

## Review of Statistical Inference from STA 2023

**Examples:** For each of the following examples, we will first determine which kind of problem it is. Then we will set the problem up as if to do by hand. We will interpret the Minitab output given for each problem.

1. Do pregnant women who use cocaine have babies with lower birth weight than women who do not use cocaine? Pregnant women were tested for cocaine/crack, and the birth weights of babies (in grams) were recorded and averaged for women who tested positive, and those who tested negative separately.

	<b>n</b>	$\bar{x}$	<b>s</b>
<b>Negative Test</b>	5974	3118	672
<b>Positive Test</b>	134	2733	599

2. Many children are diagnosed each year with asthma. In an effort to educate these children about their condition, an educational video was developed. To test the effectiveness of this video, ten randomly selected children, of elementary school age, who had been recently diagnosed, were chosen to participate in a study. A nurse asked the children a series of questions about asthma, then showed them the video and asked the questions again. The children's scores follow:

<b>Child</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>Before</b>	61	60	52	74	64	75	42	63	53	56
<b>After</b>	67	62	54	83	60	89	44	67	62	57

3. The College Alcohol Study at the Harvard School of Public Health interviews samples of students at 119 colleges periodically and asks questions about their drinking habits and behavior. One of the questions asked was whether they had ever engaged in unplanned sexual activities because of drinking alcohol. In 1993, 2440 out of 12708 students surveyed answered yes to the question, while in 2001, 1871 out of 8783 answered yes. Has there been a significant increase?

## Two-Sample T-Test and CI

Sample	N	Mean	StDev	SE Mean
1	5974	3118	672	8.7
2	134	2733	599	52

Difference =  $\mu$  (1) -  $\mu$  (2)

Estimate for difference: 385.000

95% CI for difference: (281.262, 488.738)

T-Test of difference = 0 (vs >): T-Value = 7.34 P-Value = 0.000 DF = 140

## Paired T-Test and CI: before, after

Paired T for before - after

	N	Mean	StDev	SE Mean
before	10	60.0000	10.0000	3.1623
after	10	64.5000	13.2267	4.1826
Difference	10	-4.50000	5.12619	1.62104

95% CI for mean difference: (-8.16705, -0.83295)

T-Test of mean difference = 0 (vs < 0): T-Value = -2.78 P-Value = 0.011

## Test and CI for Two Proportions

Sample	X	N	Sample p
1	2440	12708	0.192005
2	1871	8783	0.213025

Difference =  $p$  (1) -  $p$  (2)

Estimate for difference: -0.0210201

95% upper bound for difference: -0.0118184

Test for difference = 0 (vs < 0): Z = -3.78 P-Value = 0.000

## Test and CI for Two Proportions

Sample	X	N	Sample p
1	2440	12708	0.192005
2	1871	8783	0.213025

Difference =  $p$  (1) -  $p$  (2)

Estimate for difference: -0.0210201

95% CI for difference: (-0.0319846, -0.0100556)

Test for difference = 0 (vs not = 0): Z = -3.78 P-Value = 0.000

## **Review STA 2023 – Which Case?**

1. There is no known cure for fibromyalgia – a mysterious ailment with symptoms that include stiffness, fatigue, and pain. But acupuncture may help, according to research from the Mayo Clinic. Twenty-five patients underwent six sessions of acupuncture, while 25 received a simulated version. A month later, those who got the real thing had less pain and felt significantly less tired and anxious.

2. It is well known that older moms have a higher chance of miscarrying, but a recently published study of 14,000 women shows that the father's age matters too. If he's 40 or older, the mother's risk of miscarrying is three times higher than if the dad is under 25.

3. Some pregnancies end in miscarriage during the first 8 weeks, often for no apparent reason. Some studies suggest approximately 20% end this way.

4. If you suffer from high blood pressure and high cholesterol, make sure you're being treated for both. Having the two problems together dramatically increases the risk of heart attack and stroke. Yet fewer than one third of high-risk patients are actually prescribed medication for both problems, found a study of nearly 3,000 men and women conducted by the University of California, Irvine.

5. In case you need encouragement: It takes only 14 days to start seeing good results from flossing, says a New York University study of 51 sets of twins. All the participants brushed regularly, but one twin in each pair also flossed. After two weeks, the flossing twins had significantly less gum bleeding.