**Week 4 Stats, Monday**

Announcements/Questions:

* Stats Reading getting a little heavy? Stats Main Page has pages to emphasize!
  + This week: Ch. 7 (it’s short & sweet). Priorities (most to least important)
    1. pp 162-182, 200-204 – the bestiary
       - categorical x, continuous y - ANOVA 1-way layout
       - categorical x, categorical y - tabular designs (week 7?)
    2. pp 182-194 - ANOVA 2-way layouts, split plot designs, 3+ factors
    3. pp 194-200 – experiments over time, fully crossed design (experimental regression)
* *Stats Syllabus* redone as blogs page (not doc)
* No class Wednesday (Day of Absence) – see week’s schedule for activities
* OK to post .docx lecture notes instead of .pdf’s?
* Evergreen grad (UMass/Amherst grad student) questioned stats of eminent Harvard profs!

Today

* Type I and Type II Errors ( Ch. 4 )

|  |  |  |
| --- | --- | --- |
| **Your choice**  **In the real world** | **Retain H0** | **Reject H0** |
| **H0 true** | Correct Decision | Type ? error |
| **H0 false** | Type ? error | Correct Decision |

Examples:

* + What is our H0 for anthropogenic Climate Change?

If indeed climate change is anthropogenic, and we incorrectly fail to reject a false H0. We retain the null hypothesis and do nothing to slow climate change  
we have committed a Type II error. This is indeed grave.   
In this case, we want a high β, and are willing to sacrifice α

“Precautionary Principle”

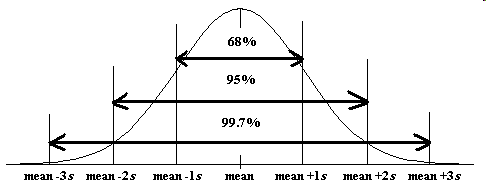
* + Similarly, what is your H0 for a new chemical pesticide?

Assume it does no harm until proven otherwise?

* + Analogy to “producer” vs. “consumer” errors.   
    What does this mean to you, as a consumer?
* p-values vs. power – α vs. β   
  Parametric statistics tend to control α, the probability of a type I error  
  an inverse, but not simple relationship.   
  typically, you’ll need a larger n for greater statistical power (or will have to relax p)

p. 103, figure 4.5

* Ch. 5: The 3 Frameworks (Parametric, Monte Carlo, Bayesian)
  + parametric vs monte carlo
  + next week – something about Bayesian
* Ch. 6: Field Experiments
  + What makes a good study design?
    - Recognizing a bad one….
  + Basic kinds of field experiments
* Ch. 7: Bestiary of Experimental and Sampling Designs (see slides)
* T-test – comparing 2 means
  + Independent samples, randomly selected
  + Drawn from a randomly distributed population
  + Student’s (Gosset’s) t-distribution (2-sample t-test t-tables)
    - For tcritical, need p-value & degrees of freedom (n1 + n2 -2)
  + Example p. 109 (#ants in field vs. ants in forest)
  + H0 :
  + Ha :
* ANOVA – comparing more than 2 means (chalk talk – next week)
  + H0 :
  + Ha :
  + assumptions for parametric ANOVA–
    - normality (Shapiro-Wilks test)
    - equal variances (Levene’s test)
* Discussion: Parametric vs. nonparametric ANOVA
* **Advanced ANOVA topics – deferred to Week 5**
* **Standard Deviation vs. Standard Error (vs. Covariance)**



* To review for next week’s quiz? What to expect next week? A take home exam?