

# Infant and child mortality differentials by socioeconomic status during epidemics

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## Study Background

It is well known that exposure to epidemics is associated with increased mortality, especially during critical periods in infancy and early childhood.

Studies have shown that life expectancy did not differ among the different socioeconomic status (SES) in pre-industrial times.

## Table. Cox regression Estimating Survival from Birth up to the Age of 15

### Model characteristics:

Number of subjects = 1962  
 Number of observations = 9193  
 Number of failures = 186  
 Time at risk = 4788.490075  
 LR chi2(17) = 62.30  
 Log likelihood = -1068.0559

Variables	Hazard Ratio	Standard Error	z	P > z	95%	Conf Interval
actual exposure	2.132	0.435	3.71	0.000	1.429	3.180
previous exposure	1.752	0.660	1.49	0.137	0.837	3.664
exposed in utero	0.781	0.213	-0.91	0.365	0.457	1.334
sex (female)	0.921	0.137	-0.55	0.582	0.688	1.233
<b>SES at birth</b>						
_unskilled (ref.)	1.000					
_semi-skilled	0.756	0.166	-1.27	0.203	0.492	1.163
_skilled	0.569	0.235	-1.37	0.172	0.254	1.277
<b>_middle class</b>	<b>0.567</b>	<b>0.128</b>	<b>-2.52</b>	<b>0.012</b>	<b>0.365</b>	<b>0.882</b>
_elite	0.351	0.360	-1.02	0.307	0.047	2.618
_unknown	0.960	0.225	-0.17	0.863	0.606	1.521
<b>Parish</b>						
_Hög (ref.)	1.000					
_Kävlinge	0.777	0.236	-0.83	0.406	0.428	1.410
_Halmstad	1.117	0.300	0.41	0.680	0.660	1.893
_Sireköpinge	0.887	0.265	-0.4	0.689	0.495	1.592
_Käeröd	0.899	0.231	-0.41	0.678	0.544	1.487
<b>Birth Cohort (5y cat.)</b>	<b>0.952</b>	<b>0.059</b>	<b>-0.79</b>	<b>0.431</b>	<b>0.844</b>	<b>1.075</b>
<b>Birth Season</b>						
_winter (ref.)	1.000					
_spring	1.226	0.277	0.91	0.365	0.788	1.908
_summer	1.174	0.259	0.73	0.468	0.761	1.809
_fall	1.146	0.248	0.63	0.531	0.749	1.753

## Hypotheses

It might be that people of higher SES could have been less exposed or less affected by epidemic outbreaks. Consequently, their survival might be also higher in post-epidemic crisis periods, given the potential long-term effects suffered by people of lower SES.

## Data and Methods

The data derived from the SEDD (Scanian Economic Demographic Database) and is available from 1813 up 1910.

The strategy of the analyses can be described in three steps:

- 1) Identifying and choosing the crisis and the post-epidemic period (see **Figure 1**)
- 2) Modeling mortality in a chosen epidemic period as well as in the subsequent post-epidemic period (“period models”)
- 3) Modeling the impact of epidemic exposure on mortality from birth up to the age of 15 (“age model”, see **Table**)

Figure 1. Mortality trend 1813-1910

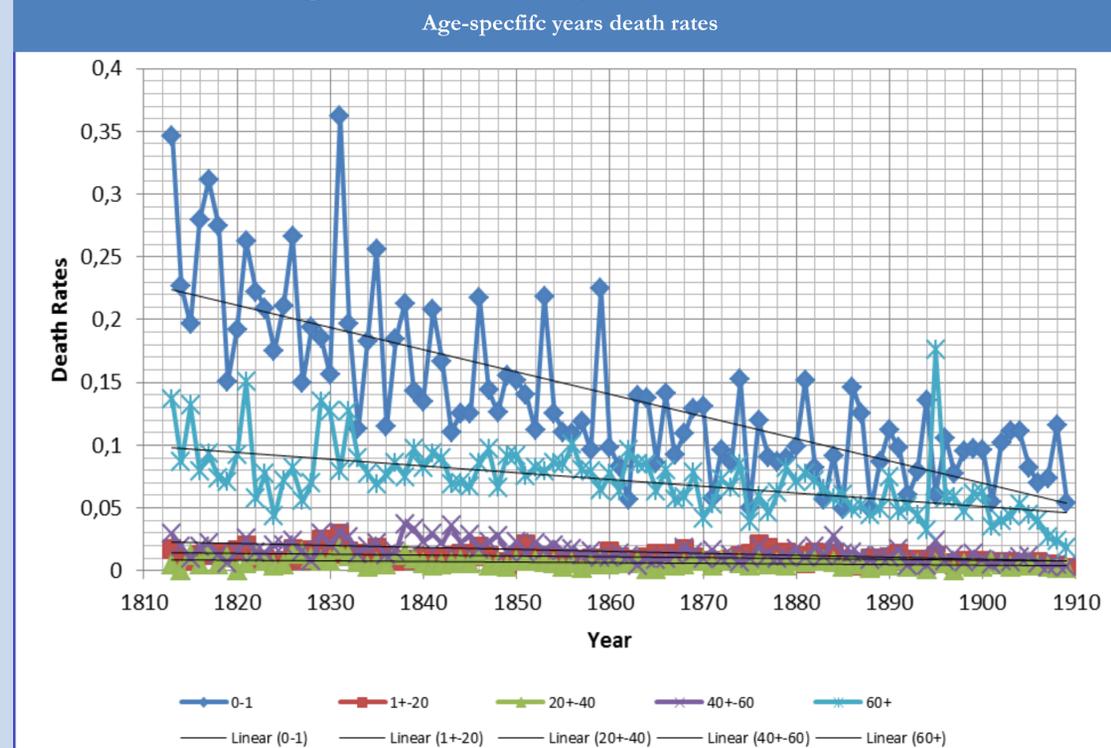
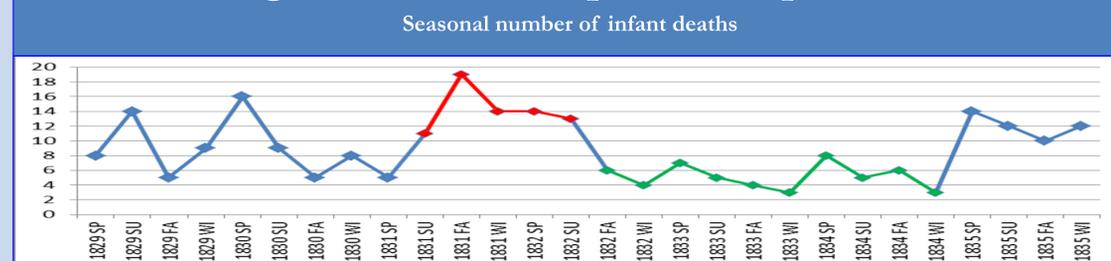


Figure 2. Crisis and post-crisis periods



## Results

After the analysis of mortality trends between 1813 and 1910, from summer 1831 to summer 1832 has been identified as “epidemic period” and from fall 1832 to winter 1835 as “post-epidemic period” (see **Figure 2**). The Cox regressions which model mortality during the epidemic as well as during the post-epidemic period indicate in both periods survival is not significantly associated with the social-economic status (data not shown). Individuals between 15 and 25 years old appear to be less vulnerable when compared to IDs of younger or elder age categories.

The results of the Cox regression model which estimates child mortality from birth up to the age of 15 during both epidemic and post-epidemic periods are given in the table to the left. Survival is significantly decreased by actual epidemic exposure (HZ = 2.132\*\*\*) and also a previous exposure to the epidemic appears to be associated with lower survival; although this finding is not significant (HZ = 1.752n.s.). In contrast to our “period models” and also to previous studies, children born to unskilled workers significantly exhibit higher mortality, almost twice the risk of death, than children born to the middle class.

## Conclusion

The models that estimate mortality in both epidemic as well as post-epidemic periods are in concert with findings from previous studies. Mortality appears not to be affected by SES. However, SES matters for children up to the age of 15, if the models account for time-varying epidemic exposure. Children born to unskilled workers exhibit lower survival than children born to families of higher SES. This finding is in line with our prediction that wealth might be beneficial during crisis periods. Further, our final model (TABLE) indicates that previous epidemic exposure also does decrease survival. Wealth might also be useful to lower the detrimental effects while recovering from crisis.

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