**Curriculum Vitae**

**EDUCATION:**

**University of Michigan School of Public Health,** Ann Arbor, MI 2014-2017

*Doctorate of Epidemiology*

Honor: Regents Fellow

**Santa Fe Institute Complex Systems Summer School,** Santa Fe, NM Summer 2017

SFI-CSSS is a competitive summer program that brings together faculty, post-doctoral fellows, and graduate students around the world for four weeks of intensive training.

**University of Michigan School of Public Health**, Ann Arbor, MI 2012-2014

*Master of Public Health, Epidemiology-International Health*

Honor: Deans Award

**University of North Carolina at Chapel Hill**, Chapel Hill, NC 2007-2011

*Bachelor of Science, Psychology with Highest Honors and Highest Distinction*

Honors Thesis: Applying chaos theory: Chronic pain, music, and cognition

*Bachelor of Arts, Biology with Highest Distinction*

*Minor, Arabic*

**EMPLOYMENT EXPERIENCE:**

**Assistant Professor,** Department of Kinesiology and Community Health, University of Illinois at Urbana-Champaign (2022-Present)

**Postdoctoral Fellow,** SARS-CoV-2, norovirus, and rotavirus modeling, Emory University (2020-Present)

**Postdoctoral Fellow,** Zika and Dengue Co-Circulation under Environmental Change and Urbanization, University of Michigan (2018-2020)

**Graduate Student Research Assistant,** EcoDess Study on Diarrheal Disease in Rural Ecuador, University of Michigan (2012-2018)

**OTHER RESEARCH EXPERIENCE:**

**Research Analyst,** Oral Health-Buddy Research Study, University of Michigan (2014-2015).

**Research Analyst,** Blue Cross Blue Shield of Michigan PGIP Program Evaluation, University of Michigan (2014).

**Project Coordinator,** Cross Sectional Study on Sanitation and Diarrheal Disease in Rural Ecuador, University of Michigan (Summer 2013)

Awards: International Health Master’s Travel Award, Global Public Health Initiative Grant

**Visiting Scholar,** Applying chaos theory: Chronic pain, music, and cognition, UNC-Chapel Hill (2012)

**Principal Investigator,** Applying chaos theory: Chronic pain, music, and cognition, UNC-Chapel Hill (2010-2011)

 Awards: Dunlevie Honors Undergraduate Research Award (grant)

**Research Assistant,** Sensation and Perception Lab, UNC-Chapel Hill (2008-2011)

**GRANTS AND FELLOWSHIPS:**

Active support:

Title: Characterizing the role of spatial and temporal variability in vaccine coverage on transmission of VPDs in Vietnam

Sponsor: Vaccine Impact Modeling Consortium

Dates: 5/01/2021-10/31/2021

PI: Hannah Eleanor Clapham

Role: Advisor

Amount: $90,000

Title: Modeling ongoing SARS-CoV2 vaccination data in light of emerging data on immunity and viral evolution

Sponsor: NIH/NIGMS (3R01GM124280-04S1)

Dates: 6/01/2021-5/31/2022

PI: Lopman

Role: Co-Investigator

Title: Integrating data streams with multi-scale modeling to guide norovirus vaccine decision-making

Sponsor: NIH/NIGMS (R01 GM124280)

Dates: 06/01/2018–05/31/2023

PI: Lopman

Role: Co-Investigator

Title: Modeling the impact of rotavirus vaccination in GAVI countries

Sponsor: Vaccine Impact Modeling Consortium

Dates: 8/01/2018-8/31/2022

PI: Garske

Role: Co-Investigator

Title: Zika and dengue co-circulation under environmental change and urbanization

Sponsor: NIAID (5R01AI32372)

Dates: 8/02/2017-7/31/2022

PI: Joseph N.S. Eisenberg

Role: Postdoctoral fellow

Completed support:

Title: Modeling the impact of SARS-CoV2 vaccination in low-middle income countries

Sponsor: World Health Organization

Dates: 5/15/2021-8/31/2021

PI: Kraay

Role: PI

Amount: $50,457

Title: Collaborative research: RAPID: Integrative modeling of intervention serology and the role of shield immunity in reducing COVID-19 epidemic spread

Sponsor: National Science Foundation (2032084)

Dates: 6/01/2020-5/31/2021

PI: Lopman

Role: Postdoctoral fellow

Title: Preparing for the SARS-CoV2 Vaccine: Modeling of transmission pathways, viral evolution, and vaccination strategies

Sponsor: NIH/NIGMS (R01 GM 12480-03S1)

Dates: 6/01/2020-5/31/2021

PI: Lopman

Role: Co-Investigator

Title: Modeling the effects of the environment on enteric pathogen dynamics

Sponsor: NIGMS (U01GM110712)

Dates: 9/01/2014-6/30/2019

PI: Joseph N.S. Eisenberg

Role: graduate student researcher

Small university grants:

Rackham Travel Grant (2014, 2015, 2016, and 2017)

Rackham Research Grant (2017)

Interdisciplinary Training in Microbial Systems Grant (ITiMS) (2017)

Epidemiology Block Grant (2015, 2016)

International Health Master’s Travel Award (2013)

University of Michigan Global Public Health Initiative Grant (2013)

Dunlevie Honors Undergraduate Research Award (2010)

**PUBLICATIONS:**

**Kraay, A.N.M.,** Trostle J,\* Brouwer AF,\* Cevallos T W, Eisenberg JNS (2018). Determinants of short-term movement in a developing region and implications for disease transmission, *Epidemiology,* Jan; 29(1):117-125. doi: 10.1097/EDE.0000000000000751.

**Kraay, A.N.M.,** Brouwer A.F, Lin N.,a Collender, P.A., Remais J.V., Eisenberg J.N.S. (2018). Modeling environmentally-mediated rotavirus transmission: the role of temperature and hydrologic factors, *Proceedings of the National Academy of Sciences*, 115(12): E2782-E2790, <https://doi.org/10.1073/pnas.1719579115>.

**Kraay A.N.M.,** Hayashi M.L., Hernandez-Ceron N., Spicknall I., Eisenberg M.C., Meza R., Eisenberg J.N.S. (2018). Fomite-mediated transmission as a sufficient pathway: a comparative analysis across three viral pathogens, *BMC Infectious Diseases,*18:540.

**Kraay A.N.M.,** Ionides, E.L. Lee G.O., Eisenberg J.N.S. (2020). Direct, indirect, and overall effectiveness of Rotarix vaccination in rural Ecuador, 2008-2013. *International Journal of Epidemiology*, dyaa124, <https://doi.org/10.1093/ije/dyaa124>

Gallagher M.E., Sieben A.J., Nelson K.N., **Kraay A.N.M.,** Walter A. Orenstein, Lopman B., Handel A., Koelle K. (2020). Considering indirect effects is critical when evaluating SARS-CoV-2 vaccine candidates. *Nature Medicine.* <https://doi.org/10.1038/s41591-020-01172-x>

**Kraay A.N.M.,\*** Man, O.,\*a Levy M.C, Ionides E.L., Levy K, Eisenberg J.N.S. (2020). The concentration-dilution hypothesis of rainfall: a systematic review and meta-analysis. *Environmental Health Perspectives*, 128(12). <https://doi.org/10.1289/EHP6181>

**Kraay A.N.M.,** Han P.a, Kambhampati A.K., Wikswo M.E., Mirza S.A., Lopman B.A. (2021). Impact of non-pharmaceutical interventions for SARS-CoV-2 on norovirus outbreaks: an analysis of outbreaks reported by 9 US states. *Journal of Infectious Diseases*. jiab093. <https://doi.org/10.1093/infdis/jiab093>

**Kraay A.N.M.,** Hayashi M.A.L., Berendes D.M., Sobolik J.S., Leon J.S., Lopman B.A. (2021) Risk of fomite-mediated transmission of SARS-CoV-2 in child daycares, schools, nursing homes, and offices: a modeling study. *Emerging Infectious Diseases* 27(4): 1229-1231. doi: <https://doi.org/10.3201/eid2704.203631>

Shioda K., Lau M.S.Y., **Kraay A.N.M.**, Nelson K.N., Siegler A.J., Sullivan P.S., Collins M.H., Weitz J.S.W., Lopman B.A. (2021). Estimating the cumulative incidence of SARS-CoV-2 infection and the infection fatality ratio in light of waning antibodies. *Epidemiology*. doi: 10.1097/EDE.0000000000001361

**Kraay A.N.M.** (2021). Response to Park et al. *Journal of Infectious Diseases.* jiab246. <https://doi.org/10.1093/infdis/jiab246>

Toor J, Echeverria-Londono S, Li X, Abbas K, Carter ED, Clapham H.E., Clark A., deVillier M.J., Eilsertson K., Ferrari M., Gamkrelidza I., Hallett T.B., Hinsley W., Hogan D., Huber J.H., Jackson M.L., Jean K., Jit M., Karachaliou A., Klepac P., **Kraay A.N.M.,** Lessler J., Li X., Lopman B.A., Mengistu T., Melcalf C.J., Moore S.M., Nayagam S., Papdopoulos T., Perkins T.A., Portnoy A., Razavi H., Razavi-Shearer D., Resch S., Sanderson C., Sweet S., Tam Y, Tanvir H., Minh Q.T., Trotter C.L., Truelove S., Vynnycky E., Walker N., Winter A., Woodruff K., Ferguson N.M., Gaythorpe K.A.M. (2021). Lives saved with vaccination for 10 pathogens across 112 countries in a pre-COVID-19 world, *ELife*, 10: e67635.

**Kraay A.N.M.,\*** Nelson K.N.,\* Zhao C., Weitz J.S. Lopman B.A.(2021). Modeling serological testing to inform relaxation of social distancing for COVID-19 control. *Nature Communications.* 12: 7063.  <https://doi.org/10.1038/s41467-021-26774-y>

Sobolik J.S., Sajewski E., Jaykus L., Cooper D.K., Lopman B.A., **Kraay A.N.M.,** Ryan P.B., Leon J.S. Controlling risk of SARS-CoV-2 infection in essential workers of enclosed food manufacturing facilities. *Food Control.* 2022 Mar;133:108632. doi: 10.1016/j.foodcont.2021.108632. Epub 2021 Oct 22.

**MANUSCRIPTS UNDER REVIEW:**

**Kraay A.N.M.,** Gallagher M.E., Ge Y., Han P.a, Baker J.M., Koelle K., Handel A.\*, Lopman B.A.\* Modeling the use of SARS-Cov-2 vaccination to safely relax non-pharmaceutical interventions. Submitted. Preprint: <https://doi.org/10.1101/2021.03.12.2125348>

Nelson K.N., **Kraay A.N.M.,** Handel A., Lopman B.A. Estimating the attributable fraction of norovirus: a model-based approach. Submitted.

Sobolik J.S., Sajewski E.T., Jaykus, L., Kooper D.K., Lopman B.A., **Kraay A.N.M.,** Ryan P.B., Guest J.L., Webb-Girard A., Leon J.S. Low risk of SARS-CoV-2 transmission via fomite, even in cold chain. Submitted. Preprint: <https://doi.org/10.1101/2021.08.23.21262477>

**Kraay A.N.M.,** Steele M.K., Baker J.M., Hall E.W., Deshpande A., Saidzosa B.F., Mukaratirwa A., Boula A., Mpabalwani E. M., Kiulia N.M., Tsolenyanu E, Enweronu-Laryea C., Abebe A., Beyene B., Tefera M., Willilo R., Batmunkh N., Pastore R., Mwenda J.M., Antoni S., Cohen A.L., Pitzer V.E., Lopman B.A. Predicting the long-term impact of rotavirus vaccination in 112 countries from 2006-2034: a transmission modeling analysis. Submitted.

\*Authors contributed equally

aDenotes work by a trainee

**INVITED TALKS:**

**Kraay A.N.M.** (2021). Environmental transmission of SARS-CoV-2. COVAMOD Consortium group meeting. April 26.

**Kraay A.N.M.** (2020). Impact of handwashing on SARS-CoV-2 transmission. Water and Health Conference, fhi360 side event. October 26.

**Kraay A.N.M.** (2020) Impact of handwashing of SARS-CoV-2 transmission. Center for Global Safe WASH Seminar Series. October 21.

**Kraay A.N.M.** (2020). Serological testing, moderate social distancing, and surface decontamination mitigate the severe consequences of COVID-19 transmission. Georgia Southern University BEES Webinar Series. May 25.

**Kraay A.N.M.** (2017). Rainfall and diarrheal disease: evaluating the concentration dilution hypothesis for all-cause diarrhea, Invited speaker, Institute for Disease Modelling Symposium, Seattle, April 18.

**Kraay A.N.M.**, Brouwer A.F., Lin N.,a Collender P.A., Remais J.V., Eisenberg J.N.S. (2017). Modelling the role of temperature on environmentally-mediated rotavirus transmission, Invited Speaker, Institute for Disease Modelling Symposium, Seattle, April 18.

**Kraay A.N.M.** (2017). Invited speaker, MACEPID Symposium: Water, Microbes, & Human Health, Ann Arbor, March 9.

**Kraay A.N.M.** (2017). Potential impact of climate change on rotavirus transmission: a waterborne disease model analysis, Invited Speaker, Doctoral Day, Ann Arbor, January 27.

**Kraay A.N.M.**, Brouwer AF, Trostle J, Cevallos WT, Eisenberg JNS (2016). Travel and Disease Transmission. Invited Speaker, Institute for Disease Modelling Symposium, Seattle, April 20.

**ORAL PRESENTATIONS:**

**Kraay A.N.M.,** Man O,a Levy MC, Levy K, Eisenberg JNS (2019) Understanding the impact of rainfall on diarrhea: testing the concentration-dilution hypothesis using a systematic review and meta-analysis. ASTMH Annual Meeting, National Harbor, MD, November 24.

Liu Y, Dong J, Jurgens A, **Kraay A**, Ogle K, Schwalm CR, Stopnitzky S, Weissman JL, Zhan SH (2018). Information measures of land-carbon source-sink dynamics. AGU Fall Meeting, Washington, DC, December 11.

**Kraay A.N.M.**, Levy K, Ionides EL, Levy MC, Eisenberg JNS (2018). Rotarix vaccination alters diarrhea seasonality and etiology in rural Ecuador, Oral Presentation, ASTMH Annual Meeting, New Orleans, October 30.

**Kraay A.N.M.**, Ionides EL, Lee GO, Eisenberg JNS (2018). Direct, Indirect, and Overall Effectiveness of Rotarix Vaccination in Rural Ecuador, 2008-2013, Invited Speaker, Institute for Disease Modelling Symposium, Seattle, April 16.

**Kraay A.N.M.,** Brouwer AF, Lin N,a Collender PA, Remais JV, Eisenberg JNS (2017). The role of the environment in rotavirus transmission: temperature and hydrologic factors, Oral Presentation, ASTMH Annual Meeting, Baltimore, November 6.

**Kraay A.N.M.**, Brouwer AF, Lin N,a Collender PA, Remais JV, Eisenberg JNS (2017). Modelling the role of temperature on environmentally-mediated rotavirus transmission, Oral Presentation, MIDAS Annual Meeting, Atlanta, May 24.

**Kraay A.N.M.** (2016). Climate change and waterborne disease: building a framework, Oral presentation, Water and Health Conference, Chapel Hill, October 12.

**POSTER PRESENTATIONS:**

**Kraay A.N.M.,** Gallagher M.E., Ge Y, Han P., Baker J.M., Koelle K., Handel A., Lopman B.A. (2021). Modeling the use of SARS-CoV-2 vaccination to safely relax non-pharmaceutical interventions, Poster, Midas conference, virtual, May 12.

**Kraay A.N.M.,** Brouwer A.F., Eisenberg M.C. (2019). Catastrophic consequences of in utero mother-child transmission: mechanistic modeling of Zika and other viral pathogens, Poster, Epidemics conference, North Charleston, SC, December 4.

**Kraay A.N.M.,** Ionides E.L., Lee G.O., Eisenberg J.N.S. (2017). Impact of Rotarix vaccination in rural, coastal Ecuador, Poster, MIDAS Annual Meeting, Bethesda, April 4.

**Kraay A.N.M.,** Ionides E.L., Lee G.O., Eisenberg J.N.S. (2017). Impact of Rotarix vaccination in rural, coastal Ecuador, Poster, American Society of Tropical Medicine and Hygiene, Atlanta, November 7.

**Kraay A.N.M.,** Lin N., Brouwer A.F., Eisenberg J.N.S. (2016). Dynamic model of rotavirus transmission with impact of temperature, Poster, American Society of Tropical Medicine and Hygiene, Atlanta, November 16.

**Kraay A.N.M.,** Lee G.O., Eisenberg J.N.S. (2016). Prevalence of rotavirus infection over time in rural, coastal Ecuador, Poster, American Society of Tropical Medicine and Hygiene, Atlanta, November 14.

**Kraay A.N.M.,** Brouwer A.F., Trostle J., Cevallos W., Eisenberg J.N.S. (2016). Determinants of short term movement patterns in a developing region and implications for disease transmission, MIDAS Network Meeting, Reston, May 23.

**Kraay A.N.M.,** Trostle J., Cevallos W., Eisenberg J.N.S. (2015). Determinants of short term Movement. Poster presented at American Society of Tropical Medicine and Hygiene Annual Meeting, Philadelphia, October 26.

**Mullis A.**, Eisenberg M.C., Eisenberg J.N.S. (2014). Cholera Transmission in Haiti: Deconstructing a Gravity Model. Poster presented at Water and Health Conference, Chapel Hill, October 15.

**Mullis A.**, Fuller J., Eisenberg J.N.S. (2013). Sanitation and Diarrheal Disease in Rural Coastal Ecuador. Poster presented at University of Michigan Epidemiology Department Poster Session, Ann Arbor, October 25.

**Mullis A.,** Hollins M. (2011). Applying chaos theory: Chronic pain, music, and cognition. Poster presented at the North Carolina Psychological Association Conference, Chapel Hill, April 20.

**Mullis A.,** Hollins, M. (2011). Applying chaos theory: Chronic pain, music, and cognition. Poster presented at the UNC Celebration for Undergraduate Research, Chapel Hill, April 11.

**Peer Reviewer** for *Science, Scientific Reports, Royal Society Interface, Mathematical Biosciences, Environmental Health Perspectives, PLOS One, American Journal of Epidemiology, Emerging Infectious Diseases, Disaster Management and Public Health Preparedness, Vaccine, PLOS Neglected Tropical Diseases, Public Health Reports, American Journal of Tropical Medicine and Hygiene, SAGE Open Medicine, Epidemiologia, Annals of Epidemiology, Microbiology Spectrum*

**SELECTED PRESS COVERAGE (from 12 published news articles):**

Healio, Title: Measures to combat COVID-19 cause sharp decline in norovirus, <https://www.healio.com/news/infectious-disease/20210305/measures-to-combat-covid19-cause-sharp-decline-in-norovirus>

News and Medical Life Sciences, Title: COVID-19 restrictions led to 86 percent drop in norovirus infections in the US, finds study. Link: <https://www.news-medical.net/news/20201201/COVID-19-restrictions-have-led-to-86-percent-drop-in-norovirus-infections-in-US-finds-study.aspx>

Portland Monthly, Title: Barf Break, Winter 2020/2021, page 116

Georgia Public Broadcasting, Title: Emory Expert ‘It’s going to be hard to avoid outbreaks in schools’, link: <https://www.gpb.org/news/2020/08/12/emory-expert-its-going-be-hard-avoid-outbreaks-in-schools>

WebMD, Title: Coronavirus on surfaces: what’s the real risk. Link: <https://www.webmd.com/lung/news/20200903/coronavirus-on-surfaces-whats-the-real-risk>

Association of schools and programs of public health member research and reports, Title: Michigan Study: Rotavirus transmission influenced by temperature, water movement, link: <https://www.aspph.org/michigan-study-rotavirus-transmission-influenced-by-temperature-water-movement/>

**AWARDS AND HONORS:**

Regents Fellow (2014-2018)

Dean’s Research Award (2012-2014)

Dean’s Award (2012-2014)

University of North Carolina at Chapel Hill Distinguished Scholar (2007-2011)

Pfizer Corporate Merit Scholar (2007-2011)

Robert C. Byrd Scholar (2007-2011)

Best undergraduate poster, Celebration for Undergraduate Research (2011)

Phi Beta Kappa Member (2010-Present)

Honors student (2007-2011)

Dean’s List (2007-2011)

Distinguished Service Award (2008)

**MENTORING AND TEACHING:**

**Guest Lecturer,** EPI570. Infectious disease dynamics: theories and models, “Mathematical modeling of environmental reservoir diseases”, Atlanta, GA, March 29, 2021.

**Guest Lecturer,** EH750: Environmental determinants of infectious disease, “Environmental transmission of SARS-CoV-2”, Atlanta, GA, March 3, 2021.

**Master’s thesis advisor** for Peichun Han: “Impact of non-pharmaceutical interventions for SARS-CoV-2 on norovirus outbreaks reported to NoroSTAT: 2012-2020.” (2020-2021)

**Guest Lecturer,** EPID 543: Epidemiology of viral diseases, “Seasonality of rotavirus” Ann Arbor, MI, November 4, 2019.

**Undergraduate Capstone Project Advisor** for Yichen Zhang: “Temperature and all-cause diarrhea in rural Ecuador: evidence for etiologic shift in the post-vaccine era” (2017)

**Department Tutor,** Epidemiologic Methods and Biostatistics, Ann Arbor, MI (January 2017-April 2018).

**Graduate Student Instructor,** EPID 601: Epidemiologic Methods, University of Michigan School of Public Health, Ann Arbor, MI (September-December 2016)

**Master’s Capstone Project Advisor** for Nan Lin: “Dynamic Model of Rotavirus Transmission with Impact of Temperature” (2015-2016).

**Private Tutor,** Epidemiologic Methods, Ann Arbor, MI (2016)

**Instructional Aide,** EPID 601: Epidemiologic Methods, University of Michigan School of Public Health, Ann Arbor, MI (September-December 2015)

**Guest Lecturer**, 5th Grade Science Class, Heritage Elementary, Ann Arbor, MI, October 2015.

**Graduate Student Mentor**, University of Michigan School of Public Health, Ann Arbor, MI (2013)

**Guest Lecturer**, (2013) Global Health Course, University of Michigan School of Nursing, Ann Arbor, November 5.

**Private Mathematics and Spanish tutor**, Tutor Doctor, Chapel Hill, NC (2012)

**Science, English and Music Elementary Teacher,** Escuela Katitawa, Salasaka, Ecuador (2011)

**Assistant English and Swimming Teacher,** Los Nogales, Ambato, Ecuador (2011)

**Private English and US History Tutor**, Chapel Hill, NC (2011)

**ESL Teacher,** Carrboro Human Rights Center (2010)

**ESL Teacher,** WCOM Radio Station (2008)

**Spanish Teacher,** Greenville, NC (2007)

**INSTITUTIONAL SERVICE:**

**Doctoral Committee Representative,** Epidemiology Doctoral Student Organization, University of Michigan (2016-2017)

**Leader,** Epidemiology Women’s Group, University of Michigan (2016-2017)

**Treasurer,** Epidemiology Doctoral Student Organization, University of Michigan (2015-2016)

**COMMUNITY INVOLVEMENT:**

**Founding Member and Partner,** Fundacion Rescate, organization that supports foster children in Sucua, Ecuador (2012-present)

**Big Sister,** Big Brothers Big Sisters of Washtenaw Country, Ann Arbor, MI (2015-2018)

**Translator**, Diabetes Research Study, University of Michigan (2012)

**Cohort Member**, Public Health Action Support Team, University of Michigan (2012-2013)

**Clinic Volunteer,** El Centro de la Nina Trabajadora, Quito, Ecuador (2011)

Village Band Clarinet Player (2008-2011)

**UNC Hospitals Volunteer,** Chapel Hill, NC (2010)

**Volunteer,** El Futuro, non-profit psychology clinic for low income Hispanics (2009-2010)

**Clarinet Teacher,** Carolina Music Outreach (2008)

**Swimming lessons instructor,** Linking Immigrants to New Communities (2007-2008): Taught swimming lessons to Spanish-speaking immigrants

**Community Organizations Chair,** Carolina-Duke Basketball Marathon, Organization that raises money for pediatric cancer research, Fundraising committee, (2007-2008)

**LANGUAGE SKILLS:**

**Spanish**-non-native fluency

**Modern Standard Arabic**-Unofficial oral proficiency score of advanced high, some **Egyptian dialect**

**CERTIFICATIONS:**

CITI, HIPPAA, PEERRS