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Old-age mortality and social class in northern Norway in the first half of the twentieth century

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ABSTRACT

The number of studies on social inequality in mortality in Norway before 1960 is limited and they often focus on early life outcomes. Little is known about socioeconomic differences in old-age mortality before the emergence of the welfare state. Linked census and church records from the Historical Population Register of Norway were used to study a sample of 10,457 men and women born 1841–1870 who lived in Troms, a province in northern Norway, in the early twentieth century. We analysed the association between social class, measured in adulthood, and mortality at age 60 and older using Cox proportional hazards models. The results do not indicate a clear social gradient in mortality. Differences between social classes varied in the magnitude and direction of effects, depending on gender and place of residence. For women, the association between social class and mortality was weaker overall. Only farming was significantly associated with decreased mortality risk compared to the group of lower-skilled and unskilled workers. Differences were more pronounced among men, with higher mortality for non-manual classes in towns, and lower mortality for skilled workers and farmers in rural areas. The advantage for farmers was amplified in combination with manual or non-manual work.

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1. Introduction

1.1. Past and present social inequality in health and mortality

Substantial evidence exists concerning a social gradient in health and mortality in modern welfare states. The higher an individual's socioeconomic position – measured by education, income or occupation – the better their health and the longer their life expectancy (Mackenbach, 2019). Some influential theories aimed at explaining social inequalities in health have made the point that these patterns have existed for centuries. Link and Phelan (1995), for example, have suggested that socioeconomic conditions are fundamental causes of disease, as access to flexible resources such as money, knowledge, prestige, power and social support enables privileged groups in society to avoid risk or limit the adverse consequences of disease. This, however, depends on the historical context regarding the possibilities for the prevention and treatment of a given disease, which an addition to fundamental cause theory has emphasised (Clouston et al., 2016). Marmot (2004) has pointed to the psychosocial effects of social inequality itself as an explanation for a social

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gradient in health and mortality across time and space. Antonovsky (1967), on the other hand, has argued that the relationship between social class and mortality has passed through different phases in Western world history, corresponding to different stages in the demographic transition and industrialisation.

In recent decades, research in the field of historical demography has increasingly focused on social inequality in mortality using longitudinal life-course data. Although systematic comparisons over time and across countries are challenging due to varying data quality, availability and methodology, evidence suggests that disparities in adult mortality in the nineteenth and twentieth centuries did not always display the same social pattern and thus should not be considered a 'historical constant' (Bengtsson & van Poppel, 2011; Edvinsson & Lindkvist, 2011; Schenk & van Poppel, 2011). Some studies have shown a clear survival advantage for the upper classes (van Poppel et al., 2009), while others have found little variation in mortality by social class overall (Edvinsson & Broström, 2012). Furthermore, it has been argued that the place of residence was of greater significance for mortality than social class during the periods of industrialisation and urbanisation (Edvinsson & Lindkvist, 2011; Schenk & van Poppel, 2011). Findings from a recent historical study using longitudinal population data from Sweden spanning from 1813 to 2015 suggest that it might have been during the very period when the welfare state was established that the social gradient in mortality emerged (Bengtsson et al., 2020).

In Norway, most research concerning health inequalities has focused on the period after 1964, when the National Population Register was established. In these studies, substantial inequalities in health or mortality by education, income or occupation have been shown (Kinge et al., 2019; Strand et al., 2014; Texmon, 2022). Less is known about patterns of health inequalities in earlier periods in Norway, in a pre-welfare state context. The potentially earliest study mentioning social inequality in health was Eilert Sundt's study on poverty in Norway's capital city in 1868, which described a higher prevalence of illness among the poor compared to other classes in society (Sundt, 1870). Later mortality research based on historical population data in Norway has primarily focused on the long-term trends of overall mortality decline, the urban-rural divide, and infant and child mortality (Sommerseth & Thorvaldsen, 2022). Fewer historical studies have explicitly investigated socioeconomic differences in mortality. Engelsen (1983) studied death records from 1802 and 1803 in a random sample of 44 Norwegian parishes, and found no marked differences in mortality between upper and lower social strata (with the main division drawn between well-off farmers and cotters). He suggested that the advantage of higher living standards for the better-off might have been counteracted by living in larger households and in areas of higher density at a time when exposure to infectious diseases was a decisive factor. However, a study of two socially contrasting parishes in Oslo found independent effects of apartment size as a proxy for wealth and residential social status on influenza mortality during the Spanish influenza pandemic one hundred years later (Mamelund, 2006). A study of infant mortality in two parishes in southern Norway between 1814 and 1878 found no association with social class (Fure, 2002). Lindbekk (2016) studied a cohort born in 1855 in Trøndelag province in Norway and found that both wealthy farmers and cotters experienced lower infant and child mortality than 'unestablished' workers and those who worked in the public or private sector in the larger cities. She placed special emphasis on the 'sufficient and sustainable livelihood' connected to the occupational category of farmers and cotters in rural Norway.

Overall, the body of evidence for social inequality in health and mortality in Norway before 1960 is limited and often focuses on early life outcomes. Little is known about class differences in old-age mortality in Norwegian society before the emergence of the welfare state. The aim of this study was to analyse differences in survival after the age of 60 by social class in the first half of the twentieth century, based on individual-level longitudinal data from the province of Troms in northern Norway.

1.2. Social inequality in old-age mortality

Social inequalities in old age involve more biological processes compared to earlier in life. A universal health decline sets in for everyone at a certain age, but socioeconomic factors interact with the ageing process (Hoffmann, 2008). Moreover, common measures of social inequality such as income and occupation are based on the labour market, so their impact in old age must be thought of as an after-effect (ibid.). The life-course perspective on health inequalities has been a crucial approach in social epidemiology, which '*sees a person's biological status as a marker of their past social position and, through the structured nature of social processes, as liable to selective accumulation of future advantage or disadvantage*' (Blane, 2006, p. 54). In line with this, we assume that social class at working age had a lasting effect on old-age mortality in early twentieth century Norway. Previous studies generally agree that social inequalities in health and mortality – whenever they are present at younger ages – also exist in old age, but findings about the magnitude of these disparities remain inconclusive. A review of studies from the 1990s and early 2000s concerning mortality rates in mostly Nordic and Western European countries concluded that socioeconomic inequalities in mortality persisted into the oldest ages for women and men in all studied countries, although differences were rarely extreme (Huisman et al., 2013). A Canadian study on socioeconomic status and health throughout the life-course based on cross-sectional survey data from the 1990s found that health inequality increased progressively over the life span, instead of converging towards old age (Prus, 2007). A recent report from Statistics Norway showed that considerable differences in remaining life expectancy after age 62 by prior occupation persisted in the period 1981–2020, even though they were slightly smaller than at working age (Texmon, 2022). Breslow and Buell (1960) found a negative occupational class gradient in mortality ratios among Californian men for the years 1949–1951, which was strongest in young adulthood and decreased with age, with the last age group (60–64 years) showing only small variations by class. Chapin (1924) compared mortality rates from 1865 in Rhode Island and found a higher mortality among non-taxpayers compared to taxpayers in all adult age groups, including those who died after the age of 60.

The focus on old-age mortality in this study is based on the life-course perspective. We hypothesise that people belonging to different social classes have had differing exposure to health risks, differing opportunities for resource accumulation throughout their life-course, and therefore differing chances for survival when leaving the active workforce in later life.

1.3. Historical context for this study

In the first decades of the twentieth century, the remaining life expectancy at age 60 in Norway was around 17 and 18 years for men and women, respectively (Statistics Norway, 2021). Compared to other Western European countries, Norway was among the countries with the lowest mortality in the period 1850–1950 (Backer, 1961). The steady mortality decline was interrupted by the two world wars and the Spanish influenza pandemic of 1918–19, although to a varying degree depending on age and gender. In the years before and during the Second World War, the mortality decline continued for women aged 40–70, while it stagnated for men in the same age group (Backer, 1961).

The provision for old age was still primarily based on family care. In 1900, the newly passed Poor Law formally ended the centuries-long tradition of '*legd*' in Norway, which was a locally organised system of care for poor and elderly people without families, who were sent from farm to farm, where they would receive board and lodging for a limited period of time. Even before 1900, however, a considerable proportion of the elderly with no relatives lived on poor relief, which for most was not considered a dignified way to grow old (Haavet, 1994). The largest group of recipients of poor relief was the working class, including seamen, craftsmen, cotters, day labourers and fishermen, as well as widows (Seip, 1994). The increased cost of poor relief, combined with the supposedly weaker family ties demonstrated by the decline in intergenerational co-residence between 1875 and 1900 (Sommerseth, 2011), may have given rise to challenges concerning provision for

old age. One decade after the Poor Law, pension schemes were gradually introduced at the municipal level, starting in southern Norway. However, it was not until 1936 that Norway passed a pension law that included a needs-based pension at the national level, which was converted into a universal basic pension without means-testing in 1957 (Nordic Social-Statistical Committee, 2009; Seip, 1994). Prior to this, freehold farmers could arrange retirement contracts (*'føderådskontrakt'*) with the subsequent owner of their farm (usually their eldest son or son-in-law), which were designed to ensure their livelihood in old age. Early in the twentieth century, the average age for entering into these agreements was around 70 years, which corresponded to the age threshold for state pensions granted to civil servants and their widows at this time (Helland-Hansen, 1997). Those who already had scarce resources during working life (e.g. workers who were not salaried employees) faced a higher level of uncertainty in old age, once they had lost their ability to earn money, had no claim to pensions and no property to utilise.

Situated north of the Arctic Circle, Troms is the second-northernmost province in Norway and had approximately 81,700 inhabitants in 1910. The population consisted of three ethnic groups: Norwegians, Sámi and Finns. The Sámi and Finnish population lived in all municipalities of Troms, although the concentration was highest in northern and eastern Troms (Sommerseth, 2011; Thorvaldsen, 1995). At the turn of the century, industrialisation was still limited in the north of Norway. Here, the occupational landscape was characterised by subsistence farming and fishing – often in combination – and low levels of specialisation compared to the larger cities in southern Norway. Tromsø was the main urban centre of the province, and was a small but densely populated town with roughly 7,600 inhabitants in 1910. Another rapidly growing village was Harstad, which became the second urban municipality of the province in 1904. In 1910, Harstad had a population of around 2,000. Although these towns were very small compared to the larger cities in southern Norway, it has been argued that the many small towns in Norway had a social structure and function similar to those of the large cities, and differed from the sparsely populated parishes in terms of their occupational landscape and social life. Both Tromsø and Harstad were crucial northern centres for equipment, administration and communication in the fishing and shipping industry (Myhre, 2006; Stugu, 2006). In 1910, 25 medical doctors in Troms were responsible for a population that was spread across an area of over 26,000 km^2 (NOS, 1912). Compared to other Norwegian provinces, Troms ranked high in overall mortality rates. Deaths from external causes played an important role in mortality, especially for men in coastal areas. This is because the majority of deaths from external causes were due to drowning in the context of fishing and shipping. Even though mortality from accidents decreased everywhere in Norway after 1900, the age group above 50 in northern Norway still had a considerably higher share of unnatural deaths compared to in the rest of the country (Backer, 1961).

2. Material and methods

The data for this study were extracted from the Historical Population Register of Norway (HPR). The HPR is a national database under construction, and aims to include the records of everyone who lived in Norway during the period from 1801 to 1964 (the year in which the National Population Register was established and unique identification numbers where introduced). In the construction of the HPR, identifying variables, including name, sex, birth date and birthplace, are used in order to link records for the same individual across different sources over their life-course, as well as to establish family linkages. For detailed description of the record linkage in the HPR, see Thorvaldsen et al. (2015).

In the study sample for the present analysis, we included residents of the province of Troms in the census of 1900 or 1910 at age 40–59. This age range is theorised to represent a point in the life-course at which social class becomes more stable compared to earlier in life, and is therefore able to indicate life chances and resources, which might become relevant for material conditions and survival in old age. If an individual was found in both censuses with classifiable occupational data

Table 1. Comparison of sample characteristics between the total population of women and men in Troms aged 40–59 in the 1910 census and the share with available death record in Troms in the Historical Population Register.

	Men aged 40–59		Women aged 40–59	
	Total sample (N = 6,964)	Death record at age ≥40 (N = 4,858, 70%)	Total sample (N = 7,127)	Death record at age ≥ 40 (N = 3,891, 55%)
%				
Social class				
Non-manual classes	8.1	7.2	6.6	7.0
Skilled workers	7.2	6.2	6.5	6.3
Farmers	56.1	61.9	50.3	56.7
Lower-skilled/unskilled workers	27.5	24.1	28.2	23.9
Missing/unclassifiable	1.0	0.7	8.3	6.1
Marital status				
Unmarried	10.2	6.9	13.2	8.7
Widowed	5.3	5.2	11.4	9.4
Married	84.5	87.9	75.5	81.9
Place of residence				
Rural	89.8	91.0	87.7	88.7
Urban	10.2	9.0	12.3	11.3
Place of birth				
Troms	85.2	88.6	87.1	89.4
Outside of Troms	14.8	11.4	13.0	10.6

Notes: Social class based on modified version of the Historical International Social Class Scheme (HISCLASS) (van Leeuwen & Maas, 2011).

Source: Norwegian Historical Data Centre, UiT The Arctic University of Norway. Historical Population Register of Norway. Original sources at the National Archive of Norway.

within the defined age range, priority was given to information at higher ages (i.e. the 1910 census). For the present study, it was not possible to account for in- or out-migration after the census of 1910. We therefore focused on the men and women who lived in Troms at age 40–59 and who could be linked to their death record within Troms. This was the case for 70% of men and 55% of women in this age group in the 1910 census (Table 1). Internal migrants within Troms were included in the study, but missing death records could be due to migration overseas or to another Norwegian province after the census enumerations. Moreover, successful linkage of available records in HPR is generally hampered by uncertainty due to imprecisely registered information that is needed for linkage or several possible matches for very common names. In order to assess possible selection effects in this study, characteristics of individuals who could be linked to their death record were compared to the corresponding total cross-sectional population from the 1910 census.[1]

The differences in proportions in Table 1 indicate that those who could be linked to a death record in Troms were more likely to be male, married, farmers, and living in their province of birth, which are some of the common biases in studies that rely on probabilistic linking methods (Dribe & Eriksson, 2018; Gagnon & Bohnert, 2012; Moilanen et al., 2021; Thorvaldsen, 1995). In general, women can be more difficult to link, due to surname changes. Moreover, married individuals and farmers present greater residential stability, and are therefore easier to trace across sources, which has previously been shown for historical record linkage in Troms (Thorvaldsen, 1995).

The outcome of interest in this study was old-age mortality in Troms. Old age was defined as 60 years and older, in line with previous studies of older adults in nineteenth century northern Sweden and Norway (Edvinsson & Broström, 2012; Sommerseth, 2011). Inclusion in the sample was therefore conditional on survival to age 60. Dates of birth were extracted from baptism records or the

[1]The 1910 census is the baseline source for almost three quarters of the individuals in the final study sample, which is why it is taken as the reference point for discussion of linking rates and representativeness. Comparing the linked sample to the total population in 1900 indicated the same selection effects (not shown).

earliest registration thereafter (e.g. the marital record or a census). Mortality data were obtained from church records and from the Norwegian Cause of Death Registry for deaths after 1950. For church records, an individual's burial date was used whenever the date of death was not available. In total, 5,891 men and 4,566 women were included in the analysis.

2.1. Social class

The main exposure variable of interest in this study was social class. Occupations are commonly used in historical research to indicate social class, as they are usually the most readily available socioeconomic variables in historical sources, which also applies to the HPR. In this study, occupations were extracted from the Norwegian censuses of 1900 or 1910 at age 40–59. Female labour was essential for the Norwegian economy in the nineteenth century, especially in manufacturing and agriculture (Myhre, 2018). However, although there are a range of female occupational titles registered in the sources, most are rather status terms (e.g. '*lærerkone',* the teacher's wife) which merely express the woman's relationship to the male head of household (van Leeuwen et al., 2002). Therefore, own occupational information (if available) was only considered for unmarried women and widows. For married women, their husband's occupation was used as their class indicator. As the proportion of missing occupations for women was still considerable, a separate category for unclassifiable or missing occupations was included.

Occupations were coded according to the Historical International Standard Classification of Occupations (HISCO). HISCO is a historicised version of the International Labour Organisation's ISCO68 scheme, and was developed on the basis of occupational titles registered in parish and civil registration documents in eight western countries, including more than 300,000 person records from Norway. The data are mostly from the nineteenth century, but encompass a period from 1690 to 1970 (van Leeuwen et al., 2002). HISCO codes were then translated to HISCLASS, which is a historical international social class scheme that contains twelve social classes (Table A1), taking into account the underlying dimensions of manual and non-manual work, skill level, supervision and economic sector (van Leeuwen & Maas, 2011). Due to the large proportion of farmers and consequently low numbers in other classes, the HISCLASS groups were aggregated into four categories: non-manual classes (HISCLASS 1–5), skilled workers (HISCLASS 6–7), farmers (HISCLASS 8) and lower-skilled and unskilled workers (HISCLASS 9–12). In order to assess whether findings depended on the type of social class scheme used, HISCO was also coded in accordance with the Social Power Scheme (SOCPO), which is a five-group classification of occupations with a focus on economic and cultural power, ranging from elite to unskilled workers (van de Putte & Miles, 2005). In this study, the groups were collapsed into elite and middle class (SOCPO 5 and 4.1), farmers (SOCPO 4.2), skilled workers (SOCPO 3) and semi-skilled and unskilled workers (SOCPO 2 and 1).[2]

Tables A2 and A3 show an overview of the five most common male occupations by HISCLASS category and environment in this study. For Troms, the non-manual classes included merchants, teachers, ship captains, different types of clerks and civil servants, and a small group of priests, medical doctors, directors, and proprietors. The category of skilled workers included, among others, carpenters, shipwrights, shoemakers, and master craftsmen in lower-ranked crafts, as well as a few foremen in construction and manufacturing. The group of lower-skilled and unskilled workers was dominated by those with fishing as their primary occupation in both the rural and urban environments. Beyond that, this group encompassed dock workers, porters, seamen and day labourers, as well as cotters and farm workers in the rural areas. Unmarried women with a classifiable occupation were, to a large extent, registered in lower-skilled and

[2]HISCLASS and SOCPO classifications based on HISCO-codes were extracted from a dataset for the Historical Sample of the Netherlands (HSN) (Mandemakers et al., 2020) and manually amended for this study, where needed.

unskilled domestic work, farm work and handcrafts. A small group of unmarried women had skilled or non-manual occupations in teaching, trade or midwifery, or as working proprietors in catering and lodging.

Engaging in multiple occupations was common in northern Norway, especially among farmers, as most farms were of modest size and called for additional sources of income (Lavik, 1932). The most common occupational combination was farming and fishing. These two activities were so intertwined that their combination was considered an occupation in itself – fisherman-farmer (*'fiskerbonde'*). Usually, women were responsible for farming when their husbands participated in the seasonal fisheries (Balsvik, 1991). In this study, fishermen-farmers were included in the farmer category, while those with fishing as their sole or main occupation were categorised as lower-skilled workers (HISCLASS 10). More than half of the farmers in the sample were fishermen-farmers. When looking at secondary occupations registered in the censuses, it was evident that not just fishing but occupations from all defined class categories overlapped considerably with farming in rural areas, while most residents of the towns reported only one occupation. It has been suggested that considering information about additional economic activities besides the primary occupation could be valuable for determining social position in historical populations (Paping, 2010; van de Putte & Svensson, 2010). In a sub-analysis for the rural areas, we therefore included combinations of farming with occupations corresponding to the other class categories (farming registered as either the first or secondary occupation). For this part of the analysis, the combination of farming and fishing was also treated as a separate category.

2.2. Covariates

Many studies of past or contemporary populations have discussed the potential protective effect of marriage on survival (Berntsen, 2011; Brenn, 2019; Edvinsson & Lindkvist, 2011; Holom et al., 2021). *Marital status* at age 60 was defined based on the last available registration, either through civil status registered in the censuses or records of marriage or death of a spouse recorded in the church books after the censuses. The marital status variable in this study distinguished between unmarried, married, and widowed. The few individuals who were divorced or lacked information were considered unmarried.

A variable for *place of birth* distinguished the large group of those born in the province of Troms from those born in other places in Norway or abroad. Living in the province of their birth could indicate stronger social networks compared to immigrants. Information on *place of residence* was also taken from the censuses, together with the occupational data at working age. Several studies have raised the question of whether disparities in mortality in the past were caused by spatial factors – particularly living in urban or rural areas – rather than by social factors (Edvinsson & Lindkvist, 2011; Schenk & van Poppel, 2011). In the first decades of the twentieth century, the difference in remaining life expectancy at age 40 between the cities and rural Norway was decreasing, but was still around 4 years for men and almost 2 years for women (Borgan, 2007). The occupational landscape also differed between rural and urban areas, with a higher share of urban residents being non-manual and skilled workers. This study distinguished between the urban areas (Tromsø and Harstad) and the rural areas of the province. Analyses of the complete sample and rural areas further included a covariate for place of residence, which divided the province into four geographical regions (coastal-south, coastal-north, inner-south and inner-north). Coastal areas were characterised by smaller farms and more densely populated fishing villages, which experienced population influxes during fishing seasons. The inland municipalities were more sparsely populated, while southern areas of the province were home to most of the larger farms of the province, especially inner-southern Troms. Moreover, residents of northern Troms experienced forced evacuation and destruction of property on a large scale as a result of the 'scorched earth' strategy of the German forces as they withdrew from Norway in winter 1944 (Stugu, 2012).

Table 2. Sample characteristics for men and women.

	Men ($N = 5,891$)	Women ($N = 4,566$)
Year of birth (mean (range))	1857 (1841–1870)	1857 (1841–1870)
Year of death (median (range))	1934 (1901–1973)	1936 (1901–1974)
Age at death (median (range))	77.0 (60–104)	78.8 (60–105)
Social class (% (N))		
Non-manual classes	7.0 (410)	6.9 (317)
Skilled workers	6.4 (374)	6.6 (302)
Farmers	62.1 (3,657)	57.3 (2,617)
Lower-skilled/unskilled workers	24.6 (1,450)	25.0 (1,141)
Missing/unclassifiable	/	4.1 (189)
Marital status (%, (N))		
Unmarried	5.1 (303)	7.8 (357)
Widowed	9.6 (563)	19.9 (910)
Married	85.3 (5,025)	72.3 (3,299)
Place of residence (% (N))		
Urban	8.8 (517)	11.0 (504)
Rural	91.2 (5,374)	89.0 (4,062)
Inner-North	5.1 (301)	5.3 (243)
Coastal-North	31.2 (1,837)	30.4 (1,389)
Inner-South	7.0 (414)	7.8 (356)
Coastal-South	47.9 (2,822)	45.4 (2,074)
Place of birth (% (N))		
Troms	86.3 (5,085)	87.7 (4,003)
Outside of Troms	13.7 (806)	12.3 (563)

Notes: Social class based on modified version of the Historical International Social Class Scheme (HISCLASS) (van Leeuwen & Maas, 2011).

Source: Norwegian Historical Data Centre, UiT The Arctic University of Norway. Historical Population Register of Norway. Original sources at the National Archive of Norway.

Table 3. Hazard ratios for mortality in Troms at age 60 and older by social class for women and men born between 1841 and 1870.

	Model 1 HR (95% CI)	*P*-value	Model 2 HR (95% CI)	*P*-value
Social class				
Men	N = 5,891			
Non-manual classes	1.02 (0.92, 1.14)	0.682	1.02 (0.91, 1.14)	0.795
Skilled workers	0.84 (0.75, 0.94)	0.002	0.84 (0.75, 0.95)	0.005
Farmers	0.83 (0.78, 0.88)	<0.001	0.87 (0.81, 0.93)	<0.001
Lower-skilled/unskilled workers	Ref.		Ref.	
Women	N = 4,566			
Non-manual classes	0.90 (0.79, 1.02)	0.087	0.92 (0.81, 1.04)	0.188
Skilled workers	0.90 (0.80, 1.03)	0.124	0.92 (0.81, 1.05)	0.217
Farmers	0.88 (0.82, 0.94)	<0.001	0.89 (0.83, 0.96)	0.002
Lower-skilled/unskilled workers	Ref.		Ref.	
Missing/unclassifiable	0.87 (0.75, 1.02)	0.088	0.87 (0.74, 1.01)	0.074

Notes: Model 1 adjusts for age (timescale), model 2 additionally adjusts for marital status, place of birth, and place of residence; strata by 10-year birth cohorts.

Social class based on modified version of the Historical International Social Class Scheme (HISCLASS) (van Leeuwen & Maas, 2011).

Source: Norwegian Historical Data Centre, UiT The Arctic University of Norway. Historical Population Register of Norway. Original sources at the National Archive of Norway.

2.3. Statistics

Descriptive characteristics of the study sample are presented as frequencies and mean values stratified by gender (Table 2). Cox proportional hazards models were used to model the association between social class and old-age mortality. Hazard ratios (HR) with 95% confidence intervals (CI) were estimated to indicate increased or reduced mortality risk compared to the given reference group. All analyses were conducted for women and men separately. Attained age was used as the underlying time scale in all models, which simultaneously served as age-adjustment. The log–log

Table 4. Hazard ratios for mortality in different environments in Troms at age 60 and older by social class for women and men born between 1841 and 1870.

	Urban HR (95% CI)	*P*-value	Rural HR (95% CI)	*P*-value
Social class				
Men	N = 517		N = 5,374	
Non-manual classes	1.25 (1.01, 1.56)	0.043	0.94 (0.82, 1.08)	0.384
Skilled workers	0.94 (0.76, 1.17)	0.594	0.83 (0.72, 0.96)	0.013
Farmers	/		0.86 (0.80, 0.92)	<0.001
Lower-skilled/unskilled workers	Ref.		Ref.	
Women	N = 504		N = 4,062	
Non-manual classes	0.91 (0.73, 1.14)	0.409	0.91 (0.77, 1.08)	0.281
Skilled workers	0.88 (0.70, 1.11)	0.279	0.92 (0.78, 1.08)	0.319
Farmers	/		0.90 (0.84, 0.98)	0.011
Lower-skilled/unskilled workers	Ref.		Ref.	
Missing/unclassifiable	0.74 (0.51, 1.09)	0.126	0.89 (0.75, 1.07)	0.213

Notes: Model 1 (urban) adjusts for age (timescale), marital status, and place of birth, model 2 (rural) additionally adjusts for place of residence; strata by 10-year birth cohorts.
Social class based on modified version of the Historical International Social Class Scheme (HISCLASS) (van Leeuwen & Maas, 2011).
Source: Norwegian Historical Data Centre, UiT The Arctic University of Norway. Historical Population Register of Norway. Original sources at the National Archive of Norway.

Table 5. Hazard ratios for mortality in Troms at age 60 and older by social class and combinations with farming for women and men born between 1841 and 1870.

	Men HR (95% CI)	*P*-value	Women HR (95% CI)	*P*-value
Social class and combinations with farming	N = 5,374		N = 4,062	
Non-manual classes	1.00 (0.83, 1.20)	0.980	0.88 (0.71, 1.09)	0.238
Skilled workers	0.83 (0.70, 0.99)	0.035	0.92 (0.76, 1.10)	0.346
Farming only	0.88 (0.80, 0.96)	0.005	0.88 (0.80, 0.97)	0.008
Farming + fishing	0.87 (0.81, 0.94)	<0.001	0.93 (0.85, 1.01)	0.093
Farming + non-manual work	0.79 (0.69, 0.91)	0.001	0.85 (0.72, 1.01)	0.059
Farming + skilled work	0.80 (0.69, 0.93)	0.003	0.95 (0.79, 1.15)	0.623
Farming + lower-skilled/unskilled work	0.65 (0.54, 0.79)	<0.001	0.92 (0.73, 1.16)	0.485
Lower-skilled/unskilled workers	Ref.		Ref.	
Missing/unclassifiable	/		0.89 (0.75, 1.06)	0.206

Notes: The model adjusts for age (timescale), marital status, place of birth, and place of residence; strata by 10-year birth cohorts.
Social class based on modified version of the Historical International Social Class Scheme (HISCLASS) (van Leeuwen & Maas, 2011).
Source: Norwegian Historical Data Centre, UiT The Arctic University of Norway. Historical Population Register of Norway. Original sources at the National Archive of Norway.

plot and Schoenfeld residuals were examined to check the proportional hazards assumption, which was considered to be reasonably fulfilled. Non-proportionality was most notable at high ages when survival curves tended to converge for the small proportion of individuals still alive. A variable for 10-year birth cohorts was included as a stratum variable in all models, allowing for separate baseline hazards. The first model included only social class, and the second model additionally adjusted for place of birth, place of residence and marital status (Table 3 and Table A4). Marital status was included as a time-varying covariate. The status was updated at the age of (re-)marriage or the death of an individual's spouse. For 37% of married men and 25% of married women, their spouse's date of death was unknown, and their baseline marital status remained unchanged throughout follow-up. However, excluding married individuals who lacked information on their spouse's death did not alter the results significantly. In order to assess whether social class had a different association with mortality in the towns, the full model was run again, stratified by rural and urban area (Table 4). Finally, the association between occupational combinations with farming and mortality was assessed using extended social class categories in a sub-analysis for the rural areas (Table 5). Individuals entered the analysis at age 60 and were followed until their death. Therefore, right-

censoring was limited to those changing marital status during follow-up. All analyses were carried out in R version 4.2.3. using the package 'survival' (Therneau, 2022).

3. Results

The distribution of the main variables of the study sample at baseline is shown in Table 2. The proportions of the social class categories were similar for women and men, with more than half of the population being farmers and around 7% in non-manual and skilled work. The vast majority of the sample were married at age 60, although the proportion of widowed individuals was considerably higher for women. Most individuals were born in Troms province, and 8.8% and 11.0% of men and women, respectively, lived in an urban environment. The median age at death was 77 for men and 78.8 for women.

Table 3 shows hazard ratios for mortality at age 60 and older by social class for men and women. For men, the groups of skilled workers and farmers had 16% and 17% lower mortality risk, respectively, compared to lower-skilled and unskilled workers, while for the non-manual classes, both reduced and increased mortality risk were compatible with the data. Adding covariates in model 2 modified the mortality pattern only marginally, mainly for farmers, whose lower mortality risk was slightly attenuated. For women, differences by class were less pronounced. All classes presented a somewhat lower mortality risk than the reference group, although only the hazard ratio of 0.89 for farmers was statistically significant in the adjusted model. Using SOCPO produced overall similar results (Table A4).

When investigating effect estimates for old-age mortality by social class in urban and rural areas separately, a diverging pattern emerged (Table 4). Among men, limiting the sample to rural residents did not alter the results greatly, but in the urban environment, skilled workers did not differ significantly in their mortality risk from lower-skilled and unskilled workers, while effect estimates for the non-manual classes indicated a 25% increased mortality risk. Among women, there was less variation in mortality patterns across different environments. All groups, especially the unclassifiable group, showed a survival advantage rather than an increased risk in the towns, but none of the effect estimates reached statistical significance.

Table 5 presents effect estimates for mortality by social class including separate categories for those who combined farming with occupations corresponding to the other class categories. Several occupational combinations seem to have been beneficial among men – most notably combining farming with lower-skilled or unskilled work, which was associated with a 35% lower mortality risk compared to those who were solely engaged in lower-skilled or unskilled work. Effect estimates for fishermen-farmers and farmers were similar (HR 0.87 and 0.88, respectively), while those combining non-manual work with farming had a 21% decreased mortality risk. Skilled workers with and without farming had a 20% and 17% lower mortality risk, respectively. For women, only the effect estimate for the group combining farming and non-manual work (HR 0.85) was marginally lower than the one for farmers without secondary occupations.

4. Discussion

This study investigated the association between social class in adulthood and mortality at age 60 and older among residents of Troms in the first half of the twentieth century, assuming differing chances for resource and risk accumulation for the social classes throughout their life-course. Overall, the results did not indicate a clear social gradient in mortality. Differences between social classes varied in magnitude and direction of effects depending on gender and place of residence. For women, the association between social class and mortality was weaker overall. Only farming was significantly associated with decreased mortality risk, compared to the group of lower-skilled and unskilled workers. Differences were more pronounced among men, with higher mortality for the non-manual

classes in the towns and lower mortality for skilled workers and farmers in rural areas. The advantage for farmers was amplified in combination with manual or non-manual work.

A survival advantage for farmers has been shown in previous historical studies (Dribe & Eriksson, 2018; Gavrilov & Gavrilova, 2012; Temby & Smith, 2014). For Norway, farming was also pointed out as the occupation with the lowest mortality within the primary sector between 1960 and 2000 (Borgan, 2009). Different explanations for this finding in historical populations have been suggested in the international literature, including physical activity, high levels of autonomy (Temby & Smith, 2014) and food security (Mourits, 2017). A study on intergenerational co-residence in northern Norway found that, in 1900, the likelihood of elderly people living with their offspring was highest in farming households (Sommerseth, 2011). Since family care was still crucial for many at retirement age in the early twentieth century, this could have been one element of the lower mortality for farmers in our study. Further, farmers often had the advantage of a retirement contract, which ensured their livelihood after transferring their farm to the next generation and may have increased their chances of growing old. Edvinsson and Broström (2012) did not find support for this hypothesis in their study of older individuals in northern Sweden in the nineteenth century. In general, farmers were a heterogeneous group, and historians have disagreed on whether they were to be considered part of the middle classes. It has been argued that only a limited number of proprietors and civil servants could be considered socially superior to freehold farmers in rural Norway in the late 19th and early 20th centuries, although most freeholders were subsistence farmers and therefore not necessarily privileged in an economic sense (Myhre, 2004).

In this study, skilled workers in the rural environment had lower mortality among men, whether they were farmers as well or not. Findings for skilled workers from previous studies in other countries have been inconclusive (Bengtsson et al., 2020; Edvinsson & Broström, 2012; Schenk & van Poppel, 2011). In some contexts, skilled workers were small-scale employers or highly specialised artisans, while in others they did not distinguish themselves greatly from lower-skilled workers (van de Putte & Svensson, 2010). In rural Troms, specialisation was rather low, but at least for men it seems there were significant differences in mortality compared to the reference group. Whether this was due to differences in occupational risk, capital or unmeasured environmental factors requires further investigation.

A common thread in the printed annual medical reports for the province in the early 1900s was the impression that workers in lower-skilled or unskilled labour, such as fishing, mining, or construction, were living 'hand to mouth', and were unable to save for difficult years to come (NOS, 1913). Any one of these occupations did not necessarily constitute a stable or sufficient source of income. Fishermen-farmers in our study had a decreased mortality risk similar to those solely engaged in farming. Given that the reference group of lower-skilled and unskilled workers was dominated by fishermen, this could indicate that it was not the physical risk of fishing as such that constituted a mortality risk in old age, but the possibly limited resources connected to it – especially seen from a life-course perspective. The surprisingly low mortality risk for farmers who were engaged in other types of lower-skilled or unskilled work might show that – in combination – these occupations enabled valuable accumulation of resources. One example was tar making, which provided substantial additional income for farmers in inner Troms when prices were high (Lavik, 1932; NOS, 1918).

Only a small proportion of the non-manual classes in the towns had secondary occupations, while a third of those in the non-manual classes in rural Troms were also farmers. In this study, the combination of non-manual work with farming indicated lower mortality risk for both women and men. One could suppose that, in some cases, the registered occupation of farming rather functioned as a proxy for property ownership. It is not unlikely that this group encompassed some of the more affluent individuals in the rural population, who were mostly engaged in their non-manual professions, while farming was conducted by family members and farm workers. Household size usually increased with social status (Balsvik, 1991), and the censuses from 1900 and 1910 indicated that households combining farming and non-manual work had

more servants than other farming households in Troms. For married women, this could have meant being relieved of some of their duties in farming, domestic work, and childcare, which represented a heavy workload in small farming households, when the husband was absent due to additional work. In fact, this study did not suggest an additional benefit of any other occupational combination with farming for women's longevity. The gendered household economy may have affected women and men differently. Beyond material factors, household size and composition as well as individual fertility histories were important factors for women's living conditions at the time (Balsvik, 1991).

In general, this study found smaller differences in mortality by social class, and low precision of effect estimates for women. Results suggested that, compared to the group of lower-skilled and unskilled workers, women with missing or unclassifiable occupational information had lower mortality risk. These were mostly unmarried or widowed women living with their adult children or other relatives. Rather than pointing to an especially precarious situation, a missing occupation in this context might instead have indicated that many of these women were provided for. Furthermore, one could argue that historical mortality differences by occupation are expected to be more pronounced among men whose lives used to be more intertwined with their work outside the home (Borgan, 2009), in terms of both occupational risk factors and lifestyles connected to their social work environment. In our study, this gender difference was certainly amplified by the fact that, for the majority of women, social class was measured indirectly through their husband's occupation. Any long-term health effects of carrying out specific occupations instead of the assumed social and economic dimensions of class membership did not come into effect for women with this indirect social class measure. The sample size in this study did not allow for a meaningful sub-analysis of unmarried women in paid labour, but this could be a valuable exercise in a larger population sample in order to assess the extent to which occupational risks over the life-course – or the lack thereof – played into social patterns in later-life mortality among women compared to men.

In the analysis for the urban environment, the group of non-manual classes showed the highest mortality risk among men. A similar pattern was observed for mortality in northern Sweden in the period 1860–1900. Edvinsson and Lindkvist (2011) found that mortality at age 20–60 presented different patterns depending on the environment. They found a survival advantage for men in the upper and middle classes in the periphery, while these groups had higher mortality in an urban and coastal environment compared to the reference group of unskilled workers. At the national level in Norway, mortality for men in towns remained considerably higher than in rural areas between 1890 and 1950 – both in working age and among elderly men up to the age group 70–80. A suggested explanation for this pattern at the time was the harsh urban working conditions (Backer, 1961). However, this can hardly explain why men in lower-skilled and unskilled work had lower mortality than those in non-manual work in the urban centres of Troms. The lack of a survival advantage for the non-manual classes might be explained by lifestyle factors such as diet, alcohol consumption and smoking (Dribe & Eriksson, 2018). It has been suggested that smoking was most prevalent among upper class men in Norway before the socioeconomic smoking pattern reversed towards the second half of the twentieth century (Lund, 1996). In the printed annual medical reports on health and living conditions in Troms from the early 1900s, the district physicians voiced their concern about the drinking habits in the population, especially among fishermen (NOS, 1902, 1918), but this tells us little about the situation in more affluent circles. As Lie and Roll-Hansen (2001) have pointed out, official statistics on arrests due to public intoxication in Norway at the turn of the century inevitably turned alcoholism and drunkenness into a phenomenon of the working class. In Sweden, Debiasi and Dribe (2020) found a significantly higher mortality from circulatory diseases for men in non-manual compared to manual occupations in the first half of the twentieth century, while women in the non-manual classes presented a survival advantage from 1920 onwards. The present study did not include information on causes of death, which could have given an indication of the burden of lifestyle-associated diseases within

the studied classes. Nowadays, health behaviours are often found to explain why individuals from *lower* socioeconomic groups are at higher risk of disease and mortality (Petrovic et al., 2018), but this might not be a historical constant. It is possible that, a hundred years ago, adverse health behaviour connected to consumption goods and a sedentary lifestyle counteracted some of the material advantages in the upper strata of the population, especially among urban men. It should be noted that the category of non-manual classes was most representative for lower non-manual professions in the present study, as the share of higher professionals and managers (HISCLASS 1–2) in the sample was very small.

How can these results be contextualised in the broader discussion about the emergence of a social gradient in adult mortality in the past? Two longitudinal studies investigated mortality by social class in middle and old age over a period of 200 years in southern (Bengtsson et al., 2020) and northern (Edvinsson & Broström, 2020) Sweden. Both studies found that the social gradient in mortality with a clear advantage for the upper classes only emerged in the second half of the twentieth century. Before that, differences between social classes were small or even reversed. Dribe and Eriksson (2018) studied life expectancy at age 60 in early twentieth century Sweden and found the lowest life expectancy for men in non-manual work, while patterns among women resembled a social gradient, although with small differences between groups overall. Similar to these findings, we did not detect a clear advantage for the non-manual classes in our study. However, we cannot make conclusions about any centuries-long trends of a social gradient in mortality. The gradient has repeatedly been shown in studies using data from 1960 onwards, but any generalisation for earlier periods can only be tentative. Our study would be in line with a late emergence of a social gradient as seen in southern and northern Sweden, but longitudinal data covering multiple centuries at the regional and national level in Norway are required.

As the emergence of the social gradient in mortality in Sweden coincided with the development of the welfare state (i.e. the expansion of health care provision, pensions, and unemployment benefits), Bengtsson et al. (2020) considered psychosocial stress and lifestyle rather than access to health care to be the likely explanations. An unhealthy lifestyle is considered to be a major risk factor for cardiovascular diseases, which were slowly replacing infectious diseases as leading causes of death throughout the first half of the twentieth century. In their addition to fundamental cause theory, Clouston et al. (2016) describe a phase of 'natural mortality' for any given disease, in which knowledge, effective prevention and treatment are lacking. In this stage, they expect social inequalities in mortality for the disease to be varying, absent or even favouring the disadvantaged. A gradient, they argue, only emerges with advancements in prevention and treatment, from which the privileged groups in society are expected to benefit first (ibid.). Knowledge about risk factors for chronic diseases, especially cardiovascular disease, only came into focus in Norway from the mid-twentieth century onwards (Nordhagen et al., 2018). The absence of a social gradient in all-cause mortality in the early twentieth century in our study could therefore partially be interpreted as the result of a natural mortality pattern for chronic diseases, which only later transformed into the gradient we find today.

An important limitation of this study is the selection effect of the linking process as shown in Table 1 and, related to this, the inability to account for out-migration in the analysis. Although the linking bias resulted in an over-representation of certain groups such as farmers and married individuals, the important question is how the relationship between social class and mortality could have been affected. Previous research for Norway has shown that expected occupational gains were important drivers of migration in the second half of the nineteenth century, especially for people from lower socioeconomic groups (Moilanen et al., 2021). If materially disadvantaged individuals from lower classes were therefore under-represented in the study sample, this could have led to an underestimation of mortality disparities by social class. However, Moilanen et al. (2021) also found that the majority of both rural-to-rural and rural-to-urban migration in northern Norway happened within the respective region of origin. Moreover, the mean age of our sample at the time of the census enumerations was 50 and 51 years for women and men, respectively, and one

would assume that migration for occupational advancement was more pronounced at an earlier stage in the life-course. Another selection bias connected to migration is what has been called the 'healthy migrant effect', which refers to the tendency that it is the healthier share of the population that moves (Puschmann et al., 2017). High out-migration can lead to underestimation of the mean age at death in a local population, although this effect becomes smaller when studying older-aged subgroups (van den Berg et al., 2021). If we assume that the lower linkage rates of non-farmers in this study are due to out-migration, some of the survival advantage of farmers could be an artefact of the higher linkage rates connected to their residential stability. Increasing linkage rates in HPR within and across provinces is therefore highly desirable for future longitudinal studies of social inequality in mortality in Norway before 1960.

Overall, the categorisation based on registered occupations in this study cannot be expected to have captured all aspects of economic and social resources relevant for health and longevity at the time. As demonstrated, combining occupations across the defined class lines was common, and income or wealth probably varied considerably within the class categories. Future studies of social inequality in later-life mortality for historical periods in Norway could aim to exploit available sources of tax records together with household-level occupational data, which would allow for a more nuanced assessment of socioeconomic advantage or disadvantage. Furthermore, the inclusion of causes of death could be beneficial for an improved understanding of how social class was related to specific disease patterns and health behaviour in early twentieth century Norway. There is much that is left to explore, and as data linkage across sources of historical microdata and the modern population registers continues, more opportunities will emerge to understand when and how social inequalities in mortality in Norway developed and transformed over the previous centuries.

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References

Antonovsky, A. (1967). Social class, life expectancy and overall mortality. *The Milbank Memorial Fund Quarterly*, *45*(2), 31–73. https://doi.org/10.2307/3348839

Backer, J. (1961). *Dødeligheten og dens årsaker i Norge 1856–1955 [Trends of mortality and causes of death in Norway 1856–1955]. Samfunnsøkonomiske Studier Nr. 10*. Statistisk sentralbyrå.

Balsvik, R. R. (1991). Kvinner i nordnorske kystsamfunn [Women in the nothernmost coastal communities of Norway]. *Historisk Tidsskrift*, *4*, 636–653.

Bengtsson, T., Dribe, M., & Helgertz, J. (2020). When Did the health gradient emerge? Social class and adult mortality in Southern Sweden, 1813–2015. *Demography*, *57*(3), 953–977. https://doi.org/10.1007/s13524-020-00877-5

Bengtsson, T., & van Poppel, F. (2011). Socioeconomic inequalities in death from past to present: An introduction. *Explorations in Economic History*, *48*(3), 343–356. https://doi.org/10.1016/j.eeh.2011.05.004

Berntsen, K. N. (2011). Trends in total and cause-specific mortality by marital status among elderly Norwegian men and women. *BMC Public Health*, *11*(1), 537. https://doi.org/10.1186/1471-2458-11-537

Blane, D. (2006). The life course, the social gradient, and health. In M. Marmot, & R. G. Wilkinson (Eds.), *Social determinants of health* (pp. 54–77). Oxford University Press.

Borgan, J.-K. (2007). Farligere i byen? Dødelighetsforskjeller by og land 1875–2005 [More dangerous in the city? Differences in urban and rural mortality 1875–2005]. In R. R. Bore (Ed.), *På liv og død. Helsestatistikk i 150 år* (pp. 89–104). Statistics Norway.

Borgan, J.-K. (2009). *Vedvarende ulikhet i dødelighet etter yrke [Persistent inequality in mortality by occupation]. Økonomiske analyser 3/*2009. Statistics Norway.

Brenn, T. (2019). Survival to Age 90 in Men: The Tromsø study 1974–2018. *International Journal of Environmental Research and Public Health*, *16*(11). https://doi.org/10.3390/ijerph16112028

Breslow, L., & Buell, P. (1960). Mortality from coronary heart disease and physical activity of work in California. *Journal of Chronic Diseases*, *11*(3–4), 421–444. https://doi.org/10.1016/0021-9681(60)90047-3

Chapin, C. V. (1924). Deaths among taxpayers and non-taxpayers income tax, Providence, 1865. *American Journal of Public Health*, *14*(8), 647–651. https://doi.org/10.2105/AJPH.14.8.647-a

Clouston, S. A., Rubin, M. S., Phelan, J. C., & Link, B. G. (2016). A social history of disease: Contextualizing the rise and fall of social inequalities in cause-specific mortality. *Demography*, *53*(5), 1631–1656. https://doi.org/10.1007/s13524-016-0495-5

Debiasi, E., & Dribe, M. (2020). SES inequalities in cause-specific adult mortality: A study of the long-term trends using longitudinal individual data for Sweden (1813–2014). *European Journal of Epidemiology*, *35*(11), 1043–1056. https://doi.org/10.1007/s10654-020-00685-6

Dribe, M., & Eriksson, B. (2018). Socioeconomic status and adult life expectancy in early 20th-century Sweden: Evidence from full-count Micro census data. *Lund Papers in Economic Demography*, *2018*(1).

Edvinsson, S., & Broström, G. (2012). Old age, health, and social inequality: Exploring the social patterns of mortality in 19th century northern Sweden. *Demographic Research*, *26*, 633–659. https://doi.org/10.4054/DemRes.2012.26.23

Edvinsson, S., & Broström, G. (2020). *Is high social class always beneficial for survival? A study of northern Sweden 1801–2013.* CEDAR Working Papers (Vol. 2). Centre for Demographic and Ageing Research.

Edvinsson, S., & Lindkvist, M. (2011). Wealth and health in 19th century Sweden. A study of social differences in adult mortality in the sundsvall region. *Explorations in Economic History*, *48*(3), 376–388. https://doi.org/10.1016/j.eeh.2011.05.007

Engelsen, R. (1983). Mortalitetsdebatten og sosiale skilnader i mortalitet [The mortality debate and social differences in mortality]. *Historisk Tidsskrift*, *62*(2), 161–202.

Fure, E. (2002). Social differences in infant mortality in the Norwegian Parish Asker and Bærum 1814–1878. *Hygiea Internationalis*, *3*(1), 177–192. https://doi.org/10.3384/hygiea.1403-8668.0231177

Gagnon, A., & Bohnert, N. (2012). Early life socioeconomic conditions in rural areas and old-age mortality in twentieth-century Quebec. *Social Science & Medicine (1982)*, *75*(8), 1497–1504. https://doi.org/10.1016/j.socscimed.2012.06.007

Gavrilov, L. A., & Gavrilova, N. S. (2012). Biodemography of exceptional longevity: Early-life and Mid-life predictors of human longevity. *Biodemography and Social Biology*, *58*(1), 14–39. https://doi.org/10.1080/19485565.2012.666121

Haavet, I. E. (1994). Retten til en verdig alderdom [The right to dignified ageing]. In Ø Bjørnson, & I. E. Haavet (Eds.), *Langsomt ble landet et velferdssamfunn. Trygdens historie 1894-1994* (pp. 139–157). Ad Notam Gyldendal.

Helland-Hansen, K. (1997). *Føderådsordningens historie i Norge. Del 1 [The history of retirement contracts in Norway. Part 1]*. Riksarkivaren.

Hoffmann, R. (2008). *Socioeconomic differences in old age mortality*. Springer.

Holom, E. C., Hărăguş, M., & Bolovan, I. (2021). Socioeconomic and marital-status inequalities in longevity: Adult mortality in Transylvania, 1850–1914. *The Journal of Interdisciplinary History*, *51*(4), 533–564. https://doi.org/10.1162/jinh_a_01627

Huisman, M., Read, S., Towriss, C. A., Deeg, D. J. H., & Grundy, E. (2013). Socioeconomic inequalities in mortality rates in old age in the world health organization Europe region. *Epidemiologic Reviews*, *35*(1), 84–97. https://doi.org/10.1093/epirev/mxs010

Kinge, J. M., Modalsli, J. H., Overland, S., Gjessing, H. K., Tollanes, M. C., Knudsen, A. K., Skirbekk, V., Strand, B. H., Haberg, S. E., & Vollset, S. E. (2019). Association of household income with life expectancy and cause-specific mortality in Norway, 2005–2015. *Jama*, *321*(19), 1916–1925. https://doi.org/10.1001/jama.2019.4329

Lavik, G. (1932). Om tjærebrenning i Målselv [Tar making in Målselv]. *Tidskrift for skogbruk*, *32*, 213–227.

Lie, E., & Roll-Hansen, H. (2001). *Faktisk talt. Statistikkens historie i Norge [As a matter of fact. The history of statistics in Norway]*. Universitetsforlaget.

Lindbekk, K. (2016). *Fast og tilstrekkelig levebrød. Livsløpene til trøndere født i 1855 og foreldrene deres. 1815-1910 [Sufficient and sustainable livelihoods. A life course study of the cohort 1855 from Trøndelag and their parents. 1815-1910]. Doctoral dissertation*. University of Oslo.

Link, B. G., & Phelan, J. (1995). Social conditions as fundamental causes of disease. *Journal of Health and Social Behavior*, 80–94. https://doi.org/10.2307/2626958

Lund, K. E. (1996). *Samfunnsskapte endringer i tobakksbruk i Norge i det 20. århundre [Societal changes in tobacco use in Norway in the 20th century]. Doctoral dissertation*. University of Oslo.

Mackenbach, J. P. (2019). *Health inequalities. Persistence and change in European welfare states* (1st ed.). Oxford University Press.

Mamelund, S. E. (2006). A socially neutral disease? Individual social class, household wealth and mortality from spanish influenza in two socially contrasting parishes in Kristiania 1918–19. *Social Science & Medicine*, *62*(4), 923–940. https://doi.org/10.1016/j.socscimed.2005.06.051

Mandemakers, K., Hornix, J., Mourits, R., Muurling, S., Boter, C., van Dijk, I. K., Maas, I., van de Putte, B., Zijdeman, R., Lambert, P., van Leeuwen, M. H. D., van Poppel, F., & Miles, A. (2020). *HSN standardized, HISCO-coded and classified occupational titles, HSN release 2020.02*. IISG Amsterdam. https://hdl.handle.net/2066/226570

Marmot, M. (2004). *Status syndrome. How your place on the social gradient directly affects your health*. Bloomsbury.

Moilanen, M., Myhr, S., & Østbye, S. (2021). Scraping the bottom of the barrel? Evidence on social mobility and internal migration from rural areas in nineteenth-century Norway. *Scandinavian Economic History Review*, *70*(3), 252–272. https://doi.org/10.1080/03585522.2021.1901775

Mourits, R. (2017). Later-Life mortality and longevity in late-18th and 19th-century cohorts. Where are We Now, and where Are We heading? *Historical Life Course Studies*, *4*, 1–19. https://doi.org/10.51964/hlcs9336

Myhre, J. E. (2004). The middle classes of Norway, 1840–1940. In T. Ericsson, J. Fink, & J. E. Myhre (Eds.), *The Scandinavian middle classes 1840–1940* (pp. 103–145). Oslo Academic Press.

Myhre, J. E. (2006). Den eksplosive byutviklingen 1830–1920 [The rapid urban development 1830–1920]. In K. Helle, F.-E. Eliassen, J. E. Myhre, & O. S. Stugu (Eds.), *Norsk byhistorie. Urbanisering gjennom 1300 år* (pp. 249–381). Pax Forlag.

Myhre, J. E. (2018). The cradle of Norwegian equality and Egalitarianism: Norway in the nineteenth century. In S. Bendixsen, M. B. Bringslid, & H. Vike (Eds.), *Egalitarianism in Scandinavia: Historical and contemporary perspectives* (pp. 65–85). Springer International Publishing.

Nordhagen, R., Grøholt, E., Graff-Iversen, S., & Major, E. (2018). Folkehelse i Norge 1814–2014 [Public health in Norway 1814–2014]. In *Folkehelserapporten - Helsetilstanden i Norge*. Folkehelseinstituttet. Retrieved June 6, 2023 from https://www.fhi.no/nettpub/hin/folkehelse-i-historien/folkehelse-i-norge-1814—2014/

Nordic Social-Statistical Committee. (2009). Old-age pension systems in the Nordic Countries. *Nordic Social-Statistical Committee*, *35*(9).

Norges officielle statistik (NOS). (1902). *Beretning om sundhetstilstanden og medicinalforholdene i Norge 1900 [Report on health and medical conditions in Norway 1900]*. Direktøren for det civile Medicinalvæsen. https://www.ssb.no/a/histstat/nos/nos_iv_055.pdf

Norges officielle statistik (NOS). (1912). *Sundhetstilstanden og medicinalforholdene 1910 [Health and medical conditions 1910]*. Direktøren for det civile Medicinalvæsen. https://www.ssb.no/a/histstat/nos/nos_v_181.pdf

Norges officielle statistik (NOS). (1913). *Sundhetstilstanden og medicinalforholdene 1911 [Health and medical conditions 1911]*. Direktøren for det civile Medicinalvæsen. https://www.ssb.no/a/histstat/nos/nos_v_216.pdf

Norges officielle statistik (NOS). (1918). *Sundhetstilstanden og medicinalforholdene 1915 [Health and medical conditions 1915]*. Direktøren for det civile Medicinalvæsen. https://www.ssb.no/a/histstat/nos/nos_vi_133.pdf

Paping, R. (2010). Taxes, property size, occupations and social structure: The case of the 18th- and 19th-century northern Dutch countryside. *Belgisch Tijdschrift Voor Nieuwste Geschiedenis*, *40*(1–2), 215–248.

Petrovic, D., de Mestral, C., Bochud, M., Bartley, M., Kivimäki, M., Vineis, P., Mackenbach, J., & Stringhini, S. (2018). The contribution of health behaviors to socioeconomic inequalities in health: A systematic review. *Preventive Medicine*, *113*, 15–31. https://doi.org/10.1016/j.ypmed.2018.05.003

Prus, S. G. (2007). Age, SES, and health: A population level analysis of health inequalities over the lifecourse. *Sociology of Health & Illness*, *29*(2), 275–296. https://doi.org/10.1111/j.1467-9566.2007.00547.x

Puschmann, P., Donrovich, R., & Matthijs, K. (2017). Salmon Bias or Red Herring? *Human Nature*, *28*(4), 481–499. https://doi.org/10.1007/s12110-017-9303-1

Schenk, N., & van Poppel, F. (2011). Social class, social mobility and mortality in The Netherlands, 1850–2004. *Explorations in Economic History*, *48*(3), 401–417. https://doi.org/10.1016/j.eeh.2011.05.010

Seip, A.-L. (1994). *Sosialhjelpstaten blir til. Norsk Sosialpolitikk 1740–1920 [The development of the welfare state. Norwegian social policy 1740-1920] (Vol. 2)*. Gyldendahl.

Sommerseth, H. L. (2011). The effect of ethnicity and economy upon Intergenerational Coresidence: Northern Norway during the last part of the nineteenth century. *Journal of Family History*, *36*(3), 263–285. https://doi.org/10.1177/0363199011406634

Sommerseth, H. L., & Thorvaldsen, G. (2022). The impact of microdata in Norwegian historiography 1970 to 2020. *Historical Life Course Studies*, *12*, 18–41. https://doi.org/10.51964/hlcs11675

Statistics Norway. (2021). *Forventet gjenstående levetid etter kjønn og utvalgte alderstrinn 1821-2020 [Remaining life expectancy by sex and selected age groups 1821-2020]*. Retrieved June 6, 2023 from https://www.ssb.no/statbank/table/05862/

Strand, B. H., Steingrimsdottir, O. A., Groholt, E. K., Ariansen, I., Graff-Iversen, S., & Naess, O. (2014). Trends in educational inequalities in cause specific mortality in Norway from 1960 to 2010: A turning point for educational inequalities in cause specific mortality of Norwegian men after the millennium? *BMC Public Health*, *14*(1), 1208. https://doi.org/10.1186/1471-2458-14-1208

Stugu, O. S. (2006). Mot et urbanisert land? 1920–2000 [Towards an urbanised country? 1920–2000]. In K. Helle, F.-E. Eliassen, J. E. Myhre, & O. S. Stugu (Eds.), *Norsk byhistorie. Urbanisering gjennom 1300 år* (pp. 385–507). Pax Forlag.

Stugu, O. S. (2012). *Norsk historie etter 1905. Vegen mot velstandslandet [Norwegian history after 1905]*. Det Norske Samlaget.
Sundt, E. R. (1870). *Om fattigforholdene i Christiania. Fra den ved Christiania Repræsentantskabs Beslutning af 9de September 1868 nedsatte Kommitte [On poverty in Christiania]*. J Chr Gundersens Bogtrykkeri.
Temby, O. F., & Smith, K. R. (2014). The association between adult mortality risk and family history of longevity: The moderating effects of socioeconomic status. *Journal of Biosocial Science*, *46*(6), 703–716. https://doi.org/10.1017/S0021932013000515
Texmon, I. (2022). *Dødelighet etter yrke. Utvikling etter 2000 [Mortality by occupational group. Development after 2000]*. Statistics Norway.
Therneau, T. (2022). *A Package for Survival Analysis in R*. https://CRAN.R-project.org/package=survival
Thorvaldsen, G. (1995). *Migrasjon i Troms i annen halvdel av 1800-tallet. En kvantitativ analyse av folketellingene 1865, 1875 og 1900 [Migration in Troms province in the second half of the 19th century. A quantitative analysis of censuses 1865, 1875 and 1900]. Doctoral dissertation*. UiT The Arctic University of Norway.
Thorvaldsen, G., Andersen, T., & Sommerseth, H. (2015). Record linkage in the historical population register for Norway. In G. Bloothooft, P. Christen, K. Mandemakers, & M. Schraagen (Eds.), *Population reconstruction* (pp. 155–172). Springer.
van den Berg, N., van Dijk, I. K., Mourits, R. J., Slagboom, P. E., Janssens, A. A. P. O., & Mandemakers, K. (2021). Families in comparison: An individual-level comparison of life-course and family reconstructions between population and vital event registers. *Popul Stud (Camb)*, *75*(1), 91–110. https://doi.org/10.1080/00324728.2020.1718186
van de Putte, B., & Miles, A. (2005). A social classification scheme for historical occupational data: Partner selection and industrialism in Belgium and England, 1800–1918. *Historical Methods*, *38*(2), 61–92. https://doi.org/10.3200/HMTS.38.2.61-94
van de Putte, B., & Svensson, P. (2010). Measuring social structure in a rural context. Applying the SOCPO scheme to Scania, Sweden (17th-20th century). *Belgisch Tijdschrift voor Nieuwste Geschiedenis*, *40*(1–2), 249–293.
van Leeuwen, M. H. D., & Maas, I. (2011). *HISCLASS. A historical international social class scheme*. Leuven University Press.
van Leeuwen, M. H. D., Maas, I., & Miles, A. (2002). *HISCO: Historical international standard classification of occupations*. Leuven University Press.
van Poppel, F., Jennissen, R., & Mandemakers, K. (2009). Time trends in social class mortality differentials in The Netherlands, 1820–1920: An assessment based on indirect estimation techniques. *Social Science History*, *33*(2), 119–153.

Appendix

Table A1. Original HISCLASS groups and modified class categories for this study.

HISCLASS number	Original HISCLASS label	Categories in this study
1	Higher managers	Non-manual classes
2	Higher professionals	Non-manual classes
3	Lower managers	Non-manual classes
4	Lower professionals, clerical and sales personnel	Non-manual classes
5	Lower clerical and sales personnel	Non-manual classes
6	Foremen	Skilled workers
7	Medium skilled workers	Skilled workers
8	Farmers	Farmers
9	Lower skilled workers	Lower-skilled/unskilled workers
10	Lower skilled farm workers	Lower-skilled/unskilled workers
11	Unskilled workers	Lower-skilled/unskilled workers
12	Unskilled farm workers	Lower-skilled/unskilled workers

Notes: Historical International Social Class Scheme (HISCLASS) (van Leeuwen & Maas, 2011).

Table A2. Overview of the five most frequent male occupations by social class category and environment in the study sample.

	Lower-skilled /unskilled workers	Farmers	Skilled workers	Non-manual classes
Total	Fishermen* (67.9%)	Fishermen-farmers (65.4%)	Carpenters (29.1%)	Working proprietors – trade (26.5%)
	Cotters (7.2%)	Farmers (34.6%)	Shoemakers (16.8%)	Captains (14.1%)
	Farm workers (6.1%)		Shipwrights (9.1%)	Teachers (13.7%)
	(Day) labourers (4.3%)		Masons (7.2%)	Sales supervisors (5.6%)
	Dock workers (1.9%)		Blacksmiths (6.4%)	Salespeople (4.9%)

(*Continued*)

Table A2. Continued.

	Lower-skilled /unskilled workers	Farmers	Skilled workers	Non-manual classes
Urban	Fishermen (33.8%)		Carpenters (22.8%)	Working proprietors – trade (19.4%)
	(Day) labourers (16.4%)		Shipwrights (13.6%)	Captains (18.1%)
	Dock workers (9.2%)		Masons (8.0%)	Teachers (5.6%)
	Loaders/Porters (8.7%)		Shoemakers (8.0%)	Salespeople (5.6%)
	Seamen (7.7%)		Tailors (4.9%)	Transport or communication supervisors (5.0%)
Rural	Fishermen* (73.1%)	Fishermen-farmers (65.4%)	Carpenters (34.0%)	Working proprietors – trade (31.2%)
	Cotters (8.4%)	Farmers (34.6%)	Shoemakers (23.6%)	Teachers (21.2%)
	Farm workers (7.0%)		Blacksmiths (8.0%)	Captains (16.0%)
	(Day) labourers (2.5%)		Masons (6.6%)	Sales supervisors (6.4%)
	Seamen (0.8%)		Shipwrights (5.2%)	Salespeople (4.4%)

*Many fishermen in rural Troms were also registered as cotters.

Notes: Social class based on modified version of the Historical International Social Class Scheme (HISCLASS) (van Leeuwen & Maas, 2011).

Source: Norwegian Historical Data Centre, UiT The Arctic University of Norway. Historical Population Register of Norway. Original sources at the National Archive of Norway.

Table A3. Overview of the five most frequent occupations for farmers in rural Troms who reported a second occupation (ref. Table 5).

	Lower-skilled /unskilled workers	Skilled workers	Non-manual classes
Farmers	Forestry workers (9.2%)	Carpenters (46.9%)	Working proprietors – trade (26.8%)
	Stone workers (9.2%)	Shoemakers (13.0%)	Teachers (17.9%)
	Mine workers (9.2%)	Blacksmiths (10.6%)	Captains (12.3%)
	Mail carriers (9.2%)	Masons (5.8%)	Sales supervisors (6.0%)
	Road workers (6.7%)	Shipwrights (4.3%)	Postmasters (5.1%)

Notes: Social class based on modified version of the Historical International Social Class Scheme (HISCLASS) (van Leeuwen & Maas, 2011).

Source: Norwegian Historical Data Centre, UiT The Arctic University of Norway. Historical Population Register of Norway. Original sources at the National Archive of Norway.

Table A4. Hazard ratios for mortality in Troms at age 60 and older by social class based on SOCPO for women and men born between 1841 and 1870.

	Model 1 HR (95% CI)	*P*-value	Model 2 HR (95% CI)	*P*-value
Social class				
Men	N = 5,871			
Elite/Middle class	1.05 (0.94, 1.17)	0.381	1.05 (0.94, 1.18)	0.386
Farmers	0.84 (0.79, 0.89)	<0.001	0.88 (0.82, 0.93)	<0.001
Skilled workers	0.85 (0.75, 0.95)	0.006	0.86 (0.76, 0.97)	0.017
Semi-skilled/unskilled workers	Ref.		Ref.	
Women	N = 4,553			
Elite/Middle class	0.90 (0.79, 1.01)	0.083	0.92 (0.81, 1.05)	0.217
Farmers	0.88 (0.82, 0.94)	<0.001	0.89 (0.82, 0.96)	0.002
Skilled workers	0.88 (0.77, 1.00)	0.052	0.89 (0.78, 1.02)	0.099
Semi-skilled/unskilled workers	Ref.		Ref.	
Missing/unclassifiable	0.87 (0.75, 1.02)	0.085	0.86 (0.74, 1.01)	0.071

Notes: Model 1 adjusts for age (timescale), model 2 additionally adjusts for marital status, place of birth and place of residence; strata by 10-year birth cohorts.

Social class based on modified version of the Social Power Scheme (SOCPO) (van de Putte & Miles, 2005).

Source: Norwegian Historical Data Centre, UiT The Arctic University of Norway. Historical Population Register of Norway. Original sources at the National Archive of Norway.