

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

Göran Broström and Sören Edvinsson

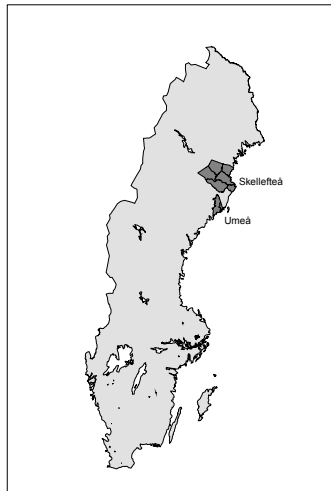
November 19, 2016

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

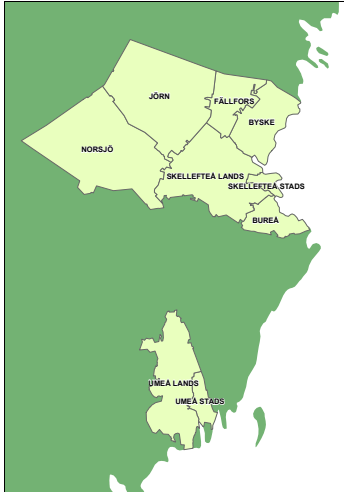
Questions

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?

Where?



Here!



Skellefteå:

- Small town, heavy industry in the nineteenth century.

Umeå:

- Not so small town, older. Center for administration, education, and military.

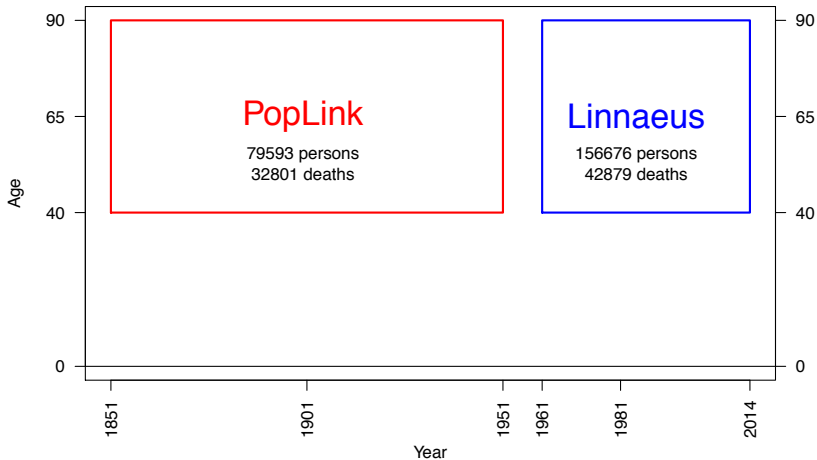
Rural areas:

- Very similar: Small farms dominating.

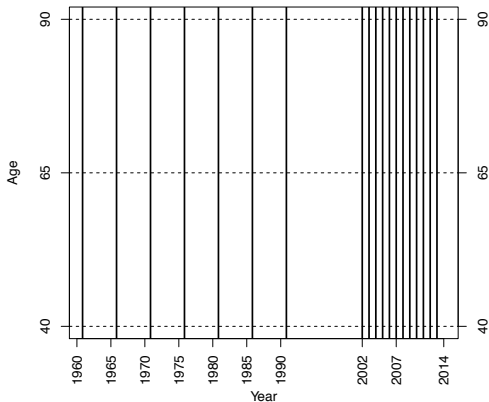
Data sources

- Swedish church book records (1851–1950).
 - digitized by the Demographic Data Base at Umeå University,
 - 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



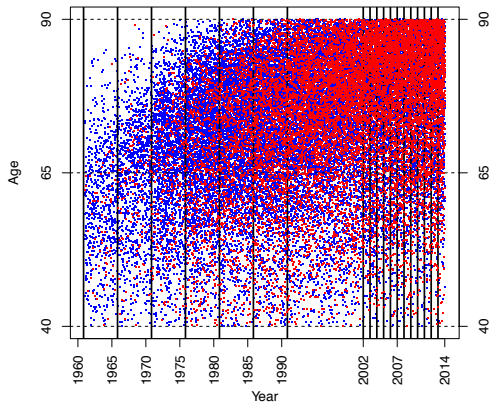
The Linnaeus data



	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.

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Variables

sex

birth date

death date

cause of death

parish

HISCLASS grouped.

income 1990–2005, grouped by quartiles.

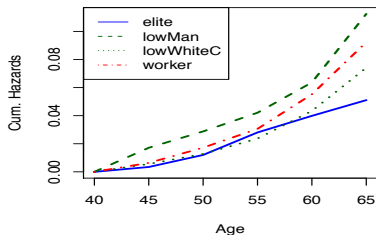
education 1990–2005. Seven categories.

HISCLASS

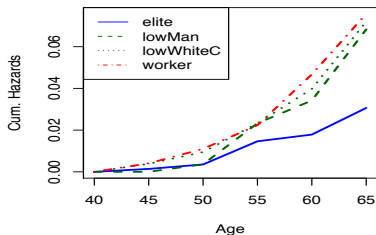
1. **elite**, HISCLASS 1 and 2. Higher managers and professionals.
2. **lowMan**, HISCLASS 3 and 8. Lower managers and farmers.
3. **lowWhiteC**, HISCLASS 4, 5 and 6. Lower white collar.
4. **worker**, HISCLASS 7, 9, 10, 11 and 12. Workers of different skills including farm workers.

Proportional hazards for women?

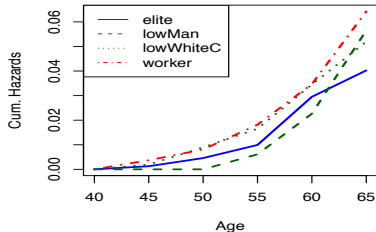
1981–1990



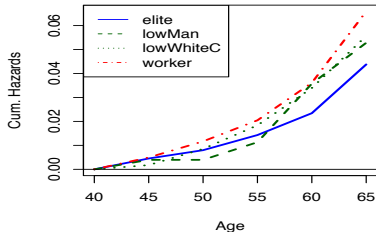
1991–2001



2002–2007

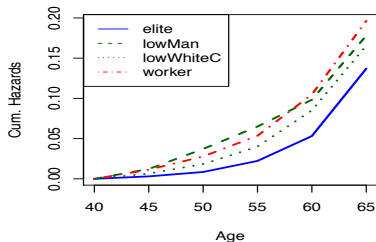


2008–2013

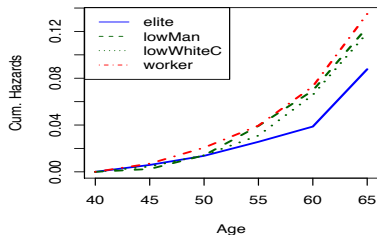


Proportional hazards for men?

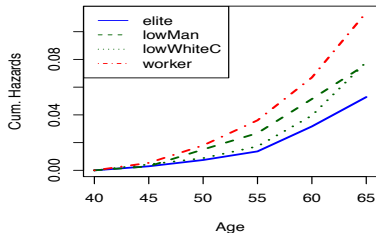
1981–1990



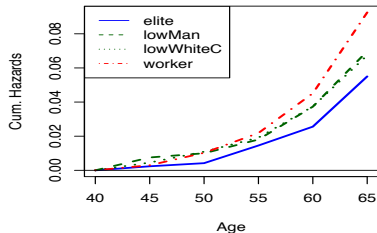
1991–2001



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.

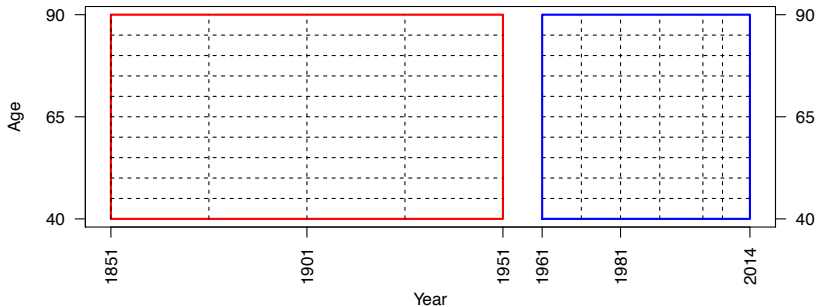
No proportional hazards (wrt HISCLASS)!

- 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

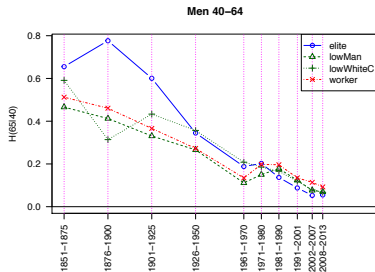
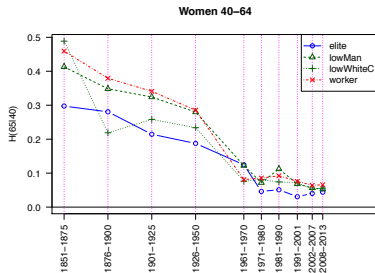


Poisson regression:

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

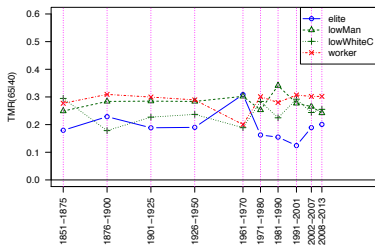
- the number of **deaths** and
- the total **exposure time**.

Women and men, age 40–64

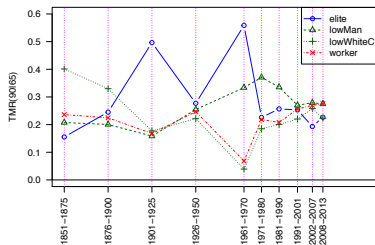


Relative differences, ages 40–64 and 65–89

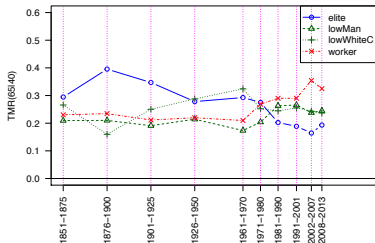
Women 40–64



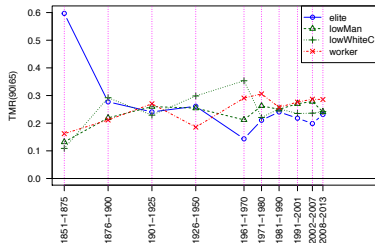
Women 65–89



Men 40–64

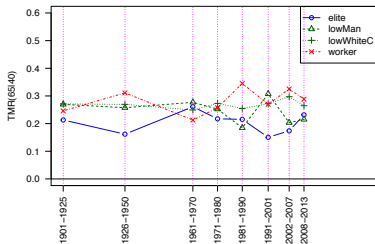


Men 65–89

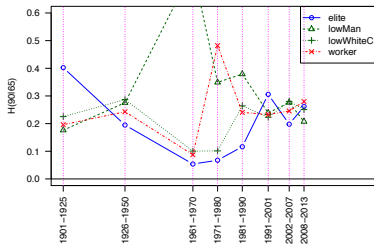


Cancer mortality, ages 40-64 and 65-89

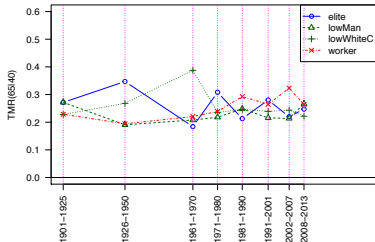
Women 40-64



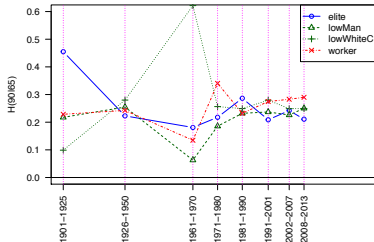
Women 65-89



Men 40-64

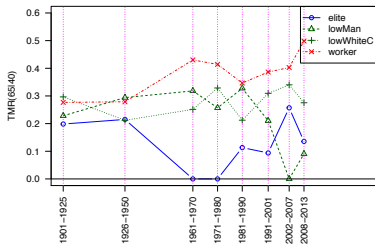


Men 65-89

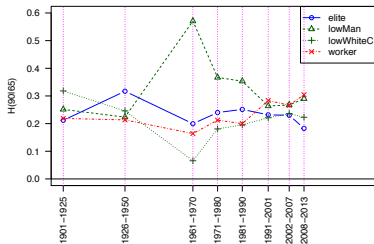


Cardiovascular mortality

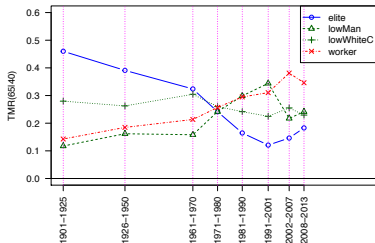
Women 40–64



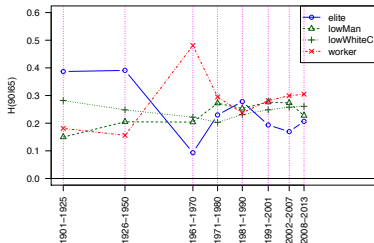
Women 65–89



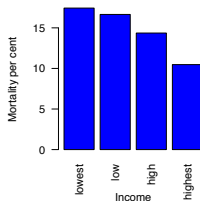
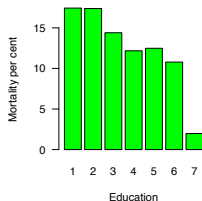
Men 40–64



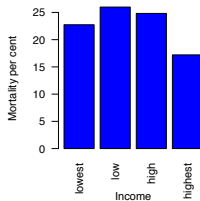
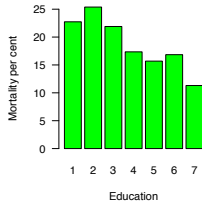
Men 65–89



Education and income, 1990–2005, all deaths

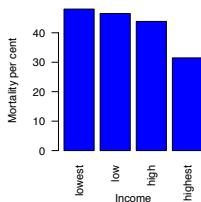
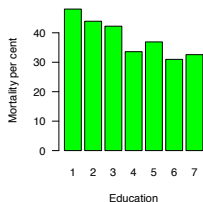


Women, 40–64.

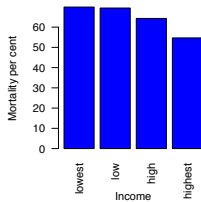
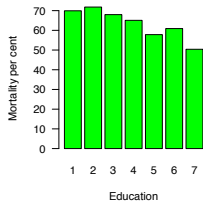


Men, 40–64.

Education and income, 1990–2005, all deaths

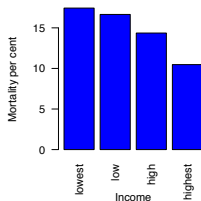
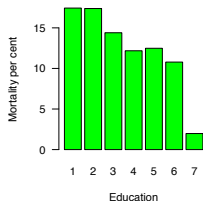


Women, 65–89.

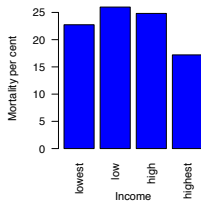
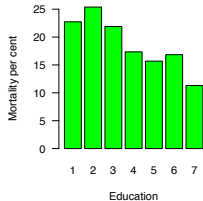


Men, 65–89.

Education and income, 1990–2005, cancer

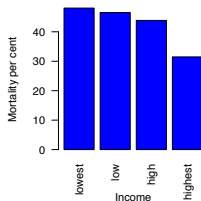
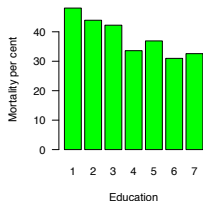


Women, 40–64.

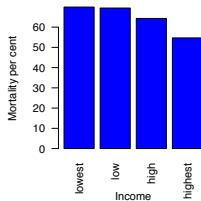
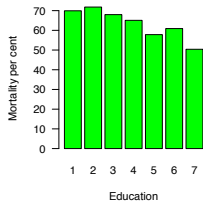


Men, 40–64.

Education and income, 1990–2005, cancer

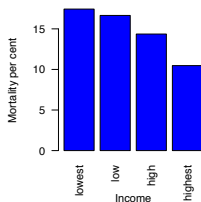
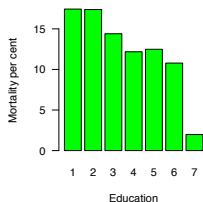


Women, 65–89.

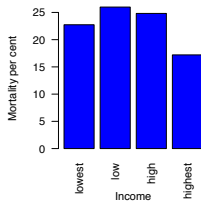
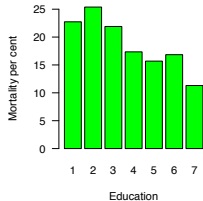


Men, 65–89.

Education and income, 1990–2005, cardiovascular

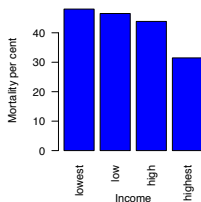
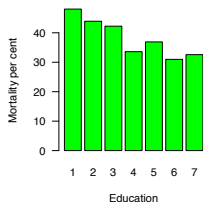


Women, 40–64.

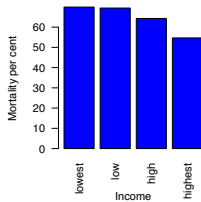
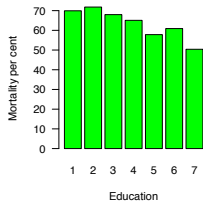


Men, 40–64.

Education and income, 1990–2005, cardiovascular



Women, 65–89.



Men, 65–89.

Answers(?)

1. Has **inequality in mortality** between **social classes** increased?
 - Not really
2. Are there any **gender differences** in the effect of social position?
 - Yes
3. Is social position **equally important** among the **retired** population as for those in **working age**?
 - Not really
4. Is there a difference between classes in mortality from **cardiovascular** diseases and **cancers** respectively?
 - Yes
5. Are there large differences in survival depending on level of **education** and **income** categories?
 - Yes, definitely.

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.
- Education and income are the most important variables during late time period.

Software for report writing and 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).
- **Version control** (reproducibility)
 - **git**: <http://git>
 - **gitHub**: <http://github.com/goranbrostrom/>