Infant Mortality in Nineteenth Century Denmark

Regionality, Feeding Habits, Illegitimacy and Causes of Death

Anne Løkke

Nineteenth century Denmark experienced a growth in population more rapid than most other European countries. This growth was primarily based on a relative low infant and child mortality in the European context and an emigration rate lower than that of the other Scandinavian countries. Seen in this perspective, in a very concrete sense the future of the Danish nation was created in the nurseries.

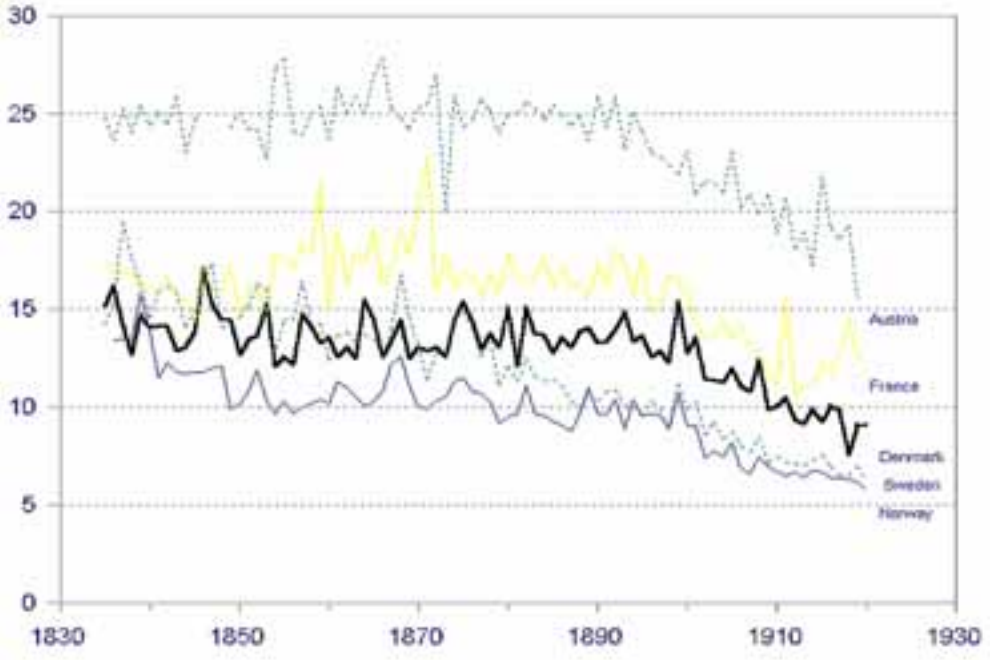
This study concentrates on mapping infant mortality in nineteenth century Denmark as an example of the composition of the infant mortality in a low mortality country: How homogeneous was infant mortality? Which groups bore the brunt of excess mortality and which groups got off with less? By what means was the low level maintained? First, however, a few words should be said on levels and trends.

Levels and Secular Trends, 1835–1920

The national average infant mortality rate (IMR), 1835 to 1900, was low in Denmark compared to most European countries, 13–15 percent (Figure 1), and the IMR remained relatively stable throughout the period, apart from the 15 percent peak in the late 1840s, when Denmark was struck both by war and the failure of potato and grain harvests (Figure 2).

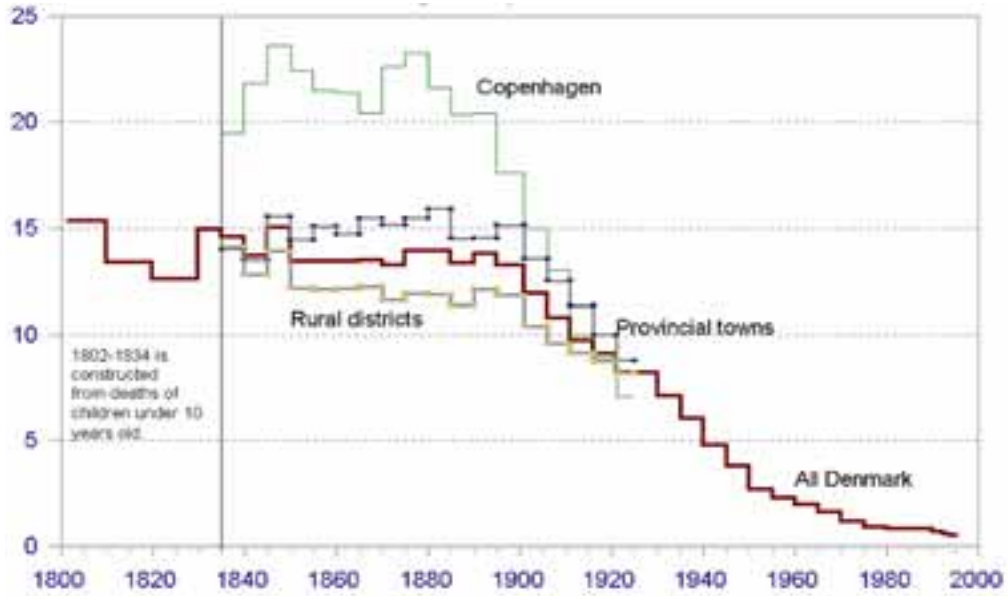
There was, however, a distinct difference between the capital and the rest of the country: the level in Copenhagen was 20–24 percent with marked peaks in the 1840s and 1870s. The average in the rural districts was 12–14 percent with the highest rates and the greatest fluctuations from 1835 to 1849, while from 1850 to 1900, the rate

Figure 1. Deaths in the first year of life per 100 live births, 1835–1920.



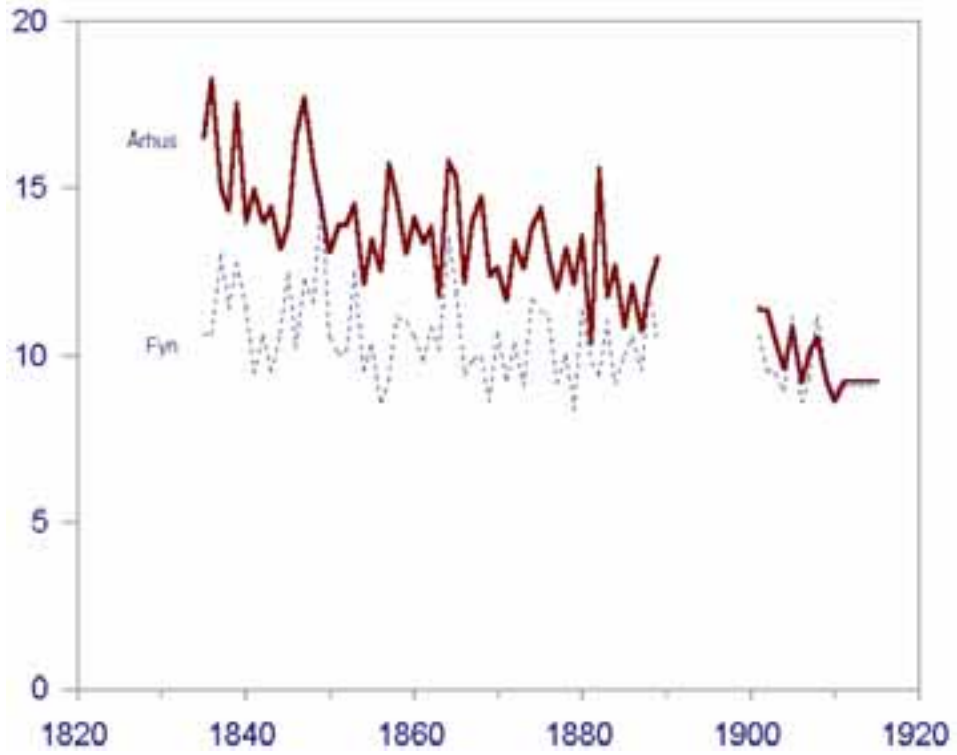
Source: Mitchell (1980), *European Historical Statistics* 137–141.

Figure 2. Deaths of infants in the first year of life per 100 live births, Denmark 1802–1995.



Source: For 1835–1996, see Løkke, *Døden i Barndommen*, 478. 1802–1834 is constructed for this paper from the number of deaths under age 10, based upon the assumption that the number of deaths under one year of age was the same proportion of all deaths under age 10 in the periods 1802–1809, 1810–1819, 1820–1829, and 1830–1834, as it was in 1835–1839.

Figure 3. Deaths in the first year of life per 100 live births, Århus and Fyn dioceses, rural districts, 1835–1915.



Source: Statistic Tabelværk concerning marriages, births, and deaths. Sources for 1890–1899 are missing. For 1911–1915, only the average exists.

was more stable, about 12–13 percent. The provincial towns had a level closer to that found in the rural districts, but with a tendency to rise during urbanization. In the 1830s, nine percent of the births in Denmark were in Copenhagen, ten in percent provincial towns and 81 percent in rural districts. Around 1900 the corresponding distribution was 19 percent, 20 percent and 61 percent.[1] This means that during the period an increasing number of infants were exposed to the higher mortality levels of the capital and towns. The great decline in IMR started in Copenhagen in the 1880s, followed by the provincial towns and the rural districts from 1900.

1 "Befolkningsforholdene i Danmark i det 19. Aarhundrede," *Statistisk Tabelværk,* 5. rk., litra A, nr. 5, (København., 1905), 106–107.

Regional Differentials in the Danish Countryside, 1835–1920

There were obvious regional variations in IMR in the rural districts aggregated at the diocese (*stift*) level (Figure 3).[2] Aggregated at district (*herred*) level, 1835 to 1874, the differences are even more marked (Maps 1, 2, and 3).[3] There are districts with a stable IMR of six to ten percent, and there are districts that are equally stable with an IMR of 18–24 percent. But most districts showed a tendency to decline one or two levels between the 1830s and the 1850s, some of them going from the next highest (16–18%) to the lowest (6–10%) level.

It should be noted that the level in the Danish regions with the highest mortality (18–24%) was much lower than in the high level regions in Iceland, Sweden and Bavaria (30–50%). High mortality areas in Denmark would be called low mortality areas in an Icelandic context in the first half of the nineteenth century.

The minimum average level attainable for a parish for the period 1851 to 1868 was six to ten percent for the whole population and six to eight percent for legitimate infants. The same minimum level is found in aggregated figures at the parish level in Norway and among the royal families of Europe in the nineteenth century.[4] This IMR, six to eight percent, seems to be the minimum level that a population selected by criteria other than infant mortality could reach before the great mortality decline around 1900.

Regional Differences in Provincial Towns, 1835–1920

The regional levels of the rural districts recur in the provincial towns located in the same region (Figure 4). Most distinctive in the early period was the very small town of Mariager, with its 564 inhabitants; located in a high mortality area, it had the second highest IMR after Copenhagen which had 120,819 inhabitants.

Urbanization did not have the same effect on all towns. Odense, found in a low mortality area, experienced considerable growth without an increase in IMR, while Randers, in a high mortality area, saw an increase from 15 percent in the 1830s to more than 20 percent in the 1870s.

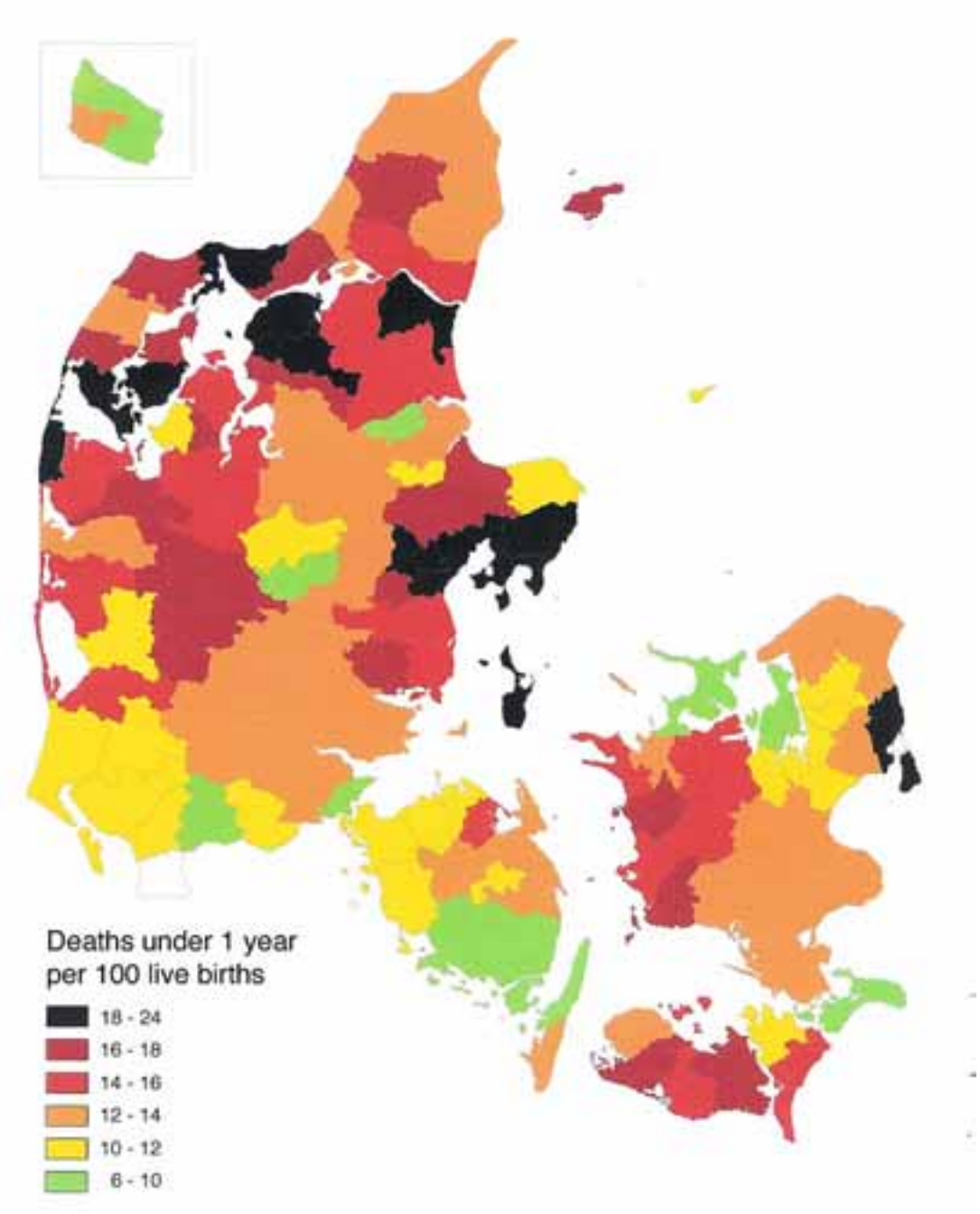
---

2 *Statistisk Tabelværk* over ægteviede, fødte og døde, all volumes concerning 1835–1920.

3 The maps are derived from the clergymen's annual lists submitted to the central authorities. First published in Anne Løkke, *Døden i Barndommen – Spædbørnsdødelighed og moderniseringsprocesser i Danmark 1800 til 1920* (København, 1998), 144 I–III, where the tables can also be found, 482–493. It is possible to access my computerized lists from The Danish Data Archives http://www.dda.dk/index.html, study number DDA-4485 (Løkke).

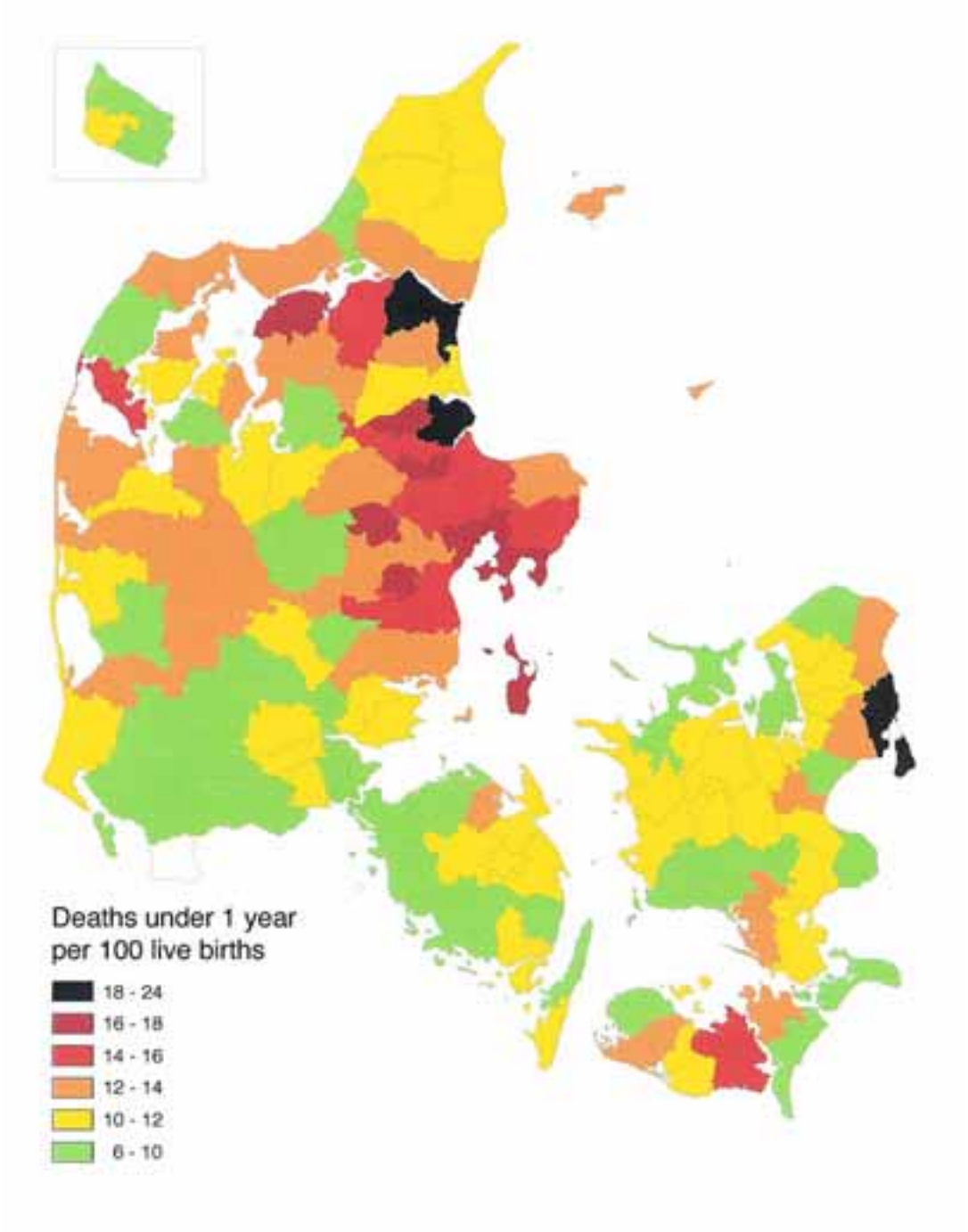
4 Harald Westergaard, Die Lehre von der Mortalität und Morbilität (Jena, 1901), 402.

Map 1. Infant mortality in Denmark, rural districts, 1836–1840.



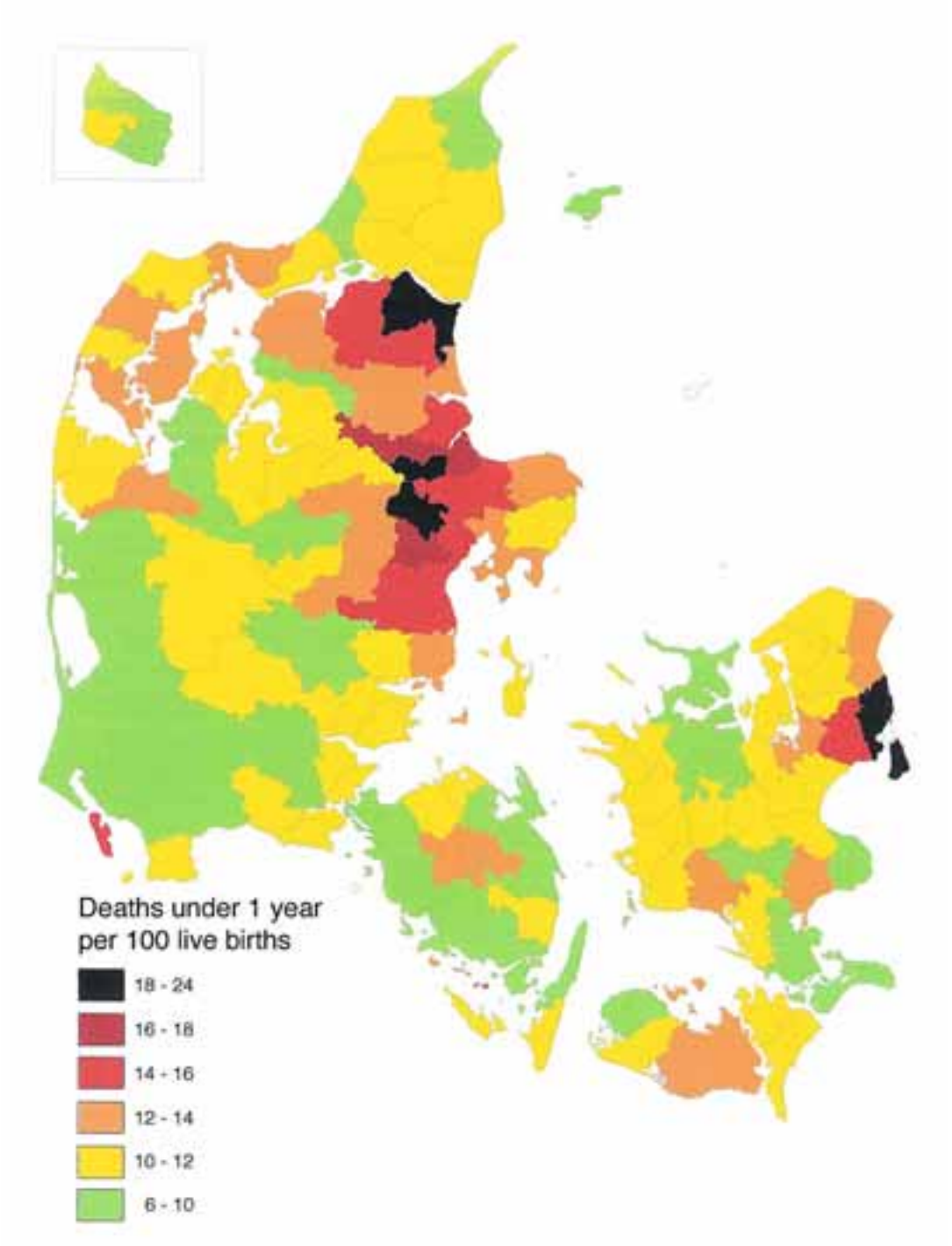
Source: *Døden i Barndommen – Spædbørnsdødelighed og moderniseringsprocesser i Danmark 1800 til 1920*, Bilag 2.3a.

Map 2. Infant mortality in Denmark, rural districts, 1850–1854.



Source: Løkke, *Døden i Barndommen – Spædbørnsdødelighed og moderniseringsprocesser i Danmark 1800 til 1920*, Bilag 2.3a.

Map 3. Infant mortality in Denmark, rural districts, 1870–1874.



Source: H. C. Sager, *Dødeligheden blandt de Nyfødte,* (Rudkjøbing, 1877).

Figure 4a. Deaths in the first year of life per 100 live births in some provincial towns, 1835–1844.

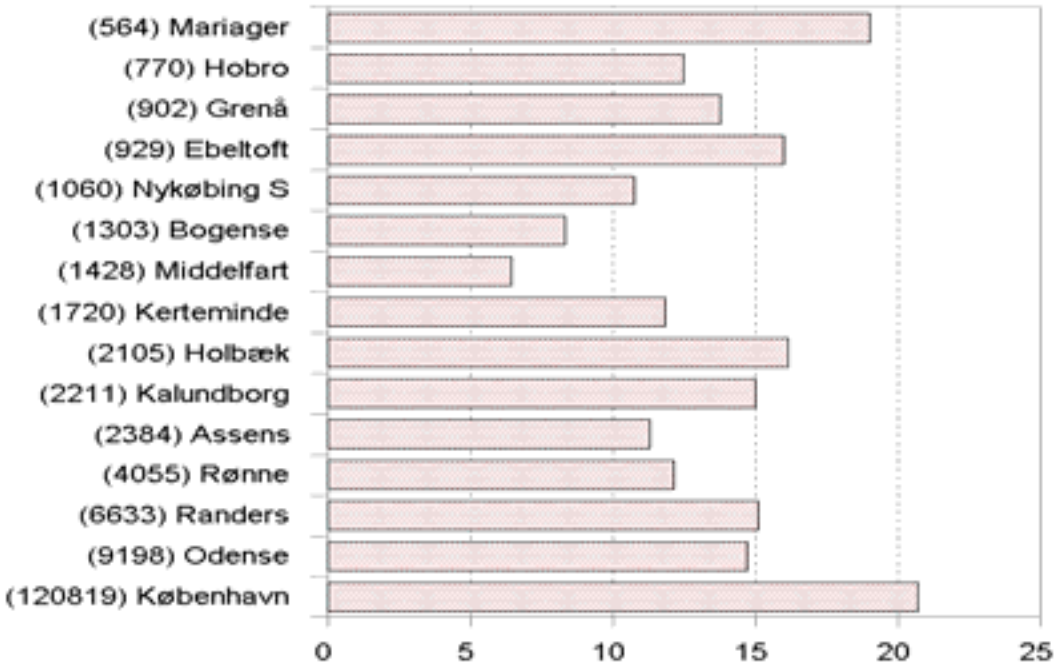
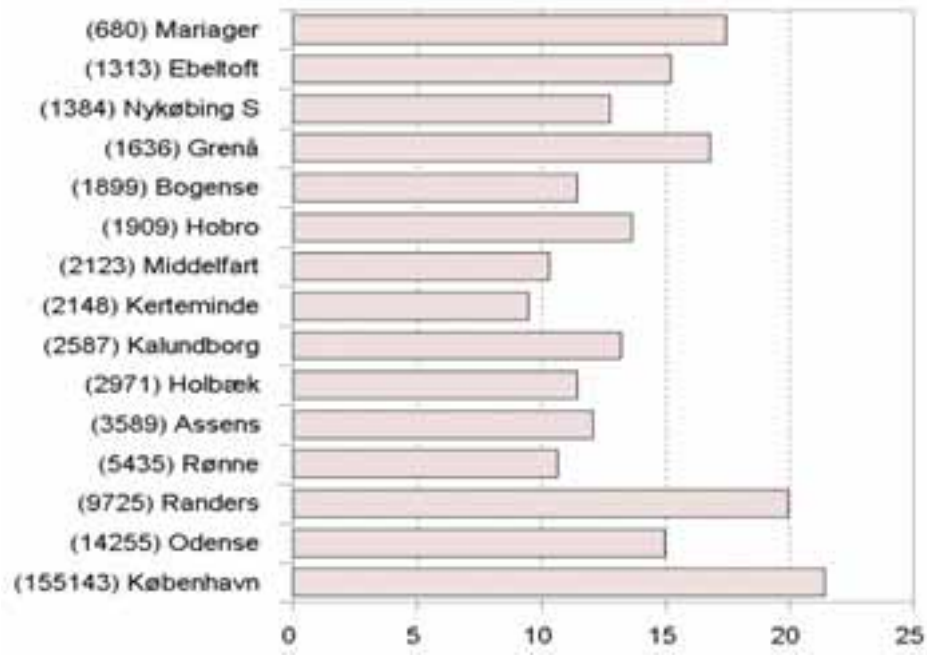
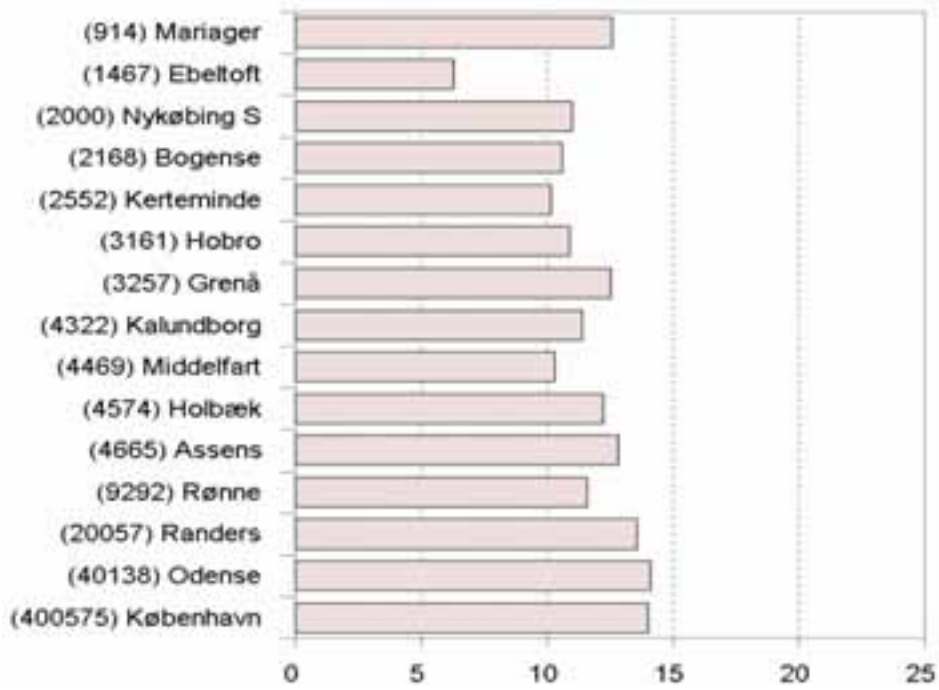


Figure 4b. Deaths in the first year of life per 100 live births in some provincial towns, 1860–1868.



Source: Løkke, *Døden i Barndommen*, bilag 2.9 and *Befolkningsforholdene* (1905), S.T. 5 rk. Litra A, nr, 5 s. 17. Number of inhabitants 1840 in parentheses.

Figure 4c. Deaths in the first year of life per 100 live births in some provincial towns, 1901–1910.



Source: Løkke, *Døden i Barndommen*, bilag 2.9 and *Befolkningsforholdene* (1905), S.T. 5 rk. Litra A, nr, 5 s. 17. Number of inhabitants 1840 in parentheses.

Regionality and Social Differences in Provincial Towns and Rural Districts, 1835–1920

In rural areas and small towns, 1820 to 1879, the IMR of the clergy, the officials and the great landowners was low (approximately 10 percent). Among the peasant population, however, region was as important a variable as wealth, and the relationship was not the same from region to region. In some regions quite wealthy farmers and poor farm workers had the same low IMR (10% for all births, 6–8% for the legitimate). In other regions the poorest part of the population had an excess IMR, especially before 1850. In some high mortality regions, however, wealthy farmers and poor farm hands both had high IMR levels (18–24%) before 1850. But after 1850 the levels split in a direction opposite to what might be expected: farm owners, a fairly well-off middle class accounting for half the rural population, still had a high IMR, while the rate declined among farm workers. In the areas where a high IMR was maintained into

the 1870s, the result was that the poor farmhands had a lower IMR than the economically well-off farm owners.[5]

From 1911 the official statistics provide the number of deaths and the number of mothers giving birth distributed by occupation of the head of the household. The mortality rate for infants calculated from this material is not completely comparable with the IMR in general, because twins count as one birth and still-born are counted as being born, but not as dead. With these reservations in mind, rates may be calculated for the legitimate infants of various occupational groups the years 1916–1920: workers in crafts and industries, 9.4 percent; rural workers, 8.3 percent; farmers, 6.9 percent; and higher social groups (high officials, doctors, etc.) five percent. For illegitimate births the rate in the provincial towns was 17.8 percent and in the rural districts, 15.5 percent.[6] In the countryside and the provincial towns the great decline seems to have occurred first in the wealthiest and more educated part of the population.

Regionality Patterns?

No coast-inland pattern can be observed on any of the maps, and the maps do not give rise to hypotheses about any single cause which might determine similar infant mortality level all over the country. For example, the island of Bornholm (the square insert upper left on the maps) was characterized by isolated farmhouses. The western parts of Fyn (the big island in the middle of Denmark), on the other hand, had a high population density and many villages where small crofters lived very close to one another. Yet both were low mortality areas. The same goes for the quality of the farmland and the size of the farms. There are high and low mortality areas spread thoughout regions uniform in these respects, while some very heterogeneous regions have similar rates of infant deaths. That does not mean that these factors are without influence on the IMR, but rather that they do not have such a strong effect that they overshadow other causes. In this current project I have refrained from examining these factors.

One pattern can be observed on the maps: rural districts in the immediate neighborhood of a larger town show a tendency to higher levels than other districts. For Copenhagen it is quite evident from others sources that the metropolis was surrounded by suburban slum areas recorded as rural districts. However, this is not the case for many of the smaller towns. The impact of the provincial towns on the

5 Th. Sørensen, Børnedødeligheden i forskjellige Samfundslag i Danmark (København, 1883).

6 *Statistisk Tabelværk* 5. Rk. litra A No.15, 28–29 and 42–45.

surrounding area still needs to be examined in detail. From my study it is clear, however, that neither the size nor the growth of the town determines the exact level of IMR. But (in the nineteenth century) growth of a town meant a rise in infant mortality in the surrounding rural district, while the proximity of a larger town had a tendency to inhibit the attainment of the lowest level of infant mortality, six to ten percent.

A pattern linking IMR at the district level to the rate of still-births or the rate of illegitimacy does not emerge from my material (Figures 5a, 5b, 6a and 6b). There is no systematic correspondence between the distribution of IMR levels and districts with few or many still-births. The same goes for the distribution of districts according to the illegitimacy rates.

The most spectacular IMR pattern that can be observed from the maps is in the eastern part of the Jutland Peninsula. This area did not experience the same decline in the IMR as the rest of the rural districts from the 1830s to the 1850s and during the 1870s. On the contrary, in the 1870s this part of Denmark stands out as having an IMR rate distinctly higher than the rest of the rural districts. This has given rise to the question as to what the rural districts in the eastern part of Jutland had in common and what distinguished them from the rest of the country?

Resistance and Exposure

To work with this question it is necessary to decide which factors to examine and to develop a way of treating the interference of the broad range of factors which in other studies have proven to influence the level of IMR: for example, climate, population density, legitimacy, order of birth, confession, age of parents and feeding practices. Many attempts have been made to group these factors or to order them in a hierarchy, but they seem to elude this kind of order. It is always possible to discuss whether, for example, unsuccessful breast-feeding is a biological, social, economic or cultural factor.

To capture the interlinked nature of the factors influencing the level of IMR in a non-hierarchical way, I have developed a model that treats the level of IMR as an unstable balance between resistance and exposure.[7] This model makes visible ways in which the same level of IMR in two populations may be caused by different factors, and how the same build-up of resistance may produce a different IMR, if exposure is changed.

7 The model is inspired by Jan Sundin, "Spädbarnsdödelighet och kulturelle faktorer i 1800-talets Sverige," *Bibliotek for Læger,* december (1993), 384–399, but differs from Sundin's model in the way it leaves room for any factor which in the future may be proven to affect the IMR.

Model 1 showing the level of infant mortality as a function of the balance between exposure and resistance. Many factors can increase or diminish exposure as well as resistance.

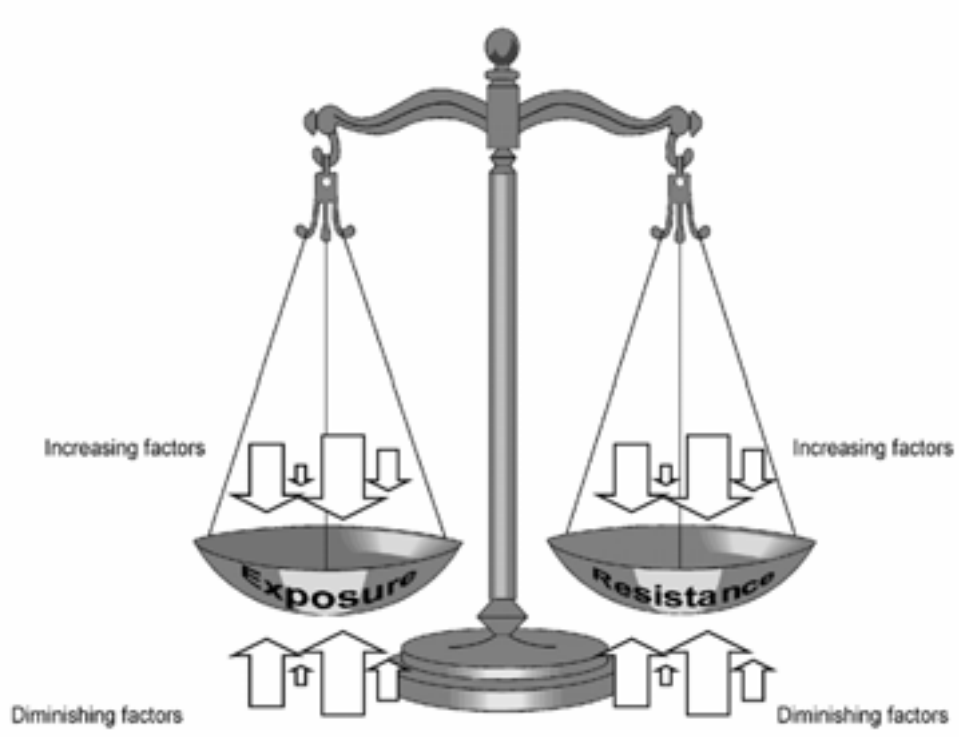
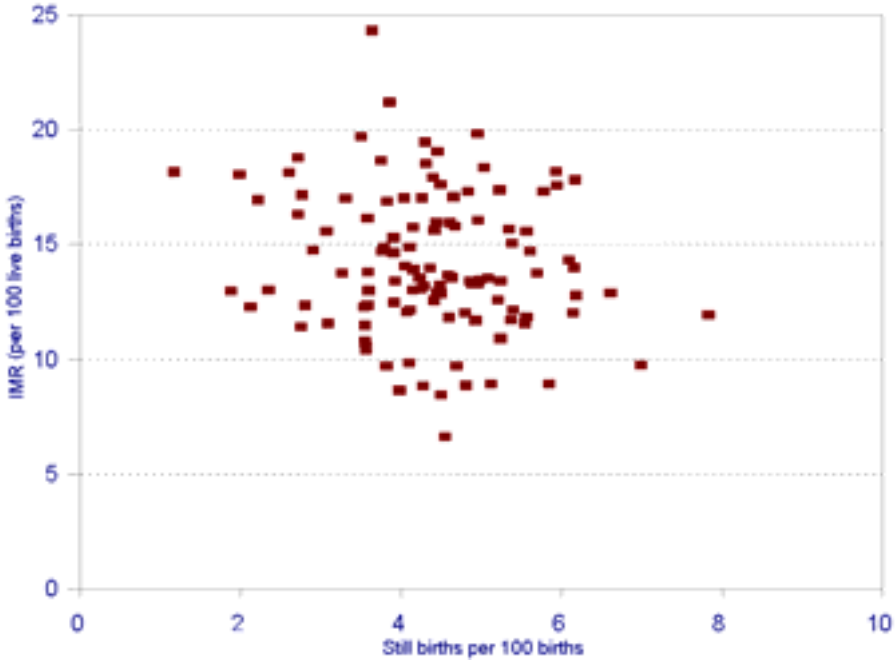
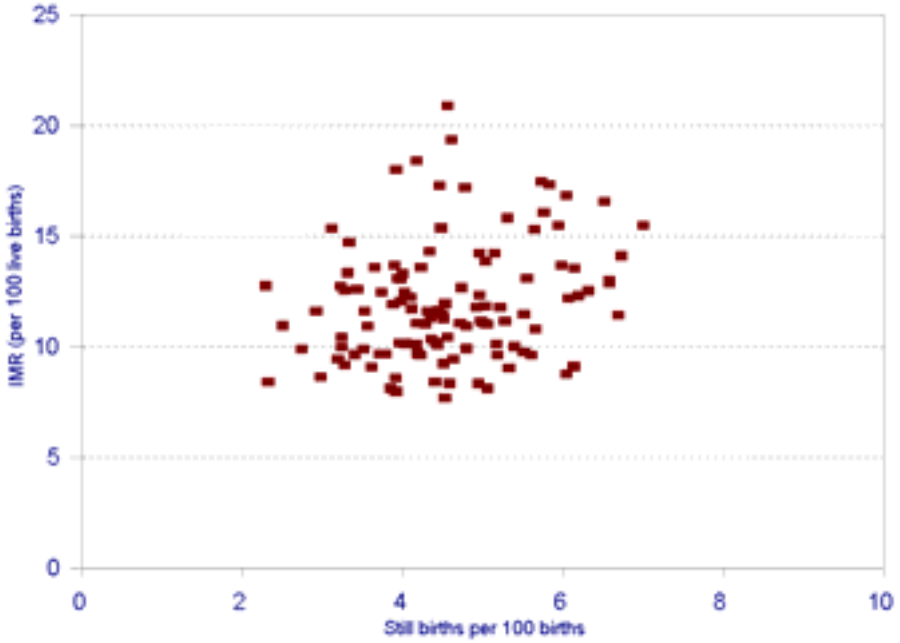


Figure 5a. Stillbirths and IMR in rural districts, 1836–1840.



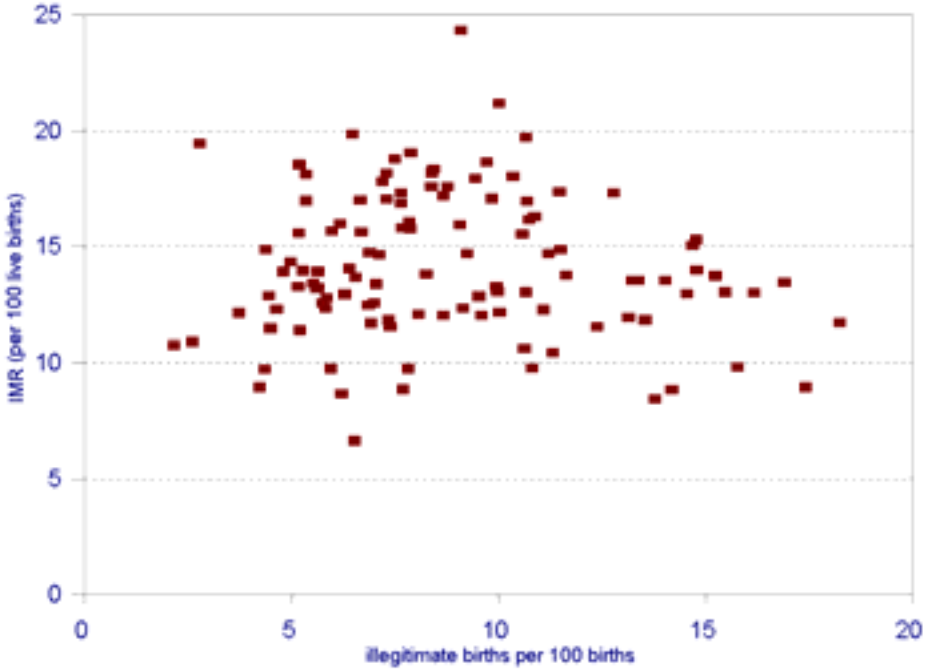
Source: Løkke, *Døden i Barndommen*, bilag 2.3a.

Figure 5b. Stillbirths and IMR in rural districts, 1850–1854.



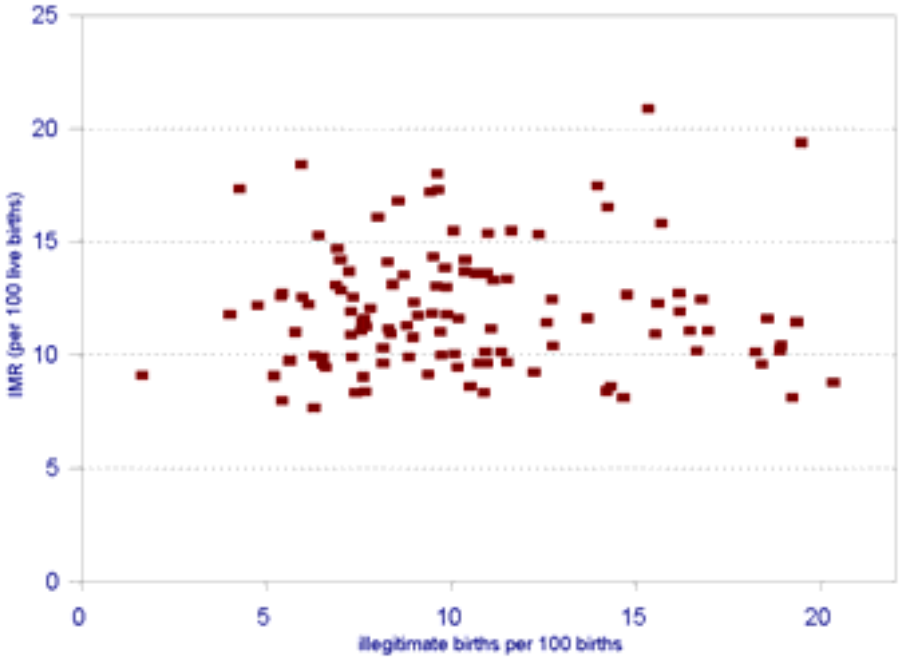
Source: Løkke, *Døden i Barndommen*, bilag 2.3a.

Figure 6a. Illegitimacy and IMR in rural districts, 1836–1840.



Source: Løkke, *Døden i Barndommen*, bilag 2.3a

Figure 6b. Illegitimacy and IMR in rural districts, 1850–1854.



Source: Løkke, *Døden i Barndommen*, bilag 2.3a

Breast-feeding

Among historical demographers there is agreement that breast-feeding is a key factor in determining the infant mortality level. A connection between regional differentials and lack of breast-feeding in high mortality areas has long been acknowledged for Iceland, Sweden and Germany. There IMR levels of around 30–50 percent of live births are not unusual in areas where breast-feeding was not in use in the nineteenth century.

In nineteenth century Denmark, however, breast-feeding was prevalent throughout the country. Although no regions or areas have been found where breast-feeding was not the normal way of nursing, there were still very marked regional differentials in the Danish nineteenth century infant mortality rates. The main argument in this article is that breast-feeding is not just breast-feeding. The way breast-feeding is administered can be very different and have very different effects measured in terms of infant mortality.

The massive reporting of breast-feeding in nineteenth century Denmark could encourage concentration on the exposure side of the model, a very relevant study which has still to be done in Denmark. However, I have chosen to start from the

resistance side of the model or, more precisely, the factors thought to increase resistance. While a lot of factors are known to reduce the resistance of infants, only a few can increase it, the most important of which is breast-feeding.[8]

In the demographic literature breast-feeding is often described as a one-zero variable: either breast-feeding exists or not. Breast-feeding results in low infant mortality, lack of breast-feeding in high mortality. Generally speaking, this reasoning is not false, but it is rather crude. My work with the infant care literature of two centuries has shown that there are very different ways of administering breast milk. The period of breast-feeding may be long or short, extra sustenance may or may not be administered, the infant may be fed by the mother or by a wet nurse, the infant may be allowed only a restricted number of occasions and/or limited time at the breast, or there may be no restrictions or unsystematic breast-feeding. The status of nutrition of the mother and her diet during breast-feeding also affect the composition of the milk. Likewise her ability to produce the increasing amount of milk demanded by the growing infant is affected by numerous factors.

All these differences must be assumed to affect the performance of breast-feeding as a resistance-building factor. The task to undertake is then to discover if different breast-feeding regimes existed in nineteenth century Denmark and to establish if they in some systematic way were related to the IMR level. To accomplish this, I have examined eight districts (*herreder*) that were chosen to cover both high mortality areas, low mortality areas and some in between.

Before examining breast-feeding in nineteenth century Denmark, however, it is necessary to discuss how to determine whether one practice is healthy and another unhealthy for infants, in other words to discuss the biological requirements of infants.

The Biological Requirements of Infants

Determining the biological requirements of infants is not straightforward. The infant cannot be seen as a piece of nature or a biological constant, the universal physical requirements of which can be discovered once and for all. The first problem is that the purely biological infant is not accessible as an object of research: a specific infant is always part of a specific environment and a specific culture which determine what effect a given treatment produces in an infant. The infant, however, is not infinitely plastic either, although its requirements can be met in many ways. The IMR varies more intensely than the mortality of older children and adults, a fact that shows that the biological limits for adapting to the cultural environments are more restricted for

8 Other known resistance-building factors are vaccination and good health of the mother while growing up, as well as during pregnancy.

infants. But even the bodies of adults have their biological limits. The biological requirements of bodies may be thought of as zones of response. In the center a limited zone of "best practices," where the biological response is a minimal mortality. Around this zone there will be an area with and endless number of practices which do not fulfil the biological requirements and thereby increase mortality more or less.

The next problem is that the scientists who try to discover the biological functions of infants are always bound by the discourses of their time and culture. Here are a couple of examples. In 1971 research sponsored by FAO/WHO concluded that the breast milk of healthy mothers was insufficient to satisfy the energy requirements of normal infants beyond three months of age. The deductions were based on a few selected points of measure and linear thinking that regarded the energy requirements of infants (kcal/kg/day) as a linear function of age. In 1981, when trust in nature began to be in fashion again, other FAO/WHO experts proved that the required energy intake drops rapidly during the first months of life and begins to rise again after the tenth month. The resulting U-shaped curve led the experts to conclude that breast milk alone satisfies the energy requirements of the average infant for the first six months of life.[9]

About 1970, in an era fascinated by technology, an American pediatrician established that: "formula feeding has become so simple, safe, and uniformly successful that breast-feeding no longer seems worth the bother."[10] This statement expressed the twentieth century dream of dreams for pediatricians in America who had long advised mothers to give up breast-feeding for the visible and uniform bottle-feeding.[11] This effort bore fruit to such a considerable extent that at the time it was not possible to find a control group in the US that had been entirely breast-fed for six months.

In the 1990s the trend in the science of infant nutrition has been to admire the ingenuity of nature. More and more studies have been conducted that show the complex feed-back mechanisms between mother and infant. There are mechanisms that adjust the amount and composition of breast milk to various circumstances, such as premature birth, the age of the infant, varies micro-floras, twins, etc. Another line of research finds still more advantages in breast milk as compared to formula-feeding: for example, immunological qualities and superiority of breast-feed infants in growth and development of eyesight and intelligence.

How can historians use the knowledge of pediatricians to discuss infant feeding in the past, when this scientific knowledge varies so much over time? The scientific research of our era is, of course, subjugated to the same conditions as earlier research.

---

9 WHO, Infant Feeding, The Physiological Basis (Geneva, 1990), 61–62.

10 L. F. Hill, "A salute to La Leche League International," *The Journal of Pediatrics*, 73 (1968), 161–62.

11 Rima D. Apple, Mothers and Medicine. A Social History of Infant Feeding, 1890–1950 (Wisconsin, 1987).

Many of today's results will be revised. But scientific research is not useless for pediatricians or for historians because it is socially constructed. However, it is the indispensable duty of both to reflect over the conditions under which the knowledge is produced. This demand has been increasingly easy to meet during recent decades, because the development of international co-operation has resulted in a profound awareness of the cultural and environmental conditions for scientific observations. This produces knowledge that does not claim to be universal. Precisely because the limitations of this knowledge in time and space are known, it can make a contribution to the discovery of the biological response given different cultural and environmental conditions.

When an historian examines nutritional habits of the past to get an idea of their importance for the level of mortality, the answer is neither to take the newest scientific knowledge at face value nor to reject it. The examination must be carried out as a comparison over time, as well as space, using the pediatric research of today, not as an eternal truth, but as a known yardstick positioned squarely in these elements.

Breast-feeding according to Pediatrics

Today pediatricians explain the better survival of infants who are entirely breast-fed as opposed to those fed entirely artificially, all other things being equal, with four points:

- Breast milk is not handled and not so exposed to contamination on the way to the baby. Every other food for babies is exposed to contamination because it has to be handled.
- Breast milk automatically meets the nutritional needs of young infants, both needs that have been discovered, as well as the ones science has not yet uncovered.
- The breast-fed infant does not receive harmful or useless substances.
- Through breast milk the infant gains access to the immune system of the mother, and the development of the infant's own immune system is stimulated.[12]

The excess mortality of artificially fed infants is highest where the hygienic conditions are worst, where knowledge of suitable substitution is poor, and where poverty places obstacles in the way of obtaining suitable substances.

12 WHO, *Infant Feeding* (1990), 31.

In the western industrialized world of today the differences in mortality between breast-fed and formula-fed infants are so very small that pediatricians disagree as to whether there is any at all. As far as morbidity is concerned, however, breast-feeding still seems to favor infants in the industrialized world. Breast-feeding contributes to prevention of allergies,[13] otitis media, coeliac diseases and bronchial infections.[14]

Breast and Complementary Feeding – a Question of Timing

Nutritional science of today leaves no doubt that, for young infants all over the world, it is an advantage to be entirely breast-fed. But to what age does it remain an advantage? Or, in other words, what is the optimal age for introducing complementary feeding and for final weaning? And how does complementary feeding affect the infant when introduced at a non-optimal age?

The last question will be considered first. In a WHO review that brings together scientific information concerning the physiological development of infants, it is argued that in the first four months of life complementary food can harm the infant in at least four ways:

- the infant may ingest harmful micro-organisms.
- the food may contain too few nutrients in forms the infant is able to use.
- the food may contain nutrients in forms or concentrations which cause indigestion or other illnesses, both short- and long-term.
- any other sustenance will reduce breast milk production because the infant's demand, expressed in suckling, guides the production of the milk supply. An infant satisfied by something else will not suckle sufficiently to ensure the proper amount of milk.[15]

The effects of complementary feeding depend naturally on its content. Although the infant is well-equipped to digest proteins and fat from breast milk, the size of the molecules in other proteins, as well as other types of fat, can cause allergy problems and indigestion.[16]

At the age of three months infants start to produce the enzyme that adults use to digest starches. So, from this age, infants tolerate starches fairly well, and from the age of four months they can make some use of the nutrients in starches, although they do

13 WHO, *Infant Feeding* (1990), 65.

14 WHO, *Infant Feeding* (1990), 31.

15 WHO, *Infant Feeding* (1990), 55, 62.

16 WHO, *Infant Feeding* (1990), 56.

not yet need them. By the age of six months starches can be digested well. However, infants who are fed foods containing starch before the age of three months have been observed to develop frequent gastrointestinal disturbances, particularly diarrhea. Some researchers have observed that infants given starches before the age of three months are able to digest them before other infants, but it takes a while before the acute diarrhea settles down. The undigested starches may also interfere with the absorption of other nutrients.[17]

Nutritional science agrees that breast-feeding without any complementary feeding before the age of four to six months is optimal for all infants, regardless of which culture or under which circumstances the infant is brought up.[18] Under good sanitary conditions and when it is possible to purchase safe food, this may be the optimal age to start complementary feeding. The mouth, tongue, intestinal canal and reflexes are then developed to process such food, and older infants thus gain access to nutrients that are not available in optimal quantities in the breast milk to meet the increasing demand from the growing infant. On the contrary, under bad sanitary conditions it may be safer to extend the period during which the infant is entirely breast-fed to around 12 months of age, because it is first at this age that extra nutrients are absolutely necessary. Prolonged breast-feeding without complementary feeding before the age of 12 months will spare the infant from combating a harmful micro-bacterial flora until the immune system is more mature.

The optimal timing for final weaning, i.e. the transition from breast and complementary feeding to a diet devoid of breast milk, depends on the cultural and sanitary conditions. In western industrialized countries it has not yet been possible to demonstrate positive effects of breast-feeding beyond the second half of the first year of life. In Bangladesh, Rwanda and Egypt, however, the survival of the child is dependent on breast milk from the mother until the age of three years.[19]

In summary, the level of infant mortality is most fruitfully seen as a balance between exposure and resistance. A major part of building resistance is determined by nutrition, and the best nutrition for infants under the age of six months is obtained from breast-feeding. However, the optimal nutritional situation for infants and

17 WHO, *Infant Feeding* (1990), 56.

18 There are a few exceptions: HIV infection in the mother and not in the infant and some very rare congenitial and hereditary metabolic disorders in the infant are the most important. WHO, *Infant Feeding* (1990), 41–51.

19 Kim F. Michaelsen e.a., "Weight, length, head circumference, and growth velocity in a longitudinal study of Danish infants," *Danish Medical Bulletin. Journal of the Health Sciences*, 41 (1994), 577–85; Kim F. Michaelsen, "Nutrition and Growth During Infancy. The Copenhagen Cohort Study," *Acta Pædriatica,* 86:Supplement 420 (1997), Allan S. Cunningham, Derrick B. Jelliffe and E. F. Patrice Jelliffe, "Breast-feeding and health in the 1980s: A global epidemiologic review," *The Journal of Pediatrics*, 118:5 (1991), 659–66.

children over the age of six months is in part determined by exposure. In infectious environments with poor sanitary conditions safety must take priority, which may make it necessary to postpone the introduction of complementary food until the very latest moment from the point of view of nutrients. Good sanitary conditions and a well-functioning health sector provide the latitude for giving high priority to an optimal vitamin and mineral content in food, thus making complementary feeding the best choice.

Infant Feeding in Nineteenth Century Denmark

How can knowledge be obtained about infant feeding before 1900? In Denmark it is impossible to establish exact breast-feeding rates that early. The first scientific examination of breast-feeding rates in Denmark is from 1915. It is a marvelous study that examined working class infants born in Copenhagen from the mid-1890s to 1912.[20] However, some information may be obtained about nineteenth century infant feeding. Three main groups of sources have proven useful:

1) Medical reports: Since 1803 all Danish doctors, both medical officers and private practitioners, have been required to send a yearly medical report to the Royal Board of Health (*Det Kongelige Sundhedskollegium*). One of the subjects which had to be taken up was the condition of infants and of mothers who had newly given birth.[21]

2) Folklore collections of popular culture: There has been a quite intensive collection of folklore in Denmark. Much material has been published and more is found in the handwritten manuscripts in the National Museum and other museums.[22]

---

20 For the examination of breast-feeding rates in Denmark, see Løkke, Døden i Barndommen, 151 and 207; Susanne Houd, Ammefrekvens og Ammemønstre i Danmark 1938–1988. Rapport til "Fællesforum vedr. amning og spædbørnskost i Danmark," nedsat af Indenrigsministeriet 26.4.1986. Undersøgelsen gennemført ved midler fra Sundhedsstyrelsens Sundhedspulje, (København, Unpublished photocopy, c. 1989); and Michaelsen, "Nutrition".

21 The medical reports are preserved and kept in the National Archives (*Rigsarkivet*). A summary from the Royal Board of Health has been published every year since 1838. See Løkke, *Døden i Barndommen,* 511.

22 A survey over published and unpublished folklore narratives about infants, infant care and motherhood is published in J. S. Møller, *Moder og Barn i Dansk Folkeoverlevering. Fra Svangerskab til Daab og Kirkegang,* (København, 1940).

3) Handbooks in childcare: Many handbooks in infant care describe traditions they found harmful, in order to combat them.

There are great weaknesses associated with all three source groups. The medical reports tend to condemn what they report. Often doctors think of peasants as *dirty beasts*, regardless of whether they report from a high mortality or a low mortality area. They also constantly complain that infants are breast-fed too little, too much or incorrectly. The same goes for many of the handbooks.

The problem with the folklore collections is the nostalgic perception of the fading traditional culture of the peasants. The old peasants were more natural than the increasing urban population, or so the argument goes. It is natural to breast-feed, and thus the infants of the peasants were breast-fed for years. This argument is not disturbed by parallel stories about bottle-feeding and pre-chewing food. To use these sources it is necessary to combine them at a strict regional and local level and be very aware of the chronology.[23]

However, when I abandoned all the sources that gave no concrete description of ways of feeding infants at various ages and became aware of the chronology, a pattern began to emerge.[24] This pattern grew more distinct, when I realized that the career of the doctor influenced how he perceived infant care. Doctors who had been both in a high mortality area and in a low mortality area were capable of seeing the differences, whereas doctors who spent their whole lives in one area tended to describe popular practice in the normal medical clichées without regard to the actual infant care.

Conditions on Fyn

All the concrete reports from Fyn tell about a very deeply rooted tradition of breast-feeding. No special infant food was prepared. The infants were nursed for at least a year, more often for two or three. In the second half of their first year, when the infants were able to sit on their mother's knee and take food from the table, they were allowed to eat what they could manage and liked from the adult menu.

The famous Danish composer Carl Nielsen (1865–1931), who came from an old Fyn family of peasants, rural workers and village fiddlers, described the following in his autobiography (He was number seven of twelve children.):

> We children were allowed to nurse until we were a couple of years of age. I remember still the sensation of my mother's skin. .... When my mother sat suckling the

23 See the analyses and further discussions in Løkke, *Døden i Barndommen*, 151–172 and 204–207.

24 See further discussions in Løkke, *Døden i Barndommen*, 151–172 and 204–207.

> youngest of us, she was often glad - almost delighted. So it happened, she took the small one away, played a little with the breast and then put it to the mouth of one of the older children, saying, "Do you want a bit too, ducky?" I have stood in my wooden shoes before my mum and had my part of the feast.[25]

The medical reports tell the same story. Nearly all the infants from Fyn were breast-fed, complementary food was introduced late in the first year of life, and nursing was prolonged well into the second or third year of life. If mothers of young infants had to go somewhere, they left their offspring with a lactating neighbor, who then suckled both her own infant and the one left in her care until the mother returned. (The disadvantage of this habit was that small epidemics of syphilis appeared now and again among mothers and infants, if some unfortunate sailor husband had brought home the disease.)

Eastern Jutland

In this part of the country it was part of the normal procedure during birth that a neighbor chewed a *sut teat* for the newborn while the mother was giving birth to the placenta. A *sut* is a rag with chewed bread and sugar.

The *sut* is known from all over Denmark, but it is only from this area that I have seen it mentioned as part of the normal treatment during birth. In many other places it seems to have been used by poor mothers to soothe the baby if she was forced to leave it alone. The medical reports provide a closer look. To quote one from 1874:

> I think the cause of the many gastric diseases is to be found in the very inexpedient nourishment the parents offer the infants. Certainly the baby is often breast-fed, but nearly always it has also - and that right from birth - "food". And this food consists for most infants of exactly the same food as the grown-ups eat. People believe firmly that infants who eat all kinds of food from birth will be the strongest. Think about a baby eating kale and split peas (which is the main menu in winter), sour rye bread and salted pork; and you would nearly have to agree that people are right: Infants who can stand that menu must indeed be strong.[26]

The doctor continued by describing how the more lucky infants had pap made for them, instead of the diet mentioned above, but nearly none escaped very early solid sustenance alongside the mother's milk.

---

25 Nielsen, Carl, *Min fynske barndom*, (København, 1927), 14–15.

26 Rigsarkivet Medicinalberetning for 1873 ved J.C. Neergaard.

Infant Feeding in Denmark

With just a cursory examination it is difficult to see much difference between Fyn and East Jutland. In both cases the infants had mother's milk and adult food. But the very important difference is the timing. In East Jutland complementary feeding was started at birth or very soon after, while such extra sustenance was delayed until the second half of the first year of life on Fyn. What is excellent for one year-olds can kill a newborn.

Of the eighth districts (*herreder*) I have examined, the infant feeding on Fyn and in East Jutland are two extremities of a broad spectrum. The districts in Sjælland and Bornholm also combine breast-feeding and complementary feeding, but not as extremely as on Fyn and in East Jutland.

The most extreme practices formulated as ideal types are as follows:

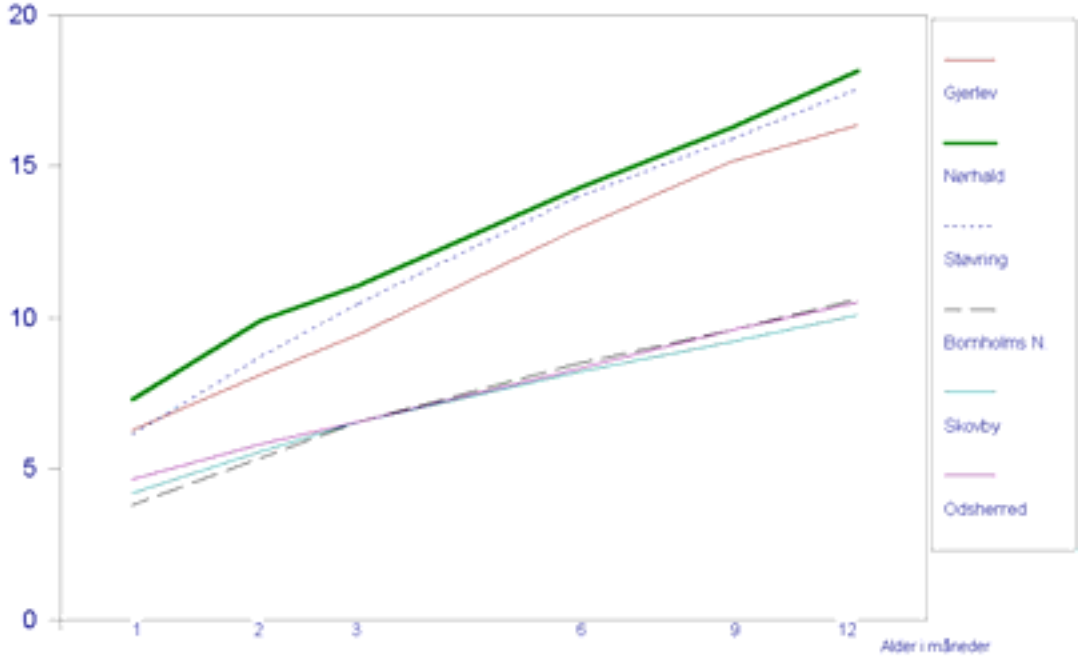
- type 1: The infant was breast-fed completely without other sources of nutrition until the child was able to sit at the table and eat. This point in time could arrive between the infant's sixth and twelfth months of life. The child continued to be breast-fed parallel until finally weaned at an age between eighteen months and three years. Women's milk was seen as fully sufficient to fulfill requirements of infants up to one year of age.

- type 2: The infant was breast-fed, but was very soon also given other means of sustenance. This extra food was varied from place to place and over time. For example, the *sut* was sometimes used, the meals of the family might be chewed by an adult, or pap might be made from rye, oat, wheat, barley or crackers, with or without butter, cows' milk or cream, and, after about 1830, potatoes. Breast milk was seen as necessary but not adequate for the infant, and mothers often worried if they had milk enough or if the milk was good.

I have not formulated bottle-feeding or any artificial feeding as a third type, because I have not found any regions in Denmark where the ideal was not to breast-feed at all. This does not mean that there have not been infants who were fed artificially; nor does it mean that bottle-feeding has not been more common in some regions than in others. But it does mean that I have not discovered entire regions with non-breast-feeding cultures such as were found in Island, Sweden and Bavaria. This observation fits well with the lower average level of infant mortality in Denmark, and it could explain why the Danish high mortality areas do not reach the extremely high levels of IMR found in regions known to avoid breast-feeding altogether.

The spectrum running from type 1 to type 2 is also a continuum from a kind of infant feeding that creates a maximum of resistance over a resistance-neutral method, to the worst kind of type 2 feeding that reduces resistance both by causing stress to the infant's digestion with indigestible sustenance and by increasing exposure through

Figure 7. Accumulated IMR per 100 live born in six districts in rural areas, 1851–1868.



Source: Løkke, *Døden i Barndommen*, bilag 2.3.

direct contact with food and tools that may bear germs. The results of a given method of infant feeding in terms of the IMR level depends, however, on all the other factors known to influence infant mortality. In places with extreme exposure, for example, due to high population density or with traditions of poor hygiene, type 2 would prove more fatal than in sparsely populated areas. The same level of infant mortality may be achieved by many combinations of breast-feeding, different kinds of sustenance and various exposures.

The bulk of the local infant feeding traditions was found to be somewhere in between the two ideal types. However, traditions very close to type 1 are found in the areas with the very lowest IMR (7–10%), and traditions very close to type 2 and with very early introduction of extra sustenance were found in the areas with the highest mortality.

In the type 2 areas of eastern Jutland, the required extra sustenance was rather expensive: butter, cream and fine wheat among the most prestigious classes. This could explain why the more wealthy social groups in this area had a higher IMR than the poorer rural laborers. Because the infants were breast-fed anyway, it gave them a better chance when the parents could not afford extra sustenance such as butter, cream and pap from fine wheat.

When analyzed in biometrical terms, it is seen that mortality was higher in the high mortality areas already after the first month of life, and it remained higher

throughout the first year of life (Figure 7). In the low mortality areas no weaning crisis is seen.

Judged by modern pediatric knowledge, the infant feeding practices in type 1 areas were very close to what is now regarded as the best practice in an infectious environment.[27] Type 2 is considered today to be dangerous for young infants in at least four ways: by inducing harmful micro-organisms, by not providing the nutrients the infant needs, by including nutrients in a form or concentration that harms the digestion of an infant, and by reducing the mother's production of breast milk because the infant nurses less when it is satisfied by other means of sustenance.[28]

To summarize, although breast-feeding was prevalent in nineteenth century Denmark, there were distinct regional differences in infant feeding practices. These differences are so important in the infant mortality context that they may be responsible for a major part of the regional differentials in IMR.

Infant Feeding and Doctors

Preston and Haines found that in the USA doctor's infants did not exhibit mortality below the national average. They argue that it must be because proper knowledge was lacking from society before the twentieth century.[29] This conclusion may be qualified when looking at the Danish example: knowledge was not lacking in general, but it was certainly lacking in the case of the doctors. Where the mothers in low mortality regions were very close to practicing what today is thought to be the best form of nursing, doctors in their advice books were recommending practices now thought to be harmful.[30] Furthermore, the doctor's knowledge was becoming more dangerous for the infant's lives throughout the nineteenth century. While physicians in the Age of Enlightenment and the early nineteenth century encouraged all mothers, of high rank or low, to provide their infants with their own milk in a type 1 manner, breast-feeding gradually became unfashionable in the Victorian Era. By mid-century the doctors writing books on infant care accepted both types 1 and 2. They only had reservations concerning the type of extra sustenance to be given. It should be liquid

27 Cunningham (e.a.), "Breastfeeding," 664; Michaelsen, "Nutrition," 31; WHO, *Infant Feeding* (1990), 41–64.

28 WHO, *Infant Feeding* (1990), 62.

29 Samuel H. Preston and Michael R. Haines, *Fatal Years. Child Mortality in Late Nineteenth Century America* (Princeton, 1991), 188–89 and 209.

30 Carl Edv. Levy, Kortfattet Anviisning for unge Mødre til Sundhedsmæssig Forpleining af deres spæde Børn (København, 1845); Aug. Thornam, Den første Barnepleie (København, 1869).

pap, made from bread without extra fat and given with a spoon.[31] This meant that parents seeking the doctor's advice on how to keep their infants alive received little help, as the doctors recommended a practice that today has proven rather dangerous.

From the 1860s onward matters worsened. While the leading obstetricians and pediatricians still recommended both types 1 and 2, they were under increasing attack from their less specialized colleagues, who worried about the problems upper-middle and upper class mothers encountered who wanted to nurse their babies.

In a generally positive review of a book on child care from 1876 the reviewers severely disagreed with the author on one point – the superior effects of mother's milk in keeping children healthy and alive, compared with bottle feeding:

> I see here a relic of sentimentality ... In these social classes, who most often seek the doctor's advice in these matters, the nutrition the mother can provide to her baby is indeed truly often poor. And in her attempts to fulfill a "mother's first duty" often by the great pains, tensions, excitement and the loss of body materia, lay the foundations for serious complaints, often nervous, but now and then even worse. Of course, I think of the delicate lady, not of the sturdy wet nurse. In my opinion it is more often than not the task of the doctor to prevent the mothers' instinctive or learned sense of obligation to breast-feed their infants themselves.[32]

Instead, he advised the mothers to take a wet nurse if the family could afford it or to use Biedert's cream compound or Nestle's Farine Lactée. The last advice was rather dangerous. The commercial artificial food not only deprived the infant of the resistance that could be built up from breast milk; it contained a large amount of carbohydrates indigestible for newborns, and knowledge about sterilization processes was lacking. Ten years were to pass before the German chemist Soxhlet invented a device for safe sterilization of milk in feeding bottles according to Pasteurian principles.

A biometrical analysis of the increasing IMR among the off-spring of doctors, lawyers and their equals in a large parish in Copenhagen, 1820–1879, indicates that this fashion did have an impact on the infant feeding habits. While the 1820–39 curve fits well with breast-feeding and the introduction of new food, e.g. extra substance at the age of six months, the later curves suggest an increase in artificial feeding immediately after the birth.[33]

31 Løkke, *Døden i Barndommen*, 249–51.

32 Hospitalstidende (1876), 240.

33 Løkke, *Døden i Barndommen*, Figure 2.43.

This state of affairs was changed with the breakthrough of the "medical infant care program" in the infant care books.[34] This program was discussed among doctors from 1876 onward, but it was only from 1890 that the program of tranquility, cleanliness and regularity reigned supreme in Danish books on infant care. This program prescribed six months of breast-feeding without extra sustenance and then weaning over two to six months, until breast-feeding ceased after the age of twelve months. For infants who could not be breast-fed, the program offered recipes for scientifically prepared bottles in accordance with the bacteriological principles of Pasteur and the chemical analysis of women's milk.

When considering whether rigorous pursuit of the "medical infant care program" could possibly have been instrumental in reducing infant mortality, there is no doubt that the understanding of bacteriological processes improved artificial feeding and that increased cleanliness reduced the exposure of children to risk. On the other hand, the insistence on regularity may have delayed the fall in infant mortality, since suspending the interaction between mother and infant prevented the regulation of the mother's milk supply to the baby's needs. The result of this is what is called secondary milk shortage, that is, the mother is unable to produce sufficient milk after the first two or three months of the infant's life.

The rate of breast-feeding did decline during the twentieth century, but the decline did not really accelerate before 1940. Among workers in Copenhagen in the years before 1912 approximately 55 percent of all infants were breast-fed for at least six months.[35] Among infants born in wedlock the percentage who were breast-fed at least four months declined from 62 percent in 1940 to 17 percent in 1969. [36]

---

34 The concept of the "medical infant care program" is mine, and was introduced in *Døden i Barndommen.*

35 G. Riemann, "Om Diegivningens Udbredelse og Betydning," *Maanedsskrift for Sundhedspleje* (1915), 249f.

36 F. Biering-Sørensen, J. Hilden and K. Biering-Sørensen, "Breast-feeding in Copenhagen 1938–1977. Data on more than 365.000 infants," *Danish Medical Bulletin,* 27:1 (1980), 44. The percentages from Riemann can not be compared directly with Biering-Sørensen, as Riemann measures breast-feeding without any sustenance and Biering-Sørensen measures any breast-feeding, even if extra sustenance was given.

Illegitimacy

Children born out of wedlock were not as unusual in nineteenth century Denmark as later myths of the Biedermeier and the Victorian eras let us presume. In the entire country roughly ten percent of all births were outside the bonds of marriage during the whole century.[37] But the national average conceals very distinct differentials. While in Copenhagen 20–26 percent of all births were illegitimate, the level in the rural districts on average was seven to ten percent and in the provincial towns on average eight to thirteen percent, declining from the mid- to late century. There were also large differentials among rural districts aggregated at district level (*herred*), from two percent in a few districts to 16–17 percent, a rate found in the first half of the century in the districts of Fyn.

There is no easy correlation between IMR and the rate of illegitimacy. Figures 6a and 6b show that all combinations were at work at the district level. Both districts with a very low and with a very high IMR could have high rates of illegitimacy.

While the official statistics readily provide the number of illegitimate infants born, there was a reluctance to calculate and publish the IMR for these infants. It was first after several battles with the central administration that the Statistical Bureau received permission to collect this information. From 1860 on, however, the Bureau was able to categorize infants who died during their first month of life as legitimate or illegitimate. From 1895 this distinction was also made for the first year of life.

Examinations of parish registers show, as expected, that the IMR among illegitimate infants was higher than among legitimate children born in nineteenth century Denmark. But in most parts of the country, the rate were not excessive. For the period 1820–1879 the average calculated for 46 rural parishes produced an IMR of 16.4 percent for the illegitimate infants. This was roughly the proportion 1.4:1 in comparison with the legitimate children.[38] This goes for Copenhagen as well until 1840, when an unfortunate development for the illegitimate infants began, which will be discussed below.

The combination of a relatively high rate of illegitimacy and a relatively low excess mortality for these infants could be due to a very high proportion of children who received legitimacy during the infant's first year of life. In many places in the Danish countryside it was not unusual for couples to marry after the birth of the first child. For 1870–1879 an average of 24 percent of the illegitimate infants born in ten rural parishes were legitimized by marriage between their parents during the child's first year of life. In addition, some infants were legitimized by the marriage of the mother

37 Rising from 7.4 percent in 1801–1809 to 11.5 percent 1840–1849, thereafter slowly declining to 9.6 percent in 1890–1900; "Befolkningsforholdene," *Statistisk Tabelværk,* 5. rk, Litra A, nr. 5, 109.

38 Sørensen, *Børnedødeligheden i forskjellige samfundslag*, (1883), 80.

to someone other than the father of the infant. As much as 37 percent or those born to unwed mothers were legitimated either by the father or another bridegroom in the few parishes where this has been examined.[39]

Legitimation poses a rather complicated methodological question because it affected both the composition of the population at risk and the number of reported deaths. Considerable differentials should be expected between the mortality of the two groups of infants, both recorded as illegitimate in the parish registers: that is – those who were only juridically illegitimate and the infants who were really social illegitimate and left alone with their mother. The mortality of infants born to couples not yet married must be assumed to be close to that of infants born in wedlock. This means that the mortality of the socially illegitimate infants must be assumed to be higher than the mortality for the whole group of "registered illegitimate."

Another problem is that in the parish registers, infants whose mothers married between the child's birth and death tend to be registered in the burial register as legitimate. This means that the number of deaths among the legitimate infants is systematically too large in relation to the registered number of live births and too small for the illegitimate. Thereby, the IMR of the legitimate infants appears to be higher, and of the illegitimate, lower, than the social reality. The whole question of illegitimacy and IMR in the countryside still waits for a thorough investigation which accounts for the different cultural settings and the behavior of the family toward the unwed mother.

Illegitimacy in Copenhagen

The proportion of infants born out of wedlock in Copenhagen was high: 26 percent of all births, 1801–1809, a rate that slowly declined to 20 percent for the years 1880–1889. Not all of the mothers were inhabitants of Copenhagen. The city had plenty of facilities suitable to attract unsupported expectant mothers. Most important was the Royal Lying-in Hospital, founded in the eighteenth century, whose explicit aim was to provide pregnant unmarried women with free and anonymous birth assistance to prevent clandestine childbirths and infanticide. For women able to pay there were many private possibilities as well, small maternity homes and midwives who received pregnant women as boarders.[40]

As for the rest of the country, a thorough study is still waiting to be done, but there is more knowledge for Copenhagen. From 1877 the city medical officer (*stadslægen*)

39 Sørensen, *Børnedødeligheden*, 89, note 1; Sørensen, "Fejlkilder ved Beregning af Dødeligheden hos uægte Fødte," *Hospitalstidende*, (1889), 629–42.

40 "Befolkningsforholdene," *Statistisk Tabelværk*, 5. Rk., Litra A, nr. 5, 109.

kept statistics based on the death certificates, which distinguish between legitimate and illegitimate births. For 1820–1879 only one parish has yet been studied, but it is a rather large and fairly representative one, Christianshavn.

The illegitimacy rate of Christianshavn showed increasing excess mortality during the century, rising from an IMR level at 25 percent in the 1820s to close to 50 percent in the 1870s. The rate for legitimate births remained at a stable level, about 20 percent during the same period. In the 1820s the IMR level of working-class infants was similar for both illegitimate and legitimate births, but during the century the rate of the latter decreased, while the former increased.[41]

In the late 1870s, when the statistics for all of Copenhagen include the IMR for illegitimate births, the level was just under 40 percent. From the 1880s a rapid decline started, so that the level had been reduced to about ten percent in 1920, a rate that was still excessive, because the IMR for legitimate births had declined as well.

The IMR of illegitimate infants placed in foster homes by the Royal Lying-in Hospital is known for some periods: 1850–1854, it was 38 percent and 1870–1878, 42 percent.[42] Since 1888 law requires the supervision of all foster children by the municipal health authorities. The IMR among these infants was 40 percent when the inspection started. Even though most foster homes with excessive fatalities were sorted out by the Royal Lying-in Hospital and completely disappeared as a result of compulsory inspection, these figures render probable the assumption that at 50 percent, the IMR among illegitimate infants in Christianshavn is a bit too high. But there is no doubt that the rate was increasing in the 1860s and 1870s and had reached a level of about 40 percent or more before the decline began.

Cause of Death Registration

The registration of causes of death in Denmark followed other paths than the population statistics. In Copenhagen some initiatives were taken in the sixteenth century based on information given to the sexton by relatives. After 1749 statistics were based on this information.[43]

The modern cause of death registration derived from death certificates started in 1829/1832. Then the law prescribed that death certificates should always be issued by a doctor when death occurred in places where a doctor could be found. In practice,

41 Sørensen, Børnedødeligheden i forskjellige samfundslag, (Kbh., 1883), 102–109.

42 *Den hygiejniske kongres* (1858), 140–41; Fritz Levy "Om Plejebørnene med særligt Hensyn til Forholdene i Kjøbenhavn," *Ugeskrift for Læger*, (1884) 274.

43 Løkke, Døden i Barndommen, 55.

this meant Copenhagen and the provincial towns.[44] From 1832 onward the doctor issuing the certificate was obligated to indicate a cause of death. The information from these certificates in Copenhagen was collected and published from the start in 1832 and in the provincial towns from 1860. Cause of death registration for the rural districts, however, has existed only since 1920.[45]

The Causes of Death, 1835–1960

When causes of death for infants in Copenhagen 1836–1920 are divided into main groups (Figures 8a, 8b, and 9), they reflect changes in the way causes of death were categorized as well as a changing cause of death pattern. Three main developments can be distinguished.

- The proportion of infant deaths with no registered cause of death declined.
- The proportion registered with a symptom (cramps, atrophia) and/or age (newborn), rather than a disease, as cause of death also declined. This means, of course, that the importance of diseases as cause of death increased.
- Digestive maladies as cause of death experienced sudden popularity. Before the mid-1860s this cause was seldom used; then it increased to be the most commonly used single cause of death in the 1890s. This development started before any proper prevention or treatment had established itself in the medical world: a sterilizing procedure for bottle feeding was established by Soxhlet in 1886.[46] The general advice on breast-feeding without extra sustenance the first six months of life as the best way of feeding infants dominated from about 1890. Finally, the treatment of infants that were already ill improved in the beginning of the twentieth century. At the same time prevention of digestive disorders among infants began to be used as an argument for investments in better public hygiene. The recategorization of a large part of the infant deaths to digestive illnesses was part of the process which caused the IMR to decline.[47]

---

44 In places with no doctor, two civil men appointed by the chief constable of the local police were supposed to inspect the body and complete the certificate.

45 Løkke, Døden i Barndommen, 55–56.

46 "Sterilisering af Komælk, der bruges til Opfødning af Børn." Efter F. Soxhlet XXXIII: 15–16 *Münch. med. Wochensch*. (1886); *Ugeskrift for Læger,* 4:15 (1887), 215.

47 Løkke, Døden i Barndommen, 62–64.

In the twentieth century all infant deaths tended to have a disease as cause of death except the feared "cot death" (listed as sudden death without known cause). During the period 1930–1960 the defeat of infectious diseases was rather successful, leaving the bulk of the remaining infant mortality to conditions related to the development of the fetus and the transition from fetus to infant.[48] In the 1930s infectious diseases, including pneumonia, were a more common cause of death than prematurity, congenital malformations, injuries from birth and other maladies. Later, the latter group far outnumbered infectious diseases as causes of death. In 1931 the numbers were as follows: prematurity, congenital malformations, injuries from birth and other affections of newborns (2.8% of the live births), pneumonia (2.3%), and infectious diseases (1.6%). In 1950 the corresponding values were 2.0 percent, 0.5 percent and 0.2 percent.[49]

Discussions and Conclusions

The IMR in nineteenth century Denmark was much more heterogeneous than the stable average indicates. This heterogeneity can be seen in almost every possible variable, and the great mortality transition that took place from the turn of the century was as much a process of homogenization as a fall.

The IMR levels in nineteenth century Denmark show distinct regional patterns, most marked in the rural districts, but they also dictate the IMR in the provincial towns. One exception is that, for the top social layer in the towns, the regional patterns apparently exercised less influence, while fashion seems to have had a certain importance.

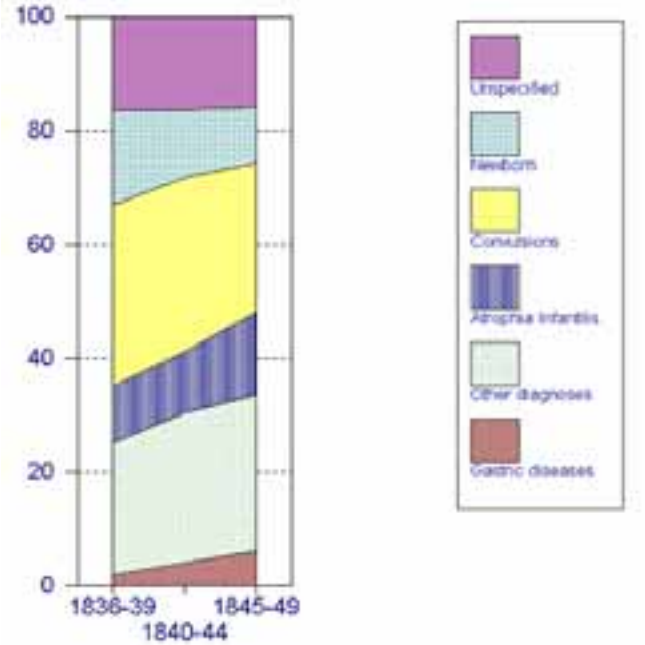
The regional pattern, however, is not sufficient to describe the secular trends. Supplied with two more patterns overlapping each other, however, it is possible to make out the most important developments, that is a socio-economic pattern and an urbanisation pattern.

The socio-economic pattern affected mainly those who were worst off. Among laborers in the countryside and in the towns, a falling curve of infant mortality is apparent throughout the century and is most readily explicable in the light of economic improvements. The lower classes lived under such harsh conditions that the mothers were forced to leave their children earlier and breast-feed them less than their own ideal of mothering demanded. Quite small economic improvements resulted in better care and breast-feeding of children in the first months of fragility and

48 Anne Løkke, "Infancy and Old Age," 70.

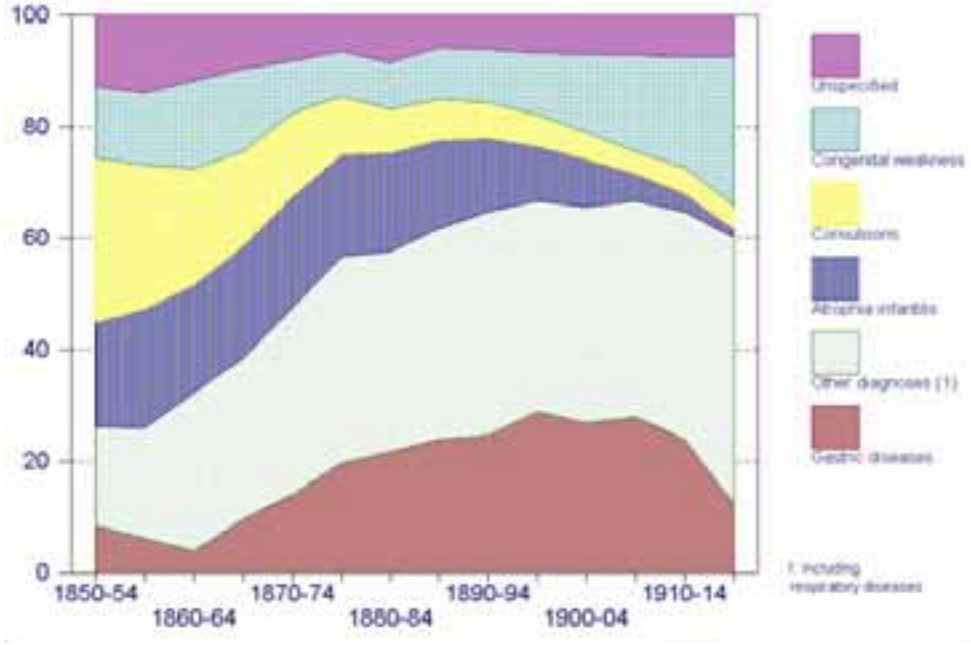
49 P. C. Matthiessen, "Spædbørnsdødeligheden i Danmark 1931–1960," in *Statistiske Undersøgelser* 11, ed. Det statistiske Departement (1964), 9, table 2.

Figure 8a. Deaths during the first two years of life distributed as causes of death in percent of all deaths in the age group. Copenhagen 1836–1849.



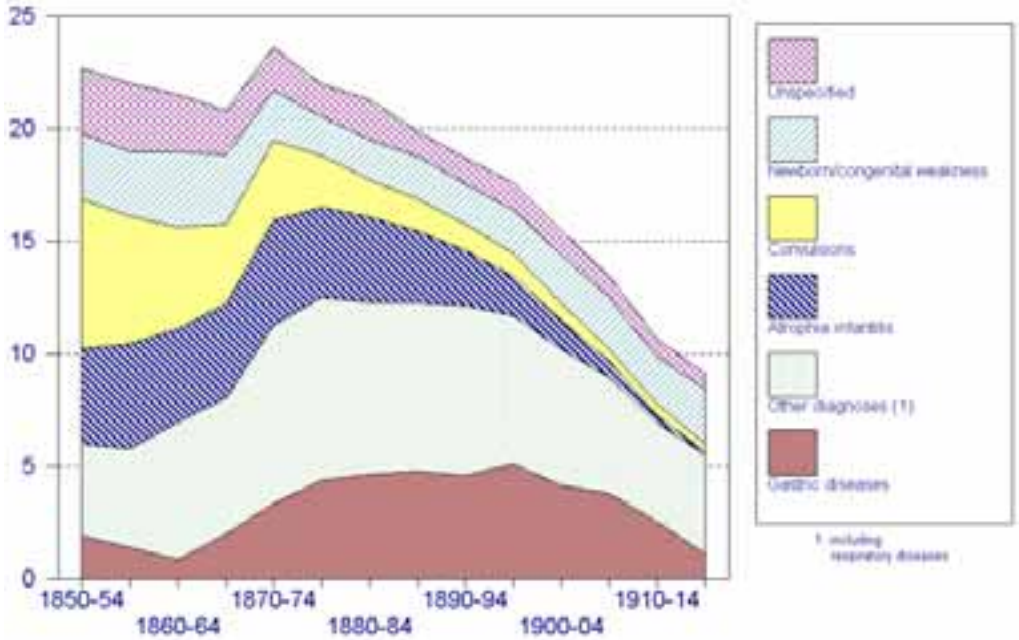
Source: Anne Løkke, *Döden I Barndommen. Spædbørnsdødlighed og moderniseringsprcesser i Danmark 1800–1920*. København, Gyldendal 1998, Bilag 2.3.

Figure 8b. Deaths in infancy distributed as causes of death in percent of all deaths in infancy. Copenhagen 1850–1919.



Source: Anne Løkke, *Döden I Barndommen. Spædbørnsdødlighed og moderniseringsprcesser i Danmark 1800–1920*. København, Gyldendal 1998, Bilag 2.3.

Figure 9. Deaths in infancy per 100 live born distributed according to the causes of death. Copenhagen 1850–1919.



Source: Anne Løkke, *Döden I Barndommen. Spædbørnsdødlighed og moderniseringsprocesser i Danmark 1800–1920*. (København, 1998), Bilag 2.3.

dependence. Easing the economic burdens of those living under the harshest conditions did not automatically lead to a fall in infant mortality, however. As was shown in the case of the farmers, prosperity was not sufficient to ensure a high level of survival. In addition, it was necessary for the infant to be cared for and fed in a way that was within the relatively limited biological spectrum, ensuring that the nutrition received built up resistance to infection and that exposure to risk factors was reduced. The drop in infant mortality among agricultural laborers as an automatic consequence of economic improvements resulted from the fact that breast-feeding was the universal norm, while the use of "dummies" and a farinaceous diet by the poor was a matter of necessity. A slight improvement in the economic situation made it possible and attractive to breast-feed more, as they were unable to afford dietary supplements of butter, milk and cream which gave prestige among farmers in high mortality areas.

In the countryside it is quite clearly possible to observe the decline in infant mortality among agricultural laborers. On the other hand, the fall in the rate among workers in Copenhagen is only visible in a decline during the first month of life, because after 1850 rapid urbanization provoked a hygienic crisis, which becomes apparent in the mortality increase in the second half of the first year of life. The urbanization crisis reached its peak in Copenhagen in the 1870s. Over a period of time investment in public hygiene reduced the environmental risks to which children

were exposed in the major cities. This solution of one of the problems associated with the urbanization crisis had the effect of turning the long-term gentle decline into an accelerated fall from the 1890s onward.

Urbanization crises can be registered in the larger provincial towns as well, while the courses they ran appear also to have been influenced by the regional levels. Thus infant mortality did not rise as dramatically in Odense in its period of growth as it did in Randers. In the case of Odense infant mortality was low in the surrounding countryside, while Randers was situated in an area of high mortality.

In the period 1820–1860 there were marked social differences in the IMR levels in Copenhagen, the better off having the lowest levels. At the peak of the urbanization crisis in the 1870s, however, the social differences disappeared. From the end of the 1880s a decrease for all groups became apparent, but the fall was most rapid in the upper classes. Thus, important social differences in infant mortality re-emerged in the years between 1900 and 1920. The rapid decrease in infant mortality in the upper social echelons suggests that new knowledge enabled them to use prosperity to ensure the survival of their children.

The minimum IMR was ten percent for a regional population as a whole, while the percentage for legitimate infants in these areas was about six to eight percent. The maximum nutritional build-up of resistance to infection and the least exposure to risk were the prerequisites determining these low figures. This minimal infant mortality was not to be found in the vicinity of middle-sized and large towns. The fact that country districts with such low mortality rate were to be found indicates that, in nineteenth century Denmark, tradition, norms and knowledge existed that kept infant mortality at a low level without the intervention of doctors and modern scientific knowledge. In the country districts, where exposure to risk was low, a very high infant mortality rate was accordingly neither biologically, socially nor economically inevitable. However, general public or scientific awareness of this knowledge did not exist, despite the fact that there are indications that knowledge of the protective nature of breast-feeding was becoming more general and had an effect in certain regions. Other regions were apparently quite insensible to changes that could have reduced infant mortality in the nineteenth century. The regional levels show this quite well. No channels or institutions existed to work systematically for greater homogeneity at the lowest level. And when the battle against infant mortality commenced, nobody asked the peasant women in the low mortality areas what they did. Instead, the "medical infant care program" was adopted. This program won the day and ousted all the old regional infant feeding cultures without considering whether they were more or less successful in keeping infants alive.

Anne Løkke is Associate Professor at the Department of History, University of Copenhagen, Njalsgade 102, 2300 København S, Denmark.