STAT 200 revised/Linguistics Question Q9

1. It is thought that approximately 1 out of every 600 babies will be born with an orofacial cleft (cleft lip or cleft palate; see Little *et al.* 2004). Suppose a study is done of 10,000 newborns whose mothers who smoked regularly during their pregnancy, and it is found that there are `m` babies with an orofacial cleft. The researchers believe that smoking during pregnancy may increase the chance of the mother giving birth to a baby with an orofacial cleft.

    (a) What is a parameter of interest in this study?

        i. The proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy.
        ii. All babies born with an orofacial cleft.
        iii. The proportion of babies born with an orofacial cleft.
        iv. Whether a baby is born with an orofacial cleft.
        v. The number of babies born with an orofacial cleft in the sample.

    (b) In testing a hypothesis here, what would the null hypothesis be?

        i. The proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy equals 1/600.
        ii. The proportion of the 10,000 babies chosen that are born with an orofacial cleft is `phat`.
        iii. The proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy is greater than 1/600.
        iv. The proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy is equal to `phat`.
        v. The proportion of the 10,000 babies chosen that are born with an orofacial cleft does not equal 1/600.

    (c) What would the alternative hypothesis be?

        i. The proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy is greater than 1/600.

ii. The proportion of the 10,000 babies chosen that are born with an orofacial cleft is `phat`.

iii. The proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy is less than 1/600.

iv. The proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy is not equal to `phat`.

v. The proportion of the 10,000 babies chosen that are born with an orofacial cleft does not equal 1/600.

(d) Under the null hypothesis, what is the approximate sampling distribution of the sample proportion?

i. $N\left(\texttt{phat}, \sqrt{1/600 \times 599/600/10,000}\right)$

ii. $N\left(\texttt{phat}, \sqrt{\texttt{phat}\,(1-\texttt{phat})\,/10,000}\right)$

iii. $N\left(1/600, \sqrt{1/600 \times 599/600/10,000}\right)$

iv. $N\left(1/600, \sqrt{1/600 \times 599/600/\texttt{m}}\right)$

v. $N\left(1/600, \sqrt{\texttt{phat}\,(1-\texttt{phat})\,/10,000}\right)$

(e) Find the z-score for the sample proportion assuming the null hypothesis is true. Give your answer to four decimal places.

(f) Use software to compute the P-value for this test. Your answer must be rounded to four decimal places.

(g) What is an appropriate conclusion for the hypothesis test at the 5% significance level?

i. There is no evidence to reject the hypothesis that the proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy is less than 1/600.

ii. There is evidence to reject the hypothesis that the proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy is greater than 1/600.

iii. There is reason to believe the proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy is greater than 1/600.

iv. There is no evidence to reject the hypothesis that the proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy is equal to 1/600.
Little, Julian, Amanda Cardy, and Ronald G. Munger (2004): Tobacco smoking and oral clefts: A meta-analysis. *Bulletin of the World Health Organization* **82**, 213-218.
The following information is not visible to a student.
Randomisation:
```
m <- round(runif(1, min=20, max=28))
phat <- (m/10000)
```
Attempts: Five attempts should be permitted, with any incorrect parts indicated to students after each attempt.
Solution: Available in WeBWorK
Keywords: sample proportion, hypothesis tests, P-value; identify a parameter of interest for a study, select appropriate null and alternative hypotheses, identify the approximate sampling distribution of the sample proportion, compute the z score for the test, use software to find the P-value for the test, select the appropriate conclusion for the test.
DBsubject('Statistics')
DBchapter('Hypothesis tests')
DBsection('One sample proportion')
Level(3)

Problem 12
User Settings
Grades
Instructor Tools
   Classlist Editor
   Hmwk Sets Editor
      Confidence Intervals
         12
         --12
   Library Browser
   Statistics
      Confidence Intervals
   Student Progress
      Confidence Intervals
   Scoring Tools
   Email
   File Manager
   Course Configuration
   Help
   ❓

Report bugs

Problems

Problem 1
Problem 2
Problem 3 ✓
Problem 4
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It is thought that approximately 1 out of every 600 babies will be born with an orofacial cleft (cleft lip or cleft palate; see Little *et al.* 2004). Suppose a study is done of 10,000 newborns whose mothers who smoked regularly during their pregnancy, and it is found that there are 19 babies with an orofacial cleft. The researchers believe that smoking during pregnancy may increase the chance of the mother giving birth to a baby with an orofacial cleft.

(a) What is a parameter of interest in this study?

- A. The proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy.
- B. The proportion of babies born with an orofacial cleft.
- C. Whether a baby is born with an orofacial cleft.
- D. The number of babies born with an orofacial cleft in the sample.
- E. All babies born with an orofacial cleft

(b) In testing a hypothesis here, what would the null hypothesis be?

- A. The proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy is greater than 1/600.
- B. The proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy equals 1/600.
- C. The proportion of the 10,000 babies chosen that are born with an orofacial cleft does not equal 1/600.
- D. The proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy is equal to 0.002.
- E. The proportion of the 10,000 babies chosen that are born with an orofacial cleft is 0.002.

(c) What would the alternative hypothesis be?

- A. The proportion of the 10,000 babies chosen that are born with an orofacial cleft does not equal 1/600.
- B. The proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy is greater than 1/600.
- C. The proportion of the 10,000 babies chosen that are born with an orofacial cleft is 0.002.
- D. The proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy is not equal to 0.002.
- E. The proportion of babies born with an orofacial cleft whose mothers smoked regularly during their pregnancy is less than 1/600.

(d) Under the null hypothesis, what is the approximate sampling distribution of the sample proportion?

- A. $N\left(1/600, \sqrt{1/600 \times 599/600/10000}\right)$
- B. $N\left(1/600, \sqrt{19/10000 \times (1 - 19/10000)}/10000\right)$
- C. $N\left(1/600, \sqrt{1/600 \times 599/600/19}\right)$
- D. $N\left(19/10000, \sqrt{1/600 \times 599/600/10000}\right)$
- E. $N\left(19/10000, \sqrt{19/10000 \times (1 - 19/10000)}/10000\right)$