Part 1
Lecture 1c GAMES AND CONCEPTS

1

```
TITLE1  "  FREQ PROCEDURE IS FIRST PROGRAM RUN  " ;

DATA  FINAL ; INPUT CURE $  N  @@ ;
DATALINES ;
NO   2  YES  8
RUN ;

PROC  FREQ  DATA = FINAL ; WEIGHT  N ;
TABLES  CURE  /  BINOMIAL  ;  EXACT  BINOMIAL  ;  RUN ;
```

CURE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
NO	2	20.00	2	20.00
YES	8	80.00	10	100.00

Binomial Proportion
For CURE = NO the Proportion (P) is 0.2000 with a Sample Size of 10

RESULTS FROM SAS FREQ PROCEDURE (continued)

Binomial Proportion	
CURE = NO	
Proportion (P)	0.2000
ASE	0.1265
95% Lower Conf Limit	0.0000
95% Upper Conf Limit	0.4479
Exact Conf Limits	
95% Lower Conf Limit	0.0252
95% Upper Conf Limit	0.5561

Test of H0: Proportion = 0.5	
ASE under H0	0.1581
Z	-1.8974
One-sided Pr < Z	0.0289
Two-sided Pr > |Z|	0.0578
Exact Test	
One-sided Pr <= P	0.0547
Two-sided = 2 * One-sided	0.1094

[ASE = Asymptotic standard error]

MY NOTE: Because p value is greater than 0.05 95% CI contains P = 0.50

A popular measure of the size of the variability expected between sample proportions repeatedly selected from a population is called the standard error.

Standard Error(SE)of a Sample Proportion p

$$SE = \sqrt{\frac{p \times q}{n}} = \sqrt{\frac{p \times (1-p)}{n}} \qquad p = 0.8$$

Standard Error of a Sample Proportion
under the Assumption that the Probability of Success is P

$$SE = \sqrt{\frac{P \times Q}{n}} = \sqrt{\frac{P \times (1-P)}{n}} \qquad P = 0.50$$

In the previous output from the FREQ procedure the standard error of a proportion was reported twice.

First, for the observed proportion p = 0.2 and next for the proportion expected under the Null Hypothesis P = 0.50. In both cases n=10.

$$Standard\ Error\ of\ Proportion\ (2/10) = 0.2$$

$$SE = \sqrt{\frac{0.2 \times 0.8}{10}} = 0.1265$$

$$Standard\ Error\ of\ Probability\ 0.5\ for\ n = 10$$

$$SE = \sqrt{\frac{0.5 \times 0.5}{10}} = 0.1581$$

Exact Conf Limits	95% Lower Conf Limit	**0.0252**
	95% Upper Conf Limit	**0.5561**

Test of H0:	Proportion = 0.5	
Exact Test	One-sided Pr <= P	0.0547
	Two-sided = 2 * One-sided	**0.1094**

MY NOTE: The 2-Tail p value = 0.1094 and the 95% confidence interval does contain 0.5.

The Null Hypothesis (H_0) is that $P_{H0} = 0.50$

```
TITLE1  "  FREQ PROCEDURE IS FIRST PROGRAM RUN  " ;

DATA  FINAL ; INPUT CURE $  N  @@ ;
DATALINES ;
NO   1   YES   9
RUN ;

PROC  FREQ  DATA = FINAL ; WEIGHT  N ;
TABLES  CURE  /  BINOMIAL  ;  EXACT  BINOMIAL  ;  RUN ;
```

CURE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
NO	1	**10.00	1	10.00
YES	9	90.00	10	100.00

** Scientist discovered an error and made the correction !

Exact Conf Limits 95% Lower Conf Limit **0.0025**

95% Upper Conf Limit **0.4450**

Test of H_0: Proportion = 0.5

Exact Test One-sided Pr <= P 0.0107

Two-sided = 2 * One-sided **0.0214**

MY NOTE: The 2-Tail p value = 0.0215 and the 95% confidence interval does **NOT** contain P_{HO} = 0.5

CONCLUSION

If this result is due to chance the probability of getting 9 or **more** successes for the new drug is 0.0107 and the probability of getting one or **fewer** successes is also 0.0107

The 2-tail p value 0.0214 is the probability of getting a result as extreme or more extreme than the observed difference under the Null Hypothesis that the difference was due to chance, that is, P = 0.5

CONCLUSION (con't)

We would report that 90 percent of the patients cured on the new drug is **SIGNIFICANTLY** greater than the null hypothesized proportion of 0.5.

(p = 0.0214 and 95% CI = 0.0025, 0.4450)

NOTE: 95% confidence interval CI does NOT contain the Hypothetical Probability P = 0.5

End of Lecture 1

Next up in Part 1 Lecture 2: The Central Limit Theorem