Welcome back to The Methodology Center Perspective!

Spring has finally arrived in Pennsylvania, which means that we are preparing for our thirteenth annual NIDA-funded Summer Institute on Longitudinal Methods. This summer, David Mackinnon will present Statistical Mediation Analysis. Each attendee will receive a copy of David’s new book, entitled “Introduction to Statistical Mediation Analysis.”

We are gearing up for an exciting Annual Conference of the Society for Prevention Research (SPR), which will be held May 28–30 in San Francisco, CA. Linda Collins, Director of The Methodology Center, will become the new President of SPR this summer. Linda and I will participate in a panel symposium on facilitating secondary data analysis for early-career prevention scientists. The Center has organized several symposia for SPR this year, including a session on estimating treatment effects in observational and experimental studies (organized by Joseph Schafer and Joseph Kang of The Methodology Center) and one on advanced modeling of sexual risk behavior (organized by me and Edward Smith of Penn State). Also, John Dziak and I will provide a technical demonstration of our recently-developed SAS procedures for variable selection, latent class analysis, and latent transition analysis. Please visit us and pick up a free CD with our software! You can read more about our participation in the upcoming SPR conference on Page 3.

I am thrilled to announce that the National Council on Problem Gambling (NCPG) has awarded Bethany Bray, Assistant Director of The Methodology Center, their annual Outstanding Dissertation Award for her dissertation entitled “Examining Gambling and Substance Use: Applications of Advanced Latent Class Modeling Techniques for Cross-sectional and Longitudinal Data.” Bethany will present her work at the NCPG annual conference this June in Long Beach, CA. In addition, Dr. Bray has been awarded pilot funding from the Social Science Research Institute at Penn State to collect innovative data on gambling and alcohol use among college students. We look forward to learning more from Bethany about this emerging public health area.

One goal of our Center is to identify methods developed in various disciplines that show promise for advancing research on the prevention and treatment of problem behaviors. Daniel Rivera, Associate Professor of Chemical Engineering at Arizona State University, received a Mentored Quantitative Research Development Award (K25) entitled “Control Engineering Approaches to Adaptive Interventions for Fighting Drug Abuse” last fall from NIH. Linda Collins and Susan Murphy of The Methodology Center serve as Daniel’s mentors. The goal of Daniel’s K25 is to examine how control engineering principles can lead to novel approaches for time-varying, adaptive interventions aimed at prevention and treatment of multiple, co-occurring disorders associated with substance use, HIV/AIDS, and mental health.

The NIDA-funded Prevention and Methodology Training Program, which is a collaborative effort involving Penn State’s Prevention Research Center and The Methodology Center, is going strong. If you know a talented graduate student or postdoctoral researcher who is interested in a career focusing on both prevention science and quantitative methodology, please encourage him or her to find out more about postdoctoral training opportunities in this program (see our website for details).

The Methodology Center looks forward to welcoming two visiting faculty members this summer. Lisa Dierker, an Associate Professor of Psychology at Wesleyan University, and Jian-Jian Ren, a Professor of Mathematics at the University of Central Florida, will join us for the upcoming year. We hope that their time with us will stimulate novel, interdisciplinary projects and allow new perspectives to influence our research. With the addition of Lisa and Jian-Jian, and the return of Linda Collins from her sabbatical, we look forward to a great year ahead!

Warm regards,

Stephanie T. Lanza, Ph.D.
Scientific Director, The Methodology Center
Penn State University

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Special Issue on Methodology in Developmental Psychology

In March, 2008 APA published the special issue New Methods for New Questions in Developmental Psychology. The issue, edited by E. Michael Foster (The Methodology Center and the University of North Carolina at Chapel Hill) and Ariel Kalil (University of Chicago), focuses on recent developments in social science methodology. One goal of this issue is to highlight the interplay between new methods and advances in developmental theory, and how they can continue to inform each other.

Topics covered in the issue include modeling gene-environment interactions, estimating pathways using recursive partitioning, pooling data from multiple longitudinal data sets, modeling social networks, estimating causal effects, applying growth curve modeling to dyadic data, integrating qualitative and quantitative methods, and estimating stage-sequential processes over time. Given the increasing availability of statistical software for applying new methods, social scientists have more tools at their disposal than ever before. Many of the articles in this special issue provide instructional material to help social scientists apply these new methods in their own studies. For example, Stephanie Lanza and Linda Collins (both of The Methodology Center) discuss syntax and provide sample code for running latent transition analysis using SAS® PROC LTA to estimate transitions in dating and sexual risk behavior.

For more information and a complete list of articles contained in the special issue, visit http://content.apa.org/journals/dev/44/2.
Featured Scientist

Bethany Bray

Bethany Bray received her Ph.D. in Human Development and Family Studies and her Masters of Applied Statistics from Penn State in 2007. She received a pre-doctoral fellowship from the Prevention and Methodology Training program offered by The Methodology Center and the Prevention Research Center at Penn State. Currently, Bethany is a research associate and the assistant director of The Methodology Center.

Bethany’s research is focused on understanding the development of gambling and its relation to the development of comorbid problem behaviors like alcohol and drug use. Her interests are driven largely by the fact that gambling and gambling problems are recognized as emerging areas of public health concern in the United States, and the mounting evidence that alcohol and drug use are some of the most important correlates of gambling and gambling problems.

Bethany develops and applies cutting-edge statistical methods in this research area. In particular, she focuses on latent class analysis and its extensions. These methods provide a way to identify types of individuals characterized by similar multi-dimensional patterns of behavior, describe change over time in behavior, and model relations among multiple behaviors. These methods make it possible, for example, to identify types of individuals at high risk for developing gambling problems (or problems in multiple domains like gambling and alcohol use). These methods also provide an alternative to the traditional practice of identifying high-risk individuals using the pathological gambling diagnostic criteria. A latent class approach provides important advantages, such as helping prevention scientists to develop programs targeted to individuals at different stages in the developmental process.

Bethany was awarded the 2008 Outstanding Dissertation Award by the National Council on Problem Gambling for her doctoral work in this area. Her dissertation, entitled “Examining Gambling and Substance Use: Applications of Advanced Latent Class Modeling Techniques for Cross-sectional and Longitudinal Data” (Bray, 2008), is comprised of three empirical studies using increasingly sophisticated latent class and latent transition modeling techniques to identify types of high-risk gamblers and to examine the relation between gambling and substance use. She will present her award-winning work at the Council’s annual conference in June.

Bethany was also invited to present a talk on this work at the annual conference of the American Academy of Health Behavior in March 2008.

Bethany also works on a variety of other methodological and substantive research projects. She works closely with Stephanie Lanza and Linda Collins in The Methodology Center on advanced latent class modeling techniques that incorporate covariates, distal outcomes, and multiple developmental processes. In collaboration with Ty Ridenour (University of Pittsburgh) and The Second Mile, she is investigating whether known predictors of substance use are also related to gambling during late childhood and the desire to gamble in the future. Bethany is also conducting pilot projects funded by The Methodology Center and by the Children, Youth and Families Consortium (CYFC) of the Social Science Research Institute at Penn State. The goal of the CYFC-funded study, entitled “Unique and Shared Aspects of Alcohol Use and Gambling in College: A Pilot Study to Inform Behavior Assessment,” is to develop a measure of gambling behavior for college students. She will incorporate this measure into the University Life Study in order to investigate the daily, event-level co-occurrence of gambling and alcohol use among college students. Finally, in collaboration with Helene White (Rutgers University) and scientists from the Social Development Research Group at the University of Washington, she modeled transitions into and out of light and intermittent smoking from adolescence to emerging adulthood using Markov models (White, Bray, Flemming, & Catalano, in press).


New Study Reveals High School Seniors’ Motivations to Drink

In 2006, a team of five early-career researchers from The Methodology Center and the Prevention Research Center at Penn State competed (as the “Daughters of Prevention” team) in the inaugural Sloboda and Bukoski Society for Prevention Research Cup Competition at the annual conference of the Society for Prevention Research. Four members of the team were trainees of the Prevention and Methodology Training Program at Penn State. Led by Donna Coffman (The Methodology Center), they set out to determine whether high school seniors have different motivations to drink alcohol. If they do, prevention and intervention programs for alcohol use can be designed to target different subgroups of seniors as a cost-effective alternative to universal programs that target all seniors. High school seniors were of particular interest as the transition out of high school represents a unique opportunity for prevention scientists to target individuals prior to potential escalations in behavior during college. Results of the study were published in a recent issue of Prevention Science (Coffman, Patrick, Palen, Rhoades, & Ventura, 2007). The study received a great deal of national press from groups such as CBS News and WebMD.

Data for the study were from the 2004 Monitoring the Future (MTF) survey, a national survey conducted annually by the University of Michigan’s Institute for Social Research. Latent class analysis was used to identify the following subgroups of high school seniors based on eight reasons for drinking alcohol:

- **Experimenters** - drink alcohol primarily to experiment
- **Thrill-seekers** - drink primarily to have a good time and to get high
- **Relaxers** - drink primarily to relax
- **Multi-reasoners** - drink for all of these reasons and to cope with problems and anger

Membership in the Multi-reasoners subgroup was associated with significantly greater odds of drinking before 4 p.m. and a greater frequency of drunkenness in the past year, compared to the Experimenters. In addition, they were significantly more likely to have initiated drinking at an earlier age than members of the Experimenters subgroup. Analyses were conducted using PROC LCA (available for download at http://methodology.psu.edu/).

Recent Activity in The Methodology Center

Stephanie Lanza has been selected by the Society for Prevention Research Early Career Preventionist Network to receive the 2008 ECPN Early Career Award. Each year, this award is given to an individual for their contributions to advancing the field of prevention science.

Bethany Bray was awarded the National Council on Problem Gambling's 2008 Outstanding Dissertation Award for her dissertation entitled "Examining Gambling and Substance Use: Applications of Advanced Latent Class Modeling Techniques for Cross-sectional and Longitudinal Data."

Linda Collins delivered the closing keynote address at the annual Meeting of the Society of Behavioral Medicine in San Diego in March 2008. The theme of the conference was "Celebrating the Past, Inspiring the Future." Her talk was entitled "Building More Efficacious and Effective Behavioral Interventions: One View of the Future of Intervention Development."

Joseph Schafer will give a keynote address at the third European Congress of Methodology (joint with the Society for Multivariate Analysis in the Behavioral Sciences) in Oviedo, Spain this July. The title is "Marginal Causal Modeling with Imputed Estimating Equations."

Linda Collins will be one of the faculty at the Eighth Annual Summer Training Institute on Randomized Controlled Trials Involving Behavioral Interventions, sponsored by the NIH Office of Behavioral and Social Science Research. The Institute will be held this July in Virginia.

E. Michael Foster (The Methodology Center, the University of North Carolina at Chapel Hill) and Ariel Kalili (University of Chicago) edited a special issue on Developmental Psychology focused on quantitative methods. Stephanie Lanza and Linda Collins contributed an article demonstrating the use of PROC LTA for latent transition analysis.

The symposium Individual and Contextual Differences in Treatment Effects: New Methodologies for Experimental and Observational Research, chaired by Joseph Schafer, will include the following talks: Marginal Causal Modeling when the Treatment is Measured with Error (Joseph Kang), Variable Selection for Tailoring Treatment (Susan Murphy), and Causal Effect Moderation with Application to Level of Care Matching for Adolescent Substance Abuse Treatment (Daniel Almirall). The speakers will describe innovative techniques to explore individual and contextual differences in treatment effects, both in observational and experimental settings, with wide-ranging applications to research on physical and mental health outcomes. Discussion will be provided by Elizabeth Stuart of Johns Hopkins University.

The symposium Advanced Statistical Modeling of Sexual Risk Behavior Over Time, chaired by Edward Smith, will include the following talks: The Effects of the HealthWise Intervention on Condom Use Knowledge (Donna Coffman), Alcohol Use and Sex: Modeling Daily Co-variation in Behaviors (Megan Patrick), and Using Latent Transition Analysis to Model Transitions in Dating and Sexual Risk Behavior (Stephanie Lanza). Discussion will be provided by Richard Jenkins of the National Institute on Drug Abuse.

Linda Collins and Stephanie Lanza will participate in a panel symposium on facilitating secondary data analysis for early-career prevention scientists. This symposium, which was organized by members of the Society for Prevention Research (SPR) and the Early Career Preventionist Network (ECPN), will bring together senior scientists interested in collaborations using their data, NIH representatives familiar with relevant funding mechanisms, and early-career prevention scientists interested in analyzing existing data.

A technical demonstration featuring New Developments in SAS Procedures for Prevention Research will be presented by David Lemmon, John Dziak, Bethany Bray, and Stephanie Lanza. A new SAS® procedure for variable selection, PROC SCADLS, will be demonstrated along with PROC LCA & PROC LTA for latent class and latent transition analysis.

Michael Cleveland, along with Mark Feinberg and Mark Greenberg, will present the talk Cross-Level Interactions Between Family and School Contexts: Testing an Interactive Model of Adolescent Risk Behaviors. The poster Examining Differences in Patterns of Tobacco, Alcohol, and Marijuana Use by Gambling Behavior will be presented by Bethany Bray and Michael Cleveland of The Methodology Center, along with Mark Feinberg and Mark Greenberg of the Prevention Research Center at Penn State.


Linda Collins, Stephanie Lanza and colleagues (including Mildred Maldonado-Molina, a former trainee of The Methodology Center who is now an Assistant Professor of Epidemiology at the University of Florida) conducted a study using latent transition analysis to compare substance use onset among Hispanic populations in the US and in Puerto Rico:


Ty Ridenour (University of Pittsburgh), Bethany Bray (The Methodology Center) and colleagues contributed the chapter:


Funding for the 2008 ECPN Early Career Award was provided by the National Institutes of Health and the National Science Foundation. Visit us on the Web: http://methodology.psu.edu/
I am interested in modeling change over time in risky sexual behavior during adolescence, but I cannot decide how to code my outcome variable. I could create a dummy variable at each time point that indicates whether or not the individual has had intercourse, a count variable for the number of partners, or a continuous measure of the proportion of times they used a condom, but none of these approaches seems to capture the complex nature of the behavior.

--- Uni Dimensional

Dear Uni, you are right that all of these dimensions (having intercourse, number of partners, proportion of times used a condom) may be important to take into account in a model of sexual risk behavior. It's difficult to imagine a single composite score that could reflect these different aspects of behavior. One approach you might consider is modeling the outcome as a latent class variable. Latent class analysis (LCA) is a measurement model that identifies underlying subgroups in a sample based on a set of categorical indicators. In your study, each indicator can correspond to a different dimension or aspect of behavior. This approach would yield a set of subgroups of individuals, each characterized by a particular behavioral pattern. Although each individual's true class membership is unknown, the model provides estimates of an individual's probability of membership in each class.

Latent class analysis can be extended to longitudinal data. This approach, called latent transition analysis (LTA), is used to estimate transitions over time in latent class membership. In other words, development in discrete latent variables over two or more times can be examined. Once a latent transition model is selected, covariates can be incorporated in the model as predictors of initial status or as predictors of change over time in the behavior. This would allow you to address questions such as "Does parental permissiveness in middle school predict sexual behavior in middle school, or transitions to more risky behavior in high school?" In addition, the model can be extended to include multiple groups in order to determine whether characteristics such as ethnicity moderate the relation between parental permissiveness and transitions to more risky behavior.

Lanza & Collins (2008) demonstrated the use of latent transition analysis to model change over time in dating and sexual risk behavior across three time points during emerging adulthood. Data were from three waves of the National Longitudinal Survey of Youth 1997. Four categorical indicators of the latent variable were assessed each year: the number of dating partners in the past year (0, 1, 2 or more), past-year sex (yes, no), the number of sexual partners in the past year (0, 1, 2 or more), and unsafe sex, that is, sex without a condom, in the past year (yes, no). The following five latent classes were identified at each time: Non-daters (18.6% at Time 1), Daters (28.9%), Monogamous (11.7%), Multi-partner safe (23.1%), and Multi-partner exposed (17.7%). Transition probabilities showed that members of the higher-risk Multi-partner exposed latent class were most stable in their behavior across time. Interestingly, individuals who were most likely to transition into this higher-risk latent class were members of the Monogamous latent class, suggesting that the Monogamous group might be an important target for prevention efforts. Alcohol, cigarette, and marijuana use all were significantly related to sexual risk behavior at Time 1, although alcohol and marijuana use were stronger predictors of membership in the higher-risk Multi-partner exposed latent class than cigarette use. Past-year drunkenness predicted transitions from the Non-daters and Daters latent classes to the Multi-partner exposed latent class.

PROC LCA & PROC LTA, SAS® procedures for latent class and latent transition analysis, are available free of charge from The Methodology Center website (http://methodology.psu.edu/).