

## Answer on Question #67671 – Math – Statistics and Probability

### Question

A recent study of 3100 children randomly selected found 24% of them deficient in vitamin D.

a) Construct the 98% confidence interval for the true proportion of children who are deficient in vitamin D.

### Solution

If  $n\hat{p} \geq 10$  and  $n(1 - \hat{p}) \geq 10$ , we can use the following formula to compute the confidence interval for the true population proportion:

$$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1 - \hat{p})}{n}},$$

where  $\hat{p}$  is a sample proportion,  $n$  is the sample size,  $z^*$  is multiplier dependent on the level of confidence:

Confidence Level	$z^*$ multiplier
90%	1.645
95%	1.960
98%	2.326
99%	2.578

In our case, we have  $\hat{p} = 0.24$ ,  $n = 3100$ ,  $z^* = 2.326$ .

Conditions  $n\hat{p} \geq 10$  and  $n(1 - \hat{p}) \geq 10$  are met. Thus, a 98% confidence interval for the true proportion of children who are deficient in vitamin D is given by

$0.24 \pm 2.326 \sqrt{\frac{0.24(1-0.24)}{3100}} \approx 0.24 \pm 0.018 = (0.222, 0.258)$ , hence in terms of percent it will be  $24\% \pm 1.8\% = (22.2\%, 25.8\%)$

**Answer:**  $0.24 \pm 0.018 = (0.222, 0.258)$ .

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