Thinking Beyond Simple Random Sampling

Fei Wang, STAT495

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Introduction

- SRT 5.5
- Sampling is an essential component of environmental studies
- Can be very expensive and time-consuming -> need to provide as much information as possible
- Occupational hazards -> importance of the sampling scheme

Rule of Thumb

Always consider alternatives to simple random sampling for a potential increase in **efficiency, lower costs, and validity**.

Composite sampling

- The number of required analyses is reduced by compositing several samples into one and analyzing the composited sample

E.g. Contaminated hot spots

- Pooling samples of 5 provides substantial savings for prevalences from 0.005 to 0.05

$$Relativecost = \frac{n+1}{n} - (1-\pi)^n$$

- relative cost: relative cost to no compositing
- n: no. of samples in the pooled sample
- π: prevalence of contaminated samples
- e.g. if π=0.10, when n=1, RC=1.1; when n=5, RC=0.61; when n=30, RC=0.99 -> pools of five is better

Ranked Set Sampling

- Use professional judgement **ranking** of a characteristic of interest to improve estimation of a population parameter

E.g. Mean Age of trees

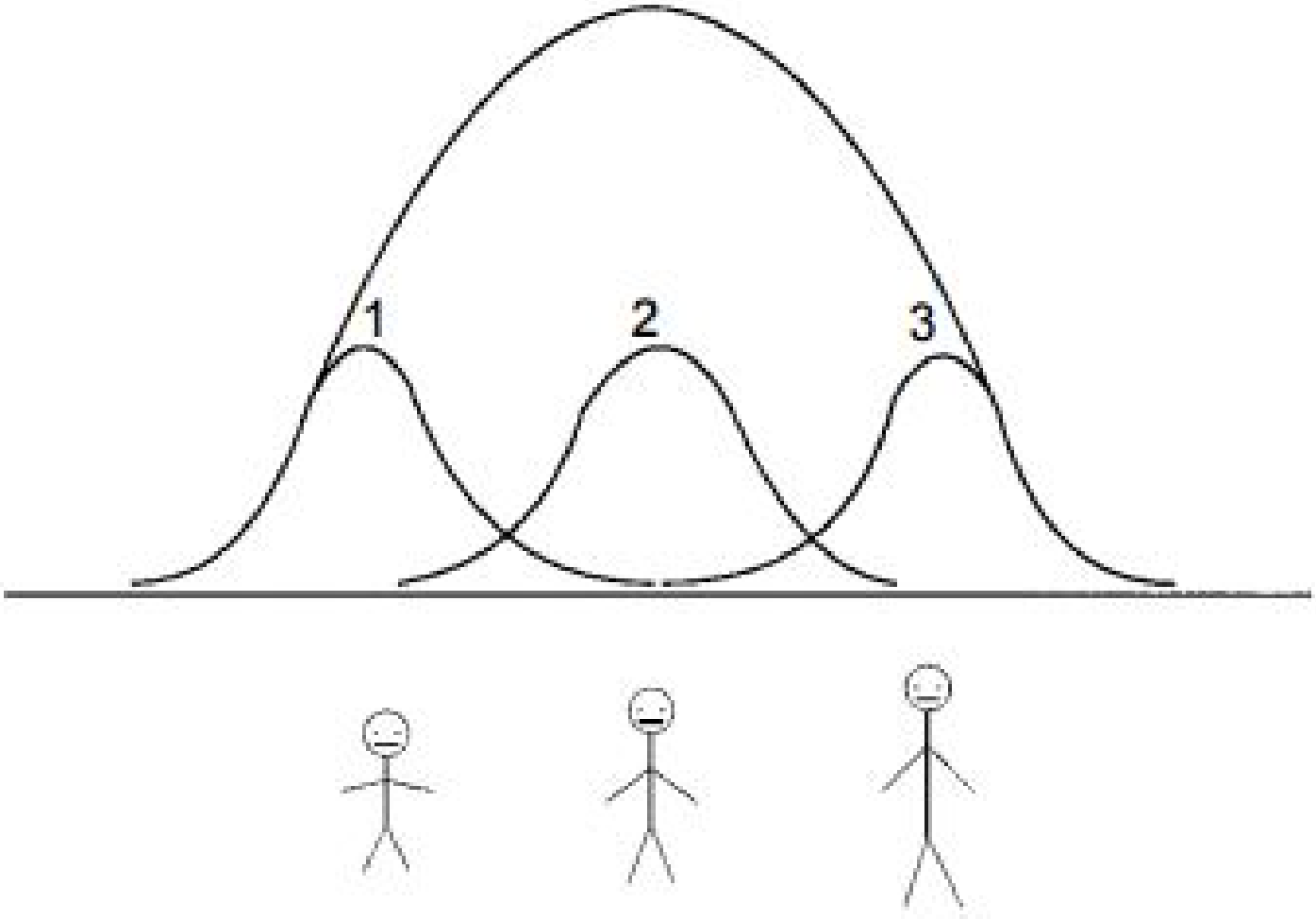
- Appropriate judgment-based measurement (e.g. visual size of the tree, bigger the tree older the age)

1. Randomly select 3 trees, mark the smallest tree
2. Randomly select another set of 3 trees, mark the medium one
3. Randomly select another set of 3 trees, mark the biggest one
4. Repeat 1-3 ten times, 10 trees from each stratum, a total of 90 trees
5. Determine the age of each marked tree and use it to estimate

Assessment

How are you going to estimate the mean height of students at Amherst College using Ranked Set Sampling?

Answer



Patil, G. P. 2002. "Ranked Set Sampling, Volume 3, Pp 1684–1690 in Encyclopedia of Environmetrics" edited by A. H. El-Shaarawi and W. W. Piegorsch. Retrieved July 2015 (http://sites.stat.psu.edu/ gpp/pdfs/tr2001-0203.pdf).