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Research Article

Indigenous life expectancy in Sweden 1850-1899: Towards a long and healthy life?

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Lena Karlsson[1]

Abstract

BACKGROUND
Previous research has shown that the health transition and demographical pattern of indigenous people has followed a different path compared to non-indigenous groups living in the same area with higher mortality rates and shortened life expectancy at birth.

OBJECTIVE
This paper draws attention to the development of life expectancy for the Sami and non-Sami during the colonization era (1850-1899). The paper will compare the development of life expectancy levels, infant mortality, and age-specific mortality between the Sami and the non-Sami population and analyze the main causes of death.

METHODS
The source material for this study is a set of data files from the Demographic Data Base (DDB) at Umeå University. Life tables and calculations of values of life expectancies are calculated using period data.

RESULTS
The analysis reveals that the life expectancy at birth was remarkably lower for the Sami during the entire period, corresponding to a high infant mortality. When comparing life expectancy at birth with life expectancy at age one, Sami still had a lower life expectancy during the entire period. The analysis also reveals a lower proportion of deaths due to infections among the younger Sami.

CONCLUSIONS
The results paint a complex picture of the demographic transition in Sápmi. Neither the Sami nor the non-Sami population followed the same pattern of increased life expectancies at birth, as the Swedish population did in general. The negative consequences of colonization (high mortality, low life expectancy at birth) hit the Sami and non-Sami populations, but at different time periods.

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1. Introduction

Previous research has shown that the health transition and demographical pattern of indigenous people has followed a different path compared to non-indigenous groups living in the same area with higher mortality rates, shortened life expectancy at birth, poverty, and increased vulnerability to diseases (McCalman et al. 2009; Gracey and King 2009; Stephens et al. 2006; Tobias et al. 2009). In present-day Sweden, the Sami have equally good health as the majority population, which indicates that they no longer can be described as vulnerable in a demographic context (Hassler et al. 2005; Axelsson and Sköld 2006). A study from 2005 has shown that the life expectancy of the Swedish Sami and their non-Sami counterparts is quite similar (Hassler et al. 2005). Life expectancy at birth is 74.9 years for the Sami men compared to 74.6 for non-Sami men and 80.0 years for Sami women compared to 80.3 for non-Sami women (Hassler et al. 2005). This was not the case during the eighteenth and nineteenth centuries when the Sami experienced higher death rates, especially among infants (Brändström 2007; Karlsson 2012; Sköld et al. 2011; Sköld and Axelsson 2008). Higher infant mortality rates and lower life expectancy levels at birth have also been measured among the American Indian population during the late nineteenth and early twentieth century (Hacker and Haines 2011).

The present study is concerned with the development of life expectancy among the Sami population during the later era of colonization (here restricted to the years 1850-1899). One obstacle to answering the question about life expectancy among indigenous people in previous time periods is the absence of sufficient information on mortality in historical data. This is not the case for the Swedish Sami where the Demographical Data Base at Umeå University has digitized records from the Sápmi area between 1750 and 1900. The paper will analyze the development of life expectancy levels among the Sami and compare the results with both the non-Sami population and the Swedish population in general. Differences in life expectancy levels, infant mortality and age-specific mortality rates among men and women and between different time periods will be discussed. In addition to life expectancy and mortality trends, a section will discuss the main causes of death among the Sami and non-Sami population. The results will be discussed in relation to the colonization process and demographic transition as well as to the source material and the quality of the sources.

1.1 The demographic transition in Sweden and Sápmi

The demographic transition in Sweden entails a decline in death rates from the nineteenth century to the beginning of the twentieth century (Willner 2005). The

decline of fertility and mortality rates in Sweden led to a growing proportion of elderly people. The mortality rates were highest among infants and the elderly, and when infant mortality rates started to decline during the second half of the nineteenth century, life expectancy levels apparently increased. During the second half of the eighteenth century life expectancy at birth was 33.7 years old for men and 36.6 years old for women. A hundred years later, life expectancy at birth for men was 40.5 years old and 44.6 years old for women (SCB 1999).

At the beginning of the seventeenth century and before the Swedish state established population statistics, a common belief was that Sami either died very young or very old (von Düben 1873). This belief seems to involve a degree of truth. From previous research about the demographic transition in Sápmi we know that the age specific mortality and infant mortality rates were generally higher among the Sami population compared to the non-Sami population, especially during the first era of colonization (1750-1840) (Karlsson 2012). The infant mortality rate among the Sami in the parish of Jukkasjärvi between the years 1750 and 1840 reveals that more than 20 percent of all infants died within their first year of life; a mortality rate that was almost twice as high as the rate among the non-Sami (Karlsson 2012).

The few studies that involve fertility patterns in Sápmi display a constant rate of fertility for Sami and non-Sami women regardless of the age of the mother, and this resulted in a relatively high average child bearing age (von Düben 1873; Sköld 2004; Wahlund 1932). The Sami women were seen as giving birth to fewer children than the non-Sami women, and the explanation for this phenomenon was that Sami women had higher levels of abortion (Wahlund 1932).

1.2 Colonization and assimilation in Sápmi

Colonization is a process that is shared by all indigenous people. The way colonization is expressed differs, but, whenever it occurs, indigenous people and newcomers experience complex and very difficult relations (Loomba 2005). Related to the colonization process is the acculturation process. Acculturation is described as a process that takes place over a period of time and entails changing the culture and the individual (Berry 1990). How this process affects indigenous groups depends on the cultures involved and the quality of the relationship between the groups (Kvernmo 2006). The acculturation of indigenous groups can lead to positive effects; however, the negative effects have been more commonly observed throughout history.

During the mid-sixteenth century the Swedish regent Gustav Vasa started to intensify the tax levy in Sweden. The Sami paid their taxes in furs and dried fish, and they also traded these products in exchange for flour and butter. Access to a new source

of nourishment resulted in a large increase in the Sami population but also caused vulnerability because of their dependence on food sources that the Sami themselves could not produce (Lundmark 1998). At the beginning of the seventeenth century there was a change in the tax policy and the Sami were required to pay their taxes in articles of food (meat and fish). The consequence of this new policy was a crisis in the maintenance of living conditions for the Sami, and the solution was to become reindeer herders (ibid). During the seventeenth and eighteenth century the Swedish state exercised strict control over the practice of religion. The Sami were forbidden to practice their religion and persons who violated this law could risk the death penalty. At the same time, a large number of churches and schools were built and missionaries worked intensively to convert Sami to Christianity.

The Swedish state used different strategies to enable the colonization and development of Sápmi. For example, according to the Settlement Act of 1673, settlers were promised 15 years of freedom from taxes (ibid). The settlers arrived in Sápmi towards the end of seventeenth century, but it was not until the mid-eighteenth century that in-migration really started. At this time, the colonization process began and during the subsequent 150 years the Sami population, which had been in the majority, became the minority population in the area. During the colonization process there were several factors that strongly affected the living conditions of the Sami population: taxes, rights to land, school systems, the practice of religion, and living arrangements (ibid). In the aftermath of colonization, the assimilation process of the Sami population began. The assimilation policy meant that the possibilities of practicing reindeer herding were reduced and that restrictions were put in place on the use of their native language (Alex et al. 2006).

1.2.1 Colonization, assimilation and health

The relationship between colonization, assimilation and health can be described in different ways. The health disadvantages of contemporary indigenous people can be explained in terms of the trajectory of their colonization and assimilation (Fur 2006). Today, the health situation and mortality rates of the Sami correspond with the health situation and mortality rates of the population in Sweden in general. This "demographical shift" has not yet been reached by other indigenous groups around the world, such as the Maori and Aborigines (Trovato 2001). We still know very little about the relationship between colonization, assimilation, and health in Swedish Sápmi or why the Sami advanced more rapidly in the epidemiological model than other indigenous populations. The colonization and assimilation process in Sápmi includes a set of complex relations between the Swedish national state, the church, and the Sami

population as well as between the two populations living in Sápmi. The situation becomes even more complex because the population profile changed dramatically in only 150 years, where the Sami changed from a population in the majority to a minority population. A theoretical perspective regarding the relationship between assimilation and health focuses on the effects of migrations on health development. Previous research on differences in the health situations between migrants and the majority population in contemporary populations have found implications of the "healthy migrant theory," "healthy migrant effect," or "healthy migrant hypothesis." The "healthy migrant theory" implies that people who are more mobile and able to migrate have better health and lower mortality rates than the average person (Wingate and Alexander 2006; Kolčić and Polašec 2009). Over time, and as a function of assimilation, the migrant health advantage erodes and the health pattern between the migrants and the majority population shifts positions (Antecol and Bedard 2006). Few studies have examined the "healthy migrant theory" in an internally migrant population or in historical populations. From previous studies we know that, during the eighteenth and nineteenth centuries, childhood and infant mortality rates were dramatically high among the Sami population. We also know that the infant mortality rate of the non-Sami population living in the Sami area was low to start with, but increased over time and sometimes became even higher than among the Sami population (Karlsson 2012).

2. Data and method

The source material for this study is a set of data files from the Demographic Data Base (DDB) at Umeå University. Since 2002 parish records from the Sápmi area have been digitized from the eighteenth and nineteenth centuries. The Sápmi Population Database is the first indigenous database of its kind in the world and spans approximately 150 years (1750-1900). The dataset is a result of a combination of sources: records of births, deaths, marriages, migration, and catechetical examination registers. The result of this combination of sources is that every individual who lived in the parishes is included and can be followed from cradle to grave. This is possible because the clergy regularly updated the register (Lundström 1995; Sköld and Axelsson 2008). The study includes the two northern parishes of Gällivare and Jukkasjärvi (Figure 1).

Figure 1: Map of Sweden, including the parish of Gällivare and Jukkasjärvi

Source: Demographic Data Base, Umeå University.

2.1 The variables and missing cases

2.1.1 Life expectancy

Life tables and calculations of values of life expectancies are calculated using period data (the year/years of occurrence rather than year of birth). The period life tables present the mortality and life expectancy at a given moment in time, whereas the cohort life tables present the life history of a specific group of individuals. In order to construct life tables, period death rates are converted to probabilities of death by a standard method (Wilmoth et al. 2007). When calculating the life expectancy at birth, ten-year intervals and five-year age groups are used in order to make comparisons with Swedish national data (taken from The Human Mortality Database). Using ten-year intervals and five-year age groups will also provide more stable calculations (Glei, Lundström, and Wilmoth 2008). The open-ended 75+ age group was used as the upper category. When

calculating the lived person-years, the population of each age group at the mid-point of the five year time period is used. Only infants born within the study area and with a known birthday have been included when calculating life expectancies and infant mortality rates. In order to have a more stable dataset, life expectancies are calculated for the two parishes together. In historical populations like these, high rates of infant and early childhood mortality result in lower values of life expectancy at birth than at other ages - this is referred to as an imbalance (Canudas-Romo and Becker 2011). Therefore, the life expectancy at birth and life expectancy at age one will be compared.

The quality of the Sápmi database is crucial for this study. Even though the data provides opportunities to study life expectancy at birth, it should also be mentioned that the sources associated with these parishes do have their shortcomings. First, an underregistration of deaths would result in an underestimation of death rates as well as an overestimation of life expectancy levels. Historical data such as this generally lacks information about the age of death for every individual. In general, such observations are distributed proportionally across the age range (Wilmoth et al. 2007). In this paper there are only 13 individuals (registered as dead but without an age at death) during the entire time period, and they are described as "missing cases". Second, unreported out-migration is a general problem when analyzing historical data (Glei, Lundström, and Wilmoth 2008). As a result of difficulties related to the reindeer herding (diseases and extreme weather conditions), the Sami had a high proportion of out-migration (Kvist 1989). Furthermore, the Sami could physically reside in one parish, but belong to another parish due to factors like high taxes (Sköld 2004). Another problem that influences unreported out-migration was the clergy´s inaccurate maintenance of registers (Glei, Lundström, and Wilmoth 2008).

Even though we can be certain that everybody in the material is dead at this moment, we lack information about the time for death (see Table 1). Among the individuals with an unknown reason for ending their register we can find the unreported out-migration and unreported death. A higher proportion of Sami individuals ended their registration without a known cause being recorded, and this was especially notable among the Sami living in Jukkasjärvi parish (almost ten percent). Table 1 reveals that it is possible that the problem with unreported out-migration and unreported death were more common in relation to the Sami population. This can cause an overestimation of life expectancy levels among the Sami. For those individuals ending registration without an explanation, a date is given. From information about that date and the year when they were born, we can see if the distribution of ages at end of registration looks like ages at out-migration and ages as death. Generally, the unknown reason for ending the register is more commonly used for the younger population. For the Sami in Jukkasjärvi and Gällivare, 75 percent of the individuals with an unknown reason for ending the register are under the age of 49 years, a similar distribution to ages at out-

migration. The age at death shows a higher distribution, with more young children and elderly (25 percent under the age of three and 25 percent above the age of 66). Similar patterns are found among the non-Sami in Jukkasjärvi and Gällivare. The distribution of the individuals with an unknown reason for ending the register is consistent over time, which makes it possible to recover the trend in life expectancy.

Table 1: Reported causes for ending the register in the parish of Gällivare and Jukkasjärvi from 1850 – frequencies and percent

	Gällivare %	Jukkasjärvi %
Sami		
Dead	84.2	63.5
Out-migration	13.3	26.6
Unknown	2.5	9.8
N	1988	1805
Non-Sami		
Dead	62.8	66.4
Out-migration	34.9	27.9
Unknown	2.2	5.7
N	2500	1052

With the exception of the aforementioned shortcomings, the data that covers the populations in Gällivare and Jukkasjärvi are well suited for calculating life expectancy levels.

Even if the data runs from 1750, there are reasons not to use information about age at death before 1850 when calculating life expectancies: first, the "unknown reasons" for ending the register are associated with fluctuations over time which cause numerator/denominator bias (some decades have almost 50 percent of the Sami population ending the register with an "unknown reason"); second, the in-migration of the non-Sami population had not really started in the two parishes, causing small non-Sami samples (see Figure 2 and 3); and third, different problems with mortality data, such as a high number of deaths recorded as occurring at very old age (age exaggeration), which were more common before the involvement of Statistic Sweden in 1860 when age became centrally controlled and data were corrected after contact with the local parish (Vaupel 2009).

2.1.2 Causes of death

The dataset for this study makes it possible to examine the main causes of death among the Sami and the non-Sami population. In the past, deaths were often described by their symptoms, such as "ageing weakness," and this often masked the real, but unknown, cause of death (Alter and Carmichael 1996; SCB 1999; Sundin 1996). As of 1831, the clergy were no longer required to enter causes of death in their records, with the exception of deaths related to smallpox, suicide, accidents, childbirth, and major epidemics (SCB 1999). However, the data show that they often continued to do so. The basis for coding used in this study is the ICD-10 system (International Statistical Classification of Diseases and Related Health Problems- Tenth Revision) (World Health Organisation 2004). A dictionary on Swedish diseases in the past (Lagerkranz 1988) was used to classify varying local terms for the same disease. The causes of death are classified as: *tuberculosis*, *infectious diseases* (e.g. scarlet fever, smallpox, whooping cough, and measles), *cancer*; *circulatory diseases* (e.g. heart attack, heart failure, and stroke), *respiratory diseases* (e.g. pneumonia, angina, and influenza), *accidents/external causes* (e.g. drowning), *ageing*, *unknown diseases,* and *others* (symptoms like coughing and pain, stomach trouble, muscular diseases, and childbearing).

Causes of death among the Sami and the non-Sami population were compared for three different age groups: 1-19 years old, 20-59 years old and 60 years and above. The reason for not including the infants in the analysis is their high proportion of "unknown diseases" as a cause of death. The proportion of Sami with reported causes of death is somewhat lower than that of the non-Sami (43 percent and 49 percent, respectively).

2.1.3 Ethnicity

What methods can be used to separate the Sami population from the non-Sami population? The external definition and categorization of ethnicity is crucial because they each demand a focus on power and authority (Jenkins 1997). Collective identification and social organization are two necessary elements for analysing and understanding ethnic groups (Jenkins 1997). Due to the historical nature of this data, it is not possible to gain knowledge of an individual's own perception of her or his cultural and ethnic identification; however, the importance of the question remains. Ethnicity was not registered in the church records; however, the database provides the opportunity to find information about a person's ethnicity. The material separates the indigenous Sami population from the settler population through a system of ethnic indicators that are designed and implemented by the historian Gabriella Nordin (Nordin

2009). The ethnic indicators used are: occupation, mortality records, geographical information, name, and family relations (if the individual has Sami parents, grandparents, or siblings). Individuals with at least one ethnic indicator are treated as Sami; all others are treated as non-Sami. The non-Sami group includes the settlers who began to move into the Sami area in the mid-eighteenth century, mostly from other parts of Sweden but sometimes from Finland and Norway (Sköld et al. 2011).

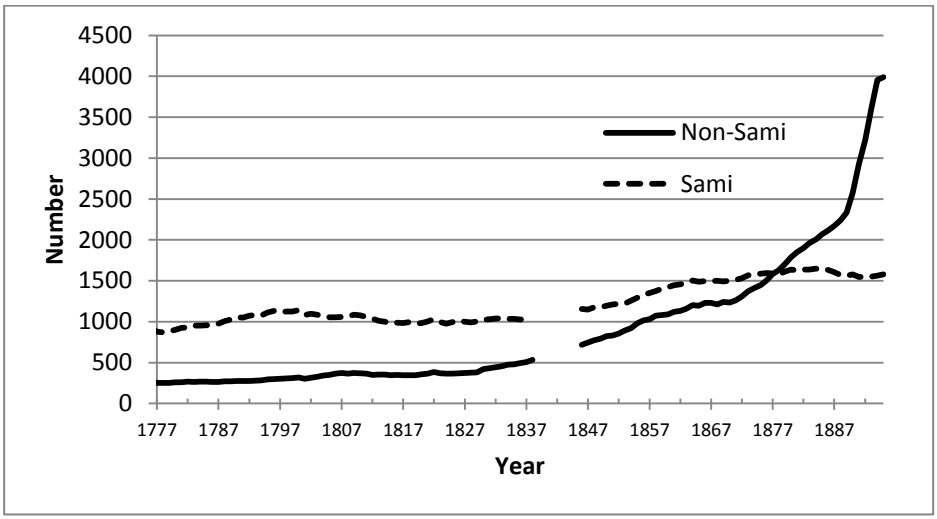
2.1.4 Gender

In the dataset, the majority of the individuals can be distinguished by means of gender. A small proportion is registered as "unknown" or "indefinite" (Jukkasjärvi has four such individuals and Gällivare has three). These will be treated as missing cases.

3. Results

3.1 Population development in Gällivare

Figure 2: Population development in Gällivare 1777-1900



Note: The year between 1839 and 1845 are excluded due to insufficient population registration.

In 1742 Gällivare left the parish of Jokkmokk and became an independent parish. Figure 2 shows that, towards the end of the eighteenth century, the Sami population in Gällivare was three times as large as the non-Sami population. However, from 1830 and onward, the non-Sami population started to increase more rapidly than the Sami population. At this time the iron ore mining in the area began to expand and by the end of the nineteenth century the railway was finished causing major population growth (Nordin 2009). By the end of the nineteenth century, there were almost three times more non-Sami than Sami inhabitants in the parish of Gällivare.

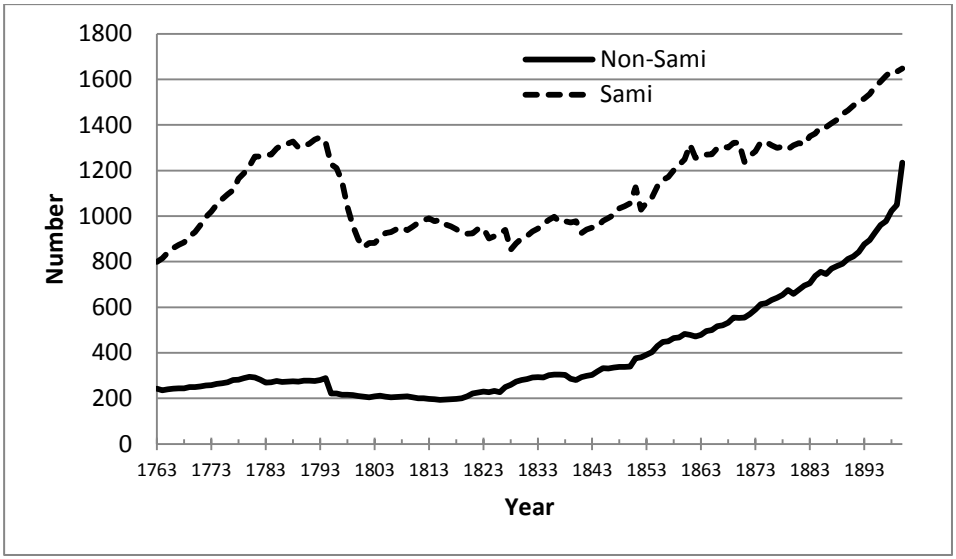
Concerning the ageing structure, the two populations in Gällivare had distinctly different population profiles. At the beginning of the colonization process (1780), the settlers were few and showed a more incoherent age profile. The adult segment of the non-Sami population was larger at this time because many had arrived without children. At the end of the colonization process (1890), the high in-migration of settlers had significantly changed the population profile in Gällivare. The age structure profile among the Sami had a higher proportion of the elderly while the proportion of young children and young adults had grown considerably among the settlers.

3.2 Population development in Jukkasjärvi

Jukkasjärvi, the northernmost of the parishes, was established in 1673. The Sami population in Jukkasjärvi was four times greater than the non-Sami population in 1763 (Figure 3). At the end of the eighteenth century, a high proportion of the Sami population living in Jukkasjärvi out-migrated into Norway (Lundmark 2008). In 1845 the non-Sami population started to increase and by the end of the colonization era the difference between the two populations had diminished. Compared to the Sami population in the parish of Gällivare, the Sami population in Jukkasjärvi maintained its majority group status during the period 1763-1900.

The age structures of the two populations living in the parish of Jukkasjärvi differed from each other during the colonization era. As for the parish of Gällivare, the age structure profile among the Sami in 1890 had a higher proportion of the elderly, while the proportion of young children and young adults had grown considerably among the settlers.

Figure 3: Population development in Jukkasjärvi 1763-1900



3.3 Remaining life expectancy and infant mortality

3.3.1 Female life expectancy at birth and infant mortality

While the life expectancy of Swedish women increased, the life expectancy of the two populations living in Sápmi followed a more turning curve (Table 2). Between the years 1850 and 1859 the life expectancy at birth was 53.2 years for Sami women and 57.6 for non-Sami women. There is a turning point in the 1860s where the life expectancy among the Sami and non-Sami women falls below the life expectancy among Swedish women. Life expectancy at birth decreased among both Sami and non-Sami women up to the 1880s. Then the life expectancy increased among the Sami and non-Sami women but still remained much lower than among the Swedish women in general. By the end of the colonization era, 1890-1899, the life expectancy of Sami women was 45.3 years, compared to 47.2 years for non-Sami women and 53.5 years for Swedish women in general. The gap in life expectancy levels between the ethnic groups was largest between the years 1850 and 1859, at 4.4 years.

In the 1860s, the female Sami faced a much higher infant mortality compared to the non-Sami population and the rest of Swedish females (Table 2). From the peak in 1860-1869 (where every fifth Sami female died within its first year of life), there is a general trend of decreasing Sami female infant mortality, whereas the non-Sami experienced an increased female infant mortality from the 1850s. From the 1870s onwards, infant mortality among the non-Sami exceeded that of the Sami. From the period between 1860 and 1869, both populations in Sápmi had higher infant mortality compared to the rest of Sweden, on the same level as Swedish infants had 50 years before (SCB 1999).

Table 2: Life expectancy at birth and infant mortality rate (per 1000) in Gällivare and Jukkasjärvi and Sweden

	Female						Male					
	Sami		Non-Sami		Sweden		Sami		Non-Sami		Sweden	
	IMR	LE	IMR	LE	IMR	LE	IMR	LE	IMR	LE	IMR	LE
Periods:												
1850-59	123	53,2	126	57,6	138	43,9	169	45,1	126	51,4	162	45,1
1860-69	182	45,8	131	45,5	127	46,6	159	41,9	133	42,3	149	47
1870-79	147	40,7	150	43,5	121	48,4	170	38,4	135	45	142	48,5
1880-89	134	41,7	148	44,5	102	51,2	191	41,4	163	43,6	122	51,9
1890-99	132	45,3	144	47,2	92	53,5	199	43,4	161	47,3	111	54,9

3.3.2 Male life expectancy at birth and infant mortality

Compared to the Sami women, the Sami men had lower life expectancy levels than non-Sami men during entire period between 1850-1899 (Table 2). In the 1850s, the men living in Sápmi had the same or higher life expectancy than their Swedish counterparts, but during the next coming decades the two populations in Sápmi had lower life expectancies. Between the years 1890 and 1899, life expectancy among Sami men was 43.4 years, whereas the life expectancy among the non-Sami men was 47.3 years and 54.9 years among Swedish men. The ethnic gap between the Sami and the non-Sami was largest between the years 1870 and 1879, at 6.6 years.

The gender gap concerning life expectancy among the Sami population shows that Sami men had a lower level of life expectancy than Sami women, especially during the years 1850 and 1859. The gender gap was smaller in the non-Sami population and after 1860 women and men had very similar tendencies in relation to life expectancy at birth.

Between the years 1850 and 1859, the Sami male infant mortality was at the same high level as Swedish males in general (Table 2). In the 1890s, when infant mortality in

Sweden had declined, the Sami had their highest infant mortality rate where almost 200 of 1000 living male births resulted in a death. While there is a general trend of decreasing infant male mortality in Sweden between 1850 and 1899, the infant mortality among the Sami increased during the second half of the nineteenth century, ending on the same high level as that for Swedish males one hundred years before (SCB 1999). Until 1879, the non-Sami had considerably lower rates than the rest of Sweden, thereafter infant mortality became much higher. Compared to female infant mortality, male infant mortality among the non-Sami was lower than the Sami throughout the entire period.

The next step is to compare life expectancies at birth with those at age one. This comparison will provide information for comparing infant mortality with mortality at other ages.

3.4 Life expectancy at age one and age-specific mortality

3.4.1 Female life expectancy at age one and age-specific mortality

Up to the 1860s the two populations living in Sápmi had much higher life expectancies than Swedish women in general. This result indicates that, once the female children in Sápmi had survived their first year of life, their life expectancy was much greater than female Swedish children in general, but after 1860 the situation was the opposite. Table 3 shows that non-Sami women had a higher life expectancy at age one than Sami women. This holds true for almost the entire period, but there is one significant exception between 1860 and 1869. During the period between 1860 and 1889 the mortality rates among Sami and non-Sami females were well above the rate for Swedish females, but during the last decade (1890-1899) the rates were at the same relatively low level as the rest of Swedish females. The low age-specific death rate among the non-Sami females between 1850 and 1859 can be explained by a small non-Sami sample.

3.4.2 Male life expectancy at age one and age-specific mortality

Table 3 shows a similar picture as Table 2; where the Swedish males who survived the hazards of their first year of life had an increasing level of life expectancy, whereas the males in Sápmi displayed a much more winding path. As was saw among the females in Sápmi, the males living in Sápmi had a lower level of life expectancy from the mid

nineteenth century and onwards compared to Swedish males in general. From 1870 on, the non-Sami males had a higher life expectancy than was seen among the Sami males.

Table 3: Life expectancy at age one and age specific mortality rate 1-4 years (per 1000) in Gällivare and Jukkasjärvi, Sweden

	Female						Male					
	Sami		Non-Sami		Sweden		Sami		Non-Sami		Sweden	
	MR 1-4	LE_1	MR 1-4	LE_1	MR 1-4	LE_1	MR 1-4	LE_1	MR 1-4	LE_1	MR 1-4	LE_1
Periods:												
1850-59	22	59,6	10	64,9	29	49,9	33	53,1	13	57,8	31	52,7
1860-69	36	55	41	51,3	29	52,3	34	48,8	41	47,8	30	54,1
1870-79	48	46,7	34	50,2	25	54	39	45,1	48	51	27	55,5
1880-89	37	41,7	41	51,2	22	56	31	50,1	48	51,1	22	58
1890-99	22	51,2	22	54,1	17	58	25	53,1	26	55,3	16	60,7

From 1860 and onward, the Sami males had lower age-specific death rates than among the non-Sami males. The age-specific death rate among the non-Sami males went from very low during the mid-nineteenth century (13) to very high rates during the end of the nineteenth century (48). As for the non-Sami females, the low age-specific death rates between 1850 and 1859 can be explained by a small non-Sami sample. The gap between the Sami and the non-Sami males was closed around 1890, but retained a higher mortality rate than Swedish males.

3.5 Life expectancy in Sápmi- a conclusion

The progress concerning the life expectancies of Sami women and men is not a straightforward process. The results show that, during almost the entire period, Sami women and men had lower life expectancies than settlers. It is also important to note the fact that all the women and men living in the Sápmi area shared the destiny of living a far shorter life than the Swedish population in general. The differences in mortality rates between the Sami and non-Sami did not become more equal because of decreased mortality rates among Sami but rather because of increased levels of infant mortality among the non-Sami.

3.6 Causes of death

Although the Sami are believed to have lived a healthy life in a favorable climate with good eating habits (von Düben 1873), we know less about the causes of death among them in the nineteenth century. In the case of smallpox, the Sami showed a lower mortality rate than for that of the rest of Sweden at times when smallpox epidemics were of similar magnitude for both populations. Sköld describes the phenomenon in terms of the Sami's cultural perception of smallpox and avoidance of exposure to the disease, both physically and culturally (Sköld 1997; 2004). The Sami reportedly had a higher incidence of eye diseases due to the extreme weather conditions associated with snow and sunshine, and as a result of smoke in their huts (von Düben 1873).

Table 4 shows the differences in causes of death between the Sami and non-Sami population. Among the youngest segment of the population (aged 1-19 years old), 28 percent of the Sami died of infections, whereas the same proportion among the non-Sami was 45 percent. The younger Sami population had more deaths due to accidents and/or external causes, respiratory diseases, and unknown reasons. Among the 11 percent of deaths due to accidents among the youngest Sami, seven percent consisted of drowning accidents (not shown in the table).

Table 4: Leading causes of death in Gällivare and Jukkasjärvi, by ethnicity and age groups, 1850-1899, percent

	Sami			Non-Sami			Total
Age-groups	**1-19**	**20-59**	**60-**	**1-19**	**20-59**	**60-**	
Tuberculosis	3	12	1	3	14	5	6
Infections	28	11	3	45	16	4	21
Cancer	-	3	2	-	3	3	2
Circulatory	1	2	1	1	3	6	2
Respiratory	19	11	8	14	18	10	14
Accidents/external	11	8	5	6	8	4	7
Ageing	-	-	27	-	-	24	6
Unknown	32	28	45	27	17	39	31
Other causes	6	25	8	4	21	5	11
N	350	257	146	434	354	245	1844

Note: Table 4 reveals overall significant age differences between the Sami and the non-Sami population: p<.05.

Sami adults (aged 20-59 years old) exhibited a lower proportion of deaths due to infections compared to the corresponding group in the non-Sami population (11 and 16 percent, respectively). Compared to the younger segment of the population, respiratory

causes of death were slightly more common among the non-Sami population (18 and 11 percent, respectively).

For the elderly Sami and non-Sami (aged 60 and above) the next most common cause of death (after unknown reasons) were age-related causes (27 and 24 percent, respectively). Deaths due to circulatory diseases and tuberculosis were somewhat more common among the elderly non-Sami.

Between 1850 and 1899, deaths due to infections and respiratory diseases were more common among the two younger groups. For both populations living in Gällivare and Jukkasjärvi, tuberculosis as a cause of death was more common among individuals aged 20-50 years old. It is worth noting the high proportion of deaths due to other causes among the Sami and non-Sami population aged 20-59 years old (25 and 21 percent, respectively). One major reason for this is the high proportion of deaths due to pregnancy and childbearing (around 30 percent of all deaths classified as "others" in this age group are due to childbearing).

4. Discussion

The analysis has shown that the Sami population, including men and women, generally had a lower level of life expectancy at birth compared to the non-Sami population during the years between 1850 and 1899. From 1860 onwards, both populations in Sápmi, including both men and women, showed lower levels of life expectancies at birth and at age one compared to the Swedish population in general. The analysis also reveals that the most dangerous life period was the first year of life, where there is a general trend of decreasing Sami female infant mortality and a general trend of increasing Sami male infant mortality. The excess in infant mortality for Sami males and a greater sex difference among the Sami have been found in a previous study concerning infant mortality in Swedish Sápmi during the era of colonization 1750-1900 (Sköld et al. 2011). These sex and ethnic differences need further research to be explained.

From previous studies, some favoured explanations as to the higher infant mortality among the Sami and non-Sami population as compared to the general Swedish population can be given. Compared to Stockholm and other urban areas, the northern area of Sápmi was not covered to the same degree by the medical interventions used to reduce the high infant mortality in the rest of the country. From the mid-eighteenths century, medical instructions were published concerning the care of infants (aimed to improve hygiene and increase breast feeding) and district doctors were employed in the urban areas (Brändström 1990). During the mid-nineteenth century it still was a rare event for someone in northern Sweden to be visited by the doctor and

many parishes could not afford to employ a midwife (Brändström 1990; Sköld 2001). For the Sami, the traditional nomadic lifestyle and the extremities of living as reindeer herders played a vital part in the high infant mortality recorded. Only a few days after giving birth, the Sami women either continued the travel with the reindeer or were left alone with the newborn in a hut (Serning 1950). At the same time, the Sami children were breast-fed for several years, which would have functioned as a medical preventive (Ellmin 1851).

The decrease in life expectancy levels and the increase in infant mortality rates among the Sami and non-Sami population between the 1850s and 1870s is certainly striking. One possible explanation are the years of misery between 1860 and 1870 where 1867 and 1868 were plagued with severe crop failures in northern Sweden (Häger, Torell, and Villius 1978). Another possible explanation are the two catastrophic scarlet fever and diphtheria epidemics that ravaged Sweden between 1850 and 1870 (Willner 2005). As was the case with the previous epidemics of smallpox, the non-Sami children were particularly seriously affected by the diphtheria (Sköld 2004). The higher level of life expectancy among both Sami and non-Sami in the 1850s, as compared to Sweden generally, can be explained by the increased level of data integrity and completeness through the involvement of Swedish statistics regarding age at death after the 1860s (Glei, Lundström, and Wilmoth 2008; Lundström 1995). Forthcoming research will continue to focus on the differences in mortality patterns and life expectancies between the Sami and the non-Sami by considering the quality of mortality data at advanced ages and the migration patterns of the Sápmi area.

The results are not straightforward and paint a complex picture of the demographic transition in the Sápmi area. Neither the Sami nor the non-Sami population followed the same pattern of increased life expectancies at birth as the Swedish population did in general. The negative consequences of colonization (high mortality, low life expectancy at birth) hit both the Sami and non-Sami populations, but at different time periods. High levels of mortality affected the Sami during the entire research period (1850-1899) whereas the non-Sami had more difficulties with increasing infant mortality rates between 1850 and 1899.

By using increasing levels of life expectancy at birth as indicators of a positive shift in the epidemiological transition, the results can be approached from another perspective. From the results of this study, we can conclude that from the 1860s onwards we can see a slow increase in life expectancy among the two populations in Sápmi.

As has been shown in previous studies about causes of death between the Sami and non-Sami population, this study revealed a lower proportion of deaths due to infections among the Sami (Sköld 1997, 2004). The higher, expected proportion of deaths due to respiratory diseases among the Sami was only seen in the youngest segment of the

population. The differences in causes of deaths between the Sami and the non-Sami population can be explained by a combination of access to the medical system, exposure to diseases, and differences in classifying deaths by the clergymen. The higher proportion of "unknown reasons" as a cause of death among the Sami can be related to their nomadic lifestyle as reindeer herders, which made it more difficult to classify a death that may have occurred months earlier. The higher proportion of deaths due to accidents and or external causes among the Sami children can also be explained by the nomadic life style and its extreme form of living. Even if the Sami living in Sweden today show mortality patterns (overall mortality and life expectancy) that are similar to those of the rest of the Swedish population, some groups of the Sami still have higher mortality due to accidents and external injuries (Hassler et al. 2005).

We still have a great deal to learn about the demographic and epidemiologic transitions in Sápmi during the nineteenth century. We need to gain a better understanding of the factors that caused the Swedish Sami to develop similar mortality patterns as the Swedish population in general from the 1950s and onwards (Sköld et al. 2011). The answer to our main question may well be found where this study ends; that is, in the first half of the twentieth century. Unfortunately, there are no data available that could provide us with such an answer at the present time. Other indigenous populations around the world still experience higher mortality patterns and poorer health than their non-indigenous counterparts. By learning more about the demographic progress of the Swedish Sami, we will hopefully be able to transfer this knowledge to other indigenous populations that have, as yet, not been affected by the same improvements in levels of life expectancy.

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