Daphne H. Liu

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EDUCATION

PhD in Statistics **December 2023**
University of Washington, Seattle, WA

- Statistics in the Social Sciences track
- ***Thesis***: Statistical Methods for the Analysis and Prediction of Hierarchical Time Series Data with Applications to Demography
- ***Advisor***: Adrian E. Raftery
- ***Honors***: Center for Statistics and the Social Sciences Blalock Fellowship 2016-2017

BA in Mathematics **May 2016**
Cornell University, College of Arts and Sciences, Ithaca, NY

- Minor in Asian American Studies
- Semester abroad at University College London
- ***Honors****: cum laude* in Mathematics, distinction in all subjects

RESEARCH INTERESTS

- Bayesian statistics
- Statistical demography
- Predictive modeling
- Dynamics of education, family planning, and fertility

PROFESSIONAL EXPERIENCE

Academic Collaborator, United Nations Population Division **June 2023 – Present**
Develop Bayesian methods and software in R to create annual conditional probabilistic projections of fertility given a range of hypothetical policy intervention scenarios targeting women's education and access to family planning.

Survey Statistician, U.S. Census Bureau **December 2022 – Present**
Statistician in the Center for Economic Studies. From December 2022 to June 2024, participated in the Economic Measurement and Research Internship program. Current projects include:

1. Development of methods for evaluation of sampling designs using simulation studies in R to support the Census Household Panel project.
2. Validation and comparison of different methods in Python and R for prediction of race and ethnicity for individual survey respondents when self-response is missing.

Consultant, University of Washington **2021 – 2023**
Acted as an expert statistical consultant for a project examining the relationship between the labor market and female reproductive behavior in China in 1982–2015.

Research Assistant, University of Washington **2017 – 2023**

1. Evaluated how women's education and access to family planning can impact fertility decline in high-fertility countries to improve current probabilistic projections of fertility. Used regression and time series methods in R to evaluate quasi-causality and the possible effects of education and family planning policy outcomes on fertility.
2. Created a Bayesian hierarchical model for conditional probabilistic projections of fertility for five-year time periods, conditional on policy interventions targeting women's education and access to family planning. Estimated models using Markov chain Monte Carlo (MCMC) methods and assessed model

performance using out of sample validation.

3. Developed Bayesian methods for multiple imputation of missing data in multilevel time series data with nonlinear relationships, using school enrollment rates as a motivating dataset. Estimated models using MCMC methods and assessed model performance through simulation studies.

Teaching Assistant, University of Washington **2019 – 2022**
TA for CSSS/STAT/SOC 563 "Statistical Demography," which covered topics including modeling age-specific demographic rates, statistical modeling and forecasting of fertility, mortality, migration, and population, and reconstructing vital rates from imperfect data.

JOURNAL PUBLICATIONS

Liu, D. H. and Raftery, A. E. (2024), Bayesian Projections of Total Fertility Rate Conditional on the United Nations Sustainable Development Goals. *Annals of Applied Statistics*, 18(1): 375-403. DOI: 10.1214/23-AOAS1793

Liu, D. H. and Raftery, A. E. (2020), How Do Education and Family Planning Accelerate Fertility Decline? *Population and Development Review*, 46: 409-441. DOI: 10.1111/padr.12347

- Selected citations:
  - United Nations Department of Economic and Social Affairs, Population Division (2021). Global Population Growth and Sustainable Development.
  - United Nations Population Fund (2023). State of World Population 2023.
- Media coverage:
  - Eckart, Kim for UW News (2020, September 8). How birth control, girls' education can slow population growth.
  - Schenk, Zoe (2020, October 5). Birth control: Empowering women and slowing population growth. *The Daily of the University of Washington.*

PREPRINTS

Liu, D. H. and Raftery, A. E., Multiple Imputation of Hierarchical Nonlinear Time Series Data with an Application to School Enrollment Data. arXiv:2401.01872.

OTHER PUBLICATIONS

Liu, D. H. and Raftery, A. E. (2021, May 29). Accelerating fertility decline through education and family planning. *N-IUSSP*.

CONFERENCE PRESENTATIONS

Liu, D. H., Gerland, P., Kantorová, V., Raftery, A.E., Wheldon, M. C., and Williams, I. (2024, April 17–20). "Conditional Probabilistic Projections of Fertility Given Policy Intervention Scenarios." In *Population Association of America Annual Meeting*, Columbus, OH. (Poster presentation)

Liu, D. H. and Raftery, A. E. (2024, April 17–20). "Imputing Missing Data in Hierarchical Time Series: An Application to School Enrollment Rate Data." In *Population Association of America Annual Meeting*, Columbus, OH. (Poster presentation)

Liu, D. H. and Raftery, A. E. (2022, April 6–9). "Bayesian Projections of Total Fertility Rate Conditional on the United Nations Sustainable Development Goals." In *Population Association of America Annual Meeting*, Atlanta, GA.

Liu, D. H. and Raftery, A. E. (2021, December 5–10). "Bayesian Projections of the Total Fertility Rate for Improvements in Education and Family Planning." In *IUSSP International Population Conference*, virtual.

Liu, D. H. and Raftery, A. E. (2021, May 5–8). "Bayesian Projections of the Total Fertility Rate for Improvements in Education and Family Planning." In *Population Association of America Annual Meeting*, virtual. (Poster presentation)

Liu, D. H. and Raftery, A. E. (2020, April 23–25). "How Do Education and Family Planning Accelerate Fertility Decline?" In *Population Association of America Annual Meeting*, virtual.

Liu, D. H. and Raftery, A. E. (2019, April 10–13). "Assessing the Impact of Potential Policies on Fertility in High-Fertility Countries Using Granger Causality and Bayesian Hierarchical Models." In *Population Association of America Annual Meeting*, Austin, TX. (Poster presentation)

SERVICE

Graduate Student Representative **2018 – 2019**
Department of Statistics, University of Washington

Statisticians and Biostatisticians of Underrepresented Genders (SBUG) Officer **2017 – 2021**
University of Washington

Diversity, Inclusion, Community, and Equity (DICE) Committee Student Representative **2017 – 2020**
Department of Statistics, University of Washington