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INFANT MORTALITY IN A CHANGING SOCIETY
The effects of child care in a Swedish parish 1820–1894

Anders Brändström and Jan Sundin

1. The subject

It is hard to find any event in history which had a greater impact on mankind than the demographic transition in the western world during the last centuries. The main trends of the transition were in many respects similar in all countries. In Scandinavia this process, as has been pointed out by several observers, took place during about the same period of time.

Reliable figures describing the crude rates of vital events exist in Sweden from 1749 and onwards. These figures show that mortality may have decreased slightly before 1800, but that the steady, seldom interrupted, trend downwards began after 1810.

This decline continued until the time of our own generation. Fertility, on the other hand, remained high and above 30 0/00, until the 1870ies. After another 60 years the fertility decline was completed.

Simple calculation shows that the major part of the decrease in mortality in Sweden during the nineteenth century was caused by the drop of mortality during the first year of life (infant mortality) from about 20 % 1810/10 to 8.5 % in 1901/10. (Fig 2).

This development had of course a profound effect on population growth in Sweden. Consequently there was an important change in the socio-economic structure of the Swedish society during the following 150 years. This article gives a contribution to the knowledge of how and why infant mortality decreased in one Swedish parish during the early phase of the Swedish demographic transition. Such knowledge can tell us much about the material, social and cultural development of a society or, as a Swedish
physician has put it, infant mortality is 'a good indicator of the maturity of a society'.

2. Regional patterns of infant mortality

It is a well-known fact that infant mortality is not evenly spread over the surface of earth at any certain time. We can see it today in the large differentials between the industrialized countries and the Third World. We
can also find regional differences in historical times, between, as well as within countries. The regional differences of general mortality in Norway were observed by Eilert Sundt in the middle of the nineteenth century. The Swedish statistician Fr Th Berg published a survey of infant mortality rates in all Swedish counties 1860-66, showing that the figures could vary between 92 0/00 as in the county of Jämtland with the most favourable rate and 174 0/00 as in Västernorrland with the least favourable rate. In the largest town, the city of Stockholm, the infant mortality rate (IMR) was as high as 271 0/00.
Starting with Berg's observations his follower Johan Hellstenius broke down the rates of the neighbouring counties Jämtland and Västernorrland for the period 1860-82. The results showed a consistent pattern of high mortality in the coastal area and a gradual reduction of the rate up to the western montainous part of Jämtland. There were, however, three kinds of 'enclaves' on his map. Some of the rural coastal areas showed surprisingly high rates, whereas all iron foundries that had a parish administration of their own had significantly lower rates than their rural hinterlands. Finally, all nomadic communities had extremely high infant mortality. The last observation was confirmed by Sten Wahlund, giving the figures separately for nomads and settled inhabitants in four north-western parishes for the period 1795-1895.

Present-day researchers have discussed the regional differences with great interest. In Finland for example the articles by Oiva Turpeinen showed a pattern similar to the Swedish one for the eighteenth and nineteenth centuries. One of the first issues, in continuing the tradition of Berg and Hellstenius in the case of Sweden, would be to fill in the gap between data on the county level and Hellstenius' information about all parishes in two of the counties. With the help of the files of aggregate statistics on the deanery level at the Demographic Database in Umeå, it has been possible to produce one map of IMR for the Swedish deaneries in 1806 and another for the year 1855. A deanery consists of a number of parishes (usually 5-15) as an intermediate unit between parish and diocese. A parish varied considerably both in population and space. The average parish kept between 1 000 to 3 000 inhabitants during the 19th century.

These two maps have primarily been produced for methodological purposes in order to prepare for other maps covering longer periods of time, when the registration of the aggregate statistics will have advanced further. Despite all the criticism that can be made about random fluctuations when looking at a single year, we find it remarkable that the same regional pattern appears on both maps, although on a generally lower level of IMR in 1855. Certain areas seem to be especially afflicted by high infant mortality. Berg's and Hellstenius' observations about the counties of Jämtland and Västernorrland are confirmed. The highest rates in 1806 are found in the Lake Mälar region and in the northern deanery of Torneå. There are also areas of relatively high IMR south of the Lake Vänern and south-east of Lake Vättern and in parts of the counties of Småland and Blekinge. The areas with the most favourable figures are, mostly, found in the western parts of Sweden and in the southern province of Skåne, an observation which corresponds with figures on the county level given by Berg.
Map I. Infant mortality rates in Swedish deaneries 1806.

Source: The Demographic Database, Umeå University.
Map 2. Infant mortality rates in Swedish deaneries 1855.

Source: The Demographic Database, Umeå University.
Looking at the maps one could be tempted to think that high infant mortality in the deanery of Tornë is an evenly spread phenomenon. Given the results presented by Hellstenius on the parish level we must, however, beware of making hasty conclusions. Tornë deanery consists of eight parishes from the coasts to the Norwegian border in the west. Figures collected in a current investigation by Anders Brändström show that infant mortality, at least during the first half of the nineteenth century, is highest in the parish of Nedertorneå on the coast. IMR decreases gradually for each parish further west of the coast.

3. Infant mortality on the level of parish

The Demographic Database at Umeå University keeps individual demographic and social data covering most of the nineteenth century for a number of Swedish parishes. Using the database one can go below the aggregate level and combine many variables in a micro-demographic study. Swedish parish registers have been presented in a number of books and articles previously. Their reliability has been tested by several researchers. The unanimous opinion is that they are reliable, especially for the period after the year 1800. They are good sources for the study of infant mortality. The greatest problem may be the accuracy of the registration of stillborn children and the distinction between stillborn children and those who died almost immediately after birth. Some under-registration of children who died soon after birth may have occurred, but this is a problem of little statistical import, at least for the nineteenth century.  

Apart from information about the date of birth, marriage and death of individuals, the parish registers tell us about where, within the parish, the newborn child lived as well as its moves and changes of residence later. They also give information about the occupational status of the father/mother, the parents’ marks in reading and comprehension and the causes of their deaths. The latter is given according to the knowledge of the priest, which means that we very often find information about the symptoms rather than the name of the diseases. The degree of detail given in the information about causes of death also depends on the knowledge and involvement of individual priests. ‘Disease unknown’ and similar statements are frequently found, especially for those who died at a very early age. We must not, however, totally underestimate the ability of the priests considering the general level of medical knowledge of their time.  Even during the eighteenth century some students of theology attended the
medical lessons of Linnaeus and other 'naturalists' at Uppsala and Lund. The Swedish clergy played an important part in local 'secular' administration. One of its many duties was to spread the knowledge of preventive health measures and medical care in the parishes. The Swedish Statistical Commission instructed the clergy how to classify the causes of death in the yearly statistical tables of mortality they had to deliver to the authorities from every parish. Books and articles on medical subjects were published from the eighteenth century and onwards and spread all over the country. Some of them appeared quite early in the libraries of many parish priests.

3.1 Nineteenth century IMR in four Swedish parishes

Four of the database parishes have been chosen for our investigation: Nedertorneå, Svinnegarn, Trosa and Fleninge (See map 1). Geographically they are situated in regions with different patterns of infant mortality during the nineteenth century. Nedertorneå is - as we have already pointed out - a parish with an extremely high IMR at the beginning of the century. Svinnegarn is situated in the Lake Mälar region, but in an area with low mortality compared with other parts of the region. Trosa and Fleninge are both in regions with a relatively low IMR both 1806 and 1855. Fleninge is a part of the county of Malmöhus' with a low rate in the 1860’s according to Berg’s figures. Nedertorneå at the beginning of the century consists mainly of self-owning farmers on relatively small plots of cultivated land. When Sweden lost Finland in 1809 a borderline was drawn along the river Torneå, dividing the parish into a Swedish (but Finnish-speaking) and a Russian-Finnish part. It was necessary for the Swedish authorities to establish an administration on the Swedish side, and to build a new centre for trade and commerce. After a few decades that meant the birth and growth of the town of Haparanda within Nedertorneå parish. It also meant the growth of a middle class and a proletariat, especially within the little town.

Svinnegarn is dominated by large landed estates and during the nineteenth century the so-called 'stater system' was fully developed. This meant that the labour force was predominantly employed on one-year contracts paid partly in kind and partly in cash. Trosa parish is also dominated by large estates, but the cultivation of the land is mostly handled by a system of crofters working on small plots of land to satisfy their own needs and earning their rent by day-labour for a large landowner. Fl-
Ninge is a small parish on the plains in southern Sweden. The land is divided between self-owning farmers. As is usual in the Swedish countryside during the nineteenth century, Ninge too has its population growth and proletarization.\(^{12}\)

Five-year averages of IMR for the four parishes have been calculated for the period 1820-1894 and can be seen in figure 3. All four parishes have rates at the beginning of the period that would be expected from their geographical situation. Nederorneå has an IMR of about 400 0/00 during the first two decades. Ten years later the rate has dropped to about 250 0/00. The decrease continues during the rest of the period - except for two minor peaks - but slowly, so that the figure for 1890-94 is about 200 0/00. Because of the smaller size of the populations of Svinnevar and Trosa, their two curves fluctuate more. Usually the rate during the last 25 years is around or just above 100 0/00, while it had often been above 200 0/00 before. Ninge has no downward trend of infant mortality.

Figure 3. Five-year averages of infant mortality in four database parishes 1820-1894.

Source: The Demographic Database, Umeå University.
IMR normally fluctuates between 100 and 150/00. The reason for the different levels and trends of the curves is, of course, hard to find as yet. One plausible explanation is that the four parishes were at different stages of a general decline of IMR. We shall have to carry out further investigations before we can give more definite answers.

3.2 Social differentials of infant mortality

If the statement which we made in our introduction is true, and knowledge about infant mortality can give us information about the material, social and cultural development of a society, we should expect not only regional but social variations. This question has been discussed by many researchers, particularly in Sweden where data allow us to divide the population into social groups. Usually Swedish data have been generated from one or a few birth cohorts within limited geographical areas and limited periods of time. The results are somewhat confusing and point in different directions. One observation is, however, frequently made: There is no absolute correlation between low IMR and economic status. In some cases crofters and other landless groups have a lower IMR than self-owning farmers in the same area, while other investigations give the opposite result. One fact, which seems to be well-established is that the IMR for illegitimate children is higher than for the rest of the population. This has also been observed by Olva Turpeinen in Finland, who has suggested that a high IMR is correlated with low economic standard. This may be true for women at the lowest levels of the social scale for whom children may also have been an obstacle to marriage, work and social acceptance. In our opinion, facts about the mortality rate of illegitimate infants cannot be used to describe the situation for legitimate poor infants.

Let us for a moment look at table 1 showing the distribution of infant mortality for the four database parishes divided into three periods. The three periods cover roughly the same time span for all parishes, although - for reasons of data availability - Svinne's first period starts as early as in 1803 and Fleninge's last period ends in 1890.

Turpeinen's results are usually confirmed in our table as well as in several other investigations. One exception is, however, that the children of farmers in Nedertorneå have a higher IMR than illegitimate children between 1820 and 1869.

Our population has been divided into three social groups in Fleninge, Svinne and Trosa: self-owning farmers, crofters and the proletariat.
Table 1. Infant mortality in four database parishes 1820-44, 1845-69 and 1870-1890/94 divided into social groups.

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<td>Middle class</td>
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1. First period is 1803-1844.
2. Last period is 1870-1890.

Source: The Demographic database, Umeå University.

In Nedertorneå the division is different. The crofters are not separated from the rest of the proletariat since they are so few. The middle class forms a group of its own, having a much greater significance than in the three totally rural parishes. The middle class consists mainly of merchants, trading craftsmen and civil servants.

Generally speaking it seems as if the proletariat in parishes with a relatively low IMR has higher infant mortality than the other social groups. In Nedertorneå the rate for the farmers is higher than that of the proletariat in 1820-69, a period of high infant mortality. When Nedertorneå's IMR is lower, in 1870-94, the farmers' IMR is low! During certain periods in the three other parishes the crofters have lower IMR than the farmers, a fact which confuses the picture even more!
3.3 Social differentials over time

The only parish of the four presented above, with a population large enough to allow for a closer study of social differentials over a longer time perspective (in five-year periods) is Nedertorneå. The same parish is also interesting because of the rapid drop of infant mortality from a very high level to rates that are closer to the national average, although still above it at the end of the nineteenth century. We have therefore concentrated on Nedertorneå and the results can be studied in figure 4.

Figure 4. Five-year averages of infant mortality in Nedertorneå 1820-1894, divided into social groups.

Source: The Demographic Database, Umeå University

Between 1820 and 1834 all three social groups in Nedertorneå have roughly the same rate of infant mortality at 400 0/00 or more. During the following ten years the IMR of the middle class in Nedertorneå drops from about 480 0/00 to about 200 0/00, and it remains at this level or even
below it except for three five-year periods (1855-59, 1880-84 and 1885-89). The next group to follow the same path is the proletariat for which the rate drops from about 400 0/00 to about 230 0/00 from 1840 to 1849. The long-term trend may show a slight decrease after that, but it is of little significance compared with what happened during the 1840'ies. Starting at about the same time, but not nearly as rapidly the IMR of the farmers begins to decline, a process that continued up until the last decades of our period of study. The farmers' final rates, however, are below those of the other two social groups.

The shape of these curves perhaps explains some of the confusion which occurs when comparing data from age cohorts of children born during a limited number of years. If the social pattern of the decline of infant mortality in Nedertorneā also existed in other regions, this would mean that social differentials depend on the time of observation. Data from two other studies support this hypothesis. The children of smiths and unskilled workers born at the iron foundry of Lōgdō 1744-1793 had an IMR of, for the former, 193 0/00 and, for the latter, 222 0/00. In 11 iron foundries in the county of Våsternorrland smiths' children born in 1830-35 had a rate of 187 0/00 and unskilled workers' children born at the same time had a rate of 202 0/00. The children of those surviving in the second cohort, born between 1850 and 1880, had a different pattern. Children of smiths and of unskilled workers had both the same IMR, 127 0/00.

Children born in the Nordingrā area at the beginning of the 1830'ies had the highest IMR in the proletariat, 309 0/00. Children of farmers had a rate of 268 0/00 and the crofters' IMR was 222 0/00. When the children of the survivors were divided into social groups the rate of the proletariat was 169 0/00, of the farmers 247 0/00 and of the crofters 202 0/00. The position had changed. In this sense there are similarities between Nordingrā and Nedertorneā, similarities that are even more striking when one considers that Nordingrā also had a high IMR throughout the century. 15

3.4 Differences within the first year of life

Turning once more back to Fr Th Berg's survey of infant mortality in Swedish counties 1860-66, we find that there is - of course - an uneven distribution of infant mortality during the children's first year of life. Usually mortality is the highest during the first month after birth. Then it decreases slowly from the second to the twelfth months. This pattern can
be found in both industrialized and nonindustrialized countries of today. The death rate is particularly high during the first week of life.

The distribution of deaths over the first year differed regionally in the 1860ies. Counties with a high general IMR had relatively higher figures during months 4-6 compared with counties with a low general IMR. The relative level of mortality after the sixth month was also higher than during months 1-3 compared with counties with low infant mortality. This does not mean that the downward trend over the year was totally absent, but that it was not as pronounced as in counties with a low IMR.

This observation tempts us to analyze the distribution of deaths within the first year of life in the database parishes. The results in table 2 a-e also include Turpeinen's rates for two Finnish parishes, Koivulahti and Pudasjärvi and Berg's figures for Sweden 1860-66.

Table 2 a-e. Infant mortality in four database parishes, in the Finnish parishes Koivulahti and Pudasjärvi and in Sweden at different periods divided on age at death. Per 1 000 live births. Svinnegar's first period is 1803-1844 and Fleninge's last period is 1870-1890.

2 a. During the first week of life.

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2 b. During the 2-4th week of life.

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<td>-</td>
<td>59</td>
<td>-</td>
</tr>
<tr>
<td>Nedertorne</td>
<td>-</td>
<td>138</td>
<td>-</td>
<td>139</td>
<td>-</td>
<td>124</td>
<td>-</td>
</tr>
<tr>
<td>Koivulahti</td>
<td>292</td>
<td>-</td>
<td>178</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pudasjärvi</td>
<td>69</td>
<td>-</td>
<td>48</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: The Demographic database, Umeå University. Oiva Turpeinen, loc. cit. in footnote 6. Fr Th Berg, loc. cit. in footnote 3.

Mortality during the first month of life is, not surprisingly, higher than during the following months in all parishes irrespective of the period of time (table 2 c). There are, however, strikingly high figures for some of our parishes. In the case of Svinnegar 1820-44 the high rate is explained by high mortality during the first week (table 2a). Trosa's high rate in 1845-69 is mainly concentrated on weeks 2-4 and Fleninge's 76 0/00 in 1870-94 is due to a slight increase of mortality during the first week. So far, however, we have no reason to pay too much attention to these findings, since the relatively small number of children may have mislead us.
The results from Nedertorneä in 1820-44 and from the Finnish parish of Koivulahti in 1749-73 are harder to ignore. These rates are so high and the numbers of observed births are so large that there must be something more than coincidence behind the figures. Our curiosity grows even more when we find that mortality during the first week is relatively low in the two parishes, but very high during the following three weeks. We can also observe that the high rate for the first month decreased considerably in both parishes to a relatively normal level in Koivulahti 1841-50 and in Nedertorneä 1870-1894.

Mortality during month 2 is high in Koivulahti 1749-73 and in Nedertorneä 1820-44. It decreases substantially with time, although it is still higher in Nedertorneä than in the other database parishes in 1870-94. For months 3-12 we find the same difference between Fleninge (lowest), Trosa and Svinnegarne (relatively low) and Nedertorneä and Koivulahti (highest). In all parishes there is a decrease with time. For Fleninge, Svinnegarne and Trosa the decrease is about 20 0/00, for Nedertorneä only 10 0/00 despite its high rate during the first 25 years of observation. Koivulahti has a considerable decrease from an extremely high rate in the eighteenth century, but it is not comparable to the decrease during the first and second months.

We can conclude that there has been a moderate decrease in infant mortality during months 3-12 in all parishes observed. In Nedertorneä this decrease was considerable in absolute figures but there was still a large difference between Nedertorneä and the other parishes. The decrease in Nedertorneä was more pronounced during the first month of life and mainly concentrated on weeks 2-4. The Finnish parish of Pudasjärvi had relatively low rates all the time and in all months, while Koivulahti had a pattern similar to Nedertorneä's including the disappearance of the peak in weeks 2-4 from 1749-73 to 1841-50.

3.5. Social differences at different periods of time within the first year of life.

Accepting the risk of having too little information and random fluctuation we shall try to elaborate on some differences between social groups at different periods of time within the first year of life in Nedertorneä.

Figure 5a shows what happened to the middle class in Nedertorneä during the three 25-years periods 1820-94. Mortality during the first week of life was rather low even during the first period and the decrease was
Figure 5 a-c. Infant mortality in Nedertornea 1820-44, 1845-69 and 1870-94 according to age at death and divided into social groups.

a. Middle class

b. Proletariat

c. Farmers

Source: The demographic Database, Umeå University.
moderate. A substantial decrease took place during the second month, as well as during the rest of the first year of life. The decrease is concentrated to the first decades. Later mortality during months 3–12 even increases!

The proletariat of Nedertorneå has higher mortality during the first month during the years 1820–44 compared with the middle class. A change had occurred during the years 1845–69, so that the rate for the first month was almost the same as for the middle class. Minor improvements had also taken place in 1870–94, but most of the change occurred earlier. No improvement at all was registered for months 3–12 for the different periods of time.

While the farmers of Nedertorneå had a moderate mortality rate during the first week throughout the whole period, substantial changes took place for weeks 2–4. The rate went down from a high level during the three 25-years periods. The distribution over the first month in 1870–94 equalled Berg’s figures for Sweden as a whole in 1860–66. The same change took place during months 2–12, although not so markedly as during weeks 2–4. Most of the change occurred between the last two 25-years periods. The farmers had a more steady decrease in infant mortality during months 3–12 compared with the other two social groups, where the decline levelled off after the second period for the middle class and never changed at all for the proletariat.

3.6. Biometrical analysis

Another way of describing the distribution of infant mortality during the first year of life is to project cumulative infant mortality rates on a logarithmic time scale, the so called biometrical analysis, developed by Bourgeois-Pichat. John Knodel and Hallie Kintner used this method in order to establish differences in the shapes of the curves depending on the patterns of breast feeding and weaning in historical populations. They found that the cumulative rates of artificially fed infants formed a convex curve where the rates rose more quickly during the first months of life than during the later months of the first year. Breast fed infants had an opposite pattern with a steeper rise during the later part of the first year of life, thereby giving the curve a concave shape.

A biometrical analysis of IMR for the three social groups during the three 25-years periods in Nedertorneå gives the results that are presented in figure 6 a–c.
Figure 6 a-c. Cumulative infant mortality rate, Nedertorneå 1820-44, 1845-69 och 1870-94.

Source: The Demographic Database, Umeå University.
During the first period the curves of the farmers and the proletariat are convex. The mortality of the middle class children does not produce such a curve, but rather a straight line. In 1870-94, all three curves form almost straight lines with a more modest slope than previously. This process started earlier among the proletariat, as can be seen in figure 6 b for the period 1845-69.

The curves for farmers and the proletariat are in the beginning similar to expected curves for artificially fed children. In Nedertorneå, however, the slope is changing most markedly between the first and the second month, which is much earlier than for Knodel's and Kintner's populations.

Obviously these data give more qualified information about the process that we observed in figure 5. There was a considerable decrease in infant mortality for the middle class after a short period of time. Most of the decrease took place during all months of the first year of life. The adjustment of mortality during weeks 2-4 to a more 'normal' pattern, was not at all comparable to what happened within the other two social groups, where in the beginning the pattern was very abnormal compared with the Swedish average. The change came more rapidly in the proletariat than among the farmers. The former never improved their rates for months 3-12, but the latter had a steady decline even for those months. This explains why the farmers had a total IMR which was lower than for the other two groups during the last 25-years of observation.

3.7. Seasonal differences over time

Seasonal differences of infant mortality is sometimes a reflexion of an uneven distribution of births. It is, however, relatively easy to take this factor into consideration provided that we are dealing with mortality within the first month of the child's life. Figure 7 shows the death rates during the first month of life over the calendar year for the three 25-years periods.

Two seasons of high infant mortality are distinctly recognizable in 1820-44. One covers the warm months culminating in July. The second season of high mortality starts in October and ends in January, the coldest period of the year. In 1845-69 there are no signs of such a distribution. The diagram moves on a lower level and shows signs of random fluctuation. During the last 25 years the rates are even lower and no seasonal variation of significance can be seen. So far there is reason to believe that the change of the pattern had something to do with the drastic decline of
Figure 6 a-c. Cumulative infant mortality rate, Nedertorneå 1820-44, 1845-69 and 1870-94.

Source: The Demographic Database, Umeå University.
mortality during the first month of the children's lives.

Infant mortality in Stockholm 1871-1890 had a seasonal pattern, similar

to the one that existed in Nedertorneå 1820-44 with the same two peaks.
Diarhoea was the main cause of death during the summer, and respiratory
diseases played the same role during the winter peak.\(^{18}\) Digestive distur-

cances, primarily caused by artificial feeding, produced the same pattern

of seasonality in the Netherlands during the nineteenth century. In Eng-
land where the infant mortality rates were far below the Swedish and
Dutch ones, only the winter peak appeared.\(^ {19}\)

4. Towards an interpretation

4.1. Some medical considerations

It is necessary to underline some basic medical facts before we make an
attempt to interpret the things we have found in this case study. Mortal
factors are often divided into 'endogenous' and 'exogenous' ones, the first
meaning the child's condition at birth, the second meaning new factors
affecting the child after birth. Endogenous factors are for instance gene-
tical abnormalities causing an early death, but they can also depend on the
prenatal care which influences the foetus. The physical condition of the
mother is therefore of importance for the level of endogenous mortality
among the infants. The effect on the infant mortality rate is strongest
during the first week and the first month of life.\(^ {20}\)

It is reasonable to argue that most of the extremely high infant morta-
lity during the nineteenth century was caused by exogenous factors, which
could have been weaker if the economic conditions had been better or if
cultural factors, such as attitudes towards child care and the educational
level of the population, had been more favourable. An important part of
exogenous deaths was caused by infectious diseases, some of which were
much more serious than they are today. Exposure to these diseases was of
various kinds. Some diseases are mainly transmitted by water and food,
such as cholera, diarrhoea, dysentery, non-respiratory tuberculosis,
typhoid and typhus. High exposure to these diseases can be attributed to
the treatment of food and water. Cow's milk, which is often a substitute
for the mother's own milk, has historically been the carrier of tuber-
culosis, dysentery, diarrhoea, grippe and colic. Other diseases are transmitted
by animals; typhus can be spread by the body louse, bubonic plague by
rats and malaria by mosquitos. A third group of diseases are transmitted by air and spread by human exhalation or dust. Such diseases are for example respiratory tuberculosis, pneumonia, influenza, whooping cough, measles, scarlet fever, diphtheria and smallpox. Some air-transmitted diseases can also be spread by milk, for instance diphtheria.

Certain factors in the child's surroundings influence the risk of exposure to infections. Obviously population density plays such a role. Intensive human contacts within the local society and between its inhabitants and the world outside increases exposure to the most epidemic kinds of diseases, especially to those which are air-transmitted. A low level of hygiene allows the diseases to spread rapidly and infected food can be fatal. This factor can be fought by changing the educational level and the attitudes of a population. Other things, such as bad housing conditions may also cause higher exposure to infections. It is obvious too, that the diseases will be more or less fatal depending on the general nutritional status of the child. These things are partly influenced by economic conditions. It is, however, also true, that attitudes cannot be totally explained by the economic standard of the population. Better hygiene can be accomplished without raising the standard of living. The composition of the food is not entirely a product of economic possibilities. Breast feeding promotes good nutrition. The child has even before its birth received a certain resistance to diseases through the placenta. In addition a breast-fed child receives resistance against many diseases through the mother's milk. Obviously this protection depends on the willingness of the mother to give the child of her own milk and on the time when the child is weaned. Besides, before people boiled 'artificial' food and cleaned the bottles thoroughly between the meals, breast feeding was a more hygienic method.21

4.2. What data tell us

Some of the findings of our data can easily be explained by what has been said in the previous paragraphs. The difference on the Swedish national level between town and countryside during the nineteenth century, with a significantly higher IMR in the towns, can be a reflection of different population density, frequency of human contacts and hygienic conditions. A higher rate on the Swedish coast compared with the interior parts of the country can sometimes be explained using the same arguments. They might also explain the high IMR in the county of Stockholm.
For some regions this interpretation is unsatisfactory. It does not give any answer to why there are low rates in the two counties of the province of Skåne, confirmed by our figures for Fleninge parish. It does not explain the high IMR in the county of Västernorrland, a relatively sparsely populated area. It does not tell us why the iron foundries in that county had a lower IMR than their hinterlands. It does not account for the difference between the nomads and the settled population in the mountainous area of northern Sweden. Finally, why is infant mortality in Nedertorneå so high during the beginning of the nineteenth century and why does it decline so rapidly?

How, then, can we understand these differences? We do not have information or room enough in this article to discuss all the differences and all possible explanations. We shall therefore concentrate on what happened in Nedertorneå during the 75 years between 1820 and 1894. Endogenous factors of economic origin are difficult to accept as a major cause. There are no large social differences in the level of mortality during the first week. The number of stillborn children is not higher in Nedertorneå than in areas with a low IMR. In the period of high mortality in Nedertorneå there was no correlation between low economic status and high mortality. Negative genetical factors would also have raised mortality during the first week and the number of stillborn children and the rapid decline is not compatible with such an explanation. The same arguments can be raised against the importance of the quantity of food supply and housing conditions.

We also have to look at cultural and social patterns. Among other things these patterns concern hygienic conditions and the quality of the composition of food, where breast-feeding seems to be a crucial factor. A statement from an international conference on 'Key issues in infant mortality' declares:

"Breast-feeding is one of the most effective ways of overcoming factors related to lack of resources, such as infection and poor nutrition. Since these factors are of such an importance, a significant increase in the practise of breast-feeding would surely lead to a reduction in infant mortality."24

This attitude is shared not only by present-day physicians but also by students of our historical past. In the Swedish case Johan Hellstenius quoted contemporary provincial physicians who suggested that the high infant mortality rate in the county of Västernorrland was caused by the
lack of breast-feeding. Cows' milk or even more unappropriate food was
given to the children instead. Oiva Turpeinen quotes similar statements
from doctors in Finland. Ulla-Britt Lithell has observed the same phenome-
on and put it in connection not only with high mortality but with high
fertility supporting the same standpoint as John Knodel.

The same complaint was heard from the provincial physicians of Nedertorneå as early as the eighteenth century:

'The children are fed with a skin teat and a horn; the sweet milk has
hardly been in the horn for half an hour when it becomes sour. The
remains are poured into a vessel and used again the next day. But
this is not all; the skin teat is never washed, and during the summer,
flies have free entrance laying their eggs in the horn; the child is
hardly three weeks old when thick soured milk is given to it. - - -
When entering the farmers' cottages one smells the stench of the
teat.'

It may also be used as an argument e silentio that such complaints were
never heard regarding the conditions in Fleninge. We must, however, go a
step further and see if quantitative data supports this theory. We shall
therefore summarize the possible effects of 'non-breast feeding' and ana-
lyze our data from Nedertorneå.

Contemporary reports from Nedertorneå during the beginning of the
nineteenth century claim that most mothers did not at any time introduce
their children to breast-feeding:

'A farmer in the village of Seivits has lost 11 of 13 children in their
infancy, another farmer has only 3 children left of 23. Both couples
are themselves healthy --- One does not have to make thorough in-
vestigations to find that uncleanness and soured milk are the causes
of death. The peasants cannot be convinced of this fact, since a few
children survive and become fat and healthy. Many children suffer
from rickets. --- Diarrhoea and vomiting caused by food is common'.

Similar statements appear several times in the reports. The conditions
in 1840 are for instance described by the provincial physician:

'I have never seen children so lovelessly treated as those of the Finns.
All day they are screaming in the cradle without skin, because of
uncleanness and vermin. Nobody takes care of them. They are never
given milk from the mother if she can find other kinds of food for them.

Instead they are fed with thick and viscous soured milk, given through unclean teats, which are never washed. Mortality is also unusually high among the children of the Finns, especially during the summer months when the mother works outdoors and leaves the children at home without care.³⁰

What would we expect to happen if these statements are true? First of all there could be a crisis after the first days of life when the children's stomachs had to digest cows' milk or even heavier food. The effect could be diarrhoea and other disturbances of the stomach. Unsuitable nutrition would also cause general weakness and a low protection against microorganisms transmitted to the child by food or by air.

Our data for Nederorneå 1820-44 supports this theory. There was a remarkably high infant mortality rate during weeks 2-4 and the rates were also high during the following months. Mortality during the second half of the first year of life was also high, which could be an effect of weakness caused by malnutrition. A careful study of registered causes of death has not yet been performed. The findings presented above have, however, made us take a brief look at the pattern of infant mortality in Nederorneå before 1820. Two short periods were chosen for closer study, 1800-02 and 1811-12. The number of births were counted from the register of births and baptisms. The resulting figures were used as the population at risk (a fairly close estimation) and compared with the number and distribution of infant deaths within the first year of life taken from the register of deaths and burials. All causes of death were registered and divided according to the age at death.

We found the same picture of infant mortality as in 1820-44, as can be seen in table 3. Total IMR 1800-02 is 488 0/00 (!) and for 1810-12 it is 372 0/00. The high level of 1820-44 was not a temporary peak, but representative of a longer period. Mortality was not surprisingly high during the first week, but extremely high during the following weeks and during the second month. The higher total figure for 1800-02 was mainly caused by a higher mortality rate during months 3-12. The reason seems to have been an epidemic of whooping cough which accounted for one third of the deaths in months 3-6 and almost 40 % in months 7-12.

More than half of the deaths in 1800-02 are recorded under the heading 'reason unknown', which makes it hard to draw any far-reaching conclusions. Fever was given as the cause for some of the deaths and a few children
Table 3 a-b. Infant mortality and causes of death 1800-1802 and 1810-1812 in Nedertoerna. Number of deaths among 1 000 live births.

<table>
<thead>
<tr>
<th>a. 1800-1802</th>
<th>Age at death</th>
<th>1st week</th>
<th>2-4th week</th>
<th>2nd month</th>
<th>3-6 month</th>
<th>7-12 month</th>
</tr>
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<tbody>
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<tr>
<td>'Unknown'</td>
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<td>26.0</td>
<td>109.0</td>
<td>50.0</td>
<td>72.0</td>
<td>2.9</td>
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<td>8.8</td>
<td>8.8</td>
<td>19.0</td>
<td>29.2</td>
<td></td>
</tr>
<tr>
<td>Whooping cough</td>
<td>-</td>
<td>5.8</td>
<td>11.7</td>
<td>51.1</td>
<td>30.7</td>
<td></td>
</tr>
<tr>
<td>Cough</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Gripes and colic</td>
<td>-</td>
<td>8.8</td>
<td>8.8</td>
<td>8.8</td>
<td>7.3</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>3.0</td>
<td>1.5</td>
<td>3.0</td>
<td>11.7</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>32.0</td>
<td>134.0</td>
<td>80.0</td>
<td>162.0</td>
<td>79.0</td>
<td></td>
</tr>
</tbody>
</table>

Total number of born children: 685

b. 1810-1812 | Age at death | 1st week | 2-4th week | 2nd month | 3-6 month | 7-12 month |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>Cause</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>'Unknown'</td>
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<td>27.8</td>
<td>73.6</td>
<td>6.9</td>
<td>37.5</td>
<td>16.5</td>
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<tr>
<td>Fever fits</td>
<td>1.4</td>
<td>1.4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Whooping cough</td>
<td>-</td>
<td>1.4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Cough</td>
<td>4.1</td>
<td>16.7</td>
<td>6.9</td>
<td>22.2</td>
<td>20.8</td>
<td></td>
</tr>
<tr>
<td>Gripes and colic</td>
<td>2.8</td>
<td>56.9</td>
<td>20.8</td>
<td>30.6</td>
<td>18.1</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>2.8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>38.0</td>
<td>150.0</td>
<td>35.0</td>
<td>94.0</td>
<td>56.0</td>
<td></td>
</tr>
</tbody>
</table>

Total number of born children: 720

Source: Church Records of Ala-Tornio and Nedertoerna, The Provincial Archive, Harnosand.

were said to have suffered from digestive diseases. The 'unknown factor' is a little smaller in 1810-12, but still above 40%. One observation worth making, namely that at least one third of all deaths during weeks 2-4 are said to have been caused by 'pains in the stomach'. This figure is 60% for the second month and 30% for months 3-6. This information reinforces our theory.

If we take for granted that infant mortality was high in Nedertoerna at the beginning of the nineteenth century because the mothers did not breast-feed their children, why did the change come so quickly, and do we have any data to support our belief that the decline must have been caused by a higher frequency of breast feeding? First of all, we know that mothers breast-feed their children in Nedertoerna today. If the custom was different previously it must have changed at some time. Secondly, the de-
cline was more significant during the first months of life, which we would have had reason to believe from our theory. In 1870-94 the level of mortality during the first two months in Nedertorneå, was not substantially higher than the Swedish average, but it was still much higher during the last months of the first year of life.

4.3. What happened in Nedertorneå?

The theory also needs a plausible explanation of the rapid change. This cannot be given using statistical methods only. We must look for evidence in as many qualitative sources as possible to find proof, and this will also be done. So far we have already found a number of facts and statements that supports our theory. Contacts between the population of Nedertorneå and medical science were not very frequent during the eighteenth century. The 'next-door' provincial physician lived in Umeå, about 400 kilometers south of Nedertorneå. In 1780 the small Finnish town of Torneå on the eastern side of the river procured a doctor of its own. He observed the high mortality rate in connection with the lack of breast-feeding and tried to obtain assistance from Swedish central authorities but with little results. His own attempts and those of his followers to change the nutritional pattern were not successful, judging from their frequent complaints during the following decades.

The interest of Nedertorneå in the eyes of central authorities grew substantially after 1809, when all of a sudden it became situated on the border to Russian territory. More civil servants arrived and attempts were made to build a new town, finally successful after some 20 years. The growing middle class was obviously concerned about mothercare and childbirth, since they - despite hard resistance from the farmers - managed to get a decision by the local parish administration that a midwife should be appointed who was appropriately educated in Stockholm. The midwife arrived in 1837, at about the same time as the decline in infant mortality started in the middle class. Now the provincial doctor had an assistant who could pass on the message to the mothers. The doctor was also aware that he had to use the priest and other officials of the local parish administration in his campaign and so he did. An innovation started in the middle class and spread rapidly to the proletariat. Even the farmers changed their habits, although more reluctantly. The path of innovation was the same as during the campaign for vaccination against smallpox at the beginning of the nineteenth century and during the change from the system
of home education to primary schools in the middle of the century. The middle class was followed by the proletariat - which often lived in closer contact with the middle class and was easier to convince by threats - and finally reached the conservative and more distant farmers.

The result was a rapid decline in infant mortality. Once the farmers had accepted the new habits they enjoyed their fruits to an even greater extent than the other groups. It meant that mortality decreased during the first months of the childrens' lives, when nutrition was most vital. It also meant that the high mortality rate among the newly born children declined considerably during the hot summer, when contaminated artificial food could be fatal. The growth of the town of Haparanda had on the other hand a negative effect on the children of the middle class and the proletariat living there. Population density increased, human contacts became more intensive and hygienic conditions probably deteriorated in the town but not in the countryside. The civil servants and the commercial class who had started the process of better nutrition for their children had also been the active promoters of urbanization. They reaped a harvest that was not altogether a good one.

5. Generalization and further research

Considering the interpretations given above, can we make any generalizations about the patterns of infant mortality during the first phase of the Swedish demographic transition? Can we for instance say anything about the geographical variations? We may assume that population density and the intensity of human contacts have an impact on the differences between town and countryside and - in the case of Sweden - also on the differences between coast and interior. This theory is confirmed by what happened to the middle class and the proletariat in Nederornea during the growth of the town of Haparanda.

This theory has also been supported by other observers, but one must also look for other explanations, especially when the pattern is broken. We need more empirical evidence to account for the high mortality rate among the nomads. Unexpectedly high IMR's in relatively sparsely-populated and relatively isolated areas such as parts of the county of Västernorrland and the parish of Nederornea are also more difficult to understand using a simple theory. We have maintained that endogenous factors are hardly a possible explanation of this phenomenon. The same thing can be said about
purely economical factors. Crosstabulation of many variables has, of course, its risks when dealing with a small population and one single parish.

The most plausible explanation is that cultural habits also play their part. Nedertorneå is probably an extreme example of a parish where the pattern of breast-feeding played an important role in deciding the level of infant mortality during the nineteenth century. There are other areas in Finland where the same factor is said to have been operating and there is also reason to believe that artificial feeding of young children raised the IMR in some parts of Sweden besides Nedertorneå. These patterns and their change should be examined in more detail. The impact of breast-feeding patterns on the national figures should be studied further. The result might be that it was of a marginal significance on the national level during the general decline in nineteenth century Sweden. So far, however, we know too little to say anything decisive about it. Aggregate figures could hide diverging tendencies in different social groups, to mention one confusing circumstance. More consideration should, however, be given to cultural factors in general, when the level of infant mortality and its changes in nineteenth century Sweden are discussed. Hygienic factors contribute to the level of infant mortality, for instance the treatment and distribution of milk. Hygiene is partly a matter of economic standard, but it is also influenced by attitudes and education.38

The level of education and open mindedness to innovation is crucial for a change of habits. This is shown by the different pace in adopting new habits in Nedertorneå. This can also explain the relatively low rates of IMR in the iron foundries of Sweden despite a relatively high population density and many contacts with the world outside. The population of the iron foundries was influenced by its closeness to the priest and the patriarchal administrators of the foundry. The foundries procured trained midwives at an early stage and some of them had a physician of their own.39

One way of bringing more order into the discussion would be to add together the results of a lot of data already available from different investigations and, among other things, look at them in the light of what has been said above. One of the authors of this article has, for instance, found it fruitful to reconsider the results from two cohorts of children born in an area with a high IMR and from the iron foundries in the county of Västernorrland, looking more closely at the distribution of deaths within the first year of life and the registered causes of deaths. The results point at a higher infant mortality rate during the first months of life in
the area with a high IMR, although not as pronounced during weeks 2-4 as compared with Nedertorneå. Causes of death and statements of provincial physicians are compatible with the theory of the effects of a low frequency of breastfeeding. As in Nedertorneå there are signs of a more rapid decrease of mortality among the proletarized children, and especially a pronounced decrease during the first months.40

Secondly, we need more empirical data from different regions and from a longer period of time than in this article in order to identify regions with different levels and to describe the development over a longer period of time. Much can already be done by using the statistical tables for parishes and deaneries produced by the priests. A closer examination of the high infant mortality rate in the city and county of Stockholm would be of great value, especially considering the distribution of deaths within the year and in some cases also a look at social differences over a longer period of time. The low IMR in the county of Jämtland should be a subject for closer examination, among other things to find possible reasons for an almost 'ideal' state in nineteenth century Sweden.

More variables can be brought into the discussion when we study the 'database parishes'. We have reason to expect large differences in infant mortality between families in the same social group and also between different generations. An investigation of mortality on the village level can give detailed information about the spatial distribution. Individual data about the success of the campaign for vaccination against smallpox exist in the records. In the case of Nedertorneå it would also be interesting to study interrelationships between infant mortality and ethnicity using the results of current linguistic research into family names and ethnic origin in the same parish. This question becomes even more interesting when we consider the high IMR found on the Finnish side of the border and the apparently lower rate not so far to the south of Nedertorneå, where the population is Swedish-speaking.

Crosstabulation of many variables has, of course, its risks when you are dealing with a small population and one single parish. Hypotheses can, however, be produced and methods can be tested while we are waiting for a whole region to appear in the computer, where different levels of IMR exist in different parts of the region.

Finally, we have to look for evidence in contemporary qualitative sources. There is a vast number of interesting reports from the provincial physicians and midwives from all over Sweden from the eighteenth century onwards. The Swedish Medical Board published a number of reports and investigations on this subject. County governors delivered reports every
five years, which contain information about the conditions within the coun-
ties including health conditions. On the parish level minutes of the bi-
shop's visitsations and the records of the parish general meetings and the
meetings of the parish councils are sources of information. Official committe
reports, private investigations by dedicated priests and diaries of travel-
ers through a region are other examples. It would demand a great deal of
work to realize all these sincere wishes for more research, but the ques-
tions are, in our opinion, important enough to legitimate all the efforts
required.

6. Conclusions

We know surprisingly little about patterns of mortality in the past. This
article has been discussing infant mortality in Nedertorneå particularly.
During this period infant mortality in Sweden was an important part of the
crude death rate. Its decline was, on the other hand, substantial up until
1900, and thereby a major cause of rapid population increase and proleta-
ization. The differentials were, however, great between regions, social
groups, sexes and age groups (even within the children's first year of
life).

Several factors affect infant mortality, among them biological heritage
and other endogenous circumstances, population density, social and econo-
mical conditions (e.g. quantitative supply of food) and cultural habits.
Many differentials and the change of them over a long period of time
cannot be explained exclusively by non-cultural factors, although it is
reasonable to believe that population density for instance was important.

This investigation has shown that cultural factors can obviously influence
the level of infant mortality, its differences over the first year of
life, its distribution during the calender year and changes in social groups
over a long period of time. The composition of the infants' food, absence
of breast-feeding and presumably a lack of knowledge about hygienic child
care among the parents are the only reasonable explanations for the high
IMR in the parish of Nedertorneå during the first decades of the nine-
teenth century. This opinion is supported both by quantitative and quali-
tative evidence. Information spread by the provincial physicians and,
primarily, by educated midwives undoubtedly changed the attitudes and
habits of the parents and thereby drastically and rapidly reduced IMR to
half of its previous level. This seems to have taken place as a social
process, starting in the middle class. The farmers in the countryside were
the last group to accept the new pattern. The linguistic barrier may also have contributed to the farmers' reluctance.

Generalizations about infant mortality in other parts of Sweden cannot be made from this microdemographic study alone. There are, however, many statements from contemporary medical practitioners indicating that the conditions may very well have been similar in some other regions. The methods used in this article may be valuable when testing such a hypothesis. A micro-analysis in parishes with different levels of infant mortality and with different population density and social structure would bring us closer to understanding the pattern of infant mortality. Studies over a longer period of time may also reveal some important facts.
APPENDIX

Table 3. Number of children born in the four Data Base parishes, 1820-44, 1845-69 and 1870-94.

<table>
<thead>
<tr>
<th></th>
<th>Nedertorneå</th>
<th>Fleninge*</th>
<th>Trosa</th>
<th>Svinnegarn**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1820-44</td>
<td>2 006</td>
<td>644</td>
<td>570</td>
<td>630</td>
</tr>
<tr>
<td>1845-69</td>
<td>2 541</td>
<td>800</td>
<td>611</td>
<td>351</td>
</tr>
<tr>
<td>1870-94</td>
<td>3 559</td>
<td>575</td>
<td>689</td>
<td>441</td>
</tr>
</tbody>
</table>

* The last period is 1870-89
** The first period is 1803-20

Table 4. Number of children born in Nedertorneå in different social groups 1820-44, 1845-69 and 1870-94.

<table>
<thead>
<tr>
<th></th>
<th>1820-44</th>
<th>1845-69</th>
<th>1870-94</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle class</td>
<td>255</td>
<td>333</td>
<td>367</td>
</tr>
<tr>
<td>Farmers</td>
<td>700</td>
<td>701</td>
<td>709</td>
</tr>
<tr>
<td>Proletarians</td>
<td>1 051</td>
<td>1 507</td>
<td>2 483</td>
</tr>
</tbody>
</table>

Table 5. Number of children born in different months in Nedertorneå 1820-44, 1845-69 and 1870-94.

<table>
<thead>
<tr>
<th>Month</th>
<th>1820-44</th>
<th>1845-69</th>
<th>1870-94</th>
</tr>
</thead>
<tbody>
<tr>
<td>JAN</td>
<td>184</td>
<td>215</td>
<td>314</td>
</tr>
<tr>
<td>FEBR</td>
<td>168</td>
<td>215</td>
<td>257</td>
</tr>
<tr>
<td>MAR</td>
<td>173</td>
<td>210</td>
<td>263</td>
</tr>
<tr>
<td>APR</td>
<td>131</td>
<td>162</td>
<td>241</td>
</tr>
<tr>
<td>MAY</td>
<td>157</td>
<td>185</td>
<td>233</td>
</tr>
<tr>
<td>JUNE</td>
<td>133</td>
<td>202</td>
<td>299</td>
</tr>
<tr>
<td>JULY</td>
<td>168</td>
<td>224</td>
<td>311</td>
</tr>
<tr>
<td>AUG</td>
<td>177</td>
<td>234</td>
<td>288</td>
</tr>
<tr>
<td>SEPT</td>
<td>158</td>
<td>228</td>
<td>273</td>
</tr>
<tr>
<td>OCT</td>
<td>182</td>
<td>224</td>
<td>297</td>
</tr>
<tr>
<td>NOV</td>
<td>181</td>
<td>213</td>
<td>299</td>
</tr>
<tr>
<td>DEC</td>
<td>185</td>
<td>200</td>
<td>309</td>
</tr>
</tbody>
</table>
Table 6. Number of children born in five year periods in different social groups. NedarTorneå 1820-94.

<table>
<thead>
<tr>
<th></th>
<th>Middle class</th>
<th>Farmers</th>
<th>Proletarians</th>
</tr>
</thead>
<tbody>
<tr>
<td>1820-24</td>
<td>30</td>
<td>146</td>
<td>178</td>
</tr>
<tr>
<td>1825-29</td>
<td>39</td>
<td>119</td>
<td>223</td>
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<tr>
<td>1830-34</td>
<td>34</td>
<td>124</td>
<td>204</td>
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<td>1835-39</td>
<td>60</td>
<td>156</td>
<td>184</td>
</tr>
<tr>
<td>1840-44</td>
<td>71</td>
<td>140</td>
<td>229</td>
</tr>
<tr>
<td>1845-49</td>
<td>60</td>
<td>124</td>
<td>258</td>
</tr>
<tr>
<td>1850-54</td>
<td>50</td>
<td>139</td>
<td>246</td>
</tr>
<tr>
<td>1855-59</td>
<td>62</td>
<td>143</td>
<td>275</td>
</tr>
<tr>
<td>1860-64</td>
<td>73</td>
<td>160</td>
<td>337</td>
</tr>
<tr>
<td>1865-69</td>
<td>68</td>
<td>121</td>
<td>313</td>
</tr>
<tr>
<td>1870-74</td>
<td>52</td>
<td>117</td>
<td>337</td>
</tr>
<tr>
<td>1875-79</td>
<td>57</td>
<td>124</td>
<td>476</td>
</tr>
<tr>
<td>1880-84</td>
<td>72</td>
<td>126</td>
<td>538</td>
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<tr>
<td>1885-89</td>
<td>74</td>
<td>153</td>
<td>541</td>
</tr>
<tr>
<td>1890-94</td>
<td>74</td>
<td>149</td>
<td>428</td>
</tr>
</tbody>
</table>
NOTES


2. Eilert Sundt, Om dödligheden i Norge. Bidrag till Kundskab om Folkets kaar (Christiania, 1855). The same regional pattern existed for infant mortality in Norway during the 1880's. Axel Johannesen, Dödligheten i Norge af Børn under 1 Aar (Christiania 1902).


4. Johan Hellstenius, 'Barnadödligheten i Västernorrlands och Jämtlands län', Statistisk Tidskrift, Map (1844). Emil Nilsson continued the discussion of the regional differences in a dissertation 1889. Using Hellstenius' figures and the result of a number of investigations concerning the impact of breast-feeding on infant mortality in Germany, Nilsson concluded that the quality and the composition of the food was the major factor explaining the regional differences in the area under study. Emil Nilsson, Om orsakerna till och botemeden mot den stora barnadödligheten i allmänhet och särskilt i Västernorrlands län (Stockholm 1889).

5. Sten Wahlund, Demographic studies in the nomadic and settled population of northern Lapland (Uppsala 1932), p 78f.


7. See for instance A-S Kälvenmark, 'The country that kept track of its population', Time Space and Man. Essays on microdemography. Reports from the Demographic Data Base 1. (Umeå 1979), for a discussion of the sources and for a bibliography of studies where the sources have been tested for different purposes. See also Jan Sundin, 'The Demographic Data Base at the University of Umeå', and R. Schofield, 'Microdemography and epidemic mortality' in Time Space and Man. Schofield's findings refer mainly to the period before 1800, when the sources were more incomplete than they became later.


11. In 1797 Sven A. Hedin published a handbook in 'Practical Medical Science' especially for the priests: Sven A. Hedin, Handbok för praktiska läkarvetenskapen (Stockholm 1797).


14. Olva Turpeinen, loc.cit. in footnote 6, p 12. Dutch data divided according to social status show lower IMR for the more wealthy groups. See the Dutch articles, loc. cit. in footnote 6.

15. Jan Sundin and Lars-Göran Tedebrand, article in this volume.


17. John Knodel and Hallie Kintner, loc. cit. in footnote 16.

18. Klas Lindroth, Dödsorsakerna och dödligheten i Stockholm 1871-1890 (Stockholm 1892), diargrammes 1 and V.


23. The importance of cultural factors and the level of knowledge has also been discussed by several authors. See for instance discussion and references to Sigismund Peller, 'Mortality, Past and Future', Population Studies, 1, 4 (1947/1948) and to Alfred Sauvy, General Theory of


26. Oiva Turpeinen, loc. cit. in footnote 6. Dutch authors, loc. cit. in footnote 6, refer to the same kind of complaints.


29. Provinsialläkarers ämbetsberättelser (Reports of the provincial physicians) at the Swedish National Archive, Sign. Å-1, Torneå year 1797.

30. Reports of the provincial physicians, loc. cit. in footnote 28, Torneå year 1807 and Nedertorneå year 1840. There are more of this kind of statements in Anders Brändström, 'Nu äro tiderns förändrade och bönderna med dem'. Spådbarnsödligheten i Nedertorneå 1820-94 (Times are changed and the farmers too. Infant mortality in Nedertorneå 1820-94), Mimeograph, Department of History (Umeå 1980).


33. Henrik Sandblad, loc. cit. in footnote 31, p 41.

34. Reports of the provinval physicians 1780-1810, loc. cit. in footnote 28.


40. Jan Sundin and Lars-Göran Tedebrand, loc. cit. in footnote 15.