

Practice Midterm

1. In a survey of a very large population, the frequencies of two health problems are to be estimated from a single simple random sample. It is thought that one of the health problems effects about 3% of the population and the effects about 40%. Ignore the finite population correction factor in answering the questions.

[a] How large should the sample be in order for the standard errors for both estimates to be less than 0.01?

[b] What are the actual standard errors for this sample size?

2. In Stat 21, Spring 94 there were 314 students, and 131 of these students were female. In a simple random sample of 91 of the 314 STAT 21 students, let \bar{V} be the fraction of the 91 respondents who were female and played a video game in the week prior to the survey. To estimate π , the fraction of women in the class that played video games in the week prior to the survey, we use the estimator:

$$\hat{\pi} = \frac{\bar{V}}{131/314}.$$

Prove that $\hat{\pi}$ is an unbiased estimator of π .

3. Breast cancer is one of the most common malignancies among women in the U.S. If it is detected early enough – before the cancer spreads – chances of successful treatment are much better. Do screening programs speed up detection enough to matter?

The first large-scale trial was run by the Health Insurance Plan of Greater New York, starting in 1963. The subjects (all members of the plan) were 62,000 women age 40 to 64. These women were divided at random into 2 equal groups. In the treatment group, women were encouraged to come in for annual screening, including examination by a doctor and x-rays. About 20,200 women in the group did come in for screening; but 10,800 refused. The control group was offered usual health care. All the women were followed for many years. Results for the first 5 years are shown in the table below.

		Cause of Death			
		Breast Number	Cancer Rate	All Other Number	Rate
Treatment Group					
Examined	20,200	23	1.1	428	21
Refused	10,800	16	1.5	409	38
Total	31,000	39	1.3	837	27
Control Group					
	31,000	63	2.0	879	28

[a] Does screening save lives? Which numbers prove your point?

[b] The death rate from all causes among women who refused screening is about double the death rate among women who came in for the exam. Did screening cut the death rate in

half?

4. In a famous sociological study in the 1950s, 784 high school students were asked which two of ten given attributes were most desirable in their fathers. The following table shows how the desirability of the attribute “being a college graduate” was rated by male and female students. Did the males and females value this attribute differently? Conduct a statistical test to answer this question.

	Male	Female
Mentioned	86	55
Not mentioned	283	360

Provide each of the following:

1. Null Hypothesis:
2. Alternative hypothesis:
3. Test statistic:
4. p -value:
5. Is the result statistically significant? Explain
6. What are your conclusions?