

# HW 5

- (35pt) Let  $\pi$  denote the probability that a randomly selected individual supports laws legalizing abortion predicted using gender ( $G = 0$  if gender is male and  $G = 1$  if gender is female), religion affiliation (protestant, catholic or jewish;  $R_1 = 1$  if Protestant and 0 otherwise;  $R_2 = 1$  if Catholic and 0 otherwise;  $R_1 = R_2 = 0$  if Jewish) and political party (democrat, republican or independent ;  $P_1 = 1$  if Democrat and 0 otherwise;  $P_2 = 1$  if Republican and 0 otherwise;  $P_1 = P_2 = 0$  if independent). The model used is

$$\text{logit}(\hat{\pi}) = \beta_0 + \beta_1 G + \beta_2 R_1 + \beta_3 R_2 + \beta_4 P_1 + \beta_5 P_2.$$

and the estimated logit model is

$$\text{logit}(\hat{\pi}) = 0.11 + 0.16G - 0.57R_1 - 0.66R_2 + 0.47P_1 - 1.67P_2.$$

- (2pt) Estimate the probability that a male, protestant and republican supports laws legalizing abortion. Estimate the probability that female, catholic and democrat supports laws legalizing abortion
  - (2pt) Interpret  $b_1 = 0.16$  and  $b_2 = -0.57$ .
  - (3pt) If  $\text{SE}(b_1) = 0.064$  construct a 95% confidence interval for  $\beta_1$  and interpret your result.
  - (2pt) Test  $H_0 : \beta_1 = 0$  against  $H_1 : \beta_1 \neq 0$
  - (3pt) If  $\text{SE}(b_2) = 0.38$  construct a 95% confidence interval for  $\beta_2$  and interpret your result.
- The Table below appeared in a national study of 15 and 16 year old adolescents. The event of interest is ever having sexual intercourse. The goal is to study the effect if any of race and gender on having sexual intercourse (Yes, No).

Race	Gender	Intercourse	
		Yes	No
White	Male	43	134
	Female	26	169
Black	Male	29	23
	Female	22	36

Consider the following model

$$\text{logit}(\pi(\text{Intercourse}=\text{Yes}|\text{Gender}, \text{Race})) = \beta_0 + \beta_1\text{Gender} + \beta_2\text{Race}$$

- (a) (2pt) Estimate  $\beta_1$  and  $\beta_2$  and interpret your result
- (b) (2pt) Estimate the probability of yes for a black female. Estimate the probability of yes for a white male.
- (c) (2pt) Construct a 95% confidence interval to describe the effect of gender on the odds of Intercourse controlling for race (i.e. construct a 95% interval for  $e^{\beta_1}$ ), Interpret your result
- (d) (2pt) Test  $H_0 : \beta_1 = 0$  against  $H_a : \beta_1 \neq 0$ . Use  $\alpha = 0.05$ .