Sample Surveys
and the Box Model
Connecting the Two

Review

basic rules of chance

addition rule

multiplication rule

chance processes

especially those we can model with a box model

expected value and standard error

The sum will be about _____ give or take _____ or so.

normal approximation

Scenario

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The number of approvers in our sample will be about _____ give or take _____ or so.

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The number of approvers in our sample will be about _____ give or take _____ or so.

$$\textbf{expected value for sum} = 400 \times \frac{8m}{13m} \approx 246$$

$$\textbf{standard error for sum} = \sqrt{400} \times \sqrt{\frac{8}{13} \times \frac{5}{13}} \approx 10$$

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&= \frac{246}{400} \times 100\,\% \\
&= 0.615 \times 100\,\% \\
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\textbf{standard error for percent} &= \frac{\textbf{standard error for sum}}{\textbf{number of draws}} \times 100\,\% \\
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The **percent** of approvers in our sample will be about 62% give or take _____ or so.

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The number of approvers in our sample will be about 246 give or take 10 or so.

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The **percent** of approvers in our sample will be about 62% give or take 3% or so.

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Poll a random sample of 16 Americans and ask: "With respect to the abortion issue, would you consider yourself pro-life or pro-choice?"

Assume 300m Americans and that 50% are pro-life and 50% are pro-choice.

Questions

1. What's the expected value and standard error for the number in your sample that are pro-life?

2. What's the expected value and standard error for the percent in the sample that are pro-life?

3. 95% of the time, the sample percentage will fall between ____ and _____.

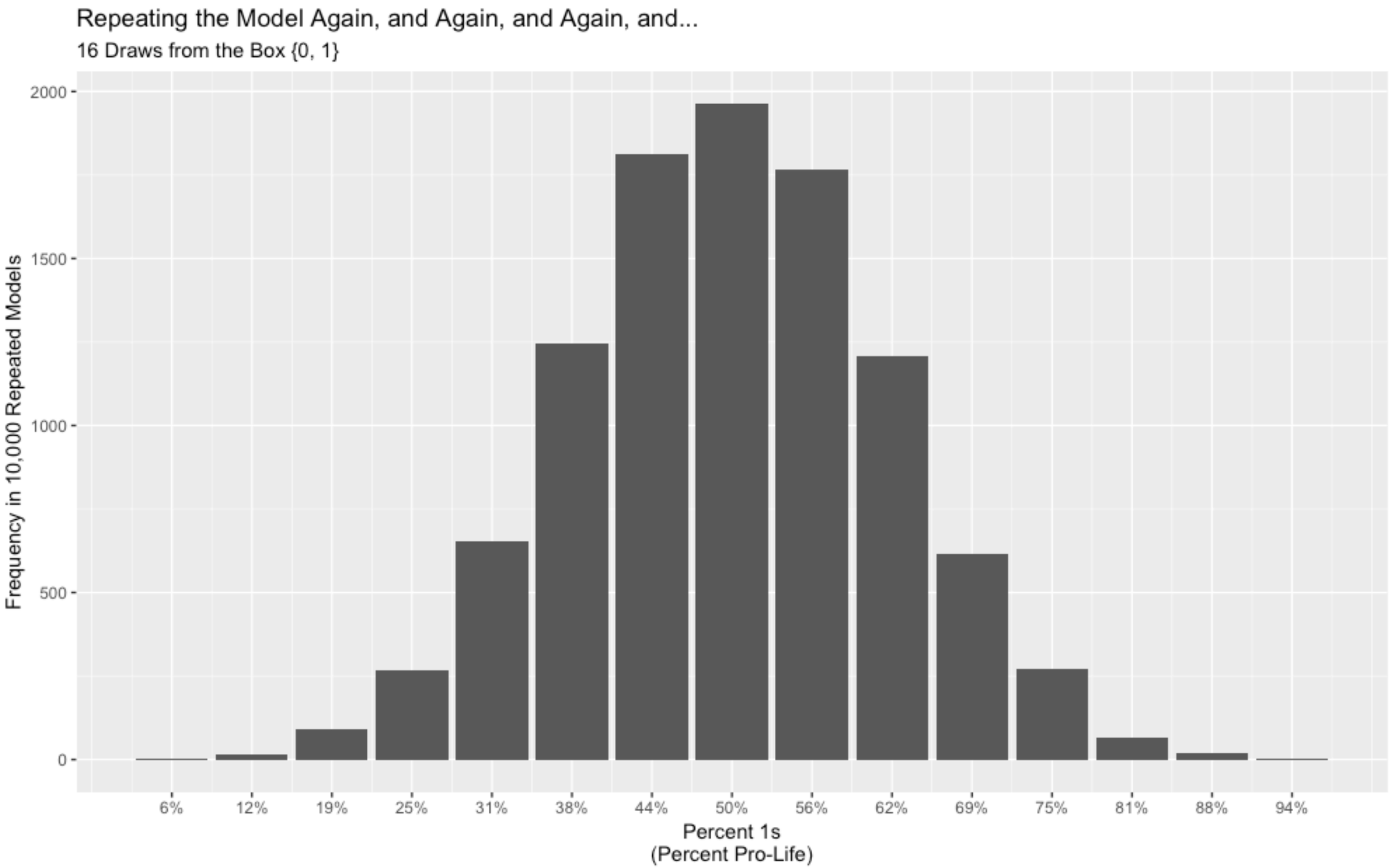
Exercise

Do it! We can't sample Americans, but we can toss a coin. Let a Head be like sampling a pro-life respondent. Let a Tail be like sampling a pro-choice respondent.

1. **Toss the coin 16 times and find the percent of "pro-life respondents." Round to the nearest whole percent.**

2. **Add a yellow sticky note to the top of the column for your percent.**

3. **If you have time, do it again!**


Repeating the Model Again, and Again, and Again, and...
16 Draws from the Box {0, 1}
Frequency in 10,000 Repeated Models
2000
1500
1000
500
0
6%
12%
19%
25%
31%
38%
44%
50%
56%
62%
69%
75%
81%
88%
94%
Percent 1s
(Percent Pro-Life)

Concluding Observations

population **sample**

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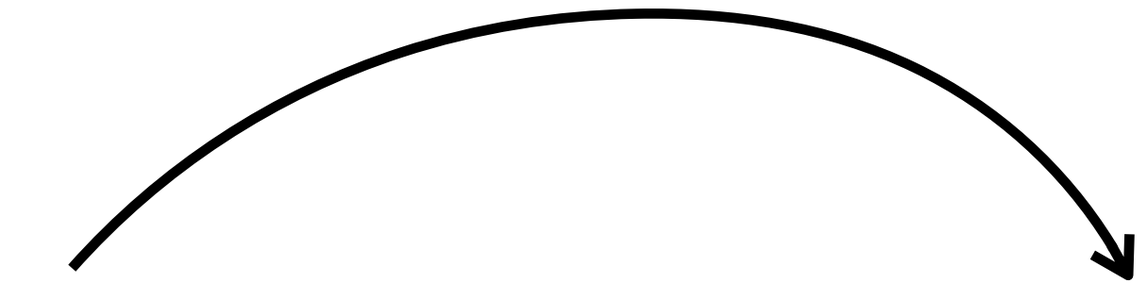
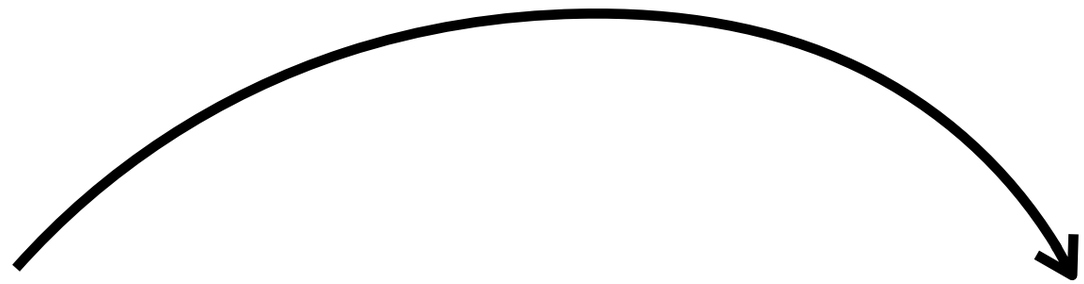


population **sample**

Concluding Observations

If we know what the population looks like, we can describe what the samples will look like.



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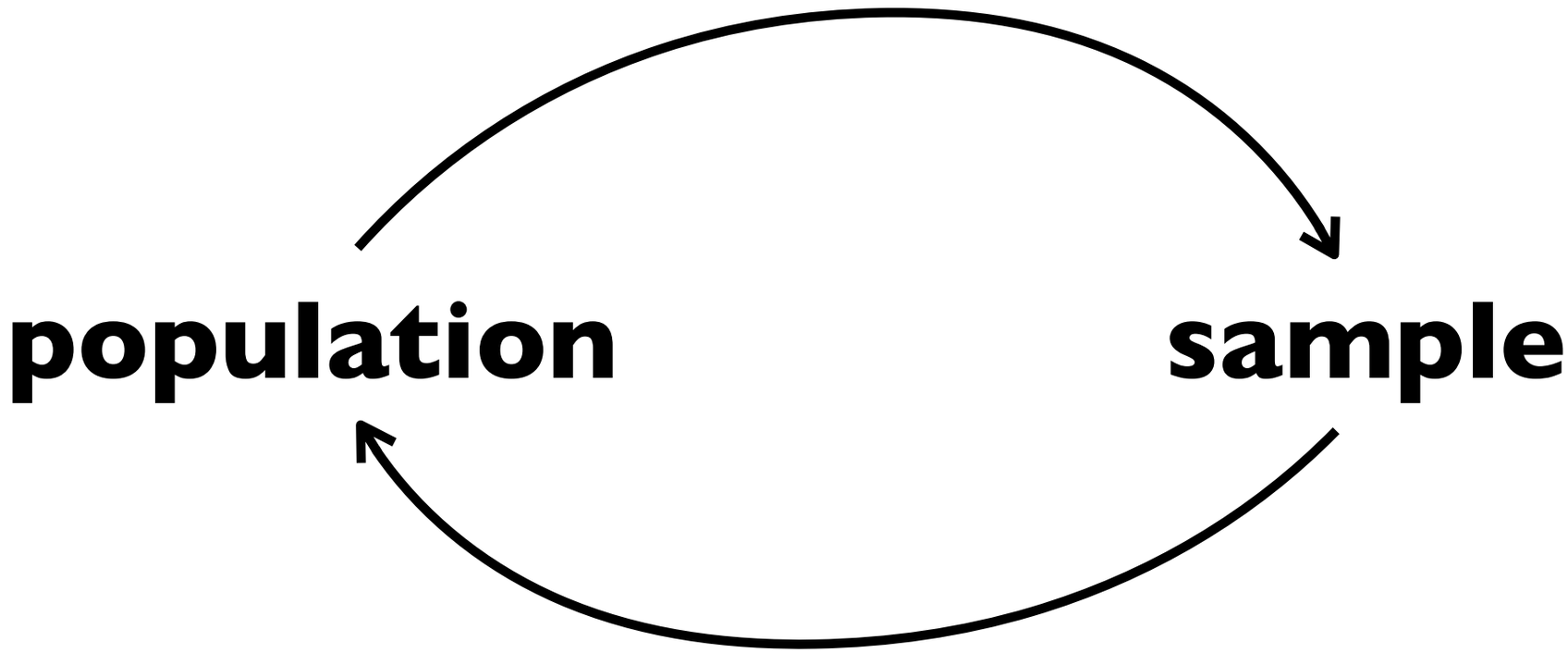

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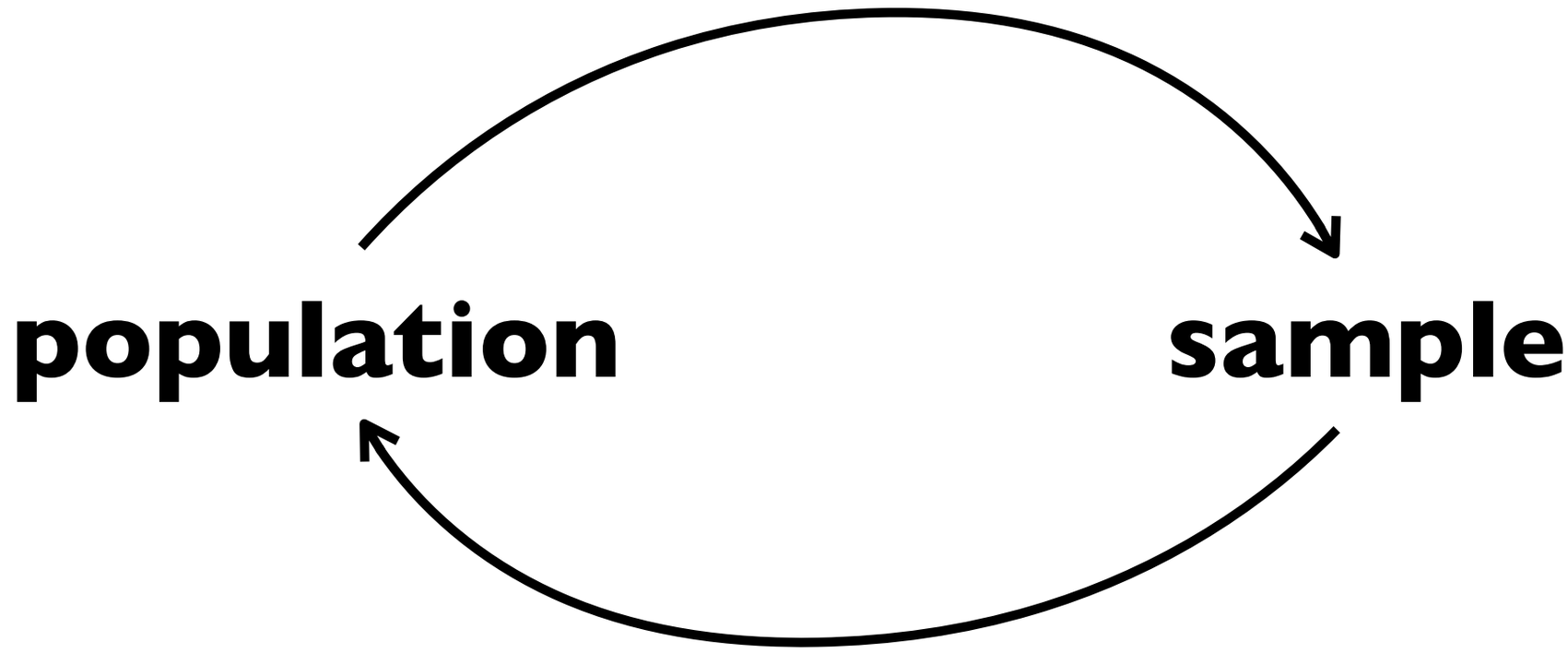

In practice, we only have a sample!
Based on the sample, what can we say about the population?

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The expected sample percentage equals the population percentage.

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$$
\begin{aligned}
\textbf{expected value for percent} &= \frac{\textbf{expected value for sum}}{\textbf{number of draws}} \times 100\,\% \\
&= \frac{\textbf{number of draws} \times \textbf{avg. of box}}{\textbf{number of draws}} \times 100\,\% \\
&= \textbf{avg. of box} \times 100\,\% \\
&= \frac{\textbf{number of 1s}}{\textbf{total number}} \times 100\,\% \\
&= \textbf{fraction of 1s in population} \times 100\,\% \\
&= \textbf{percent of 1s in population}
\end{aligned}
$$

Concluding Observations

The sample percentage is about the population percentage give or take a SE or so.

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population

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sample