$n=12$

Renal Disease

The mean serum-creatinine level measured in 12 patients 24 hours after they received a newly proposed antibiotic was 1.2 mg/dL.

***7.1** If the mean and standard deviation of serum creatinine in the general population are 1.0 and 0.4 mg/dL, respectively, then, using a significance level of .05, test whether the mean serum-creatinine level in this group is different from that of the general population.

Hypotheses:

$H_0: \mu = 1.0$

$H_A: \mu \neq 1.0$

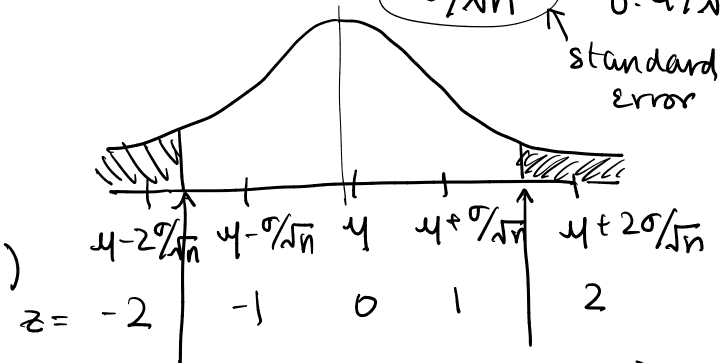
Data: $\mu = 1.0$, $\sigma = 0.4$, $\bar{x} = 1.2$, $n = 12$

Calculations: $z = \dfrac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \dfrac{1.2 - 1.0}{0.4/\sqrt{12}} = 1.73$

standard error

Assumptions:

1. SRS
2. Our sample mean comes from a normal population. (Normality)



$P(z < 1.73)$ $\quad$ $P(z > 1.73)$

$P(z > 1.73) + P(z < 1.73)$

$= 2 * P(z > 1.73)$

$= 2 * 0.04182$

p-value $= 0.08364 > \alpha = 0.05$

Conclusions:

Fail to reject the null. We do not have sufficient evidence to suggest that the mean serum-creatine level in group is different from that of the general population.

***7.2** Compute a two-sided 95% CI for the true mean serum-creatinine level in Problem 7.1

$\bar{x} \pm 1.96 \dfrac{\sigma}{\sqrt{n}}$

$= 1.2 \pm 1.96 \left(\dfrac{0.4}{\sqrt{12}}\right)$

$= \boxed{(0.974, 1.426)}$

$s = 0.6$

***7.3** Suppose the sample standard deviation of serum creatinine in Problem 7.1 is 0.6 mg/dL. Assume that the standard deviation of serum creatinine is not known, and perform the hypothesis test in Problem 7.1.

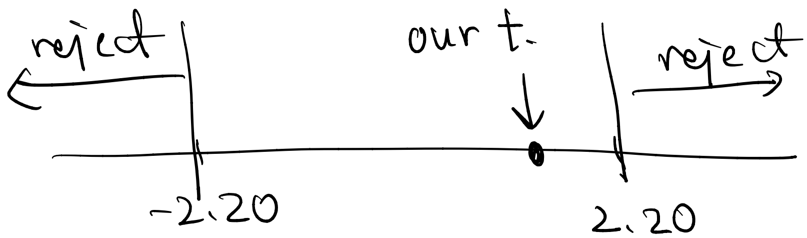
Data: $\mu = 1.0$, $s = 0.6$, $\bar{x} = 1.2$, $n = 12$

Calculations: $t_{df=11} = \dfrac{1.2 - 1.0}{s/\sqrt{n}} = \dfrac{0.2}{0.6/\sqrt{12}} = 1.15$

$$t^*_{crit, df=11, \alpha(2)=0.05} = 2.20$$

2-sided t-test

Decision Rule: $-t^*_{crit} \leq t_{df=11} < t^*_{crit} \Rightarrow$ fail to reject



Statistical Decision: Fail to Reject.

Conclusion: We do not have sufficient evidence to suggest that the mean of our sample is different from 1.0.

***7.4** Compute a two-sided 95% CI for the true mean serum-creatinine level in Problem 7.3.

$$\bar{x} \pm t^*_{crit, df=11, \alpha(2)=0.05} \frac{s}{\sqrt{n}}$$

$$1.2 \pm 2.20 \frac{0.6}{\sqrt{12}}$$

$$= \boxed{(0.819, 1.581)}$$

Ophthalmology

The drug diflunisal is used to treat mild to moderate pain due to osteoarthritis (OA) and rheumatoid arthritis (RA). The ocular effects of diflunisal had not been considered until a study was conducted on its effect on intraocular pressure in glaucoma patients who were already receiving maximum therapy for glaucoma [5].

***8.19** Suppose the change (mean +/- *sd*) in intraocular pressure after administration of diflunisal (follow-up – baseline) among 10 patients whose standard therapy was methazolamide and topical glaucoma medications was -1.6 +/- 1.5 mm Hg. Assess the statistical significance of the results.

$H_0: \mu = 0$ (no change)

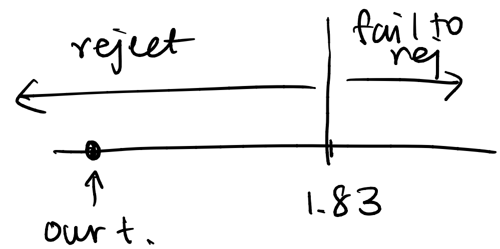
$H_A: \mu < 0$ (lower intraocular pressure)

Assumptions: 1. SRS, 2. Our data comes from a normally distributed population.

Data: $\bar{x} = -1.6$, $s = 1.5$, $\mu = 0$, $n = 10$

Calculations: $t = \dfrac{\bar{x} - \mu}{s/\sqrt{n}} = \dfrac{-1.6 - 0}{1.5/\sqrt{10}} = -3.37$

$t^*_{crit, \alpha(1) = 0.05, df = 9} = 1.83$



Statistical Decision: Reject H_0.

Practical Decision: We have evidence to suggest that methazolamide and topical glaucoma medications may reduce intraocular pressure.

***8.20** The change in intraocular pressure after administration of diflunisal among 30 patients whose standard therapy was topical drugs only was -0.7 +/- 2.1 mm Hg. Assess the statistical significance of these results.

$H_0: \mu = 0$ (no change)

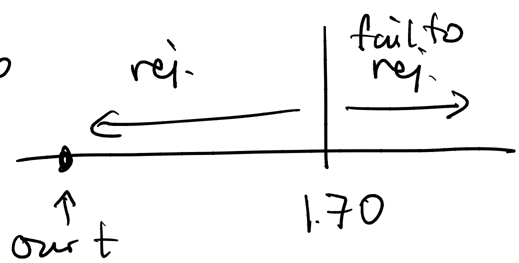
$H_A: \mu < 0$ (lower intraocular pressure)

Assumptions: 1. SRS. 2. $n \geq 30 \Rightarrow$ CLT implies normality

Data: $\bar{x} = -0.7$, $s = 2.1$, $\mu = 0$, $n = 30$

Calculations: $t = \dfrac{\bar{x} - \mu}{s/\sqrt{n}} = \dfrac{-0.7 - 0}{2.1/\sqrt{30}} = -1.826$

$t^*_{crit, \alpha(1) = 0.05, df = 29} = 1.70$



Stat. Decision: Reject H_0

Practical Decision: We have evidence to suggest that patients whose standard therapy was topical drugs lowered intraocular pressure

$\bar{x} \pm t^{*}_{crit, \boxed{\alpha(2)=0.05}} \, df= \_ \, \frac{s}{\sqrt{n}}$

***8.21** Compute 95% CIs for the mean change in pressure in each of the two groups identified in Problems 8.19 and 8.20.

(8.19) $\bar{x} \pm t^{*}_{\alpha(2)=0.05, df=9} \frac{s}{\sqrt{n}}$

$-1.6 \pm 2.26 \frac{1.5}{\sqrt{10}}$

$= \boxed{(-2.67, -0.53)}$

(8.20) $\bar{x} \pm t^{*}_{\alpha(2)=0.05, df=29} \frac{s}{\sqrt{n}}$

$-0.7 \pm 2.05 \frac{2.1}{\sqrt{30}}$

$= \boxed{(-1.49, 0.09)}$

~~***8.22** Compare the mean change in intraocular pressure in the two groups identified in Problems 8.19 and 8.20 using hypothesis-testing methods.~~