Confidence intervals

Last time: Wald confidence intervals

Example: Titanic data

$$\log\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 Sex_i + \beta_2 Age_i + \beta_3 SecondClass_i + \beta_4 FirstClass_i + \beta_5 Sex_i \cdot Age_i$$

```
...
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.408232   0.330916   1.234 0.217337
## Sexmale     -1.163444   0.437622  -2.659 0.007848 **
## Age         -0.007186   0.011684  -0.615 0.538522
## Pclass2      1.191858   0.243233   4.900 9.58e-07 ***
## Pclass1      2.697561   0.295822   9.119  < 2e-16 ***
## Sexmale:Age -0.049851   0.014782  -3.373 0.000745 ***
...
```

Confidence intervals for linear combinations

Class activity

https://sta712-f22.github.io/class_activities/ca_lecture_16.html

Inverting the likelihood ratio test

Types of research questions

So far, we have learned how to answer the following questions:

- What is the relationship between the explanatory variable(s) and the response?
- What is a "reasonable range" for a parameter in this relationship?
- Do we have strong evidence for a relationship between these variables?

> What other kinds of research questions might we ask?

Making predictions

- For each passenger, we calculate $\hat{p}_i$ (estimated probability of survival)
- But, we want to predict *which* passengers actually survive

> How do we turn $\hat{p}_i$ into a binary prediction of survival / no survival?

Confusion matrix

		Actual	
		$Y = 0$	$Y = 1$
Predicted	$\widehat{Y} = 0$	344	70
	$\widehat{Y} = 1$	80	220

> Did we do a good job predicting survival?