

1. (25 pts) The following excerpts are from an article in the Richmond Times-Dispatch, September 3, 2008¹. Read the excerpts and answer the questions below.

Results so far from three studies of the cholesterol-lowering drug Vytorin are not enough to prove or rule out a possible link to a higher risk of cancer, so the drug should be used with caution until more is known, editors of a leading medical journal urged yesterday.

The possible cancer risk unexpectedly arose in July, when Dr. Terje Pedersen of Oslo, Norway, announced preliminary results from a study testing whether Vytorin could prevent damage to the heart's aortic valve from worsening.

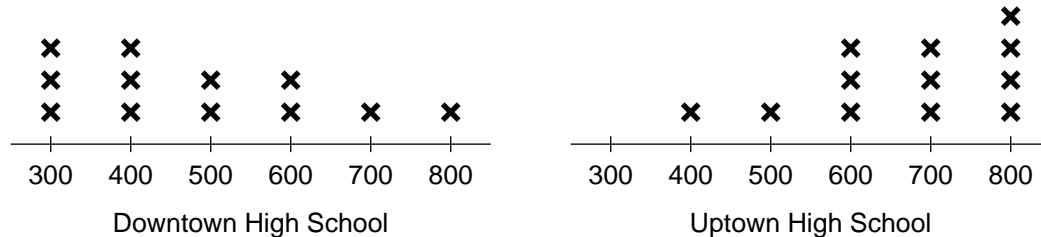
The drug made no difference in heart attacks, strokes or surgeries related to the valve problem. But doctors saw a greater number of cancer cases in those taking it compared with others given dummy pills.

That prompted an interim analysis of results of two other ongoing studies of Vytorin by scientists at Oxford University in England. Their review found higher rates of cancer deaths among Vytorin users, but the number of cancer cases did not differ significantly.

- (a) (5 pts) State appropriate null and alternative hypotheses for this situation concerning Vytorin and cancer.
- (b) (4 pts) In the third paragraph, the article states "But doctors saw a greater number of cancer cases in those taking it compared with others given dummy pills." What are the statistical terms for the "dummy pill" and the group that was administered the dummy pill?
- (c) (4 pts) What type of bias is eliminated by using the dummy pill?
- (d) (4 pts) Was the link between Vytorin and cancer statistically significant? Explain.
- (e) (4 pts) Is this study observational or experimental? Explain.
- (f) (4 pts) Identify one explanatory variable and one response variable in this study.

¹<http://www.inrich.com/cva/ric/search.apx.-content-articles-RTD-2008-09-03-0144.html>

2. (15 pts) A statistics class has an enrollment of 24 freshmen. Twelve of them graduated from Uptown High School and the other twelve graduated from Downtown High School. Their SAT Math scores are shown in the following diagrams.



One student is selected at random from the class. The student tells the teacher what his SAT Math score was and the teacher must decide which high school the student attended. The hypotheses are

H_0 : The student attended Downtown High School.

H_1 : The student attended Uptown High School.

- (3 pts) What is the direction of extreme?
 - (4 pts) State a reasonable decision rule.
 - (4 pts) For your decision rule, find the values of α and β .
 - (4 pts) If the student says that his SAT Math score is 500, what is the p -value of that observation?
3. (25 pts) The following excerpts are from an article in the Richmond Times-Dispatch, September 21, 2008². Read the excerpts and answer the questions below.

Could the oh-so-close presidential polls be skewed because they don't account for many young voters who use cell phones only?

Some supporters of Sen. Barack Obama, puzzled by why he can't mount a big lead over Sen. John McCain in a difficult environment for Republicans, say the pollsters are missing younger, pro-Obama voters who have cell phones only.

Even some pollsters raise another uncertainty about the plethora of Virginia polls – whether all of the respondents who say they back Obama will vote in November for the nation's first black major-party nominee.

²<http://www.inrich.com/cva/ric/search.apx.-content-articles-RTD-2008-09-21-0221.html>

The Pew Research Center's Scott Keeter, a former pollster at Virginia Commonwealth University, found that cell-only respondents are significantly more likely to support Obama. But he said they also are substantially less likely to be registered to vote and, if registered, less likely to go to the polls.

A Pew survey in June found that Obama held a 48 percent to 40 percent advantage over McCain among cell-phone users and a 46 percent to 41 percent advantage among landline users.

The Gallup organization, one of the oldest and most respected polls, says it does account for cell-phone users. About 15 percent of households now use cell phones only.

Residents of those households tend to be younger, more minorities and more transient, the Gallup organization's Web site says.

Those would be more likely to be Obama supporters.

Coker said the Obama campaign should be more worried about the so-called "Wilder effect" or "Bradley effect."

The phenomenon was named for Virginia's L. Douglas Wilder and California's Tom Bradley, black office holders who saw substantial poll leads disappear on Election Day. This resulted in a theory that some voters are embarrassed to tell pollsters that they will not support a black candidate.

- (a) (3 pts) What type of bias in the survey might result because some people use cell phones only?
 - (b) (3 pts) What type of bias is the "Wilder effect?"
 - (c) (4 pts) If the Pew Research Center intentionally selected a specific number of cell-phone users and a specific number of landline users, then what kind of sampling method would that be?
 - (d) (3 pts) Is the 48% figure cited by the Pew survey a parameter or a statistic?
 - (e) (4 pts) In these surveys, what is the variable of primary interest? Describe it verbally.
 - (f) (8 pts) Draw a bar graph showing the results of the Pew survey. Your graph should show the results for the cell phone users and the landline users. Incorporate those results into one graph.
4. (25 pts) Hall College has five dormitories: Ball Hall (20 students), Paul Hall (30 students), Brawl Hall (40 students), Maul Hall (50 students), and Y'all Hall (60 students). A researcher wants to do a survey of student opinion at Hall College and he decides to use a cluster sample, using the dormitories as the clusters. He would like to have two dormitories in his sample.
- (a) (5 pts) Describe the procedure for selecting the students to be in the cluster sample.

- (b) (4 pts) Using a seed of 34, carry out the method you described in part (a). Tell which dormitories were selected.
- (c) (2 pts) Given the results of part (b), how many students are in the sample?
- (d) (4 pts) Were all students equally likely to be chosen?
- (e) (5 pts) Now describe how he might, instead, take a *simple* random sample of 80 students.
- (f) (5 pts) Using a seed of 17, find the first 5 students selected in a simple random sample.
5. (10 pts) US News and World Report Magazine ranks liberal arts colleges. Using data in their current ranking, 25 of the top 27 schools and their cost for the academic year 2008-09 are shown in the following table. (I omitted the United States Military Academy (#14) and the United States Naval Academy (#22) because they do not charge tuition.)

College	Cost	College	Cost
Amherst College	37640	Grinnell College	31098
Williams College	37640	Harvey Mudd College	36635
Swarthmore College	36490	Washington & Lee University	37412
Wellesley College	36640	Colgate University	39545
Middlebury College	49210	Smith College	36058
Bowdoin College	38190	Hamilton College	38600
Pomona College	35625	Oberlin College	38280
Carleton College	38046	Bryn Mawr College	36540
Davidson College	33479	Colby College	48520
Haverford College	37525	Bates College	49350
Claremont McKenna College	37160	Macalester College	36504
Vassar College	40210	Barnard College	37538
Wesleyan University	38634		

Draw either a frequency plot, a stem-and-leaf plot, or a histogram (your choice) of the cost data.