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#11 wasn't assigned due to technical reasons.

1. How much Math do we really need?

In 2010, G. B. Ramanathan wrote "How Much Math Do We Really Need?" in the Washington Post. Challenge: (1) Identify his conclusion and state whether you agree or disagree (choose just one side). (2) Give your reasons. A copy of this article is available at www.StatLit.org/CP/20101023-Math.pdf

2. Is it important to distinguish association from causation?

The textbook and our teacher claim that it is important to distinguish association from causation. Yet most of us have never thought about this and have functioned quite successfully. State whether you agree or disagree with the text/teacher by writing AGREE or DISAGREE as the first word in your response. Then give your reasons. [PS. For this essay, just pick one side.]

3. Movie Receipts Stream Graph

Stream graphs are a new form of interactive visualization that present data in a fluid time-based format. See the stream graph of [Movie Box Office Receipts from 1986-2008](#). Play around with the visual tool. Move the mouse over different movie revenue streams; move the time slider at the bottom of the graph. Each movie is a separate layer. Revenue for a given movie at a particular moment in time is measured by layer thickness: top minus bottom of the layer. Total revenue for a given movie is the area (left to right and top to bottom). Total revenue for all movies at a given moment is the sum of all layers at that time.

Based on the data provided, answer these five questions:

1. How would you describe the change in total receipts over this 22 year period?
2. Are there any seasonal patterns repeated yearly?
3. What is required to compare attendance at different times for this graph?
4. What are three factors (confounders) that might explain an increase in revenues over time?
5. Is this a good or bad graph? Pick just one of these and give your reasons.

Note: If you are one of the first three people to respond, there won't be three prior responses for you to review. You will have to return later to enter your three required reviews.

www.nytimes.com/interactive/2008/02/23/movies/20080223_REVENUE_GRAPHIC.html

4. Ranking Countries by Olympic Medals

Study the table of selected results from the 2008 Summer Olympics competition in Beijing. [Click on the image/attachment icon on the right]. Number your comments.

- 1) Come up with TWO other methods of ranking Olympic countries that would result in different countries (other than the U.S.) at the top. State your new ranking criteria and give the resulting order (if possible). [Your method may include medal type and any other related factor(s) obtained from outside sources.]
- 2) The Olympic committee never announces the country that is the overall winner of the games. Give at least one plausible reason for this practice/policy?
- 3) Why MIGHT most of the member countries be happy with this policy of not announcing the overall winning country?

5. Does allowing concealed-carry reduce crime rates?

A contiguous group of states did not allow concealed-carry of a revolver (small gun). The states were fairly similar and had similar crime rates for various types of crime. One state, X, in the center of this group passed a law allowing concealed-carry. Ten years later, concealed-carry permits had been issued to 5% of the population.

Crime rates in state X were tabulated for 10 years before and after the law was passed. The following crime rates decreased by the percentage shown after 10 years.

- * Violent crime: Robbery (49%), rape (39%), murder (22%) & aggravated assault (8%).
- * Property crime rates decreases by 9%.

The smoothed results (three-year averages) are shown in the attachment.

Source: John Lott, *More Guns; Less Crime*. P. 172 and 175-176.

Crime rates in the surrounding states, Y, were also tabulated at the same times.

Comparable rates either stayed the same (within 5%) or increased by 5 to 10%.

The researcher concluded that

> allowing concealed-carry in state X caused the decreased crime rates in state X.

Answer these questions; number your answers.

1. What kind of study is this? Experiment or Observational? Longitudinal or Cross-sectional? Controlled or uncontrolled? Give your reasons.
2. What kinds of factors are taken into account by the design of this study?
3. How strong is this evidence for supporting the researcher's conclusion?
Note any other factors that might have been responsible for the observed changes.

6. Bigger Tableware Helps Widen Waistlines

Read the article at www.StatLit.org/CP/2006-Bigger-Tableware-Helps-Widen-Waistlines.pdf

- 1) What kind of study is this? Experiment vs. observational study? Longitudinal vs. cross-sectional? Controlled vs. uncontrolled?
- 2) Are there any plausible confounders that didn't take into account? If so, indicate how they would confound the association.
- 3) Are there any opportunities for bias in this study? if so, what are they?
- 4) Evaluate the quality of the argument. How strongly do these statistics support the point of the story? Choose one of these five evaluations (very weak, somewhat weak, mixed, somewhat strong, very strong) and give your reasons.

7. Students consider prostitution to pay for school

Read this story: "Students consider prostitution to pay for school" A copy is at

> www.statlit.org/cp/2011-Students-Consider-Prostitution-To-Pay-For-School.pdf

1. The article does not give the percentage of students who would consider prostitution to pay for school. Why not? Give at least two reasons.
2. Why is the percentage reported (one in three) so much higher than the percentage of students who have actually done sex work (4%)? Give your reason(s).
3. Identify a small change in defining "sex work" that could increase the survey percentages? Identify a small change in the definition that could decrease the percentage. [See "Assembly"]
4. Suppose a reader mistakenly concludes that a third of these students would consider prostitution to pay for school. Who has primary responsibility for this mistaken conclusion: the authors of the study, the journalists who wrote the article, the reader or someone else? Pick just one and give reasons for your choice.

8. Spanking Lowers IQ

Big data finds associations like this one. Your mission is to evaluate them.

Article at www.StatLit.org/CP/2009-Children-who-get-Spanked-have-lower-IQ.pdf

Answer these questions. Number your answers.

- (1) Is this an experiment or an observational study? Is this a longitudinal or cross-sectional study?
- (2) What idea seems most easily influenced by assembly? Give your reasons.
- (3) Identify a plausible confounder that might influence the results. Indicate how this confounder could influence

the outcome and how it could be connected with the predictor.

(4) If there is bias, what types of bias might influence this association?

9. AARP Insurance Savings: Mean, Median and Most

Ad: "[AARP] Members who switch to the AARP Auto Insurance Program ... save an average of \$375." AARP: American Association of Retired Persons. [Click the button on the right side to see the AARP attachment]

Answer these three questions (number your answers).

1. Does this \$300 amount describe the mean, median or mode? Give your reason?
2. Do you expect the mean savings to be bigger or smaller than the median? Give your reason.
3. Suppose that most AARP members who Insured with Hartford Auto would save less than \$50 if they switched to the AARP Auto Insurance Program. Could both claims (\$50 savings and \$375 savings) be true? Answer Yes or No and give your reasons for your conclusion.

10. College students: Later classes, lower grades

Story at www.StatLit.org/CP/2011-College-Students-Sleep-Longer-But-Drink-More.pdf

Answer these questions (number your answers):

1. Context: What is a plausible confounder for the association between class-start time and grades? Indicate how confounder relates to outcome and predictor. If none, give a reason why.
2. Assembly: What two groups or measures are most susceptible to assembly in defining or measuring?
3. Error/bias: What kinds of bias are most likely or plausible in this study? Show where they arise in the study.
4. How strong is the argument that eliminating early-morning classes would improve students' grades? Pick one of these five and support your conclusion: Very weak, fairly weak, mixed, fairly strong, very strong.

12. US Income Mobility

Open the 100% row table at www.StatLit.org/images/2005-IRS-Income-Mobility.jpg This table is tricky. Submit C4L2 in moodle before posting your response here.

Carefully study the examples in the notes. Remember that quintiles are fifths. The lowest (1st) quintile is 20% of the subjects having the lowest incomes. Think of 500 people in 1996 sorted by income: 100 per quintile. Now imagine where these same people are income wise in 2005. This table shows all the changes from 1996 (the rows) to 2005 (the columns). Number your answers.

1. Describe the 28.6% in the 1st row, 2nd column of data using percent or percentage grammar.
2. Comment on the income mobility in our society. Is it good or bad? Choose one answer and give your reasons by referring to the data in the table.

13. 2011 US High-School Graduation Rates by State, Race and Ethnicity.

Give at least two plausible explanations for why the 2011 High-school graduation rates are lower for Minnesota than for any other state in the US for American Indians and Hispanics, and are second from the bottom for blacks and Asians. Reference CARE if possible. Check attachment for details by state. [Click the button on the right side to see the data by state]

14. 2014 Movie Viewings vs Box-Office Revenues

Read www.StatLit.org/pdf/2014-Movie-Viewings-vs-Box-Office-Revenues.pdf

Note that more of those surveyed saw Divergent than saw American Sniper, but the latter had almost twice the box-office revenues as the former. 1) Comment on how the 3 point margin of error might be involved. See statistical significance on p. 103. 2) Give at least two other plausible explanations for this reversal. Connect your explanations with the CARE categories.

15. 2011 US High-School Graduation Rates by State, Race and Ethnicity #2

Give at least two plausible explanations for why the 2011 high-school graduation rates for WHITES are lower for Minnesota than for any of the surrounding states (ND, SD, IA, WI). Check the attachment for details by state. [Click the button on the right]

16. Slumberland Furniture Financing

Slumberland Furniture Financing (see attachment): Special terms (Zero percent financing for 49 months) apply to purchases of \$2499 or more charged with approved credit. Tax and delivery charges are due at time of purchase. Interest will be charged to your account from the purchase date at the regular APR if the purchase balance is not paid in full within the promotional period or if you make a late payment. For newly opened accounts, the regular APR is 27.99%. The APR may vary.

Challenge: Suppose you open a new account at Slumberland with approved credit and charge a \$3,000 purchase.

1. How much would you have to pay in interest if you make the first 48 payments on time, but are late on the last payment (#49). Suppose your monthly payment would be \$100 per month if you had to pay interest and made all payments on time. Note: Total Payment = Monthly payment * # months. Total Interest = Total Pay - Amount of Purchase.

2. Analyze and evaluate Slumberland's Furniture Financing policy.

17. 25,000 U.S. Deaths Linked to Sugary Drinks

Copy at www.StatLit.org/cp/20130320-25000-US--Deaths-Linked-To-Sugary-Drinks.pdf

1) Does the article assert or imply causation? If so, how or where?

2) How do the number of deaths in this article relate to material presented in Chapter 5 of the textbook? [See page 242]

3) Evaluate the strength of the argument for a causal connection between sugary drinks and deaths using relevant aspects of the "Take CARE" model.

18. New car engines emit more harmful particles

Comment on what might be misleading and why in this news story. Use the "take CARE" categories when appropriate.

See attachment or go to <http://news.yahoo.com/car-engines-emit-more-harmful-particles-predecessors-study-154007716--finance.html>

19. Could Water Help You Lose Weight?

Read the associated news story in Moodle (Story2010). Copy at www.StatLit.org/cp/20100823CouldDrinkingWaterBeforeMealsHelpYouLoseWeight.pdf

- 1) Identify what kind of study is involved: experiment or observational, longitudinal or cross-sectional.
- 2) Identify some plausible confounders. If you can't identify any, give a reason.
- 3) Evaluate the strength of this argument using the "Take CARE" model. Take special note of any potential sources of Error/bias.

20. Most college men drink 5 or more

A university poster (attached) claims that "most U of A men drink 5 or fewer drinks when they party". [They define this as "moderate"] Milo claims this same result implies that "most U of A men drink 5 or more drinks when they party." He argues that the "5 or less" is obtained by adding up the percentage that drink zero, that drink one, etc. till they get to the lowest number of drinks that involve most men (at least 50% which was 5 in this case). Milo says if you start at the same place (5 in this case) and go up, the sum will be at least 50%. Thus, "most U of A college men drink 5 or more drinks when they party." Challenge. Is Milo right or wrong in his conclusion -- or maybe we can't say. If necessary, try different ways of grouping the men by # of drinks to support your claim.

21. UK Bank Raids

The average haul from a bank raid in the UK between 2005 and 2008 is £20,000. Two-thirds of these bank raids were successful (robbers get away with some cash without being caught). Each bank robber has a 20% chance of being captured during the robbery. Displaying a gun is associated with a £10,000 increase in their take compared to not showing a gun; a firearm was displayed in 36% of bank raids. Note: £ is the symbol for the British pound. First complete Moodle exercise A2011BH located in section 0

Answer these challenges. Number your answers.

- 1) Give two different reasons why the average haul might increase if a gun is displayed.
- 2) Does the article tell us whether a robbery with a gun is more likely to be "successful"?
- 3) What might be some disadvantages to showing a gun during a bank robbery?
- 4) Should a bank robbery display a gun during a robbery? Give your reasons.

Source: www.telegraph.co.uk/news/uknews/law-and-order/9323830/Crime-really-doesnt-pay-a-third-of-bank-robbers-make-nothing-at-all.html

22. Halloween Consumer Survey

Based on the Sept 2012 Monthly Consumer Survey. Copy at www.StatLit.org/cp/2012-Halloween-Survey.pdf. Challenge: Explain these results (Number your answers).

- 1) For any year or item (costumes, candy, decorations or greeting cards), the amount spent per BUYER (Average of Buyers) is always more than the amount spent per PERSON (Net Average). Explain how or why.
- 2) Consider just greeting cards. The average BUYER spent MORE in 2007 (\$11.89) than in 2012 (\$10.72), but the average PERSON spent LESS in 2007 (\$3.92) than in 2012 (\$4.34). Explain how or why one could increase while the other decreased. [Notice the associated "percentage buying"].

23. Does allowing concealed-carry reduce crime rates?

Repeat of Challenge 5. Try to do a better job

A contiguous group of states did not allow concealed-carry of a revolver (small gun). The states were fairly similar and had similar crime rates for various types of crime.

One state, X, in the center of this group passed a law allowing concealed-carry. Ten years later, concealed-carry permits had been issued to 5% of their population.

Crime rates in state X were tabulated for 10 years before and after the law was passed. The following crime rates decreased by the percentage shown after 10 years. Violent crime: Robbery (49%), rape (39%), murder (22%) & aggravated assault (8%). Property crime rates decreased by 9%. The smoothed results (three-year averages) are shown in the attachment.

Crime rates in the surrounding states, Y, were also tabulated at the same times. Comparable rates either stayed the same (within 5%) or increased by 5 to 10%. The researcher concluded that
> allowing concealed-carry in X CAUSED the decreased crime rates in state X.

Answer these questions; number your answers.

1. What kind of study is this? Is it a controlled study?
 2. What factors are taken into account by the design of this study?
 3. How strong is this evidence for supporting the researcher's conclusion?
- Note any other factors that might have been responsible for the observed changes.
[a. p. 176 b. p. 172-173]

24. Giving Criminals Monetary Support after Release

Read the study as described below. Answer these questions. Number your answers.

1. What kind of a study is this? Be specific.
2. What confounders might block a real association so it appeared there was no association? If none, give your reason.
3. Does this study prove that giving monetary support to newly-released prisoners does not influence recidivism (re-arrest)? Evaluate the strength of this study.

THESIS: Recidivism (committing a crime after release from prison) is a major social problem. Many in criminal justice thought that giving a criminal monetary support upon their release from prison would reduce their likelihood of "returning" to crime.

STUDY: To test this conclusion, 2,000 prisoners (men and women about to be released from state prisons in Texas and Georgia) were randomly assigned into six groups. The average age (29.5) and the average length of sentence (2.8 years) were quite similar among the six groups. Group I got 26 weekly payments; groups II and III got 13 weekly payments. Payments were the equivalent of unemployment payments. Group IV got some aid in job placement. In the two control groups (V and VI) receiving no assistance, subjects in V were interviewed by researchers while subjects in VI received no contact – the normal treatment.

RESULTS: This data shows the percentage of the ex-convicts in the group that were re-arrested and charged with a crime within the first 12 months after release.
>> Group: I (50%), II (49%), III (49%), IV(49%), V (48%), VI (49%).