⓵ This quiz has been regraded; your score was affected.

2020 Quiz 4

Due No due date **Points** 22.5 **Questions** 20
Available Jul 27 at 13:00 - Jul 27 at 15:00 about 2 hours **Time Limit** None

Instructions

This quiz is open from 1pm AEST to 3pm AEST.

You may refer to your lecture notes in answering the quiz.

Answers must be your own work.

Plagiarism declaration

By submitting work for this quiz I hereby declare that I understand the University's policy on academic integrity (https://academicintegrity.unimelb.edu.au/) and that the work submitted is original and solely my work, and that I have not been assisted by any other person (collusion) apart from where the submitted work is for a designated collaborative task, in which case the individual contributions are indicated. I also declare that I have not used any sources without proper acknowledgment (plagiarism). Where the submitted work is a computer program or code, I further declare that any copied code is declared in comments identifying the source at the start of the program or in a header file, that comments inline identify the start and end of the copied code, and that any modifications to code sources elsewhere are commented upon as to the nature of the modification.

This quiz was locked Jul 27 at 15:00.

Attempt History

	Attempt	Time	Score	Regraded
LATEST	Attempt 1	112 minutes	18.5 out of 22.5	19.5 out of 22.5

⓵ Correct answers are no longer available.

Score for this quiz: **19.5** out of 22.5
Submitted Jul 27 at 14:52

This attempt took 112 minutes.

Partial

Question 1

Original Score: 0.5 / 1.5 pts **Regraded Score: 1.5 / 1.5 pts**

⓵ This question has been regraded.

A randomised trial is considered a ‘gold standard’ design. Which of the following are true of a randomised controlled trial? (Tick all that apply.)

- [ ] It controls for variables other than the treatment that are known to affect the outcome of interest.
- [x] It controls for variables other than the treatment that affect the outcome of interest but are unknown.
- [ ] It rules out competing explanations for any differences we observe between a control and treatment group, other than the treatment.
- [ ] It is simple to implement.

A randomised trial is not simple to implement. It controls for other variables and the other three answers express that in different ways.

Incorrect

Question 2

0 / 1.5 pts

Which of the following are important design principles to follow, to reduce the possibility of biased estimates of effects, in a study that compares several treatment groups? (Tick all that apply.)

- [x] Equal sample sizes in the groups.
- [ ] Normally distributed data in each group.
- [x] Random allocation to treatment groups, if possible.
- [ ] Low variance of variables measured.

Equal sample sizes, low measurement error and Normally distributed data in each group are not required to produce unbiased estimates. The first two help with precision, and Normally distributed data allow a t-test. Random allocation to treatment supports unbiased treatment estimates.

Incorrect

Question 3

0 / 1 pts

An experiment is conducted to investigate the effectiveness of a drug treatment in the form of a tablet, to deal with tinnitus, a chronic ringing or buzzing noise in the ears. Subjects recruited for any of the following study designs all suffer from tinnitus.

Which of the following is *false*?

- ( ) A randomised trial in which some subjects received the treatment and the others did not, would be a design with independent samples.
- ( ) Giving the treatment to the females and using the males as controls would not be regarded as an acceptable equivalent to randomisation.
- (•)

A design in which subjects volunteer to receive the treatment, and others are used as controls, could give biased estimates of the treatment effect.

A trial in which the treatment is allocated to all patients, and improvement in the right ear is compared with improvement in the left ear, would be a suitable matched design with subjects acting as their own controls.

If some patients receive the treatment and others do not, it is an independent samples design. Volunteering to receive the treatment is likely to lead to bias; it is not randomised. The same is true of the treatment being given to females and not to males. If the treatment is given to all patients, as in the matched design, the treatment effect cannot be estimated.

Question 4

1 / 1 pts

A major flaw in the design of the *Literary Digest* Poll to predict the 1936 US Presidential election result was:

It asked about voting intentions.

The target population was too large.

The response rate was lower than expected.

The sampling frame was biased.

The low response rate was not a design issue, it was an outcome. The target population was very large, but this was not a flaw. Of course it needed to ask about voting intentions. The key flaw was a biased sampling frame.

Question 5

1 / 1 pts

George Gallup predicted the result of the *Literary Digest* Poll before the Literary Digest even published their prediction. Gallup's prediction was very close to the *Literary Digest's* result. In relation to this, which of the following is *false*?

- Gallup's prediction of The Literary Digest result was more accurate (closer to the observed result) than his prediction of the actual election result.
- Gallup was lucky in his sampling.
- Gallup used a sample frame that corresponded to The Literary Digest sample frame.
- Gallup used a sample of about 3000 people to predict The Literary Digest result.

Gallup used a sample frame that corresponded to the Literary Digest's, and a sample size of 3,000. His prediction of the Literary Digest's prediction was out by 1% (44%/43%) whereas his prediction of the presidential election was out by 6% (56%/62%). He was not lucky in his sampling for predicting the Literary Digest's prediction; he had a sound approach.

Partial

Question 6

1 / 1.5 pts

Miettinen wrote, regarding the sample size of a study: “On the first level, the decision is a binary one — the choice between zero and non-zero as the size.”

Which of the following principles are consistent with this remark? (Tick as many as apply.)

- [x] Researchers should not start their planning with sample size; they should start with other design principles such as good measurement, lack of bias, random sampling or random allocation, and so on.
- [ ] A study that is poorly designed may not be worthwhile carrying out at all.
- [x] Before a researcher plans the sample size, she should think about other, more important, aspects of the design of the study.
- [ ] A sample size calculation giving the value zero is an indication that the study should not be conducted.

A sample size calculation giving the value zero is bizarre, and not consistent with Miettinen's remark. The other responses are either a re-expression of Miettinen's quote, or consistent with it.

Question 7

1 / 1 pts

A statistician gave advice on sample size to a researcher. After receiving the recommendation for the settings specified, the researcher wrote back and said: “After some thought, we don’t believe we’ll be able to recruit that many participants and we wonder if the sample size calculation can be redone based on a smaller effect size”.

Which of the following is an appropriate response to this?

- “The sample size was calculated using hypothesis testing theory. We should do it using the precision of the estimate, to get a different value.”
- “You could just reduce the power chosen for the sample size calculation. That will allow you to still use the current effect size, and is likely to be acceptable to the research community when it comes to publishing your study.”
- “Yes it can; what effect size do you now have in mind?”
- “If you are asking for a smaller sample size, and we keep everything else the same (power, level of significance) the detectable effect size must be larger, not smaller.”

Question 8

1 / 1 pts

A researcher is concerned about the mental health of young adults (aged 18 to 35) during the COVID-19 pandemic. She is planning to undertake a study using the K10 (Kessler Psychological Distress Scale) to estimate the mean psychological distress score. Assume she will be able to obtain an appropriate random sample of young adults, and that the standard deviation of K10 scores is 6.5. If the researcher wants the margin of error on the estimate of the mean to be 1, what sample size should be used?

Use the Excel workbook provided in this subject to obtain your answer.

163

Question 9

1 / 1 pts

Another researcher wishes to investigate the effect of online support groups on the mental health of young adults (aged 18 to 35) during the COVID-19 pandemic. The study is planned to be a randomised trial with one group receiving usual care (psychological counselling) and the other group receiving usual care plus participation in the online support group.

The primary outcome will be measured using the K10 (Kessler Psychological Distress Scale). Assume that the standard deviation of K10 scores is 6.5, and that a clinically meaningful mean difference between treatments is 4 points on the K10.

A two-sided test will be used, with level of statistical significance 5%. If power is set at 80%, what sample size should be used in each group?

Use Minitab to obtain your answer.

43

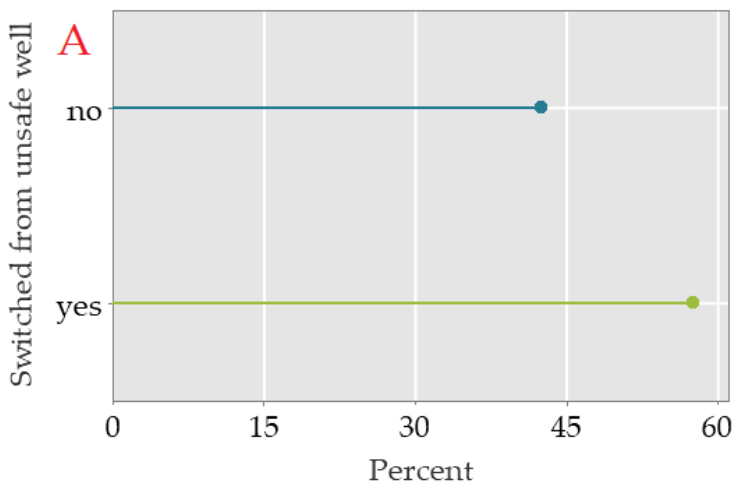
43 is the number in each group.

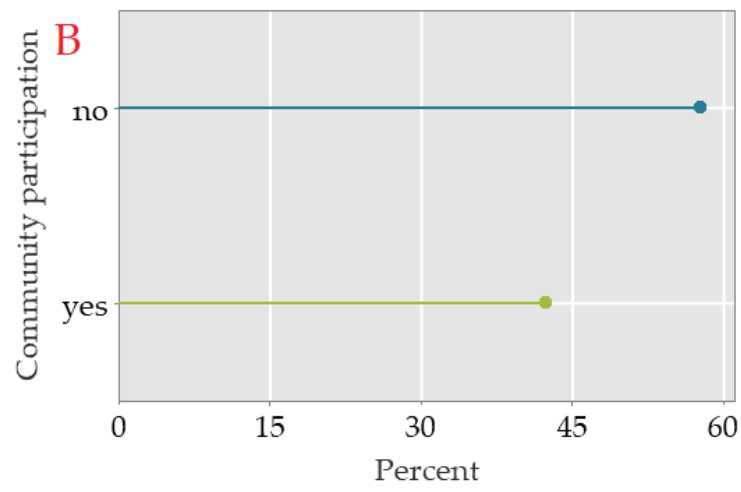
Question 10

1 / 1 pts

A study was carried out in an area of Bangladesh where high levels of arsenic in wells used for drinking water were measured. Households using the wells were encouraged to switch to a well with water safe for drinking. Several explanatory variables were measured including the participation of the household in community organisations. One research question of interest was whether community participation predicted switching from an unsafe well. The data are in wells.mwx.

Which of the four representations below is most appropriate for addressing this question?





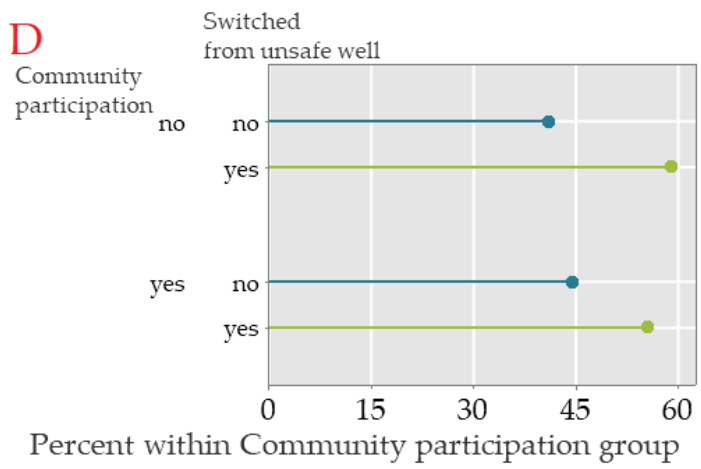
C

Rows: Switched from unsafe well

Columns: Community participation

	no	yes	All
no	714	569	1283
yes	1029	708	1737
All	1743	1277	3020

Cell Contents
Count



D

B

C

A

Only the dotchart that compares switching percentage (yes/no) by community participation represents the research question.

Question 11

1 / 1 pts

Fit a logistic regression model predicting Switching from an unsafe well from Community participation. Check that "no" Community participation is the baseline or reference category.

Report the odds ratio for Community participation to three decimal places.

0.863

Question 12

0.75 / 0.75 pts

For the analysis above, obtain a 95% confidence interval for the odds ratio for Community participation.

Report the lower bound of the confidence interval to three decimal places.

0.746

Question 13

0.75 / 0.75 pts

For the analysis above, obtain a 95% confidence interval for the odds ratio for Community participation.

Report the upper bound of the confidence interval to three decimal places.

0.999

Question 14

1 / 1 pts

Which one of the following is the most appropriate interpretation of the results of the analysis you obtained above?

- (•) The odds of switching are lower for households participating in community organisations than for households not participating.
- ( ) The P-value rounds to 0.05 so there is no real effect of community participation.
- ( ) The odds of switching are higher for households participating in community organisations than households not participating.
- ( ) Community participation should encourage switching, so the results do not make sense.

Since the estimated odds ratio is less than one, the odds of switching are lower for households participating in community organisations than for households not participating. The P-value of 0.05 does not lead to the conclusion that "there is no real effect"; that would be concluding that the null hypothesis is true. We may not be able to pre-judge the direction of an effect and we should not do so.

Question 15

1.5 / 1.5 pts

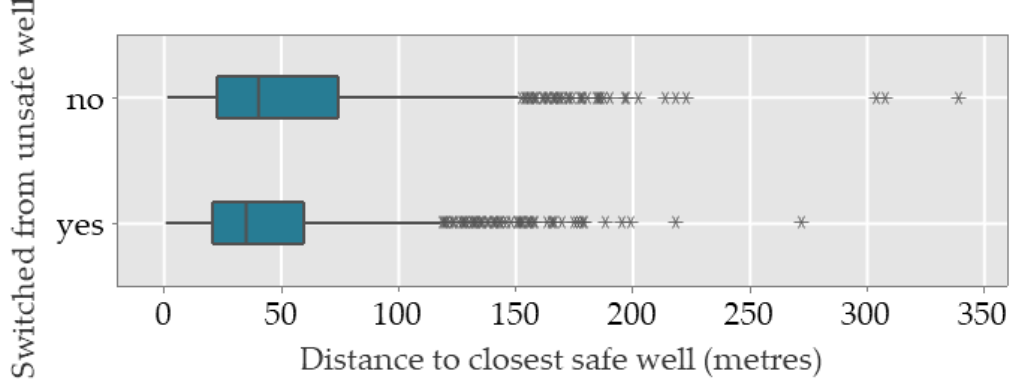
A colleague who is unfamiliar with logistic regression asks if there are other ways of carrying out a hypothesis test of the association between Switching from an unsafe well and Community participation.. Which of the following are appropriate methods? (Tick as many as apply)

- [ ] Hypothesis test of zero correlation
- [ ] Two sample t-test
- [x] Fisher's exact test
- [x] χ^2 test

Question 16

1.5 / 1.5 pts

A colleague using the well.mwx data shows you some analysis including a logistic regression model using Distance to the closest safe well (metres) as an explanatory variable. She shows you the following output.



Coefficients

Term	Coef	SE Coef	95% CI	Z-Value	P-Value
Constant	0.6060	0.0603	(0.4878, 0.7242)	10.05	0.000
Distance closest safe well (m)	-0.006219	0.000974	(-0.008128, -0.004309)	-6.38	0.000

Odds Ratios for Continuous Predictors

	Odds Ratio	95% CI
Distance closest safe well (m)	0.9938	(0.9919, 0.9957)

Analysis of Variance

		Wald Test	
Source	DF	Chi-Square	P-Value
Regression	1	40.74	0.000
Distance closest safe well (m)	1	40.74	0.000

She asks your advice about the analysis and interpretation of results. Which of the following are correct? (Tick all that apply.)

- [x] Rescaling the distance to the closest safe well (to tens or hundreds of metres) will assist with interpreting the odds ratio.
- [ ] The analysis is incorrect as the odds ratio is very close to 1 but the *P*-value is very small.
- [x] The odds of switching decreases as the distance to the closest safe well increases.
- [ ] The odds of switching increases as the distance to the closest safe well increases.

Since the odds ratio is less than one, the odds of switching decreases as the distance to the closest safe well increases. Since the odds ratio is in relation to a change of 1 metre in distance, rescaling the distance to the closest safe well (to tens or hundreds of metres) will assist with interpreting the odds ratio. When the unit of the explanatory variable is small, it is possible to obtain an odds ratio very close to 1, but a small *P*-value.

Question 17

1 / 1 pts

NHANES is a longitudinal study designed to assess the health and nutritional status of adults and children in the USA. The first wave of the study was in 1971. The data are in NHANES.mwx. All subjects in this dataset were current cigarette smokers at the first wave of the study in 1971.

Consider the variables 'race' (C10) and 'diabetes' (C32).

The coding for the values of diabetes is: 0 = never, 1 = ever, 2 = missing.

The coding for the variable 'race' is 'Black/Other' and 'White'.

Here is the cross-tabulation of race by diabetes:

Race	Diabetes, never	Diabetes, ever	Diabetes, missing
Black/Other	133	6	96
White	744	9	758

Ignoring the 'Diabetes, missing' column, estimate the difference in proportions who have ever had Diabetes: Black/Other minus White.

Examine the estimate of the difference of proportions and 95% confidence interval.

Report the difference of proportions, not percentages, to three decimal places.

0.031

Question 18

1 / 1 pts

Continue with the data above. Again, ignore the 'Diabetes, missing' column.

Carry out Fisher's Exact test of the null hypothesis of no association between 'race' and 'diabetes' (never/ever).

Report the P-value to three decimal places.

0.019

Question 19

1 / 1 pts

Now consider the variables 'race' (C10) and 'diabetes' (C32) in the NHANES data set, including all three levels for 'diabetes'. That is, now include 'Diabetes, missing'.

Carry out a χ^2 test of association between 'race' and 'diabetes'.

Obtain the percentages in each level of 'diabetes' for each level of 'race'.

Report the P-value to three decimal places.

0.001

Question 20

1.5 / 1.5 pts

A colleague considers the analyses of 'race' and 'diabetes' in Questions 17, 18 and 19. She wishes to report the analysis of the difference of proportions from Question 17, and asks for your advice.

Which of the following are appropriate responses to this? (Tick as many as apply.)

- [x] "Using that result relies on the assumption that the missing diabetes information does not depend on 'race; 'we need to evaluate that assumption."
- [x] "There is evidence that the proportion of missing diabetes is higher for one level of 'race' than the other."
- [ ] "That's fine - information about diabetes just wasn't available sometimes, so it was missing."
- [ ] "Fisher's exact test (Question 17) and the confidence interval for the difference of proportions (Question 16) are consistent, so there is no need to worry about the missing data."

Missing data are an issue, especially if the percentage of missing information varies by group, and in this context it does.

Quiz Score: **19.5** out of 22.5