

## Multiple Comparisons

The goal of the project is to write up explicitly one statistical result dealing with multiple comparisons from the primary literature (consider HW # 11, problem 1.) For the assignment at hand, you will state the problem as well as evaluate it. You may not use the Ioannidis paper from class, but you can use other work of his. Below are some possible sources for the assignment (the paper and result you choose must have been published via a peer-reviewed system).

MULTIPLE COMPARISONS: When running more than one type of statistical inference (test or confidence interval), problems of multiple comparisons refers to inflated (usually type I) error rates. That is, chance alone is likely to produce a significant result - even when there are no effects - if enough hypotheses are assessed.

- Schoenfeld and Ioannidis. “Is everything we eat associated with cancer? A systematic cookbook review.” *American Journal of Clinical Nutrition*, 97: 127-134, 2013. <http://ajcn.nutrition.org/content/97/1/127.long>
- Other Ioannidis papers.
- Murtaugh. “In defense of p-values.” *Ecology*, 95: 611-617, 2014. <http://www.esajournals.org/doi/abs/10.1890/13-0590.1>
  - de Valpine. “The common sense of p-values.”
  - Barber and Ogle. “To P or not to P.”
  - Burnham and Anderson. “P values are only an index to evidence: 20th- vs. 21st-century statistical science.”
  - Or any of the other remaining 5 discussion articles.
- Gelman and Stern. “The difference between ‘significant’ and ‘not significant’ is not itself statistically significant.” *The American Statistician*, 60: 328-331, 2006. [http://www.tandfonline.com/doi/abs/10.1198/000313006X152649#.VHSD\\_M15Vnc](http://www.tandfonline.com/doi/abs/10.1198/000313006X152649#.VHSD_M15Vnc)
- Other Gelman papers.
- Schulz and Grimes. “Multiplicity in randomised trials I: endpoints and treatments.” *The Lancet*, 365: 1591-1595, 2005. <http://www.sciencedirect.com/science/article/pii/S0140673605664616>
- Schulz and Grimes. “Multiplicity in randomised trials II: subgroup and interim analyses.” *The Lancet*, 365: 1657-1661, 2005. <http://www.sciencedirect.com/science/article/pii/S0140673605665166>
- Jager and Leek. “An estimation of the science-wise false discovery rate and application to the top medical literature.” *Biostatistics*, 15: 1-12, 2014. <http://biostatistics.oxfordjournals.org/content/15/1/1.long>
  - Or any of the 8 discussion items which follow (including one by Ioannidis)
- Moonesinghe, Khoury, and Janssens. “Most published research findings are false - but a little replication goes a long way.” *PLoS Medicine* 4:; e28. 2007. <http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.0040028>
- Look at the references sections of the papers above for more related articles.

## Write-up

- There is no R analysis for this assignment.
- There is no requirement that you tell me your problem beforehand, but it might be wise to confirm early on that the problem you have chosen is (a) appropriate for the assignment, and (b) accessible to you.
- Your write up should be typed, though writing in some of the mathematics by hand is okay. The format should be as follows:
  1. AN INTRODUCTION / MOTIVATION TO THE PROBLEM. Why did the authors decide to tackle the problem you are about to tell us? [Note: be sure to back up any claim you make. That probably means a citation.]
  2. THE SPECIFIC PROBLEM WHICH YOU WILL ADDRESS. For example, in HW #11, this problem would have been as given in Corollary 6: “The hotter a scientific field (with more scientific teams involved), the less likely the research findings are to be true.”
  3. THE PROOF, DERIVATION, LOGICAL ARGUMENT ETC. The main gist of your paper is to convince the reader that the specific problem above is true. Using what you know about statistics and multiple comparisons as well as what the paper argues, convince the reader. Again, be sure to cite anything that is not your own idea.

All notation and symbols should be well characterized or well defined.
  4. CONCLUSION / DISCUSSION. Contextualize your result in the general field of science or medicine. For example, you might want to reflect on the types of situations in which the specific problem is detrimental.
- The assignment should be done individually. Any two assignments evaluating the same journal article will be considered carefully to ensure that there are not heavy similarities in the arguments. It would be wise to choose a different article or problem from your friends.