Week 4 Quiz

TOTAL POINTS 9

1. Person 1 has hazard $h_1(t) = 1$, and Person 2 has hazard $h_2(t) = 2$. What is the probability of dying within the first year for each patient? 1 point

   Hint:

   The survival function $S(t)$ in terms of the hazard function is:

   $$S(t) = e^{-\int_0^t h(s)ds}$$

   - 0.6, 0.6
   - (selected) 0.63, 0.86
   - 0.37, 0.14

2. Let $T > 0$. 1 point

   For patient 1, let the survival function be $S_1(t)$ and the hazard function be $h_1(t)$.

   For patient 2, let the survival function be $S_2(t)$ and the hazard function be $h_2(t)$

   You see that $S_1(T) > S_2(T)$. The survival probability of patient 1 at time T is higher than the survival probability of patient 2 at time T.

Which of the following is true about the hazard of patient 1 and 2 at time T?

Hint:

$$S(t) = e^{-\int_0^t h(s)ds}$$

- ○ h_1(T) > h_2(T)
- ○ h_1(T) < h_2(T)
- ○ h_1(T) = h_2(T)
- ◉ None of the above

3. Now assume that the hazards for patient 1, h_1 and for patient 2, h_2 are proportional to each other. Also assume that $S_1(T) > S_2(T)$ for some T > 0. 1 point

Then which of the following is true about the hazards?

- ○ h_1(T) = h_2(T)
- ○ h_1(T) > h_2(T)
- ◉ h_1(T) < h_2(T)

4. You've fit a Cox model on 2 features: age and smoking status. 1 point

The coefficients of these features are:

$\beta_{age} = 0.9$ and $\beta_{smoker} = 10.0$.

What is the hazard ratio between Person 1, a 40 year old non-smoker, and Person 2, a 30 year old smoker?

Recall that Cox Proportional Hazards assumes a model of the form:

$$h(t) = \lambda_0(t)e^{(\beta_{age} \times Age + \beta_{smoker} \times Smoker)}$$

We're asking you to find the ratio:

$$\frac{h_1(t)}{h_2(t)}$$

- 2.64
- 0.36
- 2.7

5. You've fit a cox model and have the following coefficients: 1 point

$\beta_{female} = -1.0$

$\beta_{age} = 1.0,$

$\beta_{BP} = 0.6$

$$h(t) = \lambda_0(t)e^{((\beta_{female} \times female) + (\beta_{age} \times Age) + (\beta_{BP} \times BP))}$$

Which of the following interpretations is most correct?

- (●) All other things held equal, being a female decreases your risk
- ( ) All other things held equal, having lower age increases your risk
- ( ) All other things held equal, having higher BP decreases your risk

6. Assume h_1(t) = t, and h_2(t) = 1.0. At which time T > 0 does S_1(T) = S_2(T)? 1 point

- ( ) None of the above
- (●) 2
- ( ) 1
- ( ) 0.5

7. Using the Nelson-Aalen estimator estimate H(7), the value of the cumulative hazard at t=7 for this dataset. 1 point

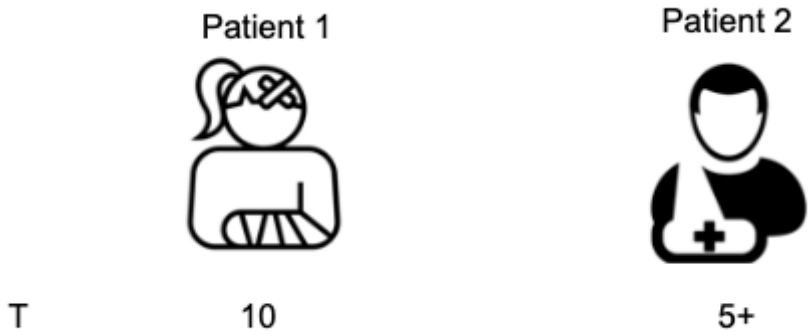
ID	Outcome
1	3
2	4
3	8
4	6+

The Nelson-Aalen estimator is:

$$H(t) = \sum_{i=0}^{t} \frac{d_i}{n_i}$$

- ○ 8/11
- ◉ 7/12
- ○ 5/9

8. Which risk assignments would make this pair **concordant**? 1 point



- ○ 0.3, 0.8
- ○ 0.5, 0.3
- ○ 0.5, 0.5
- ◉ The pair is not permissible

9. Compute the Harrell C-index for the following dataset and risk scores:

1 point

ID	Outcome	Score
1	4	1.6
2	6+	1.2
3	5	0.8
4	7	0.1

Step 1: Find all the permissible pairs

Step 2: of the permissible pairs, determine which ones are concordant.

Step 3: of the permissible pairs, determine which ones are risk ties.

$$\text{Harrell's c-index} = \frac{concordant + 0.5 \times riskties}{permissible}$$

- ○ 1.0
- ◉ 0.8
- ○ 0.7

☐ I, **Mirko Jerber Rodriguez Mallma**, understand that submitting work that isn't my own may result in permanent failure of this course or deactivation of my Coursera account.
Learn more about Coursera's Honor Code