read:
DD ch. 1–11 (B)
DD ch. 1–3 (A)
read:
LN pp. 137–160

this time: inference for μ

next time: inference for p

today:
LN pp. 137 →

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AMS 7
8 May 18

Q_1: Is the difference between 25.0 °C ($\bar{y}$) & 24.3 °C (theoretical mean) practically significant? (large in biological terms)

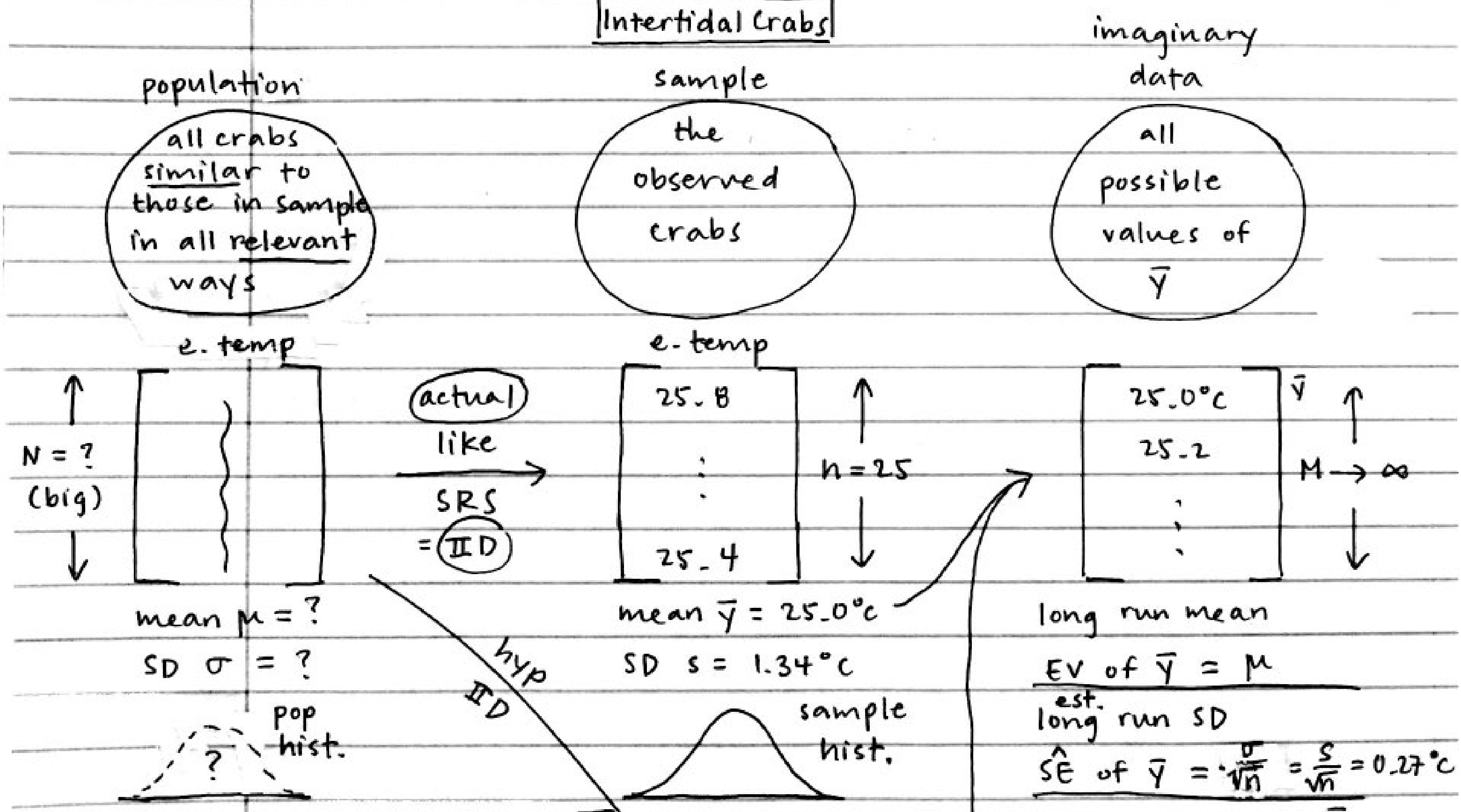
A_1: (best) consult an expert on intertidal crabs

$$\frac{25.0\,°C - 24.3\,°C}{24.3\,°C} = \frac{0.7\,\cancel{°C}}{24.3\,\cancel{°C}} \doteq 2.9\%$$

* Is a 2.9% diff. between data & theory big enough to matter?

Rough rule of thumb: relative differences of 5% or more are often (but not always) practsig; relative differences smaller than 5% can still be practsig if they accumulate over time.

Intertidal Crabs



* to specify pop., answer this Q:
What is the broadest scope of valid generalizability outward from this sample dataset?

n = 25

mean $\bar{y}$ = ?
(ex. 25.2 °C)

long run hist. of $\bar{y}$
$\hat{SE}$ 0.27 °C
CLT
μ

R-22
EV of $\bar{y}$ = $E_{IID}(\bar{y}) = \mu$

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

$\boxed{\hat{SE}(\bar{y}) = \frac{s}{\sqrt{n}}} = \frac{1.34\,°C}{\sqrt{25}} = 0.27\,°C$ → really important formula

estimated SE of $\bar{y}$

Scanned with CamScanner

pop. | hypokalemia | sample

whole
known
general

at random (IID) →

part
unknown
specific

Probability (easier)

μ = known

$\bar{y}$ = unknown (?)

pop | crabs | sample

whole
unknown
general

→ IID

part
known
particular

Statistics (harder)

μ = unknown (?)

$\bar{y}$ = known

(deductive reasoning) = (deduction)

(inductive reasoning) = (induction)
= (statistical inference)

crabs

Inferential Summary

unknown pop. quantity of main interest	μ = pop. mean of internal temp after equil. to 24.3°c	pop.
estimate of μ	$\bar{y}$ = 25.0°c	sample
give or take for $\bar{y}$ as est. of μ	$\hat{SE}(\bar{y}) = \frac{s}{\sqrt{n}} \doteq 0.27$°c	imaginary data
95% confidence interval	$\bar{y}_I$ (2.064)(0.27°c) = (24.44°c, 25.56°c) = (25.0°c − 0.56°c, 25.0°c + 0.56°c)	imaginary data

Stat. Inf as of 1908

- William Gosset (1908)
  - hops, yeast, barley, water

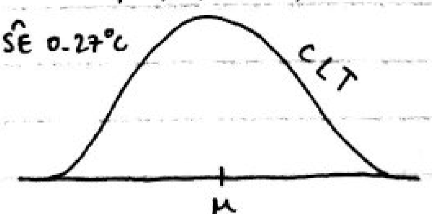
degrees of freedom

t – curve (n−1)

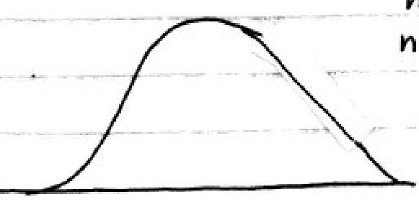
n = 25
n−1 = 24

long run hist. of $\bar{y}$

$\hat{SE}$ 0.27°c

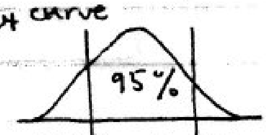


long run hist of $\bar{y}$, accounting for uncertainty in σ

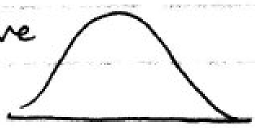


t-table p. L-142

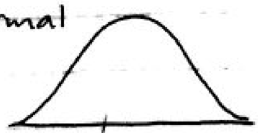
t_{24} curve



t_{ν} curve
nu "new"



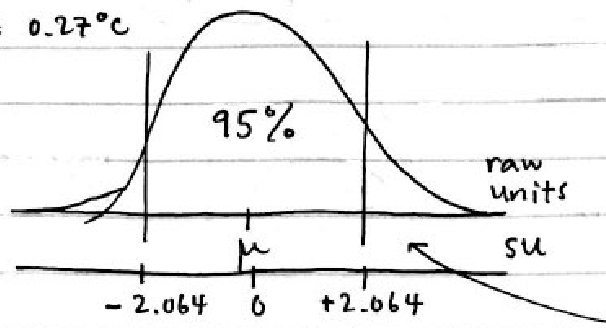
→ normal



as $\nu \to \infty$

long run hist. of $\bar{y}$, accounting for uncertainty in σ

$\hat{SE}$ 0.27°C



$\mu + 2.064\ \hat{SE}$

$= \mu + (2.064)(0.27°C)$

$$P_F(\mu - 2.064\,\hat{SE} \le \bar{y} \le \mu + 2.064\,\hat{SE}) \doteq 95\%$$

relative frequency

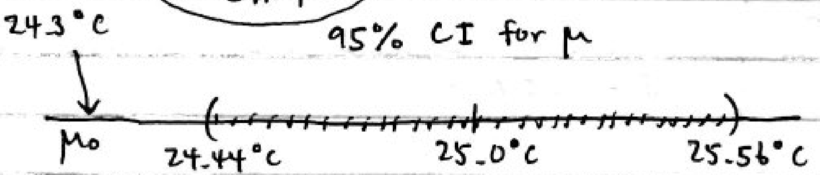
<u>Neyman's Confidence Trick</u>

$$P_F(\bar{y} - 2.064\,\hat{SE} \le \mu \le \bar{y} + 2.064\,\hat{SE}) \doteq 95\%$$

* Let's use $\bar{y} \pm \underbrace{2.064}_{0.95}\,\hat{SE}$ as a 95% confidence interval (CI) for μ

t_{n-1}

μ_0 = theory value of μ = 24.3°C



★ at 95% level of confidence, the theory value of 24.3°C is <u>not</u> supported by the data; the diff. between $\bar{y}$ (25.0°C) & μ_0 (24.3°C) is <u>statistically significant</u> (statsig).