New methods help identify what drives sensitive or socially unacceptable behaviors

November 27 2018, by Mary Guiden

Meng Cao, who is pursuing a doctoral degree in statistics, and Professor Jay Breidt teamed up with researchers from the Department of Human Dimensions of Natural Resources to drill down on results from using the randomized response technique. Credit: Joe Mendoza/CSU Photography

Conservation scientists and statisticians at Colorado State University

have teamed up to solve a key problem for the study of sensitive behaviors like poaching, harassment, bribery, and drug use.

Sensitive behaviors—defined as socially unacceptable or not compliant with rules and regulations—are notoriously hard to study, researchers say, because people often do not want to answer direct questions about them.

To overcome this challenge, scientists have developed indirect questioning approaches that protect responders' identities. However, these methods also make it difficult to predict which sectors of a population are more likely to participate in sensitive behaviors, and which factors, such as knowledge of laws, education, or income, influence the probability that an individual will engage in a sensitive behavior.

Assistant Professor Jennifer Solomon and Associate Professor Michael Gavin of the Department of Human Dimensions of Natural Resources at CSU, and Abu Conteh from MacEwan University in Alberta, Canada, have teamed up with Professor Jay Breidt and doctoral student Meng Cao in the CSU Department of Statistics to develop a new method to solve the problem.

The study, "Understanding the drivers of sensitive behavior using Poisson regression from quantitative randomized response technique data," was published recently in *PLOS One*.

Conteh, who, as a doctoral student, worked with Gavin in New Zealand, used a specific technique, known as quantitative randomized response, to elicit confidential answers to questions on behaviors related to non-compliance with natural resource regulations from a protected area in Sierra Leone.

In this technique, the researcher conducting interviews has a large container containing pingpong balls, some with numbers and some without numbers. The interviewer asks the respondent to pick a ball at random, without revealing it to the interviewer. If the ball has a number, the respondent tells the interviewer the number. If the ball does not have a number, the respondent reveals how many times he illegaly hunted animals in a given time period.

While the interviewer does not know specifically if the number given was a number on a ball or a number related to illegal hunting, the distribution of numbered and unnumbered balls allows inferences to be drawn.

Using this technique, Conteh made inferences about the percent of the population that engaged in illegal behavior. But Gavin, Solomon and Conteh wanted to learn more about what drives poaching: Are younger men more inclined to engage in this illegal activity? Are people from larger households more likely to violate hunting regulations? Were people deterred from illegal activity by their knowledge of law enforcement activity?

Frustrated with their inability to move beyond generalizations about an overall population, Gavin and Solomon asked Breidt for help refining the data.

An intriguing proposition

Breidt had read about the randomized response technique in scientific journals, and was intrigued.

"Here's this interesting probabilistic way to get data, but I had never encountered someone who really did it," he said.

He enlisted Cao, who is pursuing a doctoral degree in statistics, to tackle the problem. Cao and Breidt developed a methodology and the software to implement it. They tested the new methodology with extensive simulations, before applying it to the Sierra Leone data.

Armed with the new computer program, the scientists found that people from rural communities with less access to jobs in urban centers were more likely to hunt in the reserve. People in communities with a greater proportion people displaced by Sierra Leone's 10-year civil war were also more likely to hunt illegally.

The researchers said that collaborating across disciplines was and is key to addressing complex problems like this one. It is commonplace for people to be noncompliant with rules and regulations and equally important for social scientists to analyze these behaviors.

Solomon said the team is hopeful that the software and methodological approach will be used broadly for research around the world.

"This is an exciting advance that should prove useful for a variety of different topics of societal concern," she said.

More information: Meng Cao et al, Understanding the drivers of sensitive behavior using Poisson regression from quantitative randomized response technique data, *PLOS ONE* (2018). DOI: 10.1371/journal.pone.0204433

Provided by Colorado State University

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