch people, and members of the nobility and patriciate - thereby providing clues for the role that medicine has played as a factor behind the mortality decline. We use event history models to estimate the length of life. We observed very strong increases in survival in all selected groups, starting in cohorts born in the seventeenth century. The medical profession was no exception to this trend yet the rise in life expectancy in the profession did not surpass that of other groups. Thus, medical knowledge for a long time seems to have provided only limited advantages to those who possessed it.

The life expectancy of medical professionals in the Netherlands, sixteenth -twentieth centuries

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Introduction

In the recent debates about the ‘Rise of the West’, and the start of modern economic growth during the Industrial Revolution, a lot of attention has been paid to the role that the rise in life expectancy has played in this process. Mechanisms through which increases in life expectancy might have had an effect on the industrial revolution include the facilitation of knowledge accumulation (Bar and Leukhina 2010) and the provision of incentives to invest in human capital (De la Croix and Licandro 2013).

Most demographers are of the opinion that only from the late eighteenth century on, European countries started to experience a decrease in mortality (Caselli 1991; Floud et al. 2011; Vallin 1991; Livi Bacci, 1991, pp. 69-71). Gregory Clark, using estimates on adult life expectancy from a variety of sources, even argued that ‘the average person in the world of 1800 was no better off than the average person of 100,000 BC. (...) The lucky denizens of wealthy societies such as eighteenth-century England or the Netherlands managed a material lifestyle equivalent to that of the Stone Age. (...) Life expectancy was no higher in 1800 than for hunter-gatherers: thirty to thirty-five years’ (Clark 2007).

Yet the idea that life expectancy was rather stable until around 1800 has been questioned on the basis of information, relating to selected groups of the population, groups that have left the clearest evidence of their lives. Comprehensive data on the nobility from a variety of countries covering a much longer period than is usually the case allowed Cummins to show that life expectancy began increasing long before the Industrial Revolution (Cummins 2014). Using an impressive amount of data on famous people, De la Croix and Licandro showed that permanent improvements in life expectancy of famous people started for generations born around 1650 and occurred in almost all (elite) occupations (De la Croix and Licandro 2015). Information from a very large database of visual artists in the Low Countries, a middle-class group, confirmed this finding (Van Poppel, Van de Kaa and Bijwaard 2013). Yet there still is a lack of data on the evolution of life expectancy among those population segments that did not belong to elite groups such as the nobility.

An additional reason to look for data on non-elite groups is that by identifying groups that acted as forerunners in the mortality decline important clues might be provided for researchers

trying to explain *why* mortality declined. After all, the main causes of the post-1800 increase in life expectancy are still debated and that applies even more to a possible pre-1800 one. A series of factors such as rising incomes, better nutrition, and sanitary measures have been suggested to have contributed to the rise in life expectancy in the nineteenth century. Whereas medical science and the medical profession figured prominently among them as early as the first decades of the twentieth century (Buer 1926; Griffith 1926), from the 1970s on the role of medical progress was strongly downplayed (McKeown 1976a; McKeown 1976b; Colgrove, 2002; Wootton 2006). De la Croix and Licandro hypothesized that medical progress *was* one of the driving forces of the pre-1800 life expectancy increase (De la Croix and Licandro 2015). Ryan Johansson also drew attention to the role of medicine in the long-term pre-1800 mortality decline (Ryan Johansson 2010). In Ryan Johansson's view, between 1550 and 1750, various forms of useful medical knowledge became available, improving the chances of survival of the wealthy elites with enough money to be treated regularly and frequently by professional doctors. By implication, Ryan Johansson argues, the history of the modern rise of life expectancy in the West should begin with the study of elite mortality: with those "exceptional" groups that produced and delivered disease-specific knowledge, and with the wealthy elites who were in a position to command their services.

In line with this suggestion we study here the development of life expectancy among members of the medical profession in the Netherlands over a long period of time, stretching from the sixteenth to the twentieth century. We compare their life expectancy with that of groups which, in some respects, were on equal standing with them because of their social background and education. The focus on the medical profession allows us also to test the proposition that a growing body of medical knowledge brought a survival advantage to the medical profession. After all, doctors could apply their superior medical knowledge not only to their patients, but to themselves and their families as well, and that would lead to an earlier and/or faster increase in their life expectancy than observed among other groups.

We restrict our study to male mortality at adult and older ages. According to Johansson, until the late 1600s when the formal 'medicalization' of elite infancy and childhood began, physicians treated mostly adults. Within this group the specialized treatment of diseases specific to women was relatively neglected until after 1800. As the medical conditions of adult men appear to have been a greater and earlier focus of treatment than that of children and adult

women and because the number of females in the medical profession and in other professional groups was extremely limited, this narrow focus is warranted.

Medical progress and mortality decline

Current-day historians of medicine are skeptical about the existence of practical medical progress before the twentieth century. The picture that emerges from studies on the life expectancy of groups, such as the aristocracy and the upper bourgeoisie, is that only during the course of the eighteenth century the most privileged groups acquired an advantage over the rest of the population (Livi Bacci 1991, pp. 66-67). Until then the largest part of the health risks affected all parts of the population without real opportunities for escape. Ryan Johansson, however, argues that there is a substantial body of evidence supporting the view that a growing corpus of useful medical knowledge was produced in Europe from the sixteenth century onwards and that it accelerated rapidly by the 1700s. This included contributions to both 'public health' (defined as the prevention and containment of epidemics) and 'private health'. For example, as early as the 1200s, Europe's leading physicians began to advise royal and elite patients that they could postpone the onset of chronic diseases, and thus live longer, by making healthy lifestyle choices. This included advice to eat simple food in modest amounts, drink alcohol only in moderation, get enough sleep, and avoid emotional excesses. A 'cure' for syphilis, the root of the sarsaparilla turned into a medicinal powder, became more common in the 1600s and offered a means to slow the progress of the disease and lengthen the time between diagnosis and death. Knowledge that scurvy could be cured by consuming oranges was adopted by innovative physicians in England in the early 1600s. Malaria was addressed by importing cinchona bark. Royal physicians began giving their patients 'public health' advice by encouraging them to flee local outbreaks of the plague, and to spend as little time as possible in unhealthy places. They were encouraging their patients to bathe frequently, cultivating the belief that cleaner houses were healthier than dirtier ones and advising them to keep flies off food and bugs out of bed. And, finally, inoculation became available to the rich and later to the poorer parts of the population. Johansson's conclusion was that innovative medicine in early modern Europe managed to make disease-specific progress, and delivered that progress to elite patients so effectively that by circa 1700 a set of acute diseases that once were prevalent and deadly among adults, could be prevented,

managed, or cured. By the late 1600s, ‘after a surprising amount of useful, health-related knowledge had been produced’, adult royal life expectancy showed signs of increasing. Compared with earlier cohorts, members of Britain’s royal families born during the eighteenth century survived much longer on average than their forerunners.

Mortality among the medical profession

How does the mortality of doctors fit in this picture? Are there any indications that they were enjoying a relatively high life expectancy earlier than other groups?

The health experiences of doctors have been of interest to the professionals themselves for a long time in many countries (Woods 2000, 230-231).¹ At the start stands the work of Bernardino Ramazzini (1633-1714), who, on the basis of his long-lasting clinical experience, described the relation between occupation and illness in his *De morbis artificum diatriba* (1700), a book that was translated in many languages. One chapter in his book was devoted to the illnesses of the literati, among which the doctors figured prominently. Clear patterns in the mortality of doctors became visible only when from the early 1830s on (Casper 1834; Thackrah 1832) the unordered casuistry was replaced by studies based on statistical data on mortality and cause of death (Van Lieburg 1986). Numerous studies on the mortality of the medical profession were then published in many countries in Europe (Westergaard, 1901). Léonard (1978, pp. 1490-1498) gave an impressive overview of local studies published in France in the nineteenth century. For the city of Paris, for example, Jacques Bertillon compared age-specific death rates for medical doctors in the age range of 20 to 60 years for the period 1885-89 with those of several other liberal professions (Bertillon 1892).

Most historical studies concluded that doctors had a higher mortality than comparable professions. In explaining this pattern, reference was often made to the study of the famous Berlin professor of forensic medicine Johann Ludwig Casper. In his opinion, there was no profession that made such a strong demand on the physical and mental forces of a person as the medical one, not a single profession that allowed its members only irregular and incomplete

¹ The health of medical doctors has remained a popular topic until now (Carpenter, Swerdlow and Fear 1997; Juel, Mosbech and Hansen 1999; Rimpelä et al. 1987).

nights' of rest; physical strains, weather influences, night watches, interrupted meals and heavy emotions of all kinds worked together to produce damaging effects on the health of doctors. Medical professionals also ran much higher risks of succumbing to epidemics; 'their profession brings them directly and repeatedly into contact with all infective agents, and because their assistance is sought again and again and from all sides at the same time, the irregular and excessive efforts exhaust them so that they are fated to be infected more easily than anyone else' (Zeeman 1856b, 65). Casper's ideas figured also prominently in Dutch studies on the mortality of doctors (Büchner 1852; Zeeman 1856a, 52; Dompeling 1882).

Generally, these older studies are based on very small numbers, which makes the results subject to large random fluctuations. They use rather crude indicators of survival, such as the average age at death of medical professionals in a given period or the age distribution of the medical profession at a certain point in time. A problem is also the lack of information on mortality in comparable population groups. Doctors in many countries had and have generally a high social status, high levels of education and above-average income. Their belonging to upper socioeconomic groups will have had an effect on their mortality and comparing them with the general population thus does not reveal the beneficial or detrimental effects of their profession, their special knowledge and skills for survival. Several studies therefore tried to collect information on the survival of groups with comparable levels of education and status, the protestant clergy in particular.

These studies hardly ever take time trends into account although there are some exceptions. Hill, for example, studied birth cohorts of physicians included in the Roll of the Royal College of Physicians of London. Between birth cohort 1570-1689, 1690-1749 and 1750-1799, expectation of life at age 35 increased from 30.3 via 32.1 to 35.3 years. Compared to English peers, the physicians lived one to two years longer, an outcome explained by the 'simpler life' they were living, their easier pursuit of 'the even tenor of their way', and by selection effects (entering the profession demanded a certain level of health, and acquired immunity) (Hill 1925). For the German city of Esslingen, in the state of Württemberg, Salzmann (Salzmann 1885) calculated the average duration of life of (a very small number of) physicians over a long period. In the sixteenth century, the average duration of life (at birth) among physicians was 36.5 years; in the seventeenth century 45.8; in the eighteenth 49.8, and in the nineteenth century it reached the age of 56.7. This increase was ascribed to the disappearance of

the plague and the fewer epidemics of typhus, diseases which formerly decimated medical practitioners.

Weinberg compared the life expectancy at birth of medical doctors in the German state of Württemberg in birth cohorts 1785-89 (58.2 years) to 1836-55 (61.1 years), and concluded that over time only a small improvement could be observed of around 2.7-2.9 years. At age 25, doctors had almost the same life expectancy as the state population at large but lagged five years behind the protestant clergy (Weinberg 1897). Whereas the clergy experienced a clear increase in life expectancy over time, the physicians did not, partly as a result of increased competition among the members of this group and their growing concentration in large cities. The more favourable health condition of the clergy from the start of their career due to factors inherent to their training period, their comfortable income, their simple and orderly life, and the fact that their work was not physically demanding were among the factors that explained their favourable position. Weinberg also compared his findings on Württemberg with those of studies in Denmark, England, Norway and Switzerland. This prompted him to conclude that the increase in life expectancy among doctors in the nineteenth century ran mostly in parallel with that among the general male population.

The medical profession in the Netherlands and its social standing

The Dutch medical profession is an interesting case to study as for quite some time The Netherlands were considered to be a forerunner in medical education. Medical education at university level in The Netherlands started in the late sixteenth century with a curriculum that was considered relatively advanced (Lindeboom 1970). The medical curriculum at the universities attracted many students from abroad. Boerhaave was called the 'common teacher of Europe' (Lindeboom 1970, 211). From around 1800, the Netherlands moved towards homogeneity of the medical profession and a fixed level of standards of practice, acquired through education and training whereby the medical profession exercised great control over entry (Schepers 1991). The country gradually conformed to the model curriculum of medical education that became common to most European countries around 1940 (Luyendijk-Elshout 2004).

Alongside the academically educated practitioners, the medical profession in the Netherlands consisted from the first half of the sixteenth century on of two other groups, that differed from the university trained doctor by the legal status of its members, the education and training they had received and the functions they performed: the simple barber-surgeons, and an intermediate class of surgical men that had received medical training by a guild, a training governed by municipal and surgeon guilds' regulations. To be admitted to the guild, apprentices had to pass an exam before the masters of the guild (Van Lieburg 1983a).

After the abolition of the guilds in 1798 (Frijhoff 1985), a law of 1818 regulated the issuing of medical licenses. It created a clear legal boundary separating the unqualified from the qualified practitioners and reinforced an already existing division within the medical profession between academic and non-academic-trained practitioners. The academics generally earned a higher income and enjoyed a higher status than the non-academics. The university-trained doctors were to receive an extensive theoretical training while the non-graduates were trained by apprenticeship and/or by attending a private or clinical school to be able to pass the examination (Van Lieburg 1985; Van Lieburg 1983b). The groups of medical men performed different functions: the doctors in medicine diagnosed complaints, prescribed treatments and attended and advised; the surgeons offered craft and manual skills (Van Lieburg 2014).

The authority of the medical profession was regulated again in 1865. All medical students would henceforth be required to pass a state examination consisting of theoretical and clinical practical parts, which conveyed the authority to practice in all fields of medicine. The requirements for the examination could be met only by attending the universities (Van Lieburg 1999).

In the social stratification system of the Republic (Groenhuis 1977), the medical profession ranked rather high but the prestige of the various groups of medical professionals differed widely (Frijhoff 1983a). The university-trained medical doctors holding a doctor's degree stood clearly above other medical professionals. They predominantly came from the highest layers of the lower middle class and the bourgeoisie. Their prestige was above all determined by the societal consensus on the priority of intellectual over physical work, of knowledge over capability (Frijhoff 1983b). In the eighteenth century, medical doctors became part of the more compact and homogeneous middle group of professions, together with the ministers, the upper middle class of merchants and surgeons and army officers (Frijhoff 1983a). The Protestant clergymen therefore are a suitable candidate for comparison of the life expectancy

of the medical profession. Their social position in the period of the Dutch Republic has been studied extensively (Buisman 1992; Groenhuis 1977). Almost all Dutch reformed ministers have been university-trained theologians since the early seventeenth century (Van Lieburg 2003). As far as education was concerned, ministers were thus equal to the university trained medical professionals. The families they originated from were mostly the bourgeoisie, but many country pastors belonged to or at least originated from the lower middle class (Bots, Matthey and Meyer 1979). The incomes of the ministers were generally rather modest.

Data

The life expectancy of medical professionals is estimated from information on dates of birth and death included in a data base of the medical professions in the Netherlands in the period 1450-1950, developed by Mart van Lieburg. Data are based among others on local sources about practicing medical professionals of all sorts: list of medical doctors admitted by the *Collegium medicum*; yearbooks of (barber-) surgeons guilds; printed and hand-written lists of locally practicing medical professionals, information on students graduating from the departments of medicine of all universities and those who passed the examination after having been trained in one of the clinical schools. Information was also collected on all persons responsible for the training of students in medicine both at the universities, the clinical schools and in the various urban training facilities. As information on those members of the medical profession that were member of the surgeon guilds is missing for the period before 1800 and information is not yet complete about the military health officers, our dataset for the cohorts born before 1750 predominantly consists of university trained doctors.

Life expectancy of Protestant ministers comes from data bases that almost completely cover all clergymen practicing from 1572 until 2004 within the borders of the Dutch Republic and the Kingdom of the Netherlands. One database provides information on all Reformed ministers born in the period 1572-1749 (Ter Braake, Fokkens and Van Lieburg 2015). The database was compiled on the basis of printed minister books of the classes, the regional bodies of the Dutch Reformed Church, since 1695 and the primary source publication of the Classical Acts (including ministers' lists) between 1572 and 1621. For birth cohorts 1750 and later, we made use of a database called *Dominees.nl*, developed by Frans Verkade. In this database, birth

and death dates and dates of entry into the profession have been included for clergymen born between January 1st 1750 and December 31st 1909. It is partly based on the same sources as the aforementioned database, but supplemented with information on dates of death from ecclesiastical and civil registrations, family and newspaper announcements, and genealogies covering all Protestant congregations.

We have supplemented our data on life expectancy of medical professionals and protestant clergy with comparable data on three other groups: Dutch visual artists, a group of notable persons and the nobility and patriciate. Life expectancy for visual artists is deduced from a database called RKDartists, a database with information about Dutch visual artists from around 1200 to the present. Just as was for a long time the case with the non-university trained medical professionals, it was the guilds that provided a framework for the training of the visual artists. Visual artists were on the whole self-employed and operated much as a craftsman would. Information about their life expectancy thus reflects that of the lower middle classes of their time (Van Poppel, Van de Kaa and Bijwaard 2013). The information on notable persons comes from the Biographical Portal of the Netherlands (www.biografischportaal.nl). The Biographical Portal contains biographical information on notable persons in Dutch history from the earliest times until up to present. They are coming from a variety of mostly high-or medium-ranking status groups, included people prominent in religious organizations, the industry, armed forces, politics and administration. Finally, several published small-scale studies contain information on pre-1800 expectation of life at age 20 for the nobility and the patriciate, the urban political elite. Data relate to the patriciate of Leyden and Zierikzee and the nobility in the former provinces of Friesland, Holland, Guelders, and Utrecht (See Van Poppel, Van de Kaa and Bijwaard, 2013). Although some members of the nobility and patriciate may have been part of the ‘notable persons’ (unfortunately, this cannot be checked as we do not have the underlying individual records for the nobility and patriciate), the groups as a whole differ from each other.

For all of these databases we used the period of birth as the classification principle. Periods of births were constructed without having an *a priori* assumption of the factors affecting the temporal development of the remaining life expectancy and with only the numbers of persons available in each category in mind. Table 1 summarizes the sources used in the study whereas table 2 gives an overview of the number of cases in the various datasets. The table shows that

from 1600 on, sufficient numbers are available to estimate life expectancy for the medical profession and for all other social groups.

Table 1 and table 2 about here

Methods

Using the previously discussed sources to estimate the life expectancy of the medical profession compared to that of other social groups is not without problems. First of all, selectivity is an issue. For various datasets it is unknown at what age exactly the event took place that allowed a person to enter the risk-set. Unlike medical doctors graduating at a university, 'famous' (artist) or 'notable' people do not usually have a clear age at which their risk of dying as a 'famous' person started. One becomes famous by building a reputation based on a series of activities or a collection of work. By definition, famous people have a zero-mortality risk before they are 'famous' and this period must not be included in the risk-set for mortality. For visual artists as well as for 'notable' persons, the inclusion of a person presupposes that some of his work or activities have survived. This inbuilt survival advantage for the best-known persons is an example of what is called 'survivor treatment selection bias' (Hanley, Carrieri and Serraino 2006; Suissa 2008). Survivor treatment selection bias will not be a problem for the medical professionals and the ministers as information was collected even on persons who worked only for a short period of time in their profession.

Reliability of the information in the various databases is another issue. Although most people in this selection come from sources of high quality and whose life data are well known, misclassifications of dates of birth and death might have taken place. In the database, years of birth and death are sometimes not exactly given but refer to a range of years. The cases in which only the approximate period within which a person is likely to have been born and/or the period within which he is assumed to have died is reported, present a problem. By assuming a parametric statistical distribution, such as the Gompertz distribution for the length of life, these approximate birth and death dates nevertheless are sufficient to derive life expectancies.

We have used event history analysis to estimate the expected length of life. In event history analysis the time till an event, in this case from birth till death, is modelled. We condition

on survival till at least the age of 25, as this is the age at which ministers had completed their university training, medical professionals had graduated or taken their exams, and visual artists, in order to become a known artist, had lived long enough to have made some noticeable artwork.

The Gompertz distribution is often assumed in the analysis of lengths of life. This distribution has two parameters, a shape α and a scale parameter β , in which the latter can depend on observed characteristics (such as sex). The density for a duration t in a Gompertz distribution is:

$$f(t) = e^{\alpha t + \beta} \exp\left(-\frac{1}{\alpha} e^{\beta} (e^{\alpha t} - 1)\right) \quad (1)$$

The remaining life expectancy e in birth cohort T (conditional on reaching age 25) can be approximated by:

$$e_{25}(T) = -\exp\left(\frac{1}{\alpha} e^{\beta + 25\alpha}\right) (\beta - \ln(\alpha) + 25\alpha + \gamma) / \alpha \quad (2)$$

where $\gamma \approx 0.5772$ is Euler's constant. We use maximum likelihood estimation based on the information on the dates of birth and death. The computations were carried out the using STREG procedure in STATA (StataCorp 2009).

Results

For a first impression of the mortality of medical professionals we calculated non-parametric (Kaplan-Meier) survival curves for ages 25 and higher. Figure 1 illustrates how the survival function varied by birth cohort. The selection comprises the first cohort with a sufficient number of cases, which at the same time is the cohort with the lowest life expectancy at age 25 (1600-49) and six later cohorts. The figure demonstrates the improvement in survival for medical professionals from the eighteenth century on, an improvement that has not been interrupted since then. In particularly in the older cohorts the risk of dying at a relatively young age— say below

age 50 – was quite high. This is suggestive of a situation where the role of chronic diseases was limited but external forces and epidemic diseases played an important role. It is also in line with the finding of several nineteenth century studies that mortality was especially high among medical professionals aged fifty or less (Zeeman 1856b). Younger doctors were more frequently ‘in contact with the sick; are exposed to zymotic diseases and their night rest is disturbed’ (Woods 2000, 232-233).

Figure 2 shows the values for life expectancy at age 25 with 95% confidence intervals.

Figure 2 about here

For the period before 1600 where the number of medical professionals was rather small (80), male life expectancy at age 25 would appear to be 33.9 ± 7.3 years. For the first half of the seventeenth century, a remaining life expectancy in the order of 29.6 ± 3.2 is recorded and for the second half 32.3 ± 2.8 years. It is plausible that the trough in cohort 1600-49 is a real one, to a large degree determined by plague epidemics. Noordegraaf and Valk counted over the period 1450-1668 a total of 110 plague years in the province of Holland, causing quite high mortality in particular in the years 1624-25, 1635-37, 1652-57 and 1664-67 (Noordegraaf and Valk 1988, p. 39-43). The three last-mentioned crises could (partly) have affected cohort 1600-49. In addition to that, adverse economic circumstances and periods of conflict had their effects and enhanced the impact of the epidemic (Israel 1995). The drop in life expectancy observed in the cohort born during the first half of the seventeenth century is also in line with findings from the recent study of the ages at death of European nobles (Cummins 2014).

Among medical professionals born in the first half of the eighteenth century a substantial rise in life expectancy started. This was only temporarily interrupted in birth cohort 1800-49, a cohort which was heavily affected by the potato blight in the 1840s, and by various epidemics of cholera, smallpox and measles in the 1840s, 1850s and 1860s.

Comparing life expectancies between the various categories within the group of medical professionals is rather complicated. Until around 1780, we only have information on university-trained medical doctors whereas after 1865 all medical professionals were university-trained. Thus, only for those medical professionals who were licenced between 1780 and 1865 – roughly coinciding with birth cohorts 1750 to 1840- we can distinguish between medical doctors who

graduated at the university and medical professionals trained at clinical schools. Table 3 compares, for a more refined categorization of birth cohorts, the life expectancy of university-trained and non-university trained medical professionals. The data suggest that the university trained doctors did a little bit worse than the non-university trained ones in the first cohort whereas in cohorts born after 1820 medical doctors had significantly higher life expectancies. The distinction between the two groups not only captures differences in status and training, but partly also differences in places where people practiced. The university trained medical professionals were overrepresented in towns, in particular in the first birth cohorts. Here larger numbers of people lived who could afford the advice of the university doctors. Important was also that universities were located in the cities and that the mental climate there corresponded more with the cultural and intellectual needs and the social aspirations of the medical doctors (Rutten 1985; Verdoorn 1965, 122-124). Urban living was still associated in this cohort with excess mortality. In later birth cohorts the urban mortality penalty had almost disappeared and we observed, in line with earlier studies, that medical professionals mostly working in the countryside were worse off than those concentrated in towns. Medical professionals in the countryside were worse off than those working in towns. As a medical doctor in the 1850s wrote: 'To earn a living for themselves and their family' this group had to go out in all weathers, and had often to do without a night's rest, relaxation and civilized contacts' (Zeeman 1856b).

Table 3 around here

To place the results for the group of medical professionals as a whole in perspective, we first of all compare them with estimates of life expectancy for other social groups. Figure 3 shows that trends in life expectancy for the medical profession, the visual artists, the ministers and the notable persons all point in the same direction: there is a drop in the 1600-49 birth cohort, compared to the group born before the beginning of the seventeenth century, followed by a more or less continuous rise, and a new dip or a flattening of the trend in cohort 1800-49 followed by a renewed increase. In all groups considered here, we observe that birth cohorts who had lived their lives mostly before 1800 had already undergone clear improvements in life expectancy. This applied in particular to medical professionals, ministers and notable persons.

Noteworthy is that medical professionals were in the oldest cohorts worse off than the notable persons, and had even lower life expectancies than the visual artists. Life expectancy of the protestant ministers was almost on the same level as that of the medical men for quite some time. After cohort 1800-49, the various social groups were almost on the same level but the medical profession was still not doing better than any of the other groups.

The differences in life expectancy between the medical professionals on one hand and the visual artists and the notable persons on the other hand, were statistically significant in each birth cohort except the first one (born before 1600) and, for the visual artist, except for cohort 1750-99; compared to the ministers, differences in expectation of life were significant in all birth cohorts from 1750-99 on. In the most recent cohorts, differences in life expectancy between medical professionals, artists, the clergy and notable Dutch men did hardly exist. When compared with the outcomes of cohort life tables for Dutch males as a whole (unweighted averages for birth cohorts 1810-49, 1850-1899 and 1900-10 were respectively 37.57, 45.50 and 47.10 years) life expectancy of medical professionals evolved more or less parallel over time but at a slightly lower level than Dutch male cohorts. Only medical professionals born in 1900-10 had a higher life expectancy than the general population.

Figure 3 about here

In Figure 4 we compared the life expectancy of the medical profession with that of the nobility and the patriciate. Data for these two groups come from published aggregated data and mostly relate to very small samples. For patriciate and nobility data were only available for life expectancy at age 20. To make these data comparable with those for the medical profession, we calculated life expectancy at age 20 also for the medical profession, applying the same methods as used for age 25.

Although the general trend of life expectancy for the nobility and patriciate is quite well reflected in the results for the medical professionals, the life expectancy of medical professionals strongly exceeded that of these groups during the full period of three centuries covered. The trough for the years of birth 1600-49 is most clearly reflected in the figures for the patriciate of the city of Leyden. The patriciate of Zierikzee had a very low life expectancy during the whole period. This part of the country has long been characterized by very high mortality (Hofstee,

1978, 115-145), affected as it was by endemic malaria and was prone to flooding. From the beginning of the eighteenth century onward, life expectancy of nobles and patriciate tended to lengthen fairly steadily and life expectancy of the nobility of Guelders and Friesland then came fairly close to the value calculated for the medical professionals.

Figure 4 around here

Conclusion

From a low point in birth cohort 1600-49 on, a modest and later on a strong increase in life expectancy occurred among a variety of social groups in the Netherlands. The medical profession was no exception to that rule. As was the case in other countries, the life chances of medical professionals improved substantially from the mid-eighteenth century onward and in particular after the mid-nineteenth century. In the most recent cohort, medical professionals scored better than the general population. A comparable trend was observed in the USA where since the 1920s, and to an ever-increasing degree, the mortality risks of medical doctors were below those of the general population (Jütte 2013). The same tendency was observed in the UK (Woods 1996). During the second half of the nineteenth century, as the status of the medical profession began to rise slowly and knowledge of the causes of the diseases and the means of their prevention were advanced, doctors were able to take at least elementary measures to protect themselves. This would tend to suggest the importance of the occupational hazards of medicine for the survival of doctors before that time. In addition to that the improved economic position of doctors in relation to that of the working population between the 1860s and 1960s might be related to this changing health status (Riley 1996). This was partly caused by the fact that non-university trained medical professionals, that for a larger part originated from lower social status groups, gradually disappeared.

The rise in life expectancy in the medical profession lagged behind that in most of the other social groups for which we have data. Thus it is hard to conclude that medical progress was the driving force behind the mortality decline. After all, the increase in life expectancy among medical men was not much different from that of ministers and even less than the one observed among the visual artists and notable Dutch people.

Our results are in line with the many nineteenth-century studies that showed that medical professionals, compared to other ‘civilized classes’ had a somewhat lower average duration of life. Contemporary observers argued that not a single profession had such an intense effect on mental and physical forces, nor offered so little opportunity for leisure than the medical one. The lack of physical exercise, exposure to severe weather, sleep deficits, nocturnal exposure, irregularity in meals, changing emotions and exposure to the risks of infection were the factors undermining the health and survival prospects of the medical professionals. Our results therefore do not lend support to the idea that the life of a medical man was as a rule longer than that of a non-medically trained or -educated individual from the middle or higher classes. This raises doubts about the idea that the growing body of medical knowledge brought a survival advantage to the medical profession. Although we have indications that the supposedly most informed medical men, the university-trained medical doctors, had better survival prospects, at least in the cohorts born after 1820, than the less formally educated surgeons, this outcome can also be interpreted as the result of the harsher working and living conditions of the non-university trained medical professionals that worked in the countryside. It is therefore highly unlikely that medical progress was a driving force of the pre-1800 mortality decline.

In discussing the reasons for the increase in life expectancy of famous people from the seventeenth century on, De La Croix and Licandro considered two variants of the medical progress as potential candidates. First of all they referred to the increasingly experimental attitude prevalent in the field of medicine in the period 1500-1800, an attitude which led to significant advances based on practice and empirical observations rather than on a correct disease theory. A variation of this medical progress theory, called the Enlightenment hypothesis, implied that the new approach to the world promoted by the Enlightenment led to a decrease in superstition and ‘could have led the elite to consider that they indeed had some hold on their length of life’ and it might have pushed the upper classes to give up bad medical habits (De la Croix and Licandro 2015). De la Croix and Lisandro did not supply direct evidence on the changes in life expectancy of the medical profession as a specific group and our findings do not indicate either that this group did have a life expectancy advantage in comparison with other socio-economic groups. If medical progress indeed had played a role as a factor in the mortality decline before the nineteenth century, the bearers of this new knowledge were not the ones reaping the benefits.

Although compared with other studies of the life expectancy of the medical profession our database is quite large and is able to bridge a very long period of time, it still has shortcomings that have to be remedied before it can provide more precise answers on the study of the long-term development of life expectancy. Most importantly, more information has to be collected on the non-university-trained medical practitioners, practicing in the eighteenth and seventeenth centuries. This allows us to pay more attention to the persons that were mainly responsible for the day-to-day health care of the masses. Even with this shortcomings, however, the database is valuable and large enough to draw conclusions about the long-term development of life expectancy among medical men.

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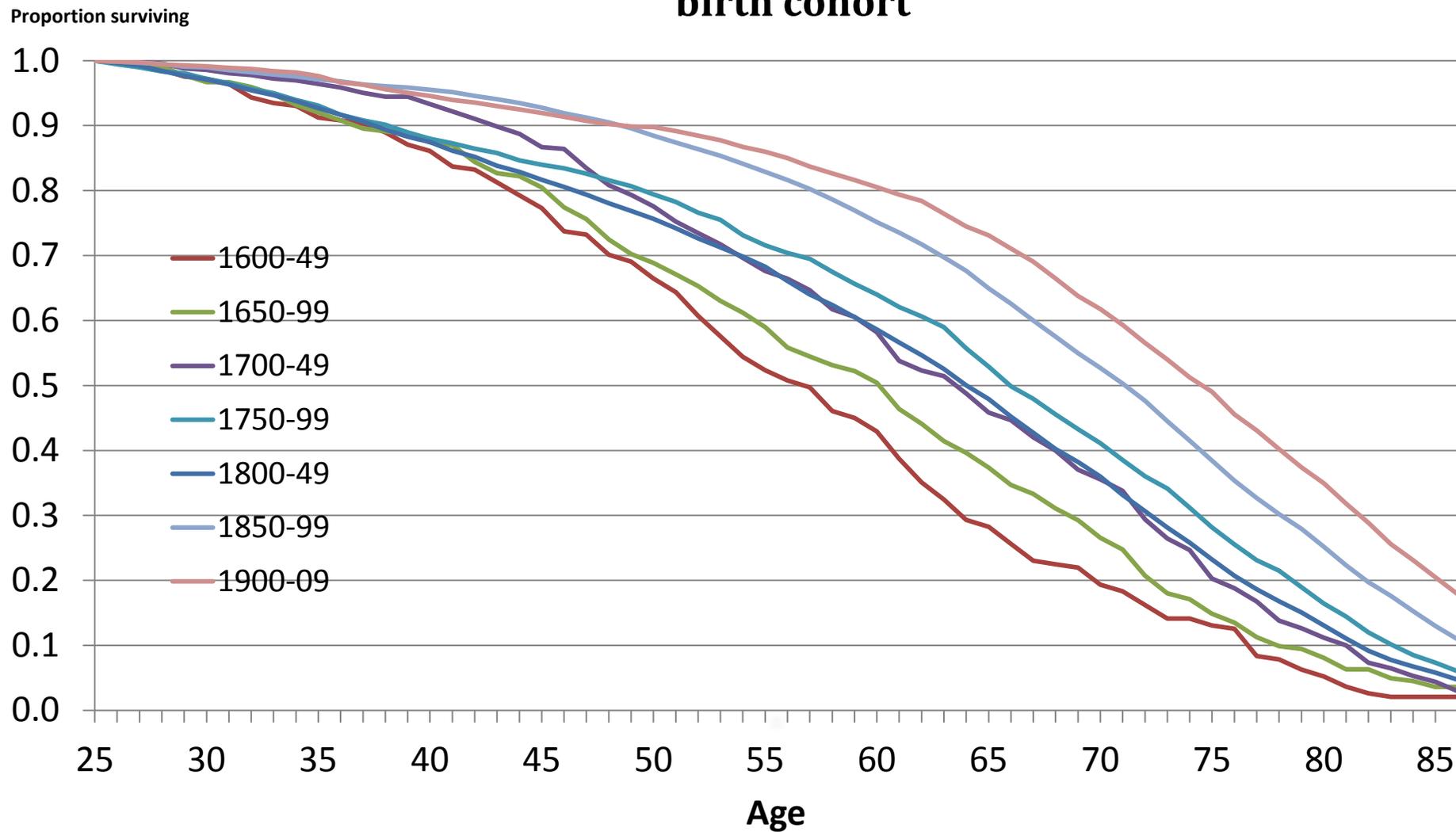
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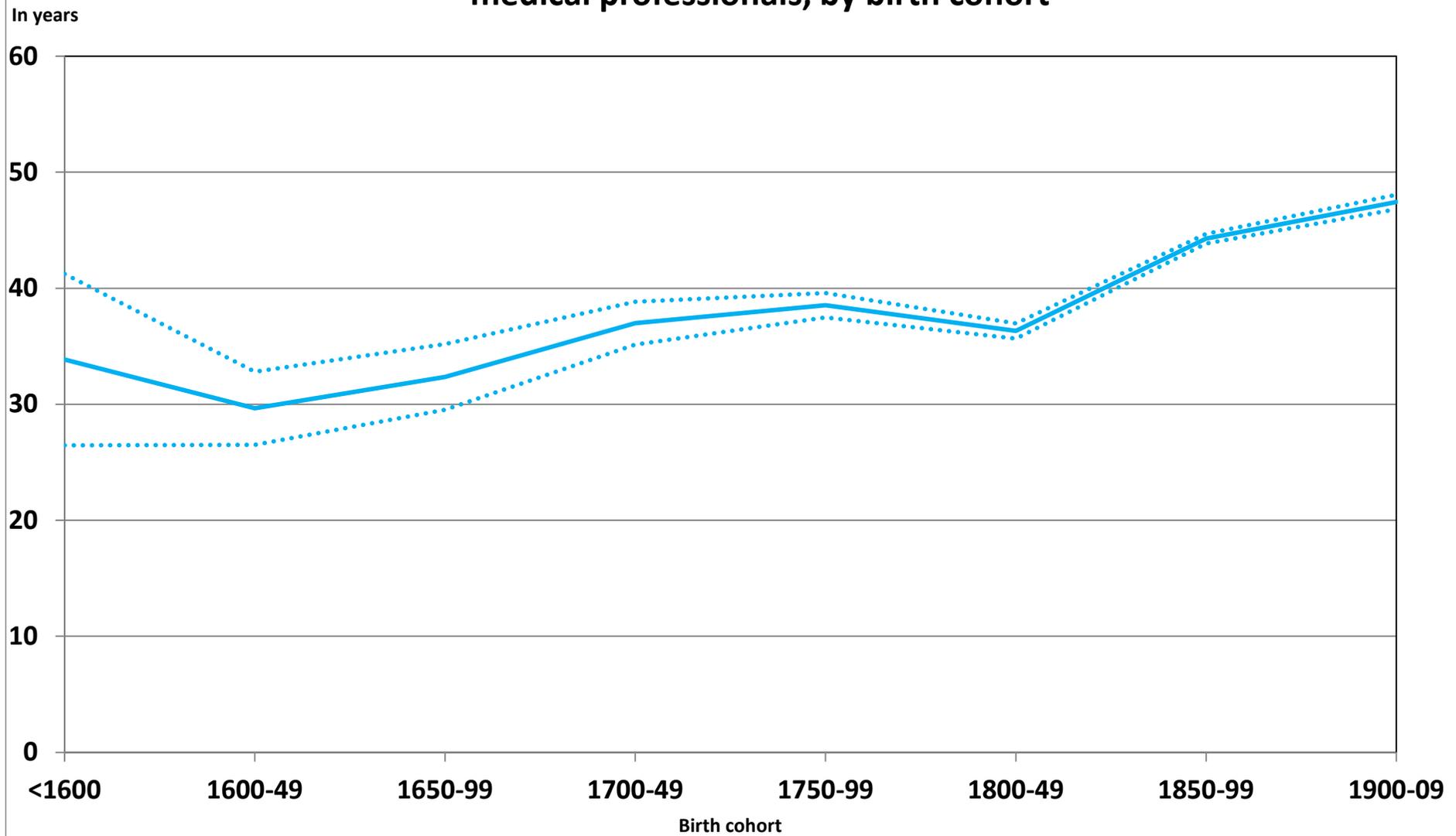
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Figure 1. Survival curves for male medical professionals, by birth cohort



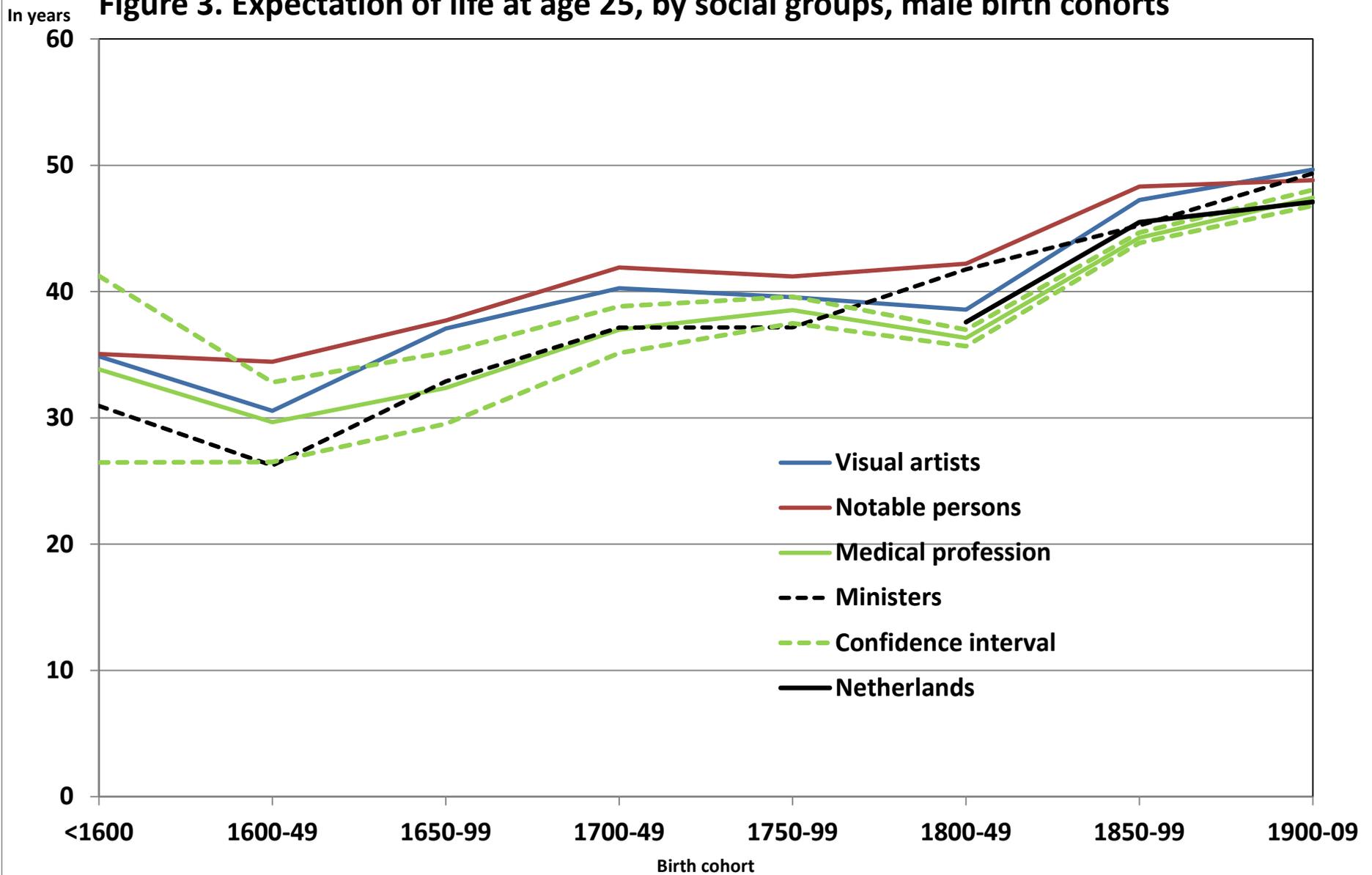
Source: See table 1

Figure 2. Expectation of life at age 25, and 95 % confidence intervals, male medical professionals, by birth cohort



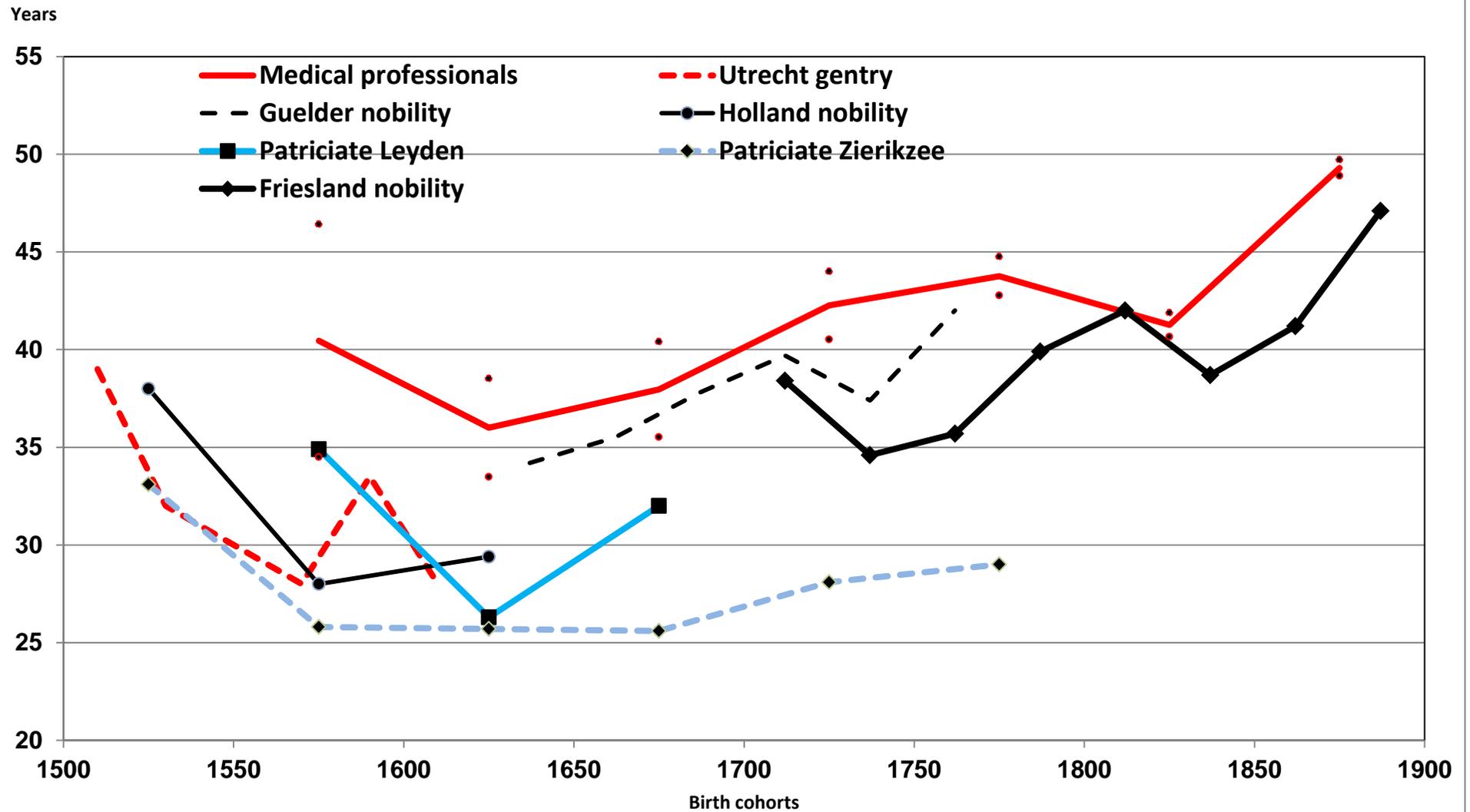
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Figure 3. Expectation of life at age 25, by social groups, male birth cohorts



Source: See table 1

Figure 4. Expectation of life at age 20 (and confidence intervals) male medical professionals compared to nobility and patriciate, in years



Source: See table 1

Table 1: Characteristics of the data used in this study

	Medical professionals	Protestant ministers	Notable persons	Visual artists	Nobility and patriciate
Life expectancy estimated on basis of	Individual records with dates of birth and death	Individual records with dates of birth and death	Individual records with dates of birth and death	Individual records with dates of birth and death	Published studies based on aggregated individual records
Sources	Local sources about practicing medical professionals: yearbooks of surgeons guilds; information on students graduating from the departments of medicine of universities or passing examination of clinical schools.	Printed minister books of the regional bodies of the Dutch Reformed Church, Classical Acts, ecclesiastical and civil registrations, family and newspaper announcements, and genealogies	Biographical Portal of the Netherlands containing biographical information on notable persons in Dutch history, based on ecclesiastical and civil registrations, family and newspaper announcements, and genealogies.	RKDartists, a database with information about Dutch visual artists, based on ecclesiastical and civil registrations, family and newspaper announcements, and genealogies.	Published studies on nobility of provinces of Utrecht, Guelder, Holland and Friesland and patriciate of cities of Zierikzee and Leijden
Birth cohorts	1550-1910	1550-1910	1500-1910	1550-1910	1500-1899

Table 2: Number of observations of condensed groups by birth cohort, males, period 1500-1909

Period of birth	Medical profession	Ministers	Notable persons	Visual artists
< 1600	80	557	961	1104
1600-1649	341	1276	730	1523
1650-1699	346	1626	794	633
1700-1749	458	1875	940	655
1750-1799	1558	2250	1424	1199
1800-1849	4106	3026	1676	2615
1850-1899	6147	3562	1885	4756
>=1900	2613	1132	554	1159
Total	15649	15304	8964	13644

Table 3. Expectation of life at age 25 and 95 % confidence intervals, male university and non-university trained medical professionals, by birth cohort

Birth cohort	Non-university trained	University trained
1750-74	43.92 (41.50 – 46.35)	36.85 (33.93- 39.77)
1775-99	39.20 (37.63 – 40.78)	36.42 (34.29- 38.56)
1800-09	37.27 (35.17 – 39.37)	38.40 (35.88- 40.93)
1810-19	34.75 (33.08 – 36.43)	35.95 (33.97- 37.93)
1820-29	33.55 (31.24 – 35.85)	37.92 (36.05- 39.78)
1830-39	31.84 (28.90 – 34.77)	39.22 (37.66- 40.77)