

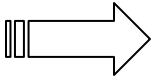
## Statistical Results *versus* Outcome Statements

- ✓ Statistical results are not the same as outcome statements.
- ✓ Statistical results are focused on whether or not the Null Hypothesis is ACCEPTED or REJECTED.
- ✓ A REJECTED Null Hypothesis means the data analysis has determined that the results are STATISTICALLY SIGNIFICANT at a precise probability level.
- ✓ To ACCEPT the Null Hypothesis means that the data analysis has determined that THE RESULTS ARE NOT STATISTICALLY SIGNIFICANT.



- ✓ Outcome statements interpret the statistical results and tie them to either a research hypothesis (if present) or to precisely what was being investigated.

Examples:



1) A researcher was convinced that a die she owned was not rolling randomly, meaning that it was “loaded,” and she predicted that a test of her suspicion would support her belief. She tossed the die 36 times and calculated a 1 x 6 Chi Square on the data.

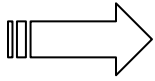
Statistical Results~1:  $\chi^2 = 16.334$ ,  $\chi^2 .01(5) = 15.09$ , Reject  $H_0$

Outcome Statement~1: Since  $H_0$  was rejected and the data analysis produced a statistically significant result, the researcher’s belief (her hypothesis) about the die being loaded was supported. The die apparently IS loaded.

Statistical Results~2:  $\chi^2 = 8.776$ ,  $\chi^2 .05(5) = 11.07$ , Accept  $H_0$

Outcome Statement~2: The analysis of the die rolling data resulted in a non-significant outcome since  $H_0$  was accepted. Consequently, the researcher’s belief that the die was loaded was not supported. The die is rolling randomly and the researcher’s suspicions were unfounded.





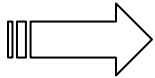
2) A researcher wished to determine which of two treatment procedures would be most effective in improving the health of nursing home residents. Two groups of subjects were exposed to either TREATMENT A or TREATMENT B and after 30 days judged to be either IMPROVED or NOT IMPROVED. Of those receiving TREATMENT A, 40 were IMPROVED and 10 NOT IMPROVED. Of those receiving TREATMENT B, 15 were IMPROVED and 30 NOT IMPROVED. A 2 x 2 Chi Square was used to analyze the data.

Statistical Results:  $\chi^2 = 21.159$ ,  $\chi^2_{.001(1)} = 10.83$ , Reject  $H_0$

Outcome Statement: Since the Chi Square result was strongly statistically significant (the actual p value associated with this result is  $< .001$ ), we can conclude that our observed frequencies are very much different than our expected frequencies. A reexamination of our original data, furthermore, supports the conclusion that TREATMENT A, with 80% of the participants IMPROVED, versus only 33.33% IMPROVED in the TREATMENT B group, is the better of the two treatment procedures.<sup>1</sup>

<sup>1</sup> TREATMENT A had 50 participants.  $40/50 = .8 \times 100 = 80\%$  TREATMENT B had 45 participants.  $15/45 = .3333 \times 100 = 33.33\%$

*The last example uses correlation to illustrate this point.*



3) A school psychologist believed firmly that IQ scores were stable over time and believed further that a person's IQ score obtained at age 5 would be positively correlated with their IQ score at age 15. High IQ scores at age 5 would be associated with high IQ scores at age 15, and low age 5 IQ scores would be associated with low age 15 IQ scores. Data for 30 students was available in her school system's data base.

Statistical Results~1:  $r = .589$ ,  $r_{.01(28)} = .463$ , Reject  $H_0$

Outcome Statement~1: The psychologist's hypothesis was supported. Age 5 IQ scores are positively correlated with age 15 IQ scores. It is possible to reliably predict age 15 IQ scores from age 5 IQ scores.

Statistical Results~2:  $r = .274$ ,  $r_{.05(28)} = .361$ , Accept  $H_0$

Outcome Statement~2: The psychologist's hypothesis was not supported. No correlation exists between age 5 IQ scores and age 15 IQ scores. It is not possible to reliably predict age 15 IQ scores knowing their age 5 IQ scores.

Statistical Results~3:  $r = -.643$ ,  $r_{.01(28)} = .463$ , Reject  $H_0$

Outcome Statement~3: The psychologist's hypothesis was not supported. However, the results are statistically significant. But, contrary to what the psychologist predicted, a statistically significant NEGATIVE correlation was found between age 5 IQ scores and age 15 IQ scores. It is possible to reliably predict age 15 IQ scores from age 5 IQ scores but the relationship is an inverse one, high age 5 IQ scores are associated with low age 15 IQ scores and vice versa. The psychologist was correct in the belief that age 15 IQ scores could be predicted from age 5 IQ scores but WRONG about the nature of the relationship.

Revised: Oct. 22, 2007