WS #7 - Interaction

Math 150, Jo Hardin

Monday, February 17, 2025

Your Name: _____

Names of people you worked with: _____

What is your favorite snack? Can you get it in Claremont?

Task: The Heart and Estrogen/progestin Replacement Study (HERS) is a randomized, double-blind, placebo-controlled trial designed to test the efficacy and safety of estrogen plus progestin therapy for prevention of recurrent coronary heart disease (CHD) events in women. Below are two logistic regressions which aim to model whether the individuals had a pre-existing medical condition (other than CHD, self reported), `medcond`, using (here) the variables `age` and `diabetes`.

```
glm(medcond ~ age + diabetes, data = HERS, family="binomial") |> tidy()
```

```
# A tibble: 3 x 5
  term        estimate std.error statistic      p.value
  <chr>          <dbl>     <dbl>     <dbl>        <dbl>
1 (Intercept)  -1.89     0.408       -4.64 0.00000349
2 age           0.0185   0.00603      3.07 0.00217
3 diabetes      0.487    0.0882       5.52 0.0000000330
```

```
glm(medcond ~ age*diabetes, data = HERS, family="binomial") |> tidy()
```

```
# A tibble: 4 x 5
  term          estimate std.error statistic     p.value
  <chr>            <dbl>     <dbl>     <dbl>       <dbl>
1 (Intercept)   -2.52     0.478       -5.26 0.000000141
2 age            0.0278   0.00707      3.93 0.0000844
3 diabetes       2.83     0.914        3.10 0.00192
4 age:diabetes  -0.0354   0.0137      -2.58 0.00986
```

Find the following odds ratio: odds of having a medical condition for those with diabetes (coded as 1) as compared to the odds of having a medical condition for those without diabetes (coded as 0) under three different settings:

a. Use the additive model with `age` and `diabetes`.

b. Use the model where `age` and `diabetes` interact for someone who is 50 years old.

c. Use the model where `age` and `diabetes` interact for someone who is 70 years old.

d. Using the OR values, does it seem that `age` and `diabetes` interact in predicting `medcond`? Explain.

Solution:

a. OR $= e^{0.487} = 1.627$
b. OR $= e^{2.835-0.0354 \cdot 50} = 2.901$
c. OR $= e^{2.835-0.0354 \cdot 70} = 1.429$
d. Although the full conclusion should probably use p-values[1] or confidence bounds, the change in OR from 2.9 to 1.4 across a 20 year age span indicates that `age` and `diabetes` do interact.

[1] note, the p-value in the interaction model is definitely significant at 0.0098, indicating interaction