Math 111 — Analysis of Experiments **Spring 2008**

Collected Homework
p 285: 4, 14
worksheet: 3, 4, 6

Problems from book (page 285):

4. A member of Congress is interested in whether her constituents favor a proposed gun-control bill. Her staff reports that letters on the bill have been received from 361 constituents and that 323 of these oppose the bill. What is the population of interest? What is the sample? Is the sample likely to represent the population well? Explain your answers.

14. At a party there are 30 students over age 21 and 20 students under age 21. You choose at random 3 of those over 21 and separately choose at random 2 of those under 21 to interview about attitudes toward alcohol. You have given every student the same chance to be interviewed: What is that chance? Why is your sample not a Simple Random Sample?

The following reports come from various newspaper articles. For each one answer the following questions:

a. Was the study an experiment or an observational study? Describe in your own words how you think the details of the study were actually carried out.
b. What were the treatment and response variables?
c. Identify some potential confounding factors and explain why you think that they may need to be controlled.
d. What is the population that the researchers intend for the study to provide information about? How were the treatment groups chosen? Comment on the appropriateness of the samples.

1. (McCaddon and Kelly Age and Aging, Vol. 23 7/94) Suspicion has been growing that a lack of vitamin B12 is somehow implicated in the development of Alzheimer's disease. Now researchers in the United Kingdom have confirmed this suspicion. They evaluated members of a family with genetic predisposition towards Alzheimer's disease. They found that four out of six of family members with confirmed Alzheimer's disease had abnormally low vitamin B12 levels in their blood. This compares to only one out of 12 among the family members who were at equal risk for developing Alzheimer's disease but did not. The researchers speculate that a vitamin B12 deficiency could result in impaired methylation reactions in the central nervous system — a characteristic feature in Alzheimer's disease. They also consider the possibility that the genetic predisposition to Alzheimer's disease may actually be related to a genetic impairment in the ability to absorb vitamin B12. Vitamin B12 deficiency in itself often causes disorientation and confusion and thus mimics some of the prominent symptoms of Alzheimer's disease.

2. In a study inspired and partly financed by the MacArthur Foundation, Dr. Katrine Spiegel, Dr. Eve Van Cauter, and Rachel Lepoult found that even in young, healthy people, as little as a week-long sleep debt of three or four hours a night has adverse effects on the body's ability to process carbohydrates, manage stress, maintain a proper level of hormones, and fight off infections. They conducted a study of 11 healthy men aged 18-27 who spent 16 consecutive nights in a clinical laboratory where the researchers tightly controlled the amount of time they spent in bed. After three 8-hour nights, they were restricted to six consecutive 4-hour nights, followed by seven 12-hour nights. None were

allowed to sleep during the day.

3. (Reuter's Health July 13, 2002) New research shows that the most common form of skin cancer is found more frequently among smooth-skinned older adults than in their more wrinkled peers. Griffiths and his colleagues at the University of Manchester in England studied 118 white patients with basal cell carcinoma, comparing their skin characteristics with those of 112 adults without the disease. All participants were older than 50. The investigators found that as a whole, the skin cancer patients had less-wrinkled skin despite being slightly older — their average age was about 72, compared with the 69 in the comparison group. The findings were reported in a recent issue of the Archives of Dermatology.

   Age would be a possible confounding factor here (why?), does it seem to be?

4. In 2001, 30,000 people in China died from AIDS while 26,000 died in Botswana (the figures come from UN councils). Does this mean AIDS is worse in China?

5. A study finds that more people who drink beer die at an early age than people who drink wine.

6. April 14, 2003, ACS News According to a new report, the anti-depressant medicine bupropion (Zyban) tripled quit rates for women and formerly depressed smokers when compared to control groups whose members took a placebo (sugar pill). Findings from a clinical trial were recently published in Nicotine and Tobacco Research (Vol. 5, No. 1: 99-109), and are the first to show high success rates for women and people with a history of depression. After one year, approximately 26% of the women smokers who used bupropion SR (sustained release) during the eight-week study were still tobacco free, compared with 8.5% of the placebo group. Among formerly depressed smokers, about 29% of the bupropion group members were still non-smokers one year later, compared with 8% of the placebo group. The marketers of Zyban, GlaxoSmithKline, funded the original clinical trial, which was designed and directed by CTRI researchers. It included 893 people, randomized into four groups. Two groups were treated for eight weeks with bupropion SR tablets (one group also used nicotine patches; the other placebo patches). Two groups received placebo tablets (again one with nicotine patches, one with placebo patches). The patch did not significantly improve quit rates for either group. Study participants had brief counseling sessions weekly and brought in their pill bottles so researchers could count any unused medication. The close supervision ensured that they used the full course of pills and patches — something that doesn't happen enough in the real world, according to Glynn. "The number one problem with cessation now is compliance. The base problem behind relapse is when people don't continue with their treatment plan, or don't follow it completely," he said.

7. Sep 11, 2007; New York; HealthNewsDigest.com — It's well known that smoking cigarettes increases risk for a host of serious health problems from cancer to heart disease. Now a new study from Weill Cornell Medical College in New York City looks at how they do their dirty work by contributing to atherosclerosis, or hardening of the arteries. The evidence points to nicotine, the addictive chemical in cigarettes.

   Previous studies have suggested that nicotine in cigarettes can hurt the heart by activating the sympathetic nervous system and increasing the heart rate – potentially leading to fatal arrhythmias.

   The new Weill Cornell study looked at two so-called "potentially reduced exposure products" – Eclipse and Quest. Eclipse cigarettes work by heating inhaled air to activate its contents without burning the tobacco. Quest cigarettes are made with tobacco that is genetically-modified to have lower nicotine. Eclipse and Quest 3 have nicotine yields of 0.2 and 0.05 mg per cigarette, respectively. This compares to the two regular cigarettes studied – 2R4F and Quest 1, with nicotine yields of 1 and 0.6 mg per cigarette, respectively. Eclipse and Quest cigarettes are marketed with the implication

that they may be less harmful or addictive than conventional cigarettes. 2R4F is a research cigarette supplied by the University of Kentucky.

The study found that mice exposed to smoke from low-nicotine cigarettes had significantly smaller atherosclerotic lesions, compared to those exposed to regular cigarettes but still larger than lesions in control mice not exposed to cigarette smoke, which showed the least evidence of atherosclerosis. The accelerating effects of smoking on lesions was seen early, within weeks of smoke exposure.

Although Quest 1, Quest 3 and 2R4F cigarettes all have the same tar yield (10 mg/cigarette), mice exposed to smoke from the high-nicotine 2R4F and Quest 1 cigarettes developed larger lesions than did mice exposed to smoke from Quest 3, which has the lowest nicotine content of all the products tested. According to the Weill Cornell investigators, this finding points to the special role of nicotine in promoting arteriosclerosis.

Researchers also found that iPF2alphaV, a marker for oxidative stress that has been linked with atherosclerosis in humans, increased proportionately with the level of nicotine. This finding may indicate that nicotine promotes atherosclerosis, in part, by blocking production of nitric oxide, a chemical that mediates the protective functions of the lining of blood vessels.

"These findings are preliminary. Going forward we will want to look at whether doping cigarettes with extra nicotine increases their atherogenic potential; whether blockers of nicotine reduce atherosclerosis; and if oral administration of nicotine has the same effects," says Dr. Catanzaro.