

Erik Erhardt

Research Statement

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My research career has been significantly shaped by collaborations across diverse disciplines focussed into a few key thematic areas¹: dementia, depression, undergraduate education, and vulnerable populations. When developing and supporting grant proposals, I look for solid research strategies which can simultaneously best address the applied research questions of interest, while also enabling interesting methodological and statistical model and software development. Following this strategy, I have cultivated local long-term collaborative relationships maintaining a high level of funding and publication productivity.

■ Biostatistical collaborations

My collaborative research spans diverse themes. Biostatistics faculty are in high demand as statistical support and as thesis committee members, naturally leading to diverse research. Nevertheless, I have developed several collaborations that focus on a few key applied areas.

Dementia and Depression. Since 2013, I have been the **Director of the Biostatistics and NeuroInformatics (BNI) Core** for the second and third phases of the Center for Biomedical Research Excellence (COBRE) in Brain Function and Mental Illness at the Mind Research Network. I have collaborated and advised many scientists on applying and interpreting statistical methods, publishing papers as a collaborator (Mayer, Ling, Dodd, Stephenson, Reddy, Robertson-Benta, **Erhardt**, Harms, Vakhtin, Campbell, Sapien, and Phillips 2022). I have applied statistical and machine learning techniques and written software to study dementia with **Dr. Gary Rosenberg**. I have been the senior statistician on his large team since 2015 on an NIH R01 grant, a U-grant, a P20 NM Alzheimer's Disease Research Center, and Lead for the Statistics Core on an upcoming NIH P30 proposal (**Erhardt**, J. C. Adair, J. E. Knoefel, Caprihan, Thompson, Prestopnik, Hobson, Siegel, and G. A. Rosenberg 2021). I have been working with **Dr. Christopher Abbott** since 2016 (and informally for years before). I am currently the lead statistician on a multi-center NIH/R61 grant to continue studying electroconvulsive therapy (ECT) to develop methods for personalized treatments for depression with fewer cognitive side effects. This area has many opportunities for the development of associated multilevel Bayesian models (Deng, Argyelan,

¹These research areas are not an accident: my stepmom died early from dementia, members of my family struggle with depression and anxiety, I'm passionate about education as a first-generation college student, and I want to use my skills to contribute to local social justice.

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Miller, Quinn, Lloyd, Jones, Upston, **Erhardt**, McClintock, and Abbott 2021). With a new collaborator, **Dr. Saphira Ryman**, I have been studying Parkinson's disease and longitudinal relationships with hippocampal volume (**Erhardt**, Horner, Shaff, Wertz, Nitschke, Vakhtin, Mayer, J. Adair, J. Knoefel, G. Rosenberg, Poston, Cedeno, Deligtisch, Richardson, and Ryman 2022). The work with these three groups is the core area of my research agenda, and our collaborative groups are productive and create opportunities for methods and software development.

Undergraduate education. I am a **co-PI on a 5-year NSF grant** on improving undergraduate STEM education. After two cohorts of students, we see strong positive effects when research is incorporated in undergraduate STEM courses for (among other things) student persistence in STEM and retention at UNM (still too early for publications). I have been part of **two NIH/R25 submissions** for a Summer Institute for Research Education in Biostatistics at UNM, where I would have been one of the lead curriculum designers and instructors, though neither was funded. I am also an **implementation partner** of Passion-Driven Statistics (PDS), a project-based active-learning teaching strategy for undergraduate statistics for which I am a national advisor. I have successfully implemented the PDS framework in my Advanced Data Analysis 1 & 2 courses (Stat 427/428, 428/528). I have also developed an active-learning version of **Introduction to Statistics** at UNM and shown that it is superior to the standard version while using the same course materials (**Erhardt** and Lim 2020). Relatedly, I am also responsible for starting a **Statistical Literacy** course at UNM developed, coordinated, and taught by ASA Fellow Milo Schield.

Vulnerable populations. With Dr. Page-Reeves, in a **5-year PCORI grant** with a two-year extension, we have studied programs of diabetes self-management and have recommendations for improving outcomes of managing A1c and depression, among other health outcomes for poor Latinx people living with diabetes (**Erhardt**, Murray-Krezan, Regino, D. Perez, Bearer, and Page-Reeves 2022). I also serve on the **UNM President's Albuquerque Homeless Coordinating Council**, UNM Homelessness Research Committee, Research and Assessment Working Group to help study trends in times from assessment to housing and factors predicting a return to homelessness (Page-Reeves, **Erhardt**, Ehrenfeucht, Crisanti, Mas, Horn, Schwartz, Kasper, Gorvetzian, Candidate, Feiluola, Padilla, Lucero, and M. Perez 2022).

Software. In nearly all of my collaborations, the **R package** I have written for analyzing and visualizing results of longitudinal multiple regression models has simplified and accelerated analysis, interpretation, and communication (**Erhardt** 2022). Other data processing and visualization functions standardize and simplify data analysis workflows, such as improved best subset selection methods, visualizing regression diagnostics, visualizing all model effects and contrasts in a model, and data reading and formatting not appearing in other packages.

Overall, I believe that I have successfully built a core research agenda while cultivating a productive range of secondary collaborations. I have also contributed substantially to the incredibly diverse research of my non-Biostatistics colleagues within and beyond the University of New Mexico and its Health Science Center. This ability to do focused work while continually learning about and supporting consequential, meaningful research in other disciplines is a crucial aspect of work in Biostatistics which I cherish and hope to continue.

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