Saving the Child

Regional, cultural and social aspects of the infant mortality decline in Iceland, 1770-1920

Ólöf Gardarsdóttir
ABSTRACT
The dissertation deals with the infant mortality decline in Iceland during the 19th and early 20th century. It shows that despite its low degree of urbanization, pre-transitional Iceland displayed higher infant mortality rates than most other European countries. Levels are only comparable with a few areas in Europe, all of whom were known for a tradition of artificial feeding of newborns. In the Icelandic case, infants were either not breastfed at all or were weaned at a very young age.

Another characteristic of infant mortality in Iceland were huge fluctuations during epidemics. Because of the isolation of the country, several diseases that had become endemic in other societies, such as measles, became dangerous epidemics in Iceland and affected all age groups. After 1850 the effects of epidemics declined and 20 years later there was a steep decline in infant mortality. By the beginning of the 20th century infant mortality in Iceland was lower than in most other societies.

Although epidemics often had important temporary consequences upon infant mortality level in pre-transitional Iceland, being breastfed or not was without doubt the most important determinant of infant survival. There were huge differences in infant mortality levels between areas where breastfeeding was common and those where newborns were artificially fed. Towards the turn of the 20th century significant changes occurred. Even though there were still differences in infant mortality between those babies who were breastfed and those who were not, infant survival had improved greatly and survival chances of Icelandic newborns that were fed artificially became in an international perspective relatively good.

Midwives played a central role in the infant mortality decline in Iceland. Growing secularization during the second part of the 19th century improved educational opportunities for women and also changed the content of education. Improved educational opportunities were reflected in changes in the education of midwives. At the same time there was growth in the publication of books that directly dealt with the issue of infant health. The increase in the number of educated midwives was a factor of central importance. The interaction between midwives and a literate population was most likely the key to infant survival in the Nordic countries. This study shows that the custom to breastfeed spread earlier in areas with higher literacy. Not only is it plausible that the interest in changing prevailing traditions was directly related to literacy levels of individual mothers, it is also shown that midwives had the best education in areas where literacy rates were high. On the other hand, the remarkable improvements in infant survival obtained towards the end of the 19th century were scarcely linked to changes in the economic structure. Those factors only started to play an important role in the 20th century. In its initial stages, changes in infant feeding and improvements in personal hygiene were more important.

Key words: infant mortality, neonatal mortality, breastfeeding, infant feeding, midwives, physicians, hygiene, neonatal tetanus, measles, fertility, literacy, history of medicine, Iceland.
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BASIC TERMINOLOGY

Infant mortality rate (IMR):
Mortality of live-born babies who die before their first birthday (per 1,000 live-births) during a given period.

Neonatal mortality rate:
Mortality during the first 28 days of life (per 1,000 live births).

Post-neonatal mortality:
Mortality during the 2d-12th month of life. Post-neonatal mortality is usually given as a ratio, i.e. post-neonatal deaths per 1,000 live births (instead of survivors after the first month).

Stillbirth rate:
Late foetal deaths per 1,000 births (usually both live and stillbirths are included in the denominator).

Early childhood mortality rate (ECMR):
The number of children dying between their first and their fifth birthday per 1,000 population in the same age group.

Crude birth rate:
The ratio of live births to the average population.

Marital (legitimate) fertility rate:
Number of legitimate births to the number of married women, aged 15-49.

Extra-marital (illegitimate) fertility rate:
Number of illegitimate births to the number of unmarried women, aged 15-49.
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Umeå in spring 2002
Ólóf Garðarsdóttir
Infant mortality decline in its European context.
Presentation of the problem

1.1. INTRODUCTION

In February 1911, a girl was born in the commune of Ásar in southern Iceland. She was given the name Róshildur and grew up in a group of 15 siblings who were born between 1904 and 1925. Her family was relatively well off and occupied the largest holding in the parish. Róshildur was the seventh child of her parents. Three of her siblings died in infancy, two of them were older than Róshildur. What they died of is not given in the parish register of Ásar. According to the parish registers however, one younger brother died of whooping cough at the age of three months. Róshildur remembers the death of her younger brother vividly and, in her mind, he died of barnaveiki (child-disease), a term that is frequently used for diphtheria in Iceland. Two other siblings were taken ill by the disease, but survived with the help of a homeopath who was usually sent for in the case of a disease in the family. Róshildur claims that he managed to save the lives of many young children in the area. She recalls intense poverty in many households of the commune with several families constantly facing the threat of sudden death or illness.

One of the most important persons of Róshildur’s childhood was her grandmother Gyðriður Ólafsdóttir, who served as a midwife in the local community. Róshildur describes her as a loving person who cared for the poor and the elderly. Gyðriður had in many ways experienced a childhood similar to that of her granddaughter. She was born in 1844 in a parish east of Ásar and her mother gave birth to 14 children of whom only eight survived their first birth-
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day. Györföur married in 1865 and her marriage too was an exceptionally fertile one — like her mother she gave birth to 14 children. Despite frequent births, she devoted herself to the vocation of midwifery during her fertile years. Like many midwives of her generation, she did not receive any formal education in midwifery, but was one of the wise women who were entrusted to carry out the important task of helping women in childbirth. Midwifery was by no means easy at that time. Like many other agrarian districts in Iceland, the area where Ásar is situated was remote and sparsely populated and frequently midwives had to travel long distances on horseback across turbulent rivers to attend to childbirths. Usually midwives in sparsely populated areas stayed with childbearing women for a few days after delivery as did Györföur. However, in the case of destitute families, with a large number of young children, she used to take the newborns home with her and cared for them in her own household for a few weeks after delivery. The newborns were then given cow’s milk diluted with boiled water. After a few weeks, the young child was taken back to his or her family, equipped with a feeding-bottle and a set of new cloths donated by the midwife. Grandmother Györföur delivered Róshildur and all her siblings except for the two youngest (born in 1921 and 1925). None of the children were ever breastfed and Róshildur maintains that breastfeeding was virtually unknown in the commune when she grew up. The account of the midwife taking newborns home with her certainly supports this.

Róshildur grew up as a sister of six younger siblings and her childhood memories are filled with the upbringing and care of infants and young children. She was frequently made responsible for minding her younger siblings and she remembers vividly how she used to clean the feeding bottles. “This was by no means an easy task since the milk tended to turn sour easily and then stick to the bottle. Sometimes we used salt diluted in water to clean the bottles”, she recalls. During her childhood glass bottles were most frequently used, but no rubber teats were available in the district. Teats of wood were most common and in Róshildur’s family wooden spools (used for cotton thread), were re-shaped and used as teats. They were wrapped in wool and covered with linen when the infant was fed.

When my informant Róshildur was born in 1911, Icelandic society was on the threshold of a new era. People of her generation have, during their lifetime, probably experienced more changes in the economic and social structure of the country than any other. Until the late 19th century, this society situated on the periphery of the Danish kingdom, was extremely sparsely populated. The majority of the population were tenant farmers of relatively scant means and most inhabitants depended primarily on animal husbandry for their livelihood. However, the fisheries formed an important subsidiary income in many areas. The settlement pattern was characterized by scattered farms along the coast, with the vast interior largely uninhabited.

At the beginning of the 20th century, Icelandic society was slowly beginning to enter the initial phase of a modernized society with an increasing national product and a relatively complex infrastructure. The fisheries, which are seen as
the main cause of modernization in Iceland, had gradually grown in importance during the late 19th century. By the beginning of the 20th century technological development within the fisheries greatly increased production. Motors were first introduced in boats in 1902 and shortly after that the first trawlers came to Iceland.6 This development was accompanied by rapid changes in the settlement pattern. During most of the 19th century, Iceland was a predominantly rural society with only one town of importance, the capital Reykjavik, with 1,150 inhabitants in 1850. By 1901 the population of Reykjavik had grown to almost 7,000 and to 28,300 in 1930.7 Other towns and villages were much smaller, but grew in size and number during the first decades of the 20th century. In 1901 only 12 per cent of the Icelandic population lived in municipalities with more than 1,000 inhabitants, as against more than 50 per cent in 1930.8

The most radical changes experienced by Icelandic society towards the end of the 19th century were, however, by no means economic in nature. For the shift in economic structure was gradual and a large proportion of the population in the early 20th century still relied upon a household based economy. Agricultural activities remained important both for the rural and the urban population well into the 20th century. The most fundamental changes in Icelandic society during the late 19th century are related to the better survival chances of young children. Within only a few decades, infant mortality rates declined from levels that were higher than in most other European countries to ones that were lower than those in any other society. When UNICEF, during the late 1980s, set as a target a reduction in the under-five-year-mortality rate in all countries of the world to below 70 per 1,000 live births (by year 2000), it was recognized that Iceland together with Norway and New Zealand had already achieved this as early as the 1930s.9 By 1930, infant mortality in Iceland was as low as 44 per 1,000 live births. A newborn female could then expect to reach age 65.

Whereas the health and survival chances of newborns in Iceland during the 1930s can be portrayed as exemplary, the situation was very different only a few decades earlier. When my informant’s grandmother was born during the 1840s, infant mortality in Iceland fluctuated between 240 and 660 per 1,000. Chances of survival improved greatly during the last three decades of the 19th century and by the beginning of the 20th century infant mortality rates had dropped to just above 100 per 1,000 live births. In less than 30 years, infant mortality rates had changed from being among the highest in Western Europe to among the lowest in the world.

With its extremely high infant mortality rates, pre-transitional Iceland stood in sharp contrast to other countries in northern Europe. Within a European context, infant mortality in Iceland up to the 1870s, can only be compared with that of certain German speaking districts (mainly in the south of Germany and in Austria) and with a few areas in northern Sweden and Finland. Most those areas are known for the artificial feeding of newborns.10 Figure 1.1 shows the development of infant mortality in Iceland and four other European societies during the period 1840–1930.
Initially Iceland and Bavaria displayed infant mortality rates that were much higher than all the other countries. Bavaria's was constant at around 350 until 1865. The rates in the other Nordic countries presented here (Norway and Denmark) had already dropped below 150 by the mid-19th century. Until the 1870s, Iceland had infant mortality rates two to three times higher than those of its neighbour Norway and between 80 and 100 per cent higher than the mother-country Denmark. The most industrialized country of the five, England and Wales, exhibited levels close to those of Denmark.

Whereas Iceland and Bavaria displayed comparable levels of infant mortality in the mid-19th century, the rate of decline in those two countries could not be more different. Whereas Bavaria experienced a gradual, relatively slow decrease, the rate in Iceland fell very sharply after 1865. During the late 1880s, Iceland's rate dropped below that of both England and Denmark and from the 1910s her rates ran in tandem with those of Norway. At this point in time infant mortality levels in Bavaria were still above 200 per 1,000.

Róshildur Sveinsdóttir's vivid account of her own life and that of her grandmother presented above has been a source of inspiration in my effort to develop hypotheses and find explanations of the dramatic increase in the survival chances of young children in late 19th and early 20th centuries Iceland. Many of
Róshildur’s statements, however, are both puzzling and paradoxical and raise questions about the reliability of different types of source material used to explain infant mortality decline in Iceland.

The most perplexing statement made by my informant is that breastfeeding was not practiced in her home-commune during her childhood. There is rather good evidence about the general lack of breastfeeding in Iceland in the 18th and early 19th centuries and despite the fact that little research has been carried out on breastfeeding in Iceland after 1850 it has generally been assumed that the rapid decline in infant mortality during the late 19th century was mainly the result of its introduction.11 This assumption is to a certain extent based on printed medical reports from the beginning of the 20th century that show that by then breastfeeding was common.12 Róshildur’s testimony implies that even if breastfeeding had become fairly common by the beginning of the 20th century, there were still areas that continued the old tradition of the artificial feeding of newborns. Her account also shows that even if aggregate infant mortality had fallen to low levels, the constant threat of death was still present in certain families and in certain areas. Indeed she grew up in an area that was traditionally known for exceptionally high mortality rates.

Róshildur’s account also indicates that despite the extension of the medical sector in the late 19th and early 20th centuries, not all Icelanders had immediate access to medical expertise or educated midwives. Homeopaths were still quite influential in some areas13 and untrained midwives were practicing in several communes. Róshildur’s grandmother was one of these and she remained faithful to the old Icelandic tradition of fostering newborns away from their families. During the late 1840s, both central and local authorities in the Lutheran societies had fought against this practice of taking newborns away from their homes. By then it was fairly common for children to be taken to church and baptized directly after birth. In the Icelandic case it was apparently customary for midwives to take the newborns to their own homes after the ceremony where they cared for them for two or three weeks.14 It seems odd that this custom was still prevalent in the beginning of the 20th century. Yet the continued practice of fostering young infants from impoverished households at the midwife’s for a period of time, is also a proof of the importance of informal networks, in a poor and sparsely populated society that lacked all the formal institutions of a welfare state.

With its unusually high infant mortality rates during the pre-transitional period and with their extremely steep decline, Iceland presents an interesting case for the study of infant mortality. It goes without saying that there were a vast number of interrelated factors behind this development. The main objectives of this study are to analyze the main causes of the high infant mortality in pre-transitional Iceland and to explain the impressive decline in infant mortality that occurred in the late 19th and early 20th centuries. The next section includes a presentation of the main determinants of infant mortality and a discussion of
the health transition debate. There then follows a description of socio-economic developments in Iceland and, in the last section of this part of the study, hypotheses and models to account for infant mortality decline are presented.

1.2. Determinants of Infant and Early Childhood Mortality. Previous Research

The increase in mean age which occurred in Europe during the late 19th and early 20th centuries was largely due to the improved survival chances of the very young. In the Icelandic case, only 60 per cent of all newborns in the mid 19th century could expect to live to their fifth birthday. Half a century later the average life expectancy at birth had improved greatly and more than 80 per cent of all newborns would survive the riskful period of infancy and early childhood. What were the chief factors behind this important achievement? And what were the main determinants of infant mortality in the pre-transitional period? In what follows, four important determinants of infant mortality are presented: infant feeding, educational standards, the physical environment and social status.

Infant feeding

It is evident that there were a vast number of underlying factors at work behind the levels and developments of mortality among young children. There is though little doubt about breastfeeding being the most important determinant of infant health in the European past. As in modern Third world societies where sewage and water systems are missing, infants that were exclusively breastfed from birth were protected against various lethal diseases. Infants that were breastfed and received no additional food were protected against pathogens often contained in milk and other food products. Diarrhoeal diseases were without doubt the most common cause of death among infants and other young children in pre-transitional Europe and the decrease in the occurrence of diarrhoeal diseases was, in all likelihood, the main factor behind the mortality decline in the youngest age groups.

There are, however, great variations in feeding practices both as regards the duration of breastfeeding and the age at which solid food is introduced into infant’s diet. Various studies have shown that the early introduction of supplementary food into an infant’s diet is very common around the world today. Even in cultures with a tradition of long-term breastfeeding, supplementary food is often introduced at very early ages, even directly after birth. In the beginning, supplementary food most often consists of water, teas or other unnutritive liquids, but sometimes of animal milk. Sometimes mashed or pre-chewed local food is given to infants as early as the first or second month after
birth. In many societies the colostrum is regarded as impure and thrown away. In this case the introduction of breastfeeding is delayed by 1–3 days and the infants are then normally given formula milk or "purifying liquids" to clean their intestines. The child is then deprived of the beneficial properties of the colostrum and, in areas with poor hygienic conditions, the introduction of additional food at such early ages greatly increases the risk of diarrhoea.

In modern developing countries artificial feeding at early ages is generally associated with increased infant mortality risks. It has been shown that infants that receive additional food in early infancy are up to two or three times more likely to die than those who are exclusively breastfed. Morbidity rates are definitely higher and infants that are weaned at early ages or receive supplementary food generally have much higher incidences of diarrhoea than their counterparts who are solely breastfed. A few studies have also reported higher risks of respiratory diseases for infants that are not breastfed.

In the modern period differences in mortality risks between breastfed and artificially fed infants are clearly associated with household and poverty related factors. Infants from wealthy households with modern facilities, such as clean drinking water and sewers are usually at no greater risk of dying young than their counterparts in rich western societies, even though they are not breastfed. The beneficial influence of breastfeeding is greatest where water supplies and sanitation are poor. A household-based study carried out in Malaysia has, for example, revealed that the absence of a modern sewage system and clean drinking water is strongly associated with mortality among babies who were exclusively artificially fed or only partially breastfed. For those infants who were exclusively breastfed, the absence of these facilities did, on the other hand, not make any important difference for their survival chances. Similar results are shown in a longitudinal study including 3,000 mothers and their infants in the Philippines where it was shown that even the addition of non-nutritive liquids to the breastmilk such as water and teas, nearly tripled the incidence of diarrhoea.

Historical sources do not normally provide us with the same detailed knowledge on feeding methods as modern medical and ethnographic studies. However, there are several studies that offer a relatively good picture of feeding practices in the past. It is well known that in many societies, where long-term breastfeeding was the common practice, supplementary food was often given at very young ages. Furthermore, demographic and social conditions resulted in many infants being deprived of the breast at very young ages. Many women in the lower social strata started working immediately after delivery. Mortality rates in all age groups were high in pre-industrial societies and childbearing women were often at risk of dying. Motherless infants were therefore quite numerous and the mortality rates among those infants were generally higher than for those breastfed by their mothers. The number of foundlings in European cities of the past was also high.
Even if motherless children were often put to a wet-nurse, the risk was high that they were either totally or partly deprived of the breast. In her book on wet nursing in Europe Valerie Fildes notes that during the 18th century cornets [feeding horns] were used with foundlings in France when they left foundling hospitals and were placed with wet-nurses. This indicates that foundlings were rarely breastfed exclusively or at least not for long. Even if survival chances among foundlings improved somewhat during the 19th century, mortality rates were as a rule extremely high in this group in pre-industrial Europe.

In her study of infant feeding in France, Catherine Rollet showed that there were important regional variations in the duration of breastfeeding in 19th and early 20th centuries France. In the south, infants were generally breastfed for long periods, whereas in the industrial areas of the north, breastfeeding was of short duration. Rollet argues that women’s work in the growing industrial cities of the north was the main reason behind this pattern. Other areas where breastfeeding was uncommon in France were the cattle farming districts of the northwest. Therefore, Rollet maintains that in areas where cow’s milk was abundant, mothers were likely to offer it to their children at very early ages.

The early introduction of artificial food to the diet of infants that were otherwise breastfed is likely to have produced differences in mortality rates in earlier times. Thus, Valerie Fildes has shown that in the beginning of the 20th century there were still notable differences in survival chances amongst infants exclusively breastfed and those who were not breastfed or only partially breastfed. Fildes has, furthermore, argued that the drop in neonatal mortality during the period 1680–1840 in English parishes can mainly be ascribed to the changes in traditional beliefs about the colostrum. Towards the end of the 17th century it became increasingly common to put the infant to the breast shortly after the birth and the practice of giving infants purifying liquids instead of the colostrum was widely abandoned. As a consequence neonatal mortality fell.

There are a number of areas in pre-industrial Europe where breastfeeding was either of very short duration or where infants were exclusively artificially fed. This was especially the case in southern Germany (in particular in Bayern and Württemberg), lower Austria and districts around the Gulf of Bothnia (Finland and Northern Sweden). In all these societies infant mortality rates were extremely high, between 300 and 400 per 1,000. Another characteristic was that neonatal mortality was also high, commonly above 200 per 1,000 live births. Diarrhoeal diseases were common and as a rule these societies displayed a peak in infant mortality during hot summer months.

Relatively little has been written on infant mortality in the Icelandic past. Until recently, research on infant mortality had almost exclusively focused on the 18th and early 19th centuries, the period before the publication of statistics on infant mortality. The most influential scholar in the field, Loftur Guttormsson, has based his research on parish registers in several parishes in Iceland. He has argued that infant mortality in pre-transitional Iceland fluctuated between 250 and 300 per 1,000 and only during periods of crisis passed above those levels.
Another historian Gisli Gunnarsson has, on the other hand, maintained that infant mortality was usually as high as 400 per 1,000 during the late 18th and early 19th centuries. Both Loftur and Gisli claim that the practice of feeding newborns artificially was the main reason behind the high infant mortality rates in pre-transitional Iceland.

Several historians have attempted to explain differences in breastfeeding traditions in European societies. Societies where breastfeeding of newborns was largely abandoned have received particular attention. The Swedish historian Ulla-Britt Lithell has maintained that women's hard-work prevented mothers from breastfeeding their babies in rural areas in northeastern Sweden and western Finland. Another Swedish historian, Anders Brändström, has argued that there was not always a positive relationship between women's hard work and high infant mortality. Using evidence from the parishes of Jokkmokk and Nertornea, he shows how difficult it is to determine, beyond doubt, the relationship between women's work and breastfeeding. Due to the introduction of breastfeeding, infant mortality rates in Nertornea fell from 350 per 1,000 to 180 per 1,000 during the period 1820–1870. At the same time the workload of women remained unchanged or even increased, as the availability of hired labour diminished and farmers were to a larger extent forced to rely on the work of family members. In the Saami population of Jokkmokk, on the other hand, infant mortality rates remained high, especially during the summer months when the workload of women was at its most intensive. This was the case despite the fact that almost all children were breastfed for at least two or three years. Brändström concludes, therefore, that women's work alone does not create a regime where infants are denied the breast. Other factors of a cultural and social nature are needed to explain differences in infant feeding traditions.

In the Icelandic case, Loftur Guttormsson agrees with Lithell's idea about hard work amongst childbearing women being the main reason behind the abandonment of breastfeeding. He argues that breastfeeding of newborns was the common rule in Iceland during the middle ages, but that it was largely abandoned during the 15th century. Loftur suggests that this occurred following two outbreaks of the bubonic plague when the population in Iceland was greatly reduced. As a result, the workload of women increased and as a consequence breastfeeding was abandoned. Even though the population eventually increased, the tradition of feeding newborns artificially seems to have prevailed.

**Parental education**

Whether literacy contributes to differences in infant mortality rates, and to the inclination to breastfeed in particular, is another important question. Most contemporary studies carried out in the Third World have shown that literacy, and above all female literacy, usually has an important bearing upon infant survival
chances. Even after controlling for factors such as social class and economic conditions, women’s education remains a crucial determinant of infant survival in contemporary poor societies.\(^\text{37}\)

Although maternal education is generally seen as one of the most influential contributory factors in the decline in infant mortality, it is by no means obvious in what ways exactly increased literacy rates affect levels of infant mortality. John Caldwell has suggested that maternal education diminishes the importance of a fatalistic view of infant deaths. Literate mothers are thus generally more likely to use the available health services. It has also been suggested that education is positively related to female autonomy.\(^\text{38}\) Das Gupta argues that

> education helps women to overcome the barriers posed by low autonomy, low social status and low economic status. ... Education enhances competence in a variety of ways through enhancing knowledge, confidence and other responses, as does social status.\(^\text{39}\)

Historical studies tend to display somewhat less conclusive results on the relationship between parental education and child survival than do modern studies in poor societies. Samuel Preston and Michael Haines show that literacy rates affected survival chances of young children in the United States at the beginning of the 20\(^\text{th}\) century. However, they affirm that the “relative and absolute mortality advantage of literate mothers and of members of professional classes is far greater today.”\(^\text{40}\) They maintain that lack of know-how was the main explanation for relatively high infant mortality rates in the higher strata in the United States in the beginning of the 20\(^\text{th}\) century. However, in line with modern studies, Preston and Haines show that mother’s literacy had a more important bearing upon child survival than was the case with fathers’ literacy, but that fathers’ literacy was more important for infant survival in urban than in rural areas.\(^\text{41}\)

A study of the association between infant survival and literacy in Sweden during the 19\(^\text{th}\) century revealed results similar to those in the United States.\(^\text{42}\) A paper that is based on information on reading skills in catechetical registers in Swedish parishes, showed that education did not affect infant survival to any notable degree in the early 19\(^\text{th}\) century. After the mid-19\(^\text{th}\) century, however, levels of literacy affected infant survival. The study showed that children benefited in particular from mothers’ literacy, whereas fathers’ literacy rates had little impact upon infant survival. Like in the Preston and Haines’ study, it is shown that the relationship between infant survival and literacy was strongest in the urban setting. Here, however, the relationship is only detected in the case of women’s literacy. This is, according to the authors, related to the changing position of women. Women gained increased control over the resources of the household and this produced a precondition for women to influence the health of their children. However, “not until the period of industrialization and urbanization could literacy be transformed into something beneficial for the survival of children.”\(^\text{43}\)
The urban and the rural environment

Mortality rates tended to be considerably higher in urban than in rural areas during the pre-transitional era. The urban environment produced conditions that were generally unhealthy for human beings. Because of crowding, diseases spread easily in the urban environment and before water and sewage systems were introduced in urban areas, water- and food-borne diseases occurred commonly in towns and villages.

As in other age groups, the pattern of high urban mortality is generally also observed among infants in the European past. In Sweden for example, infant mortality rates in urban areas were above 220 per 1,000 during the 1830s, whereas the countryside displayed infant mortality rates of only 160. After 1830, infant mortality rates fell steadily in rural areas, whereas urban infant mortality showed little improvement between 1830 and 1880. After 1880 infant mortality decline in urban areas accelerated and dropped below the countryside during the 1920s.

Similar trends are observed for other countries. In 1880 large cities in Germany displayed high infant mortality rates; more than one in every four children died before the age of one. At the same time rural areas had infant mortality rates of less than 200 per 1,000. Between 1870 and 1900 urban areas experienced an accelerated downward trend, whereas improvements in rural areas were of minor importance. By the turn of the century urban infant mortality was lower in cities than was the case in rural areas. In Germany, Austria and Sweden, the downward trend in infant mortality coincided with accelerated urbanization.

Jörg Vögele has studied the development of infant and child mortality for urban areas in Prussia and the German Empire during the mortality transition and shown that mortality rates were highest in the most populous cities. Infants and children in cities with more than 10,000 inhabitants were affected by respiratory and digestive diseases to a larger degree than was the case with smaller towns. Similar results have been revealed for France and England where population density has proved to be an important indicator in explaining variations in infant and child mortality rates. In their analysis on the spacial dimension of infant mortality in England and Wales, Woods, Williams and Galley do, however, point out that there were important exceptions to this general pattern, even very small towns in southern England experienced substantially higher levels of infant mortality than the surrounding rural areas. They also show that in some cases, rural areas displayed very high infant mortality rates.

Despite a general pattern of higher mortality in urban than in rural areas in 19th century Europe, it is difficult to establish a clear-cut association between degree of urbanization of individual countries and their infant mortality levels. Thus, infant mortality rates were not particularly high in England, the most industrialized and urbanized country of pre-transitional Europe. The rates there were lower than in less industrialized countries such as France, not to speak of Germany. The predominantly rural areas of northern Sweden and Finland also had higher rates during the early 19th century. A crucial factor behind this paradox is without doubt the differences in infant feeding practices between coun-
tries and areas. As infants that were solely breastfed were protected from various air and food-borne diseases, large urban areas with a strong tradition of breastfeeding could display relatively low infant mortality rates. In those areas the weaning of infants was most often associated with increases in mortality during the late post-neonatal period. Those areas also tended to have higher early childhood mortality than infant mortality. This was for example the case with Spain and England. Childhood mortality tended to be particularly high during hot summers in urban areas during the pre-transitional period.

In his study on social inequalities in mortality in the city of Sundsvall, Sören Edvinsson investigated the development of mortality for different age groups. He showed that infant and child mortality rates in Sundsvall started to decline during the 1830s. With accelerated urbanization after 1860, infant mortality rates continued to fall, whereas childhood mortality rates rose temporarily. This was particularly true for the age group 1–4 years. Infants were apparently better protected against airborne and waterborne diseases than was the case with the older children due to beneficial effects of breastfeeding. Anne Lokke's research in Denmark reveals similar results. Infant mortality rates in Copenhagen rose during the 1860s, but Lokke shows that the rise was concentrated in the age group 3 to 12 months. Neonatal mortality and mortality in the second month continued to decline during this period. Mortality from intestinal diseases peaked in Copenhagen during the 1870s and Lokke chooses to talk about an urbanization crisis in the city of Copenhagen during this period.

Research on differences in infant mortality in England and Wales has also revealed the importance of exogenous factors in urban infant mortality. Whereas urban and rural neonatal mortality rates were almost equal, post-neonatal mortality in towns and villages tended to be higher in the urban setting than in the rural. Babies and other children in towns and cities were much more prone to die from intestinal and respiratory diseases than their more fortunate counterparts in rural settings.

Investigations have revealed somewhat contradictory results on the impact of public health measures in urban areas upon infant health. England was the pioneer in sanitary reforms. After the introduction of the first Public Health Act in 1848, the construction of central water and sewage systems and the removal of refuse became important issues in most English cities. Furthermore, an attempt was made to eliminate domestic animals from the urban environment and, following the French example of the "Goutte de lait" movement, milk depots were established in many urban areas, where parents had access to pasteurised milk. Despite these measures infant mortality in urban England remained high, and as a matter of fact the decline in infant mortality rates in England did not begin until 1900. Sanitary reforms are likely to result in a decrease in deaths due to diarrhoeal diseases, since they limit the exposure to microorganisms spread in food and water. In urban England and Wales, however, mortality from infantile diarrhoea increased between 1870 and 1900. P.J. Atkins has suggested that the consumption of milk that was often of poor quality even
contributed to ill health among infants in England, particularly because of its share in infant deaths from diarrhoea, tuberculosis and scarlet fever. Atkins affirms that pasteurisation of milk was not likely to have had much of a positive impact on infant health before 1920. He shows that infants who were not breastfed or only partially so were definitely more at risk of death from infantile diarrhoea than their counterparts who were breastfed only.\textsuperscript{55}

In urban areas in Germany the construction of central water and sewage systems took place between 1870 and 1890 and by the turn of the century all towns with more than 2,500 inhabitants had a central water system. In two recent articles, Jörg Vögele has discussed the impact of public health measures in Germany and shown that the fall in infant mortality between 1870 and 1900 cannot be explained by the fall in mortality rates from water- and food-borne diseases. Despite the effort of cities to improve public health, in particular by the construction of water systems, municipal milk supply and improvements in infant care, proportionally more infants died of diarrhoea at the end of the century than before 1870. Vögele concludes that in theory these measures could have contributed to the decline in infant mortality. In practice, however, their effects was often limited or inadequate. Since theories about the origins of disease were still unclear, the [water] systems often did not satisfy hygiene requirements. The number and capacity of milk depots and infant welfare centres were relatively small, and, what is more, their acceptance among the working-classes was limited since they were designed to a large extent without regard to actual working-class living conditions.\textsuperscript{56}

In Vögele's view public health measures only had a relatively slight impact on the drop in infant mortality rates. He adopts an explanation-model similar to that of Thomas McKeown\textsuperscript{57} and argues that the main cause of the rise in life expectancy during the last three decades of the century was related to rising living standards, the key explanatory factors being in the field of demographic, social and economic change.\textsuperscript{58}

As in many other countries, public health measures in Sweden followed the example of England during the second part of the 19th century.\textsuperscript{59} With the Public Health Law of 1874, Public Health Committees became compulsory in urban areas. They consisted of the town physician, the police chief, a representative of the magistrate, and four others. The Swedish Public Health Law included both environmental and health matters and was applied at the public and individual level. Its main objective was to ensure that the population had access to clean water with a focus on the construction of water and sewage systems.\textsuperscript{60}

As in German cities, the decline in urban infant mortality in Sweden coincided with the application of the new public health law and the building of water and sewage systems. But as with the German and English experience, this decline has not always proved to have been due to the fall in mortality due to
water- and food borne diseases. For Sundsvall, Sören Edvinsson has found that death rates due to infantile diarrhoea remained high (especially during the summer months), despite the introduction of sanitary reforms. Similar results are revealed for Stockholm and Gothenburg, and in Uppsala, where the construction of water and sewage systems and the otherwise strict application of the public health law did not result in diminished mortality due to diarrhoea. On the other hand, Linköping experienced an improvement following the sanitary reforms. Those parts of the city that were equipped with water and a sewage system revealed a diminished frequency of deaths from diarrhoea, whereas the situation remained unchanged in those areas that lacked these facilities.

Recent research on infant mortality in a number of Icelandic parishes during the 18th and early 19th centuries revealed that there were considerable regional differences in mortality rates in Iceland. It has been shown that densely populated coastal areas often displayed higher infant mortality rates than did rural areas. Loftur Guttormsson has shown that infant mortality rates were above 300 per 1,000 in the coastal parish of Hvalsnes in southwestern Iceland between 1766–1810. During the same period infant mortality rates were only between 210 and 270 per 1,000 in three sparsely populated inland parishes situated in southern, western and northern Iceland.

In an article on "Household Structure and Urbanization" Gísli Ágúst Gunnlaugsson and Loftur Guttormsson analysed population developments in two expanding fishing villages in eastern and northern Iceland (Seyðisfjörður and Siglufjörður) at the end of the 19th century. Both villages revealed very high death rates, especially as regards infant mortality. Between 1891 and 1900 infant mortality rates at the national level were close to 120 per 1,000, but, at the same time, were between 150 and 160 in Siglufjörður and Seyðisfjörður. Both towns experienced accelerated population growth with extremely high in-migration during late 19th and early 20th centuries. According to the authors, overcrowding, hard work, the lack of health services and insecure communications are all factors that could have produced this situation of excess-mortality. Michael Drake has described a similar situation in the expanding fishing districts in Norway.

**Socio-economic factors**

Studies carried out in modern societies often display a relatively strong correlation between socio-economic factors and infant mortality. This correlation is not always as clear-cut among historical populations. However, the social group that almost without exception displayed higher mortality rates than all others were children born out of wedlock. The relative differences between legitimate and illegitimate infants differ somewhat between countries and time periods. In Sweden and Denmark infants born out of wedlock had between 70 and 80 per cent higher mortality rates during the second part of the 19th century than in-
fants born within wedlock. Similar results are revealed for France whereas the difference was only around 30 per cent in the Netherlands during the same time period.

Despite generally high infant mortality among illegitimate infants, recent research has shown that mothers and their illegitimate children were by no means a homogenous group. Often single mothers benefited from the help of close kin living either in the same household or in the immediate neighbourhood. It has thus been shown both for Sweden and for the Netherlands that illegitimate infants who lived in the same parish as their grandparents were almost as likely to survive to their first birthday as was the case with children born within wedlock.

Another aspect of differences in the preconditions of illegitimate children was the tradition of cohabitation of people from the lower social classes. This was an arrangement that was common in several parts of Europe, in particular in urban areas. In the Swedish case this form of cohabitation proved to be so widespread in the capital Stockholm that contemporaries termed this type of informal consensual union *Stockholmsäktenskap* (Stockholm-marriage).

In a recent article on illegitimate infant mortality in a fishing village in southwestern Iceland, I show that it was fairly common for women from the lower strata of society to give birth to their first child without being married. As in the case of Sweden it was common that these women lived with the child's father. I showed that infant mortality of illegitimate children was highly dependent upon the household position of their mothers. Babies of unmarried mothers who were servants or paupers within the household of a non-relative, had mortality rates that were twice those of legitimate children, whereas children of unmarried mothers who lived with the child's father or who lived with their grandparents, had only slightly higher mortality rates than children born within wedlock.

Several authors have shown that women who gave birth to illegitimate children belonged almost exclusively to the lowest strata of society, and that high mortality rates of illegitimate infants can be a function of bad economic conditions rather than the stigmatisation of their mothers. Peter Laslett discussed the development of subcultures among the working classes in England, where sections of the working class lived together in free consensual unions having several children together without marrying. Often the custom to have children without marrying persisted over several generations. Scott, Tilly and Cohen maintain that women giving birth to illegitimate children generally expected to get married, but the circumstances of their lives - propertylessness, poverty, large-scale geographical mobility, and the absence of traditional social protection - prevented the fulfilment of these expectations.
Hans Marks has maintained that for Sweden in the majority of such cases, births were a consequence of postponed marriage. Young couples in the lower strata of society postponed their marriages until they had acquired some kind of property. Icelandic and Swedish evidence thus indicates that the increase in illegitimacy may be seen as a function of a general increase in the relative size of the propertyless strata of society, i.e. that section of society that did not profit from improvements experienced by the higher classes.

When it comes to the influence of parental occupational status upon infant survival in pre-transitional times, studies have frequently revealed relatively contradictory results. Several studies carried out in the Nordic countries have thus shown that infant mortality was often considerably lower in the group of landless farm-labourers than was the case with well-to-do farmers. These paradoxical results are explained by the fact that childbearing mothers belonging to the lower classes were more likely to breastfeed than was the case with farmers who had a ready access to animal milk. Similar results have been reported for France and for England. When scrutinizing infant mortality rates due to diarrhoea in relation to social class, Woods et al. discovered that infants belonging to the working class displayed lower rates than was the case with the higher classes. Again, this is explained by the fact that breastfeeding was more common among the working class than was the case with other social groups.

In Iceland, little has been written on socio-economic differences in infant mortality. A study of two kin-groups during the 18th and early 19th centuries indicates that mortality differentials between social groups were of no importance during the pre-transitional era. One of the two kin-groups, the Briem family, was without doubt one of the richest and most influential in the country during the 19th century, whereas the other consisted of relatively poor farmers. It is shown that there were no differences in infant mortality rates between the two families and that the Briems experienced somewhat higher early childhood mortality rates than was the case with the more deprived family.

Preston and Haines also discuss the relatively weak correlation of infant mortality and socio-economic status in the late 19th century United States. They affirm that the general lack of know-how in all social groups was the main obstacle to parental attempts to improve their children's survival chances.

Several scholars have shown that the regional aspect is a better indicator of differences in infant mortality than social class during the pre-transitional period. Daniel Scott Smith argues that before the mortality transition took place, geographical region played a crucial role in mortality levels. Social and economic conditions did not affect survival chances as was the case in later periods. Infectious diseases were common as cause of death in all social groups and the highest social strata was not in a position to avoid contact with the lower classes since they communicated frequently with them through servants. Another study on the importance of social class and environment has been carried out by Naomi Williams on the town of Sheffield. Williams' study supports Smith's ideas about the relatively more important effects of environment than social
class. She shows that bad water and the lack of sewers was the main cause of infant mortality in the town of Sheffield during the mid-19th century. She demonstrates that there were remarkable differences in infant mortality within the town and that mortality rates were highest in an area closest to the river. Even if social class mattered, the environmental factors were of greater importance. Thus a child belonging to the highest strata of society and living close to the river was more likely to die in infancy than a child from the lower classes living in a healthier part of the town.

Whereas there is not always an evident association between economic means and infant mortality, the transition towards lower infant mortality rates during the 19th century was almost without exception in favour of the higher social strata. Sören Edvinsson has shown that for Sweden, declining mortality experienced in Sundsvall during the second part of the 19th century increased socio-economic differences in mortality. Similar results are unveiled by Magdalena Bengtsson in a study of the town of Linköping and by Bo Burström and Eva Bernhard in Stockholm. Both studies show that the upper social layers tend to display a much steeper infant mortality decline than did the lower social groups. Even for England, Alice Reid shows in her study on the infant health movement in England, that the highest classes were first to implement new knowledge about the ideal treatment of infants and consequently infant mortality decline was steepest in the upper layers of society.

Several recent studies support Daniel Scott Smith’s idea about the relatively greater importance of region than social class in mortality levels during the pre-transitional period. The decline in mortality during the second part of the 19th century was, however, characterized by a diminishing gap between regions. At the same time the gap between social classes increased. Smith maintains in his analysis:

Probably during the nineteenth century and certainly during the twentieth, differentials based on regions and between cities and the countryside narrowed. Differentials in mortality between groups within areas may also have increased in the nineteenth and early twentieth century as more affluent groups distanced themselves from higher mortality groups in the areas.

Recent research has offered support to Smith’s ideas about the great importance of region for mortality in the pre-transitional era. Whereas the gap between social classes tended to increase with declining mortality rates, the trend in the importance of regional variations was generally reversed. There were generally huge differences in infant mortality between areas, a gap that decreased while mortality rates declined. The infant mortality decline was thus characterized by the feature that areas with previously high mortality rates declined more steeply than was the case with low mortality areas. The mortality transition was thus not only characterized by a secular decline in mortality, but also in the closing of the gap between areas. At the same time, the gap between urban and rural areas diminished and eventually urban mortality dropped below rural mortality.
A few aspects of the health transition debate

The discussion above indicates that there were several interrelated pathways to better survival chances in Europe. During the post-war period, several scholars have attempted to find a general model to explain this important feature of the demographic development in late 19th and early 20th century Europe. Ever since Frank E. Notestein presented his theory on the demographic transition, transition models have been popular in demographic research on mortality. Notestein's model was originally designed to predict population development in the developing world. His model assumes that the main precondition for mortality decline is economic prosperity. The decline in mortality is, according to Notestein, the main impetus for population changes. The decline in mortality does then always precede the decline in fertility.

An influential scholar in the field of demography, Abdel Omran has used a term epidemiologic transition to describe the process of declining mortality in late 19th century Europe. The term is broader than the term of mortality transition as it encompasses changes in morbidity regimes as well as mortality. The epidemiologic transition is thus a process of development from a regime characterized by high mortality in young ages to a regime where mortality was largely restricted to the elderly. In Omran's view the epidemiologic transition produced the most notable improvements in health and survival among children and child-bearing women. Omran's approach is very much in line with traditional modernization theories, representing the optimistic view that economic growth and gradually rising living standards were the main precondition for the eventual decline in mortality and (later) in fertility.

Thomas McKeown is another author who has argued that economic improvements were the main force behind the mortality decline. McKeown maintained that medical knowledge was of negligible importance in this process of mortality decline and he also credited only a minor importance to public health initiatives. In his view the "invisible hand" of rising living standards, predominantly in the form of per capita consumption, was the chief factor behind the secular decline in mortality.

McKeown's assumptions have been heavily criticized during recent decades. One of his most fervent critics is the historian Simon Szreter. He argues that public health measures had a far larger impact upon survival than acknowledged by McKeown. In Szreter's view, improvements in water and sewage systems in the last third of the 19th century had a major impact upon health in urban areas in Britain. He also argues that there is by no means a self-evident connection between economic growth and increased survival. On the contrary, economic growth is in the short run likely to bring about disruption, deprivation, disease and death (the four D's). According to Szreter nutritional standards did not improve for large sections of society during the modernization process. Urban areas, the cradles of economic growth, were thus as a rule charac-
terized by higher mortality and more poverty than rural districts. Szreter also criticizes McKeown for largely disregarding the factor of human agency in his model.

Several other scholars called for models that encompass the factor of human agency. In an article in *Health Transition Review* John Caldwell criticizes the traditional transition models for being above all descriptive and not analytical. He calls for a model that encompasses cultural and social factors. Caldwell's research is mainly carried out in contemporary developing societies and, in line with most other researchers in contemporary societies, he shows that maternal education is the most important determinant of infant survival even after controlling for other variables such as social class.

Third world studies have in various ways had an impact upon research interests in historical studies on infant mortality. Thus, UNICEF has initiated several projects directly related to infant health in the past. Since the 1980s, there has thus been a powerful interaction between the medical professions and historical demography. “Lessons from the past challenge for the future” is the subtitle to a chapter by Godelieve Masuy-Stroobant written within the European mortality project *Decline in Infant mortality in Europe*. The title in itself indicates how important the interactions between different disciplines dealing with the issue of infant health in the past and the present are. The health indicators developed within the framework of UNICEF and WHO emphasize the importance of childhood survival, female literacy rates, access to clean water and the promotion of breastfeeding as the main indicators for development in the global perspective. The growing importance of all those issue within development programs has greatly influenced research interests within the discipline of historical demography, in particular within the field of infant mortality.

The present study is carried out within the framework of a Nordic project on the decline of infant mortality in the Nordic countries 1750–1950 (*Ett välfärdsamhälles framväxt: Nedgången i spädbarnsdödlighet i ett nordiskt och europeiskt perspektiv; ca 1750—1950*). This project was in its turn an integral part of a larger European project *The International Project on the Decline of Infant and Childhood Mortality in Europe during the last two Hundred Years*, a project that was organized in collaboration with UNICEF and the *Instituto Degli Innocenti* in Florence. In both projects it is presumed that the decline in infant and childhood mortality in Europe was one of the main determinants behind the development of modern welfare states. But before proceeding to models and hypotheses used in this study let us have brief look at population developments and socio-economic conditions in Iceland. A description of the development of the health sector in Iceland is also in its place here.

Population growth and socio-economic changes

Pre-industrial Iceland was an extremely sparsely populated rural society under Danish rule. The country is slightly more than 100,000 km$^2$ and the vast interior is still largely uninhabited. According to the first national census of 1703 the country had slightly more than 50,000 inhabitants and never exceeded 51,000 during the entire 18th century and the first two decades of the 19th century. Birth and particularly death rates were characterized by considerable fluctuations. When mortality peaked, the number of deaths by a large margin exceeded the number of births. During a smallpox-epidemic in 1707–1708 for example about one third of the entire population died.101

During the second part of the 18th century, two serious mortality crises came about in Iceland, one during the 1750s and one in the 1780s (see Figure 1.2). Both those crises were preceded by volcanic eruptions and their consequences were widely discussed by the bishop over southern Iceland Hannes Finnsson (1739–1796) in an article he called “Um mannafékkun af hallærum” (On population decline caused by crises).102 The early 1750s were marked by cold weather and there was a shortage of hay in many areas. In august 1755 a volcanic eruption started in Katla in southern Iceland and in the subsequent year crude mortality rate rose to almost 100 per 1000. Hannes Finnsson wrote that several thousand individuals in this part of the country died from hunger in 1756 and 1757.103 No severe epidemic diseases were reported in Iceland those years and it must be assumed that mortality rates were to a large extent a result of the immediate and secondary effects of the Katla eruption.

A volcanic eruption in Lakagigar in southeastern Iceland, thirty years later had a far more wide ranging effect. One fifth of the total population of the country died between 1783 and 1786.104 Crude mortality rates reached levels of 114 per 1,000 in 1784 and 131 per 1,000 in 1785. This period witnessed the last severe subsistence crises in Icelandic history. Later mortality peaks are chiefly to be explained by the outbreak of epidemic diseases. Due to the geographical isolation of the country, epidemics were relatively infrequent visitors and therefore many infectious diseases that had become endemic childhood diseases in other European countries proved extremely fatal in Iceland. Crude mortality during the early 19th century quite frequently peaked at levels of between 50 and 60 per 1,000. High mortality peaks at the national level during epidemics are also to be explained by the contact between districts brought about by seasonal labour migration. This was common and often resulted in epidemic disease reaching all districts of the country within the course of a year.105

Despite limited changes in its socio-economic structure, Iceland experienced relatively strong population growth during the second quarter of the 19th century. This was especially true for the period 1820–1860 when the population
rose by around 1 per cent per year. Thus, the population was 48,000 in 1820 and close to 68,000 in 1860. During this period climatic conditions were apparently good. After the frequent crises and population decline of the late 18th century, much land was vacant. As the availability of land was the main precondition for marriage and the founding of a family, nuptiality and crude birth rates were high during this period (1820–1860). However, despite relatively favourable socio-economic conditions, death rates were quite high too and mortality peaks not infrequent. This was especially true for the 1840s when severe epidemics of influenza, whooping cough, scarlet fever, measles and diphtheria were documented in Iceland. In other European countries similarly frequent peaks in mortality from epidemic disease have been observed during this period. Population increase in Iceland at this time was then mainly explained by rising crude birth rates.

After a period of economic expansion, socio-economic conditions deteriorated after 1850. Climatic conditions were less favourable than before and fish catches poor. Between 1850 and 1870 there was thus a notable decline in the export of fish products, a trend that was reversed towards 1880. Agriculture in Iceland was to a large extent dependent upon animal husbandry and sheep rearing in particular. During the 1850s a sizeable proportion of the sheep flock was slaughtered after a disease was discovered in most parts of the country. As the traditional diet in Iceland was largely dependent upon animal-based food, this had noteworthy consequences for the inhabitants. The historian Guðmundur Jónsson has shown that there was a decrease in food supply after the mid 19th century. Between 1800 and 1840 there was a constant increase in the energy

![Figure 1.2. Population development and crude birth and death rates in Iceland, 1735–1950](image)

value per person of the diet of Icelanders, but it declined noticeably between 1850 and 1870. After 1870, energy values started to increase again, but didn’t reach the value of the 1840s until after 1890.\textsuperscript{111}

The period between 1860 and 1880 has also been described as one of overpopulation in Iceland. The population had risen from around 50,000 in 1830 to 70,000 in 1870\textsuperscript{112} without any considerable changes in either the economic or social structure. The historian Gísli Ágúst Gunnlaugsson has shown how this crisis experienced in Icelandic society was reflected in deteriorating marriage prospects.\textsuperscript{113} By applying restrictive social legislation, local authorities attempted to prevent young people from establishing a family and settling in cottages in fishing areas, where they might run the risk of becoming a burden upon the local community. This in its turn resulted in an increase in household size in farming areas. Young people remained in their parental home long past the normal age at marriage, a growing proportion of the adult population remained unmarried and the mean age at first marriage rose. Measures to prevent people marrying were, however, unable to prevent sexual activity so there was a dramatic increase in illegitimacy. During the first half of the 19\textsuperscript{th} century births outside marriage had accounted for between 10 and 15 percent of all births. The figure rose to almost 25 during the mid-1870s.\textsuperscript{114}

Despite deteriorating socio-economic conditions there was no notable increase in mortality rates between 1850 and 1880. Indeed, during the early 1850s mortality was low, although this was followed by a temporary increase in the 1860s. After 1870 death rates fell steadily and only in 1882, following a measles’ epidemic, did the number of deaths exceed the number of births. The commencement of the secular decline in mortality in Iceland coincided almost exactly with the onset of the decline in crude birth rates. The time lag between mortality and fertility decline observed in so many other European countries (in the way that mortality started to decline earlier than fertility) did not occur in Iceland. It is also worth stressing that birth rates fluctuated sharply during the pre-industrial period. In a country where the availability of land continued to be the main prerequisite of marriage and the founding of a family, birth rates, as well as nuptiality rates, were liable to fluctuate, especially since mortality played such an important role in its population development.\textsuperscript{115}

Despite relatively low mortality rates during the 1870s, there was no great increase in population and during the 1880s the population declined slightly. This was mainly due to the onset of mass-emigration to North America, an event that was accompanied by decreasing birth rates. Population increase gained pace again after 1890, with the growth rate exceeding 1 per cent per year until the 1990s. The most important explanation of this was rapidly declining mortality. However, it is also worth noting that birth rates have remained relatively high in modern Iceland. Apart from the years of the great depression during the 1930s, crude birth rates were close to 30 per 1,000 until the 1960s and did
not drop below 20 per 1,000 until 1970. During the first half of the 20th century, the Icelandic population almost doubled. At the turn of the 20th century, the country had a population of 78,000. By 1950 it had risen to 144,000.

It was noted earlier that by European standards, urbanization started late in Iceland. Until the last quarter of the 19th century almost all its inhabitants lived in sparsely populated rural districts. Reykjavik was by far the largest town in Iceland with a population of only 7,000 inhabitants at the turn of the 20th century. The chief impetus behind the modernization of Icelandic society lay in the growth of the fisheries. Between 1880 and 1930 the fisheries gradually changed from being a source of subsidiary income for farmers to being the most important industry in Iceland. This development entailed radical changes in the settlement pattern of the country. Between 1901 and 1930 the share of the population living in municipalities with more than 1,000 inhabitants rose from 12 per cent to more than 50 per cent.

Although there were only modest changes in the economic outlook and settlement pattern in Iceland during the 18th and 19th centuries, important changes did occur within Icelandic society. The period after the mid-18th century was thus a period of diverse social reforms, something that is among other things reflected in the growing importance of the medical sector. During this period there were also important changes in the provision of physicians and midwives.

**The medical sector**

The first professional physicians were appointed to Iceland during the 1760s. The highest medical official of the country was the *Landphysicus* (state physician) who resided in Reykjavik. Shortly after his appointment four district physicians were employed in Iceland. By 1800 the number of medical districts had grown to six. The second part of the 19th century was characterized by a rapid development of professional medicine. Following a law passed in 1875, the country was divided into 20 medical districts. By the turn of the 20th century these had increased to 42.

The development in the provision of midwives went hand in hand with that of physicians. One year after the first State physician (*Landphysicus*) was appointed to Iceland a Danish midwife was employed in Reykjavik to assist him with the training of midwives. Initially, there was to be only one midwife in each of the 20 counties. This requirement was not met in all counties. As Iceland was sparsely populated, only relatively few women had access to trained midwives. It is also worth noting that during the late 18th and early 19th centuries not all counties had trained midwives. As was the case with the development of medical provision, the number of midwives increased sharply during the second half of the 19th century.
Table 1.1. Physicians’ and midwives’ ratio in Iceland, 1800–1930

<table>
<thead>
<tr>
<th></th>
<th>Physicians</th>
<th></th>
<th>Midwives</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Pop/physician</td>
<td>N</td>
<td>Pop/midwife</td>
</tr>
<tr>
<td>1800</td>
<td>6</td>
<td>7,960</td>
<td>13</td>
<td>3,690</td>
</tr>
<tr>
<td>1840</td>
<td>7</td>
<td>8,160</td>
<td>30</td>
<td>1,900</td>
</tr>
<tr>
<td>1875</td>
<td>21</td>
<td>3,390</td>
<td>76</td>
<td>930</td>
</tr>
<tr>
<td>1910</td>
<td>60</td>
<td>1,260</td>
<td>193</td>
<td>440</td>
</tr>
<tr>
<td>1930</td>
<td>120</td>
<td>900</td>
<td>195</td>
<td>560</td>
</tr>
</tbody>
</table>


Table 1.1 shows the development of medical provision in Iceland during the 19th and early 20th centuries. The most notable changes occurred during the last decades of the 19th century. Thus whereas in 1870 there were almost 3,400 inhabitants per physician, by 1910 the number had fallen to 1,250, and by 1930 to 900. Even more dramatic changes were seen in the provision of midwives, with the increase there occurring somewhat earlier than was the case with physicians. The midwife / population ratio fell from one to 1,900 inhabitants in 1840 to one to 930 in 1875 and one to 440 in 1910. It is worth noting that the midwife / patient ratio was comparatively favourable in Iceland. Thus in Sweden, a country that has been seen to have unusually many midwives, the midwife / population ratio was one to 3,336 inhabitants in 1860 and one to 1,846 in 1900. Here again, however, it must be stressed that communications in Iceland were not easy so that it often took midwives several hours to attend to childbirth. The medical districts were far larger, the result being that physicians never saw a majority of the sick.

In this context the improvements made during the first decades of the 20th century were not only a matter of the increase in the number of physicians and midwives. Better means of communications and the fact that a larger part of the population lived in towns and villages made access to medical provision easier and quicker than when all visits had to be made on horseback and when practically no rivers were bridged. Here it can be mentioned that the midwife Helga Nielsdóttir (1903–1986) who served in Reykjavik since 1923 took her driver’s license in 1929 and for a while visited childbearing women on a motorbike. In 1938 a physician serving in the medical district of Eyrarbakki, which by Icelandic standards was relatively densely populated, noted in his report that during a single year he had driven 7,000 kilometers in the course of his visits to patients.
Icelandic physicians in the 18th and 19th centuries normally received their education in Denmark. A few were trained by the Landphysicus in Reykjavík, but as a rule such physicians spent at least a few months at the maternity clinic in Copenhagen. Midwives were initially trained by the Landphysicus, with the assistance of the town midwife of Reykjavík. She had received her education in Copenhagen. Midwives serving in Reykjavík were, as a rule, educated in Copenhagen and on a few occasions midwives in other parts of the country travelled to Denmark to learn their midwifery. As in other societies at this point in time, midwives were as a rule married and had in most cases given birth before they were accepted onto the educational program. This tradition was strictly maintained until around the mid 19th-century, when it became increasingly common for midwives to be relatively young and unmarried when they started their studies. The education of midwives was of short duration, initially only three weeks. During the 1850s the Landphysicus Jón Hjaltalín prolonged the training of midwives to three months. In 1912 the period was extended to six months and to nine months in 1924.

During the last part of the 19th century, there was a tendency to transfer the responsibility and control of public health issues in Iceland to local bodies, the so-called breppsnefndir (local governments). They appointed midwives and took charge of vaccination. In 1902 Health Boards (heilbrigjósnéfndir) were set up by law. They were to be established within each commune and were obliged to have the district physician as one of their members. Costly sanitary measures, such as the introduction of water and sewage systems were, however, not introduced in Iceland until the turn of the 20th century. In 1901 a law was passed obliging local governments in towns and villages to issue regulations on sanitary measures, covering the supply of fresh water, sewers and waste disposal. The first two decades of the 20th century were characterized by huge investments in most towns in water and sewage systems. As members of the Health Boards, physicians played an important role in the introduction of sanitary measures in towns and villages. Some physicians were also members of Parliament and fervent advocates there of sanitary measures. The issue of infant care and feeding practices became a “hot” issue in this period and several measures were introduced to improve infant health. Thus important initiatives concerning infant health were taken in the beginning of the 20th century. The most notable decline in infant mortality occurred, however, before these costly measures were introduced. In the next section I present a model and various hypotheses to explain the level and development of the infant mortality in Iceland during the 19th and early 20th centuries.
1.4. MODELLING THE INFANT MORTALITY DECLINE IN ICELAND

How could a sparsely populated rural society, where the majority of the inhabitants lived under relatively good environmental and climatic conditions produce levels of infant mortality that were higher than in the slums of the urban poor on the European continent? With its mild winters and relatively cold summers, Iceland had climatic conditions that were probably ideal for infant survival. Furthermore, there were no urban areas of importance in the country. As the other Nordic countries, Iceland was part of the Lutheran church and in line with them displayed higher literacy rates than did other societies in Europe. Nevertheless, infant mortality rates in pre-transitional Iceland were twice those of the other Nordic societies.

The sharp decline in infant mortality during the last third of the 19th century is a further puzzle. No important changes in the socio-economic structure occurred during this period and the decline was initiated when the country faced a situation of deteriorating economic conditions (see above). The reasons for the decline are obviously not of an economic nature, nor can the decline be explained by the introduction of complex and expensive changes in the infrastructure.

The main subjects addressed in this study can be summarized as follows:

(1) What were the main determinants of infant mortality in pre-transitional Iceland? What was the relative importance of child-care, what that of diseases? To what extent can differences between areas be explained by environmental and structural factors, to what extent by social and cultural factors?

(2) Even though the study is in part devoted to the mortality regime in Iceland during the pre-transitional era, it is chiefly focussed upon the decline in infant mortality. What were the main reasons behind the dramatic decline in infant mortality that occurred around 1870? To what extent are the changes related to changes in the socio-economic environment, to what extent to cultural factors, such as literacy? What measures were introduced to combat infant deaths and who were the actors? The main focus of this study is on human agency.

On the basis of earlier research on feeding practices in Iceland during the 18th and early 19th centuries, it would seem natural to explain the changes in infant mortality levels there by changes in infant feeding practices and / or in the treatment of food-products. It is quite obvious that the introduction of breastfeeding in a society where newborns were chiefly handfed would improve survival chances greatly. The question then, however, is: who were the central actors behind the change in the feeding of infants? A society where infants had for centuries chiefly been fed by animal milk and various other
food-products was not likely to change radically its infant feeding practices without any intervention or changes in its mentalité. Such changes were bound to be preceded by actions on the part of central or local authorities. The preconditions for a successful action/change in this respect would also be that childbearing women were willing, or in the position, to change their behaviour.

It is somewhat difficult to see any self-evident relationship between literacy rates and infant mortality in the European past. Societies with prevailing patterns of artificial feeding and high infant mortality are found both among populations with relatively low literacy rates and in areas in protestant northern Europe where literacy rates among the population generally were high as early as the 18th century. However, it may be assumed that high literacy rates would have facilitated the introduction of breastfeeding in societies with high literacy levels. Thus, Anders Brändström has shown in the Swedish case that measures undertaken by politicians and physicians to counteract the widespread tradition of artificial feeding had relatively immediate effects in northern Sweden. Pamphlets on child-care and child diseases were printed and distributed in all parishes and physicians, midwives and parish ministers were educated as to the advantages of breastfeeding.

Do high literacy rates in Iceland help to explain why the decline in infant mortality there occurred within such a short time period? Despite very moderate changes in the socio-economic structure, important changes did occur in Iceland during the last decades of the 19th century. The period after 1870 has been described as a period of an intensified secularisation in Icelandic society. Pétur Pétursson, for instance, maintains that

one observes a process of disengagement of primary education from the Church and its transposition to the sphere of specialized agencies. This, too, could be labelled desacralization of primary education in view of its former role in preparation for confirmation.

The secularisation trend in Icelandic elementary education went hand in hand with comparable developments in other European countries. This development was generally accompanied by better educational opportunities for women and consequently an increase in the share of literate women. A less fatalistic attitude towards life and death accompanied by increasing educational opportunities for women is likely to have created conditions where mothers of young children increasingly believed in their ability to affect directly the health and survival chances of their children.

Despite the evident implications of infant feeding practices upon mortality levels, it seems rather simple to assume that high infant mortality rates in Iceland could be explained by the prevailing practices of artificial feeding alone. Besides, such an unproblematic hypothesis leaves us with the evident question of why children were artificially fed. What conditions in a poor rural society created traditions where the majority of women seem to have chosen not to breastfeed their newborns? Even though this issue is not a key subject of this study, it requires discussion because only by shedding light on it, is it possible to
explain why traditions changed. A radical change in the prevailing traditions of the feeding of infants is not likely to occur within a time span of only a few years. It must be assumed that other changes occurred that paralleled the changes in feeding practices. The enormous fall in infant mortality beginning around 1870 certainly indicates that major changes occurred. To what extent were those changes related to changes in personal hygiene, or to socio-economic conditions or cultural factors, such as changes in education? To what extent were these merely the result of changes in the virulence of various endemic and epidemic diseases?

Figure 1.3 presents a simple interactive model that I use to explain the preconditions for infant survival in Iceland. The model assumes that individuals (here informal level) and institutions (formal level) are situated in given contexts and that changes only occur through an interaction between them. The contextual framework given in the model consists of the following: (1) Environment/epidemiological regime, (2) Economic and social structure and (3) Value systems, knowledge and resources.

Even though those structures might seem rather fixed I take for granted that individuals, families and communities are always in a position to change their conditions. Human beings adapt to the given environment in certain ways, ways that are by no means prearranged. And there are always several ways to act during a situation of crisis or the outbreak of an epidemic. Likewise individuals and families have their own ways of adapting to the socio-economic structure and of deciding how to prioritise the utilization of their resources.

Figure 1.3. An interactive model for infant survival
Changes are brought about in the interaction between individuals, within families and within formal institutions. Individuals manipulate their environment and through interactions with others bring about changes in their situation, in their immediate surroundings and in prevailing value systems. Because formal and informal institutions do not exist in a vacuum, decision-making is deeply embedded in prevailing value-systems. In this context it must be borne in mind that Iceland was part of a larger entity, the Danish kingdom, and the Icelandic elite had extensive contacts with Copenhagen, the administrative centre of the country. Thus, physicians were educated in Denmark and several members of the intelligentsia spent many years there.

Infant health was dependent upon various factors, some of which were easy to influence at the family level, others at the formal level by local or by central initiatives. The model above includes various important factors for infant survival both at the formal and informal level. Some of the factors are hardly relevant for the 18th and 19th centuries, but start to play a role after the turn of the 20th century. This is for instance the case with the introduction of "water and sewage systems" and "child allowances." By introducing the latter, the state offers families the possibility of changing the division of labour within the family and better opportunities for mothers belonging to the lower strata of society to focus more on their newborns.

The division of work between family- or household members is, however, not only a matter of state intervention. Families or neighbours in a rural society have more than one way of dividing work between their members. How individual families and local communities choose to do this is partly a result of the socio-economic structure, partly of deep-rooted ideologies. If the male head of household spends many weeks away from the farm carrying out subsidiary occupations in distant geographical locations, the likelihood that mothers with young children are involved in difficult outdoor tasks on the farm increases, and this may result in problems with breastfeeding. This is, however, at least in part a matter of choice within the family or kin group. Whether mothers of young infants engage in hard outdoor work outside occurs in some cultures, but not in others with a similar socio-economic outlook.

The two first boxes in the Formal level in Figure 1.3 contain probably the most important factors in the initial stages of the infant mortality decline in Iceland. Elementary education is often seen as one of the most important factors for infant survival. As the secularisation of Icelandic society increased, so too did educational opportunities for women. Educated women were more likely to believe in their own ability to affect directly the health and survival chances of their children.

Here it is hypothesized that the most important actors in this process were midwives. They had direct contact with childbearing women. Midwives were recruited in the local community and, therefore, were in a position to influence and to gain the trust in the community. They were the individuals who were in a position to instruct childbearing mothers about breastfeeding and the impor-
tance of personal hygiene. Improvements in the education of midwives would then, in the course of time, have had an important bearing upon child survival. Such changes would take time and there would be differences between areas in the pace of change. Areas with many educated midwives would change faster than others. It can be assumed that in areas where literacy rates were high, local authorities were more likely to spend their resources on educating midwives than was the case with areas where literacy rates were lower.

There were without doubt differences between individuals in this process. Women who were educated were probably more likely to change their behaviour than those who were illiterate. The change would also be a function of the age of mothers. Young mothers would generally be more willing to change their behaviour than older ones. Yet a transition from a tradition of handfeeding all newborns to feeding most exclusively from the breast for several months, is not likely to have occurred within one or even two generations.

The chief sources used in this study are parish registers and the annual returns of births, deaths and marriages produced by parish ministers. As in other European countries, the registration of births, deaths and marriages was in the hands of the clergy. Several parish ministers kept records of vital events as early as the 17th century, but they were not required to do so by law until 1746. Even after the central bureau of statistics was established, parish ministers continued, in the main, to be the chief agents responsible for reporting vital events. As with church records in the other Lutheran states, these sources are thought to be fairly reliable. There are, however, a few problems with them especially in connection with the study of infant mortality. These will be discussed in other parts of the study.

Medical reports are the second most important source-material. According to a Danish regulation from 1803, district physicians were required to send annual reports on the health conditions in their districts to the Landphysicus (State physician), the most senior figure in the health service in Iceland. The Landphysicus, in his turn, was to send a summary of these reports to the central medical authorities in Copenhagen. According to the regulation of 1803, physicians were to report on mortality, especially among infants and childbearing women. In spite of this, however, the district physicians' reports offer very incomplete information on infant and child mortality, feeding practices and diseases before 1850. With the introduction of a new regulation in 1846, fuller information on infant health and mortality was required. This brought about significant improvements in the medical reports. During the second part of the 19th century, the reports became much more detailed, with particular attention being paid to the state of midwifery, childcare and infant feeding practices. Unfortunately, very few reports and midwives' diaries are to be found in the archives for the period before 1912 when midwives were obliged to send in reports about births. From 1911 onwards, medical health reports have been published an-
nually, although summaries were published each year from 1896.\textsuperscript{138} Summaries from the unprinted medical reports dating from 1880–1905 were published retrospectively by the Directorate of Public Health in Reykjavík.\textsuperscript{139}

The introductory chapter of this study presented the case of a family that lived in a sparsely populated rural area in southern Iceland during the first decades of the 20\textsuperscript{th} century. It was shown that in this area newborns were as a rule given cow’s milk. The infant feeding pattern described for this area deviated greatly from that described in the medical reports in other areas. It is, therefore, likely that there were great variations in child rearing practices and feeding traditions between one part of Iceland and another. Several recent studies suggest that the pre-transitional period was not only characterized by important differences in infant mortality between countries, but also within countries.\textsuperscript{140} This study is, therefore, largely devoted to the analysis of differences in infant mortality between Iceland’s regions. This method will make it easier to determine what actors influenced mortality levels. It will also facilitate the search for the most important factors behind the increase in child survival during the late 19\textsuperscript{th} and early 20\textsuperscript{th} centuries.

The study’s main focus is on the period after 1820, but it was seen as useful to discuss briefly the development and characteristics of infant mortality during the period 1770–1940, so as to give a better picture of conditions before the mortality transition. This is done in the next part of the study. Furthermore, I attempt to explain regional variations in both the level and development of infant mortality during three periods: 1840–1852, 1872–1880 and 1890–1901.

In part 3 I examine the cultural and social implications of infant mortality and its decline in three distinct geographical areas. The main objective there is to determine the main actors behind the mortality decline. The final part outlines the conclusions of this study.
National trends and characteristics of infant mortality

It has been noted earlier that an important characteristic of the pre-transitional mortality regime in Europe were the vast differences in infant and early childhood mortality between countries and regions. Partly those differences are attributed to differences in environmental conditions, such as population density, combined with differences in the availability of clean water and fresh milk. Another more important reason for those differences was of cultural origin and mainly related to the feeding methods of infants. Being breastfed was a crucial factor and the length of breastfeeding too played a central role for survival chances.

The pre-transitional period was not only marked by differences in levels in infant and childhood mortality. The pattern of mortality decline was thus by no means uniform. Frequently, childhood mortality started to decline earlier than infant mortality. In most European societies infants were breastfed and were, therefore, during the pre-transitional period largely protected against several diseases that proved fatal to older children, in particular in urban areas where sanitary conditions were bad. Thus, infants did not benefit from sanitary measures introduced in urban settings during the last three decades of the 19th century to the same extent as older children. Therefore the transition towards improved survival in Europe was generally initiated by a decline in early childhood mortality with infant mortality tending to start its decline 20 or 30 years later. However, this pattern was by no means universal and there are examples of societies where infant mortality started to decline earlier than childhood mortality.

This part of the study presents an analysis of the trends and characteristics of the level of infant mortality in Iceland. The first chapter is chiefly taken up with a comparison of developments of infant early childhood mortality. It spans a long period from 1770 to 1940. It starts with a discussion of sources on
infant mortality and then compares early childhood mortality and mortality in individual months of the first year. Because of the geographical isolation of Iceland the epidemiological regime was rather peculiar and, therefore, the second chapter is devoted to this problem. The last chapter presents an analysis of regional patterns in infant mortality in Iceland during the period 1840–1901. How important were differences in infant mortality between areas? Was there a difference in infant mortality rates between sparsely populated rural areas and densely populated fishing districts? Did patterns persist over time or was there a change as infant mortality declined?

2.1. DEVELOPMENT OF INFANT AND EARLY CHILDHOOD MORTALITY, 1770–1920

Registration of births and infant deaths. Parish registers and returns of vital events as sources for the study of infant mortality in Iceland

In the Dano-Norwegian kingdom the first regulations relating to vital events date from 1735. Bishops were made responsible for the collection of returns from deans who, in turn, received information from individual parish ministers. In the earliest returns only the total numbers of deaths, births and marriages were required. A few changes were made during the 18th and early 19th centuries and the Icelandic returns dating from the last three decades of the 18th century deviated in some aspects from the other countries in the kingdom. Whereas the classification into age groups for the other parts of Denmark was only given for 10 year age groups, the Icelandic returns are much more specific on mortality below the age of 10.

It was, however, not until 1835 that that infant deaths were recorded separately.4 In the Icelandic case, those changes first appeared in the statistics in 1838. Then infant deaths were recorded separately and early childhood mortality was divided into two age groups: that of 1–2 year olds and of 3–4 year olds. Contrary to earlier periods, stillbirths were recorded separately (although they were generally included in both births and deaths in the published statistics). Further changes were made in the recording of infant deaths in the early 1850s when the individual month of death during the first year was specified.5 With the establishment of the Statistical bureau in Reykjavík in 1914, the collection and processing of vital statistics was transferred to the Icelandic authorities.6

In many European societies, the registration of vital events is incomplete. Underregistration affects both births and children dying in early infancy. Often the birth of a child was not reported to the relevant authorities until several days after delivery so that an infant dying a few days after birth was not registered.
Contrary to the situation in many other societies, church records in the Nordic countries are generally seen as pretty reliable, both for historical demography in general and for the study of infant mortality in particular.\(^8\)

The Danish Lutheran church requested that children were baptized within a week of birth.\(^9\) Icelandic parish registers contain one column for the date of birth and one for the date of baptism and from this it would appear that the rule requiring early baptism was adhered to strictly. It is, thus, extremely rare to find children who were not baptized within two days of birth.\(^10\) In the case of newborn children who were weak, an emergency baptism was carried out either by the midwife or another adult in the household.

Whereas there is little reason to believe that the underregistration of births and infant deaths was of any great importance in Iceland, the registration of stillbirths is more problematic. According to Danish legislation dating from 1803, infants who died within 24 hours were to be registered as stillborn.\(^11\) However, there are good grounds for believing that the rules were largely ignored in Iceland. Death records indicate that there was a strong preference for considering a child as being alive at birth if it showed the least sign of life. Infants that died shortly after birth were hardly ever recorded as stillborn, but were said “to have died during the first day” or “died immediately after birth.” As the “salvation” of the individual in the traditional society depended heavily upon baptism it cannot be ruled out that foetal deaths were on some occasions registered as live births.

![](image)

Figure 2.1. Stillbirth ratio and first day mortality in Iceland, 1804–1940
Figure 2.1 shows the stillbirth ratio and first day mortality (when available) in Iceland during the period 1804 to 1940. From a European perspective, the stillbirth ratio is approximately what would be expected during the pre-transitional period. The stillbirth ratio fluctuated between 25 and slightly above 40, which is, for example, somewhat higher than in Sweden\(^{12}\) but slightly lower than in Denmark.\(^{13}\) The Icelandic official statistics only give mortality for the 1\(^{st}\) day and for the neonatal period as a whole and therefore it is not possible to assess the level of perinatal mortality. A comparison of 1\(^{st}\) day mortality with the stillbirth ratio shows how ill-definable the borderline between life and death was. Thus, with the exception of epidemic years (e.g. the measles epidemic in 1882), the fluctuations in 1\(^{st}\) day mortality tend to run in opposite direction to the stillbirth ratio. Such discrepancies are not thought to be of importance. The main conclusion is that the registers of vital events are a relatively reliable source for the study of infant mortality in Iceland. Even though there might be a slight over-registration of live births this would not produce skewed results during a period of high mortality rates.

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**On the evaluation of infant mortality in Iceland prior to 1838**

Whereas the returns of vital events in Iceland can be seen as a reliable source for the study of infant mortality after 1838, one has chiefly to rely upon parish records for the period prior to that year. The registration of age of death is often imprecise in the 18\(^{th}\) and early 19\(^{th}\) centuries' death records. In the case of the death of an infant or other young child the notion *ungbarn* is often given instead of an exact age. Today the term *ungbarn* is used for *infant* but literally it means *young child* and is not necessarily solely used for children who die before the age of one. Another problem with some of the records is that “1 year” can stand both for those who died in their first year and those who died at the age of one. To establish beyond doubt the age at death for this period, record linkage between birth and death records has to be carried out.

In a recent article a stratified sample of six parishes has been used to shed light on the development of infant mortality in the late 18\(^{th}\) and the early 19\(^{th}\) centuries.\(^{14}\) The parishes differ in their socio-economic characteristics and are situated in both rural and coastal areas. Three of the parishes are in the southern part of the country, one in the southwest, one in the west and one in the north. Around five per cent of the entire Icelandic population lived in these parishes during the period 1801–1880.

In order to demonstrate how these parishes could be seen to be representative of the Icelandic infant mortality pattern during the second part of the 18\(^{th}\) and the first part of the 19\(^{th}\) centuries (i.e. before the statistical period), we chose to compare the development of infant and early childhood mortality there with the national average after the publication of data on infant mortality at the national level had begun. The results are shown in Figure 2.2.
It is shown that infant mortality levels in the research areas and the country as a whole were almost identical during the period 1841–1860, whilst they were in the former slightly higher after 1860. This is explained by the increase in the relative share of the population of the parish of Hvalsnes in the southwestern part of the country. The levels of early childhood mortality are also seen to represent the national average fairly well. Statistics from the research areas would then seem to give us a fairly good idea of Icelandic infant mortality rates for the period prior to 1838.

Even though parish registers are the only sources available for an exact calculation of infant mortality rates in Iceland prior to 1838, the Danish statistician Hans Oluf Hansen has, in a chapter in *The great mortalities*, used returns of vital events in a study of infant mortality there during the late 18th century. It was noted above that Icelandic returns of vital events from the late 18th century offer more detailed information on age at death in childhood than do those in Norway and Denmark. A new law on the return of vital events that was passed in 1775 in the Dano-Norwegian kingdom was never implemented in Iceland, but following the massive volcanic outbreak in Lakagigar in southern Iceland in

![Figure 2.2. Infant and early childhood mortality in six parishes compared to Iceland as a whole, 1841–1880](image)

1783 a committee (komission) was established by the Danish authorities to make inquiries about general conditions in Iceland. The German C. U. D. Eggers (1758–1813)\(^6\) headed this committee which demanded that radical changes were made in the returns of vital events. Deaths were to be separated into the following groups: (1) 1st and 2d year, (2) 3–5 years, (3) 5–10 years, (4) 10–20 years, etc. Parish ministers were asked to collect this information retrospectively for the preceding years and did so back to 1768. The returns in both bishoprics in Iceland remained in this new form until the law was changed once again in 1800. One of the two Icelandic bishops, Hannes Finnsson (1739–1796), even continued to send in returns in the old form alongside with the new ones. Thus, for a few years during the late 18th century two data sets are available for this part of the country.\(^7\)

The returns dating from the 18\(^{th}\) century pose several problems that will not be discussed in detail here. In short, problems are related both to the reporting of births and of deaths. First it is by no means clear whether stillbirths are included or not in the figures on births and deaths. The second problem relates particularly to the returns produced by Eggers, as these were created retrospectively for the period prior to 1784. Because of the inaccurate registration of age at death in the parish records, many ministers were certainly faced with problems in deciding the precise age at death in their records of earlier years. All those problems are widely discussed by Hansen in a dissertation he wrote at the University of Copenhagen.\(^8\) The Icelandic historian Guðmundur Hálfdanarson is another scholar who has investigated the quality of the annual returns and has used both types, i.e. those resulting from the Eggers’ initiative (called aðventurksýrslur or adventstabeller) and the traditional ones (ársskýrslur) from the original lists sent in by individual deans. He has shown that in some of the old returns several parishes or even in a few cases whole deaneries are missing from the national total.\(^9\)

In spite of the obvious source related problems of the returns of vital events collected on the initiative of Eggers in the late 18\(^{th}\) century, it is of interest to test them against the data from the six parishes that were presented above. As the main objective is to test how well the six parishes can be seen to represent the national mortality picture, I chose an extremely simple method to calculate the infant and second year mortality. For this I use all births in individual years as a denominator (instead of the actual at risk population).\(^{10}\) The results are shown in Figure 2.3. Here the development of infant mortality and that of one year olds in the parish sample are compared with the figures from the returns of vital events during the period 1771–1800.

Figure 2.3 shows that the trends in the first and second year mortality rate (per 1,000 live births) in the six parishes and in the country as a whole run parallel for the entire period. There are, however, some differences in levels between the two data sets, differences that are most apparent for the period prior to 1785. It must be assumed that there was an uncertainty in age of death in the national data set during this period as the figures were collected
NATIONAL TRENDS AND CHARACTERISTICS OF INFANT MORTALITY

Figure 2.3. The development of infant and one year old mortality in six parishes in Iceland compared to that of one year olds in the returns from parish ministers, 1771-1800.


retrospectively. The parish figures are between 20 and 35 per cent higher than the national figures during this period. After 1784 the forms are filled in concurrently and it must therefore be assumed that the rates derived from them are closer to reality. With the exception of the period 1786-1790 the levels of first and second year mortality are almost identical in the two data sets.

If we look at the development year by year, similar trends are revealed (see Figure 2.4). The peaks in the two data sets tend to follow each other closely, particularly after 1780. Both trends clearly reveal, how prone to fluctuations mortality among young children was during the pre-transitional period. The highest peak occurred during the mid 1780s. As noted above, this period was described as the last subsistence crisis in Iceland. It was largely due to a volcanic eruption in southeastern Iceland in 1783. The inhabitants of several parishes were forced to abandon their home communes and move westwards. This put an additional pressure on the population in fishing areas in the southwestern and
western part of the country. The effects of the volcanic eruption were further aggravated by extremely harsh weather in subsequent years and by a smallpox epidemic two years after the volcanic eruption.

Despite the fact that none of the parishes in the sample was affected by the natural catastrophe in a direct way, infant mortality here was as high as 735 per 1,000 live births in 1784 and 667 per 1,000 in 1785. When one-year-old children are included the levels run as high as 882 in 1784 and 833 in 1785. In the national data set constructed on the basis of the returns of vital events the peak during those years is almost identical to that of the parish data set, 824 per 1,000 live births in 1784 and 880 in 1785.

The comparison of the two data sets offers a further proof that the six parishes used in this study can be seen to represent infant mortality levels in Iceland fairly well. Another feature revealed by Figures 2.3 and 2.4 is the relatively low share of second year mortality compared to that of infant mortality. In what follows a comparison is made between mortality during the first year and childhood mortality. The main objective is to bring to light the main determinants of infant and childhood mortality during the pre-transitional and transitional periods.
Trends and chief characteristics of infant and early childhood mortality

In 1846, the _Collegium Medicum_ in Copenhagen decided to send to Iceland a young physician, Peter A. Schleisner (1818–1900), to make inquiries into the general etiology of the country. After his stay, Schleisner wrote a thesis on the nosography in Iceland. In various parts of his thesis he discussed the health and treatment of young children in Iceland. The following description is given of infant feeding practices:

The child is fed from birth with the strongest milk that is to be had, sometimes even mixed with cream ... The milk is very rarely mixed with water, nor are children fed on whey. That is to say, Icelanders believe that diluted milk weakens the child. In a few places, the child is given sacramental wine for the first few days. In one place I saw that the infant was given sour milk, which was left in the butter churn, and mixed with fish liver oil. The child is almost exclusively fed with cold milk; it is drawn through a quill, around which is tied a piece of parchment or a linen cloth; I have also seen a straw-like bone from a bird, or the straw from lyme grass, used for this purpose. The milk is sucked through this instrument from the so-called Óskur, a vessel made of wood, but there it turns sour immediately, as these containers are never kept clean. It is only in the towns that people use pottery or bottles. More or less as soon as they are born, children are also given pacifiers, filled with chewed bread, butter and sugar, and shortly after that, people put all kinds of food, such as chewed fish, meat, or cabbage into the pacifiers.

Schleisner concluded his description by saying that considering the treatment of newborns in Iceland, it is by no means surprising that 300 out of 1,000 children died before their first birthday. He maintained that he found it amazing that so many survived and that those children who survived the first year were generally in good physical shape.

The introductory chapter to this study offers a description of a community in southern Iceland where the tradition of feeding newborns artificially prevailed into the 20th century. The tradition of fostering newborns in the midwife’s home, away from their mothers, was also discussed, a tradition that can be seen as a further proof of the prevailing tradition of feeding newborns artificially. Schleisner discussed this tradition at length in his thesis and maintained that it was most common for the midwife to take the newborn to the church for baptism right after delivery and then to care for it in her own home. If the midwife could not take the child home with her, it was common practice for the child to be left with the parish minister’s wife instead or with another woman living in the vicinity of the church.

Even though the practice of fostering newborns away from their homes seems not to have occurred in other Nordic countries, newborns in those societies were generally taken to church to be baptized immediately after delivery. This
practice of taking newborns away from their mothers was one of the main concerns of medical authorities in other Lutheran countries around the mid-19th century. In a letter from the Royal Chancellery in Denmark in 1847 it is stressed that baptism does not necessarily have to take place in the church, but could also be performed at home with three witnesses present. It was generally believed that many lives could be saved if newborns were kept with their mothers instead of being brought to church in cold weather.

The practice of feeding newborns with animal milk and other food products was likely to lead to problems in the intestinal organs. The Scottish explorer Steuart McKenzie (1780–1848), who spent a summer in Iceland almost half a century before Schleisner's visit described the frequency of intestinal diseases in Iceland. In an appendix to his book *Travels in the Island of Iceland in the summer of the year 1810* he maintained that:

Inflammatory affections of the abdominal viscera are ... very common among the Icelanders; chiefly perhaps in consequence of the peculiar nature of the diet to which they are accustomed. It is possible also that a disposition may be given to these complaints by the treatment of the children in their early infancy. A mother in Iceland seldom suckles her child; but nourishes it from the time of its birth, with cow's or sheep's milk, which the infant sucks from a piece of moistened rag, or a sponge. Where from extreme poverty, or other circumstances, milk cannot be obtained, a little fish or flesh meat are rolled up in cloth and linen, and put into the infant's mouth, is the substitute most commonly employed. The diet of the Icelanders likewise gives much disposition to worms; and the ascarides are observed to be particularly frequent.

Not unexpectedly the unhealthy feeding habits were reflected in high infant mortality levels in pre-transitional Iceland. Together with a few other societies in Europe where infants were either not breastfed at all or weaned at a very early age, mortality levels amongst them were extremely high. This feature of infant mortality in Iceland has been remarked upon by Loftur Guttormsson who compared to 18th and 19th centuries' Iceland with a few other societies in German speaking areas and in northern Sweden and Finland.

Figure 2.5 compares the development of infant, neonatal, post-neonatal and early childhood mortality in Iceland for the period 1771–1940. For the period prior to 1853 data from the six parishes are used, whereas the rates after 1853 are based upon the national totals. The reason for using data from the sample six parishes instead of the national totals for the period between 1838 and 1852 is that the latter don't allow one to analyse mortality within the first year. It must, however, be stressed that infant mortality in the sample is almost identical with the national average (see Figure 2.2.).

One of the main characteristics of the mortality overall is the high share of infant mortality. Furthermore it is revealed that neonatal mortality was unusually high. The huge overall fluctuations are a third characteristic. Figure 2.5 also shows how deadly the early 1780s were. During the five year period 1781–1785, infant
Figure 2.5. Infant (IMR), neonatal, post-neonatal and early childhood mortality (ECMR) in a sample of six parishes in Iceland 1771–1850 and at the country level as a whole, 1852–1940


mortality was as high as 460 per 1,000. An increase in early childhood mortality (1–4 years) was also evident during the period following the volcanic eruption in Lakagigar. Prior to that, early childhood mortality in the six parishes was slightly below 20 per 1,000. This was somewhat higher than, for example, in Sweden, but much lower than in most other countries on the European continent. The low degree of urbanization in Iceland is likely to have protected older children to some extent from several water- and airborne diseases that were frequent in other European societies with a higher level of urbanization.

After unusually high mortality rates during the early 1780s, the following decades were characterized by relatively favourable infant mortality rates. Between 1786 and 1820 there were no marked peaks in infant and early childhood mortality. The period too was relatively free from lethal epidemic diseases. Iceland was then more isolated from the rest of Europe than was the case in later periods. This was especially true during the Napoleonic wars at the beginning of the century when few foreign vessels arrived in Icelandic ports. After 1820, the trend was reversed. Contemporaries describe the period between the late
1820s and the 1850s as one of frequent outbreaks of fatal epidemic diseases. Thus Iceland was on several occasions visited by epidemics, such as diphtheria, scarlet fever, whooping cough, measles and influenza. The increase in mortality is observed both among infants and older children. Early childhood mortality had, since the crisis of the 1780s, remained at low levels of around 20 per 1,000, but during the period 1826 to 1830 early childhood mortality quadrupled. During those five years, epidemics of scarlet fever and whooping cough and cow-pox were reported. The subsequent five year period was somewhat less lethal, but mortality among infants and other young children remained at relatively high levels until the early 1850s. After several decades that were free from epidemics, the acquired immunity status of all age groups in the population was probably rather weak and the consequences unusually severe. Increasing childhood mortality from diseases like diphtheria, scarlet fever, whooping cough and measles, has, however, also been observed in other European countries.

After periods of unusually high mortality levels, the infant mortality rate dropped to between 200 and 250 per 1,000 during the 1850s. Between 1850 and 1870 it remained at levels close to those of the period 1790 to 1820. Around 1870 it started its secular decline. Initially the decline was extremely steep and was only to be interrupted during the measles epidemic of 1882. When comparing the development of neonatal and post-neonatal mortality, it can be noted that the former started to decline earlier than was the case with the latter.

Neonatal mortality decreased slightly between the 1840s and the 1850s, but during the 1860s the pace of decline accelerated. Post-neonatal mortality rates remained high until the early 1870s when the pace of decline quickened to that of neonatal mortality a few years earlier. The drop in early childhood mortality commenced approximately at the same time as that in post-neonatal mortality, but all age groups were quite severely hit by the measles epidemic of 1882. It was noted earlier that the transition towards improved survival in Europe was generally initiated by the decrease in early childhood mortality with infant mortality tending to fall 20 or 30 years later. In Iceland where infant mortality rates were several times higher than rates amongst older children, this pattern was reversed.

Compared to many other societies in Europe, post-neonatal mortality was not particularly high. Here it must be observed that post-neonatal mortality is usually shown as a ratio, i.e. the number of deaths during the 2nd to the 12th month to all live births. In a society where neonatal mortality is high the post-neonatal ratio tends to be relatively low and therefore it is not easy to compare post-neonatal mortality with that in other societies. The problems associated with the measurement of the post-neonatal ratio are discussed further in chapter 3.1.

The extremely high infant mortality levels in Iceland raise several questions about environmental, biological and social factors behind mortality levels. One important factor relates to the importance of the child’s sex for survival. How was high infant mortality distributed among the sexes in a society with high infant mortality rates as in Iceland?
Figure 2.6. Sex mortality ratios for infants and 1-4 year olds, Iceland 1838-1940
Sources: Hagskinna. Icelandic Historical Statistics, pp. 53 and 182-84 and CD, Tables 2.14 and 2.40.

Figure 2.6 shows the sex-mortality ratio for infants and the age group 1-4 years during the period 1838-1940. As expected, boys were at far greater risk of dying during infancy than was the case with girls. During the pre-transitional period the ratio fluctuated between 110 and 120. This accords with results in other European societies. For the age group 1-4 years old, on the other hand, the results differ from the European pattern. There, as a rule female mortality in those age groups was higher than that of males, but in Iceland the reverse was the case. However, a characteristic Iceland has in common with many other societies is that the differences between the sexes increases relatively with declining infant mortality rates. It can be concluded then that the sex mortality ratios for infancy and early childhood do not to any remarkable extent deviate from the expected pattern.

Whereas differences in mortality between the sexes are not likely to illuminate the causes of high infant mortality levels in Iceland there are several other characteristics of the Icelandic infant mortality regime that require further scrutiny. One feature that needs to be analysed are the huge fluctuations, fluctuations that are also present during the neonatal period. These are obviously the result of a particular epidemiological regime. However, before discussing this particular feature of Icelandic infant mortality, a further analysis of general levels of mortality during the pre-transitional period will be carried out. An attempt is made to determine a base level of infant mortality in the pre-transitional period. Was there some sort of norm in levels of infant mortality in the Icelandic past, a level that can be seen to represent a minimum, when epidemics were absent? Was the decline in infant mortality in Iceland initiated by a decline in this hypothetical base level or by the declining effects of epidemics?
In search of a baseline infant mortality rate in the Icelandic past

The concept of baseline, or bottom-line mortality is relatively difficult to operate with. Does it imply that there is some sort of optimal infant mortality rate that is achieved in a given milieu under conditions free from severe epidemics? This would not be a realistic measure in a pre-transitional society where dying from epidemic and endemic diseases was the norm. One way is to set the base line where infant mortality is at its lowest. Base-line mortality would then be the lowest attainable rate given the available knowledge and optimal care of infants, in a geographical unit that is relatively well protected from epidemics. Robert Woods and Nicola Shelton have shown that the lowest infant mortality rate in pre-transitional England and Wales lay around 100 per 1,000 live births, and was to be found in a few sparsely populated rural areas where long term breastfeeding was common. In Sweden the rural county of Jämtland, situated on the Norwegian border, displayed infant mortality rates of around 90 per 1,000 during the 1860s and on the other side of the border there were examples of counties with mortality rates as low as 80 per 1,000. The level of infant mortality rates in Norway as a whole during the pre-industrial era was not much above 100 per 1,000.

During the pre-transitional period there were a number of places in Iceland with considerably lower mortality rates than the national average. These places could theoretically serve as the baseline mortality for Iceland. Here, however, an attempt is made to assess a base-line mortality level at the national level. Only by doing so is it possible to assess approximately the timing and relative importance of individual factors behind the decline in infant mortality. What part did the decline of epidemics play in decreasing infant mortality, what was the role of better child-care? No attempt is made here to find a level that can be seen as free from disease. Such a situation is unrealistic in a pre-transitional setting. A society does not exist in a vacuum and young children as well as other age groups were always at risk of dying from endemic infectious diseases. The level decided upon is one that is determined by a situation that can be attained within periods that were free from fatal epidemic diseases and which caused infant mortality to peak at extreme levels. This will offer an opportunity to estimate to what extent the mortality decline was initiated by the decrease (and eventual disappearance) of mortality peaks caused by epidemics, and to what extent it came from other (internal) factors that were, at least in part, related to changes in the treatment of children.

The frequent outbreaks of epidemic disease during the period 1820–1850 makes it difficult to decide on an adequate model for baseline mortality by traditional measures. Previous research as to the relative impact of crisis mortality has mainly focused on crude mortality rates in times of subsistence crises. Such models frequently assess the baseline mortality as the mean of the 10 years preceding and following the crisis. Models of this character are difficult to apply in the Icelandic case, because epidemics often occurred every decade and
sometimes even more frequently. Before proceeding further let us, thus, have a look at the development of infant mortality year by year. This is presented in Figure 2.7. The overall trend is shown by a 10 year moving average.

It is apparent that infant mortality was very prone to sharp annual fluctuations. It is also apparent that during the pre-transitional era there were periods with relatively few and low mortality peaks, like for example the period around 1800. It was noted above, that this was a period that was relatively free from epidemic diseases due to the isolation of the country. Prior to this period conditions have been described as unusually harsh. During the worst years, there were infant mortality peaks of several hundreds per 1,000 above the mean level. This was especially true of the year 1784 when infant mortality came close to 800 per 1,000. Mortality peaks were also frequent between 1820 and 1850, whereas the following two decades (1850-1870) resemble more the period between 1791-1820 in that then the country was spared from several of the major baby killers such as, small-pox, measles and whooping cough.

Despite less frequent, and above all lower, mortality peaks in the 1850s and the 1860s, average mortality levels did not fall below those experienced during earlier epidemic-free periods. From around 1850 until the mid 1860s infant mortality was at the same level as from 1790-1820 at around 250. Shortly before 1870, however, mortality levels dropped below this and apart from the measles epidemic in 1882, peaked at only slightly above the 10 year mean. A slight increase is seen during an epidemic of whooping cough in 1889 and in the early 1890s an increase is noted during an outbreak of measles.
In a recent article in the journal *Saga* it is argued that the minimum infant mortality level in pre-transitional Iceland was approximately 220–250 per 1,000 live births. In the late 18th and early 19th centuries, aggregate infant mortality levels appear to have fluctuated around this during periods that were more or less free from severe epidemics. Let us, then, assume that the bottom line of infant mortality in pre-transitional Iceland was 250 per 1,000. Figure 2.8 shows the indexed annual infant mortality rate for the period 1771–1900. The index value 1 is 250. A value of 0.5 would then stand for an infant mortality level of 125 per 1,000, 2 for 500, and 3 for 750 per 1,000. The Figure illustrates well how infant mortality was prone to extreme fluctuations. Between 1850 and 1870 there is a certain stabilization of mortality at the 250 per 1,000 level. Obviously, Iceland had now entered a new mortality regime where lethal epidemic diseases such as measles and whooping cough started to turn into less harmful childhood diseases.

However, a comparable stabilization level was experienced between 1790 and 1820. Although this period was certainly somewhat more prone to sharper fluctuations than the period after 1850, fluctuations shown in the Figure are in part explained by small numbers, as the data set for this period consists of only six parishes. Infant mortality in the pre-transitional period was then characterized by both short term and long term fluctuations. Figure 2.8 shows how infant mortality dropped more or less permanently below the 250 per 1,000 level around 1870. The only deviation from this was the peak during the measles epidemic in 1882. The period around 1870 is evidently marked by notable

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**Figure 2.8.** Annual infant mortality indexed 1771–1900 (mortality index 1 = 250)

Source: See Figure 2.7.
changes in the infant mortality regime in Iceland. In part this new regime is typified by the disappearance of large mortality peaks and in part was due to changes in the treatment of infants, a change that began soon after the mid 19th century. It is reasonable to believe that these changes were brought about by the start of breastfeeding or other changes in feeding traditions in certain areas or among certain social groups. This assumption can be made on the basis of the decline perceived in neonatal mortality rates.

The high neonatal mortality rate and above all large fluctuations in neonatal mortality needs further discussion. Pre-industrial Iceland was characterized by high levels of neonatal mortality, like other areas with prevailing traditions of artificial feeding, but also by pronounced fluctuations of neonatal mortality. This is rather puzzling feature. Therefore, next chapter discusses the main features of the epidemiological regime in Iceland.

2.2. PECULIARITIES OF THE ICELANDIC MORTALITY REGIME

Exogenous and endogenous infant mortality

There is a strong tradition within the discipline of demography to presume that neonatal mortality is to be explained by endogenous factors, such as congenital anomalies, complications related to a short gestation period, low birth weight or problems during delivery. Post-neonatal mortality is, on the other hand, largely to be explained by exogenous factors. The character of the physical environment is thus generally of greater importance during the post-neonatal period than the neonatal one. Newborns come to the world with antibodies acquired during the gestation period and are therefore protected against several diseases. Moreover, breastmilk offers further protection. The huge differentials in infant mortality often reported between urban and rural areas are thus mainly detected during the post-neonatal period and frequently only after the first six months of life. For England it has thus been shown that neonatal mortality tends to be approximately equal in urban and rural areas, whereas post-neonatal (and childhood) mortality is generally higher in urban areas, as children there are more exposed to infectious diseases than their rural counterparts.

Several factors suggest a high level of exogenous neonatal mortality in Iceland during the pre-transitional period, with pronounced fluctuations in neonatal morality indicating that newborns were defenceless against several factors in the environment. It is highly unlikely, however, that the pronounced fluctuations in neonatal mortality during the early 19th century can be explained by problems or complications arising during the gestation period. The possibility of malnourishment that would affect birth weight and conditions of newborns to such an extent that neonatal mortality would increase in the way it did between 1820 and 1850, can certainly be rejected. Iceland was a poor society, but after
the crisis of the 1780s, famine did not occur there to any important degree. Paradoxically, the high mortality period of 1820–1850 has been described as an era of economic prosperity. And, infant mortality stated to decline during a period when economic conditions deteriorated markedly (on economic conditions see chapter 1.3).

Several studies have revealed that exogenous neonatal mortality tends to be extremely high in areas where infants are not breastfed. This was the case in several parts of southern Germany (most notably in the Bayern and the Württemberg area), as well as in Austria and in districts around the Gulf of Bothnia (Finland and northern Sweden). In all these areas infant mortality was extremely high, between 250 and 400 per 1,000 and neonatal mortality was especially so. It was by no means uncommon to find that 50 per cent of infant deaths occurred during the first month.

In societies where infants were breastfed for relatively long periods, neonatal mortality was much lower. This was, for example, the case with England where neonatal mortality was less than half that of Iceland and lay at around 50 per 1,000 throughout the 19th century (compared to levels of between 100 and 200 in Iceland). In England, changes in infant mortality rates were largely determined by variations in post-neonatal mortality. Woods, Watterson and Woodwards argue that the decline in neonatal mortality in England was mainly due to improvements in obstetrics. Little improvement was made in this field during the 19th century and therefore neonatal mortality did not start to decline until after the turn of the 20th century. In the Icelandic case improvements, in line with those described for England, can be seen in the decline in the stillbirth ratio and in first day mortality in the beginning of the 20th century (see Figure 2.1).

As regards neonatal mortality in general, its high level in Iceland, is in all likelihood, to be explained chiefly by the prevailing tradition of the artificial feeding of newborns. The quotation from the Danish physician Peter A. Schleisner given above strongly indicates that high neonatal mortality in Iceland mainly derived from the practice of offering milk and other food products to young children. It is indeed relatively well documented that during this period, infants were largely fed undiluted fat milk and even cream. This type of food is particularly dangerous for newborns since they are not able to digest the fat. It has also been noted that cow's milk and other animal milk not only has a higher fat content than human milk, but that the content of casein is also considerably higher than in human milk. This hastens the dehydration process in infants who are fed undiluted cow's milk. Even under conditions where hygiene was at a high level, this type of food is likely to cause problems of dehydration and diarrhoea, especially amongst the very young.

The chief cause of diarrhoeal diseases in artificially fed infants during the pre-transitional period was, however, without doubt related to unhygienic conditions with most infants dying from intestinal diseases likely to have been infected by the e-coli bacterium or other common bacteria found in contaminated food. All these bacteria have a short incubation period and it is therefore by no
means surprising that areas where the artificial feeding of newborns was common experienced high neonatal mortality. Anders Brändström has shown for the parish of Nedertorneå in northern Sweden, where newborns seldom were given the breast, that mortality peaked during the second week post-partum. Unfortunately, the returns on vital events in Iceland do not allow us to analyse infant mortality during individual weeks of the first month. A further analysis of this problem is carried out in chapter 3.2 where mortality trends and feeding practices in three regions, based on the analysis of parish registers, is discussed.

Seasonal variations in infant mortality

In the European past, mortality tended to peak during the summer and in particular when they were hot. In areas where infants were not breastfed this was especially so. As Iceland had a tradition of artificial feeding of infants one might expect a similar pattern to that described for other areas where breastfeeding was not practiced. Figures 2.7 and 2.8 show neonatal and post-neonatal mortality for individual calendar months during two time periods in the pre-transitional period. It is shown that season had hardly as much impact upon mortality differentials as was the case with other European societies. In the case of neonatal mortality, there was a slight downward trend during late summer. Mortality rates tended to be highest in autumn and winter. As regards post-neonatal mortality, there is, however, a mid-summer peak especially in the late 1850s. During the late 1840s there were only minor variations between calendar months.

These results are somewhat perplexing. It must, however, be borne in mind that Icelandic summers are hardly comparable to those in other areas of Europe where breastfeeding was uncommon. Even in the northernmost areas of Finland and Sweden where newborns were artificially fed, summers are comparatively hot and frequently the temperature in July exceeds 30 degrees Celsius. In Iceland, on the other hand, the mean July temperature fluctuates between 8 and 11 degrees and it is very uncommon that the day temperature exceeds 20 degrees. In societies where summers were hot increased diarrhoeal mortality is mainly attributed to difficulties in storing food and keeping milk and other food-products fresh. In Iceland, where conditions were rather favourable when compared to those areas, high levels of neonatal mortality can therefore only be seen as a sign of inappropriate food given to newborns under extremely poor hygienic standards.

An interesting detail in the relatively modest seasonal variations both in neonatal and post-neonatal mortality is that mortality tended to be at its lowest during late winter and early spring, when the availability of food-products was most limited in the rural society. Conversely mortality rates were high in early autumn after the slaughtering of the life-stock had taken place and the availability of food was most abundant. This indicates that infant mortality is hardly to be explained by nutritional factors (reflected in malnourishment of mothers to
newborns). On the other hand, high levels in autumn could partly be explained by the heavy workload of women during the processing of food-products. These results also raise the question whether conditions in farming households during the slaughtering and processing of food were even less hygienic than during the rest of the year. It is worth noting that medical reports often remark on the frequent occurrence of diarrhoeal diseases during late summer and autumn.\textsuperscript{57} But let us now have a closer look at the impact of epidemics upon infant mortality rates in Iceland.

\textit{The epidemiological regime}

It was shown above that infant mortality in Iceland was not only high, but it was also prone to considerable fluctuations. This goes for neonatal mortality in particular. Whereas the high levels are to a large extent to be explained by the tradition of artificial feeding, it is not easy to attribute the pronounced fluctuations to that factor alone. These are rather a function of a specific epidemiological regime, a regime that is to be explained by the relative isolation of the country.

Figure 2.5 showed that fluctuations in neonatal mortality tended to diminish in importance towards the end of the 19\textsuperscript{th} century whereas post-neonatal and early childhood mortality followed the same pattern throughout the period.
Towards the end of the 19th century, neonatal mortality ceased to experience the same kind of peaks in connection with outbreaks of epidemics. Earlier, in the 18th and early 19th centuries, neonatal mortality was more likely to peak during periods of epidemic disease as post-neonatal and early childhood mortality. The fact that several of the most fatal epidemic diseases occurred very infrequently in Iceland, often with an interval of 30 to 40 years, made all age groups vulnerable to them. Mothers were not able to provide their unborn children with immunity and as a consequence newborns were affected to the same extent as other age groups.

The “virgin soil” character of the epidemiological regime in Iceland is best exemplified by the description of the Danish physician Schleisner. During his stay in Iceland in 1846 a measles’ epidemic broke out. Schleisner offered the following description of the epidemiological environment in Iceland during the pre-transitional period. It comes from an article he submitted to the Journal of the Statistical Society of London, five years after his visit to Iceland:

To foreign epidemics belong small-pox, measles, scarlatina, and hooping cough, which, at intervals of twenty years and upwards, are introduced by merchant-ships to this isolated island. During the intervals, they are quite unknown. When any of these epidemics are brought to the island, the whole population is attacked, as with one stroke; thus for instance, when the measles was brought to Iceland three years since, that disease, which for sixty years
previously had been quite unknown there, attacked the whole population, and all ages, from the child to the old man. The measles, which in Europe is a benignant disease, raged there with such a fury, that the number of deaths for that year was more than doubled.58

The same year Schleisner made his inquiries in Iceland another Danish physician, Peter A. Panum (1820–1885), made his well-known study of measles in the Faeroe Islands.59 Panum’s and Schleisner’s descriptions of the measles in those islands in the North Atlantic were very similar. In both cases, measles hadn’t been reported for several decades and therefore all age groups were affected. In the Faeroese case, Panum and his colleague Manicus (1795–1877) reported that around 90 per cent of the population in the islands were affected by the measles and few, other than elderly people who had caught the disease in the previous epidemic in 1781, were spared.60 Modern studies in societies that had previously been protected from measles report equally high morbidity rates during epidemics. In southern Greenland an epidemic broke out in 1951. The morbidity rates rose to more than 99 per cent and in 45 per cent of those cases complications occurred.61

It is also well known that measles is dangerous for pregnant women and tends to cause spontaneous abortion. In the case of Greenland it was reported that pregnant patients in several cases experienced such an abortion or premature delivery.62 Similar descriptions of premature delivery are to be found in the Faeroese case63 and in medical reports from years of measles’ epidemics in Iceland there are numerous descriptions of the fatal effects for pregnant mothers and their offspring. Pregnant women experienced miscarriages or premature births and if the child was alive at birth it usually died shortly afterwards.64

Unfortunately, Schleisner’s study in Iceland does not offer us a detailed account of morbidity and mortality rates from measles as was the case with Panum’s study in the Faeroe Islands. Considering the similarity of the two islands it may be assumed, however, that the effects were very much alike (or if anything worse in Iceland, because Iceland had not experienced a measles epidemic in 1781 like her neighbours). Infant mortality rates rose above 600 per 1,000 live births. Figure 2.1 above showed that stillbirth ratio tended to increase during measles epidemics; in the case of the epidemic of 1846 stillbirth ratio rose from around 30 to 50 per 1,000. Unfortunately, information on mortality levels during individual months or weeks of the first year are not available for the 1846-epidemic. When the measles next struck in 1882, mortality for individual months of the first year and mortality in the first day was recorded. Let us examine, how the measles affected individual age groups.

Table 2.1 compares the cumulative infant mortality with that of preceding and succeeding decades. It is shown that measles was extremely fatal in all months of the first year. Infant mortality was 440 per 1,000 in 1882 compared to 180 in 1871–1880 and 152 in 1883–1890. During the epidemic, first day mortality was 34 per 1,000 compared to a rate of around 8 in the years before and after the
epidemic. Neonatal mortality was more than double that of adjacent years. There was also a remarkable increase in the stillbirth ratio (from around 35 to 50 per 1,000).

The measles epidemic of 1882 is the last epidemic in Iceland to have such extreme effect on mortality levels. The great killers of the 19th century appear to have relatively little effect on levels of infant and childhood mortality in later periods. Even if diseases such as measles and whooping cough continued to strike as epidemics, they occurred at ever shorter intervals.\(^6^5\) Epidemics were more often met with quarantine measures while certain diseases, such as for example scarlet fever, tended to become endemic.\(^6^6\)

As in other European societies, measles and other childhood diseases continued to have an important bearing upon the health of young children, and a slight increase in mortality was always apparent, in particular during epidemics of whooping cough and measles. The fact that measles still took the form of epidemics in Iceland was likely to have some impact upon mortality, even though the effects were by no means comparable to those of the 19th century. Acquired passive immunity would protect the very youngest for a few months and as they were the most vulnerable, infant mortality was bound to be notably lower than during previous epidemics.

Anne Hardy has analysed the effects of measles and whooping cough upon infant mortality in England. She showed that whooping cough tended to be more fatal than measles because, contrary to measles, babies acquire no maternal antibodies against whooping cough. Whereas children were protected against measles for around six months, neonatal and early post-neonatal mortality from whooping cough tended to be relatively high.\(^6^7\) The sharply decreasing infant mortality from measles in Iceland indicates that the country was now entering a regime similar to that of other European countries. The fact that the country was visited by measles relatively frequently would increase the likelihood of mothers being able to provide their newborns with immunity against the disease.

| Table 2.1. Cumulative infant mortality and stillbirth rate 1882 and comparatively 1871–1880 and 1883–1890 |
|-------------------------------------------------|-----------------|-----------------|-----------------|
| Stillbirth                                       | 1882            | 1871–1880       | 1883–1890       |
| 1st day                                         | 48.6            | 32.8            | 36.0            |
| Neonatal mortality                              | 34.4            | 8.7             | 7.7             |
| Mortality after second month                    | 165.6           | 74.7            | 59.8            |
| Third month                                     | 201.9           | 95.3            | 78.8            |
| Sixth month                                     | 237.6           | 110.2           | 91.0            |
| Ninth month                                     | 318.5           | 141.3           | 119.1           |
| Twelfth month                                   | 381.6           | 160.3           | 137.2           |

The analysis of the distribution of mortality in measles and whooping cough might help to shed further light on the changes that occurred in the epidemiological regime at the beginning of the 20th century. During the period in question a measles epidemic was reported in 1916 in all medical districts in Iceland and, similarly, in 1920 a severe epidemic of whooping cough was noted in all districts. In 1916, measles swept through the country between May and November and even if it was possible to some extent, by means of quarantine measures, to prevent children from catching the disease, infant mortality from measles alone in that year was 1,430 per 100,000 and early childhood mortality 350 per 100,000. Compared to England, for example, these rates are rather high. During the period 1889–1891, infant mortality from measles was only 626 per 100,000 in urban areas in Britain and 176 in rural areas.

Four years after the measles epidemic, in 1920, infant mortality from whooping cough was 2,512 per 100,000 and that in early childhood mortality 770 per 100,000. As in the English case young children were now more at risk of dying from whooping cough than from measles. Figure 2.11 shows the distribution of deaths from measles and whooping cough during individual months of the first year and for individual years in early childhood. Quite a large number of children below the age of three months died from whooping cough and the disease was apparently quite lethal among very young children. Mortality continued to be relatively high during the second year of life, but then declined sharply.

Figure 2.11. Number of deaths from measles in 1916 and from whooping cough in 1920–1921 for individual months of the first year and for individual years during the early childhood period
Sources: SI. Dánarskyrslur 1916–1921.
Table 2.2. The increase in infant mortality during years of measles' epidemics, 1846–1916

<table>
<thead>
<tr>
<th>Epidemic year</th>
<th>IMR, prior to and after the epidemic</th>
<th>Increase (absolute) per 1000</th>
<th>Relative increase (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1846</td>
<td>610.7 / 238.7</td>
<td>372.0</td>
<td>155.8</td>
</tr>
<tr>
<td>1882</td>
<td>439.3 / 156.4</td>
<td>282.9</td>
<td>180.9</td>
</tr>
<tr>
<td>1908</td>
<td>165.6 / 97.7</td>
<td>67.9</td>
<td>69.5</td>
</tr>
<tr>
<td>1916</td>
<td>81.2 / 64.2</td>
<td>17.0</td>
<td>26.5</td>
</tr>
</tbody>
</table>


The age-specific mortality pattern of measles differed remarkably from that of whooping cough. It is quite obvious that by 1920 young infants were to a large extent protected from measles. This would be both because of an immunity acquired during the gestation period and by the effects of antibodies in breastmilk. The number of deaths from measles increased markedly in the last quarter of the first year and the disease was also quite lethal in the 1–2 year age group. Children above the age of three were not likely to die from measles.

Unfortunately, no national data on cause specific mortality rates from individual diseases is available prior to the 20th century. It is, however, of interest to compare the increase in infant mortality during years of epidemics of measles and whooping cough over time. Tables 2.2 and 2.3 show the increase in infant mortality during years of measles and whooping cough epidemics from the 1840s to 1920. During the 19th century, measles was far more fatal than whooping cough. Its effects in 1846 and 1882 have been described above. Table 2.2 shows that, compared to adjacent years, infant mortality more than doubled during measles epidemics. The effects were still relatively severe in 1908 when infant mortality rose from 98 to 166 per 1,000. In 1916, however, the effects were much less pronounced with infant mortality increasing only from 64 to 81 per 1,000. Not unexpectedly changes in infant mortality during epidemics of whooping cough were less pronounced than in the case of measles. During the 19th century, infant mortality increased by around 80–90 per cent during whooping cough epidemics.

Table 2.3. The increase in infant mortality during years of whooping cough epidemics, 1843–1920

<table>
<thead>
<tr>
<th>Epidemic year</th>
<th>IMR, prior to and after the epidemic</th>
<th>Increase (absolute) per 1000</th>
<th>Relative increase (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1843</td>
<td>435.9 / 238.7</td>
<td>197.2</td>
<td>82.6</td>
</tr>
<tr>
<td>1890</td>
<td>238.9 / 124.5</td>
<td>114.4</td>
<td>91.9</td>
</tr>
<tr>
<td>1920</td>
<td>83.4 / 59.9</td>
<td>23.5</td>
<td>39.2</td>
</tr>
</tbody>
</table>

Sources: See Table 2.2.
Exceptionally high infant mortality levels in Iceland are to be explained by various interrelated factors. A large share of infant deaths were due to the tradition of artificial feeding. However, the results above indicate that it is important not to underestimate the huge effects of epidemic disease. The "virgin soil" character of the Icelandic epidemiological regime is mainly reflected in the extremely high levels of neonatal mortality during epidemics of measles. The Icelandic epidemiological regime underwent important changes at the beginning of the 20th century. The great baby killers of the 19th century now had relatively modest effects. The fact that newborns were to a large extent protected against lethal diseases (above all measles) was likely to reduce infant mortality levels greatly during epidemics of measles. Improved living conditions, reflected in better housing, improved diet and better access to physicians and other health workers had undoubtedly started to play an important role in the continued decline in infant mortality. Changes at both the individual and the macro level now protected the most vulnerable against the threats of disease and death. Earlier, families and communities had few means to counteract those threats. In particular, in the case of the outbreak of diseases where whole families and entire localities were affected the situation was hard to cope with. The following section deals with some of the human implications of death and the change that occurred in the course of the 19th and early 20th centuries.

Human implications of epidemics and other mortality crises
It is not easy to imagine the impact of the immediate and indirect effects of epidemics and natural catastrophes, when a majority of the population was severely affected. In an isolated and sparsely populated society like that of Iceland, where the care for the sick was entirely the responsibility of family, kin and neighbours, the defences against the threat of a famine or an epidemic were weak. Several accounts from the 18th century demonstrate that the mental and material tools, available to individuals and localities to cope with crises, easily broke down when faced with the short and long term effects of natural catastrophes. Several contemporaries have described the chaotic situation after the volcanic eruption in Lakagigar in 1783 and the crises which followed, that were exacerbated by harsh climate and a small-pox epidemic. More or less the whole population was affected, but it took several months before information on the severity of the situation was acknowledged in Denmark. The bishop Hannes Finnsson described the situation in southern Iceland during the smallpox epidemic in the following way:

... mortality was so huge, that in a parish of a mean size where usually 20 persons died yearly, 200 died now; in some places the father and the mother died; the children were then found almost dead and some of them already dead by somebody from another farm coincidentally passed by; it also
happened on two occasions that one found around 10 persons that had died of hunger and weakness on the road from Krísvgík and Grindávík to Njarðvík or Vatnsleysuströnd.

Mortality rates like those experienced during the 18th century were not reported during the 19th. However, high adult morbidity and mortality rates during outbreaks of epidemic diseases tended to affect the survival chances of young children in an indirect way, as described in the citation above. In households where most household members were affected, the effects of diseases were aggravated by the fact that nobody could care for the sick in a proper way. In sparsely populated areas where the distance between farms was several kilometres no help could be expected from neighbours or friends. Even in later mortality crises, when mortality by no means reached the levels of the 1780s, the situation was severe. During the measles epidemic of 1882, a district physician described the situation in one household where two out of six children died. In his report he maintained that no complications occurred in connection with the measles. He concluded: “Death is simply a result of the exhaustion of those adults who cared for the children.”

A similarly tragic description is offered on the effects of the Spanish-influenza epidemic in 1918 in Reykjavík, an epidemic that had much less effects on mortality rates than earlier epidemics in Iceland. Despite this, the lack of qualified persons to take care of the sick was described as a major problem.

Grief lies as a cloud over Reykjavík. Thousands of people mourn their closest relatives. Funeral processions are always nearby and all over the place. Flags fly at half-mast. Dozens of people have been buried in the same grave. All mortuaries are full. Coffins are spread waiting all over the cemetery, because there has not been time to lower them into the graves.

Yes, this is the situation. What is worst is that people have died without the slightest attention being accorded to them. In some places, everyone fell sick at the same time in the same house, and no one could even go to fetch water. People watched their loved ones die, without being able to move in order to help.

Compared to earlier epidemics, neither the measles epidemic of 1882 nor the influenza epidemic of 1918 were particularly fatal and by no means struck to the same extent in all age groups as did the epidemics in earlier centuries. The influenza epidemic hit mainly urban areas and affected mainly grown ups. The few examples presented above show, however, how acute the situation could be in this sparsely populated society that lacked infrastructural means to combat the worst immediate and long-term effects of a disease.
Decline in infant mortality during a period of economic crisis.
Household and family structures as determinants of infant survival

Even though there are examples of the devastating effects of worsening economic conditions the relationship between them and infant mortality is not always evident. Thus, infant mortality levels reached huge heights in the period 1820–1850, a period that has been described as a rather prosperous one. The decline in infant mortality, experienced during the second part of the 19th century, was certainly not due to favourable socio-economic conditions. On the contrary, the period between 1850 and 1880 has been described as an era of deteriorating economic conditions. Fishing catches were poor and the dietary intake per inhabitant diminished (see chapter 1.3).

Between 1860 and 1880 Icelandic society displayed all the signs of over-population. Marriage prospects deteriorated and the proportion of the population depending on poor relief for their maintenance increased. Gísli Ágúst Gunnlaugsson has shown how this population crisis is reflected in changes in household structure and household size in farming areas. The total number of households in Iceland had risen slightly during the first half of the 19th century, but despite accelerated population growth the number of households remained almost constant between 1860 and 1880. This resulted in an increase of the average household size. At the beginning of the 19th century the mean household size in Iceland was 6.4 but had risen to 7.4 in 1880. This situation was most noticeable in inland rural areas whereas household size was rather small in coastal districts. In the farming areas, grown-up offspring remained longer in their parental home and the number of three-generation households increased. A growing proportion of the population remained unmarried. Iceland has thus been described as an extreme example of the West-European marriage pattern. The age at first marriage increased and so did the illegitimacy ratio. The proportion of illegitimate children reached a peak during the mid 1870s when a quarter of all children were born out of wedlock.

How could such a pronounced decline in infant mortality occur during a period of deteriorating economic conditions? What were the main forces behind this decline? As to the general effects of crises upon infant survival in the European past, somewhat disparate results have been unveiled. Tommy Bengtsson shows for Sweden that infants are less sensitive to economic fluctuations than is the case with older children, whereas David Reher and Alberto Sanz-Gimeno show that both infants and children in Spain were affected by economic fluctuations.

The inverse relationship of economic growth and infant mortality has been discussed in some studies. Simon Szreter has argued that economic growth in general increased mortality among infants and children. Indirectly this relationship is revealed in several studies on urban mortality that show that urban areas where the impetus of growth lay tend to display much higher mortality rates than surrounding rural areas. That problem is, however, in many ways not related
to the question above, since high infant mortality in urban areas is mainly due to higher infection risks than in rural areas. However, it can be argued that abundant economic resources are by no means the key to infant survival. This is especially true for the very young. As the mortality in the very first months of life was so very high in pre-transitional Iceland the explanation is probably not primarily to be found in the economic conditions. A newborn’s primary needs are satisfied by access to the mother’s breast and a mother who is not severely affected by malnourishment is, as a rule, in a position to fulfil those needs. But what conditions were likely to hamper women from putting their newborns to the breast? It is not easy to understand that women in a poor society like the Icelandic one would not make use of such an evident resource as breastmilk. Behind the tradition of feeding newborn artificially are, without doubt, several interrelated explanatory factors.

As late as 1900 Iceland’s Landphysicus, Jónas Jónassen (1840–1910), wrote in his medical journal Eir that unsuitable clothing and shoes of young women in the countryside presented a serious health risk. He noted that during the hay-making season, women were sometimes forced to stand in the wet pastures for 14 to 16 hours without suitable shoes or socks. The Icelandic climate is characterized by cold, windy and above all humid summers. Still today, these factors present risks for breastfeeding women and milkstasis is relatively common complication among women in cold climates. Whether problems related to climatic conditions contributed to the rise of a tradition where newborns were fed artificially is, of course, highly dependent upon the question whether it was common for mothers of young children to work outside the house.

Several scholars have maintained that one of the factors behind the tradition of not putting a baby to the breast lay in the workload of women. However, research has produced somewhat contradictory results on the impact of mothers’ work on the inclination to breastfeed. Women’s work per se in a traditional rural society does not necessarily hamper mothers from putting their newborns to the breast and the combination of work and breastfeeding in a household based economy was almost certainly the common rule. In the Icelandic case, however, there are several factors of a socio-economic and demographic nature that could have had a negative influence upon the inclination to breastfeed. Loftur Guttormsson has hypothesized that breastfeeding was largely abandoned during the 15th century following two outbreaks of the bubonic plague. The massive population decrease which occurred twice during the 15th century could have increased the workload of women and this, in its turn, would, in the long run, have changed the prevailing practice of infant feeding, and created a tradition of artificial feeding, a tradition that was obviously not abandoned even though the demographic and socio-economic situation stabilized.

The Icelandic settlement pattern was characterized by scattered farmsteads with often several kilometres between them. This is likely to have hindered neighbours and relatives living in the parish from offering help to families after childbirth. Another related factor is that in many upland communities, men
went away to fish often for several weeks of the year. During this period women, children and the elderly were left alone. Under such conditions it is likely that childbearing women would often have been forced to carry out all the hard work, both indoors and outdoors. At such times, the care of infants was likely to be left to older siblings or to the elderly.

If the hard work of childbearing women, following a decrease in population, was a crucial factor behind the abandonment of breastfeeding, was then the increase in population, under certain conditions, likely to encourage a return to the practice of breastfeeding? Breastfeeding is a relatively complex phenomenon and it is unlikely that an increase in population alone would provoke an immediate change in feeding patterns. However, the growth in population and in particular the growth in mean household size could have created preconditions that made breastfeeding an easier choice for mothers.

Thus, difficulties in the economic environment that were above all reflected in poor fishing catches, decreasing marriage prospects (de facto unemployment of young people) followed by an increase in the mean household size, are likely to have created conditions in rural areas where there were more people available than were needed to carry out the regular tasks on the farm. In a situation like this, an opportunity was created for mothers to spend more time indoors with their young and this would make it possible for them to breastfeed.

The impact of differences in settlement patterns between regions and of differences in the division of work between the sexes, upon infant survival is further discussed in chapter 3.2 below. Here, however, a discussion on changes in fertility rates is needed to further shed light on changes in breastfeeding patterns. To what extent then was the decline in infant mortality related to the decline in fertility?

Fertility and infant mortality

It is a well-known fact that breastfeeding affects the length of the amenorrhoea period and societies with a solid tradition of breastfeeding tend to display relatively long birth intervals. Knodel and Kintner have shown that birth intervals were extremely short in those areas of Germany where infants were not breastfed. Loftur Guttormsson has argued that high fertility and short birth intervals are two of the main indicator of the absence of breastfeeding in 18th and early 19th century Iceland. Does then the change in fertility rates coincide with the decline in infant mortality in Iceland?

It was shown in chapter 1.3 that the decline in crude birth rates commenced somewhat earlier than the decline in infant mortality (see Figure 1.2). However, as nuptiality and crude fertility are closely related, declining crude birth rates could merely be a function of worsening marriage prospects. Therefore the analysis of marital fertility is needed to establish whether the decline in fertility could be an indication of the start of breastfeeding.
In Figure 2.12 the fertility index that was developed for the Princeton fertility project is used to show the development of marital fertility rates in Iceland. The index Ig measures marital fertility in relation to the fertility of American Hutterite women marrying between 1921–1930. An Ig index value of 1.0 would then signify that fertility is at the same level as among the Hutterite women. Within the Princeton project it is assumed that levels above 0.6 indicate that no fertility control was practiced. The Hutterite fertility has been described as the highest fertility reported for a human population. Fertility among the Hutterites was high, because they forbade all contraception and because mothers only breastfed for a few months.

Figure 2.12 shows the marital fertility index for Iceland and, for comparative purposes, for Denmark and Niederbayern (southern Bavaria). In the introduction to this study, Bavaria, together with Iceland, was presented as an example of a society with unusually high infant mortality rates (see Figure 1.1 in chapter 1.1) and a tradition of feeding newborns artificially. In both those societies marital fertility was extremely high. In Bavaria, figures on fertility are only available for the period after 1870, but the marital fertility index remained at a level of 0.9 until the end of the 19th century. Then marital fertility declined sharply and dropped below the 0.6 level during the 1920s. In Iceland marital fertility index was close to 1.0 in the mid-19th century, but between 1850 and 1870 there was

Figure 2.12. Marital fertility index (Ig) in Iceland, Denmark and Niederbayern 1850–1930
a decline and in 1870 the marital fertility was slightly below 0.8. Thereafter there is little change in fertility until 1890 when it started its secular decline. Around 1930, fertility dropped below the 0.6 level (the level that indicates deliberate family limitation). This is a decade later than for Bavaria and 30 years later than for Denmark.

An analysis of the age specific fertility rate might offer a better picture of the implications of the fertility decline in Iceland. If breastfeeding was initiated this is likely to be reflected in longer birth spacing, which would above all be seen in declining fertility in the youngest (and most fertile) age-groups. A decline in the fertility in the older age groups would, on the other hand, be more likely to be a function of intentional birth limitation (birth stopping).

Figure 2.13 shows that the decline in marital fertility between the mid-1850s and the mid-1870s occurred in all age groups except in that aged 45–49. The decline is most pronounced among 20–24 year olds. Initially, marital fertility in this age group was close to 600. This is even somewhat above the Hutterite level (of 550). With the exception of this age group and the age group 25–29, the level is only slightly below the Hutterite one during the period 1856–1860.

Between 1856–1860 and 1861–1865 little change occurred, but after 1866 the decline was noticeable. During the period 1871–1875 marital fertility among 20–24 years olds had dropped to a level of 425. In all likelihood declining fertility rates were at least in part the result of the start of breastfeeding in Iceland. Modern studies have shown that the period of amenorrhoea is only around two months if breastfeeding is not practiced at all. It is likely that in a society where only few newborns were put to the breast, only a slight increase in breastfeeding could greatly improve infant survival. First and foremost infant survival would be greatly improved through the direct effects of breastfeeding. However, an increase in the amenorrhoea period is also likely to affect survival in a more indirect manner. A longer spacing between births evidently produces fewer babies and conditions are created where parents had more time for individual children.

In a society with a long tradition of feeding newborns artificially, it is neither likely that breastfeeding became widespread nor that it was of long duration in its initial stages. In all likelihood, breastfeeding was of short duration and possibly practiced only among certain groups in society or in certain areas where conditions were favourable. However, only small changes in feeding practices were likely to produce considerable results. In a pre-transitional society where an understanding of the ways in which diseases spread was not available, neonatal mortality from diarrhoeal diseases was bound to be high if newborns were not put to the breast. The fact that neonatal mortality started to decline as early as during the 1850s is a further indication that breastfeeding was beginning to gain ground at least among certain sections of the society.

The decline in fertility occurring during the late 1850s and early 1860s created conditions for a continued decline in infant mortality in the subsequent decades. With the continued increase in rates and duration of breastfeeding, improvements
were likely to accelerate. Changes in infant feeding practices were, however, not likely to occur without societal effort. Breastfeeding among humans is complex and women usually need support and encouragement if it is to be successful. Who then were the actors promoting breastfeeding? Where did breastfeeding gain ground in its initial stages? It has been noted earlier that there were generally large differences between areas in both the level and development of infant mortality. Therefore, the remaining chapters of this study are largely devoted to regional aspects of infant survival. The main objective is to localize the main actors behind the remarkable decline in infant mortality experienced by Icelandic society during the late 19th and early 20th centuries. First, however, the main trends and regional patterns of infant mortality in Icelandic counties between 1840 and 1920 are portrayed. Were there differences in infant mortality rates between sparsely populated rural areas and densely populated fishing districts? Did mortality patterns persist over time or was there a change as infant mortality declined?
2.3. **Regional Variations in Infant Mortality, 1840–1920**

The pre-transitional period in Europe was in general characterized by enormous regional differences in infant mortality rates. It has long been known that densely populated urban areas tended to display higher mortality rates than did sparsely populated rural areas. Recent research has, however, shown that sometimes there were important differences in infant mortality rates between areas irrespective of the degree of urbanization. The health transition process in European societies was not only marked by a decline in infant mortality, but also in the decreasing importance of regional differences in infant mortality rates. At the beginning of the 20th century there were generally only slight differences in mortality levels between areas. The development during the 20th century has been characterized by an accelerated decrease in infant mortality in urban areas and, during the 1920s and 1930s, urban infant mortality had in many European societies dropped below that in rural areas. At this point in time infants in urban areas started to benefit from better access to medical expertise.

**Regional differences in socio-economic structure**

Before presenting regional differences in infant mortality in Iceland, it is necessary to offer a brief description of differences in the socio-economic structure between areas. Map 2.1 shows all the parishes in Iceland together with the towns and villages that had more than 500 inhabitants in 1870 and in 1901. It shows how vast areas of the central part of the country were completely uninhabited. Most parishes were sparsely populated and during the pre-industrial period only a few numbered more than 500 inhabitants. The southwestern part of the country formed the exception. Parishes in this area were densely populated and the number of cottars was traditionally high. A notable proportion of the population derived their livelihood from the fisheries. This was also the case in coastal areas in the peninsula of Snæfellsnes (in the west) and that of Vestfirðir (in the northwest). All these areas had good access to rich fishing-grounds off the west and south coast. Because of the numerous inlets and fjords, this part of the country had many excellent natural harbours, a factor that in the long run facilitated the development of the fishing sector.

The inhabitants of rural upland communities in the south and the west chiefly derived their livelihood from pastoral farming. However, a large proportion of the population in those areas had an important subsidiary income from the fisheries. Thus, fishing crews in the fishing areas in the west and the southwest were to an important extent recruited from these areas. Relatively many farmers in upland communities owned boats and were heavily involved in the fisheries for part of the year. It was even relatively common for male farmers and
farmhands from distant rural areas in northern Iceland to work seasonally in the south and west during the fishing season. As the main fishing season in the south and the west occurred during late winter and early spring, a dormant season within rural areas, there was no conflict with the labour requirements of the agrarian sector. On several occasions, contemporaries observed that the population in fishing areas often doubled during the fishing season.

The mobility of the labour-force was reversed in late summer during the hay-making season when the demand for additional labour was greatest in the agrarian areas. Then, many inhabitants of the fishing villages spent a few weeks in the rural areas. Fishing was highly seasonal in its character and the fishing villages were marked by massive seasonal unemployment. The opportunity of work within the farming sector helped many families to avoid seeking help

Map 2.1. Icelandic parishes with towns and villages with more than 500 inhabitants in 1870 and 1901
Source: The map was created by Ólóf Garðarsdóttir on the basis of one by Björn Gunnlaugsson 1846.
from the poor law authorities. Ólafur Þorvaldsson (1884–1972) who lived in the fishing town of Hafnarfjörður, described the effects of labour migration during the late-summer in the following way:

In many places, only women, children, and the elderly were left behind at their place of residence. Many farms and houses were totally abandoned, everyone had left for somewhere. Where both the husband and the wife were able leave, they sometimes left their children in the care of their neighbours, who stayed behind. Often the windows of these homes were covered, until the people returned.97

The northern and the eastern parts were traditionally much less dependent upon the fisheries than were the western and southwestern areas. There, the main fishing season coincided with the hay-making season when labour requirements were at their most intensive within the agricultural sector.98 Therefore fisheries in those areas were of moderate importance and population increase was to a large extent restricted to the agrarian sector. During the last three decades of the 19th century, there was a dramatic change in the socio-economic structure of the northwest and of particular of the east. Following massive investments by foreigners in the fisheries there was a major population increase in coastal areas.99 This development gave rise to an intensification of labour migration in Iceland. Demand for experienced fishermen and female fish processors in the east opened up possibilities for working class families in the west and southwest parts of the country to maximize their income by working temporarily during the autumn season within the fisheries in the east.100 The socio-economic structure and changes in living arrangements are likely to have affected mortality patterns in different parts of the country. Let us now then have a look at the regional structure of infant mortality during the 19th century.

Mortality patterns

Several contemporaries in the in the late 18th century were well aware of regional differences in infant mortality in Iceland. The physician Bjarni Pálsson (1719–1779) and the natural scientist Eggert Ólafsson (1726–1768) who were appointed by the Danish government to assess the socio-economic conditions of the country from 1752–1757, noted in their travel accounts that infant mortality was much lower in northern Iceland than in the southern and western parts of the country.101 Two decades later, a similar observation was made by the bishop of Iceland Hannes Finsson (1739–1796).102

A description offered by the midwife Sigríður Örum (1753–1828) around 1800 suggests that there were also notable differences in feeding practices between the north on the one hand and the south and the west on the other. Sigríður was born in the parish of Laufás in northern Iceland (Suður-Þingeyjarsysla). She served as a midwife first in the southwest close to Reykjavík and later in the northeast.103 Sigríður observed that both the north and the southwest were
characterized by the tradition of artificial feeding of newborns. Differences lay mainly in the timing of the introduction of solid food into infants' diet. In the south and the west, infants were, shortly after birth, given solid food that consisted mainly of fish, butter and porridge. Food was then pre-chewed by an adult and put into a piece of linen that the child would suck from. In the north, on the other hand, infants were as a rule not given solid food until they had reached the age of three months.¹⁰⁴

Considering the fact that the authors of the Enlightenment period had little numerical evidence about infant mortality levels in Iceland, their impression of regional patterns of infant mortality proved remarkably accurate. This is shown in Maps 2.2—2.6 which show infant mortality at the county level for four time-periods during the years 1840–1921 (and at the parish level for the period 1840–1852). Here I have chosen to show the mortality levels at the county level for, (1) the period 1840–1850 a period that was marked by unusually high infant mortality rates due to epidemic diseases, (2) the period 1870–1880 when the transition towards lower infant mortality rates had just commenced, (3) the period 1890–1901 when infant mortality levels in Iceland had declined remarkably and now ran in parallel with those of the other Nordic countries and (4) the 1911–1921

Map 2.2. Infant mortality in Icelandic counties, 1840–1850
Source: NAI. Biskupsskjalasafn. C. VI. Skýrslur um fædda, gifta og dána.
period when mortality levels were lower than in most other Europeans societies. Some important regional variations are apparent as regards both patterns and developments in infant mortality during the period 1841–1921.

During the first period shown here 1840–1850 (Map 2.2), infant mortality rates at the national level were above 300 per 1,000 live births. Very pronounced differences between counties are detected. The lowest county rate (that for Þingeyjarsýslur in northern Iceland) was of 208 per 1,000, the highest (Rangár-vallasýsla in southern Iceland) was twice that level (at more than 400 per 1,000 live births). Both counties were predominantly rural. The regional pattern is more or less consistent with ideas put forward by contemporaries during the late 18th century. The lowest rates are in counties situated in the north and the east, with much higher ones in counties in the south and the west. The same pattern is revealed at the parish level (Map 2.3). The lowest rate was in a parish, situated in the north, only 90 per 1,000 births during the period 1840–1853 while the highest was in the island of Vestmannaeyjar in the south, at over 600 per 1,000. Levels of infant mortality in the northern and eastern part of the country were in most parishes in this period between 100 and 250 per 1,000 and by far the highest parish in this area displayed levels of infant mortality of

Map 2.3. Infant mortality in Icelandic parishes, 1840–1852
Source: See Map 2.2.
400 per 1,000. Levels of infant mortality experienced in this part of the country are by no means uncommon in other rural areas in Europe during this time period.\textsuperscript{106}

On the other hand, levels of infant mortality in the high mortality counties of the west and the south are far above the levels experienced in most European countries at that point in time. As an illustration one can take the rural county of Rangárvallasýsla in the south and that of Dalasýsla in the west, counties that experienced the highest rates during this period. The parish with the lowest rate in those districts had one of 283 the highest 617 and of the 22 parishes in these two counties only four had rates below 350 per 1,000 during this 13 year period. Such levels are to be found in a few areas in northern Sweden and Finland and in southern Germany.\textsuperscript{107}

By the 1870s infant mortality had decreased considerably. At the national level it had dropped below 200 per 1,000. Considerable improvements had taken place in all areas (Map 2.4). As in the earlier period, the northern agrarian county of Óingeyjarsýslur had the lowest rates in Iceland (123 per 1,000). The

\begin{figure}
\centering
\includegraphics[width=\textwidth]{map.png}
\caption{Map 2.4. Infant mortality in Icelandic counties, 1872–1880
\textsuperscript{107}Source: NAI. Skjalasafn landshöfðingja. Séröskjur. Yfirlit yfir gifta, fædda, dána, aklur kvenna er börn fæddu, svo og yfir fermda, 1872–1901.}
county of Snæfellsnes- og Hnappadalssýsla (Snæfellsnes-peninsula), a relatively densely populated fishing area in the west had the highest rates (253 per 1,000). The highest mortality of the period 1840–1852, the county Rangárvallassýsla, still displayed rates that were comparably high (200 per 1,000). By and large the pattern observed during the period 1840–1852 persisted. Thus, areas in the south and the west tended to be high, whereas the low mortality areas were situated in the northeast. However, there was a remarkable change in the mortality pattern in the east and the northwestern peninsula of Vestfirðir. Both these areas displayed low mortality rates in the first period, but in relative terms had considerably higher ones during the 1870s. After 1880, infant mortality continued to fall at a fast pace. Note that because of the rapidly decreasing levels of mortality between the periods another scale is used in the two maps 2.2 and 2.4.

By the 1890s infant mortality at the national level in Iceland was, in European terms, relatively low, being slightly above that of the other Nordic countries. At the national level infant mortality rates had fallen to 116 during the period 1890–1901 and most counties in the country were close to this level (Map 2.5). It can be argued that Iceland was at this point in time about to enter a new mortality regime, a regime of low infant mortality, where the differences between areas

Map 2.5. Infant mortality at the county level in Iceland, 1891–1901
are about to disappear. Now the lowest county displayed a rate of only 80 per 1,000, whilst by far the highest county, Strandasýsla (on the peninsula of Vestfirðir), had rate of 164 per 1,000.

The regional pattern had altered considerably from earlier periods. The most notable decline occurred in the counties closest to the capital. Decline occurred in most areas in this part of the country irrespective of their economic structure (farming/fishing) or their earlier levels of infant mortality. The decline in those areas was thus between 45 and 60 per cent from the 1870s to the 1890s (whereas the average general decline was only 39 per cent). Thus two counties northeast of the capital were among the highest areas during both earlier periods, but now ranked among the four lowest (see for example Mýrasýsla). (Table 2.4 below shows the rank order of individual counties at different periods).

The low mortality areas in the northeast experienced below average rates of decline; e.g. Óingeyjarsýslur with only 24 per cent. Even if infant mortality in this county was still very low, several of the counties in the southern southwestern part of the country were now equally low. Areas next to Gullbringu- og Kjósarsýsla, the county in which Reykjavík is situated, had rates close to those of the low mortality areas of the north. The question arises whether this development was a result of a diffusion of ideas on infant feeding from the capital to

Map 2.6. Infant mortality at the county-level in Iceland, 1911–1921
surrounding districts. Those areas were the first to benefit from the development of medical expertise and the number of well-trained midwives and physicians was highest there. In its initial stages propaganda in favour of breastfeeding is likely to have spread from the capital to the surrounding areas. Areas situated far from the capital would then lag behind, with improvements coming somewhat later. This aspect will be further discussed in the remaining chapters of the book.

Relatively speaking, the situation in the east and in the northwestern peninsula of Vestfirðir continued to deteriorate. Now these areas, which in the 1840s had displayed extremely low levels of infant mortality, had higher rates than other areas in Iceland. This is especially true for the peninsula of Vestfirðir (northwest). In both areas, however, important changes in the socio-economic structure occurred. Investment by foreigners in the fisheries led to an economic boom and an enormously rapid population growth in the coastal areas.\textsuperscript{108} Inmigration to those districts was huge and in some cases the population more than doubled during a period of only a few years.\textsuperscript{109} It has been shown that infant mortality in coastal villages in the eastern part of the country was very high during this period of economic growth. The economic changes occurring in those fishing areas created an enormous demand for male and female labour, a situation that is likely to have affected the survival chances of young infants. The workload of mothers, bad housing conditions and primitive health care are all factors that were likely to affect the health of young children. As regards the medico-political situation in the areas that lagged behind in the development towards low mortality rates. Both the areas had been without a physician for long periods in the mid 19\textsuperscript{th} century and had very few trained midwives.\textsuperscript{110}

The analysis of regional differences in infant mortality reveals that even though there were cases of high infant mortality in the expanding fishing districts in eastern and northwestern Iceland at the end of the 19\textsuperscript{th} century, no obvious correlation between population density and infant mortality can be established for the 19\textsuperscript{th} century as a whole. Although the sparsely populated northeastern areas displayed low infant mortality rates, there are also examples of sparsely populated rural areas with very high ones. This is especially the case with the two counties where infant mortality rates ranged above other districts during almost the entire 19\textsuperscript{th} century (Rangárþingystra and Dalabystra). Frequently, however, densely populated areas with high population turnover displayed high infant mortality rates.\textsuperscript{111} This was to a more pronounced degree the case with fishing districts in the west and southwest. Thus the fishing county of Snæfellsnes- og Hnappadalssýsla in the west had very high infant mortality throughout the 19\textsuperscript{th} century.

The county of Gullbringu- and Kjósarbystra (where Reykjavík is situated) is another district with a high population turnover and high population density along the coastline. However, this county experienced a much more favourable mortality development than did Snæfellsnes- og Hnappadalssýsla. In the beginning of the period Gullbringu- and Kjósarsýsla as a whole was close to the national average and at the turn of the century the situation was even better. At that point in time, infant mortality rates in this county were among the lowest in Iceland.
After the turn of the 20th century infant mortality in Iceland continued to decline at a fast pace. Furthermore, differences between areas continued to diminish. During the second decade of the 20th century infant mortality at the national level was below 70 per 1,000 live births and few counties deviated to any important degree from this. Map 2.6 shows infant mortality in all counties. Now the county where Reykjavík is situated was exactly at the national level. The counties that displayed a level significantly lower than the national level were all sparsely populated rural areas. This was especially the case with the district of Þingeyjarsyslur with an infant mortality level of only 44 per 1,000 and the county of Mýrasýsla (north of Reykjavík) with one of only 50 per 1,000.

Only one county stands out as having infant mortality rates that were significantly higher than the national average. As in the late 19th century this was the case with the county of Norður-Ísafjarðarsýsla on the Vestfjarða-jörð-peninsula. Its rate of more than 100 per 1,000 was 50 per cent higher than the national average. The eastern parts, however, had now dropped to levels close to the national. Thus, there seems to be a change in the regional mortality patterns in Iceland around the turn of the 20th century, with the situation in the agrarian areas improving at a faster pace, than in the densely populated fishing districts. Let us now have a closer look at the timing and extent of decline in different areas.

**Timing and extent of decline in different parts of the country**

In the light of the enormous regional differences in infant mortality during the pre-transitional period the question arises as to the relative share in the decline of individual counties. Was the decline in infant mortality mainly due to the drop in mortality levels in counties where they were highest, with the relatively low mortality counties less or not at all affected? Did the decline occur at approximately the same period in all counties? Another important question concerns differential in the impact of epidemic diseases in different areas. During the pre-industrial era, communications with foreign countries were most frequent with the fishing areas of the southwest. It is also well known that the northeastern areas (Þingeyjarsyslur) did not experience the same intensity of labour migration as most other parts of the country. The same was true for isolated areas in the southeast. To what extent can low levels of infant mortality in the north and east be explained by their isolation, i.e. the fact that these areas were better protected from lethal infectious diseases than was the case with those in the southwest, where fishing vessels form abroad arrived much more frequently?

Let us first turn to the problem of the timing and extent of decline in different areas. Table 2.4 shows the level and development of infant mortality in all counties for each decade between 1840 and 1921. The first seven columns show how each county ranks in relation to the others. The next seven columns show the actual infant mortality levels. The first county shown in the table is the county of Gullbringu- og Kjósarsýsla (the county where Reykjavík is situated).
The Table then presents the counties in a clockwise direction from Borgarfjarðarsýsla, a rural county northeast of Gullbringu- og Kjósarsýsla, to the rural county of Árnessýsla southeast of the capital area.

The decline between the 1840s and 1850s is notable, mainly because the 1840s were hit by several severe epidemics. Most counties remained relatively unchanged between the 1850s and 1860s, but between the 1860s and 1870s the national infant mortality rate fell by 22.8 per cent. When scrutinizing the decline in the different counties between the 1860s and the 1870s it appears that it was relatively sharp in almost all areas. Only one county experienced a slight increase in mortality and one county remained approximately unchanged. In the others there was a considerable decline in infant mortality both in relative and absolute terms. As a rule, the decline was most notable in areas with previously high mortality levels. Thus the rate in the county of Dalasýsla in the west fell by 38 per cent, from a level of 369 to one of 229 per 1,000 between the two decades. Areas with low mortality levels, on the other hand, did not as a rule experience notable changes. The decline of the 1870s diminished the gap between areas, but the old pattern persisted. In the 1860s the lowest county displayed an infant mortality rate of 145 per 1,000, the highest was more than three times that (368 per 1,000 live births). In the 1870s the rate in lowest county had dropped to 133 per 1,000. The highest county during this period, Snæfellsnes- og Hnappadalssýsla, was slightly less than double that (253 per 1,000).

The mean rate of infant mortality during the 1880s was similar to that of the 1870s: the halting of the process of decline being mainly due to the measles epidemic of 1882. In most counties there was a slight increase in infant mortality. In four counties the rates remained unaltered and in three counties there was a decrease of between 4 and 11 per cent. If the year of the measles' epidemics is excluded from the analysis, the downwards trend continues.

The decline in infant mortality between the 1880s and the 1890s was even more intense than that between the 1860s and 1870s. Now all counties are affected. The most dramatic decline occurred in Mýrasýsla (in the west) where infant mortality fell by 63 per cent between the 1880s and the 1890s (from 213 during the 1880s to 80 during the 1890s). Again there was, as a rule, a steeper decline in the high mortality areas than in the low mortality ones. This pattern is, however, not as straightforward as in previous periods and there are examples of areas with relatively high mortality rates during the 1880s that fell little. This is notably the case in the eastern part of the country. After the turn of the century, there is an obvious change in the pattern of decline. The pace of decline is generally more pronounced in the agrarian districts than in the fishing ones, with the most notable decline being in the rural areas in the western part of the country.

When looking at the rate of decline for the entire period from the 1860s to the 1890s, three observations can be made. (1) The rate of decline was highest in western/ southwestern/ and southern part of the country (in the area ranging from the southern county of SkafIFSýslur to the western county of Snæ-
fellsnes- og Hnappadalssýsla). Two counties in the north (Húnavatnssýsla and Skagafjarðarsýsla) also experienced this steep mortality decline. All these counties showed remarkable improvements (declining by between 54 and 71 per cent during this 30 year period) irrespective of earlier levels. The steepest decline occurred in the highest areas and in the counties closest to the capital. The east and the northwest peninsula of Vestfirdir lagged behind and had the highest rates at the end of the century. The rate of decline was between 38 and 51 per cent between the 1860s and the 1890s. Low mortality districts in the northeast displayed the lowest rate of decline (34–39 per cent), but due to low infant mortality levels in the initial stages, they remained at relatively low levels at the end of the century. After the turn of the century on the other hand, the rate of decline was highest in the agrarian districts, in particular those situated in the western and eastern parts of the country.

Let us now turn to the possibility of differences in the effects of epidemic diseases. Were sparsely populated areas better protected against the lethal effects of epidemic diseases than densely populated fishing districts? Were the initially high levels of infant mortality in the western and southern areas mainly to be explained by livelier communications with foreign countries and more intensive internal migration than was the case with, for example, the areas in the northeast?

Figures 2.14—2.17 show the annual fluctuations of infant mortality in four counties. The overall trend is shown by 10 year moving averages. In this analysis, the main focus is on four mortality peaks; the measles epidemics of 1846 and 1882 and the whooping cough epidemics of 1843 and 1872. The counties shown in Figures 2.14 and 2.15 are high mortality areas in the western part of the country; one of them (Snæfellsnes- og Hnappadalssýsla) was a densely populated fishing district, the other (Dalasýsla) an extremely sparsely populated rural district. Figure 2.16 shows the county of Gullbringu- og Kjósarsýsla (where Reykjavík is situated). The rate here was close to the national average in the 1840s, but below it by the end of the century. The last county shown here (Figure 2.17) is that of Pingeyjarsýslur, the rural county where rates were initially among the lowest in the country.

By comparing the four figures it can be seen that none of the counties were completely spared from the effects of the epidemics referred to above. The general impression is that the effects of epidemics were more wide ranging in geographical terms in the early periods than was in the later ones (This feature is also apparent when comparing the development in other counties, see Appendix 1). The effects of the measles’ epidemic of 1882 are thus relatively modest in the most sparsely populated area that was farthest away from the capital (Pingeyjarsýslur). If we take for example the two neighbouring high mortality counties of Dalasýsla and Snæfellsnes- og Hnappadalssýsla it is shown that the rate in the rural county of Dalasýsla does not rise as much above the average level (represented by the 10 year moving average) as is did in the densely populated county of Snæfellsnes- og Hnappadalssýsla. During the measles epidemic of 1846 the rate of infant mortality increased by 300 per 1,000 in the rural county
Table 2.4. Development of infant mortality rates in Icelandic counties, 1840–1921

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### Iceland

|       | 314.6 | 237.8 | 245.3 | 189.3 | 197.2 | 116.3 | 67.9  |

and by over 400 in the coastal one. The same pattern is apparent during the measles epidemic in 1882 when infant mortality increased by slightly more than 350 in Dalasýsla but by more than 400 in (the peninsula of) Snæfellnes- og Hnappadalssýsla. When comparing these two counties it can be concluded that epidemics were likely to have more lethal effects in densely populated coastal districts than in sparsely populated inland ones.

The factor of population density was by no means universal. The capital area was a good example of a densely populated area with relatively low infant mortality peaks during epidemics. There, the peaks were notably lower than in Snæfellnes- og Hnappadalssýsla and approximately on a par with those in the rural county of Dalasýsla, i.e. around 250 in 1846 and 300 in 1882. During the outbreak of whooping cough in 1872, the capital county of Gullbringu- og Kjósasýsla was less affected than both the western counties. The low mortality rural county of Þingeyjarsýslur was affected quite strongly by the epidemics of the 1840s, i.e. approximately to the same extent as Reykjavik and Dalasýsla. In later epidemics, however, the increase was much less notable. In the case of the measles epidemic in 1882, for example, mortality rates only rose around 80 per 1,000 above the average level. Here it must, however, be mentioned that the

![Figure 2.14. Development of infant mortality in the county of Snæfellnes- og Hnappadalssýsla, a fishing area in western Iceland, 1840–1900](image-url)

effects of measles in this area were distributed across two years, i.e. 1882 and 1883. It is also worth mentioning that measles occurred in the eastern part of the country in 1869. They only occurred in the counties of Austur-Skaftafellssýsla, Múlasýslur and possibly in some parishes in Óingeyjarsýslur. If parts of the female population in the northwestern part of the country had acquired immunity against measles during the epidemic in 1869, it is evident that infant mortality would be lower in those areas during the 1882-epidemic. In any case, it is obvious that this county was to a large extent protected from the lethal effects of epidemic diseases after 1850. Is this a sign of more effective quarantine measures or were there other factors at work?

When the Danish physician Schleisner came to Iceland in 1846, he criticized the very limited effects of quarantine measures there. Medical reports indicate that epidemics such as measles and whooping cough in general reached all districts of the country within a few months. There are only a few examples of effective prevention against the spread of diseases. The mechanisms for the better control of diseases are likely to have improved with better knowledge and the expansion of the medical sector during the late 19th century. Populations in rural areas

Figure 2.15. Development of infant mortality in the county of Dalasýsla, a rural area in western Iceland, 1840–1900
Sources: See Figure 2.14.
and in districts situated far from harbours were then better able to prevent the spread of diseases than were populations in densely populated urban areas with frequent contacts with foreign countries.

Another factor must, however, be considered in the discussion of the effects of epidemics on infants. The effects of measles on young infants in the pre-industrial society were discussed above. There it was noted that during the pre-transitional period, newborns in Iceland were not protected against measles. This is partly explained by the lack of immunity of a population in a virgin soil environment and partly by the fact that infants were not breastfed and thus did not acquire the immunity against the disease through breastmilk. If breastfeeding was generally introduced in some parts of the country and not in others, this is likely to be reflected in differences in mortality rates among the very young during the neonatal and early post-neonatal period. This might of course explain the more modest effects of epidemics in the low mortality areas of Gullbringu- og Kjóssasýsla and in Þingeyjarsýslur compared to the high mortality areas of Dalasýsla and Snæfellsnes- og Hnappadalssýsla. This issue of differences in breastfeeding practices between areas will be discussed further in part 3. First, however, a general discussion on the implications of infant mortality differences between rural areas and densely populated fishing districts is needed.

Figure 2.16. Development of infant mortality in the county of Gullbringu- og Kjóssasýsla, a fishing area in southwestern Iceland where Reykjavík is situated, 1840–1900
Sources: See Figure 2.14.
A rural penalty in a pre-industrial setting?

Differences in infant mortality between towns and rural areas

In pre-transitional Europe, urban places tended to be unhealthier than rural districts. Unhealthy living conditions in urban areas were the product of several environmental and socio-economic factors. Problems with contaminated water and milk were common in pre-transitional urban settings. Overcrowded housing conditions and problems with the disposal of human and animal waste further reduced the survival chances of the inhabitants of towns and cities. The situation of unhealthy living conditions and high mortality in urban areas has been termed “the urban penalty” by Gerry Kearns. In a study of Sweden, Kearns stresses that the size of towns was by no means a precondition of high mortality rates in urban areas. Small towns and villages were often unhealthy and portrayed all the disadvantages of bigger cities. There is thus no reason to believe that the mechanisms behind high mortality in crowded places automatically differed between small towns and large cities. During periods of economic expansion and intense immigration, small urban areas could prove unhealthier than bigger more established cities:

The urban penalty begins to be paid in quite small places, not just in large cities. Consequently, the study of a relatively lightly urbanised country such as

Figure 2.17. Development of infant mortality in the county of Bingseyjarsýslur, a rural area in northern Iceland, 1840–1900

Sources: See Figure 2.14.
Sweden can usefully be set alongside studies of more heavily urbanised places.\textsuperscript{118}

When it comes to analysing the unhealthy effects of small urban places, the fishing districts in pre-industrial Iceland are an interesting case in point. Fishing villages were as a rule small with rarely more than 400 or 500 inhabitants. The capital Reykjavik is the only exception, with 7,000 inhabitants in 1901. Despite their small size, however, there is ample evidence in biographies and medical reports on the unhealthy living arrangements in Iceland’s fishing districts. Population density was extremely high, especially during the fishing season when populations often more than doubled. There are numerous accounts of outbreaks of diarrhoea in those districts during this period of the year. In many of these areas there was a permanent lack of clean drinking water and inhabitants had to collect rainwater from roofs or muddy ponds.\textsuperscript{119} Because of the increased population, the lack of drinking water was more acute during the fishing season and because of the density of the dwellings, outbreaks of acute diarrhoeal diseases such as typhoid fever spread much faster than during other times of the year. A good description of the unhealthy living conditions in the crowded fishing areas in Reykjanes is provided by the report of the Landphysicus in 1859, when he describes an outbreak of typhoid fever in the southwestern districts.

The typhoid epidemic had its origin in this district towards the middle of the month of May. It started with an epidemic of Dysteria, a disease that is common among fishermen in the crowded fishing areas. Those areas are, as is well known, visited by a lot of farmers and workers from the upland areas who according to an old and depraved tradition leave their farms to act as fishers for two or three months. On the 12\textsuperscript{th} of May I was contacted by the communal director from the large fishing area called “Sydnæs” and asked to visit this area that lies around 8 Miles from the town. I agreed immediately to this request and spent a few days in the area where the disease was most acute. The total population in the area was around 3,000 including the seasonal migrants and 20 per cent of those were affected by the disease.\textsuperscript{120}

In the light of the apparently unhealthy situation in the fishing districts, it is paradoxical that infant mortality rates in Iceland often tended to be higher in the agrarian areas than in many of the more densely populated fishing districts.\textsuperscript{121} Accounts from contemporaries suggest that those differences might be explained by differences in feeding practices between urban and rural areas. Several accounts from the late 18\textsuperscript{th} and early 19\textsuperscript{th} centuries suggests that women in fishing villages were more likely to feed their infants with breastmilk than was the case with their counterparts in the rural districts. This was reported by Bjarni Pálsson and by Eggert Ólafsson who maintained that breastfeeding was only practiced by poverty stricken women in fishing areas, which due to their extreme poverty had no access to cow’s milk and therefore chose to breastfeed their newborns for a short period of time.\textsuperscript{122}
Almost hundred years after Eggert's and Bjarni's statement, the Danish physician Peter A. Schleisner made a similar observation. He maintained that Icelandic women as a rule deprived their children of the breast. According to Schleisner there were notable exceptions from the general rule of the artificial feeding of newborns. Thus, women in Reykjavik breastfed almost without exception, and the same was true for most women in other towns. Schleisner, in line with Eggert and Bjarni, pointed out that in fishing areas it was common for women from the lowest social strata to breastfeed for a short period. Women were though reluctant to breastfeed exclusively and infants were, from birth, given solid food, for example pre-chewed dried fish and liver.

The tradition of feeding newborns artificially in the rural setting and, vice versa, the inclination to at least offer the breast for a short period to newborns in the urban setting is likely to have nullified the advantage the rural environment otherwise would have had over the urban setting. Other important factors lay the quality of artificial food and the equipment used to feed infants. As regards the quality of food, rural areas had several advantages over the towns and villages. Thus, households in rural areas usually had access to fresh milk, and water too was likely to be more wholesome than in the more densely populated villages. There is no doubt about the unhealthy environments of the fishing villages, especially during the fishing season. In many of these areas there was a permanent lack of clean drinking water and the inhabitants had to collect rainwater from the roofs or fetch water from filthy ponds.

It must, however, be borne in mind that the situation was not always particularly healthy in the rural setting. There are several accounts in the medical reports, of human and animal waste frequently being disposed of near the wells where water was fetched for the household. In rural areas where infants were not breastfed, the risk of falling ill from contaminated food was, therefore, great. Since the knowledge as to how diseases spread was not available, it was often more by chance than by deliberate measures that infants were protected from diarrhoeal diseases caused by bad food.

It was shown above that the practice of feeding newborns artificially in Iceland resulted in high neonatal mortality. If breastfeeding was practiced to some extent in the first few weeks after birth in the fishing areas, this is likely to be reflected in lower neonatal mortality rates than in the rural setting. Newborns would, to at least some extent, be protected against \textit{E. coli} and other bacteria that cause diarrhoea in infants. On the other hand, it can be assumed that the post-neonatal period would be more risky for infants in the fishing districts, where environmental conditions were usually worse than in the agrarian setting.

Another risk to infants in the fishing districts lay in the fact that households in those areas often lacked ready access to fresh milk. Let us here again compare the two neighbouring counties in the western part of the country, the fishing area of Snæfellsnes- og Hnappadalssýsla and the rural area of Dalasýsla. Both areas displayed extremely high infant mortality rates.
Figures 2.18 and 2.19 show the development of neonatal and post-neonatal mortality in Dalasýsla and Snæfellsnes- og Hnappadalssýsla. Two different patterns of mortality are revealed, with neonatal mortality extremely high in the rural setting, and post-neonatal mortality is higher in the fishing area. Comparatively high post-neonatal mortality in the densely populated fishing areas suggests that infants in those regions were more likely to die from infectious diseases than their counterparts in the high-mortality rural areas. Conversely, infants in rural areas with high infant mortality rates were more likely to suffer from complications associated with artificial feeding among newborns. However, it must be noted that even though neonatal mortality was lower in the fishing district than in the rural setting, both areas had comparatively high neonatal mortality rates. In England for example, neonatal mortality was only slightly above 50 per 1,000. Thus, even though the situation during the neonatal periods seems to have been somewhat better in the fishing areas than in the rural districts, the figures do not indicate that there was a strong tradition of breastfeeding newborns in those areas.

That neonatal mortality tended to be higher in the sparsely populated agrarian setting than in areas with a high density of population, seems to have been a common feature throughout Iceland (see Appendix 2). Agrarian areas with

Figures 2.18. The development of neonatal and post-neonatal mortality in the county of Dalasýsla, 1853–1901
extremely high infant mortality rates tend to reveal neonatal mortality rates that were much higher than was the case with post-neonatal mortality. On the other hand, densely populated fishing districts are more likely to display post-neonatal mortality rates that are higher than neonatal mortality. This pattern came to an end towards the end of the 19th century when neonatal mortality tended to be similar in most counties.124

The results above indicate that Iceland displayed important similarities to other areas on the European continent where artificial feeding was practiced. As a rule these areas seem to display a paradoxical pattern of little difference in infant mortality between urban and rural areas. In the case of the parish of Nedertorneå in northern Sweden, the infant mortality rate in the town of Haparanda, was during the pre-transitional period, three times lower than in the surrounding agrarian areas.125 In areas of Austria south of the Alps urban mortality also tended to be lower than rural mortality.126

Around 1870 infant mortality was approximately the same in urban and rural areas in the German districts.127 Between 1870 and 1900 infant mortality declined markedly in the urban setting whereas mortality rates remained high in rural areas.128 In an article published in 1900 the physician Fr. Prinzing showed

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Figures 2.19. The development of neonatal and post-neonatal mortality in the county of Snæfellsnes- og Hnappadalssýsla, 1853–1901
Sources: See Figure 2.18.
that urban areas displayed generally better infant survival rates than the rural areas. This was particularly true for the districts with previously high infant mortality rates and a strong tradition of artificial feeding of newborns.

In the Icelandic case similar patterns seem to have prevailed. The tradition of feeding newborns artificially was strongest in the rural areas. The notable improvements experienced in the areas around Reykjavik towards the end of the 19th century also indicate that there might have been similar forces at work in Iceland as in other areas in Europe where it was common to give artificial food to newborns. But what factors were at work behind these patterns? What factors created the rural penalty? What was it in the rural environment that made women choose not to breastfeed their babies? Or, to put it another way, what made it possible or more desirable in the urban setting? How important was breastfeeding for survival in different environments? And who were the actors behind the introduction of breastfeeding? All these issues will be discussed in next part of the study. There, mortality trends in three distinct regions are studied. By comparing infant mortality in three areas with different socio-economic structures and differences in cultural background, an attempt will be made to shed light on these questions.

**SUMMARY OF PART 2**

This part of the study has addressed the main trends and characteristics of infant mortality in Iceland. It is shown that Iceland had many characteristics in common with other areas in 19th century Europe where it was usual for newborns to be fed artificially. Despite the low level of urbanization, infant mortality rates were high. This was especially true for neonatal mortality. As in other areas with prevailing traditions of artificial feeding, marital fertility rates were high. Shortly after the mid-19th century changes occurred. The fall was initiated by a decline in neonatal mortality, one that was accompanied by a decline in marital fertility. Post-neonatal mortality started its decent later.

Another important characteristic of infant mortality in pre-transitional Iceland was the vast fluctuations. Severe subsistence crises occurred during the 18th century, that caused infant mortality to rise to levels that for individual years passed 800 per 1,000. Mortality peaks during the 19th century were lower and mainly due to the effects of epidemics. During the late 18th and the first years of the 19th centuries, Iceland had been relatively isolated from the rest of Europe and therefore several diseases that had developed into relatively harmless childhood diseases in other countries had devastating effects. On a few occasions infant mortality at the aggregate national level rose above 500 per 1,000 births. The period between 1820-1850 was particularly lethal. Shortly after the mid 19th century, epidemics ceased to have such a devastating effect upon infant mortality rates, the only exception after 1850, being a measles epidemic in 1882.
A third characteristic discussed in this chapter was the vast regional differences in infant mortality. This is a characteristic Iceland shared with other European societies during the pre-transitional era. What is rather unusual in this respect is that infant mortality rates tended to be higher in the rural setting than in many densely populated fishing areas. Accounts from contemporaries indicate that this was probably due to differences in feeding practices. Thus, breastfeeding seems generally to have been more common in towns and villages than in the rural setting. As in other European societies the decline in mortality was accompanied by a reduction in variations between areas.

The model proposed in the introductory chapter to this study accounted for several interrelated factors that were prone to influence infant survival in Iceland. It was presumed that individuals were situated in given contexts. The contextual framework of the model consisted of the following factors: (1) Environment/epidemiologic regime, (2) Economic and social structure and (3) Value systems, knowledge and resources. This second part of the study has mainly dealt with the two first factors. However, the chief focus of this study is on the subject of value systems and on human agency and the remaining chapters will deal with those issues in various ways.

The preceding part of the study leaves us with several open questions. Were there differences in feeding patterns in the pre-transitional regime? Were there areas where full-term breastfeeding was practiced? Were there others where infants were partly breastfed, but given additional food at an early age? Were there differences in infant mortality between social groups? Which social classes were likely to introduce breastfeeding? And above all, who were the actors when it came to influencing mothers about the beneficial effects of breastfeeding? These issues will be discussed in the following part of the study which contains an in depth study of infant mortality and its decline in different settings.
The interaction of culture and environment during the 19th and early 20th centuries.

Infant mortality in different settings

This part of the study deals with the impact of socio-economic and cultural factors upon infant mortality in different counties during the 19th and early 20th centuries. These counties display important differences; they are situated in three distinct parts of the country and they differ markedly in their settlement pattern and socio-economic outlook. The idea behind the choice of different areas lies in the opportunity it offers to highlight the relative importance of the diverse factors that might have produced differences in mortality levels and mortality decline. To what extent did these depend upon the prevailing environmental conditions? How important were social and economic factors in the levels of mortality and its decline? Were there fundamental differences in infant feeding traditions in the areas? What actors were behind the decline; what impact did health workers have, what individual parents? How did these actors interact? Were mothers in regions with high literacy rates more likely to listen to advice about breastfeeding than was the case in regions with low levels of literacy?

The first chapter of this third part of the study I call early medical intervention. It offers a description of such an intervention to diminish infant mortality from neonatal tetanus in the early 19th century in Vestmannaeyjar, an island situated off the southern Icelandic coast in the county of Rangárþingi Suðurlands. Infant mortality rates in this small island were extremely high even by Icelandic standards. During the 18th and early 19th centuries more than 70 per cent of all infants in
the island died from neonatal tetanus during the first week. Danish medical authorities sent several physicians to find ways to prevent babies succumbing to the disease and during the 1840s it was effectively defeated in the island.²

The second chapter analyses differences in infant mortality in the three counties during the 19th century. What were the main reasons for differences in mortality? This part is largely dedicated to the problem of infant feeding. Causes of death and the disease panorama in the three counties are discussed.

The third chapter discusses the role of midwives and other health workers in bringing about the decline in infant mortality. This chapter also includes speculations about the impact of literacy upon infant survival. The fourth chapter includes a discussion of the impact of parental social status upon survival and in the fifth chapter I focus on the 20th century. Iceland was then characterized by a rapid growth of towns and villages and, therefore, I add to the study an analysis of mortality trends in five of Iceland's towns and the agrarian hinterlands.

### 3.1. An Isolated Case of Early Medical Intervention. The Battle Against Neonatal Tetanus in the Island of Vestmannaeyjar, 1800–1860

In 1838, the State physician responsible for Iceland (*Landphysicus*) Jón Thorsten- sen sent a letter to the *Collegium Medicum* in Copenhagen in which he criticized the attempts of the medical authorities in Denmark to find remedies against neonatal tetanus in the island of Vestmannaeyjar.³ By then the Medical Board (*Collegium Medicum*) had sent no less than six medical doctors to make inquiries about the disease in this small island of slightly more than 200 inhabitants.⁴ At that time there were only five physicians covering the rest of the country with its 60,000 inhabitants. The criticism of the *Landphysicus* was based on the pragmatic view that the resources spent on this small island would have been of more use in other parts of the country. In his view the evidence of history showed that the disease was incurable and deeply rooted in the island's natural conditions and its inhabitants' way of life.

When one takes into consideration the specific reason for the temporary establishment of the physician's position, that is the inquiry about the so-called *ginklof*² (neonatal tetanus), it cannot be seen as necessary to uphold this position any longer. Experience has shown that there is no cure for this disease as it lies deeply rooted in the island's natural conditions and its inhabitant's way of life.⁶

The observations made by the *Landphysicus* in 1838 can be seen as typical of the general ideas about the causes of neonatal tetanus in Vestmannaeyjar. In line with the prevailing miasmatic ideas of disease causation, the physicians who
visited the island in the early 19th century all looked for the cause of high infant
mortality in the natural environment of the island, as well as in the diet and
general living conditions of its inhabitants. Artificial feeding of newborns was
generally seen to be one of the main factors behind high mortality rates from
neonatal tetanus in Vestmannaeyjar during the 19th century.

The citation above elucidates how extraordinary the actions taken in
Vestmannaeyjar were at the beginning of the 19th century. The disease and the
situation in the island in general aroused great interest in the Collegium Medicum
in Copenhagen during the first half of the 19th century. For the situation in
Vestmannaeyjar was extreme even by Icelandic standards. The explanation for
the acute interest in the island is without doubt to be found in the fact that levels
of infant mortality exceeded all acceptable norms during the early 19th century.

The extent of neonatal tetanus in Vestmannaeyjar

Neonatal tetanus is a well-known disease in Third World countries today. It is
caused by a bacterium Clostridium tetani that grows in animal faeces, dead tissue
and decaying substances. It is in soil and animal excrement, and often on the
surfaces of skin and tools. Transmission takes place when there is direct contact
between bacteria and the umbilical stump and is therefore often related to
unhygienic cord cutting or the application of filthy substances to the umbilical
stump. Today the transmission of the disease is often related to home delivery
and untrained assistance during delivery. Signs of neonatal tetanus appear two
to ten days after birth and normally death occurs within two weeks from birth. The
first symptoms are difficulties with swallowing, followed by a general stiffness
and convulsions that occur with increasing intensity. The case fatality rate in
historic populations was close to 100 per cent.

In some contemporary Third World countries a simple model has been used
to estimate the occurrence of neonatal tetanus in given populations. As neonatal
tetanus most frequently occurs between the 4th and the 14th day of life, the
model assumes that it occurs in populations that show a 4–14-day mortality rate
that is higher than the mortality rate during the last 14 days of the neonatal
period. In a recent article, the anthropologist Daniel Vasey has applied this
model in order to estimate the occurrence of neonatal tetanus in rural areas in
Iceland. According to Vasey’s estimates, approximately one fourth of all infant
deaths in Iceland can be explained by neonatal tetanus.

The tetani bacterium was not discovered until 1884. It is therefore an interes-
ting fact that this disease was fought relatively successfully in Vestmannaeyjar as
early as the 1840s, during a period when miasmatic ideas about disease causation
dominated the medical debate. In other areas in the North Atlantic that were
known for tremendously high mortality rates from neonatal tetanus,
improvements were not made until the beginning of the 20th century. This was
the case with the island of Grimsey in northern Iceland and the Scottish island
of St. Kilda. Deaths from tetanus in St. Kilda peaked during the 1860s when
neonatal mortality reached 690 per 1,000 live births. Improvements in Grímsey and St. Kilda occurred approximately at the same time in the early years of the 20th century.

The problem of neonatal tetanus has received relatively little attention amongst medical historians. Since the transmission of the disease is generally linked to unsanitary conditions, and in particular the contact with animal faeces, there is little doubt about its existence in rural societies in past times. Delivery frequently occurred under primitive conditions and the fact that domestic animals were often kept in human dwellings increased the risk of transmission. It is therefore rather paradoxical that neonatal tetanus was most common on islands where agricultural activities were of relatively little importance.

Here explanations for the high mortality rates from neonatal tetanus in Vestmannaeyjar are sought. The analysis is, however, mainly directed at the role of physicians and midwives in this process of early medical intervention to save the lives of young children. How was it possible to find remedies against a bacteriological disease long before the germ theory was developed and accepted?

Figure 3.1. Infant mortality in Vestmannaeyjar 1816–1863 compared to the national average
Figure 3.1 compares the development of infant mortality in Vestmannaeyjar during the period 1816–1860 with the national average. Initially, infant mortality rates in Vestmannaeyjar exceeded 800 per 1,000 live births. There was a slow, but gradual decline in infant mortality in the island until the late 1840s with the mid-century levels of infant mortality around 650 per 1,000 live births. During the first half of the 19th century infant mortality rates in Vestmannaeyjar were between two and four times higher than the national average. During the late 1840s the pace of infant mortality decline in Vestmannaeyjar accelerated and by 1860 infant mortality was slightly below 300 per 1,000. This was somewhat higher than the national average, but in line with mortality rates in the neighbouring high mortality county of Rangárvallasýsla on the mainland.

The majority of infant deaths in Vestmannaeyjar occurred during the neonatal period. When breaking up the distribution of neonatal deaths according to the Boerma and Stroh model it is shown that most neonatal deaths occurred during the 4th–14th day interval, when mortality in neonatal tetanus is most common (Table 3.1). During the period 1816–1846 the 4–14 day mortality rate reached levels above 600 per 1,000 live births. Improvements in the subsequent period occurred primarily during the 4th–14th day interval and by 1846–1863 neonatal mortality had dropped to a level of 216 per 1,000. At that point in time infant mortality on the island was 360, a rate that was comparable to the county of Rangárvallasýsla where Vestmannaeyjar is situated.

The decline in neonatal mortality in Vestmannaeyjar was accompanied by an increase in post-neonatal mortality. Here it must be mentioned that the results for post-neonatal mortality tend to be somewhat skewed. As both neonatal and post-neonatal mortality are found by using the same denominator (live births) post-neonatal mortality outcomes tend to be low if many infants die during the neonatal period. Then relatively few infants belong to the actual at risk population (i.e. survivors after the first month), whereas a much larger population is used to calculate post-neonatal mortality (i.e. all live births). Because of the extremely high neonatal mortality rates in Vestmannaeyjar I have chosen to show separately the actual post-neonatal mortality rate (here called post-neonatal mortality “refined”).

Table 3.1. The distribution of infant deaths in Vestmannaeyjar 1816–1846 and 1847–1863 (per 1,000 live births)

<table>
<thead>
<tr>
<th>Period</th>
<th>Number of births mortality in brackets</th>
<th>0-3 days</th>
<th>4-14 days</th>
<th>15-28 days</th>
<th>Post-neonatal mortality</th>
<th>Post-neonatal “refined”</th>
<th>IMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1816-46</td>
<td>(N=599)</td>
<td>37.6</td>
<td>624.3</td>
<td>35.8</td>
<td>23.3</td>
<td>76.9</td>
<td>720.9</td>
</tr>
<tr>
<td>1847-63</td>
<td>(N=383)</td>
<td>10.4</td>
<td>216.7</td>
<td>41.8</td>
<td>91.4</td>
<td>125.0</td>
<td>360.3</td>
</tr>
</tbody>
</table>

It is shown that both methods reveal a higher post-neonatal mortality rate during the later period. The second method though offers a much more realistic picture of mortality levels and it is shown that post-neonatal mortality lies approximately at the national level. The increase in post-neonatal mortality between the two periods is not easy to explain. A plausible explanation could be that those children who were spared from the disease belonged to the higher social strata where hygienic standards were quite good. It is also possible that the development of the fisheries and the accelerating population growth in Vestmannaeyjar during the second part of the 19th century created a situation of over-crowding that would bring about a deterioration in the health of young children.

**Medical intervention**

The first attempt of the Icelandic medical authorities to shed light on the disease of *ginklofi* (lockjaw) in Vestmannaeyjar was made by the *Landphysicus* Jón Sveinsson (1753–1803), when in 1789 he sent a questionnaire to the parish minister in Vestmannaeyjar requesting information about the disease. Ten years later, the district physician Sveinn Pálsson went to the island to conduct an inquiry into the disease. He sent a detailed report to the authorities in Copenhagen. Sveinn pointed out that most newborns died before the 10th day of life and observed that children of Danish parents were, to a large degree, spared from this dreadful disease. According to Sveinn, food was the main culprit, consisting, as it did, mainly of oceanic birds, primarily young fulmars, puffins, and gannet. He furthermore notes that the cause of this dreadful disease was, perhaps, just as much:

a) the oily down on which the mothers rest, b) the water which the lethargic islanders refuse to fetch from other places but the few foul puddles and lava fissures close to the farmsteads, which in the summer were full of *podaris* and all kinds of larvae, and which throughout the whole year were full of dirt and refuse from the houses; c) the low and confined living quarters, which were full of the foul stench from the oilskins; d) bad fuel, mostly from dried puffins corpses and other oily waste.16

Like many of his successors, Sveinn Pálsson noted that Danish middle-class families were to a large extent protected from the disease. Moreover, he noted that the disease was fairly common in neighbouring parishes on the mainland. In his view the disease could largely be avoided if newborns were breastfed. Moreover, he recommended the use of fresh water and improvements in the management of food. During subsequent decades, remedies suggested by physicians serving in the island were almost identical to those proposed by Sveinn Pálsson. The disease was mainly explained by cultural and environmental factors, such as bad air and the poor diet of the inhabitants. Danish physicians in
particular were shocked by the prevailing practices of artificial feeding on the island and all of them suggested that breastfeeding be introduced as a means of saving infants from tetanus.

Even though miasmatic ideas about the origin of disease continued to dominate the international debate on disease causation, two physicians arriving in Vestmannaeyjar during the late 1830s and early 1840s, developed a more concrete notion about the origins of neonatal tetanus. This was particularly true of A.S.I. Haalland (1814—1845) who served in the island in the years 1840—1845. He carried out a number of autopsies on tetanus victims. Haalland pointed out that in all cases the umbilical area was infected and he argued that the careless manner in which the umbilical stump was treated after birth was the main cause of the high infant mortality from tetanus in Vestmannaeyjar. He also noted that out of 14 infants born to families “living according to Danish traditions in houses of timber” only one died from tetanus.17

Haalland suggested that a young woman be sent from the island to study the art of midwifery in Copenhagen. Furthermore he proposed that a small maternity hospital be established in Vestmannaeyjar to which all women on the island would go to give birth. There, mothers would receive a more healthy diet than they were used to and would be educated about the beneficial effects of breastfeeding.

Following Haalland’s proposal, a young woman Sólveig Pálsdóttir was sent to Copenhagen in 1842 to study at the maternity hospital there. She arrived back on the island a year later. In the years that followed, however, most inhabitants in Vestmannaeyjar continued to rely on the services of the old midwife Guðrún Jónsdóttir who was Sólveig’s mother. During the period 1843—1846 Sólveig only delivered 14 infants, whilst her mother delivered 54. There were no changes of importance in neonatal mortality in the years immediately after Sólveig’s return from Copenhagen, with children she delivered almost as likely to die as the ones delivered by other women. Of the 14 children Sólveig delivered in the period 1842—1846 10 died (64%) and of the 54 infants her mother delivered 40 died (74%). The radical changes in infant survival took place towards the end of the 1840s both in the case of infants delivered by Sólveig and her mother. During the period 1847—1850 Sólveig delivered 35 children of whom 13 died (37%) and her mother 19 of whom 6 died (32%) The drastic change in infant mortality after 1846 was thus not related to the impact of individual midwives.18

The real breakthrough in survival chances on the island of Vestmannaeyjar occurred in 1847. Then the Collegium Medicum in Copenhagen decided to send to Iceland a young physician, Peter A. Schleisner (1818—1900), to make inquiries about the general etiology of the country. Schleisner’s second task was to establish a maternity hospital in Vestmannaeyjar. Schleisner arrived in Iceland in the spring of 1847 and spent the summer travelling in the western part of the country. He arrived in Vestmannaeyjar in June 1848. Upon his arrival, there was no doubt in his mind that neonatal tetanus was chiefly to be explained by the inadequate care of the umbilical stump. Autopsies went only to confirm his belief. During his
stay, 23 women gave birth in Vestmannaeyjar. All were delivered in the maternity hospital and all were cared for by Schleisner and his housekeeper Guðfinna J. Austmann. During delivery he was most often assisted by the young midwife Sólveig Pálsson and on a few occasions by her mother.

All infants were kept in the hospital for three weeks and during this period the umbilical stump was carefully washed every day, treated with oil (balsamum copaiba) and covered with linen. When the child was sent home its mother received oil, a sponge to wash the child with, appropriate clothing and a feeding bottle. Schleisner had planned to keep the mothers in the clinic with the newborns being given a special diet. The plan was to diminish the share of seabirds and increase the amount of vegetables in the diet and an attempt was also to be made to encourage breastfeeding during this period. It turned out that only 8 of 23 mothers agreed to stay in the hospital. However, all the infants were kept there. Schleisner maintained that the women’s reluctance to stay in the maternity hospital resulted partly from the high costs and partly from their unfamiliarity with the food. According to Schleisner, mothers as a rule refused to breastfeed their babies.

The hospital stopped operating shortly after Schleisner’s departure. However, the midwife Sólveig Pálsson continued to take childbearing women into her own home. Most of these infants were kept in the midwife’s home for a period of from two to three weeks after delivery, whereas the mothers went home after recovering from childbirth.

![Figure 3.2. Yearly fluctuations in neonatal mortality in Vestmannaeyjar, 1831–1863](image)

Sources: See Table 3.1.
Schleisner’s achievement in Vestmannaeyjar was remarkable with neonatal mortality from tetanus declining immediately after his arrival. This can be illustrated by the example of changes in neonatal mortality in the year the maternity hospital was established. Before Schleisner’s arrival, between January and August 1847, ten children were born on Vestmannaeyjar. Only two of these children survived the neonatal period, all the other eight were said to have died from *ginklofi* 6 to 11 days after birth. After the maternity hospital was opened in September the situation was reversed. Between September and December twelve infants were born on Vestmannaeyjar of whom only one died from neonatal tetanus. The shift in neonatal mortality in Vestmannaeyjar after Schleisner’s arrival is clearly revealed in Figure 3.2 that shows yearly fluctuations in neonatal mortality for the period 1831–1863. Before Schleisner’s intervention neonatal mortality fluctuated between 500 and just above 800 per 1,000. After 1847, neonatal mortality rates infrequently exceeded 400, and commonly oscillated between 200 and 350 per 1,000 live births.

The decline in neonatal mortality in Vestmannaeyjar occurred mainly during the interval from the 5th to the 10th day after birth. This is evident from Figure 3.3 (survival function) where the development of neonatal mortality is shown for three periods, (1) the period 1816–1830 when neonatal mortality rates remained at extremely high levels, (2) 1831–1845 when neonatal mortality started to decline and (3) 1846–1863 after changes in methods of delivery to counteract neonatal tetanus were introduced and implemented on the island. International
studies have shown that mortality from neonatal tetanus is at its highest during the interval from the 6th to the 11th day after birth and this is the age group where most notable improvements occurred. A slight improvement took place between the two first periods, but it is the period 1847–1863 that is characterized by the most notable improvement. During this period 80 per cent of all infants survived the first 10 days, compared to slightly more than 50 per cent during 1831–1845 and 40 per cent during the period 1816–1830. Infant mortality in the island is by no means low during this period, but the changes were nevertheless dramatic.

**Causes of death in Vestmannaeyjar**

In the case of Vestmannaeyjar, there is no doubt about neonatal tetanus being a major baby killer during the early 19th century. The disease was obviously well known among contemporaries and the symptoms were unmistakable for laymen and physicians who served in the island. Nevertheless, care is needed when analysing information on cause of death given in the parish registers of Vestmannaeyjar. Physicians serving on the island frequently complained about parents not calling for a doctor when their children fell ill and the parish minister had on most occasions not seen the infant before it was buried.

Table 3.2 shows cause specific neonatal mortality in Vestmannaeyjar in the years 1816–1863. Until 1847 when Schleisner arrived in Vestmannaeyjar there was a continuous increase in the share of neonatal tetanus compared to other causes of death. The cause trismus, ginklofi (lockjaw) or vestmannaeyjabarnaveiki (Vestmannaeyjar-childhood-disease), all terms used for neonatal tetanus, are most frequently given during the period 1841–1847, when 94.9 per cent of all neonatal deaths were attributed to the disease. Infant mortality from the disease alone thus reached the level of 587 per 1,000 live births compared to 375 per 1,000 in 1816–1830 and 461 in 1831–1840. There is a strong reason to believe that there was some under-registration of ginklofi during the earliest period when 47 per cent of all neonatal deaths received a relatively unspecific cause of death, namely barnaveikindi (childhood disease) or even vanaleg barnaveikindi (common childhood disease). On the other hand it can be assumed that there was a certain over-registration of ginklofi during the period 1840–1847. Then the debate about the disease was at its height and since it was extremely common on the island, it is not unlikely that a parish minister who hadn’t seen the infants, simply assumed that newborns that died a few days after birth died from tetanus. Medical reports indicate that breastfeeding was uncommon in Vestmannaeyjar and it must therefore be assumed that many infants in the island died from diarrhoea at early ages.

A comparison of Schleisner’s report to the Collegium Medicum in Copenhagen with the church registers, strongly indicates that there was an over-registration of neonatal tetanus in the parish records during Schleisner’s stay on the island.
Table 3.2. Cause-specific neonatal mortality in Vestmannaeyjar (per 1,000), 1816–1863

<table>
<thead>
<tr>
<th></th>
<th>Trismus, Ginklofí or Vestmannaeyjádisease</th>
<th>Barnaveikindi, Barnaveikleiki</th>
<th>Other causes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Of all neonatal deaths (%)</td>
<td>Neonatal mortality rate (per 1,000 live births)</td>
<td>Of all neonatal deaths (%)</td>
</tr>
<tr>
<td>1816-30</td>
<td>51.7%</td>
<td>375 (per 1,000 live births)</td>
<td>46.6%</td>
</tr>
<tr>
<td>1831-40</td>
<td>66.4%</td>
<td>461 (per 1,000 live births)</td>
<td>30.6%</td>
</tr>
<tr>
<td>1841–Aug 1847</td>
<td>94.9%</td>
<td>587 (per 1,000 live births)</td>
<td>1.3%</td>
</tr>
<tr>
<td>Sept 1847-1863</td>
<td>36.0%</td>
<td>83 (per 1,000 live births)</td>
<td>58.4%</td>
</tr>
</tbody>
</table>

Sources: See Table 3.1
During his stay in Vestmannaeyjar, 23 women gave birth at the maternity hospital. Five of the 23 children died during the neonatal period. According to Schleisner's report three of these children were reported to have died from *ginkloft*, one child was born weak and one died from acute diarrhoea.\(^{24}\) On the other hand, in the death register maintained by the parish minister, all five neonates were said to have died from *ginkloft*.

Information on neonatal tetanus is likely to be fairly accurate after 1847. Most infants were delivered in the midwife’s home and it can be assumed that the parish minister generally consulted the midwife about the cause of infant deaths. According to the church records, neonatal tetanus remained a fairly common disease in Vetmanneayjar after 1847. During the period 1847–1863, the mortality rates from neonatal tetanus was 83 per 1,000, whereas 134 per 1,000 died from the less specific disease of *barnaveikindi* / *barnaveikleiki* (childhood disease/ childhood weakness) and 13 per 1,000 from other diseases.

In a recent article, the anthropologist Daniel E. Vasey presents an estimate of neonatal tetanus mortality in Iceland for the period 1790–1839.\(^{25}\) He bases his analysis on 21 parishes in Iceland and he uses the statistical model developed by J.T. Boerma and G. Stroh (see description above).\(^{26}\) For reasons that are by no means obvious, Vestmannaeyjar was not included in his study. Vasey concludes that around 25 per cent of all infant deaths in pre-industrial Iceland were caused by neonatal tetanus. Vasey criticizes studies carried out in other areas in northern Europe with high neonatal mortality rates and argues that neonatal tetanus was bound to be a common cause of death in rural areas with high mortality during the first 14 days of life. Vasey's criticism of Nordic research is directed in particular towards Anders Brändström’s study of infant mortality in the parish of Nedertorneå in northern Sweden.\(^{27}\) Nedertorneå was, like many districts in northern Sweden and Finland, characterized by the artificial feeding of newborns. Brändström showed that infant mortality in Nedertorneå peaked during the second and third week of life and that the most common cause of death was diarrhoea. Brändström’s analysis is based on fairly reliable cause of death data both from parish records and in medical reports. On the other hand, the most serious flaw in Vasey’s study is the fact that he uses only a little qualitative evidence to support his argument. Thus, he does not use information on cause of death in parish records and he does not analyse medical reports available in his research areas.

Vasey’s article is though an important contribution because of the way he discusses the occurrence of a disease that has received too little attention from historians. However, it must be doubted whether Vasey’s high estimates of mortality from the disease hold for Iceland as a whole or for other areas with artificial feeding practices. Previously, the Boerma-Stroh model has only been used to estimate neonatal tetanus mortality in modern Third World countries where breastfeeding of newborns is the norm. It was shown in part 2 that in areas where newborns were solely artificially fed, neonatal mortality tended to be high and in such areas it has been shown that mortality tended to peak during
the second week of life. Thus, there is an overlap between the period of most intense tetanus mortality (peaking during the 6th to 11th day) and mortality from diarrhoea and dehydration caused by the unsuitable feeding practices of newborns (peaking primarily during the second week). This makes the estimation of the relative effects of neonatal tetanus in pre-industrial Iceland, and in other areas with prevailing traditions of artificial feeding of newborns, difficult.

**Explanations**

Why were infants in Vesmannaeyjar and the other small islands in the North Atlantic affected to a larger extent by the disease of neonatal tetanus than was the case with populations living in the immediate neighbourhood under comparable social and economic conditions? Both in the case of the islands of Vestmannaeyjar and Grimsey in Iceland and of St. Kilda in Scotland, neonatal mortality was several times higher than was the case with infants on the mainland of Iceland and Scotland. We can only speculate as to the causes of high mortality from tetanus on the islands, compared to the neighbouring areas.

The geographical background of the inhabitants of Vestmannaeyjar was not to any important degree different from that of populations in neighbouring parishes on the mainland. Because of the extremely high infant mortality there was no natural increase in the island and consequently only 12 per cent of the adult population was born there according to the national census of 1845. Three quarters of all the inhabitants had inmigrated from various parishes in southern and southwestern Iceland. Because of the varied backgrounds of the inhabitants, it is highly unlikely that the treatment of newborns varied from what was common practice in other districts of Iceland. Here it is of importance to note that midwives serving on the island came from different parts of Iceland and were in general not related to each other. It is thus unlikely that they passed some specifically traditional treatment of the umbilical cord to each other. Moreover, physicians sent to the island were generally extremely precise in their description of the treatment of infants and their reports contain no description of any practice involving the application of any substances to the umbilical stump. On the other hand, physicians on several occasions reported that the umbilical stump was not covered and never washed. This was likely to be the case in other areas in Iceland as well. The question then remains why infants in Vestmannaeyjar were to a larger extent exposed to the tetani bacterium than was the case with infants in other areas of Iceland.

There are several reasons as to why the tetani bacterium could have survived better in the Vestmannaeyjar environment than in other areas. As in the two other Atlantic islands with high mortality from neonatal tetanus (Grimsey and St. Kilda), Vestmannaeyjar was known for an acute shortage of clean water. The inhabitants, therefore, frequently collected water from shallow ponds. The tetanus bacterium is frequently found in the sediment at the bottom of such ponds and it is thus likely that contagion can be explained by the use of infected water.
Another important factor that could have contributed to the frequent occurrence of neonatal tetanus is the fact that, because of the lack of firewood, dried corpses of puffins and other seabirds were used as combustible material. As the tetani bacterium grows ideally in decaying matter this is likely to have been the most common source of contagion. Traditionally, women were responsible for the firewood and in an era when elementary hygienic measures such as handwashing were not common, the frequent handling of decaying substances was likely to bring about contagion. As soon as elementary hygienic measures were introduced, death rates from tetanus were bound to decrease. Thus, tetanus mortality fell permanently as soon as women started to give birth in the midwife’s home where she would care for the infant while the umbilical wound healed. Here it must be mentioned that the physician C.E. Levy who was the head of the maternity hospital in Copenhagen (where midwives were educated) wrote a book that was used in the education of midwives both in Denmark and in Iceland. In the first edition of the book he recommended that midwives pay special attention to the care of the umbilical stump. Levy sat on the Medical Board (Collegium Medicum) in Copenhagen and thus took an active part in decisions concerning public health measures in Vestmannaeyjar. He was one of the individuals who took decisions about which physicians were sent to Iceland and he decided that a local woman from Vestmannaeyjar should come and study midwifery.

It must be assumed that Levy paid close attention to his apprentice Sólveig Pálsdóttir and made sure that she received the best possible instruction as to the importance of sanitary measures in relation to childbirth. Upon her return to Iceland, however, Sólveig was apparently not able to introduce her new-found knowledge immediately. All births occurred in the home and even if the midwife followed all instructions about hygiene when she delivered the children and cut the umbilical cord, she was in all likelihood not in a position to convince mothers of the need to avoid bringing the stump into contact with filthy material. This changed dramatically as soon as newborns were kept in the midwife’s home.

One must conclude that the Vestmannaeyjar case is a good example of how the sanitary movement produced important improvements in infant survival. In part the improvements were accidental and certainly not based on scientific knowledge as to the mechanisms of contagion by bacteriological diseases. It is worth noting that mothers in Vestmannaeyjar continued the practice of artificial feeding and infant mortality rates remained relatively high compared to the national average and certainly compared to mortality levels in Denmark. Mortality had, however, now dropped to levels close to those of neighbouring parishes on the Icelandic mainland.

The fact that breastfeeding was not initiated in Vestmannaeyjar is interesting in the light of the fact that a well educated midwife and a physician served on this small island, where communications were easier than in most other parts of Iceland. Sólveig Pálsdóttir had been trained as a midwife in Denmark where infants were as a rule put to the breast. Sólveig has been described as a strong
and determined woman who was respected in the local community. It is hard to believe that she would not have been able to encourage local women to breastfeed if she was convinced about its beneficial effects. Sólveig had only spent a few months in Copenhagen and for her there was no obvious or quantitative evidence of the positive effects of breastfeeding. Her mission was to combat a lethal disease that caused extremely high neonatal mortality rates. Once this disease was more or less eradicated there was no apparent reason for further changes in the living arrangements in Vestmannaeyjar. Infants and young children were perceived as vulnerable beings that were prone to die. It is highly unlikely that Sólveig or other inhabitants in Vestmannaeyjar believed that further improvements could be achieved in the field of infant health. Fatalistic ideas prevailed, not only in Iceland but in other countries as well. Anne Løkke has argued for Denmark that during the early 19th century, relatively high infant mortality levels were seen as inevitable. Infants simply died of childhood, or young age just as the elderly died of old age. There were, however, limits to the acceptable norms.

High mortality areas in Denmark and in other parts of the Danish kingdom always received special attention from the medical authorities. As a result the situation in Iceland was frequently debated in the *Collegium Medicum*. There, Vestmannaeyjar presented the extreme case. Neonatal mortality rates of between 70 and 90 per cent were seen as scandalous, both in Iceland and in Denmark. The radical actions taken to improve the survival chances of infants on Vestmannaeyjar in the early 19th century must then be seen in this light. The measures taken on the island represent an isolated example of early medical intervention and were not extended to other high mortality areas in Iceland. On the other hand, medical reports on health conditions on Vestmannaeyjar did in the long run, awaken interest in infant health in Iceland, although further concrete actions against high infant mortality levels there were not taken until after the mid-19th century. The inquiries made in Vestmannaeyjar increased the existing knowledge about infant health in Iceland and about infant feeding in particular. The lack of breastfeeding was thus on several occasions remarked upon by physicians in Iceland and in Denmark during the 19th century. The issue of breastfeeding will play a central role in the analysis in the next two chapters.
3.2. **DIFFERENT TRADITIONS OF INFANT FEEDING AND THEIR CONSEQUENCES FOR INFANT SURVIVAL DURING THE 19TH CENTURY**

*Description of the research areas*

This part of the study discusses the implications of various cultural and social factors upon infant survival chances in three areas. The research areas are three counties situated in three different parts of the country and characterized by considerable differences in socio-economic development. Two of them are predominantly rural and in one the inhabitants derived their livelihood mainly from the fisheries. The research areas are shown in Map 3.1.
The county chosen to represent a fishing district is Gullbringu- og Kjósarsysla, the most densely populated county in Iceland. Most inhabitants were landless cottars who derived their livelihood primarily from the fisheries. Farming was of relatively little importance. During the fishing season these coastal districts attracted people from different parts of the country. It has been shown that population turnover in this part of the country was extremely high. The capital Reykjavík is situated in Gullbringu- og Kjósarsysla and as in the rest of the county, the main source of its income came from the fisheries. However, a considerable proportion of the population in Reykjavík were crown officials (embattismenn) both of Icelandic and Danish origin. Merchants and craftsmen too were comparatively numerous in the capital. Because of its distinctive character, Reykjavík is treated separately in the analysis below.

The second district is Rangárvallasysla in southern Iceland. The main source of livelihood in this county was cattle- and sheepfarming. Farmers in this area frequently increased their income by bowling, whilst fishing was of considerable importance, especially during late winter and early spring. Then male servants, and frequently also farmers, left their farms and worked in the fisheries in the southern and the southwestern coastal areas. While men were away fishing, women and children often had sole responsibility for the farm. The only village of importance in Rangárvallasysla was that of Vestmannaeyjar. Because of the lack of grassland and pasture, the conditions for traditional farming were extremely poor on the island. Fishing therefore, constituted the basic source of livelihood.

The third district is Pingeyjarsyslur in the northeast. This part of the country was extremely sparsely populated and sheepfarming was the most important source of income. Fishing was of minor importance in the area and contrary to most other districts in Iceland, seasonal labour migration to distant fishing areas was uncommon. Farmers living on the coast of the fjord of Eyjafjörður in the western part of the county were, however, in part involved in fishing when shoals of fish filled the fjord during late summer. However, as late-summer was the most labour-intensive period within agriculture, fisheries were traditionally of little importance in these agrarian parts of the north. Investments by foreign entrepreneurs and the international demand for shark liver oil did, however, somewhat increase the importance of the fishing sector in this area during the late 19th century. At the beginning of the 20th century, fishing for herring changed the economic outlook considerably in many of the northern areas.

This part of the study is chiefly based upon two sorts of quantitative source material. The first are the returns of the vital events that formed the basis of the national statistics. These are only available for the period after 1840 (on discussion of sources, see chapter 2.1). The second main source material consists of the parish and catechetical registers. These are used in the analysis on causes of death and for the study of Reykjavík in particular. Furthermore, the parish registers are used to establish mortality for the period prior to 1840. As work with parish registers is very time consuming I have chosen a sample of parishes within each
The sample parishes are shown in black in Map 3.1. The population of each of the parishes used in the analysis is given below as is, for comparative purposes, the total population in which they lay (Table 3.3).

Figure 3.4 shows the changes in the size of the population in the three counties between 1801 and 1910. The capital Reykjavík (in Gullbringu- og Kjósarsýsla) and the island of Vestmannaeyjar (in Rangárvallasýsla) are shown separately. The districts experienced somewhat different trends in population development. Until 1870 the population increase was most pronounced in the rural county of Þingeyjarsýslur in the north and in the capital Reykjavík. In both areas population increase was above the national average. Thus, whilst the population of Iceland increased by 0.7 per cent per year between 1801 and 1870, the rate was 1.2 per cent in Þingeyjarsýslur and 2.8 in Reykjavík.

The population increase in Þingeyjarsýslur during this period occurred exclusively in rural upland areas and was mainly based on the settlement of deprived farmers in the previously uninhabited mountainous grassland of the northeastern and eastern parts of the country. Following a volcanic eruption in Askja in 1874 these highland areas were largely abandoned and many inhabitants in the eastern part of Þingeyjarsýslur subsequently emigrated to Canada. Mass-emigration was the main cause of the population decline in the county between 1870 and 1901.

Table 3.3. Population of the counties in the study, together with the population in the parishes used as sample in parts of the study

<table>
<thead>
<tr>
<th>Counties</th>
<th>Parishes</th>
<th>1801</th>
<th>1850</th>
<th>1901</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gullbringu-og Kjósarsýsla (total)</td>
<td>4,005</td>
<td>5,670</td>
<td>11,982</td>
<td></td>
</tr>
<tr>
<td>Reykjavík*</td>
<td>866</td>
<td>1,506</td>
<td>7,158</td>
<td></td>
</tr>
<tr>
<td>Hafnarfjörður**</td>
<td>857</td>
<td>1,260</td>
<td>1,243</td>
<td></td>
</tr>
<tr>
<td>Hvalsnes***</td>
<td>391</td>
<td>721</td>
<td>1,243</td>
<td></td>
</tr>
<tr>
<td>Rangárvallasýsla (total)</td>
<td>4,203</td>
<td>5,165</td>
<td>4,973</td>
<td></td>
</tr>
<tr>
<td>Eyvindarhólar****</td>
<td>464</td>
<td>471</td>
<td>419</td>
<td></td>
</tr>
<tr>
<td>Vestmannaeyjar</td>
<td>173</td>
<td>399</td>
<td>607</td>
<td></td>
</tr>
<tr>
<td>Þingeyjarsýslur (total)</td>
<td>3,119</td>
<td>4,453</td>
<td>5,166</td>
<td></td>
</tr>
<tr>
<td>Presthólar</td>
<td>134</td>
<td>267</td>
<td>285</td>
<td></td>
</tr>
<tr>
<td>Skinnastaðir</td>
<td>162</td>
<td>238</td>
<td>185</td>
<td></td>
</tr>
<tr>
<td>Svalbarð í Þistilfirði</td>
<td>103</td>
<td>203</td>
<td>252</td>
<td></td>
</tr>
<tr>
<td>Laufás</td>
<td>154</td>
<td>181</td>
<td>187</td>
<td></td>
</tr>
<tr>
<td>Múli</td>
<td>90</td>
<td>127</td>
<td>290</td>
<td></td>
</tr>
<tr>
<td>Iceland (total)</td>
<td>47,240</td>
<td>59,157</td>
<td>78,470</td>
<td></td>
</tr>
</tbody>
</table>

*In all parts of the study presented below Seltjarnarnes is included.
** The parish Bessastaðir is always included in the analysis for Garðar.
*** Includes Kirkjuvogssókn, Hvalsnes and Útskálar.
****Eyvindarhólar includes Eyvindarhólar, Skógar and Steinar.
Source: Hagskinna. Icelandic Historical Statistics, pp.64–76 and 86–89.
The population development in the southern rural area of Rangárvallasýsla (with the exception of Vestmannaeyjar) reveals a development different to that of Íngeyjarsyslur. Compared to the national average the increase was slow and from 1880 to 1910 the county experienced a considerable population decline, down from 5,400 to 3,900. The growth of Vestmannaeyjar was rather slow until the turn of the century although this fishing village experienced considerable population growth during the initial years of the 20th century. The growth of Vestmannaeyjar was based on the slowly increasing importance of the fisheries and the rise of its working class population. Likewise, the fisheries were the main impetus behind the growth of Gullbringu- og Kjósarsýsla. The most notable increase occurred in Reykjavík, with the rate of increase accelerating after 1880. The capital had 3,000 inhabitants in 1880 and by the turn of the century more than double that figure at 7,000. In other parts of the county of Gullbringu- og Kjósarsýsla the rate of increase was somewhat above the national average until 1890, when there was a temporary decrease in population in the county outside of Reykjavík. Partly the decrease was due to the shift of the population to Reykjavík. In part, however, the decrease in the fishing areas outside of Reykjavík has been explained by intensive out-migration to the areas in the eastern part of the country, areas that during this period experienced notable economic expansion.
The research areas differed not only in their socio-economic structure and demographic development. There were also considerable differences in their cultural environment. Thus, the northern county of Þingeyjarsyslur has been described as unusual for its early interest in social and economic improvements. Iceland's first cooperative was established in the area and in 1858 its first saving association (Sparjóður Búlausts). This sparsely populated rural area is also an interesting example of a community with high levels of literacy at an early date and a keen interest in establishing reading societies which distributed books around the district. Loftur Guttormsson has, in his study on differences in literacy rates between northern and southern Iceland, shown that already during the 18th century the county of Þingeyjarsýslur had notably higher literacy rates than the southern part of the country.

Infant mortality differences
The research areas were marked by important differences in infant mortality rates. Figure 3.5 shows the development of infant mortality in all the counties. Reykjavik is shown separately. The figures for the period prior to 1840 are only based on a sample of parishes in each county (see Table 3.3). Infant mortality in the northern district of Þingeyjarsýslur was very low compared to that in Rangárvallasýsla in the south, with the latter displaying rates up to three times higher than the former. The pattern of decline differed too somewhat between the two areas. It was shown in Part 2 that the period between 1821 and 1850 was characterized by increased infant mortality rates at the national level. In the parish of Eyvindarhólar in Rangárvallasýsla, infant mortality was as high as 550 during the 1820s but declined to 400 in the subsequent decade. The extremely high levels during the 1820s were in all likelihood partly due to the consequences of volcanic eruption, in Eyjafjallajökull in 1822 and in Katla in 1823. In both those outbreaks northerly winds prevailed and therefore toxic particles from the volcano blew over the area where Eyvindarhólar is situated. This probably had directly disastrous effects on vegetation and animals in particular because in 1823 the outbreak occurred in mid-summer when the haying season was about to start. Compared to the national average, infant mortality in Rangárvallasýsla was high throughout the century, but the decline was relatively abrupt especially prior to 1860.

Infant mortality in the other rural county, Þingeyjarsýslur, was extremely low. The development follows more the national trend than did that in Rangárvallasýsla as there is a slight increase between the 1820s and the 1830s. After 1850 there was an abrupt decline from 270 to 150. The decline was then rather modest until the turn of the century. By the end of the century, infant mortality rates in Rangárvallasýsla had dropped to about 130 per 1,000 whereas in Þingeyjarsýslur they were around 100.
Infant mortality in the densely populated county of Gullbringu-og Kjósarsýslu was lower than in Rangárvallasýsla, but considerably higher than in Óingeyjarsýslu. Initially Reykjavík, situated in the eastern part of this county, displayed mortality rates that were considerably lower than those in the surrounding fishing areas. Infant mortality in Reykjavík was similar to that of Óingeyjarsýslu in the north. During the epidemic decades of the 1830s and 1840s, infant mortality in Reykjavík increased from 160 to 250 only to fall again to 160 during the 1850s. During the second part of the 19th century the development of infant mortality in the capital was in line with the experience of Óingeyjarsýslu and by the end of the century it had dropped to 100 per 1,000.

The rest of the densely populated county of Gullbringu- og Kjósarsýslu displayed rates that were much higher than was the case in Reykjavík. Between 1840 and 1850, infant mortality in the county outside of Reykjavík was around
330 per 1,000. Infant mortality dropped to 240 during the 1850s, but there was little improvement between 1860 and 1890. During this period, the gap between Reykjavík and the neighbouring fishing districts increased somewhat. In the last decade of the century, however notable improvements were made so that by the turn of the century infant mortality rates in this county were only slightly higher than in Reykjavík.

In Part 2 of this study it was noted that contemporaries often remarked upon the rather unique situation of Reykjavík. In the following section I will focus upon differences in feeding practices in the research areas. The description of the areas above shows that all three differed considerably in their socio-economic outlook. To what extent did differences in feeding traditions lead to differences in infant mortality rates? What protection did a short period of breastfeeding offer in different types of environment?

**Infant feeding in rural areas and in fishing districts**

Even though the particular way of infant feeding in Iceland was often remarked upon by physicians and other persons visiting Iceland during the 18th and 19th centuries, the descriptions are often rather unspecific. What exactly was the source of information for foreigners who spent a few months in Iceland and commented upon the artificial feeding of infants? On some occasions it is hard to establish beyond doubt whether written information about infant feeding relates to newborns or informants were just struck by the fact that infant were weaned early, compared to the tradition in their homelands and that they were appalled by the tradition that very young infants received artificial food. However, on the basis of the written evidence it can be established, beyond doubt, that the tradition of breastfeeding was extremely weak in Iceland and at least in some areas infants were not given the breast at all, not even in the first days after delivery.

The Scottish traveller McKenzie was quite definite in his comments when he affirmed that “a mother in Iceland seldom suckles her child; but nourishes it from the time of its birth, with cow’s or sheep’s milk.” The natural scientist Eggert Ólafsson (1726—1768) on the other hand maintained that infants in rural areas were sometimes breastfed for three days, whereas it was common among the lowest social strata in the villages to breastfeed for longer periods. It can be assumed that survival differed between these two types of settings. Another factor of importance here is the type of food given to children. Did they receive animal milk or other food? Was the milk diluted in water or given undiluted? How was the milk procured, at the household level or from other households? What were the environmental conditions in the respective areas, did the household have access to clean water or was there a shortage of water? All these issues could have an important bearing upon infant health and survival chances in areas where it was common to give other food than breastmilk to newborns.
The low mortality of Reykjavík was frequently debated by physicians during the 19th century. In his book *Hugvekja um Medferð á ungbornum* (Thoughts on the treatment of young children) published in 1846, the *Landphysicus* Jón Thorstensen (1794–1855) discussed this feature of Reykjavík. Thorstensen maintained that there were no noteworthy differences in the economic situation in Reykjavík and that of the neighbouring fishing districts. In both cases the majority of the population were poor cottars and fishermen and, according to Thorstensen, housing conditions were certainly no better in Reykjavík than in other areas in the neighbourhood. Therefore, according to Thorstensen, low infant mortality rates in Reykjavík could only be explained by the fact that, contrary to most other areas in Iceland, there was a long-standing tradition of breastfeeding in the capital. The *Landphysicus* gave no further account of the feeding practices of the fishing areas close to Reykjavík. Nonetheless, there are a few accounts, mainly from the late 18th century, on feeding practices in the densely populated fishing districts in the western and southwestern parts of the country.

The differences in feeding practices between urban and rural areas was briefly discussed in chapter 2. Most authors that discuss the differences in infant feeding traditions during the pre-transitional era maintain that there were notable differences between the rural setting and fishing villages. Eggert Ólafsson maintained that only the most deprived fisherwomen in coastal areas would breastfeed their children for more than three days. According to Eggert, however, infants in the fishing districts were infrequently breastfed for more than a month. Furthermore, he argued, it was common for well-to-do farmers or “other charitable men in the locality to donate cow’s milk to children from poor households.”

The physician Schleisner who was in Iceland during the mid 1840s also discussed differences in feeding practices between urban and rural areas. In his thesis, he maintains that:

I have already on several occasions noted that Icelandic mothers do not give the breast. From this there are a few exceptions. Thus, for example in Reykjavík and most other towns, most women breastfeed; it also happens in the fishing areas that the most deprived women who have no cow-milk, are forced to do so.

Schleisner’s and Eggert’s statements indicate that there were important differences in feeding practices between densely populated fishing areas and the rural setting. From both accounts it can be deduced that Icelanders generally preferred to give infants other food than breastmilk and that the main reason for breastfeeding lay in poor access to milk. Schleisner distinguished between areas that had acquired the status of a town and other fishing districts. Danish merchants and their families formed quite high proportion of the population in Reykjavík and other towns and it must be assumed that the inclination to breastfeed to a large extent is to be explained by the influence of the Danes. Eggert’s and Schleisner’s announcements indicate that breastfeeding was hardly
of long duration. Both maintain that children were given additional food shortly after delivery and the custom of offering milk to deprived families in those areas where women tended to breastfeed, indicate that weaning was often introduced at very early ages. It is also noted by the two authors that other food in addition to milk was given to infants at very young ages. But what actual food was given to infants?

Milk was given undiluted in most cases. The description above of the fishing districts also shows that young infants were commonly given other food than milk and several accounts in medical reports show that it was by no means uncommon for babies to receive fish liver, meat and other food that was pre-chewed by other household members.

In Part 2 I mentioned an interesting aspect of differences in feeding practices between northern Iceland on the one hand and the southern and southwestern parts on the other hand. The midwife Sigriður Örum (1753–1828) who reported about those differences was born in Díngeyjarsyslur in the north and she maintained that infants in northern Iceland were not breastfed. However she argued that, contrary to the situation in southern Iceland, infants in the north were not given solid food until they were at least three months old. Those differences are likely to have produced important differences in the severity of diseases and the survival chances of young children.

Schleisner had spent most of his time in Iceland on Vestmannaeyjar and in the southern and western parts of the country. His description of feeding practices in rural Iceland is thus likely to apply to the southern county of Rangárvallasýsla. Unfortunately, the district physician Skúli Thorarensen (1802–1872), who served in southern Iceland from 1834–1869 never discussed the issue of breastfeeding in his reports. The most reliable sources on feeding practices in the area are thus to be obtained from the physicians who served on Vestmannaeyjar and who maintained that breastfeeding was almost unknown in the area. Evidence from the late 18th century also suggests that breastfeeding was generally not practiced in this part of the country. After the decline of infant mortality had begun, Skúli's successor Þorgrímur Johnsen (1838–1917) complained about the shortage of educated midwives in the area and maintained that gastro-intestinal diseases were common there. Another physician, Tómas Hallgrímsson (1843–93) wrote in 1874 that children were weaned at very early ages and that diarrhoeal diseases were therefore common among newborns.52

Medical reports from the low mortality county of Díngeyjarsyslur in northern Iceland offer relatively little information on infant feeding and infant health during the early 19th century. The low levels of infant mortality shown in Figure 3.3 above indicate relatively favourable conditions among infants, at least after 1850 when levels of infant mortality in this area fell below 130 per 1,000. Those levels were probably hard to obtain during the pre-transitional era if newborns were not put to the breast. Sources from the 18th century indicate that artificial feeding was common among newborns at that time. Several prominent physicians who wrote on infant feeding during the 18th century were born in the northern
district. This was the case with Jón Pétursson (1733–1801) and Jón Sveinsson (1752–1803), who both maintained that breastfeeding was generally not practiced in Iceland and that diarrhoea was the most important cause of death among infants. It is highly unlikely that neither of these two physicians would have talked about it if there had been a strong tradition of breastfeeding in the districts where they spent all their childhood and part of their adulthood. It can thus be assumed that breastfeeding was uncommon in Óingeyjarsýslur during the 18th century. Sigríður Órum, the midwife cited above, was also born in the northern district of Óingeyjarsýslur and lived there during the last decades of the 18th century. According to her, breastfeeding was not practiced in the area.

It does, however, seem that at sometime during the first half of the 19th century, the practice of breastfeeding started to spread in the northern area. The district physician Jón Finsen (1826–1885) who had been serving in the northern medical district for two years observed in 1858 that mortality among infants and small children was low in the district and that breastfeeding was quite common. There is no reason to believe that the basis of Jón Finsen’s statement wasn’t relatively sound. His medical reports clearly show that he was very interested in the health and well-being of young children and he wrote at length on the subject. Moreover, he showed a keen interest in training women for midwifery and his reports indicate that his relationship with midwives in the district was marked by respect and trust.

Information on infant feeding traditions strongly indicates that breastfeeding was by far the most important determinant of infant survival in 19th century Iceland. To shed further light on the implications of different methods of infant feeding, it is worth comparing causes of death in the areas. However, because the registration of causes of death during the 19th century was very imprecise, the cumulative infant mortality model developed by Bourgeois-Pichat is first used to shed further light on the underlying factors of infant mortality during the 19th century. Regional differences in mortality patterns during the first month of life will also be analysed.

Regional patterns of infant mortality and their underlying causes.
Biometric models

In Part 2, I discussed the significance of exogenous mortality during early infancy in Iceland. It was argued that the isolation of the country created an epidemiological regime where young infants were likely to suffer from the effects of several diseases to which children in other European societies had acquired a passive immunity. The case of Vestmannaeyjar presented above is of course an extreme example of an area with high exogenous neonatal mortality. But since Icelandic newborns were frequently artificially fed, the share of exogenous neonatal mortality in other areas was evidently high as well. It has thus been shown that in societies where newborns are not given the breast, neonatal and early
post-neonatal mortality tend to be exceptionally high. In those areas a neonatal mortality between 100 and 150 per 1,000 live births was by no means uncommon.\textsuperscript{56} Anders Brändström has shown for the parish of Nedertorneå in northern Sweden, where newborns were generally not breastfed, that infant mortality tended to peak during the second week of life.

The well-known biometric model of infant mortality developed by Bourgeois-Pichat in the early 1950s has chiefly been used to estimate the share of endogenous mortality during the neonatal period.\textsuperscript{57} The model assumes that infant mortality, after the neonatal period, in general increased linearly as a function of $[\log(n+1)]^3$ ($n$ being age in days). Bourgeois-Pichat suggested that the share of endogenous, as against exogenous mortality during the first month of life could be found by extrapolating the cumulative rate of the post-neonatal period to the y-axis, with the endogenous neonatal mortality being the value below the cutting point at the y-axis (the intercept) (see Figure 3.6).

Generally, around 75 per cent of all neonatal deaths are of an endogenous nature. Bourgeois-Pichat constructed his model from cause of death data and thus the model has proved highly relevant to infant mortality research. However, there are limitations to the model. John Knodel and Hallie Kintner have shown that in societies where newborns are not breastfed or where babies are weaned at an early age the model cannot be used to estimate the share of endogenous neonatal mortality. Furthermore, they show that post-neonatal mortality deviates from the linear model in those areas.\textsuperscript{58} Instead of displaying a linear trend, mortality tends to rise steeply after weaning is introduced, often during the second

Figure 3.6. Illustration of the biometric model developed by Bourgeois-Pichat

Source: Figure 3.7 in John Knodel and Hallie Kintner, "The Impact of Breast Feeding Patterns on the Biometric Analysis of Infant Mortality", \textit{Demography} 14(4)(1977), pp. 392
or third month and thus the function (development) displays a convex form. The fact that the development of infant mortality during the post-neonatal period is not linear makes the estimates of endogenous mortality highly uncertain. Thus, estimates vary depending on which monthly values are chosen to construct the line that is extrapolated to the y-axis. On the other hand Knodel and Kintner argue that the biometric model is an excellent tool for estimating the extent of artificial feeding or early weaning of young infants.\(^{59}\) Several studies on infant mortality in areas with a weak tradition of breastfeeding have confirmed this view.\(^{60}\)

As populations with a weak tradition of breastfeeding tend to deviate from the linear model so that the mortality function takes the form of a convex curve early during the post-neonatal period, the model is, in what follows, used to analyse differences in feeding practices in the research areas. One would expect

![Figure 3.7. Biometric cumulative infant mortality in Rangárvallasýsla (the parish of Eyvindarhólar), Þingeyjarsýslur (the parishes Skinnastaður, Svalbarði, Presthólar, Laufás, Múli), Gullbringusýsla (parish of Hvalsnes) and Reykjavík (shown separately), 1821—40](image)

areas where artificial feeding was common to display an increase in infant mortality during the early post-neonatal period, whereas the development would be linear in areas where infants were put to the breast. Furthermore it can be assumed that neonatal mortality was high in areas where children were not at all put to the breast.

Figure 3.7 shows cumulative infant mortality in the research areas for the period 1821–1840. During this period infant mortality at the national level was close to 350 per 1,000 births. Huge differences in mortality patterns between the areas are unveiled. The results support the evidence on feeding practices described by contemporaries. Thus the two low mortality areas of Reykjavík and Þingeyjarsýslur that appear to have adopted the practice of breastfeeding relatively early, display a linear development of post neonatal mortality. The lines in those two areas run almost parallel. It can be assumed that breastfeeding was both more common and of longer duration in Reykjavík than was the case in the rural area of Þingeyjarsýslur. Reykjavík was more densely populated and had more contact with foreign countries and surrounding areas than was the case with most other districts in Iceland. These were conditions that, in all likelihood, would have produced high accelerated cumulative infant mortality during the late post-neonatal period, if breastfeeding had been of short duration. Instead Reykjavík displayed a linear development throughout the first year with mortality rates in the capital lower for all months of the first year than was the case in the sparsely populated district of Þingeyjarsýslur.

There are striking differences in infant mortality between Reykjavík and the surrounding fishing districts. However, neonatal mortality in Gullbringu- og Kjósumýssla is relatively low or close to that of Reykjavík and Þingeyjarsýslur. During the second, third and fourth month there is an accelerated upward trend in cumulative infant mortality, a trend that slowed down after the fifth month. Low neonatal mortality supports the view of contemporaries who maintain that women in fishing villages, where milk supplies were often limited, were likely to put newborns to the breast for a short period of time. High mortality during the early post-neonatal period supports the general impression that breastfeeding in this area was rarely of a long duration.

The rural parish of Eyvindarhólar (Rangárþingeyjarsýslur) in the south, is the district that displayed by far the highest infant mortality rates of all the areas. During the period 1821–1840, only just under half of all infants in this area survived to their first birthday. Most deaths occurred during the first month of life, neonatal mortality being close to 300 per 1,000. Mortality during the post-neonatal period was more or less in line with what we saw in the fishing district of Hvalsnes (Gullbringu- og Kjósumýssla). Thus, the curve displays a convex form during the early post-neonatal period. The extremely high neonatal mortality rates strongly indicate that infants in this area were never put to the breast, not even during the very first days after birth.
During the period 1871–1880, the transition towards lower infant mortality in Iceland had just begun. Infant mortality at the national level was at this point in time somewhat above 180 per 1,000. Figure 3.8 shows that all the research areas had experienced improvements in infant survival (note that the scale is different from that in Figure 3.4). The most notable improvements were made in the two areas with previously high mortality levels. This was especially true for the rural county of Rangárvallasýsla where neonatal mortality had dropped from almost 300 per 1,000 live births to 200. The development during the post-neonatal period is now linear and runs parallel with the two low mortality areas of Óingeyjarsýslur and Reyjavík.

In the fishing district of Gullbringu- og Kjósarsýsla, however, improvements were less dramatic. The most notable improvements in this area occurred during the neonatal period. Neonatal mortality had, since the period 1821–1840, dropped from around 140 to 80 and was thus somewhat lower than in the high mortality rural county of Rangárvallasýsla. The development during the post-neonatal period was in line with the pattern observed during the earlier period and deviated most noticeably from the other areas. The excess mortality is especially apparent during the second month. This indicates that feeding practices for young infants in the area were probably similar to earlier periods. It is thus likely that newborns were put to the breast, but that weaning occurred at a very early age, often before children had reached the age of one month.

As neonatal mortality in the high mortality agrarian district of Rangárvallasýsla was higher than in Gullbringu- og Kjósarsýsla it can be hypothesized that the practice of feeding newborns wholly artificially continued to be widespread. Cattle farming was the main source of income in Rangárvallasýsla and in no other county was the possession of cows more common. The economy in the area was largely household based and most households had direct access to fresh milk. It can therefore be assumed that infants that were not breastfed had better survival chances during the post-neonatal period than was the case with their counterparts in densely populated fishing districts where water was bad and milk frequently contaminated and sometimes unavailable. With somewhat improved personal hygiene, sparsely populated rural areas, where environmental conditions were relatively good, were likely to experience improvements in infant survival even though the breastfeeding of newborns had not become the common practice. However, babies in the very first weeks of life were likely to be most hard hit. It is relatively well documented that during this period parents continued to give newborns undiluted fat milk and even cream. This type of food is particularly dangerous for newborns since they are not able to digest the fat. It has also been noted that cow's milk and other animal milk not only has a higher fat content than human milk, but that the content of casein is also considerably higher than in human milk. This hastens the dehydration process in infants receiving undiluted cow's milk. Even under conditions where hygiene is at a high level this type of food is likely to cause problems of dehydration and diarrhoea, especially among the very young.
The low mortality districts of Reykjavík and Þingeyjarsýslur reveal a somewhat more moderate decline in infant mortality between the two periods, with the decline in the rural district of Þingeyjarsýslur less pronounced than in Reykjavík. In both areas cumulative post-neonatal mortality remained linear. Reykjavík had, during this period, dropped to levels that by European standards were exceptionally low. Almost 90 per cent of all infants in the capital survived to their first birthday and neonatal mortality was only slightly above 30 per 1,000. It is hard to believe that much better results could be obtained at this point in time in a densely populated village, where the majority of the population consisted of relatively deprived fishermen. In the other Nordic countries there are relatively few examples of areas with infant mortality rates that are as low as Reykjavík and almost all of these were sparsely populated rural districts. In England too there were a few examples of mortality rates around 100 in rural districts. Considering the fact that young children in Reykjavík were to a larger extent than their counterparts in other areas exposed to the risk of infection, it must be assumed that the capital, at this point in time, was characterized by extraordinarily favourable infant care, with most newborns being put to the breast and breastfed for relatively long periods.
Figure 3.9. Biometric cumulative infant mortality in Rangárvallasýsla, Ísingoeyjar­sysla, Gullbringu- og Kjósarsýsla (with the exception of Reykjavík) and Reykjavík, 1891–1900

Source: See Figure 3.8.

Figure 3.9 shows the cumulative infant mortality for the period 1891–1900. Infant mortality at the national level had now dropped to slightly below 120, a level that was comparable to that in the other Nordic countries and low in European terms. All the areas display a linear development during the post-neonatal period and differences in infant mortality rates between the areas are not pronounced. In Reykjavík, infant mortality had only slightly declined and the low mortality rural county of Ísingoeyjar­sysla in the north remained at approximately the same level as during the previous period. Infant mortality in the previously high mortality county of Rangárvallasýsla had declined considerably, both during the neonatal and post-neonatal periods. The most notable improvements had, however, been made in the fishing district of Gullbringu-og Kjósarsýsla. The obvious excess-mortality during the early post-neonatal period observed in earlier times had now disappeared.

The analysis above indicates that there were considerable differences in mortality patterns within the first year between areas. Thus, a comparison of the two high mortality districts, the rural county of Rangárvallasýsla and the fishing district of Gullbringu- og Kjósarsýsla, proves that areas with similar outcomes at the end of the first year could display an entirely different patterns. On the basis of limited information from qualitative sources and by the application of the biometric model developed by Bourgeois-Pichat it is argued that infant deaths
in the high mortality areas are to a large extent to be explained by the practice of artificially feeding newborns (or early weaning). The biometric model strongly supports this in the case of the densely populated fishing district of Gullbringu-
og Kjósarsýsla. The model proves less conclusive, however, in the rural area of Rangárvallasýsla. There mortality was extremely high during the neonatal pe-
riod, but only during the first period analysed (1821–1840) is the biometric curve convex during the early post-neonatal period.

An analysis of the mortality pattern during individual days of the first month might help to shed further light on the cause of death in the different areas. In the areas where newborns were not at all breastfed one would expect a “Nedertorneå-syndrome”\(^{64}\), i.e. a steep increase in mortality during the second week of life. On the other hand, if mortality is unusually high already during the first days of life, it is likely to be explained to a larger extent by endogenous factors, such as complications that occurred during birth or the malnutrition of mothers, resulting in more vulnerable low weight babies.

Figures 3.10 and 3.11 show the development of mortality rates for individual days of the first month in the four research areas during the period 1821–1840. By comparing the figures it appears that mortality during the very first few days of life was almost identical in all the areas. For the rest of the first month, the rural parish of Rangárvallasýsla in the south deviated strongly from the other areas. Already late in the first week the county displayed a considerable rise in mortality. This was somewhat earlier than in the case of Nedertorneå in northern

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**Figure 3.10.** Mortality for individual days of the first month in the rural areas of Rangárvallasýsla (the parish of Eyvindarhólar) and Pingeyjarsýslur (the parishes of Skinnastadir, Svalbarði Í Þistilfirði, Presthólar, Laufás and Múli), 1821–1840

Sources: See Figure 3.7.
Sweden, but otherwise the pattern seems to be very similar to the one found there. Let us now lump together the development during individual weeks of the first month in order to compare neonatal mortality with the Swedish case.

In Table 3.4 mortality during the first month is shown for individual weeks with the first week being divided into two parts. It appears that mortality rates are similar in all the areas during the first three days. After that the areas differ considerably from each other. Reykjavík is the only district with the expected pattern of rapidly declining mortality throughout the neonatal period. In Hvalsnes (Gullbringusýsla) and in Þingeyjarsýslur first week mortality was close to that in Reykjavík. On the other hand, mortality rates in the second week was much higher than in Reykjavík and came close to the rates of the first week in both areas. Second week mortality was, nevertheless, somewhat lower than reported for the parish of Nedertorneå in Sweden, where second week mortality was higher than 60 per 1,000. It is likely that there were mixed feeding patterns in these areas, i.e. that even if breastfeeding was probably relatively common, there were a number of infants who were never put to the breast. Consequently mortality rates were relatively high during the second week of life. It is also possible that breastfeeding was the general rule, but that infants were commonly given additional food immediately after birth and consequently cases of diarrhoeal diseases occurred resulting from contaminated food.

![Graph showing mortality rates for individual days of the first month in Reykjavík and in the parish of Hvalsnes (in Gullbringusýsla), 1821-1840.](image)

**Figure 3.11.** Mortality for individual days of the first month in Reykjavík and in the parish of Hvalsnes (in Gullbringusýsla), 1821-1840

Sources: See Figure 3.7.
Table 3.4. Infant mortality in the individual weeks of the first month in Rangárvallasýsla (Eyvindarhólar), Óingeyjarsyslur (Laufás, Múli, Svalbarði ðístilfirði, Presthólar i Núpasveit and Skinnastadur i Óxarfirði), Gullbringusýsla (Hvalsnes) and Reykjavík shown separately, 1821–1840

<table>
<thead>
<tr>
<th></th>
<th>Rangárvallasýsla</th>
<th>Gullbringusýsla</th>
<th>Reykjavík</th>
<th>Óingeyjarsýslur</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3 days</td>
<td>33.5%</td>
<td>30.0%</td>
<td>31.9%</td>
<td>20.9%</td>
</tr>
<tr>
<td>4-7 days</td>
<td>92.9%</td>
<td>31.7%</td>
<td>26.4%</td>
<td>26.4%</td>
</tr>
<tr>
<td>2d week</td>
<td>74.3%</td>
<td>51.1%</td>
<td>23.6%</td>
<td>47.3%</td>
</tr>
<tr>
<td>3d week</td>
<td>52.0%</td>
<td>14.1%</td>
<td>15.0%</td>
<td>16.7%</td>
</tr>
<tr>
<td>4th week</td>
<td>33.5%</td>
<td>8.8%</td>
<td>10.0%</td>
<td>11.1%</td>
</tr>
<tr>
<td>Neonatal</td>
<td>286.2%</td>
<td>135.7%</td>
<td>106.9%</td>
<td>122.4%</td>
</tr>
</tbody>
</table>

Source: See Figure 3.7.

In the parish of Eyvindarhólar in Rangárvallsýsla, the mortality rates in the second week was much higher than was the case in Óingeyjarsýslur and Hvalsnes (Gullbringusýsla). Second week mortality was also well above the Swedish rates (74 compared to 60 per 1,000). In the Swedish parish an increase in mortality was not reported until ca. the 7th day, but in Rangárvallasýsla there was a slight upward trend as early as the 4th day and a steep increase on the 5th day (compare Figure 3.10). If we assume that the main cause of death was diarrhoea resulting from contact with contaminated food immediately after birth, one would expect to see mortality rise at approximately the same time in the Icelandic and the Swedish cases. Both places were, in the early 19th century, rural areas with low sanitary standards and it must be assumed that babies in both areas were at approximately the same risk of falling ill from common bacteria causing diarrhoea.

The *E. coli* bacterium, and other common bacteria which cause diarrhoeal diseases, have a very short incubation period (often less than two days). Newborns in areas with unsanitary conditions who received foods other than breastmilk were therefore at risk of falling ill shortly after birth. Eventually acute diarrhoea would lead to dehydration, a process that was accelerated if infants didn’t receive enough fluid. It is a well known fact that most diarrhoeal deaths are attributed to dehydration and therefore methods used to feed sick newborns was likely to have produced some differences in the development of the disease. In the Swedish parish of Nedertorneå, infants were fed via the so-called *dhorn* (cow horn) an instrument that made the feeding of infants relatively easy. In the Icelandic sources there is no mention of a horn being used to feed infants. Newborns were thus generally handfed from a wooden vessel (*aksur*) and the milk was sometimes given through a quill. According to Schleisner who was in Iceland in
Table 3.5. Infant mortality in the individual weeks of the first month in Rangárvallasýsla (Eyvindarhólar), Gullbringusýsla (Hvalsnes) and Reykjavík shown separately, 1872-1880 (1871-1875 for Reykjavík)

<table>
<thead>
<tr>
<th></th>
<th>Rangárvallasýsla</th>
<th>Gullbringusýsla</th>
<th>Reykjavík</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3 days</td>
<td>29.1</td>
<td>33.7</td>
<td>10.3</td>
</tr>
<tr>
<td>4-7 days</td>
<td>14.6</td>
<td>12.1</td>
<td>7.7</td>
</tr>
<tr>
<td>2d week</td>
<td>43.7</td>
<td>38.9</td>
<td>15.4</td>
</tr>
<tr>
<td>3d week</td>
<td>14.6</td>
<td>21.9</td>
<td>7.7</td>
</tr>
<tr>
<td>4th week</td>
<td>4.9</td>
<td>24.3</td>
<td>10.3</td>
</tr>
<tr>
<td>Neonatal total</td>
<td>96.9</td>
<td>138.7</td>
<td>51.4</td>
</tr>
</tbody>
</table>


1846 glass bottles were available in the towns, whereas wooden vessels were used in the rural areas. It goes without saying that a method of handfeeding infants in this way was prone to result in insufficient fluid-intake in the case of diarrhoea.

Sometimes solid food, already chewed by an adult was put onto a rag and the child would then suck out the fluid. When it came to giving additional fluid to newborns already suffering from diarrhoea this method was in all likelihood less effective than the method described for Sweden and therefore the process of dehydration was likely to be faster in the Icelandic case. It is also possible that different types of food in the two areas could have resulted in these differences. Thus, infants in Sweden were given soured milk whereas Icelandic infants received food that contained a large amount of fat.67 But how did, mortality rates for individual weeks of the first month develop in the different areas?

Table 3.5 shows the pattern of neonatal mortality after the transition towards lower infant mortality rates had begun (Note: Þingeyjarsýslur in the north is not included in this analysis). In the high mortality county of Rangárvallasýsla neonatal mortality had decreased considerably compared to the period 1821-1840. The most notable improvement occurred during the second part of the first week. There mortality fell from 90 to 20 per 1,000. There was also a significant decrease during the second week, when mortality dropped from over 70 to slightly more than 40. Reykjavík displayed no radical changes and in the fishing district in Gullbringu- og Kjósarsýsla (Hvalsnes) the old pattern prevailed. Compared to the period 1821-1840, there was a slight decrease in mortality, especially during the second week of life.
The decline of mortality during the second week of life between the two periods indicates that breastfeeding had gained in importance. This was above all true for the high mortality district of Rangárvallasýsla. Reports from the physician Tómas Halldórsson who served in the district in the early 1870s indicate that newborns were often put to the breast, but that breastfeeding was of an extremely short duration. It was also frequently noted that infants were often given additional food shortly after birth. Thus a pattern described by Brändström prevailed although the second week mortality decreased considerably.

Mortality in the fishing district of Hvalsnes (Gullbringu- og Kjósarsýsla) was now on a par with that in Rangárvallasýsla; second week mortality slightly lower than in Rangárvallasýsla, but with higher mortality in the subsequent two weeks. It can thus be assumed that the old practice of putting newborns to the breast, but introducing solid food at very early ages, prevailed. There was a slight upward trend between the 3d and the 4th weeks, a trend that corresponded to the convex curve during the post-neonatal period (compare Figure 3.7).

The results above indicate that the secular decline in infant mortality in Iceland during the second part of the 19th century can mainly be attributed to improvements in feeding practices for newborns. A few areas had developed a strong tradition of breastfeeding already during the first half of the 19th century. In those areas the decline in infant mortality was relatively moderate. In other areas where infants had been either totally kept off the breast or where they were weaned at very early ages, the slow growth in the practice of putting newborns to the breast produced considerable improvements in their survival chances.

In rural areas where environmental conditions were favourable, only a slight improvement in infant feeding was likely to have produced considerable improvements. This seems to be the case in Rangárvallasýsla where breastfeeding was introduced, but where infants were only infrequently breastfed for lengthy periods. Nevertheless infant survival improved noticeably. In densely populated fishing districts, where sanitary conditions were worse than in the rural areas, more effort was needed to bring infant mortality levels down. There, however, a tradition of putting newborns to the breast for a short while prevailed from an earlier period. Therefore neonatal mortality in those districts tended to be lower than was the case in the rural areas, whereas post-neonatal mortality was considerably higher (see also last chapter where this is discussed). The improvements in post-neonatal mortality seems generally to have occurred later than improvements in neonatal mortality and in the fishing district of Hvalsnes (Gullbringu- og Kjósarsýsla) post-neonatal mortality remained high until the last decade of the 19th century.
Differences in infant feeding practices in their socio-economic context

Generally the tradition of artificial feeding of newborns seems to have prevailed longer in the agrarian areas than in the fishing villages and perhaps longest in the agrarian areas with the best access to cow milk. It is maybe not a coincidence that Rangárvallasysla, the area with the highest rates of infant mortality and the lowest breastfeeding rates, was the region where cattle farming was most common. In Rangárvallasysla (together with the neighbouring county of Árnessýsla) the possession of cattle was most widespread in the entire country. In 1831 there were slightly under 2 inhabitants per milch cow. The rate was much lower in Reykjavík and in other areas of Gullbringu- og Kjósarsýsla where there were 3.2 inhabitants per milch cow. In the rural district of the north the rate was even lower, it being between 4 and 5 inhabitants per milch cow in Índeyjarsyslur. In this part of the country sheep farming dominated and the proportion of cattle was thus low by national standards.

It is not assumed here that the ownership of a cow per se would prevent women from breastfeeding, but a ready access to fresh milk was maybe a factor that was likely to retard the process of change from a practice of artificial feeding to one of breastfeeding. In areas where milk supplies were limited and where a majority of the population did not possess a cow, women were more likely to start to breastfeed. In areas where milk was expensive this would also be the most convenient way. Similar observations on the positive relationship between the abundant availability of milk and a reluctance to breastfeed have been made in France. Catherine Rollet maintains that:

La plus grande facilité de se procurer du lait animal nous paraît être la deuxième condition du développement plus précoce et massif de l'allaitement artificiel dans le nord de la France.69

The abundance of milk combined with other factors of a socio-economic nature are likely to have contributed to differences in infant feeding practices. Thus the high mortality rural district of Rangárvallasysla was both known for a tradition of cattle farming and of seasonal work of men within the fishing areas. Men (both farmers and male servants) were thus in many cases away from home fishing for long periods and women, children and the elderly were thus left alone with the farm.70 Under such conditions it was very likely that the care of infants was left to older siblings or to the elderly, whereas young women of childbearing age were often left to do the hard work outdoors. The cold and wet climate in Iceland could then furnish an additional factor in bringing about milkstasis and other complications in connection with breastfeeding, a factor that might discouraged women to breastfeed.71

In this sense the northern county of Índeyjarsyslur displayed a different picture. Men in this area only infrequently left the household to go fishing.72 Fishing was restricted to the household and combined with other tasks. It is likely that in this situation women with newborns had a better chance of focussing their attention on the baby and on work indoors while men and other household
members were responsible for tasks outdoors. A similar situation was created in the urban environment. Even though married women in the childbearing ages worked hard during the fishing season, it is not unlikely that mothers were spared from work outdoors when they were breastfeeding. The nature of the urban environment made it possible to allocate tasks to relatives and neighbours living nearby that mothers with young children would have been forced to do in the rural environment.

Patterns of mortality during individual periods support ideas about important differences in feeding during the pre-transitional period. The next section discusses causes of death in the research areas.

_Causes of death and the disease panorama_

It is of course highly unrealistic to assume that a full knowledge of the disease panorama among infants and young children in Iceland is available for the 19th century. It was shown above that even on the small island of Vestmannaeyjar, where the interest of physicians and other intellectuals was directed solely towards the health of young infants, the parish registration of causes of death was surprisingly vague. In other areas physicians only infrequently saw an infant on its deathbed. Because of the sparse settlement pattern and long distances between settlements, parish ministers had few opportunities to discuss causes of death with district physicians.

Despite evident limitations of the data on cause of death, qualitative and quantitative material will, in what follows, be used to shed light on the causes of death among infants in the research areas before and during the transition towards low mortality rates. What were the main causes of death before the secular decline in infant mortality? What caused the decrease? How important was the introduction of breastfeeding for the decline in infant mortality? District physicians frequently discussed common diseases and feeding practices in their districts. According to a law dating from 1803 it was required that physicians reported specifically on mortality among childbearing women and young children. Health reports are, however, relatively vague during the first half of the century and most physicians maintain that mortality among young children in their district was "normal" or "as usual."

Changes occurred towards the mid-19th century, when the discussion of diseases became much more detailed and sophisticated than it was before. It has been argued that changes in disease-classification were introduced in Iceland by the Danish physician Schleisner and by Jón Finsen (1826–1885) who served in northern Iceland during the period 1856–1867.

After 1850, medical reports are often very informative about feeding and the general condition of infants. The reports contain information on the number of trained midwives in each district and in some cases the Landphysicus wrote to individual physicians and required additional information on those issues. The
medical reports are quite informative especially during the 1860s and 1870s and the *Landphysicus* Jón Hjaltalín (1807–1882) wrote detailed ones to the *Collegium Medicum* in Copenhagen.

The only available sources on cause of death at the individual level for the 19th century are death records in the parish registers. It was not until 1911 that death certificates were required from physicians. The legislation from 1911 only required death certificates from physicians serving in towns and villages, but it was not until 1950 that a death certificate was required in the country as a whole. However, with the establishment of the Statistical bureau in Reykjavík in 1914 the reporting of causes of death changed radically. Death certificates were to be sent to individual parish ministers. They in their turn wrote a report on each death that was then sent to the Statistical Bureau in Reykjavík along with the death certificate. In their reports parish ministers were required to register cause of death for each individual according to the best available source, preferably from a physician. In fact death certificates were frequently issued in those areas where a certificate was not required. But let us now have a look at the causes of death given by the parish minister.

Table 3.6 shows cause specific infant mortality in the three research areas. It is apparent that it is difficult to draw precise conclusions from this material, as the share of those for whom no cause of death was given was relatively high. This is especially true for the fishing district of Hvalsnes in Gullbringusýsla, where either no cause of death was given for almost 40 per cent of infant deaths (93.5 per 1,000 births) or death was said to be from some unknown disease (45.9 per 1,000 births). Moreover, causes of death reported by the parish ministers are frequently highly imprecise. Thus, a large proportion of infants were said to die of *barnaveikindi* (childhood disease) or *vanaleg barnaveikindi* (common childhood disease), terms that could stand for almost anything. This occurred most frequently in the high mortality rural area of Rangárvallasýsla where 223 deaths per 1,000 births fell into this category.

Regional differences in the occurrence of diseases of the respiratory organs are not large. Mortality rates from diseases were by far the lowest in the rural county of Rangárvallasýsla and by far the highest in the other rural county (Bingeyjarsýslur). Compared to elsewhere in Europe, mortality rates from diseases of the respiratory organs seem to be relatively low. Thus two studies in urban Sweden during the late 18th and the mid 19th centuries revealed infant mortality rates from respiratory diseases of between 30 and 60 per 1,000.

There are interesting differences in mortality from highly infectious diseases such as measles and whooping cough. Despite the frequent contacts with foreign countries and high mobility of its population, Reykjavík displayed lower infant mortality rates from those diseases than the other areas. The highest areas were the province of Gullbringu- og Kjósarsýsla in the vicinity of Reykjavík and Rangárvallsýsla, the counties where breastfeeding was reported to be uncommon or of short duration.
### Table 3.6. Cause specific infant mortality rates in the research areas 1821–1840
(per 1,000 live births)

<table>
<thead>
<tr>
<th>Disease</th>
<th>Gullbringu- og Kjósarsýsla</th>
<th>Reykjavík (721 births)</th>
<th>Hvalsnes (567 births)</th>
<th>Dingeyjarsýslur 3 parishes (539 births)</th>
<th>Rangárvallasýsla Eyvindarhólar (269 births)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diseases of the respiratory organs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intestinal diseases</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Krampi, barnakrampi (convulsions)</td>
<td>38.8</td>
<td>26.5</td>
<td>91.8</td>
<td>14.9</td>
<td></td>
</tr>
<tr>
<td>Barnaveikindi (childhood disease)</td>
<td>54.1</td>
<td>1.8</td>
<td>1.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal diseases of childhood</td>
<td>19.4</td>
<td>24.7</td>
<td>44.5</td>
<td>223.0</td>
<td></td>
</tr>
<tr>
<td>Yellow fever</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small-pox, measles, scarlet fever, whooping cough</td>
<td>1.4</td>
<td>24.7</td>
<td>8.3</td>
<td>33.5</td>
<td></td>
</tr>
<tr>
<td>Landfarsótt (epidemic)</td>
<td>1.4</td>
<td>26.5</td>
<td>22.3</td>
<td>3.7</td>
<td></td>
</tr>
<tr>
<td>Ginklofi (neontal tetanus)</td>
<td>8.3</td>
<td>5.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Born weak (congenital diseases)</td>
<td>4.2</td>
<td>30.0</td>
<td>2.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other diseases</td>
<td>12.5</td>
<td>10.6</td>
<td>7.0</td>
<td>22.3</td>
<td></td>
</tr>
<tr>
<td>Of unknown disease</td>
<td>66.6</td>
<td>93.5</td>
<td>37.6</td>
<td>48.3</td>
<td></td>
</tr>
<tr>
<td>Infant mortality (per 1,000 live births)</td>
<td>210.9</td>
<td>372.1</td>
<td>240.6</td>
<td>468.4</td>
<td></td>
</tr>
</tbody>
</table>

Sources: See Figure 3.7.

As breastmilk contains antibodies against several infectious diseases this can be seen as a further indicator of the strong breastfeeding tradition in Reykjavík and vice versa of artificial feeding in other parishes in Gullbringu- og Kjósarsýsla and in Rangárvallasýsla. Another relatively common disease is *landfarsótt*. The translation of the term is “epidemic”\(^77\) and it can thus be assumed that it was used for common infectious diseases. According to Schleisner, however, the term is almost exclusively used for typhoid fever in Iceland.\(^78\) The physician Guðmundur Björnsson (1864–1937) maintained in an article in *Skúrrir* 1908 that “in older times *landfarsótt* was the term commonly used for gastro-intestinal diseases.”\(^79\) It can only be concluded that the term is of an extremely vague nature. It also indicates that outbreaks of intestinal diseases were extremely common in pre-transitional Iceland and that diarrhoeal diseases were seen to be dangerous epidemic diseases.
As regards the disease of neonatal tetanus, Vasey's estimates about high mortality from neonatal tetanus in Iceland must be doubted. Vasey argued that a fourth of all infant deaths in Iceland were attributable to neonatal tetanus. This is far higher than the figures presented in Table 3.6. Neonatal tetanus was most common in the parish of Eyvindarhólar in Rangárvallasýsla where infant mortality from neonatal tetanus was 40.9 per 1,000 live births. In this parish, where neonatal tetanus was considered to be relatively common, less than 10 per cent of all deaths were ascribed to it. In the other areas the disease appears to be less common still. No infant is said to have died from neonatal tetanus in Óingeyjarsýslur; in Reykjavík the rate was 5.3 per 1,000; whilst in other parishes in Gullbringu- og Kjósarsýsla it was 8.3.

Of course, under-registration of neonatal tetanus cannot be out-ruled. This could be the case in particular in Óingeyjarsýslur in the north where neonatal tetanus was never discussed in the medical reports during the first half of the 19th century. On the other hand, a substantial under-registration of tetanus is not likely to have occurred in the other areas. The parish of Eyvindarhólar in Rangárvallasýsla in the south was close to the island of Vestmannaeyjar, and during this period there was a very lively discussion of the disease among physicians and other intellectuals. In an account of the parish written by M. Torfason, the parish minister of Óeyvindarhólar, during the 1830s, he notes that ginklofi was a common disease among newborns in the area. It must be doubted that the parish minister missed many cases of tetanus. It is also highly unlikely that there was an underregistration in Reykjavík. All medical reports from district physicians were sent to the Landphysicus in Reykjavík. At this time he was also the physician there. The intense interest in this disease among medical authorities both in Denmark and among prominent physicians in Iceland during this period makes it highly unlikely that many cases were missed. In none of the research areas did the incidence of neonatal tetanus come close to the levels reported in Vestmannaeyjar. Thus the disease can hardly be seen to have had a major impact on infant mortality in Iceland.

The cause of death that produced by far the largest differences in infant mortality between the areas is barnaveikindi (childhood disease). It seems very likely that more than one disease was covered by this term. Its significance is also likely to have varied according to the overall disease panorama in different areas. Thus in an area where intestinal diseases were common among young children, barnaveikindi would be used for diarrhoeal diseases, whereas the term would be used for lung diseases in an area where these were common. Diseases of the respiratory organs are generally less common among young infants than gastro-intestinal diseases. In the Icelandic case, physicians wrote extensively about how common diarrhoea was among young children. On the basis of this it can be argued that the term barnaveikindi was often used for diarrhoea. Only in Reykjavík and in Óingeyjarsýslur did parish ministers occasionally use a term directly related to the gastro-intestinal organs. For instance in Reykjavík, convulsions or cramps was used quite often, without doubt to describe gastro-intestinal dis-
Table 3.7. Cause specific infant mortality rates in the research areas (per 1,000 live births) 1871–1880

<table>
<thead>
<tr>
<th></th>
<th>Gullbringu- og Kjósarsýsla Hvalsnes</th>
<th>Rangárvallsýsla Eyvindarhólar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diseases of the respiratory organs</td>
<td>9.7</td>
<td>38.8</td>
</tr>
<tr>
<td>Intestinal diseases</td>
<td>7.3</td>
<td>4.9</td>
</tr>
<tr>
<td>Convulsions</td>
<td>14.6</td>
<td>131.1</td>
</tr>
<tr>
<td>Barnaveiki</td>
<td>14.6</td>
<td></td>
</tr>
<tr>
<td>Internal diseases of childhood</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Yellow fever</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles, whooping cough, etc.</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td>Landfarsótt</td>
<td>2.4</td>
<td>4.9</td>
</tr>
<tr>
<td>Ginklofi</td>
<td></td>
<td>4.9</td>
</tr>
<tr>
<td>Born weak</td>
<td>80.3</td>
<td></td>
</tr>
<tr>
<td>Other diseases</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td>No cause</td>
<td>124.1</td>
<td>34.0</td>
</tr>
</tbody>
</table>

Infant mortality (per 1000 live births) 265.2 218.4

Sources: See Table 3.5.

orders. Hallie Kintner has shown for Germany that the category cramps was in some areas used for diarrhoeal diseases in infants. Quantitative and qualitative evidence indicate that the same applied for Iceland. However, it cannot be ruled out that in some cases cramps were on some occasions used for neonatal tetanus, at least in the northern area where the cause neonatal tetanus hardly ever occurred in the sources. In the areas, where there was a great awareness of the disease, this would occur less often.

Unfortunately, parish registers in Reykjavík and in most parishes of the northern district of Ísingeyjarsýslur do not contain information on causes of death for the period after 1870. Table 3.7, therefore, shows cause specific infant mortality rates for the two high mortality parishes, those of Gullbringu- og Kjósarsýsla (Hvalsnes) and Rangárvallasýsla (Eyvindarhólar) during the period 1871–1880. In both cases infant mortality had declined markedly from previous period. In the case of Hvalsnes infant mortality had declined from 370 per 1,000 to 265, and in Eyvindarhólar infant mortality had dropped from 468 to 218. In what disease categories did then the decline occur?

The information on causes of death during this period is as unspecific as for earlier periods. The cause of death was not given for more than half of all infants deaths in Hvalsnes (Gullbringu- og Kjósarsýsla) and therefore it is hard to base any meaningful analysis on cause-specific mortality there. In Rangárvallasýsla the most notable improvements occurred within the category barnaveiki, whereas the infant mortality rate from lung diseases increased. It is to be expected that the decline in infant mortality in this area occurred mainly
because of the diminishing importance of diarrhoeal diseases. Somewhat improved hygiene and slowly increasing breastfeeding rates were without doubt the main factors behind this decline. Here it must, however, be stressed that infant mortality rates in this area were still high compared to most other areas in Iceland and physicians continued to complain about the general lack of breastfeeding.

From the discussion above it can only be concluded that what passed for causes of death in the registers and elsewhere only provide a very vague indication of actual causes of death. As noted earlier a modern cause of death registration system was not introduced in Iceland until 1911 when Parliament passed legislation on death certificates in towns and villages. On the other hand, physicians started to send statistics on morbidity in their districts to the medical authorities in Reykjavík during the last decade of the 19th century. The main difficulty in using this material to shed light on the disease panorama among infants and young children is related to the fact that physicians were hardly ever called for in the case of sick children. As then extremely few sick people ever saw a physician, it is meaningless to use the figures to calculate morbidity rates. Here, the information is only used to cast light on the relative importance of different diseases in the different areas (Table 3.8).  

It is shown that the relative share of respiratory and intestinal diseases varied in an important way from area to area. Respiratory diseases were thus the most common diseases among infants and young children in both Reykjavík (and its vicinity) and in the northern district of Þingeyjarsyslur. Around half of all infant and childhood patients in those areas were reported to suffer from diseases of the respiratory organs. The relative share of those diseases was much lower in Rangárvallasýslu where only a quarter of all patients suffered from them. On the other hand, more than half of all infant patients there and 38 per cent of all children were reported to suffer from intestinal diseases. It can also be noted that intestinal diseases were also common among adults in this area. This provides a further support for the general assumption that the absence of breastfeeding in Rangárvallasýslu was the main underlying factor behind high infant mortality in the area.

By the late 19th century, mortality rates had dropped to relatively low levels, but diarrhoeal diseases were still common in the areas where breastfeeding traditions were weak. All physicians serving in the southern part of the country in the late 19th and early 20th centuries wrote that many women in the area did not breastfeed and where breastfeeding occurred it was of very short duration. As late as the early 20th century it was noted that it was still common to give undiluted milk to infants and that they were given solid food at very early ages. The example presented in the introduction to this book also proves that there were still parishes in the southern part of the country where infants were hardly ever put to the breast as late as the second decade of the 20th century. Again the family presented in the introduction to this study can be taken as indicative of this.
Table 3.8. Morbidity in the research areas 1896–1900. The share of patients suffering from different diseases among infants, children and adults (%)

<table>
<thead>
<tr>
<th></th>
<th>Reykjavik and Hafnarfjörður</th>
<th>Rangárvallasýsla (Vestmannaeyjar included)</th>
<th>Æingeyjarsýslur*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 year (N=127)</td>
<td>1-15 years (N=1005)</td>
<td>Adults (N=1911)</td>
</tr>
<tr>
<td>Diseases of the respiratory organs</td>
<td>49.6</td>
<td>46.7</td>
<td>5.8</td>
</tr>
<tr>
<td>Intestinal diseases</td>
<td>37.0</td>
<td>19.2</td>
<td>20.6</td>
</tr>
<tr>
<td>Measles, Scarlet fever, Whooping c., diphteria</td>
<td>9.4</td>
<td>25.6</td>
<td>5.4</td>
</tr>
<tr>
<td>Other diseases</td>
<td>3.9</td>
<td>8.6</td>
<td>20.3</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Sources: NAI. Skjalasafn landlæknis. D. Ársskyrslur lækna (1896–1900).

Several studies show that the decline in infant mortality in European societies occurred mainly towards the end of the 19th century. Robert Woods and Nicola Shelton maintain that the decline in infant and early childhood mortality in the late 19th and early 20th century was mainly due to the decline in the frequency of diarrhoeal diseases. 86 Similar observations have been made by James Riley. Dorothy Porter has argued that important changes in the priorities and the objective of public health occurred in most European societies towards the end of the 19th century. Even though the sanitary movement had brought about important improvements in health at earlier stages, 87 the breakthrough of the germ theory radically changed the preconditions for a more effective battle against several waterborne diseases. The main focus of the late 19th century was on the following risk groups: tuberculosis victims, potential sufferers from puerperal fever, infants at risk from diarrhoea and diphtheria in schoolchildren. 88
Towards the end of the 19th century, infant mortality levels in Iceland dropped to levels that were on a par with the other Nordic countries and were in a European perspective relatively low. In its initial stages the development towards low mortality rates were only to a small extent due to the same sort of measures introduced in England and other countries on the European continent towards the end of the 19th century. For example, the introduction of water and sewage systems did not begin in Iceland until the first decade of the 20th century. Declining mortality in infancy from diarrhoeal diseases was in its initial stage mainly due to the introduction of breastfeeding and better hygiene in the treatment of food. These were, however, changes that did not occur without intervention. In the next part of this study an effort is made to shed light on the importance of midwives and physicians in the battle for breastfeeding in Iceland. Furthermore, the implications of literacy in different areas are discussed.

3.3. THE MIDWIVES - THE PHYSICIANS AND THE LOCAL CULTURE

On several occasions, Icelandic physicians observed in their reports that infant mortality in Reykjavik was much lower than in the surrounding parishes and often remarked that breastfeeding was more common in Reykjavik than in other parts of the country. In his report to the Collegium Medicum in Copenhagen in 1864 the Landphysicus Jón Hjaltalin wrote:

If one studies the real causes of the more favourable mortality rates in the parish of Reykjavik than in the rest of the country, they cannot, according to my unshakeable opinion, be due to anything else than by the medical service that is always on offer there. I say this, because, as has already been mentioned, it is well known that Reykjavik is a very unsound place in which to live and that the majority of its population does not live in as a healthy manner as is common in the countryside.89

Can this statement of Hjaltalin be supported by empirical evidence? How could midwives and physicians contribute to better infant survival in the mid 19th century? What knowledge and what mental and material tools did they have at their disposal? Was there in general a positive relationship between low mortality levels and good access to medical expertise during the 19th century? And what impact did literacy rates have upon survival? How did medical literature about breastfeeding affect feeding practices? Were the inhabitants of areas where literacy rates were high more likely to employ educated midwives than areas where literacy rates were low?
Ideas about infant health and breastfeeding in the medical literature

The historian Loftur Guttormsson has pointed out that Icelanders writing about infant feeding during the 18th and early 19th centuries were most often highly ambivalent in their attitude towards breastfeeding. According to prevailing miasmatic ideas of disease several factors in the physical and psychic environment were thought to have an adverse impact on breastmilk. Bad tempered mothers were thus advised not to breastfeed and the bad diet of mothers was often seen to be the main factor behind bad infant health. Thus Eggert Ólafsson argued that mothers in fishing villages in western Iceland sometimes put their newborns to the breast for a short while after delivery.

Eggert maintained that newborns in northwestern Iceland received cow’s milk and all sorts of local food from birth. According to Eggert, however, it was not the cow’s milk per se that caused the high infant mortality rates, but rather the food that was given to the cows. These were mainly given dried and often spoiled fish, something that was likely to cause intestinal diseases among very young children.

Lactation in humans is associated with numerous social and culture bound values. Whereas the initiation of breastfeeding is normally not particularly problematic in societies with a strong tradition of breastfeeding, it is linked to various complications in societies with a weak tradition and an early introduction of bottlefeeding. In such societies there is a strong need for direct support and encouragement if breastfeeding is to be successful. Otherwise mothers tend to abandon breastfeeding early, arguing that their milk is not good or that they don’t have enough milk. In societies with a sound tradition of breastfeeding, judgments about the influence of diet and environment on the quality of milk were not likely to have had much influence, at least not among the lower classes. It must, however, be doubted that the ideas put forward in many of the writings of the Enlightenment period could have had positive effects upon breastfeeding in countries where breastfeeding was not practiced at all, or where children were weaned at very early ages.

It was noted above that with a new regulation in Iceland in the 1840s, medical reports changed their character. They became more informative on infant health and particularly on breastfeeding. The growing interest in infant health is also marked in several publications on the issue in Denmark and Iceland towards the mid-19th century. During this period important changes occurred in ideas about breastfeeding. The somewhat ambivalent attitude towards the benevolent effects of breastfeeding characteristic of earlier periods was more or less abandoned. Breastmilk was now considered to be best for babies — unreservedly! It is also of interest that books written on infant health also changed in the way they addressed the readers. Whereas books and articles during the 18th and early 19th centuries were mainly addressed to the enlightened male public, the target now became increasingly the mothers.

In 1846 a book for midwives written by the Danish physician Carl E. Levy was translated into Icelandic. After the publication of this book, the medical authorities asked Levy to write a book about child-care and breastfeeding for
Icelandic mothers. Levy's book received the title *Kortfattet Anviisning for unge Mødre til sundhedsmessig Forpleing af deres spøde Børn* (A short handbook for young mothers about the healthy treatment of their young children) and was meant as advisory literature for Icelandic mothers, above all on the subject of breastfeeding. In the foreword to the book he discussed the high infant mortality in Iceland and accounted for it by bad feeding habits. The intention was to translate his book into Icelandic and distribute it among childbearing women. Before this was done, however, the Icelandic *Landphysicus* Jón Thorstensen (1794—1855) came out with a book on infant care, called *Hugvækt um Medferd á unghornum* (Thoughts about the treatment of young children). Similar views on infant feeding appear in both books. Breastmilk is considered to be the best and most natural food for young infants and both physicians advise that the child is put to the breast immediately after birth. In contrast to their forerunners neither Levy nor Thorstensen recommend purifying liquids to clean the infants' intestines. They also recommended that infants be fed on demand. This also contradicted the views set out in earlier literature where it was strictly recommended that infants be fed according to a schedule.

It is not an easy task to estimate the real influence of books and booklets on infant feeding in a relatively poor society like the Icelandic one. Even if literacy rates were high and the possession of books more common in Icelandic households during the early 19th century, than was the case in many other societies, it is hard to believe that Thorstensen's advice had immediate effects on feeding practices. It is, however, important not to underestimate the impact of Thorstensen's book, at least not in the long run. The publication went hand in hand with increased interest in the issue of elementary education and in a growing number of physicians. They were responsible for the education of midwives, who in their turn were an important link to the local population. With increasing interest in the role of the midwives as health promoters, books on breastfeeding and other health related issues became increasingly important in the battle for better infant care. They were, however, changes that took quite a while to develop.

Jón Thorstensen served as *Landphysicus* in Iceland for almost forty years (1819—1855) and it was only towards the end of his career that he published his book on infant care. In the light of his interest in infant feeding displayed in his publications, it strikes one as odd how little interest he showed in the problem of infant feeding, in his reports to the *Collegium Medicum*. Thus he rarely discussed breastfeeding in his medical reports and he seemed not particularly interested in improving the education of midwives. The interest in breastfeeding seems mainly to relate to his academic interests. Jón Thorstensen does not seem to have had any practical solutions to the general problem of the absence of breastfeeding in Iceland. There are also a few factors that indicate that he was maybe not as certain about the indisputably beneficial effects of breastfeeding as suggested by the book he published towards the end of his career in 1846.

Thus, in 1834 he was the prime mover behind the publication of a revised manuscript that had been written by one of the first physicians in Iceland, Jón Pétursson (1733—1801) who served in the northern medical district during the
period 1775–1801. Despite the fact that Jón Thorstensen was one of those who revised the manuscript before it was published, several reservations are expressed about breastfeeding in the chapters on the treatment of infants.

I would argue that Thorstensen worked in the tradition of the Enlightenment period, where the ideas about breastfeeding were more of an abstract issue that was seriously debated among the learned classes but was hardly directed to the common public. In this sense his successor Jón Hjaltalin (1807–1882) represented the opposite case. He became Landphysicus after Thorstensen's death in 1855. He is not known in Icelandic history as a fighter for infant health. Hjaltalin has been described as an energetic individual with varied interests. He is best known for his engagement in other health problems, such as his controversial ideas about sheep disease (fjárklæði) during the 1850s and on hydrotherapy. Even though his publications include relatively little about the issue of young children and infants, his medical reports show that he was much more pragmatic in his standpoint on infant health than was the case with his forerunner and he evidently saw midwives as important actors in the fight against infant mortality. Thus, in his medical reports he explicitly affirmed that they were important in the promotion of breastfeeding and he initiated various changes in legislation concerning the education of midwives. During Hjaltalin's time in service, the education of midwives was also allocated to individual district physicians (1855) instead of being concentrated in Reykjavik and Copenhagen as in earlier times. This change can be seen as part of a general development leading to the allocation of control and responsibility in the field of public health to local administrative bodies.

![Figure 3.12. Number of women being admitted as midwife apprentices in Iceland, 1761–1905](source: Based on published biographies of Icelandic midwives. See: Jósmætur á Íslandi 1. Björg Einarsdóttir (ed.) (Reykjavik, 1984).)
This in turn implies that the individual physician could have an important bearing upon health policy in his district. Physicians were members of the Communal Councils (hreppsnefndir) and thus were an important authority when it came to decisions about, for example, the increase in the provision of midwives in their districts. An energetic physician with a keen interest in promoting breastfeeding had a good chance of achieving improvements.

Changes in the legislation concerning midwives had an important bearing upon the number of trained midwives in Iceland. This can be seen in Figure 3.12. There was a steady increase in the number of new midwives after 1855. The most notable increase occurred shortly after 1870. During the period 1876–1880, 46 women were trained as midwives as compared to 15 in the preceding period. The number of apprentices peaked in 1886–1890 when 69 women were trained. Thus the increase in the provision of midwives at the national level coincided approximately with the dramatic decline in infant mortality. In what ways did then midwives and other health workers affect infant survival? What ideas did contemporaries have about the responsibilities of midwives and what was their influence in individual districts?

**Midwives as health promoters**

The idea that midwives were central actors in the promotion of breastfeeding is not complicated. Midwives had direct contact with childbearing women and during the 19th century they, as a rule, remained with mothers for a few days after delivery. This doesn't, however, automatically signify that they would instruct women about breastfeeding. The medical literature of the 18th and early 19th centuries does not indicate that midwives were seen as the most obvious people to carry out this task. Before the first physician was appointed to Iceland in 1760, the midwife's task was first and foremost to offer emotional support to childbearing women. Parish ministers were to choose a faithful and goodhearted woman in the local community to assist women in delivery. One of the main concerns here was to instruct midwives about the sacrament of baptism, so that they could carry out an emergency baptism if infants were born weak and seemingly unlikely to survive the journey to the church. Prior to the 1760s, parish ministers were responsible for the choice of midwives and despite changes in legislation concerning their training and obligations, parish ministers continued to play a central role in the choice of midwives well into the 19th century.

In 1762, shortly after the appointment of the first physician in Iceland, the formal training of midwives was introduced. The analysis of the curriculum in the training program for midwives reveals that it was mainly directed towards obstetric care. There is no evidence that midwives were explicitly required to assist and instruct childbearing women about breastfeeding. None of the books written on infant health by the supporters of the Enlightenment discuss the possible role of midwives for infant health. In Sweden for instance this was different.
Already during the second part of the 18th century, the central authorities in Sweden started a campaign in favor of breastfeeding. Influenced by the mercantilist ideology, the 18th-century authorities were convinced that the country was underpopulated, and already in 1749 the Tabellkommissionen (the antecedent of the Central Bureau of Statistics) was founded. The clergy were required to keep annual records of vital events in all parishes, information that was collected by Tabellkommissionen. From the beginning Tabellkommissionen’s interests were directed towards mortality and statisticians were convinced that high levels of infant mortality were the main cause of the under-population (folkbrist) of the country. Thus, measures were undertaken to diminish infant mortality. Pamphlets on child-care and child diseases were printed and distributed in all parishes and physicians, midwives and priests were instructed in the advantages of breastfeeding. Medical workers, above all midwives, were seen as the key to changes in feeding practices. The Swedish authorities were highly pragmatic in their decision-making and as midwives had the best and the most direct access to childbearing women and had the ability to win the trust of local populations, they were seen as the most suitable protagonists for increased breastfeeding. Anders Brändström has shown that in some areas at least, actions launched by the central or local authorities to promote breastfeeding had an important bearing on the development of infant mortality rates. A midwife who gained the trust of the local population could, within a matter of only a few years, convince mothers to abandon artificial feeding and, as a result mortality fell dramatically.

In the light of this apparent choice by the Swedish medical authorities, it strikes one as somewhat odd that their Danish neighbors did not adopt the same measures to counteract high infant mortality and to promote breastfeeding in Iceland. It was thus not until the 1840s that the discussion as to the possibly positive influence of midwives on infant survival took place in Denmark and Iceland. In Sweden midwives had a relatively unique status compared to the other Nordic countries. Contrary to their Danish colleagues they were allowed to use sharp tools and not required to call for a physician in the case of complications occurring during delivery. It must also be borne in mind that, contrary to many areas in Sweden, breastfeeding was the common practice in Denmark. Danish physicians and other medical authorities were therefore normally not faced with the problem about who should teach mothers about the beneficial effects of breastfeeding. This does not, however, mean that Danish midwives did not offer important support to young mothers. Even if assistance and instructions about breastfeeding were not explicitly defined as their duty, it can be assumed that most of them had an important role when it came to guidance on breastfeeding. However, when it came to finding strategies to promote breastfeeding in a society that had largely abandoned the practice of putting newborns to the breast, the midwife was apparently not the most obvious choice.

In the matter of medical intervention in Vestmannaeyjar, the issue of infant feeding in Iceland was frequently discussed in the Collegium Medicum in Denmark. It was, however, by no means self-evident to the physicians on the Health Board.
who would be best suited to promote breastfeeding in Iceland. Initially midwives were by no means seen as potential combatants in this regard. Higher officials and parish ministers were far more likely to be regarded as the relevant authorities on the issue. This is obvious in a letter from the Royal Chancellery written to the District Governor (amtmáður) in western Iceland in 1803:

As it has been brought to the Chancellery's attention that as Icelandic children are generally not breastfed, but are reared on excessively fatty milk from animals, or with other provisions, that are prepared with unhygienic water from dirty puddles, infecting the children with all kinds of diseases, one would hereby most cordially request, Mr. District Governor, that you should, at the most opportune moment, ask your subordinate officials to caution the public about the harmful consequences of these bad habits and, moreover, to attempt to convince people to put an end to this behavior [my italics].

Important changes in ideas about how to promote breastfeeding occurred towards the mid-19th century. The increased involvement of Danish physicians in Vestmannaeyjar was no doubt an important development in this respect. It was shown above that the physician Haalland as early as 1843 proposed that a woman was sent to Copenhagen to study midwifery. In Haalland’s proposal, the midwife was to instruct mothers about breastfeeding. The physician Schleisner also explicitly claimed that one of the most important obligations of midwives was to instruct mothers about the importance of breastfeeding. In his view:

A midwife’s work must therefore first and foremost consist in (1) help in delivery, (2) care for the newborn child and (3) instruct the mother about breastfeeding.

I have discussed earlier the practice prevalent in Iceland of taking newborns to the church as early as the first day. It has been shown that frequently midwives took care of children in their own homes after the baptism. The prevailing tradition of taking newborns to the church was one of the main concerns of medical authorities in the Lutheran countries around the mid-19th century. In a letter from the Royal Chancellery in Denmark in 1847 it is stressed that baptism does not necessarily have to take place in the church, but could also be performed at home. Attempts to transfer baptism from the church to the home can without doubt be seen as an important aspect of secularization during the 19th century, with the physical health of newborns being accorded a more central place than previously when their spiritual well-being had been dominant. In this context it is of interest to see in what ways and to what extent the provision of midwives and other health workers affected infant survival in individual districts.
Individual midwives in different districts

If the assumption holds good that midwives were not seen as potential promoters of improvements in infant feeding practices until after 1840, it strikes one as paradoxical that Reykjavik, already in the early 19th century, had low infant mortality rates and a strong tradition of breastfeeding. How was it possible that such important improvements were brought about if there were no defined objectives as to how to promote changes in feeding practices in Reykjavik? How was it possible that Reykjavik produced infant mortality rates that were so much lower than was the case with other fishing villages in the immediate neighborhood? An interesting fact in this regard is that Reykjavik and the surrounding districts shared the same geographical hinterland. This is demonstrated in Table 3.9 that shows the place of birth of all women above the age of 21 living in Reykjavik and in the parish of Hvalsnes (Gullbringu- og Kjósarsýsla) in 1845.

In both areas around one third of the female population was born within the boundaries of the respective parishes and one quarter in other parishes of the county of Gullbringu- og Kjósarsýsla. Thirty per cent of all the women in Hvalsnes and 19 percent of Reykjavík's female population were born in various parishes in southern Iceland. Reykjavík had a slightly larger hinterland than Hvalsnes with a somewhat higher share of its population coming from more distant parts of the country. Furthermore, almost 4 per cent of all women living in Reykjavík in 1845 were born in Denmark. By and large, however, it can be seen that women in the two areas had very similar geographical backgrounds.

It is well known that midwives in Reykjavik were traditionally better educated than was the case with midwives in other parts of the country. They were without exception trained in Copenhagen. The mere fact that they were taught in a maternity hospital in a large city meant that they were able to practice extensively during their studies. This single fact does not, however, ensure that they would be successful in promoting breastfeeding (or be willing to do so) in an area where a majority of women were not inclined to do so. The example of Vestmannaeyjar, presented above (chapter 3.1) showed that the midwife Sólveig Pálsdóttir, who studied in Copenhagen and was sponsored by Danish authorities, was not at all successful in promoting breastfeeding in Vestmannaeyjar. The question is whether and why the priorities of midwives serving in Reykjavik differed from Sólveig's. Whether a midwife is successful in promoting breastfeeding is of course dependent upon various interrelated factors. Personal charisma, a certain perseverance and an ability to communicate and to gain the trust of the local population are factors of plausible importance. Who then were the women who became midwives in Reykjavík?
Table 3.9. Place of birth of all women aged 21 and older in Reykjavik and in Hvalnes 1845

<table>
<thead>
<tr>
<th>Place of birth</th>
<th>Reykjavik</th>
<th>Hvalnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reykjavik</td>
<td>33.1</td>
<td></td>
</tr>
<tr>
<td>Hvalnes</td>
<td></td>
<td>34.0</td>
</tr>
<tr>
<td>Other parishes in</td>
<td>25.1</td>
<td>25.1</td>
</tr>
<tr>
<td>Gullbringu- og Kjosarsysla</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southern Iceland</td>
<td>18.8</td>
<td>30.1</td>
</tr>
<tr>
<td>Western Iceland</td>
<td>10.2</td>
<td>4.7</td>
</tr>
<tr>
<td>Northern and Eastern Iceland</td>
<td>8.2</td>
<td>5.0</td>
</tr>
<tr>
<td>Denmark</td>
<td>3.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Not known</td>
<td>1.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Total</td>
<td>390</td>
<td>300</td>
</tr>
</tbody>
</table>


Unfortunately, the sources tell us little about the midwives' personality. Biographical evidence, however, does offer certain information on the midwives. The most striking feature in the case of Reykjavik is the fact that almost all midwives serving in Reykjavik during the period 1761–1850 were of Danish nationality. One of them was the first trained midwife to be appointed to Iceland in 1762. Her name was Margarethe K. J. B. Magnussen (1718–1805) and she served in Reykjavik for almost half a century, until her death in 1805. She had given birth to two daughters in Denmark before she took her exam in 1761, at the age of 43. She had met her Icelandic husband Benedikt Magnussen in Denmark where he trained to be a blacksmith. They moved to Reykjavik in 1761 and Margarethe's husband died only two years after their arrival in Iceland. Margarethe was succeeded by two other Danish midwives, Johanne Marie Jørgensdotter Wieszend Malmquist (born in 1763) and Sophie Larsen Hansen (born in 1801). Malmquist served in Reykjavik from 1803–1812. She had been married in Denmark before she came to Iceland, but nothing is known about her family. The other midwife, Hansen was married to the tailor Ivar Hansen and she had given birth to two children when she was accepted at the maternity hospital. The family came to Iceland in 1839. She served in Reykjavik until 1848.

In Denmark infants were as a rule breastfed and therefore these women brought with them a long-standing tradition of putting newborns to the breast. This does not, however, mean that they were able to convince mothers to breastfeed in a society where infants were either not at all breastfed or were given cow's milk and solid food at very early ages. One of the obstacles Danish midwives had to face was the problem of language. Even if Danish and Icelandic are closely related it must have been a severe handicap for Danish women not to be able to communicate with childbearing women in their own mother tongue.

The question is, however, whether it was a certain advantage not to belong to the local population. At first sight this seems quite contradictory. Wasn't a foreign woman who attempted to change the innate behavior of the local po-
population likely to be met with suspicion? Or could a strong-minded individual with warmth and a positive attitude surmount this obstacle? Perhaps, a foreign midwife with such personal qualities was more likely to be successful than a relatively young woman from the local population who tried to introduce new ideas to get often experienced mothers to change long-standing traditions.

There is, however, a more crucial element in the mosaic of interrelated factors that ensured the successful implementation of breastfeeding in Reykjavík. The main prerequisite for being admitted to the educational program for midwives in the Nordic countries during the 18th and early 19th centuries was that apprentices ought to be married and to have previously given birth. An examination of the life-histories of Icelandic midwives shows that until the mid-19th century, they were almost without exception, married when they underwent their midwifery training. All the Danish midwives that served in Reykjavík during the late 18th and early 19th centuries were married and had given birth in Denmark before they came to Iceland. The mere fact that they themselves had experienced childbirth in a country where infants were put to the breast was probably an important prerequisite to being able to pass on the practice of breastfeeding to others. In this way, the Danish midwives serving in Reykjavík had an important advantage compared to their Icelandic counterparts who might have wanted to promote breastfeeding but had never experienced how to pass the practice on to other women. Sóliceig Pálsdóttir who was sent to Copenhagen from the island of Vestmannaeyjar is an example of a woman who learned her midwifery in Copenhagen in the early 1840s. She was also one of the very few examples of women who were accepted into the educational program at the maternity hospital in Copenhagen without having had any children herself. (Because of the severity of the situation in Vestmannaeyjar an exemption was made in her case). This, and the fact that she grew up in a society where infants were hardly ever put to the breast, was an important factor in explaining why breastfeeding did not gain popularity on Vestmannaeyjar after Sóliceig's arrival from Copenhagen in 1843. But let us now have a further look at the implications of midwifery for the two rural districts, Rangárvallasýsla and Þingeyjarsýslur.

It was shown above that the two rural counties presented in this study, Rangár-vallasýsla and Þingeyjarsýsla displayed extreme differences both in the level and the development of infant mortality. Rangárvallasýsla was characterized by high infant mortality and mothers in this country continued to feed young infants artificially longer than was the case in most other areas in Iceland. Þingeyjarsýslur presents the opposite case. Infant mortality in this county had already dropped to a relatively low level as early as 1850. What part did individual midwives and physicians play in this development? Who were the physicians and midwives who served in these counties? What was their relationship with the local population? Do differences in literacy rates explain differences in infant mortality rates and the incentive to abandon the prevailing practice of artificially feeding infants?
The high mortality area of Rangárvallasýsla was by no means worse off when it came to medical provision than many other districts in the 19th century. The county was part of the southern medical district and physicians serving in the district usually lived in Rangárvallasýsla. Moreover, the island of Vestmannaeyjar had been de facto a separate medical district since the 1820s. There were thus two physicians serving within the boundaries of the county for most of the 19th century.

Sveinn Pálsson (1762–1840) served in Rangárvallasýsla during the period 1799 to 1834. He was the physician who played an important role in the battle against neonatal tetanus in Vestmannaeyjar at the turn of the 19th century. In his reports to the Collegium Medicum, he observed the prevailing tradition of handfeeding newborns. In his view high mortality in the area was mainly to be explained by the unfortunate feeding of infants. Sveinn’s successor Skúli Thorarsen (1805–1872) was appointed to the district in 1834 and served there until 1869. Two midwives had been trained in Rangárvallasýsla during the 1820s and 1830s by the old Landphysicus and they served until the 1860s. After Skúli was appointed to the area, he trained one midwife who worked in Rangárvallasýsla.

Medical reports Skúli sent to the medical authorities in Reykjavík do not suggest that he had any ambition to promote breastfeeding in the area. Despite the fact that regulations required that district physicians reported on the health of young children and childbearing women, Skúli never mentioned the issue of breastfeeding in any of his reports. His reporting of midwives only includes lists of them and he never described how their training was carried out in practice. It is also an interesting fact that no woman is sent to Reykjavík to study midwifery during Skúli’s time in service. In Þingeyjarsýslur in the north the situation was utterly different.

The district physician Jón Finsen (1826–1885), whose father was an Icelander and mother a Dane, had been serving in the northern medical district (where Þingeyjarsýslur is situated) for three years in 1858 when he observed that mortality among infants and small children was relatively low in the district. Furthermore, he maintained that breastfeeding was quite common in the area. Low neonatal mortality in Þingeyjarsýslur support this statement (see Figure 3.5). Finsen showed great interest in the well-being of small infants and he discussed feeding practices and infant care in all his reports. When he came to the district four educated midwives were in service there. Three of those served in Þingeyjarsýslur.

On his arrival Finsen started training women for midwifery and in his first report he mentions that he is teaching three. Finsen’s reports reflect his confidence in the midwives of his district and on several occasions he mentioned their devotion and hard work. In 1862, he pointed out in his medical report to the Landphysicus that midwives in his district totaled 11 and that by 1864 the number had grown to 20. He himself had taught 16 midwives and two of them were
serving in other districts. Seven new midwives got a position in Óingeyjarsýslur during the 1850s and 1860s. In 1870, more than half of the parishes, however, were without a midwife who had been instructed by a physician.

Finsen offered a detailed description of the educational program he developed. He resided in the town of Akureyri which is situated in the county of Eyjafjarðarsýsla (Eyjafjarðarsýsla is the neighboring county to Óingeyjarsýslur). The midwife apprentices moved to Akureyri during their studies and got their practical training by accompanying the town midwife to childbearing women. Such a training would not have been possible in the sparsely populated area in southern Iceland.

Another interesting feature is revealed when scrutinizing midwives' education in this sparsely populated agrarian district in Iceland. Four of the midwives serving in the district had had their education in Copenhagen during the years 1845—1859. Beside the capital of Reykjavík no other district in the country sent more than one woman to Copenhagen during this period. In many other respects this county is an interesting example of a community with high a level of literacy and a remarkable interest in establishing reading societies that distributed books around the district.

Loftur Guttormsson has, in his study on regional differences in literacy rates shown that already during the 18th century, the county of Óingeyjarsýslur displayed higher ones than did other parts of the country. According to the catechetical registers, only 14 per cent of youth was reported to be illiterate in this part of the country in 1749. The southern part of the country had much lower literacy rates. But in what ways could literacy have contributed to the differences in infant mortality? Or more specifically, how did literacy work in favor of improved survival? The last section of this chapter of the study contains thoughts on this important issue.

The impact of literacy upon survival

It has been noted earlier in this study that popular literacy in the Nordic Lutheran states was high in a European perspective and with the Pietist reformation, during the late 18th century, reading skills improved greatly. The literacy campaigns launched in the Nordic countries had remarkable effects in improving literacy rates. A study in two parishes of Iceland has shown that those inhabitants involved in the campaigns (15—19 years old) revealed much better reading skills than did the older section of society who had not been involved in the literacy campaigns. In Iceland, however, no public schools were established and education remained in the hands of parents under the supervision of parish ministers until around 1870 when the number of schools increased rapidly.

The obvious association between literacy rates and infant survival is not easy to see. Initially literacy was primarily for religious purposes. In a society where reading is almost exclusively related to the reading of religious texts, literacy per se is not likely to have had much impact upon survival. Another problem relates to the issue of prevailing knowledge. If knowledge about how to improve
health is not available, reading would hardly have an impact upon survival. For the USA, Samuel Preston and Michael Haines have argued that until the very late 19th century, high infant mortality in all social groups is mainly to be explained by the fact that knowledge about how to improve survival was non-existent. In the Icelandic case, where breastfeeding obviously was the main precondition for better survival, it may be argued that the beneficial effects of breastfeeding were relatively widely acknowledged.

Unfortunately, despite relatively unique source material (especially in Sweden and in Iceland) little has been written in the Nordic Lutheran context about the effects of literacy rates upon infant survival. A recent study carried out on several parishes in the Sundsvall and Skellefteå region in northern Sweden shows that there was no association of parental literacy and survival. In the second part of the 19th century, literacy started to matter, but only in the urban setting.

Literacy rates in Sweden and in Iceland are comparable. In both countries literacy rates were high by European standards already in the late 18th century. Then, however, reading was chiefly religious. It must also be noted that reading and writing were two separate skills during most of the 19th century. François Furet and Jacques Ozouf have in their book on literacy in France also shown that this division between reading and writing prevailed there too until the late 19th century. They argue that only those who were both able to write and read were fully literate and maintain that during the second part of the 19th century there was a clear development from restricted literacy to mass literacy, when the writing skill became more and more common in French society.

In Iceland the interest in popular writing as a supplementary skill to reading was relatively keen already during the early 19th century. This interest can be seen in a study carried out by the Icelandic literary society (Híð íslenska bókmenntafélaga) in Copenhagen. In 1838 this society sent a questionnaire to all parish ministers in Iceland calling for a detailed description of their parishes. During subsequent years, lists were returned from the majority of parish ministers.

These lists, Sýslu and söknarsysningar, contain detailed descriptions of various social, economic and cultural factors. One of the subjects concerned writing skills. The inquiry did not include any questions about reading skills, which implies that by that time it was taken for granted that most adults could read. Writing was, on the other hand, a less self-evident skill. Parish ministers were requested to report on the number of people who could write and furthermore, if possible, give a detailed report on the age and sex of those who could not. It is an interesting fact that the authors of the questionnaire were especially interested in information on those who could NOT write and not vice versa. To what extent did they perceive the inability to write as a problem that was to be dealt with, even in the case of women?

An analysis of the reports from the parish ministers in the research areas reveals that information on writing abilities was highly subjective. The general impression is that there was an increasing interest in teaching young men to write whilst several parish ministers note that the interest in teaching young women to
write was by no means as strong. It is frequently noted that writing skills amongst young people were better than amongst the elderly. The status of writing skills appears to have been poorest amongst elderly women.\(^{139}\) Only two parish ministers, one in each of the two rural counties, sent in detailed information on the number of men and women in different age groups who could not write.

Let us now take a closer look at differences in the writing abilities in the two parishes. Table 3.10 indicates that the pattern of literacy rates reported for the mid-18th century still prevailed. Thus, 53 per cent of the inhabitants of the northern parish in Óingeyjarsýslur could write, whereas the same was true for only 21 per cent of the inhabitants in the southern parish in Rangárvallasýsla. Unfortunately it is not stated how many of those who could write were women, but as the information of those who could not write is broken down according to age and sex, the share of women who could write can be derived from the figures. Thus, it appears that the share of women able to write in Óingeyjarsýslur (north) was about as high as the share of men. In the southern district of Rangárvallasýsla on the other hand, 62 per cent of those who could not write were women. In the youngest age groups the share of women who could not write was almost equally high, with 60 per cent of those who could not write in the ages below 20 being women.

<table>
<thead>
<tr>
<th>Northern district</th>
<th>Southern district</th>
</tr>
</thead>
<tbody>
<tr>
<td>Óingeyjarsýslur</td>
<td>Rangárvallasýsla</td>
</tr>
<tr>
<td>(Svalbarð)</td>
<td>(Eyvindarhólar, Steinar, Skógar)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th>%</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 10 years</td>
<td>40</td>
<td>41</td>
<td>81</td>
<td>49.4</td>
<td>46</td>
<td>66</td>
<td>112</td>
<td>47.5</td>
</tr>
<tr>
<td>10-20 years</td>
<td>13</td>
<td>10</td>
<td>23</td>
<td>50.0</td>
<td>24</td>
<td>37</td>
<td>61</td>
<td>47.5</td>
</tr>
<tr>
<td>20-30 years</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>62.5</td>
<td>17</td>
<td>16</td>
<td>33</td>
<td>50.0</td>
</tr>
<tr>
<td>More than 30 years</td>
<td>20</td>
<td>27</td>
<td>47</td>
<td>44.7</td>
<td>36</td>
<td>83</td>
<td>123</td>
<td>38.0</td>
</tr>
</tbody>
</table>

| Not able to write, total | 76  | 84   | 160  | 47.5 | 123  | 202  | 325  | 79.3 |
| Able to write, total     | 177 | 52.5 | 85   | 20.7 |

| Total                  | 337 | 410  |

Information on writing skills is of course highly subjective and it appears that ideas and definitions on "writing abilities" differed greatly between parish ministers. A few parish ministers seem to define writing as the ability to sign one's name. From the Sýslu- og sóknarlýsingar, however, it is obvious that most parish ministers defined writing skills much more rigorously and required a relatively sound knowledge of the art of writing from those they chose to describe as "being able to write". Thus, an interesting remark about the writing skills of the parishioners in Höfði in Æingeyjarsýslur is made by the parish minister Jón Jónsson:

Among the men, only five farmers are more or less able to write, and young men in a similar manner in the whole parish, and even if some women and girls scribble notes for each other, one can hardly describe that as being able to write.  

Even though Jón Jónsson did not think highly of the scribbling of the girls and women in his parish, his statement shows that there were at least a number of women there who wrote letters to each other. It also indicates that literacy was certainly a secular occurrence and by no means restricted to the reading of religious texts. What implications could this have on infant survival?

Although there is a general consensus among scholars on the importance of literacy, particularly female literacy, for infant survival in modern Third World societies, it is by no means clear in what ways literacy works in favor of infant health survival. It has been suggested that education works in favor of female autonomy and diminishes fatalistic ideas towards life and death. Literate women are thus, for example, more likely than illiterate women to consult health workers if their children fall ill. What implications could differences in the ability of women to write have in the two rural areas presented above? The fact that literacy rates were higher in Æingeyjarsýslur during the late 18th century and the ability to write more pronounced as early as the 1830s is also a sign of the general will to ameliorate social conditions. In line with experiences in the Third World today one might assume that literate parents were more likely to be willing to make changes in their lifestyles and traditions. This would include the motivation to start breastfeeding. The fact that midwives were sent from this area to study in Copenhagen indicates that there was an interest in the local communities in Æingeyjarsýslur to promote changes.

In societies where breastfeeding was uncommon, skillful midwives were of key importance. They did not, however, exist in a vacuum. A good midwife with a keen interest in promoting breastfeeding was not likely to be successful if there wasn't an interest in the local community in changing practices. Such interest was likely to be greater in a community with a high proportion of literate women.

It was noted earlier that secularization trends in Icelandic society started after the mid 19th century (see discussion in chapter 1.4). One aspect of these trends was the growing interest in public education. This developed during the 19th century and resulted in new legislation in 1879 making it compulsory for all
children to be taught to write and be given the basic skills in arithmetic. Even though the education of children in agrarian areas remained largely in the hands of the households and the clergy, this period was marked by an increased interest in establishing schools in towns and villages and when the first law on compulsory schooling was introduced in 1907, more than 90 per cent of all children in the towns regularly attended permanent schools.

As in other European societies education levels among the popular classes and in particular among women improved greatly after the mid-19th century. Enrolment figures at the Public school of Reykjavik show that the interest in the education of women increased notably during this period. From the establishment of the primary school in 1862 until 1880, girls accounted for only a third of the pupils. Within only a few years during the early 1880s, the proportion of girls increased and from 1885 the number of girls and boys was approximately equal.

Changes that occurred in Iceland during the second half of the 19th century cannot be measured in a growing national product nor major changes in the social structure. A trend toward a secular literacy, increasing literacy rates, publication of books on infant health that were directed to mothers, together with the growing interest in the education of midwives created preconditions for the better survival chances for infants. All these changes could in various ways have promoted increased survival of infants. The high literacy rates are likely to have been a contributory factor in the steep infant mortality decline in Iceland. This fact ensured the availability of well-educated midwives and it created preconditions for change in mentalité where parents were willing to change traditional behavior.

The changes that occurred during the initial stages of the mortality decline were by no means costly. Above all, they required changes in attitudes, changes that took place in Iceland, relatively fast, during the second part of the 19th century. These changes occurred early in Reykjavik, where midwives were better educated than in other parts of the country. Important changes at an early date are, however, also perceived in agrarian areas as in the case of Óingeyjarsyslur. A pattern where the diffusion of ideas spread from the urban setting to the rural areas is therefore by no means the general rule in Iceland. The urban environment did, however, have several advantages over the rural setting. This was especially true for Reykjavik where physicians were numerous and midwives had a better education than in most other parts of the country. Those individuals were also near at hand for the inhabitants of the towns.

But there are other aspects of the urban environment that might have helped to create differences in feeding practices and infant mortality rates between towns, other fishing districts and rural areas. The social stratification of the towns was much more differentiated than was the case both with the rural areas and the fishing districts. This was especially true in the case of Reykjavik. Reykjavik was not only a small fishing village, like the surrounding coastal districts, it was also the administrative centre of this sparsely populated island at the edge of the
Danish kingdom. It is thus well known that a considerably larger proportion of the population in Reykjavík consisted of high crown officials than was the case with other places in Iceland. What implications did this have for infant survival? Were low mortality rates in Reykjavík in part the function of the relatively high share of infants belonging to the upper classes? What impact did rapidly increasing proletarianization and an increasing proportion of infants born out of wedlock have on infant mortality levels?

The next chapter deals with the impact of social factors upon infant mortality in urban areas during the 19th and early 20th centuries. The first section focuses upon the impact of nationality and social class upon neonatal mortality in the island of Vestmannaeyjar, where neonatal mortality from tetanus fell sharply towards the mid 19th century (see chapter 3.1). In the second section I discuss the impact of social class in Reykjavík. The main objective of this section is to answer the question: to what extent the relatively low infant mortality rates in Reykjavík in the early 19th century can be explained by the relatively high proportion of parents belonging to the upper strata of society.

3.4. SOCIAL INEQUALITIES IN DEATH

On the classification into social groups. Methodological problems

The examination of social class in the Icelandic past poses several problems. This is especially true of the agrarian setting. Thus, national censuses and church registers offer very imprecise information on the socio-economic position of individuals. Almost all heads of households got the occupational title bóndi (farmer) or even husbóndi (meaning literally head of household). It can be assumed that the "labels" given in the sources do not describe occupation but rather some other type of social ranking. In traditional Icelandic society, social, economic and political status was mainly determined by household position. Thus, heading a household in the traditional society was the main criterion of independence. The sources do not necessarily distinguish between landowning farmers (sjálf-seignarðendur) and poor tenant farmers (leigulíkar). A study of social stratification in the rural setting on the basis of censuses and church records is therefore more or less meaningless. Even in fishing districts, where there is no doubt that the majority of household heads derived their livelihood from the fisheries, there was a tendency to classify heads as "farmers" or "farmers living from animal husbandry and fisheries."

This type of categorization came to an end towards the end of the 19th century and eventually a more diversified classification system was introduced, a system where the actual occupation of an individual determined the choice of title. However, contrary to most other places, a relatively elaborate classification system was introduced in Reykjavík as early as the 1820s. Therefore a detailed
analysis of infant mortality in relation to social class can be carried out for Reykjavik. In the case of Vestmannaeyjar, however, I use a very simple classification system. All individuals with Danish names are put into one category and all, as a matter of fact, can be seen to belong to the middle or upper class. Icelanders are put into two groups, one called middle/upper class with all others lumped together in a second group of lower social strata. Those who are put into the middle class group are either crown officials, or are merchants or craftsmen. In the group of “others” I lump together fishermen, farmers and those who have no occupational title.

In the study of Vestmannaeyjar, the illegitimacy ratio was low and no separate analysis is made for this group. In the case of Reykjavik, however, I treat illegitimate mortality separately. All illegitimate children are then gathered together into one category irrespective of their parents’ occupation. Because of the inclination to give no occupational title to women, whether or not they were married, the analysis of the group of illegitimate children is relatively difficult. However, as the names of the fathers of illegitimate children are almost, without exception, given in the Icelandic birth registers, it may be possible to discuss the implications of illegitimacy in the past. But let us now have a look at the meaning of social class and nationality for infant survival in the high mortality area of Vestmannaeyjar.

*Differences in infant mortality between families. The impact of parents’ nationality and social class in the island of Vestmannaeyjar*

High neonatal mortality from tetanus on the island of Vestmannaeyjar was discussed above (see chapter 3.1). Physicians serving in Vestmannaeyjar frequently raised the issue of nationality in their reports on neonatal tetanus. They noted that infants in Danish families were better protected against neonatal tetanus than infants of Icelandic origin. The physicians attributed differences between Icelandic and Danish infants to more appropriate diet, healthier housing and better general hygiene in Danish households. In their attempt to find remedies against the high mortality rates in Vestmannaeyjar the life style of the Danes was frequently seen as an example of how to avoid the consequences of a fatal disease. In the analysis below, mortality rates in the three social groups are shown for the period before and after the decline in neonatal tetanus mortality. It was shown above that there was a clear turning point in 1846 when the Danish physician Schleisner came to the island. Thus, between 1846 and 1847, neonatal mortality dropped by more than 50 per cent. To see if the decline in neonatal mortality affected the various social groups in different ways, Table 3.11 compares neonatal mortality in the three social groups before and after 1847.
Table 3.11. Neonatal mortality in Vestmannaeyjar in relation to parents' nationality and social class, 1816–1863

<table>
<thead>
<tr>
<th></th>
<th>1816-1846</th>
<th></th>
<th>1847-1863</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Neonatal mortality</td>
<td>Number of births</td>
<td>Neonatal mortality</td>
<td>Number of births</td>
</tr>
<tr>
<td>One or both parents of</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Danish nationality</td>
<td>333.3</td>
<td>42</td>
<td>0.0</td>
<td>21</td>
</tr>
<tr>
<td>Middle class Icelandic</td>
<td>621.6</td>
<td>37</td>
<td>192.3</td>
<td>52</td>
</tr>
<tr>
<td>Other Icelanders</td>
<td>736.1</td>
<td>486</td>
<td>295.1</td>
<td>308</td>
</tr>
<tr>
<td>Total number of births</td>
<td>565</td>
<td></td>
<td>371</td>
<td></td>
</tr>
</tbody>
</table>

Sources: See Table 3.1 and *Manntal á Íslandi 1845. Suöuramt* (Reykjavik, 1982), pp. 203–13.

When scrutinizing the information in the birth records, it appears that Danish merchants in Vestmannaeyjar were most often married to Icelandic women. Presuming that infants as a rule were cared for by their mothers, infant mortality in the mixed families should not be different from infant mortality in middle class families of Icelandic origin. Interestingly enough, however, there are important differences in neonatal mortality between the two groups. Table 3.11 shows that during the first period, infants where one or both parents were of Danish origin displayed neonatal mortality rates of 333 per 1,000 live births. Although this was a relatively high rate, it was only half that displayed by their counterparts in the Icelandic middle class families (622 per 1,000). Neonatal mortality of children belonging to the lower strata of society (farmers, fishermen, crofters) in Vestmannaeyjar was as high as 736 per 1,000 during this period.

After the transition towards lower neonatal mortality rates, improvements are seen to have been made by all groups. The most notable improvements were made in the upper social layer, both among infants of Danish and Icelandic origin. None of the 21 Danish children born in the island during this period died during the neonatal period. Neonatal mortality among Icelandic middle class infants had dropped to 192 per 1,000 and to 295 among those of the Icelandic lower class.

But how were individual families affected? International research on the distribution of infant mortality between families has shown that even in areas with extreme levels of infant mortality, a relatively large proportion of families tended to remain unaffected, i.e. lost none of their children. The analysis below focuses on neonatal mortality in individual families. Families are placed in four categories according to their neonatal mortality rates. To allow meaningful analysis, only families with four children or more are included in this part of the study. The analysis is done separately for families where the eldest child is born before 1841 (56 families) and for those where the first child was born after 1840 (42 families).
Table 3.12 shows that almost all families were severely hit by the appalling tetanus disease during the period 1816—1840. Only five families of 56 belonged to the low mortality category and lost none or few of their children during the neonatal period (none or one in the case of families with four to eight children, two in the case of more children than eight). Three of these families were of Danish origin; one was Icelandic belonging to the middle class. Half of all the families belonged to the "extremely high mortality category" and lost more than three quarters of all their children during the neonatal period. Another 36 per cent lost more than half of their children (high mortality category).

The reverse trend appears during the second period. Only one family belonged to the extremely high category and slightly above 45 per cent of all families were placed in the lowest category. The rest of the families were evenly distributed between the two other categories “relatively low” and “relatively high”. Apparently, quite a large number of families managed to avoid the disease completely, whereas only a few families lost quite a high proportion of their children to tetanus. Infants of Danish origin had a better chance of surviving than had the others and Icelandic middle class families were also more likely to have more surviving children after the first month.

<table>
<thead>
<tr>
<th>First child born between 1816 and 1840</th>
<th>First child born after 1840</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of children</td>
<td>Percentage of all families</td>
</tr>
<tr>
<td>Extremely high neonatal mortality*</td>
<td>28</td>
</tr>
<tr>
<td>High neonatal mortality levels**</td>
<td>20</td>
</tr>
<tr>
<td>Relatively low neonatal mortality levels***</td>
<td>3</td>
</tr>
<tr>
<td>Low neonatal mortality levels****</td>
<td>5</td>
</tr>
<tr>
<td>Total number of children</td>
<td>56</td>
</tr>
</tbody>
</table>

Note: * 3 out of 4 children or more die during the 1st month
** between half and up to 3 out of 4 children die during the 1st month
*** 1 to 2 out of 4 or less die during the 1st month
**** less than 1 out of 4 children die during the 1st month

Sources: See Table 3.1.
Apparently, when protection against the disease became more effective, inequalities between families became more apparent. Families of good economic means, living in better houses were then most likely to be able to implement practices that were likely to prevent their newborn from catching the disease. Parents living in poor housing had fewer possibilities to put into practice hygienic measures that would effectively prevent their newborns from catching the disease. Another important aspect of the increasing gap in neonatal mortality between social groups is the possibility of growing differences in feeding practices between them. Extremely low neonatal mortality rates among Danes after the tetanus disease was effectively defeated certainly indicates that the Danes were more likely to breastfeed than was the case with Icelanders.

Even though Vestmannaeyjar presents an extreme case both in the European and the Icelandic context, the pattern of decline is comparable to that of many other societies. Thus, several studies have shown that the upper classes tend to benefit earlier from improvements than is the case with the lower strata of society. They are better able to implement knowledge about how to avoid diseases than can the lower classes. Another factor that might be of importance in this context is that women in the upper classes were able to introduce breastfeeding and remove other kinds of food from their children’s diet, more easily than could women in the lower classes. Many women from the lower strata, married or not, worked in the fishing for part time of the year and were not able to allocate their time in the same manner as women from the higher strata. This could, during a period of rapidly declining infant mortality rates, create sharper differences in mortality between social groups.

But how was the social pattern of infant mortality and infant mortality decline in Reykjavik? As regards infant mortality levels, the situation in Reykjavik and Vestmannaeyjar could not be more different. As noted earlier Reykjavik displayed lower levels than most other areas in Iceland, whereas Vestmannaeyjar displayed the opposite.

**Social class and infant mortality in an urban setting.**

**The case of Reykjavik.**

In this part of the study birth and death registers are used to shed light on the importance of social background for infant survival. Social class of father at the time of birth is used in the analysis. The population is divided into six social groups, (1) High strata, (2) merchants, (3) craftsmen, (4) farmers, (5) fishermen and (6) illegitimate. To the high strata belong chiefly crown officials, who were both of Icelandic and Danish nationality. The group of merchants includes all individuals that were involved in mercantile activity, irrespective of their position within the industry. The groups of craftsmen or artisans need no further explanation, whereas the groups farmers and fishermen are more complex
categories. As noted earlier in this part, farmers in the densely populated fishing areas often derived their livelihood mainly from the fisheries. This was evidently the case with farmers in Reykjavik as well. This can be seen in the fact that household members, often sons or servants, in the households of farmers, are frequently said to work within the fisheries. It is likely that those heads with the occupation title farmer in the records owned their farm or at least had animal husbandry as a main occupation. On the other hand, those who are said to be fishermen (sjómen) or cottars (purraðarmenn) or lodgers (búsmenn) were likely to derive their livelihood chiefly from the fisheries. Agricultural activities for those individuals would be of relatively minor importance. As a matter of fact the term purraðarmenn signifies a “man sitting in a dry house”, i.e. a man without access to milk.

In Reykjavik, the social status of a father is given in both birth and death records during the period from 1820 until the late 1840s and again between the 1850s and the early 1870s. During the period 1875–1900 the social status of the father is only infrequently noted. Again, shortly after the turn of the 20th century parish ministers start to note down the occupational status of fathers in the birth records. The time periods chosen here are largely based on the availability of source-material. However, the time periods available for the study of infant mortality are not inappropriate for the purpose of studying changes in infant mortality levels between eras with respectively high and low mortality levels. During the first period, 1820–1840, infant mortality in Reykjavik was still at a relatively high level, whereas the decline had started during the second period. In the end of this section an analysis of the infant mortality levels in the early 20th century is presented for comparative purposes.

Table 3.13. Distribution of births in Reykjavik according to social groups, 1821–1840 and 1851–1875 (%)

<table>
<thead>
<tr>
<th>Social Group</th>
<th>1821–1840 (733 births)</th>
<th>1851–1875 (1,715 births)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High strata/crown officials</td>
<td>8.2</td>
<td>6.8</td>
</tr>
<tr>
<td>Merchants</td>
<td>9.5</td>
<td>11.1</td>
</tr>
<tr>
<td>Craftsmen</td>
<td>10.2</td>
<td>7.5</td>
</tr>
<tr>
<td>Farmers</td>
<td>14.9</td>
<td>10.0</td>
</tr>
<tr>
<td>Fishermen/daylaborers/cottars</td>
<td>24.6</td>
<td>33.0</td>
</tr>
<tr>
<td>Illegitimate</td>
<td>15.0</td>
<td>17.4</td>
</tr>
<tr>
<td>None</td>
<td>17.6</td>
<td>14.3</td>
</tr>
</tbody>
</table>

Table 3.13 gives a good indication of the occupational structure in Reykjavík during the two time periods 1821-1840 and 1851-1875. Unfortunately, a rather large proportion of fathers have no occupational title, almost 18 per cent during the first period and 14 per cent during the second. It is difficult to estimate whether those who do not have an occupational title are representative of the sample as a whole or whether there is a bias in the results. Most likely, however, the fathers not receiving an occupational title in the sources belong to the lower strata of society. The likelihood that they belong to the highest strata of society is small as such persons are most often addressed by their title.

There seems not to be a significant change in the occupational structure in the capital between the two periods. There is an increase in the proportion of infants born out of wedlock, an increase that is in line with the increase in the Icelandic population as a whole. The illegitimacy ratio was 15 per cent during the first period compared to slightly more than 17 in the second. During both periods the illegitimacy ratio in Iceland as a whole was around 15. The most notable increase occurs within the group of unskilled laborers (fishermen and day labourers): their share increased from 25 to 33 per cent. The share of farmers declined from 15 to 10 per cent. Changes in other groups are of little importance.

Despite relatively pronounced population growth during this period, Reykjavík remained a small village and agricultural activities within it remained of importance during the period in question. However, the increase in the group of children to fishermen and to unmarried mothers indicates that there was a trend towards increased proletarianization during the period in question.

Infant mortality in the six social groups is shown in Figure 3.13. During the first period, the overall infant mortality rate in Reykjavík was slightly above 200 per 1,000 (compared to more than 300 at the national level). The findings by no means indicate that good socio-economic circumstances means a better survival rate for infants. On the contrary, children who belonged to the higher social strata either displayed infant mortality rates somewhat above or just at the mean level. Lowest infant mortality rates were found among the children of fishermen and day labourers. With infant mortality rates of 255 per 1,000, illegitimate infants ranged around 20 per above the mean level in Reykjavík at the time.

The relatively high mortality levels among infants belonging to parents in the higher social strata is somewhat perplexing. The three highest social groups were not only generally characterized by better economic means than the others, but also by the fact that several of those families were of Danish origin. One would therefore, as was the case in Vestmannaeyjar, have expected comparatively low infant mortality rates in these groups. In this light it strikes one as somewhat surprising that this group had infant mortality rates that were higher than the group fishermen and day labourers. A part of the explanation may lie in communications, in particular with visitors from foreign countries. Because of Iceland’s relation with Denmark, families from the highest strata were likely to communicate extensively with people arriving from foreign countries. Epidemics from abroad would, thus probably spread easily in the higher classes. This is
likely to have been the case with some epidemics. It must, however, be borne in mind that epidemics in Iceland frequently reached all areas in the country within a year, and it is therefore relatively improbable that one social class would have better protected than others (see chapter 2.2). More research is needed to shed light on this issue. Above it would be of interest to see if there were differences in infant mortality between Danes and Icelanders in the upper social layers.

During this period farmers displayed by far the highest infant mortality rates. With infant mortality of slightly more than 300 per 1,000, this relatively favoured group revealed a rate that was almost double that of the landless and 20 per cent higher than among the illegitimates.

The most plausible explanation for these somewhat contradictory results is that women belonging to the working classes were more likely to breastfeed their babies than those in the upper strata, partly because they had poor access to fresh milk. Then, breastfeeding became the optimal food for the infant. The favourable situation among babies in Reykjavík is a further proof for the high levels of breastfeeding rates in the capital, reported by several physicians during the early 19th century. It is a further indication that midwives had good contact with childbearing women in Reykjavík and were able to convince mothers from the lower social strata to breastfeed (see chapter 3.3).

The comparatively high levels of infant mortality among the upper classes might, at least in part, rely upon the ready access to cow's milk. Most or all individuals with the occupational title "farmer", possessed a cow and thus had good access to fresh milk. Families belonging to the upper classes were also likely to be in this position. Thus, a study from the town of Seyðisfjörður revea-

![Figure 3.13. Infant mortality in five social groups and among illegitimate children in Reykjavík, 1821–1840 and 1851–1875](image)
led that families belonging to the middle class generally possessed a cow. It was also shown that with improving economic conditions towards the end of the 19th century, the number of cattle per household increased. Despite the increasing importance of wage earning, the economy was still partly household based and with poor communications, it was of importance to have good access to fresh food products. However this, in its turn, could create differences in priorities when it came to choosing the type of food for infants. Whereas fishermen's wives were likely to choose to breastfeed, the other groups had alternatives ready to hand and could choose to preserve the old Icelandic tradition of artificial feeding.

The results presented above are in accordance with those in several other studies, especially in Sweden, that show that infant mortality rates sometimes were lower among the poor than among the higher strata of society. As in several Swedish and Danish studies farmers are shown to have higher infant mortality rates than other social groups during the pre-transitional period. Other studies in urban areas during the pre-transitional period have sometimes revealed lower mortality among the urban poor than among the higher social strata.

The relatively low infant mortality rates among illegitimate children are perhaps the least expected results in this analysis. Whereas wives of fishermen and day-labourers were likely to be able to breastfeed, it seems somewhat perplexing that single mothers could do so in a social system before child allowances. It has, however, been shown earlier that infant mortality among illegitimate babies was not as high in Iceland as in many other pre-transitional societies. Whereas the illegitimacy ratio in Iceland was higher than in many other societies, the survival chances of infants that were born out of wedlock seem, compared to other European societies in the pre-transitional period, to have been relatively good.

But before discussing further the relatively favourable infant mortality rates among illegitimate infants, let us have a look at social differences in the later period. Overall infant mortality in Reykjavik had declined considerably between the periods. Infant mortality rates in the capital were now at a level of 165 per 1,000. When observing the development within different social classes, comparable results to those of the Vestmannaeyjar study emerge, i.e. the upper classes seem to be more likely to improve their situation in the move towards lower mortality rates. The most notable improvement was made within the class of crown officials, with infant mortality within this group dropping from 250 to 100. Improvements within the group of farmers are also significant, but mortality in this group was comparatively high.

Infant mortality among fishermen increased slightly between the periods and this group, which earlier had displayed lower rates of infant mortality than all other classes, now figured slightly above the mean level. Improvements were made in the other groups, but they were much more insignificant. This is especially true for the group of illegitimate children, a group that apparently had had little chance of improving its situation. Proletarianization occurred during the period
and population growth in Reykjavik was significant between the two periods which is likely to have brought about a deterioration in the housing conditions of the poorest, i.e. among fishermen/daylabourers and among unmarried mothers. A fast population growth creating a situation of over-crowding would affect the survival chances of young children. Similar results emerged for Linköping in Sweden, where the middle and lower classes started out with similar levels of infant mortality and where the most notable improvements were made by the former.\textsuperscript{151}

The group of illegitimate children needs further consideration. In a recent article on survival chances among illegitimate infants in a fishing district in southwestern Iceland during the second half of the 19\textsuperscript{th} century, I showed that differences in infant mortality rates between legitimate and illegitimate children during the pre-transitional period were relatively small compared to the general pattern in Europe.\textsuperscript{152} In part, this feature is explained by a particular pattern of co-habitation that was created in expanding fishing areas where it was more or less acknowledged that young people belonging to the lower strata lived together and had children without getting married. In most cases, however, the couple got married after the birth of one or sometimes two illegitimate children.

I showed that more than half the women who gave birth to an illegitimate child headed a household with the child's father.\textsuperscript{153} Babies to these women displayed infant mortality rates that were only slightly higher than among their counterparts born within wedlock. Another relatively large group of women that gave birth to an illegitimate child lived in the parental household. Their children too were just as likely to survive their first birthday as legitimate children.

Only a relatively small group of unmarried mothers (28 per cent) were in the vulnerable position of a servant or a pauper and lived in the household of a non-relative. Infant mortality among their children was almost 500 per 1,000, or twice that of the illegitimate babies whose mothers enjoyed a more favourable household position. By applying a proportional hazard model, I showed that the household position of unmarried mothers was the single most important indicator of their babies' survival.\textsuperscript{154} It is argued that in expanding fishing districts, with high geographical mobility, where a large proportion of the population belonged to a propertyless lower class, cultural patterns were created where it was accepted that couples had children before marrying.\textsuperscript{155}

An analysis of differences in infant mortality rates among illegitimate infants in relation to the living arrangements of their mothers has not been carried out for Reykjavik. It may, however, be assumed that the situation was similar to that in the neighboring parish of Gardar and Bessastaðir. The fact that infants of unmarried mothers displayed approximately the same survival chances as social groups other than crown officials and merchants suggests that many of these women, like their counterparts in Gardar, lived in consensual unions with their children's fathers.
Generally speaking it can be argued that the development of infant mortality between 1821–1840 and 1851–1875 brought the social groups closer together. The only social group that deviated markedly from the others in the second period was the highest strata of crown officials. This group displayed a low rate of 100 per 1,000. All the other groups displayed mortality rates relatively close to each other, at levels between 150 and 200. It is of interest to see how the different social groups continued to develop during the late 19th and early 20th century. Did mortality in the higher social groups continue to decline at faster rates than in the lower strata or would all social groups benefit from improvements to the same extent?

Unfortunately the birth records of Reykjavik only infrequently contain information on father’s occupation during the period 1875 to 1910. By the 10 year period 1911–1920 infant mortality had declined remarkably from the two earlier periods and in Reykjavik was now only slightly above 60 per 1,000. Because of the dramatic changes that occurred in the occupational structure in the town, it is somewhat difficult to use the same occupational classification as in Figure 3.13. Here I use a rather simple three part social classification: high, middle and low. To the high social group belong mainly civil servants and academics. In the middle group I lump together craftsmen, merchants, farmers, captains and other non-manual occupational groups within the fisheries. The number of farmers within the boundaries of Reykjavik had fallen to 35 persons. It therefore seemed pointless to classify them separately. The “low” group includes unskilled workers, daylabourers and fishermen. Again illegitimate children are shown separately.

Table 3.14 reveals that infant survival chances during this period were largely determined by socio-economic factors. In the highest social stratum, infant mortality was only 21 per 1,000, whereas illegitimate infants displayed a mortality rate of more than 90 per 1,000. The conditions among the upper classes were obviously ideal. Infant mortality rates of 20 per 1,000 were not easy to find in Europe during this period. It must be assumed that infants belonging to

<table>
<thead>
<tr>
<th>Social Status</th>
<th>Mortality Rate per 1,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>High social strata (286)</td>
<td>21.0</td>
</tr>
<tr>
<td>Middle social strata (981)</td>
<td>42.8</td>
</tr>
<tr>
<td>Low social strata (783)</td>
<td>75.4</td>
</tr>
<tr>
<td>Illegitimate (465)</td>
<td>90.3</td>
</tr>
<tr>
<td>Not known (64)</td>
<td>125.0</td>
</tr>
<tr>
<td>All (2,579)</td>
<td>60.9</td>
</tr>
</tbody>
</table>

this social group were as a rule breastfed and enjoyed favourable hygienic conditions. Women in the upper classes were able to introduce breast-feeding and take away all other food from their children's diet, opportunities that were not necessarily available to all women the lower classes. Some of them were likely to have to start work shortly after delivery and were therefore not able to fully breastfeed, and had to leave the child with others at least for part of the day. With better and more precise knowledge about how to avoid several air- and waterborne diseases, the upper classes were without doubt in a better situation. They had better housing, better facilities and an ability to care for and isolate their children during outbreaks of epidemics.

The general conclusion here is that social class seems not to be an important determinant of infant survival in the pre-transitional period, at least not in Reykjavík. This result is in accordance with a study carried out by the historian Guðmundur Hálfdanarson, who in a genealogical study of two kin groups in agrarian Iceland showed that during the late 18th and early 19th centuries there were no differences in infant mortality between families belonging to the highest social stratum and those belonging to the lowest.

During the transition towards lower infant mortality rates, socio-economic factors started to play an important role for survival and in the case of Reykjavík the most notable improvements in infant health were made within the higher social strata. It is, however, worth stressing that although the decline within the lower strata is less pronounced than among the better off in Reykjavík, improvements were made in all groups. Another issue of importance is that despite growing differences between social groups, infant mortality rates in Reykjavík were low during all periods compared to most other areas in Iceland. This goes for all social groups, with the exception of farmers during the first period.

It is argued that the favourable rate of Reykjavík relies on other factors, above all high breastfeeding rates, rates that were attained by the interaction of well-trained midwives with the local population. Eventually other areas in the vicinity of Reykjavík started to benefit from the expertise of midwives and towards the end of the 19th century Reykjavík seems to lose the advantage it had over other areas in Iceland. It was thus argued in chapter 2.3 that Iceland seems to enter a new mortality regime towards the end of the 19th century, a regime where rural areas started to display more favourable survival chances than expanding urban areas. At the same time, Iceland entered a phase where several health related measures were introduced in towns and villages. The next part deals with differences in infant mortality between urban and rural areas at the beginning of the 20th century.
3.5. A NEW MORTALITY REGIME?

INFANT MORTALITY TRENDS IN THE EARLY 20TH CENTURY

The emergence of an urban penalty?

Important changes occurred in Icelandic society during the early years of the 20th century. The most obvious feature was the growing proportion of the population living in towns and villages. Figure 3.14 shows that only slightly more than 10,000 people lived in towns by 1890, whereas 60,000 resided in rural areas. Between 1890 and 1940 there was a decrease in the population living in rural areas whereas the population living in the urban areas increased. In 1940 more than half of the Icelandic population lived in the seven largest towns with more than half of those in the capital Reykjavik.

The changes in the economic and demographic development in Iceland during the late 19th and early 20th centuries are reflected in rapid changes in the occupational structure. Figure 3.15 shows the occupational structure for four census years. Little changes occurred between 1840 and 1870, more than 80 per of the working populations being recorded as belonging to the agrarian sector. The proportion of the population earning their livelihood from the fisheries increased slightly, whereas a minority of the population lived from other industries. In 1901, relatively pronounced changes had occurred in the occupational structure, with the importance of the fisheries increasing dramatically and that of the agricultural sector falling. Close to 20 per cent of the population derived their livelihood from the fisheries whereas 60 per cent were employed in agriculture. The last decades of the 19th century were also characterized by the growth of the service sector. The expansion of the service sector continued at an accelerated pace after the turn of the century and by 1930 a third of the population was said to live from private and public services. The share of the fisheries continued to increase somewhat and other industries also increased. Population primarily employed within agriculture had by 1930 fallen to 35 per cent.

What impact did these changes have upon infant mortality? Did rapid urbanization and growing proletarianization lead to increased infant mortality in urban areas? Did the capital under these shifting conditions lose the lead in infant survival it had had in the 19th century? Or did Reykjavik and other towns and villages benefit from sanitary measures, such as the introduction of water and sewage systems? Did the inhabitants of the towns benefit from medical expertise to a greater extent than the population in the rural setting?

The study below includes the same areas as that on the 19th century above (chapters 3.2 and 3.3). In order to shed a sharper light on differences in mortality between the urban and the rural areas I have added to this part of the study all villages that had received the status of a town in 1920 and the discussion on
Figure 3.14. Population development in urban and rural areas in Iceland, 1890–1940
Source: Hagshinna. Icelandic Historical Statistics, pp. 64–75.
Note: 1. In the figures for Reykjavik the population of Seltjarnarnes is included. 2. Other towns counted here are Hafnarfjörður (including Hafnarfjarðarsókn and Bessastaðarsókn), Ísafjörður, Siglufjörður, Akureyri, Seyðisfjörður (Seyðisfjarðarsókn included) and Vestmannaeyjar.

Figure 3.16 shows the development of infant mortality in the towns mentioned above and all rural areas during the period 1891–1900. The Figure shows that in the 1890s, infant mortality in Reykjavik was still considerably below the national average. Between the 1890s and the 1910s, the national infant mortality declined dramatically from a level of around 120 to 70. The decline was less pronounced in Reykjavik where infant mortality already had dropped below 100 before the turn of the century. After 1910 infant mortality in Reykjavik followed approximately the national average and was generally slightly below. As for other towns, they were slightly above, whereas the rural areas followed the Reykjavik level approximately. In the 1940s, the trend is reversed and the rural areas figure slightly above the other environments. The differences were extremely small and not significant at the 90 per cent level.
THE INTERACTION OF CULTURE AND ENVIRONMENT

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Figure 3.15. Occupational structure in Iceland, 1840–1930

Table 3.15. Population in the research areas, 1890–1930

<table>
<thead>
<tr>
<th>Counties</th>
<th>Towns</th>
<th>1890</th>
<th>1910</th>
<th>1930</th>
</tr>
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<tbody>
<tr>
<td>Gullbringu- og Kjósarsýsla</td>
<td>10,256</td>
<td>17,595</td>
<td>37,188</td>
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</tr>
<tr>
<td>Reykjavík</td>
<td>4,468</td>
<td>12,040</td>
<td>29,366</td>
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<tr>
<td>Hafnarfjörður</td>
<td>1,633</td>
<td>2,019</td>
<td>4,093</td>
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<tr>
<td>Rangárvallasýsla</td>
<td>5,335</td>
<td>5,343</td>
<td>6,898</td>
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<tr>
<td>Vestmannaeyjar</td>
<td>565</td>
<td>1,319</td>
<td>3,393</td>
<td></td>
</tr>
<tr>
<td>Suður-Múlasýsla</td>
<td>4,680</td>
<td>5,675</td>
<td>6,727</td>
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<tr>
<td>Seyðisfjörður</td>
<td>658</td>
<td>1,032</td>
<td>1,095</td>
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<tr>
<td>Bangeyjarsýslur</td>
<td>4,909</td>
<td>5,150</td>
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<tr>
<td>Eyjafjarðarsýsla</td>
<td>5,557</td>
<td>7,463</td>
<td>11,396</td>
<td></td>
</tr>
<tr>
<td>Akureyri</td>
<td>602</td>
<td>2,239</td>
<td>4,582</td>
<td></td>
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<tr>
<td>Siglufjörður</td>
<td>321</td>
<td>654</td>
<td>2,022</td>
<td></td>
</tr>
<tr>
<td>Norður-Ísafjarðarsýsla</td>
<td>3,934</td>
<td>5,816</td>
<td>5,786</td>
<td></td>
</tr>
<tr>
<td>Ísafjörður</td>
<td>1,227</td>
<td>2,741</td>
<td>2,297</td>
<td></td>
</tr>
<tr>
<td>Iceland (total)</td>
<td>70,929</td>
<td>85,183</td>
<td>108,861</td>
<td></td>
</tr>
</tbody>
</table>

Source: Hagskinna. Icelandic Historical Statistics, pp. 68–75 and 86–89.
The paradoxical Icelandic mortality pattern of often higher infant mortality in rural areas than in densely populated towns and villages was chiefly explained by the fact the women in towns and villages were more likely to breastfeed than were those living in rural areas. Figure 3.18 indicates that during the early years of the 20th century, Reykjavik lost the remarkable advantage it had enjoyed in previous periods. The pattern of relatively high rural and often low urban mortality was likely to disappear as breastfeeding was generally introduced and personal hygiene improved in the agrarian areas.

The heavy inmigration into towns and villages during the first decades of the 20th century is also likely to have created problems in the urban environment that were particularly dangerous to young children. In a study of three fishing districts in the late 19th and early 20th centuries it was shown that expanding fishing districts tended to have higher infant mortality than the national average, which was explained by the unhealthy living conditions of those areas. The conditions in the fishing areas are described as follows:

Living conditions in the fishing towns and villages were not particularly healthy in the early twentieth century. Many families lived in cellars that were damp and cold, especially in winter; health services were rudimentary, and communications often very insecure. The work load of both men and women

Figure 3.16. The development of infant mortality in Iceland, 1891–1950
(who played such an important part in fish processing in the Icelandic fishing industry) was heavy, as was the case in many other countries.\textsuperscript{158}

Considering the enormous population growth in Reykjavík after 1890 it can only be noted that infant mortality rates were unusually favourable during these first decades of the 20\textsuperscript{th} century. Figure 3.14 and Table 3.15 show that the population of Reykjavík grew threefold from 1890 to 1910 and again more than doubled between 1910 and 1930. It is not difficult to imagine what consequences for housing conditions this enormous population growth was likely to have had. This development would in all probability affect the lowest stratum of society hardest, which in fact seems to be the case. It was thus shown in part 3.3 above that in the beginning of the 20\textsuperscript{th} century, the lower social strata had between two and three times higher infant mortality than the higher layers of society (Table 3.14).

Map 3.2. Towns in Iceland in 1910
However, none of the social groups presented in that study had high infant mortality rates by European standards. This indicates that the conditions for infants in Reykjavik remained relatively favourable and that breastfeeding continued to be quite common there. The extremely low levels obtained during this period do, however, also indicate that there were other factors at work. Water and sewage systems were being installed in all larger towns in Iceland during the first and second decade of the 20th century. It can be hypothesized that because of relatively late urbanization, Iceland escaped the urban penalty experienced in most other countries in Europe. Public health measures were introduced primarily in an urban setting. The fact that measures to counteract the unhealthy aspects of the urban environment were slowly being undertaken exactly at the same time as urbanization and industrialization intensified could, indeed have protected Iceland from the health-related threats experienced in most European cities. Let us, then have a further look at public health measures in early 20th century Iceland.

**Health measures and their target population**

In 1899 the town physician of Reykjavik Guðmundur Björnsson (1864–1937) wrote an article in the public health journal *Eir*. There he discussed at length the principles of the bacteriological revolution and stressed the importance of ensuring clean water for the entire population of Reykjavik. He pointed out that there were no public water systems in Iceland, although in four villages entrepreneurs had installed private ones.¹⁵⁹

Only ten years after this remark was made by Guðmundur all major towns and villages in Iceland had central water systems and in some, sewage systems were being installed. These arrangements and above all the ever growing awareness of the importance of clean water and fresh milk¹⁶⁰ were likely to have improved the survival chances of infants and young children in the rapidly growing towns and villages. In 1907 a final epidemic of typhoid fever was reported in one of Reykjavik’s quarters. Guðmundur made a detailed analysis of the households that were affected in this epidemic and the following year the installation of a water system in Reykjavik was begun.¹⁶¹ Medical reports in subsequent years indicate that the typhoid fever of 1907 marked a turning point and severe diarrhoeal diseases were relatively uncommon in the following years.¹⁶²

The access to clean water and better sewers was certainly one of the prime issues discussed in the town council of Reykjavik in the opening years of the 20th century.¹⁶³ Another important issue during those years was the health of infants and other young children. As in other European societies during this period the interest in promoting and extending breastfeeding was frequently debated among physicians. As in other western societies too an ideology of professional motherhood emerged¹⁶⁴ and the publication of journals and books intended for mothers was a notable feature the late 19th and early 20th centuries.¹⁶⁵
As early as 1888 Landphysicus Jónas Jónassen (1840–1910) wrote in the introduction to his book Barnfóstran (The child's nurse) -- a book that he dedicated to all Icelandic mothers:

There is no doubt that the terrible death of a child is only to be explained by improper treatment of young children. It is hard for a mother's heart to see her young child buried. It is even harder if she has to admit that the death of her child is her own fault. The improper treatment of children does not have its roots in ill will, but is mainly to be explained by lack of knowledge.\textsuperscript{166}

The interest in infant health problems was profound in early 20\textsuperscript{th} century Iceland and several national surveys were carried out to assess the extension of breastfeeding contra artificial feeding in different parts of the country. These studies discussed type of feeding in a more detailed manner than before, dividing feeding methods into three categories, i.e. exclusively breastfed, mixed feeding and exclusively artificially fed. District physicians wrote lengthy reports on infant feeding and after 1912 midwives were required to fill in detailed forms on each woman they helped in delivery.\textsuperscript{167} These forms include detailed information on parity, age of mothers, previous stillbirths and complications occurring during delivery. Furthermore it was required that midwives returned information as to how long they stayed with the mother after delivery and whether the child received the breast or the bottle. According to the forms, midwives were also to note for how long the mother breastfed, but this obligation was seldom met. Information on feeding practices can therefore only be seen to apply to the first one or two weeks after delivery.

The forms were sent to district physicians who were supposed to assess the importance of breastfeeding in their district. Most medical reports from the second and third decade of the 20\textsuperscript{th} century are therefore quite informative about infant health and feeding practices and in the early 1920s the physician Katrín Thoroddsen carried out a study about differences on feeding practices between areas, based on those reports.\textsuperscript{168}

The most detailed survey on feeding practices was, however, a study carried out in connection with the 1920-census. Then, all households with a child below the age of one were asked whether the infant was breastfed when the census was taken and in the case of weaned infants, mothers were asked whether the child had previously been breastfed and for how long.\textsuperscript{169}

Compared to other European societies, however, the monitoring of infant and maternal health in Iceland was still relatively primitive at this point in time and was organized very much in the same manner as during the 19\textsuperscript{th} century. The first modern hospital in Reykjavík was not opened until 1929 and until the late 1930s there was no organized monitoring of maternal and infant health. Most infants were delivered at home and in towns and villages midwives used to visit the mothers during the first two weeks after the birth and give them instructions about infant care.\textsuperscript{170} This was not possible in agrarian areas. The country was sparsely populated and many midwives served under harsh conditions and had to travel long distances to attend births. Commonly those
midwives stayed with the mother for a while to help them with the children and other tasks in the household. In a number of areas, midwives sometimes took newborns home and cared for them there so that the mother could rest after the birth.171

Despite little change in the organization of maternal health and delivery, the education of midwives was successively improved and by the beginning of the 20th century there were few districts that didn't have access to educated midwives. Without doubt this had an important bearing upon infant health. The fact that midwives were required to report on breastfeeding in each individual case was likely to serve as an incentive to further promoting the practice. A decision to ask individual households about feeding methods in connection with the census taking shows what an important issue infant feeding was for the medical authorities. The decision per se was also likely to exert pressure upon individual mothers.

In the following, medical and midwives’ reports will be used to shed light on differences in breastfeeding traditions in the research areas. To what extent did differences in breastfeeding practices produce differences in the disease panorama and mortality patterns? But before attempting to answer this let us have a look at causes of death among infants and children below the age of five.

**Disease panorama and causes of death**

By 1911 a law was brought into force in Iceland which obliged physicians in urban areas to write death certificates for all deaths occurring within the borders of the town.172 Comparable legislation was not introduced into rural areas until 1950.173 However, quite frequently a death certificate was issued in the rural setting as well. According to the 1911 Act, death certificates were to be sent to individual parish ministers. They in their turn wrote a report on each death that was then sent to the Statistical Bureau in Reykjavik along with the death certificate.174

In their reports parish ministers were required to register the cause of death for each individual according to the best available source, preferably from a physician. In these reports the cause of death is given as coming from one of three sources each represented by the letter D, P or L. No clarification, either in the law, or in the regulations associated with it, is given as to the significance of these abbreviations. D obviously stands for “dámarvottorð” (death certificate) since a death certificate is always available when this abbreviation is given. P probably stands for “prestur” or parish minister I assume that L stands for “hjósmóðir” or midwife. In Icelandic society, midwives were indeed quite often seen as representing physicians. The fact that an L is often recorded in the case of the death of a newborn indicates strongly that it stands for midwife.

The fact that physicians were not always required to write a death certificate makes the comparison of cause of death rather difficult. This is especially so since there was an apparent discrepancy between urban and rural areas.
Nevertheless the reports from parish ministers will here be used to shed light on differences between areas. Let us, however, first have a look at differences in the registration of causes of death according to the source from which the information was derived. This is done in Figure 3.17. The categorization of diseases is shown in Appendix 3.

It is shown that in 44 per cent of all deaths (424) a certificate had been issued by a physician. The share of parish ministers deciding on the cause of death was almost identical at 45 per cent (427). In 11 per cent of the cases midwives decided on the cause of death. In the case of midwives congenital diseases dominated over all other causes. This obviously results from fact that midwives, in most cases, reported on the cause of death of children who died as a result of complications occurring during delivery. Deaths from other causes were proportionally fewer than in the case of parish ministers and physicians. The choices of cause of death did not differ between parish ministers and physicians to any important degree. However, no cause of death was given most frequently by parish ministers: 22 per cent of all cases. This was true in only four per cent of all cases among physicians and eight among midwives. Parish ministers also tend to give the cause “barnakrampi” (childhood convulsions / cramps/eclampsia) more frequently than did the other groups. It was argued in chapter 4 that this cause was quite frequently used to describe intestinal diseases in earlier times. Parish ministers were obviously more likely to continue to use this traditional notion than were physicians who were more inclined to use more modern and varied names for intestinal diseases.

Figure 3.17. Share of infant deaths from individual diseases according to source reporting on cause of death, Iceland 1916–1921
Source: SI. Dánarskýrslur 1916–1921.
Table 3.16. Cause-specific infant and early childhood mortality (per 100,000), Iceland 1916–1921

<table>
<thead>
<tr>
<th>Disease Category</th>
<th>IMR</th>
<th>ECMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congenital diseases</td>
<td>1181.2</td>
<td>3.9</td>
</tr>
<tr>
<td>Childhood diseases</td>
<td>810.0</td>
<td>293.8</td>
</tr>
<tr>
<td>Lung diseases</td>
<td>1802.2</td>
<td>293.8</td>
</tr>
<tr>
<td>Intestinal diseases</td>
<td>519.7</td>
<td>54.5</td>
</tr>
<tr>
<td>Childhood convulsions (“barnakrampi”)</td>
<td>641.2</td>
<td>17.5</td>
</tr>
<tr>
<td>Other infectious diseases</td>
<td>330.7</td>
<td>165.4</td>
</tr>
<tr>
<td>Other diseases/accidents</td>
<td>384.7</td>
<td>70.1</td>
</tr>
<tr>
<td>Cause of death not specified</td>
<td>816.7</td>
<td>75.9</td>
</tr>
</tbody>
</table>

Mortality rates /1000                  | 64.9  | 9.7  |

Source: See Figure 3.15.

Table 3.16 shows that infant mortality at the national level was slightly below 65 per 1,000 live births during the period 1916–1921. Early childhood mortality was below 10 per 1,000. It appears that intestinal diseases were no longer a frequent cause of death among infants and other young children. At the national level, death rates from intestinal diseases were 520 per 100,000 for infants and only 55 per 100,000 for 1–4 year old children. Mortality from lung diseases was much higher, i.e. 1,802 for infants and 294 in early childhood. It is worth noting, however, that cause of death is often unspecified in the case of infants.

But, how were differences in mortality levels between regions and between urban and rural areas reflected in differences in the disease panorama? It was noted above that the most important part of the infant mortality decline in European societies towards the end of the 19th century was explained by the diminished importance of intestinal diseases. One would therefore expect to see a relatively high mortality from intestinal diseases in the areas that had not yet dropped to low levels of infant mortality. One would also expect to see high mortality from intestinal diseases in towns and villages in those areas.

Table 3.17 shows the infant mortality rate in different disease categories in the research areas. A first observation that has to be made is that in some of the areas the share where no cause is given is relatively high. This is particularly true for the village of Seyðisfjörður and the town (island) of Vestmannaeyjar. In other areas the share of unknown diseases is between 5 and 16 per cent.

What strikes one as relatively odd is that differences in mortality from congenital diseases are relatively pronounced between regions. It is hard to believe that there were such notable differences in obstetric care between regions at such a late date. It is likely that many of the children who died from complications related to birth in some areas were given no cause of death. This is most certainly the case with, for example, Vestmannaeyjar where no child died from congenital diseases. In Reykjavik where the best midwives worked and where physicians were near at hand the share was high. It seems likely that the registration
### Table 3.17: Infant mortality rates (per 100,000 live births) from various categories of diseases, research areas 1916-1921

<table>
<thead>
<tr>
<th></th>
<th>Con-</th>
<th>Atrophy</th>
<th>Childhood</th>
<th>Lung</th>
<th>Intestinal</th>
<th>Barna-</th>
<th>Other inf.</th>
<th>Other diseases</th>
<th>Other causes</th>
<th>IMR</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>gen-</td>
<td>and</td>
<td>diseases</td>
<td></td>
<td>diseases</td>
<td>krampi</td>
<td>accidents</td>
<td>diseases</td>
<td>given</td>
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<tr>
<td></td>
<td>rachitis</td>
<td></td>
<td></td>
<td></td>
<td>Ecclampsia</td>
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<td></td>
</tr>
<tr>
<td>Gullbringu- og Kjósarsýsla</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reykjavik</td>
<td>1077.9</td>
<td>243.4</td>
<td>799.7</td>
<td>1947.1</td>
<td>834.5</td>
<td>730.2</td>
<td>452.0</td>
<td>208.6</td>
<td>382.5</td>
<td>66.5</td>
</tr>
<tr>
<td>Other parishes (fishing)</td>
<td>1116.8</td>
<td>304.6</td>
<td>507.6</td>
<td>2639.6</td>
<td>101.5</td>
<td>913.7</td>
<td>304.6</td>
<td>507.6</td>
<td>609.1</td>
<td>70.1</td>
</tr>
<tr>
<td>The peninsula of Vestfirdir (northwest)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Town of Ísafjarður</td>
<td>920.2</td>
<td>613.5</td>
<td>1380.4</td>
<td>1533.7</td>
<td>2454.0</td>
<td>460.1</td>
<td>306.7</td>
<td>153.4</td>
<td>766.9</td>
<td>85.9</td>
</tr>
<tr>
<td>O parishes in N-Ísaf (fishing)</td>
<td>1447.8</td>
<td>517.1</td>
<td>1241.0</td>
<td>1861.4</td>
<td>1861.4</td>
<td>413.7</td>
<td>413.7</td>
<td>206.8</td>
<td>1964.8</td>
<td>99.3</td>
</tr>
<tr>
<td>North. predominantly rural</td>
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<td></td>
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<td></td>
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<tr>
<td>Town of Akureyri</td>
<td>689.7</td>
<td>229.9</td>
<td>2069.0</td>
<td>1149.4</td>
<td>229.9</td>
<td></td>
<td>459.8</td>
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<td>229.9</td>
<td>50.6</td>
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<td>Town of Siglufjörður</td>
<td>826.4</td>
<td>413.2</td>
<td>1239.7</td>
<td>826.4</td>
<td>413.2</td>
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<td>826.4</td>
<td>413.2</td>
<td>53.7</td>
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<tr>
<td>Other parishes in Eyjafjarður (rural)</td>
<td>1666.7</td>
<td>1944.4</td>
<td>1111.1</td>
<td>138.9</td>
<td>972.2</td>
<td>138.9</td>
<td>138.9</td>
<td>694.4</td>
<td>68.1</td>
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<td>Dingeyjarsýslur (rural)</td>
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<td>1583.4</td>
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<td></td>
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<tr>
<td>Seyðisfjarður</td>
<td>1149.4</td>
<td>574.7</td>
<td>2298.9</td>
<td>574.7</td>
<td>1149.4</td>
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<td></td>
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<td>57.5</td>
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<tr>
<td>Other in S-Múlasýsla (fishing/rural)</td>
<td>988.9</td>
<td>247.2</td>
<td>988.9</td>
<td>1606.9</td>
<td>618.0</td>
<td>370.8</td>
<td>370.8</td>
<td>370.8</td>
<td>741.7</td>
<td>63.0</td>
</tr>
<tr>
<td>South</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Town of Vestmannaeyjar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rangárvallasýsla</td>
<td>1972.4</td>
<td>197.2</td>
<td>986.2</td>
<td>394.5</td>
<td>1380.7</td>
<td></td>
<td></td>
<td></td>
<td>986.2</td>
<td>59.2</td>
</tr>
<tr>
<td>Iceland</td>
<td>1181</td>
<td>155.2</td>
<td>810</td>
<td>1802</td>
<td>519.7</td>
<td>641.2</td>
<td>330.7</td>
<td>229.5</td>
<td>816.74</td>
<td>64.9</td>
</tr>
</tbody>
</table>

Source: See Figure 3.17.
of cause of death was more exact in Reykjavik than in most other areas. The fact that physicians were, as a rule, called for in the case of complications ensured that death certificates were issued and in these congenital diseases would, without exception, figure in the statistics.

By far the most common diseases in most areas were those of the lungs. Between 10 and 50 per cent of all infants in the areas shown here died of lung diseases (national level 28 per cent). Most areas are though relatively close to the national level of 1,800 per 100,000. The pattern often seen in studies with higher mortality from intestinal diseases in urban than in rural areas is not seen here. What is seen, on the other hand, is that in areas that display comparatively high infant mortality rates, intestinal diseases tend to dominate over other causes. This is the case in particular with the town of Ísafjörður as well as with the surrounding fishing areas in the county of Norður-Ósafjarðarsýsla on the peninsula in the northwest. The same is true for the island of Vestmannaeyjar in the south.

Normally, infant mortality from childhood diseases is higher in the urban than in the rural setting. Apparently it was easier to protect infants in the sparsely populated rural areas than in the more densely populated urban ones. Even though there is a general pattern of higher mortality from childhood diseases in urban than in rural areas it is interesting to see that in some large urban areas like Reykjavik the mortality rate from childhood diseases is relatively low. This could be explained by the sound tradition of breastfeeding in Reykjavik. Here it can also be noted that the traditionally low mortality county of Þingeyjarsýslur, where breastfeeding tended to be more widespread than in other areas, had no infant deaths from childhood diseases.

An analysis of the information on causes of death in different regions shows that the disease panorama was quite different from one place to another. As noted earlier, differences in infant mortality rates between regions had now become small compared to earlier periods. However, the analysis of causes of death in different regions of the country reveals that intestinal diseases were more fatal in areas with previously high levels of infant mortality and a prevailing tradition of artificial feeding. This is the case with Rangárþingeyjarsýsla, which had an infant mortality rate of 1,077 per 100,000 from intestinal diseases whereas the average rate for Iceland was 520.

In general it can be established that towns situated in areas with a tradition of artificial feeding were characterized by high infant mortality rates and in particular from intestinal diseases. Thus the village of Vestmannaeyjar (in Rangárþingeyjarsýsla) had a mortality rate from intestinal diseases of 1,757 per 100,000 and the town of Ísafjörður in Norður-Ósafjarðarsýsla — the county with the overall highest mortality rates during this period — had an infant mortality rate from intestinal diseases of almost 2,500 per 100,000. To what extent are regional differences in mortality rates from intestinal diseases to be explained by differences in breastfeeding traditions? The next section includes an analysis of medical reports in the research areas. Were there still differences in breastfeeding patterns between
areas? To what extent are differences in traditions of infant feeding reflected in differences in the disease panorama and what impact did breastfeeding have upon survival chances by the beginning of the 20th century?

**Regional differences in the amount of breastfeeding and the disease panorama**

Medical reports from individual physicians indicate that intestinal diseases were less frequent during the second decade of the 20th century than they had been earlier. Figures 3.18–3.21 show that breastfeeding ratios were noticeably different between areas. An obvious feature is that patterns reported for earlier periods seem to have persisted. Areas with high infant mortality rates in earlier periods display relatively low breastfeeding rates and vice versa. Thus, Figure 3.18 shows that 90 per cent of all infants in Reykjavík were put to the breast. Towns and villages in the vicinity of Reykjavík display diverse patterns. In Hafnarfjörður only 50 per cent of all infants were exclusively breastfed whereas infants in Keflavík were breastfed to the same extent as their counterparts in Reykjavík.

According to medical reports, the disease panorama differed somewhat between areas with high breastfeeding rates and those with lower breastfeeding rates. In 1913 the district physician in Reykjavík wrote:

> Mothers prefer to breastfeed, because milk is expensive and sometimes unavailable. Cough or pulmonary diseases are the most common causes of death among young children and acute gastro-intestinal diseases are relatively rare.

A different picture is provided for the neighbouring town of Hafnarfjörður where breastfeeding was relatively rare. There, gastro-intestinal diseases were reported to be the most common ones among infants and young children. Here, however, infant mortality from intestinal diseases was not particularly high. It seems, then, that infants continued to fall ill if they didn’t receive the breast, but more adequate food and better hygiene resulted in recovery.

Another physician in the western part of the country maintained that mothers usually put their newborns to the breast, but that breastfeeding was generally of short duration. After weaning was introduced, diarrhoea was common among infants. Few children were though reported to die from gastro-intestinal diseases and he agreed with his colleague in Reykjavík that the most common causes of death among young infants were respiratory diseases.

The fishing area in the northwest, Norður-Ísafjarðarsýsla (on the peninsula of Vestfirðir) was the county with by the far the highest infant mortality rates during the second decade of the 20th century. It was also shown that this county had higher infant mortality rates from intestinal diseases than did other areas in the study. In the town of Ísafjarður infant mortality from intestinal diseases
was almost 2,500 per 100,000 and close to 1,900 in other parishes in the county of Norður-Ísafjarðarsýsla, compared to a national average of only slightly more than 500.

Considering the high mortality from intestinal diseases it is hardly surprising that breastfeeding ratios were comparatively low in the medical districts of the county of Norður-Ísafjarðarsýsla (see Figure 3.19). It is perplexing, however, to see that the town of Ísafjörður which had higher infant mortality from intestinal

![Figure 3.18. Infant feeding practices in Reykjavik and two other medical districts in Gullbringusýsla, 1911-1920](source)


![Figure 3.19. Infant feeding practices in the peninsula of Vestfirðir in northwest Iceland, 1911–1920](source)

Source: See Figure 3.18.
diseases than any other place in Iceland, also had breastfeeding ratios above 70 per cent. It is hardly likely that breastfeeding there was of long duration. The only medical report from this district that discussed infant health in detail dates from 1913. There it was maintained that the treatment of infants had improved considerably. Nonetheless, it was also noted that *cholerine* was the most common

![Breastfed □ Partly breastfed ■ Exclusively artificially fed](image)

**Figure 3.20.** Infant feeding practices in three medical districts in northern Iceland, 1911–1920

*Source: See Figure 3.18.*

![Breastfed □ Partly breastfed ■ Exclusively artificially fed](image)

**Figure 3.21.** Infant feeding practices in two medical districts in southern Iceland, 1911–1920

*Source: See Figure 3.18.*
One year earlier in 1912, the district physician of Hesteyri, north of Ísafjörður, maintained that breastfeeding was gaining in importance, but was far from being universal.

The pronounced differences in infant mortality and in infant feeding traditions between the two rural areas of Pingeyjarvíslur in the north and Rangárvallasýsla in the south have been remarked upon on several occasions in this study. Figures 3.20 and 3.21 show that differences in infant feeding traditions prevailed into the 20th century. In the three medical districts in northern Iceland shown here between 80 and 95 per cent of all mothers breastfed their newborns (Figure 3.20). Physicians in those districts maintained that infant health was good and the death of an infant was almost always associated with premature birth and low birthweight.

The southern part of the country presents the opposite situation (Figure 3.21). Only around half of all newborns in this area were put to the breast. In 1897 the district physician wrote:

It is extremely unusual for mothers in my district to breastfeed. It is, furthermore, still a common belief among many peasants that milk diluted with water is unhealthy for infants.

Ten years later the physicians in the southern part of the country all stated that cow’s milk is still the most common food for newborns, but that the it was as a rule given diluted in boiled water. Most physicians in this part of the country complained about the fact that infants were given solid food too early and that gastro-intestinal diseases were common among young children.

It is worth noting that despite low breastfeeding ratios, infant mortality rates in this southern area had dropped to relatively low levels. It must be assumed that the relatively healthy environment protected young children from the fatal effects of diarrhoeal diseases. It must be stressed here that most heads of households in this area were farmers and the ownership of cattle almost universal. With better hygiene and a practice of diluting milk with boiled water, infants in this area had good survival chances despite not being breastfed. In the fishing areas the conditions were different. Traditionally infants were not put to the breast on the island Vestmannaeyjar. There infant mortality from diarrhoeal diseases was much higher than was the case in the rural setting. In this context, it can be observed that neonatal mortality had towards the end of the 19th century in most counties dropped to relatively low levels of between 50 and 60 per 1,000. These are levels that were common in European societies where infants were usually breastfed relatively extensively. Only in those counties where breastfeeding was uncommon, was neonatal mortality higher. This was the case with Norður-Ísafjarðarsýsla, with Rangárvallasýsla and with the rural county of Dalasýsla (see Appendix 2).

The midwives’ reports offer an excellent opportunity to check the importance of breastfeeding for survival. The reports do not, however, state if the child survived infancy or not. Record linkage with parish records do make such an
analysis possible. In the following an analysis on the importance of breastfeeding for survival in a fishing village is carried out. Two midwives served in the district during the period 1915—1925 and they delivered almost all the children in the village. As the midwives reports’ are confidential documents, I have chosen not to publish the names of the midwives and the name of the town is also disguised.

The two midwives were relatively close in age, but had different backgrounds. Midwife A was born in 1876, the daughter of a communal director in a rural area around 100 km from the village. She studied midwifery in Reykjavik and went to Copenhagen to study at the Maternity Hospital. Midwife B was born in 1889 in a parish close to the fishing village, the eldest child of a poor fisherman with many children. Despite the extreme poverty of the family, she managed to get a position in the school for midwives in Reykjavik in 1912 and she even got a scholarship to Copenhagen to study at the Maternity Hospital.

The two midwives seem to have had similar routines. Both visited childbearing women for 12 to 14 days and no apparent differences seem to be in the socio-economic backgrounds of the women they helped to deliver. Despite this, relatively pronounced differences appear in the breastfeeding ratios between the two. In the case of midwife A, 86 per cent of all women breastfed, whereas the same was true for only 55 per cent in the case of midwife B. One can only speculate about the reasons behind these, not insignificant differences. Considering the fact that both received the same type of education approximately during the same time period, one would expect them to reach similar breastfeeding ratios. They served in an area where breastfeeding was not particularly uncommon in earlier times, but where infants were often given solid food at very young ages.

It is likely that both of them preferred women to put their newborns to the breast. Why midwife B, who was born in the area and had her network there, didn't succeed to the same extent as midwife A, who came from another area might be explained by the kind of relationship she had with the local population. Several sources show that midwife she enjoyed a respected position in the community and was extremely active in the social life of the village.

Table 3.18. Type of infant feeding in a fishing village 1915—1925 related to the midwives who helped in delivery

<table>
<thead>
<tr>
<th>Midwives (year of birth)</th>
<th>Period</th>
<th>Deliveries</th>
<th>Breastfed</th>
<th>Not breastfed</th>
<th>No information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Midwife A</td>
<td>1918—24</td>
<td>199</td>
<td>86.4</td>
<td>13.6</td>
<td>0.5</td>
</tr>
<tr>
<td>Midwife B</td>
<td>1915—24</td>
<td>276</td>
<td>55.4</td>
<td>42.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Total %</td>
<td></td>
<td></td>
<td>68.2</td>
<td>30.5</td>
<td>1.3</td>
</tr>
<tr>
<td>Total (N)</td>
<td></td>
<td>475</td>
<td>324</td>
<td>145</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 3.19. Mortality, according to feeding methods of infants delivered by two midwives in a fishing town in southwestern Iceland, 1915–1925

<table>
<thead>
<tr>
<th>Feeding method</th>
<th>Midwife B</th>
<th>Midwife A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IMR</td>
<td>Births (N)</td>
</tr>
<tr>
<td>Breastfed</td>
<td>26.1</td>
<td>153</td>
</tr>
<tr>
<td>Not breastfed</td>
<td>110.2</td>
<td>118</td>
</tr>
<tr>
<td>(Not given)</td>
<td>400.0</td>
<td>5</td>
</tr>
</tbody>
</table>

Sources: See Table 3.18 and NAI. Skjalasafn presta og prófasta. Prestsjónustubækur.

Relatively low breastfeeding ratios are therefore not likely to be explained by a reluctance to listen to her advice. Nonetheless, breastfeeding ratios were not particularly high among women she helped in childbirth. The difference between the midwives has no obvious explanation. It can only be established that these two midwives seem to have had different priorities in their relationship with childbearing women.

Table 3.19 compares infant mortality among the breastfed and among those who were not. When looking at infant mortality it is shown that there were pronounced differences between those infants that were breastfed and those who were not and those differences were almost identical for both midwives. Infant mortality was slightly above 25 per 1,000 among those infants that were breastfed and almost four times higher among those who were artificially fed (100 per 1,000). By European standards, those infants who were to put to the breast at birth had, thus, extremely good survival chances. Several studies on differences in infant mortality between breastfed and artificially fed children at the beginning of the 20th century have revealed that infant mortality among breastfed babies only infrequently fell below 50 per 1,000 live births. Infant mortality among those babies who never received the breast was on several occasions higher than 500 per 1,000.

Table 3.20. Proportional hazard coefficients for infant mortality in a fishing village in southwestern Iceland, 1915–1925 (Cox regression model)

<table>
<thead>
<tr>
<th>Variables in the Equation</th>
<th>B</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant feeding</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference category = Breastfed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Artificially fed</td>
<td>1.385</td>
<td>1</td>
<td>.002</td>
<td>3.993</td>
</tr>
<tr>
<td>Feeding method not known</td>
<td>3.639</td>
<td>1</td>
<td>.000</td>
<td>38.059</td>
</tr>
</tbody>
</table>

Complications in connection with birth

Reference category = No complications

.855 | 1 | .167 | 2,350 |

Source: See Table 3.19.
Naturally, the fact that infants were not breastfed, on some occasion depended on external complications such as the death or sickness of the mother. When the mother died shortly after delivery, the two midwives do not in most cases say what kind of feeding method was introduced. Therefore, infant mortality among the seven children who had no feeding method given in Table 3.19 was extremely high. One would expect that in most of those cases, that both the mother and child would die. The midwives' reports include a column where it is given if the unborn child is in the wrong position or if other complications occur and the midwife is forced to call for a physician. Table 3.20 presents a proportional hazard model where the covariance “complications at birth” is included. I have chosen to apply a broad definition of “complications.” All cases when a physician is called are included, but also all cases where the foetal position deviated from

![Figure 3.22. Survival of breastfed and artificially fed infants in a fishing village in southwestern Iceland, 1915–1925.](image)

Source: See Table 3.19.
the most common cephalic foetal presentation. Those cases are all included, even if there was no notification by the midwife that complications had occurred and that no physician was called.

It is shown that after controlling for this factor infant feeding definitely remains extremely important for infant survival. Infants that were not breastfed are four times more likely to die than those who received the breast (results significant at the 95 per cent per cent level). Not unexpectedly complications in connection with childbirth increased the risk of infant death. Differences are though not significant at the 95 per cent level, which is of course the result of the extremely wide definition of the term “complications” and because of the small numbers.

But how permanent was the protection offered a child who was breastfed from birth? Midwives only very infrequently noted in their reports for how long infants were breastfed. In most cases they visited the mother for only a couple of weeks after delivery and therefore did not normally give any indication of the length of breastfeeding. Quite frequently however, physicians notified in their reports that breastfeeding was usually of a rather short duration and that women started to give additional food to their babies during the first or second month.

Figure 3.22 compares the survival of those who were breastfed at birth with those who never received the breast. It shows that infants who were breastfed at birth had an advantage for a relatively long time over their counterparts who were not. It is shown that in the first days after birth, survival chances were identical in the two groups. This is hardly surprising since mortality in the very first days after birth is normally associated with complications occurring during the gestation period. Shortly after the first week however, notable differences appear. The differences are most pronounced during the first three months, but until six months of age breastfed children had a notable advantage over the other group. After having reached the age of six months survival chances were similar.

As breastfeeding seems not to have been of long duration, infants that were put to the breast at birth had notable advantages over those that never received the breast. The following chapter discusses further differences in feeding practices between areas and between midwives. In part further use will be made of the midwives’ reports, but additionally this part of the study examines the information on breastfeeding in the 1920 census.

3.6. CHANGING TRADITIONS OR PERSISTING STRUCTURES?
A SYNTHESIS

It is quite obvious that the secular decline in infant mortality in Iceland during the last three decades of the 19th century is chiefly to be explained by improvements in feeding practices among newborns. A few areas had developed a strong
tradition of breastfeeding already during the first half of the 19th century. In those areas, infant mortality was relatively low early in time and the decline in infant mortality after 1870 was relatively modest. In other areas where infants had been either totally kept off the breast or where they were weaned at very early ages, the slow growth in the practice of putting newborns to the breast produced considerable improvements in their survival chances. In rural areas where environmental conditions were favourable, only a slight improvement in infant feeding was likely to produce enormous improvements. This seems to be the case in Rangárvallasýsla where breastfeeding was introduced, but where infants were only infrequently breastfed for lengthy periods. Nevertheless infant survival improved noticeably.

In densely populated fishing districts, where sanitary conditions were worse than in the rural setting, more effort was needed to bring infant mortality levels down. There, however, a tradition of putting newborns to the breast for a short while prevailed from an earlier period. Therefore, neonatal mortality in those districts tended to be lower than was the case in the rural areas, whereas post-neonatal mortality was considerably higher. In Iceland, improvements in post-neonatal mortality seem generally to have occurred later than improvements in neonatal mortality and in the fishing district of Hvalsnes (in Gullbringu- og Kjósarsýsla) post-neonatal mortality remained high until the last decade of the 19th century. Medical reports indicate that even if women in general had started to put newborns to the breast they were generally reluctant to abandon totally the tradition of giving “substantial” solid food to very young infants. This practice was both likely to cause acute diarrhoea in young infants, and to speed up the weaning process. After the turn of the century, however, infant mortality rates were low in most areas. Is this to be explained by an extension of breastfeeding or were there other factors at work? It was noted above that physicians often remarked upon the short duration of breastfeeding in their reports. This indicates that other factors such as better hygiene in the treatment of food might help to explain the continued steep decline in infant mortality in Iceland after the turn of the 20th century. Environmental conditions and relatively favourable climatic conditions would then have contributed to this favourable situation.

In the following the census material from 1920 will be used to shed light on patterns of breastfeeding in the research areas. The main objective is to see to what extent regional patterns from previous periods persisted. First however, the impact of individual midwives in the local community will be discussed. I have chosen to focus on midwives in three of the counties included in the study in previous chapters. The midwives’ districts are thus situated in the following counties: (1) The rural county of Pingeyjarssýslur in the north, where breastfeeding was common at an early date and infant mortality rates low, (2) The rural county of Rangárvallassýsla where the situation was the reverse, i.e. breastfeeding uncommon and infant mortality high, and (3) Reykjavík that was characterized by a strong tradition of breastfeeding and low mortality rates.
Other source material used in this part of the study are the reports from midwives, and in part a questionnaire from the Ethnographic Institute (Bjöðháttadeild) at the National Museum in Reykjavík on customs related to birth and the first year of life dating from the early 1960s. Questionnaires were sent to 117 informants (68 women and 49 men). In some cases staff from the Bjöðháttadeild interviewed the informants. Most informants were born between 1880 and 1915. Twenty-two of the informants were born in the northern counties of Þingeyjarsyslur and Eyjafjarðarsýsla, 19 in the southern counties of Rangárþingeyjarsýsla and Skafatarfellssýsla. In part the analysis below is based on their answers.

**Actors of change in their cultural context.**

**Individual midwives in the local community**

The results above indicate that traditional differences in feeding practices between areas prevailed into the 20th century. It is also suggested that individual midwives had different priorities when it came to instructing women about how to feed their newborns. Midwives had different backgrounds and they worked in environments that differed from each other. Childbearing women were not a homogenous group either. They varied in their geographical background, social status, educational level and age, just to mention a few factors that were of importance. Whether midwives were successful in promoting breastfeeding was dependent upon all these factors. In the following the midwives’ reports are used to shed light on differences in feeding practices between areas and between individual midwives.

By the beginning of the 20th century there were considerable differences between the conditions of midwives in urban and rural areas. Even though midwives’ districts in towns and villages were often rather large in geographical terms (most frequently including the surrounding rural areas), the situation between the two settings was by no means comparable. Midwives in towns and villages therefore developed routines that were very different from the rural. Midwives in the rural setting seldom had the opportunity to leave the women after childbirth and then pay visits on a regular basis. Instead they were forced to live with the mothers for a few days after delivery.

The rural and the urban also differ in the way that in many midwives’ districts only a few deliveries occurred each year, whereas the more populous towns and villages had a large number of births. Thus, midwifery, had by the beginning of the 20th century, developed into a full-time profession in the towns and villages, instead of being a secondary occupation for farmers’ wives in the rural setting. It was quite common for midwives in urban areas to be unmarried and to devote their lives to midwifery, whereas almost all midwives in the rural setting were married and had many children themselves.
Table 3.21. Type of infant feeding among infants in Reykjavík 1913–1925 related to the midwives who helped in their delivery

<table>
<thead>
<tr>
<th>Midwives</th>
<th>Period</th>
<th>Deliveries</th>
<th>Breastfed %</th>
<th>Not breastfed %</th>
<th>Mixed feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Óðrunn Björnsdóttir (1859)</td>
<td>1914–25</td>
<td>1561</td>
<td>85.7</td>
<td>13.2</td>
<td>1.1</td>
</tr>
<tr>
<td>Sesselja Olafsdóttir (1858)</td>
<td>1916–19</td>
<td>247</td>
<td>86.2</td>
<td>13.8</td>
<td></td>
</tr>
<tr>
<td>Þórdís Jónsdóttir Carlqvist (1879)</td>
<td>1913–25</td>
<td>994</td>
<td>98.7</td>
<td>1.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Helga Sigurðardóttir (1888)</td>
<td>1916–25</td>
<td>184</td>
<td>77.7</td>
<td>21.2</td>
<td>1.1</td>
</tr>
<tr>
<td>Sigriður Thorarensen (1894)</td>
<td>1920–25</td>
<td>314</td>
<td>95.9</td>
<td></td>
<td>4.1</td>
</tr>
<tr>
<td>%</td>
<td></td>
<td></td>
<td>90.2</td>
<td>9.2</td>
<td>0.6</td>
</tr>
<tr>
<td>Total (N)</td>
<td></td>
<td>3300</td>
<td>2976</td>
<td>304</td>
<td>20</td>
</tr>
</tbody>
</table>


In towns and villages, it was usual for midwives to pay visits to childbearing women for the first 14 days after delivery. Midwives' reports show that this rule was almost universal. In the case of all midwives in towns more than 90 per cent of childbearing women were visited for between 12 and 14 days. Even in the case of an infant death or a stillbirth visits were common. In the case of disease some midwives continued to pay women a visit for one or two months. But let us now have a look at the breastfeeding rate among the women under the care of individual midwives in Reykjavík.

Table 3.21 shows differences between midwives in Reykjavík. As expected, in this town where breastfeeding was already the rule during the early 19th century, breastfeeding was common among the clients of all midwives. Generally, however, the youngest midwives seemed somewhat more likely to persuade mothers to breastfeed than the older ones. The mean rate, however was above 90 per cent and none of the midwives deviated greatly from this mean.

In the rural setting, the old tradition where midwives stayed with childbearing women for a few days after delivery prevailed. Both in Þingeyjarsýslur and in Rangárvalsýsla the time spent with mothers was most commonly 3 or 4 days. Breastfeeding ratios among childbearing women in relation to midwives are shown in Tables 3.22 and 3.23. Table 3.22 shows that in all midwives' districts in northern Iceland breastfeeding rates were high. The overall ratio is 82 per cent and mixed feeding occurs in 6.4 per cent of all cases. Few midwives deviated from this level.

Differences between midwives in Rangárvalsýsla are, on the other hand, more important. Table 3.22 shows that the overall ratio is slightly below 50 per cent. In general it can be said that the older the midwife the fewer infants were breastfed. Infants delivered by the three oldest midwives were infrequently breastfed (for example 8 of 24 in the case of the midwife Guðríður Jónsdóttir...
who was born in 1863). Younger midwives seem to have been more likely to succeed in promoting breastfeeding. Thus 16 out of 21 infants delivered by Hildur Jónsdóttir (born 1890) were breastfed and in the case of five we do not know whether they were breastfed or not.

Even if in the late 19th century it was generally acknowledged among physicians and midwives that breastfeeding was of importance for the well-being of young infants, it is likely to have taken one or two generations to change entirely the prevailing feeding practices. Midwives who started their career in a setting where almost all infants were artificially fed, and where this mode of feeding an infant was considered to be in the child's best interest, are not likely to have been successful in promoting breastfeeding in all cases. The oldest midwives are likely to have developed routines in their relationship with childbearing women and kept those routines throughout their career.

Another reason why breastfeeding would be more common in the case of young midwives could also be that the multiparous were probably more likely to call for the old midwife, who had helped them in earlier deliveries, whereas a new midwife was likely to have tended to the primiparous. A woman who experienced her first birth when breastfeeding was starting to be common in the area was probably more likely to breastfeed than a mother who had experienced many births and was used to feeding her children with cow's milk or other local food. In Rangáravallsýsla, as in other communities, mothers would choose the way of feeding their babies that they considered most advantageous for the child. That breastfeeding was the optimal way of feeding a newborn was by no means obvious in a 19th century context in Rangáravallsýsla. The initial weeks and months were a delicate period in every human's life and even if midwives or other medical professionals could give several examples of artificially fed infants who died early after an episode of acute diarrhoea, infants who survived despite being fed artificially, were also numerous. Vice versa there were examples of infants dying despite being breastfed.

Table 3.22. Type of infant feeding among infants in medical districts in northern Iceland 1917 related to the midwives who helped in their delivery

<table>
<thead>
<tr>
<th>Midwife</th>
<th>Deliveries</th>
<th>Breast-fed</th>
<th>Not breastfed</th>
<th>Mixed</th>
<th>Not given</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sigurveig Jónatansdóttir (1858)</td>
<td>8</td>
<td>7</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guðrún Jónasdóttir (1858)</td>
<td>9</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guðrún Brynjólsdóttir (1864)</td>
<td>12</td>
<td>11</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Áðalsbjörg Pálsdóttir (1870)</td>
<td>17</td>
<td>10</td>
<td>1</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Stefania Hannesdóttir (1871)</td>
<td>18</td>
<td>15</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marta Jónsdóttir (1890)</td>
<td>14</td>
<td>12</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total (N)</strong></td>
<td><strong>78</strong></td>
<td><strong>64</strong></td>
<td><strong>8</strong></td>
<td><strong>5</strong></td>
<td><strong>1</strong></td>
</tr>
<tr>
<td><strong>%</strong></td>
<td></td>
<td>82.1</td>
<td>10.3</td>
<td>6.4</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Source: NAI. Skjalasafn landlæknis. Ársskýrslur lækna. Skýrslur ljósmædra 1917.
Table 3.23. Type of infant feeding among infants in medical districts in southern Iceland 1915–1925 related to midwives who helped in their delivery

<table>
<thead>
<tr>
<th>Midwife</th>
<th>Period</th>
<th>Deliveries</th>
<th>Breastfed</th>
<th>Not breastfed feeding</th>
<th>Mixed</th>
<th>Not given</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elín Jónsdóttir (1842)</td>
<td>1915-16</td>
<td>11</td>
<td>5</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guðrúur Jónsdóttir (1863)</td>
<td>1915-24</td>
<td>24</td>
<td>8</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guðfinna Björnsdóttir (1879)</td>
<td>1915-23</td>
<td>17</td>
<td>6</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elín Á. Árnadóttir (1886)</td>
<td>1915-25</td>
<td>16</td>
<td>10</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hildur Jónsdóttir (1890)</td>
<td>1915-16</td>
<td>21</td>
<td>16</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Hildur I. Hallórsdóttir (1894)</td>
<td>1923-24</td>
<td>7</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rannveig Helgadóttir (1897)</td>
<td>1921</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total (N)</strong></td>
<td><strong>98</strong></td>
<td><strong>48</strong></td>
<td><strong>44</strong></td>
<td><strong>1</strong></td>
<td><strong>5</strong></td>
<td><strong>5.1</strong></td>
</tr>
</tbody>
</table>

% 49.0 44.9 1.0 5.1


The concern of parents for their newborn’s life and well-being can best be observed in numerous descriptions of food given to infants during the 19th century. It has thus been described as common for parents to be reluctant to give their offspring milk diluted in water. “They do not grow satisfactorily”, was a common complaint among parents, according to several medical reports. Instead, infants in poor households that lived just above the existence minimum would choose to give their newborn, cream and butter, the most valuable food items on the farm.

The family presented in the introduction to this study provides a good example of a midwife who worked in the traditional setting of artificial feeding. The midwife, Guðrúur Ölfusdóttir, who was born as early as 1844, was probably convinced that artificial feeding was the best way of feeding a newborn. The devotion Guðrúur showed for several decades in this poor community was admirable. On several occasions she took newborns from destitute families into her own home where she already had many mouths to feed. Promoting breastfeeding was, however, never a realistic option nor a preferable choice for her. For her successor, the midwife Elín Árnadóttir (born 1886) the preconditions were different.

Contrary to Guðrúur, Elín had received an education as a midwife and she obviously tried to convince women to breastfeed. Table 3.21 above shows that she succeeded in many cases, with 10 of 16 children that she delivered during the period 1915–1925 being put to the breast. As a matter of fact she helped my informant’s mother in childbirth in the case of the two youngest siblings. By then the grandmother had grown old and was no longer able to attend in childbirth. Róshildur’s mother had by then given birth 13 times and 10 of her children survived and were healthy. For her, a woman in her early forties, the
option of breastfeeding was probably very distant. In the case of the midwife Elin, it is doubtful that it crossed her mind to try to convince this experienced mother from a respectful family in the local community to change her mode of feeding her newborns. For younger mothers in the same area, on the other hand, breastfeeding might have been the most obvious choice and there the young midwife Elin would have played a central role. But let us now turn to the situation in urban areas, where breastfeeding was traditionally more common than in the rural setting.

It is quite obvious that the custom of taking care of newborns in midwives’ homes could only exist in areas where breastfeeding was not practiced. In areas with a firm tradition of breastfeeding it would hardly have occurred to a midwife to take a newborn baby away from a mother for a period of two or three weeks. In areas where infants were generally artificially fed, on the other hand, this could be seen as an act of mercy a good way to relieve a poor family with many young children from taking care of a young infant. In the questionnaire preserved at the Ethnographic Institute of Reykjavik (биотадеильд) a number of questions related to the midwife. Informants were asked if it was common for midwives to take the newborn child home with her after delivery. This question is examined here in detail, as I see the custom of caring for newborns in a midwife’s home as an important indicator of the absence of breastfeeding.

Twenty-two of the informants in the study grew up in southern Iceland (Рангárvалласýsla and Скагателлсýслур) and were born during the period 1876—1907. Twenty-one of them replied to the question whether it was common for the midwife to take the newborn home with her. All of them claimed to know about the custom of midwives taking the child home with them. Five said that it was by no means a common event, but that it occurred in some cases. The most common reason for this was said to be the fact that the household was poor or that the family had already many young children to care for. One informant, a woman born in 1874, mentioned one of the midwives in the area by name and stated that she used to take the children home with her and keep them for at least a week, sometimes for two or three weeks. Of the informants three had served as midwives themselves in the area (born in 1876, 1889 and 1890). All of them said they knew of the custom although two of them referred to the midwives serving before them when discussing it.

When analysing the answers from northern Iceland (Дингейjarсýслур and Ейяфjarдзарсýсла) a different picture is revealed. There 18 of 19 individuals (born between 1880 and 1916) replied the question. Only five said that they knew of the custom. All of them were men born in 1880, 1888, 1890, 1899 and 1901 and they gave the same reasons as in the other area, i.e. poverty and a large number of young children in the family. All other informants stated that they did not know any examples of this practice, even if they had read about it. A woman born in 1896 said: “This custom belongs to the past. The economic conditions in the area were good when I grew up and it was therefore not necessary to take infants away from the mother” and a midwife born in 1895 wrote: "No. This would only be possible if the mother was not able to breastfeed
the infant.” Two other informants from this area who were midwives (born in 1901 and 1905) stated that they knew of no examples of this custom. One of them claimed that "sometimes, in the case of poor childbearing women, they delivered in my home and rested there for a week or so.”

Not surprisingly the question about breastfeeding unveiled clear differences between the two areas. The question concerning breastfeeding was put in the following way: 'Was it uncommon for women to breastfeed? When did this change? In the southern area almost all informants answered in the affirmative and stated that breastfeeding had been uncommon when they grew up. The three midwives who replied to the questionnaire also agreed. The oldest was born in 1876 and was trained as a midwife in 1900. She wrote: "Many women were reluctant to breastfeed their newborns and I tried to convince them that breastmilk was of vital importance for the small child.”

The other two midwives were younger and were trained in 1911 and 1912. They affirmed that previously breastfeeding was uncommon in the area, but increased rapidly during their professional lives as midwives. Other informants pointed out that breastfeeding was uncommon at least until the turn of the century, but that after that there was an increase in the number of educated midwives which resulted in increased rates of breastfeeding. All, however, maintained that animal milk was diluted with water. Ten informants remembered the custom of pre-chewing food for young infants. The food was put into a piece of cloth that was closed at one end and then the child sucked the food out of this so-called düsa. Other informants remembered the düsa, but said that the food was not pre-chewed, but consisted mainly of potatoes and bread soaked in milk and used as a pacifier. Glass bottles of glass were most common according to the informants, but two of them remembered that infants were given milk from wooden vessels. According to one of the midwives rubber teats were common after 1920, but before that wooden teats trimmed with a piece of cloth were quite usual.

In the north most informants wrote that women as a rule used to breastfeed. Only one man, born in 1895, replied that breastfeeding used to be uncommon, but that it changed when educated midwives came to the area. Here it is worth noting that educated midwives were common in the area already by the 1870s. Some of the informants wondered about the formulation of the question, i.e. the fact that they were asked if it was uncommon to breastfeed. One man born in 1880 replied:

No, on the contrary, breastfeeding was the most common way of feeding an infant. Today some women have abandoned the practice which I consider shameful.

A woman born in 1908 said:

I have always thought that it was considered normal for women in the past to breastfeed at least if the mother was healthy. Breastfed infants were considered to be much healthier than those who were not breastfed.
Another woman born in 1899 maintained that women used to breastfeed and that she did not remember a single woman who was not able to do so.\textsuperscript{198}

The discussion above shows that even though it became increasingly common to put newborns to the breast, these were changes that took time to develop. It is also shown that there were variations between individual mothers and between individual midwives. Age seems to be an important factor in determining how infants were fed. Midwives more or less worked according to traditions they adopted during their first years of service and mothers were probably not likely to change their method of feeding their children after many experiences of childbirth. Moreover, the results above indicate that the prevailing tradition within a geographical area was a more important determinant of infant feeding methods than other factors. The last section discusses this issue.

\textit{Persisting structures. Regional differences in breastfeeding traditions}

In their well-known study on breastfeeding, fertility and infant mortality in Germany, John Knodel and Etienne van de Walle argue that traditions of infant feeding tend to be extremely persistent. A survey carried out in Germany at the beginning of the 20\textsuperscript{th} century showed that in areas that reported a tradition of artificial feeding of newborns in earlier periods had, despite subsequent campaigns in favour of breastfeeding, an extremely weak tradition of breastfeeding in modern times. In the article, they concluded that

the data for Bavaria and Hessen collected in the first years of this century are probably representative of the nursing patterns prevalent in these states during the previous several decades.\textsuperscript{199}

The evidence presented on the Icelandic midwives in the section above indicates that this also goes for Iceland. Even though the practice of breastfeeding newborns was slowly expanding, artificial feeding was still quite common in many areas. This was above all the case in the rural medical districts of southern Iceland where only half of all newborns were put to the breast.

The midwives’ reports were used to shed light on differences in breastfeeding ratios. These sources offer little opportunity to estimate the duration of breastfeeding. This factor is, however, of importance when estimating whether the tradition of breastfeeding was strong or not. It is well known that the early introduction of additional food tends to affect the amount of breast-milk and thus significantly increase the risk of early weaning.\textsuperscript{200} In areas where newborns were traditionally given varied food, both fluid and solid, and where the practice of breastfeeding was only recently being introduced, mother with all likelihood felt inclined to offer their children additional food early. In societies with a strong tradition of breastfeeding, it was not uncommon for it to continue for around nine months. This was the case, for example, with England at the beginning of the 20\textsuperscript{th} century.\textsuperscript{201}
The census material discussed above, offers a perfect opportunity to carry out a study on the duration of breastfeeding. There is one major disadvantage to this material, i.e. the fact that the infants that died before the census was taken on December 1st are, of course, not included in it. As artificially fed infants were more prone to die in infancy, this factor produces a bias in the results, in particular in areas where infant mortality was high and the breastfeeding ratio low. Otherwise the material is of good quality and almost all enumerators filled in information on infant feeding. The enumerators were requested to ask women whether their child was being breastfed or not. In the case of weaned / not breastfed infants they were to ask for how long the baby had been breastfed. This does, of course, mean that there was some inaccuracy in the case of weaned infants, since the length of breastfeeding is then most often given in months or on some occasions in weeks.

In an article in the women's journal *Kvennabladid*, the midwife Sigurveig Gunnarsdóttir (Åsi Í Hegranesi) discussed problems related to breastfeeding. There she maintained that women often tended to exaggerate the problems associated with getting the child to take the breast. She maintained that the only thing needed was a little patience and argued that almost all women are able to breastfeed. She concluded:

It is not the case that children of fisherwomen living here at the seaside should be any more likely to take the breast, than children in the agrarian areas. But since they (the fisherwomen) have no cows, they can do nothing but offer the child the breast. It is sometimes quite a struggle to get the child to take the breast, but with perseverance they succeed. It is important to offer the breast as early as possible, even before the milk comes to it, which often does not happen for two or three days after delivery. During those first days it is important not to offer the bottle to the child, because then the child gets used to the foreign teat.202

Sigurveig's ideas about women in fishing areas being more likely to breastfeed than women in rural areas is consistent with the ideas put forward by several physicians both in the 19th and early 20th century. Figure 3.23 shows that if all rural areas are lumped together into one category a general pattern of low breastfeeding ratios prevailed there as late as 1920. In towns and villages, on the other hand, infants were put to the breast. The highest breastfeeding rates and the longest duration of breastfeeding was reported for Reykjavik where 70 per cent of all infants were still breastfed at the age of two months. In rural areas the same was true for only 40 per cent of infants, with towns other than Reykjavik situated in between. In all areas breastfeeding decreased sharply and after six months only a third of all infants in Reykjavik and 20 per cent in the other areas were being breastfed. At the end of the first year, only 10 per cent of all infants were still put to the breast.
The regional analysis above shows that even though mothers in fishing districts were in general more likely to breastfeed than their counterparts in agrarian areas, there were important exceptions from this rule. Let us therefore have a closer look at breastfeeding patterns in the regions discussed in earlier sections. This is done in Figures 3.24—3.26. They show the duration of breastfeeding (survival function) in days for individual districts. Here it must be kept in mind that infants who died before the census was taken are not included in the study.

Let us start with the rural area in the south (Figure 3.24). Because of the small numbers I have added to the county of Rangárvallasýsla, the neighbouring counties of Ærnessýsla and Vestur-Skaftafellssýlsa. The rural areas in these counties displayed similar breastfeeding patterns as Rangárvallasýsla. Because of the often apparent differences between villages and rural areas, villages are shown separately and because of the extreme situation in the island of Vestmannaeyjar that island is also shown separately.

It is apparent that breastfeeding rates at birth were still extremely low in the rural areas with only half of all infants being put to the breast. It is also apparent that in most cases infants were only breastfed for a very short period. After a month the breastfeeding rate was only around one third and less than 20 per cent were being breastfed at the age of three months. In the village of Vestmannaeyjar the rate of breastfeeding was considerably higher at birth, at 80 per cent. However, infants were weaned at extremely young ages and breast-
feeding rates had dropped below 40 per cent by the end of the third month. The pattern of weaning in the rural settings in the south and in Vestmannaeyjar strongly indicates that additional food was introduced into children’s diet shortly after birth.

The two other villages in the south, Eyrarbakki and Stokkseyri, situated in the westernmost part of Arnnessysla, displayed an utterly different pattern. Breastfeeding rates were extremely high at birth. Thus 90 per cent of all newborns were put to the breast and weaning in these two villages occurred at a considerably slower pace than in the other two cases. Around 60 per cent of all six month old babies were still breastfed and at ten months more than 50 per cent of all babies were being put to the breast. Those two villages had in many ways a specific character as Danes belonging to the middle class were traditionally relatively numerous in Eyrarbakki and Stokkseyri. Eyrarbakki in particular was a merchant center in the south and Danish habits likely to have influenced breastfeeding practices there.

But let us now have a look at the northern rural county, a district that during the 19th century, by Icelandic standards, displayed extremely low infant mortality rates and where breastfeeding was common as early as the mid 19th century.

![Figure 3.24. Duration and pattern of breastfeeding in southern Iceland 1920](Source: NAI. Skjalasafn Hagstofu Islands. Aðalmanntal 1920.)
Here I show the two parts of Þingeyjarsýslur, Norður-Þingeyjarsýsla and Suður-Þingeyjarsýsla separately. Those two counties were still predominantly rural in character, although several fishing villages were starting to develop. Figure 3.25 shows that the breastfeeding pattern in these two northern counties differed markedly from the southern areas. In Norður-Þingeyjarsýslur in particular, breastfeeding was obviously the rule. Almost all newborns were put to the breast around 80 per cent were being breastfeed at the age of three months. Breastfeeding ratios at six months were around 70 per cent and were above 50 per cent at the end of the 10th month. In Suður-Þingeyjarsýslur breastfeeding from birth was less common, with 70 per cent of all newborns being put to the breast. However, those babies that were given the breast were generally breastfed for relatively long periods. The curve thus runs parallel with that for Norður-Þingeyjarsýsla.

A close analysis of the material shows that breastfeeding was least common in the westernmost parishes and grew in importance as one moved east. These results indicate that a rather limited area in northern and northeastern Iceland, including both Þingeyjarsýslur and parts of Norður-Múlasýsla (not shown here) was characterized by strong tradition of breastfeeding and thus displayed a

![Figure 3.25. Duration and pattern of breastfeeding in the two predominantly rural counties of Norður-Þingeyjarsýsla and Suður-Þingeyjarsýsla 1920](image)

Source: See Figure 3.24.
pattern distinct from other parts of Iceland. Compared to societies with a strong tradition of breastfeeding, like for example England, lengthy breastfeeding was common in this area. Robert Woods has shown that a majority of infants in England had already been weaned by the age of six months.\textsuperscript{203}

But how was the situation in Reykjavík and the surrounding fishing districts? Traditionally, Reykjavík together with Þingeyjarsýslur in the north was marked by a strong tradition of breastfeeding. Figure 3.26 shows that it continued to be both common and of long duration in the capital. Thus 85 per cent of all newborns were put to the breast. In the surrounding fishing areas breastfeeding at birth was less common. In Hafnarfjörður only 55 per cent of all newborns were breastfed and in other fishing villages west of Hafnarfjörður the rate was somewhat below that of Reykjavík.

The pace of weaning differed slightly between Reykjavík and the other areas. Mothers in Reykjavík were thus more likely to continue breastfeeding after the child reached four months than was the case with mothers in the other two areas. By then 55 per cent of all babies in Reykjavík were being breastfed, whereas

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure3.26.png}
\caption{Duration and pattern of breastfeeding in Reykjavík, Hafnarfjörður and other fishing villages in Gullbringusýsla 1920}
\end{figure}
the ratio was only 25 per cent in Hafnarfjörður and slightly above 30 in the other fishing villages. Compared to the agrarian areas in the south and compared to Vestmannaeyjar these were favourable breastfeeding ratios.

The breastfeeding pattern in Reykjavik was more comparable to that in the fishing villages of Stokkseyri and Eyrarbakki in the south (Figure 3.23). Compared to the rural areas in the north (Þingeyjarsýslur), however, breastfeeding in Reykjavik was of rather short duration. It was argued above that breastfeeding in Reykjavik was more common during the 19th century than in any other area in Iceland. Infant mortality was thus somewhat lower in Reykjavik than in the more healthy environment of Þingeyjarsýslur. In 1920 breastfeeding was definitely somewhat more common and of longer duration in Þingeyjarsýslur than in Reykjavik.

It is not unlikely that the duration of breastfeeding in Reykjavik declined during the late 19th and early 20th centuries. Population growth was enormous in the capital and the majority of immigrants came from areas in the south where breastfeeding traditions were weak. Even though midwives succeeded in convincing mothers from those areas to put their newborns to the breast it is likely that many of them stopped breastfeeding rather early. Previously, when the town of Reykjavik was smaller it was easier for individual midwives to be in control and to convince mothers to continue breastfeeding. This was likely to change with the rapid population growth in the capital. The population in Þingeyjarsýslur, on the other hand, was a stagnant rural population with unimportant geographical mobility. There traditions from earlier periods were likely to persist to a greater extent.

Table 3.24 shows that differences in breastfeeding patterns between areas were very significant, even after controlling for legitimacy. Even though Reykjavik displayed somewhat unexpected results, it can be maintained that structures from the past persisted. In areas where infants were seldom put to the breast in the 19th century, breastfeeding ratios were low in 1920. These results are

<table>
<thead>
<tr>
<th>Area</th>
<th>B</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference category, Reykjavik</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rangárvallasýsla, rural south</td>
<td>0.873</td>
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</tr>
<tr>
<td>Vestmannaeyjar, south</td>
<td>0.346</td>
<td>1</td>
<td>0.046</td>
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<tr>
<td>Other villages, south</td>
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<td>0.621</td>
</tr>
<tr>
<td>Þingeyjarsýslur, rural north</td>
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<td>1</td>
<td>0.152</td>
<td>0.803</td>
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<tr>
<td>Gullbringusýsla (outside Reykjavik)</td>
<td>0.482</td>
<td>1</td>
<td>0.000</td>
<td>1.619</td>
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</table>

<table>
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<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
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<td>1</td>
<td>0.261</td>
<td>0.840</td>
</tr>
</tbody>
</table>
comparable with those of Knodel and van de Walle for Germany. However, traditions were slowly changing and the share of infants that were being breastfed was without doubt higher in Rangárvallasýsla in 1920 than it had been in the 19th century. This view is supported by the fact that young midwives were more likely to be able to convince mothers to breastfeed.

During the 19th century, being breastfed or not was without doubt the most important determinant of infant survival. Towards the turn of the 20th century significant changes occurred. Even though there were still differences in infant mortality between those who were breastfed and those who were not, infant survival had improved greatly and survival chances of Icelandic newborns that were fed artificially were, from an international perspective, relatively good. Results in chapter 3.4 do, however, indicate that children who did not receive the breast were more likely to suffer from intestinal diseases than did those who were breastfed for a considerable period.

As in other European societies, the ambition to save the child was strong throughout the 19th century. Important changes which occurred in Iceland towards 1850 made this ambition a realistic goal. Several interrelated factors were at work. Secularization, improved educational opportunities for women and the increase in the number of educated midwives were factors of central importance. The remarkable improvements in infant survival towards the end of the 19th century were, on the other hand, only to an insignificant degree a result of changes in the economic structure. They only started to play an important role in the 20th century. In its initial stages, changes in infant feeding and improvements in personal hygiene were more important.

It has been shown that even though there were still considerable differences in breastfeeding patterns between areas as late as 1920, important improvements had been made in all areas. Those improvements were not obtained without effort. In the battle for breastfeeding well-educated midwives were of central importance. They had direct contact with childbearing women and were near at hand in the first days after delivery. Midwives were, however, not only important actors when it came to promoting breastfeeding they were also important promoters of hygiene and of changes in the treatment of food given to infants. In a relatively healthy environment, the dilution of milk with water, the boiling of water and the cleaning of vessels used to feed infants were factors that ensured high survival rates.

**Summary of Part 3**

This part of the study has dealt with various aspects of the infant mortality decline in Iceland during the 19th and early 20th centuries. The main focus is on human agency. Who were the main actors behind the infant mortality decline in Iceland? If we again refer to the model presented in the introductory part to the
study, the main focus has been on the uppermost level in the model, i.e. on the one including the factors *value systems* and *knowledge*. The main objective was to establish in what ways the interaction between individuals and institutions brought about improvements in infant survival.

Chapter 3.1 presents an extreme case of high infant mortality. The island of Vestmannaeyjar was known for its high levels of mortality from neonatal tetanus. During the 18th and early 19th centuries between 70 and 90 per cent of all newborns died during the first two weeks. Already in the beginning of the 19th century Icelandic and Danish authorities showed great interest in improving survival on the island. Already by the 1820s, physicians were sent to Vestmannaeyjar to make inquiries about the disease and during the 1840's the disease of neonatal tetanus was relatively successfully fought on the island. The achievement in Vestmannaeyjar is a good example of how the sanitary movement brought about improvements in infant survival long before the breakthrough of the bacteriological revolution. However, the measures undertaken on the island can be seen as isolated case of early medical intervention. Although neonatal tetanus was successfully fought, infant mortality levels in this area remained high. Despite the fact that a physician and a well-trained midwife were serving on this small island, the tradition of feeding newborns artificially remained the common rule until the late 19th century.

The remaining chapters of this last part of the study (3.2-3.6) are in one way or another taken up with the issue of infant feeding methods. The analysis is done separately for different regions. In accordance with other studies, it is shown that breastfeeding was the most important determinant of infant survival prior to the 20th century. Chapter 3.2, however, discusses the complexity of infant feeding. Infant feeding was not merely a question of giving the breast or not giving the breast. Today it has been shown that in many areas around the world, where long-term breastfeeding is the common rule, babies are often given subsidiary food at very early ages. The timing and the type of food given to very young infants could have important bearing upon their survival chances.

In the Icelandic case, there were huge regional variations in infant feeding traditions and consequently in mortality levels. However, with the exception of northeastern parts of Iceland and of Reykjavík, breastfeeding was either not practiced at all or infants were given additional local food at a very early age. Consequently, infants were generally weaned at a very young age. The radical changes in infant survival chances towards the end of the 19th century were, however, not a result of radical changes in infant feeding methods, but the combined result of slowly increasing breastfeeding rates and better hygiene. In the sparsely populated Icelandic society, important improvements could be obtained with only such moderate changes.

Changes in infant feeding traditions did not occur without societal effort. In chapter 3.3 it is shown that midwives were important promoters of infant survival. Through their close contact with mothers, they often bought about important changes in feeding traditions and in standards of hygiene. This was
especially true for the period after 1850, when the education of midwives greatly improved. General improvements in educational levels and an increasing secularization of Icelandic society also created conditions that contributed to more concrete ideas about how to change infant feeding traditions. It is shown that women, in areas where literacy levels were high, were more likely to start breastfeeding than in areas with low literacy rates. In part, this relied upon the fact that midwives in areas with high literacy rates were generally the best educated. It is also argued that literate women were more likely to be willing to change traditional behaviour than those who were not.

Chapter 3.4 deals with the impact of social class and nationality upon infant survival in Vestmannaeyjar and in Reykjavík. For Vestmannaeyjar it is shown that nationality had great impact upon survival chances. Infants of Danish origin displayed much lower mortality rates than Icelandic ones. Neither in Vestmannaeyjar nor in Reykjavík was social class an important determinant of infant survival during the pre-transitional period. However, during the transition towards lower infant mortality, socio-economic factors started to play an important role for survival. The most notable improvements were thus made within in the upper layers of society. This is explained by the more favourable conditions within the higher strata, which made it easier to implement knowledge about the optimal care of infants.

The two final chapters of this part of the study deal with infant survival during the early 20th century. By the turn of the 20th century Icelandic infant mortality levels were lower than in most other societies. At this point in time, Iceland started to display weak signs of an urban penalty with low levels of infant mortality in many rural areas and often slightly higher levels in more densely populated fishing areas. It is, however, argued that Iceland largely escaped the urban penalty because urbanization only gained pace at the same time as sanitary improvements were being introduced in the urban environment.

After the turn of the century, the survival chances of newborns had improved greatly and even infants that never received the breast had comparatively good survival chances. Nevertheless, as late as the early 1920s, there were still important differences in infant mortality rates among breastfed and not-breastfed babies.

In chapter 3.6 individual level data is used to shed light on differences in breastfeeding traditions between areas. It is shown that infant feeding traditions remained remarkably constant. In regions, where breastfeeding was not practiced in earlier periods, a large share of newborns never received the breast and others were weaned at very young ages. These results are comparable with those of Knodel and van de Walle for Germany.
4.1. A PATH TO SURVIVAL

Pre-transitional Iceland has been described as one of the least urbanized societies in Europe. Nevertheless, during the early 19th century this country, situated at the periphery of the European continent, displayed higher mortality rates than most other European societies. Levels were comparable with only a few areas in Europe, all of which were known for a tradition of artificial feeding of newborns. But Iceland was not only unique for its high levels of infant mortality. The rate of decline in infant mortality that was experienced during the late 19th century was even more extraordinary. Within only four decades Icelandic infant mortality levels dropped from being higher than in most other European societies to being among the lowest. At the beginning of the 20th century Icelandic infant mortality rates were on a par with those in neighbouring countries and in 1920 only Norway enjoyed levels comparable to those of Iceland.

This study has addressed a number of issues related to infant mortality. The primary objective was to analyse the main forces behind the infant mortality decline. In the beginning of this study an interactive model to account for that decline was proposed. It was assumed that the decline in infant mortality was chiefly a result of human agency. Individuals and institutions are placed in given contexts, contexts that put certain limitations on their actions. The natural environment and epidemiological regime are obvious constraints in the traditional
context, and socio-economic conditions and knowledge are factors that limit available options. However, human beings differ in ways of adapting to given conditions, and priorities about how to expend resources differ between individual families and communities.

It was argued that the most important factor behind the decline in infant mortality was changes in feeding practices of newborns. It was hypothesized that the main actors behind the changes in feeding practices were the midwives. They were recruited in the local community, had close contacts with childbearing women and generally remained with mothers for a few days after delivery. It was also suggested that levels of literacy were important determinants of infant mortality decline. Furthermore, it was hypothesized that babies belonging to the higher social strata were in the initial stages of the mortality decline more likely to benefit from improvements than their counterparts from the lower sectors of society. It is furthermore suggested that improvements in the way infants were fed occurred initially among young mothers.

Most of the proposed hypotheses have been proven. It has been shown that there were two key factors behind the decline. The first one involves changes in the epidemiological regime and consequently in virulence of various epidemic diseases, and the second, changes in feeding patterns. Here, midwives played a central role.

The study has shown that during the 18th and early 19th centuries, individuals had relatively limited opportunities of improving infant survival chances. In the late 18th century, Iceland was hit on two occasions by severe natural catastrophes that resulted in a dramatic increase in the mortality rates of all age groups. Because of the isolation of the country the epidemiological regime in Iceland was rather unique. Thus, newborns had no acquired maternal antibodies against several dangerous epidemic diseases. In other European societies diseases like measles had become endemic and had therefore little impact upon mortality among babies below six months of age.

Whereas the 18th century was marked by several subsistence crises that caused huge peaks in infant mortality, the 19th century was more or less free from such crises. On the other hand, epidemic diseases were frequent, particularly during the period 1820-1850. After 1850 the effects of epidemics declined and twenty years later the fall in infant mortality started.

Although epidemics had important temporary consequences upon infant mortality levels in Iceland, the principal cause of high infant mortality rates is to be found in a weak breastfeeding tradition. Not unexpectedly there were huge regional variations in infant mortality levels, differences that are chiefly to be explained by differences in infant feeding traditions.

The pattern of high urban and low rural mortality frequently observed elsewhere is not experienced by Iceland. By far the highest mortality was found in sparsely populated rural areas and the place with the lowest infant mortality rates during the pre-transitional era was Reykjavik, the most densely populated
area in Iceland. In towns and villages, milk was often not available and therefore breastfeeding was more common than in the agrarian districts where cow’s milk was procured at the household level.

The ambition to improve infant health has been clear though throughout the period under study. During the Enlightenment period much was written about the importance of saving children’s lives and breastfeeding was commonly discussed throughout the 18th and 19th centuries. The attempts to promote breastfeeding were, however, rather unsuccessful until after 1850. A straightforward explanation of those unchanging structures would be the fatalistic attitudes towards life and death current at the time. This appears, however, to be somewhat simplistic. Neither parents nor other members of society were indifferent to an infant death. However, it may be assumed that it was a common belief that little could be done to prevent relatively high infant mortality rates. Within an environment with a given state of knowledge and a given socio-economic situation there are limits to what human beings can actually achieve. In the 18th and early 19th century context, the death of an infant was a common occurrence. Infants were vulnerable creatures and little could be done to prevent their death.

Even though relatively high levels of infant mortality were accepted as an inevitable evil, there were limits to the acceptable norms. In the European context it can be argued that the notable focus upon infant mortality during the 19th century arose mainly from the apparent contrast between urban and rural areas. Low mortality in rural areas was proof that better results could be obtained. Danish medical authorities were as interested as their European colleagues in bringing down infant mortality rates in the urban setting. Anne Løkke has shown that Iceland, with its extremely high infant mortality rates, also constituted a region within the Danish kingdom that in the eyes of the medical authorities, transcended all acceptable norms of infant mortality.1

The island of Vestmannaeyjar in southern Iceland provides a case where substantial resources were expended in order to bring down infant mortality from levels that were higher than in any other parish in Iceland. Infant mortality of more than 80 per cent was not acceptable to contemporaries either in Denmark or in Iceland. Therefore costly measures to find a remedy against the disease were set in train as early as the beginning of the 19th century. However, the measures undertaken in Vestmannaeyjar are here seen as an anomaly in the early 19th century context. Comparable measures were not undertaken elsewhere. Little numerical evidence was available on actual infant mortality levels in Iceland until the late 1830s when the category of infants was added to the death statistics. With increased knowledge about infant mortality levels and about the prevailing tradition of artificial feeding in Iceland, measures to counteract the problem became increasingly concrete. Breastfeeding was the prime issue for medical authorities. It is apparent that as early as the beginning of the 19th century Danish medical authorities were aware of the Icelandic practice of not putting newborns to the breast and, on several occasions, this practice was remarked upon. Ideas as to how to change this practice and to convince mothers to put their newborns
to the breast were, however, rather diffuse. This changed towards the mid-19th century when it was increasingly acknowledged that midwives were the most suitable agents to carry out this task.

The study shows that midwives often were remarkably successful in promoting breastfeeding. This was especially true for midwives in Reykjavík, and in spite of the fact that its population came from the same areas as the surrounding fishing districts, Reykjavík displayed considerably higher breastfeeding ratios. As notable advances were made in several areas, it seems somewhat strange that traditional structures of infant feeding persisted. For example, in those areas where breastfeeding was almost non-existent in the mid-19th century, only around 50 per cent of all women breastfed in the 1920s. Breastfeeding was, furthermore, of short duration. Despite this, infant mortality rates continued to decline and in the beginning of the 20th century they were low, by European standards, in all counties of Iceland.

Human agency is a complicated issue and historical sources are most often silent about those who are the central actors in every child’s life. How do mothers decide upon a method of feeding? What impact do prevailing traditions have upon her choice? What advice is given by her mother or other women in the neighbourhood? What influence does a midwife’s advice have? What is the information put forward in books and booklets? Midwives were certainly central actors in promoting breastfeeding in 19th century Iceland, although not all were equally successful. A well-trained midwife, who was convinced about the beneficial effects of breastfeeding would not always get her views across in an area where others ideas about infant feeding were strong. The same midwife would certainly be more successful in an area where ideas about the benevolent effects of breastfeeding had gained ground.

In the beginning of the 20th century, advocates of breastfeeding could show, with numerical evidence, that infants who were breastfed had considerably better survival chances than those who were not. This numerical evidence was not available in early 19th century Iceland. Infants died and it was not possible for individual families who lived with a given set of infant feeding traditions, to figure out whether infants who received the breast were more likely to die than those who did not. In those areas where the tradition of feeding infants artificially was strongest, the belief that cow’s milk was best for babies persisted. The decision to offer the most valuable type of food on the farm to a newborn – cream and butter, instead of milk diluted in water – is a proof of how important children were in most parents’ lives.

This study has been given the title Saving the child. It offers a description of a long running battle against high infant mortality rates. The main parts of the study deal with the period after the turn of the 19th century, but glimpses into the late 18th century are offered as well. The study offers little direct evidence from individual parents as to how they coped with the grief involved in the loss of many children. It is, however, obvious that the high rates of infant mortality were seen as an acute social problem during the entire period. Even though it
can be established beyond doubt that a fairly high death rate of small children was seen as an inevitable evil, the belief that the trend could be reversed was strong as early as the 18th century. There was, however, little possibility of change. Even though it was generally acknowledged that breastfeeding would in all likelihood, save many children's lives, society had no means at its disposal to bring about changes in traditions. An agent was needed who was in a position to offer support and instruction to mothers after childbirth. That agent came to be the midwife.

To save children was in all likelihood always the intention of parents and midwives. New knowledge, better living conditions, and changing settlement patterns made this objective easier to achieve. The changes experienced in Icelandic society, such as secularization and changes in elementary education also had an impact upon the autonomy of women. It became easier for them to convert prevailing knowledge into improved survival chances for their children.

4.2. INFANT MORTALITY IN ICELAND VIEWED IN THE EUROPEAN CONTEXT

Pre-industrial Iceland had a peculiar infant mortality regime that it shared with few other areas in Europe. In such areas, breastfeeding was either not practiced at all or was of very short duration. Here Bavaria and Württemberg and a few districts in northern Sweden and Finland are the best-known cases. All were characterized by extremely high neonatal mortality, with a peak during the second week. Another characteristic of regions with a tradition of artificial feeding of newborns is that, contrary to the general rule in the past, mortality was often higher in rural than in urban areas.

Even though mortality rates in Iceland during the pre-transitional period were comparable to that of several districts in southern Germany and Austria, the pattern of decline in Iceland was entirely different. Whereas infant mortality in the German speaking districts remained high past the turn of the 20th century, infant mortality in Iceland declined at a steep pace much earlier. The same was true for other areas in the Nordic countries where newborns were traditionally not put to the breast. In all those areas infant mortality declined from extremely high levels long before the modernization of those societies is seen to have started. In this study it is argued that this early achievement depended, to a large extent, upon high literacy levels in the Nordic societies, levels that were much higher than in the Catholic parts of central Europe. High literacy rates created preconditions which were not at hand in less literate societies.

Secularization in the Nordic societies during the second part of the 19th century also changed the content of education and improved educational opportunities for women. Improved educational opportunities were, amongst other, reflected in changes in the education for midwives. At the same time the
publication of books that directly dealt with the issue of infant health increased. Growth in the number of educated midwives was a factor of central importance. The interaction between midwives and a literate population was with all likelihood the most important key to infant survival in the Nordic countries.

In a European context, Iceland can probably best be compared to Norway. These countries shared a relatively mild climate with warm winters and cold summers. Furthermore Norway like Iceland had a very low degree of urbanization. These were important preconditions that were prone to ensure high infant survival rates in a pre-industrial setting. Contrary to Iceland, breast-feeding was relatively widespread in Norway and throughout the 19th century Norway displayed mortality rates that were lower than most other European societies. Iceland, with its peculiar tradition of artificially feeding newborns, attained the highest levels in almost all of Europe. However, because of the favourable environmental conditions, as breast-feeding spread relatively little effort was needed to obtain favourable mortality levels. Thus extremely low mortality levels were achieved in Iceland despite the fact that breastfeeding was generally of rather short duration.

Now, with an infant mortality rate of only 3 per 1,000, Iceland together with a few other societies has the world's lowest infant mortality of the early 21st century. Such low levels can only be obtained in rich societies with high technological development. However, infant mortality rates are by no means solely a question of economic resources. Low infant mortality is largely a question of priorities both for society and the individual. In the modern context this can be seen in the fact that some of the richest countries of the world have comparatively high infant mortality. There are also great variations in mortality rates between the world's poorest countries. This study underlines the critical importance of human agency in bringing about improved infant health, agency that can best be mobilized in societies, with equal educational opportunities where everyone has the same right to basic health care.
NOTES PART 1


7 In the following analysis Seltjarnarnes is always included in the numbers for Reykjavík.


12 Recently, however, the historian Sigurður Gylfi Magnússon has challenged the view that breastfeeding was common in early 20th Century Iceland: Sigurður Gylfi Magnússon, Manninum, ást og sorg. Einsögunmön sky á íslandska sveitasamfélagni 19. og 20. aldur (Reykjavík, 1997), pp. 171-78.


33 Gísli Gunnarsson, The Sex-Ratio, the Infant Mortality and Adjoining Societal Response in Pre-Transitional Iceland.


36 Loftur Guttormsson, "Barnaeldi, ungbarnadauði og viökoma á Íslandi 1750–1860", pp. 137–69. – Another Icelandic historian Helgi Þorláksson has maintained that breastfeeding was practiced until the early 18th century. Helgi Þorláksson, "Óvelkomin börn?”, pp. 111–12.
See for example: John C. Caldwell, "Routes to low Mortality in Poor Countries", Selected readings in the cultural, social and behavioral determinants of health. John C. Caldwell and Gigi Santow (eds.), pp. 3-5. - Monica Das Gupta, "Death clustering, mother's education and the determinants of child mortality in rural Punjab, India", What do we know about Health Transition, pp. 441-61.


Monica Das Gupta, "Death clustering, mother's education and the determinants of child mortality in rural Punjab, India", pp. 441-61.


Ibid, p. 23.


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81 Preston and Haines, Fatal Years, pp. 198–207.


85 Edvinsson, Den osunda staden, chapter 9.


88 Daniel Scott Smith, "Differential Mortality in the United States before 1900", p. 753.


90 Marie C. Nelson. "Disease, dirt and demography."


See also an article of Peter Aaby, Lessons for the past: Third World evidence and the reinterpretation of developed world mortality decline” Health Transition Review 2 (supplementary issue 1992).


See for example Peter A. Schleisner, Island undersøgt fra et lagsvidenskabeligt Sympunkt, p. 61. According to Schleisner 18,000 Icelanders died in 1707 leaving behind 34,000. Most of them from hunger. – Sigurjón Jónsson, Sóttarfar og sjúkdómar á Íslandi 1400–1800 (Reykjavik, 1944), pp. 40–47.


Ibid.

The increase in mortality has been explained partly by starvation and partly by a smallpox epidemic that broke out during the year following the volcano eruption. Guðmundur Hálfdanarson, “Mannfall í móðuharðindunum”, Skáfláreldar 1783–1784. Gísli Ágúst Gunnlaugsson et al. (eds.), (Reykjavik, 1984), pp. 139–62.


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109 Jón Jónsson, Útgerð og aflabring við Ísland 1300–1900 (Reykjavík, 1994).


113 Gísli Ágúst Gunnlaugsson, Family and Household in Iceland.


115 Gísli Ágúst Gunnlaugsson, Family and Household in Iceland, chiefly chapter 3.

116 Magnús S. Magnússon, Iceland in Transition.


120 Heilbrigðisskýslur (Public Health in Iceland) 1938 (Reykjavík, 1941), pp. 134–35.

121 A brief study of the biographies of Icelandic midwives shows that it was extremely uncommon for those serving before the mid 19th century not to be married. A well known exception was the midwife Sólveig Pálssdóttir who served in the island of Vestmannaeyjar during the period 1843–1867 (see chapter 3.1 below). A change in the tradition of only recruiting married women to the profession of midwifery seems to have occurred around 1850 with the appointment of the town midwife of Reykjavík Þorbjörg Sveinsdóttir who served in Reykjavík during the period 1856–1903. – Helga Þórarinsdóttir, ”Saga Ljosmæðrafélags Íslands 1919–1979”, Ljósmaður á Íslandi 2. Björg Einarsdóttir (ed.) (Reykjavík, 1984). – For legislation on the marital status of midwives in the Danish kingdom see: Løkke, Døden i barndommen, p. 309.

122 NAI. Skjalasafn landlaeknis. D. Ársskýslur lækna. Skýslur landlæknis til heilbrigðisráðsins í Danmarku (Jón Hjaltaín 1861).


124 Tíðindi um stjórnarmálafni Íslands geðin út af Hinu íslenskra bókmenntafélagi 3 (1870–1875) (Copenhagen, 1875), pp. 394–432.

125 Stjórnartöindi fyrir Ísland 1903, A-deild, pp. 198–201.


135 Published data for regional mortality studies are available from 1913 when the Statistical Bureau was established in Reykjavík.


138 *Stjórnartiðindi fyrir Ísland* 1897–1901, C-deild.


NATIONAL TRENDS AND CHARACTERISTICS OF INFANT MORTALITY

NOTES PART 2

1 Lovsamling for Island 2 (1721–1748), pp. 226–27. – Vital statistics for the 18th and early 19th centuries were published in Rit þess íslenska kárdómstistafélagss, 6–15 (Copenhagen 1786–1797), and in Klausturpóstinn 1–9 (Beitstaðar, 1818–1826).

2 Lovsamling for Island 4 (1773–1783), pp. 132–133. The change in 1775 did not apply to Iceland. On the other hand, changes were made in 1785 that were only intended for Iceland.

3 Lovsamling for Island 5 (1781–1794), pp. 102–5. During the period 1768–1800 information on age at death is given for the following age groups, 0–1, 2–4, 5–9 and then for 10 year age groups. After 1800 Iceland joined the other countries and for the period 1800–1837 the division into age groups is 0–10, 10–20, etc. Lovsamling for Island 6 (1792–1805), pp. 447–48.

4 Lovsamling for Island 10 (1832–1836), pp. 671–77. – Statistics for the period after 1838 were published in the series Skýrslur um landshag (Copenhagen, 1858–1875). – Landshagsskjörlur Stjornartiöindi C-deild between 1887–1889. Statistics for the period after 1911 are available in Hagaskjörlur (Statistique de l'Islande) published by the Statistical bureau in Reykjavik.

5 After 1853 mortality is specified by individual months of the first year (i.e. 1st month, 2nd month, 3rd month, 4th to 6th, 7th to 9th and 9th to 12th month). As regards childhood mortality, information is available for individual age groups, i.e. 1,2,3,4 years old. After 1863 registration for the neonatal period was improved yielding information on deaths during the first day as well as information on the legal status of neonatal deaths. However, it was not until 1915 that post-neonatal deaths were specified according to the children's legal status at birth. Published information on births and deaths by calendar months is available after 1853. See: NAI (National archives Iceland). Bps. C. VI. Skýrslur um faedda gifta og dåna 1838–70. – Statistique de l'Islande (24). État et mouvement de la population 1911–1915 (Reykjavik 1921).


13 Anne Løkke, Døden i barndommen, appendix 2.3a.
18 Hans Oluf Hansen, "Gejstlige indberetninger om fødte og døde på Island 1735–1861.” Rather surprisingly, Hansen uses the figures for the 1st and 2d year as though they only referred to the 1st year in his chapter in The great mortalities and his rates on infant mortality are therefore significantly higher than those presented below. – The same figures were used by Gisli Gunnarsson in The Sex-Ratio, the Infant Mortality and Adjoining Societal Response in Pre-Transitional Iceland (Lund, 1983).
20 In the following number of births taken from Hans-Oluf Hansen, not from the estimates used in the statistics.


23 Peter A. Schleisner, *Island undersögt fra et lægevidenskabeligt Synspunkt* (Copenhagen, 1849).


32 Towards the end of the 18th century around 60 foreign vessels entered Icelandic ports per year. This number dropped quickly in the first decades of the 19th century and in 1808 only one ship came to Iceland. The number of vessels remained low until the mid 1810s. *Hagshúna. Icelandic Historical Statistics*, pp. 566–67.


34 *Ibid*.


The sex mortality ratio is found by dividing the male mortality rate by the female mortality rate times 100. A value above 100 signifies that male mortality is higher and vice versa.


See above all: Loftur Guttormsson, "Barnældi, ung-barnadauði og viðkoma á Íslandi 1750–1860.”


53 Anders Brändström, *"De kärtekslösa mödrarna"*, chapter 4.


55 Anders Brändström, *"De kärtekslösa mödrarna"*, p. 107.


57 During the 1890s and the early 20th century, the distribution of intestinal diseases in individual calendar months was relatively even. Almost without exception, however, there was a drop in the occurrence of intestinal diseases during late winter and spring (March to May). *Skýrslur um heilbrigöi manna á Íslandi árin 1881–1890* (Reykjavík, 1965), pp. 113 and 131. – *Skýrslur um heilbrigöi manna á Íslandi árin 1891–1895 með viðhuka við skýrslur árin 1896–1900* (Reykjavik, 1961), pp. 20, 33, 44, 58, 90, 101, 105, 109 and 114. – NAI. Skjalasafn landlaeknis. D. Ársskýrslur lakna 1896–1900.


62 Ibid.

63 Manicus, "Mæslingerne i Færøerne i Sommeren 1846", p. 205.

64 There are several descriptions of the effects of the measles upon pregnant women, in particular during the epidemic of 1882. See: *Skýrslur um heilbrigöi manna á Íslandi árin 1881–1890*, pp. 18–22 (medical districts 4, 5, 6, 9 and 19).

65 This was in line with developments in neighbouring countries. See Thomas McKeown, *The Modern Rise of Populations* (New York, 1976), pp. 95–100. – Thus, even though the Icelandic epidemiological regime had undergone major changes during the 19th century, epidemics of measles continued during the 20th century. It has thus been shown that measles struck regularly with an interval of around 7 years during the period 1890–1960. A. D. Cliff, P. Haggett, J. K. Ord and G. R. Versey, *Spatial diffusion. An Historical Geography of Epidemics in an Island Community* (Cambridge, 1981), chapter 4.


73 NAI. Skjalasafn landlæknis. D. Ársskýrslur lekna (Hjörtur Jónsson Stykkishólmni).


77 This is reflected in the high proportion of never married women elderly women in the census of 1901. In some areas the proportion of never-married women above the age of 60 was above 30 per cent. See Gísli Ágúst Gunnlaugsson and Ólóf Gardárdottir, “Availability of Offspring and the Household Position of Elderly Women: Iceland 1901”, *Journal of Family History* 20 (2) (1995), pp. 159–79.


79 On the discussion of household structure and social development in Iceland, see Gísli Ágúst Gunnlaugsson, *Family and Household in Iceland*.


92 A study carried out in Bangladesh shows that the probability of conception is not only dependent upon the length of amenorrhoea. It is shown that the secretion of human prolactin and gonadotropin further delays the probability of conception. John Meredith, Jane A. Menken and A. K. M. Alauddin Chowdhury, "The Effects of Breastfeeding and Nutrition on Fecundability in Rural Bangladesh. A Hazard-Model Analysis", *Population Studies* 41 (1987), 433–46. – J.E. Tyson, R.S. Freedman, A. Perez, H.A. Zacur and J. Zanartu, "Significance of the secretion of human prolactin and gonadotropin for puerperal lactational infertility", p.62. – Cronin, "Influence of lactation upon ovulation", 422–24. – About length of amenorrhoea in developing counties of today, see also: Mohamed, *Breast-feeding, supplementary feeding and lactational amenorrhoea*.


94 Luövik Kristjánsson, *Íslenzkir sjövarhettingar* 2 (Reykjavik, 1982), pp. 368–74


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101 Eggert Ólafsson, *Vice-Lovmand Eggert Olaffens og Land-Physici Bjarne Povelssens Reis i geiennem Island førarstaltet af Videnskabernes Salskab i Kjøbenhavn* (1–2) (Sorøe, 1772), pp. 450-53 (1) and 685-86 (2).

102 Hannes Finnson, "Um Barna-Dauda á Íslandi", *Rit þess Íslenzka Lærdöms-Lista Félags* 5 (1785), pp. 115–42.


104 Scheel, "Om Barskeloners og spæde Børns Behandling i Island, med Hensyn til de Midler, som kunne formindske den store Mortalitet iblandt de sidste", *Nyt Bibliotek for Physik, Chemie og Oecomie*, 9 (Copenhagen, 1806).

105 Because of the small numbers, the analysis for the parishes includes 13 years instead of 11.


110 On several occasions during the mid 19th century the situation in this part of the country was discussed by the Icelandic Landphysicus in his reports to the Collegium Medicum in Copenhagen. See for example: NAI. Skjalasafn landlaeknis. D. Ársskyrslur løkna. Skýrslur landlaeknis til heilbrigðistraðöns í Danmörku 1858 og 1860. See: Ólòf Garðarsson and Loftur Guttormsson, "Regional aspects of the development of health reforms and the decline in infant mortality in 19th century Iceland", *Nordic Demography in History and Present-Day Society. The Thirteenth Nordic Demographic Symposium 15–17 August 1999*. Lars-Göran Tedebrand and Peter Sköld (eds.) (Umeå, 2002), pp. 179–200.


112 The difference between those areas and Reykjavik is significant at the 95 per cent level. During this period the district of Gullbringu- og Kjósarsysla where Reykjavik is situated displayed a level that was exactly at the national level. If the other counties are compared to this county significant differences (at the 95 per cent level) only occur in the case of N-Isafjarðarsysla and Pingeyjarsyslur. Borgarfjarðar- og Barðarstrandarsysla is significantly lower at the 90 per cent level.


115 NAI. Skjalasafn landlaeknis. D. Ársskyrslur løkna 1843, 1846, 1882 and 1890.


121 Thus, most districts that figured highest were counties in exclusively agrarian settings with few or no villages. Conversely, there were examples of areas that were relatively densely populated areas with high population turnover that had moderate or low mortality rates. Most commonly this difference is related to the degree of urbanization.

122 Eggert Ólafsson, *Vice-Lovmand Eggert Olaffens og End-Physic Bjarne Povelssens Reise igjennem Island foranstaltet af Videnskabernes Selskab i Kjøbenhavn* 1 (Sorøe, 1772), pp. 334-35.

123 Schleisner, *Island undersøgt fra et lægesidenskabeligt Synspunkt*.

124 As a matter of fact, during the period 1890–1901 neonatal mortality fluctuated around 50 per 1,000 in all counties, except for the regions where breastfeeding was uncommon: Vestfirðir, Dalasýsla and Rangárþing ytra-sýsla [see discussion in part 3 of the study].

125 Anders Brändström, "De kärlekolsösa mödrarna".


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1 In the following, the term county is used both for counties and for deaneries. With a few exceptions the boarders of these two administrative units are the same. In the study I lump together the two deaneries of Suður-Pingeyjarprófastðæmi and Norður-Pingeyjarprófastðæmi into one (here called Pingeyjarþýslur), and likewise Vestur-Skaftafellsprófastðæmi and Austur-Skaftafellsprófastðæmi (Skaftafellssýslur).

2 Results of the study on neonatal tetanus in Vestmannaeyjar have earlier been presented at the 19th Congress for Historical Sciences. Loftur Guttormsson and Ölöf Garðarsdóttir, “Public intervention to diminish infant mortality from neonatal tetanus in the island of Vestmannaeyjar (Iceland) during the first half of the nineteenth century.” Paper presented at the 19th International Congress for Historical Sciences. Oslo, August 6–13 2000.

3 DNA (Danish National Archives). Det kongelige Sundhedskollegiums arkiv. Decanatsprotocoll 437–1838.


5 Ginklofi is the most common term used for neonatal tetanus in Iceland. It has the same meaning as lockjaw in English.


8 Neonatal tetanus thus differs from many other bacterial diseases in not being transferred from person to person.


The denominator used in the “refined” method is the actual at risk population (i.e. live births minus those dying during the neonatal period).

Two other women helped women in childbirth. Applying a proportional hazard model, it is shown that the survival chances of young infants were not related to the individual midwife. The only variable producing significant results is the “period factor”. The year 1847 marked the real breakthrough, when survival chances of young infants improved drastically. Infants that Sólveig delivered before the year 1847 were as likely to die as children delivered by other midwives and the survival chances of infants delivered by other midwives also improved greatly after 1847.


Ibid.

Ibid.


See Johnsen, Ginklofinn í Vestmannæyjum, p.12.


The model is based on the assumption that mortality rates in the 4–14 day and 15–27 day intervals tend to be equal when the disease of neonatal tetanus is not present in a population. On the other hand, mortality rates in the first period (4–14 days) tend to exceed those in the second period (15–27) when there are many deaths from neonatal tetanus.


Personal communication: Neal Chamberlain, Kirksville College of Osteopathic Medicine Department of Microbiology/Immunology, Arizona. School of Health Sciences.

C.E. Levy, Kennslubók handa yfirsetukonum (Copenhagen, 1846), p. 349.

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42 In all parts of the analysis below the parish of Seltjarnarnes is included in figures for Reykjavik.

It must be stressed here that the figures from the first period, i.e. 1820–1840, are only based on a few parishes in each county. Source material for this period is only in the form of parish records: Eyvindarhólar, Steinar and Skógár in Rangárvallasysla. However, it can be noted here that infant mortality rates presented for the parish of Eyvindarhólar are almost exactly the same as reported for two other parishes in Rangárvallasysla. See, Anný Kristín Hermansson, “Byggð undir Eyjafjöllum 1768–1907.” Unpublished BA-dissertation, Department of History, University of Iceland 1993. Figures for Þingeyjarsýslur are based on five parishes (Laufás, Múli, Skinnastadir, Presthólar and Svalbarð í Distílfróði). The period after 1840, on the other hand, shows the development in the counties as a whole.


George Steuart McKenzie, Travels in the island of Iceland in the summer of the year 1810 (Edinburgh, 1811), pp. 403–4.


Egger Ólafsson, Vice-Lovmand Eggert Olafssens og Land-Physici Bjarne Povelssens Reise igjennem Island foranstaltet av Videnskabernes Selskab i Kjøbenhavn 1–2 (Sorøe, 1772), pp. 334–35.

Schleisner, Island undersøgt fra et lægevidenskabeligt Synspunkt, p. 194.


Jón Pétursson was born in Svarfaðardalur in Eyjafjarðarsysla and Jón Sveinsson was in Munkahverá, Ýjafjörður (Ýjafjarðarsýsla is the county next to Þingeyjarsýslur).


59 Ibid.


61 In this county the ratio was one milch cow per 2.3 inhabitants, compared to between 4 and 5 inhabitants in the other rural county of Pingeyjarsyslur. In Reykjavik the ratio was one milch cow per 18 inhabitants. See: Gísli Ágúst Gunnlaugsson and Ádalgeir Kristjánsson, "Félags- og hagfrón á Íslandi á fyrri hluta 19. aldar", Saga 28 (1990), p. 34–35.


64 Brändström, "De kärlekstlösa mödrarna."


67 Brändström, "De kärlekstlösa mödrarna", p. 160–64. In his Swedish Nedertorneå study Brändström made a separate analysis of 73 high mortality families in the parish (322 babies). The neonatal mortality pattern of these families was similar to that of the parish in general, with an elevated mortality during the second week of life and a reduced mortality shortly after. First week mortality among the 322 children in this group was slightly about 70 per 1,000 and second week mortality as high as 180 per 1,000. During the third week mortality dropped below 70 per 1,000 and to around 50 in the fourth week. Brändström explains high mortality among these infants mainly by the fact that they were not breastfed

68 NAI. Skjalasafn landlaeknis. D. Árskyrslur lækna. Austurhluti suðuramts (Tómas Hallgrímsson 1875).


70 Lúðvík Kristjánsson, Íslenzkir sjávarhættir 2 (Reykjavík, 1980).

71 On milkstasis see for example: Mjölkstasis (http://www.nedoktor/barn/fakta/mjolktstockning.htm)


73 Lovamling for Island 6 (1792–1805), pp. 661–63.
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78 Schleisner, Island undersógt fra et lagevidenskabeligt Synspunkt, p. 46. Schleisner maintains that: "Dette Ord betyder egentlig ganske generelt Epidemie, men I Annalene, I daglig Tale og af Præstene bruges denne Benevnelse næsten udelukkende om Typhus.”


80 Jón Finsen’s medical reports indicate that there was little awareness about the disease in northern Iceland. In his first report to the Landphysicus he notes that he has not had any reports about neonatal tetanus in his district. In the second report, however, he remarks that he has made more enquiries about the disease and found out that the disease was extremely common on the island of Grimsey. See: NAI. Skjalasafn landlaeknis. D. Årsskyrslur lækna. Austra vesturhéðar Norður- og Austuramts (Jón Finsen 1858 and 1859). 


84 Unfortunately, the neighbouring fishing village of Hafnarfjörður is included in the figures for Reykjavik.


89 NAI. Skjalasafn landlaeknis. D. Ársskyrslur lækna. Skýrsla landlaeknis til heilbrigðisráðsins í Danmörku (Jón Hjaltalin 1864).


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92 Eggert Ólafsson, *Vice-Løvmand Eggert Olaflens og Land-Physici Bjarne Povilssens Raize igjennem Island føraralldeti af Videnskabelnes Selskab i Kjøbenhavn* (1—2) (Sorøe, 1772).

93 "Not enough milk" *Division of Child Health and Development Update* 21 (4) (1995). http://www.who.int/chd/publications/newslet/update/updt-21.htm/. – See too: Froozani, M.D., K. Permezhadeh, A.R. Dorsty Motlagh and B. Golestan, "Effect of breastfeeding education on the feeding pattern and health of infants in their first 4 months in the Islamic Republic of Iran", *Bulletin of World Health Organization* 77(5) (1999), p. 384. – Ethnographic studies indicate that women need support and it has been shown in a study initiated by the World Health Organization that for mothers receiving breast-feeding counselling, feeding from the breast only at one month increased from 31 percent to 54 and at four months from 18 to 43 per cent.

94 Loftur Guttormsson, "Barnaeldi, ungbarnadagi og viökoma á Íslandi 1750—1860."

95 Levy’s book for midwives was first published in Icelandic in 1846 and then reprinted in a revised version in 1871. Carl E. Levy, *Kennisbók banda yfirsetukonum* (Copenhagen, 1846) and *Kennisbók banda yfirsetukonum*. Aukin og endurbætt af Dr. A. Samdfeldt. Reykjavik (Copenhagen, 1871).


104 NAI. Skjalasafn landlækní. D. Ársskyrslur lækná. Skýrsla landlækní til heilbrigðisráðsins í Danmörku (Jón Hjaltaín 1861).

105 *Sjómarstöðindi fyrr Íslund 1872*, A-deild. According to a royal ordinance issued in 1872, individual communal councils (breppsnafnir) were charged with looking after the state of public health in the areas under their jurisdiction.


107 Ibid, p. 53.

108 Ibid.
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112 Brändström, "De kärlekslösa mödrarna", chapter 2.


115 NAI. Skjalasafn landlæknis. D. Árskýrslur lækna. Vestmannaeyjar (Haialand 1843).

116 Schleisner, Island undersøgt fra et lægevidenskabeligt Synspunkt, p. 192.


118 Lavsamling for Island 13 (1844–1847).

119 Short bibliographies on all midwives that have served in Iceland are available in: Ljósmæður á Íslandi. Steinunn Finnbogadóttir (ed.) (Reykjavik, 1984). — See too: Sigurjón Jónsson, Ágrif af sögu fjösmæðrafærðslu á Íslandi (Reykjavik, 1959), pp xx.

120 Johanne was apparently married in Denmark, but there is no information on her background in the Icelandic sources. She met her second husband, the carpenter Malmqvist there. After her education in 1803 she came to Iceland and met her Swedish husband with whom she had a son. They left Iceland in 1812. Ljósmæður á Íslandi, p. 348.

121 Ljósmæður á Íslandi 1, p. 606.


124 NAI. Skjalasafn landlæknis. D. Árskýrslur lækna (Skúli Thoransen 1840–1869).

125 Information on the education of individual midwives is obtained from Ljósmæður á Íslandi 1. Björg Einarsdóttir (ed.) (Reykjavik, 1984).

126 NAI. Skjalasafn landlæknis. D. Árskýrslur lækna. Austra vesturhéraö Norður- og Austuramts (Jón Finsen 1858).

127 Ibid (1864 and 1866).

128 Information is based on Björg Einarsdóttir and Valgardur Kristjónsdóttir, Ásíappid hjósmæðra og yrirstætefnum 1761–1982 (Reykjavik, 1984).

129 NAI. Skjalasafn landlæknis. D. Árskýrslur lækna. Austra vesturhéraö Norður- og Austuramts (Jón Finsen 1858).


136 François Furet and Jacques Ozouf, *Reading and writing. Literacy in France from Calvin to Jules Ferry* (Cambridge, 1982), pp. 166—91.


138 These lists called *Sýslu og sóknarlýsingar* also contain information on the number of educated midwives and physicians as well as a description of the most common diseases in each parish, with special attention being paid to neonatal tetanus and leprosy.


142 *Stjórnartiðindu* 1880, pp. 6—9.


146 This has been shown for Sweden in areas with mortality levels above 400 per 1,000. There, nearly 50 per cent of all families lost no infants; Anders Brändström, "The Impact of Female Labour Conditions on Infant Mortality: A Case Study of the Parishes of Nedertorneå and Jokkmokk, 1800-96", Social History of Medicine 1 (1988), pp. 329-358. – Katherine Lynch and Joel B. Greenhouse, "Risk Factors for Infant Mortality in Nineteenth-Century Sweden", Populations Studies 48 (1994), pp. 117-33.


152 Ólöf Garðarsdóttir, "The implications of illegitimacy."

153 Ibid, pp. 452-54.

154 Ibid, pp. 454-55. Besides household position, the model included mothers age and sex of child.

155 Ibid, pp. 455-57.


157 Unfortunately, statistics on different settings is not published for the period after 1926 (with the exception of the period 1911-1915). Moreover the returns behind the statistics have not been preserved in the archives. It is thus not possible to get a picture of differences between areas without substantial work with parish records.


163 Knut Zimsen, the Mayor of Reykjavik for several decades describes in detail the public work undertaken by the town council in his biography. Lýðvik Kristjánsson, *Úr ba í borg. Nokkrar endurminningar Knúd Zimsens fyrirverandi borgartjóra um þróun Reykjavíkur* (Reykjavik, 1952).


167 *Stjórnartiöindi* 1912, A-deild, pp. 65—68.


171 Ólöf Garðarsdóttir, "Persistent structures or changing traditions?"

172 *Stjórnartiöindi* 1911, A-deild, pp. 192—95.


174 SI. Dánarvottorð 1916—1921 and Dánarskyrslur 1916—1921.
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175 NAI. Skjalasafn landlaeknis. D. Ársskýrslur lækna. See for example Reykjavík (Guðmundur Hannesson 1910 and Jón Hj. Sigurðsson 1913) and Hafnarfjörður (Þorður Edilonsson 1909, 1910 and 1911).

176 Heilbrigöisskýrslur 1911–20, (Reykjavík 1913).

177 Ibid, Hafnarfjörður.

178 Ibid, Skipaskagi. See also Ólafsvík.

179 Heilbrigöisskýrslur 1911–20 Ísafjörður 1913.

180 Heilbrigöisskýrslur 1911–20 Hesteyri 1912.

181 Heilbrigöisskýrslur 1911–20 Vopnafjörður 1915.


191 NMI. Skrá 10. Barnið, føding og fyrsta ár. Nr. 2613

192 Basic bibliographic evidence on individual midwives is to be found in: Ljósmodur á Íslandi 1. Björg Einarsdóttir (ed.) (Reykjavík, 1984).


195 NMI. Skrá 10. Barnið, føding og fyrsta ár

196 NMI. Skrá 10. Barnið, føding og fyrsta ár, 634.

197 NMI. Skrá 10. Barnið, føding og fyrsta ár, 948.


**NOTE PART 4**

1 Anne Lokke, Døden i barndommen. Spændørnsdødelighed og moderniseringsprocesser i Danmark 1800 til 1920 (Copenhagen, 1998), pp. 69–74.

BIBLIOGRAPHY

Unpublished sources

1. DNA (Danish National Archives — Rigsarkivet)
   1.1. Det kongelige Sundhedkollegiums arkiv.
   Indkomne sager. Decanatsprotocoll 437-1838.

2. NAI (National Archives of Iceland — Þjóðskjalasafn Íslands)
   2.1. Biskupsskjalasafn
   B. VI: Árskýrslur presta og prófasta. Skýrslur um fædda, fermda, gifta, dána og fólksfjölda í Hólabiskupsdæmi 1743-1799.
   C. VI: Árskýrslur presta og prófasta. Skýrslur um fædda gifta og dána 1838-1870.

2.2. Skjalasafn presta og prófasta
   Prestrjónustubækur og söknarmannatöl
   Vestur-Skaftafellsþjóðafélag

Rangárvaldarþjóðafélag
   Vestmannaeyjar. Prestþjónustubækur: BA2. 1816-1839 (Ofanleiti), BA4. 1816-1845 (Kirkubbyr) and BA6. 1846-1863.

Árnesþjóðafélag

Kjalarnesþjóðafélag
256 SAVING THE CHILD


Borgarþjóðarprófastsdæmi

Eyjafjarþjóðarprófastsdæmi

Súður-Dingeyjarþjóðarprófastsdæmi

Norður-Dingeyjarþjóðarprófastsdæmi
Skinnastaður í Óxararfirði. Prestþjónustóbok: BA 2. 1816-68.

2.3. Skjalasafn landlæknis
D. Ársskyrslur lækna 1804–1946.
Fæðingarbækur og fæðingarskyrslur 1883–1950

2.4. Skjalasafn landsböðingja
Séröskjur. Yfirli yfir gifna, fædda, dana, aldur kvenna er börn fæddu, svo og yfir fermda, 1872-1901.

2.5. Skjalasafn Hagstofunnar
Æðalmanntal 1920.
3. NMI (National Museum of Iceland — Pjóðminjasafn Íslands)

3.1. Department of Ethnology

4. SI (Statistics Iceland — Hagstofa Íslands)
Dánarskyrs ír 1916–1921
Dánarvottorð 1916–1921

5. Interview and personal communication

5.1. Interview
Sveinsdóttir, Róshildur, Hraunteig 42, 105 Reykjavík. Interview carried out August 7 1999.

5.2. Personal Communication
Chamberlain, Neal, Kirksville College of Osteopathic Medicine School of Health Sciences Arizona.
Department of Microbiology/Immunology.
Haines, Michael, Colgate University, Hamilton, New York.

Published sources

1. Official publications and statistics
Heilbrigósskyrs ír 1911–1920 (Reykjavík, 1922).
Klausturpósturinn 1–9 (Beitistaðir, 1818–1826).
Landshagskyrs ír fyrir Ísland 1899-1911 (Reykjavík 1900-1912).
Lønsamling for Island 2-18 (1721-1863) Oddgeir Stephensen and Jón Sigurðsson (eds.) (Copenhagen, 1858-1889).
Mannatal á Íslandi 1845. Suðuramt (Reykjavík, 1982).
Mannatal á Íslandi hinn 1. nóvember 1901 (Copenhagen, 1904).
Nýjarlabók fyrir Ísland, samin eptir tilskipun 27. Málmánaður 1848 (Copenhagen).
Skyrs ír um heilbrigó manna á Íslandi árin 1881-1890 (Reykjavík, 1965).
258 SAVING THE CHILD

Skýrslur um heilsufar og heilbrigðisfélami á Íslandi 1901-1904 (Reykjavík, 1914).

Skýrslur um heilsufar og heilbrigðisfélami á Íslandi 1905 og 1906 (Reykjavík, 1905-1906).

Skýrslur um landslagi á Íslandi 1-5 (Copenhagen 1858-1875).


Statistique de l'Islande 46b. Manntal á Íslandi 1. desember 1920 (Reykjavík, 1926).

Stjórnartíðindi fyrir Island 1874-1950 (Copenhagen/ Reykjavík 1874-1950).

Tóindi um stjórnarmál almennandi Islands gefin út af Hinu íslenzka bókmenntafélagi 3 (1870-1875) (Copenhagen, 1875).

2. Contemporary medical and topographical publications and bibliographies


Benediktstöttir, Brynja, Erlingur Gíslason and Ingunn Þóra Magnúsdóttir, Brynja og Erlingur fyrir opnum tjóldum (Reykjavík, 1994).

Bjarnason, Þorkell, "Fyrir 40 árum", Timarit hins íslenzka bókmenntafélags 13, (1892), pp. 170-258.


Björnsson, Guðmundur, "Um vatnsleiðslu og skólapræsi", Eir 1 (1899), pp. 188-92.


Danish-Norwegian - English dictionary (3d edition) 1897.


Finset, Jón, Lagtlegar angaendu Sygdomsforholdene i Island (Copenhagen, 1874).

Finsson, Hannes, "Um Barna-Dauda á Íslandi", Rit þess Íslenzka Læðóms-Lista Félag 5 (1785), pp. 115-42.


BIBLIOGRAPHY


Hjaltalin, Jón, "Um barnaveikina og medöl þau er við henni eiga" (Reykjavík, 1855).

Hjaltalin, Jón, Heilbrigðistíðindi (1871-1880).

Levy, Carl E., Kennslubók banna yfirsetukonum (Copenhagen, 1846).

Horrebow, N. Tiforlæðileg Eftertreningar om Island (Copenhagen, 1752).


Jónassen, Jónas, Barnfóstran. Fyrirvögg banna aðfjóru um rjetta meðforð á ungþornum (Reykjavík, 1888).


Levy, Carl E., Kortfattet Anvisning for unge Mødre til sundhedsmessig Forpleiing af deres spade Børn (Copenhagen, 1845).

Levy, Carl E., Kennslubók banna yfirsetukonum. Aukin og endurbætt af Dr. A. Sandfeldt: Reykjavík (Copenhagen, 1871).


McKenzie, George Steuart, Travels in the island of Iceland in the summer of the year 1810 (Edinburgh, 1811).


Ólafsdóttir, Kristín, Heilsufréttir banna húsmæðrum. Handbók og námsbók (Reykjavík, 1943).

Ólafsdóttir, Kristín, Manneldisfréttir banna húsmæðrum (Reykjavík, 1945).

Ólafsson, Eggert, Vice-Lovmand Eggert Olaffens og Land-Physicis Bjarne Povelssens Reise igiennem Island foranstaltet af Videnskabernes Selskab i Kjøbenhavn 1-2 (Sorøe, 1772).


Pétursson, Jón, "Um orsakir sjukdóma á Íslandi, yfirhöfud". Rit þess Konungliga Íslenska Lærðóms-lista Félagis 11, 1790, 107-69.


Prinzing, "Die Kindersterblichkeit in Stadt und Land”, Jahrbücher für Nationalökonomie und Statistik 75 (1900), 593-644.
**Secondary literature (published and unpublished)**


Berg, Th. "Om dödligheten i första lefnadsåret", *Statistisk tidskrift* (1869), pp. 435-93.


Brändström (see: Lynch, Edvinsson, Rogers).


Caldwell, John C., "Routes to low Mortality in Poor Countries", Selected readings in the cultural, social and behavioural determinants of health. John C. Caldwell and Gigi Santow (eds.) (Canberra, 1986).

Caldwell, John C., "Introductory thoughts on health transition", What do we know about Health Transition. The cultural, social and behavioural determinants of health. The proceedings of an International Workshop, Canberra, May 1989 (1) (Canberra, 1990), pp. xi-xiii.


Cleland, John, "Maternal education and child survival: further evidence and explanations", What do we know about Health Transition. The cultural, social and behavioural determinants of health. The proceedings of an International Workshop, Canberra, May 1989 (2) (Canberra, 1990), pp. 400-419.


Dement, Michel, (see: Bourdelais).


Edvinsson (see: Brändström, Rogers).


Field manual for neonatal tetanus elimination (Geneva, 1999) [World Health Organization].


Füret, François and Jacques Ozouf, *Reading and writing. Literacy in France from Calvin to Jules Ferry* (Cambridge, 1982).


Garðarsdóttir (sec: Gunnlaugsson, Guttormsson).

Greenhouse, Joel, (see: Lynch)

Guðbergsson, Gylfi Már and Theodór Theodórsson, ”Áhrif Skátaærla á byggð og mannfjölda í Leiðavellahreppi og Kleifarhreppi” *Skátaærdur 1783-1784.* Gísli Ágúst Gunnlaugsson et al. (eds.) (Reykjavik, 1984), pp. 100-17.


Gunnlaugsson, Gísli Ágúst, *Ómaga og utangárshólfur* (Reykjavik, 1982) [Safn til sögu Reykjavíkur].


Gunnlaugsson, Gísli Ágúst, "Everyone has been good to me especially the dogs", *Journal of Social History* 27 (1993), pp. 341-58.


Guttormsson, (see: Garðarsdóttir, Gunnlaugsson).


Haines (see: Preston).


Hålfdanarson, Guðmundur, Íslenska fjöðrikið. Uppruni og endimörk (Reykjavik, 2001).

Hålfdanarson (see: Guttormsson).


Hellestenius, Johan, "Barnadödligheten i Västernorrlands och Jemtlands län", *Statistisk Tidskrift* (1884), pp. 153-68.


http://www.co.boulder.co.us/health/Disease_Fact_Sheets/rota.htm

http://www.who.int/inf-fs/en/fact125.html


Johannesson, Þorkell, Órnesni í Vestmannaeyjum (Reykjavik, 1938).

Johnsen, Baldur, “Ginklosfönn í Vestmannaeyjum”, Læknavaldið Fylgirit 14 (Reykjavik, 1982).

Jónsson, Guðmundur, Vinnuhjú á 19. öld (Reykjavik, 1981) [Ritsafn Sagnfreðistofnunar 5].


Jónsson, Guðmundur, Hagsvötur og íþnaðing. Dríðin landsframleiðsla á Íslandi 1870-1945 (Reykjavik, 1999) [Bjóðhagsstofnun, sérrit 3].

Jónsson, Jón, Úgerð og aflabröð við Ísland 1300-1900 (Reykjavik, 1994).

Jónsson, Sigurjón, Söttaðar og sjúkdómar á Íslandi 1400-1800 (Reykjavik, 1944).

Jónsson, Sigurjón, Ágríp af sögu húsmæðrafræðslu á Íslandi (Reykjavik, 1959).

Jónsson, Vilmundur, Skipun heilbrigðisvöxtar á Íslandi (Reykjavik, 1942).


Kertzer, David, Sacrificed for honour: Italian infant abandonment and the politics of reproductive control (Boston, 1993).


Kintner, Hallie, "Classifying Causes of Death during the Late Nineteenth and Early Twentieth Centuries: The Case of German Infant Mortality", Historical Methods 19 (2) (1986), pp. 45-54.

Kintner, Hallie (see: Haines, Knodel).


Köck (see: Kytir).


Kristjánsson, Ádalgeir (see Gunnlaugsson).

Kristjánsson, Lúðvik, Úr ba í borg. Nokkrar endurminningar Knúd Zimsens fyrirverandi borgarstjóra um þrún Reykjavíkur (Reykjavík, 1952).


Kruse (see: Kok).


Larsen, Guðrún, "Holocene emphysema within the Katla volcanic system, south Iceland: Characteristic and environmental impact", *Jökull* 49 (1999), pp. 5-9.


Lee, Robert (see: Kearns).


Livi-Bacci (see : Breschi).


Maynes, Mary Jo *Schooling in Western Europe: a Social History* (Albany, 1985).


Millward, (see: Bell).


Mohamed, Sumaya Ibrahim, Breast-feeding, supplementary feeding and lactational amenorrhoea (Uppsala, 1993).


Mooney (see: Williams).


Münz (see: Kytir).


Ozouf, (see Furet).


Pitkänen, Kari J., Deprivation and Disease. Mortality during the Great Finnish Famine of the 1860s (Helsinki, 1993).


Riley, James, Sickness, Recovery and Death. A History and Forecast of Ill Health (Iowa, 1989).

Rogers, (see: Brändström, Kearns, Nelson).


Sanz Gimeno, (see Reher, Ramiro Farinas).


Shelton (see: Woods)


Snævarr, Sigurður, Hagþýsing Íslands (Reykjavik, 1993).


Stefánsson, Halldór, Jökuldalsheiöin og byggöin þar (Akureyri, 1948).


Stroh (see: Boerma)


Van Poppel (see: Kok).


Vesikari, Timo and Benjamin Torun, "Diarrheal Diseases", *Health and Diseases in Developing Countries* Kari S. Lankinen, Staffan Bergström, P. Helama Mäkerä and Miikka Peltomaa (eds.) (London, 1994), pp. 135-46.


Viazzo (see: Corsini).


Watterson, (see: Woods).


Williams (see: Woods)

Winberg (see: Ahlberger).


Woodward (see: Woods).


Dórdarson, Matthias, *Sildarsaga Íslands* (Copenhagen, 1930).


APPENDIX 1

Infant mortality in Iceland's counties year by year and as a ten year moving average
1840–1901
SAVING THE CHILD

IMR, annual V-Isafjarðars
10 years moving averages

IMR, annual N-
10 years moving averages

IMR, annual Strand
10 years moving averages

IMR, annual Hímar
10 years moving averages

IMR, annual Skagafj
10 years moving averages

IMR, annual Eyjafj
10 years moving averages

Per 1000 live births

1840 1845 1850 1855 1860 1865 1870 1875 1880 1885 1890 1895 1900
APPENDIX 2
Neonatal and post-neonatal mortality in Iceland's counties 1853–1901
### APPENDIX 3

**Classification of diseases in Iceland during the 1910s and 1920s**

<table>
<thead>
<tr>
<th>Code</th>
<th>Namir sjúkdómar</th>
<th>Infectiones</th>
<th>Number of deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1916-1920 Infants</td>
</tr>
<tr>
<td>1</td>
<td>Mislingar</td>
<td>morbili</td>
<td>36</td>
</tr>
<tr>
<td>2</td>
<td>Skarlattssótt</td>
<td>scarlatina</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Heimankoma</td>
<td>erysepelas</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Barnaveiki</td>
<td>diptheria</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>Kíghósti</td>
<td>tussis convulsiva</td>
<td>70</td>
</tr>
<tr>
<td>7</td>
<td>Kvefpest (flensa)</td>
<td>influenza</td>
<td>58</td>
</tr>
<tr>
<td>8</td>
<td>Kvefsótt</td>
<td>tracheobronchitis pneumonia</td>
<td>57</td>
</tr>
<tr>
<td>9</td>
<td>Graftarsótt</td>
<td>septicopyæmia (non puerperalis)</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Barnsfararsótt</td>
<td>febris puerperalis</td>
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</tr>
<tr>
<td>11</td>
<td>Stífkrampi, ginklofi</td>
<td>tetanus, trismus</td>
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</tr>
<tr>
<td>12</td>
<td>Taugaveiki</td>
<td>febris typhoidea</td>
<td>4</td>
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<tr>
<td>13</td>
<td>Dilaveiki</td>
<td>typhus exanthematicus</td>
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<tr>
<td>14</td>
<td>Rykkjaveiki</td>
<td>typhus recurrens</td>
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<tr>
<td>15</td>
<td>Blódkreppusótt</td>
<td>dysenteria tropica</td>
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<tr>
<td>16</td>
<td>Blódsótt</td>
<td>dysenteria nostras</td>
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<tr>
<td>17</td>
<td>Austurlensk kólera</td>
<td>cholera asiatica</td>
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<tr>
<td>18</td>
<td>Íórakvefsótt</td>
<td>cholera nostras</td>
<td>32</td>
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<td>19</td>
<td>Svarti dauði (pest)</td>
<td>pestis</td>
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<td>20</td>
<td>Heilasótt</td>
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<td>21</td>
<td>Köldusótt</td>
<td>febris intermittens</td>
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<td>22</td>
<td>Giktsótt (líðasótt)</td>
<td>febris rheumatica</td>
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<td>23</td>
<td>Aðrar farsóttir</td>
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<td>24</td>
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<td>Lekandi</td>
<td>gonorrhoea</td>
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<td>Linsæri</td>
<td>ulcus molle</td>
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<td>27</td>
<td>Holdsveiki</td>
<td>lepra</td>
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<td>28</td>
<td>Berklaveiki</td>
<td>tuberculosis</td>
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<td>28 a</td>
<td>Lungnatæring</td>
<td>phthisis pulmonum</td>
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<td>28 b</td>
<td>Hálstæring</td>
<td>phthisis laryngis</td>
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<tr>
<td>28 c</td>
<td>Berklaðar</td>
<td>tuberculosis universalis acuta</td>
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<tr>
<td>28 d</td>
<td>Eitlætæring (kirtlav.)</td>
<td>scrophulosis</td>
<td>1</td>
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<tr>
<td>28 e</td>
<td>Berklameín í beinum og líðamótum</td>
<td>tumor albus</td>
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<td>28 f</td>
<td>Heilaberklabolga</td>
<td>meningitis tuberculosa</td>
<td>25</td>
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<tr>
<td>28 g</td>
<td>Berklameín í kviðarholinu</td>
<td>phthisis intestinalis etc.</td>
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<tr>
<td>28 h</td>
<td>Berklameín í í þvag- og getnáðarfærum</td>
<td>tuberc. organor. uropopoetic.</td>
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<td>28 i</td>
<td>Berklameín í óðrum liðfærum</td>
<td>tuberculosis aliorum organorum</td>
<td>5</td>
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<tr>
<td>Page</td>
<td>Apparatus</td>
<td>Description</td>
<td></td>
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<tr>
<td>------</td>
<td>-----------</td>
<td>-------------</td>
<td></td>
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<tr>
<td>29</td>
<td>Hundsdæði (vatnsfænl)</td>
<td>lyssa</td>
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<td>30</td>
<td>Militsbruni</td>
<td>pustula maligna, anthrax</td>
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<td>31</td>
<td>Snifa</td>
<td>malleus humidus</td>
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<td>32</td>
<td>Sullaeviki</td>
<td>echinococcus</td>
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<td>33</td>
<td>Ormaveiki</td>
<td>trichinosis, anchylostoma</td>
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<tr>
<td>34</td>
<td>Igulsveppa</td>
<td>actinomycosis</td>
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II.-III. Eitranir og áverkar

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<th>Page</th>
<th>Apparatus</th>
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<tbody>
<tr>
<td>37</td>
<td>Áfengiseitrun</td>
<td>Intoxicationes et casus mortiferi</td>
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<tr>
<td>35-36</td>
<td>Slys</td>
<td>alcoholismus</td>
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<tr>
<td>38-50</td>
<td>Sjálfsmorð</td>
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<td></td>
<td>Manndráp</td>
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IV. Meðfæddar bilanir og krankleikar

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<tr>
<th>Page</th>
<th>Apparatus</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>Meðfætt fjöreysir</td>
<td>debilitas et asphyxia neonatorum</td>
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<tr>
<td>52</td>
<td>Vanskapanir</td>
<td>vitia primæ formationis</td>
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<tr>
<td>53</td>
<td>Aðrir meðfæddir sjúkdómar</td>
<td>alii morbi congeniti</td>
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<td></td>
<td>Dó snögglega í svefni</td>
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V. Vanheilindi

<table>
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<tr>
<th>Page</th>
<th>Apparatus</th>
<th>Description</th>
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<tbody>
<tr>
<td>54</td>
<td>Beinkróm (enska sýkin)</td>
<td>rachitis</td>
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<td>55</td>
<td>Beinmyra</td>
<td>osteomalacia</td>
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<td>56</td>
<td>Kregða (óþrif)</td>
<td>atrophia infantum</td>
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<td>57</td>
<td>Hungur</td>
<td>inatitio</td>
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<td>58</td>
<td>Ellíhrumleiki</td>
<td>marasmus senilis</td>
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<tr>
<td>59</td>
<td>Holdfúi (kolbrandur)</td>
<td>gangræna</td>
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<td>60</td>
<td>Spiklopi</td>
<td>myxoedema</td>
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<td>61</td>
<td>Kverkeitlismormun</td>
<td>cachexia strumipriva, c. Thyeroprvia</td>
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<tr>
<td>62</td>
<td>Sykursýki</td>
<td>diabetes mellitus</td>
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<td>63</td>
<td>Ívaghlauþ</td>
<td>diabetes insipidus</td>
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<td>64</td>
<td>Gikt</td>
<td>arthritis urica</td>
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<tr>
<td>65</td>
<td>Addisonsveiki</td>
<td>morbus Addisonii</td>
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<tr>
<td>66</td>
<td>Önnur vanheilindi</td>
<td>alii morbi constitutionales</td>
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VI. Æxli

<table>
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<th>Page</th>
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<th>Description</th>
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<tbody>
<tr>
<td>67</td>
<td>Krabbamein</td>
<td>carcionoma</td>
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<tr>
<td>68</td>
<td>Sarkmein (átumein)</td>
<td>sarcoma</td>
</tr>
<tr>
<td>69</td>
<td>Önnur æxli</td>
<td>alia neonplasmata</td>
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VII. Sjúkdómar í einstaka lyfærum

<table>
<thead>
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<th>Page</th>
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<tr>
<td>70</td>
<td>Kýli</td>
<td>furunculus</td>
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<td>71</td>
<td>Bólguettranir</td>
<td>phlegmone</td>
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</tbody>
</table>
SAVING THE CHILD

72. Aðrir sjúkdómar

alíi morbi

B. Sjúkdómar í beinum og liðamónum

Mórib ossium et articulationum

73. Sjúkdómar í beinum

morbi ossium

74. Liðamein

pyarthros

75. Langvinn liðagíg

polyarthritis rheumatica chronica

76. Aðrir sjúkdómar

alíi morbi

C. Sjúkdómar í blöðinum, eitolunum, miltinum

Mórib sanguinis, glandularum lienisque

77. Mergrunarsótt

anæmia perniciosa

78. Hvitblæði

leukæmia

79. Hodgkinsveiki

pseudolukæmia

80. Bantisveiki

anæmia splenica

81. Kreppusótt

scorbutus

( skeirbjúgur )

82. Barlowsveiki

morbus Barlowii

83. Werlhoffsveiki

morbus maculosus Werlhoffii

84. Blöðraumáðaríga

hæmoglobinuria

85. Dreyrasykí

hæmophília

86. Eitlamein

adentis

87. Miltisbólg og miltísþróti

splenitis et tumor lienis

88. Aðrir sjúkdómar

alíi morbi

D. Sjúkdómar í æðakerfinu

Morbi circulationis

89. Hjartabólga

endocarditis acuta

90. Gollursbólga

pericarditis

91. Hjartafemba

hypertrophia et dialatio cordis

92. Hjartabilun

vitium cordis

93. Hjartarýrnun

myocarditis

94. Hjartakveisa

angina pectoris

95. Sjúkdómar í lifðum

arteriosclerosis, embolia etc.

96. Sjúkdómar í bláðum

phlebitis etc.

97. Aðrir sjúkdómar

alíi morbi

E. Sjúkdómar í tangakerfinu

Morbi systematis nervosi

98. Heilahimnumeín

meningitis suppurativa

99. Heilavatnssyki

hydrocephalus internus

100. Heilamein o.fl.

absscessu cerebri etc.

101. Heilablóðfall

apoplexia cerebri

102. Heilamorknun

emolliio cerebri

103. Geðveiki

morbus mentalis

104. Mænumbólga

myelitis

105. Mænumtæring

tabes dorsalis

106. Flogaveiki

epilepsia
<table>
<thead>
<tr>
<th>Page</th>
<th>Condition</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>107</td>
<td>Barnakrampi</td>
<td>eclampsia infantum</td>
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<tr>
<td>108</td>
<td>Taugaveiklun o.f.l.</td>
<td>neurasthenia etc.</td>
</tr>
<tr>
<td>109</td>
<td>Basedowsveiki</td>
<td>morbus Basedowii</td>
</tr>
<tr>
<td>110</td>
<td>Aðrir sjúkdómar</td>
<td>ali morbi</td>
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</tbody>
</table>

**F.-G. Eyrna- og augnsjúkdómar Morbi aurium et oculorum**

<table>
<thead>
<tr>
<th>Page</th>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>111</td>
<td>Eyrnasjúkdómar</td>
<td>morbi aurium</td>
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<tr>
<td>112</td>
<td>Augnsjúkdómar</td>
<td>morbi oculorum</td>
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**H. Sjúkdómar í andfjarunum Morbi organorum respirationis**

<table>
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<th>Page</th>
<th>Condition</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>113</td>
<td>Blóðnasir o.f.l.</td>
<td>epistaxis etc.</td>
</tr>
<tr>
<td>114</td>
<td>Sjúkdómar í barkakýlinu</td>
<td>laryngospasmus etc,</td>
</tr>
<tr>
<td>115</td>
<td>Ákaft lungnakvef</td>
<td>bronchitis acuta</td>
</tr>
<tr>
<td>116</td>
<td>Langvinnt lungnakvef</td>
<td>bronchitis chronica</td>
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<tr>
<td>117</td>
<td>Lungnabólga</td>
<td>pneumonia</td>
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<tr>
<td>118</td>
<td>Lungnæmbo</td>
<td>emphysema pulm.</td>
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<tr>
<td>120</td>
<td>Brjósthimnubólga</td>
<td>pleuritis, empyema</td>
</tr>
<tr>
<td>121</td>
<td>Aðrir sjúkdómar</td>
<td>ali morbi</td>
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</table>

**I. Sjúkdómar í meltingarfarum Morbi organorum digestionis**

<table>
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<th>Description</th>
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<td>122</td>
<td>Sjúkdómar í munninum</td>
<td>morbi oris</td>
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<tr>
<td>123</td>
<td>Sjúkdómar í hálsinum</td>
<td>morbi phar.</td>
</tr>
<tr>
<td>124</td>
<td>Sjúkdómar í vélindanu</td>
<td>morbi oesophagi</td>
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<td>125</td>
<td>Magasár</td>
<td>ulcus ventriculi</td>
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<tr>
<td>126</td>
<td>Aðrir sjúkdómar í maganum</td>
<td>ali morbi ventriculi</td>
</tr>
<tr>
<td>127</td>
<td>Garnakvef</td>
<td>ileus</td>
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<td>128</td>
<td>Botnlangabólga</td>
<td>appendicitis</td>
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<tr>
<td>129</td>
<td>Garnaengja</td>
<td>ileus</td>
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<td>herma</td>
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<td>131</td>
<td>Holhimnubólga</td>
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<td>132</td>
<td>Lifraraskrupnun</td>
<td>cirrhosis hepatis</td>
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<td>Gallsteinar</td>
<td>cholelihiasis</td>
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<tr>
<td>134</td>
<td>Aðrir sjúkdómar í liffrinni</td>
<td>ali morbi hepatís</td>
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<tr>
<td>135</td>
<td>Sjúkdómar í magabrisinu</td>
<td>morbi pancreatis</td>
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<tr>
<td>136</td>
<td>Aðrir sjúkdómar</td>
<td>ali morbi</td>
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**J. Sjúkdómar í pagafarum Morbi organorum uropeticorum**

<table>
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<td>Ákof nýrnabólga</td>
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<td>138</td>
<td>Langvinnt nýrnabólga</td>
<td>nephritis chronica</td>
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<td>Blöðrubólga</td>
<td>cystitis</td>
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</table>
286  SAVING THE CHILD

140  Sjúkdómar í  blöðrubiktlinum  hypertrophia prostatœ etc.

141  Steinsótt  lithiasis renalis et veic.

142  Aðrir sjúkdómar  ali morbi

K.  Sjúkdómar í getnadur-  Morbi organorum sexualium
farumkvenna, þær er ekki  muliebrum (extra puerperalis)
stafa af barnsburði

143  Legbólga  metritis non puerperalis

144  Grindarholsbólga  salpingitis

145  Blóðlát  metrorrhagia non puerper.

146  Eggjastokkæxli  cystoma ovarii etc.

147  Aðrir sjúkdómar  ali morbi

L.  Sjúkdómar, sem stafa  Morbi e graviditas et partu
af barnsþykt eða barnsburði

148  Utanlegshaðkt  graviditas extrauter.

149  Fósturlát  abortus

150  Blóðlát um eða  hamorrhagia puerperalis
eftir fæðingu

151  Barnsfararkrámpi  eclampsia puerperalis

152  Bláðarbólga á  phlegmasia alba dolens puerperalis
sængurkonunum

153  Brjóstamein  mastitis

154  Aðrir sjúkdómar  ali morbi

VIII.  Óþekkt dæðamein

155  Óþeikt eða  causa ignota seu non indicata 121  34
ótilgreind

Classification of diseases in Figure 3.17 and Tables 3.16-3.17.

Codes in the official classification of diseases

Congenital diseases  51 and 53
Atrophy and rachitis  54 and 56
Childhood diseases  1, 2, 5 and 6
Lung diseases  7, 8 and 114 to 123.
Intestinal diseases  12, 18 and 126 to 136
Child convulsions (“barnakrampi”)  107
Other infectious diseases  4, 9, 10, 11, 20, 23 and 28a to i

Reports from the Demographic Data Base,
Umeå University

During the first half of the nineteenth century, infant mortality in Iceland was considerably higher than in most other European countries. In fact, levels of infant mortality on this European periphery were comparable only with a few regions in central and northern Europe, all known for a tradition of artificial feeding of newborns or weaning in the first weeks of life.

Iceland was not only unique for its high levels of infant mortality. The pace of decline, which came in the late nineteenth century, was even more striking. Thus, by the beginning of the twentieth century, infant survival in Iceland ranked among the best in the world.

This book narrates the story of the struggle for improving survival chances for Icelandic children. It focuses mainly on the agents of change – most important of whom were the local midwives.