# BIOS6621 Homework p-value

### What would be your message to an investigator whose analysis comparing two groups gave p=0.61? What would be your next action(s) for the project?

I will suggest a potential variance if the result violates prior plausibility. Probably there is no difference between those two groups.

I will report continuous p-value, review the research assumptions as well as designs, and suggest reliable repeats and replications for the same research.

### What would be your message to an investigator whose analysis comparing two groups gave p=0.061? What would be your next action(s) for the project?

I will suggest an acceptance of uncertainty and looking for detailed explanation.

I will confirm with the investigators for relevant evidence, mechanism, research design and data quality, and interpret the p-value based on sample size and meaningful effect size.

### What would be your message to an investigator whose analysis comparing two groups gave p=0.000061? What would be your next action(s) for the project?

I will probably accept the “statistical significance” but point out that the p-value measures neither the size of effect, nor the importance of a research.

Besides actions above, I will check the data-based odds of the alternative hypothesis to null hypothesis, and probably also provide additional FPR (false positive risk) and s-value (Shannon information).

### An investigator requested an analysis, and then requested a slight modification of the analysis. The analyses gave p=0.041 and p=0.068 respectively. What would be your message to the investigator? What would be your next action(s) for the project?

My opinion follows the ATOM principles, according to which, we should accept potential variance and keep transparency in conducting and presenting the research.

I will record and report the result truthfully after FPR test, and I will focus more on the practical effect size of this research based on expert judgement and reproductivity from other groups.

### A particular treatment showed a benefit, with p=0.00031, with few side-effects and low cost. Would you recommend the treatment be widely used? What further information would you want to see?

I would not recommend a wide application for this treatment immediately.

I will confirm the practical benefits with existing evidence of this treatment and other equivalence testing. I will also check for other supplemented information, such as, s-value, AnGred, and FPR.

### What problem were p-values created and popularized to solve? What problem(s) have their widespread use created?

p-values were created as a heuristic “tool to indicate when a result warrants further scrutiny” (Fisher 1925, Edgeworth 1885).

p-values become a tyrant on the fate of a research, since the confusion of the “statistical significance” to “scientific significance”.

### List three things you will try to do, or avoid doing, in future projects when reporting p-values in an analysis.

**Things I WILL try to do:**

Accept the countenance uncertainty  
Keep thoughtful through context and prior knowledge  
Open to transparency and to expert judgement  
Be aware of ourselves limitations modestly

**Things I will NOT try to do:**

Jump to the conclusion simply for the statistical results.  
Overestimate effects or benefits through single research.  
Report or mention the “statistical significance” in abstract section.

### Then, write a ½ to 1 page double spaced summary of some of your reading on the subject:

Paradoxically, p-value is a combination of contradict theories, mixed with different ways of inferential reasoning. Our human beings born with two different ways of reasoning: deduction and induction(Goodman 1999, Goodman 2003). Deduction was based on the knowledge and hypothesis, which we assume as natural truth and predict the possible outcomes accordingly. In this way, as long as our premises are correct, we cannot get a wrong result, we just need to check the compatibility of our observation and the “objective truth”. Statistically, Neyman and Pearson’s hypothesis test is the classical way to check the truth of deductive reasoning (Goodman 2008). On the other hand, inductive reasoning is the backward of deduction. We need to collective and observe the samples as detailed as possible to get the “hypothesis”. The evidence and judgement of every single observation are essential for the conclusion of induction. Every piece of new information can expand our knowledge toward new hypotheses. Fisher’s p-index is designed to test the strength of evidence, solely for induction.

Naturally, deduction and induction are incompatible for solving a particular problem. We cannot know everything but also do not know anything about it at the same time. However, p-value is a preposterous combination of both(Goodman 1999). Neyman and Pearson hypothesis text focuses on the “long-run”, error-based, and deductive reasoning. In this way, the individual is anonymous and interchangeable less important. Fisher’s p-value is specifically mistakenly used to test the strength of evidence on the type I error rate -value; the researchers focus on the “short-run” and requires identifiable and unique evidence. We simply cannot ask p-value to work out both the long-run and the short-run, anonymous as well as identifiable, deductive as well as inductive(Goodman 1999).

For ages, we have been using the factor should not have been exist our analysis. P-value indeed is a chimera, not only for its logical void, but also for the illusionary “significance” and “worth” giving to people.

### Reference

Goodman, S. (2003). "Commentary: The P-value, devalued." Int J Epidemiol 32(5): 699-702.

Goodman, S. (2008). "A dirty dozen: twelve p-value misconceptions." Semin Hematol 45(3): 135-140.

Goodman, S. N. (1999). "Toward evidence-based medical statistics. 1: The P value fallacy." Ann Intern Med 130(12): 995-1004.

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