

1.1 Migraine and acupuncture. A migraine is a particularly painful type of headache, which patients sometimes wish to treat with acupuncture. To determine whether acupuncture relieves migraine pain, researchers conducted a randomized controlled study where 89 females diagnosed with migraine headaches were randomly assigned to one of two groups: treatment or control. 43 patients in the treatment group received acupuncture that is specifically designed to treat migraines. 46 patients in the control group received placebo acupuncture (needle insertion at non-acupoint locations). 24 hours after patients received acupuncture, they were asked if they were pain free. Results are summarized in the contingency table below.

		pain free		
		yes	no	total
group	treatment	10	33	43
	control	2	44	46
	total	12	77	89

(a) What percent of patients in the treatment group was pain free 24 hours after receiving acupuncture? What percent in the control group?

Answer: percent of patients in the treatment group is $10/43=23\%$
 percent of patients in the control group is 4%

(b) At the first glance does acupuncture appear to be an effective treatment for migraines? Explain your reasoning?

Answer: At the first glance acupuncture appears to be an effective treatment for migraines because percent of patients in the treatment group is 5.75 times larger than that in the control group.

(c) Do the data provide convincing evidence that there is a real reduction for those patients in the treatment group? Or do you think that the observed difference might just be due to chance?

Answer: We cannot make a decision that the data provides convincing evidence that there is a real reduction for those patients in the treatment group or the observed difference might just be due to chance. More rigorous statistical inference may be needed.

1.2 Sinusitis and antibiotics. Researchers studying the effect of antibiotic treatment for acute sinusitis compared to symptomatic treatments randomly assigned 166 adults diagnosed with acute sinusitis to one of two groups: treatment or control. Study participants received either a 10-day course of amoxicillin (an antibiotic) or a placebo similar in appearance and taste. The placebo consisted of symptomatic treatments such as acetaminophen, nasal decongestants, etc. At the end of the 10-day period patients were asked if they experienced significant improvement in symptoms. The distribution responses is summarized below.⁵²

Self-reported significant improvement in symptoms

		Self-reported significant improvement in symptoms		
		yes	no	total
group	treatment	66	19	85
	control	65	16	81
	total	131	35	166

- (a) What percent of patients in the treatment group experienced a significant improvement in symptoms? What percent in the control group?

Answer: percent of patients in the treatment group experienced a significant improvement in symptoms is $66/85=77.6\%$

percent of patients in the control group experienced a significant improvement in symptoms is $65/81=80.2\%$

- (b) Based on your findings in part (a), which treatment appears to be more effective for sinusitis?

Answer: placebo (control treatment).

- (c) Do the data provide convincing evidence that there is a difference in the improvement rates of sinusitis symptoms? Or do you think that the observed difference might just be due to chance?

- (d) Answer: Given that the control group showed slightly better outcome of improvement, the treatment does not appear to be effective.

1.5 Cheaters, study components. Researchers studying the relationship between honesty, age and self-control conducted an experiment on 160 children between the ages of 5 and 15. Participants reported their age, sex, and whether they were an only child or not. The researchers asked each child to toss a fair coin in private and to record the outcome (white or black) on a paper sheet, and said they would only reward children who report white. Half the students were explicitly told not to cheat and the others were not given any explicit instructions. In the no instruction group probability of cheating was found to be uniform across groups based on child's characteristics. In the group that was explicitly told to not cheat, girls were less likely to cheat, and while rate of cheating didn't vary by age for boys, it decreased with age for girls. Identify

Answers:

(a) the cases: 160 children that the experiment is conducted on.

(b) the variables and their types: age (numeric), gender (categorical), white(categorical), black(categorical), and

(c) the main research question: the relationship between honesty, age and self-control of children between the ages of 5 and 15 in this study.

1.6 Stealers, study components. In a study of the relationship between socio-economic class and unethical behavior, 129 University of California undergraduates at Berkeley were asked to identify themselves as having low or high social-class by comparing themselves to others with the most (least) money, most (least) education, and most (least) respected jobs. They were also presented with a jar of individually wrapped candies and informed that the candies were for children in a nearby laboratory, but that they could take some if they wanted. After completing some unrelated tasks, participants reported the number of candies they had taken. It was found that those who were identified as upper-class took more candy than others. Identify

Answer:

(a) the cases: 129 University of California undergrads at Berkeley.

(b) the variables and their types: social-class (ordinal), money (continuous), education (ordinal) and respected job (ordinal), number of candies (continuous)

(c) the main research question: the relationship between socio-economic class and unethical behavior in this study.