



AP[®] Statistics 2003 Sample Student Responses Form B

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A

3. A study was conducted to determine if taking vitamin C reduces the occurrence of the flu. The study was conducted using 808 student volunteers who did not take a flu shot. The subjects were randomly assigned to one of two groups: a treatment group who received 1,000 milligrams of vitamin C daily or a control group who received a placebo flavored to taste like the vitamin C treatment. All participants were monitored to ensure that they adhered to their assigned treatment on a daily basis throughout the period of the study. At the end of the flu season, each subject's medical record was reviewed by a physician to determine whether he or she had contracted the flu during the period of the study. The physician did not know which treatment each subject received. The results of the study are shown in the table below.

| | Flu | No Flu | Total |
|-----------|---------|---------|-------|
| Placebo | 331,817 | 74,183 | 405 |
| Vitamin C | 302,749 | 101,251 | 403 |
| Total | 633 | 175 | 808 |

(a) Is this study an experiment or an observational study? Explain your answer.

This study is an experiment, because researchers imposed a treatment on the participants, the independent/explanatory variable was manipulated, there was a control group, and it was a double-blind study. Researchers either gave the volunteers Vitamin C treatment, or the placebo, as treatment. The ind. variable was manipulated (Vitamin C or no Vitamin C) to affect the response variable. The control group was the group of ppl who took the placebo, to minimize lurking variables. Because of all these factors/precautions/treatments (and because subjects were randomly assigned), we can say with certainty that this is an experiment.

(b) Based on this study, a health expert claims that there is evidence to suggest that vitamin C reduces the occurrence of the flu in the population of students who would volunteer for such a study. State the name of a test and the null and alternative hypotheses that the health expert could have used to support this claim. Do not carry out the test.

The health expert could carry out a p-test, which tests the proportion of vit-C takers who didn't get the flu (\hat{p}_1) against the proportion of placebo takers who didn't get the flu (\hat{p}_2)

$$H_0 \text{ (null hypothesis)}: p_1 = p_2$$

$$H_a \text{ (alternate hypothesis)}: p_1 > p_2$$

GO ON TO THE NEXT PAGE.

B

3. A study was conducted to determine if taking vitamin C reduces the occurrence of the flu. The study was conducted using 808 student volunteers who did not take a flu shot. The subjects were randomly assigned to one of two groups: a treatment group who received 1,000 milligrams of vitamin C daily or a control group who received a placebo flavored to taste like the vitamin C treatment. All participants were monitored to ensure that they adhered to their assigned treatment on a daily basis throughout the period of the study. At the end of the flu season, each subject's medical record was reviewed by a physician to determine whether he or she had contracted the flu during the period of the study. The physician did not know which treatment each subject received. The results of the study are shown in the table below.

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- (a) Is this study an experiment or an observational study? Explain your answer.

This is an experiment because here we have a treatment group and a control group, that received a placebo instead of the vitamin C. In this ^(experiment) problem we ^{also} have a double-blinding, since the physician did not know which treatment each subject received and all participants did not know what they really received.

- (b) Based on this study, a health expert claims that there is evidence to suggest that vitamin C reduces the occurrence of the flu in the population of students who would volunteer for such a study. State the name of a test and the null and alternative hypotheses that the health expert could have used to support this claim. Do not carry out the test.

We should use the χ^2 -test in this problem.

H_0 : C does not reduce the occurrence of the flu in the population of students who would volunteer for such a study.
 H_a : vitamin C reduces the occurrence of the flu in the population of students who would volunteer for such a study.

This is a contingency table, so for this kind of tables we should use the chi-square test statistic.

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