**Analysis of Penguin Species Distribution and Island Association**

**Chi-Square Goodness of Fit Test**

The first analysis employed a Chi-Square Goodness of Fit Test to assess whether the observed distribution of penguin species aligns with an expected uniform distribution. In other words, the test evaluated the null hypothesis that each of the three species (Adélie, Chinstrap, and Gentoo) is equally represented in the dataset.

The observed frequencies of each species were tallied, and expected frequencies were calculated assuming an equal distribution across the three categories. The resulting chi-squared statistic was with 2 degrees of freedom, leading to a p-value of This extremely low p-value indicates strong evidence against the null hypothesis. Therefore, we reject the notion of a uniform distribution of species within the dataset.

**Chi-Square Test for Independence**

The second analysis involved a Chi-Squared Test of Independence to investigate a potential association between penguin species and the island they inhabit. The null hypothesis for this test posits that species and island are independent variables, meaning no relationship exists between the two.

A contingency table was constructed to summarize the co-occurrence of species and island. The subsequent chi-squared test yielded a chi-squared statistic of with 4 degrees of freedom and a p-value less than . Similar to the previous test, the exceptionally low p-value provides compelling evidence to reject the null hypothesis. Consequently, we conclude that there is a statistically significant association between penguin species and their island of origin.

**Conclusion**

The analyses conducted demonstrate that the distribution of penguin species within the dataset is not uniform and that there is a significant association between species and island habitat. Further investigations could explore the nature of this association, such as identifying which species are prevalent on specific islands and examining potential ecological factors influencing these patterns.