# The late emergence of socioeconomic mortality differentials:
A micro-level study of working age and elderly mortality in southern Sweden 1815-1968

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*Abstract*
This paper deals with socioeconomic differences in mortality among adults and elderly in a rural area of southern Sweden from 1815 to 1968. It is a period of falling mortality in all age-groups. It is also a period of a transformation from an agricultural to a modern industrial society. The economic structure of the area is typical to rural Sweden, with growing industrial and declining agricultural activities. We use longitudinal micro-level data with information on demographic events including migration, on household structure and occupations, which are coded and classified using international standards (HISCO, SOCPO). We find that the socioeconomic gradient is a very recent phenomenon. While mortality falls in all socioeconomic groups it is not until the 1950s that a socioeconomic gradient appears, and then only among adults in working ages. For elderly, we find no significant mortality differentials between various social groups at any time. The finding that the social gradient in mortality is a very recent phenomenon is not consistent with the hypothesis that the well-off groups *constantly* have had an advantage in term of health due to their resources. It is neither consistent with the hypothesis of a *convergence* in mortality among different social groups as the welfare state have developed. Instead it is consistent with the hypothesis that a *divergence* has taken place, although much later than previously anticipated and not as a result of the break-through of the industrial society.

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## Introduction

In contemporary Western societies it is firmly established that health and mortality varies by socioeconomic status. This is true both for adults and children and pretty much regardless of the development of welfare state institutions (Vågerö and Lundberg 1989; Leon, Vågerö and Otterblad Olausson 1992; Mackenbach et al. 1997; Marmot et al. 1991). Despite this general consensus on the existence of socioeconomic differences in health and mortality, there is much greater disagreement on the causes of these differences; whether connected to access to better health care, different life styles (e.g. diet, smoking and physical exercise) across socioeconomic groups, psychosocial factors, or conditions and events earlier in the life course (Townsend and Davidson 1982; House, Landis and Umberson 1988; Kuh and Ben-Shlomo 2004; Lindström 2000; Lynch et al. 2000; Mackenbach et al. 1997; Marmot et al. 1991). Some scholars are also convinced that the degree of income inequality in a society is an important determinant of health and mortality mainly through lower levels of trust and social capital (Kawachi et al. 1997; Marmot and Wilkinson 2001; Wilkinson and Pickett 2006; 2010).

Few studies in contemporary epidemiological research, however, discuss these issues in a historical perspective. While it is widely recognized that the socioeconomic differences in mortality today are substantial, it remains an open question how large they were in the past (Bengtsson & van Poppel, in this volume). There seems to be an underlying idea in much research that what needs to be explained is why contemporary welfare states have not been able to eradicate socioeconomic health differentials, and not so much how, when, and why such differentials emerged. In the more historical oriented literature there are also different views on this issue. While some believe that socioeconomic differences have existed far back in time, others think they have emerged, or even widened, as a by-product of the demographic transition. Others again believe that have stayed rather constant. This issue is important not only for our understanding of present-day health and mortality patterns, but also

for our knowledge about living conditions in the past. In economic history there has been a rapidly growing interest in various non-monetary aspects of living standards, using, for example, anthropometric or demographic indicators (Allen, Bengtsson and Dribe 2005; Steckel 1995; Fogel 2004). In addition, the rise and development of inequality in historical societies has gained renewed interest recently (e.g. Hoffman et al. 2002; van Zanden 1995; Milovanovic, Lindert and Williamson 2007; Atkinson and Picketty 2005; Waldenström 2009). In order to gauge the living conditions of different groups in society over time, better knowledge of health and mortality differentials in a long-term perspective is clearly necessary.

The aim of this article is to contribute to this line of research by studying socioeconomic differences in adult mortality in a long-term historical perspective, starting early in the demographic transition (c. 1815) and going up to 1968, thereby covering the full transformation from a pre-industrial society to a modern welfare state. We look at the case of Sweden, which has received considerable attention in this field of research because of its present position among the most equal societies in the Western world with among the highest levels of life expectancy and quite low levels of socioeconomic mortality differentials (see, e.g. Wilkinson and Pickett 2010).

Our study is based on a unique longitudinal dataset covering the entire period from 1815 to 1968, using information on occupation to identify socioeconomic status. We divide the study into five periods: 1815–1864, 1865–1894, 1895–1934, 1935–1954 and 1955–1968. The first period was characterized by agricultural transformation, early industrialization and the first phase of the demographic transition with declining infant and child mortality. The second period saw the real breakthrough of industrialization in Sweden and declining adult mortality. In the third and fourth periods the industrial expansion continued with a accompanying relative decline of the rural sector, while the last period was one of impressive

economic growth and gradual emergence of the modern welfare society (see, e.g. Schön 2000). It should be noted, however, that many of the welfare reforms characterizing contemporary Sweden only came in the post-1970 period, which is outside the scope of this study.

We analyze the age groups 20-59 years and 60 and older separately because the mortality patterns in terms of causes of death differ a lot between these groups, and socioeconomic differentials also seem to be quite different between the working ages and the elderly in contemporary settings (e.g. Chaix et al. 2006). The mortality response to short-term economic stress in the nineteenth century was also much stronger for adults in working ages than for the elderly (Bengtsson 2000, 2004), which further highlights the different mortality patterns in the two age groups. We measure socioeconomic status by occupation of the family head using SOCPO; a classification scheme designed to capture economic status as well as cultural status of an occupation (Van de Putte and Miles 2005).

**Background**

In the literature dealing with socioeconomic mortality differentials in the longer term, three different views can be identified: that mortality differentials between socioeconomic groups have narrowed over time; that they have been roughly constant over time; and that they have widened over time (see Bengtsson and van Poppel, this volume).

The fact that public health measures, as well as subsidized medical care, have reached an increasingly larger share of the population during the course of the twentieth century is an argument in favor of the *convergence* view, which argues that socioeconomic mortality differences have narrowed over time. Economic resources are also more evenly distributed today than they were in the past, partly because of transfers between individuals, which strengthen the convergence hypothesis even further. Empirical support for this

hypothesis has come mainly from urban contexts, covering rather short periods of time (for overviews, see Antonovsky 1967).

The convergence view has been challenged by Link and Phelan (1995), who argue that socioeconomic inequalities in mortality basically have remained more or less *constant* over the last 200 years. They argue that while the specific mechanisms varied over time, the upper classes were always able to avoid premature deaths since they had better access to resources (Link and Phelan 1995). The empirical evidence supporting this view is rather weak, and Link and Phelan mainly cite anecdotal evidence from nineteenth-century observers, not investigations covering long time periods (see Bengtsson & van Poppel, this volume).

The convergence view has also been challenged by historical demographers, who argue that mortality in different social strata have *diverged* over the past 150 years (Smith 1983). Before then, socioeconomic mortality differentials were small or possibly even reversed. The argument is that mortality in the past was mainly due to communicable, often highly virulent, diseases. Since the upper classes were at least as exposed to disease, they suffered as much as, or even more than, the rest of the population. The English upper classes, for example, experienced about the same mortality as ordinary people up until the mid-eighteenth century (Hollingsworth 1957; Livi-Bacci 1991; Wrigley and Schofield 1981; Razzel and Spence 2004). Evidence from other parts of Europe and North America suggest that it was primarily during the course of the nineteenth century that the social gradient in mortality emerged and widened, primarily among children (Riley 2001; Woods 2000; Edvinsson 1992, 2004) and possibly a bit earlier in England (Razell and Spence 2004). Infants seem to follow a somewhat different pattern than children in ages above one year (for an overview of infant and child mortality, see Breschi and Pozzi 2004). For adults, the social

gradient in mortality seems to have emerged later, not until the end of the nineteenth century or even later (Razell and Spence 2004, 2006; see also Edvinsson 1992).

Historical demographers have also pointed to the fact that regional differences in mortality were often large in the past, much larger than socioeconomic differences, whether due to population density, communication networks, sanitation and access to safe water, organization of poor relief and health care, breast-feeding practices or differences in agricultural productivity (Smith 1983; Reid 1997; Woods, Williams and Galley 1993; van Poppel, Jonker and Mandemakers 2005). First of all, mortality was much higher in urban areas; the expression *urban penalty* has often been used to describe it. Second, differences were often large also between rural areas. Geographic differences seem to have declined during the late nineteenth and early twentieth century; the difference between rural and urban areas, as well as within urban areas, becoming smaller (Fogel 2004; Woods, Williams, and Galley 1993). Most likely this was a result of public investments in sanitation systems and health care. Interestingly enough, however, an urban penalty still remains as has been shown for southern Sweden in the late twentieth century, even though it is smaller today than it was in the past (Chaix et al. 2006). Thus, it is necessary to take regional factors into account when studying socioeconomic differences in mortality. In this study we focus on a confined geographic area to avoid confounding influence of regional factors.

The period investigated in this study is one of almost constantly increasing life expectancy. From the mid-eighteenth century onwards, life expectancy at birth in Sweden rose from 35 years, to about 45 years a century later and then continued to climb. As life expectancy increased, disease patterns also changed, from high to low virulent infectious diseases, and later to chronic diseases such as cardiovascular disease and cancer (Omran 1971; Preston 1976; Rothberg and Rabb 1983). During the course of this development, female life expectancy at birth improved more rapidly than male life expectancy. More specifically,

female life expectancy in best-practice countries from the 1840s onwards has improved almost linearly by about three months per year; the corresponding figure for males is 8.6 percent less, which makes a considerable difference over a 150-year period (Oeppen and Vaupel 2002). As an example, the gender difference in life expectancy in Sweden increased from about four years to five years or more in favor of females from the mid-nineteenth century until today (Statistics Sweden 1999, Tables 5.4-5.5). While the widening of this gap is indisputable, it does not mean that females had lower mortality in all ages in the past. In nineteenth-century Europe excess female mortality, especially from late childhood through childbearing ages, has frequently been observed, which has been connected to adverse conditions for women primarily due to childbearing, work load, and intra-household resource allocation (e.g., Alter, Manfredini and Nystedt 2004; Humphries 1991; Johansson 1984; Kennedy 1973, chapter 3; Klasen 1998; Stolnitz 1956).

While most studies of social differences in mortality cover rather short periods of time, some recent studies of Sweden follow a population over a longer time period (Edvinsson 2004; Bengtsson and Dribe 2010; Edvinsson and Lindkvist, this volume). In a study of northern Sweden throughout the nineteenth century, Edvinsson (2004) found that for the Sundsvall region, social differences in child mortality emerged after 1860 when the economy of this area improved rapidly due to the establishment of sawmill industries (see also Edvinsson 1992). For infants other factors seem to have been more important than socioeconomic status. For Skellefteå, a less dynamic region, the socioeconomic pattern was less clear with no changes over time. In a more recent study on Sundsvall, the general finding is that although social differences in mortality existed, no systematic gradient could be found (Edvinsson and Lindkvist, this volume).

In a previous study, covering the period 1766 to 1895 for the same area analyzed here, we demonstrated an increased socioeconomic differentiation in child mortality (1-15

years) during the period of improvements in living standards in the nineteenth century (Bengtsson and Dribe 2010). This seemingly paradoxical result is likely to be due to the general reduction of mortality in highly virulent diseases, due to their low, or nonexistent, nutrition dependency. For infants we found no similar increase in socioeconomic differences, which stresses the different patterns of mortality between infants and children. The general pattern during this period is that while socioeconomic status mattered more than sex for child mortality, spatial differences (parish of residence) and family level heterogeneity were even more important. It is also interesting to note that the importance of the family level did not decline over time as socioeconomic differences became more pronounced. If anything, the trend was towards an even greater importance of the family level over time. The family level was also important in all socioeconomic groups, even though it seems to have been of greatest importance among the landless. In this study we turn to adult mortality and analyze the development of socioeconomic differences from a rural pre-industrial context to a modern industrial society.

**Data and methods**

The data used are based on local population registers for five rural parishes (Hög, Kävlinge, Halmstad, Sireköpinge, and Kågeröd) located about 10 kilometers from the coast in western Scania, which is the southernmost province of Sweden.[1] Data for Halmstad and Sireköpinge is included only until 1895.

The economic structure and population development in Halmstad and Sireköpinge were similar to those in Kågeröd. The parish that differed in terms of change in economic structure and population growth was Kävlinge, which experienced a rapid development after a railroad station was built in 1886. While it previously only had some

[1] The data is maintained by the Scanian Demographic Database, which is a collaborative project between the Regional Archives in Lund and the Centre for Economic Demography, Lund University. The source material is described in Reuterswärd and Olsson (1993), and the quality of data is analysed in Bengtsson and Lundh (1991).

mills and leather industry, located by the riverside, it now attracted investments in other industrial areas, such as the food industry. A neighboring parish, on the other side of the river, experienced a growth in the textile industry which probably affected the population of Kävlinge as well.

In 1830, the five parishes had 3,978 inhabitants. By 1895 that figure had risen to 5,539 which over the 65-year period meant an average annual increase of 0.5 percent, a somewhat slower growth rate than for rural Sweden as a whole during the same period (0.6 percent) (Statistics Sweden 1999). Population continued to grow in the twentieth century, though very unevenly between parishes. Kävlinge had the fastest growth with a population increase from 1,135 in 1895 to 3,944 in 1968.

We mainly use register type data from catechetical examination registers (*husförhörslängder*) with information on both family and household structure and demographic events, which has been updated with data for births, marriages and deaths from the church books to ensure that it covers the entire population and all events. These data have been linked to tax registers *(mantalslängder* and *inkomstlängder),* which provide annual information on occupation of the family head. The database contains all individuals born in the five parishes, or migrating into them. Instead of sampling any particular group (a birth cohort for example) each individual is followed from birth, or time of arrival in the parish, to death, or migration out again. The starting year is motivated primarily by the quality of the sources. 1815 is the year when the catechetical records start, which means that we have good information on individual exposure and household context in addition to demographic and occupational information. The starting year is further motivated by the fact that major changes in the economic structure took place shortly before that time, including enclosure movements and new farming technologies. After 1968 the database is not linked to the national population registers, which makes it impossible to continue the study until the present.

We have coded all occupations in the database into HISCO (van Leeuwen, Maas and Miles 2002; see also Dribe and Lundh 2009), and then classified them according to SOCPO (Van de Putte & Miles 2005). SOCPO is a 5-category classification scheme based on skill level, degree of supervision, whether self-employed or not, as well as on pure status (the nobility). Our main reason for using SOCPO is that while it focuses on social power, it is also highly correlated with education and income. Another advantage is that it can be used both for agricultural and industrial societies. The final classification used is displayed in the table below. All occupations used refer to the head of family, which implies that married women are given the status of their husbands, while widows have their own status, and so does never married women, except in the case of life-cycle servants who get the occupation of household head.

**Socioeconomic classification (SOCPO):**

| Social power level (SES) | Commanders (authority) | Self-employed (business/property owners) | Skill | Pure status |
|---|---|---|---|---|
| 5 | High commander: executive, general policy tasks | Large scale self-employed | Non-manual superskilled | Nobility |
| 4 | Medium commander: supervisor of skilled workers | Medium scale self-employed: local businessmen and farmers | Manual superskilled/non-manual skilled | |
| 3 | Low commander: supervision of semi- and unskilled workers | | Manual-skilled | |
| 2 | | Small scale self-employed | Semi-skilled | |
| 1 | | | Unskilled | |

Source: Van de Putte and Miles (2005).

To estimate the influence of socioeconomic status, controlling for other possible mortality determinants we estimate a Cox proportional hazards model:

$$ln\ h_i(a) = ln\ h_0(a) + \beta x_i$$

where $h_i(a)$ is the hazard of death for an individual $i$ at duration (age) $a$, $h_0(a)$ is the baseline hazard, i.e. the hazard function for an individual having the value zero on all covariates, and $\beta$ is the vector of parameters for the individual covariates ($x_i$).[2] Tests of the proportional hazards assumption, based on scaled Schoenfeld residuals (see Therneau and Grambsch 2000:130-135), reveal no serious violations. The overall test never rejects the null hypothesis of proportional hazards, but in the second period there are some indications from individual coefficients that the proportionality of SP1-3 relative to 5 could be questioned. However, as this was the only case for which there might be a violation of the proportionality assumption we decided to keep the socioeconomic stratification unchanged.

We start by estimating a basic model which, in addition to socioeconomic status, only includes sex and year of birth. The full model includes, in addition, civil status, position in the household, place of birth and parish of residence. Place of birth is a proxy for the strength of social networks in the parish of residence. Household position indicates whether a person is a member of the head family (head, spouse of head or child of head) or a lodger (kin or non-kin). While socioeconomic status is a time-varying covariate in the age group 20-59 years, it is time-invariant in the age group 60 and above. In the latter case we use socioeconomic status at age 60, a time in life at which most have reached their peak in terms of socioeconomic position. The reason is that the occupation records among the elderly could be a rather misleading indicator of social and economic resources because of retirement.

[2] The estimations were made using the 'stcox' command in STATA 11. The proportionality test was made using the 'estat phtest'.

Due to possible endogeneity problems (i.e., the covariate being affected by mortality rather than the other way around, or being jointly determined by a third unobserved factor), we refrain from drawing causal inferences. This is especially the case for relation to household head. For elderly, being an elderly lodger may well may well be a result of bad health during the twentieth century when most elderly lived on their own. However, since the aim here mainly is to explore socioeconomic differences in mortality, this kind of endogeneity in some of the control variables is not of vital importance.

**Results**

Table 1 reports the means of covariates and estimations of the basic model for adults in working ages and for the elderly. We note that the information on occupation is improving over time and that proportions classified in the highest socioeconomic position is increasing over time, as expected. The proportion never-married, as well as the proportion born in the parish of residence, declines. The largest change, however, is in the share of people living as lodgers. While almost half of all elderly lived in another person's household at the beginning of the period, only five percent did so at the end of the period.

- Table 1 here

Figure 1a shows the mortality rates in ages 20 to 59 years (number of deaths divided by person years at risk) for the five socioeconomic groups; SP1 being the lowest and SP5 the highest. In absolute terms there is a convergence during much of the period, followed by a bit of divergence towards the end. Judged by this kind of evidence one would draw the conclusion that mortality is converging between socioeconomic groups over time. However, in most cases we are interested not so much in the absolute difference in mortality, as the

relative one. It is quite clear from Figure 1b that the relative mortality rates (i.e. the SES-specific mortality relative to the highest socioeconomic status) did not change much until the last period (1955-1968) when gap increased tremendously. While the lowest status group had about 60 percent higher mortality than the elite in the first period, the difference declined to less than 10 percent in the following periods, and then increased to a staggering 250 percent in the final period. The relative improvement of the lowest group from the first to the second period is consistent with our previous finding that this group becomes less vulnerable to changing food prices during the same period (Bengtsson and Dribe 2005). More importantly, however, it is evident that the socioeconomic mortality differentials observed today are a quite recent phenomenon.

- Figure 1 here

Figure 2a shows that the SES-specific mortality development for the elderly has been very different from that of the adults in working ages. While there might have been a bit of convergence over time in mortality rates, it is not as pronounced as for working age adults. The development of relative mortality is even more striking, with practically no long-term change for the elderly, and certainly no similar emergence of big socioeconomic differences as we could see for the working age adults in Figure 1b.

- Figure 2 here

Turning to the estimations of the basic models for ages 20-59 years (Table 2, panel A), the absence of clear socioeconomic differentials before the final period is confirmed. The estimated relative risks are never higher than 1.3 and they are far from being statistically

significant. In the final period the pattern changes dramatically with mortality risks in the lower status groups being more than twice as high as in the highest category (SP5). The second highest (SP4) show no significantly higher mortality than the highest groups, while the three lower groups (SP1-3) have similar relative risks.

So far we have only controlled for birth year, in order to pick up time trends in mortality, and sex, which turns out be insignificant. Expanding the model to also include civil status, household position (being lodger or not), place of birth and parish of residence (Table 2, panel B), does not change the pattern of emerging socioeconomic mortality differentials. Thus, we can safely conclude that there were indeed large differences in mortality between socioeconomic groups from the 1950s onwards, with lower socioeconomic status being associated with higher mortality. However, it is equally clear that these mortality differentials did not have their roots way back in rural society, but emerged in the post-World War II period.

Looking briefly at the control variables, we find strong effects of civil status. Currently married have lower mortality than never married and previously married. Interestingly enough, the effects of losing a wife or a husband has a much stronger impact in the earlier periods than during the twentieth century. Being a lodger or not makes no difference in terms of mortality, which could be expected in working ages, and neither does parish of residence.

- Table 2a-b here

For the elderly, the pattern is entirely different. While they also gain from declining mortality, as shown in Figure 2, the differences between the various socioeconomic strata are small both in absolute and relative terms. Furthermore, only one parameter estimate

of the influence of socioeconomic status out of twenty is statistically significant, which clearly highlights the relative unimportance of socioeconomic status for mortality in ages above 60 years. While being married means a great deal in the nineteenth century in terms of mortality risks, it means nothing in the twentieth century. Being a lodger, on the other hand, means nothing in the nineteenth century, but a great deal in the twentieth century. The fact that it was quite unimportant in the nineteenth century is hardly surprising since being a lodger in the past was very common and connected to the institution of peasant retirement (see Dribe and Lundh 2005b). Almost half of the elderly were lodgers in the first period (see Table 1b) which often meant living with one's children also among well-off farmers. Living arrangements for the elderly changed and the roughly 5 percent who lived as lodgers in the twentieth century, were a very different group compared to previously.

- Table 3a-b here

**Conclusion**

All over the Western world there has been great concern over marked socioeconomic differences in mortality, mainly observed among people in working ages. Low socioeconomic status is commonly associated with worse health and higher mortality from a number of diseases. The main question addressed in this study is when these differentials emerged. Link and Phelan (1995) stress the importance of access to health care in arguing that the well-off groups always have had better access to health care and therefore have had a constant advantage in terms of health. Others, for example Antonovsky (1967), have argued that mortality among different socioeconomic strata have converged over time as a result of the development of modern welfare states and modern medical practice. Similar ideas seem to

underlie much of the contemporary epidemiological research even though it is usually not clearly spelled out.

Our findings are clearly inconsistent with both these views. Instead we find that socioeconomic mortality differences have widened over time, and this did not happen gradually as mortality went down but very late in the process. In fact we find no socioeconomic differences at all in mortality until after World War II. Thus, the socioeconomic mortality differentials emerged in a period which is often labeled as the golden age of the Swedish economy (see, e.g. Schön 2000), with rapidly increasing real wages, close to full employment and expanding welfare systems, the health care system being part of this expansion. This finding is consistent with previous findings of increasing occupational mortality differentials between the 1960s and the 1980s (Diderichsen and Hallqvist 1997). Moreover, the socioeconomic gradient emerged among adults in working ages, but not among the elderly, which resembles the situation southern Sweden today where the social gradient tapers off with age (Chaix et al. 2006).

Our findings are significant in several respects. First, and perhaps most obvious, greater knowledge about the historical process producing inequality in health and mortality can improve our understanding of contemporary mortality differentials. Second, our findings are important for a better understanding of historical inequality by refuting the widely held view that there have been marked differences in life expectancy across socioeconomic groups far back in time. Quite the contrary, our results indicate that these differentials are of a very recent origin, and thus going back to pre-industrial and early industrial society these differences were much smaller than they are today. This implies that whatever advantage the high-status groups may have had in material aspects of living standards, it was not helpful in reducing mortality risks in adulthood.

In the literature on contemporary mortality differences by socioeconomic status four sets of explanations are usually singled out following the conclusions from the influential Black report (Townsend and Davidson 1982): artifact (group composition and measurement problems), selection, material factors and behavior (life-style). Of course, it is impossible given the information available in this study to ascertain which of these factors that were important for the development in post-war Sweden. However, it seems highly unlikely that the emergence of very pronounced socioeconomic mortality differentials can be explained by a sudden change in the selection of people into different socioeconomic groups so that this could account for the higher mortality of low-status groups. Likewise, we do not believe that compositional changes, or measurement errors in the socioeconomic classification, could account for the rise in mortality differentials after the 1950s (cf. Diderichsen and Hallqvist 1997). This leaves two broad set of factors – materialist and behavioral – as possible explanations for the increased mortality differentials, which are also the factors most commonly used to explain contemporary mortality differentials.

In the period when socioeconomic mortality differentials emerged, mortality among working age adults was dominated by three broad causes of death: cancer, cardiovascular disease, and accidents; while infectious diseases had already almost disappeared as causes of death (e.g. Willner 2005). We know from contemporary epidemiology that behavioral factors are important in explaining mortality from these causes, and that in today's welfare societies these behaviors to a considerable extent are determined by socioeconomic status. For example, smoking, physical exercise and consumption of vegetables etc. differ markedly between socioeconomic groups (e.g., Lindström 2000). However, we know very little about this for the period of relevance here. In Sweden, as well as in most other Western countries, smoking was much more prevalent in the 1950s and 1960s than it is today, at least among men. There are some indications that early anti-smoking

information in the 1960s led particularly highly educated men to quit smoking (Nordlund 2005), but in general we do not believe these effects to have been big enough to produce the dramatic rise in mortality gap. Indeed, in the 1970s about 40 percent of men in all socioeconomic groups were daily smokers (Nordlund 2005: 318). Similarly, we have no evidence pointing to a fundamentally better diet (less fat intake, more fresh fruit and vegetables, etc) in higher socioeconomic groups in this period, which could have lowered their relative mortality. It may also be argued that there were socioeconomic differences in cardiovascular disease, cancer and accidents further back in time, but that this did not show up in overall mortality differentials because of higher mortality in infectious diseases. However, we must then assume that mortality from infections disease was independent of socioeconomic status, which runs against common opinion that it was exactly in these nutrition-dependent diseases that socioeconomic differences should be most visible (see Rothberg and Rabb 1983).

Turning to health care, it is possible that there were bigger differences in access to doctors and information about proper behavior between socioeconomic groups in this period than is the case today, with a much greater supply of these services regardless of individual income. This could then be one factor explaining the increasing mortality differentials by socioeconomic status. Another possible explanation could be changes in the work environment following the complete mechanization and increased automatization of manufacturing and farming in the post-war period (see Schön 2000: 385), lowering the control over the work process. This has shown to be an important risk factor of cardiovascular disease (Marmot et al. 1991). Previous research using national level data also show increased mortality from cardiovascular diseases among industrial workers and farmers during the 1960s (Diderichsen and Hallqvist 1997), which appears to be consistent with this explanation

Finally, following the work stressing psychosocial factors (e.g. Wilkinson and Pickett 2010), it could be argued that there were changes in the way people viewed stratification and inequality, which may have increased the negative health effects of low socioeconomic status, despite the fact that society at large became more equal (Waldenström 2009) and average levels of income grew at unprecedented rates (Schön 2000).

Needless to say, these are mere speculations pointing more than anything else to the lack of knowledge in an area of vast importance for most present-day welfare societies. Much more research is clearly needed to determine the causes of the emergence of socioeconomic mortality differentials. What we have shown here is that this appears largely to be a post-World War II story, and that mortality differentials were small before that. This is by itself an important conclusion with considerable implications for the assessment of historical inequality patterns.

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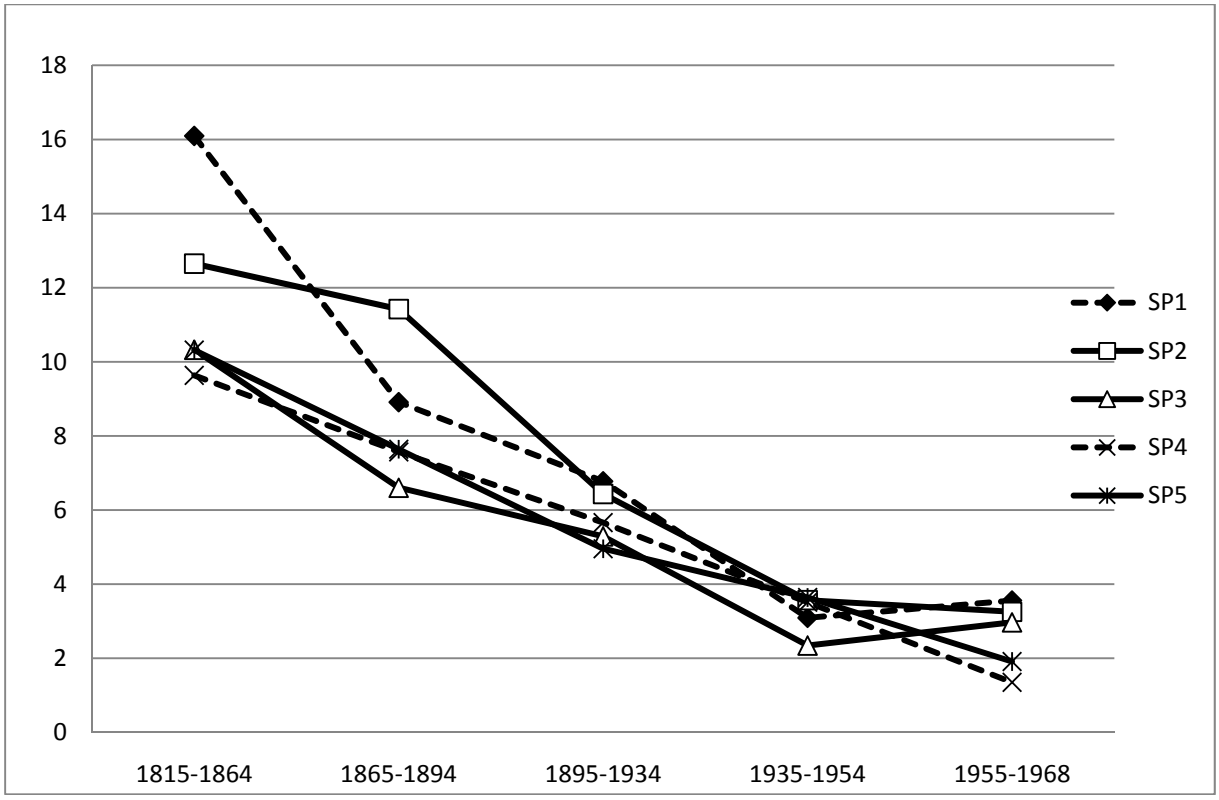
Figure 1. Absolute and relative mortality rates, 20-59 years, both sexes.

Absolute rates per 1000




Relative rates, SP5 = 100

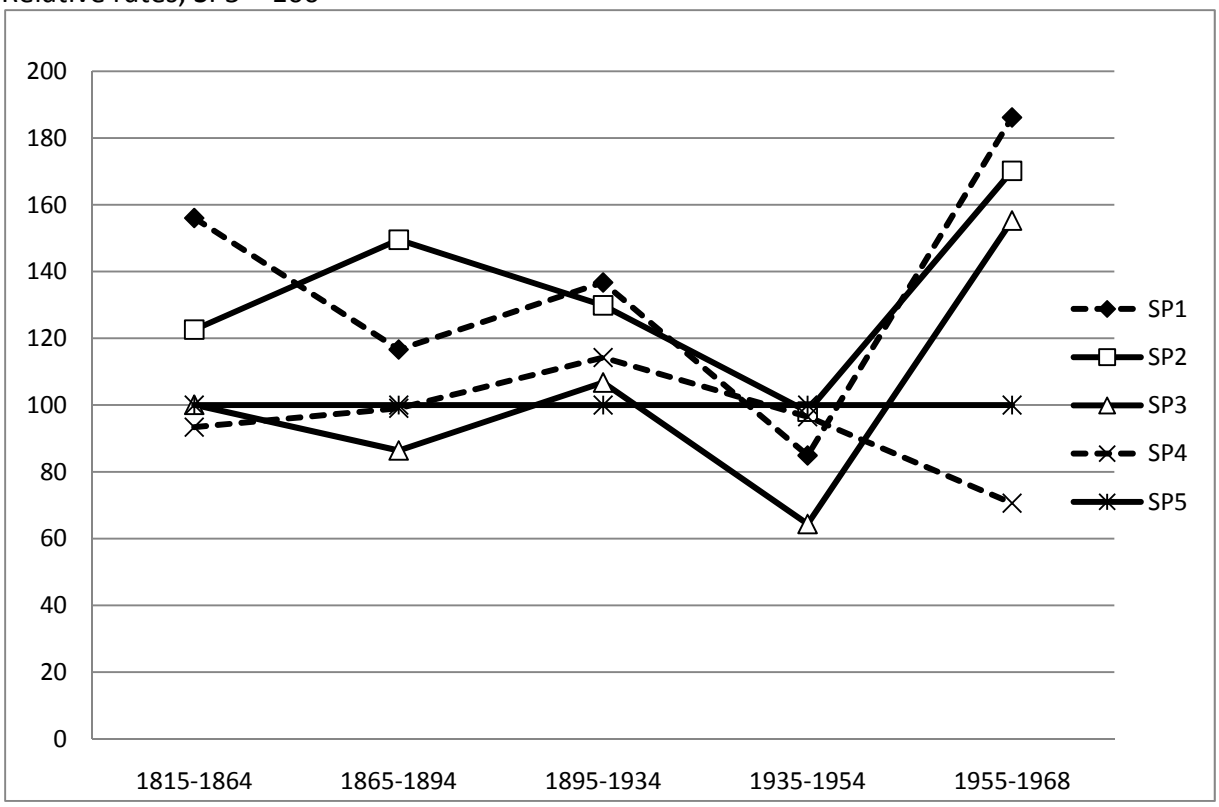
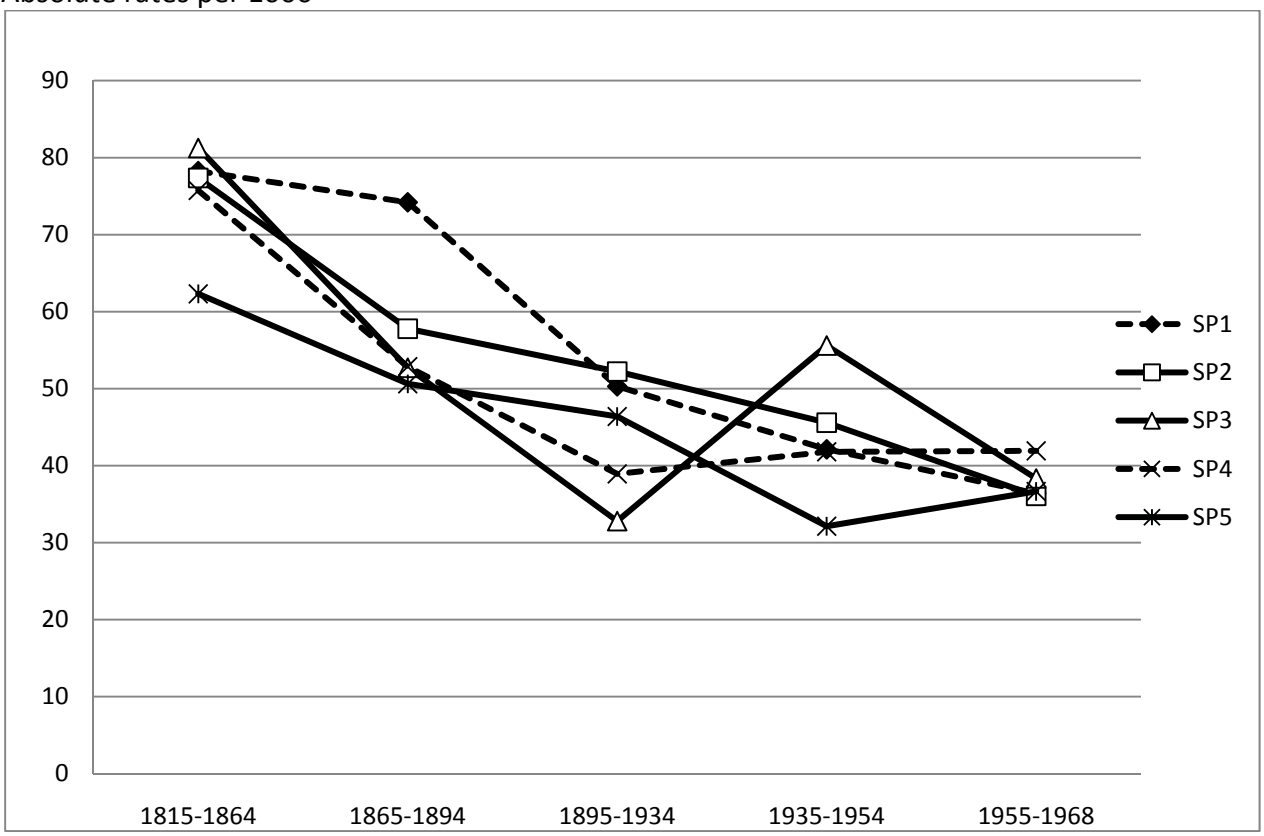


Figure 2. Absolute and relative mortality rates, 60 years and above, both sexes

Absolute rates per 1000




Relative rates, SP5 = 100

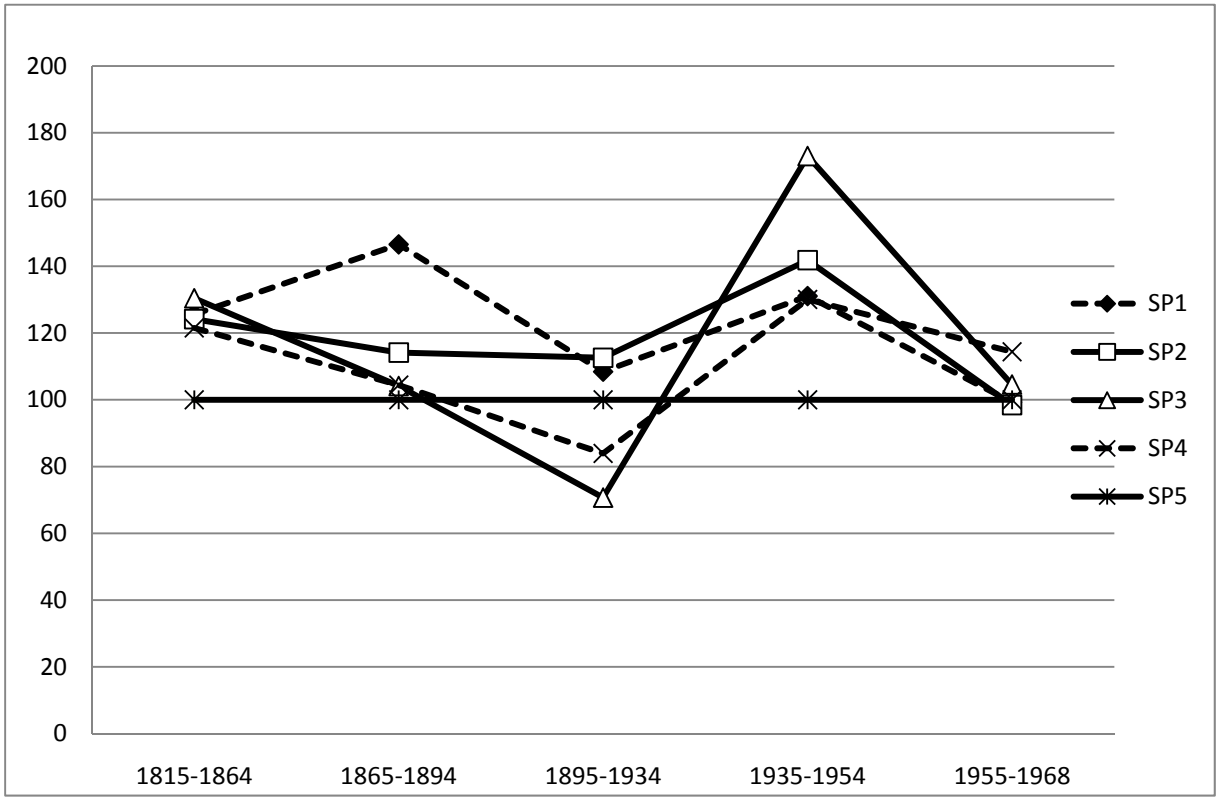


Table 1. Means of covariates for ages 20-59 years, and 60 years and above.

A.20-59 years

| | 1815-1864 | 1865-1894 | 1895-1934 | 1935-1954 | 1955-1968 |
|---|---|---|---|---|---|
| Sex | | | | | |
| Males | 49.5 | 48.3 | 47.9 | 50.4 | 51.5 |
| Females | 50.5 | 51.7 | 52.1 | 49.6 | 48.5 |
| SES | | | | | |
| SP1 | 18.3 | 24.7 | 16.2 | 16.7 | 13.1 |
| SP2 | 24.0 | 18.1 | 18.9 | 22.0 | 24.7 |
| SP3 | 6.2 | 10.3 | 17.7 | 17.2 | 22.7 |
| SP4 | 34.7 | 26.0 | 36.1 | 32.6 | 27.1 |
| SP5 | 3.9 | 6.1 | 5.7 | 7.6 | 9.6 |
| NA | 12.9 | 14.8 | 5.4 | 3.9 | 2.8 |
| Year of birth | 1806 | 1843 | 1879 | 1906 | 1922 |
| Civil status | | | | | |
| Never married | 34.5 | 33.4 | 35.7 | 31.3 | 23.5 |
| Currently married | 59.5 | 61.1 | 61.2 | 66.2 | 74.0 |
| Previously married | 6.0 | 5.5 | 3.2 | 2.6 | 2.5 |
| Place of birth | | | | | |
| Parish of residence | 29.2 | 27.3 | 14.8 | 20.4 | 19.3 |
| Other parish | 70.8 | 72.7 | 85.2 | 79.6 | 80.7 |
| Parish | | | | | |
| Hög | 11.8 | 12.3 | 10.5 | 7.3 | 5.6 |
| Kävlinge | 13.3 | 15.5 | 53.6 | 60.2 | 66.1 |
| Halmstad | 19.0 | 19.6 | NA | NA | NA |
| Sireköpinge | 20.7 | 29.0 | NA | NA | NA |
| Kågeröd | 35.1 | 23.5 | 35.9 | 32.5 | 28.2 |
| Household position | | | | | |
| Head family | 86.6 | 85.2 | 97.4 | 98.4 | 98.4 |
| Lodger | 13.4 | 14.8 | 2.6 | 1.6 | 1.6 |
| | | | | | |
| Person years | 74601.5 | 58955.9 | 78185.61 | 52275.1 | 38603.6 |
| Deaths | 906 | 513 | 452 | 177 | 106 |

Table 1. Means of covariates, continued

B. 60 years and above

| | 1815-1864 | 1865-1894 | 1895-1934 | 1935-1954 | 1955-1968 |
|---|---|---|---|---|---|
| Sex | | | | | |
| Males | 50.8 | 48.9 | 47.5 | 46.1 | 45.8 |
| Females | 49.2 | 51.1 | 52.5 | 53.9 | 54.2 |
| SES | | | | | |
| SP1 | 29.5 | 24.6 | 16.4 | 12.5 | 16.2 |
| SP2 | 26.6 | 23.6 | 18.9 | 16.2 | 18.6 |
| SP3 | 2.6 | 6.9 | 14.3 | 15.8 | 14.1 |
| SP4 | 16.9 | 21.4 | 35.2 | 43.8 | 36.8 |
| SP5 | 1.7 | 3.4 | 4.9 | 5.0 | 7.5 |
| NA | 22.8 | 20.1 | 10.4 | 6.7 | 6.9 |
| Year of birth | 1776 | 1812 | 1850 | 1875 | 1892 |
| Civil status | | | | | |
| Never married | 12.3 | 7.6 | 13.8 | 17.1 | 20.6 |
| Currently married | 50.3 | 55.4 | 60.4 | 56.2 | 57.3 |
| Previously married | 37.4 | 37.0 | 25.8 | 26.7 | 22.1 |
| Place of birth | | | | | |
| Parish of residence | 20.9 | 24.4 | 14.7 | 6.3 | 13.2 |
| Other parish | 79.1 | 75.6 | 85.3 | 93.7 | 86.8 |
| Parish | | | | | |
| Hög | 9.6 | 14.9 | 14.3 | 7.8 | 5.8 |
| Kävlinge | 9.1 | 15.6 | 44.9 | 57.9 | 59.8 |
| Halmstad | 17.8 | 19.7 | | | |
| Sireköpinge | 15.6 | 26.3 | | | |
| Kågeröd | 48.0 | 23.6 | 40.8 | 34.3 | 34.3 |
| Household position | | | | | |
| Head family | 53.9 | 68.1 | 89.9 | 94.9 | 94.7 |
| Lodger | 46.1 | 31.9 | 10.1 | 5.1 | 5.3 |
| Person years | 9538.8 | 11572.1 | 14084.9 | 13108.3 | 12067.1 |
| Deaths | 704 | 729 | 640 | 571 | 472 |

Table 2. Cox regression estimates of mortality 1815-1968. Ages 20-59 years.

A. BASIC MODEL

| | **1815-1864** | | **1865-1894** | | **1895-1934** | | **1935-1954** | | **1955-1968** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| |
| Sex | | | | | | | | | | |
| Males | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| Females | 1.00 | 0.959 | 0.93 | 0.403 | 0.86 | 0.104 | 0.80 | 0.147 | 0.79 | 0.233 |
| SES | | | | | | | | | | |
| SP1 | 1.27 | 0.233 | 1.00 | 0.994 | 1.17 | 0.502 | 0.97 | 0.931 | 2.44 | 0.079 |
| SP2 | 0.99 | 0.979 | 1.19 | 0.417 | 1.16 | 0.514 | 1.19 | 0.571 | 2.46 | 0.062 |
| SP3 | 1.05 | 0.823 | 0.80 | 0.370 | 0.94 | 0.789 | 0.74 | 0.379 | 2.32 | 0.085 |
| SP4 | 1.00 | 0.981 | 0.89 | 0.584 | 0.85 | 0.445 | 0.94 | 0.848 | 1.26 | 0.643 |
| SP5 | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| NA | 0.99 | 0.975 | 1.06 | 0.788 | 1.41 | 0.194 | 1.67 | 0.194 | 3.09 | 0.063 |
| Year of birth | 0.99 | 0.000 | 1.00 | 0.869 | 0.99 | 0.169 | 0.97 | 0.016 | 0.98 | 0.346 |
| | | | | | | | | | | |
| Individuals | 10113 | | 9926 | | 12368 | | 8040 | | 6652 | |
| Deaths | 906 | | 513 | | 452 | | 177 | | 106 | |
| Time at risk | 74601.5 | | 58955.9 | | 78185.6 | | 52275.1 | | 38603.6 | |
| Log likelihood | -6695.2 | | -3700.1 | | -3393.7 | | -1247.2 | | -725.5 | |
| LR chi2 | 24.5 | 0.001 | 8.2 | 0.314 | 17.2 | 0.016 | 13.5 | 0.062 | 13.9 | 0.054 |

Table 2. Cox regression estimates of mortality 1815-1968. Ages 20-59 years, continued

B. FULL MODEL

| | 1815-1864 | | 1865-1894 | | 1895-1934 | | 1935-1954 | | 1955-1968 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| |
| Sex | | | | | | | | | | |
| Males | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| Females | 0.98 | 0.736 | 0.91 | 0.266 | 0.83 | 0.056 | 0.81 | 0.169 | 0.82 | 0.309 |
| SES | | | | | | | | | | |
| SP1 | 1.31 | 0.207 | 1.07 | 0.761 | 1.18 | 0.467 | 0.98 | 0.954 | 2.17 | 0.129 |
| SP2 | 1.11 | 0.615 | 1.36 | 0.158 | 1.20 | 0.428 | 1.18 | 0.586 | 2.36 | 0.076 |
| SP3 | 1.14 | 0.580 | 0.89 | 0.653 | 0.97 | 0.885 | 0.74 | 0.387 | 2.27 | 0.094 |
| SP4 | 1.10 | 0.648 | 1.00 | 0.991 | 0.86 | 0.504 | 0.96 | 0.898 | 1.15 | 0.783 |
| SP5 | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| NA | 0.97 | 0.894 | 0.94 | 0.802 | 1.18 | 0.527 | 1.33 | 0.489 | 2.00 | 0.278 |
| Year of birth | 0.99 | 0.000 | 1.00 | 0.760 | 0.99 | 0.126 | 0.97 | 0.014 | 0.98 | 0.395 |
| Civil status | | | | | | | | | | |
| Never married | 1.25 | 0.020 | 1.88 | 0.000 | 1.46 | 0.002 | 1.43 | 0.046 | 1.80 | 0.013 |
| Currently married | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| Previously married | 1.76 | 0.000 | 1.88 | 0.000 | 1.73 | 0.006 | 0.69 | 0.423 | 1.05 | 0.929 |
| Place of birth | | | | | | | | | | |
| Parish of residence | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| Other parish | 1.02 | 0.781 | 1.03 | 0.758 | 0.89 | 0.408 | 0.81 | 0.280 | 1.10 | 0.711 |
| Parish | | | | | | | | | | |
| Hög | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| Kävlinge | 1.34 | 0.046 | 1.04 | 0.830 | 0.94 | 0.677 | 1.84 | 0.100 | 0.89 | 0.780 |
| Halmstad | 1.37 | 0.020 | 0.93 | 0.668 | NA | NA | NA | NA | NA | NA |
| Sireköpinge | 1.10 | 0.505 | 0.95 | 0.733 | NA | NA | NA | NA | NA | NA |
| Kågeröd | 1.30 | 0.046 | 1.01 | 0.939 | 0.85 | 0.317 | 1.82 | 0.111 | 1.18 | 0.690 |
| Household position | | | | | | | | | | |
| Head family | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| Lodger | 0.96 | 0.679 | 1.19 | 0.205 | 1.39 | 0.155 | 1.68 | 0.229 | 1.70 | 0.323 |
| | | | | | | | | | | |
| Individuals | 10113 | | 9926 | | 12368 | | 8040 | | 6652 | |
| Deaths | 906 | | 513 | | 452 | | 177 | | 106 | |
| Time at risk | 74601.5 | | 58955.9 | | 78185.6 | | 52275.1 | | 38603.6 | |
| Log likelihood | -6676.2 | | -3681.0 | | -3383.0 | | -1240.9 | | -720.6 | |
| LR chi2 | 62.52 | 0.000 | 46.36 | 0.000 | 38.7 | 0.000 | 26.14 | 0.016 | 23.61 | 0.035 |

Table 3. Cox regression estimates of mortality 1815-1968. Ages 60 years and above.

A.BASIC MODEL

| | **1815-1864** | | **1865-1894** | | **1895-1934** | | **1935-1954** | | **1955-1968** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| |
| Sex | | | | | | | | | | |
| Males | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| Females | 1.09 | 0.279 | 1.02 | 0.803 | 0.99 | 0.899 | 0.98 | 0.784 | 0.67 | 0.000 |
| SES at 60 | | | | | | | | | | |
| SP1 | 1.13 | 0.714 | 1.05 | 0.83 | 1.02 | 0.915 | 1.20 | 0.462 | 0.90 | 0.608 |
| SP2 | 1.09 | 0.799 | 0.89 | 0.617 | 0.88 | 0.532 | 1.13 | 0.603 | 0.89 | 0.579 |
| SP3 | 1.26 | 0.547 | 0.82 | 0.459 | 0.66 | 0.056 | 1.32 | 0.243 | 0.90 | 0.626 |
| SP4 | 1.10 | 0.782 | 0.76 | 0.248 | 0.89 | 0.559 | 1.07 | 0.777 | 0.93 | 0.709 |
| SP5 | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| NA | 0.87 | 0.681 | 1.00 | 0.989 | 1.04 | 0.831 | 0.83 | 0.515 | 1.14 | 0.587 |
| Year of birth | 0.99 | 0.009 | 0.99 | 0.022 | 0.99 | 0.113 | 0.98 | 0.032 | 0.99 | 0.394 |
| | | | | | | | | | | |
| Individuals | 1027 | | 1244 | | 1468 | | 1526 | | 1714 | |
| Deaths | 704 | | 729 | | 635 | | 571 | | 472 | |
| Time at risk | 9538.8 | | 11572.1 | | 14084.9 | | 13108.3 | | 12067.1 | |
| Log likelihood | -4088.0 | | -4219.0 | | -3654.6 | | -3193.0 | | -2566.6 | |
| LR chi2 | 14.8 | 0.038 | 18.5 | 0.010 | 14.8 | 0.039 | 12.3 | 0.092 | 19.4 | 0.007 |

Table 3. Cox regression estimates of mortality 1815-1968. Ages 60 years and above, continued.

B.FULL MODEL

| | 1815-1864 | | 1865-1894 | | 1895-1934 | | 1935-1954 | | 1955-1968 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| | Rel. Risk | P>\|z\| |
| Sex | | | | | | | | | | |
| Males | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| Females | 1.04 | 0.643 | 0.98 | 0.757 | 0.98 | 0.83 | 0.97 | 0.766 | 0.66 | 0.000 |
| SES at 60 | | | | | | | | | | |
| SP1 | 1.19 | 0.608 | 1.01 | 0.954 | 0.98 | 0.918 | 1.05 | 0.847 | 0.86 | 0.485 |
| SP2 | 1.12 | 0.728 | 0.91 | 0.681 | 0.87 | 0.479 | 1.07 | 0.775 | 0.88 | 0.533 |
| SP3 | 1.33 | 0.471 | 0.90 | 0.690 | 0.64 | 0.041 | 1.23 | 0.386 | 0.92 | 0.687 |
| SP4 | 1.12 | 0.736 | 0.80 | 0.350 | 0.89 | 0.544 | 1.07 | 0.761 | 0.97 | 0.863 |
| SP5 | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| NA | 0.88 | 0.707 | 0.92 | 0.725 | 0.94 | 0.765 | 0.73 | 0.296 | 1.13 | 0.631 |
| Year of birth | 0.99 | 0.014 | 0.99 | 0.034 | 1.00 | 0.25 | 0.98 | 0.037 | 0.99 | 0.334 |
| Civil status | | | | | | | | | | |
| Never married | 1.33 | 0.025 | 1.32 | 0.084 | 1.20 | 0.148 | 0.96 | 0.747 | 0.97 | 0.847 |
| Currently married | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| Previously married | 1.26 | 0.012 | 1.36 | 0.000 | 0.98 | 0.811 | 1.10 | 0.366 | 1.01 | 0.922 |
| Place of birth | | | | | | | | | | |
| Parish of residence | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| Other parish | 0.97 | 0.740 | 0.98 | 0.833 | 1.07 | 0.528 | 0.89 | 0.471 | 0.93 | 0.639 |
| Parish | | | | | | | | | | |
| Hög | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| Kävlinge | 1.42 | 0.059 | 1.08 | 0.565 | 0.91 | 0.411 | 1.01 | 0.935 | 1.03 | 0.886 |
| Halmstad | 1.04 | 0.838 | 1.06 | 0.671 | NA | NA | NA | NA | NA | NA |
| Sireköpinge | 1.31 | 0.111 | 0.96 | 0.759 | NA | NA | NA | NA | NA | NA |
| Kågeröd | 1.18 | 0.303 | 1.04 | 0.774 | 0.98 | 0.84 | 1.08 | 0.679 | 0.96 | 0.856 |
| Household position | | | | | | | | | | |
| Head family | 1 | rc | 1 | rc | 1 | rc | 1 | rc | 1 | rc |
| Lodger | 0.89 | 0.195 | 1.11 | 0.223 | 1.30 | 0.023 | 1.83 | 0.000 | 1.44 | 0.013 |
| | | | | | | | | | | |
| Individuals | 1027 | | 1244 | | 1468 | | 1526 | | 1714 | |
| Deaths | 704 | | 729 | | 635 | | 571 | | 472 | |
| Time at risk | 9539 | | 11572 | | 14085 | | 13108 | | 12067 | |
| Log likelihood | -4080 | | -4211 | | -3650 | | -3182 | | -2563 | |
| LR chi2 | 31.2 | 0.008 | 35.0 | 0.003 | 24.3 | 0.029 | 34.7 | 0.001 | 26.0 | 0.017 |