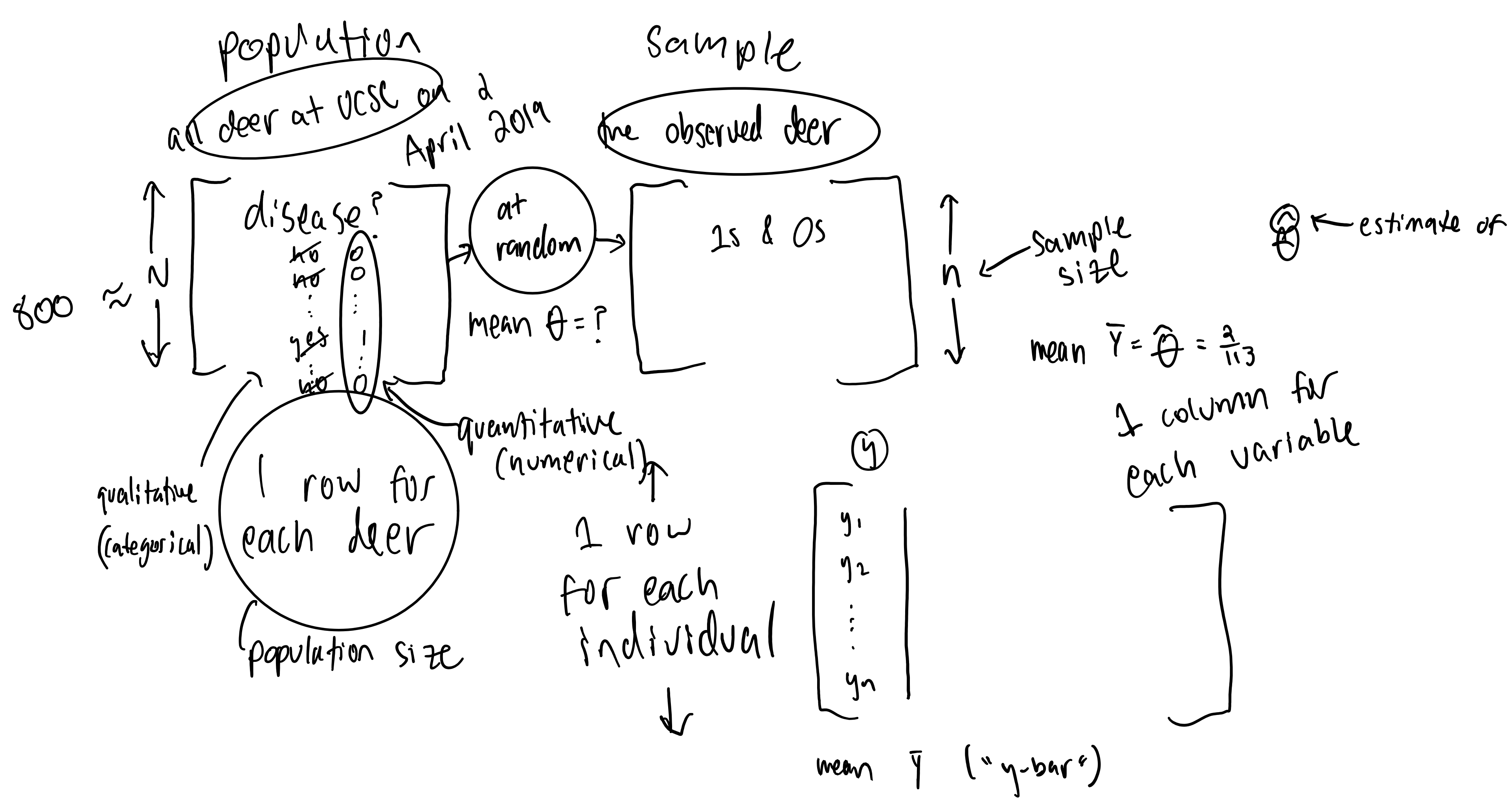
4/2/19

Tuesday, April 2, 2019 1:30 PM

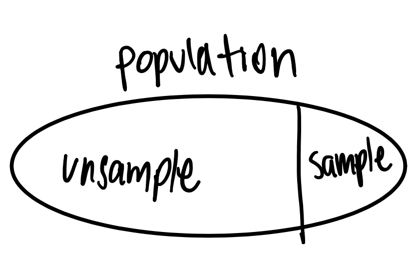
this time: a case study; experiments
read: De Groot & Schervish (2012): Ch. 1

next time: events, sample spaces, set theory
course webpage: ams131-spring19-01.courses.soe.ucsc.edu

webcasts: webcast.ucsc.edu
↳ user: ams-131-1
password: uncertainty-quantification



we want our sampling method to be unbiased



(goal:) make sample & unsample as similar as possible in all relevant ways

simplest method: choose sampled individuals at random

random sampling doesn't (can't) achieve perfect similarity between sample & unsample every time, but

(A) if we imagine repeating random sampling many M times & averaging results, the average will move toward achieving perfect similarity as # of repetitions increases

(B) as sample size (n)↑, it becomes harder for (sample, unsample) to differ by a lot along relevant dimensions

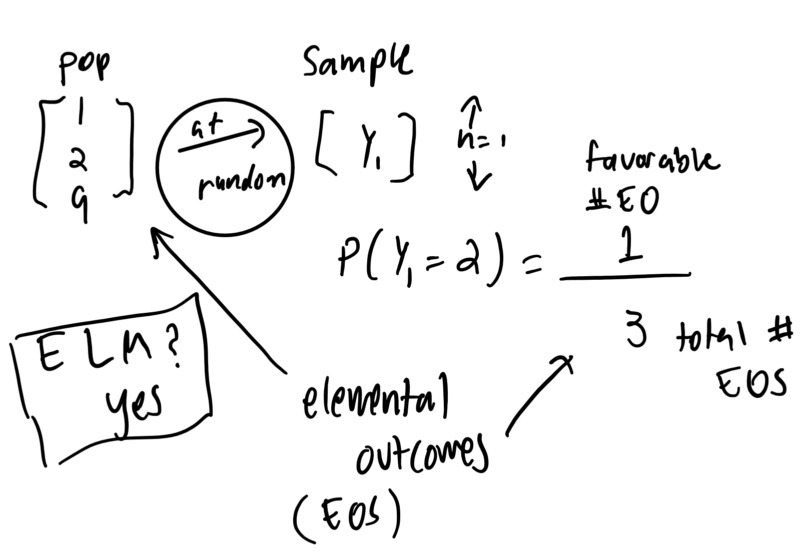
2 kinds of at random

- at random with replacement
  (independent indentically-distributed (IID) sampling)
- at random without replacement
  (simple random sampling)

[facts] ① if $n = 1$, IID = SRS

② if $n << N$, IID ≈ SRS
(<< : is a lot smaller than)

③ IID has easier math
SRS is more informative



$$\begin{pmatrix}\text{1 or more}\\ \text{T-S}\end{pmatrix} = \begin{pmatrix}\text{exactly}\\ 1\\ \text{T-S}\end{pmatrix} \text{ or } \begin{pmatrix}\text{exactly}\\ 2\\ \text{T-S}\end{pmatrix} \cdots \text{ or } \begin{pmatrix}\text{exactly}\\ 5\\ \text{T-S}\end{pmatrix}$$

$P(A \text{ or } B) = P(A) \,?\, P(B)$

$$\begin{pmatrix}\text{1 or}\\ \text{more T-S}\end{pmatrix} = \boxed{\text{not}} \begin{pmatrix}\text{exactly 0}\\ \text{T-S}\end{pmatrix}$$

$P(\text{not } A) \;?\; P(A)$

$$\begin{pmatrix}\text{exactly}\\ \text{0 T-S}\end{pmatrix} = \begin{pmatrix}\text{not}\\ \text{T-S}\\ \text{on}\\ \text{1st}\end{pmatrix} \text{ and } \begin{pmatrix}\text{not}\\ \text{T-S}\\ \text{on}\\ \text{2nd}\end{pmatrix} \text{ and} \ldots \text{ and } \begin{pmatrix}\text{not}\\ \text{T-S}\\ \text{on}\\ \text{5th}\end{pmatrix}$$

$P(A \text{ and } B) \overset{?}{=} P(A) \;?\; P(B)$