Answer Key: Problem Set 4

Applied Stats II

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Instructions

- *Please show your work! You may lose points by simply writing in the answer. If the problem requires you to execute commands in* `R`*, please include the code you used to get your answers. Please also include the* `.R` *file that contains your code. If you are not sure if work needs to be shown for a particular problem, please ask.*
- *Your homework should be submitted electronically on GitHub in* `.pdf` *form.*
- *This problem set is due before 23:59 on Wednesday April 12, 2024. No late assignments will be accepted.*

Question 1

We're interested in modeling the historical causes of child mortality. We have data from 26855 children born in Skellefteå, Sweden from 1850 to 1884. Using the "child" dataset in the `eha` *library, fit a Cox Proportional Hazard model using mother's age and infant's gender as covariates. Present and interpret the output.*

First, let's estimate our Cox proportional hazard model:

```
# load data on child mortality by mother's background and child gender
data("child")

# estimate duration Cox PH model that includes both predictors (child, mother)
infantMorality <- coxph(Surv(enter, exit, event) ~ m.age + sex, data = child)
```

Looking at Table 1, we can interpret the estimated coefficient for gender as the logged hazard ratio of boys with respect to girls for infants with mothers of the same age. If we exponentiate the estimated coefficient of gender (exp(coef)= 0.923), we see that girls are about 8% more likely to survive than girls with mothers of the same age (HR $<$ 1 = reduction in the hazard). Looking at the age coefficient, we can see that having an older mother (holding infant gender constant) is also a "poor prognostic factor" that increases the risk of death. More specifically,

a one unit increase in mother's age is associated with an increase in the logged hazard ratio for infants of the same gender.

Table 1: Cox Proportional Hazard model results

m.age	0.01^{***}
	(0.00)
sex_female	-0.08^{**}
	(0.03)
AIC	113010.97
# events	5616
N	26574

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$