Systematic Sampling Lecture 9 Section 2.7

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Systematic Sampling

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Definition (1-in-k Systematic Sampling)

1-in-*k* systematic sampling is a sampling method in which *one* of the first *k* members of the population is selected at random. Then beginning with that member, every k^{th} member is selected.

- For example, if k = 10, then one of the first 10 members is selected at random (using randInt (1, 10)).
- Suppose member #6 is selected.
- Then beginning with member #6, every 10th member is selected.
- That is, members 6, 16, 26, 36, and so on.

1-in-k Systematic Sampling

- Number the members of the population 1 through *N*.
- Using randInt (1, k), choose a random starting point in the first block of size k. That represents the first member of the sample.
- From that starting point, put every k^{th} member in the sample.

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- Reconsider the population of 30 students and the question of permitting Sunday hunting.
- This time, we will take a 1-in-4 systematic sample.

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Let's randomize them...

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And then re-number them 1 - 30

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Choose a 1-in-4 systematic sample

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• What was our sample size?

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- What was our sample size?
- What sample proportion did we observe?

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- What was our sample size?
- What sample proportion did we observe?
- How does it compare to the population proportion?

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- What was our sample size?
- What sample proportion did we observe?
- How does it compare to the population proportion?
- Do it again.

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The Determination of k

- Divide the population size *N* by the desired sample size *n*.
- Let k = N/n (rounded off).
- If you round down, you may get one extra member.
- If you round up, you may get one less member.
- It does not matter.

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- Suppose we want to select n = 8 members from a population of size N = 30.
- Compute $k = 30/8 = 3\frac{6}{8} \approx 4$.
- Use randInt (1, 4) to get a random integer from 1 to 4.
- Then include that number and every 4th number thereafter in the sample.

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• There are 4 possibilities:

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- There are 4 possibilities:
 - Random no. = 1 : Sample = $\{1, 5, 9, 13, 17, 21, 25, 29\}$.

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- There are 4 possibilities:
 - Random no. = 1 : Sample = $\{1, 5, 9, 13, 17, 21, 25, 29\}$.
 - Random no. = 2 : Sample = $\{2, 6, 10, 14, 18, 22, 26, 30\}$.

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• There are 4 possibilities:

- Random no. = 1 : Sample = $\{1, 5, 9, 13, 17, 21, 25, 29\}$.
- Random no. = 2 : Sample = $\{2, 6, 10, 14, 18, 22, 26, 30\}$.
- Random no. = 3 : Sample = $\{3, 7, 11, 15, 19, 23, 27\}$.

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• There are 4 possibilities:

- Random no. = 1 : Sample = $\{1, 5, 9, 13, 17, 21, 25, 29\}$.
- Random no. = 2 : Sample = $\{2, 6, 10, 14, 18, 22, 26, 30\}$.
- Random no. = 3 : Sample = $\{3, 7, 11, 15, 19, 23, 27\}$.
- Random no. = 4 : Sample = $\{4, 8, 12, 16, 20, 24, 28\}$.

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Homework

- Read Section 2.7, pages 117 121.
- Let's Do It! 2.9, 2.10.
- Page 121, exercises 28, 30 32.
- Chapter 2 review, p. 136, exercises 44, 46, 48 50, 51, 53, 55, 56, 63.

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