Faulty genes or faulty parents? Gender, family and survival in early and late childhood in the Netherlands, 1860–1900

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Abstract

According to the famous economist and Nobel prize winner Amartya Sen women have a significant biological advantage over men. Despite this fact women do not always live longer. In today’s third world, but also in some areas in Europe at the end of the 19th and the beginning of the 20th century we find so-called excess female mortality. In this paper we examine child mortality in The Netherlands in general and gendered patterns of child mortality in particular. The focus is on differential mortality patterns by gender for infants, older children, and young adults up to age 20 in the second half of the 19th century. The analysis takes place at three levels. We start off with an exploration of sex differentials in mortality at the national level, based on the existing literature. We next examine gender differentials in mortality at the level of several Dutch communities, in the region called Twente, focussing on the differences between the city and the countryside. The final part of the analysis focuses on the micro level of the individual and his or her family in the rural community of Lonneker located in the Twente region. In this part of our study we make use of longitudinal individual level data which are analysed with event history methodologies. Our analysis clearly demonstrates that young women and girls in The Netherlands were not always in a position to fully capitalise upon their greater biological advantage and suffered instead considerable excess mortality. Especially in the rural parts of the country girls had lower survival chances. The individual level analysis confirms the importance of sex in explaining child and adolescent mortality. These gendered mortality risks can however not be attributed to social and economic household characteristics. The analysis also shows that, when death came, it literally affected the entire family. This phenomenon, better known under the label ‘death clustering’, may have been an effect of parental incompetence.

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1. Introduction

According to the famous economist and Nobel prize winner Amartya Sen, women have a significant biological advantage over men. In his own words: “Considerable research has shown that if men and women receive similar nutritional and medical attention and general health care, women tend to live noticeably longer than men” (Sen, 1990, p. 60). This neatly fits with the common sense notion surrounding the longer life expectancy enjoyed by modern women in Western societies. Whilst excess female mortality, which arises when women die in greater numbers than do men, may
perhaps be associated with Asian and African societies where women are subjected to outright discrimination, it is seldom or never associated with Western societies. There is however every reason to assume that even until the rather recent past – as late as the 1930s or the 1940s – young women and girls in The Netherlands were not always in a position to fully capitalise upon their greater biological advantage and suffered instead considerable excess mortality.

A number of historical studies have successfully demonstrated the existence of gendered patterns of mortality in Europe from the eighteenth through to the mid-twentieth century. Already in 1978, Dominique Tabutin argued that, prior to 1940, European societies were characterised by patterns of excess female mortality at some ages, in particular for young adult women, but also at younger ages in childhood and adolescence (Tabutin, 1978). Tabutin later showed that, in some Western societies, adolescent girls between ages 5 and 19 had higher death risks than boys of the same age (Tabutin & Willems, 1998). Isabelle Devos uncovered the higher mortality risks for adolescent girls in nineteenth-century Belgium, and Stefan Klasen demonstrated the occurrence of high mortality rates among eighteenth-century adult women in Germany (Devos, 2000; Klasen, 1998). In another noteworthy study George Alter and others also found that after age 1, mortality tended to be higher for girls than for boys in a wide variety of eighteenth- and nineteenth-century Asian and European rural communities (Alter, Manfredini, & Nystedt, 2004). In the international historiography the lesser life chances of women and girls in the past are invariably related to their inferior position in society, which reduced the level of parental attention towards aspects of health, education, food and general care of girls within the family. Differences in the life course patterns between boys and girls thus translated itself in differences in health and longevity. However, these culturally determined rights, duties and behavioural patterns of boys and girls interacted with historically specific contexts, which together determined the extent of exposure and resistance to serious disease. This high degree of sensitivity to historical context therefore requires research approaches operating on the regional and individual level (Johansson, 1991, pp. 136–141, 163).

In studies mentioned earlier, female mortality disadvantages seemed strongly related to rural areas and agricultural backgrounds. Due to the agricultural revolution and the ongoing mechanization of agricultural labour, women’s work in the field was made more and more redundant (Humphries, 1991). That way, girls and women had fewer opportunities to contribute to the family income than their male counterparts, which negatively influenced their position in the household and increased the risk of discrimination. However, excess female mortality was not only found in rural areas. Isabelle Devos, for example, found excess mortality for girls in textile cities as well as in areas dominated by agriculture (Devos, 2000). The literature shows that the fate of girls living in industrial cities could go either of two ways. On the one hand their position in the family might improve. The ample employment opportunities for girls on these industrial labour markets and their contributions to the often strained family purse protected them from discrimination within the household. On the other hand, girls had to work long days while also having to assist their mother in household work. This severely reduced the health of girls and on account of their comparatively low wages they were still in an inferior position in comparison to boys (Humphries, 1991, pp. 470–472; McNay, Humphries, & Klasen, 2005, pp. 663–665).

Male mortality disadvantages existed in European historical populations as well but appear to have been restricted to the first year of life. The greater genetic frailty of male babies is seen as the most important reason for male excess mortality in infancy. But what caused the excess mortality of European adolescent girls? One of the major causes of death for adolescent girls was infectious diseases such as tuberculosis. The onset of menarche, with its changes in the biological household of the female body, is considered as an important factor for the increased susceptibility of girls for these respiratory diseases (Devos, 2000, pp. 66–67). However, mortality patterns do not merely reflect biology. Mortality patterns also reflect increases or decreases in the availability of crucial life resources. As Sheila Johansson has argued, such diseases as tuberculosis are highly sensitive to differences in living standards and general levels of wellbeing (Johansson, 1991, pp. 152–153). If young girls were exposed to this disease to a similar extent as boys, their relative mortality risks increased when they were worse fed than boys or had reduced access to health care and education. Differential mortality patterns – whether by age, social group, or gender – may therefore also reflect structural inequalities in the access to a society’s resources.

In this paper we focus on differential mortality patterns by gender for infants, older children, and adolescents up to age 20 based on aggregated community level data as well as individual data taken from Dutch Population Registers. Geographically, the
main focus of this paper is on one of the most eastern regions in The Netherlands, located in the Dutch province Overijssel, called Twente. On the basis of the community level data we test the hypothesis that excess female mortality was predominantly a rural phenomenon. We also describe children’s live chances in that region’s industrial cities. The individual level data enable us to focus more closely on the fates of Dutch boys and girls from birth until age 20 in Lonneker, one of the rural villages in the Twente area. Our choice for Lonneker is based on reasons of research strategy. Lonneker itself is a rural community (as we will show later on). However, because it is located in the immediate proximity of Enschede the village also accommodates many factory workers. This gives us the unique opportunity to compare these two occupational groups. This allows us to answer such questions as: to what extent were girls running higher mortality risks in this rural community, and to what extent did the household’s orientation on industrial textile work make a difference? And what were the main determinants for child survival in the various age groups? We investigate a number of possible social, cultural and economic explanations and causes of excess female mortality based on event history analysis. Finally, the individual level analysis also demonstrates the importance of looking at child mortality within the context of the child’s parental family unit. Neither infant nor child mortality was randomly distributed over the various families in our sample but appear to have clustered within a small group of families. Families, whether through faulty genes or faulty parents, appear to have been important determinants for child survival, for boys as well as for girls.

2. Data

In this paper we make use of community level data taken from the five-yearly death registration published by the Dutch Ministry of Domestic Affairs for the period 1875–1899. With the introduction of the Public Health Inspectorate Act (Wet regelend het Geneeskundig Staatstoezicht) and the Medical Practitioners Act (Wet op de uitoefening der geneeskunst) in 1865, it became obligatory for every physician in the country to record the cause of death, and these data were aggregated every five years for every municipality in The Netherlands according to age, sex and a classification of 34 causes of death (for a detailed overview see: Van Poppel & Van Dijk, 1997). We have used the five-yearly surveys to construct mortality rates according to age and sex for all communities in Twente, for every five-year period between 1875 and 1899.

For the individual level we look at Lonneker, an agrarian municipality in Twente, using life course data extracted from the Population Registers (PR) for a sample of 163 families containing 733 children in total. The construction of the sample was made to fit the research interests of a project focusing on mortality between the ages of 9 and 20 and proceeded in the following way. From the 1860 to 1865 Marriage Registers all first marriages were selected and these couples were followed through the PR up to the year 1890. Families were admitted to the research sample only if at least one of the parents could be located in at least the PR’s of 1870 and 1880 so as to limit loss of data through early parental death or the couple’s migration. This means that the sample not only contains couples that stayed on in the village, but that it is also biased towards couples where at least one of the partners survived until 1880. For the resulting sample of 163 families all children were recorded when born before the year 1876 so as to limit the number of children that could only be observed for brief periods of time (as observation closed at the end of the 1880–1890 register). When different registers yielded different dates of birth, these dates were checked against the Birth Registers. For all children that died within the period of observation the dates of death were checked against the Death Registers. Furthermore, for birth intervals of three years or more, both Birth and Death Registers were checked to gather information for so-called ‘missing children’: children who had died at relatively young ages and through lack of administrative punctuality had not been recorded in the PR. Additional information was gathered from the municipal taxation registers which yearly provide lists with occupation and level of taxation for all household heads. In this way families could be classified according to the occupational status of the father and the economic sector in which he was employed, as well as the level of financial resources a family could potentially deploy to take care of its children.

2 Source: Vijfjarig overzicht van de sterfte naar den leeftijd en de oorzaken van den dood in elke gemeente van Nederland (Ministerie van Binnenlandse Zaken, ’s-Gravenhage, Van Weelden en Mingelen, 1882–1901).

3 This procedure yielded another 16 births on a total of 733 live births. This is a relatively high number, 2.2% compared to the rate found for the Tilburg registers in the period 1849–1920 where 0.7% of live births went unrecorded.
3. Sex differences in mortality in The Netherlands

What do we know of sex differentials in mortality for The Netherlands? Very little. A few years ago Van Poppel constructed a rough sketch of the provincial pattern of female mortality disadvantages in the second half of the nineteenth century (Van Poppel, 1999). For The Netherlands as a whole, nineteenth-century female mortality ratios were higher between the ages of 5 and 19, while boys had higher mortality risks in the first year of life and between ages 1 and 5. Female excess mortality between the ages of 5 and 19 disappeared after approximately 1930. Provincial variation in sex differences in mortality was considerable. Excess female mortality was especially concentrated in the rural areas of the south and the east of the country. However, in some of the industrial centres of The Netherlands, life chances for boys seemed unfavourable as well (Van Poppel, 1999, p. 19). Van Poppel concluded that mortality differences in The Netherlands are urgently in need to be examined on a more refined regional level, using individual level data.

Thus, regional variation in sex differences in mortality was considerable, but only for the age group between 5 and 19. In as far as infant mortality is concerned, all provinces in The Netherlands were characterised by excess male mortality: boys’ mortality was everywhere 15–55% higher than that of girls. However, Figs. 1 and 2, made by Frans van Poppel (1999), show that, between the ages of 5 and 19, clear female mortality disadvantages – 5–20% lower mortality risks for boys – existed in the southern and the eastern provinces of the country and for girls aged 14–19 also in the northern provinces. In economic and social respects, these provinces belonged to the periphery of the country. In some of the industrial centres of The Netherlands, life chances for boys were unfavourable. It is therefore tempting to relate the lesser life chances for young girls to high pressure nineteenth-century agrarian regimes with reduced economic opportunities for girls and women, as has been suggested for England (McNay et al., 2005).

4. Twente, a Dutch region

In the first half of the nineteenth century the region of Twente, located in the east of the Dutch province of Overijssel, was still a predominantly agricultural area. But after the mid-century economic growth, industrialization and modernization began to change the regional economy in a number of radical ways. Until that time developments in agriculture lagged far behind those in the rest of the country as working methods were outdated and yields per acre were generally low. Being situated in the far east of the country at a considerable distance from the economic centres in the west, economic stimuli did not reach as far as the Twente area (Blonk, 1929, p. 48). Only in the second half of the nineteenth century did that tide begin to change, with rising agricultural prices and increased markets for Twente products (Kokhuis, 1982, p. 158). Even the agricultural crisis of the late 1870s, caused by cheap grain from other parts of the world flooding the European market, was overcome as Twente farmers switched from arable farming to cattle breeding (Kok, 2003, p. 27; Van Schelven, 1979, p. 204).

Besides agricultural improvements, the nineteenth century also saw an upcoming and rapidly expanding textile industry. As early as 1830, steam-powered spinning was introduced, but it was only after 1860 that the industrial production of textiles really began to expand. Textile factories came to be concentrated in just a few cities, especially in Enschede and Almelo, whilst the city of Hengelo specialised in metallurgy. The expanding industrial sector and ongoing mechanization attracted a fastly growing population. From 1850 to 1909 the population of Twente more than doubled, from 77,355 to 170,086. By the 1860s one-sixth of the entire population of Twente was already working in the textile industry (Slicher van Bath, 1979, p. 193; Kokhuis, 1982, pp. 153–155). At the end of the nineteenth century the industrial sector dominated the regional economy of Twente, although agriculture was never wholly abandoned. Throughout the nineteenth century a lot of interaction continued to exist between agriculture and industry. Most factory workers in the region continued to work a small plot of land or a small garden to grow vegetables or keep some cattle, often a goat (Kokhuis, 1982, p. 158). The aim of this interaction was to spread economic risks; in this way they would always have some food on the table. For Twente, the nineteenth century was clearly a century of big economic changes. Industrialization had left its mark on the regional economy even though small-scale agriculture continued to play a role in the lives of most working-class people.

5. Sex differences in mortality in Twente, 1875–1899

As we have seen above, excess female mortality at younger ages in The Netherlands was primarily found in rural areas, whilst excess male mortality for these age groups was found in some industrial centres. This indicates that excess female mortality was first and foremost related to the countryside and to agricultural
production. In the following part of this paper we will investigate whether this was also the case for Twente by comparing mortality ratios for industrial centres with those for smaller rural towns and villages. In order to do this, it is first necessary to determine which municipalities in Twente were industrial cities and which ones would qualify as rural municipalities. It is generally assumed that Enschede, Almelo and Hengelo were industrial cities because of their extensive industry, but also Goor and Oldenzaal are mentioned as industrial towns by some authors (Kokhuis, 1982, p. 154; Slicher van Bath, 1957, p. 163). To determine whether a municipality was an industrial city in the period concerned we made use of the following criteria as measured midway in the period, in 1879. First of all, we looked at population size and population density. Especially in the second half of the nineteenth century the industrial cities in Twente began to draw large numbers of immigrants.

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4 Twente existed in the nineteenth century of the following municipalities: Almelo (city), Almelo (ambt), Borne, Delden (city), Delden (ambt), Denekamp, Diepenheim, Enschede, Goor, Haaksbergen, Hengelo, Lonneker, Losser, Markelo, Oldenzaal, Ootmarsum, Rijssen, Tubbergen, Vriezenveen, Weerselo and Wierden.
from the surrounding countryside. The fourth and last criterion that was applied is the economic structure of a municipality.\textsuperscript{5} To qualify as an industrial city, the local labour market needed to have a clear majority of its population, at least 75%, employed in industry. On the basis of the above set of criteria four towns were selected to qualify as industrial cities: Enschede, Almelo, Hengelo and Oldenzaal. Enschede and Almelo met almost all of the four criteria, except for population size. Hengelo made it as an industrial city on account of its economic structure and its proportion of immigrants, and Oldenzaal qualified as an industrial city on account of its population density and its economic structure.

After having decided which municipalities qualified as industrial cities, we calculated mortality ratios by sex for industrial cities and rural towns and villages separately. The results are shown in Figs. 3 and 4. Any position in these figures below one hundred for a certain age group indicates cases of excess female mortality, and positions over and above one hundred indicate cases of excess male mortality.

\textsuperscript{5} Sources used for this measure are the Occupational Censuses (Beroepstellingen) which were held every ten years from the 1830s onwards, along with the population censuses.
Even at first impression there is a clear difference between the two graphs, especially when zooming in on the age groups 5–14 and 14–20 year old. The two graphs suggest that mortality ratios by sex in industrial cities are much more erratically patterned than those in rural areas. Let us first look at the graph for the rural areas. It shows that the highest mortality ratios are found among the youngest children. For the first two age groups we clearly find excess male mortality, highest for infants but also, though less profound, for children aged 1–5. Excess female mortality is found amongst older children, especially in the age group 5–14 it is clearly visible. In almost the entire period, except for the years 1875–1880, girls had (much) lower survival chances than boys. These lower survival chances also existed for girls aged 14–20. Although it is less evident than in the age group 5–14, because in two of the five periods excess female mortality did not exist for the older group. In most of the international literature excess female mortality was primarily found amongst children aged 5–20 years old, which indeed seems to be the case for the rural Twente communities as well.

Nevertheless, some variation did exist in these rural communities where excess female mortality is concerned. Overall the pattern shows excess female mortality but for two age groups a peak indicating excess male mortality was found. The first peak shows up for the 5–14 year olds for the period 1875–1880, and a second peak is visible for children aged 14–20 in the period 1895–1899. The reasons for these peaks in male mortality for age groups otherwise characterised by female mortality are not immediately clear. It does not...
make much sense to link these two moments of increased male mortality to the agricultural crisis of 1878. Apart from the problem of precise timing, it is difficult to explain why the crisis should not have resulted in negative life chances for girls and young women between 1875 and 1880. Nor does it seem logical that in this same period life’s fortunes changed radically again for the next age group (the 14–20 year olds) and produced high excess female mortality. Perhaps the peak in male mortality between 1895 and 1899 suggests the beginning of the disappearance of the nineteenth-century pattern of excess female mortality in these age groups. But this produces an explanatory problem for the high mortality found for girls aged 5–14 in this same period. For the moment it is unclear what these two peaks in excess male mortality among the older children stem from but the main conclusion still stands. Rural excess male mortality is to be found among children younger than 5 years old and excess female mortality is primarily found amongst children aged 5–20 years.

The urban-industrial mortality ratios provide a different picture, one without a single and compelling pattern but instead with many fluctuations between age groups and periods. Nevertheless, even though excess female mortality can be found in every period in at least one of the age groups male mortality is overall more common in these industrial cities. There is only one period, from 1880 until 1885, that seems to be following the pattern found for the rural areas with excess male mortality for infants and between ages 1 and 5, and excess female mortality for the two older age groups. It is tempting to try and relate the fluctuations to widely differing life chances between the cities resulting from different employment opportunities for boys and girls. Whereas Almelo and Enschede were predominantly textile cities, the Hengelo labour market was dominated by the metal industry. The metal factories not only paid higher wages but also employed fewer women. The ample job opportunities in the two metal towns may have created better survival conditions for boys and men as a result of their higher economic status in the household. To discover potential differences between the four cities we calculated mortality ratios per city while collapsing the figures for the period 1875–1899 as a whole.

Fig. 5 shows clear dissimilarities between the four cities in the survival rates for boys and girls in the final two age groups. Oldenzaal seems to be following the rural mortality pattern with severe excess female mortality for ages 5 and beyond. At the other end of the distribution we find Enschede, which has no excess female mortality at all, but instead excess male mortality, which was especially considerable for boys aged 5 to 14 years old. Hengelo and Almelo follow a common pattern with negative survival chances for boys aged 14 and older, and more negative outcomes for girls in Almelo in the two intermediate age groups and for Hengelo in the age group 5 through to 14. Evidently, this shows that we cannot neatly relate children’s mortality patterns to local labour market opportunities. In that case the metal working city of Hengelo should have demonstrated higher negative outcomes for females; instead it closely follows the pattern found for the textile city of Almelo. Moreover, the three textile cities also show diverging patterns. Whereas in
Enschede girls are substantially better off than boys, girls in Oldenzaal, also a textile city, were facing extremely bad survival rates. Nevertheless, it does seem that for older boys, aged 14 through to 20, negative survival rates are the predominant pattern, at least in two of the four cities.

As the figures above have shown, excess female mortality did exist in Twente, in the countryside but also in some of the cities. In the rural areas, however, excess female mortality is much more a structural problem, with consistently fewer opportunities for good health and longevity for girls from age 5 onwards. In the four cities, however, children’s life chances seem to have been less predictable as they were probably determined by a more complex and more rapidly changing set of factors. Leaving aside the mortality pattern for infants, both excess male mortality and excess female mortality did occur in all of the other age groups, depending upon the time period. Nevertheless, the overall picture shows that excess male mortality was somewhat more prevalent in the cities than was excess female mortality. Thus, in the countryside excess female mortality seems to be a structural problem, while in the city it is more of an incidental occurrence. Accordingly, we may conclude that excess female mortality in Twente is foremost a rural phenomenon.

6. Lonneker: a Dutch rural-industrial village, 1860–1890

Lonneker is a rural village located in the very eastern part of The Netherlands, in the close vicinity of Enschede. Table 1 shows the rapidly expanding population in the second half of the nineteenth century, in which the increase was no doubt related to the immediately adjoining city of Enschede and its advancing factories. Also geographically, Lonneker was being ‘conquered’ by Enschede as the village lost a sizeable proportion of its inhabitants to this city in 1884, which explains the negative growth rate for that decade. Growth was, however, not realised through migration: in almost all of the census years listed in Table 1 about 70% of the Lonneker inhabitants were born within the municipality.

Inhabitants were either small farmers (arable farming) or factory workers in textile employed in the Enschede factories. Farming is under pressure though – certainly from the 1860s onwards – because of competitive disadvantages. The proportion of the population employed in agriculture is thus falling from 65% in 1795 to 39% in 1899. Industry, on the other hand, is rising: from 38% in 1889 to 55% in 1899. The occupational distribution in the sample used in this paper reflects the local economic structure of the 1860s: families were primarily engaged in agriculture (630.8%), in factory work (220.7%) or in a variety of artisanal occupations (130.5%). We should however not view these economic sectors as mutually exclusive. Even at the end of the nineteenth-century Lonneker, as was the case in most parts of the eastern Netherlands, was a society still very much focused on the ideal of an agrarian existence. In as far as fathers in our sample families were changing occupations over time, this change very much tended in the direction of farming rather than in the direction of industrial occupations.

Households in Lonneker were relatively large: between 5.6 and 5.9 persons per household (as opposed to 5.3 and 5.5 for Enschede). This is not unusual for rural households in the east of the country. Certainly for farming families, household size was augmented by the presence of one or two grandparents. This can be demonstrated through the sample population used in this study in which 24% of farming families had a co-residing grandfather at least once in their history against only 13% for other labouring families.

It is likely that these farming families may have had a slight preference for sons who were needed to ensure continuation of the family farm. Continuation of the family farm was also likely to ensure parents a better old age: they could stay on at the farm after the son took over the property, which would greatly increase elderly parents’ general level of wellbeing (Bulder, 1993). Daughters may however have been valued for other reasons, such as helping out in the household as well as the farm and providing practical assistance of elderly parents even after the daughter’s marriage. For factory workers’ families such a gendered preference seems highly unlikely. The Enschede textile factories were offering ample employment for male and female children alike, although, admittedly, boys’ wage ratios were higher which may have made their employment more attractive to parents.

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<thead>
<tr>
<th>Year</th>
<th>N</th>
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<tr>
<td>1859</td>
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<tr>
<td>1869</td>
<td>10,503</td>
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<tr>
<td>1879</td>
<td>12,794</td>
<td>22</td>
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<td>1889</td>
<td>7491</td>
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<tr>
<td>1899</td>
<td>10,951</td>
<td>46</td>
</tr>
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7. Sex differences in infant and child mortality in Lonneker

For all children in the Lonneker sample, age-specific mortality ratios were calculated (see Fig. 6 below). The graph shows that infant mortality for boys in Lonneker was higher than for girls, as we would expect, but boys’ mortality was also higher in the age groups 2–4 and 5–9 years. After that age and up to age 20, the ASMR is clearly unfavourable for girls. For infant mortality, a warning is called for, as the data may perhaps underestimate male mortality. As a rule the Population Registers do not include any stillborn children. As was mentioned before, we have tried to overcome this problem, by checking the Birth and Death Registers for any ‘missing children’ in birth intervals of three years or more. Still, it is not unlikely that not all stillborn babies were recovered so that actual male ASMR for infants is even higher than reported here.

Fig. 6 definitely suggests differences between boys and girls between the ages of 9 and 20 years. From birth up to age 9 boys were much worse off than girls, but from the age of 10 onwards this changes completely and results in lower life chances for girls. In the following part of this paper we examine children’s fates in this nineteenth-century rural community more closely in order to find out what were the main determinants of their risk to die.

8. Statistical methods: a discrete-time event history analysis

The results discussed below have been derived from a discrete-time multi-level event history analysis using logistic regression. This method estimates the propensity to die at time ‘t,’ given that you have not died prior to that time. The database contains 733 children from 163 families so that we effectively have sets of siblings, providing us with rich data on both the individual level as well as the level of the parental family. In this way we are able to see some of the interactions between the individual child and the institutional level of the family. However, this also means that our observations, on individuals, cannot be assumed to be independent, after all the sets of siblings have a shared background in their parental family. To deal with such dependencies in the dataset a multi-level approach is required. This means that on the first level we have the individual and on the second level we have the child’s family. Moreover,
interdependencies between observations further requires the use of a robust estimation of variance which generally increases standard errors and reduces the likelihood that variables are unjustly assumed to be significant.

Event history analysis has the advantage to include all individuals, also those we lose from our population before the end of the observation period because they migrate or disappear in some other way. Until their disappearance these individuals will contribute to the estimation of the risk of dying. This phenomenon of individuals who exit from observation is called ‘censoring’ in event history terminology. Moreover, discrete-time logistic regression facilitates multivariate analysis of these time-based phenomena, so that it becomes possible to determine which factors are more influential than others, when controlled for other variables. The discrete-time models indicate the variables that most strongly and significantly determine the rate with which children are undergoing the event under study. Finally, some variables may be very important at some ages but not for other age groups. These differential effects can be measured using interactions with the variable ‘age’. The most important interaction effect concerns the relationship between the age group and the sex of the child. Clearly, death hazards for boys and girls are unequally distributed over the various age groups. The dependent variable in the discrete-time event history analysis is the odds of a child dying within a given time period as measured by monthly interval.

The analysis is divided up into separate sub models. The first model estimates the effect of sex on the hazard of dying. In the following three models different sets of explanatory variables are added in each step. If these additional variables are relevant, they will not only have an independent effect on the death hazard, but they may also have a decreasing effect on the sex differentials in the death hazard. In other words, these variables may help to explain the differences in mortality chances between boys and girls.

Variables that were included into the various discrete-time models comprise the following. We first constructed 4 dummy variables relating to the age group of the child as the chances of dying for children were not equally divided over the various age groups. Normally, infants have a much higher death hazard than older children, certainly in historical populations. Children above the age of 10 are used here as the reference category. Second, two dummy’s are included to control for religion. The concentration of excess female mortality in the southern parts of The Netherlands – which were predominantly Catholic – suggests that religion might perhaps be associated with behaviour that affects mortality. Next, we constructed a dichotomous variable indicating the sex of the child – that is whether or not the child was female – followed by interaction terms with the age group.

Following that we have a number of socio-economic variables. To begin with, we have a dichotomous variable indicating the father’s occupation, that is whether the father was a factory worker or not. The information on the family head’s occupation was taken from the Population Registers at – or a date as closely as possible to – each child’s tenth birthday. In this period the Lonneker population was nearly exclusively employed in agriculture or in factory work; the few heads employed in other occupations are included in the group of factory workers. Other occupations are mainly artisanal workers of modest means. It should also be noted that over the course of time very few switches occurred between occupations and that in case occupational switches did occur, these tended primarily in the direction of farming. The taxation variable refers to the family’s income position based on the taxation classification of the household in the community’s yearly taxation listings. The family’s ‘wealth’ position is based on a scale from zero to three. Households with a zero value were too poor to be paying any taxation at all. Families in the highest taxation category were paying a yearly sum of 21 guilders or over. In this category we primarily find the richest group of Lonneker farmers. Factory workers were only found in the two lowest taxation categories and the artisanal workers were predominantly concentrated in the two lowest categories, although some could also be found in the highest category but one. Taxation information was taken at or around the child’s tenth birthday. The next variable may help to complete the picture of the social circumstances into which each child was born, namely the fact whether parents could read and write. This information on the parents’ literacy was taken from the marriage registers and refers to parents’ ability to sign their own marriage certificate.

Further variables refer to the child’s demographic circumstances. First of all there is the information on the child’s birth rank. It is likely that first-born children were better taken care of and that with increasing birth

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7 At first glance this is perhaps a somewhat unusual choice which resulted from the fact that initially the focus of the project was exclusively centred on mortality differentials between ages 10 and 20. Rather than problematic, this choice may yield a better indication of a family’s social and economic status than occupations derived from marriage certificates or other entries from the beginning of a family’s history (see: Delger & Kok, 1998).
rank the mother’s health was being depleted. This latter fact is important when considering infant mortality. Birth rank here is defined as ‘child with birth rank 5 or higher.’ As this variable can have very different effects on the survival rate in different age groups, an interaction term is added for children in the age group 0–1 years old. Further information relates to whether any of the child’s siblings died at any point in time. This variable refers to siblings dying at whatever point in time, both before and after the death of the child concerned. This gives us some idea to what extent children’s mortality was a phenomenon which was concentrated in some families but not in others. Similarly, we investigate the potential relationship with the death of one of the parents. Are children more likely to die in those households where parents have low survival chances as well? As was explained above, the sample is biased towards surviving parents, which means that unusual effects may occur when using this information. Nevertheless, it may still be helpful in achieving a better understanding of the phenomenon of death clustering. Finally, we have information on whether or not any of the grandparents were present in the household. Having a grandfather or a grandmother present in the household may have positively contributed to a child’s life chances in those cases where grandparents helped increase a family’s resources, either financially or in terms of household and child care. On the other hand, co-residing grandparents may also have exercised further pressures on already scarce household resources. Presence of grandparents was measured at or around the child’s tenth birthday; no distinction is made between paternal and maternal grandparents.

What is missing at this moment is information on the age of the mother at the time of the child’s birth. Whilst the age of the mother may be less influential at ages 10 to 20, when looking at infant mortality this variable cannot be missed. As we are primarily focussed on sex differentials in mortality for older children, this omission may not be too large an obstacle. Moreover, the final model does control for the child’s birth rank, which may be regarded as a proxy for the mother’s age.

9. Results

The table below shows the results of the discrete-time multi-level event history analysis in a one-sided test; the table gives the $b$-coefficients for each variable and their levels of statistical significance between brackets (Table 2). Negative values for the $b$-coefficients indicate reduced mortality risks; positive values indicate increased risks. For the various dummy variables (age group, sex, religion and birth order) the results should always be interpreted in contrast to the reference category: e.g. the result for the sex of the child (‘female’) indicates whether female children have an increased or decreased risk to die as compared to male children. In models two through to four, this variable however is interacted with age group so that the value for ‘female’ now indicates the risk to die for female children in the age category older than 10 years of age. Given that we have clear hypotheses for all relationships that are being tested in these models, a one-way test of statistical significance is allowed ($p<0.1$).

Model one demonstrates that the hazard of dying is largest – as we would expect – in infancy and is still considerable in the second year of life when compared to children above the age of 10, our reference category. This relationship can also be expressed in terms of the odds of dying: in infancy the odds of dying is 26 times larger than for children aged between 10 and 20. Clearly, infancy was an extremely dangerous period of life, but once a child had reached age ten, mortality risks had been reduced to very low levels. The first model also indicates that overall there are no significant differences between boys and girls where chances of dying are concerned. However, later models will modify this conclusion. Religion does seem to be relevant, though the coefficient is not very high and the effect is counter to expectations. Children in Dutch-Reformed families seem to have a higher propensity to die. We will see though that this result will not hold in later models so that effectively, Catholic children’s survival chances are not very different from those of children in Dutch-Reformed families. Religious differences can certainly create differential patterns in mortality. For instance we do know that infant mortality in the city of The Hague towards the closing decades of the nineteenth century was higher amongst Catholics than amongst Protestants. Infant mortality amongst Catholic families was even 23% higher than for Protestant families in which the results may have been caused by differences in breastfeeding patterns (Van Poppel, Schellekens, & Liefbroer, 2002). However, religious differences after

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8 Obviously, the father’s death may have a very different impact on the family than the death of the mother. When the father dies, the main bread winner dies. However, when the mother dies the main caretaker dies (for more information: Derosas & Oris, 2002).

9 Catholic families constituted a social minority in Lonneker as well as in most of the eastern parts of the country: 20.1% of all children in this sample were Catholic whilst all of the remaining children belonged to the Dutch-Reformed Church.
age 1 diminished and became unimportant, in particular those between Protestants and Catholics.

In model two we add the interaction terms for sex of the child and the age group. We now see that female children have on the whole a lesser propensity of dying than boys, in all age categories below age ten. However, compared to boys, girls have a higher risk of dying above age ten. Whatever their circumstances or their backgrounds, girls have a higher risk of an untimely death in this age group than do boys. Here results are entirely in line with the broad picture regarding sex differentials as painted by Van Poppel and also with the community level results presented above. These results showed that in the rural areas of Twente girls had a higher risk of dying than boys from age 5 onwards. Although female disadvantages for the age group older than ten are not inconsiderable, the disadvantages faced by boys in some of the lower age groups (in particular ages 0–1 and 2–10) are far more serious. Moreover, it should be noted that the overall hazard of dying in the lowest age group is already very high. Boys’ higher mortality risk below age one is to be expected and may be attributed to the genetic disadvantage of boys in infancy. Results for the age groups 1–2 and 2–10 require other explanatory mechanisms. The greater death risks for young boys up to age 10 are usually explained through the greater risks male children experienced because of their economic and social activities outside the house. As Van Poppel shows in his article about mortality differences between men and women in The Netherlands: boys and men died in greater numbers of external causes (suicide, accidents and violence) than did girls and women (Van Poppel, 2004, pp. 119–121). While girls were kept inside to assist their mothers at home, young boys were sent on errands and other small jobs around the house or in the village, perhaps providing them with ample opportunities for play but also for accidents.

In the next step, various socio-economic variables are introduced, such as the father’s occupation, the family’s level of income as measured by taxation, and the ability of the parents to read and write. Remarkably enough, a family’s income position does not seem to be relevant; wealth does not automatically produce better survival chances for children in nineteenth-century Lonneker. A similar conclusion goes for the parent’s literacy status. The only effect we see here is the father’s occupation. Factory workers’ children have an increased risk to die as compared to children whose fathers were farmers. From a number of studies we know that social class, mostly measured by the occupation of the head, is decisive for an infant to survive the first year of life. In

Table 2
Discrete-time analysis of the propensity to die, Lonneker 1860–1890, multi-level analysis, one-way test (b-values and significance levels), and robust variance estimates.

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-8.53 (0.000)</td>
<td>-9.20 (0.000)</td>
<td>-9.29 (0.000)</td>
<td>-9.87 (0.000)</td>
</tr>
<tr>
<td>Age 0–1</td>
<td>3.27 (0.000)</td>
<td>3.95 (0.000)</td>
<td>3.95 (0.000)</td>
<td>3.66 (0.000)</td>
</tr>
<tr>
<td>Age 1–2</td>
<td>2.48 (0.000)</td>
<td>3.09 (0.000)</td>
<td>3.09 (0.000)</td>
<td>3.02 (0.000)</td>
</tr>
<tr>
<td>Age 2–10</td>
<td>1.54 (0.000)</td>
<td>2.34 (0.000)</td>
<td>2.33 (0.000)</td>
<td>2.32 (0.000)</td>
</tr>
<tr>
<td>Older than 10 (ref)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Roman Catholic (ref)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dutch-Reformed</td>
<td>0.34 (0.059)</td>
<td>0.34(0.057)</td>
<td>0.34 (0.057)</td>
<td>0.13 (0.163)</td>
</tr>
<tr>
<td>Male (ref)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Female</td>
<td>-0.13 (0.186)</td>
<td>0.94 (0.061)</td>
<td>0.93 (0.061)</td>
<td>0.83 (0.082)</td>
</tr>
<tr>
<td>age 0–1* female</td>
<td>-1.11 (0.046)</td>
<td>-1.11 (0.047)</td>
<td>-1.08 (0.049)</td>
<td>-1.34 (0.025)</td>
</tr>
<tr>
<td>age 1–2* female</td>
<td>-0.97 (0.096)</td>
<td>-0.96 (0.098)</td>
<td>-0.93 (0.104)</td>
<td>-1.34 (0.025)</td>
</tr>
<tr>
<td>age 2–10* female</td>
<td>-1.35 (0.024)</td>
<td>-1.34 (0.024)</td>
<td>-1.34 (0.024)</td>
<td>-1.34 (0.025)</td>
</tr>
<tr>
<td>Father factory worker</td>
<td>0.22 (0.084)</td>
<td>0.09 (0.210)</td>
<td>-0.61 (0.006)</td>
<td>0.73 (0.024)</td>
</tr>
<tr>
<td>Taxation category (0 to 3)</td>
<td>0.02 (0.420)</td>
<td>0.04 (0.328)</td>
<td>0.11 (0.153)</td>
<td>0.73 (0.024)</td>
</tr>
<tr>
<td>Parents literate</td>
<td>-0.01 (0.479)</td>
<td>-0.01 (0.479)</td>
<td>-0.01 (0.479)</td>
<td>-0.01 (0.479)</td>
</tr>
<tr>
<td>Birth order 5 (or higher)</td>
<td>-0.61 (0.006)</td>
<td>-0.61 (0.006)</td>
<td>-0.61 (0.006)</td>
<td>0.73 (0.024)</td>
</tr>
<tr>
<td>Birth order 5 (or higher)* age 0–1</td>
<td>0.40 (0.000)</td>
<td>0.40 (0.000)</td>
<td>0.40 (0.000)</td>
<td>0.40 (0.000)</td>
</tr>
<tr>
<td>Siblings dead</td>
<td>1.63 (0.000)</td>
<td>1.63 (0.000)</td>
<td>1.63 (0.000)</td>
<td>1.63 (0.000)</td>
</tr>
<tr>
<td>Father or mother dead</td>
<td>0.40 (0.000)</td>
<td>0.40 (0.000)</td>
<td>0.40 (0.000)</td>
<td>0.40 (0.000)</td>
</tr>
<tr>
<td>Grandparents in household</td>
<td>0.05 (0.363)</td>
<td>0.05 (0.363)</td>
<td>0.05 (0.363)</td>
<td>0.05 (0.363)</td>
</tr>
<tr>
<td>N (months)</td>
<td>154,377</td>
<td>154,377</td>
<td>154,377</td>
<td>154,377</td>
</tr>
<tr>
<td>Wald chi² (df)</td>
<td>153(5)</td>
<td>171(8)</td>
<td>174(11)</td>
<td>341(16)</td>
</tr>
<tr>
<td>Pseudo R²</td>
<td>0.08</td>
<td>0.08</td>
<td>0.08</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Note: Bold values indicate statistical significance. (p<.10).
Lonneker social factors seem less relevant for the survival of infants and older children. From other studies on urban areas in The Netherlands clear social inequalities appeared between various occupational and prosperity groups (Van Poppel, 1981). However, in regression analysis social factors do not always remain in place as was demonstrated for an extensive study on infant mortality for the textile town of Tilburg (Van der Heijden, 1995). Swedish research confirms that social class does not always neatly explain the risk of young infants dying. In fact, the significance of social class in one of the rural areas of Northern Sweden was wholly absent. Survival chances for infants born to peasant families did not differ all that much from those born to labourers or middle-class families (Edvinsson, Brändström, Rogers, & Broström, 2005). For older children the relationships between survival chances and socio-economic variables may be even weaker. This is suggested by evidence on The Hague where social class, although important for infant mortality, disappeared from the scene more or less when explaining mortality levels at ages 1–4, and disappeared completely when regarding mortality between ages 5 and 9 (Walhout, Van Poppel, & Schellekens, 2006). Although the hypothesis that ignorant parents – that is parents with low educational qualifications – may be a danger to children’s health has considerable plausibility, this is not borne out by the evidence presented here. Easy access to and correct implementation of medical care – which we assume are more difficult to manage for illiterate parents – do not seem to be relevant here.

In the final model, a set of four demographic variables is introduced, three of which appear to be very relevant for children’s survival chances. First of all, we examine the child’s birth rank. On the whole children in higher birth orders – birth order five or more – have better survival chances than their older siblings. However, the interaction term shows that this relationship does not hold for infants. In the higher birth ranks infants have a somewhat higher propensity to die than do first- to fourth-born children. This effect is well-known from the literature and is usually explained through increased competition for parents’ and particularly the mother’s time, health and resources (Van der Heijden, 1995, p. 72; Boonstra, 1993, p. 289; Desjardins, 1997, p. 185). But what determines the better survival chances of higher birth order children in the older age categories? As Jane Humphries has shown, children’s social and economic outcomes were, amongst others, determined by the size of their sibling set. Obviously, large families meant that there were many more mouths to feed and thus a reduction in the amount of available food on the table. Furthermore, the arrival of younger children generally increased the burden on the shoulders of the older children. This would hasten their inclusion into the labour force, which burdened the older children of the family with higher workloads (Humphries, 2007). On the whole those children born latest in a set of siblings seem to have benefited from the economic contributions made by the older ones in the family.

However, if any one of those siblings died at some stage, this would signal danger to the lives of other children in the family. The strong positive and highly significant results on the variable ‘siblings dead’ suggest that in these nineteenth-century Lonneker families, death came in twosomes or even threesomes. Children’s chances at survival were clearly related to other deaths in the child’s own family. If the child had siblings – either younger or older ones – who had died before, this severely increased the child’s chances to die as well. Likewise, if one or both of the child’s parents died this will also severely decrease the child’s chances at survival. It should be noted that this variable does not necessarily indicate a parental death occurring before the potential death of the child himself. It just means that the parent dies at some stage between 1860 and 1890. Due to the small number of cases, it appeared impossible to turn this variable into a proper time-varying variable to be switched on at the advent of the parent’s death before a child’s specific birthday — which would give us an ideal measure of causation. In this case we can only assume that the variable ‘father or mother dead’ indicates a relationship between a child’s death hazard and the parents’ poor health and life chances in general.11 Vice versa, mothers with children who died at some point also appeared to have had higher death risks in nineteenth-century rural Swedish communities (Alter et al., 2004). These outcomes strongly suggest that infant and child mortality is a phenomenon closely related to what can be termed as ‘death clustering’ or the phenomenon of multiple child loss.

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10 The effect of increased competition between siblings for a household’s resources is best tested by exclusively looking at surviving siblings. Unfortunately, the size of our dataset is limited; therefore we were unable to make a distinction between surviving siblings and those that had died or had moved out of the household.

11 We are aware of the fact that in this way we seem to be estimating the effect of ‘future events’ on a child’s current life chances. The variable constructed here therefore only refers to the parents’ general morbidity level. It can clearly not refer to causal effects of parental death in the sense of the loss of a family’s primary breadwinner or caretaker.
Separate models for the different age groups (not shown here) have demonstrated that in all age groups children stood an increased chance of dying themselves when one of their older or younger siblings had already died or would die at some later stage. Even at age 10–19, children are more vulnerable when other siblings have died. This phenomenon of multiple child loss cannot be related to the poorer families in Lonneker as measured by our taxation variable. Model three showed that taxation was quite insignificant for a child’s propensity to die. On the other hand, the father’s occupation did have some influence on the hazard of death. In model four this effect is explained away by the group of demographic variables which suggests that the death clustering effect as well as the effect of birth order is more important for factory workers’ families than for farming families.

The shape death clustering took at young ages can be made clear by looking at the distribution of infant deaths in our sample of Lonneker families. Most families in the sample never experienced the death of one of their infants; only in 25.08% of all families did one or more infants die. But even in this latter group deaths were not evenly distributed: of all families experiencing at least one infant death, the majority of children’s deaths (48.03%) was concentrated in a minority group of families (28.06%).

Death clustering was put on the research agenda by Monica Das Gupta through her study of twentieth-century rural Punjab in which she demonstrated that families who had already experienced the loss of other children stood an increased chance of losing further children (Das Gupta, 1990). This relationship applied to a child’s survival chances at all stages of childhood. Furthermore, the impact of death clustering in the case of these Punjabi families remained in place after controlling for several biological and social factors, such as the level of the mother’s education. Obviously, the explanation of the phenomenon of death clustering is difficult. On the one hand death clustering may be seen as an indirect indicator of parental competence or ignorance in ensuring children’s health and survival. But it may equally well indicate the influence of biological factors, such as genetically determined frailty. On the basis of her qualitative evidence Das Gupta suggested that parental incompetence played an important role in the phenomenon of death clustering.

For nineteenth-century European societies similar evidence on the importance of death clustering is available. The Swedish study cited earlier clearly outlines the enormous influence of death clustering for infants (Edvinsson et al., 2005). Families in this study — in geographically, socially and economically very different areas of Sweden — could be divided in high-risk and low-risk families. Infant deaths were strongly clustered in these high-risk families so that relatively few families accounted for a disproportionate number of infant deaths. Factors influencing a family’s chances of becoming such a high-risk family were partly biological and partly social. High-risk families were also families which had more often experienced stillbirths. Furthermore, women in high-risk families remarried one or more times, indicating — according to the authors — a certain degree of family instability. It should be underlined that in the Swedish case, social class and father’s occupation were irrelevant factors for families’ risk levels. Apparently, regarding the risk of multiple child loss family characteristics which go beyond the obvious measurable socio-economic indicators, such as occupation, social class or income, are at play. Various options are possible but difficult to test on historical populations. Families may for some reasons have adverse attitudes to children’s health risks, parents can simply be incompetent in child care or parents’ genetic outlook may not be favourable for their children’s survival chances.

Finally, model four also looks at the effect of having one or more grandparents in the household. Co-residing grandparents were more commonly found in farmer’s families, as already noted above. Although grandparents may be useful additional contributors to the family purse, because of their higher family status, they may also increase competition for the parents’ resources, time and attention. Co-residing grandparents may also be an indication of the traditional patrilineal orientation of families in which older generations are dominant over younger generations. New-born babies may suffer from a lack of attention and proper resources in such a climate. In the case of these Lonneker families however the addition of a grandparent to the household does not seem to have any influence on children’s survival.

In the final model none of the socio-economic variables are very relevant; b-values are very small and none are significant. Apparently, a child’s chances at survival are not at all depended upon the family’s social and economic status or the family’s level of income. In addition, religion has disappeared from the scene. Age group, gender and the family’s mortality history are the prime determinants of a child’s survival chances. The final model has also significantly increased in explanatory power as indicated by the Wald chi-test and the Pseudo R-square. In the final model the ability to explain total variance has increased to 12%. This means that on the basis of a small number of structural factors,
we are able to explain 12% of the total variance of the risk of children’s mortality. Obviously, mortality is determined and influenced by an enormous range of factors – for instance current or past health conditions – which all necessarily escape our observation. Statistically speaking, being able to explain at least 12% of such a complicated, dynamic and multi-faced process is not a bad performance at all. Moreover, statistically significant results cannot be easily acquired when working with relatively small datasets such as the one we are using here. Nevertheless, this analysis has produced quite a number of significant results, suggesting that the influences of age group, sex, birth rank and death clustering were indeed major factors in the survival chances of these children. The child’s age group weighs most heavily in determining the risk to die. For infants life was clearly dangerous, but when children were able to survive those dangerous first years of life, mortality risks after age 10 became low. For historical demographers this conclusion confirms what we already know from other historical populations. However, the death clustering variable introduces a relatively new and very important determinant of children’s survival chances.

10. Conclusions

In 1999 Frans Van Poppel called for the need to investigate the historical patterns of gender differentials in mortality in The Netherlands (Van Poppel, 1999, p. 15). However, until now the subject has been overlooked by Dutch historians. Meanwhile, in several other European countries historical research on gender differentials in mortality has demonstrated that in pre-twentieth-century rural societies girls aged 5–20 had a much greater chance of dying than did boys. Our two step approach of looking at the regional as well as the individual level enabled us to produce some important findings. The Twente region, which was predominantly agricultural but also included a few industrial cities, gave us the chance to compare rural and industrial towns. Our analysis demonstrated that in The Netherlands, as in other European countries, clear differences existed in gender differentials in mortality between rural and industrial towns in the second half of the nineteenth century. In agricultural towns we found a pattern that is familiar from the literature: until the age of 5 excess mortality risks were more important for boys whereas in the age group 5–20 girls and young women had higher mortality risks. The industrial cities showed less clear-cut patterns, but overall there was a slight tendency towards excess male mortality. We may therefore safely conclude that in Twente, excess female mortality was primarily an agricultural phenomenon. The individual level analysis of sets of siblings in the rural town of Lonneker confirmed that life for adolescent girls was certainly more dangerous than for boys. Beyond age 9 girls’ health clearly began to suffer in a disproportionate way.

Excess female mortality and its possible causes have been the subject of historical as well as contemporary research for quite a few years. It has shown that excess female mortality is not easy to explain as mortality is intertwined with many aspects of everyday life. Still, several authors have argued that the inferior position of girls within the household and the subsequent discrimination within the family were key issues in explaining the greater death risks for girls. Using an event history analysis based on individual level data, we tried to obtain some answers as to what may have caused excess female mortality in these rural households. Our findings have confirmed and rejected some hypotheses offered by the literature.

First of all, it appeared that social factors did not play an important role in the explanation of excess female mortality in Lonneker. Death risks, whether for boys or for girls, in the various age groups were not related to their father’s occupation. Thus, babies and older children suffered similar fates in industrial and in peasant households. In agricultural households as well as in households headed by industrial textile workers adolescent girls had higher death risks than did boys. The ample employment opportunities for girls in the Enschede textile factories were apparently insufficient incentives for parents to increase their investments in these girls. We may therefore conclude that neither excess male mortality between age 2 and 9 nor excess female mortality between age 10 and 19 were exclusively related to the economic organisation of the household in which the children grew up. Female excess mortality in adolescence may be related to rural areas, but it is certainly not exclusively related to peasant households. Furthermore, the level of taxation, and, indirectly, the level of the household’s financial resources did not seriously improve a girl’s life chances either. This strongly underscores the lesser weight of social factors in this rural community and supports an image of a community with a strong measure of social and cultural integration in which children’s life courses, including their inherent dangers, were rather uniformly shaped.

If being a girl increased a child’s mortality risks between the ages of 10 and 20, so did the family into which the child had been born. Some families were simply experiencing more child deaths than other
families; death risks for children were ‘running in the family,’ so to speak. This phenomenon of death clustering appeared of great importance to the fates of children of all ages. Obviously, the important question then is to what extent death clustering has a genetic background or rather a more social and/or cultural one. The literature mentions parental incompetence, mothers are simply not taking good enough care of their children, as well as parental ignorance, mothers do not know how to take care properly as a result of a lack of education. Parental incompetence is difficult to measure on the basis of the data we are looking at here. However, the suggestion that parental ignorance might play a role in our Lonneker case is not supported by the available evidence. The analysis has shown that parents’ literacy did not yield significant results, which implies that the education of parents and thus the reduction of ignorance is not enough to prevent the occurrence of death clustering in the family. Edvinsson and his co-authors argue in favour of a social and/or cultural explanation; they state that ‘it is highly unlikely that the clustering of infant deaths in a relatively small percentage of families […] was solely the result of hereditary or genetic factors’ (Edvinsson et al., 2005, p. 334). Nevertheless, also in the Swedish case, the mother’s educational level was not a relevant factor.

Our analysis has clearly shown the importance of sex in explaining child mortality. There is a distinct pattern of excess male mortality among the youngest ages and excess female mortality among the older children. Furthermore, the death clustering showed that the family is the primary theatre in which a child’s life chances are determined, not only for infants but also for older children. Although this article contains some important findings, we have not, however, answered the question posed in the title of this article. It may well be that genetics are less relevant for the mortality risks of older children than for those of new-born babies. In that case, our evidence would seem to support a more social and/or cultural explanation for the clustering of children’s mortality risks. Additional research however on larger databases is required to solve not only remaining mysteries around gender differentials in nineteenth-century Dutch society but also the role of death clustering in the explanation of children’s fate. Questions surrounding these phenomena still need to be answered. For example, could there be a connection between excess female mortality and death clustering? It is, however, quite clear that in future historical research on any historical society the role of death clustering and sex into the study of children’s mortality patterns can no longer be neglected.

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