**Vanderbilt-Nigeria Biostatistics Workshop:**

**Linear, Logistic, and Ordinal Regression Models with R Statistical Software**

**Bayero University and Aminu Kano Teaching Hospital, Kano, Nigeria**

**June 12-16, 2023**

**Instructors:**  Bryan Shepherd (Vanderbilt University) and Chun Li (University of Southern California)

**Abstract:**  This workshop will present regression models for binary, ordinal, and continuous data. Participants will learn the essentials of linear, logistic, ordinal, and semiparametric linear regression. We will discuss inclusion of covariates, interaction effects, natural splines, transformations, and interpretation of results. Participants will learn how to fit semiparametric transformation models to continuous data using ordinal regression models. All methods will be illustrated using R statistical software. Participants will learn regression techniques through simulations as well as using clinical data examples. Simple power and sample size calculations will also be presented.

**Pre-requisites:**  Some experience with R statistical software (or enrollment in pre-workshop R workshop), and completion of at least two statistics courses.

**Website:** https://biostat.app.vumc.org/NigeriaWorkshop2023

**Topics/Lectures (all times Nigeria)**

**Pre-Workshop Activities**

* **Pre-Workshop R Workshop**
* **Participant perspectives:** Pre-workshop survey

| Time | Topic | Instructor |
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| Day 1 | | |
| 9:00am - 9:30am | **Welcome & Introductions** | Nafiu |
| 9:30 am - 10:30 am | **Logistic Regression** | Chun |
| 10:30 am -10:45 am | **Break** |  |
| 10:45 am - 12:00 pm | **Computing Exercise:** Logistic regression simulations | Bryan |
| 12:00 pm -1:00 pm | **Power and Sample Size Fundamentals** | Chun |
| 1:00 pm -2:00 pm | **Lunch Break** |  |
| 2:00 pm -3:30 pm | **Computing Exercise:** Power and sample size functions,  Logistic Regression with AKTH data | Bryan |
| 3:30 pm -4:00 pm | **Break** |  |
| 4:00 pm -  5:00 pm | **Computing Exercise:** Logistic regression with AKTH data | Bryan |
| 5:00 pm | **Adjourn** |  |
| Day 2 | | |
| 9:00am - 9:30am | **Welcome Ceremony** | Nafiu |
| 9:30 am - 10:30 am | **Linear Regression with Nonlinear Effects** | Chun |
| 10:30 am -10:45 am | **Break** |  |
| 10:45 am - 12:00 pm | **Computing Exercise:** T-tests, linear regression, nonlinear effects | Bryan |
| 12:00 pm -1:00 pm | **Linear Regression with Nonlinear Effects** | Chun |
| 1:00 pm -2:00 pm | **Lunch Break** |  |
| 2:00 pm -3:30 pm | **Computing Exercise:** Logistic regression analysis of AKTH data with splines, interactions, and interpretation of results | Bryan |
| 3:30 pm -4:00 pm | **Break** |  |
| 4:00 pm -5:00 pm | **Computing Exercise:** Logistic regression analysis of AKTH data with splines, interactions, and interpretation of results | Bryan |
| 5:00 pm | **Adjourn** |  |

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| Day 3 | | |
| 9:00am - 10:30am | **Ordinal Regression:** Ordinal data, multinomial logistic regression, ordered logistic regression, proportional odds assumption, computing | Bryan |
| 10:30 am -10:45 am | **Break** |  |
| 10:45 am - 12:00 pm | **Computing Exercise:** Ordinal regression simulations | Chun |
| 12:00 pm -1:00 pm | **Ordinal Regression:** Partial proportional odds models, probability-scale residuals, nonlinear effects and interpretation | Bryan |
| 1:00 pm -2:00 pm | **Lunch Break** |  |
| 2:00 pm -3:30 pm | **Computing Exercise:** Ordinal regression with AKTH data | Chun |
| 3:30 pm -4:00 pm | **Break** |  |
| 4:00 pm -5:00 pm | **Computing Exercise:** Ordinal regression with AKTH data | Chun |
| 5:00 pm | **Adjourn** |  |

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| Day 4 | | |
| 9:00am - 10:30am | **Cumulative Probability Models:** linear regression, t-test, transformations, Wilcoxon rank sum test, dichotomization, categorization, latent variable interpretation | Bryan |
| 10:30 am -10:45 am | **Break** |  |
| 10:45 am - 12:00 pm | **Computing Exercise:** Cumulative probability model simulations | Chun |
| 12:00 pm -1:00 pm | **Cumulative Probability Models:** Semiparametric linear transformation models, interpretation, computation | Bryan |
| 1:00 pm -2:00 pm | **Lunch Break** |  |
| 2:00 pm -3:30 pm | **Computing Exercise:** Cumulative probability models with AKTH data | Chun |
| 3:30 pm -4:00 pm | **Break** |  |
| 4:00 pm -5:00 pm | **Computing Exercise:** Cumulative probability models with AKTH data | Chun |
| 5:00 pm | **Adjourn** |  |

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| Day 5 | | |
| 9:00 am - 11:00 am | **Finish up any Remaining Exercises / Power and Sample Size Exercise** | Bryan / Chun |
| 11:00 am -  11:30 am | **Review / Conclusions** | Bryan / Chun |
| 11:30 am - 12:00 pm | **Post-workshop Survey / Certificate Ceremony** | Bryan / Chun |
| 12:00 pm | **Adjourn** |  |