M1D7: Statistical methods and finalize data analysis

10/03/19

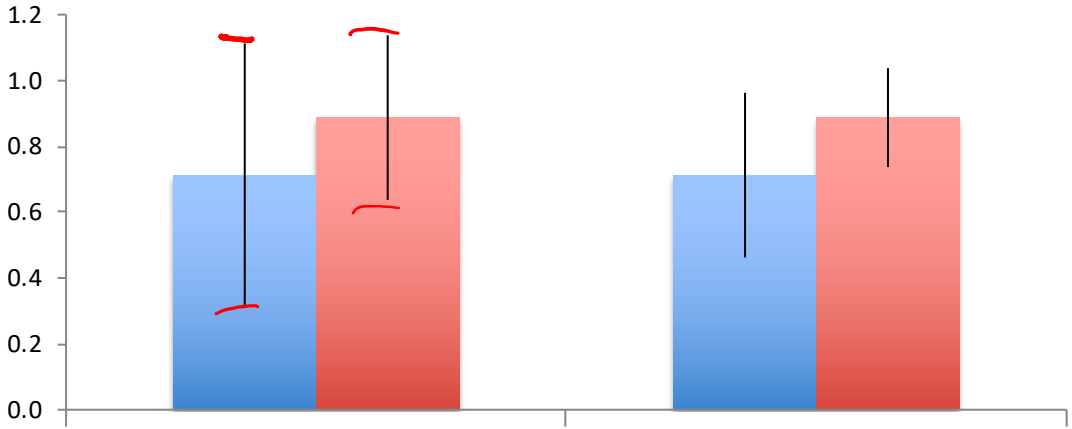
1. Statistics lecture
2. Practice statistical analysis
3. Draft Results slide
4. Process H2AX images and add scale bars
5. Postlab: Recap Mod1

Announcements

- Notebook due 10/4, 10pm
  - Graded in detail: **M1D4**, must post a pdf to Stellar
- Extra office hours:
  - Sat. (10/12) 10a-4:30p, 56-302
  - Prof Engelward: Oct 11, 8am-12pm
- Data Summary draft due 10pm, Mon. 10/14

Confidence intervals show the variance in the data set

- At 95% confidence interval, there is a 95% chance that the true mean is within the defined range



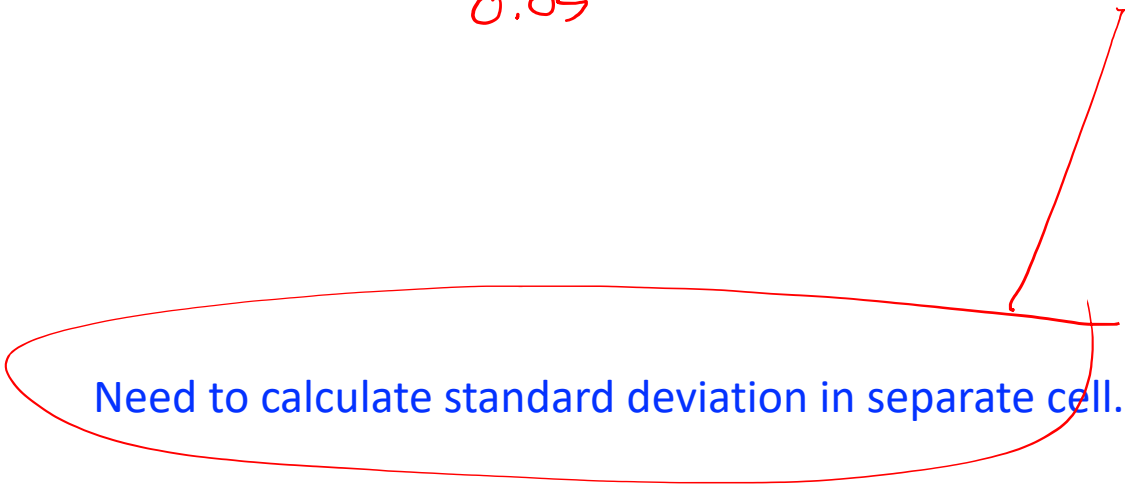
Error bars depict: 95% CI Standard Deviation

Calculating Confidence interval in excel

alpha

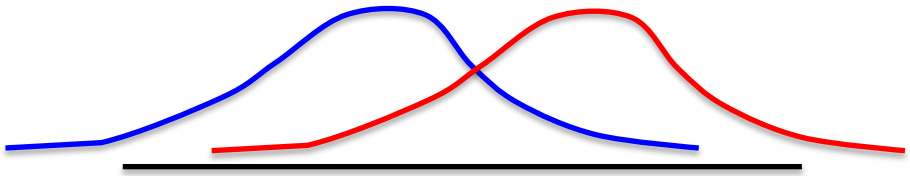
= CONFIDENCE(confidence level, standard dev., size)

0.05

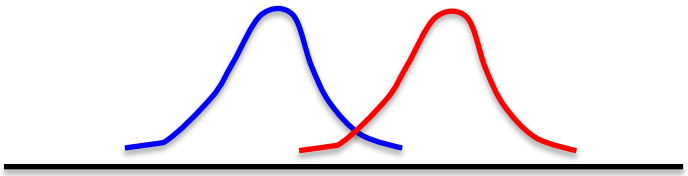


Student's *t*-test used to determine if populations are significantly different

- Assume data follows *t*-distribution
- At $p < 0.05$, there is less than a 5% chance that populations are the same (95% chance that populations are different)
- Examines signal (means):noise (variance) ratio



high noise



low noise

Calculating Student's *t* in excel

p = TTEST (array1, array2,2,3)

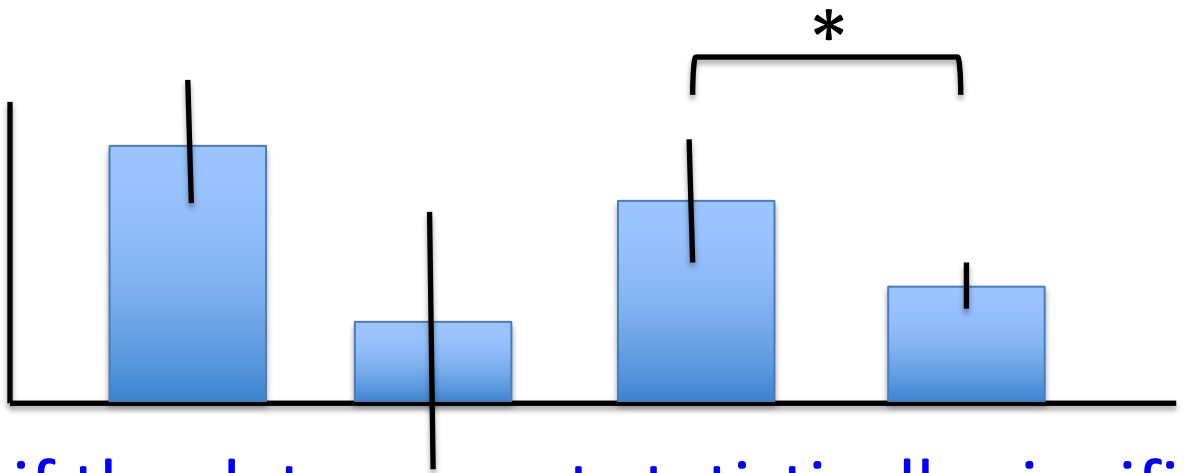
Use the fewest assumptions: two-tailed

unequal variance

Can only compare two data sets at a time

*Make sure it is clear on your plots/writing which conditions are being compared

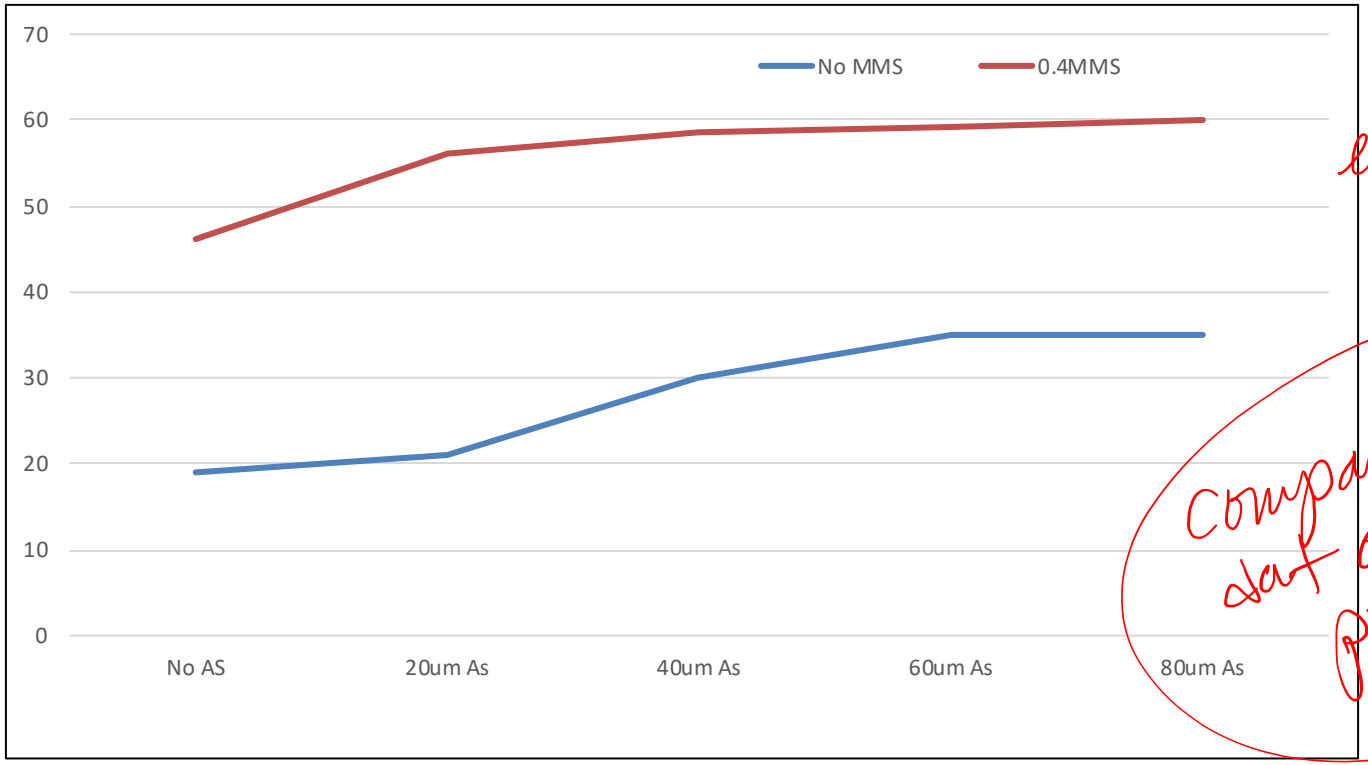
How will you use statistics in your data analysis?



What if the data are not statistically significant?

Module 1: Measuring Genomic Stability

Example of Comet Chip graph

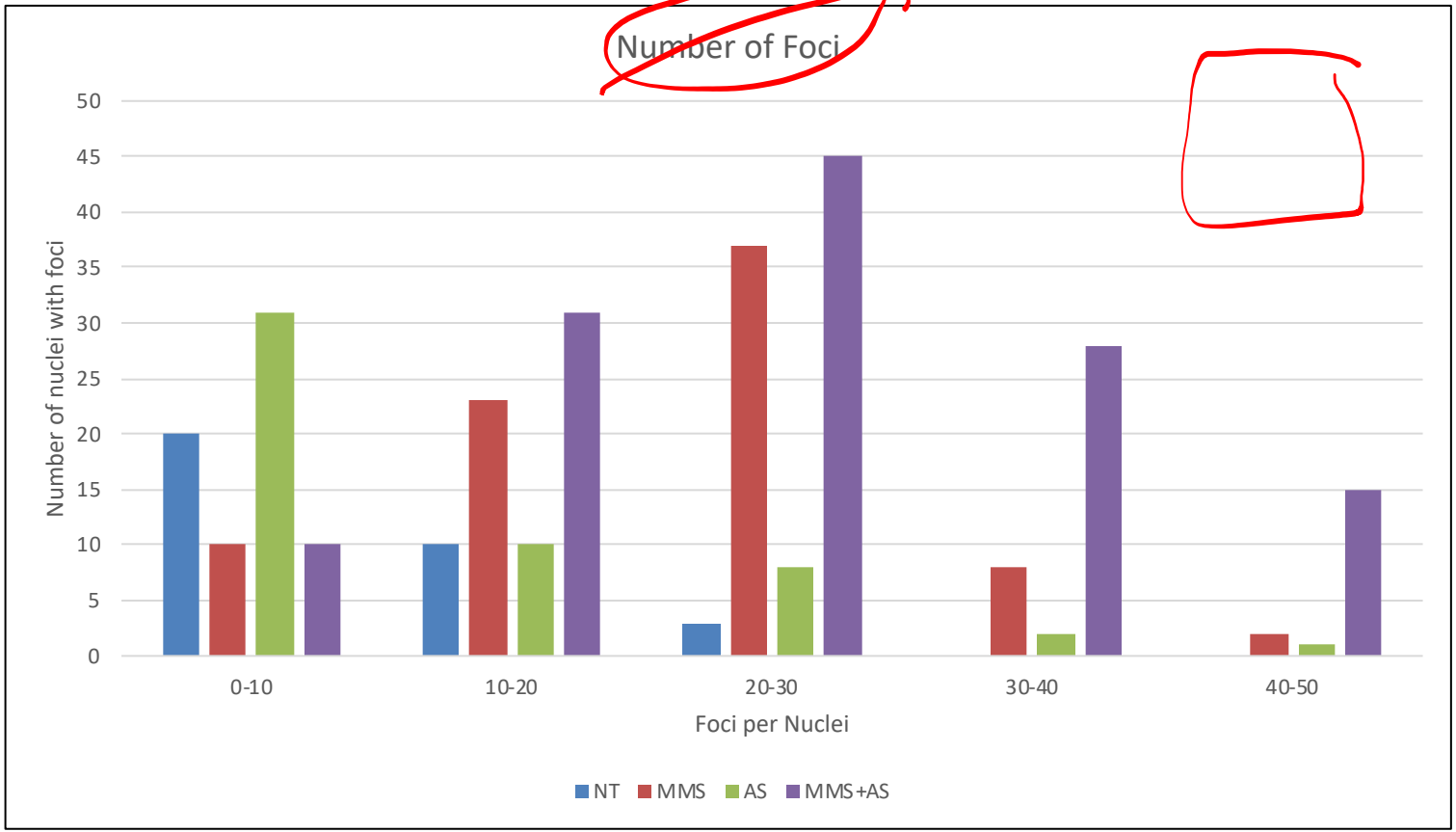


axis labels

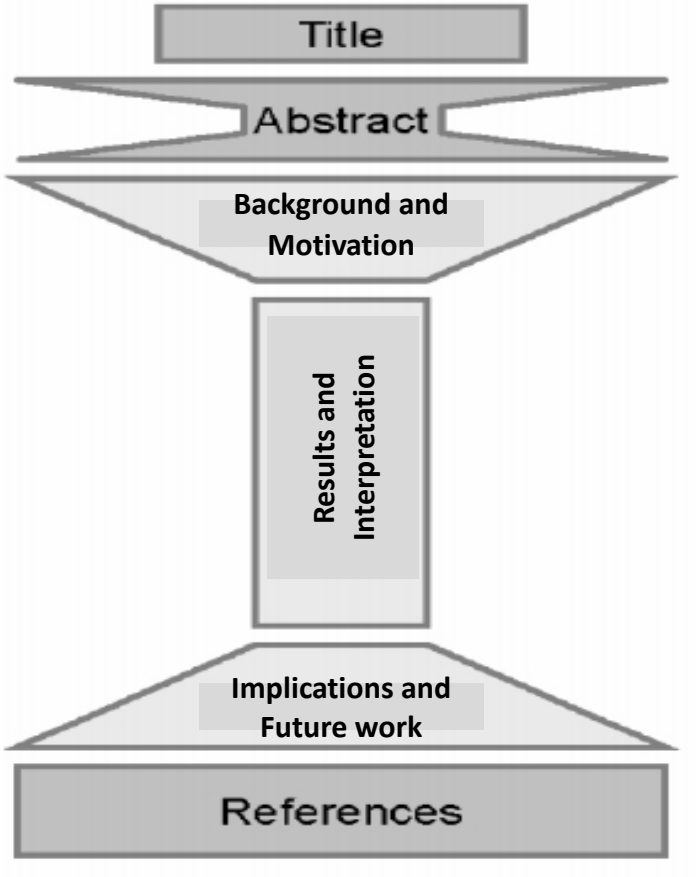
error bars? grid lines

compare your data to purple

Example of foci binning graph



M1 Data Summary



Title: take-away message

Abstract: the only section ***not*** in bullet points

ALL bullet points:

-background and motivation (include references)

- schematics

-Results and interpretation

- Cell loading
- Comet Chip assay (Trevigen analysis) purple team
- H2AX assay (Matlab and ImageJ analysis)
  - H2AX foci and EdU staining analysis
    - compare foci counts vs. fluor intensity

Implications and future work (include references)

References (*see wiki for format suggestions*)

Background & Motivation

- Impact statement
  - general background
  - describe previous work in the field
- Specific background (e.g. BER,NMDA/MMS, Arsenic, CometChip, H2AX)
  - introduce topics, pathways and specific technologies necessary to understand the experimental approach
  - Reference schematic figure
  - narrow focus to the specific question addressed in your study
- Knowledge gap/statement of problem
  - what is unknown, therefore motivating your study
- Hypothesis
  - what do you propose will be the outcome of your study?
- A brief preview of your findings
  - Here we show…
  - end with broad implications of the study

] citations

Results & Interpretation

- Figures and captions
  - ***Decide on the figures first***
  - Use figure subpanels (label with letters)
  - Text: limited on figure, explicit in caption
  - reasonable size
  - descriptive title
  - Intro/purpose at beginning of in caption
  - caption descriptive of image, very light on methods

- don't use wiki images
- remember C.I. + students t test

- Results and Interpretation (each page needs subtitle below figure caption)
  - Goal / intent / purpose of experiment = intro topic bullet
  - What you did: experiments and expectations, describe controls
  - What you found: quantitatively describe your result, referring to the figure (”Figure 1a shows…”
  - What does this indicate: interpret your result, what does it mean?
  - What does this motivate you to do next: **transition** to next experiment

Implications & Future Work

- Start with a very similar ~~paragraph~~ bullet to the last ~~paragraph~~ bullet in your Background/Motivation (restate major results and broad implications)
- Follow same order as in Figures/Results
  - Describe your conclusions from your data
    - If necessary describe caveats of experiment and suggest improvements
  - Identify unknowns and speculate (within reason)
    - Don't make huge generalizations or overreach
- Propose future experiments, identify new questions that arise
  - *What was Prof. Engelward's request for implications (hint: Arsenic)?*
- Come back to the big picture/impact statement topic introduced in background