**Question 1:**

1. g(missing) = β0 + β1\*Sex\_2+ β2\*Sex\_3 + β3\*Sex\_4
2. OR(missing) = exp (β0 + β1\*Sex\_2+ β2\*Sex\_3 + β3\*Sex\_4)
3. Probability(missing) = OR(missing)/[1+OR(missing)]

**Question 2:**



1. -.530057 + -0.2053926 = **-0.7354496**
2. e^-0.7354496 = **0.4792899217769318**
3. 0.4792899217769318/1.4792899217769318 = **0.32399**

**Question 3:**

1. OR = exp(-β1)= exp(.1273721) = **1.136**

CI = -β1 ±1.96\*SE(β1) = .1273721±1.96\*(.20508) = (-.2745847,.529) => exp(-.2745847,.529) = **(.759,1.697)**

**Odds of missing a chip among male-neutered were 13.6% greater than those male-unneutered.**

1. OR = exp(β3- β4) = exp(.161793) = **1.176**



CI = (exp(-.25316),exp(.576746)) = **(0.776,1.780)**

**Odds of missing a chip among female-spayed were 17.6% greater than those female-not-spayed.**

**Question 4:**

**G = 2log[likelihood (full model)] – 2log[likelihood (intercept-only model)]**



G = 2\*(-558.05522) – 2\*(-559.77908) = **3.44772**.

G < X20.95 (3) = **3.45**.

**Fail to Reject H0; There is not sufficient evidence that the odds of missing a chip differ across the categories of sex. (Sex is related to Odds of missing a chip?)**

**Question 5:**



g(missing) = -.8977781+ 0.609222\*age - .545649\*breed-.0491282\*Sex\_2- .0631929\*Sex\_3 - .214593\*Sex\_4 -.163809\*species - .0124464\*weight - .1005622\*sp\_age + .7632388\*sp\_breed + .0317638\*sp\_wt

**Question 6:**

1. Increase of 2.2 lbs in weight of dogs

β0 + (1)β6 + (2.2)[β7 + β10] = -.8977781 + -.545649 + 2.2\*[-.0124464 +.0317638] = -1.40092882 =>

exp(-.1.40092882) = **0.246 = OR**

**When all other predictors are held constant, there is a 75.4% decrease in odds of missing a chip for every 2.2 lbs increase in the weight of dogs.**

1. Increase of 2.2 lbs in weight of cats

β0 + (0)β6 + (2.2)β7 + (0)β10 = -.8977781 + 2.2\*-.0124464 = -.092516018 => exp(-.092516018) = **0.912 = OR**

**When all other predictors are held constant, there is an 8.8% decrease in odds of missing a chip for every 2.2 lbs increase in the weight of cats.**

1. Odds ratio comparing pure bred dogs to non-pure bred

OR = = = exp(β2+ β9) = exp(-.545649+.7632388) = **1.243**

**Odds of missing a chip among pure bred dogs are 1.243 times that of non-pure bred dogs, when all other predictors are held constant.**

1. Odds ration comparing pure bred cats to non-pure bred

OR = = = exp(β2) = exp(-.545649) = **0.579**

**Odds of missing a chip among pure bred cats are 0.579 times that of non-pure bred cats, when all other predictors are held constant.**

**Question 7:**



G = 2\*(-543.03583) – 2\*(-543.76296) = **1.45426**.

G < X20.95 (3) = **32.03**.

**Fail to Reject H0; There is insufficient evidence to suggest that the interaction between species and age is statistically significant.**

**Question 8:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Step** | **Predictor Removed** | **LR p-value** | **Log likelihood** | **AIC** | **BIC** |
| 0 | - | - | -543.03583 | 1108.07166 | 1160.62577 |
| 1 | Sp\_breed | 0.4820 | -543.28297 | 1106.56594 | 1154.34241 |
| 2 | Sp\_wt | 0.3958 | -543.6435 | 1105.287 | 1148.28582 |
| 3 | Sp\_age | 0.3689 | -544.0472 | 1104.0944 | 1142.31557 |
| 4 | age | 0.9308 | -544.05097 | 1102.10194 | 1135.54547 |
| 5 | Sex\_2, sex\_3, sex\_4 | 0.8189 | -544.51459 | 1097.02918 | 1116.13977 |
| 6 | Species | 0.5496 | -544.69364 | 1095.38728 | 1109.72022 |
| 7 | breed | 0.5165 | -544.90413 | 1093.80826 | 1103.36355 |

Final Model:

**g(missing) = β0 + β1\*weight**

**Question 9:**

In each step of the model selection, the Log likelihood decreased, in addition to both the AIC and the BIC. Since models with smaller log likelihoods, AIC and BIC are preferred, the final model that I reached is the best fit in terms of all the criterion.

**Question 10:**



**At the 0.1 significance level, we fail to reject the null hypothesis. This would indicate that the model does fit the data.**

**Question 11:  
**

**This model has some discrimination towards the Sensitivity. With the higher sensitivity, this data model will identify more animals that are high risk of having their chips missed.**

**Question 12:**

The final model here (Question 8), has only one predictor. That predictor being weight. With a coefficient of 0.0185919, the odds are e0.0185919 = 1.01877. **For every one pound increase in weight, there is a 1.877% increase in the odds of missing a chip.**