

**Education:**

- August 2020 – May 2025 (expected). Ph.D., Epidemiology and Biostatistics; concentration in data analysis and modeling. University of Georgia, Athens, GA, USA.

**Advisor:** Andreas Handel.

- August 2016 – May 2020. B.S., Mathematics and B.S., Biology; minor in Chemistry. Western Carolina University, Cullowhee, NC, USA.

**Experience:**

Statistics intern, Metrum Research Group. Fully remote. May 2024 – July 2024

- Developed Stan code for simulating data, generating predictions, and fitting Bayesian hierarchical models, including differential equation models.
- Wrote technical documentation and tutorials for building Bayesian PK/PD (pharmacokinetic and pharmacodynamic) models with Stan and R.

MAGNet intern, State Farm. Athens, GA. May 2023 – September 2023.

- Built and analyzed predictive models for insurance rating data using large datasets with millions of records.
- Implemented data science methodology using AWS cloud computing and Python.

Graduate research assistant, University of Georgia. Athens, GA. August 2020 – present.

- Research: the effect of antigenic drift (measured with antigenic distance between strains) on flu vaccine response, using Bayesian hierarchical models.
- Teaching: SIS MID 2024 (see awards); workshops on R programming, open science, and reproducible research; TA for courses on R programming and data science.

**Public code samples:**

- High dose influenza vaccines and heterologous antibody response (<https://tinyurl.com/hd-het-2024>): R and Stan programming, multilevel regression, Bayesian methods, causal analysis.
- Symptom reports and influenza diagnosis (<https://tinyurl.com/symp-ag>): R programming, machine learning, decision rules, interrater agreement.

**Awards:**

- Georgia Research Education Award Traineeship, University of Georgia, awarded August 2020. Full funding for doctoral degree for 5 years.
- Summer Institute in Statistics and Modeling for Infectious Disease (SIS MID) Instructor, *Introduction to R*, Emory University, Atlanta, GA; July 2024.
- Opening Influenza Research Fellow, Open Science Foundation, awarded January 2023.
- Doctoral Service Award, Department of Epidemiology & Biostatistics, University of Georgia, awarded May 2022.

**Publications:**

- Billings WZ\*, Ge Y\*, Knight JH, et al. High dose inactivated influenza vaccine inconsistently improves heterologous antibody responses in an elderly human cohort. *In preparation*.
- Billings WZ, Cleven A, Dworaczek J, et al. Use of patient-reported symptom data in clinical decision rules for predicting influenza in a telemedicine setting. *The Journal of the American Board of Family Medicine*. 2023; 36(5).
- Sung MH, Billings WZ, Carlock MA, et al. Assessment of Humoral Immune Responses to Repeated Influenza Vaccination in a Multiyear Cohort: A 5-Year Follow-up. *The Journal of Infectious Diseases*. 2023; jiad319.
- Ge Y, Billings WZ, Opekun A, et al. Effect of norovirus inoculum dose on virus kinetics, shedding, and symptoms. *Emerging Infectious Diseases*. 2023; 29(7).
- McKay B, Ebell M, Billings WZ, et al. Associations between relative viral load at diagnosis and influenza A symptoms and recovery. *Open Forum Infectious Diseases*. 2020; 7(11).

**Skills:**

- Programming: R, Stan, SAS, Python, Git and GitHub, bash.
- Software: Biorender, Mathematica, Tableau.
- Presentation: Quarto, R Markdown,  $\LaTeX$ , HTML/CSS.
- Statistics: machine learning, predictive analytics, statistical inference, regression modeling, multi-level (hierarchical) modeling, Bayesian methods, ordinary differential equation models.

**Graduate Coursework:**

- Epidemiology: Cohort and case-control study design; Systematic reviews and meta-analysis; Molecular epidemiology.
- Biostatistics: Linear and generalized linear models; Longitudinal data analysis; Data science and predictive modeling; Modern Biostatistics (causal inference, LASSO and extensions, joint modeling of survival and longitudinal data, functional data analysis).
- Statistics: two semesters of mathematical statistics.