Discussion Section 5 p. R-61 (AMS 7 12 Jul 2016)

(a) ①

$$\frac{(32 \cancel{\text{mmole/kg}}) - (29.8 \cancel{\text{mmole/kg}})}{29.8 \cancel{\text{mmole/kg}}}$$

$$= \frac{\mu_0 - \bar{y}}{\bar{y}} = \frac{+2.2}{29.8} = 7.4\%$$ larger

theory value for μ is 7.4% larger than data mean $\bar{y}$; this could well be a practically meaningful difference (consult biology expert)

The pop. represents (in your judgment) the broadest scope of valid generalizability outward from the data sample pop

all arthropods of this species similar to the sample arthropods

sample

the observed arthropods

imag data

all possible $\bar{y}$s

calcium

$N = ?$ (big)

actual life

SRS

IID

calcium

$n = 13$

mean $\bar{y} = 29.8$

SD $s = 1.8$

29.8

29.6

.

.

.

$M \to \infty$

mean $\mu = ?$

SD $\sigma = ?$

hypothetical IID

sample hist

pop hist.

$n = 13$

mean $\bar{y} = ?$

(ex. 29.6)

long run mean EV of $\bar{y}$ = μ

est. long run SD $\hat{SE}$ of $\bar{y}$ = 0.5

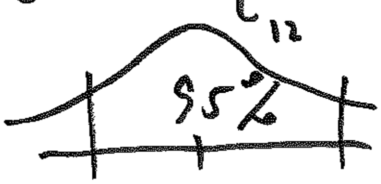
long run hist $\hat{SE}$ 0.5

μ

EV

$\hat{SE}$ 0.5

t_{12} curve



95%

μ

long run hist of $\bar{y}$

2.179

this is an inference problem because $\bar{y}$ is known & μ is unknown

inferential summary

unknown pop. quantity of main interest	μ = pop. mean calcium concentration
estimate of μ	$\bar{y} = 29.8$ mmole/kg
give or take for $\bar{y}$ as est. of μ	$\widehat{SE}(\bar{y}) = 0.5$ mmole/kg
95% interval for μ	(29.8 ± 1.1) mmole/kg

$$\text{EV of } \bar{y} = \boxed{E_{IID}(\bar{y}) = \mu}$$

est.

$$SE \text{ of } \bar{y} = \widehat{SE}_{IID}(\bar{y}) = \frac{\cancel{\sigma}\, s}{\sqrt{n}} = \frac{1.8}{\sqrt{13}} \doteq 0.5 \text{ mmole/kg}$$

$$95\% \text{ int} = \bar{y} \pm \left(t_{n-1}^{95\%}\right) \cdot \frac{s}{\sqrt{n}}$$

$$\doteq 29.8 \pm (2.179) \cdot (0.5)$$

$$= (29.8 \pm 1.1) \text{ mmole/kg}$$

95% int. for μ $\qquad$ μ_0

$$\underset{28.7}{(} \;\; \underset{29.8}{|} \;\; \underset{30.9}{)} \qquad \underset{32}{\downarrow}$$

since $\mu_0 = 32$ is not in the 95% int. for μ,

the theory that $\mu = \mu_0 = 32$ is not supported by the data $\Longleftrightarrow$

the difference between $\mu_0 = 32$ and $\bar{y} = 29.8$ is statistically significant $\Longleftrightarrow$ this difference is hard to attribute to unlucky random sampling $\Longleftrightarrow$

this difference is probably real