

Logistic regression interpretation

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Warmup activity

Work on the activity (handout) with a neighbor, then we will discuss as a class.

Warmup

$$\log\left(\frac{\hat{\pi}_i}{1 - \hat{\pi}_i}\right) = -2.45 + 0.22 \text{ Age}_i$$

What is the predicted probability of dengue for a 10 year old patient?

Warmup

$$\log\left(\frac{\hat{\pi}_i}{1 - \hat{\pi}_i}\right) = -2.45 + 0.22 \text{ Age}_i$$

Suppose we want to identify patients for whom the predicted probability of dengue is at least 0.5. What age range should we focus on?

Warmup

$$\log\left(\frac{\hat{\pi}_i}{1 - \hat{\pi}_i}\right) = -2.45 + 0.22 \text{ Age}_i$$

Compare the odds of dengue for a 12 year old patient to the odds of dengue for an 11 year old patient. What do you notice?

Interpretation

$$\log\left(\frac{\hat{\pi}_i}{1 - \hat{\pi}_i}\right) = -2.45 + 0.22 \text{ Age}_i$$

Recap: logistic regression

$$Y_i \sim \textit{Bernoulli}(\pi_i)$$

$$\log\left(\frac{\pi_i}{1 - \pi_i}\right) = \beta_0 + \beta_1 \textit{Age}_i$$

Adding more variables

Now let's add WBC as a variable to the model:

```
m2 <- glm(Dengue ~ Age + WBC, data = dengue,  
          family = binomial)  
summary(m2)
```

$$\log\left(\frac{\hat{\pi}_i}{1 - \hat{\pi}_i}\right) = 0.34 + 0.15 \text{ Age}_i - 0.31 \text{ WBC}_i$$

How should I interpret each coefficient in the fitted model?

Adding more variables

What about a *categorical* predictor?

```
m3 <- glm(Dengue ~ Age + Abdominal, data = dengue,  
          family = binomial)  
summary(m3)
```

$$\log\left(\frac{\hat{\pi}_i}{1 - \hat{\pi}_i}\right) = -0.25 + 0.22 \text{ Age}_i + 0.21 \text{ Abdominal}_i$$

How should I interpret the coefficient on abdominal pain?

For next time

Reading: in the textbook, read

- + sections 6.7.1 - 6.7.3
- + sections 2.2 - 2.4