A biometric analysis of infant mortality and temperature, northern Sweden 1895-1950

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Abstract

The effect of extreme temperatures on infant mortality in the Umeå and Skellefteå regions 1895-1950 is studied in a biometric analysis setting. More precisely, the effect of climate and weather, measured by temperature, average and extremes, on infant mortality is investigated. It turns out that climate (average) is more important than weather (extremes), low average temperatures are more important than temporary dips in temperature, but effects are different in neonatal and postneonatal settings.

Contents

1 Introduction

The impact of ambient temperature variations on infant mortality is studied for two northern Sweden areas, the Umeå coastal region and Skellefteå coastal and inland regions, during the first half of the twentieth century. Two recent papers (Junkka et al., 2021; Karlsson et al., 2021) studied neonatal mortality and temperature variations in this geographical area during the years 1880–1950. Climate and mortality in general is a research area that has generated great interest over the last years, see Bengtsson and Broström (2010) for an example of our own efforts.

The effect of seasonal variation and the occurrence of extreme monthly temperatures is studied and interacted with social class and time period. Studies are performed separately for neonatal and postneonatal mortality, and for winter and summer seasons.

Figure 1 shows the study area within Sweden, with the weather stations marked. The map is taken (with permission) from the paper by Junkka et al. (2021).

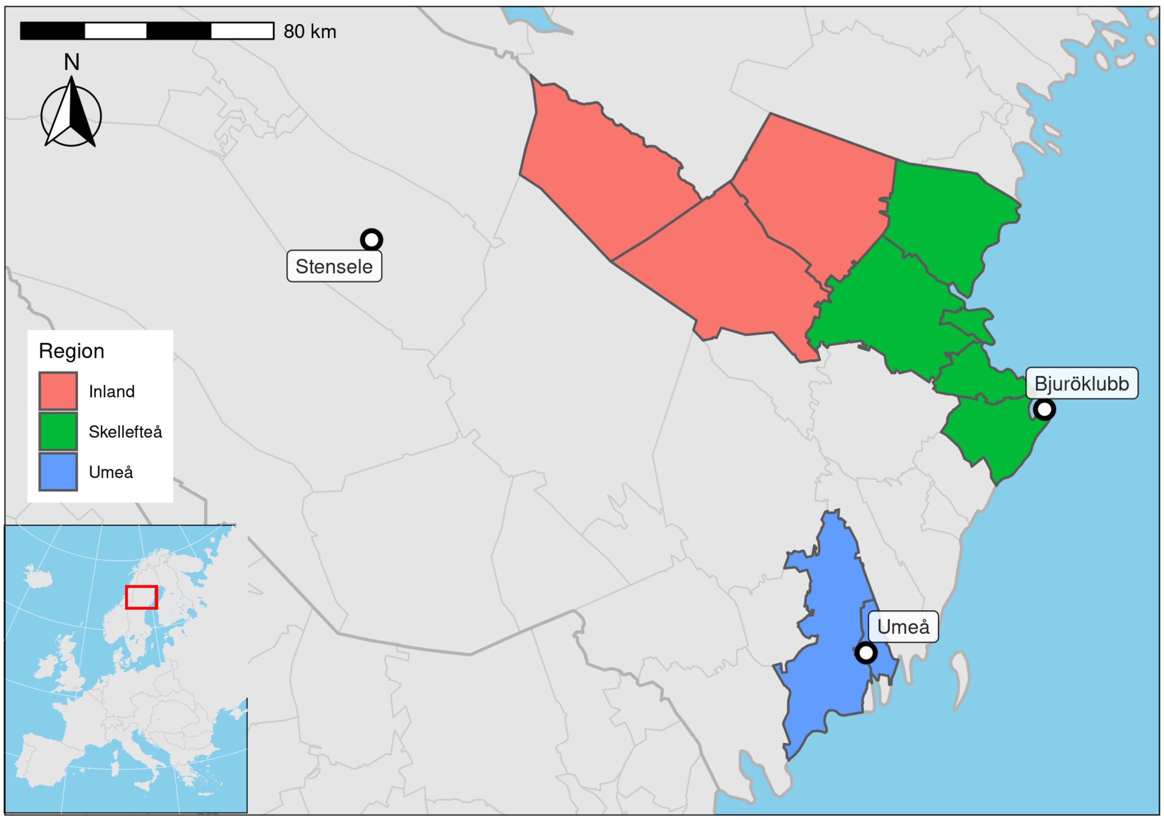

Figure 1: Umeå, Skellefteå (orange) and its inland (green).

2 Data

We have two sources of data which we combine into one data set suitable for our purpose. The first is demographic data obtained from the *Centre for Demographic and Ageing Research* (CEDAR, https://cedar.umu.se), the second is daily temperature measurements obtained from the *Swedish Meteorological and Hydrological Institute* (SMHI, https://www.smhi.se).

2.1 Infant mortality

Individual data with all births between 1 January 1895 and 31 December 1950 in two coastal and one inland areas of north Sweden, Skellefteå (51560 births) and Umeå (31213 births). They were followed until death or age one year, whichever came first. The following *static* characteristics were observed on each child:

birthdate Date of birth.

sex Girl or boy.

exit Number of days under observation.

event Logical, *TRUE* if a death is observed.

socBranch Working branch of father (if any).

socStatus Social status *within* the given working branch.

illeg Mother unmarried?

parity Order among siblings.

Some crude statistics about infant, neonatal, and postneonatal mortality are shown in Figures.

Figure 2 shows the average weekly crude infant mortality, and a clear seasonal pattern is visible.

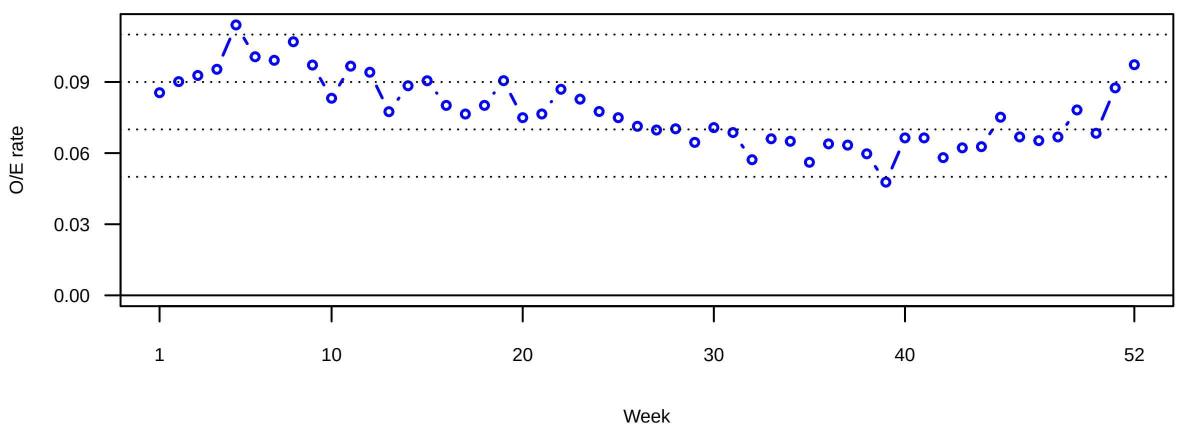

Figure 2: Crude infant mortality by week of year, Umeå/Skellefteå 1895–1950.

The average weekly neonatal mortality is shown in Figure 3.

The seasonal pattern is similar to the one we found above for infant mortality.

The average weekly postneonatal mortality is shown in Figure 4.

The seasonal pattern is once again similar to the one we found for infant mortality. Next, the decline over the years in Figures 5 and 6.

Note that the estimates of neonatal and postneonatal mortality are non-standard here: They are calculated as *occurrence-exposure rates*, that is, the number of deaths divided by *exposure time*. They are thus crude *hazard rates*, not probabilities, which is more common in definitions of mortality.

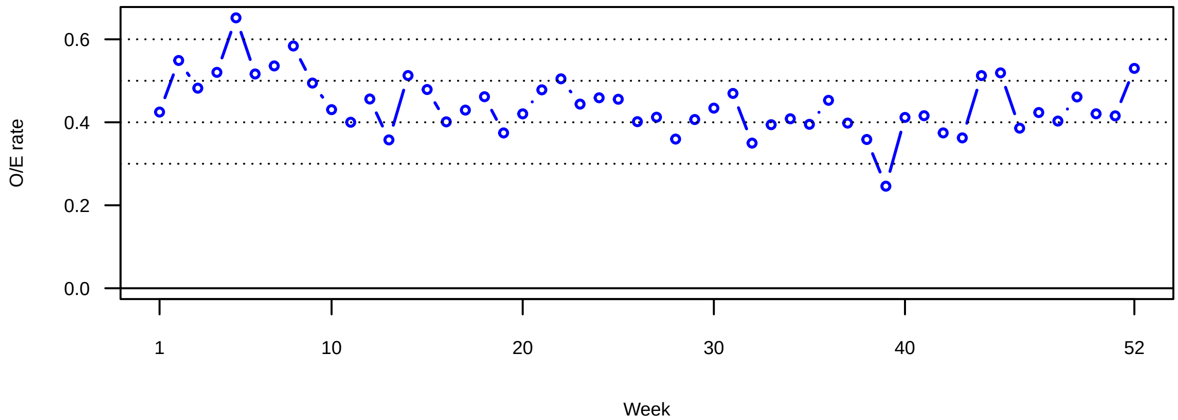

Figure 3: Crude neonatal mortality by week of year, Umeå/Skellefteå 1895–1950.

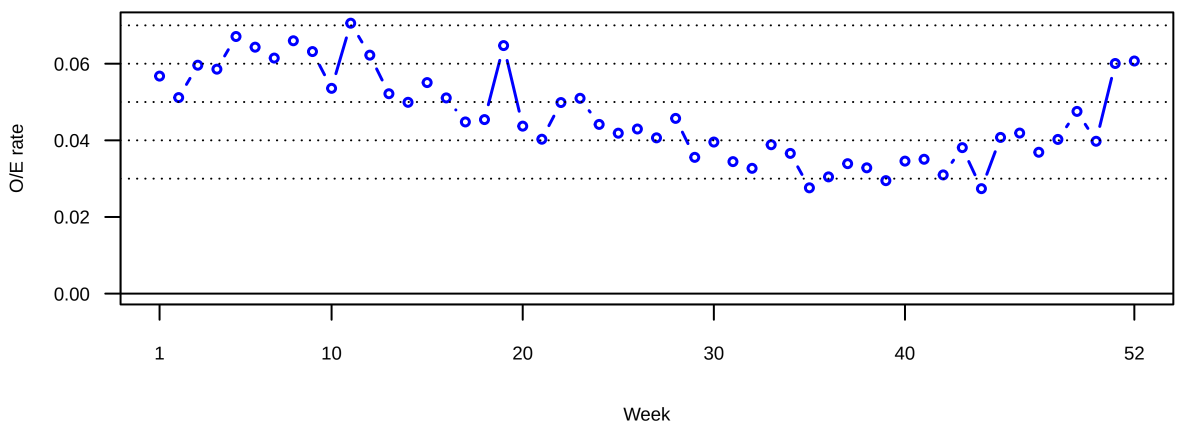

Figure 4: Crude postneonatal mortality by week of year, Umeå/Skellefteå 1895–1950.

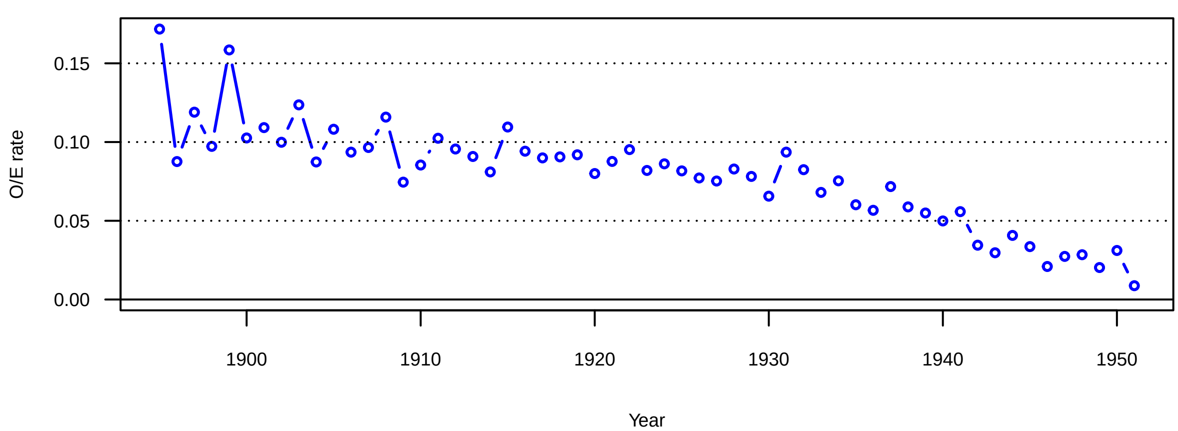

Figure 5: Crude IMR by year, Umeå-Skellefteå 1895–1950.

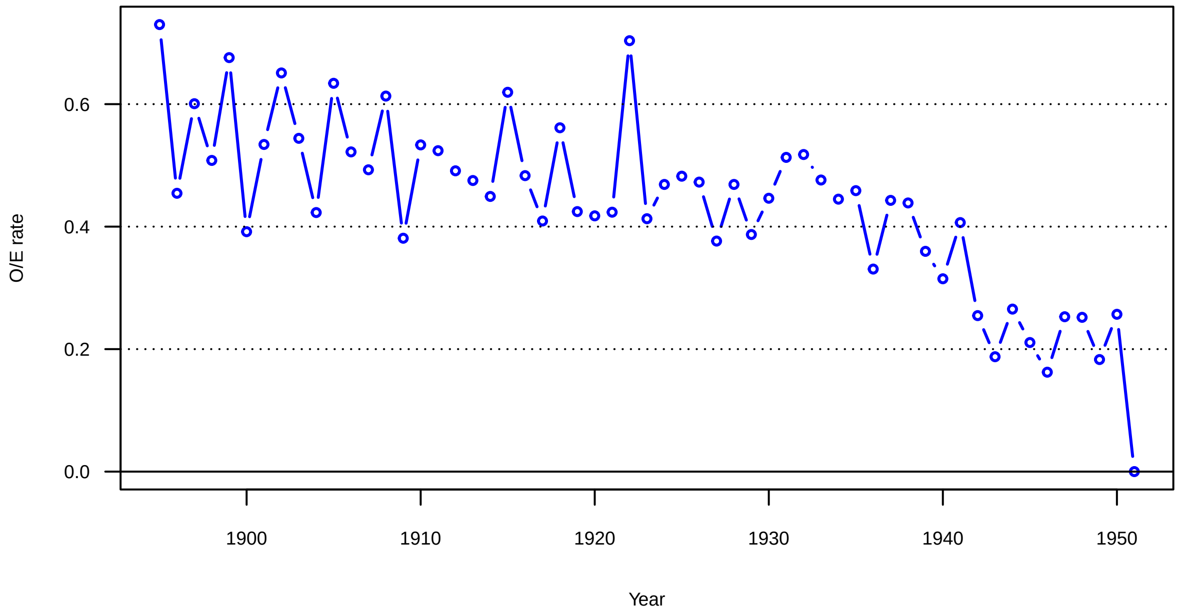

Figure 6: Crude NMR by year, Umeå-Skellefteå 1895–1950.

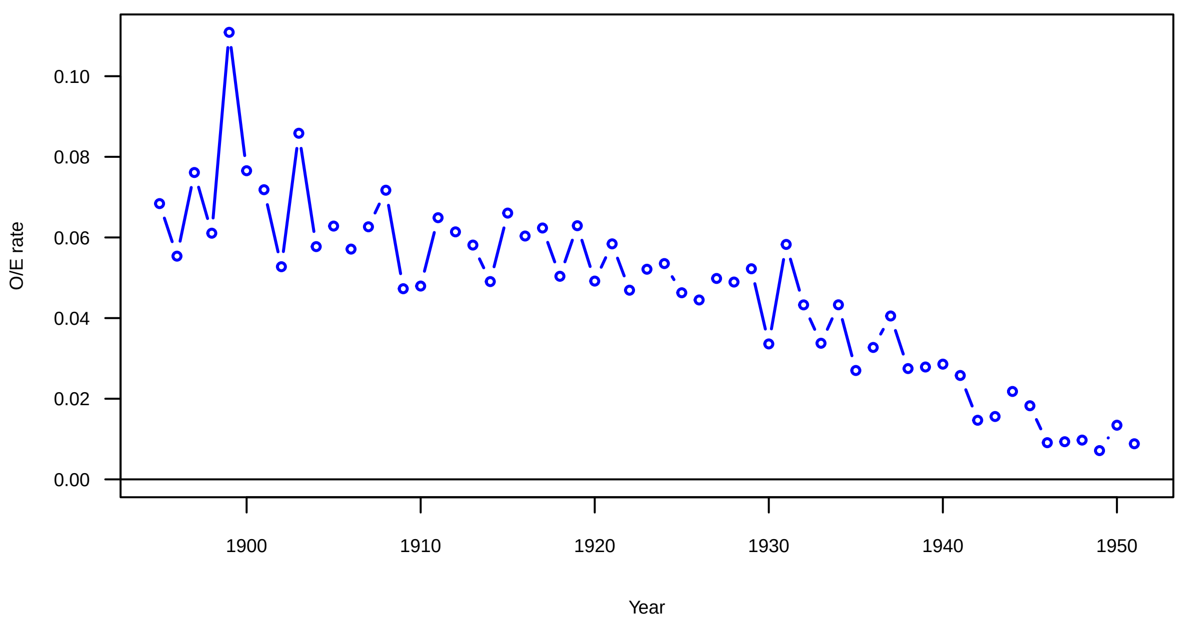

Figure 7: Crude postneonatal mortality by year, Umeå-Skellefteå 1895–1950.

2.2 Temperature

Temperature data are collected from three weather stations, *Umeå*, *Bjuröklubb* (used with population data from Skellefteå coastal area), and *Stensele* (Inland). All stations deliver daily temperature data covering our time period, usually three measures per day, morning, noon, and evening. In Table 1, the Umeå data from the week 1–7 January, 1923 is shown.

[Table 1 about here.]

There are three measurements per day, or 21 per week. In the forthcoming analyses, the weekly data are summarized in a few measurements, see Table 2. Our rule for week numbering is that week No. 1 always start on January 1. Week No. 52 always ends at December 31, and so will be eight days long, except for leap years, when it will be nine days long.

[Table 2 about here.]

Weekly averages (`mintemp`, `maxtemp`, `meantemp`) are calculated by week and year, and deviations from the averages (`emintemp`, `emaxtemp`, `emeantemp`) of the weekly averages are used as time-varying *communal covariates*. As an example, see Figure 8, where the variation around the average minimum temperature (`emintemp`) week 1 is shown.

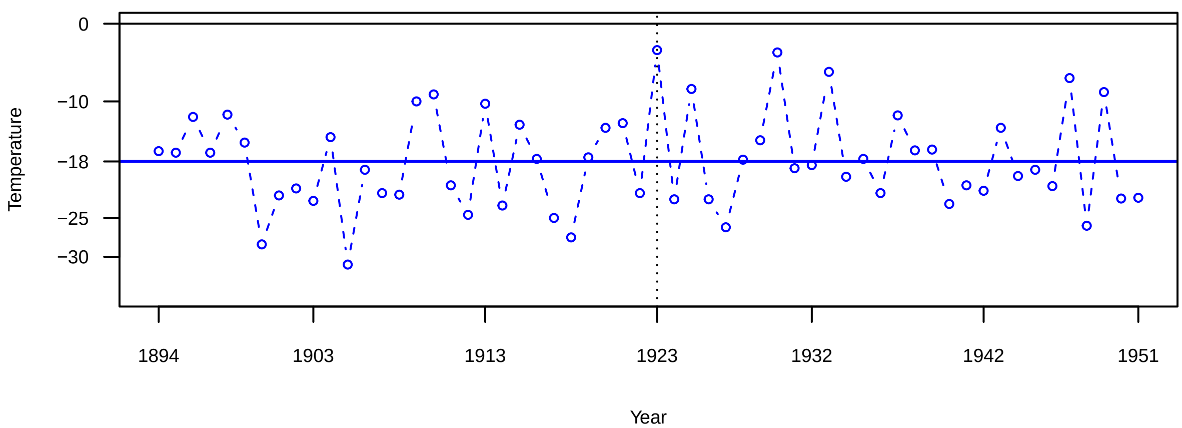

Figure 8: Minimum temperature the first week of each year.

Curiously, our randomly selected year 1923 turns out contain the warmest first week of all years, see Figure 8.

Figure 9 shows the average monthly distribution over all years. The subregional patterns and levels are very similar.

Time trends of yearly average temperatures, see Figure 10.

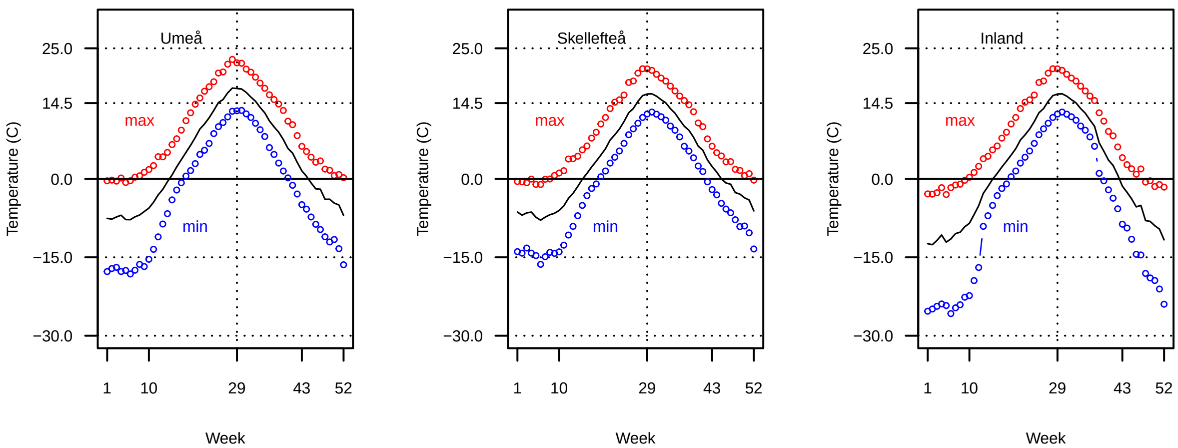

Figure 9: Weekly max, mean, and min temperature averages, 1895–1950.

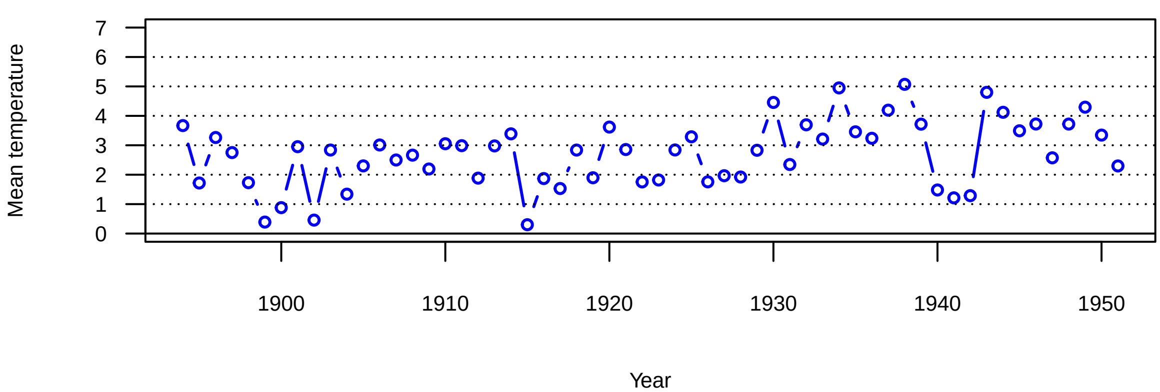

Figure 10: Yearly average temperatures, Umeå and Skellefteå.

2.3 Temperature as communal covariates

The two data sets, mortality and weather, are combined into one by treating temperature data as a communal covariate and incorporate it as such in the mortality data set. The function *make.communal* in the **R** (R Core Team, 2021) package *eha* (Broström, 2021a,b) is used for that purpose. Resulting data drame is partly shown in Table 3.

[Table 3 about here.]

3 Statistical modelling

It turns out that extremely low temperature (`lowTemp`) is bad during all seasons except summer, and extremely high temperature (`highTemp`) is bad during summer, but good otherwise. So we group season into two categories, *summer* and *not summer*. In each case separate analyses for neonatal and postneonatal mortality are performed.

The *summer* half-year consists of the weeks 14–39, about 1 April to 30 September, and the *winter* half-year is the rest, weeks 1-13 and 40–52, 1 January to 31 March and 1 October to 31 December. This is the division made in Karlsson et al. (2021), and we keep it for comparability reasons.

4 Results

The results regarding neonatal mortality is much in accordance with the results found by Junkka et al. (2021). However, they used temperature in a "hockey-stick" regression with a breakpoint at 14.5 degrees Celsius and a negative slope (decreasing risk) to the left and a positive slope (increasing risk) to the right. Instead, we are using the average weekly temperature for the 52 weeks of a year, for each week averaging over all the years in the study, as our "reference points" ("climate"), adding deviances up and down ("weather") as "short-term temperature stress". This is similar to the way prices and mortality were related in for instance Bengtsson and Broström (2011), that is, a time series split into long time trend and short term variation.

Comments on other candidate covariates:

Birth month is left out in the analyses despite that fact that it is an important factor in neonatal mortality. However, we include *time of year* in terms of *winter* and *summer* as a time-varying covariate, and in the neonatal case it will coincide to a great extent with birth period. For the postneonal case the situation is different, but it turns out that for those infants who have survived the first month of life, birth month does not matter much. We separate the investigation into two parts, *neonatal* and *postneonatal* mortality. But first, a joint analysis.

Socioeconomic status is divided into two factor covariates: *socBranch* and *socStatus*. The latter should be seen relative to actual *socBranch*. We have information on whether the infant was *illegitimate* (mother unmarried), but we incorporate those cases in the category *none* of *socBranch* and *unknown* as category of *socStatus*.

Covariates may affect neonatal and postneonatal mortality differently, and one way to investigate that is to stratify the infant mortality data into two age intervals, one from birth to one month of age and the other from one month to one year of age. Then the interaction between the stratum variable and other variables of interest is investigated, with this result:

```
Single term deletions

Model:
oe(event, exposure) ~ strata(ageIvl) * (extemp + extemp.1 + emeantemp +
    socBranch + socStatus + period + urban)
                         Df   AIC    LRT  Pr(>Chi)
<none>                      41701
strata(ageIvl):extemp     1 41699  0.025  0.874188
strata(ageIvl):extemp.1   1 41701  2.273  0.131685
strata(ageIvl):emeantemp  1 41717 18.885 1.388e-05 ***
strata(ageIvl):socBranch  3 41708 13.422  0.003808 **
strata(ageIvl):socStatus  1 41710 11.200  0.000818 ***
strata(ageIvl):period     2 41773 76.645 < 2.2e-16 ***
strata(ageIvl):urban      1 41699  0.796  0.372421
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

We can see that the variables *emeantemp*, *socStatus* and *period* all have different effects on mortality in the neonatal case compared to the postneonatal case. In terms of *infant mortality*, we can say that these caovariates have non-proportional effects.

4.1 Neonatal mortality

The analyses are split into two parts by season, *winter* is one, and *summer* the other. Summer covers the months April to September, and winter the rest of the months.

4.1.1 Winter

This period refers to the months *October to March.* A Cox regression involves as interesting variables *highTemp*, an indicator of temperature at least four degrees above the expected for at least two weeks in a row, *emeantemp* the expected temperature the actual weeek, and *extemp* the *excess temperature* the actual week.

[Table 4 about here.]

4.1.1.1 Temperature and sex We check the interaction between temperature and sex and period.

```
Single term deletions

Model:
oe(event, exposure) ~ sex * (extemp + extemp.1 + emeantemp)
              Df    AIC     LRT Pr(>Chi)
<none>           4507.1                 
sex:extemp     1 4507.6 2.47699   0.1155
sex:extemp.1   1 4505.6 0.50456   0.4775
sex:emeantemp  1 4505.3 0.11737   0.7319
```

Obviously no temperature and sex interactions

4.1.2 Summer

This period refers to the months *April to September*. A Cox regression involves as interesting variables *highTemp*, an indicator of temperature at least four degrees above the expected for at least two weeks in a row, *emeantemp* the expected temperature the actual weeek, and *extemp* the *excess temperature* the actual week.

[Table 5 about here.]

4.2 Postneonatal mortality

4.2.0.1 By birth month See Figure 11.

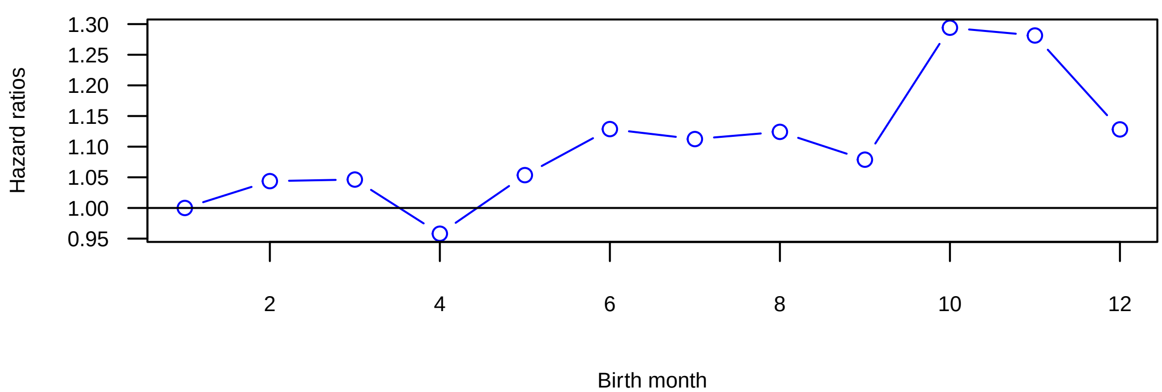

Figure 11: Crude postneonatal relative (to January = 1) mortality by birth month.

4.2.1 Winter

Interaction tests with temperature and period, postneonatal mortality:

```
Single term deletions
```

```
Model:
oe(event, exposure) ~ period * (extemp + extemp.1 + emeantemp)
                 Df   AIC    LRT Pr(>Chi)
<none>              17721
period:extemp     2 17722 4.2212   0.1212
period:extemp.1   2 17719 1.4788   0.4774
period:emeantemp  2 17720 2.3455   0.3095
```

This shows that the temperature effects do not vary much with time period, but we continue with separate analyses for the time periods (1895,1914], (1914,1935], (1935,1951]. Just to make sure, will be joined when appropriate.

4.2.1.1 Sex, urban, and temperature

Interaction tests with temperature and sex, postneonatal mortality:

```
Single term deletions

Model:
oe(event, exposure) ~ (sex + urban) * (extemp + extemp.1 + emeantemp)
                Df   AIC    LRT Pr(>Chi)
<none>             18095
sex:extemp       1 18093 0.0714   0.7894
sex:extemp.1     1 18093 0.0116   0.9143
sex:emeantemp    1 18093 0.0518   0.8200
urban:extemp     1 18094 0.6809   0.4093
urban:extemp.1   1 18094 0.6013   0.4381
urban:emeantemp  1 18094 0.2018   0.6533
```

Obviously no interactions between temperature and sex, and urban.

4.2.1.2 The time period 1895–1913

[Table 6 about here.]

Table 6 shows that the effects of extreme temperatures have the expected directions, extra high temperatures is *positive* (remember that this concerns winter conditions), but not statistically significant. *Climate* (emeantemp), on the other hand shows to be very important, where increasing temperature by one degree lower mortality by 0.7 per cent. The normal short term fluctuations (extemp) are not so important, but in the expected direction.

The importance of social class (socBranch) in explaining the effects of climate and weather is negligible, but there is variation between the regions regarding *climate*:

[Table 7 about here.]

[Table 8 about here.]

We can conclude from Tables 7 and 8 that the main difference between Umeå and Skellefteå is that *climate* has more severe effect in Skellefteå (with inland), while *weather* is less important.

4.2.1.3 The time period 1914–1934

[Table 9 about here.]

Table 9 shows that the weather effect is lagged one week (*extemp.1*), and that climate continues to be very important. Let's look at regional differences.

[Table 10 about here.]

[Table 11 about here.]

4.2.1.4 The time period 1935–1950

[Table 12 about here.]

Table 12 shows that

[Table 13 about here.]

[Table 14 about here.]

4.2.2 Summer

[Table 15 about here.]

The result in Table 15 shows that *climate* (`emeantemp`) is more important than *weather* (`exTemp`). Moreover, no signs of interaction between weather or climate and the rest of covariates (not shown).

5 Conclusion

Remains to be written, especially the discussion about temperature and mortality.

Used processing time (seconds):

```
    user   system  elapsed
1369.718 1182.758  302.344
```

Done: 2022-02-12 17:42:32.

References

Bengtsson, T. and Broström, G. (2010). Mortality crisis in rural southern Sweden 1766–1860. In Kurosu, T., Bengtsson, T., and Campbell, C., editors, *Demographic Response to Economic and Environmental Crisis*, pages 1–16. Reitaku University Press, Kashiwa.

Bengtsson, T. and Broström, G. (2011). Famines and mortality crises in 18th to 19th century southern Sweden. *Genus*, 67:119–139.

Broström, G. (2021a). *eha: Event History Analysis.* R package version 2.9.0. https://CRAN.R-project.org/package=eha.

Broström, G. (2021b). *Event History Analysis with R, Second Edition.* Chapman & Hall/CRC, Boca Raton.

Junkka, J., Karlsson, L., Lundevaller, E., and Schumann, B. (2021). Climate vulnerability of Swedish newborns: Gender differences and time trends of temperature-related neonatal mortality, 1880–1950. *Environmental Research*, 192. article id 110400.

Karlsson, L., Junkka, J., Schumann, B., and Häggström Lundevaller, E. (2021). Socioeconomic disparities in climate vulnerability: neonatal mortality in northern Sweden, 1880–1950. *Population and Environment*, 10.1007.

R Core Team (2021). *R: A Language and Environment for Statistical Computing.* R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org.

List of Tables

Table 1: Raw temperature data from first week of 1923, Umeå.

Date	Time	Temperature	Quality
1923-01-01	07:00:00	0.4	G
1923-01-01	13:00:00	0.6	G
1923-01-01	20:00:00	0.0	G
1923-01-02	07:00:00	-1.4	G
1923-01-02	13:00:00	-1.4	G
1923-01-02	20:00:00	-1.2	G
1923-01-03	07:00:00	0.4	G
1923-01-03	13:00:00	0.8	G
1923-01-03	20:00:00	1.2	G
1923-01-04	07:00:00	1.4	G
1923-01-04	13:00:00	1.2	G
1923-01-04	20:00:00	1.0	G
1923-01-05	07:00:00	-1.4	G
1923-01-05	13:00:00	-3.2	G
1923-01-05	20:00:00	-3.4	G
1923-01-06	07:00:00	1.0	G
1923-01-06	13:00:00	0.4	G
1923-01-06	20:00:00	0.4	G
1923-01-07	07:00:00	0.6	G
1923-01-07	13:00:00	0.4	G
1923-01-07	20:00:00	0.4	G

Table 2: Weekly summarized temperature data: Umeå 1923, first week.

week	year	mintemp	maxtemp	meantemp	emintemp	emaxtemp	emeantemp
1	1923	-3.4	1.4	-0.1	-17.73	-0.36	-7.54

Table 3: Data with communal covariates.

enter	exit	event	extemp	extemp.1	emeantemp	week	year
0.0000000	0.0180327	0	0	1	12.584483	35	1900
0.0180327	0.0372634	0	-4	0	11.286207	36	1900
0.0372634	0.0564942	0	-1	-4	10.086207	37	1900
0.0564942	0.0757250	0	1	-1	6.910345	38	1900
0.0757250	0.0949557	0	-2	1	5.315517	39	1900
0.0949557	0.1141865	0	0	-2	3.610345	40	1900

Table 4: Neonatal mortality, October to March.

Covariate	**Mean**	**Coef**	**H.R.**	**S.E.**	**L-R p**
extemp	−0.024	−0.005	0.995	0.006	0.447
extemp.1	−0.026	−0.012	0.988	0.006	0.053
emeantemp	−4.140	−0.020	0.980	0.006	0.001
socBranch					0.277
office	0.105	0	1	(reference)	
farming	0.471	−0.002	0.998	0.108	
none	0.024	0.122	1.130	0.169	
worker	0.400	0.111	1.117	0.093	
socStatus					0.237
high	0.591	0	1	(reference)	
low	0.409	−0.077	0.926	0.065	
period					0.000
(1895,1914]	0.354	0	1	(reference)	
(1914,1935]	0.372	−0.087	0.917	0.053	
(1935,1951]	0.275	−0.618	0.539	0.071	
urban					0.610
FALSE	0.863	0	1	(reference)	
TRUE	0.137	−0.044	0.957	0.087	
subreg					0.297
ume	0.296	0	1	(reference)	
ske	0.487	0.055	1.057	0.059	
inland	0.217	−0.040	0.961	0.074	
sex					0.000
boy	0.516	0	1	(reference)	
girl	0.484	−0.228	0.796	0.048	
parity					0.000
1	0.260	0	1	(reference)	
2-4	0.455	−0.334	0.716	0.059	
5+	0.285	−0.064	0.938	0.063	
Events	1806	TTR	3899		
Max. logLik.	−2170				

Table 5: Neonatal mortality, April to September.

Covariate	**Mean**	**Coef**	**H.R.**	**S.E.**	**L-R p**
extemp	0.022	0.001	1.001	0.012	0.910
extemp.1	0.019	0.007	1.007	0.012	0.529
emeantemp	9.817	−0.006	0.994	0.005	0.160
socBranch					0.042
office	0.107	0	1	(reference)	
farming	0.460	0.211	1.234	0.112	
none	0.026	0.410	1.506	0.159	
worker	0.407	0.125	1.133	0.098	
socStatus					0.391
high	0.582	0	1	(reference)	
low	0.418	0.058	1.060	0.067	
period					0.000
(1895,1914]	0.333	0	1	(reference)	
(1914,1935]	0.370	−0.126	0.881	0.056	
(1935,1951]	0.297	−0.533	0.587	0.072	
urban					0.061
FALSE	0.860	0	1	(reference)	
TRUE	0.140	−0.171	0.843	0.092	
subreg					0.617
ume	0.295	0	1	(reference)	
ske	0.485	0.045	1.046	0.061	
inland	0.220	−0.007	0.993	0.074	
sex					0.000
boy	0.511	0	1	(reference)	
girl	0.489	−0.217	0.805	0.049	
parity					0.000
1	0.269	0	1	(reference)	
2-4	0.451	−0.266	0.766	0.061	
5+	0.280	−0.103	0.902	0.066	
Events	1689	TTR	4026		
Max. logLik.	−2024				

Table 6: Postneonatal mortality, October to March 1895-1914.

Covariate	**Mean**	**Coef**	**H.R.**	**S.E.**	**L-R p**
extemp	−0.273	−0.018	0.982	0.007	0.017
extemp.1	−0.237	−0.016	0.984	0.008	0.036
emeantemp	−4.154	−0.050	0.951	0.008	0.000
socBranch					0.012
office	0.063	0	1	(reference)	
farming	0.557	0.274	1.315	0.166	
none	0.022	0.344	1.411	0.250	
worker	0.358	0.429	1.536	0.149	
socStatus					0.641
high	0.638	0	1	(reference)	
low	0.362	0.042	1.043	0.090	
urban					0.612
FALSE	0.938	0	1	(reference)	
TRUE	0.062	−0.066	0.936	0.131	
subreg					0.000
ume	0.305	0	1	(reference)	
ske	0.476	−0.392	0.676	0.070	
inland	0.218	−0.526	0.591	0.091	
sex					0.000
boy	0.514	0	1	(reference)	
girl	0.486	−0.269	0.764	0.061	
parity					0.000
1	0.187	0	1	(reference)	
2-4	0.423	−0.025	0.976	0.087	
5+	0.390	0.232	1.261	0.086	
Events	1111	TTR	15642		
Max. logLik.	−3884				

Table 7: Postneonatal mortality, Umeå, October to March 1895-1913.

Covariate	**Mean**	**Coef**	**H.R.**	**S.E.**	**L-R p**
extemp	−0.223	−0.014	0.986	0.013	0.266
extemp.1	−0.183	−0.016	0.984	0.013	0.210
emeantemp	−3.621	−0.013	0.987	0.012	0.292
socBranch					0.003
office	0.099	0	1	(reference)	
farming	0.425	0.644	1.904	0.259	
none	0.024	0.778	2.177	0.362	
worker	0.452	0.756	2.129	0.229	
socStatus					0.345
high	0.583	0	1	(reference)	
low	0.417	0.125	1.133	0.132	
urban					0.602
FALSE	0.827	0	1	(reference)	
TRUE	0.173	−0.076	0.927	0.147	
sex					0.009
boy	0.513	0	1	(reference)	
girl	0.487	−0.252	0.777	0.097	
parity					0.033
1	0.204	0	1	(reference)	
2-4	0.452	−0.115	0.891	0.131	
5+	0.344	0.167	1.182	0.132	
Events	436	TTR	4777		
Max. logLik.	−1429				

Table 8: Postneonatal mortality, Skellefteå with inland, October to March 1895-1913.

Covariate	**Mean**	**Coef**	**H.R.**	**S.E.**	**L-R p**
extemp	−0.294	−0.019	0.981	0.009	0.037
extemp.1	−0.260	−0.015	0.985	0.009	0.100
emeantemp	−4.388	−0.063	0.939	0.009	0.000
socBranch					0.384
office	0.046	0	1	(reference)	
farming	0.616	−0.037	0.964	0.215	
none	0.021	−0.047	0.954	0.346	
worker	0.317	0.153	1.166	0.196	
socStatus					0.950
high	0.663	0	1	(reference)	
low	0.337	−0.008	0.992	0.123	
urban					0.329
FALSE	0.987	0	1	(reference)	
TRUE	0.013	0.321	1.378	0.314	
sex					0.000
boy	0.514	0	1	(reference)	
girl	0.486	−0.279	0.757	0.078	
parity					0.006
1	0.179	0	1	(reference)	
2-4	0.411	0.041	1.042	0.117	
5+	0.410	0.279	1.322	0.114	
Events	675	TTR	10865		
Max. logLik.	−2444				

Table 9: Postneonatal mortality, October to March 1914-1934. Adjusted for sex, parity, and subregion.

Covariate	Mean	Coef	H.R.	S.E.	L-R p
extemp	−0.020	0.004	1.004	0.008	0.589
extemp.1	−0.044	−0.025	0.975	0.008	0.001
emeantemp	−4.170	−0.056	0.946	0.009	0.000
socBranch					0.038
office	0.098	0	1	(reference)	
farming	0.497	0.373	1.452	0.154	
none	0.026	0.176	1.193	0.236	
worker	0.380	0.350	1.419	0.129	
socStatus					0.000
high	0.600	0	1	(reference)	
low	0.400	0.328	1.388	0.092	
urban					0.442
FALSE	0.863	0	1	(reference)	
TRUE	0.137	−0.087	0.917	0.114	
subreg					0.000
ume	0.265	0	1	(reference)	
ske	0.508	−0.347	0.707	0.080	
inland	0.227	−0.451	0.637	0.100	
sex					0.000
boy	0.506	0	1	(reference)	
girl	0.494	−0.233	0.792	0.065	
parity					0.000
1	0.254	0	1	(reference)	
2-4	0.445	0.224	1.251	0.087	
5+	0.301	0.436	1.546	0.091	
Events	967	TTR	17087		
Max. logLik.	−3586				

Table 10: Postneonatal mortality, Umeå, October to March 1914-1934.

Covariate	**Mean**	**Coef**	**H.R.**	**S.E.**	**L-R p**
extemp	−0.118	0.019	1.019	0.015	0.216
extemp.1	−0.138	−0.022	0.978	0.015	0.131
emeantemp	−3.619	−0.061	0.941	0.016	0.000
socBranch					0.003
office	0.185	0	1	(reference)	
farming	0.388	0.697	2.009	0.249	
none	0.041	0.279	1.322	0.365	
worker	0.385	0.696	2.005	0.203	
socStatus					0.056
high	0.600	0	1	(reference)	
low	0.400	0.279	1.321	0.145	
urban					0.666
FALSE	0.637	0	1	(reference)	
TRUE	0.363	−0.065	0.937	0.150	
sex					0.001
boy	0.513	0	1	(reference)	
girl	0.487	−0.394	0.675	0.118	
parity					0.006
1	0.304	0	1	(reference)	
2-4	0.458	0.086	1.090	0.145	
5+	0.238	0.461	1.585	0.156	
Events	303	TTR	4522		
Max. logLik.	−1067				

Table 11: Postneonatal mortality, Skellefteå with inland, October to March 1914-1934.

Covariate	**Mean**	**Coef**	**H.R.**	**S.E.**	**L-R p**
extemp	0.015	−0.001	0.999	0.010	0.900
extemp.1	−0.011	−0.026	0.974	0.009	0.005
emeantemp	−4.369	−0.049	0.952	0.009	0.000
socBranch					0.926
office	0.066	0	1	(reference)	
farming	0.536	0.122	1.130	0.190	
none	0.020	0.060	1.062	0.309	
worker	0.378	0.056	1.058	0.163	
socStatus					0.001
high	0.600	0	1	(reference)	
low	0.400	0.387	1.473	0.120	
urban					0.932
FALSE	0.945	0	1	(reference)	
TRUE	0.055	0.016	1.016	0.186	
sex					0.039
boy	0.503	0	1	(reference)	
girl	0.497	−0.160	0.852	0.078	
parity					0.000
1	0.236	0	1	(reference)	
2-4	0.441	0.300	1.350	0.109	
5+	0.324	0.443	1.557	0.114	
Events	664	TTR	12566		
Max. logLik.	−2508				

Table 12: Postneonatal mortality, October to March 1935-1950. Adjusted for sex, parity, and subregion.

Covariate	**Mean**	**Coef**	**H.R.**	**S.E.**	**L-R p**
extemp.1	0.394	−0.007	0.993	0.013	0.591
emeantemp	−4.129	−0.057	0.944	0.016	0.000
socBranch					0.073
office	0.172	0	1	(reference)	
farming	0.313	0.571	1.771	0.249	
none	0.028	0.685	1.984	0.390	
worker	0.487	0.481	1.618	0.221	
socStatus					0.228
high	0.508	0	1	(reference)	
low	0.492	0.169	1.184	0.140	
urban					0.048
FALSE	0.764	0	1	(reference)	
TRUE	0.236	−0.383	0.682	0.198	
subreg					0.827
ume	0.318	0	1	(reference)	
ske	0.473	−0.098	0.907	0.159	
inland	0.210	−0.072	0.930	0.190	
sex					0.138
boy	0.516	0	1	(reference)	
girl	0.484	−0.182	0.834	0.123	
parity					0.012
1	0.375	0	1	(reference)	
2-4	0.502	0.006	1.006	0.140	
5+	0.123	0.494	1.639	0.179	
Events	268	TTR	13484		
Max. logLik.	−1267				

Table 13: Postneonatal mortality, Umeå, October to March 1935-1950.

Covariate	**Mean**	**Coef**	**H.R.**	**S.E.**	**L-R p**
extemp	0.376	0.014	1.014	0.031	0.650
extemp.1	0.364	0.003	1.003	0.031	0.936
emeantemp	−3.615	−0.037	0.964	0.031	0.226
socBranch					0.507
office	0.278	0	1	(reference)	
farming	0.226	0.475	1.608	0.416	
none	0.047	−0.267	0.766	0.760	
worker	0.450	0.405	1.499	0.330	
socStatus					0.154
high	0.543	0	1	(reference)	
low	0.457	0.381	1.463	0.266	
urban					0.053
FALSE	0.510	0	1	(reference)	
TRUE	0.490	−0.536	0.585	0.279	
sex					0.727
boy	0.519	0	1	(reference)	
girl	0.481	0.082	1.085	0.234	
parity					0.275
1	0.417	0	1	(reference)	
2-4	0.503	−0.005	0.995	0.257	
5+	0.080	0.568	1.765	0.364	
Events	73	TTR	4281		
Max. logLik.	−355				

Table 14: Postneonatal mortality, Skellefteå with inland, October to March 1895-1913.

Covariate	**Mean**	**Coef**	**H.R.**	**S.E.**	**L-R p**
extemp	0.407	−0.003	0.997	0.017	0.878
extemp.1	0.408	−0.011	0.989	0.017	0.516
emeantemp	−4.368	−0.065	0.937	0.017	0.000
socBranch					0.042
office	0.122	0	1	(reference)	
farming	0.354	0.702	2.018	0.329	
none	0.019	1.262	3.533	0.482	
worker	0.504	0.614	1.847	0.309	
socStatus					0.559
high	0.492	0	1	(reference)	
low	0.508	0.096	1.101	0.164	
urban					0.482
FALSE	0.883	0	1	(reference)	
TRUE	0.117	−0.192	0.825	0.280	
sex					0.048
boy	0.515	0	1	(reference)	
girl	0.485	−0.285	0.752	0.145	
parity					0.042
1	0.355	0	1	(reference)	
2-4	0.501	0.018	1.018	0.167	
5+	0.143	0.477	1.611	0.206	
Events	195	TTR	9203		
Max. logLik.	−901				

Table 15: Postneonatal mortality, April to September. Adjusted for sex, parity, time period, and subregion.

Covariate	**Mean**	**Coef**	**H.R.**	**S.E.**	**L-R p**
extemp	0.006	0.007	1.008	0.011	0.504
extemp.1	0.003	−0.012	0.988	0.011	0.287
emeantemp	9.963	−0.020	0.980	0.004	0.000
socBranch					0.000
office	0.107	0	1	(reference)	
farming	0.464	0.497	1.644	0.115	
none	0.025	0.342	1.407	0.172	
worker	0.403	0.453	1.572	0.100	
socStatus					0.000
high	0.587	0	1	(reference)	
low	0.413	0.302	1.352	0.065	
urban					0.008
FALSE	0.860	0	1	(reference)	
TRUE	0.140	−0.228	0.796	0.088	
period					0.000
(1895,1914]	0.340	0	1	(reference)	
(1914,1935]	0.370	−0.207	0.813	0.050	
(1935,1951]	0.291	−1.018	0.361	0.077	
subreg					0.000
ume	0.294	0	1	(reference)	
ske	0.487	−0.411	0.663	0.054	
inland	0.219	−0.435	0.647	0.067	
parity					0.000
1	0.266	0	1	(reference)	
2-4	0.455	0.038	1.039	0.062	
5+	0.279	0.312	1.367	0.065	
sex					0.000
boy	0.512	0	1	(reference)	
girl	0.488	−0.169	0.845	0.046	
Events	1914	TTR	45958		
Max. logLik.	−7639				