
# Setting Up a Test of Difference in Population Proportions

Julie Deeke

Statistics Course Developer

# C.S. Mott Children's Hospital Poll

**C.S. Mott Children's Hospital conducted a national poll on an issue in children's health, water safety. We will be looking at an example about swimming lessons.**

# Research Question

**Is there a significant difference between the population proportions of parents of black children and parents of Hispanic children who report that their child has had some swimming lessons?**

**Populations - All parents of black children age 6-18 and all parents of Hispanic children age 6-18**

**Parameter of Interest - $p_1 - p_2$**

**We'll let 1 = black and 2 = Hispanic**

# Research Question

**Is there a significant difference between the population proportions of parents of black children and parents of Hispanic children who report that their child has had some swimming lessons?**

**Populations - All parents of black children age 6-18 and all parents of Hispanic children age 6-18**

**Parameter of Interest - $p_1 - p_2$**

**Test for a significant difference in the population proportions of parents reporting that their child has had swimming lessons at the 10% significance level.**

# Hypotheses

$H_0 : p_1 - p_2 = 0$

$H_a : p_1 - p_2 \neq 0$

$\alpha = 0.10$

# Survey Results

- A sample of 247 parents of black children age 6 -18 was taken with 91 saying that their child has had some swimming lessons.
- A sample of 308 parents of Hispanic children age 6 -18 was taken with 120 saying that their child has had some swimming lessons.

# Assumptions

We need to assume that we have two independent random samples.

We also need large enough sample sizes to assume that the distribution of our estimate is normal. That is, we need $n_1\hat{p}$, $n_1(1-\hat{p})$, $n_2\hat{p}$, and $n_2(1-\hat{p})$ to all be at least 10.

# Assumptions

**We need to assume that we have two independent random samples.**

**We also need large enou**
**that the distribution of c**
**is, we need $n_1\hat{p}$, $n_1(1-\hat{p})$,**
**least 10.**

**That is, we need to estimate the common proportion, and then make sure that we would expect at least 10 yes's and 10 no's in each sample.**

# Checking Assumptions

$\hat{p} = (91+120)/(247+308) = 211/555 = 0.38$

$247(0.38) = 94;\ 247(1-0.38) = 153;$

$308(0.38) = 117;\ 308(1-0.38) = 191$

# Checking Assumptions

$\hat{p} = (91+120)/(247+308) = 211/555 = 0.38$

$247(0.38) = 94;\ 247(1-0.38) = 153;$

$308(0.38) = 117;\ 308(1-0.38) = 191$

**If this assumption is not met, we can perform different tests that bypass this assumption.**

# Best Estimate of the Parameter

$\hat{p}_1 = 91/247 = 0.37$

$\hat{p}_2 = 120/308 = 0.39$

$\hat{p}_1 - \hat{p}_2 = 0.37 - 0.39 = -0.02$

1 = black

2 = Hispanic