Chapter 6
Confidence Intervals

6.1
Confidence Intervals for the Mean

Estimating Population Parameters

* You can use sample statistics to estimate the value of an unknown population parameter.
* Point estimate – a single value (one #) estimate for a population parameter.
  * The sample mean ($\bar{x}$) is a point estimate of the population mean (μ).
  * Remember from Chapter 5 – they are equal (or should be close)

EX:

* An economics researcher is collecting data about grocery store employees in a county. The data listed represents a random sample of the number of hours worked by 20 employees from several grocery stores in the county. Find a point estimate of the population mean μ.

* Find the sample mean

30	27	37	33	23	35	40	23	31	33
44	39	29	26	22	30	39	41	38	39

+

Total: 659 Hours

pop. mean = sample mean

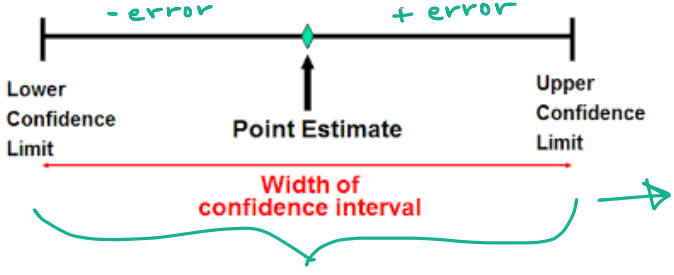
$\mu = \bar{x} = \frac{659}{20} = 32.95$ hours

Interval Estimates

* In the previous example, it is very unlikely that the population mean exactly equals the sample mean.
* So instead of using a point estimate (one #), you can use an interval estimate (a range of #s).
  * You can estimate that the population mean (μ) lies in an interval.
    * More likely to lie in a range of numbers than to exactly equal one number.

Interval Estimate

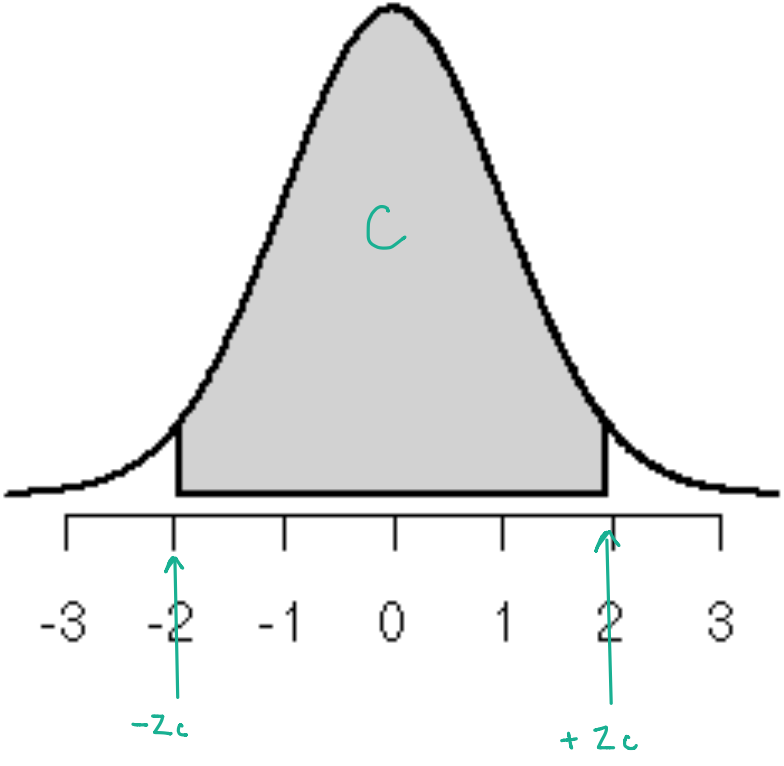
* An interval, or range of values, used to estimate a population parameter.
* To form an interval estimate:
* Use the point estimate (one # from a sample) as the center of the interval.
* Then add and subtract the margin of error to it.



Represents the interval that the population mean should be in

Level of Confidence (c)

* The probability (Area under the curve) that the interval estimate contains the population parameter → shows how confident we are that the pop. mean lies in our interval.
* The area under the standard normal curve between the critical values, $-Z_c$ and $+Z_c$ (two z-scores).
  * Critical Values – separate sample statistics that are probable (usual) from sample statistics that are improbable (unusual)

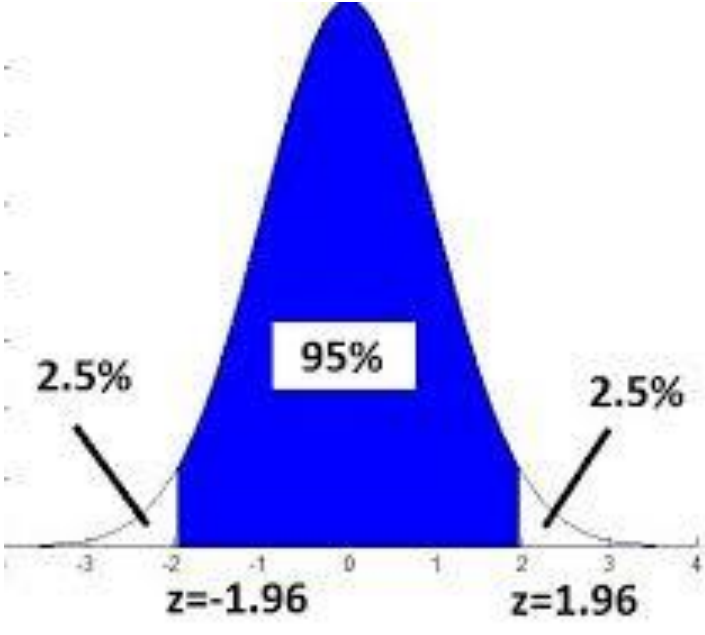


C = confidence interval (gray area)

$1 - C$ = white area

$\frac{1}{2}(1 - C)$ = left over white area dividing evenly on each side

EX:



$C = 95\% = 0.95 \rightarrow$ 95% Confident that the pop. mean lies in this interval

$1 - 0.95 = 0.05$

$\frac{0.05}{2} = 0.025$ left over on each side

* To find Z_c:
  - Distr
  - invnorm
  - area: 0.025
    μ : 0
    σ : 1
  - $Z_c = \pm 1.96$