Statistical Reasoning Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

WS 6.2: Experimental vs. Observational Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Day: \_\_\_\_\_\_

Determine if the below situations are observational studies or experiments – and why.

1. Over a 4 month period, among 30 people with bipolar disorder, patients who were give a high does (10g/day) of omega-3 fats from fish oil improved more than those given a placebo.
2. The leg muscles of men aged 60-75 were 50% to 80% stronger after they participated in a 16-week, high intensity resistance-training program twice a week.
3. Among a group of disabled women aged 65 and older who were tracked for several years, those who had a vitamin B12 deficiency were twice as likely to suffer severe depression as those who did not.
4. In 2001 a report in the Journal of the American Cancer Institute indicated that women who work at nights have 60% greater risk of developing breast cancer. Researchers based these finding on the work histories of 763 women with breast cancer and 741 women without.
5. In 2002, the journal Science reported that a study of women in Finland indicated that having sons shortened the lifespan of mothers by about 34 weeks per son, but that daughters helped to lengthen the mothers’ lives. The data came from church records from the period 1640-1870.
6. Some gardeners prefer to use non-chemical methods to control insect pests in their gardens. Researchers have designed two kinds of traps, and want to know which design will be more effective. They randomly choose 10 location in a large garden and place one of each kind of trap at each location. After a week, they count the number of bugs in each trap.

For each of the following, tell the explanantory and response variable.

1. The National Student Loan survey provides data on the amount of debt for recent college graduates, their current income, and how stressed they feel about college debt. A sociologist looks at the data with the goal of using amount of debt and income to explain the stress caused by the college debt.
2. A study published in the New England Journal of Medicine compared two medicines to tread head lice: an oral medication and a topical lotion. Researchers studied 812 people in 376 households in seven areas around the world. Of the 185 randomly assigned to the oral medication, 171 were lice-free after 2 weeks compared to only 151 of 191 that received the lotion.
3. A pediatrician wants to know whether watching TV causes girls to be overweight. She interviews 173 11-years old girls and records the number of hours of TV each girl watches per day and whether each girls is overweight. She finds that girls in the sample who watch more than 2 hours of TV per day or over twice as likely to be overweight than girls in the sample who watch fewer than 2 hours of TV per day.
4. A team of veterinarians wants to compare the effectiveness of two fertility treatments for panadas in captivity. The two treatments are in-vitro fertilization and male fertility drugs.
5. A public speaking teacher has developed a new lesion that she believes decreases student anxiety in public speaking situations more than the old lesson. She designs an experiment to test if her new lesson works better than the old lesson. Public speaking students are randomly assigned to receive either the old lesson or the new lesson; their anxiety levels during a variety of public speaking experiences are measured.

Practice:

1. The financial aid office of a university asks a sample of students about their employment and earnings. The report says that “for the academic year earnings, a significant difference was found between men and women, with mean earning more on the average.” Explain the meaning of “a significant difference”.
2. Observational studies suggest that children who watch many hours of TV get lower grades in school and are more likely to commit crimes than those who watch less TV. Explain why these studies not show that watching TV CAUSES these harmful effects. In particular, suggest some lurking variables that may be confounded with heavy TV viewing?
3. Does eating dinner with your family improve academic performance? According to an ABC News article, “Teenagers who eat dinner with their family at least 5 times per week are more likely to get better grades in school.” This finding was based on an observational study done by Columbia University. Explain why such a study cannot establish a cause-effect relationship. What lurking variable may we find?
4. Suppose we are testing a new antibacterial cream “Formulation NS.” We know that from previous research that with no medication, the average healing time (defined at the time for a scab to fall off) with no medication is 7.6 days. We make a small cut on the inner forearm of 25 volunteer college students and apply Formulation NS to the wound. The average healing time for these subjects is 7.1 days. A statistical test shows that this is statistically significant. Explain why this result is “not important” although it is statistically significant.