Homework 4: Fatal Injuries in the Iliad

Chi-square Test of Independence

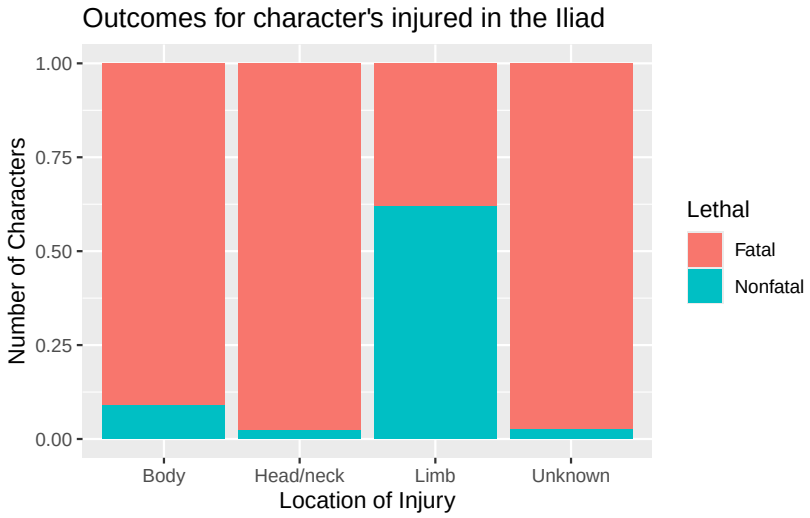
Homer's Iliad is an epic poem, compiled around 800 BCE, that describes several weeks of the last year of the 10-year siege of Troy (Ilion) by the Achaeans. The story centers on the rage of the great warrior Achilles. But it includes many details of injuries and outcomes, and is thus the oldest record of Greek medicine. The data report 146 recorded injuries for which both injury site and outcome are provided in the Iliad (Hutchinson, 2013). The top 6 rows of the recorded injuries is shown below:

```
# A tibble: 6 x 3
  Poem          InjurySite Lethal
  <chr>         <chr>      <chr>
1 Homer's Iliad Head/neck  Fatal
2 Homer's Iliad Body       Fatal
3 Homer's Iliad Limb       Nonfatal
4 Homer's Iliad Limb       Fatal
5 Homer's Iliad Head/neck  Fatal
6 Homer's Iliad Head/neck  Fatal
```

Research Question: Is the location of an injury associated with whether the injury was fatal?

1. Identify the explanatory and response variables in the context of this study.

2. How would you describe the position of this bar plot? Filled Stacked Dodged



3. Based on the plot does there appear to be an association between the variables? Explain your answer.

We can summarize the recorded injuries in a contingency table:

InjurySite	Fatal	Nonfatal	Total
Body	61	6	67
Head/neck	44	1	45
Limb	13	21	34
Unknown	37	1	38
Total	155	29	184

4. Which injury location has the smallest number of observations?

5. Were there more fatal injuries or nonfatal injuries overall?

6. What proportion of body injuries were fatal?

$$\hat{p}_{\text{fatal|body}} =$$

7. What proportion of limb injuries were fatal?

$$\hat{p}_{\text{fatal|limb}} =$$

8. Set up the null and alternative hypotheses to test the research question.

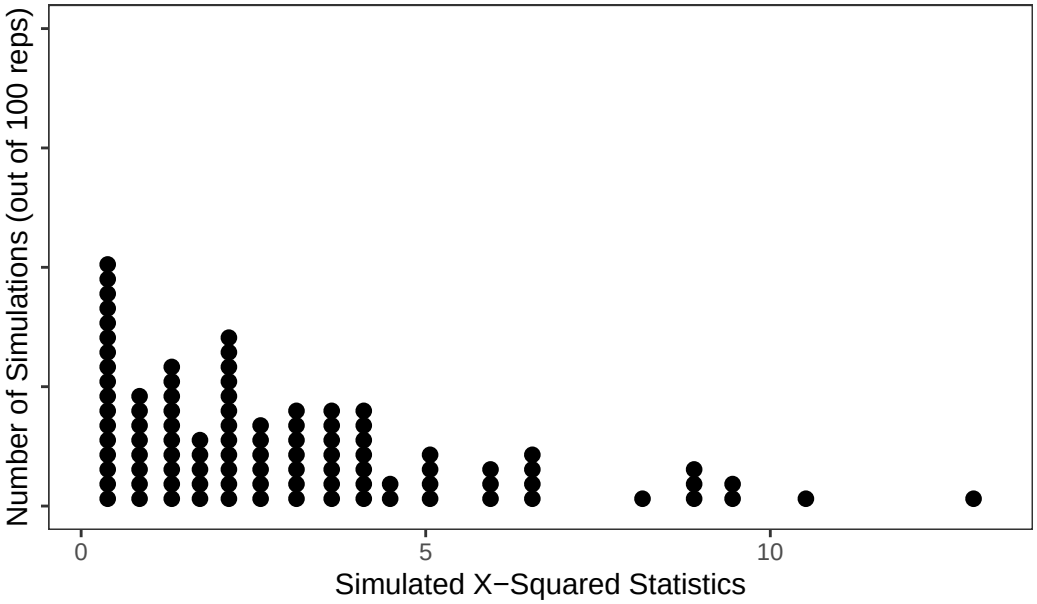
9. In the table below, fill in the *expected* counts.

	Fatal	Nonfatal
Body		
Head/neck		
Limb		
Unknown		

10. Use the observed and expected counts to compute the Chi-square test statistic.

$$X^2 =$$

After running 100 simulations under the assumption the location of an injury is not associated with whether the injury was fatal, I obtained the following distribution.



11. Use the simulated distribution of the Chi-square test statistic under the assumption location of an injury is not associated with whether the injury was fatal to estimate your p-value and make a decision about your null hypothesis.

12. Is it appropriate us the Chi-square distribution to test our research question?

13. How many degrees of freedom would the Chi-square distribution for our Test Statistic follow?

14. Select the correct code/output for the Chi-square Test to investigate this question.

a.

```
chisq_test(x = iliad,
           response = Lethal,
           explanatory = InjurySite,
           correct = FALSE
           )
```

```
# A tibble: 1 x 3
  statistic chisq_df  p_value
      <dbl>    <int>    <dbl>
1      67.7        3 1.34e-14
```

b.

```
chisq_test(x = iliad,
           response = Lethal,
           correct = FALSE
           )
```

```
# A tibble: 1 x 3
  statistic chisq_df  p_value
      <dbl>    <dbl>    <dbl>
1      86.3        1 1.56e-20
```

c.

```
chisq_test(x = iliad,
           response = Lethal,
           p = c(0.84,0.16)
)
```

```
# A tibble: 1 x 3
  statistic chisq_df p_value
      <dbl>    <dbl>   <dbl>
1   0.00783        1   0.929
```

19. Write a conclusion and make sure to include your evidence.

20. Based on the study design and data collection method, what conclusions can we draw regarding the relationship between injury location and fatal outcomes? Can these findings be generalized to a broader population? Explain why or why not.

Canvas Quiz

Make sure to complete the Homework Quiz on Canvas.