Erin N Frame (née Hulland), MPH

Education:

09/2018 – Present
University of Washington
Department of Global Health – Metrics and Implementation Science
PhD candidate in Metrics - Anticipated graduation 6/2023
GPA: 3.8 / 4.0
Dissertation working title: *Pandemic Preparedness and COVID-19: lessons learned from global and local response, what we can learn from existing preparedness metrics, and how to respond to novel threats*

08/2012 – 05/2014
Emory University
Rollins School of Public Health
Master of Public Health (MPH) – Biostatistics
GPA: 3.7 / 4.0

08/2007 -05/2012
Pennsylvania State University
Bachelor of Science (BS) – Biology and French, Statistics minor
GPA: 3.6 / 4.0

01/2010-05/2010
IES Institute Paris, France
French Language Studies, Spring Study Abroad

Relevant Work Experience:

09/2018 – present
Local Burden of Disease, Pandemics & COVID-19 Teams
Institute for Health Metrics and Evaluation, Seattle WA
Researcher, Pandemics Team (20 hours / week)   *01/2023 – present*

- Developed report of current state of pandemic preparedness and geospatial mapping for WHO R & D Blueprint Priority Pathogens for use and dissemination with global partners and the WHO as Phase I of a multi-phase project
- Provided technical expertise on a WHO funded grant considering multidimensional risk mapping to guide pandemic preparedness, including development of custom maps of multiplicative risks of spillover and outbreak potential for each of the WHO Blueprint Priority Pathogens, routine meetings with co-investigators, and mentoring of junior staff
- Assisted with the dissemination of niche map results for mpox, henipaviruses, and MERS via technical, deadline management, and publication support

Researcher (40 hours / week)   *09/2020 – 12/2021 & 06/2021-12/2022*
Graduate Research Assistant (20 hours / week)   *01/2021– 06/2021*

- Responsible for weekly production of results from data cleaning through SEIR model estimation and our results briefings used by governors, ministries of health, and other public health governing bodies
    - Used multitude of coding languages and software principles for maintaining a rapid-paced, high quality production pipeline including Python, Linux command line, Git and Github, and R and R Markdown
- Worked as first author on a manuscript analyzing differences in countries' COVID-19 outcomes including pandemic preparedness indicators, response metrics, and governance variables to better understand this pandemic and prepare for the next
- Developed a system for flagging routine data issues in our files and worked with engineering team to create a set of files to help with debugging and identifying reporting errors on a weekly basis

- Developed plots, maps, tables, and text bullets for the results briefings to be automated for rapid dissemination
- Trained junior staff members on data cleaning and quality control processes
- Created quality control products for data extraction analysts to better assess quality and coverage of inputs including testing data, serology data, hospitalizations, cases and deaths
- Provided analytic models and data visualizations of understanding the reasons for vaccine hesitancy among different demographic groups in the United States
- Assisted with the IDM – Gates Ventures training on COVID models by providing context of data and surveillance considerations

Graduate Research Assistant (20 hours / week)   *09/2018 – 06/2020*

- Provided maps and geospatial estimates of travel time to nearest health facility given 5x5 km grid cells at risk for viral hemorrhagic fevers in Africa
- Estimated the largest reduction in raw and person-weighted travel time with the simulated placement of a new facility in a given country
- Estimated the travel time to any location at risk for viral hemorrhagic fevers from any point in a given country
- Assisted with literature reviews, data extraction, geo-positioning, and data cleaning of published data on Rift Valley Fever
- Assisted with new grant development and current grant reporting
- Modeled environmental suitability of Monkeypox virus using environmental and species covariates and extracted published literature using generalized boosted regression modeling
- Estimated spillover event potential from animals to humans for Monkeypox considering environmental suitability and populations living in such locations
- Assisted with early database curation of COVID-19 cases globally with demographic data, published March 2020
- Performed a meta-analysis of published systematic reviews of mask effectiveness for respiratory virus transmission including data extraction, processing, code development, documentation and manuscript preparation

06/2020 – 09/2020   **Global Development Division – Polio Eradication Team**
Bill and Melinda Gates Foundation, Seattle WA
Summer Associate (40 hours / week)   *06/2020 – 09/2020*

- Evaluated additional geospatial covariates to improve a random effects model for circulating type 2 vaccine-derived polioviruses
- Forecasted possible district-level transmission in upcoming months to help with outbreak preparedness and response
- Investigated the use of existing friction travel surface in standard human mobility models (radiation and gravity models) for improving infectious disease exposure modeling
- Developed a manuscript draft on ongoing work
- Attended working group sessions on piloting of the novel type 2 oral poliovirus vaccine (nOPV2)

06/2014 – 07/2018   **Emergency Response and Recovery Branch**
Center for Global Health, US Centers for Disease Control and Prevention, Atlanta GA
Statistician (40 hours / week, GS-1530-11)   *04/2016 – 07/2018*
Junior Biostatistician (40 hours / week, ORISE Fellow)   *06/2014 – 04/2016*

- Provided statistical analyses for the Emergency Response and Recovery Branch, Division of Global Health Protection, and external partners including analysis of survey data, descriptive statistics, survival analysis, linear and logistic regression, principal components analysis, propensity score matching, capture-recapture, non-parametric analyses, meta-analyses and sample size calculations

- Collaborated with branch scientists on and provided sample size calculations and survey designs for various types of international surveys including cross-sectional population surveys, respondent driven sampling, longitudinal surveys, and national-level surveys
- Provided statistical support and mentoring to branch Epidemic Intelligence Service officers, epidemiologists and researchers, CDC Haiti country office and external partners
- Analyzed and disseminated results to key stakeholders regarding clinical outcomes, survival, and sociodemographic disparities among HIV positive patients in Haiti using the national HIV registry
- Developed and conducted multiple trainings in Haiti (in French):
  - Data cleaning and analysis trainings for hospital statisticians / information officers
  - Verbal autopsy survey methods and questionnaire implementation for interviewers
  - EpiSample and Open Data Kit trainings for household selection and data collection for interviewers
  - R programming for beginners for Ministry of Health and CDC Haiti staff
  - Annual training for intermediate-level Field Epidemiology Training Program fellows on study design and sample size calculations
- Assisted with development of grant proposals
- Provided technical assistance to several partner organizations including Ministry of Health in Haiti, the International Organization for Migration, the World Health Organization, among others.

11/2013 - 05/2014	**Surveillance and Health Services Research Team**
	American Cancer Society, Atlanta, GA
	Intern (20 hours / week)

- Performed various data analysis tasks under the supervision of two leading cancer epidemiologists including logistic regression, chi-square analysis, survival curves, and Cox Proportional Hazards models on national cancer registry data using SAS, SEER*Stat, and JoinPoint software

Publications:

2015   **Hulland, E.N**., Brown, J.L., Swartzendruber, A.L., Sales, J.M., Rose, E.S., & DiClemente, R.J. (2015). The association between stress and coping and sexual risk behaviors over 24-months among African-American female adolescents. Psychology, Health, and Medicine, 20(4): 443-456. DOI 10.1080/13548506.2014.951369

2016   Dynes, M., Rosenthal, M., **Hulland, E**., Hardy, C., Torre, L., & Tomczyk, B. (2016). Handheld Solar Light Use, Durability, and Retention among Women and Girls in Internally Displaced Persons Camps in Haiti — 2013-2014. International Journal of Disaster Risk Reduction, 18: 162-170. DOI: 10.1016/j.ijdrr.2016.04.016.

2016   Han, X., Jemal, A., **Hulland E.,** Simard, E.P., Nastoupil, L., Ward, E., & Flowers, C.R. (2016). HIV infection and survival of lymphoma patients in the era of highly active antiretroviral therapy. Cancer Epidemiology, Biomarkers & Prevention. DOI: 10.1158/1055-9965.EPI-16-0595

2016   Ellis, B.H., **Hulland, E.N.,** Miller, A.B., Barrett Brixby, C., Lopes Cardozo, B., & Betancourt, T.S. (2016). Mental Health Risks and Resilience among Somali and Bhutanese Refugee Parents. Migration Policy Institute, October 2016. http://www.migrationpolicy.org/research/mental-health-risks-andresilience-among-somali-and-bhutanese-refugee-parents

2016   **Hulland, E**., Blanton, C., Leidman, E., & Bilukha, O. (2016). Parameters associated with design effect of child anthropometry indicators in small-scale field surveys. Emerging Themes in Epidemiology. 13(1):13. DOI 10.1186/s12982-016-0054-y

2016   Mirkovic, K.R., Lathrop, E.H., **Hulland, E.N**., Jean-Louis, R., Lauture, D., D'Alexis, G., Handzel, E.W., & Grand'Pierre, R. (2016). Quality and uptake of antenatal and postnatal care in Haiti. BMC Pregnancy and Childbirth, 17:52. DOI: 10.1186/s12884-016-1202-7.

2017   **Hulland, E.**, Chowdhury, R., Sarnat, S., Chang, H., & Steenland, K. (2017). Socioeconomic Status and Non-fatal Adult Injuries in Selected Atlanta (Georgia USA) Hospitals. *Prehospital and Disaster Medicine. 32(4):1-11.* DOI: 10.1017/S1049023X17000255.

2017   Boyd, A.T., **Hulland, E.N.**, Grand'Pierre, R., Nesi, F., Honoré, P., Jean-Louis, R., & Handzel, E.W. (2017): Use of Rapid Ascertainment Process for Institutional Deaths (RAPID) to identify pregnancy-related deaths in tertiary-care obstetric hospitals in three departments in Haiti. *BMC Pregnancy and Childbirth, 17:145.* DOI: 10.1186/s12884-017-1329-1

2017   Domercant, J.W., Jean Louis, F., **Hulland, E.N.**, Griswold, M., André-Alboth, J., Ye, T., & Marston, B.J. (2017): Seroprevalence of Herpes Simplex Virus type-2 (HSV-2) among pregnant women who participated in a national HIV surveillance activity in Haiti. *BMC Infectious Diseases, 17:577.* DOI: 10.1186/s12879-017-2674-4

2017   Hynes, M., Meehan, K., Meyers, J., Mashukano Maneno, L. & **Hulland, E.N.** (2017): Using a Quality Improvement approach to improve maternal and neonatal care in North Kivu, Democratic Republic of Congo. *Reproductive Health Matters, 25 (51): 140-151.* DOI: 10.1080/09688080.2017.1403276

2018   Louis, F.J., Buteau, J., François, K., **Hulland, E.N.**, Domerçant, J.W., Yang, C., Boncy, J., Burris, R., Pelletier, V., Wagar, N., Deyde, V., Lowrance, D.W., & Charles, M. (2018): Virologic outcome among patients receiving antiretroviral therapy at five hospitals in Haiti. PLoS ONE, 13 (1). DOI: 10.1371/journal.pone.0192077

2018   Jean Baptiste, A.E., Chevalier, M., Polo, E., Noel, E., **Hulland, E.N.**, & Archer, W.R. (2018): Trends in hepatitis B and hepatitis C seroprevalence among blood donors – Haiti, 2005 – 2014. ISBT Science Series, 13(2): 150-157. DOI: 10.1111/voxs.12427

2018   Etheart, M.D., Pierre, K. Jean-Charles, N.P.D., Destiné, A.M., Andrecy, L.L., Barthelemy, N., Greiner, A., Giese, C., **Hulland, E.N.,** Knipes, A., Adrien, P., Fitter, D., & Lafontant, D. (2018): A multidisciplinary joint-team efforts deployed for a cholera outbreak response post-hurricane Matthew in southern Haiti, October 2016. International Journal of Infectious Diseases, 73: 273. DOI: 10.1016/j.ijid.2018.04.4037

2019   **Hulland, E.N.,** Subaiya, S., Pierre, K., Barthelemy, N., Pierre, J.S., Dismer, A., Juin, S. Fitter, D. & Brunkard, J. (2019). Increase in reported cholera cases in Haiti following Hurricane Matthew: an interrupted time-series model. *American Journal of Tropical Medicine and Hygiene, 100(2): 378.* DOI:10.4269/ajtmh.17-0964.

2019   Martinsen, A., **Hulland, E.N.,** Phillips, R., Darius, J.A., Felker-Kantor, E., Simpson, D., Stephens, M.,Thomas, E., Quick, R., & Handzel, T. (2019). Alternative Water Transport & Storage Containers: Assessing Sustained Use of the PackH2O in Rural Haiti. American Journal of Tropical Medicine and Hygiene, 100(4): 981. DOI: 10.4269/ajtmh.18-0228.

2019   Rajasingam, A., Hardy, C., Kamwaga, S., Sebunya, K., Massa, K., Mulungu, J., Martinsen, A., Nyasani, **E., Hulland,** E., Russel, S., Blanton, C., Nygren, B., Eidex, R., & Handzel, T. (2019) Evaluation of an Emergency Bulk Chlorination Project Targeting Drinking Water Vendors in Cholera-Affected Wards of Dar es Salaam and Morogoro, Tanzania. American Journal of Tropical Medicine and Hygiene, 100(6): 1335. DOI: 10.4269/ajtmh.18-0734.

2019   Louis, F.J., Segaren, N., Desinor, O., Beard, S.R., Jean-Lois, R., Chang, J., Boisson, S., **Hulland, E.,** Wagar, N., DeVos, J., Francois, K., Buteau, J., Boncy, J., Marston, B.J., Domercant, J.W., Yang, C., & Macarthur, C. (2019). High Levels of HIV-1 Drug Resistance in Children Who Acquired HIV Infection Through Mother to Child Transmission in the Era of Option B+, Haiti, 2013 to 2014. The Pediatric Infectious Disease Journal, 38(5): 503. DOI: 10.1097/INF.0000000000002270.

2019   Greene-Cramer B., Boyd A.T., Russell S., **Hulland E.**, Tromble E., Widiati Y., et al. Systematic identification of facility-based stillbirths and neonatal deaths through the piloted use of an adapted RAPID tool in Liberia and Nepal. PLOS ONE, 14(9): e0222583. DOI: 10.1371/journal.pone.0222583.

2019   Doherty S., **Hulland E.**, Lopes-Cardozo B., Kirupakaran S., Surenthirakumaran R., Cookson S., et al. Prevalence of mental disorders and epidemiological associations in post-conflict primary care attendees: a cross-sectional study in the Northern Province of Sri Lanka. *BMC psychiatry. 19(1):83.* DOI: 10.1186/s12888-019-2064-0.

2019   Leidman, E., Couture, A., **Hulland, E.**, & Bilukha, O. (2019). Concordance between estimates of acute malnutrition measured by weight-for-height and by mid-upper arm circumference after age adjustment:

population-representative surveys from humanitarian settings. *BMC Nutrition, 5(1): 39.* DOI: 10.1186/s40795-019-0301-z.

2019   Amsalu R., Morris C.N., Chukwumalu K., Hynes M., Janjua S., Couture A., Summers, A., Cannon, A., **Hulland, E.N**., & Baunach, S. (2019). Essential newborn care practice at four primary health facilities in conflict affected areas of Bossaso, Somalia: a cross-sectional study. Conflict and health, 13(1):27. DOI: 10.1186/s13031-019-0202-4.

2019   **Hulland, E.N.,** Wiens, K.E., Shirude, S. et. al. (2019) Travel time to health facilities in areas of outbreak potential: maps for guiding local preparedness and response. *BMC Med, 5(232).* DOI:10.1186/s12916-019-1459-6.

2020   Xu, B., Gutierrez, B., Mekaru, S., Sewalk, K., Goodwin, L. Loskill, A., Cohn, E.L, Hswen, Y., Hill, S.C., Cobo, M.M., Zarebski, A.E, Li, S., Wu, C.H, **Hulland, E**., Morgan, J.D, Wang, L., O'Brien, K., Scarpino, S.V., Brownstein, J.S., Pybus, O.G, Pigott, D.M, & Kraemer, M.U.G. (2020) Epidemiological data from the COVID-19 outbreak, real-time case information. Scientific Data, 7(106). DOI: 10.1038/s41597-020-0448-0.

2020   O'Son, L., **Hulland, E**., Cookson, S.T., Castro, K.G., Yaacoub, H. (2020) The International Journal of Tuberculosis and Lung Disease, 24 (4): 414-419. DOI: 10.5588/ijtld/19.0523

2020   Xu, B., Gutierrez, B., Mekaru, S., Sewalk, K., Loskill, A., Wang, L., Cohn, E., Hill, S., Zarebski, A., Li,S., Wu, C.H, **Hulland, E.,** Morgan, J., Scarpino, S., Brownstein, J., Pybus, O., Pigott, D., Kraemer, M. (2020) Open access epidemiological data from the COVID-19 outbreak. The Lancet Infectious Diseases, 20(5): 534. DOI: 10.1016/S1473-3099(20)30119-5

2020   Hardcastle AN, Osborne JCP, Ramshaw RE, **Hulland EN**, Morgan JD, Miller-Petrie MK, Hon J, Earl L, Rabinowitz P, Wasserheit JN, Gilbert M, Robinson TP, Wint GRW, Shirude S, Hay SI, Pigott DM. Informing Rift Valley Fever preparedness by mapping seasonally varying environmental suitability. Int J Infect Dis. 2020 Oct;99:362-372. doi: 10.1016/j.ijid.2020.07.043. Epub 2020 Jul 30. PMID: 32738486; PMCID: PMC7562817.

2020   **Hulland, E**. (2020) COVID-19 and health care inaccessibility in sub-Saharan Africa. The Lancet Healthy Longevity, 1(1): Page: e4-e5. DOI: https://doi.org/10.1016/S2666-7568(20)30017-9.

2021   IHME COVID-19 Forecasting Team. Modeling COVID-19 scenarios for the United States. *Nat Med* **27,** 94–105 (2021). https://doi.org/10.1038/s41591-020-1132-9

2021   Greene-Cramer, B. J., **Hulland, E. N**., Russell, S. P., Eriksson, C. B., & Lopes-Cardozo, B. (2021). Patterns of posttraumatic stress symptoms among international humanitarian aid workers. *Traumatology, 27*(2), 177–184. https://doi.org/10.1037/trm0000286

2021   Patrick M, Tsige Y, Adow A, Abdirashid, M. Yunis H, Githiri D, **Hulland E**., et. al. (2021) Acceptability of urine diversion dry toilets in Dollo Ado refugee camp, Ethiopia. International Journal of Hygiene and Environmental Health. 2021 May;234:113745. DOI: 10.1016/j.ijheh.2021.113745. PMID: 33799074.

2021   Lasry, A., Danho, N.K., **Hulland, E.N**. *et al.* Outcome of HIV Testing Among Family Members of Index Cases Across 36 Facilities in Abidjan, Côte d'Ivoire. *AIDS Behav* **25,** 554–561 (2021). https://doi.org/10.1007/s10461-020-03002-0

2021   **Hulland EN**, Leidman E, Wilkinson C, Tondeur M, Bilukha O (2021) Anemia design effects in cluster surveys of women and young children in refugee settings. PLOS ONE 16(7): e0254031. https://doi.org/10.1371/journal.pone.0254031

2021   COVID-19 Mental Disorders Collaborators. Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. The Lancet, Volume 398(10312): 1700-1712. https://doi.org/10.1016/S0140-6736(21)02143-7.

2022   Bollyky, Thomas J. and **Hulland, Erin N**. (co-first authors). Pandemic preparedness and COVID-19: an exploratory analysis of infection and fatality rates, and contextual factors associated with preparedness in 177 countries, from Jan 1, 2020, to Sept 30, 2021. The Lancet, 399 (10334): 148-1512. https://doi.org/10.1016/S0140-6736(22)00172-6

2022   COVID-19 Excess Mortality Collaborators. Estimating excess mortality due to the COVID-19 pandemic: a systematic analysis of COVID-19-related mortality, 2020–21. The Lancet, 399 (10334): 1513-1536. https://doi.org/10.1016/S0140-6736(21)02796-3

2022   COVID-19 Cumulative Infection Collaborators. Estimating global, regional, and national daily and cumulative infections with SARS-CoV-2 through Nov 14, 2021: a statistical analysis. The Lancet, 399 (10334): 2351-2380. https://doi.org/10.1016/S0140-6736(22)00484-6

2022   COVID-19 Forecasting Team. Variation in the COVID-19 infection-fatality ratio by age, time, and geography during the pre-vaccine era: A systematic analysis. The Lancet, 399 (10334): 1469-1488. https://doi.org/10.1016/S0140-6736(21)02867-1.

2022   Global Burden of Disease Long COVID Collaborators. Estimated Global Proportions of Individuals With Persistent Fatigue, Cognitive, and Respiratory Symptom Clusters Following Symptomatic COVID-19 in 2020 and 2021. *JAMA.* 2022;328(16):1604–1615. doi:10.1001/jama.2022.18931

Posters and Presentations:

2014   **Hulland, E**. The Association between stress, coping, and sexual risk behaviors over 24 months among African-American female adolescents. *Society of Behavioral Medicine 35th Annual Meeting.* Philadelphia, PA. April 26, 2014.

2016   **Hulland, E.** Parameters associated with design effect of child anthropometry indicators in small-scale field surveys. *2nd International Conference on Survey Methods in Multinational, Multiregional, and Multicultural Contexts*. Chicago, IL. July 28th, 2016.

2019   **Hulland, E.** Travel time to health facilities in areas of viral hemorrhagic fever outbreak potential: maps for guiding preparedness and response. *University of Washington Department of Global Health SLEIGH symposium.* Seattle, WA. May 30, 2019.

2019   **Hulland, E.N.** Precision Public Health and Pandemic Preparedness: Quantifying travel time to health care from locations at risk for pathogen transmission. *American Society for Tropical Medicine and Hygiene Annual Meeting.* National Harbor, MD. November 21, 2019.

2021   **Hulland, E.N.** Pandemic preparedness and COVID-19: an exploratory analysis of infection and fatality rates, and contextual factors associated with preparedness in 177 countries, from Jan 1, 2020, to Sept 30, 2021. IHME Independent Advisory Committee Autumn Meeting. November 17, 2021.

2021   **Hulland, E.N.** Pandemic preparedness and COVID-19: an exploratory analysis of infection and fatality rates, and contextual factors associated with preparedness in 177 countries, from Jan 1, 2020, to Sept 30, 2021. Routine meeting with Bill Gates and Gates Foundation, IHME, and Gates Ventures senior leadership. December 13, 2021.

Professional organizations:

2014 – 2015   Society of Behavioral Medicine (Member)
2015 – 2017   American Statistical Association (Member)
2018 – present American Society for Tropical Medicine and Hygiene (Member)

Skills:

Languages:
- English (Native Tongue)
- French (Advanced)
- Spanish (Low Intermediate)

Software:
- R software (Advanced)
- Microsoft Excel, Word, Office, PowerPoint (Advanced)
- SAS statistical software and SAS-callable SUDAAN (Advanced)
- SEER*Stat (Advanced)
- EpiSample (Advanced)
- ArcGIS (Intermediate)
- Open Data Kit (Intermediate)
- Python (Low Intermediate)
- Stata (Basic)
- EpiInfo (Basic)

Erin N Frame (née Hulland), MPH

- SPSS (Basic)
- SQL (Basic)