

### Life after High School?

Did the events of September 11 impact the future plans of high school seniors? Educators have expressed fear that the economic impact may mean that fewer students can afford to attend college. Some commentators have suggested that a heightened sense of patriotism may increase military enlistments, while others think that the existence of actual hostilities may deter young people from choosing a military path. A polling organization wants to investigate what this year’s high school seniors are planning to do after they graduate.

Question #1:

During the ‘90s about 63%<sup>1</sup> of high school graduates enrolled in college. The pollsters hope to estimate the percentage of this year’s seniors planning to attend college with a margin of error no greater than 4%. What size sample would suffice if they want to have 90% confidence in the estimate?

The pollsters randomly select 5 cities in Upstate New York and then randomly select one high school in each city. The guidance office at each of the chosen schools is instructed to ask 100 randomly selected seniors what their current plans are, and to report the results back to the pollsters. The data collected from the 5 schools are summarized in the table.

| Plans                          | Count |
|--------------------------------|-------|
| College                        | 289   |
| Employment                     | 112   |
| Military                       | 26    |
| Other (travel, parenting, etc) | 51    |
| Undecided/No response          | 22    |

Question #2:

Determine a 90% confidence interval for the percentage of seniors planning to go to college this year. Explain carefully what your interval means.

Question #3:

During the 90’s about 4.5%<sup>2</sup> of high school seniors enlisted in the military. Do these data suggest that the percentage who enlist is different this year? Test an appropriate hypothesis and state your conclusion.

Question #4:

A few of the seniors did not respond to the guidance queries, and others said they were undecided. Some of these people might eventually decide to enlist in the military. Suppose that half of this small group also enlist. Would that cause you to change your conclusion in

Question #3? Explain.  $\hat{p} = \frac{37}{500} = .074$   $z = \frac{.074 - .045}{\sqrt{\frac{(.045)(.955)}{500}}} = 3.128$   $P = .0018$

Question #5:

Explain, in this context, what a Type I error and a Type II error would be.

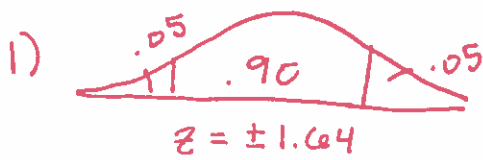
Type I error: If the pollsters believe that the percentage of students entering the military has changed, when in fact, the percentage has stayed the same.

Since  $P < \alpha$ , reject  $H_0$ . There is enough evidence to conclude that the proportion of students enlisting in military differs from 4.5%.

<sup>1</sup> United States Bureau of Labor Statistics, <http://www.bls.gov/news.release/hsgec.nr0.htm>

<sup>2</sup> Defense Technical Information Center, <http://dticaw.dtic.mil/prhome/poprep99/html/chapter2>

Type II error: If the pollsters believe that the percentage of students entering the military has stayed the same, when in fact, the percentage has changed.



$$ME = z \sqrt{\frac{P(1-P)}{n}}$$

$$.04 = 1.64 \sqrt{\frac{(.63)(.37)}{n}}$$

$$n = \frac{(.63)(.37)}{\left(\frac{.04}{1.64}\right)^2}$$

$$n = 391.8411$$

$$n \approx 392$$

| 2) conditions | check |
|---------------|-------|
| Random Sample | given |

|                  |  |
|------------------|--|
| 10% condition    | 500 seniors are less than 10% of all seniors |
| $np \geq 10$     | $500(.578) = 289 \geq 10$                    |
| $n(1-p) \geq 10$ | $500(.422) = 211$                            |

$$.578 \pm 1.64 \sqrt{\frac{(.578)(.422)}{500}}$$

(.542, .614)  
 we are 90%  
 Confident that  
 the true proportion of  
 seniors that plan to  
 go to college is between  
 54.2% and 61.4%

3) P = the proportion of seniors who enlist in military

$H_0: P = .045$   
 $H_a: P \neq .045$

$$\hat{p} = \frac{26}{500} = .052 \quad z = \frac{.052 - .045}{\sqrt{\frac{(.045)(.955)}{500}}} = .755$$



two tailed one proportion z test,  $\alpha = .05$      $P = .45$

| Conditions       | Check  |
|------------------|--|
| Random Sample    | given  |
| 10% condition    | 500 Seniors are less than 10% of all seniors |
| $np \geq 10$     | $500(.045) = 22.5 \geq 10$                   |
| $n(1-p) \geq 10$ | $500(.955) = 477.5 \geq 10$                  |

Since  $P > \alpha$ , fail to reject  $H_0$ . There is not enough evidence to conclude that the proportion of students enlisting in military differs from 4.5%.