STAT 100 Notes January 7, 2010

See post-lecture Notes from Jan 5 for summary. A few copies of handouts from Tuesday are available (2 sheets of paper – 3 sides).

Note about Course Procedure: Keep up with readings according to weekly schedule in first-day handout. (Three articles for next week).

Recall Sports League Whole Round Outcome
(My overhead was obstructed and was wrong anyway, so here is the correction. The "random" data are different too.)

AWAY

HOME

	1	2	3	4
1	X	0	3	1
2	0	X	3	3
3	1	1	X	0
4	3	3	3	X

The points earned by the home teams (rows) are 4,6,2,9 respectively
The points earned by away teams (columns, but complementary scores) are 4,4,0,4 resp.
So the total points for the teams 1,2,3,4 are 8,10,2,13

Q: Can you (in principle) do a simulation of the above with a computer? How would you set the probabilities in each cell?

Q: Can you do a simulation of the above without a computer? How?

Q: Suppose you are interested in assessing the relative quality of a league of real-life teams. How does the simulation suggested above help you to do this assessment?

Q: Suppose you conclude that there is no real difference in the quality of the teams. Is there a way to benefit financially from this knowledge?

Q: Is coin tossing an abstract game or an analytical strategy???

Last time the "Statistics in the Courtroom" article was briefly introduced. I hope you realized you should read this article! Here are some things to think about while reviewing the article. Note that the issues are the same as mentioned in the Moore Introduction involved in your assignment.

Kristen Gilbert was apparently giving a large dose of epinephrine to patients that did not need it.

Q: What was suggested as the motivation for Ms Gilbert's felony?

Q: What non-statistical evidence was there that Ms. Gilbert was doing something wrong? Was it enough to find her guilty of murder?

Q: What was the nature of the statistical evidence against Gilbert?

Q: What was the role of that evidence in the assessment of the situation?

Hypothesis Testing: The aim is to see whether a certain hypothesis can stand up to the observed data. We do this by temporarily assuming the hypothesis to be true, and using this assumption to compute the "probability of the data". (The quoted phrase is not exact but gives the general idea.) If the probability of the data is very small, then we tend to doubt the truth of the hypothesis. If it is not small, we would have to say the hypothesis is believable.

Here is another description of the idea: If something happens that is rare under ordinary circumstances, then this is evidence that the circumstances are not ordinary.

Q: Can you see how "scientific surprise" (quote from p 5) enters into the logic of Hypothesis Testing?

Q: With so many coincidences of high murder rates in just the Gilbert shifts, why was it useful to test the hypothesis of innocence more formally?

Q: How does a p-value measure "scientific surprise"?

Q: The table on p 9 is reproduced here:

	Death Present?		
Gilbert Present	Yes	No	Total
Yes	40	217	257
No	34	1350	1384
Total	74	1567	1641

Q: How do you use such a table to determine if the (horizontal) row feature and the (vertical) column feature are related?

Q: There were 40 deaths on Gilbert's shifts, and the chance of a death on any shift, assuming Gilbert innocent, is 74/1641. The authors compute the chance that **40 or more** deaths occur in Gilbert's 257 shifts is 1/100,000,000. Why does this make the innocence assumption unbelievable?

Q: The probability of exactly 40 deaths on the 257 shifts is even less likely. Why was this not the crucial calculation? Hint: The chance of exactly 11 deaths on those shifts is .12?

Q: The p-value does not describe the probability that Gilbert is innocent. What is it the probability of?

Q: How do you prove with statistics that A causes B? What are the requirements of such a study?

Q: What is the difference in an "experiment" and an "observational study"? See p 15.

Q: What is the prosecutor's fallacy? A: It is to assume that the chance of innocence of a suspect, given the evidence, is the same as the chance of the evidence, given the innocence of the suspect.

Note that the logic of hypothesis testing is valid in the Gilbert situation – we do reject the hypothesis of only chance variation explaining the outcome. However, that is not the say what the cause of the outcome is – it just suggests there must be one. This was enough to get the case to trial, but not, by itself, to convict Gilbert.

Reading Guide for Week 2:

Pages 293-306: To Catch a Thief. Use of graphics for time series. General Strategy of Estimation. Probability. Histogram. Moving Average. Cumulation.

Pages 339-358: Assuring Product Reliability and Safety. Exploratory Graphics. Reliability. Components in Series and in Parallel. Distribution Models (Normal, Weibull). Confidence. (Don't sweat the model details.)

Page 373-389: Advertising as an Engineering Science. Process of Data Based Information Collection. Bar Charts. Covariates. Perecentages. Combinations.