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Women's Labor Market Experience, Motherhood, and Children's Mortality Risks in the Past

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Did Factory Girls Make Bad Mothers? Women’s Labor Market Experience, Motherhood, and Children’s Mortality Risks in the Past

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Prior research has suggested that the quality of maternal care given to infants and small children plays an important role in the strong clustering of children’s deaths. In this article, we investigate the quality of maternal care provided by those women who most nineteenth-century social commentators declared would never make good housewives or mothers: the young girls and women working in textile mills. We carried out this examination using an analysis of children’s mortality risks in two textile cities in The Netherlands between roughly 1900 and 1930. Our analysis suggests that these children’s clustered mortality risks cannot have resulted from either their mothers’ labor market experience or biological or genetic factors.

Introduction

In historical populations, many infants and children did not survive the first few years of their lives. In recent years, a number of studies have demonstrated that infants’ and children’s deaths in these populations were not randomly distributed over families but were instead strongly clustered within only a limited number of families (Edvinsson et al. 2005; Janssens, Messelink, and Need 2010). This phenomenon, which came to be known as “death clustering,” was first publicized by Monica Das Gupta in her study of twentieth-century rural Punjab. Das Gupta demonstrated that families who had already experienced the loss of other children faced an increased chance of losing further children (Das Gupta 1990). This relationship applied to a child’s survival chances at all stages of childhood following the neonatal period. The statistical impact of death clustering in the case of these Punjabi families remained in place after controlling for several biological and social factors, including short birth intervals, high fertility levels, and the mother’s educational level. On the basis of qualitative evidence, Das Gupta therefore suggested that parental incompetence in the sample of Punjabi families must have played an important role in the clustering of deaths. She argued that this parental incompetence arose out of a basic inability to manage domestic affairs, which occurred independent of education, income, and occupation. Some mothers were simply less resourceful and less organized than others in running a household and caring for children.

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The Dutch and Swedish studies cited previously (Edvinsson et al. 2005; Janssens, Messelink, and Need 2010) have also not been able to explain the clustering of deaths by the biological and socioeconomic factors regularly referenced in this type of study. This might indicate that in some families either genetic factors or inadequate child-care practices contributed to higher child mortality. Tentative evidence for the role of genetic factors may be found in the fact that mortality risks seem to have been transferred between generations. There is, for instance, some evidence that mothers with low infant mortality risks themselves had mothers with low mortality risks (Lindkvist and Broström 2008). In addition, another study indicates that the clustering of deaths is related to the frequency with which families experienced stillbirths (Edvinsson et al. 2005). Finally, mothers with children who died at some point appeared to have higher death risks themselves (Alter, Manfredini, and Nystedt 2004).

The quality of parental care is, however, very difficult to assess, even in present-day societies, let alone in the past. In this article, we investigate the quality of maternal care of a specific group of women who most nineteenth-century Western societies perceived as “loose” women who would never make good housewives and mothers. These were the young girls and women who worked in factories and textile mills. Factory girls were often contrasted with women working as domestic servants, who, through their training in middle-class households, were at least learning how to be proper housewives and maintain certain standards of decency and hygiene in the house. We also compare the “track record” of child mortality for these factory girls with the record of those young women for whom no occupational entry has been found. We assume that these young women had never, or only marginally, been active in the paid labor market and had probably stayed mostly at home before their marriage to help out in the parental household.

**Motherhood Versus Industrial Employment**

Nineteenth-century middle-class social workers in The Netherlands were adamant that industrial employment had deleterious effects on young women and girls. Factory work would bring young women down in every way, but above all in the ways of morality. As one social worker wrote in her report on a daughter of one of “her” families: “We took her away from the factory in 1872 because of the demoralising association with factory folks which brought her down to such a deep level of indifference that we feared for her future. . . . In this way we hope to have preserved her from moral destruction.”

Young women often fared better when trained as domestic servants. This occupation was considered to at least bring the working girl into contact with higher levels of society whose greater degree of civilization might rub off on her (Regt 1984:163–164).

In Great Britain, contemporary middle-class opinion was also strongly biased against women in industrial occupations and, more specifically, women employed in textile mills. In his report on the 1911 British census, the nation’s registrar general extensively considered fertility and child mortality levels amongst the British working classes. He was especially anxious to prove that female textile workers combined low levels of fertility with high levels of child mortality. He noted that whereas “distinctly working class” groups such as female textile workers had lost many children as a result of their employment away from home, women involved in teaching, clerical work, or shopkeeping could afford to obtain a “reasonably adequate substitute for the mother” and thereby decrease the likelihood of child death (Garrett 1998).

In her book *Wives and Mothers in Victorian Industries*, Margaret Hewitt recounts the nineteenth-century bias against women in industrial occupations. Contemporary opinion
deemed that these women would make bad housewives and would be unfit to take adequate care of husband and children. According to Hewitt, a well-known saying at the time advised young men not to marry a factory girl: “God forbid that I should marry a girl out of the mill.” She also reports that female domestic servants were afforded more respectability than factory girls and were regarded as better prepared for their future tasks as mothers and housewives (Hewitt 1958:49, 72).

In The Netherlands a national debate arose in the final quarter of the nineteenth century regarding the issue of women working in factories. Most contemporaries were convinced that the majority of the period’s social problems were linked in one way or another to increased female employment in factories and protoindustrial production. Employers feared that the image of immorality attached to factory work might endanger the steady supply of cheap female labor. They felt compelled to try and put public opinion at ease over women’s work in industrial settings, but these attempts had little effect (Altena 2003:73–140). Several decades later, in the 1930s, women’s factory work was still regarded as an unfit occupation for “proper” women because of the moral dangers it involved (Hogema and Van Der Padt 1997:7). Women’s factory work would bring ruin upon the entire family, as one of the chief engineers of the state railways in the factory town of Tilburg explained in the late 1880s:

Factory girls will never become proper housewives, and when the working man is fortunate enough to marry a decent girl who has served for five or six years in a good household and thus knows how to keep house, then such a man will be very lucky, whereas when he marries a factory girl who knows nothing at all about housekeeping, his household will be in total disorder, he will go to the pub and bring himself down. (Giele 1981:90)

This middle-class overseer clearly echoes the opinions of his British contemporaries. Factory girls had an equally bad reputation in The Netherlands: if not completely synonymous with prostitutes, these girls were at least seen as not too far removed from them. To trust factory girls with the care of small and vulnerable children was therefore not considered a good idea at the beginning of the twentieth century.

In current scholarly work on children’s mortality risks, we find quite different views on the relationships among mothers’ work experiences, their social position, and the survival chances of their children. In general, children’s survival chances have been found to be positively correlated with higher levels of gender equality and women’s autonomy (Mason 1997). Furthermore, gender equality and women’s autonomy are usually associated with labor market experience, earning power, and higher education levels. Even when they quit work after marriage, women with ample experience in the better-earning factory jobs may therefore have had more control over domestic affairs than, for instance, former domestic servants (Gittins 1982). Moreover, in current historiography, female domestics are often pictured as traditional and subservient, not only in their work roles but also in marriage. According to Gillis, the long experience of female domestics in subordinate roles in middle-class households gave them an attractive position in the marriage market (Gillis 1985:244–245). However, mothers with little bargaining power in marital and domestic affairs have in general not been able to secure resources necessary for children’s survival.

On the other hand, studies also indicate that women’s factory work may have hampered their health in serious ways (McNay, Humphries, and Klasen 2005), which in turn may also have harmed their children’s health. Mothers’ health in nineteenth-century societies was a crucial determinant for the health of their infants, likely even before their birth
(Millward and Bell 2001). After all, it is not very likely that mothers who were in poor health themselves could adequately care for young children. This effect may have been even more relevant for female textile workers who continued their industrial employment after marriage.

In this article, we investigate children’s mortality risks between birth and age five in two industrial textile cities in The Netherlands: the textile town of Enschede, in the east of the country, and the textile town of Tilburg, in the south of the country. We compare the life chances of children born to mothers who had worked in the local textile mills before, or even during, their marriage with the life chances of other children in these two communities. All mothers in the sample belong to the birth cohort 1881–1885, and all of their children were born between roughly 1900 and 1930. We also include information on the father’s occupation/social class, the mother’s age and her total fertility history, and information on the sex of the child. We use multivariate and multilevel methods that take into account the fact that individuals within a family share an unobserved frailty component. Before we discuss the historical context, the data, and the first set of results, we briefly present an overview of the development of infant and child mortality in The Netherlands.

Infant and Child Mortality in The Netherlands

As in most other European countries, infant mortality in The Netherlands rose during the nineteenth century up through the 1870s. After that point, infant mortality began a process of steep decline. However, as can be seen in Figure 1, large regional differences in infant mortality remained in place during the initial decades of its decline (Ekamper and Van Poppel 2008). In this study, the provinces that are of most interest to us are the province of North-Brabant, in which the town of Tilburg is located, and the province of Overijssel, in which the town of Enschede is situated. Although before the 1870s, the province of North-Brabant belonged to the group of provinces that were considered “less” dangerous for infants, after the 1870s, this southern province recorded high levels of infant mortality, as can be seen in Figure 1. Infant mortality in North-Brabant was high not only compared to provinces with more benevolent mortality regimes (e.g., the north of the country), but also compared to the nation at large. The province of Overijssel, situated in the east, belonged to the group of provinces, both before and after the 1870s, where infants had better chances of surviving their first year of life.

The large regional differences, and above all the reversal in the relative positions of several of these provinces, have given rise to a long and still ongoing debate in The Netherlands (Engelen 2009:114–119). Many explanations have been advanced to explain North-Brabant’s move to its laggard position after the 1870s, but all studies include Catholicism, the dominant religion in this province, as one of the ingredients. Catholic women had higher fertility levels and shorter birth intervals than other women, they were reluctant to adopt modern practices of hygiene, and they did not breastfeed their babies (Walhout 2010). To some scholars, this latter fact is related to the increased “culture of prudishness” invoked by the Catholic clergy at the end of the nineteenth century. Apart from women’s labor market history, we will therefore also take a special interest in testing the explanatory power of religion for children’s survival chances.

1 Only a limited number of female factory workers continued their employment during marriage. This situation occurred exclusively in Enschede. Nevertheless, for the small number of women who did do so, the mortality outcomes of their children may have been affected in part by their employment during marriage and their consequent absence from the household, rather than by their lack of maternal competence.
Two Textile Cities

Tilburg and Enschede were both industrial towns with most of their female inhabitants employed in industry. Both were textile towns, but in Tilburg the sector was fully concentrated on the production of woolen yarn and cloth, whereas the textile mills in Enschede were all cotton mills. Other significant differences existed. The pace of industrialization in Enschede was much faster than that in Tilburg, where cottage-weaving, mainly by male workers, continued to be of importance until the end of the nineteenth century. Moreover, employers in Tilburg were reluctant to hire many women for work within their factories and continued to employ girls and, above all, married women working out of their homes as burlers and menders. This latter practice enabled factory owners to make use of cheap female labor without having to introduce them within their factory walls. Both male workers and entrepreneurs in Tilburg prided themselves on the small numbers of unmarried women and girls in their factories, and particularly the total exclusion of married women from their industrial workforce. In Enschede, however, the textile mills employed large numbers of women and girls. Sex-segregation on the shop floor was minimal: women could be weavers and spinners, and they did work side by side with male workers. This situation is probably the result of the continued demand for labor in Enschede between 1860 and 1930 (De Groot 2001:186).

Female labor force participation in Enschede was thus considerably higher than in Tilburg at the end of the nineteenth century (see Table 1). In 1899, four out of every 10 women were active in the paid labor market in Enschede as opposed to three out of 10 in Tilburg.

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2In 1897, cottage weavers were still 55 percent of all weavers. After 1900, however, cottage weaving declined rapidly. By 1905, the proportion of cottage weavers had dropped to 22 percent of all textile producers (De Groot 2001:193).

3In 1938, the proportion of women working at home in burling, mending, and fluffing, as opposed to within the factory walls, was still 38.5 percent. Home production by married women in Tilburg was vital for the town’s textile entrepreneurs, who therefore opposed all proposals aimed at totally banning married women’s work (De Groot 2001:205–206).
Women’s employment structure in Tilburg and Enschede, by percentage

<table>
<thead>
<tr>
<th>Employment sector</th>
<th>Enschede 1899</th>
<th>Enschede 1930</th>
<th>Tilburg 1899</th>
<th>Tilburg 1930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>0.1</td>
<td>0</td>
<td>4.2</td>
<td>2.2</td>
</tr>
<tr>
<td>Industries</td>
<td>74.2</td>
<td>63.1</td>
<td>45.2</td>
<td>50</td>
</tr>
<tr>
<td>Building</td>
<td>0</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Trade and finance</td>
<td>4.8</td>
<td>10.3</td>
<td>11.7</td>
<td>15.2</td>
</tr>
<tr>
<td>Domestic service</td>
<td>18.4</td>
<td>19.2</td>
<td>33.3</td>
<td>18.7</td>
</tr>
<tr>
<td>Professions</td>
<td>2.4</td>
<td>7.2</td>
<td>5.4</td>
<td>13.9</td>
</tr>
<tr>
<td>Total participation</td>
<td>43.3</td>
<td>40.3</td>
<td>29.0</td>
<td>37.4</td>
</tr>
</tbody>
</table>

*Source:* CBS, Statline. Figures have been derived from the occupational censuses.

Data for both towns, we have data on one cohort of women who were born in the period 1881–1885. The data used in this study are taken from the population and civil registers of the towns of Enschede and Tilburg, resulting from nonselective samples taken from the towns’ birth registers. Continuous population registers have existed in The Netherlands since 1849. These population registers enable the historian to follow the evolution of the family and the household on a day-to-day basis. They thus present linked information on demographic events for the entire population, even the very mobile, and facilitate the computation of a wide range of demographic rates.

All women in the two samples surviving until their fifteenth birthday were admitted into observation and followed through the population registers until they disappeared from observation. We reconstructed the entire life course for all women, including all information on their demographic and occupational careers. The data were analyzed with the help of event history analysis techniques, which encompass a collection of statistical procedures that make possible the complex analysis of duration data. We then analyzed the risk of dying for infants and children below the age of five, examining the effect of various independent variables. Of prime interest here were the mother’s occupational experiences. However, other relevant socioeconomic variables, such as the father’s social class and the family’s religion, were taken into account as well. Finally, we also looked at the effect of a number

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4Data were collected in the framework of the Historical Sample of the Netherlands (www.iisg.nl/hsn/).

5For an introduction into the contents and use of Dutch population registers, see Janssens (1993:50–68).
Event History Analysis

The results discussed in the following have been derived from a discrete time-event history analysis using logistic regression models. To conduct this analysis, we first constructed a so-called “person-period file” that included a record for each live-born child for each month the child survived, starting with the first month of life up to the month of death or the last month of the period under study, whichever came first. For each month a child survived, the dependent variable (dying) took a value of 0; if the child died in a given month, his or her final record was added, with the dependent variable having value 1. The database thus constructed contained the month-history of all 1,556 live-born children of the 353 mothers in the sample.

For each successive month of age, the event history analysis estimated the dying hazard (i.e., the probability of dying for those children who were still alive at the start of the month). In addition to month of age, we collected various other types of child data, including information about the parental family such as father’s occupation and the family’s religion. This means that we effectively had sets of siblings, so that we were 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 individual children’s months cannot be assumed to be independent, because the sets of siblings have a shared background in their parental family. To account for unobserved heterogeneity between families or mothers, a random mother effect was included in the regression models. The resulting mixed models were estimated using the xtlogit procedure of the statistical package Stata, version 10.

The following analysis is divided into two parts. In the first part, we estimate the hazard of dying for infants during the first year of life. The second part deals with the risk of dying between birth and age five. We present a separate analysis for the age group from birth to age one, because mortality risks were much higher for infants than for individuals in later stages of the life course. This higher risk is reflected in our data as well: of all live-born children, 168, or 10.8 percent, died in the first year of life. However between age one and age five, only 47 children died, which represents 3.4 percent of all children in that risk set. It is also not unlikely that mortality determinants have different effects on the survival chances of infants compared to the chances of older children. This makes it desirable to analyze different age groups separately. However, the comparatively small number of events—that is, the small number of deaths relative to the number of months of observation—made it impossible to present a separate analysis for the group aged one to five years. We therefore decided to present a separate model for infants and a second model in which we added the group aged one to five years to the infant model.

For each part of the analysis, we discuss two measures for the variance between mothers. First, we discuss the variance in an empty model with no covariates, and second, we discuss the variance in the full model including child and family information as covariates. The difference in the between-mother variance of the empty and full models indicates the reduction in the unobserved heterogeneity between the mothers and thus the gains realized by the full model. Moreover, the between-mother variance of the full model provides an indication of the unexplained variance between mothers that still remains. In other words, this measure indicates whether discussion of any remaining death clustering is justified.

For each of the two parts, we make use of the same set of covariates. The first covariate is labeled “month,” indicating the time elapsed since birth. Obviously, the hazard of dying
is greatest immediately after birth, but even after age one, the hazard may decrease with each month added to the life course. The second variable indicates the town, as death risks may vary between the two. As we have mentioned previously, child and infant mortality were a lot higher in Tilburg at that particular time than in the town of Enschede.

We then incorporate a number of biological and demographic variables: the sex of the child, the age of the mother at the child’s birth, the birth rank of the index child, whether or not the index child was the first child born to that mother or part of a twin, and the duration of the birth interval immediately preceding the birth of the index child. A time-varying variable indicates whether or not a following child was born. The dichotomous variable indicating the sex of the child—that is, whether or not the child was female—is especially important for infant mortality, as boys generally have higher mortality risks in the first few months of life. The age of the mother plays a role in this mortality risk, as children born to either very young or very old mothers tend to have lower survival chances, especially during the first few months of their life. The child’s birth rank within the family can also have a considerable effect on his or her survival chances. It is likely that first-born children received better care and that the mother’s health was depleted with increasing birth rank. This latter fact is important when considering infant mortality. Short birth intervals could have disastrous effects, especially for infants. If the preceding interval was only short, the mother’s biological resources may not have been fully replenished for the new birth. Finally, the arrival of a new baby, indicated by the variable “next child born,” may have negatively affected the survival chances of the index child as maternal care and domestic resources were shifted toward keeping the newborn child alive.

Following this, we add variables indicating other deaths in the family. We first include two time-varying variables indicating whether the child’s father or mother died during the time this index child was under exposure of the risk of dying. Further time-varying variables indicate whether the previous child died before or after the birth of the index child, as well as the total number of previous children who died. It is evident that the death of one of the parents could have strong negative effects on the survival chances of infants and young children. However, the effects might be very different depending on which parent died (Derosas and Oris 2002). Premature death of the mother might have a strong negative effect for infants who could no longer be breastfed. In addition, without older daughters, it might be difficult to keep the household going. When fathers died, it was likely that the main source of family income disappeared. In both cases, the family might fall apart and be divided among various other relatives, such as uncles and aunts. The second variable included here indicates whether or not the index child had any siblings who died before reaching age five, either during the life of the index child or before its birth. This variable is constructed as a count variable indicating the number of children in the family who died before age five. The variable indicating whether or not the sibling born immediately before the index child died is a simple dichotomous (but still time-varying) variable that switches on in the case of the previous sibling’s death.

Subsequently, we include three sets of dummies with socioeconomic variables: the occupations of both mother and father, as well as the occupation of the maternal grandfather. Of course, the mother’s occupation is of special interest to us. We constructed three categories of women’s occupations as comparisons to those women who had been factory workers prior to their marriage and who in some cases also stayed on in the factories for a certain period after marriage. We first compare these female factory workers to women who had never had a recorded occupation in the population registers and who therefore seemed to have specialized themselves in housekeeping. We then compare the female factory workers to women who had been employed as domestic servants. This latter group had
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the reputation of being better housekeepers and possibly embracing certain middle-class values concerning child health and child care. Finally, we compare the female factory workers to the last category of women’s occupations, women who had been teachers or farmers. This seems an odd combination, and it certainly is, but these two groups were numerically too small to be considered separately.

The other occupational dummies refer to the father’s occupation and the occupation of the maternal grandfather. Regarding the father’s occupation, we expected that higher occupational strata would have lower mortality risks than those at the bottom of the scale. Measuring the effect of the occupational group of the maternal grandfather is unusual. Most studies never test this variable, probably because this information is not readily available; as a result, we lack plausible hypotheses about the relationship between the maternal grandfather’s occupational status and the mortality risks of his grandchildren. We regard this variable primarily as an indicator of the mother’s social background that may say something about the mother’s early training and socialization. If the mother grew up in a farming family and then went on to work in one of the textile factories—a path that was by no means uncommon in towns such as Enschede—the variables affecting the mortality risks of her children might be very different from those affecting young women who were brought up in unskilled working-class households with few resources for small children. Also, given the fact that we do not have any occupational entry at all for a substantial number of women, it is extremely helpful to know their social background.6

Finally, we include dummies indicating the child’s religious denomination. In Dutch historiography, the usual expectation is that Catholics had higher mortality risks for infants and younger children than did Protestants (Van Poppel, Schellekens, and Liefbroer 2002). This expectation seems to be confirmed by the higher mortality levels found in both the rural and urban areas of North-Brabant. In the town of Tilburg, almost all inhabitants were Catholic, with only a small group adhering to the Dutch-Reformed Church. In Enschede, on the other hand, the religious affiliations of the population were more diversified: around the turn of the century, 60 percent of the population belonged to the Dutch-Reformed Church, 25 percent were Catholic, and the greater part of the remaining group were Calvinists, the more orthodox version of Protestantism. The dummies indicating the family’s religion use the Dutch-Reformed affiliation as the reference category, while the Catholics are taken together as a single group and the other religious denominations are taken together as “other religions.”

Results

Table 2 shows the outcomes of the regression analyses for a child’s risk of dying for both the first year of life and the period from birth to age five. The table lists the estimated \( b \)-coefficients and corresponding odds ratios for each covariate, as well as the level of statistical significance. Negative values for the \( b \)-coefficients are accompanied by odds ratios less than 1 and indicate reduced mortality risks; positive \( b \)-values or odds ratios greater than 1 indicate increased risks. Regarding the \( b \)-values, it therefore follows, perhaps a little counterintuitively, that variables that have positive health effects, and thus reduced mortality risks, will have negative \( b \)-coefficients. For the various dummy variables (sex, town, occupations, religion), the results should always be interpreted in contrast to the reference category: for example, the results for the sex of the child (female) indicate whether female

6Tests have shown that these three types of occupational variables were not correlated with each other.
Table 2
Logistic regression models for the monthly risk of dying

<table>
<thead>
<tr>
<th></th>
<th>Between birth and age 1</th>
<th>Between birth and age 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$b$</td>
<td>odds ratio</td>
</tr>
<tr>
<td>Null model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>$-4.984^{***}$</td>
<td></td>
</tr>
<tr>
<td>Variance between mothers</td>
<td>0.619</td>
<td>0.712</td>
</tr>
<tr>
<td>Deviance</td>
<td>1,869</td>
<td>2,945</td>
</tr>
<tr>
<td>Full model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>$-2.106^{***}$</td>
<td>$-2.432^{***}$</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Month of age</td>
<td>$-0.113^{***}$</td>
<td>0.893</td>
</tr>
<tr>
<td>Town</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enschede (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tilburg</td>
<td>0.488‡</td>
<td>1.629</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0.034</td>
<td>1.035</td>
</tr>
<tr>
<td>Demography</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age of mother</td>
<td>$-0.058^{**}$</td>
<td>0.944</td>
</tr>
<tr>
<td>Birth rank</td>
<td>0.111*</td>
<td>1.117</td>
</tr>
<tr>
<td>First born</td>
<td>$-0.699^*$</td>
<td>0.497</td>
</tr>
<tr>
<td>Twin child</td>
<td>0.845**</td>
<td>2.328</td>
</tr>
<tr>
<td>Previous interval</td>
<td>$-0.020^{**}$</td>
<td>0.980</td>
</tr>
<tr>
<td>Next child born</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Family mortality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother dies</td>
<td>2.328**</td>
<td>10.257</td>
</tr>
<tr>
<td>Father dies</td>
<td>1.455</td>
<td>4.284</td>
</tr>
<tr>
<td>Previous sibling dies</td>
<td>0.020</td>
<td>1.020</td>
</tr>
<tr>
<td>Total siblings dead</td>
<td>0.076</td>
<td>1.079</td>
</tr>
<tr>
<td>Mother’s occupation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factory work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching/farming</td>
<td>0.065</td>
<td>1.067</td>
</tr>
<tr>
<td>Domestic service</td>
<td>0.026</td>
<td>1.026</td>
</tr>
<tr>
<td>No occupation</td>
<td>$-0.324$</td>
<td>0.723</td>
</tr>
<tr>
<td>Father’s occupation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unskilled (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper/middle</td>
<td>$-0.392$</td>
<td>0.676</td>
</tr>
<tr>
<td>Farm/skilled</td>
<td>$-0.131$</td>
<td>0.877</td>
</tr>
<tr>
<td>Maternal grandfather’s occupation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unskilled (reference)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
children have an increased or decreased risk of death as compared to male children. For the odds ratios, the ratio for "town" indicates that in Tilburg, the monthly odds of dying during the first year of life are 1.629 times higher than the odds in the reference town Enschede. Because of the fact that the monthly dying hazard is rather low, the odds ratios may also, and more simply, be interpreted as hazard ratios. Therefore, it is also valid to conclude that in Tilburg, the monthly hazard of dying is 1.629 times higher than the monthly hazard in Enschede. Finally, for continuous covariates like age, the interpretation refers to a one-unit increase: as age increases by one month, the hazard of dying becomes 0.893 times smaller.

Let us begin by taking a look at the results for the first year of life, presented in the left two columns of Table 2 for the full model. The results indicate that for infants the first few months of life were indeed highly dangerous, but with every month added to the infant’s life, the risk of dying decreased considerably and highly significantly, by about 11 percent. Demographic family dynamics posed further threats to infants, with the major one being, not surprisingly, the mother’s death, which affected the infant’s survival chances very seriously and very negatively. However, the infant’s position in the family was also highly important for survival, as is indicated by the birth rank and first-born variables. First-born children clearly had better survival prospects, as is indicated by the negative coefficient, whereas children of higher birth ranks faced significantly higher mortality risks. Survival prospects had nothing to do with the mother’s increasing age, as this variable shows a clearly positive effect on infant survival. However, the birth rank variable does suggest that maternal resources, both biological and social, became depleted with increasing numbers of births and rising family size. Obviously, being part of a twin birth also did not improve the infant’s chances of survival through its first year of life, as was the case with infants born after a relatively brief birth interval. Of course, the arrival

For reasons of parsimony, we do not explicitly mention the reference category in Table 2 where this is obvious, such as for “twin child.”
of a new sibling soon after the birth of the index child might also pose a serious threat to the latter’s survival chances. Unfortunately, we could not test this variable because of small numbers, but we will return to it when looking at survival between birth and age five.

We are first and foremost interested in the question of whether or not factory girls made bad mothers. As we can see from the results in Table 2, factory girls did no better or worse than mothers with other occupational backgrounds. Spending at least some years of their lives within factory walls did not make them less suited for the care of infants, at least not compared to other women in these two towns. Surprisingly, though, the mother’s social background does seem to have been relevant. Children born to mothers from farming or skilled working-class backgrounds had better survival chances than children born to mothers with unskilled working-class backgrounds. The effect is considerable and quite significant. However, it is even more surprising that infant mortality for women from middle- or upper-class backgrounds was no better or worse than infant mortality for women who had been raised in unskilled working-class households. In general, social and economic variables appeared to be quite irrelevant to child survival. The literature in the field has raised serious doubts about consistent causal links between socio-economic position and mortality (Bengtsson and Van Poppel 2011). Social and economic factors in late-nineteenth-century Dutch towns appear irrelevant as well, or at the very least, their effects were difficult to find (Janssens, Messelink, and Need 2010; Van Der Heijden 1995:179–185).

Other issues of interest are location and religion. The dummy for Catholic religion yields a surprising result. Both Dutch-Reformed and Catholic infants exhibited equal mortality risks. This result is quite similar to what was found for another town in the eastern part of The Netherlands (Janssens, Messelink, and Need 2010). In addition, through the use of interaction effects (not shown here), we confirmed the lack of any differences between southern and eastern Catholics in our data. These systematic results are an interesting notation in the long-standing debate on the higher mortality levels of Catholic families in The Netherlands. However, infants born in the southern town of Tilburg did have a higher risk of dying in the first year of life than those born in Enschede, but this occurs irrespective of their religious background. Perhaps the quality of housing and sanitation in Tilburg was worse than in Enschede. However, some doubt about the decisive importance of these environmental factors has been cast by a study showing that the unfortunate destiny of so many Tilburg infants was not significantly related to the lack of a modern water supply system (Van Der Heijden 1995:179–185).

Finally, the variable counting the number of siblings that died and the variable indicating whether the previous sibling died are of great interest. We had hoped that these variables might give some indication of further unexplained clustering of mortality risks within families. However, that was not the case. Perhaps this effect hides two potentially opposing forces that might have been at work here: if more siblings die because of unexplained frailty within the family, the risk for the index child increases. However, a reduction in the number of siblings that may be competing for scarce resources may also mean an improvement in the index child’s survival chances.

Now, turning to the variation between mothers regarding infant mortality, for each mother we can observe the monthly risk for her children of dying in the first year of life in the following manner. If, for example, a mother has three children, one of which dies in the

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8Unfortunately, we were not able to conduct a full analysis by town on account of insufficient numbers for some of the relevant categories.
fifth month, then the risk for that particular mother equals the number of months in which a child dies (1) divided by the total number of (first-year) months observed for each child (5 + 12 + 12). Obviously, if fewer children die and if death occurs later in the first year of life, the monthly risk of dying for that mother’s children will be lower. The variation of this monthly risk across mothers is captured by the null model, the results of which are presented at the top of Table 2.

Although the null model does not contain any covariates, it offers a few interesting results. From these results, we can first derive the average dying hazard and then determine the amount of variation in this hazard across mothers. From the intercept (−4.984), one can derive an estimate of the monthly hazard of dying during the first year of life, which equals the antilogarithm of −4.984, or 0.00685. Next, from these odds (defined as the probability of dying divided by the probability of not dying), one can derive the probability of dying (hazard) itself by evaluating odds divided by (1 + odds), which here equals 0.00685 / (1 + 0.00685), or 0.00680. Note that, as we stated previously, with small hazards, the values of odds and hazard are almost equal. Although the monthly dying hazard of 0.00685 may seem small, it leads to a relatively large dying hazard for the whole first year of life: as the chance to survive one month equals (1 – 0.00680), the chance to survive 12 months amounts to (1 – 0.00680)12, which equals 0.921; hence, the hazard of dying in the first year of life is 0.079. The monthly and yearly hazard just calculated hold for an average mother. But, of course, there is variation between mothers. In the null model, we assume that each mother has her own personal intercept, and that all these intercepts are normally distributed around the mean intercept value of −4.984. Taking the square root of the between-mother variance of the null model yields the standard deviation of this normal distribution, which is the square root of 0.619, or 0.831. We can exploit this deviation to compute an interval that contains 95 percent of all mothers’ intercepts. The lower and upper bounds of this interval lie 1.96 standard deviations below and above the mean intercept, producing bounds of −4.984 − (1.96 × 0.831) and −4.984 + (1.96 × 0.831), respectively, or −6.613 and −3.355. As with the mean intercept, we can now transform the lower and upper bounds into a lower and upper monthly dying hazard, which equal 0.00134 and 0.03373, respectively. The lower and upper yearly survival chances then become (1 − 0.0337)12, or 0.662, and (1 − 0.00134)12; or 0.984; consequently, the lower and upper yearly dying hazards are 0.016 and 0.338. These 95 percent interval widths clearly demonstrate that mothers varied substantially as to the survival chances of their children during the first year of life. Hence, we may explain this between-mother variation using predictor variables, as we do in the full model. Comparing the between-mother variances in the null and the full model, we can conclude that this measure has been reduced substantially, from 0.619 to close to zero. Hence, we may conclude that the covariates in the full model are able to explain nearly all of the variance in the mortality rates that was initially present between the mothers.

We next discuss the results for the mortality risks of children under age five (see the right two columns of Table 2), but we limit this discussion only to those results that are most relevant. Indeed, most of the factors that proved relevant for infant mortality preserved their effect after we added the observations of children between age one and age five to the dataset. The early death of the mother is still a factor of decisive importance; however, in this model we can also see the emergence of the father, probably in his role as the family’s primary breadwinner, as a determinant of children’s survival success. Again, the child’s birth rank and status as a first-born child have the expected signs and significance. It is clear that increased household size and increased competition between children for potentially
scarce resources negatively impacted children’s chances of survival to age five.\textsuperscript{9} Perhaps this is also why the effects of being part of a twin birth and being born after a brief previous birth interval continued to be negative after age one. Having a same-age or slightly older sibling may have been a large drain on the family’s resources. In a similar way, we can see that the arrival of a new baby was detrimental to the survival chances of the index child between birth and age five.

The social and economic variables in this second model yield at least one striking difference from the first model. Children born to mothers who had never had any recorded occupation, as compared to children of mothers who had been in industrial or any other occupation, were better at surviving the first five years of life. This is an intriguing result. Who were these women? The women in the two samples who had never had a recorded occupation were certainly not disproportionately drawn from a specific social class. Nonparticipation in the labor market was not significantly more likely for middle- or upper-class girls than for working-class girls. Note also that this result leaves intact the advantage that we encountered previously for mothers with a background in farming or the skilled working classes. Women who had been socialized in farming or skilled working-class households had lower risks for early child death than those who came from unskilled households.

Again, we find that young children from Catholic families did not fare any worse than children from Dutch-Reformed families. But the town of Tilburg continues to indicate a problem for children’s survival that cannot be attributed to Catholicism or the city’s higher fertility level, as the two models we presented here take these influences into account. As was the case in the infant model, whether or not there had been previous child deaths in the family proved irrelevant.

Again, from the null model results, we can derive the interval (0.57, 0.98) for a child’s chance to survive the first five years of life, which holds for the children of 95 percent of all mothers. This interval indicates a considerable degree of variation between mothers. However, comparing the between-mother variances of the null and the full model, we again find that the covariates in the full model have explained more or less all of the initial variance found between the mothers.

Conclusions

On the basis of the analysis presented here, we can draw the following conclusions. First of all, it is evident that infant and child mortality were strongly clustered within certain families. Most families in early-twentieth-century Enschede and Tilburg never experienced the death of one of their infants or young children under the age of five. However, there is no indication that this pattern of clustered deaths can be attributed to the lack of maternal care of mothers who had been factory girls before their marriage. Therefore, this analysis represents a posthumous rehabilitation of late-nineteenth-century factory girls, or at least those in Enschede and Tilburg. Factory girls did not make bad mothers—at least as far as we can judge from their children’s survival chances. Their children did not have higher mortality risks before age five than children born to mothers who had been in other occupations. Women who had been in domestic service cannot therefore be labeled “better” mothers. Neither their training in middle- and upper-class households nor their supposedly stronger position in the marriage market had any effect on the survival chances of their children.

\textsuperscript{9}The negative effects of large numbers of children on all of the existing children have been documented by Humphries (2007).
However, it does seem that some mothers were better than others. Women who had never had any recorded occupation or had been recorded as having no occupation in the population registers were better at keeping their children alive than were other women. The same result was found for women who had been raised in farming or skilled working-class households. It is noteworthy that the husband’s social status had no influence on child mortality whatsoever. This does suggest that mothers’ social attributes were more relevant for child survival than the social attributes related to the fathers. It could well be that these women carried over into their own families the child-care practices they had learned from their mothers. Perhaps the traditional practice of prolonged breastfeeding, which gave children a much better start in life than the “modern” practice of bottle feeding, played a role here. It may have been the case that women from farming or skilled working-class households and women who had never been active on the paid labor market were more prone to continue traditional child-care practices.

Nevertheless, it should be stressed that social factors were not the primary determinants deciding the fates of infants and young children. Attributes at the level of the child itself, as well as family dynamics, were far more important factors. Having parents, especially the mother, present; being the first-born; and having only a few siblings who might compete for scarce resources were the most decisive factors making the difference between life and death. In addition, older mothers seemed to take better care of their infants than did younger ones. Could it be that older mothers had acquired more bargaining power in marital and domestic affairs and were hence able to direct more resources toward their infants? In any case, these types of factors were able to explain nearly all of the variation that was initially found between the mothers. Deaths were indeed clustered, but it proved possible to explain the clustering on the basis of a rather large set of variables relating to socioeconomic, cultural, and, above all, demographic variables. Most of the statistically significant variables pertain to the level of the child rather than the level of the mother, such as birth rank, the presence of a twin, previous birth interval, and the age of the mother. From this, it follows that a mother’s risk to lose one or more of her children depended in part on the particular set of children she had. Some of the relevant variables in our study point to the role played by biological and genetic factors in the clustering of deaths within a family. The length of the previous birth interval, for instance, is related to a woman’s fecundity level, and all four family mortality variables may be seen as indicators for a family’s biological strength and physical stature. However, a correct assessment of the role of genetic factors in children’s death risks requires the use of large datasets with family trees spanning the life courses of multiple generations.

References


