

## Practice Assignment: Random Sampling

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- 1) What is the purpose of taking a simple random sample from a population?
- a) To produce a sample that is representative of the population
  - b) To eliminate bias in selecting the sample
  - c) To allow us to generalize our results from the sample to the population
  - d) All of the above

Answer: d

- 2) Determine whether this statement is true or false: If a biased sampling method is used, we cannot generalize results from the sample to the population.

Answer: True

- 3) In 2014, the statistical news website *FiveThirtyEight* conducted a series of online polls regarding people's views of acceptable behavior when flying. They found that, of the 858 respondents who had flown at least once in their lifetime, 41% thought it was either "very" or "somewhat" rude to recline your seat during a flight. A statistics instructor was curious if this result would differ for students at her school who had flown at least once. She took a simple random sample of 400 students from her school and collected data from the 327 who had flown at least once before. Of those 327 students, 56% thought it was either "very" or "somewhat" rude to recline your seat.

Part A: What is the population in the statistics instructor's study?

- a) All students who had flown at least once at her school
- b) All students at her school
- c) The 400 students selected for the study
- d) The 327 students selected who had flown at least once

Answer: a

Part B: What is the parameter the statistics instructor would like to estimate?

- a) The proportion of *FiveThirtyEight* respondents who thought it was either "very" or "somewhat" rude to recline your seat during a flight
- b) The proportion of students at her school who had flown at least once who thought it was either "very" or "somewhat" rude to recline your seat during a flight
- c) The proportion of students at her school who had flown at least once

d) Whether a student thought that it was either “very” or “somewhat” rude to recline your seat during a flight

Answer: b

Part C: Which study, the *FiveThirtyEight* poll or the statistics instructor’s survey, more likely suffered from a biased sampling method? Explain.

Answer: The *FiveThirtyEight* poll more likely suffered from a biased sampling method. The *FiveThirtyEight* poll was an online survey where people could volunteer to participate. The statistics instructor used a simple random sample from the population, which is an unbiased sampling method.

Questions 4–7: A social justice nonprofit group would like to study what factors may contribute to the frequency of hate crimes in the United States. They plan on collecting data on the rate of hate crimes for city jurisdictions in each state; however, they only have funding to sample 15 states.

The following table (continued on the following page) displays the number of hate crimes per 100,000 people recorded by the FBI in the year 2019 among city jurisdictions in the 50 states.<sup>1</sup>

Ordered Number	State	Hate Crimes per 100k
1	Alabama	0.00
2	Alaska	3.34
3	Arizona	5.06
4	Arkansas	3.23
5	California	3.84
6	Colorado	5.56
7	Connecticut	4.31
8	Delaware	7.70
9	Florida	1.78
10	Georgia	3.76
11	Hawaii	4.21
12	Idaho	3.97
13	Illinois	1.70
14	Indiana	3.61

Ordered Number	State	Hate Crimes per 100k
26	Montana	5.10
27	Nebraska	3.25
28	Nevada	1.57
29	New Hampshire	8.57
30	New Jersey	9.13
31	New Mexico	6.53
32	New York	4.75
33	North Carolina	3.86
34	North Dakota	4.08
35	Ohio	8.17
36	Oklahoma	1.43
37	Oregon	7.03
38	Pennsylvania	1.63
39	Rhode Island	2.63

<sup>1</sup> U.S. Department of Justice, Federal Bureau of Investigation, Criminal Justice Information Services Division (2019). *2019 Hate Crime Statistics*. <https://ucr.fbi.gov/hate-crime/2019/hate-crime>

15	Iowa	1.90
16	Kansas	5.48
17	Kentucky	5.93
18	Louisiana	1.71
19	Maine	7.85
20	Maryland	5.47
21	Massachusetts	11.70
22	Michigan	6.96
23	Minnesota	5.51
24	Mississippi	16.88
25	Missouri	4.29

40	South Carolina	6.38
41	South Dakota	4.50
42	Tennessee	2.57
43	Texas	2.58
44	Utah	1.94
45	Vermont	16.08
46	Virginia	2.10
47	Washington	13.62
48	West Virginia	9.66
49	Wisconsin	3.66
50	Wyoming	5.55

- 4) Describe how you could use cards to select a simple random sample of 15 states. In your description, include the number of cards you would need, what you would write on each card, and how you would select your sample.

Answers will vary.

Sample answer: On each of the 50 cards, write the name of each state so that the 50 cards represent the 50 states. Shuffle the cards and then deal 15 cards to get the sample.

- 5) Use the *Generate Random Numbers* tool at <https://lumen-learning.shinyapps.io/randomnumbers/> to generate a simple random sample of 15 states from this population. Fill in the following table with the corresponding states and number of hate crimes per 100,000 people in city jurisdictions in 2019 for each of your randomly generated numbers.

Randomly Generated Number	State	Hate Crimes per 100k
6	Colorado	5.56
20	Maryland	5.47
49	Wisconsin	3.66
18	Louisiana	1.71
26	Montana	5.10
14	Indiana	3.61
11	Hawaii	4.21
36	Oklahoma	1.43

37	Oregon	7.03
2	Alaska	3.34
46	Virginia	2.10
38	Pennsylvania	1.63
10	Georgia	3.76
31	New Mexico	6.53
21	Massachusetts	11.70

Answers will vary.

Sample answer: Noted above in red.

- 6) Calculate the mean (e.g., average) number of hate crimes per 100,000 people in city jurisdictions in 2019 for the 15 states in your randomly selected sample from Question 5. Is the resulting value a parameter or a statistic?

Answers for the value of the mean will vary depending on the sample. Since this value is calculated from a sample, it is a statistic.

- 7) Would you expect the sample you generated in Question 5 to be representative of the population? Explain.

Answer: Yes; we used a random number generator to select the sample, so the sampling method is unbiased.

