Caitlin Ward

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Education

2018-2021	**University of Iowa** PhD, Biostatistics Advisors: Dr. Jacob Oleson and Dr. Grant Brown Topic: Bayesian Methods for Spatio-Temporal Epidemic Models
2016-2018	**University of Iowa** MS, Biostatistics
2012-2016	**Iowa State University** BS, Statistics, *Summa Cum Laude*, Minors in Mathematics and Russian Studies

Research Interests

Bayesian statistics	Statistical computing	Infectious disease epidemiology
Network analysis	Spatio-temporal modeling	Medical imaging

Employment

2022-Present	**University of Minnesota** *Assistant Professor*, Division of Biostatistics & Health Data Science	Minneapolis, MN
2021-Present	**University of Iowa** *Adjunct Assistant Professor*, College of Nursing	Iowa City, IA
2021-2022	**University of Calgary** *CANSSI Distinguished Postdoctoral Fellow* Supervisors: Dr. Rob Deardon and Dr. Alexandra Schmidt	Calgary, AB
2016-2021	**University of Iowa** *Graduate Research Assistant*, Department of Biostatistics Biostatistics Consulting Center Center for Public Health Statistics Public Policy Center	Iowa City, IA

Honors and Awards

2021	Milford E. Barnes Award, University of Iowa College of Public Health
2021	Ada Louise Ballard and Seashore Dissertation Fellowship, University of Iowa
2021	University of Iowa Dare to Discover Banner Campaign, Featured Researcher
2020	William R. Clarke Graduate Teaching Assistant Award, University of Iowa
2020	University of Iowa Council on Teaching Outstanding Teaching Assistant Award
2020, 2021	Recipient of Thank a Teacher note of appreciation through the Center for Teaching
2018	Leon F. Burmeister Memorial Scholarship Award, University of Iowa
2018	William R. Clarke Graduate Research Assistant Award, University of Iowa
2015	George W. Snedecor Undergraduate Award, Iowa State University

Publications

Peer-Reviewed Journal Publications

27. Biesheuvel, M. M., **Ward, C.**, Penterman, P., van Engelen, E., van Schaik, G., Deardon, R., Barkema, H. W. (2023). Within-herd transmission of Mycoplasma bovis infections after initial detection in dairy cows. *Journal of Dairy Science*. doi: 10.3168/jds.2023-23407

26. **Ward, C.**, Deardon, R., Schmidt, A. (2023). Bayesian modeling of dynamic behavioral change during an epidemic. *Infectious Disease Modelling*. doi: 10.1016/j.idm.2023.08.002

25. Bathla, G., Soni, N., **Ward, C.**, Pillenahalli Maheshwarappa, R., Agarwal, A., Priya S. (2023). Clinical and Magnetic Resonance Imaging Radiomics–Based Survival Prediction in Glioblastoma Using Multiparametric Magnetic Resonance Imaging. *Journal of Computer Assisted Tomography.* doi: 10.1097/RCT.0000000000001493

24. Shaw, C., **Ward, C.**, Lee, K., Williams, A., Herr, K. (2023). The relationship between rejection of care behaviors and pain and delirium severity in hospital dementia care. *Innovation in Aging*. doi: 10.1093/geroni/igad076

23. **Ward, C.**, Brown, G., Oleson, J. (2022). Incorporating infectious duration-dependent transmission into Bayesian epidemic models. *Biometrical Journal*. doi: 10.1002/bimj.202100401

22. Heeren, T., **Ward, C.**, Ashida, S., Sewell, D. (2022). Applying network analysis to assess the development and sustainability of multi-sector coalitions. *PLoS ONE*. doi: 10.1371/journal.pone.0276114

21. Shaw, C., **Ward, C.**, Gordon, J., Williams, K. N., Herr, K. (2022). Elderspeak communication and pain severity as modifiable factors to rejection of care in hospital dementia care. *Journal of the American Geriatrics Society*. doi: 10.1111/jgs.17910

20. Walker, E. A., **Ward, C.**, Oleson, J., Sapp, C., McCreery, R. W., Tomblin, J. B., Moeller, M. P., (2022). Language growth in children with mild to severe hearing loss who received early intervention by 3 months or 6 months of age. *Journal of Early Hearing Detection and Intervention*. doi: 10.26077/e97b-7add

19. Shaw, C., **Ward, C.**, Gordon, J., Williams, K. N., Herr, K. (2022). Characteristics of elderspeak communication in hospital dementia care: findings from the Nurse Talk observational study. *International Journal of Nursing Studies*. doi: 10.1016/j.ijnurstu.2022.104259

18. Horak, S., **Ward, C.** (2022). Evaluating a state child care assistance program using administrative data. *Evaluation and Program Planning*. doi: 10.1016/j.evalprogplan.2022.102094

17. Eskandari, A., Narayanasamy, S., **Ward, C.**, Priya, S., Aggarwal, T., Elam, J., Nagpal, P. (2022). Prevalence and significance of incidental findings on computed tomography pulmonary angiograms: a retrospective cohort study. *The American Journal of Emergency Medicine.* doi: 10.1016/j.ajem.2022.01.064

16. **Ward, C.**, Brown, G., Oleson, J. (2021). An individual level infectious disease model in the presence of uncertainty from multiple, imperfect diagnostic tests. *Biometrics.* doi: 10.1111/biom.13579

15. Lence, T., Lockwood, G. M., Storm D. W., **Ward, C.**, Cooper, C. S. (2021). The utility of renal sonographic measurements in differentiating children with high grade congenital hydronephrosis. *Journal of Pediatric Urology.* doi: 10.1016/j.jpurol.2021.07.021

14. Priya, S., Aggarwal, T., **Ward, C.**, Bathla, G., Jacob, M., Gerke, A., Hoffman, E., Nagpal, P. (2021). Radiomics side experiments and DAFIT approach in identifying pulmonary hypertension using Cardiac MRI derived radiomics based machine learning models. *Scientific Reports.* doi: 10.1038/s41598-021-92155-6

13. Priya, S., Lui, Y., **Ward, C.**, Le, N., Neetu, S., Maheshwarappa, R., Monga, V., Zhang, H., Sonka, M., Bathla G. (2021). Radiomic based machine learning performance for a three class problem in neuro-oncology: time to test the waters? *Cancers.* doi: 10.3390/cancers13112568

12. Priya, S., Agarwal, A., **Ward, C.**, Locke, T., Monga, V., Bathla G. (2021) Survival prediction in glioblastoma on post-contrast magnetic resonance imaging using filtration based first-order texture analysis: comparison of multiple machine learning models. *The Neuroradiology Journal.* doi: 10.1177/1971400921990766

11. Priya, S., Lui, Y., **Ward, C.**, Le, N., Neetu, S., Maheshwarappa, R., Monga, V., Zhang, H., Sonka, M., Bathla G. (2021). Machine learning based differentiation of glioblastoma from brain metastasis using MRI derived radiomics. *Scientific Reports.* doi: 10.1038/s41598-021-90032-w

10. Priya, S., Aggarwal, T., **Ward, C.**, Bathla, G., Jacob, M., Gerke, A., Hoffman, E., Nagpal, P. (2021). Radiomics detection of pulmonary hypertension via texture-based assessments of cardiac MRI: a machine-learning model comparison. *Journal of Clinical Medicine.* doi: 10.3390/jcm10091921

9. Bathla G., Priya, S., Lui, Y., **Ward, C.**, Le, N., Neetu, S., Maheshwarappa, R., Monga, V., Zhang, H., Sonka, M. (2021). Radiomics-based differentiation between glioblastoma and primary central nervous system lymphoma: a comparison of diagnostic performance across different MRI sequences and machine learning techniques. *European Radiology.* doi: 10.1007/s00330-021-07845-6

8. Priya, S., **Ward, C.**, Locke, T., Neetu, S., Maheshwarappa, R., Monga, V., Bathla G. (2021). Glioblastoma and primary central nervous system lymphoma: differentiation using MRI derived first-order texture analysis - a machine learning study. *The Neuroradiology Journal.* doi: 10.1177/1971400921998979

7. **Ward, C.**, Oleson, J., Tomblin, B., Walker, E. (2020). Modeling population and subject-specific growth in a latent trait measured by multiple instruments over time using a hierarchical Bayesian framework. *Journal of Applied Statistics.* doi: 10.1080/02664763.2020.1817346

6. Kandemirli, S., Chopra, S., Priya, S., **Ward, C.**, Locke, T., Soni, N., Srivastava, S., Jones, K., Bathla, G. (2020). Presurgical detection of brain invasion status in meningiomas based on first-order histogram based texture analysis of contrast enhanced imaging. *Clinical Neurology and Neurosurgery.* doi: 10.1016/j.clineuro.2020.106205

5. Bathla, G., Ortega-Gutierrez, S., Klotz, E., Juergens, M., Zevallos, C. B., Ansari, S., **Ward, C.**, Policeni, B., Samaniego, E., Derdeyn, C. (2020). Comparing the outcomes of two independent computed tomography perfusion softwares and their impact on therapeutic decisions in acute ischemic stroke. *Journal of NeuroInterventional Surgery.* doi: 10.1136/neurintsurg-2020-015827

4. Bathla, G., Priya, S., Samaniego, E., Deo, S. K., Fain, N. H., Soni, N., **Ward, C.**, Derdeyn, C. P. (2020). Cerebral computed tomographic angiography using third-generation reconstruction algorithm provides improved image quality with lower contrast and radiation dose. *Neuroradiology.* doi: 10.1007/s00234-020-02406-y

3. Hartley, C. C., Renner, L. M., **Ward, C.** (2019). A new factor solution for the domestic violence–related financial issues scale (DV-FI). *Journal of Interpersonal Violence.* doi: 10.1177/0886260519860888

2. **Ward, C.**, Oleson, J., Jones, K., Charlton, M. (2018). Showcasing cancer incidence and mortality in rural ZCTAs using risk probabilities via spatio-temporal Bayesian disease mapping. *Applied Spatial Analysis and Policy.* doi: 10.1007/s12061-018-9276-4

1. Saletta, M., Goffman, L., **Ward, C.**, Oleson, J. (2018). Influence of language load on speech motor skill in children With specific language impairment. *Journal of Speech, Language, and Hearing Research.* doi: 10.1044/2017_JSLHR-L-17-0066

Journal Papers in Submission

- Segbefia, C., Telke, S., Olayemi, E., **Ward, C.**, Asamoah-Akuoko, L., Appiah, B., Tancred, T., Adu-Afarwuah, S., Akwasi-Kuma, A. B., Yawson, A. E., Acquah, M. E., Ofori-Acquah, S. F., Adongo, P. B., Ametorwo, R., Bates, I., Reilly, C., Dei-Adomakoh, Y. (Revisions Requested). Deferrals for anaemia among first-time prospective blood donors in Southern Ghana-results from the BLIS study.

- Yasir, A., Schafer, I.J., Santiago Ramos, L.J., Coriano, N., Rivera Gutierrez, R., Mueller, M., Maldonado, J. Jara Aviles, V., Cuevas Oquendo, M., Carle Rivera, V., De Leon Marrero, J., Nally, J.E., Galloway, R., Hamond, C., LeCount K., Anderson, T., **Ward, C.**, Munoz-Zanzi, C. (In preparation). Presence and diversity of Leptospira spp. in domestic animals, rodents, and mongooses in Puerto Rico communities.

- **Ward, C.**, Deardon, R., Schmidt, A. (In preparation). Estimating the relative importance of multiple data sources informing behavioral change during the COVID-19 pandemic.

- Tarr, G., **Ward, C.**, Rounds, J., Smith, K. (In preparation). Risk for Shiga-toxin producing Escherichia Coli dependent on animal density, seasonality, and strain.

- Dimou, A., Moore, R. M., **Ward, C.**, Leontovich, A., Guo, R., Suman, S., Dicke, B., Schimke, J., Stueven, N. A., Atherton, C. L., Nevala, W. K., Markovic, S. N. (In preparation). Spatial analysis of neuropilin 2 expression in the microenvironment of melanoma.

- **Ward, C.**, Wang, C., Novotny, B., Leontovich, A., Nevala, W. K., Markovic, S. N. (In preparation). Fast inference for spatial generalized linear mixed models for use in multiplexed imaging analysis.

Teaching

Institution/Course	Role	Semester	Delivery Method	Class Size
University of Minnesota				
PUBH:7402 Biostatistics Modeling and Methods	Instructor	Spring 2023	In-person	14
	Instructor	Spring 2024	In-person	15
University of Calgary				
STAT:205 Introduction to Statistical Inquiry	Instructor	Winter 2022	Online/ Hybrid	180
University of Iowa				
BIOS:4120 Introduction to Biostatistics	Instructor	Summer 2019	In-person	7
	Instructor	Fall 2019	Online	27
	Instructor	Spring 2020	Online	33
	Instructor	Summer 2020	Online	65
Iowa Summer Institute in Biostatistics	Guest Lecturer	Summer 2021	Online	15
Topic: Epidemic Modeling	Guest Lecturer	Summer 2022	Online	11
EPID:5540 Public Health Surveillance Topic: COVID-19 Modeling	Guest Lecturer	Fall 2020	Hybrid	16

Advising

PhD Advisor	Tanvi Mehta (Co-advised with Joe Koopmeiners)	Biostatistics
PhD Committee Member	Jordan Aron	Biostatistics
	Ammar Yassir	Environmental Health Sciences

Funding

Active

Title: Midwest Disease Modeling and Analytics Preparedness Center (MDAP)
PIs: Dr. Eva Enns, Dr. Kristin Sweet, Dr. Adams Dudley
Source: CDC
Period: Nov 2023 - Oct 2028
Role: Co-Investigator (17% salary support)
Award: $17.5 million

Title: Generating Synthetic Data to Measure Subcounty Health Inequities
PI: Dr. Harrison quick
Source: County Health Rankings & Roadmaps
Period: Jan 2024 - Dec 2024
Role: Co-Investigator (20% salary support)
Award: $97,536

Title: The BLOODSAFE Data Coordinating Center: A Data Center for More Safe Transfusions in Sub-Saharan Africa
PI: Dr. Cavan Reilly
Source: NIH/NHLBI U24HL151541-03
Period: Jul 2020 - Jun 2026
Role: Co-Investigator (10% salary support)
Award: $768,916

Title: Quantitative Assessment of Pre-metastatic Immune Subversion as a Risk Factor for Melanoma Relapse
PI: Dr. Svetomir Markovic
Source: NIH/NCI
Period: Jun 2023 - Dec 2024
Role: Co-Investigator/Subcontract PI (5% salary support)
Award: $59,634

Completed
Title: Midwest Antiviral Drug Discovery (AViDD) Center
PI: Dr. Reuben Harris and Dr. Fang Li
Source: NIH/NIAID U19AI171954-01
Period: May 2022 - Apr 2025
Role: Co-Investigator (25% salary support)
Award: $66,431,207

Title: Simulation Based Inference in Introductory Statistics
Purpose: Creation of an interactive OER with embedded Shiny applications using simulation-based approaches to illustrate statistical concepts
Source: University of Iowa Libraries Open Educational Resources (OER) Grant
Period: May 2020 - May 2021
Role: Co-Principal Investigator
Award: $6,000

Presentations

Invited Talks

March 2024	Bayesian Modelling of Epidemics: From Population to Individual-level Models. *ENAR*. Short Course Co-Instructor. Baltimore, MD.
May 2023	Capturing Spatio-temporal Behavioral Change in Bayesian Epidemic Models. *Statistics in Medical Imaging*. Minneapolis, MN.
October 2022	Capturing Dynamic Behavioral Change in Bayesian Spatial Epidemic Models. *GEOMED 2022*. Virtual.
June 2022	Bayesian Modelling of Epidemics: From Population to Individual-level Models. *International Society for Bayesian Analysis World Meeting.* Short Course Co-Instructor. Montréal, QC.
June 2022	Sound the Alarm: Modeling Behavioral Changes in Response to Epidemic Intensity. *Statistical Society of Canada Annual Meeting.* Virtual.
April 2022	Epidemic Modeling: Investigating Popular Approaches in the Context of COVID-19. University of Calgary O'Brien Institute for Public Health Seminar Series. Virtual.
February 2022	Sound the Alarm: Modeling Behavioral Changes in Response to Epidemic Intensity University of Minnesota Division of Biostatistics. Virtual.
January 2022	Sound the Alarm: Modeling Behavioral Changes in Response to Epidemic Intensity University of Iowa Department of Biostatistics. Virtual.
December 2021	Incorporating Infectious Duration-Dependent Transmission into Bayesian Epidemic Models. *Conference on Computational and Methodological Statistics.* Virtual.
July 2020	Introduction and Demonstration of an Interactive COVID-19 Forecasting Tool. University of Iowa College of Public Health Spotlight Series on COVID-19. Virtual.
October 2019	Accountable Communities of Health: Measuring Connectivity and Sustainability using Network Analysis. University of Iowa Public Policy Center. Iowa City, IA.

Contributed Talks

June 2022	Sound the Alarm: Modeling Behavioral Changes in Response to Epidemic Intensity. *International Society for Bayesian Analysis World Meeting.* Montréal, QC.
June 2022	Bayesian Modeling of Dynamic Behavioral Change During the COVID-19 Pandemic. *Bayesian Young Statisticians Meeting.* Poster Presentation. Montréal, QC.
August 2020	An Individual Level Infectious Disease Model in the Presence of Uncertainty from Multiple, Imperfect Diagnostic Tests. *Joint Statistical Meetings.* Virtual.
October 2019	A Spatio-Temporal Infectious Disease Model in the Presence of Uncertainty from Multiple, Imperfect Diagnostic Tests. *Women in Statistics and Data Science Conference.* Speed poster. Seattle, WA.
August 2019	Modeling Population and Subject-Specific Growth in a Latent Trait Measured by Multiple Instruments Over Time Using a Hierarchical Bayesian Framework. *Joint Statistical Meetings.* Poster presentation. Denver, CO.

Service

Professional

- Refereed articles for the following journals
  Biostatistics (1)
  Statistics in Medicine (1)
  Spatial and Spatio-temporal Epidemiology (1)
  International Statistical Review (1)
  Journal of the American Medical Association (1)
  JAMA Network Open (3)
  Epidemiology and Infections (1)
  PLOS ONE (1)
  BMC Public Health (1)
  BMC Infectious Diseases (1)
  Journal of Speech, Language, and Hearing Research (1)

Division of Biostatistics, University of Minnesota

- Diversity, Equity, and Inclusion Committee, 2023 - Present
- Exam Committee, 2022 - Present

Department of Biostatistics, University of Iowa

- Biostatistics Student Organization
  - Mentorship Chair, 2020 - 2021
  - President, 2019 - 2020
  - Treasurer, 2018 - 2019
- Graduate Student Team Leader, COVID-19 Modeling Web Application, 2020
- Student Representative, Administrative Committee, 2019 - 2020
- Student Representative, Web-Based Instruction Resource Committee, 2019 - 2020

University of Iowa

- Graduate & Professional Student Government Grant Reviewer, 2019 - 2020

Software

- `BayesSEIR` - An R Package designed to simulate and fit Bayesian SEIR models of infectious disease spread using various methods to describe the infectious period.
  https://github.com/ceward18/BayesSEIR

Professional Activity

- Member, American Statistical Association (ASA)
- Member, International Society for Bayesian Analysis (ISBA)
- Center for the Integration of Research, Teaching and Learning (CIRTL) Practitioner Level
  - Teaching as Research (TAR) project: Evaluating Student Attitudes and Engagement in a Project-Enhanced Online Introduction to Biostatistics Course
- Member, Phi Beta Kappa