

**Data Presentation**

1. (6pts). Which of the following points about the data presentation lecture and chapter are true? MTF
- A) A major point in this chapter/lecture is that different ways of presenting the same data can have a large influence on how people interpret or respond to the data.
  - B) We said in class that, for example, a 50% reduction in mortality could be same as saving only 1 life per 1000 individuals.
  - C) If an HIV test is 98% accurate, a person with a positive result normally has a 2% chance that it is a false positive.
  - D) Lecture and the book showed that use of a log scale on a graph inflates (increases) the appearance of differences.

**Language of evaluation (is science logical?)**

2. (6pts) The following options pertain to the concept of model falsifiability. Which are true? MTF
- A) We discussed a newspaper article on pet psychics. It was suggested that many of the claims of a pet psychic (about how the pet feels) are not falsifiable.
  - B) When data are irrelevant to a model, it means the model is not falsifiable.
  - C) If a model is not falsifiable, **no** data can possibly be gathered that might refute the model.
  - D) After watching a video, we concluded that psychic phenomena applied to humans (e.g., horoscopes, palm reading) are not falsifiable.
  - E) *When doing a coin flip in class, we expected that the Probability of Heads was 0.5, even before we looked at the data.* This  $\text{Pr}[H] = 0.5$  is an example of a **null** model.

- 3 (6 pts) The following points pertain to the book and lecture on 'language'. Which statements are true? MTF

- A) In testing the model that smokers have at least 5-fold (5X) the lung cancer rates of non-smokers, data showing that smokers have 7 lung cancers per 1000 per year and non-smokers have 2 lung cancers per 1000 per year would be inconsistent with the model. (Ignore the possibility of sampling error.)
- B) In testing the model that smokers have at least 5-fold (5X) the lung cancer rates of non-smokers, data showing that heavy drinkers have 7 lung cancers per 1000 per year and non-drinkers have 2 lung cancers per 1000 per year would be inconsistent with the model. (Ignore the possibility of sampling error.)
- C) In science and in many aspects of society, the scientific method dictates that we adopt strict thresholds for acceptance of a model (typically rejecting the model if the probability of observing the data is less than 0.05). A model slightly below the acceptance threshold is considered just as refuted as one far below the threshold.
- D) If data support a model, then they are also consistent with it.
- E) A null model is part of every properly designed study. A study lacking a null model is not properly designed.

**Correlations & Causation**

**4. (8 pts)** Which of the following statements describe a (non-zero) correlation? Do not choose any option that describes a zero correlation, for which a correlation is undefined, or which describes causation without an associated correlation. If insufficient information is given to determine whether a correlation exists, treat it as if there is no correlation. MTF

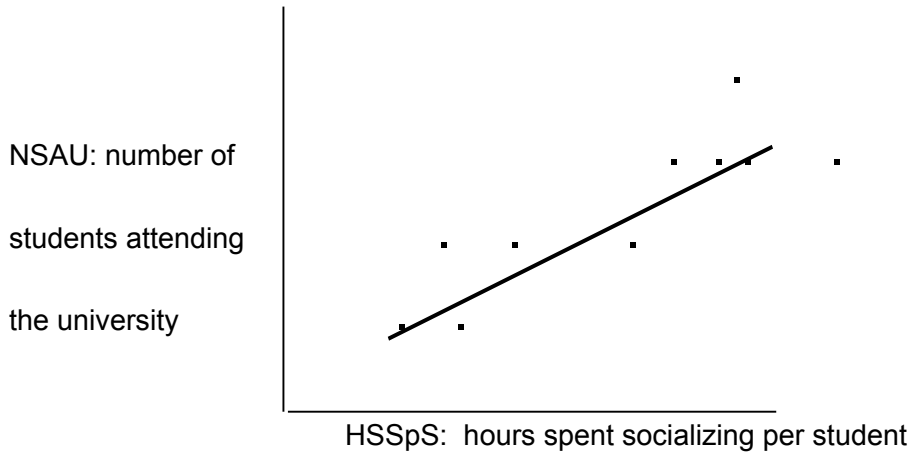
- (A) The grass is greener on the other side of the fence.
- (B) 98% of convicted felons eat bread.
- (C) One third of UT students voted in local elections; two thirds did not vote.
- (D) Schools that have large student bodies spend more on athletics than schools with small student bodies
- (E) Over the last 3 decades, STD rates declined after beer taxes were raised
- (F) Brushing teeth reduces tooth decay
- (G) Average retail sales in the U.S. are flat across the months of May, June, and July.
- (H) Half of UT students want an extra day of vacation in the middle of Fall semester; 2/3 of Austin residents want lower city taxes.

**5 (8 pts)** You observe that, over the past 4 decades, car accident rates have decreased when gasoline taxes have gone up. One proposal is that higher gas taxes **cause** reduced car accident rates. Thus, increasing taxes causes the car accident rate to go down.

Which of the following models instead invoke a third variable to explain the **cause** of this correlation? In answering, recall that, for models that invoke a third variable, raising taxes would not by itself cause accident rate changes. MTF

<b>Causal model</b>	<b>Third variable?</b>
Higher gas taxes cause reduced alcohol consumption because people have less money to spend on alcohol. Reduced alcohol consumption reduces 'drunk' driving, which reduces car accident rates.	(A)
Higher gas taxes are imposed in good economic times because the public will tolerate higher taxes only when the economy is good. Good economic times also cause less drinking, thus fewer drunk drivers. The lower accident rate in good economic times is due to the reduction in drunk drivers.	(B)
Higher gas taxes cause reduced driving because people have less money to spend on gasoline. Reduced driving reduces car accident rates because cars spend less time on the road.	(C)
Higher revenues from gas taxes must be spent on road repair. Better roads lead to lower accident rates.	(D)

6. (5 pts) Which model(s) are **inconsistent** with the following graph? That is, mark an answer if it CAN BE RULED OUT using the information in the following graph. Assume you have no data other than what is presented in this graph. MTF



- (A) HSSpS is correlated with NSAU
- (B) HSSpS is negatively correlated with NSAU
- (C) HSSpS is positively correlated with NSAU
- (D) Large universities require students to enlist in more social organizations than small universities
- (E) Large universities require students to enlist in fewer social organizations than small universities
- (F) Large universities have more students who initiate social organizations
- (G) Large universities have fewer students who initiate social organizations

7) (5pts) The following table gives car accident rates (per million miles driven) according to car color and type of car. How could red be correlated with a higher accident rate than non-red cars for these data? MTF

		car type	
		sports	non-sports
car color:	red	5 per million miles	1 per million miles
	non-red	10 per million miles	2 per million miles

- A) Red can be correlated with a higher accident rate only if some variable not included in this table underlies the correlation.
- B) The correlation depends on the number of cars in each cell: if most sports cars are red, most non-sports cars are non-red, or some combination of the two, then red will often be correlated with high accident rates.
- C) The correlation depends on the number of cars in each cell: if most sports cars are non-red, most non-sports cars are red, or some combination of the two, then red will often be correlated with high accident rates.
- D) The trend in the table already shows that red has a higher accident rate than non-red.

**Controls**

**8. (6pts)** Mark all of the following statements about controls that are correct. In some options, you are asked to decide if a factor X is controlled. MTF

- (A) Controls are absent from correlational data because the data are gathered prior to any manipulation
- (B) A control group must be chosen randomly to qualify as a true control.
- (C) Factor X is controlled if X is present in the Control group and absent from the Treatment Group
- (D) Factor X is controlled if X is absent from both the Control and Treatment groups
- (E) Factor X is controlled if X is present in every individual in both the Control and Treatment groups

**9. (6 pts)** Researchers are attempting to identify the causes of type II diabetes. Each of rows (A)-(I) describe different combinations of life style factors present (indicated by "+") or absent (-) in different groups of people. The factors are: 'Fast food' consumption at least 2X per week; exercise at least 2hr/week; family history of diabetes; at least 10 servings of vegetables per week; and obesity. For each row, there is also an average level of diabetes (not shown).

Which two rows would you want to compare to determine if **family history ('history') is correlated with differences in diabetes when all other factors are controlled?** In evaluating possible answers, pick any comparison that controls for **all** unwanted factors, and assume that these treatments differ only in the ways stated. Mark exactly two options, or option J if none apply. Each row (each option) describes a different set of factors. If multiple combinations satisfy the problem, any correct combination will be accepted. (Two answers or J).

		factor				
		fast food	exercise	history	veggies	obese
Option	(A)	+	+	+	+	+
	(B)	-	+	+	+	-
	(C)	-	-	+	-	+
	(D)	-	-	-	+	-
	(E)	-	-	-	-	-
	(F)	+	-	+	-	-
	(G)	+	+	-	-	+
	(H)	+	+	+	+	-
	(I)	-	-	+	+	-
	(J)	No combination satisfies the request				

**10. (6 pts)** An epidemiologist does a survey to evaluate attitudes about public support of health care, comparing attitudes with income level. Only correlational data are gathered (no experiment). For such a study, which of the following options are true? MTF

- A) Characteristics that are the same for all individuals in the study (e.g., state of residence, if the study was confined to one state) would **not** be controlled for because they are not variables in the study.
- B) Variables that were not recorded or otherwise known about individuals in the study could **not** knowingly be controlled for.
- C) If a variable is recorded for each individual, it is then always possible to control for it in the analysis.
- D) Suppose the goal was to assess whether the neighborhood was a factor in attitudes. If four different neighborhoods were chosen for the study, then the random choice of which individuals within each of those neighborhoods to include in the study would ensure that all variables besides neighborhood would be controlled (on average).

### Experiments

**11 (7 pts) Prisoners of Silence video.** A criticism raised about the Facilitated Communication test shown in the video is that the test environment was intimidating because it did not accurately reflect the normal FC environment. Thus the children could not be expected to get the right answers. Which of the following options are valid arguments for or against this challenge (either way), taking into account the outcome of the test. MTF

- (A) Null model. The null model for the experiment is that the child cannot communicate (i.e., the experiment is looking for positive responses); use of this null model biased the test against communication.
- (B) Replication: by asking the child/facilitator to identify more than one object/picture, the criticism of intimidation is overcome, because there is time for the child/facilitator to overcome the intimidation.
- (C) Controls: The best control for this kind of study (in light of the objection raised above, and in light of the results obtained) is to use each child with a familiar facilitator and also with an unfamiliar facilitator, to control for the "intimidation" effect of an unfamiliar facilitator.
- (D) Controls: the controls for the study were the examples in which the child and facilitator were shown the same photo; the fact that the correct response was typed in these cases demonstrates that the FC setting was operating as normal.
- (E) Blind: the use of blind was unnecessary in assessing communication, yet the blind feature of the study contributed the most to intimidation.

**12. (6pts)** Which options about the in-class personality survey are true? MTF

- (A) It was an experiment because the survey used a blind design.
- (B) It was not an experiment because there was no manipulation.
- (C) Most of the Bio301 students scored the personality description of themselves as reasonably accurate (a score of 3 or better in a range of -5 to +5).
- (D) Randomization. In light of the goal, the study would have been improved if the distribution of who got which survey had been randomized, both in our class and in the video.
- (E) Blind was essential to the goal of the studies. If everyone had known the true purpose of the survey (and had known the design), it is likely that our class would not have rated the personality description so highly.

**13. (6pts)** Which are true of phase III clinical trials with humans? MTF

- A) They typically include features of blind, and replication.
- B) You must enlist in phases I and II to be admitted to phase III
- C) Clinical trials qualify as experiments on humans.
- D) Clinical trials usually lack controls for ethical reasons
- E) Undesired variables are controlled by randomization of assignment to treatment or placebo groups
- F) People chosen for a study are screened to eliminate hidden, 3<sup>rd</sup> variables that might affect the outcome

**14. (5pts)** Which features of ideal data apply to experiments but not correlational data? MTF

- (A) blind                      (B) randomization                      (C) replication                      (D) controls

**15 (7pts).** Which of the following studies describe experiments, regardless of whether the experiment was designed well or poorly. Some of these studies would be considered unethical, but the question is merely about which studies are experiments. MTF

- (A) To evaluate the efficacy of a poison-ivy remedy after being accidentally exposed, you deliberately apply the remedy to one part of your exposure but not to another part, wait, and observe the extent of rash on the treated and untreated areas.
- (B) A professor normally prepares exams with all new questions. In a moment motivated by apathy, he uses all old questions to see if exam scores turn out higher than average.
- (C) In 1918, astronomers awaited the solar eclipse to measure the distance of a star from the edge of the sun. This study was the first critical test of Einstein's general theory of relativity.
- (D) A researcher merely records the diets of a large number of pregnant women. He finds that women who took twice the recommended daily dose of vitamin A have a 1 in 57 chance of a child with birth defects.
- (E) On Halloween night, you attempt to find out which types of candy are most preferred by the folks coming to your door. You adopted your usual practice of mixing different types of candy in a single bowl, but on this night, you keep track of which types get taken first.

**16 (5 pts)** This question refers to the palm-reading segment shown in the "Secrets of the Psychics" video. Which are true? Ray Hayman was the palm reader. MTF

- A) Ray's attitude about the validity of palm reading changed at least twice in his career, each time based on data from his own experiences
- B) The video mentioned that Ray had, at one point, read palms the 'opposite' of what the book said. Given what you were told in the video, this 'reverse' reading qualified as an experiment.
- C) There was no apparent control group for any of the palm reading experiments covered in the video.
- D) The palm reading experiments did not qualify as being blinded, because Ray always knew what procedure he was doing.

**17. (4 pts) Key code, name, and ID number.** Fill in (A B) in scantron field 17 to indicate your key for this version of the exam.

Be sure your name and E ID number are correctly bubbled in on the scantron.

Your name is required on this exam form and the scantron form to receive credit for this test.