STAT 512 HW5

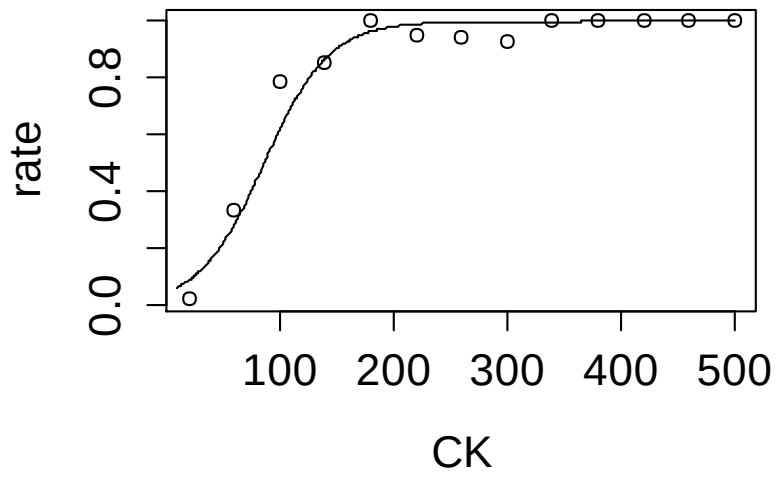
40 points Total, 2 pt per problem unless otherwise noted.

#1 CK Heart Simple Logistic Regression

A. Summary

```
Coefficients:
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.028360   0.366977  -8.252   <2e-16 ***
CK           0.035104   0.004081   8.602   <2e-16 ***
```

B. Plot with logistic curve overlaid



C. Odds Ratio = 1.036, CI = (1.028, 1.045)

D. **(4 pts)** Odds Ratio (for 10 pt increase) = exp(0.0351*10)= 1.420, so a 10 pt increase in CK is associated with an 1.4 times increased odds of heart attack.

E. Pseudo R2 = 0.856

F. CK = 148.858

#2 Low Birth Weight multiple logistic regression

A. Low vs Race (**4 pts**)

```
      low
race         0         1
   1 0.7604167 0.2395833
   2 0.5769231 0.4230769
   3 0.6268657 0.3731343

Chi-square p-value = 0.08189
```

B. Low vs Smoke (**4 pts**)

```
      low
smoke         0         1
    0 0.7478261 0.2521739
    1 0.5945946 0.4054054

Chi-square p-value = 0.03958
```

C. emmeans for smoke (**4 pts**)

```
smoke      prob         SE  df asymp.LCL asymp.UCL
 0     0.2521739 0.04049497 Inf 0.1812470 0.3393525
 1     0.4054054 0.05707414 Inf 0.3000509 0.5202566
```

D. (**4 pts**) AIC model includes mwt, race and smoke

```
Coefficients:
      Estimate Std. Error z value Pr(>|z|)
(Intercept) -0.10922    0.88211  -0.124  0.90146
mwt         -0.01326    0.00631  -2.101  0.03562 *
race2        1.29009    0.51087   2.525  0.01156 *
race3        0.97052    0.41224   2.354  0.01856 *
smoke1       1.06001    0.37832   2.802  0.00508 **

Analysis of Deviance Table (Type III tests)
            LR Chisq Df Pr(>Chisq)
mwt     4.9601  1   0.025939 *
race    9.3260  2   0.009438 **
smoke   8.2444  1   0.004088 **
```

E. Odds Ratio = 2.886, 95%CI = (1.395, 6.198)

F. emmeans for Smoke

```
smoke      prob         SE  df asymp.LCL asymp.UCL
 0     0.2540822 0.04668634 Inf 0.1736805 0.3556828
 1     0.4957621 0.07100197 Inf 0.3603980 0.6317504
```

G. Tukey adjusted comparisons for race (**4 pts**)

contrast	odds.ratio	SE	df	z.ratio	p.value
1 / 2	0.2752448	0.1406157	Inf	-2.525	**0.0310**
1 / 3	0.3788879	0.1561908	Inf	-2.354	**0.0487**
2 / 3	1.3765489	0.7235152	Inf	0.608	0.8157

White mothers (race group 1) have significantly lower odds of having a low birthweight baby as compared to black mothers (race group 2) or other mothers of other races (race group 3).

H. H-L test p-value = 0.4997. Fail to Reject H0. No evidence of lack of fit.

```
#1 CK heart data
CKheart <- read.csv("C:/hess/STAT512/HW_2019/HW5/CKheart.csv")
str(CKheart)
#A
Model1 <- glm(cbind(withHA, withoutHA) ~ CK, family =
binomial(link = "logit"), data = CKheart)
summary(Model1)
#B
CKheart$rate <- CKheart$withHA/(CKheart$withHA +
CKheart$withoutHA)
NewData <- seq(10, 500, 1)
phat <- predict(Model1, list(CK = NewData), type = "response")
plot(rate ~ CK, data = CKheart)
lines(phat ~ NewData)
#C
exp(Model1$coef)
exp(confint(Model1))
#E
NullModel <- glm(cbind(withHA, withoutHA) ~ 1, family =
binomial(link = "logit"), data = CKheart)
1-logLik(Model1)/logLik(NullModel)
#F
library(MASS)
probs <- seq(0.1, 0.9, 0.05)
ld <- dose.p(Model1, cf = 1:2, p = probs)
ld
```

```
#2 Low BW data
BirthData <-
read.csv("C:/hess/STAT512/HW_2019/HW5/birthweight.csv")
str(BirthData)
BirthData$race <- as.factor(BirthData$race)
BirthData$smoke <- as.factor(BirthData$smoke)
str(BirthData)
```

```
#A
Table1 <- with( table(race, low), data = BirthData)
prop.table(Table1, 1)
chisq.test(Table1)
#B
Table2 <- with( table(smoke, low), data = BirthData)
prop.table(Table2, 1)
chisq.test(Table2)
#C
Model1 <- glm(low ~ smoke, family=binomial, data = BirthData)
library(emmeans)
emmeans(Model1, ~ smoke, type = "response")
#D
library(MuMIn)
library(car)
FullModel <- glm(low ~ ., family=binomial, data = BirthData)
options(na.action = "na.fail")
dredge(FullModel, rank="AIC")
Model2 <- glm(low ~ mwt + race + smoke, family = binomial, data
= BirthData)
summary(Model2)
Anova(Model2, type = 3)
#E
exp(Model2$coef)
exp(confint(Model2))
#F
emmeans(Model2, pairwise ~ smoke, type = "response")
#G
emmeans(Model2, pairwise ~ race, type = "response")
#H
library(ResourceSelection)
hoslem.test(Model2$y, fitted(Model2), g = 10)
```