The t Distribution

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Standard Error of the Mean

When approximating the standard error of the mean we use

$$\text{se}(\bar{x}) = \sigma_{\bar{x}} \approx \frac{s}{\sqrt{n}}$$

where $s = \widehat{\sigma_x}$ is the standard deviation of the population (the original data not the means).

The Distribution of the Mean

For a random sample of size n from a population with mean μ the distribution of the standardized value of the sample mean $\hat{\mu} = \bar{x}$, that is

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$$

is approximately t with $n - 1$ degrees of freedom provided

- n is "large" ($n \geq 30$)
- or for "small" n ($n < 30$), the *data* come from an approximately normal distribution

We write

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} \sim t_{n-1}$$

Normal and t distributions

What do the degrees of freedom do? How fat are the tails?