

**Language of evaluation: falsifiability, irrelevant, consistent, support, null, ...**

1. (5pts) Which of the following options 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 could not possibly be refuted by the data, no matter how the data had turned out.
- C) If data are irrelevant to a model, they are also consistent with it.
- D) It was briefly mentioned that the FDA does not require testing nor approval of herbal remedies and other natural dietary supplements before being marketed; drugs do require testing and approval. This example was used to illustrate contrasting *null* models of 'safe until proven harmful' for herbal remedies and 'harmful until proven safe' for drugs.
- E) A null model is considered proven if the data support it with  $P > 0.95$ .

2. (7 pts) Which statements are true? MTF

- A) In testing the model that 60-year old coffee drinkers experience half the stroke rate of 60-year old non-coffee drinkers, data showing that 60-year old coffee drinkers experience 5 strokes per 10,000 and 60 year old non-coffee drinkers experience 2 strokes per 10,000 would be inconsistent with the model. (Ignore the possibility of sampling error.)
- B) In testing the model that 60-year old coffee drinkers experience half the stroke rate of 60-year old non-coffee drinkers, data showing that 60-year old **smokers** experience 2 strokes per 10,000 and 60 year old **non-smokers** experience 2 strokes per 10,000 would be consistent with the model. (Ignore the possibility of sampling error.)
- C) A null model is often rejected if the probability of observing the data ( $P$ ) is  $< 0.05$ . However, additional data may change that outcome and lead to the model being accepted.
- D) If data are consistent with a model, then they also support it.
- E) A null model is usually chosen because it has been supported in prior studies. It is generally not true that null models are chosen without considering previous scientific tests.

**Correlations & Causation**

3. (7 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. If part of a group is described as doing an activity or possessing some attribute, assume that others in the group do not do the activity or lack the attribute. MTF

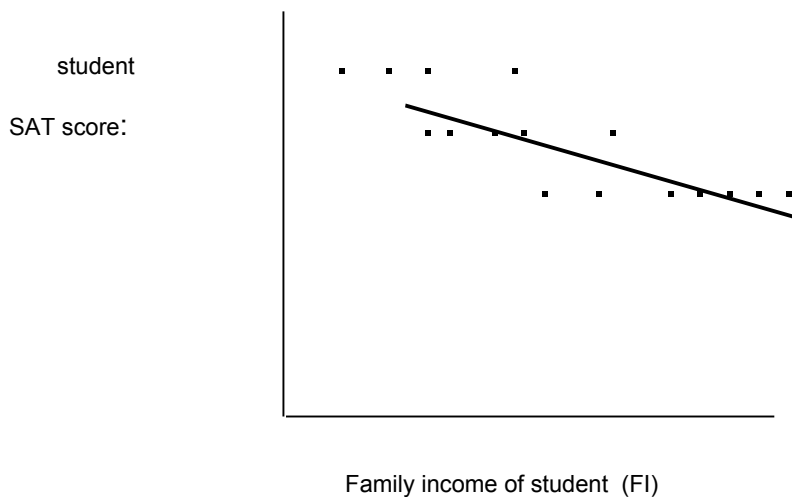
- (A) The accident rate of red cars is 5 per 1,000 per year; the accident rate of non-red cars is 3 per 1,000 per year.
- (B) Large universities have higher football winning rates than small universities
- (C) Schools that have large student bodies spend more on athletics than schools with small student bodies
- (D) Two thirds of women voted in the last election, one third of males did not vote.
- (E) Texting while driving increases a driver's car accident rate
- (F) People who talk on cell phones while driving have higher accident rates than people who do not talk on cell phones while driving.
- (G) The UT tower is orange on nights of a major athletic victory but is not orange on nights of a major athletic loss.

4 (8 pts) Counties with a high fish content in the diet have lower heart disease rates (by age) than countries with high content of red meat. One model is that fish consumption leads to healthier hearts than does red meat consumption.

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, replacing red meat consumption with fish consumption would not by itself reduce heart disease. MTF

Causal model	Third variable?
People living in countries that consume lots of fish tend to have jobs associated with manual labor (e.g., working on boats) and get more exercise than people in countries eating lots of red meat. Higher levels of exercise lead to lower heart disease rates.	(A)
People in countries that consume lots of fish tend to live near oceans. Living near oceans is less stressful than living inland. Higher stress levels lead to more heart disease.	(B)
Fish have different types of fats/oils than does red meat. When eaten, the types of oils in fish cause fewer heart problems than the types of oils in red meat.	(C)
People in countries that consume lots of fish tend to live near oceans. Healthier types of crop plants can be grown near oceans than can be grown inland. Healthier plants in the diet leads to reduced heart disease.	(D)

5. (6 pts) Which model(s) are **inconsistent** with the following graph? (INCONSISTENT!) 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) SAT score is correlated with FI
- (B) SAT score is negatively correlated with FI
- (C) SAT score is positively correlated with FI
- (D) Parents in wealthier families encourage their children to study more than parents of poorer families
- (E) Parents in wealthier families encourage their children to study less than parents of poorer families
- (F) Children of wealthier families worry less about academic performance than children of poorer families
- (G) Children of wealthier families worry more about academic performance than children of poorer families

6) (5pts) Consider a correlation between college grades and belonging to a sorority/fraternity: members of these social organizations have lower grades than non-members. If grades are due to owning vs. not owning a car instead of membership, what grades are expected in cells 1 & 2 of the following table? Assume that no other variables are important. (one answer only)

		membership in frat/sorority:	
		no	yes
own car:	yes	(1)	low grades
	no	high grades	(2)

- A) 1 is high, 2 is high                      C) 1 is low, 2 is high  
 B) 1 is high, 2 is low                        D) 1 is low, 2 is low

7) (5pts) The following table gives voting rates of people according to whether they drink coffee and exercise more than 2hr/week. Answer the following options about the possible correlations that could result from this table. MTF (DIFFICULT!)

		Coffee drinking	
		yes	no
exercise	yes	vote in 70% of elections	vote in 65% of elections
	no	vote in 80% of elections	vote in 50% of elections

- A) If no other 3<sup>rd</sup> variables apply, the table shows that the combination of no coffee and no exercise has the lowest voting rate no matter what numbers of people go in each of the 4 cells.  
 B) If no other 3<sup>rd</sup> variables apply, the table shows that coffee drinking will be correlated with higher voting rates no matter what numbers of people go in each of the 4 cells.  
 C) If no other 3<sup>rd</sup> variables apply, the table shows that exercise will be correlated with lower voting rates no matter what numbers of people go in each of the 4 cells.  
 D) Until you get the numbers for each of the cells, you cannot say what per cent of all coffee drinkers votes.

### 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 were introduced in lecture in the context of correlational data. Thus controls do not apply to just experiments.  
 (B) The random assignment of people to Control and Treatment groups in an experiment controls for 3<sup>rd</sup> variables, even those that are unknown to the investigators.  
 (C) Factor X is controlled if X is present to the same degree in the Control and Treatment Groups  
 (D) Factor X is not controlled when X is absent from both the Control and Treatment groups because it is irrelevant to the study.  
 (E) Individuals who possess the factors that get controlled are assigned to just the Control group, not the Treatment group.

9. (6 pts) Researchers are attempting to identify the causes of a student getting good grades in college. The variables being considered are: a healthy diet, whether the individual had more than 2 brothers and/or sisters ('sibs'), whether the family was impoverished ('poor'), whether the student participates in athletics, and whether the student is a member of a sorority or fraternity ('social').

Which two rows would you want to compare to determine if **diet is correlated with differences in grades 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).

Option	factor					
		diet	sibs	poor	athletics	social
(A)		+	+	+	+	+
(B)		-	+	+	+	-
(C)		-	-	+	-	+
(D)		-	-	-	+	-
(E)		-	-	-	-	-
(F)		+	-	+	-	-
(G)		+	+	-	-	+
(H)		+	+	+	+	-
(I)		-	-	+	+	-
(J)	No combination satisfies the request					

10. (5 pts) The Monty Python video on penguin intelligence compared the performance of humans and penguins on an IQ exam. Consider the last test shown in that video (with the immigrants at the zoo). Mark all of the following factors that were controlled for in that IQ test shown. MTF

- (A) inability to speak English
- (B) ability to speak English
- (C) brain size
- (D) body size
- (E) testing environment
- (F) environment in which the subjects were born and raised

### Experiments

11,12. As described in the Book, epidemiologists in Britain noted a correlation that certain cancers were more frequent among residents living near nuclear power plants than in the population at large. The following two questions pertain to this pattern and its implications. (You should be able to answer the question even without knowing the book.)

11. (4pts) Which of the following models are consistent with this correlation? MTF

- (A) nuclear power plant locations reduce cancer rates
- (B) nuclear power plant locations have no effect on cancer rates
- (C) nuclear power plant locations increase cancer rates

**12. (4pts).** Now suppose that we had been randomly assigning where people live in Britain over the last 100 years, and that we still observed that residents living near nuclear power plants had higher-than-average cancer rates. (Randomly assigning where a person lives would of course be unethical. However, assume for the sake of this question that it could be done.) Which of the following models would now be consistent with this correlation? MTF

- (A) nuclear power plant locations reduce cancer rates
- (B) nuclear power plant locations have no effect on cancer rates
- (C) nuclear power plant locations increase cancer rates

**13. (6pts)** Which options about the in-class personality survey and/or video of the mock horoscope are true? MTF

- (A) The design used in class included manipulation (experiment), replication, and blind but not randomization.
- (B) Most of the Bio301 students scored the personality description of themselves as reasonably accurate (a score of 3 or better on a scale of -5 to +5).
- (C) The personality descriptions in these experiments were specific in many details about the person.
- (D) Both experiments would have been improved by including a group in which the personality description was assigned randomly to the student.
- (E) We suggested that it was ambiguous as to whether a control group was present in the video.

**14. (6pts) Prisoners of Silence video.** Which of the following options about the FC (facilitated communication) video are true? MTF

- (A) Experiment: *Lecture and the book described two types of experiments regarding how to control for unwanted correlations among variables.* The FC experiment was **NOT** the type in which unknown variables were controlled by randomization.
- (B) Replication: tests were conducted with multiple autistic children, multiple facilitators, and the type of test was even varied.
- (C) Controls: in these studies, the controls were the parts of the tests in which the facilitator and child were shown the same information. Even in these cases, the typing often did not give the right answer.
- (D) Blind was an essential feature of these tests.
- (E) The test results were equivocal – the child sometimes correctly communicated information known only to him/her.
- (F) The design qualified as an experiment because it changed the normal FC environment: the child and Facilitator were often shown different information.

**15. (6pts)** Which are true of phase III clinical drug trials with humans? MTF

- A) They typically include 100-200 people
- B) They are considered safer than phase I and II trials
- C) The use of placebos means that they include controls; controls would necessarily be absent if placebos were not used
- D) The use of placebos means that the participants are blinded; blind would necessarily be absent if people were informed of the purpose of the study and given no pill instead of a placebo
- E) Phase III trials are considered human experiments but phase I and II trials are not

**16. (5pts)** Which features of ideal data apply to experiments but not correlational data? MTF

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

**17. (7pts).** Which of the following studies describe experiments, regardless of whether the experiment was designed well or poorly.  
MTF

- (A) Your normal practice of hosting a party is to limit invitations to those known for their 'social' skills at being the life of the party. But they invariably leave a mess and make no attempt to clean up, which is a problem for you. The next time you host a party, therefore, you also invite some less social but more considerate individuals, to see if they assist with the cleanup.
- (B) About half the time you make chocolate mousse for dessert, it turns out well, half the time it does not. From now on, you decide to record the relevant variables at each step – temperature, time, how fresh the ingredients – to discover the cause of success versus failure. You ultimately decide that several factors are at work, not a single one.
- (C) You are not pleased with the scores on exams 1 and 2. You therefore increase your study effort for exam 3 to see if you can do better.
- (D) At the end of the semester, you think back on the various exams you took and how well you did, with the intent of finding what allows you to perform well. You realize that good performance was always preceded by eating Thai food the night before the exam, poor performance was preceded by eating junk food. The following semester you continue your behavior as usual but note whether the pattern continues.
- (E) A professor makes out two versions of each exam, but writes the second version by modifying questions from the first. He/she has noticed that scores for the second version average about 5 points lower than scores for the first, which is undesirable. In attempting to correct the problem, the two versions of the next exam are initially developed the same way, but the questions are then randomized between the two versions to eliminate any bias in difficulty.

**18. (4 pts) Key code, name, and ID number.** Fill in **(A B)** in scantron field 18 to indicate your key for this version of the exam.

Be sure your name and EID 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.