**Mrs. Daniel- AP Stats**
**11.2 WS- Solution**

**Ibuprofen or Acetaminophen?**

**Hypothesis:**

$H_0$: There is no difference in the proportions of patients like these who suffer adverse effects when taking ibuprofen or acetaminophen plus codeine.

$H_a$: There is a difference in the proportions of patients like these who suffer adverse effects when taking ibuprofen or acetaminophen plus codeine.

**Assess Conditions:**

- *Random* The treatments were assigned at random.
- *Large Sample Size* The expected counts (listed below) are all at least 5.

| ***Expected counts*** | Ibuprofen | Acetaminophen plus Codeine | |
|---|---|---|---|
| Adverse effects | 48.5 | 44.5 | 93 |
| No adverse effects | 73.5 | 67.5 | 141 |
| Total | 122 | 112 | 234 |

- *Independent* Knowing if one subject had an adverse effect shouldn't give any additional information about the responses of other subjects, so the observations can be considered independent.

**Name the Test:** Chi-square test for homogeneity.

**Test Statistic:** $\chi^2 = \frac{(36-48.5)^2}{48.5} + \cdots = 11.15$, *df = 1*

**Obtain P-value***:* p-value:= 0.0008.

**Make a Decision:** Because the *P*-value of 0.0008 is less than $\alpha$ = 0.05, we reject $H_0$.

**State the Conclusion:** We have convincing evidence that there is a difference in the proportions of patients like these who suffer adverse effects when taking ibuprofen or acetaminophen plus codeine.

**Tide vs. New Tide?**

**Hypothesis:**

$H_0$: There is no association between type of wash and support for the new product among people who don't use the established brand

$H_a$: There is an association between type of wash and support for the new product among people who don't use the established brand

**Assess Conditions:**

Random: The data came from a random sample.

Large sample size: All counts are greater than 5 as evident in the table below.

| Product preference | Soft, warm | Soft, hot | Hard, warm | Hard, hot |
|---|---|---|---|---|
| Standard | 49.81 | 24.05 | 47.23 | 30.92 |
| New | 66.19 | 31.95 | 62.77 | 41.08 |

Independent: Our sample includes 354 people. This is less than 10% of the population of the US who don't currently use the established brand.

**Name the Test:** Chi- Square test for association/independence

**Test Statistic:** $x^2 = 2.058$, df= 3

**Obtain p-value:** p-value = 0.5605

**Make a Decision:** Since the P-value of 0.5605 is greater than 0.05, we fail to reject the null hypothesis.

**State the Conclusion:** We do not have enough evidence to say that there is an association between type of wash and support for the new product among people who don't use the established brand.