

Edward J. Stanek III receives \$1 million grant to develop new statistical methods for Modelling Finite Populations

Edward J. Stanek III, professor of biostatistics at the School of Public Health and Health Sciences at the University of Massachusetts Amherst, has been awarded a three-year, \$1 million grant from the National Heart, Lung, and Blood Institute to develop new statistical methods to be used in modeling finite populations.

Stanek says the research is very exciting, as it addresses some of the most basic issues facing researchers in Public Health- how to apply results of studies to particular groups, or individual subjects. For this reason, results from this research have broad applications, and may result in a fundamental change in our ability to use statistical reasoning to answer detailed questions.

As explained by Stanek, the most common statistical concept is using the sample mean to estimate the mean in a population. For example, to estimate the mean cholesterol among patients in a physician's practice, the average cholesterol is typically calculated for a sample of the patients. Since the sample doesn't include all patients, the sample average is only a guess of the true average for the practice. Although the guess is not likely to be exactly correct, using basic statistical ideas, we can judge how close the guess is likely to come to the true average cholesterol (i.e. by forming a confidence interval).

However, most patients (and medical workers) would agree that a more specific question, "What is my cholesterol level?" is more relevant. Current statistical methods were not developed to directly answer this question. Stanek, and his co-workers, are working on filling this important gap. Their research builds upon definitions of the patients and population, using the process of sampling subjects as the sole basis for the statistical models. In the process, fewer assumptions are needed, and the inference can be directly related to those studied. As explained by Stanek, this implies that the methods are non-parametric so that discussion can focus on the substantive problem being investigated, not the appropriateness of the technical statistical assumptions. The new methodology extends what are called 'design based' methods in statistics. Such methods directly account for the finite detailed nature of the study, and Stanek hopes eventually can lead to answers that are specific to an individual patient.

Using the grant, Stanek, working with Drs. Li (a former UMASS graduate) and Reed at the UMASS-Worcester Medical School and Drs. Singer and Bolfarine in the Department of Statistics at the University of Sao Paulo, Sao Paulo Brazil, new statistical methods will be developed for multi-stage sample settings and applied to problems in experimental design, survey research, and longitudinal studies. As part of this research, the UMASS investigators will work directly with the Brazilian team in Sao Paulo for three weeks each year in January, and the Brazilians will work with the UMASS team for one month here in Amherst each year in July. To help move the theoretical research into practice, the study team includes Drs Bertone-Johnson and Chasan-Taber (nutritional and physical activity epidemiologists in the Department of Public Health, UMASS-Amherst), and Dr. Ockene (cardiologist, UMASS-Worcester).

Stanek notes that the research is highly technical, and is forcing the study team to re-think the basic ideas underlying statistical inference. Such new ideas lead one to re-phrase the question, "how do you best estimate the population mean based on a simple random sample" to "how do you predict the response for subjects not included in your sample so that you can predict the population mean." Such re-phrasing has implications for teaching statistical reasoning, and interpreting statistical results.

Stanek joined the university in September 1983. She earned her doctorate in biostatistics at the University of North Carolina School of Public Health, and has been at UMASS ever since. This research follows up on a previous NIH grant that laid the foundation for the new developments.