

The Development of Infant Mortality in Iceland, 1800–1920

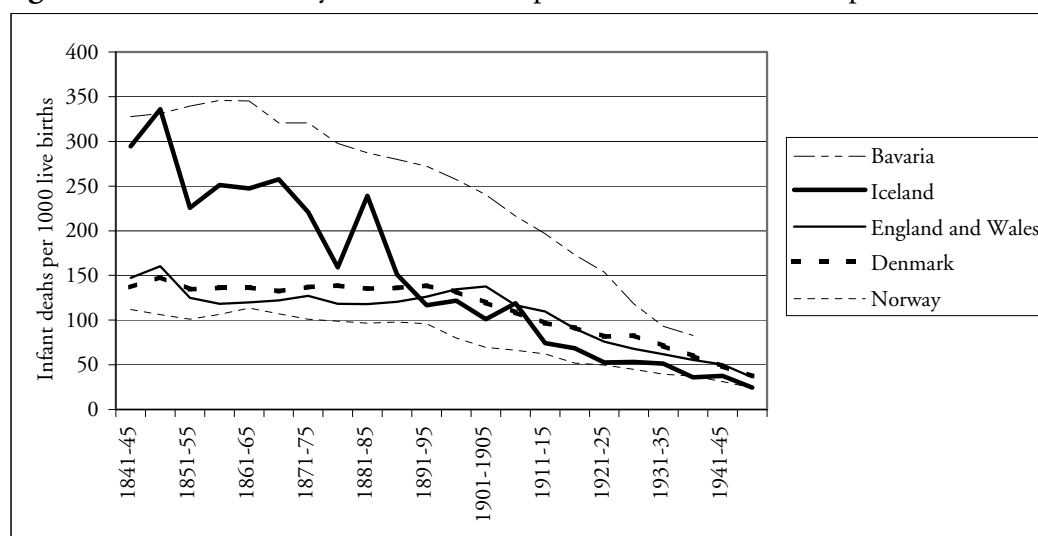
Loftur Guttormsson and Ólöf Garðarsdóttir

Introduction

By European standards infant mortality in pre-industrial Iceland was extremely high. Until 1918 the country was part of Denmark, and during the nineteenth century Danish medical authorities on several occasions expressed their concern about the high mortality rates among young children in Iceland. It was generally acknowledged that high infant mortality rates in Iceland were mainly to be explained by the prevailing practice of the artificial feeding of newborns. In Denmark infants were, as a rule, breast-fed, and there infant mortality remained at an average level of ca 140 per 1000 live births during the period 1840-1890 (Figure 1). In Iceland, on the other hand, infant mortality rates in the mid-nineteenth century were almost twice as high as in Denmark. Iceland then experienced an average of 250-300 deaths per 1000 live births, and during years of severe epidemics infant mortality rates were even higher. This was the case in 1846, when infant mortality at the national level exceeded 600 per 1000 live births.

Compared to the other Nordic countries, Icelandic infant mortality rates were exceptionally high and can best be compared to the high levels of German-speaking areas in central Europe, in particular Bavaria. Like Iceland, Bavaria was known for a tradition of artificially feeding newborns. Figure 1 shows that infant mortality rates in Bavaria and Iceland were relatively similar during the pre-transitional period. In its transition toward low mortality rates, however, Iceland deviated remarkably from Bavaria. After 1870 there was a sharp decline in infant mortality and shortly after the turn of the twentieth century, Iceland had dropped to low levels of slightly more than 100 deaths per 1000 live births, a level comparable to the other Nordic countries. At that point in time Bavaria still displayed infant mortality levels above 200 per 1000.

Figure 1. Infant mortality in Iceland compared to four other European societies.



Sources: *Hagskinna. Icelandic Historical Statistics*, Guðmundur Jónsson and Magnús S. Magnússon eds. (Reykjavík, 1997), 56–61; B.R. Mitchell, *European Historical Statistics*, 39–41. Information for Bavaria is based on different types of official statistics. Data was obtained from Michael Haines, Colgate University, Hamilton, New York.

Behind aggregate national levels of infant mortality there is a wide range of regional variations in infants' survival chances, variations that were generally acknowledged by Icelandic contemporaries during the Enlightenment. These variations mirrored important differences in ecology, socio-economic conditions, health policies and cultural practices. The main objective of this paper is to analyze regional differences in infant mortality in Iceland with particular emphasis on infant feeding and causes of death. By investigating infant mortality and the timing of change in regions with different socio-economic structures, we intend to shed light on some of the crucial factors behind the infant mortality decline in Iceland.

In the first part of this paper, however, we analyze differences in infant mortality between legitimate and illegitimate children. This part of the analysis focuses mainly on infant mortality in the fishing area of Garðar and Bessastaðir in southwestern Iceland, a district where the proportion of infants born out of wedlock was extremely high.

Infant Mortality and Legitimacy

There is an evident paradox in the infant mortality decline in Iceland, a paradox often discussed in infant mortality research on other European countries. Urban areas were known to be unhealthy for young children, and infant mortality was generally much higher in towns and cities than in rural areas. Therefore it appears

contradictory that the decline in infant mortality in Iceland took place during a period of rapid urbanization and proletarianization by the turn of the twentieth century. In Iceland the 1870s and 1880s have been described as periods of increasing poverty and overpopulation. The remarkable increase in illegitimate births during the last third of the nineteenth century has been regarded as one sign of overpopulation.

During the last decades of the eighteenth century and the beginning of the nineteenth century the illegitimacy ratio remained constant, slightly below the level of ten percent. Figure 2 shows that there was an increase in the illegitimacy ratio after 1810, and in 1830, 15 percent of all children were born out of wedlock. After 1860, the illegitimacy ratio increased again and culminated during the 1870s, when more than one fifth of all infants in Iceland were born out of wedlock. However, contrary to findings in other European societies, there appears to have been a relatively modest difference in infant mortality rates for legitimate and illegitimate infants.¹

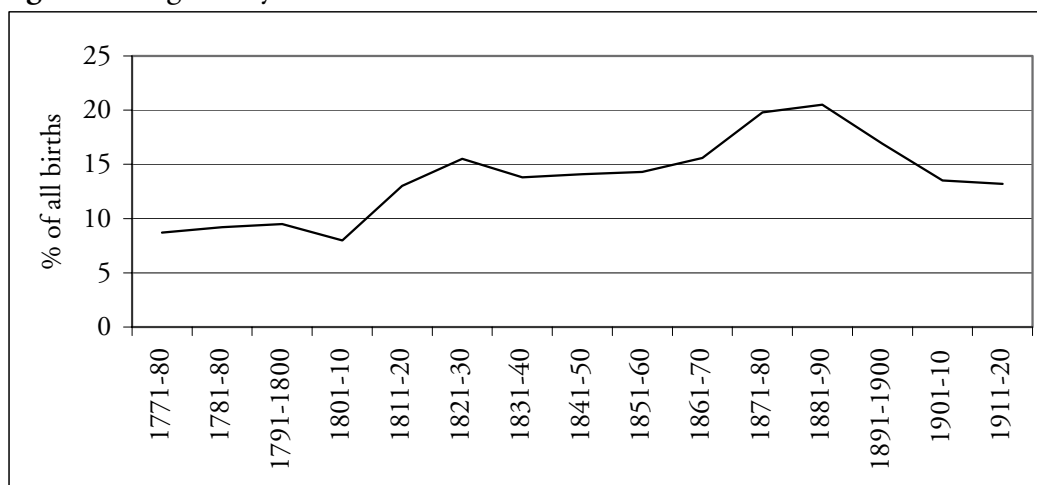
Unfortunately, published statistics for Iceland do not contain information on legitimacy and infant deaths until 1863. After that year neonatal deaths were recorded according to legal status at birth, but no information is available for the post-neonatal period. Initially differences in neonatal mortality rates between legitimate and illegitimate neonates were around 15 percent. Differences in mortality increased somewhat toward the end of the century; thus, in the beginning of the twentieth century, illegitimate infants had 30 percent higher death risks in the first month of life than their legitimate counterparts.²

Recent research has suggested that a more detailed analysis of the social and economic situation of unmarried mothers is needed to explain differences in infant

1 See, for example, Michael Mitterauer, *Ledige Mütter. Zur Geschichte der unehelicher Geburten in Europa* (München, 1983); Carlo Corsini and Pier Paolo Viazzo, "Introduction. Recent Advances and Some Open Questions in the Long-term Study of Infant and Child Mortality," in *The Decline of Infant and Child Mortality. The European Experience: 1750–1950*, eds. Carlo Corsini and Pier Paolo Viazzo (Haag, 1997), xiii–xxxi; Anders Brändström, "Life Histories of Parents and Illegitimate Children in Nineteenth-Century Sweden," in *The Decline in Infant and Child Mortality*, eds. Corsini and Viazzo.

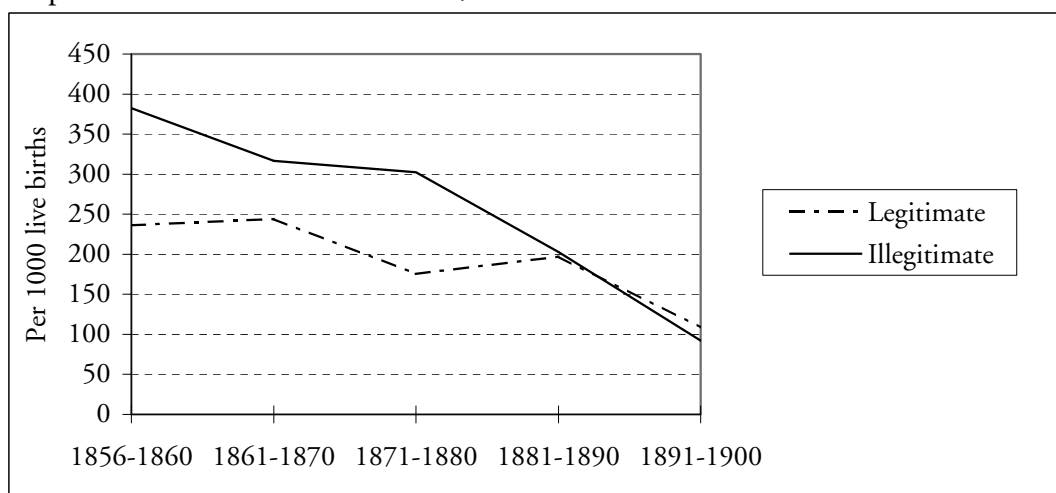
2 *Skýrslur um landshagi fyrir Ísland*, vols. 3–5. (Copenhagen, 1866–1875); *Landshagsskýrslur fyrir Ísland 1899–1912* (Reykjavík, 1899–1913).

Figure 2. Illegitimacy ratio in Iceland.



Source: *Hagskinna*, pp.50–51.

Figure 3. Trends in infant mortality rates of legitimate and of illegitimate infants in the parish of Garðar and Bessastaðir, 1856–1900.



Sources: NAI (National Archives of Iceland, Reykjavík). Prestsþjónustubækur og sóknarmannatöl VII.4, Garðar á Álftanesi (og Bessastaðir), 1816–1862 and 1863–1910.

Table 1. Death risks for illegitimate infants according to their mother's household position at their birth in Garðar and Bessastaðir 1851–1893.

Household position	Children alive after one year (N)	Children dead after one year (N)	Not known if child is alive (N)	IMR (per 1000 live births)
Mother heads a household (alone or with father)	101	34	1	252
Mother lives in her parental home	29	9	0	237
Mother servant or pauper in the household of a non-relative	26	26	6	448
Household position unknown	2	1	1	
Total (illegitimate)	158	70	8	285
Legitimate infant mortality in Garðar 1856–80				217

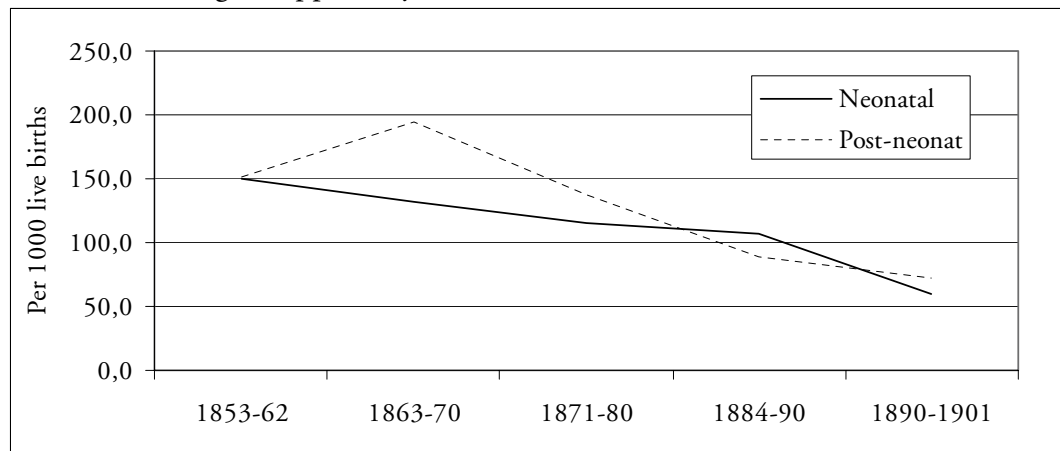
Sources: NAI (National Archives of Iceland, Reykjavík). Prestsþjónustubækur og sóknarmannatöl VII.4, Garðar á Álftanesi (og Bessastaðir), 1816–1862 and 1863–1910.

mortality for legitimate and illegitimate infants.³ A life-cycle analysis of the reproductive histories of mothers of illegitimate babies born in the parish of Garðar and Bessastaðir during the period 1851–1893 shows that the family situation of children born out of wedlock had important implications for their survival chances.⁴ Garðar and Bessastaðir is a coastal parish situated on the southwestern coast of Iceland in

3 See, for example, Anders Brändström, “Kinship and Mortality: Illegitimate Children in Sundsvall, Sweden, 1808–1900”. Paper presented at the 22nd meeting of the Social Science History Association in Washington, DC, 16–19 October 1997; Frans van Poppel, “Children in One-Parent Families: Survival as an Indicator of the Role of Parents,” *Journal of Family History* 25:3 (2000), 269–90.

4 Ólöf Garðarsdóttir, “The implications of illegitimacy in late nineteenth-century Iceland: the relationship between infant mortality and the household position of mothers giving birth to illegitimate children,” *Continuity and Change*, 15:3 (2000), 435–461.

Figure 4. The development of neonatal and post-neonatal mortality in the county of Snæfellsnes- og Hnappadalssýsla.



Sources: NAI. Biskupsskjalasafn, Skýrslur um fædda, gifta og dána C, VI, 14E (1838–1856), C, VI, 15A og 15B (1857–1870); NAI. Skjalasafn landshöfðingja. Séröskjur. Yfirlit yfir gifta, fædda, dána, aldur kvenna er börn fæddu, svo og yfir fermda, 1872–1901.

the vicinity of Reykjavík. The inhabitants were heavily dependent upon fishing, and by Icelandic standards the parish was densely populated. The proportion of children born out of wedlock was extremely high in the area. In 1870, the illegitimacy ratio mounted to around 33 percent compared to slightly more than 20 percent at the national level. During the period 1851-1880, infant mortality in the parish of Garðar and Bessastaðir was approximately 30 percent higher for illegitimate babies than was the case with children of married couples (Figure 3). When the proportion of infants born out of wedlock peaked during the late 1870s, the survival chances for legitimate infants remained at a constant level, whereas there was a steep decline in mortality among illegitimate children. Between 1881 and 1900 survival chances for the two groups were identical.

Women giving birth to illegitimate children in Garðar and Bessastaðir were by no means a uniform group. A detailed analysis of the household position and kin relations of women giving birth to illegitimate children in Garðar and Bessastaðir shows that more than 55 percent of all these mothers giving birth to an illegitimate child lived in a free concensual relationship together with the child's father and thus *de facto* had the same social position as married women. Fifteen percent of the women lived in their parental home (or in the parental home of the father), whereas 25 percent were in the vulnerable position of servant or pauper in the household of non-relatives. An analysis of differences in infant mortality between these groups shows that babies of mothers that were either in a superior household position (head of household/spouse) or were supported by strong kinship networks (lived in their parental household) had survival chances almost identical to legitimate children. Table 1 shows that mortality rates among these children were between 237

and 252 per 1000 live births, slightly higher than for their counterparts born within wedlock, who exhibited an infant mortality rate of 217 per 1000. On the other hand, the minority of infants born to unmarried women who occupied an inferior household position, that is were noted as servant or pauper, displayed infant mortality rates that were much higher, 448 deaths per 1000 live births. These results are in line with previous studies that confirm the importance of kinship networks in pre-industrial Iceland in particular during periods of need.⁵

Regional Differences in Infant Mortality

Even if no published statistics on regional differences in infant mortality were available, contemporaries in eighteenth and nineteenth century Iceland were well aware of the existence of important differences in mortality levels among districts. It was generally believed that infant mortality was relatively low in the rural areas in the northeastern part of the country and high in the southwestern part, especially in the relatively densely populated fishing districts.⁶

A number of recent studies focusing on regional differences in infant mortality in Iceland have unveiled higher mortality in densely populated coastal areas than in the rural districts. In the coastal parish of Hvaldnes in southwest Iceland infant mortality was above 300 per 1000 during the period 1766-1810. At the same time infant mortality was 210 and 268 deaths per 1000 in two inland parishes situated in western and southern Iceland.⁷ Similar results were revealed in a study of infant mortality in coastal areas in the post-transitional period. At the end of the nineteenth century infant mortality had dropped to levels around 120 per 1000 at the national level. Two expanding fishing towns in eastern and northern Iceland

5 Gísli Ágúst Gunnlaugsson and Loftur Guttormsson, "Transition into old age. Poverty and retirement possibilities in late eighteenth and nineteenth century Iceland," in *Poor Women and Children in the European Past*, eds. John Henderson and Richard Wall (London, 1994), 250–268; Gísli Ágúst Gunnlaugsson and Ólöf Garðarsdóttir, "Transition into widowhood: a life-course perspective on the household position of Icelandic widows at the beginning of the twentieth century", *Continuity and Change*, 11:3 (1996), 435–458.

6 See Eggert Ólafsson and Bjarni Pálsson, *Ferðabók*, vol. 1 (Reykjavík, 1943), 229–230 and 313–315, and vol. 2, 50; Hannes Finnsson, "Um Barna-Dauda á Íslandi," *Rit þess Íslenska Lærdóms-lista Félags* 5 (1784), 121.

7 Loftur Guttormsson, "Family, household and fisheries in south-western Iceland 1750–1850" (unpublished paper).

(Seyðisfjörður and Siglufjörður) revealed much higher death rates during this period, 150–160 deaths per 1000 live births. Both towns experienced accelerated population growth with extremely intensive in-migration during the late nineteenth and early twentieth centuries. Overcrowding, hard work, the lack of health services and insecure communications are among the factors that may have produced this situation of excess mortality.⁸

Map 1 (1840–52), Map 2 (1870–80) and Map 3 (1911–21) are based on tabulations carried out by the ecclesiastic authorities on the basis of parish register data.⁹ Important regional variations are unveiled both as regards patterns and development of infant mortality for the period 1841–1921. In the beginning there was a great range of mortality rates at the county level. As a rule, counties in the northeast had relatively low mortality rates, whereas the south and west displayed high infant mortality. During the period 1840–1852, the county with the lowest rate (Suður-Pingeyjarsýsla in northern Iceland) revealed an infant mortality rate of 213 per 1000, while the highest (Rangárvallasýsla in southern Iceland) was 400 deaths per 1000 live births. At the parish level the differences were even more apparent: the lowest rate was a parish that experienced only 87 deaths per 1000 births during this thirteen year period, while the highest rate of infant mortality was above 600 per 1000. In the 1870s infant mortality had decreased in all counties, although the rate of decrease varied considerably. As a rule, areas that started out with high mortality

the low mortality areas. As in earlier periods, the county of Suður-Pingeyjarsýsla exhibited the lowest rates in Iceland (123‰), whereas the county of Snæfells- og Hnappadalssýsla had the highest rates (253‰).

The last three decades of the nineteenth century and the initial years of the twentieth century were characterized by a steep decline in infant mortality, and shortly after the turn of the century levels of infant mortality in Iceland had dropped to levels on par with the other Nordic countries. During this period the gap in mortality levels between the areas diminished remarkably; thus in the second decade of the twentieth century (see Map 3, 1911–21) most counties displayed

8 Gísli Á. Gunnlaugsson, and Loftur Guttormsson, “Household Structure and Urbanization in Three Icelandic Fishing Districts, 1880–1930.” *Journal of Family History*, 18: 4 (1993), 334–335; Ólöf Garðarsdóttir, “Á faraldsfæti. Fólksflutningar og félagsgerð á Seyðisfirði 1885–1905” (Unpublished thesis, University of Iceland, Institute of History, 1993).

9 NAI. Biskupsskjalasafn. Skýrslur um fædda, gifta og dána C, VI, 14E (1838–56), C, VI, 15A og 15B (1857–1870); NAI. Skjalasafn landshöfðingja. Séröskjur. Yfirlit yfir gifta, fædda, dána, aldur kvenna er börn fæddu, svo og yfir fermdu, 1872–1901.

infant mortality levels close to the national level (64‰). Only one county stands out with exceptionally high infant mortality rates, the county of Norður-Ísafjarðarsýsla in the northwestern part of the country. During this period infant mortality rates in this county were above 100 per 1000 live births or around 50 percent higher than the national average.

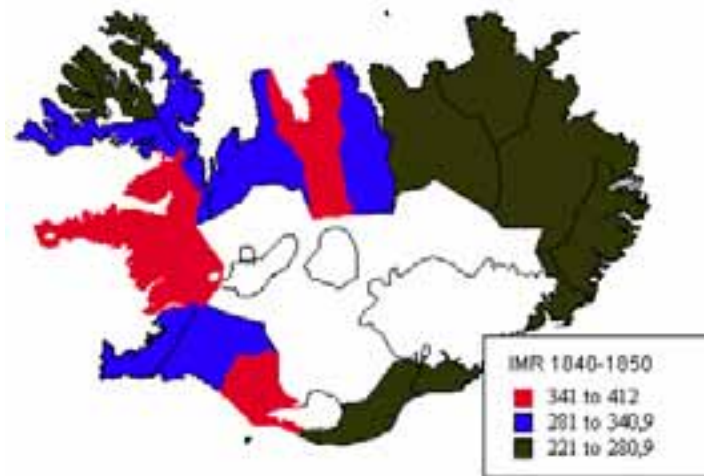
As regards mortality patterns in the mid-nineteenth century, recent research on regional differences in infant mortality has more or less confirmed the ideas put forward by Enlightenment authors. The sparsely populated counties in the northeast were characterized by comparatively low infant mortality rates, whereas infant mortality was highest in the western and southern parts. However, no obvious correlation between population density and infant mortality can be established. Although the sparsely populated northeastern areas had low infant mortality rates, there are also examples of sparsely populated rural areas with very high mortality rates. This is notably the case with the two counties (Rangárvallasýsla and Dalasýsla) where infant mortality rates ranged above other districts during most of the nineteenth century. Frequently, however, densely populated areas with high population turnover displayed high infant mortality rates. This was above all the case with fishing districts in the west and southwest.

Thus the western county of Snæfellsnes- and Hnappadalssýsla, that was dominated by fishing, had very high infant mortality throughout the nineteenth century. The county of Gullbringu- and Kjósarsýsla (where the capital Reykjavík is located) is another district with a high population turnover and high population density along the coastline. However, this county showed a much more favorable mortality development than was the case with Snæfellsnes- and Hnappadalssýsla. In the beginning of the period the county as a whole was close to the national average, and at the turn of the nineteenth century the situation had become even more favorable.

At that point in time, infant mortality rates in Gullbringu- and Kjósarsýsla were among the lowest in Iceland. In this connection it is important to note that the county of Gullbringu- and Kjósarsýsla was much more diversified in economic, demographic and social terms than was the case with Snæfellsnes- and Hnappadalssýsla. Not unexpectedly, infant mortality rates in individual parishes in Gullbringu- and Kjósarsýsla exhibited important variations. The capital of Reykjavík had relatively low infant mortality rates, while, on the other fishing communities located on the peninsula of Reykjanes exhibited high infant mortality. In these communities infant mortality was extremely high around 1850, but notable improvements occurred during the last three decades of the nineteenth century. (see the discussion below.)

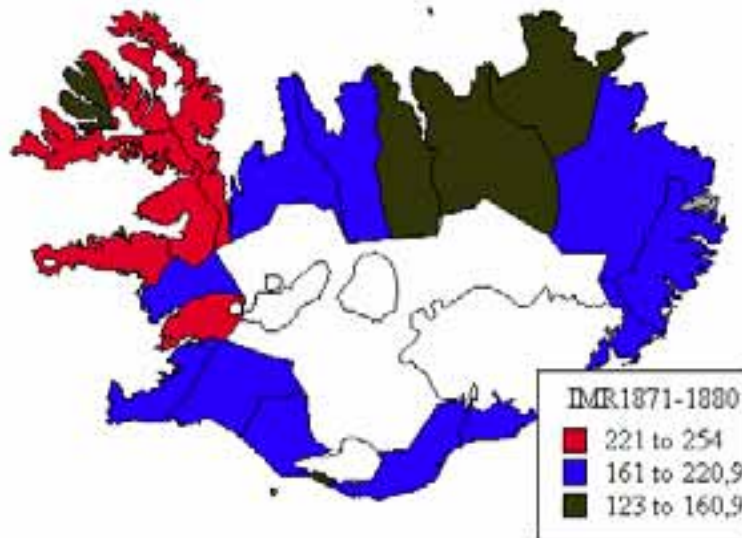
There are interesting variations in the relative share of neonatal and post-neonatal mortality between sparsely populated agrarian areas and areas with high population density. Agrarian areas with extremely high infant mortality rates tended

Map 1. Infant Mortality Rates in Iceland by counties, 1840–1852.



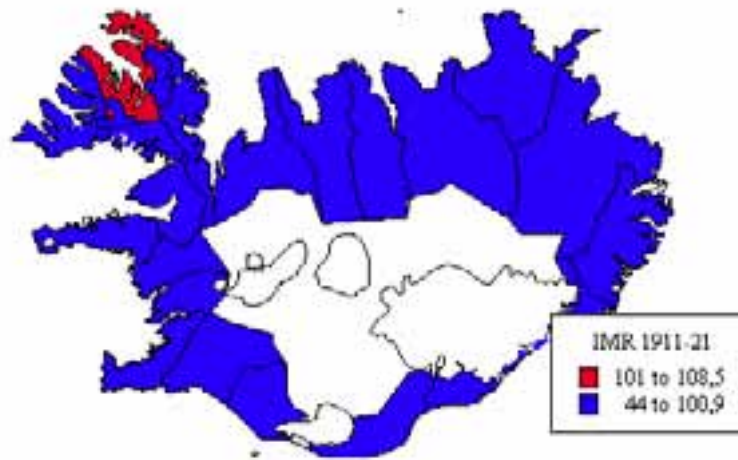
Source: NAI (National Archive Island). Bps. C. VI. Skýrslur um fædda, gifta og dána 1838–1871 (The maps were created by Ólöf Garðarsdóttir on the basis of a map by Björn Gunnlaugsson (1846)).

Map 2. Infant Mortality Rates in Iceland by counties, 1871–1880.



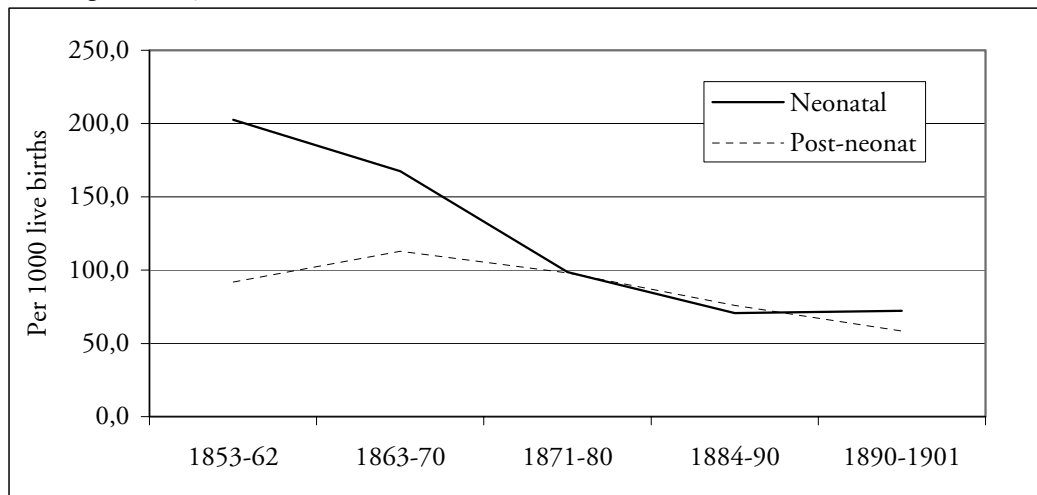
Source: NAI Skýrslur um fædda, gifta og dána, aldur kvenna er börn fæddu, svo og yfir fermda 1838–1871 and NAI. Skjalasafn landshöfðingja. Yfirlit yfir gifta, fædda og dána, aldur kvenna er börn fæddu, svo og yfir fermda 1872–1901.

Map 3. Infant Mortality Rates in Iceland by counties, 1911–1921.



Source: Statistique de Íslande 24, 56 and 57. État et mouvement de la population 1911–1915, 1916–1920 and 1921–1925 and Statistics Iceland. Reports on deaths 1916–1921.

Figure 5. The development of neonatal and post-neonatal mortality in the province of Rangárvallasýsla.



Sources: NAI. Biskupsskjalasafn, Skýrslur um fædda, gifta og dána C, VI, 14E (1838–56), C, VI, 15A og 15B (1857–1870). NAI. Skjalasafn landshöfðingja. Séröskjur. Yfirlit yfir gifta, fædda, dána, aldur kvenna er börn fæddu, svo og yfir fermda, 1872–1901.

to have 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. These two trends appear in Figures 4 and 5 showing the development of neonatal and post-neonatal mortality in two high mortality areas, the agrarian district of Rangárvallasýsla and the fishing district of Snæfellsnes- og Hnappadalssýsla. In

the 1850s more than two thirds of all infant deaths in Rangárvallasýsla occurred during the first month. Post-neonatal mortality, on the other hand, was not higher than in the neighboring agrarian districts with comparatively low overall infant mortality rates. In Snæfellnes- og Hnappadalssýsla, on the other hand, neonatal mortality was much lower than in Rangárvallasýsla: slightly less than 50 percent of all infant deaths occurred during the neonatal period.¹⁰ Comparatively high post-neonatal mortality in densely populated fishing areas suggests that infants in those regions were more likely to die from infectious diseases than their counterparts in high-mortality rural areas. Conversely, infants in rural areas with high infant mortality rates were more likely to suffer from complications connected with artificial feeding among newborns.

Several studies have demonstrated that neonatal mortality tends to be extremely high in areas where infants are not breast-fed. This was the case in several parts of Germany (in particular Bavaria and the Württemberg area),¹¹ Austria and districts around the Baltic Sea (western Finland and northern Sweden).¹² Absence of breast-feeding is the most likely reason for the extremely high neonatal mortality prevailing in pre-industrial Iceland. During the pre-statistical period around 50 percent of all infant deaths occurred during the first month of life. It is worth noting that the proportion of neonatal deaths in Iceland was higher than in other rural areas in northern Scandinavia and Bavaria where breast-feeding was uncommon.

10 Ólöf Garðarsdóttir 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*, eds. Lars-Göran Tedebrand and Peter Sköld (Umeå, 2002).

11 John Knodel, *Demographic behavior in the past. A study of fourteen German village populations* (Cambridge, 1988), 46–53; John Knodel and E. van de Walle, "Breast Feeding, Fertility and Mortality: an Analysis of some Early German Data," *Population Studies* 21 (1967), 400–402.

12 Anders Brändström, "De kärlekslösa mödrarna". *Spädbarnsdödligheten i Sverige under 1800-talet med särskild hänsyn till Nedertärneå*. Umeå Studies in the Humanities, vol 62 (Umeå, 1984), 103–106; Ulla-Brit Lithell, "Child-care. A mirror of womens' living conditions. A Community Study Representing 18th and 19th Century Ostrobothnia in Finland," in *Society, Health and Populations During the Demographic Transition*, eds. Anders Brändström and Lars-Göran Tedebrand (Umeå, 1988), 91–108.

Infant Feeding

Iceland is well-known for a tradition of artificial infant feeding, at least during the eighteenth and early nineteenth centuries.¹³ Contemporary evidence attests to the fact that during the eighteenth and early nineteenth centuries breast-feeding was extremely rare in Iceland. Apparently, only very poor women living in cottages in fishing areas occasionally breast-fed their children due to extreme poverty; they had no access to milk products.¹⁴ In these cases breast-feeding seems to have been the last resort when cow-milk could not be procured. Other kinds of social and geographical differences in infant feeding practices can also be noted. Thus infants in northern Iceland were rarely given solid food before they had reached the age of three months. In the southern and western parts of the country, on the other hand, it was common to give infants solid food already in the first month of life. The diet consisted of meat, fish or butter that had been pre-chewed by adults, the so-called *dúsa*.¹⁵

During the second half of the nineteenth century and in the beginning of the twentieth medical authorities and professional midwives exercised strong pressure on the common people to replace the traditional artificial feeding with maternal milk. This is reflected clearly in the annual medical reports and in many periodicals intended for the public.¹⁶ Results of international investigations were published in order to highlight the advantages of breast-feeding for the survival chances of babies in comparison with bottle-feeding. Empirical evidence furnished the district physicians with eloquent instances of the beneficial effects of breast-feeding.¹⁷

There is indirect evidence showing that breast-feeding progressed very unevenly from one part of the country to another. A biometric analysis of infant mortality as it develops across the first year of life, furnished by John Knodel and Hallie Kintner, has demonstrated that infant mortality in societies with artificial feeding generally deviated from the traditional linear model developed by Bourgeois-

13 Loftur Guttormsson and Ólöf Garðarsdóttir, "Aspects of infant mortality in Iceland," in *A Matter of Survival*, eds. Michael Haines and Marie C. Nelson, (forthcoming).

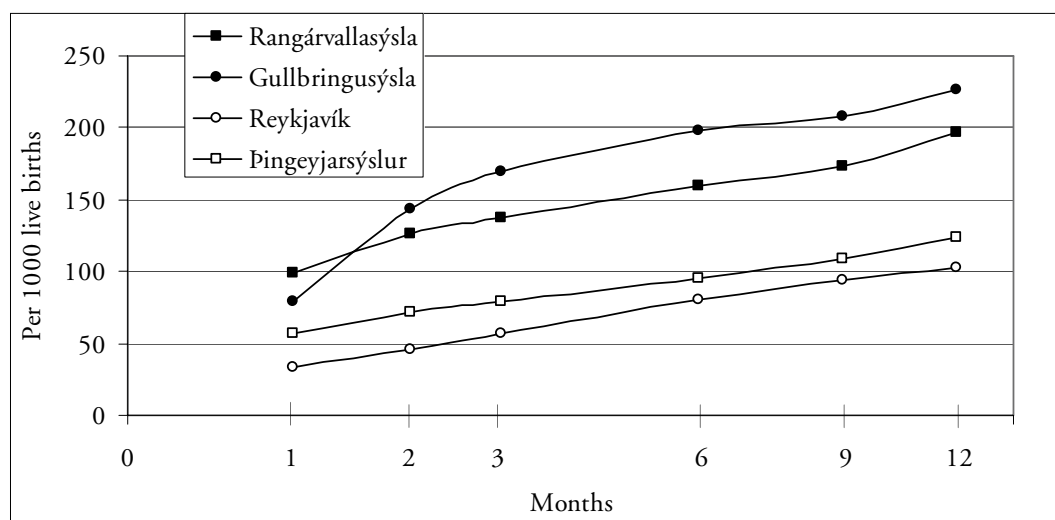
14 Guttormsson, "Barnaeldi, ungbarnadauði," 138–140.

15 Árni Björnsson, *Merkisdagar á mannsevinni. Gamla venjur, siðareglur og sagnir* (Reykjavík, 1996), 91–94.

16 See, e.g., *Eir. Mánaðarrit handa alþýðu um heilbrigðismál* (Reykjavík, 1900).

17 See, e.g., National Archives (=NA), Skjalasafn landlæknis. Ársskýrslur lækna DI and DII. Bíldudalshérað 1907.

Figure 6. Biometric cumulative infant mortality in Rangárvallasýsla, Þingeyjarsýslur, Gullbringu- and Kjósarsýsla (with the exception of Reykjavík) and Reykjavík, 1872–1880.



Source: NAI. Skjalasafn landshöfðingja. Séröskjur. Yfirlit yfir gifta, fædda, dána, aldur kvenna er börn fæddu, svo og yfir fermda, 1872–1901. Pichat,¹⁸ a model that assumes that infant mortality after the first month post-partum is linear according to age.

Figure 6 shows the extent to which infant mortality in four Icelandic areas during the period 1872–1880 deviated in this respect from a linear development. According to this evidence, breast-feeding was widespread in Reykjavík at this time, as well as in the county of Þingeyjarsýsla in northern Iceland. In both cases infant mortality rates were far below the national average (about 180‰). On the other hand, the county of Rangárvallasýsla and the county of Gullbringu- og Kjósarsýsla in southern and southwest Iceland had low breast-feeding rates (with infant mortality rates considerably higher than the national average). In Gullbringu- og Kjósarsýsla the increase in mortality is most dramatic during the second and third month. Furthermore, both these areas exhibit high neonatal mortality rates, which means that a large number of infants died from diarrhea during the first weeks of life.

Evidence from medical health reports from the nineteenth and early twentieth centuries suggests that infant feeding practices changed relatively slowly in most areas. For the later period relevant source material becomes more abundant; district

18 John Knodel and Hallie Kintner, “The Impact of Breast Feeding Patterns on the Biometric Analysis of Infant Mortality,” *Demography*, 14:4 (1977), 391–409.

physicians wrote lengthy reports on infant feeding,¹⁹ and, after 1912, midwives were required to provide detailed information on all women they helped in delivery.²⁰ Moreover, in early twentieth century Iceland several national surveys were carried out to assess the extension of breast-feeding versus artificial feeding in different parts of the country. As a rule, in these surveys feeding methods were divided into three categories: exclusively breast-fed, mixed feeding and exclusively artificially fed. The most detailed survey on feeding practices is a study carried out in connection with the 1920 census. All households with a child below the age of one were asked about feeding practices. The queries were whether the infant was breast-fed when the census was taken and, in the case of weaned infants, whether the child had previously been breast-fed and for how long.

Information on breast-feeding for the entire country, based on the 1920 census, is included in Figure 7. It shows that breast-feeding was much more common in the urban settings than in rural areas. Breast-feeding rates were highest in the capital Reykjavík; 70 percent of all children aged one and to two months were put to the breast. The same was true for only 40 percent in rural areas and for 58 percent in towns other than Reykjavík. At the same time it is clear that, even if breast-feeding was initiated, few infants were nursed for extended periods. In agrarian settlements weaning was common after the second month, whereas most breast-fed infants in Reykjavík were nursed for at least three or four months. The short duration of breast-feeding definitely points toward early introduction of supplementary diet for infants.²¹

The information in Figure 8a–8c is based on medical reports (for the period 1911–1920) from district physicians who, in turn, received reports from individual midwives. These reports do not contain material on the duration of breast-feeding. Presumably the information is mainly based on feeding relatively shortly after birth, since midwives were not supposed to carry out any health control after two weeks post-partum. Figure 8a shows that 90 percent of all infants in Reykjavík were put to the breast, a rate higher than that derived from the census material (cf. Figure 7). As midwives were principally in favor of breast-feeding, the discrepancy between the two sources may indicate that mothers normally breast-fed their newborns upon

19 A summary of these reports has been published under the auspices of the Director of Public Health, *Skýrslur um heilbrigði manna á Íslandi* and *Heilbrigðisskýrslur 1911–1920*.

20 *Stjórnartíðindi* 1914, B, 12–20.

21 On the impact of supplementary food on breast-feeding rates, see Victoria Cesar Gomes et. al., “Pacifier Use and Short Breast-feeding Duration: Cause, Consequence, and Coincidence,” *Pediatrics*, 99:3 (1997), 445–53.

advice of the midwives. Very likely, however, some stopped breast-feeding shortly after the midwife ceased visiting them, i.e. approximately two weeks post-partum.

Towns and villages in the vicinity of Reykjavík display diverse patterns: in Hafnarfjörður only 50 percent of all infants were exclusively breast-fed, whereas infants in Keflavík were breast-fed to the same extent as their counterparts in Reykjavík. The rural areas also reveal two distinct patterns: in the northeast breast-feeding appears to be the rule (Figure 8b), whereas in the south slightly more than 50 percent of all infants were put to the breast (Figure 8c). At the turn of the twentieth century, one district physician in the area complained that it was uncommon for mothers to breast-feed: “Furthermore, it is still a common belief among many peasants that milk diluted with water is unhealthy for infants.”²² An additional complaint from district physicians in southern Iceland was that infants were given solid food too early and that gastro-intestinal diseases were common among young children.²³

It took many generations for the majority of Icelandic mothers to turn their backs on the traditional practice of artificial feeding. Most of the localities which by 1920 showed the lowest level of breast-feeding belonged to the counties which had the highest infant mortality rates at the turn of the twentieth century, in particular the county of Norður-Ísafjarðarsýsla in the northwest (Map 3). It can be noted at the same time that this county was among the most isolated from the main lines of land communication. Moreover, Norður-Ísafjarðarsýsla is an interesting case in point when one looks at the problem of causes of death among infants and young children in Iceland.

Causes of Death

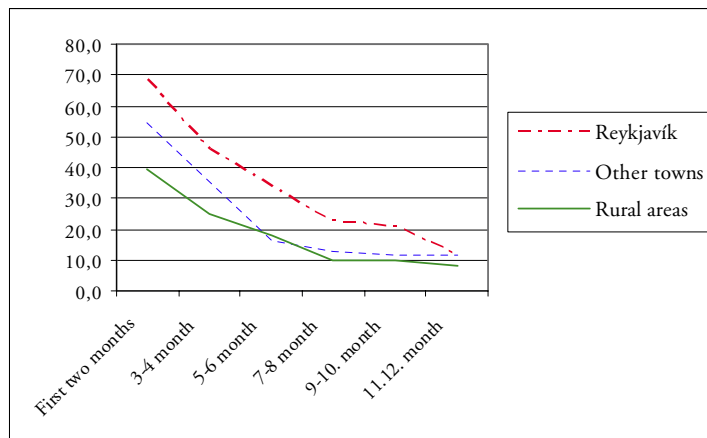
As far as the period before 1900 is concerned, our knowledge of causes of death in Iceland is primarily based on parish registers. In fact, it was not until 1911 – about eighty years later than in Denmark – that death certificates were required from physicians (medical doctors), and then exclusively in urban areas.²⁴

22 NAI. Skjalasafn landlæknis. Ársskýrslur héraðslækna, 17. læknishérað. Skaftártunga, Mýrdalur (Bjarni Jensson).

23 NAI. Skjalasafn landlæknis. Ársskýrslur lækna. Eyrarbakkaheiráð (1911 and 1918), Mýrdalshérað and Grímsnes (1911, 1912 and 1913).

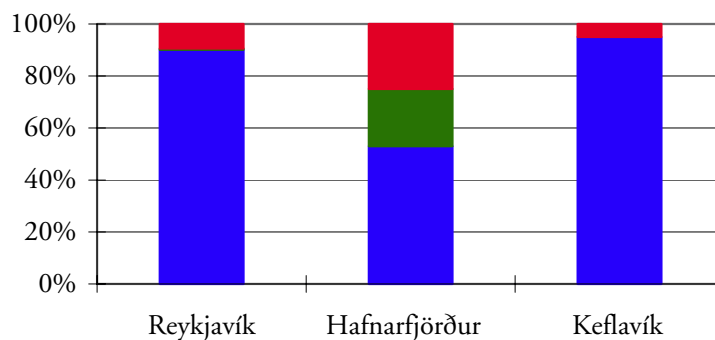
24 *Stjórnartíðindi fyrir Ísland 1911*, A, 192–195. Parish ministers continued to be responsible for the notation of causes of death in rural areas and were required to send certificates

Figure 7. Length of breast-feeding rates in Reykjavík, in other towns and in rural areas 1920.



Source: NAI. Manntal á Íslandi (frumgögn).

Figure 8a. Feeding practices 1911–1920. South-west. Urban/fishing. Breast-feeding traditionally relatively frequent, especially in Reykjavík. Early provision of educated midwives in Reykjavík.



to district physicians. For Denmark, see Anne Løkke, *Døden i barndommen. Spædbørnsdødelighed og moderniseringsprocesser i Danmark 1800 til 1929*. (Copenhagen, 1998), 55–56.

Figure 8b. Feeding practices 1911-20. North and north-east. Rural area and small fishing towns. Breast-feeding relatively frequent already in 1860. Early provision of educated midwives.

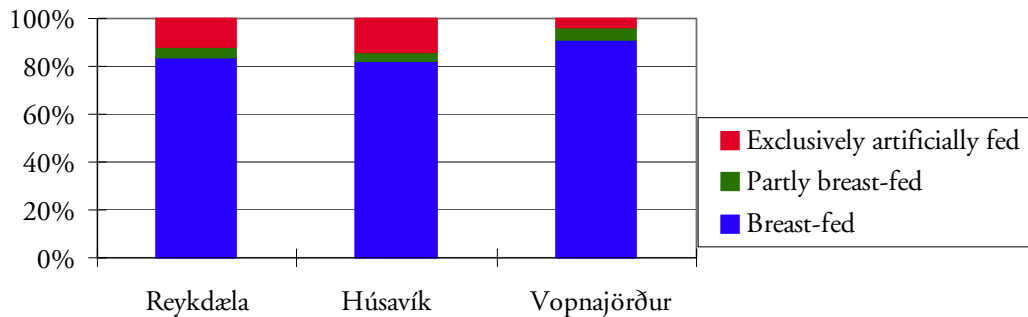


Figure 8c. Feeding practices 1911–20. South. Sparsely populated rural areas. Breast-feeding traditionally rare. Few midwives.



Source: Heilbrigðisskýrslur 1911–1920 (Reykjavík, 1922), pp. xcix.

Parish registration was introduced in Iceland in 1746. For the decades that follow burial registers do not contain any information on the cause of death of the deceased. In 1784 parish ministers were enjoined to add information on the date and cause of death of the deceased.²⁵ However, this information is very incomplete because parish ministers were not given any guidelines concerning the nomenclature and classification of mortal diseases. Neither were they provided with pre-printed forms similar to those produced by the Swedish National Health Board in

²⁵ *Skrár um skjöl og bækur í Landsskjalasafninu* II. Skjalasafn klerkdómsins. (Reykjavík, 1905).

the mid-eighteenth century.²⁶ Consequently, most causes of death as noted in the parish registers are not specific. This is true, in particular, for infants and young children. With the exception of well-known infectious diseases, such as smallpox and measles, children in the burial registers are frequently reported as dying from “child weakness” or “(common) child disease”.

From 1804 onward, district physicians were enjoined to give the Director of Public Health in Reykjavík annual reports on the general state of health and sanitary conditions. They were to pay particular attention to the most common diseases as well as to infant mortality.²⁷ With the gradual increase in the number of district physicians in the course of the nineteenth century, the reports yield more reliable and useful information, especially as regards the incidence of epidemics and infectious diseases in different parts of the country.²⁸ However, owing to the large size of individual medical districts, physicians continued until late in the nineteenth century to rely heavily on the kind of information contained in the parish registers. In addition to parish registers and medical reports, mention should be made of a number of treatises and articles written by medical doctors on the nature of the most common infant and childhood diseases and the most appropriate ways of dealing with them. However, in many respects this source material is more relevant for the study of medical and sanitary conditions than for the analysis of the actual disease panorama in the country.²⁹

Given the nature and state of available evidence, there is no way of analyzing quantitatively the importance of individual causes of death among infants and young children in nineteenth century Iceland.³⁰ *Faute de mieux*, an attempt will be made here to assess major changes during this period that seem to have affected the ecology of infant and child diseases.³¹ In this perspective it is useful to highlight the relative importance of such broad categories of diseases as “endemic/epidemic dis-

26 See Eva Nyström, “De svenska dödsorsaksstatistikens framväxt och tidiga historia,” in *Hälsa, sjukdom, dödsorsak. Studier i begreppens teori och historie*, ed. Lennart Nordenfelt (Malmö, 1986), 110–120.

27 See *Lovsamling for Island*, vol. 6 (Copenhagen, 1856), 661–663.

28 *Heilbrigðiskýrslur 1911–1920* (Reykjavík, 1922), xcii–xciv.

29 See, e.g., Jón Sveinsson, “Tilraun til að upptelia Siúkdóma þá, er til bana verða, og orðid géta, fólki á Íslandi,” *Rit þess Íslenszka Lærdómslistafélags* 14 (1794), 1–150.

30 Cf. Løkke, *Døden i barndommen*, 57–65; Jan Sundin, “Child Mortality and Causes of Death in a Swedish City, 1750–1860,” *Historical Methods*, 29:3 (1996), 94–106.

31 See Günther B. Risse, “Cause of death as a historical problem,” *Continuity and Change*, 12:2 (1997), 175–176.

eases" as well as the relative importance of intestinal and lung diseases from the late eighteenth century to the beginning of the twentieth century. In this connection, in many cases it will be necessary to distinguish between infants and young children (one to four years old).

Medical doctors writing on infant health around 1800 agreed that colic (*colica meconii*) was the most important cause of death among Icelandic infants; it was attributed mainly to the prevailing practice of artificial feeding which caused intestinal obstruction and inflation of the belly (*upphemba*),³² and, finally, diarrhoea resulting in dehydration.³³ In this respect artificial feeding had similar consequences in Iceland as in other parts of Europe where breast-feeding was either uncommon or absent.³⁴ Furthermore, Iceland shared with these regions extremely high neonatal mortality rates (see discussion above).

In some parts of the country, particularly on the small islands off the Icelandic coast, Vestmannaeyjar in the south and Grímsey in the north, neonatal tetanus caused neonatal mortality rates to rise to exceptionally high levels, 500–700 deaths per 1000 live births. It is probable that the dependence of the insular population on sea-bird products contributed largely to such calamities. As far as Vestmannaeyjar is concerned, public authorities took an initiative in the 1840s, founding a birth clinic where newborns were isolated from the unhealthy environment and cared for during the two first critical weeks of life. In this manner neonatal mortality rates in Vestmannaeyjar were reduced to “normal” Icelandic standards within a very short time.³⁵ Recently it has been argued that neonatal tetanus represented a much more wide-ranging cause of neonatal deaths in early nineteenth-century Iceland than is

32 Jón Sveinsson, “Tilraun til að upptelia Siúkdóma,” 133–135; Jón Pétursson, *Lækninga-Bók handa almúga* (Copenhagen, 1834), 8–9.

33 Helgi Skúli Kjartansson, “Ungbörn þjáð af þorsta. Stutt athugasemd um ungbarnadauða og viðurværi,” *Sagnir* 10 (1989), 98–100.

34 See, in particular, Knodel, *Demographic behavior in the past*, 46–53; Brändström, “*De kärlekslösa mödrarna*,” 94–100.

35 Loftur Guttormsson and Ólög 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 nineteenth International Congress of Historical Sciences. Oslo, August 6–13 2000. The International Commission for Historical Demography, Session I on Mortality.

commonly acknowledged, but, apparently, the argumentation does not rest on firm empirical foundations.³⁶

From the late 1820s onwards, the disease panorama among infants and young children in Iceland underwent radical change, leading to a rise in infant and early childhood mortality. As many countries on the European continent,³⁷ between 1820 and 1850 Iceland experienced an important rise in the frequency and virulence of epidemic diseases. During this period there were, among other diseases, outbreaks of scarlet fever, measles and diphtheria. In Iceland the insular condition of the country caused characteristic behavioral patterns for these diseases. Intermittently they arrived as "mortal visitors" from continental Europe and raged as epidemics throughout the country for a limited period of time, entailing catastrophic mortality, whereafter they disappeared for several decades. Thus, a smallpox epidemic raged in Iceland between 1785 and 1787. The next time the country was visited by smallpox in 1839; thanks to the preventive effects of inoculation, the disease did not spread beyond the southwestern part of the country and killed relatively few children.³⁸ Similarly, scarlet fever, which raged in 1797–98, visited the country the next time in 1827. As for whooping cough, it came in 1825, after having been absent for more than 40 years.³⁹ In both cases the sudden incidence of these two diseases is reflected in exceptionally high annual mortality rates.

It is not clear what caused Iceland during the first quarter of the nineteenth century to be more or less sheltered from infectious diseases such as those mentioned above. Possibly the important reduction in naval communication between Iceland and Continental Europe which took place as a result of the Napoleonic Wars

36 Daniel E. Vaisey, "An Estimate of Neonatal Tetanus Mortality in Iceland, 1790–1839," *European Journal of Population* 13 (1997), 62, 67; Guttormsson and Garðarsdóttir, "Public intervention to diminish infant mortality."

37 See, e.g., Robert Woods, Naomi Williams and Chris Galley, "Differential Mortality Patterns among Infants and Other Young Children: The Experience of England and Wales in the Nineteenth Century," in *The Decline of Infant and Child Mortality. The European Experience: 1750–1950*, eds. Carlo Corsini and Pier Paolo Viazzo (Den Haag, 1997), 57–72; Marie C. Nelson, "Diphtheria in late-nineteenth-century Sweden: policy and practice," *Continuity and Change* 9:2 (1994), 213–42.

38 Jón Steffensen, "Bólusótt á Íslandi," *Menning og meinsemdir* (Reykjavík, 1975), 311–314.

39 Peder A. Schleisner, *Island undersøgt fra et lægevidenskabeligt Synspunkt* (Copenhagen, 1849), 62–69; Sigurjón Jónsson, *Sóttarfar og sjúkdómar á Íslandi* (Reykjavík, 1944), 58–60.

explains the low mortality rates, at least in part.⁴⁰ So much is certain that the second quarter of the nineteenth century was marked by a wave of noxious diseases that killed infants and young children alike. It culminated with the measles epidemic of 1846 when infant mortality rose to the level of 611 deaths per thousand live births.⁴¹ The last mortality peak (infant mortality rates of 439‰) typical of the old demographic regime, in 1882, was caused by a measles epidemic. During these two epidemic waves, occurring at an interval of thirty-five years, measles proved to be a huge killer of infants and children in Iceland.⁴²

One of the diseases which raged during this period was significantly more noxious to children than infants, namely diphtheria. Until the late nineteenth century, diphtheria was not clearly distinguished from croup and even some forms of scarlet fever.⁴³ The two forms of throat distemper, diphtheria and croup, continued to be subsumed under one term in Icelandic, *barnaveiki*. In the source material *barnaveiki* appears for the first time as an epidemic disease in the 1820s; as such, it peaked around 1860 and continued to rage intermittently until the early 1880s.⁴⁴ During the second half of the century diphtheria had undoubtedly become endemic in Iceland; but thanks to the introduction of anti-diphtheria serum at the turn of the century, child deaths caused by this malady were greatly reduced.⁴⁵

Around the turn of the twentieth century, the great infant and child mortality peaks that had characterized the preceding century had disappeared. Even if diseases such as measles and whooping cough continued to behave as epidemics, only occurring at shorter and shorter intervals, their virulence was greatly reduced as well as

40 Loftur Guttormsson, Ólöf Garðarsdóttir and Guðmundur Hálfðanarson, "Ungbarna- og barnadauði á Íslandi 1771–1950," *Saga. Tímarit Sögufélags* 39 (2001), 88–89.

41 Schleisner, *Island undersögt*, 50–54; *Hagskinna. Icelandic Historical Statistics* (Reykjavík, Hagstofa Íslands, 1997), 56–59.

42 As for the effect of crowding on measles mortality, see Robert Woods and Nicola Shelton, "Disease Environments in Victorian England and Wales," *Historical Methods* 33:2 (2000), 75.

43 In Icelandic medical treatises the distinction between diphtheria and croup appears clearly for the first time in Jón Hjaltalín, *Barnaveikin og taugaveikin* (Akureyri, 1866). For comparison see Nelson, "Diphtheria in late-nineteenth-century Sweden," 220.

44 Steingrímur Matthíasson, "Barnadauði á Íslandi," *Eimreiðin* 10 (1904), 84–87. Diphtheria attained its climax in Sweden in much the same period, see Nelson, "Diphtheria," 221–223.

45 Matthíasson, "Barnadauði á Íslandi," 84–85; *Heilbrigðisskýrslur 1911–1920*: (Reykjavík, 1925), xxxiii–xxxvi.

the mortality caused by them.⁴⁶ Epidemics were increasingly met with quarantine measures while certain diseases, for example scarlet fever, tended to become endemic.⁴⁷

As a result of the progress of bacteriological knowledge at the end of the nineteenth century, the attention of medical and political authorities was increasingly drawn towards certain hygienic-related diseases, especially those that were water- and food-borne, such as typhoid fever. The early phases of urbanization entailed a growing risk of polluted drinking water as long as sewerage and water pipelines had not been installed. For those families who stuck to the practice of artificial feeding, polluted water represented a real threat. Probably these circumstances can partly account for the excessive infant mortality experienced by some fishing towns in early twentieth century Iceland.⁴⁸ Consequently, in this period much emphasis was laid on the installation of sewage and water systems. These initiatives made the urban environment much less fatal to the survival chances of infants than was the case at the end of the nineteenth century.⁴⁹

Medical health reports from individual physicians indicate that intestinal diseases were less frequent during the second decade of the twentieth century than they had been earlier.⁵⁰ This probably relates to the fact that campaigns in favor of breast-feeding launched during the initial years of the century had been more successful in

46 This was in line with developments in the neighboring countries, see Thomas McKeown, *The Modern Rise of Populations* (New York, 1976), 95–100. Probably the reduced mortality in Iceland was due to the combined effects of a more varied diet, more widespread breast-feeding and successful quarantine measures, see Guttormsson, Garðarsdóttir and Hálfðanarson, “Ungbarna- og barnadauði,” 88–91.

47 *Heilbrigðisskýrslur 1911–1920*, (Reykjavík, 1922), xx–xxiii.

48 See Gunnlaugsson and Guttormsson, “Household Structure and Urbanization,” 326–328. See also medical reports from individual physicians, e.g., NAI. Skjalasafn landlæknis. Ársskýrslur lækna, Reykjavík 1897 (Guðmundur Björnsson).

49 Concerning the installation of water and sewage systems in urban areas in the beginning of the twentieth century, see Guðjón Friðriksson, *Saga Reykjavíkur. Bæinn vaknar 1870–1940*. Vol 1 (Reykjavík, 1991), 249–269; Lúðvík Kristjánsson, *Úr bæ í borg. Nokkrar endurminningar Knud Zimsens fyrrverandi borgarstjóra um þróun Reykjavíkur* (Reykjavík, 1952), 84–112.

50 NAI. Skjalasafn landlæknis. Ársskýrslur lækna. See, for example, Reykjavík 1910 and 1913 (Guðmundur Hannesson and Jón Hj. Sigurðsson) and Hafnarfjörður 1909, 1910 and 1911 (Þórður Edilonsson).

urban areas than was the case in sparsely populated rural districts. This further improved the survival chances of young infants and children.

From 1916 onward, information on causes of death on the individual level is available in Iceland. At this point in time infant and childhood mortality had dropped to levels below most other western societies. Infant mortality figured at a level slightly below 65 per 1000 live births during the period 1916-21. Early childhood mortality was below 10 per 1000. Table 2 shows 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 one to four year old children. Mortality from lung diseases was much higher: 1,802 deaths per 100,000 for infants and 294 in early childhood. It is worth noting, however, that cause of death is often unspecified in the case of infants. Moreover, cause of death for infants was often listed as "childhood convulsions" (*barnakrampi*). Without a doubt, this category includes children who died of convulsions in connection with diarrhea and dehydration. At this point in time, the great killers of the nineteenth century appear to have had relatively little effect on levels of infant and childhood mortality. Mortality from "childhood diseases" (measles, scarlet fever, diphtheria and whooping cough) had dropped to relatively low levels, 810 per 100,000 for infants and 294 per 100,000 for one to four years old children (Table 2). During the period in question epidemics were reported in 1916 in all medical districts in Iceland and, similarly, in 1920 a severe epidemic of whooping cough was noted in all districts. Even though mortality from epidemic diseases like measles was scarcely comparable to nineteenth century levels, it is worth stressing that in individual districts and individual families the harm done by these diseases was considerable. 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 the year 1916 was 1,430 per 100,000 and early childhood mortality 350 per 100,000. The disease was most fatal during the last three months of the first year and the second and third years of life. The whooping cough epidemic of 1920 had even higher levels of fatality; in that year infant mortality in whooping cough was 2,512 per 100,000 and early childhood mortality 770 per 100,000.

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 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 Rangárvallasýsla that had an infant mortality rate of 1,077 per 100,000 from intestinal disease, whereas the average rate for Iceland was 520. In general it can be noted

Table 2. Infant and early childhood mortality from different diseases (per 100,000) in Iceland, 1916–21.

	IMR	ECMR
Congenital diseases	1181.2	3.9
Childhood diseases	810.0	293.8
Lung diseases	1802.2	293.8
Intestinal diseases	519.7	54.5
Childhood convulsions ("barnakrampi")	641.2	17.5
Other infectious diseases	330.7	165.4
Other diseases/ accidents	384.7	70.1
Cause of death not specified	816.7	75.9
Mortality rates / 1000	64.9	9.7

Source: Statistics Iceland. Dánarskýrslur 1916–21.

that fishing towns situated in areas with prevailing traditions of artificial feeding were characterized by high infant mortality rates and in particular by high mortality rates from intestinal diseases. Thus the village of Vestmannaeyjar (in Rangárvallasýsla) exhibited a mortality from intestinal diseases of 1,757 per 100,000 and the town Ísafjörður in Norður-Ísafjarðarsýsla – the county with overall highest mortality rates during this period (see Map 3) – had infant mortality rates from intestinal diseases of almost 2,500 per 100,000.

Concluding Remarks

Within the Danish kingdom, mid-nineteenth century Iceland distinguished itself by excessively high levels of infant mortality. At the same time infant mortality exhibited huge regional variations from one county to another (ranging 210–250 from 355–399 deaths per 1000 live births). Basically, the high-level regions covered the western and southern parts of the country, while the low-level regions were located in its northern and eastern parts. However, generally speaking, the transition from high-level to low-level infant mortality took place within an exceptionally short period of time, mainly between 1870 and 1915. By 1915 infant mortality rates in Iceland were on par with the lowest rates in Europe. This rapid decline in infant mortality coincided with the initial phases of Icelandic industrialization and urbanization.

In pre-transitional Iceland infant mortality did not vary significantly by social class. Furthermore differences according to the matrimonial status of the mother (legitimate/illegitimate births) were less important than in most other societies. As

far as illegitimate births are concerned, kinship networks had strong impact on the survival chances of infants. On the whole, however, it is geographical location in combination with different cultural norms, that accounts for the most important variations in infant mortality. The analysis of regional differences in infant mortality suggests that changes in infant feeding practices played a crucial role in reducing infant mortality during the transition period.

By 1800 artificial feeding was generally practiced in Iceland. During the latter half of the nineteenth century, however, many parts of the country witnessed important progress in breast-feeding. An analysis of infant mortality levels by counties shows, *grosso modo*, that levels of infant mortality were positively related to the extent of breast-feeding. In addition, a biometric analysis illustrates the impact of feeding practices on the survival chances of infants in different areas. In the 1870s they were almost twice as high in the north-east and the capital (Reykjavík) where breast-feeding had become widespread, as compared to the northwestern counties. After the turn of the twentieth century, medical health reports provide further evidence of the strong inverse correlation between infant mortality levels and breast-feeding. In many places successful breast-feeding campaigns among the common people were the outcome of a close collaboration between district physicians and midwives. On the other hand, as many babies were not nursed at all or breast-fed for only a few weeks, pressures for increasing popular awareness of the importance of cleanliness, in particular as regards the treatment of artificial milk and ways of bottle feeding, constituted a critical factor of change.

Not unexpectedly, available information on causes of death reflect the important changes which affected infant feeding practices during the transitional period. As long as artificial feeding practices prevailed, intestinal diseases had been the most important cause of infant deaths. In the 1910s, when information on causes of death at the individual level became available for the first time, intestinal ailments had been replaced by lung diseases as the most important cause of death among infants and young children. However, intestinal diseases continued to weigh heavily in areas where breast-feeding was not yet practiced on a large scale. By this time the great epidemic infant and child killers of the nineteenth century, such as measles and whooping cough, had lost much of their virulence. Occasionally, they were even successfully coped with in individual places with quarantine measures. By 1920 Iceland had become relatively safe for infants and young children in comparison with the dreadful situation prevailing around the mid-nineteenth century.

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