<u>Module 5A Questions:</u>

1. <u>Revisit this Example:</u>

The influence of SES on preterm delivery rates. This time, focus on the two extreme categories, Upper and Lower, so you can use Odds Ratio instead and compare your answer to the X^2 Contingency Analysis result.

Socio-Economic status	Cases	Controls
Upper	11	40
Upper-middle	14	45
Middle	33	64
Lower-middle	59	91
Lower	53	58
Unknown	5	5

You do not need to do a transformation, but – in case you are interested in how you would transform the right skewed OR into a normal distribution that can then be used to calculate a confidence interval, here is the process:

<u>Example:</u> The influence of SES on preterm delivery rates

Step 1: *Odds ratio = (a/c)/(b/d) = x.xx*

Step 2: *Calculate ln(OR):*

$$\ln(x.xx) = y.yy$$

Step 3: *The confidence interval for the* ***ln (OR)*** *is a normally distributed sampling distribution; we can use* ***Z****. *So, for a 95% confidence interval (α = 0.05), we can use 1.96.*

$$\ln(\widehat{OR}) - 1.96*\ln(SE_{OR}) < \ln(OR) < \ln(\widehat{OR}) + 1.96*\ln(SE_{OR})$$

then you need to transform the lower and upper boundaries back into the original scale:

$$e^{-lowerboundary} < OR < e^{-upper\ boundary}$$

2. **Are there sex differences in hyperglycemia in the 12-mouse data set?**

Researchers conducted a 12-week dietary intervention experiment in 12 mice from three genetic backgrounds (B6, BALB, CAST) were fed regular mouse chow or a High-Fat Diet (HFD). Various measurements were taken, and at the end, each mouse was assessed for hyperglycemia ("Yes" or "No").

ID	Strain	Diet	Sex	Weight0	Weight12	Glucose12	Activity	Pparg	I16	Hyperglycemia
M1	B6	Chow	M	20	22	118	3.0	6	4	No
M2	B6	Chow	F	19	21	116	3.5	6	4	No
M3	B6	HFD	M	20	27	162	6.0	8	7	Yes
M4	B6	HFD	F	19	26	160	6.5	8	7	Yes
M5	BALB	Chow	M	19	21	114	4.0	6	4	No
M6	BALB	Chow	F	18	20	112	4.5	6	3	No
M7	BALB	HFD	M	19	25	158	7.0	7	7	Yes
M8	BALB	HFD	F	18	24	156	7.5	7	6	Yes
M9	CAST	Chow	M	18	20	110	5.0	6	3	No
M10	CAST	Chow	F	17	19	108	5.5	6	3	No
M11	CAST	HFD	M	18	24	154	8.0	7	6	No
M12	CAST	HFD	F	17	23	152	8.5	7	6	No

a. **Construct a 2×2 contingency table** comparing
   Exposure: Sex (Male vs Female)
   Outcome: Hyperglycemia (Yes vs No)
b. **Calculate the odds ratio (OR)** for hyperglycemia in **males compared to females** using the standard formula:

$$\text{OR} = \frac{a \times d}{b \times c}$$

c. **Calculate the 95% confidence interval** for the odds ratio using:

$$\ln(\text{OR}) \pm 1.96\sqrt{\frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d}}$$

   Then exponentiate the lower and upper bounds to obtain the CI.
d. **Interpret the OR and its CI** in biological terms:

- Do males appear to have higher, lower, or similar odds of hyperglycemia compared to females?
- What does the width of the CI tell you about certainty given the small sample size?