

# Week 6 Day 4

Stat140-04

## Part I: Multiple Sclerosis and Sunlight

It is believed that sunlight offers some protection against multiple sclerosis, but the reason is unknown. Researchers<sup>1</sup> randomly assigned mice to one of:

- Control (nothing)
- Vitamin D Supplements
- UV Light

All mice were injected with proteins known to induce a mouse form of MS, and they observed which mice got MS.

For each situation below, write down

- Null and alternative hypotheses
- Informal description of the strength of evidence against  $H_0$
- Formal decision about  $H_0$ , using  $\alpha = 0.05$
- Conclusion in the context of the question

**1. In testing whether UV light provides protection against MS (UV light vs control group), the  $p$ -value is 0.002.**

**2. In testing whether Vitamin D provides protection against MS (Vitamin D vs control group), the  $p$ -value is 0.47.**

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<sup>1</sup>Seppa, Nathan. "Sunlight may cut MS risk by itself", Science News, April 24, 2010 pg 9, reporting on a study appearing March 22, 2010 in the Proceedings of the National Academy of Science.

## Part II: Find the errors

What's wrong? Here are several situations where there is an incorrect application of the ideas presented in this section. Write a short paragraph explaining what is wrong in each situation and why it is wrong.

1. A researcher tests the following null hypothesis:  $H_0 : \hat{x} = 23$

2. A study with  $\hat{x} = 45$  reports statistical significance for  $H_a : \mu > 50$ .

3. A researcher tests the hypothesis  $H_0 : \mu = 350$  and concludes that the population mean is equal to 350.

4. A test preparation company wants to test that the average score of their students on the ACT is better than the national average score of 21.1. They state their null hypothesis to be  $H_0 : \mu > 21.2$ .

5. A study summary says that the results are statistically significant and the p-value is 0.98.