Evan L. Ray

CONTACT

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EDUCATION

2015	Ph.D. Mathematics (concentration in Statistics), University of Massachusetts, Amherst Advisor: John Staudenmayer
2012	M.S. Statistics, University of Massachusetts, Amherst
2007	B.S. Mathematics, summa cum laude, University of Massachusetts, Boston

PROFESSIONAL EXPERIENCE

2020 – present	Research Assistant Professor, Department of Biostatistics and Epidemiology, University of Massachusetts, Amherst
2017 – 2020	Assistant Professor of Statistics, Department of Mathematics and Statistics, Mount Holyoke College
2015 – 2017	Postdoctoral Research Associate, Department of Biostatistics and Epidemiology, University of Massachusetts, Amherst
2016	Visiting Lecturer, Department of Mathematics and Statistics, Amherst College
2013 – 2015	Software Engineer, Analytics, Enformia
2010 – 2013	Research Assistant, Department of Mathematics and Statistics, University of Massachusetts, Amherst
2012 – 2013	Research Assistant, Department of Electrical and Computer Engineering, University of Massachusetts, Amherst
2009 – 2010, 2013	Teaching Assistant, Department of Mathematics and Statistics, University of Massachusetts, Amherst

GRANT FUNDING

9/2019 – 8/2024	Influenza Forecasting Center of Excellence at University of Massachusetts Role: Co-Investigator Source of Support: Centers for Disease Control and Prevention Total Award Amount: $3M estimated total costs over 5 years
2/2021 – 2/2022	Contract to support COVID-19 Forecast Hub Role: Co-Investigator Source of Support: Centers for Disease Control and Prevention Total Award Amount: $3M
5/2020 – 8/2021	Supplemental award for existing CDC Cooperative Agreement Role: Co-Investigator Source of Support: Centers for Disease Control and Prevention Total Award Amount: $350K

PUBLICATIONS

19. Holcomb KM, Mathis S. Staples JE, Fischer M, Barker CM, Beard CB, Nett RJ, Keyel AC, Marcantonio M, Childs ML, Gorris ME, Rochlin I, Hamins-Puértolas M, **Ray EL**, Uelmen JA, DeFelice N, Freedman AS, Hollingsworth BD, Das P, Osthus D, Humphreys JM, Nova N, Mordecai EA, Cohnstaedt LW, Kirk D, Kramer LD, Harris MJ, Kain MP, Reed EMX, and Johansson MA (2023). "Evaluation of an open forecasting challenge to assess skill of West Nile virus neuroinvasive disease prediction." Parasites & Vectors. 16(1): 1-13.

18. **Ray EL**, Brooks LC, Bien J, Biggerstaff M, Bosse NI, Bracher J, Cramer EY, Funk S, Gerding A, Johansson MA, Rumack A, Wang Y, Zorn M, Tibshirani RJ, Reich NG (2022). "Comparing trained and untrained probabilistic ensemble forecasts of COVID-19 cases and deaths in the United States." International Journal of Forecasting. DOI: 10.1016/j.ijforecast.2022.06.005.

17. Cramer EY, Huang Y, Wang Y, **Ray EL**, Cornell M, Bracher J, Brennen A, Rivadeneira AJC, Gerding A, House K, Jayawardena D, Kanji AH, Khandelwal A, Le K, Mody V, Mody V, Niemi J, Stark A, Shah A, Wattanachit N, Zorn MW, Reich NG (2022). "The United States COVID-19 Forecast Hub dataset." Scientific Data. 9(1): 1-15.

16. Reich NG, Lessler J, Funk S, Viboud C, Vespignani A, Tibshirani RJ, Shea K, Schienle M, Runge MC, Rosenfeld R, **Ray EL**, Niehus R, Johnson HC, Johansson MA, Hochheiser H, Gardner L, Bracher J, Borchering RK, Biggerstaff M (2022). "Collaborative Hubs: Making the Most of Predictive Epidemic Modeling." AJPH. 112(6): 839-842.

15. Cramer EY, **Ray EL**, Lopez VK, et al. (2022) "Evaluation of individual and ensemble probabilistic forecasts of COVID-19 mortality in the US." PNAS. 119(15): e2113561119.

14. Reich NG, **Ray EL** (2022). "Collaborative modeling key to improving outbreak response." PNAS. 119(14): e2200703119.

13. Bracher J, **Ray EL**, Gneiting T, Reich NG (2021). Evaluating epidemic forecasts in an interval format. PLoS Computational Biology. 17(2): e1008618.

12. Reich NG, Cornell M, **Ray EL**, House K, Le K (2021). The Zoltar forecast archive, a tool to standardize and store interdisciplinary prediction research. Scientific Data. 8(59).

11. Johansson MA, Apfeldorf KM, Dobson S, Devita J, Buczak AL, Baugher B, Moniz LJ, Bagley T, Babin SM, Guven E, Yamana TK, Shaman J, Moschou T, Lothian N, Lane A, Osbourne G, Jiang G, Brooks LC, Farrow DC, Hyun S, Tibshirani RJ, Rosenfeld R, Lessler J, Reich NG, Cummings DAT, Lauer SA, Moore SM, Clapham HE, Lowe R, Bailey TC, García-Díez M, Sá Carvalho M, Rodó X, Sardar T, Paul R, **Ray EL**, Sakrejda K, Brown AC, Meng X, Osoba O, Vardavas R, Manheim D, Moore M, Rao DM, Porco TC, Ackley S, Liu F, Worden L, Convertino M, Liu Y, Reddy A, Ortiz E, Rivero J, Brito H, Juarrero A, Johnson LR, Gramacy RB, Cohen JM, Mordecai EA, Murdock CC, Rohr J, Ryan SJ, Stewart-Ibarra AS, Weikel DP, Jutla A, Khan R, Poultney M, Colwell RR, Rivera-García B, Barker CM, Bell JE, Biggerstaff M, Swerdlow D, Mier-y-Teran-Romero L, Forshey BM, Trtanj J, Asher J, Clay M, Margolis HS, Hebbeler AM, George D, and Chretien JP (2019). "An open challenge to advance probabilistic forecasting for dengue epidemics". Proceedings of the National Academy of Sciences 116 (48) 24268-24274.

10. Reich NG, McGowan CJ, Yamana TK, Tushar A, **Ray EL**, Osthus D, Kandula S, Brooks LC, Crawford-Crudell W, Gibson GC, Moore E, Silva R, Biggerstaff M, Johansson MA, Rosenfeld R, Shaman J (2019). Accuracy of real-time multi-model ensemble forecasts for seasonal influenza in the U.S. PLoS Computational Biology 15(11): e1007486.

9. **Ray EL**, Qian J, Brecha R, Reilly MP, and Foulkes AS (2019). Stochastic imputation for integrated transcriptome association analysis of a longitudinally measured trait. Statistical Methods in Medical Research. DOI: 10.1177/0962280219852720.

8. McGowan CJ, Biggerstaff M, Johansson M, Apfeldorf KM, Ben-Nun M, Brooks L, Convertino M, Erraguntla M, Farrow DC, Freeze J, Ghosh S, Hyun S, Kandula S, Lega J, Liu Y, Michaud N, Morita H, Niemi J, Ramakrishnan N, **Ray EL**, Reich NG, Riley P, Shaman J, Tibshirani R, Vespignani A, Zhang Q, Reed C and The Influenza Forecasting Working Group (2019). Collaborative efforts to forecast seasonal influenza in the United States, 2015–2016. Scientific Reports 9(683).

7. Reich NG, Brooks LC, Fox SJ, Kandula S, McGowan CJ, Moore E, Osthus D, **Ray EL**, Tushar A, Yamana TK, Biggerstaff M, Johansson MA, Rosenfeld R, and Shaman J (2019). A collaborative multiyear, multimodel assessment of seasonal influenza forecasting in the United States. Proceedings of the National Academy of Sciences, 201812594. DOI: 10.1073/pnas.1812594116

6. Qian J, **Ray EL**, Brecha RL, Reilly MP, and Foulkes AS (2018). A likelihood-based approach to transcriptome association analysis. Statistics in Medicine. 2018;1–17. DOI: 10.1002/sim.8040

5. **Ray EL**, Sasaki JE, Freedson PS, and Staudenmayer J (2018). Physical Activity Classification with Dynamic Discriminative Methods. Biometrics. DOI: 10.1111/biom.12892

4. **Ray EL** and Reich NG (2018). Prediction of infectious disease epidemics via weighted density ensembles. PLOS Computational Biology 14(2): e1005910.

3. Lauer SA, Sakrejda K, **Ray EL**, Keegan LT, Bi Q, Suangtho P, Hinjoy S, Iamsirithaworn S, Suthachana S, Laosiritaworn Y, Cummings DAT, Lessler J, and Reich NG (2018). Prospective forecasts of annual dengue hemorrhagic fever incidence in Thailand, 2010 – 2014. Proceedings of the National Academy of Sciences, 0027-8424.

2. **Ray EL**, Sakrejda, K, Lauer, SA, Johansson, MA, and Reich, NG (2017). Infectious disease prediction with kernel conditional density estimation. Statistics in Medicine, 36:4908–4929.

1. Kozey Keadle S, Lyden K, Hickey A, **Ray EL**, Fowke JL, Freedson PS, and Matthews CE (2014). Validation of a previous day recall for measuring the location and purpose of active and sedentary behaviors compared to direct observation. Int. J. Behav. Nutr. Phys. Act., 11, 12.

PROFESSIONAL SERVICE

Ad Hoc Reviews:

2022   International Journal of Forecasting, Journal of the Royal Society Interface,
        PLOS Computational Biology

2021   American Journal of Epidemiology, International Journal of Forecasting, Nature Communications,
        Neural Information Processing Systems, Harvard Data Science Review

2020   Journal of Statistics Education, International Journal of Forecasting,
        Neural Information Processing Systems

2019   Journal of Statistics Education, PLOS Computational Biology, Statistics in Medicine

2018   PLOS Computational Biology, PLOS Neglected Tropical Diseases, Statistics in Medicine

2017   PLOS Computational Biology, Statistics in Medicine

PRESENTATIONS

Invited presentations are indicated with a *.

*Ray EL (2022, October). The COVID-19 Forecast Hub: Modeling results. CSTE/CDC Infectious Disease Forecasting Workshop. Atlanta, GA, USA.

*Ray EL (2022, October). The US COVID-19 Forecast Hub: Predictive modeling to support public health. Yale Modeling Unit Seminar Series. New Haven, CT, USA.

Ray EL, Brooks LC, Wang Y, Gerding A, Cramer EY, Bien J, Bracher J, Rumack A, Biggerstaff M, Johansson MA, Tibshirani RJ, Reich NG (2021, November). Ensemble forecasts of COVID-19 cases and deaths in the United States. Poster session presented at Epidemics. Virtual meeting.

*Ray EL (2021, November). Predictive Modeling to Support Public Health. CSTE/CDC Forecasting and Modeling Workshop. Virtual meeting.

*Ray EL (2021, October). The COVID-19 Forecast Hub: Collaborative ensemble forecasts of the short-term burden of COVID-19 in the US. New England Statistics Symposium. Kingston, RI, USA.

*Ray EL (2020, November). The COVID-19 Forecast Hub: using statistics and data science to support decision making in a pandemic. University of Florida CSQUID seminar series. Virtual meeting.

Ray EL (2020, October). The COVID-19 Forecast Hub: using statistics and data science to support decision making in a pandemic. Brown University Data Science Initiative's Decoding Pandemic Data seminar series. Virtual Meeting.

Ray EL (2019, August). ILINet Backfill: Descriptive Analysis, Effects on Forecasts, and Approaches to Mitigation. CSTE/CDC Infectious Disease Forecasting for Public Health Workshop; Atlanta, GA, USA.

Ray EL, Beaudry I, Gibson GC and Reich NG (2019, May). Toward More Refined Influenza Forecasting Models: Using Existing and Novel Data Sources to Inform Detailed Model Structure. MIDAS Network Meeting; Bethesda, MD, USA.

Ray EL and Reich, NG (2018, August). Ensemble Forecasts of Infectious Disease. Seminar Series, Pontificia Universidad Católica de Chile; Santiago, Chile.

Ray EL (2018, June). Flu Forecasting from the Research Perspective. CSTE/CDC Infectious Disease Forecasting for Public Health Workshop; West Palm Beach, FL, USA.

Ray EL and Reich, NG (2017, November). Forecasting Infectious Disease Outbreaks with Weighted Density Ensembles. Five College Statistics and Data Science Research Bytes; Amherst, MA, USA.

Ray EL and Reich, NG (2017, April). Feature-Weighted Ensembles for Probabilistic Time-Series Forecasts. Invited Session at New England Statistics Symposium; Storrs, CT, USA.

Ray EL, Sakrejda, K, Lauer, SA, Johansson, MA, and Reich, NG (2016, August). Infectious disease prediction with kernel conditional density estimation and copulas. Poster session presented at Joint Statistical Meetings; Chicago, IL, USA.

Ray EL, Sakrejda, K, Brown, AG, and Reich, NG (2016, August). Team Kernel of Truth Forecasting Method Description. Seasonal Influenza Forecasting Workshop; Atlanta, GA, USA.

Ray EL, Sakrejda, K, and Reich, NG (2015, December). Nonparametric prediction of infectious disease incidence with state space reconstruction. Poster session presented at 5th International Conference on Infectious Disease Dynamics; Clearwater Beach, FL, USA.

Ray EL, Sakrejda, K, Brown, AG, and Meng, X (2015, September). Team Kernel of Truth Forecasting Method Description. Workshop on Integrating Prediction and Forecasting Models for Decision-Making: Dengue Epidemic Prediction; Washington, DC, USA.

Ray EL and Beaudry, I (2014, April). Parallel Computation with R. University of Massachusetts Statistics Seminar; Amherst, MA, USA.

Ray EL (2012, February). Some Good Practices for R. Five College/Pioneer Valley R Users Group; Amherst, MA, USA.

Ray EL, Krafft, P, Freedson, PS, and Staudenmayer, J (2011, May). Novel analytic methods to estimate physical activity from accelerometer data: an open-source web-based tool. Poster session presented at 2nd International Congress on Ambulatory Monitoring of Physical Activity and Movement; Glasgow, Scotland.

HONORS and AWARDS

2015	Scholarship, 7th Summer Institute in Statistics and Modeling in Infectious Diseases
2013	Honorable Mention, University of Massachusetts Institute for Computational Biology, Biostatistics, and Bioinformatics Open Source Software Innovation competition. Granted for a website allowing users to apply statistical methods for objective measurement of physical activity and the WebDevelopR R package.

VOLUNTEER EXPERIENCE

2016	Volunteer Statistical Consultant, Statistics Without Borders

PROFESSIONAL AFFILIATIONS

Member, American Statistical Association