Nicholas J. Irons

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Current Position

2019– **PhD candidate, Statistics**, *University of Washington*, Seattle, WA, USA.

Education

2019– **PhD, Statistics**, *University of Washington*, Seattle, WA, USA.
Thesis: Statistical estimation and decision-making during the COVID-19 pandemic.
Advisors: Adrian E. Raftery and Carlos Cinelli

2018–2019 **MASt, Mathematics**, *University of Cambridge*, Cambridge, UK.

2014–2018 **BA summa cum laude, Mathematics**, *Northwestern University*, Evanston, IL, USA.

Research Interests

Bayesian methodology.

∗ Nonparametrics, high-dimensional regression, classification, and density estimation.[2022]
∗ Incorporating machine learning methods into Bayesian workflow.[2022]
∗ Bayesian model selection and hypothesis testing.[2023*c*,2023*d*]
∗ Combining mechanistic/mathematical and statistical models.[2018*a*,2018*b*,2021]
∗ Spatiotemporal modeling.[2021,2023*b*]
∗ Efficient, scalable, automatic inference for high-dimensional, big data, and mechanistic models.[2021,2022,2023*c*]

Causal inference, missing data, selection.

∗ Prior specification and elicitation in high-dimensional and non-identified models.[2023*d*]
∗ Robust inference and sensitivity analysis.[2023*d*]
∗ Bayesian causal inference.[2023*d*]
∗ Principled composition of Bayesian models.[2021]
∗ Modeling survey data.[2021,2023*b*]

Public health and medicine.

∗ Providing health practitioners with (Bayesian) statistical tools and actionable information by which to make informed decisions.[2021,2023*a*,2023*b*,2023*c*,2023*d*]
∗ Design and analysis of experiments.[2023*a*,2023*d*]
∗ Survival analysis.[2023*b*]
∗ Infectious disease modeling.[2021]

Selected Honors & Awards

2023 **Z.W. Birnbaum award**, *University of Washington*, Department of Statistics.
Outstanding candidacy exam.

2021–2023 **NIH Data Science in Demography & Population Health Fellowship**, *University of Washington*, Center for Studies in Demography & Ecology.

2022 **Population and Social Data Science Program**, *Max Planck Institute for Demographic Research*, Laboratory of Digital and Computational Demography.

Publications

[2023a] E. Vamva et al., *A lentiviral vector B cell gene therapy platform for the delivery of the anti-HIV-1 eCD4-Ig-knob-in-hole-reversed immunoadhesin.* Molecular Therapy Methods & Clinical Development (2023).

[2022] N. J. Irons, M. Scetbon, S. Pal, and Z. Harchaoui, *Triangular Flows for Generative Modeling: Statistical Consistency, Smoothness Classes, and Fast Rates.* Proceedings of AISTATS 2022. (arXiv version)

[2021] N. J. Irons and A. E. Raftery, *Estimating SARS-CoV-2 Infections from Deaths, Confirmed Cases, Tests, and Random Surveys.* Proceedings of the National Academy of Sciences 118 (31) (2021). Media coverage in LA Times, Bloomberg, the Guardian, and others.

[2018b] N. Earnest et al., *Realization of a Λ System with Metastable States of a Capacitively Shunted Fluxonium.* Physical Review Letters **120**, 150504 (2018).

[2018a] B. Baker, A. C. Y. Li, N. Irons, N. Earnest, and J. Koch, *Adaptive Rotating-Wave Approximation for Driven Open Quantum Systems.* Physical Review A **98**, 052111 (2018).

Preprints

[2023d] N. J. Irons and C. Cinelli, *Causally Sound Priors for Binary Experiments.* arXiv preprint (2023).

[2023c] M. Metodiev, M. Perrot-Dockès, S. Ouadah, N. J. Irons, A. E. Raftery, *Easily Computed Marginal Likelihoods from Posterior Simulation Using the THAMES Estimator.* arXiv preprint (2023).

[2023b] L. Badolato*, A. Decter-Frain*, N. J. Irons*, M. Miranda*, E. Walk*, E. Zhalieva*, M. Alexander, U. Basellini, E. Zagheni, *Predicting individual-level longevity with statistical and machine learning methods.* MPIDR Working Papers (2023). (* = equal first authors.)

Software

thames: Truncated Harmonic Mean Estimator (THAMES) of the Marginal Likelihood. (Author, maintainer)

brease: Causally Sound Priors for Binary Experiments via the Baseline Risk, Efficacy, and Adverse Side Effects (BREASE) of Treatment. (Author, maintainer)

covidest: Estimating SARS-CoV-2 Infections from Deaths, Confirmed Cases, Tests, and Random Surveys (Author, maintainer)

scqubits: Superconducting Qubits in Python (Contributor)

Presentations

PAA Annual Meeting 2024, *Columbus, OH*, April 2024, Oral presentation.
Statistical modeling of SARS-CoV-2 wastewater concentration measurements.

University of Florida Statistics Annual Winter Workshop 2024, *Gainesville, FL*, January 2024, Poster presentation.
Causally Sound Priors for Binary Experiments.

Bayesian Young Statisticians Meeting (BAYSM) 2023, *Virtual*, November 2023, Oral presentation.
Causally Sound Priors for Binary Experiments.

American Causal Inference Conference (ACIC) 2023, *Austin, TX*, May 2023, Poster presentation (accepted, unable to attend).
Non-pharmaceutical interventions against COVID-19: impacts and strategies

PAA Annual Meeting 2023, *New Orleans, LA*, April 2023, Oral presentation.
Non-pharmaceutical interventions against COVID-19: impacts and strategies

PAA Annual Meeting 2023, *New Orleans, LA*, April 2023, Poster presentation.
Environmental surveillance of SARS-CoV-2 via wastewater concentration measurements

PAA Annual Meeting 2023, *New Orleans, LA*, April 2023, Poster presentation.
Predicting Individual-Level Mortality with Traditional and Machine Learning Methods

UW Center for Studies in Demography & Ecology (CSDE) Seminar, *Seattle, WA*, January 2023, Oral presentation.
Predicting Individual-Level Mortality with Traditional and Machine Learning Methods

PAA Annual Meeting 2022, *Atlanta, GA*, April 2022, Poster presentation.
Optimal control of the COVID-19 pandemic via non-pharmaceutical intervention

AISTATS 2022, *Virtual*, March 2022, Poster presentation.
Triangular Flows for Generative Modeling

Kantorovich Initiative seminar, *Seattle, WA*, March 2022, Oral presentation.
Triangular Flows for Generative Modeling

CNRS MODCOV19 seminar, *Virtual*, December 2021, Invited talk.
Estimating SARS-CoV-2 Infections from Deaths, Confirmed Cases, Tests, and Random Surveys

IUSSP IPC2021, *Virtual*, December 2021, Oral presentation.
Estimating SARS-CoV-2 Infections from Deaths, Confirmed Cases, Tests, and Random Surveys

Simons Institute Joint IFML/CCSI Symposium, *Berkeley, CA*, November 2021, Poster presentation.
Triangular flows for generative modeling

Institute for the Foundations of Data Science (IFDS) seminar, *Virtual*, October 2021, Contributed talk.
Triangular flows for generative modeling

JSM Annual Meeting 2021, *Virtual*, August 2021, Oral presentation.
Statistical consistency of triangular flows for generative modeling

PAA Annual Meeting 2021, *Virtual*, May 2021, Oral presentation.
Estimating SARS-CoV-2 Infections from Deaths, Confirmed Cases, Tests, and Random Surveys

Teaching

University of Washington

2020– **Teaching Assistant**, *Department of Statistics*.
Stat 563: Statistical Demography
Stat 538: Statistical Machine Learning
Stat 311: Elements of Statistical Methods
Stat 342: Introduction to Probability and Mathematical Statistics

Northwestern University

2016–2018 **Teaching Assistant**, *Department of Mathematics*.
Math 220-0: Differential Calculus of One-Variable Functions
Math 224-0: Integral Calculus of One-Variable Functions
Math 230-0: Differential Calculus of Multivariable Functions

2015–2017 **Tutor**, *Departments of Mathematics and Physics and Astronomy*.
∗ Held weekly pooled office hours for the following courses: differential and integral calculus, linear algebra, Newtonian mechanics, electromagnetism, optics.

Service and Career Development

University of Washington

2022– **PNAS Journal Club Panelist**, *(Link)*.
∗ Selected as a PNAS journal club panelist from a competitive application process.
∗ Conducted regular literature reviews to recommend recent and impactful publications to be highlighted in PNAS popular science publications.
∗ Edited journal club posts prior to publication.

2023 **Faculty Candidate Hiring Assistant**, *Statistics Department*.
∗ Met with faculty candidates during the UW Statistics Department's 2023 hiring round.
∗ Interviewed candidates as part of a team of graduate students and provided feedback to the faculty hiring committee.

2022 **Writing Scientists Workshop**, *(Link)*.
∗ Participated in the inaugural workshop led by Dr. Jordan Ellenberg, University of Wisconsin mathematician and NY Times bestselling author.
∗ Selected as one of eight participants from a competitive application process.
∗ Developed a fully formed popular science piece on statistical causal inference.
∗ Gained extensive experience in evaluating and editing popular science writing by other members of the group under the instruction of Dr. Ellenberg over eight weeks.

2021– **Directed Reading Program (DRP) Mentor**, *Department of Statistics*.
∗ Mentored undergraduate statistics students through direct reading in introductory material on Bayesian data analysis in Fall 2021 and Winter 2022.
∗ Developed a 10-week curriculum of reading assignments, practice problems, and coding projects in Bayesian statistics.
∗ Planned and supervised student's final project on Latent Dirichlet Allocation (LDA) in Natural Language Processing (NLP) in machine learning.

2021– **PhD Peer Mentor**, *Department of Statistics*.
∗ Provided mentoring to new incoming statistics PhD students to help with transitioning to graduate school and life in Seattle.

2020– **Diversity, Inclusion, Community, and Equity (DICE) Committee**, *Department of Statistics*.
∗ As a member of the committee, I have helped to develop and execute various outreach and service initiatives to foster equity in STEM, including PARS (see below).
∗ Helped to compile a list of over 200 HBCUs/HSIs with STEM department contact info for UW statistics recruitment outreach.

2021– **PhD Pre-Application Review Service (PARS)**, *Department of Statistics*.
∗ Participated in forming a new DICE initiative to encourage and facilitate under-represented minority (URM) student applications to statistics PhD programs.
∗ Helped to provide constructive feedback on application materials of over 70 URM students during the Fall 2021 application cycle.

2020 **Undergraduate Research Mentor**, *Department of Statistics*.
∗ Advised three undergraduates on a research project to develop new and improved methods to build confidence intervals for multinomial proportions.
∗ Results presented in undergraduate research poster session and newsletter.

Northwestern University

2015–2016 **Chemistry Mentor**, *Academic Mentoring Program (AMP)*.
∗ Developed worksheets and facilitated weekly study sessions for URM students in general chemistry courses.
∗ Attended a training program and a class on pedagogical theory and practice in preparation for my role as an AMP mentor.

Honors & Awards

University of Washington

UW Statistics Z.W. Birnbaum award for outstanding candidacy exam	2023
UW Center for Statistics and the Social Sciences Travel Award ($500)	Fall 2023
UW Center for Statistics and the Social Sciences Travel Award ($1,000)	Fall 2022
NIH Data Science in Demography and Population Health Training Grant ($32,400/yr)	Fall 2021–Summer 2023
Honorable Mention, Ford Foundation Fellowship	2021
Provost Fellowship ($5,000)	Fall 2019
Statistics Department Fellowship ($5,000)	Fall 2019

Northwestern University

Phi Beta Kappa	Spring 2018
Mathematics Departmental Honors	Spring 2018
Summa cum Laude	Spring 2018
Ruth Dunbar Davee Endowed Merit Scholarship ($120,000)	Fall 2015–Spring 2018
Dean's List	Fall 2014–Spring 2018
Honorable Mention for Outstanding Achievement in Mathematics by a Senior	Spring 2018
Honorable Mention for Outstanding Achievement in Mathematics by a Junior	Spring 2017
Weinberg College Research Grant ($3,000)	Summer 2016
Undergraduate Research Grant ($3,000)	Summer 2015
NU Bioscientist program	Fall 2014
NU BioEXCEL program	Summer 2014

Other Honors

National AP Scholar, National Merit Scholar, National Hispanic Scholar, Illinois State Scholar

References

Dr. Adrian E. Raftery
Professor, Departments of Statistics and Sociology, University of Washington

Dr. Carlos Cinelli
Assistant Professor, Department of Statistics, University of Washington

Dr. Monica Alexander
Assistant Professor, Departments of Statistics and Sociology, University of Toronto

Dr. Emilio Zagheni
Director, Max Planck Institute for Demographic Research