

Kevin M. Bakker

Curriculum Vitae

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infectious diseases, molecular biology (ddPCR), causal inference, mathematical modeling, zoonotic pathogens, data science, and immunization

Education and Appointments

- 2020–present **Assistant Research Scientist**, UNIVERSITY OF MICHIGAN, Ann Arbor, MI, Department of Epidemiology.
- 2018–2020 **NIH F32 Research Fellow**, UNIVERSITY OF MICHIGAN, Ann Arbor, MI, Department of Statistics.
- 2017–2018 **Postdoctoral Researcher**, UNIVERSITY OF GLASGOW, Glasgow, Scotland, Institute of Biodiversity, Animal Health and Comparative Medicine.
- 2013–2017 **Ph.D.**, UNIVERSITY OF MICHIGAN, Ecology and Evolutionary Biology, Michigan Institute for Computational Discovery & Engineering Certificate.
- 2012–2014 **Master of Science**, UNIVERSITY OF MICHIGAN, Ecology and Evolutionary Biology.
- 2005–2006 **Bachelor of Science**, MICHIGAN STATE UNIVERSITY, Zoology.
- 2000–2004 **Bachelor of Science**, MICHIGAN STATE UNIVERSITY, Human Biology.

Manuscripts *In Prep*

Diana K Meza, Felix J Drexler, Paul W Duprex, Megan E Griffiths, Mafalda Viana, Mafalda, Daniel G Streicker, and **Kevin M Bakker**. "Modelling the immunosuppressive impact of morbillivirus coinfection on rabies transmission in vampire bats." (available upon request).

Reiden Magdaleno, Abigail Collingwood, Richard P Fiorella, Edward Ionides, and **Kevin M Bakker**. "Spatiotemporal distribution and meteorological correlates of scrub typhus in Thailand." (available upon request).

Marlene K. Wolfe, Dorothea Duong, **Kevin M. Bakker**, Michelle Ammerman, Lyndsey Mortenson, Bridgette Hughes, Elana M. G. Chan, Bradley J. White, Alexandria B. Boehm, Krista R. Wigginton. "Influenza A RNA in wastewater settled solids indicates outbreak." (available upon request).

Manuscripts *Submitted*

[10] Andrew F. Brouwer, Marisa C Eisenberg, **Kevin M Bakker**, Savannah Boerger, Mondal Zahid, Matthew Freeman, Joseph NS Eisenberg. "Leveraging infectious disease models to interpret randomized controlled trials: revisiting water, sanitation, and hygiene intervention trials". (available upon request).

[9] Sooyeol Kim, Lauren C Kennedy, Marlene K Wolfe, Craig S Cridde, Dorothea H Duong, Bradley J White, Rose S Kantor, Kara L Nelson, Joshua A. Steele, Kylie Langlois, John F Griffith, Amity G Zimmer-Faust, Sandra L McLellan, Melissa K Schussman, Michelle Ammerman, Krista R Wigginton, **Kevin M. Bakker**, Alexandria B Boehm. "SARS-CoV-2 RNA enriched 1000-fold in solid relative to liquid wastewater at publicly owned treatment works". (available upon request).

[8] **Kevin M Bakker**, Marisa C Eisenberg, Robert Woods, and Micaela E Martinez. "Identifying optimal vaccination scenarios to reduce varicella zoster virus transmission and reactivation". (available upon request).

Refereed Publications

- [7] **Bakker, Kevin M**, Marisa C Eisenberg, Robert Woods, and Micaela E Martinez. "Exploring the seasonal drivers of varicella zoster transmission and reactivation". In: *American Journal of Epidemiology* (2021).
- [6] M Brock Fenton, Daniel G Streicker, Paul A Racey, Merlin D Tuttle, Rodrigo A Medellin, Mark J Daley, Sergio Recuenco, and **Kevin M Bakker**. "Knowledge gaps about rabies transmission from vampire bats to humans". In: *Nature Ecology & Evolution* (2020), pp. 1–2.
- [5] **Kevin M Bakker**, Tonie E Rocke, Jorge E Osorio, Rachel C Abbott, Carlos Tello, Jorge E Carrera, William Valderrama, Carlos Shiva, Nestor Falcon, and Daniel G Streicker. "Fluorescent biomarkers demonstrate prospects for spreadable vaccines to control disease transmission in wild bats". In: *Nature Ecology & Evolution* (2019), pp. 1–8.
- [4] **Kevin M Bakker**, Micaela Elvira Martinez-Bakker, Barbara Helm, and Tyler J Stevenson. "Digital epidemiology reveals global childhood disease seasonality and the effects of immunization". In: *Proceedings of the National Academy of Sciences* 113.24 (2016), pp. 6689–6694.
- [3] *Micaela Martinez-Bakker, ***Kevin M Bakker**, Aaron A King, and Pejman Rohani. "Human Birth Seasonality: Latitudinal Gradient and Interplay with Childhood Disease Dynamics". In: *Proceedings of the Royal Society B: Biological Sciences* 281.1783 (2014), *Co-first authors.
- [2] Laura Alonso-Sáez, Alison S Waller, Daniel R Mende, **Kevin Bakker**, Hanna Farnelid, Patricia L Yager, Connie Lovejoy, Jean-Éric Tremblay, Marianne Potvin, Friederike Heinrich, et al. "Role for urea in nitrification by polar marine Archaea". In: *Proceedings of the National Academy of Sciences* 109.44 (2012), pp. 17989–17994.
- [1] Jean-François Ghiglione, Pierre E Galand, Thomas Pommier, Carlos Pedrós-Alió, Elizabeth W Maas, **Kevin Bakker**, Stefan Bertilson, David L Kirchman, Connie Lovejoy, Patricia L Yager, et al. "Pole-to-pole biogeography of surface and deep marine bacterial communities". In: *Proceedings of the National Academy of Sciences* 109.43 (2012), pp. 17633–17638.

Unrefereed Work

- 2022 **Fighting COVID-19 in the United States**, *Red Line Editorial*, scientific consultant **Kevin M Bakker**.
- 2021 **A Compendium of U.S. Wastewater Surveillance to Support COVID-19 Public Health Response.**, *Environmental Protection Agency*, Contributor **Kevin M Bakker**.
- 2021 **The COVID-19 Pandemic**, *Red Line Editorial*, scientific consultant **Kevin M Bakker**.
- 2018 **'Tis the Season for Conception**, *The Conversation*, Micaela Martinez and **Kevin M Bakker**.
- 2013 **The Chukchi Sea**, *Biomes and Ecosystems: An Encyclopedia*, Salem Press, ed: Robert Warren Howarth.

Grants in prep

- 2023–2027 **\$2,500,000 new submission** NIH R01, Addressing open epidemiological questions in Wastewater Based Epidemiology. Role PI
- 2023–2027 **\$2,500,000 resubmission** NIH R01, Quantifying the dominant modes of diarrheal disease transmission and modeling WASH interventions. Role Co-I
- 2023–2027 **\$2,500,000 resubmission** NIH R01, Integrating Fecal Shedding Dynamics of SARS-CoV-2 with Wastewater Surveillance to Estimate Population-Level COVID-19 Burden. Role Co-I

Grants in review

2022–2023 **\$1,000,000** NSF Predictive Intelligence for Pandemic Prevention Phase I. Urban infrastructure, extreme events, and waterborne disease: Improving predictability and equity for urban water futures. Role Co-PI

Active Grants

2022–2023 **\$40,200** Michigan Department of Health and Human Services SEWER addition for SARS-CoV-2 environmental surveillance. Role Co-PI

2021–2022 **\$35,100** Wastewater Based Epidemiology, University of Michigan Campus Health Response Committee (CHRC). Role PI

2022–2023 **\$2,173,000** Michigan Department of Health and Human Services, University of Michigan Genomic Surveillance and Epidemiology Partnership. Role Co-I

2021–2023 **\$2,598,000** Michigan Department of Health and Human Services SEWER project for SARS-CoV-2 environmental surveillance. Role Co-PI

2021–2022 **\$138,899** University of Michigan Skunkworks Initiative. Role Co-PI

2020–2023 **\$85,000** University of Michigan Post Translational Scholars Program. Role PI

2020–2024 **\$6,000** University of Michigan Data Acquisition for Data Science. Role PI

2016–2022 **\$5,500** University of Michigan, Undergraduate Research Opportunity Grant (3 awards). Role PI

Previous Grants & Fellowships

2021–2021 **\$8,359** Care Evolution extension, Say Yes! COVID-19 test campaign. Role Co-PI

2021–2021 **\$39,010** Care Evolution, Say Yes! COVID-19 test campaign. Role Co-PI

2020–2020 **\$474,844** (\$282,645 grant plus \$192,199 in equipment.) Coronavirus Aid, Relief, and Economic Security Act (CARES) & Michigan Department of Environment, Great Lakes, and Energy (EGLE). Role Co-PI

2019–2020 **\$3,009** XSEDE Supercomputer Startup Funding (2 awards). Role PI

2018–2020 **\$184,818** NIH National Research Service Award F32AI134016. Role PI

2016–2017 **\$47,400** University of Michigan Rackham Predoctoral Fellowship. Role PI

2014–2017 **\$10,775** University of Michigan Ecology and Evolutionary Biology Grants (7 awards). Role PI

2013–2017 **\$9,250** University of Michigan Rackham Grants (6 awards). Role PI

2015–2015 **\$4,000** University of Michigan, Michigan Institute for Computational Discovery and Engineering Fellowship. Role PI

2015–2015 **\$1,350** University of Washington Summer Institute in Statistics and Modeling in Infectious Diseases Summer Institute Grant. Role PI

Teaching

2020–2021 Nominated, UROP Mentor of the year

Fall 2012, University of Michigan, Introduction to Ecology and Evolutionary Biology, Graduate student

Fall 2015, instructor

Winter 2016

Winter 2013 University of Michigan, Ecology and Evolution of Infectious diseases, Graduate student instructor

Media (hyperlinks)

- Fox News
- Slate Magazine
- LiveScience – Birth Seas
- LiveScience – Digital Epi
- Business Insider
- MedPageToday
- UMich – Biogeography
- Science
- The Pharmaceutical Journal
- AAAS Radio
- ResearchGate News
- ABC News
- Medical Economics
- UMich – Birth Seasonality
- Discovery News
- Boston Globe
- New Scientist
- Michigan Radio
- The Express
- UMich – Digital Epi
- UMich – Vampire Bats
- Digital Trends
- Medical Daily
- Daily Mail
- NBC News
- The Scotsman
- Photonics
- Freethink

National and International Conference Presentations

- Jun 2021 **Bakker, K.M.** and K. Wigginton. Ecology and Evolution of Infectious Diseases. Montpellier, France: *virtual*
- Apr 2021 **Bakker, K.M.** and K. Wigginton. Association for Clinical and Translational Science. Washington, DC: *virtual*
- Jun 2020 **Bakker, K.M.** and D. Streicker. Ecology and Evolution of Infectious Diseases. Montpellier, France: *Cancelled - COVID-19*
- Aug 2019 **Bakker, K.M.** and D. Streicker. Ecological Society of America. Louisville, KY
- Nov 2017 **Bakker, K.M.** and M. Martinez. Jacques Monod: Open Questions in Disease Ecology and Evolution: From Basic Research to Evolutionary Medicine. Roscoff, France
- Aug 2017 **Bakker, K.M.** and D. Streicker. Ecological Society of America. Portland, OR
- Jun 2017 **Bakker, K.M.** and M. Martinez. Ecology and Evolution of Infectious Diseases. Santa Barbara, CA
- Jun 2016 **Bakker, K.M.**, M. Martinez-Bakker, B. Helm, and T.J. Stephenson. Ecology and Evolution of Infectious Diseases. Ithaca, NY
- Dec 2015 **Bakker, K.M.**, M. Martinez-Bakker, B. Helm, and T.J. Stephenson. British Ecological Society. Edinburgh, Scotland
- Aug 2015 **Bakker, K.M.** and M. Pascual. Ecological Society of America. Baltimore, MD
- Aug 2014 **Bakker, K.M.** and P. Rohani. Ecological Society of America. Sacramento, CA
- Jun 2014 **Bakker, K.M.** and P. Rohani. Ecology and Evolution of Infectious Diseases. Fort Collins, CO
- Jun 2013 **Bakker, K.M.**, Martinez-Bakker, M., King, A.A., and P. Rohani. Ecology and Evolution of Infectious Diseases. State College, PA

Invited Talks

- Jan 2022 Michigan Research and Discovery Scholars, University of Michigan, Ann Arbor, MI
- Jan 2022 Department of Biological Sciences - University of Idaho, Moscow, ID
- Dec 2021 Institute for Modeling Collaboration and Innovation - University of Idaho, Moscow, ID
- Oct 2020 New Voices in Infection Biology - Max Planck Institute for Infection Biology. Berlin, Germany
- Jul 2020 Epidemiology department, School of Public Health, University of Michigan. Ann Arbor, MI
- Oct 2019 MAC-EPID workshop meeting, School of Public Health, University of Michigan. Ann Arbor, MI
- Jun 2019 School of Mathematics and Statistics, University of Glasgow. Glasgow, Scotland
- Jan 2018 Complex Systems networks group, University of Michigan. Ann Arbor, MI
- Oct 2017 Disease ecology and wild immunology, University of Glasgow. Glasgow, Scotland
- Sept 2017 Seminar Speaker, Department of Ecology and Evolutionary Biology, University of Michigan. Ann Arbor, MI
- Sept 2016 Odum School of Ecology, University of Georgia. Athens, GA

Jul 2015 Institute for Disease Modeling. Seattle, WA

Local and Other Presentations

- Aug 2021- **Bakker, K.M.** Ongoing bi-weekly wastewater stakeholder meetings. Ann Arbor, MI
- Nov 2021 **Bakker, K.M.** Michigan Research (MICHHR) studio talk. Ann Arbor, MI
- Dec 2020 **Bakker, K.M.** Michigan Research (MICHHR) studio talk. Ann Arbor, MI
- Nov 2020 **Bakker, K.M.** Streicker group talk. Glasgow, Scotland
- May 2016 **Bakker, K.M.** *pomp* in R, a tutorial. Ann Arbor, MI
- Mar 2016 **Bakker, K.M.**, M. Martinez-Bakker, B. Helm, and T.J. Stevenson. Michigan Institute of Computational Discovery and Engineering. Ann Arbor, MI
- Feb 2016 **Bakker, K.M.** Modeling Infectious Diseases Across Scales. Ann Arbor, MI
- Mar 2015 **Bakker, K.M.** and M. Pascual. Computational discovery in complex systems biology. Ann Arbor, MI
- Mar 2015 **Bakker, K.M.**, E. Ionides, M. Eisenberg, and M. Pascual. Early career scientist symposium. Ann Arbor, MI
- May 2014 **Bakker, K.M.** Student evaluation seminar talk. Ann Arbor, MI
- Mar 2014 **Bakker, K.M.** 5 minute speed talk — recruitment weekend. Ann Arbor, MI
- Feb 2014 **Bakker, K.M.** 5 minute speed talk — departmental seminar. Ann Arbor, MI
- Jan 2014 **Bakker, K.M.** Theory group seminar talk. Ann Arbor, MI

Students Mentored

- 2021-pres Xavier Jenkins, UROP
- 2021-pres Maria Wajahat, UROP
- 2021-pres Libby Kelly, Independent study
- 2021-pres Jennifer Goodman, Independent study
- 2021-pres T. Valleroy, MPH student
- 2021-pres Sasha Tretyakova, Volunteer, MPH student
- 2021-pres Phong Hong, MSc student - Computational epidemiology
- 2021-pres Padmashri Saravanan, independent study
- 2021-pres Finnegan Klein, Greenhills Advanced Research Student
- 2021-pres Alyson Miller, Independent study
- 2020-pres Reiden Magdaleno, MRADS, independent study, lab manager
- 2018-pres Clare Dougherty, UROP, lab manager, independent study
- 2021-2021 Shreya Mullapudi, Independent study (currently a lab tech on my team)
- 2021-2021 Preti Chowdhury, summer UROP
- 2020-2021 Lior Latimer, UROP
- 2020-2021 Samantha Schrodell, UROP
- 2020-2021 Ella McKenzie, UROP
- 2020-2021 Jillian Terrell, UROP
- 2020-2021 Xiazi Yuan, UROP
- 2019-2020 Abigail Collingwood, Masters capstone
- 2019-2020 Juliette Kaplan, UROP
- 2019-2020 Cerys Rogers, UROP
- 2019-2020 Mahir Piyarali, UROP

2019-2019 Erica Fossee, UROP
 2018-2019 Victoria Minka, UROP, independent study
 2016-2019 Alyah Chmiel, Independent study, lab manager
 2016,2019 Lauren Rollins, Independent study
 2018-2018 Ariana Mitchum, MRADS
 2016-2018 Logan Austin, Independent study
 2016-2017 Nathan Warriner, UROP & independent study
 2016-2017 Madeleine Schmitter, UROP
 2016-2017 Molly Stachurski, UROP
 2016-2016 Aidan O'Connor, Independent study
 2015-2015 Emilia Iglesias, Independent study
 2014-2014 Tabea Schatz, Volunteer

Student Presentations

Dec 2021 Finnegan Klein, Greenhills Advanced Research Night, Ann Arbor, MI.
 Nov 2021 Reiden Magdaleno - Will present at the American Society of Tropical Medicine & Hygiene.
 Oct 2021 Shreya Mullapudi - Michigan Wastewater Network (MiNet) meeting, Grand Rapids, MI.
 Aug 2021 Preti Chowdhury, UROP Summer Symposium. Ann Arbor, MI.
 April 2021 Reiden Magdaleno - National Council for Undergraduate Research (NCUR) Spring Symposium. Virtual.
 April 2021 Reiden Magdaleno - MRADS Spring Symposium. Ann Arbor, MI.
 April 2021 Lior Latimer - UROP Spring Symposium. Ann Arbor, MI.
 April 2021 Samantha Schrodell - UROP Spring Symposium. Ann Arbor, MI.
 April 2021 Ella McKenzie - UROP Spring Symposium. Ann Arbor, MI.
 April 2021 Jillian Terrell - UROP Spring Symposium. Ann Arbor, MI.
 April 2021 Xiazi Yuan -UROP Spring Symposium. Ann Arbor, MI.
 April 2020 Juliette Kaplan - UROP Spring Symposium. Ann Arbor, MI. Awarded Blue Ribbon.
 April 2020 Cerys Rogers - UROP Spring Symposium. Ann Arbor, MI.
 April 2019 Clare Dougherty - UROP Spring Symposium. Ann Arbor, MI.
 April 2019 Victoria Minka - UROP Spring Symposium. Ann Arbor, MI.
 April 2017 Nathan Warriner - UROP Spring Symposium. Ann Arbor, MI.
 April 2017 Madeleine Schmitter - UROP Spring Symposium. Ann Arbor, MI.
 April 2017 Molly Stachurski - UROP Spring Symposium. Ann Arbor, MI.

Research Experience

09/2020–present **University of Michigan**, SARS-CoV-2 wastewater monitoring (lab and computational), SARS-CoV-2 immune response to vaccination and exposure (computational), OnCore certification, LabVantage training, MiChart (Epic) certification, RedCap training, ddPCR training, liquid handler training, Manage and coordinate wet lab (N=4-8) and dry lab (N=6-12) personnel.
 05/2018–08/2020 **University of Michigan**, Semi-transmissible vaccines, optical character recognition software.
 09/2017–04/2018 **University of Glasgow**, Wildlife disease modeling, transferable vaccines, model validation with serological data.
 12/2010–08/2017 **University of Michigan**, Disease modeling, statistical methods, and *pomp* (Partially observed Markov Process) model fitting with extensive coding experience with R, C++, and \LaTeX .

- 08/2007–10/2010 **University of Georgia**, Set up and ran CARD-MAR-FISH and DNA sequencing labs, 650+ hours on Fluorescent microscope, trained in PCR, qPCR, DNA extraction, and other microbial and molecular lab techniques.
- 07/2008 **Uppsala University, Sweden**, Learned MAR-FISH technique to identify bacterial activity and community structure.
- 05/2008–06/2008 **Interdisciplinary sea ice research course (MSL 695) in Barrow, Alaska**, Intensive course on data analysis and collection involving fieldwork, volunteered for an additional week to collect genetic samples of Ringed Seals.
- 11/2007–01/2008 & 11/2008–01/2009 **Antarctic research cruises aboard the Swedish Icebreaker Oden**, Research focus on the Southern Oceans bacterial community structure, collected organic matter through for DOM/POM analysis, DNA samples filtered for later extraction and 454 sequencing, respiration bottles filled for CO2 analysis, MAR-CARD-FISH samples produced from separate filtration process.
- 05/2006 **Bahamas summer study**, Marine fish, coral, and invertebrate identification/physiology, studied the behavior, reproduction, competition and feeding of marine organisms, sea urchin research project on the inverse relationship between test size and population density.
- 05/2005 **Ecology Lab–Kellogg Biological Station**, Research orientated course revolving around planning and implementing field experiments and conducting data analyses.
- 12/2005–01/2006 **Antarctic research cruise aboard the Russian Icebreaker M/S Orlova**, Southern Ocean circulation, chemistry, food webs, and organism interactions, research project on human interactions and their impact on the environment.
- 05/2003–06/2003 **Belize summer study**, Tropical and marine ecology, research project outlining human impact on the coastal ecosystem.

Service, Outreach, & Workshops

- 09/2021–present **University of Michigan**, Junior Faculty Advisory Board (JFAB) co-president, doctoral committee member, Institute for Healthcare Policy and Innovation (IHPI) member, Epidemiology graduate student liaison, MAC-EPID/MCIDT committee member, doctoral day panel interviewer, SPH poster session judge.
- 09/2020–08/2021 **University of Michigan**, Junior Faculty Advisory Board (JFAB) co-president, SPH poster session judge.
- 08/2015–12/2015 **University of Michigan**, Graduate Student Mentor: Mentored six new graduate student instructors.
- 08/2015 **Ecological Society of America**, Served as ESA student mentor for disease ecology.
- 07/2015 **University of Washington**, Summer Institute in Statistics and Modeling Infectious Disease (SISMID): Simulation based inference for epidemiological dynamics and spatial statistics.
- 07/2015 **Chumakov Institute of Poliomyelitis (Moscow, Russia)**, Visit, data collection, and developing collaborations with Russian polio researchers.
- 03/2015 **Dewitt Middle School (Dewitt, MI)**, Science outreach for 240 students via interactive learning on the scientific method, global demography, and disease ecology.
- 08/2014–07/2015 **University of Michigan**, President - Graduate students in Ecology & Evolutionary Biology (GREEBS). Activities included: organization of coffee-match, advanced R workshop, grad hacks workshop, and Professional development workshops with Robert Woods, Elizabeth Pringle, and Chelsea Wood.
- 04/2014 - 08/2014 **University of Michigan**, Coded all models from *Modeling Infectious Diseases* (ISBN: 9780691116174) in R programming language.
- 05/2014 **University of Michigan**, Qualifying exams preparation meeting, lead organizer, and speaker.
- 01/2012–06/2012 **University of Michigan**, Event Leader, 10th annual Ecology and Evolution of Infectious Disease conference and workshop.

Ad hoc Reviewer

Virus Evolution, Epidemiology & Infection, American Journal of Epidemiology, PLoS Biology, International Journal of Infectious Diseases, ClinicoEconomics and Outcomes Research, BMC Public Health, PLoS One, Epidemics, Ecology, PLoS Computational Biology, Scientific Reports, Journal of Epidemiology and Global Health, BMJ Open, ES&T Engineering, Environmental Science: Water Research & Technology

Professional Societies

2015–present **British Ecological Society.**

2010–present **Ecological Society of America.**

2009–present **American Geophysical Union.**

References

Krista Wigginton, kwigg@umich.edu, University of Michigan Associate Professor in the Department of Civil and Environmental Engineering,.

Daniel Streicker, daniel.streicker@glasgow.ac.uk, University of Glasgow Senior Henry Dale Fellow in the Institute of Biodiversity Animal Health & Comparative Medicine.

Marisa Eisenberg, marisae@umich.edu, University of Michigan Associate Professor in the Departments of Epidemiology, Complex Systems, & Mathematics.