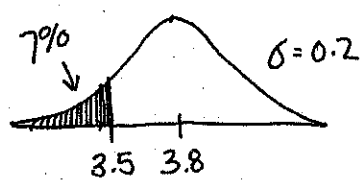
AC

AMS 7 — 10/22/09

(R-66) CASE STUDY: HYPOKALEMIA — * see notes 10/19

TRUE K^+ LEVEL = 3.8 (Healthy)

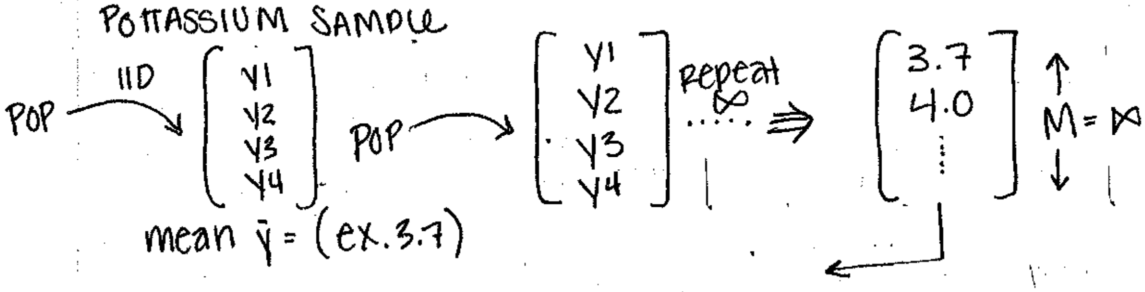


$\sigma = 0.2$ $\quad \frac{3.5 - 3.8}{0.2} = \frac{-.3}{.2} = -1.5$ ← SD's 3.5 is below the mean

P(misdiagnosis w/ n=4)

IMAGINARY DATA
POSSIBLE $\bar{Y}$

POTTASSIUM SAMPLE



mean $\bar{y}$ = (ex. 3.7)

- long run expected value of $\bar{y} = \mu = 3.8$
  - should average actual value (* on formula sheet)

SE (standard error) = $SE_{IID}(\bar{y}) = \frac{\sigma}{\sqrt{n}}$

* note: different from SE(S) ↑ as n↑ *

N	X
μ	X
σ	↑SE($\bar{y}$)↑
n	↑SE($\bar{y}$)↓

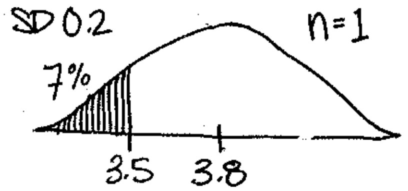
- Important: uncertainty about μ on the basis of $\bar{y}$ goes down with n but only at a $\sqrt{n}$ rate:

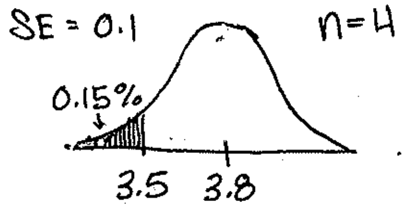
SQUARE ROOT LAW: $SE_{IID}(\bar{y}) = \frac{\sigma}{\sqrt{n}}$

To cut uncertainty in half, you must quadruple the sample size!

long run standard error of SD $\bar{y}$ = 0.1 = SE

LONG RUN HISTOGRAM OF $\bar{y}$ (n=1)





$\frac{3.5 - 3.8}{0.1} = -3$

n	P(misdiagnosis)	cost$
1	7%	25$
4	0.15%	100$

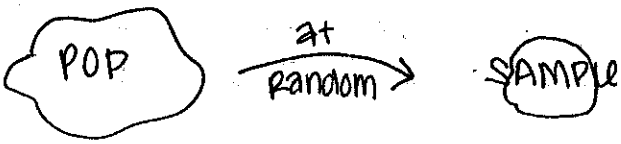
You need to specify your UTILITY; whether or not the cost is worth the accuracy

Misdiagnosis of Hypokalemia = eat bananas
misdiagnosis of HIV = :(

must weigh cost w/ value of accuracy

(L-139) CHAPTER 4: STATISTICAL INFERENCE

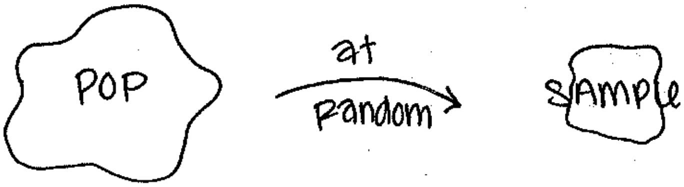
CASE STUDY: INTERTIDAL CRABS



(Hypokalemia)
PROBABILITY
→ deductive

mean μ = 3.8 mean $\bar{y}$ = ?

(L-140)



(Intertidal Crabs)
STATISTICS
→ induction

STATISTICAL INFERENCE

mean μ = ? mean = $\bar{y}$ = 25.0°C

AC

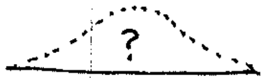
CASE STUDY: INTERTIDAL CRABS

POP All crabs of spp.	← generalize population from sample	SAMPLE observed		IMAGINARY possible $\bar{y}$

BODY TEMP

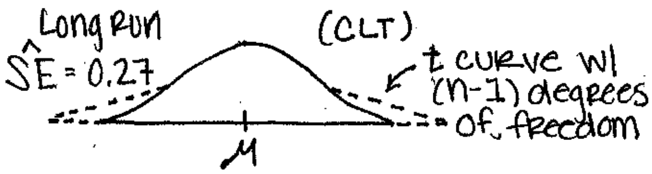
N = big $\begin{bmatrix} ? \\ ? \\ \vdots \end{bmatrix}$ $n = 25$ $\begin{bmatrix} 25.8 \\ \vdots \\ 25.4 \end{bmatrix}$ repeat ∞ x's → $\begin{bmatrix} 25.0 \\ 24.7 \\ \vdots \end{bmatrix}$ $M = \infty$

mean μ = ?
SD(σ) = ?



mean $\bar{y}$ = 25.0°C →
SD = 1.34
* Histogram (L-143)

EV = μ
$\hat{SE}$ = 0.27°C



INFERENTIAL SUMMARY

POP	unknown (pop) quantity of interest	μ = pop mean body temp after equilibrating to 24.3° (AIR)
SAMPLE	estimate of μ	$\bar{y}$ = 25.0°C
IMAGINARY	give or take for $\bar{y}$ as est. of μ	$\hat{SE}(\bar{y})$ = 0.27°C

IMAGINARY DATA CALCULATIONS

long run expected value of mean $\bar{y}$ =
EV of $\bar{y}$ = $E_{IID}(\bar{y}) = \mu$

long run standard error of $\bar{y}$ ⇒ est. SE = $\hat{SE}$ ("SE hat")
SE of $\bar{y}$ = $SE_{IID}(\bar{y}) = \frac{\sigma}{\sqrt{n}}$ $\boxed{\hat{SE}_{IID}(\bar{y}) = \frac{s}{\sqrt{n}}} = \frac{1.34}{\sqrt{25}} = 0.27°C$

I think μ is around 25.0°C ± 0.27°C