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Research Article

**Old age, health, and social inequality:
Exploring the social patterns of mortality in 19th
century northern Sweden**

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Old age, health, and social inequality: Exploring the social patterns of mortality in 19th century northern Sweden

Sören Edvinsson¹

Göran Broström²

Abstract

BACKGROUND

Social position is one of the major determinants of health. Less is known about its effect in historical contexts. Previous studies have shown surprisingly small effects of social class in working age populations. Not much is known about social differences in health among the elderly in history.

OBJECTIVE

The present paper analyses social differences in health among the elderly (60+) in the Sundsvall region in northern Sweden during the 19th century. We investigate whether social mortality differences are particularly apparent in old age when unpropertied groups lost their most important asset for survival: their capacity to work.

METHODS

The data, representing 9,535 fatal events, are analysed using a Cox regression model, assuming proportional hazards.

RESULTS

Social class had no significant effect for women during the pre-industrial period, while only those with unknown social position had higher mortality among men. During the industrial period female mortality was lowest in the skilled working class and highest in the upper class. Social position was not significant for men in the full model. Urban mortality was 30% higher for women and 59% higher for men during the pre-industrial period compared to the peripheral parishes.

CONCLUSIONS

The results lead us to question the accepted ‘fact’ of social health differences as a historical constant. Higher social position did not lead to better survival, and social differences in mortality did not increase in old age, despite the fact that the elderly were

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a highly vulnerable group. Instead, the spatial aspects of mortality were important, particularly during the pre-industrial period.

1. Introduction

Health is perhaps every human being's most valuable asset. Health is, however, something that is unevenly distributed in society. The question of why some are more exposed to disease than others has received a great deal of attention from researchers representing many different fields. One important aspect is how differential access to vital resources improves or restricts chances to remain healthy and how the effect of this is patterned by specific age characteristics. Another aspect is whether this has changed during our history. A long-term perspective on social inequality in health provides us with a background to the present situation, and an analysis of a society that differs substantially from the contemporary one opens up new perspectives on what determines these differences. The present article takes a life course approach to the issue. The aim is to analyse social differences in health among the elderly in a historical setting – the Sundsvall region in northern Sweden during the 19th century. The work thus contributes to the debate on social health inequalities by focusing on a highly vulnerable age group in a society characterized by great socioeconomic differences.

To be more specific, we test the hypothesis that social mortality differences become particularly apparent in old age. The argument is that unpropertied groups in particular were vulnerable when they reached an age at which they lost their most important asset for survival, their capacity to work, thereby increasing social differences. Furthermore, we relate this to possible gender differences and to temporal changes in the economic and social conditions when the studied district became industrialized. The results, however, present a more complex picture that causes us to question the accepted 'fact' of social health differences as a historical constant. Regarding mortality in old age, we find no signs of any disadvantage of belonging to less wealthy and unpropertied social classes, despite the precarious living conditions for these elderly at this time. Intuitively, their living conditions ought to have had some negative influence on health, but the results indicate that we also need to consider other aspects in the specific historic context that were equally or even more important; for example, spatial factors concerning how diseases were spread, or the impact of different behaviours and lifestyles on health.

2. Social class and health

2.1 The historical development of social inequalities in health

Several studies have shown how important wealth and access to economic resources are for health. In their classic overviews, Antonovsky (1967) and later Smith (1983) suggested that social inequality in health has passed through different phases in history. According to them, social differences were comparatively small during the pre-transitional phase when space was a strong determinant. Such differences then increased in their models during the transitional phase when mortality declined and wealthy groups used their resources to gain better health. Finally, health differences decreased again in modern low-mortality settings when instead health-related behaviour became important. Omran (1982) stated that even if the class differential in mortality was maintained during the epidemiologic transition, the decline set in earlier and was faster among privileged groups. This is also one of the basic, although implicit, prerequisites in McKeown's (1976) claim that nutrition is the primary explanation for the great mortality decline.

When studies, stimulated by the widely debated Black report (Whitehead 1998), began to be published on the late 20th century development, any assumptions of declining differences could be refuted. Even in modern wealthy societies social health inequality is substantial. In fact, it even seems as if (at least relative) differences are increasing (Kunst et al. 2004; Fritzell and Lundberg 2007), contrary to what Antonovsky assumed. Research has revealed a complex pattern of social class, material conditions, psycho-social effects, and health-related behaviour. Many contemporary studies implicitly or explicitly assume a "historical constant" of social health inequality that often is considered to have been even greater in earlier times (Marmot 2004). This is the basic assumption made by Link and Phelan (1995) in their outline of the fundamental causes of death. Our knowledge about social health inequalities in history and in particular before 1900 is still based on scattered evidence. Villermé found large differences in mortality between city districts of varying social composition in early 19th century Paris, and Engels gave evidence of appalling living conditions among the impoverished in the rapidly expanding industrial environments (Ackerknecht 1948). Despite their merits as sources for 19th century society and their path-breaking ideas, these 19th century observations are problematic in many ways. They lacked adequate sources and methods for analysis. Another issue concerns the degree to which we can generalize these observations to other historical contexts.

During recent years, however, increased attention has been paid to the historical perspective on social health inequalities. The results from different studies have diverged (see, e.g., Razzell and Spence 2006; Woods and Williams 1995), with some

reporting substantial differences, and many finding surprisingly small differences (for an overview, see Bengtsson and van Poppel 2011). Nevertheless, it is certainly not obvious that historical societies were characterized by the assumed social inequalities in survival. When infectious diseases dominated the cause-of-death panorama, factors related to geography were crucial to health and survival while economic conditions had less impact. Living in an urban environment or in a place with a great deal of communication increased the risks substantially and could be more important than wealth. Higher social position may therefore have become more decisive later in the epidemiologic transition when infectious diseases were partly controlled and chronic diseases instead came to dominate (on exposure and economic conditions in pre-industrial societies, see e.g., Landers 1993; Wrigley and Schofield 1981, pp 320–353).

Concerning Sweden, Edvinsson and Lindkvist (2011) found no indication of better health among wealthy adults living in the Sundsvall region during the pre-industrial period 1803-1859. This pattern remained for men during the industrial period 1860-1900, while clearer social health differences appeared among women. This illustrates the importance of considering gender as well as age patterns. In an earlier study Edvinsson (2004) found weak or varying social differences in infant mortality in 19th century northern Sweden, while industrialization caused large social differences in mortality among children 1-14 years.

Looking at the contemporary situation, several studies in gerontology, epidemiology, and other disciplines have confirmed substantial social inequalities in health among the elderly (see, e.g., Grundy and Holt 2001; Grundy and Slogget, 2003; Hoffmann 2008; Huisman, Kunst and Mackenbach 2003). There are, however, only a few studies of social inequality in old age mortality that have considered historical populations. Bengtsson and Dribe (2011) found no significant social differences in mortality among the elderly in a rural district in southern Sweden. Smith et al. (2009) found that earlier socioeconomic conditions had only a minor impact on longevity and mortality in old age.

2.2 Determinants of social differences in mortality

By social inequality in mortality we mean that survival chances differ depending on social class. Basically, we assume that access to certain resources, usually referred to as capital, is beneficial for survival and leads to social differences in health and mortality. These resources are vital to health by providing the person who owns them with better control over life circumstances, and consequently improved life chances. Bourdieu (1984) identified three major groups of capital: economic, cultural, and social. The socioeconomic position created by these forms of capital connects to different lifestyles

through what Bourdieu called *habitus*, a class-specific set of learned dispositions through which forms of practice are produced (Bourdieu 1984, pp. 31 ff; Hoffmann 2008). The different versions of capital overlap and influence each other, meaning that a person with large economic capital usually has good social and cultural capital, and vice versa. Economic capital refers to the possession of money and valuables; something that obviously has a great impact on health. Strong economic resources can be transformed into good food, healthy living conditions, and high-quality medical treatment. Access to social capital (in the form of either a community variable or an individual attribute) is vital in many contexts, not least for health (Putnam 2000; Islam et al 2006). In pre-welfare society people had to rely on contacts with family, friends, neighbours, colleagues, and others. The help could be given through economic contributions, assistance in daily life, or information.

Certain circumstances make it reasonable to assume a specific pattern of social mortality differences among the elderly. Hoffman (2008, pp. 43–49, 103–109) identified three main hypotheses concerning social health inequalities. The first argues that differences converge in old age (status levelling), the second assumes constant differences (status maintenance), and the third postulates diverging social health differences (cumulative advantage).

Antonovsky (1967) advocated the first theory, assuming small differences in childhood, adolescence, and early adulthood, but increasing during adulthood to converge in old age: “With amazing consistency, the class differentials are largest in the middle years of life” (Antonovsky 1967, p. 67). One argument for diminishing differences is that biological factors play a stronger role than social factors later in life. Frytak, Harley and Finch (2003 p. 638) suggested that what gave the wealthy the greatest advantage in adulthood lost its importance in old age. The status maintenance hypothesis suggests continuity in social health inequalities from adulthood to old age. The factors leading to social difference in adult age are still present later in life, leading to similar patterns. For instance, economic inequality during working life tends to be converted into equally strong differences in pensions (Hoffman 2008, p. 46). The third is the cumulative (dis)advantage hypothesis that (Dannefer 2003) developed from life course analysis. In Merton's description, cumulative advantage is:

“... the ways in which initial comparative advantage of trained capacity, structural location, and available resources make for successive increments of advantage such that the gaps between the haves and have-nots in science (as in other domains of social life) widen ...” (Merton 1988, p. 606)

In historical societies it is possible that a cumulative disadvantage became decisive only in old age when the most valuable capital, working capacity, was lost. Thus, we assume that access to different forms of capital became extremely important for the elderly in contexts where society assumed only minimal responsibility, resulting in

larger social health inequalities. In old age, lifetime savings of different forms of capital were crucial. Those owning a farm, an enterprise, or other assets could make arrangements for their old age, while unpropertied groups lacked that possibility.

In the present analysis we consider social position to be an indicator of economic capital. Social position influences not only economic conditions but also social capital. Contacts with friends and neighbours are unknown in our study, but we can identify relatives living nearby. The most important social network for the elderly is and was obviously the spouse, but access to children constitutes another valuable social network. They could assist in practical as well as emotional matters when parents became old, weak, and began to lose their health. Unpropertied groups usually had fewer children, partly because of later marriage (Winberg 1975, p. 241). In the Sundsvall region farmers had the largest families, while workers had comparatively few children (Fusé 2008, p. 70). Additional family members in farming households contributed to the family economy, while there were strong incentives to restrict family size and the sum of dependents among the unpropertied; something that turned into a disadvantage in old age when they faced the risk of being left without the support of close kin.

2.3 Historical background

Old age is not a uniform concept and is something that varies across different contexts and in time and space. In earlier studies on 19th century Sweden the period around 60 years of age marks the transition to old age. It was a common 'retirement age' as well as the age when life in the 'empty nest' started, i.e., the mean age at which the youngest child moved from home (Högman 1999, pp. 45–46). We have thus chosen this as our definition, still acknowledging that 'biological age' differs in time and space.

In the modern Nordic welfare state, access to life-preserving resources is largely provided for by the state or local municipalities (Esping Andersen 1990). In the society represented here it was usually up to the individuals themselves to make their own arrangements for old age. In the Western family system families were poor when their children were young, wealthier when the children were growing up, and then poor again in old age (Laslett 1988). Public arrangements for retirement were scarce. Some government employees as well as soldiers received a small pension, and the guilds offered some assistance for their aged master artisans. Others saved during their active work years; something that was easier for high-income groups and those owning real estate or some sort of production unit that could be turned into money. A special arrangement in rural society was the "undantagskontrakt" (retirement contract). Farmers transferred their farm to another person (usually a child or other next of kin) against agreement on provision and being taken care of for the rest of their lives. Unpropertied

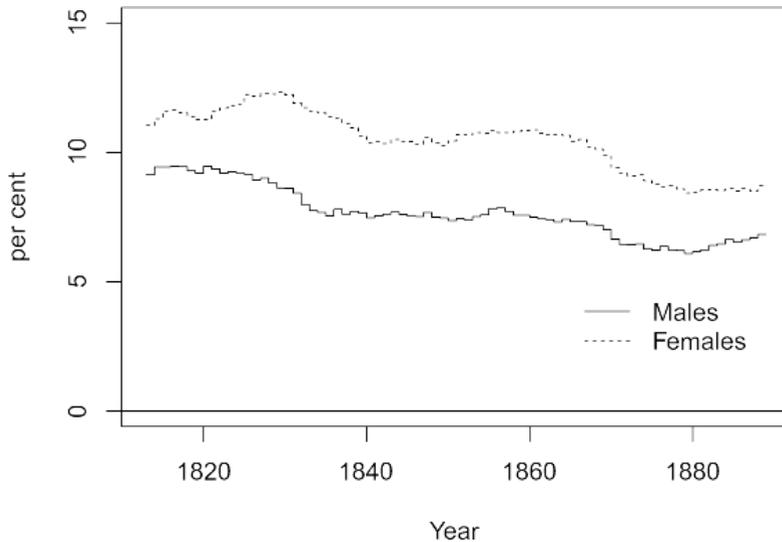
groups had few possibilities to save, making them highly vulnerable in old age. Poor relief was only for the destitute and provided for only the most basic needs. It was not until 1913 that the Swedish Parliament passed the first law on old age pensions (Högman 1999, pp. 85–90).

The Sundsvall district consists of 18 parishes in mid-northern Sweden. In the early 19th century agriculture dominated the area. The centre of the district was the small town of Sundsvall with a population of around 2,000 inhabitants. When demand for timber and wood increased around the middle of the 19th century the forests inland of Sundsvall became valuable. The logs were transported along the rivers to the coast around Sundsvall, where the timber was sawn. The district soon became the largest sawmill area in Europe, and an enormous economic development took place, especially during the 1860s and 1870s (Schön 1972).

Only a steady stream of migrants from other parts of Sweden and also other countries could satisfy the strong demand for workers. Even if the salaries were comparatively good, the workers faced uncertain employment, long working days, and risky working conditions. The mainly rural inland parishes gained from an increasing market for agricultural goods and by selling their timber. It also opened up a new labour market, which increased the costs for farm labourers. The town of Sundsvall was the commercial centre in the sawmill district. From being a small town its population increased rapidly to include some of the wealthiest people in Sweden, as well as impoverished groups. Towards the end of the century more permanent production and improvements in the formal social organization (local government) and informal social organization alleviated some of these negative aspects of the industrial break-through. The end of the century was a period of major improvements in the urban infrastructure that led to better sanitary conditions. Such improvements, however, were rarely implemented in the sawmill villages.

The rapid industrialization and the steady flow of migrants to the district resulted in a very young age structure. The elderly were comparatively few, due both to high mortality and to migration (see Figure 1). In fact, their proportion decreased from the early 19th century. The proportion of elderly was probably at its lowest during the boom years around 1870. That year, only about 6% of women and 2% of men in the town of Sundsvall had passed the age of 60.

Figure 1: Proportions of men and women above 60 of total population, Sundsvall region, 1813-1900



3. Data, variables, and methods

3.1 Data

The data for this study come from the linked digitized parish registers at the Demographic Data Base (DDB) at Umeå University (Vikström, Edvinsson and Brändström 2002), which includes information for almost the entire 19th century for the studied region. The parish registers consist of catechetical registers including the complete residential population and registers for births (available from 1780 in most parishes), deaths, marriages, and migrations (Nilsdotter Jeub 1993). The latter registers present information on demographic events, while the catechetical registers contain period information. It is thus possible to follow individuals throughout their lives, as long as they remained in the included parishes. This allows us to reconstruct their occupational careers as well as to follow their local migrations and demographic events. The data from DDB are of high quality and are unique as a source for studies of historical populations, in particular through the potential they provide for life course analysis.

We have applied a life course perspective (Kuh and Ben Schlomo 2004) focused on the social conditions in adult life for making arrangements for healthy ageing. We analysed all individuals (14,214) present in our parishes at the age of 60 or higher. For those not observed until old age we lack information on occupation in working age and may miss children living nearby who had an independent household, as we often have no indication of that relation in these cases. Therefore we require that they should have been present in the parish at age 45 for women and 50 for men at the latest, in order to reconstruct their number of children living in the parish and to identify their social position. All included individuals are followed until death, out-migration, or end of registration. We included two time-dependent variables: marital status and number of children present in the region. Social class is defined from position during working age. Additional variables are sex and type of parish.

3.1.1 Marital status

An initial status was defined at age 60, or at first observation after 60 if the person was not present in the parish at that date. From then on we identified every event indicating status change – marriage or dissolution of marriage. From the collected information the start and end of each presence period in the different statuses were established. The three categories are:

Unmarried

Those without any indication of being married or divorced are considered unmarried. In contrast to the other two statuses, the unmarried status was seldom explicitly stated. If a person showed up in the parish without information on marriage date or without any partner, he/she is considered unmarried.

Married

An explicit marriage date, or alternatively the first date the person is identified as living together with a partner as married, indicates the start of the married status. For a married couple moving into a parish, the marriage date may be missing.

Widowed

The date of entering widowhood is either the partner's death date or explicit information on widowhood at in-migration to the parish. Divorces were rare and are included among the widowed.

3.1.2 Number of children present in the region

Number of children, or the close family network, is defined as access to children and is treated as a time-dependent variable. For all persons living in the region we have identified all children (biological and non-biological) living within the region. Even if children were present they did not necessarily support the elderly. This depended on where in the region they lived and their economic and family situation. We assume that each additional child increases the chance of getting support and assistance. Thus we use the number of children as an indicator of potential help and treat it as a continuous variable.

3.1.3 Social class

The categorization of social class was based on occupations that we assume reflect differences in life chances. There are two major classification schemes developed for historical contexts: SOCPO (Van de Putte and Miles 2005) and HISCLASS (Maas and van Leeuwen 2011). The categories used here are based on the occupational classification from DDB. These are not completely possible to convert into SOCPO or HISCLASS, but the groups used here have many similarities with the latter group in particular. Comparisons between the classification schemes are made in the Appendix.

Studies from other small- and middle-sized Swedish 19th century towns have reported substantial economic differences between social classes (Kronborg and Nilsson 1975, Table 71, p. 194). Because our hypothesis is that survival in old age is dependent on the social position in working age, we identified occupation at age 50 or, if occupation is missing at that age, from a date within ten years before or after. Apart from socio-economic categories, we also distinguished between occupations within the agricultural sector and others. We used the following categories:

Unskilled workers

Those with occupational titles indicating unqualified tasks. They had restricted economic resources and rarely owned property, giving them fewer alternatives in forming their lives.

Crofters and agricultural workers

This group is considered to be in a similar position to unskilled workers, but belonging to the agricultural sector.

Skilled workers

Persons within this group have a stronger position due to their occupational skills, making them less easy to replace than unskilled workers. This increased their possibility of earning a higher income and accumulating more wealth.

Lower white collar

Those in this group have more prestige and decision-making power than workers. They were not necessarily wealthy in economic terms and represent an intermediate position when it comes to life chances.

Small-scale entrepreneurs

The group includes small shopkeepers, master artisans, and similar groups owning their own production units, varying from quite steady to short-lived enterprises. They possessed a valuable asset, allowing at least some of them to save for old age.

Farmers

The majority were freeholders on small or middle-sized farms. They owned their property and could arrange for their retirement through the “undantagskontrakt”.

Upper

This group consists of the dominant strata in society, including both higher officials and large-scale entrepreneurs. They were wealthy, had rich social contacts and a good education, and thus good opportunities to arrange for their old age.

Female occupations are underestimated in the material, in particular for married women. Unmarried women and widows are categorized according to their own occupations (if stated). Married women, on the other hand, belong to the same category as their husbands.

3.1.4 Environment

The local environment was a strong determinant of health and survival in historical times, and geographical differences were substantial. In order to control for this we separated the Sundsvall region into three geographical units, representing different environments. This grouping does not cover all aspects of relevant environmental factors, but represents differences related to proximity to the population centre, population density, and the location of industries. The three environments are:

The town of Sundsvall

The town was indirectly affected by the sawmill industry. As in other urban places in Sweden at this time, mortality was high due to high population density and sanitary problems.

The coastal surroundings of Sundsvall (Skön, Skönsmon, Timrå, Njurunda, Alnö)

The proximity of these parishes to Sundsvall partially exposed them to urban health risks. The parishes became dominated by the sawmill industry from around 1860. There were both old villages with a predominantly farming population and newly built sawmill communities.

The inland and peripheral parishes (Attmar, Tuna, Selånger, Sättna, Ljustorp, Indal, Hässjö, Tynderö)

These parishes were mainly agricultural and sparsely populated. Even if industrialization did not take place here, the possibilities of selling timber and the increased market for agricultural products had a great impact on the local economy.

3.2 Methods

The analyses were performed on the pre-industrial (1813–1860) and industrial (1861–1902) periods separately. Men and women were also treated separately. This corresponds to the approach taken in an earlier article on adult mortality (Edvinsson and Lindkvist 2011). For each period, and for men and women separately, we first applied a model in which only social class is included and then added other variables in the full model.

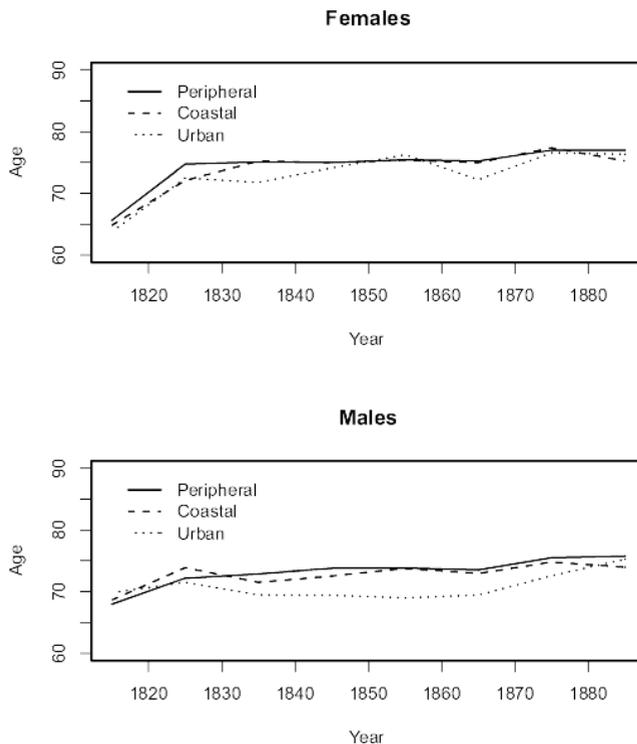
3.3 Statistical models

In the mortality analyses we used Cox regression with the package *eha* (Broström 2012a; Broström 2012b) in the statistical environment R (R Development Core team 2012). The proportionality assumption was routinely tested with no rejections, i.e., the proportional hazards model fits the data well.

4. Results

Figure 2 presents the development of median age at death for those of age 60 and older according to environment and sex. The first and most obvious observation is that there was no evident trend over time except for an increased survival in the town during the last decades of the century, and otherwise the changes were comparatively small. As expected, old women had more remaining years than old men. They could expect to live to around 75 years, while men had a couple of years less to live. The difference between environments was substantial in the early 19th century. Towards the end of the century, however, the gap had narrowed. The industrial development had no noticeable negative impact on the mortality patterns in the region for this age group, and if we find any impact it is in the form of improved life expectancy during the last decades of the century.

Figure 2: Median age at death for men and women 60 years and older in different parts of the Sundsvall region, 1813-1900



4.1 The pre-industrial period

When it comes to female mortality before 1860, former social class, uncontrolled for other variables (see Table 1, basic model, females), had no significant effect. The presented relative risks instead point in the opposite direction to what was expected. We found very small differences between social groups, with the possible exception of the small upper-class group. The results do not indicate any social gradient in mortality or any advantage for those with more resources.

In the full model (Table 1, full model, females), the availability of children in the parish did not improve survival to any substantial degree. The form of network indicated by marital status was, however, clearly significant, with much higher mortality for the unmarried (47%) and also for the widowed (20%); a pattern that basically conforms to the expected pattern regarding the direction of the differences, but is perhaps larger than what we assumed. Environment was clearly significant, with 30% higher mortality in the urban environment compared to the periphery. Even if Sundsvall had a small population, the problems of urban living were obvious (Edvinsson 1992). The difference between areas in the urban surroundings and those in the periphery were much smaller. Industrialization had not started and proximity to the unhealthy town did not have any measurable negative effect.

The added variables modified the social distribution of mortality only marginally. The variable continued to be non-significant and the general pattern remained. We did not find that unskilled workers or others from less affluent groups were disadvantaged with regard to health. Their low mortality cannot be explained by them living in healthier environments. Furthermore, the higher levels of mortality in the upper-class group did not change when controlled for marital status and parish of residence. They still had the highest levels. The main conclusion on the effect of social class is thus that there is no indication of any social gradient or any advantage of being in a higher social position.

In contrast to women, social position was strongly significant for men in the first period (Table 1, basic model, males), although the interpretation is not completely clear. The group that stands out with significantly higher mortality was the one with unknown social status. The findings for the wealthiest group correspond fairly well to what we found for the women. However, those in agricultural occupations, i.e., farmers and crofters/agricultural labourers, had considerably lower mortality among men, while the difference was small among women. As for women, we did not find any clear social gradient or that higher social status improved survival – if anything the opposite seems to be the case.

Table 1: Cox regression analysis of mortality 60 years and older, Sundsvall region 1813-1860

Variable	Females 1803-1860 Basic model			Females 1803-1860 Full model			Males 1803-1860 Basic model			Males 1803-1860 Full model		
	Mean	Exp (Coef)	p-value	Mean	Exp (Coef)	p-value	Mean	Exp (Coef)	p-value	Mean	Exp (Coef)	p-value
<i>Social class</i>			0.391			0.630			0.000			0.000
Unskilled workers	0.051	1.0	(ref)	0.051	1.0	(ref)	0.041	1.0	(ref)	0.041	1.0	(ref)
Unknown	0.156	1.136	0.352	0.156	1.185	0.217	0.082	1.483	0.006	0.082	1.566	0.002
Upper	0.012	1.293	0.306	0.012	1.278	0.330	0.021	1.232	0.310	0.021	1.018	0.931
Farmers	0.333	0.950	0.696	0.333	1.091	0.519	0.434	0.818	0.130	0.434	0.872	0.307
Small-scale entr.	0.045	1.013	0.940	0.045	0.909	0.606	0.053	1.060	0.721	0.053	0.738	0.103
Lower white collar	0.023	0.985	0.942	0.023	1.098	0.667	0.031	0.921	0.675	0.031	0.926	0.698
Skilled workers	0.076	1.062	0.698	0.076	1.118	0.476	0.082	1.038	0.805	0.082	0.972	0.855
Crofters	0.303	0.979	0.875	0.303	1.055	0.688	0.255	0.890	0.397	0.255	0.945	0.679
<i>Marital status</i>						0.000						0.003
Married				0.448	1.0	(ref)				0.765	1.0	(ref)
Unmarried				0.081	1.474	0.000				0.033	1.391	0.011
Widowed				0.471	1.201	0.002				0.202	1.176	0.007
<i>Children</i>				1.793	0.978	0.229				2.047	1.004	0.785
<i>Region</i>						0.022						0.000
Periphery				0.600	1.0	(ref)				0.629	1.0	(ref)
Coastal surround.				0.274	1.058	0.359				0.272	1.037	0.554
Urban				0.126	1.301	0.005				0.099	1.585	0.000
Deaths	1451			1451			1522			1522		
Total time at risk (years)	28826			28826			23254			23254		
Overall p-value	0.391			0.000			0.000			0.000		

Source: Demographic Data Base, Umeå University

In the full model (Table 1, full model, males) we find a similar pattern, with social class, marital status, and environment being significant. Access to children in the parish did not improve the chances of survival. Marital status, on the other hand, had a clear effect. Most men of old age were married and only a small minority had never been married. This small group of unmarried men had much higher mortality than both the married and the widowers. If we compare men and women the increased risks related to marital status show almost the same pattern. A reasonable assumption, supported by studies of mortality in working age, would otherwise be that unmarried men ought to have been more exposed than unmarried women, which was not the case here. Environment played a similar role for men as for women, with much higher mortality in the town and no difference between the peripheral parishes and those surrounding Sundsvall. The increased risk of living in the town was more accentuated for men.

The full model modified the social pattern somewhat. Most groups experienced quite equal mortality levels and only those of unknown social position experienced significantly higher risks compared to the others. For two of the social classes the added variables lowered the relative risks compared to the basic model. The upper-class group no longer showed a much higher risk and the group of small-scale entrepreneurs now had the best survival. The agricultural occupations, on the other hand, lost some but not all of their advantage. Individuals from the first two groups lived largely in the urban environment while the two latter groups obviously resided in the rural parishes; thus some of their advantage or disadvantage was explained by where they lived. To sum up the analysis for the preindustrial period, social position had a stronger impact upon men, but otherwise the general pattern was quite similar for men and women. There is no indication of any social gradient in health showing better survival for wealthy groups. The urban environment was riskiest, and lower social position did not increase mortality.

4.2 The industrial period

Earlier studies of mortality for other age groups in the examined region have reported increased social health differences later in the century (Edvinsson 1992; Edvinsson and Lindkvist 2011). Regarding the elderly, there was no negative effect of industrialization, as shown in Figure 2. The question here is whether the risk patterns for different groups changed.

For women, there was once again no obvious social gradient in mortality when only the effect of social class was measured (see Table 2, basic model, females). The variable was not significant. If we look at the general pattern, it resembles what we found for the pre-industrial period. In this period as well, the upper class had the highest

level, with an increased risk of 35% compared to the unskilled worker group. Otherwise the differences between social groups were marginal, with the best survival for skilled workers. In this respect the elderly women differed from their late 19th century younger sisters, among whom a clear social gradient had appeared (Edvinsson and Lindkvist 2011).

Table 2: Cox regression analysis of mortality 60 years and older, Sundsvall region 1861-1902

Variable	Females 1861-1902 Basic model			Females 1861-1902 Full model			Males 1861-1902 Basic model			Males 1861-1902 Full model		
	Mean	Exp (Coef)	p-value	Mean	Exp (Coef)	p-value	Mean	Exp (Coef)	p-value	Mean	Exp (Coef)	p-value
<i>Social class</i>			0.110			0.030			0.003			0.061
Unskilled workers	0.145	1.0	(ref)	0.145	1.0	(ref)	0.174	1.0	(ref)	0.174	1.0	(ref)
Unknown	0.037	0.897	0.245	0.037	0.839	0.061	0.014	0.985	0.921	0.014	0.957	0.777
Upper	0.012	1.352	0.056	0.012	1.314	0.087	0.016	1.326	0.057	0.016	1.281	0.097
Farmers	0.298	0.935	0.226	0.298	0.986	0.797	0.349	0.894	0.053	0.349	0.938	0.276
Small-scale entr.	0.033	0.955	0.653	0.033	0.915	0.426	0.028	1.235	0.056	0.028	1.198	0.124
Lower white collar	0.029	0.916	0.417	0.029	0.937	0.547	0.029	1.092	0.436	0.029	1.131	0.281
Skilled workers	0.092	0.841	0.019	0.092	0.847	0.026	0.094	0.991	0.906	0.094	1.002	0.982
Crofters	0.354	0.912	0.089	0.354	0.905	0.067	0.297	1.029	0.629	0.297	1.058	0.346
<i>Marital status</i>						0.000						0.000
Married				0.428	1.0	(ref)				0.679	1.0	(ref)
Unmarried				0.100	1.341	0.000				0.074	1.110	0.192
Widowed				0.473	1.165	0.000				0.250	1.217	0.000
<i>Children</i>				1.994	0.953	0.000				2.240	0.965	0.001
<i>Region</i>						0.173						0.003
Periphery				0.622	1.0	(ref)				0.644	1.0	(ref)
Coastal surround.				0.263	1.076	0.061				0.262	1.155	0.001
Urban				0.115	1.036	0.573				0.093	1.112	0.167
Deaths	3594			3594			2968			2968		
Total time at risk (years)	63257			63257			48612			48612		
Overall p-value	0.110			0.000			0.003			0.000		

Source: Demographic Data Base, Umeå Universit

When the other variables were introduced (Table 2, full model, females), marital status had a strong effect. Being married was a clear advantage and the increased risk for the unmarried was substantial (34% higher), although lower than in the previous period, while mortality for widows was in between these two groups. Contrary to the early nineteenth century the other family network, the sum of children available in the region, had a significant impact, with a diminishing risk of about 5% for each additional child. Another difference between the periods is that environment no longer had any effect. The difference between urban and the other environments was negligible. At this time a stronger differentiation between environments developed in several aspects. There were also large spatial health differences in other age groups (Edvinsson 1992). The elderly, however, seem to have been spared the additional risks of industrialization, and living in the otherwise unhealthy town or the rapidly growing industrial parishes did not lead to any negative health effects for this age group.

Another difference in the full model compared to the basic model is that the social class variable has become significant. However the estimates have not changed dramatically. The wealthiest citizens in the upper-class group still had the highest death risks, while the unpropertied group of skilled workers had the best survival (except for the small group with unknown social class). Once again we find no indication of any social gradient or that wealth protected against death.

Finally, the analysis for men in the industrial period according to social class is presented (Table 2, basic model, males). The social and economic inequalities in the district during industrialization are well known and living conditions differed substantially, something that could have made elderly men extra vulnerable. Nevertheless, even if the social class variable was significant, the differences between most of the social classes were not large and there was no sign of a disadvantage for those in lower social positions. The only two groups that distinguished themselves in terms of higher mortality were the wealthy upper class and the small-scale entrepreneurs, contrary to what would be expected.

The most significant variable in the full model (Table 2, full model, males) was marital status (as for women), but environment as well as number of children present in the region was also significant. The widowers had around 22% higher risks, while the increased risk for the unmarried was only 11%. The higher risks for unmarried men in 19th century Sweden are well documented, but in the present study singlehood seems to have had less impact among the elderly men than in other age groups. Compared to the previous period the disadvantage of being single was also smaller. Only a few unmarried men survived until old age, perhaps representing a specific selection of strong survivors. Having a kin network, as measured by children present in the region, increased survival chances by 3.5 % for each additional child. The regional pattern had

changed from the previous period. The elderly in the peripheral parishes had the lowest mortality, while there were small differences between the coastal, now industrialized parishes, and the town of Sundsvall. The advantage of living in the purely rural parishes was however rather small, particularly in comparison with the towns in the pre-industrial period. When the other variables were introduced social class lost its significance. The main patterns, however, did not change between the two models, with the highest levels for the upper class and the small-scale entrepreneur group.

5. Discussion

In the present paper we have analysed social differences in mortality among the elderly in the 19th century Sundsvall region. Our main result is that we find hardly any social gradient in health. This contradicts the assumed 'eternal' existence of social differences throughout history, and at least complicates the view of social inequality as a fundamental cause of disease. The analysis did not corroborate our hypothesis of increased vulnerability associated with previous lower social position for mortality in old age in a pre-welfare state society, where provision for the poor and destitute was limited. Instead of finding indications of a cumulative disadvantage leading to larger differences, the pattern for the elderly was similar as for those in the working age population. The possible arrangements for retirement did not lead to any major differences. Farmers could be expected to have been favoured in old age as they often organized their pension through retirement contracts, but this was not the case. Neither did the most privileged groups have better survival. Instead, having a partner improved individuals' life chances substantially. Having access to assistance was certainly important, but the effect of having children living nearby became significant only in the industrial period. Each additional child increased the survival chances. This can either be interpreted as meaning that the total sum of assistance was larger when more children were available or, alternatively, that this increases the chance of having at least one child who is capable of assisting the parent. In the present article we have not been able to establish possible co-residence or close spatial proximity between generations, but we might have found stronger effects if more precise measures had been available. Unfortunately it has not been possible to study other potential networks here (friends, neighbours, etc.); something that might have been crucial to survival in old age.

No major differences in the social patterns of health appeared when the region became industrialized. In the studied age group the fundamental changes brought about by the new industries, the increasing population, and the problems of overcrowding and unsanitary conditions did not lead to any substantial negative effects on survival. However, we must not only consider period effects but also potential cohort effects and

the life courses of the studied people. Those who were older during the industrial epoch had spent much of their life and occupational career in the pre-industrial society.

One crucial question is how well social classes can be defined by occupation and how well our classes correspond to access to economic resources in particular. In a study of health and socioeconomic status in mid-nineteenth century America, Ferrie (2003) found relatively equal mortality levels when analysed according to occupation or the value of real estate, but significant differences when income was used for categorization. It would certainly be valuable to validate how discriminating the categories used here are by connecting them to pure economic variables (most obviously wealth and income). Still, the access to property represented in the different categories ought to have made a difference, even if some may question how homogenous the middle groups in particular were. Some of the small entrepreneurs did not possess more than many of the workers. Nevertheless, there is no doubt that the upper class was considerably more affluent than the others and the working class in particular, but still they did not have better survival.

In historical societies characterized by a pre-transitional mortality regime, where people lived had more impact on survival than who they were. In this case we can confirm that type of environment was important. Living in the town, with poor sanitary conditions and exposure to infections, involved much higher mortality risks. During the industrial period, however, there were smaller differences in the higher ages than in adult ages. One possible explanation may be different cause-of-death patterns. Some infectious diseases that caused great environmental differences influenced the elderly only marginally. Another potential factor serving to mitigate the excessive risks in environments was poor relief, even in the society under study where public responsibility for the welfare of citizens was small. Towards the end of the 19th century poor relief expenditure increased rapidly in the town of Sundsvall. Almost every seventh inhabitant relied to at least some extent on this support (Edvinsson 1992), and the elderly were the main beneficiaries. Whether the increased costs of poor relief in the town could alleviate the urban disadvantage for the aged is a topic open for further study. There could, however, be aspects of environmental differences that we have not been able to measure using our categorization of parishes, as there were substantial differences in living conditions within parishes.

Having access to a partner turned out to be important for both men and women throughout the 19th century. The unmarried were the most vulnerable in almost all cases. Never-married elderly were a group with restricted networks. The widows/widowers had mortality levels in-between the married and the unmarried. In comparison with what we know from the adult population, it seems that the partner effect was in fact stronger for elderly women than for their younger sisters of working age.

Probably the most surprising and intriguing finding in the present study is the small social differences and lack of social gradient in health. We cannot interpret this as being an indicator of a society characterized by equality. The economic differences between groups were certainly large. This inequality, however, did not result in large health differences. To end with, we now discuss some possible explanations for this perhaps for many surprising finding.

When analysing mortality from a life course perspective, selection effects may influence the results. In a society with high mortality the frail die early, leaving a selection of biologically strong survivors. If mortality in earlier phases of the life course was socially biased, the elderly of poorer circumstances may be likely to be less frail than those from a wealthy background. In the present case not much speaks in favour of this interpretation. Earlier studies of the region during the pre-industrial era were unable to show large health differences related to social class, either in infancy/childhood or in adulthood (Edvinsson 1992; Edvinsson and Lindqvist 2011).

Another possible explanation is that, despite large economic inequality, most people shared the same environments and living conditions. There were certainly great differences in housing quality and food, but the district was not socially segregated spatially. The poor lived close to the rich and the health risks of poor sanitation and contaminated water were common to all. The poor living in the outskirts may even have been privileged in comparison with the wealthy who lived in the centre, where there was more contact with other people and thus higher exposure to all sorts of infections.

Furthermore, at this time in history it is not obvious that there was much one could 'buy' that improved health or minimized health risks, i.e., economic resources could not easily be transformed into health (Preston and Haines 1991). For many of the diseases no effective therapy was available and much of what was required to prevent ill health was in reach for less affluent groups as well. This is, however, difficult to verify and must be considered a possible hypothesis to test.

Finally, the relation between social class and the role of health may have changed over time. Health and healthy lifestyles have now become factors with which the higher social classes distinguish themselves. Thus, economic resources are allocated to what promotes health. It is doubtful whether health was equally important as a status attribute during the 19th century. One consequence of health becoming an important status attribute may be an increase in social differences in mortality.

As we conclude this paper we are still left with unanswered questions concerning why we find such small differences, but we can at least demonstrate that there is no obvious time-independent social health gradient. Negative results as regards identifying social health inequalities may be as interesting as or even more interesting than positive results. Great social inequality and social segregation certainly characterized the society we have examined, but that did not necessarily lead to large health differences. This

causes us to question the assumed continuity of social health differences. Nevertheless, we do not argue that access to economic resources was without importance for health. We still need to consider these aspects, but we also need to consider other aspects of the lives of different social classes. A historical perspective on social health inequalities can provide us with a deeper understanding of their determinants and make us aware of the need to analyse mortality in its social context.

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Appendix: Comparison between classification schemes.

A comparison between the categories used here and the two classification schemes, SOCPO and HISCLASS, shows that our groups can easily be translated into the other systems, with some restrictions. Occupations within the agricultural sector have separate categories in HISCLASS in contrast to SOCPO. Our classification most closely resembles HISCLASS. However, we have brought together some of the groups in HISCLASS that we consider to have comparable life situations and in that way we also restrict the number of categories and avoid including some categories with very small numbers.

The upper-class group corresponds to level 5 in SOCPO and classes number 1 and 2 in HISCLASS. Small-scale entrepreneurs, farmers, and most of the lower white collar group belong mainly to SOCPO level 4, while the first two groups correspond to classes number 3 and 8 in HISCLASS and the lower white collar group corresponds to class numbers 4-6. Skilled workers in the present study belong to levels 2 and 3 in SOCPO, reflecting some of the difficulties in distinguishing between skilled and semi-skilled occupations, and classes number 7 and 9 in HISCLASS. Unskilled workers and lower agricultural workers correspond to the lowest level (i.e., level 1) in SOCPO, while these categories end up in class number 11 for unskilled workers and numbers 10 and 12 for lower agricultural workers in HISCLASS.

DDB	HISCLASS number	SOCPO level
Upper	1, 2	5
Farmer	8	4
Small businessmen	3	4, (2)
Lower white collar	4, 5, 6	3, (4)
Skilled workers	7, 9	2, (3)
Unskilled workers	11	1
Lower agricultural	10, 12	1

