

Social inequality in mortality among adults and elderly in northern Sweden 1851–2013¹

Göran Broström and Sören Edvinsson

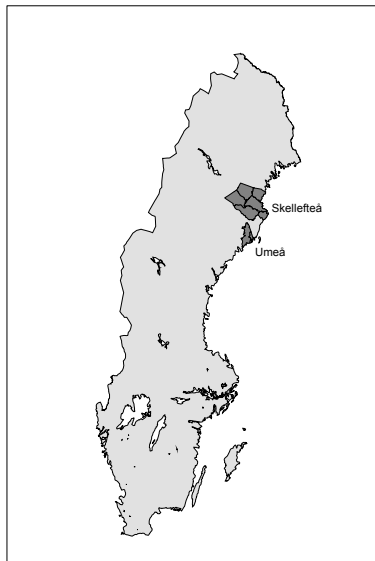
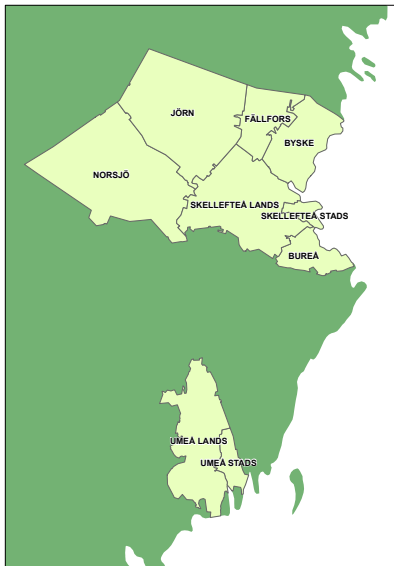
November 19, 2016

¹'Socioeconomic inequalities and mortality I: Europe'. 41st Annual Meeting of the Social Science History Association, Chicago, November 17–20, 2016.

Aims and questions

1. Has **inequality in mortality** between **social classes** increased in the adult and elderly population?
2. Are there any **gender differences** in the effect of social position?
3. Is social position **equally important** among the **retired** population as for those in **working age**?
4. Is there a difference between classes in mortality from **cardiovascular** diseases and **cancers** respectively?
5. Are there large differences in survival depending on level of **education** and **income** categories?

The Skellefteå and Umeå regions in Sweden



The Skellefteå region

- Selection of parishes surrounding the town of Skellefteå.
- Town founded in 1843 but with a very small population during the first decades.
- The majority of the population in rural villages and hamlets, getting their livelihood from agricultural production.
- 20th century: industrialisation, population increase in the town, diversified economy.

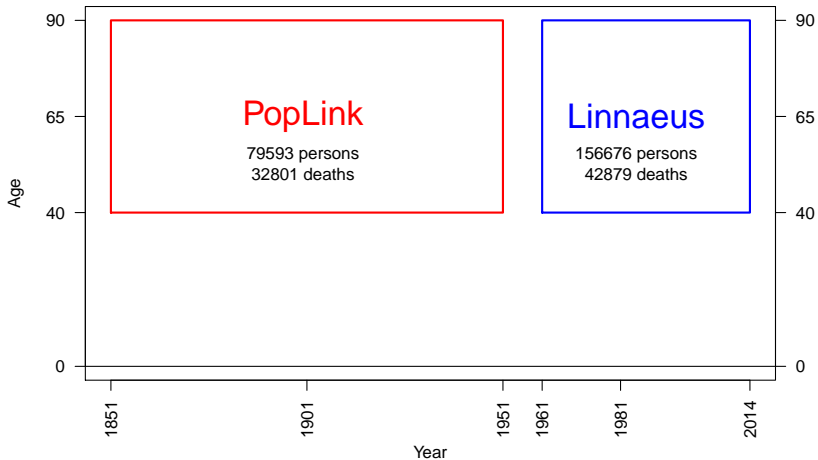
The Umeå region

- Town founded in 1622
 - Substantially larger than Skellefteå
 - administrative centre of the county Västerbotten
 - Military regiments.
 - Schools
 - University from 1963–65.
- The rural part similar to the one in the Skellefteå region.

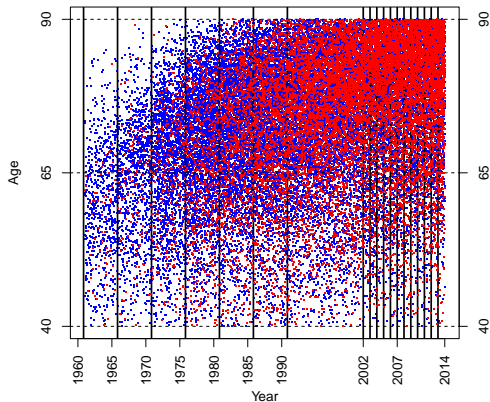
Data sources

- **Swedish church book** records (1851–1950).
 - digitized by the **Demographic Data Base** at Umeå University,
 - **POPUM** and
 - **POPLINK**
 - <http://www.cedar.umu.se/>
- The **Linnaeus** data base (1960–2013)
 - Census data 1960, 1965, . . . , 1990
 - Population registers (**LISA**, 1986–2013)
 - **Income**
 - **Education**
 - Death information from **National Board of Health and Welfare**
 - Death dates from 1 January 1961 to 31 December 2013.
 - **Causes of death** (**ULORSAK**, “main cause of death”)

The sampling frame



The Linnaeus data



	Number	Deaths
Women	70 249	13 888
Men	86 427	28 991
Total	156 676	42 879

Note: Persons with missing HISCLASS (occupation) are excluded.

Software for analysis

- **R**: <https://www.R-project.org>.
 - **RStudio**: <https://www.rstudio.com>.
- **R packages** (<https://cran.R-project.org>):
 - **skum** (Broström, 2016) data from **DDB**.
 - **rmarkdown** (RStudio Team, 2016).
 - **knitr** (Xie, 2016).
 - **eha** (Broström, 2016).
 - **xtable** (Dahl, 2016).

Variables

sex

birth date

death date

cause of death

parish

HISCLASS grouped.

income 1990–2005, grouped by quartiles.

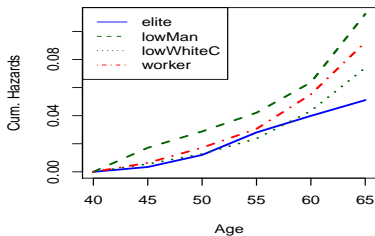
education 1990–2005. Seven categories.

HISCLASS

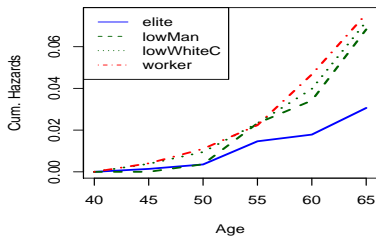
1. **elite**, HISCLASS 1 and 2. Higher managers and professionals.
2. **lowMan**, HISCLASS 3 and 8. Lower managers and farmers.
3. **lowWhiteC**, HISCLASS 4, 5 and 6. Lower white collar.
4. **worker**, HISCLASS 7, 9, 10, 11 and 12. Workers of different skills including farm workers.

Proportional hazards for women?

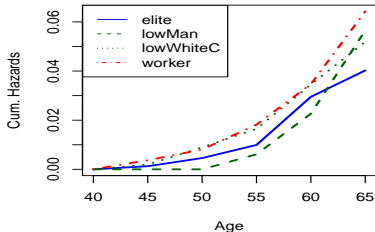
1981–1990



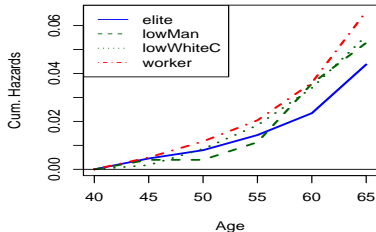
1991–2001



2002–2007

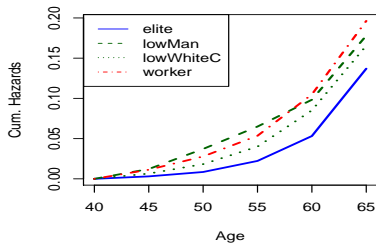


2008–2013

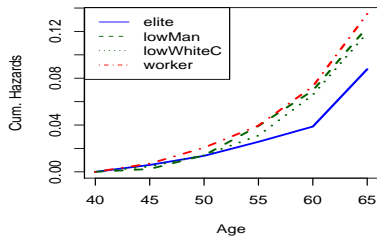


Proportional hazards for men?

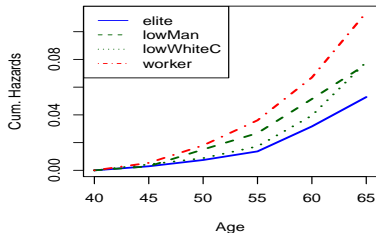
1981–1990



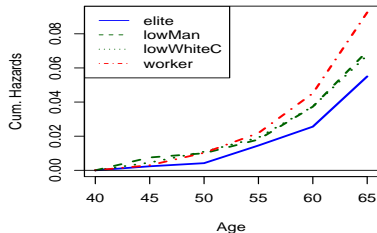
1991–2001



2002–2007



2008–2013



Interactions

```
fit <- coxph(Surv(enter - 40, exit - 40, event) ~  
  period * hisclass * sex + urban, data = vb)  
drop1(fit, test = "Chisq")
```

	Df	AIC	LRT	Pr(>Chi)
<none>		1631901.32		
urban	1	1631946	47.04	7.0×10^{-12}
period:hisclass:sex	27	1631957	110.11	5.3×10^{-12}

- This model is described by 80 coefficients.
- We show them in graphs.

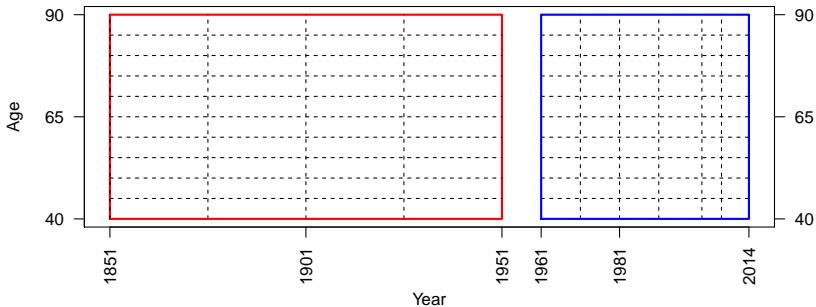
No proportional hazards (wrt HISCLASS)!

- Fit each HISCLASS **separately**, for each time period.
- Use the **cumulative hazard** at 65 (or 90) for comparison.

So, we fit separate PH models for each combination of

- **sex**
- **period**: 1851–75, 1876–1900, 1901–10, etc.
- **hisclass**
- **age group**: 40–64, 65–89.
- **cause of death**

The data table

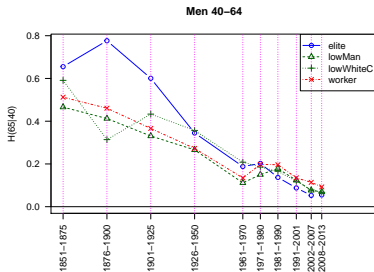
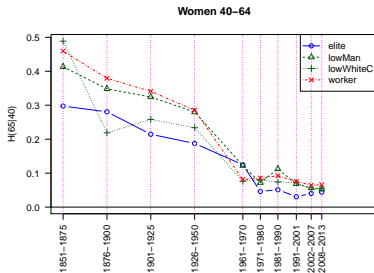


Poisson regression:

In **each cell**, and for **each** combination of **covariate levels**, calculate

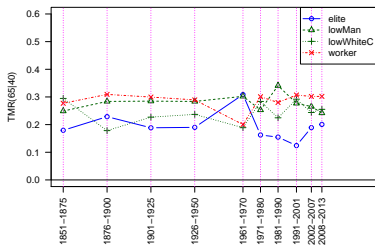
- the number of **deaths** and
- the total **exposure time**.

Women and men, age 40–64

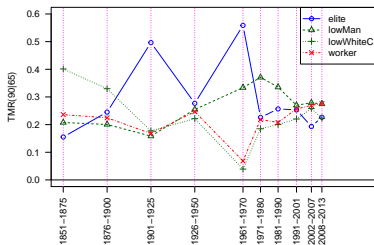


Relative differences, ages 40–64 and 65–89

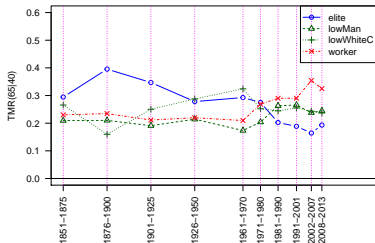
Women 40–64



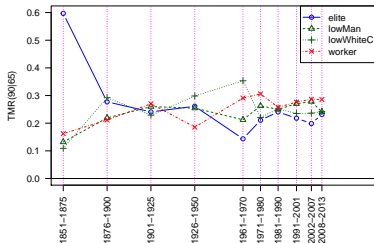
Women 65–89



Men 40–64

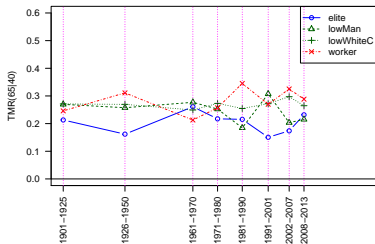


Men 65–89

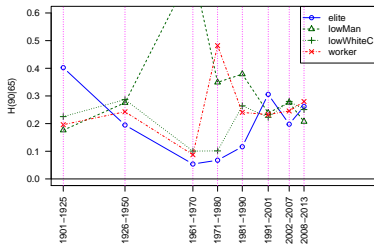


Cancer mortality, ages 40-64 and 65-89

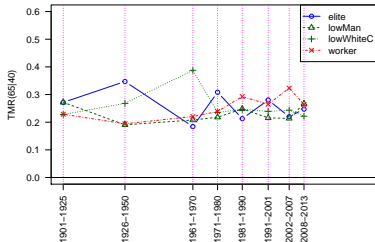
Women 40-64



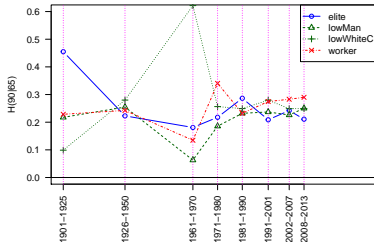
Women 65-89



Men 40-64

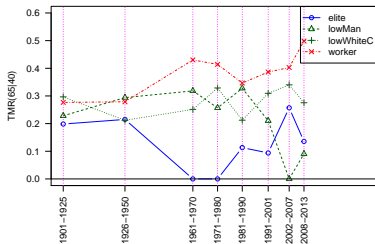


Men 65-89

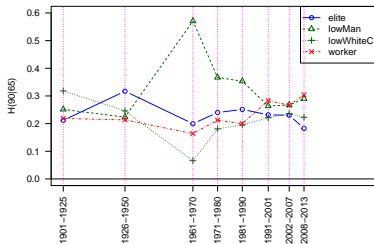


Cardiovascular mortality

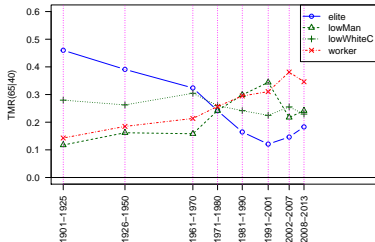
Women 40-64



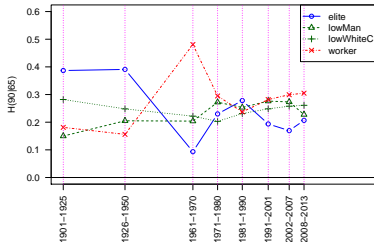
Women 65-89



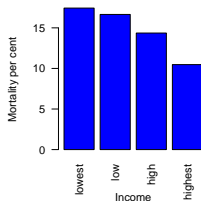
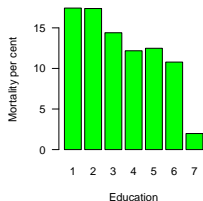
Men 40-64



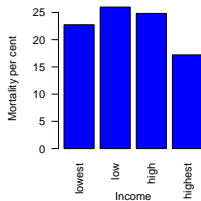
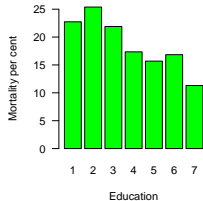
Men 65-89



Education and income, 1990–2005, all deaths

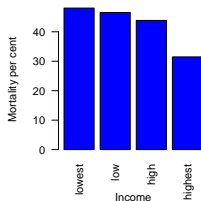
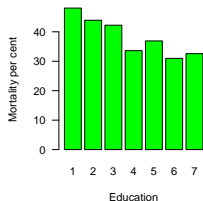


Women, 40–64.

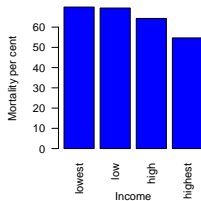
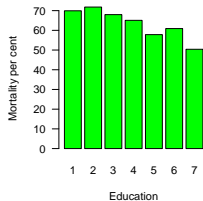


Men, 40–64.

Education and income, 1990–2005, all deaths

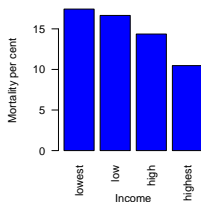
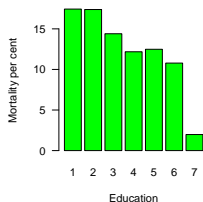


Women, 65–89.

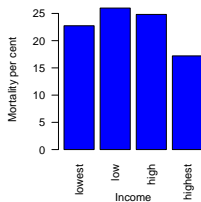
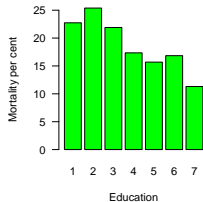


Men, 65–89.

Education and income, 1990–2005, cancer

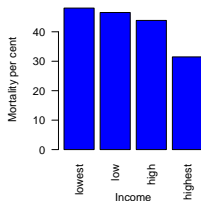
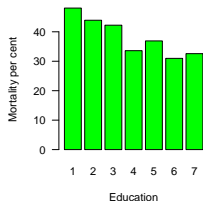


Women, 40–64.

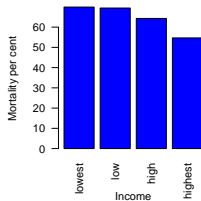
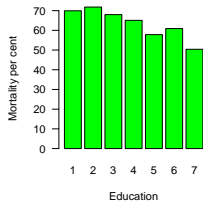


Men, 40–64.

Education and income, 1990–2005, cancer

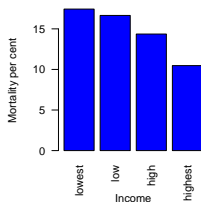
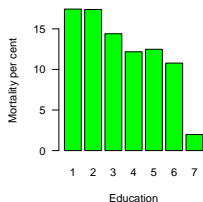


Women, 65–89.

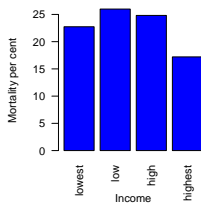
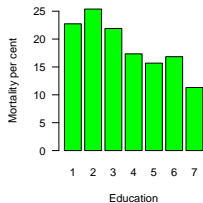


Men, 65–89.

Education and income, 1990–2005, cardiovascular

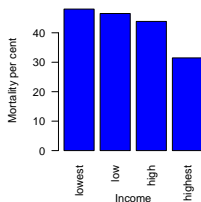
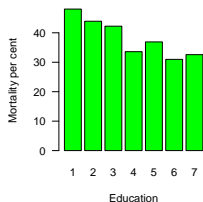


Women, 40–64.

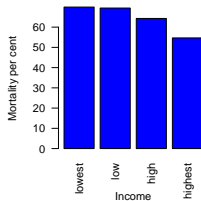
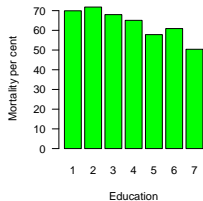


Men, 40–64.

Education and income, 1990–2005, cardiovascular



Women, 65–89.



Men, 65–89.

Conclusion

- Improved survival characterised all HISCLASSES.
- There are gender differences in the social pattern
- No difference in the social pattern in the two studied age groups.
- The upper class(es) gradually take over as the most healthy group.