# LUCAS RICHARD FATH HENNEMAN

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## *Education*

**Ph.D., Environmental Engineering, Georgia Institute of Technology**  2017
   Thesis title: *Air Pollution Accountability: Assessing Regulatory Impacts on Emissions and Air Quality*.
   Advisor: Dr. Armistead G. Russell
**M.S., Environmental Engineering, Georgia Institute of Technology**  2014
**B.S., Environmental Engineering, Johns Hopkins University** with general honors  2012

## *Professional Experience*

**Postdoctoral Fellow, Environmental Health, Harvard Chan School of Public Health**  2019 – present
**Postdoctoral Fellow, Biostatistics, Harvard Chan School of Public Health**  2017 – 2019

## *Research Interests*

- Regulatory accountability
- Health effects of air quality interventions
- Environmental policy
- Air pollution modeling using statistical and numerical methods
- Big data applications—assessing environmental change over large spatio-temporal scales

## *Academic and Professional Honors*

- Georgia Tech School of Civil and Environmental Engineering Best PhD Thesis Award (2017)
- National Science Foundation Graduate Research Fellowship (2012-2017)
- Georgia Tech Association of Environmental Engineers and Scientists Outstanding PhD Student Award (2017)
- Georgia Tech President's Fellowship (2012-2016)
- Air and Waste Management Association Scholarship (2016)
- International Institute for Applied Systems Analysis (IIASA) Southern African Young Scientists Summer Program (2014-2015)
- Air and Waste Management Georgia Chapter Scholarship (2014)
- Air and Waste Management Association Southern Section Scholarship (2014)
- Johns Hopkins University Department of Geography and Environmental Engineering Faculty Award for Service and Academic Achievement (2012)
- Trans-Atlantic Program for Young Technology Leaders Delegate to Germany for the German-American Chamber of Commerce (2011)
- Thomas J. Watson Memorial Scholarship (2008-2012)

## *Manuscripts in Review*

1. **Henneman, L.R.F.**, Dedoussi, I.C., Casey, J.A., Barett, R.H., Choirat, C., and Zigler, C.M. "Comparisons of simple and complex methods for quantifying exposure to point source air pollution emissions." *In review.*
2. Casey, J.A., Su, J.G., Barrett, M.A., **Henneman, L.R.F.**, Zigler, C.M., *et al.* "A multi-level analysis of the impact of changes in coal-fired power plant emissions on asthma-related healthcare utilization and symptoms in Louisville, Kentucky." *In review.*
3. Kim, C., **Henneman, L.R.F.**, Choirat, C., and Zigler, C.M. "Health Effects of Power Plant Emissions through Ambient Air Quality." *In review*.
4. Cummiskey, K., Kim, C., Choirat, C., **Henneman, L.R.F.**, Schwartz, J., and Zigler, C.M. "A Source-Oriented Approach to Coal Power Plant Health Effects." https://arxiv.org/abs/1902.09703. *In review.*
5. Liao, S., **Henneman, L.R.F.**, and Zigler, C.M. "Posterior predictive treatment assignment methods for causal inference in the context of time-varying treatments." https://arxiv.org/pdf/1907.06567. *In review.*

## *Journal Publications*

1. **Henneman, L.R.F.**, Mickley, L.J., and Zigler, C.M. (2019) "Air pollution accountability of energy transitions: the relative importance of wind fields and emissions in exposure changes." *Environmental Research Letters.* https://iopscience.iop.org/article/10.1088/1748-9326/ab4861
2. **Henneman, L.R.F.**, Choirat, C., and Zigler, C.M. (2019). "Accountability Assessment of Health Improvements in the United States Associated with Reduced Coal Emissions Between 2005 and 2012." *Epidemiology.* https://journals.lww.com/epidem/Fulltext/2019/07000/Accountability_Assessment_of_Health_Improvements.3.aspx
3. Shen, H., Chen, Y., Li, Y., Russell, A., Hu, Y., **Henneman, L.R.F.**, *et al.* (2019). "Relaxing energy policies on top of climate change will significantly undermine states' efforts to attain U.S. ozone standards." *One Earth.* https://www.cell.com/one-earth/fulltext/S2590-3322(19)30073-9
4. Yu, X., Stuart, A., Liu, Y., Ivey, C., Russell, A., Kan, H., **Henneman, L.R.F.**, Sarnat, S., Hasan, S., Sadmani, A., Yang, X., Yu, H. (2019), "On the potential of Google Maps location history data to characterize historical individual mobility for retrospective air pollution health studies." *Environmental Pollution.* https://www.sciencedirect.com/science/article/pii/S0269749118359049
5. **Henneman, L.R.F.**, Liu, C., Chang, H., Mulholland, J., Tolbert, P., Russell, A. (2019) "Emissions reductions and air quality responses in Atlanta, Georgia in response to regulations: developing daily time series of changes in ten pollutants and uncertainties." *Environment International*. https://www.sciencedirect.com/science/article/pii/S0160412018323110
6. Qian, Y., **Henneman, L.R.F.**, Mulholland, J.A., Russell, A.G. (2019). "Empirical Development of Ozone Isopleths: Applications to Los Angeles." *Environmental Science and Technology Letters.* https://pubs.acs.org/doi/10.1021/acs.estlett.9b00160
7. Abrams, J., Klein, M., **Henneman, L.R.F.**, Sarnat, S., Chang, H., Strickland, M., Mulholland, J.A., Russell, A.G., Tolbert, P. (2019). "Impact of air pollution control policies on cardiorespiratory emergency department visits, Atlanta, GA, 1999-2013." *Environment International.* https://www.sciencedirect.com/science/article/pii/S0160412018328046
8. **Henneman, L.R.F.**, Ivey, C., Choirat, C., Cummiskey, K., and Zigler, C.M. (2019). "Characterizing population exposure to coal emissions sources in the United States using the HyADS model." *Atmospheric Environment*. https://www.sciencedirect.com/science/article/pii/S1352231019300731
9. Lawal, A.S., Guan, X., Liu, C., **Henneman, L.R.F.**, Bhogineni, V., Weber, R.J., Nenes, A., and Russell, A. (2018). "Linked Response of aerosol acidity and Ammonia to $SO_2$ and $NO_x$ Emissions

Reductions in the US." *Environmental Science and Technology*.
https://pubs.acs.org/doi/abs/10.1021/acs.est.8b00711?af=R&

10. Shen, H., Chen, Y., Chen, Y., Fan, R., Li, Y., Zeng, E., Huang, Y., Yu, H., Shen, G., Shen, H., Zhong, Q., Russell, A., **Henneman, L.R.F.**, Ru, M., Zou, Y., Hu, Y. (2018). "Impacts of rural worker migration on air quality and health in China: From the perspective of upgrading residential energy consumption." *Environment International*.
https://www.sciencedirect.com/science/article/pii/S0160412017315945

11. **Henneman, L.R.F.**, Liu, C., Shen, H., Hu, Y., Mulholland, J., Russell, A. (2017). "Responses in ozone and its production efficiency attributable to recent and future emissions changes in the eastern United States." *Environmental Science and Technology*.
http://pubs.acs.org/doi/10.1021/acs.est.7b04109

12. **Henneman, L.R.F.**, Liu, C., Hu, Y., Mulholland, J., Russell, A. (2017). "Air quality modeling for accountability research: Operational, dynamic, and diagnostic evaluation." *Atmospheric Environment*.
https://doi.org/10.1016/j.atmosenv.2017.07.049

13. **Henneman, L.R.F.**, Chang, H., Lavoué, D., Mulholland, J., Russell, A. (2017). "Assessing regulatory impacts on ozone and PM$_{2.5}$ using empirically- and air quality model-derived pollutant sensitivities." *Air Quality, Atmosphere, and Health.*
https://link.springer.com/article/10.1007%2Fs11869-017-0463-2

14. **Henneman, L.R.F.**, Liu, C., Mulholland, J., Russell, A. (2016). "Evaluating the effectiveness of air quality regulations: A review of accountability studies and frameworks." *Journal of the Air and Waste Management Association*.
http://www.tandfonline.com/doi/abs/10.1080/10962247.2016.1242518

15. **Henneman, L.R.F.**, Rafaj, P., Annegarn, H., Klausbruckner, C. (2015). "Assessing emissions levels and costs associated with climate and air pollution policies in South Africa." *Energy Policy*.
http://www.sciencedirect.com/science/article/pii/S0301421515302044

16. Klausbruckner, C., Annegarn, H., **Henneman, L.R.F.**, and Rafaj, P. (2015). "A policy review of synergies and trade-offs in South African climate change mitigation and air pollution control strategies." *Environmental Science and Policy*.
http://www.sciencedirect.com/science/article/pii/S1462901115301180

17. **Henneman, L.R.F.**, Holmes, H., Mulholland, J., Russell, A. (2015). "Meteorological Detrending of Primary and Secondary Pollutant Concentrations: Methods Application and Evaluation Using Long-Term (2000-2012) Detailed Data." *Atmospheric Environment*.
http://www.sciencedirect.com/science/article/pii/S1352231015302521

18. Francis, R., Guikema, S., **Henneman, L.R.F.** (2014). "Bayesian Belief Networks for Predicting Drinking Water Distribution System Pipe Breaks." *Reliability Engineering & System Safety*, *130*, 1–11. http://www.sciencedirect.com/science/article/pii/S0951832014000921

## *Reports*

1. Russell, A.G., Tolbert, P., **Henneman, L.R.F.**, Abrams, J., Liu, C., Klein, M., Mulholland, J.A., Sarnat, S., Hu, Y., Chang, H., Odman, T., Strickland, M., Shen, H., Lawal, A. "Impacts of regulations on air quality and emergency department visits in the Atlanta metropolitan area, 1999-2013." *The Health Effects Institute*. https://www.healtheffects.org/publication/impacts-regulations-air-quality-and-emergency-department-visits-atlanta-metropolitan

## *Book Chapters*

1. **Henneman, L.R.F.**, Shen H., Liu, C., Hu, Y., Mulholland, J.A., Russell, A.G. "Ozone in the eastern United States: production efficiency variability over time and between sources." Air Pollution Modeling and its Application XXVI.
https://www.springer.com/gp/book/9783030220549#aboutAuthors
2. Klausbruckner, C., **Henneman, L.R.F.**, Rafaj, P., Annegarn, H. "Energy policy, regional air quality, and climate mitigation in South Africa: the case for Integrated Assessment." (2018). Applying Systems Analysis to Complex Global Problems. https://link.springer.com/chapter/10.1007%2F978-3-319-71486-8_7
3. **Henneman, L.R.F.**, Liu, C., Chang, H., Lavoué, D., Mulholland, J.A., Russell, A.G. 2016. "Estimating the Impact of Air Pollution Controls on Ambient Concentrations." Air Pollution Modeling and its Application XXIV. http://www.springer.com/us/book/9783319244761

## *Invited Presentations*

1. "Direct estimates of health improvements from reduced emissions at coal power plants." University of Texas at Austin Environmental Health Interest Group Meeting. Austin, TX. 23 January, 2019.
2. "Direct estimates of health improvements from reduced emissions at coal-fired power plants." EPA Air, Climate, and Energies Centers Work-in-Progress Webinar. 20 September, 2018.
3. "Accountability assessment: The 1990 Clean Air Act Amendments." CRC Mobile Source Air Toxics Meeting. 14-15 February, 2017. Sacramento, CA.

## *Conference Presentations*

1. **Henneman, L.R.F.**, Ivey, C., Choirat, C., Cummiskey, K., and Zigler, C.M. "Direct estimates of health improvements from reduced coal power plant emissions exposure." Community Modeling and Analysis System Conference. 22-24 October, 2018. Chapel Hill, NC. Oral Presentation.
2. **Henneman, L.R.F.**, Shen H., Liu, C., Hu, Y., Mulholland, J.A., Russell, A.G. "Ozone in the eastern United States: production efficiency variability over time and between sources." 36th International Technical Meeting on Air Pollution Modelling and its Application. 14-18 May, 2018. Ottawa, Ontario, Canada. Oral Presentation.
3. **Henneman, L.R.F.**, Liu, C., Hu, Y., Mulholland, J., Russell, A. "Impacts of emission changes on air quality and acute health effects in the Southeast, 1993-2012." Air & Waste Management Annual Conference and Exhibition. 20-23 June, 2016. New Orleans, LA. Oral Presentation.
4. **Henneman, L.R.F.**, Liu, C., Hu, Y., Mulholland, J., Russell, A. "Dynamic analysis: assessing CMAQ's ability to capture air quality trends over a time period of changing emissions." Community Modeling and Analysis System Conference. 24-26 October, 2016. Chapel Hill, NC. Oral Presentation.
5. **Henneman, L.R.F.**, Lavoue, D., Liu, C., Ivey, C., Hu, Y., Mulholland, J., Russell, A. "A Comparison of Air Pollution Sensitivities to Emissions Estimated Using First-Principles and Statistical Models." Community Modeling and Analysis System Conference. 5-7 October, 2015. Chapel Hill, NC. Poster.
6. **Henneman, L.R.F.**, Lavoue, D., Liu, C., Ivey, C., Hu, Y., Mulholland, J., Russell, A. "A Comparison of Air Pollution Sensitivities to Emissions Estimated Using First-Principles and Statistical Models." Community Modeling and Analysis System Conference. 5-7 October, 2015. Chapel Hill, NC. Poster.
7. **Henneman, L.R.F.** "Estimating Impacts of Air Pollution Controls on Ambient Concentrations." Air & Waste Management Southern Section Conference. 19-21 August, 2015. Callaway Gardens, GA. Oral Presentation.

8. **Henneman, L.R.F.**, Liu, C., Lavoué, D., Chang, H., Mulholland, J., Russell, A. "Estimating the Impact of Air Pollution Controls on Ambient Concentrations." 34th International Technical Meeting on Air Pollution Modelling and its Application. Montpellier, France. 4-8 May, 2015. Oral Presentation.
9. **Henneman, L.R.F.**, Lavoue, D., Homes, H., Mulholland, J., Russell, A. "Estimating Empirical Sensitivities of Air Pollutants to Emissions using Statistical Modeling." Community Modeling and Analysis System Conference. 27-29 October, 2014. Chapel Hill, NC. Oral presentation.
10. **Henneman, L.R.F.**, Lavoue, D., Homes, H., Mulholland, J., Russell, A. "Estimating the Impacts of Air Pollution Controls on Ambient Concentrations." Annual Conference of the American Association for Aerosol Research. 20-24 October, 2014. Orlando, FL. Oral Presentation.

## *Professional Service*

- Vice President of External Affairs and Treasurer, Harvard School of Public Health Post-Doctoral Association (2017-present)
- Various roles, Georgia Tech Association of Environmental Engineers and Scientists student group (2012-2017; Co-President 2015-2017)
- Treasurer, Georgia Tech Chapter of the Air and Waste Management Association (2014-2016)
- Journal Referee: *Atmospheric Chemistry and Physics; Air Quality, Atmosphere, and Health; Arabian Journal of Geosciences; Atmospheric Environment; Energy Policy; Environment International; Environmental Policy; Environmental Science and Technology; Open Forum Infectious Disease; Journal of the Air and Waste Management Association; Journal of Environmental Policy; Journal of Exposure Science and Environmental Epidemiology; Science of the Total Environment*

## *Community*

- Data science volunteer, Green Streets Initiative (2018)
- Assistant Coach, Chamblee High School Baseball, Chamblee, GA (2014-2017)
- Varsity Baseball, Johns Hopkins University (2008-2012)