Statistics
Spring 2023
Lecture 44

Feb 19-8:47 AM

40 randomly Selected nurses had a mean Salary of $6250/mo.

$n=40$, $\bar{x}=6250$

It is known that standard deviation of Salaries of all nurses is $400/mo.

$\sigma=400$

Find Confidence Interval for the mean Salaries of all nurses.

▶ NO C-level ⇒ use 95%.

$\_\_ < \mu < \_\_$

Since σ is given ⇒ Z Interval

inpt: Stats

$\sigma=400$

$\bar{x}=6250$

$n=40$

C-level: .95

Calculate

$6126 < \mu < 6374$

$\bar{x} = \frac{6374+6126}{2} = 6250$

$E = \frac{6374-6126}{2} = 124$

May 3-7:21 AM

Find the minimum Sample Size needed if we wish to be 98% Confident and margin of error not to exceed $100.

$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$ → with Some Algebra →

$$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E} \right)^2$$

If decimal → Round-up

$$n = \left(\frac{2.326 \cdot 400}{100} \right)^2$$

$= 86.564$

$n \approx 87$

$= \text{invNorm}(.99, 0, 1) \approx 2.326$

May 3-7:29 AM

32 randomly Selected exams had a mean of 86.5.

$n = 32$, $\bar{x} = 86.5$

It is known that Standard deviation of Scores of all exams is 12.5.

$\sigma = 12.5$

Find 90% Conf. interval for the mean Score of all exams.

C-level: .9

$82.9 < \mu < 90.1$

Since σ is given ⇒ Z Interval

Since $\bar{x}$ is in 1-decimal ⇒ Round to 1-decimal

$$E = \frac{90.1 - 82.9}{2} = 3.6$$

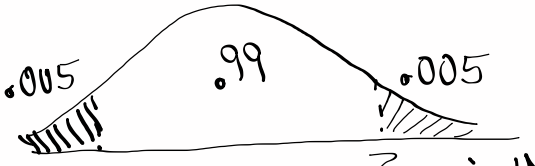
$$\bar{x} = \frac{90.1 + 82.9}{2} = 86.5$$

May 3-7:35 AM

Find minimum Sample Size needed if we wish to construct 99% Conf. interval for the mean of all exams and error not to exceed 5 points.

$$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2 = \left(\frac{2.576 \cdot 12.5}{5}\right)^2 = 41.4736$$

$n \approx 42$



$z_{\alpha/2}$ = invNorm(.995, 0, 1) = 2.576

May 3-7:42 AM

15 randomly selected cars on a certain FWY had a mean speed of 74 mph with standard deviation of 8 mph.

$n = 15$
$\bar{x} = 74$
$S = 8$

No C-level → use 95%

Find Conf. interval for the mean speed of all cars on that freeway.

$70 < \mu < 78$

σ is not given ⇒ T Interval

$\bar{x}$ is a whole # ⇒ Round to whole #

$E = \frac{78 - 70}{2} = 4$

$\bar{x} = \frac{78 + 70}{2} = 74$

May 3-7:47 AM

Find minimum sample size needed if we wish to construct 90% conf. interval for the mean speed of all cars and error not to exceed 8 mph.

$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2$ Since σ is not given, we use s instead

$= \left(\frac{z_{\alpha/2} \cdot s}{E}\right)^2 = \left(\frac{1.645 \cdot 8}{8}\right)^2 = 2.706$

$n \approx 3$

$z_{\alpha/2} = \text{invNorm}(.95,0,1) = 1.645$

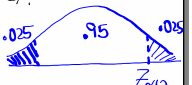
Redo with $E = 5$

$n = \left(\frac{1.645 \cdot 8}{5}\right)^2 = 6.927$ $\quad n = 7$

Redo with $E = 4$, C-level: 95%

$n = \left(\frac{1.960 \cdot 8}{4}\right)^2$

$= 15.3664$ $\quad n = 16$

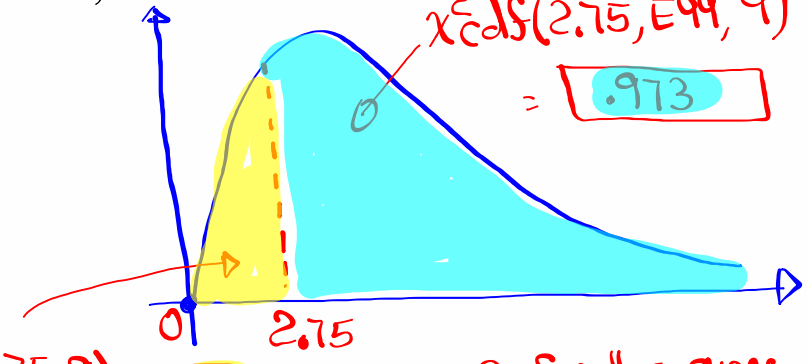


$z_{\alpha/2} = \text{invNorm}(.975,0,1)$

$= 1.960$

May 3-7:55 AM

Find area on each side of $\chi^2 = 2.75$ with df = 9, then multiply the smaller area by 2.



$\chi^2\text{cdf}(2.75, E99, 9) = .973$

$\chi^2\text{cdf}(0, 2.75, 9) = .027$

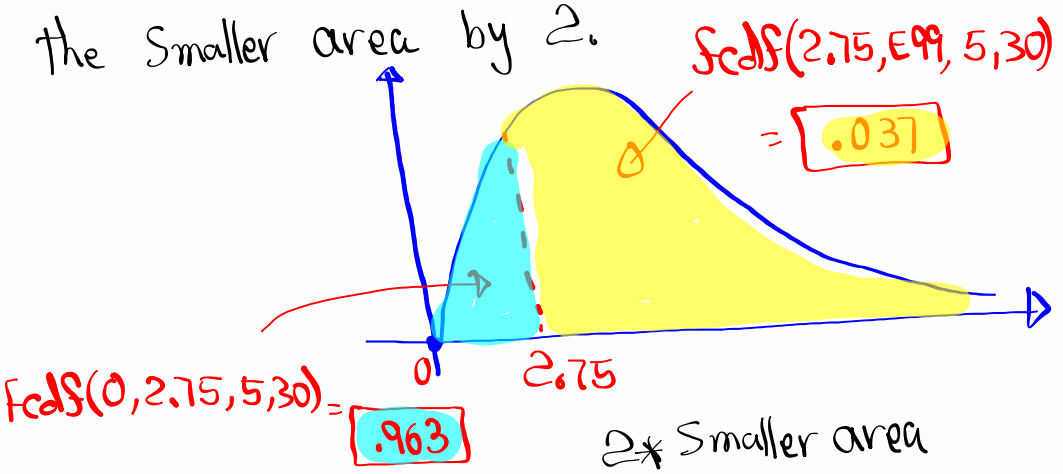
2 * Smaller area

$= 2(.027)$

$= .054$

May 3-8:07 AM

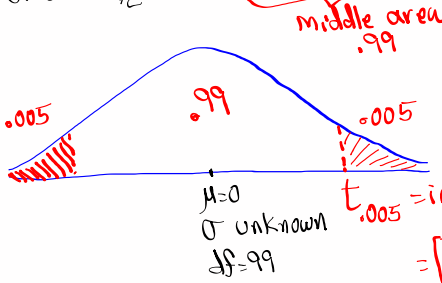
Find the area on each side of $F=2.75$ with $Ndf=5$ & $Ddf=30$, then multiply the smaller area by 2.



2 * Smaller area
$= 2*(.037) = .074$

May 3-8:12 AM

Find $t_{\alpha/2}$ for 99% C-level with df=99.



$t_{.005} = invT(.995, 99) = 2.626$

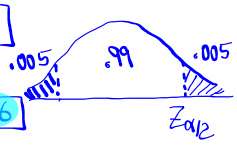
Redo with df=999

$invT(.995, 999) = 2.581$

Redo with df=9999

$invT(.995, 9999) = 2.576$

Now find $Z_{\alpha/2}$ for 99% C-level.



$Z_{\alpha/2} = invNorm(.995, 0, 1) = 2.576$

As df increase, $t_{\alpha/2} \approx Z_{\alpha/2}$

May 3-8:16 AM