

Leah I. B. Andrews

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Education

Doctor of Philosophy in Biostatistics, University of Washington, Seattle, WA *Sept. 2019 – Present*

Dissertation: Statistical Methods for Assessing COVID-19 Vaccine Effectiveness and Immune Correlates in Test-Negative Design Studies

Advisor: Dr. Peter Gilbert

Master of Science in Biostatistics, University of Washington, Seattle, WA *Sept. 2019 – Dec. 2024*

Advisor: Dr. Peter Gilbert

Bachelor of Arts in Mathematics and Chemistry, St. Olaf College, Northfield, MN *Sept. 2015 – May 2019*

Concentration: Statistics

Honors: Summa Cum Laude

Research Experience

COVID-19 Prevention Network, University of Washington, Seattle, WA

Graduate Research Assistant, Advisor: Dr. Peter Gilbert

Mar. 2023 – Present

- Develop robust causal methods to assess COVID-19 vaccine effectiveness and immune correlates of protection in test-negative design (TND) studies
- Extend targeted maximum likelihood estimator that allows for confounding control using machine-learning and missing data to TND setting
- Construct negative control methods that account for unmeasured confounding, selection bias, and missing data
- Assess TND and statistical methods using randomized placebo-controlled trials resampled as TND studies

Laryngeal Cancer Voice Rehabilitation, University of Washington, Seattle, WA

Graduate Student Consultant, Project Leads: Dr. Cassie Pan and Dr. Zain Rizvi

Apr. 2022 – Dec. 2023

- Analyze data from electronic health records of patients who underwent total laryngectomy
- Conduct exploratory analysis in R to assess clinical and surgical characteristics that are associated with successful electrolarynx use

Biostatistical Consulting Course, University of Washington, Seattle, WA

Mar. – June. 2022

Graduate Student Consultant

- Collaborated in three-person teams to provide statistical support to 23 clients from various disciplines
- Discussed client's research questions and advised on study design, statistical methods, and data presentation
- Wrote consulting session summaries with client-specific recommendations and references

Multi-Ethnic Study of Atherosclerosis Compliance, University of Washington, Seattle, WA

Graduate Research Assistant, Advisors: Dr. Lyndia Brumback and Dr. Robyn McClelland *Sept. 2019 – Mar. 2023*

- Analyzed data collected from longitudinal Multi-Ethnic Study of Atherosclerosis using R and STATA to understand the pathophysiology of hypertension and its relation to arterial stiffness
- Investigated how calcification, arterial stiffness, and blood pressure sidedness differences can inform risk assessment for hypertension, atherosclerosis, and cardiovascular disease

Design of Medical Studies Course Project, University of Washington, Seattle, WA *Mar. – June. 2022*
Study Statistician

- Collaborated in five-person multidisciplinary graduate student team to develop grant proposal to design, implement, and justify a clinical trial study and defend proposal to professors and students at mock site visit
- Proposed phase 2 double-blinded, randomized, placebo-controlled trial to investigate famotidine on right ventricular failure in pulmonary arterial hypertension patients

Neurology Intensive Care Units Palliative Care, University of Washington, Seattle, WA *Jul. – Oct. 2020*
Graduate Research Assistant, Advisor: Dr. Claire Creutzfeldt and Dr. Lyndia Brumback

- Analyzed data collected from prospective cohort study of patients and families in the Neurosciences and Medical/Cardiac Intensive Care Units using R and STATA
- Investigated discordance between family members and physicians' patient prognosis predictions
- Identified patients and families at risk for poor health outcomes and processes of care

Research Experiences for Undergraduates Program in Mathematics, IUPUI, Indianapolis, IN *Jun. – Jul. 2018*
Applied Math Undergraduate Researcher, Advisor: Dr. Julia Arciero

- Optimized parameters in existing ordinary differential equations model of murine heart transplant rejection in MATLAB using Monte Carlo methods
- Adapted model to simulate regulatory T cell (Treg) adoptive transfer and immunosuppression (IS)
- Varied Treg delivery and discovered optimal dose minimizes initial graft destruction and maximizes endogenous Treg activation
- Varied Treg delivery, IS class, and IS dose to determine optimal combinatorial treatments that prevent graft rejection and minimize IS dose

Mathematics Practicum, St. Olaf College, Northfield, MN *Jan. 2018*
Professional Data Analysts, Inc. Researcher, Advisors: Dr. Paul Roback and Dr. Jill Dietz

- Collaborated with undergraduate team to evaluate smoking cessation rate accuracy given increasing nonresponse rates in Quitline follow-up surveys
- Generated simulation in R that compared accuracy of responder, intent-to-treat, and weighted quit rate confidence intervals based on varied population size, sample size, response rate, and nonresponse bias
- Visualized simulation results in Shiny application and co-authored report on findings

Nephrology and Urology Summer Undergraduate Research Fellowship, Mayo Clinic, Rochester, MN *May – Aug. 2017*
Biochemistry and Molecular Biology Undergraduate Researcher, Advisor: Dr. Carli Sussman

- Developed *phosphodiesterase 3a (pde3a)* knockout in *Danio rerio* embryos to determine relevance of Pde3a in Polycystic Kidney Disease (PKD)
- Used CRISPR/Cas9 technology to target catalytic domain of Pde3a
- Amplified hydrolytic domain, conducted restriction enzyme digest, and performed gel electrophoresis to assess mutation efficiency
- Extracted, sequenced, and analyzed DNA using Mutation Surveyor to identify mutations

Collaborative Undergraduate Research and Inquiry Program, St. Olaf College, Northfield, MN *Jun. – Aug. 2016*
Molecular Biology Undergraduate Researcher, Advisor: Dr. Kim Kandl

- Studied role of SUMOylation in vegetative growth, mitosis, meiosis, and DNA repair in *Tetrahymena thermophila* using *ulp1* and *ulp2* knockdown strain
- Used RT-qPCR to quantify relative gene expression of *ulp1* and *ulp2* gene knockdowns in *Tetrahymena*
- Contributed to creation of construct to fluorescently tag ULP1 and ULP2 in *Tetrahymena*

Innovative Minds Partnering to Advance Curative Therapies Program, Mayo Clinic, Rochester, MN

Undergraduate Researcher, Advisor: Dr. Kim Kandl

Nov. 2015 – Mar. 2016

- Researched scientific literature to hypothesize the pathophysiology of Hypoplastic Left Heart Syndrome (HLHS) and propose experiment to test hypothesis using regenerative medicine
- Linked genetic and environmental factors to predict blocked gap junction channels in neonatal cardiomyocytes disrupt cardiogenesis
- Co-authored report and selected to deliver oral presentation at Mayo Clinic in Rochester
- Awarded silver medal out of twenty teams for HLHS category

Teaching Experience

University of Washington, Department of Biostatistics

Teaching Assistant

Jan. – Mar. 2023

- BIOST 537: Survival Data Analysis in Epidemiology

St. Olaf College, Department of Mathematics, Statistics, and Computer Science

Teaching Assistant

Feb. 2018 – May 2019

- MATH 242: Modern Computational Mathematics
- MATH 330: Differential Equations II

Publications

Pan, C., **Andrews, L.I.B.**, Johnson, E., Bhatt, N.K., and Rizvi Z.H (2024). “Factors associated with successful electrolarynx use after total laryngectomy, a multi-institutional study.” *Laryngoscope Investigative Otolaryngology*, 9(1):e1212. doi: 10.1002/lio2.1212

Brumback, L.C., **Andrews, L.I.B.**, Jacobs, D.R. Jr., Duprez, D.A., Hom Thepaksorn, E.K., Kaufman J.D., Denenberg, J.O., and Allison, M.A (2023). “The association between arterial compliance, as assessed by PTC1 and PTC2 from radial artery waveforms, with age, gender, and race/ethnicity.” *Journal of Hypertension*, 41(7):1117-1126. doi: 10.1097/HJH.0000000000003441

Brumback, L.C., **Andrews, L.I.B.**, Jacobs, D.R. Jr., Duprez, D.A., Hom Thepaksorn, E.K., Kaufman J.D., Denenberg, J.O., and Allison, M.A (2023). “Reproducibility of PTC1 and PTC2, indices of arterial compliance, from the radial artery waveform: The Multi-Ethnic Study of Atherosclerosis.” *Vascular Medicine*, 28(2):141-143. doi:10.1177/1358863X221151089

Duprez, D.A., Jacobs, D.R. Jr., **Andrews, L.I.B.**, Brumback, L.C., Denenberg, J.O., McClelland, R.L., Thomas, I.C., Criqui, M.H., and Allison, M.A (2023). “Inter-arm systolic blood pressure difference: non-persistence and association with incident cardiovascular disease in the Multi-ethnic Study of Atherosclerosis.” *Journal of Human Hypertension*, 37(3):197-204. doi: 10.1038/s41371-022-00669-x

Lapp, M.M., Lin, G., Komin, A., **Andrews, L.**, Knudson, M., Mossman, L., Raimondi, G., and Arciero, J.C (2022). “Modeling the Potential of Treg-Based Therapies for Transplant Rejection: Effect of Dose, Timing, and Accumulation Site.” *Transplant International*, 35:10297. doi: 10.3389/ti.2022.10297

Kiker, W.A., Voumard, R.R., **Andrews, L.I.B.**, Holloway, R.G., Brumback, L.C., Engelberg, R.A., Curtis, J.R., and Creutzfeldt, C.J. (2021). “Assessment of Discordance Between Physicians and Family Members Regarding Prognosis in Patients With Severe Acute Brain Injury.” *JAMA Network Open*, 4(10):e2128991. doi: 10.1001/jamanetworkopen.2021.28991

Brumback, L.C., **Andrews, L.I.B.**, Jacobs, D.R. Jr., Duprez, D.A., Shah, S.J., Dougherty, C.M., Denenberg, J.O., and Allison, M.A (2021). "The Association Between Indices of Blood Pressure Waveforms (PTC1 and PTC2) and Incident Heart Failure." *Journal of Hypertension*, 39(4):661-666. doi: 10.1097/HJH.0000000000002707

Presentations

Andrews, L.I.B., van der Laan, L., and Gilbert, P.B. "Semiparametric Methods for Vaccines and Immune Markers Using Test-Negative Designs with Missing Data." 2024 Joint Statistical Meetings, Oregon Convention Center, Portland, OR. August 2024. {*Oral Presentation*}

Andrews, L.I.B., Halloran, M.E., Neuzil, K.M., van der Laan, L., Huang, Y., Andriesen, J., Patel, M., Angier, H., Fisher, L.H., Janes, H., Sumner, K., Flannery, B., Follmann, D., and Gilbert, P.B. "COVID-19 Vaccine Effectiveness: An Evaluation of the Test-Negative Design Using Randomized Placebo-Controlled Clinical Trials." 2024 Society for Epidemiology Research Annual Meeting, Austin Marriott Downtown, Austin, TX. June 2024. {*Oral Presentation*}

Andrews, L., van der Laan, L., and Gilbert, P. "Semiparametric Methods for Evaluating COVID-19 Vaccine Regimens in Test-Negative Design Studies with Missing Data." 2024 Western North American Region/International Biometric Society/Graybill Annual Meeting, Colorado State University, Fort Collins, CO. June 2024. {*Oral Presentation*}

Andrews, L., van der Laan, L., and Gilbert, P. "Semiparametric Methods for Evaluating COVID-19 Vaccine Regimens in Test-Negative Design Studies with Missing Data." University of Washington Biostatistics Student Seminar, University of Washington, Seattle, WA. May 2024. {*Oral Presentation*}

Andrews, L. and Gilbert, P. "An Evaluation of the Test-Negative Design for Estimating COVID-19 Vaccine Effectiveness." University of Washington Biostatistics Student Seminar, University of Washington, Seattle, WA. October 2023. {*Oral Presentation*}

Andrews, L., Lapp, M., Raimondi, G., and Arciero, J. "Modeling Optimal Treatment Strategies Transplant Patients." 10th Annual Research Conference at the Interface of Biology and Mathematics, University of Tennessee Conference Center, Knoxville, TN. October 2018. {*Oral Presentation*}

Andrews, L., Lapp, M., Raimondi, G., and Arciero, J. "Modeling Optimal Treatment Strategies for Murine Heart Transplant." Indiana Undergraduate Mathematics Research Conference, Indiana University, Bloomington, IN. July 2018. {*Oral Presentation*}

Andrews, L., Johnson, K., Neville, Q., Nguyen, Q., and Peterson R. "Professional Data Analysts, Inc. Project: Investigation of Quit Rates and Survey Paradata." Professional Data Analysts Inc. Meeting, Professional Data Analysts Inc. Headquarters, Minneapolis, MN. January 2018. {*Oral Presentation*}

Andrews, L., Johnson K., and Sussman, C. "Developing a *pde3a* Mutant Zebrafish to Determine its Role in the PKD Pathway." Division of Kidney, Urologic, and Hematologic Diseases Summer Undergraduate Research Conference, DoubleTree Hotel Bethesda, Bethesda, MD. August 2017. {*Poster Presentation*}

Andrews, L. and Sussman, C. "Developing a *pde3a* mutant to Determine the Role of PDE3A in the PKD Pathway." NuSURF Program Student Extravaganza, Mayo Clinic, Rochester, MN. August 2017. {*Oral Presentation*}

Andrews, L. and Kandl., K. “Downregulation of *ULP2* Alters Nuclear Division, DNA Repair, and Pairing During Conjugation in *Tetrahymena thermophila*.” Collaborative Undergraduate Research and Inquiry Poster Symposium, St. Olaf College, Northfield, MN. August 2016. {*Poster Presentation*}

Andrews, L., Olson., P., Salij, A., Smith., P., and Rakotomahenina, L. “Blocking of Cardiac Gap Junctions: A Proposed Trigger of HLHS.” Innovative Minds Partnering to Advance Curative Therapies Symposium, Mayo Clinic, Rochester, MN. March 2016. {*Oral and Poster Presentation*}

Published Abstracts

Duprez, D.A., Jacobs, D.R. Jr., Daniels, M., **Andrews, L.I.B.**, Brumback, L.C., Denenberg, J.O., Watanabe K., Cornelissen G., Criqui M.H., Szklo, M., and Allison, M.A. “Associations of Subclavian Artery Calcification with Future Cardiovascular Events and Death: The Multi-Ethnic Study of Atherosclerosis.” Abstract 13805 at the American Heart Association Scientific Sessions, Pennsylvania Convention Center, Philadelphia, PA. November 2023.

Duprez, D.A., Jacobs, D.R. Jr., Daniels, M., **Andrews, L.I.B.**, Brumback, L.C., Denenberg, J.O., Watanabe K., Cornelissen G., Criqui M.H., Szklo, M., and Allison, M.A. “Subclavian Artery, Thoracic Aorta, and Coronary Artery Calcification, Age, Race/Ethnicity, and Sex Distributions: The Multi-Ethnic Study of Atherosclerosis.” Abstract 13729 at the American Heart Association Scientific Sessions, Pennsylvania Convention Center, Philadelphia, PA. November 2023.

Watanabe, K., Allen, T.S, **Andrews, L.I.B.**, Brumback, L.C., Cornelissen-Guillaume, G.G., Duprez, D.A., Jacobs, D.R. Jr., Criqui, M.H., and Allison, M.A. “Thoracic Aorta Calcification and Left Ventricular Structure and Function Relevant to Heart Failure: The Multi-Ethnic Study of Atherosclerosis (MESA).” Abstract P665 at the American Heart Association EPI | Lifestyle Scientific Sessions, Omni Boston Seaport, Boston, MA. March 2023.

Pan, C., **Andrews, L.I.B.**, Johnson, E., and Rizvi, Z.H. “Factors Associated with Successful Use of Electrolarynx Following Total Laryngectomy, A Multi-Institutional Study.” Abstract A187 at Triological Society Combined Sections Meeting, Hotel del Coronado, Coronado, CA. January 2023.

Allen, T.S., **Andrews, L.I.B.**, Brumback, L.C., Daniels, M.R., Denenberg, J.O., Thomas, I.C., Cornelissen-Guillaume, G.G., Duprez, D.A., Jacobs, D.R. Jr., Criqui, M.H., and Allison, M.A. “Association of Thoracic Aorta Calcification and Aortic Arch Stiffness: The Multi-Ethnic Study of Atherosclerosis.” Abstract P139 at the American Heart Association Hypertension Scientific Sessions, Hilton San Diego Bayfront, San Diego, CA. September 2022.

Duprez, D.A., Jacobs, D.R. Jr., Denenberg, J.O., McClelland, R.L., **Andrews, L.I.B.**, Thomas, I.C., and Allison, M.A. “Inter-Arm Systolic Blood Pressure Differences and Incident Cardiovascular Disease and Total Mortality in a Multi-Ethnic Population without Overt Cardiovascular Disease: The MESA Study.” Abstract 1161-083 at American College of Cardiology 2020 Together with World Congress of Cardiology, Virtual. March 2020.

Sussman, C., Pearson, E., **Andrews, L.**, Johnson, K., Koleilat, A., Ekker, S., Schimmenti, L., Harris, P., and Torres, V. “Hearing Impairment, A Novel Functional Readout, in *Pkd2* Mutant Zebrafish.” Abstract 692 at American Society of Nephrology Kidney Week, San Diego Convention Center, San Diego, CA. October 2018.

Technical Skills

Statistical Skills: Causal Inference, Missing Data, Targeted Maximum Likelihood Estimation, Machine-Learning, Generalized Linear Models, Generalized Estimating Equations, Mixed-Effects Models, and Survival Analysis

Computer Skills: R, MATLAB, Mathematica, STATA, LaTeX, Mutation Surveyor, Benchling, Chimera, SCIGRESS, MEGA7, Zotero, Endnote, and Excel

Laboratory Skills: CRISPR/Cas9, protein tagging, gene cloning, DNA extraction, gel electrophoresis, PCR, RT-qPCR, gene sequencing, immunofluorescence, chromatography (column, thin layer, paper, high pressure liquid, size exclusion), GC-MS, NMR, IR, UV spectroscopy, spectrophotometry, and differential scanning calorimetry

Honors and Awards

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| Student Most Outstanding Paper , Western North American Region of the International Biometric Society | 2024 |
| Graduate School Conference Presentation Award , University of Washington | 2024 |
| GSFEI Top Scholar Award , University of Washington | 2019 |
| School of Public Health Award of Excellence , University of Washington | 2019 |
| Phi Beta Kappa , St. Olaf College | 2019 |
| Phi Lambda Upsilon , St. Olaf College | 2019 |
| Pi Mu Epsilon Honors Society , St. Olaf College | 2018-2019 |
| Mayo Clinic IMPACT Silver Medal , Mayo Clinic | 2016 |
| Buntrock Scholarship , St. Olaf College | 2015 – 2019 |
| Cassler Scholarship , St. Olaf College | 2015 – 2019 |

Professional Affiliations

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| American Statistical Association , Student Member | 2024 – Present |
| Western North American Region of the International Biometric Society , Student Member | 2021 – Present |
| Society for Causal Inference , Student Member | 2024 |
| Association for Women in Mathematics , Student Member | 2018 – 2019 |
| Mathematical Association of America , Student Member | 2017 – 2019 |

Editorial Responsibilities

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| Statistics in Medicine , Referee | 2024, 2025 |
| The Journal of Infectious Diseases , Referee | 2023 |
| NPJ Vaccines , Referee | 2023 |
| BMC Public Health , Referee | 2020 |

Languages

English: Native
Spanish: Intermediate
Chinese: Basic

Campus Involvement

University of Washington, Seattle, WA

- Biostatistics Activities and Events Squad *Apr. 2021 – Present*
- Intramural Soccer *Apr. 2022 – Aug. 2024*
- Biostatistics Peer Mentoring Program *Sept. 2020 – Aug. 2024*
- Biostatistics Student-Invited Speaker Committee *Oct. 2023 – Feb. 2024*
- Graduate and Professional Student Senate *Oct. 2020 – Sept. 2021*
- Board Games at UW *Jan. 2020 – Jun. 2021*
- Chamber Music Club at UW *Sept. 2019 – Mar. 2020*

St. Olaf College, Northfield, MN

- St. Olaf Orchestra *Sept. 2015 – May 2019*
- St. Olaf Public Safety Dispatch *Sept. 2015 – May 2019*
- Intramural Soccer *Sept. 2015 – May 2019*