BJS Webinar Terminology
Research on Small Area Estimation for the National Crime Victimization Survey
September 23, 2026

This is a list of terms that may be unfamiliar to those new to small area estimation. These are not formal definitions; they are plain-language explanations that provide enough context so that you can enjoy the webinar. Terms are listed in roughly the order that they appear in this webinar.

Direct estimate

- What we can learn from our data alone: You survey 500 people on whether they like pizza and 400 say yes. Our direct estimate is 80% of survey respondents like pizza.

Model-based estimate

- What we can infer based on other information: You want to know average income by age for people in your county. You plot the relationship of age to income based on data that you collected. It makes a line. No one in your sample was age 99. But look at your line. If X is 99, what would Y be? You can get a model-based estimate of the expected income for someone age 99.

Frequentist

- An approach to statistics which is usually taught in statistics classes that you have had in the past.
- The truth is fixed but unknown. We rely on assumptions based on statistical principles.
- If you flip a coin one million times, half will be heads and half will be tails.
- Deductive reasoning.
- Your data are random, but if the population looks like this, your data should look like that.

Bayesian

- Considered the alternative to frequentist.
- Start with your prior belief (prior = before). This is based on what you know (or don't know) from past research/experience.
- Then you look at the data that you have.
- Based on what you see, you update your belief. This gives you a new posterior belief (post = after) belief. As you get more information, you update what you believe.
- Say I know 25% of people like Buffy the Vampire Slayer (BTVS). My prior belief is that about 25% of attendees at this webinar like BTVS. But then I see research that 40% of people who are on the BJS mailing list like BTVS. You were probably on the BJS mailing list. So, I update my prior belief and now think that about 40% of attendees at this webinar like BTVS. But then I learn only half of attendees are on the mailing list. I now think less than 40% but more than 25% of you like BTVS.
- The logic is easier; the math is sometimes harder. Ignore the equations in the slides for now.

Standard error

- A measure of uncertainty. Bigger number = more uncertainty.
- Say you survey 100 people. People in your sample drink an average of 3.5 cups of coffee a day. But what if you surveyed all people? Would they also drink an average of 3.5 cups of coffee a day? Would you confidently say that people in the United States drink 3.5 cups of coffee a day?

Balanced Repeated Replication (BRR)

- A type of standard error (see above). One way to measure uncertainty. Are your estimates sensitive to who is sampled?
- In your sample, 12% of people own motorcycles.
- But what if your sample was slightly different?
- Create designed alternate systematic (not random) samples from your sample (e.g., everyone except the people in class A, everyone but the people in class B, etc.).
- Calculate the percent of motorcycle owners for each one.
- How much do your estimates differ by sample? With software like R and SAS, you can do this quickly to directly calculate a standard error for every case.
- A lot = big standard error.

Generalized variance function (GVF)

- Another type of standard error/measure of uncertainty. Before computers, it was hard to calculate a standard error for a survey case, subgroup, or combination of variables. Instead, statisticians calculated a standard error for a small group. Based on that information, they could estimate the standard errors for everyone else.
- Use a model to get the standard error instead of calculating it directly.

Taylor series linearization (TSL)

- A third type of standard error/way to measure uncertainty.

Mean squared error (MSE)

- How different are your predictions from reality, on average?
- You predict that rate of cat ownership in your office is 45 per 1,000 people. It's really 50. Your estimate was 5 too low. Then square that. Squaring prevents positive and negative differences from canceling out and creating a false perfect prediction.
- Then look at your next prediction, then the next, and so on. Then take the average of your differences squared.
- Because it is squared, a difference of 2 becomes 4 and a difference of 10 becomes 100. It's a lot worse to be wrong by 10 than 2.

Benchmarking

- Force sum of model-based estimates to equal a direct estimate for the nation.
- Your estimate + benchmarking adjustment = national estimate.
- Why? The estimate for the nation is stable.

Residuals

- The difference between what happened and what we would predict happened.
- Smaller residual = your model did a better job predicting.
- There are differences caused by something you didn't account for.
- The average price for a home in your neighborhood costs $200,000 for 2,000 square feet. But your house costs $250,000 for 2,000 square feet. The $50,000 is the residual. Why? A lot goes into the price of a house besides square footage that your initial estimate did not account for.

Spatial dependence

- Places that are close together are more similar than places that are far apart.
- The weather in D.C. is more likely to be similar to the weather in Maryland than the weather in Iowa.