Alexander P Keil

2102-A McGavran-Greenberg Hall CB 7435
Chapel Hill, NC
27599-7435
akeil@unc.edu
(919) 966-8838

Curriculum Vitae, November 2020

I am a researcher focused on quantifying risks over the life-course from occupational and environmental exposures. I seek to advance our collective understanding of their public health impacts using a policy-oriented, causal inference framework.

Education

2014	Ph.D., Epidemiology	University of North Carolina at Chapel Hill
2010	M.S.P.H., Epidemiology	University of North Carolina at Chapel Hill
2003	B.S.(Hons), Biology	Santa Clara University

Professional experience

2016-Present **Research Assistant Professor,**
Department of Epidemiology
University of North Carolina at Chapel Hill

2014-2016 **Postdoctoral Fellow**
Department of Epidemiology
University of North Carolina at Chapel Hill

Honors

2019	Rising Star award, UNC Center for Environmental Health and Susceptibility
2018	Paper of the year - American Journal of Epidemiology
2014-2016	National Institute of Environmental Health Sciences Training Grant - Environmental Epidemiology
2014	EPICOH (Scientific Committee on Epidemiology in Occupational Health) conference Young Investigator Award
2013	Marilyn & Al Tyroler Scholarship in Epidemiology
2012	Sidney Kark Award for Distinguished Teaching Assistant - The University of North Carolina at Chapel Hill Gillings School of Global Public Health, Department of Epidemiology
2010-2014	National Institute of Environmental Health Sciences Training Grant - Occupational Epidemiology
2008-2010	National Institute of Environmental Health Sciences Training Grant - Environmental Epidemiology

Memberships

2017-Present	American Association for the Advancement of Science
2014-Present	American Statistical Association
2008-Present	Society of Epidemiologic Research
2008-Present	International Society of Environmental Epidemiology

Publications and presentations

Peer-reviewed or pre-print research papers and commentaries

1. Bayissasse, B., K. M. Sullivan, S. L. Merbs, B. Munoz, A. **Keil**, A. Sisay, A. Singer, and E. W. Gower (2020). Maximising Trichiasis Surgery Success (MTSS) Trial: Rationale and Design of a Randomised Controlled Trial to Improve Trachomatous Trichiasis Surgical Outcomes. *BMJ Open* **10**(3), e036327.

2. Gellert, K., **A. P. Keil**, D. Zeng, C. Lesko, R. Aubert, C. Avery, P. B. Lutsey, G. Windham, A. M. Siega-Riz, and G. Heiss (2020). Reducing the Population Burden of Coronary Heart Disease by Modifying Adiposity: Estimates from the Atherosclerosis Risk In Communities (ARIC) Study. *J Am Heart Assoc* **9**(4), e012214.

3. **Keil**, **A. P.**, J. P. Buckley, K. M. O'Brien, K. K. Ferguson, S. Zhao, and A. J. White (2020). A Quantile-Based g-Computation Approach to Addressing the Effects of Exposure Mixtures. *Environ. Health Perspect.* **128**(4), 047004.

4. **Keil**, **A. P.**, J. P. Buckley, and A. K. Kalkbrenner (2020). Bayesian G-Computation to Estimate Impacts of Interventions on Exposure Mixtures: Demonstration with Metals from Coal-Fired Power Plants and Birthweight. *Am J Epidemiol* **In press**.

5. Lawrence, K. G., **A. P. Keil**, S. Garantziotis, D. M. Umbach, P. A. Stewart, M. R. Stenzel, J. A. McGrath, W. B. Jackson, R. K. Kwok, M. D. Curry, et al. (2020). Lung Function in Oil Spill Responders 4-6 Years after the Deepwater Horizon Disaster. *J. Toxicol. Environ. Health A* **83**(6), 233–248.

6. Lesko, C. R., **A. P. Keil**, and J. K. Edwards (2020). The Epidemiologic Toolbox: Identifying, Honing, and Using the Right Tools for the Job. eng. *Am. J. Epidemiol.* **189**(6), 511–517.

7. Niehoff, N. M., **A. P. Keil**, R. R. Jones, S. Fan, G. L. Gierach, and A. J. White (2020). Outdoor Air Pollution and Terminal Duct Lobular Involution of the Normal Breast. *Breast Cancer Research* **22**(1), 100.

8. O'Brien, K. M. and **A. P. Keil** (2020). Design and Interpretation Considerations in Registry-Based Studies. *JAMA Psychiatry* **77**(1), 15–16.

9. Peery, A. F., A. **Keil**, K. Jicha, J. A. Galanko, and R. S. Sandler (2020). Association of Obesity with Colonic Diverticulosis in Women. *Clin Gastroenterol Hepatol* **18**(1), 107–114. e1.

10. Richardson, D., A. **Keil**, S. Cole, A. Kinlaw, et al. (2020). Assessing Exposure-Response Trends Using the Disease Risk Score. *Epidemiology* **2**, e15–e16.

11. Richardson, D. B., **A. P. Keil**, S. R. Cole, and J. K. Edwards (2020). Reducing Bias Due to Exposure Measurement Error Using Disease Risk Scores. *Am. J. Epidemiol.* **In press**.

12. Richardson, D. B., K. Abalo, M.-O. Bernier, E. Rage, K. Leuraud, D. Laurier, **A. P. Keil**, and M. P. Little (2020). Meta-Analysis of Published Excess Relative Risk Estimates. en. *Radiat Environ Biophys*.

13. Richardson, D. B., S. R. Cole, R. K. Ross, C. Poole, H. Chu, and **A. P. Keil** (2020). Meta-Analysis and Sparse Data Bias. *Am. J. Epidemiol.*

14. Stürmer, T., T. Wang, Y. M. Golightly, A. **Keil**, J. L. Lund, and M. Jonsson Funk (2020). Methodological Considerations When Analysing and Interpreting Real-World Data. *Rheumatology* **59**(1), 14–25.

15. Welch, B. M., **A. P. Keil**, T. J. van 't Erve, L. J. Deterding, J. G. Williams, F. B. Lih, D. E. Cantonwine, T. F. McElrath, and K. K. Ferguson (2020). Longitudinal Profiles of Plasma Eicosanoids during Pregnancy and Size for Gestational Age at Delivery: A Nested Case-Control Study. *PLoS Med.* **17**(8), e1003271.

16. White, A. J., K. M. O'Brien, N. M. Niehoff, B. P. Jackson, M. R. Karagas, C. R. Weinberg, and **A. P. Keil** (2020). Toenail Metal Concentrations and Age at Menopause. *Environ Epidemiol* **4**(4).

17. DeBono, N., K. Kelly-Reif, D. Richardson, **A. P. Keil**, W. Robinson, M. Troester, and S. Marshall (2019). Mortality among Autoworkers Manufacturing Electronics in Huntsville, Alabama. *Am. J. Ind. Med.* **62**(4), 282–295.

18. DeBono, N., D. Richardson, A. **Keil**, K. Kelly-Reif, W. Robinson, M. Troester, and S. Marshall (2019). Employment Characteristics and Cause-Specific Mortality at Automotive Electronics Manufacturing Plants in Huntsville, Alabama. *American Journal of Industrial Medicine* **62**(4), 296–308.

19. Doherty, B. T., K. Hoffman, **A. P. Keil**, S. M. Engel, H. M. Stapleton, B. D. Goldman, A. F. Olshan, and J. L. Daniels (2019a). Prenatal Exposure to Organophosphate Esters and Behavioral Development in Young Children in the Pregnancy, Infection, and Nutrition Study. *Neurotoxicology* **73**, 150–160.

20. Doherty, B. T., K. Hoffman, **A. P. Keil**, S. M. Engel, H. M. Stapleton, B. D. Goldman, A. F. Olshan, and J. L. Daniels (2019b). Prenatal Exposure to Organophosphate Esters and Cognitive Development in Young Children in the Pregnancy, Infection, and Nutrition Study. *Environ. Res.* **169**, 33–40.

21. Kim, S. S., J. D. Meeker, **A. P. Keil**, M. T. Aung, P. A. Bommarito, D. E. Cantonwine, T. F. McElrath, and K. K. Ferguson (2019). Exposure to 17 Trace Metals in Pregnancy and Associations with Urinary Oxidative Stress Biomarkers. *Environ. Res.* **179**, 108854.

22. Lesko, C. R., **A. P. Keil**, A. T. Fojo, G. Chander, B. Lau, and R. D. Moore (2019). Recent Substance Use and Probability of Unsuppressed HIV Viral Load among Persons on Antiretroviral Therapy in Continuity Care. *Am. J. Epidemiol.* **188**(10), 1830–1837.

23. Mooney, S. J., **A. P. Keil**, and D. J. Westreich (2019). Ten Questions about Using Machine Learning to Estimate Causal Effects (You Won't Believe the Answer to Number Nine!) *Epidemiology* **Under review**.

24. Niehoff, N. M., M. D. Gammon, **A. P. Keil**, H. B. Nichols, L. S. Engel, D. P. Sandler, and A. J. White (2019). Airborne Mammary Carcinogens and Breast Cancer Risk in the Sister Study. *Environ. Int.* **130**, 104897.

25. Niehoff, N. M., M. D. Gammon, **A. P. Keil**, H. B. Nichols, L. S. Engel, J. A. Taylor, A. J. White, and D. P. Sandler (2019). Hazardous Air Pollutants and Telomere Length in the Sister Study. *Environ. Epidemiol.* **3**(4), e053.

26. Richardson, D. B., **A. P. Keil**, A. C. Kinlaw, and S. R. Cole (2019). Marginal Structural Models for Risk or Prevalence Ratios for a Point Exposure Using a Disease Risk Score. English. *Am J Epidemiol* **188**(5), 960–966.

27. Rittenhouse, K. J., B. Vwalika, **A. P. Keil**, J. Winston, M. Stoner, J. T. Price, M. Kapasa, M. Mubambe, V. Banda, W. Muunga, et al. (2019). Improving Preterm Newborn Identification in Low-Resource Settings with Machine Learning. *PloS One* **14**(2), e0198919.

28. Shrestha, S., C. G. Parks, **A. P. Keil**, D. M. Umbach, C. C. Lerro, C. F. Lynch, H. Chen, A. Blair, S. Koutros, J. N. Hofmann, L. E. B. Freeman, and D. P. Sandler (2019). Overall and Cause-Specific Mortality in a Cohort of Farmers and Their Spouses. *Occup. Environ. Med.* **76**(9), 632–643.

29. Strelitz, J., **A. P. Keil**, D. B. Richardson, G. Heiss, M. D. Gammon, R. K. Kwok, D. P. Sandler, and L. S. Engel (2019). Self-Reported Myocardial Infarction and Fatal Coronary Heart Disease among Oil Spill Workers and Community Members 5 Years after Deepwater Horizon. *Environ. Res.* **168**, 70–79.

30. Strelitz, J., D. P. Sandler, **A. P. Keil**, D. B. Richardson, G. Heiss, M. D. Gammon, R. K. Kwok, P. A. Stewart, M. R. Stenzel, and L. S. Engel (2019). Exposure to Total Hydrocarbons during Clean-up of the Deepwater Horizon Oil Spill and Risk of Heart Attack across Five Years of Follow-Up. *Am. J. Epidemiol.* **188**(5), 917–927.

31. Gam, K. B, R. K. Kwok, L. S. Engel, A. Curry Matthew D, M. R. Stenzel, J. A. McGrath, P. Stewart, W. B. Jackson, R. L. Jensen, **A. P. Keil**, M. Y. Lichtveld, A. K. Miller, and D. P. Sandler (2018). Lung Function in Oil Spill Response Workers 1-3 Years after the Deepwater Horizon Disaster. *Epidemiology* **29**(3), 315–322.

32. **Keil**, **A. P.** (2018b). Super Learning in the SAS System. *ArXiv Prepr. ArXiv180508058*.

33. **Keil**, **A. P.** and J. K. Edwards (2018b). A Review of Time Scale Fundamentals in the G-Formula and Insidious Selection Bias. *Curr Epidemiol Rep* **5**(3), 205–213.

34. **Keil**, **A. P.**, S. J. Mooney, M. Jonsson Funk, S. R. Cole, J. K. Edwards, and D. J. Westreich (2018). Resolving an Apparent Paradox in Doubly-Robust Estimators. *Am J Epidemiol* **187**(4), 891–892.

35. **Keil**, **A. P.**, D. B. Richardson, D. Westreich, and K. Steenland (2018a). Estimating the Impact of Changes to Occupational Standards for Silica Exposure on Lung Cancer Mortality. English. *Epidemiology* **29**(5), 658–665.

36. Lesko, C. R., **A. P. Keil**, R. D. Moore, G. Chander, A. T. Fojo, and B. Lau (2018). Measurement of Current Substance Use in a Cohort of HIV-Infected Persons in Continuity HIV Care, 2007-2015. English. *Am J Epidemiol* **187**(9), 1970–1979.

37. Richardson, D. B., **A. P. Keil**, S. R. Cole, and J. M. Dement (2018). Asbestos Standards: Impact of Currently Uncounted Chrysotile Asbestos Fibers on Lifetime Lung Cancer Risk. *Am J Ind Med* **61**, 383–390.

38. Richardson, D. B. and **A. P. Keil** (2018). Challenges to Studying Population Effects of Medical Treatments. *Eur J Epidemiol* **33**(4), 365–368.

39. Buckley, J. P., B. T. Doherty, **A. P. Keil**, and S. M. Engel (2017). Statistical Approaches for Estimating Sex-Specific Effects in Endocrine Disruptors Research. *Environmental Health Perspectives* **125**(6), 067013.

40. Edwards, J. K. and **A. P. Keil** (2017). Measurement Error and Environmental Epidemiology: A Policy Perspective. *Curr. Environ. Health Rep.* **4**(1), 79–88.

41. Edwards, J. K., C. R. Lesko, and **A. P. Keil** (2017). Invited Commentary: Causal Inference across Space and Time – Quixotic Quest, Worthy Goal, or Both? *Am J Epidemiol* **186**(2), 143–145.

42. **Keil**, **A. P.** and D. B. Richardson (2017a). Reassessing the Link between Airborne Arsenic Exposure among Anaconda Copper Smelter Workers and Multiple Causes of Death Using the Parametric G-Formula. *Environmental Health Perspectives* **125**(4), 608–614.

43. **Keil**, **A. P.** and D. B. Richardson (2017b). Quantifying Risks from Radiation. *Risk Anal* **In press**.

44. **Keil**, A. P., E. J. Daza, S. M. Engel, J. P. Buckley, and J. K. Edwards (2017). A Bayesian Approach to the G-Formula. *Stat Methods Med Res*, 0962280217694665.

45. Kinlaw, A. C., J. P. Buckley, S. M. Engel, C. Poole, M. A. Brookhart, and **A. P. Keil** (2017). Left Truncation Bias to Explain the Protective Effect of Smoking on Preeclampsia: Potential, but How Plausible? *Epidemiology* **28**(3), 428–434.

46. Richardson, D. B., **A. P. Keil**, S. R. Cole, and R. F. MacLehose (2017). Observed and Expected Mortality in Cohort Studies. *American Journal of Epidemiology* **185**(6), 479–486.

47. Richardson, D. B., **A. P. Keil**, E. J. Tchetgen Tchetgen, and G. S. Cooper (2017). The Authors Respond. *Epidemiology* **28**(3), e30–e31.

48. Buckley, J. P., **A. P. Keil**, L. J. McGrath, and J. K. Edwards (2015). Evolving Methods for Inference in the Presence of Healthy Worker Survivor Bias. *Epidemiology* **26**(2), 204–12.

49. **Keil**, **A. P.**, D. B. Richardson, and M. A. Troester (2015). Healthy Worker Survivor Bias in the Colorado Plateau Uranium Miners Cohort. *American Journal of Epidemiology* **181**(10), 762–70.

50. **Keil**, **A. P.**, J. L. Daniels, and I. Hertz-Picciotto (2014). Autism Spectrum Disorder, Flea and Tick Medication, and Adjustments for Exposure Misclassification: The CHARGE (CHildhood Autism Risks from Genetics and Environment) Case-Control Study. *Environ Health* **13**(1), 3.

51. **Keil**, **A. P.**, J. K. Edwards, D. B. Richardson, A. I. Naimi, and S. R. Cole (2014). The Parametric G-Formula for Time-to-Event Data: Intuition and a Worked Example. *Epidemiology* **25**(6), 889–897.

52. Wing, S., A. Lowman, **A. P. Keil**, and S. Marshall (2014). Odors from Sewage Sludge and Livestock: Associations with Self-Reported Health. *Public Health Rep* **129**(6), 505–515.

53. Richardson, D. B., S. Wing, **A. P. Keil**, and S. Wolf (2013). Mortality among Workers at Oak Ridge National Laboratory. *Am J Ind Med* **56**(7), 725–732.

54. **Keil**, **A. P.**, S. Wing, and A. Lowman (2011). Suitability of Public Records for Evaluating Health Effects of Treated Sewage Sludge in North Carolina. *N C Med J* **72**(2), 98–104.

55. **Keil**, **A. P.**, J. L. Daniels, U. Forssen, C. Hultman, S. Cnattingius, K. C. Söderberg, M. Feychting, and P. Sparen (2010). Parental Autoimmune Diseases Associated with Autism Spectrum Disorders in Offspring. *Epidemiology* **21**(6), 805–808.

Book chapters

1. **Keil**, **A. P.** and J. K. Edwards (2018a). *"Bias in Environmental Epidemiology" in Reference Module in Earth Systems and Environmental Sciences*. Ed. by J. Nriagu. Second. Elsevier (Oxford).

Invited and symposia presentations

1. **Keil**, **A. P.** (2020a). Using Bayesian Causal Thinking to Generate Actionable Results from Exposure Mixture Data. In: *Society of Epidemiologic Research Annual Meeting*.

2. Rittenhouse, K. J., B. Vwalika, A. **Keil**, J. Winston, M. Stoner, J. T. Price, M. Kapasa, M. Mubambe, V. Banda, W. Muunga, and J. S. Stringer (2020). Machine Learning Assisted Identification of Preterm Births in Zambia. In: *Society for Pediatric and Perinatal Epidemiologic Research Annual Meeting*.

3. **Keil**, **A. P.** (2019a). *Causal Inference*. UNC Causal inference research group seminar series.

4. **Keil**, **A. P.** (2019b). *Causal Inference*. UNC quantitative psychology forum.

5. **Keil**, **A. P.** (2019c). *Public Health Priority Setting for Environmental Metals Mixtures and Birth Defects*. CEHS Stakeholder meeting.

6. **Keil**, **A. P.** (2019d). *Super Learner: Prediction and Causal Inference*. UNC Pharmacoepidemiology seminar series.

7. **Keil**, **A. P.** (2018a). *A Case for Direct Policy Assessment in Environmental and Occupational Epidemiology*. NIEHS invited speaker.

8. **Keil**, **A. P.** (2018c). *Small Data, Big Questions: Bayesian Marginal Structural Models*. Society of Epidemiologic Research annual meeting.

9. **Keil**, **A. P.**, A. Kalkbrenner, and J. P. Buckley (2018). *Applying the Bayesian G-Formula to Estimate Impacts of Public Health Actions on Environmental Exposure Mixtures*. Society of Epidemiologic Research annual meeting.

10. **Keil**, **A. P.** (2017a). *A Case for Direct Policy Assessment in Environmental and Occupational Epidemiology*. SERtalks – North Carolina.

11. **Keil**, **A. P.** (2017b). *Asbestos Standards for the 21st Century: The Impact of Currently Uncounted Asbestos Fibers on Lung Cancer Risk*. Society of Epidemiologic Research annual meeting.

12. **Keil**, **A. P.** (2017c). *Machine Learning for Causal Inference*. Causal Inference Research Group Meeting, University of North Carolina at Chapel Hill.

13. **Keil**, **A. P.** (2016a). *Study Designs to Address Healthy Worker Biases*. Epidemiology Congress of the Americas.

14. **Keil**, **A. P.** (2016b). *A Bayesian Approach to the G-Formula*.

15. **Keil**, **A. P.** (2015). *Making Sense of Competing Risks and Occupational Arsenic Exposure Using the Parametric G-Formula*. Society of Epidemiologic Research annual meeting.

16. **Keil**, **A. P.**, D. Richardson, and S. Cole (2014b). *Controlling Healthy Worker Survivor Bias of the Radon-Lung Cancer Dose-Response in a Cohort of Uranium Miners*. International Society of Environmental Epidemiology annual meeting.

17. **Keil**, **A. P.** (2014b). *Estimating the Effects of Occupational Exposure Interventions on Cardiovascular Outcomes Using the Parametric G-Formula*. Cardiovascular Disease Epidemiology Seminar Series, University of North Carolina at Chapel Hill Department of Epidemiology.

18. **Keil**, **A. P.** and J. Edwards (2012). *Comparison of Three Causal Models to Control Time-Varying Confounding in a Cohort of Bone Marrow Transplant Recipients.* Causal Inference Research Group Meeting, University of North Carolina at Chapel Hill.

Conference workshops

1. **Keil**, **A. P.** (2020b). *Workshop: Causal Inference for Exposure Mixtures*. International Society of Environmental Epidemiology annual meeting.

2. **Keil**, **A. P.** and J. S. Kaufman (2018b). *Workshop: Causal Inference in Environmental Epidemiology*. International Society of Environmental Epidemiology annual meeting.

Conference presentations

1. **Keil**, **A. P.** and J. K. Edwards (2018c). Causal Inference in Little Data: Bayesian Marginal Structural Models. In: *Society of Epidemiologic Research Annual Meeting*.

2. **Keil**, **A. P.**, A. K. Kalkbrenner, and J. P. Buckley (2018a). Applying the Bayesian G-Formula to Estimate Impacts of Public Health Actions on Environmental Exposure Mixtures. In: *International Society of Environmental Epidemiology Annual Meeting*.

3. **Keil**, **A. P.**, A. K. Kalkbrenner, and J. P. Buckley (2018b). Applying the Bayesian G-Formula to Estimate Impacts of Public Health Actions on Environmental Exposure Mixtures. In: *Society of Epidemiologic Research Annual Meeting*.

4. **Keil**, **A. P.**, J. K. Edwards, and J. P. Buckley (2016). A Bayesian Approach to the G-Formula for Estimating Intervention Effects in Sparse Data. In: *Epidemiology Congress of the Americas*.

5. **Keil**, **A. P.**, J. K. Edwards, and J. P. Buckley (2015). Direct Assessment of Public Health Impacts of Exposure Mixtures: A Bayesian g-Formula Approach. In: *Statistical Approaches for Assessing Health Effects of Environmental Chemical Mixtures in Epidemiology Studies*.

6. **Keil**, **A. P.**, D. Richardson, and S. Cole (2014a). Controlling Healthy Worker Survivor Bias of the Radon-Lung Cancer Dose-Response in a Cohort of Uranium Miners. In: *EPICOH: Scientific Comittee on Epidemiology in Occupational Health Annual Meeting*.

7. **Keil**, **A. P.**, J. Edwards, A. Naimi, and S. Cole (2013). Comparison of Three Causal Models to Control Time-Varying Confounding in a Cohort of Bone Marrow Transplant Recipients. In: *Society of Epidemiologic Research Annual Meeting*.

8. **Keil**, **A. P.**, D. Richardson, and S. Cole (2011). Are Marginal Structural Models Useful to Appropriately Control the Healthy Worker Survivor Effect for Occupational Epidemiological Studies? In: *EPICOH: Scientific Committee on Epidemiology in Occupational Health Annual Meeting*.

9. **Keil**, **A. P.**, J. Daniels, and I. Hertz-Picciotto (2009a). Prenatal Imidacloprid Exposure and Subsequent Diagnosis of Autism Spectrum Disorder in a California Case-Control Study. In: *International Conference on Role of Environmental Stressors in the Developmental Origins of Disease*.

Select papers under review/in preparation

1. Bommarito, P. A., B. M. Welch, **A. P. Keil**, G. P. Baker, D. E. Cantonwine, T. F. McElrath, and K. K. Ferguson (In preparation). Prenatal Exposure to Consumer Product Chemical Mixtures and Size for Gestational Age at Delivery.

2. Buckley, J. P., **A. P. Keil**, and J. K. Edwards (In preparation). An Intervention Framework for Exposure Mixtures in Environmental Epidemiology. *Int J Epidemiol*.

3. Chanti-Ketterl, M., **A. P. Keil**, F. Kamel, H. Chen, K. M. Hayden, G. Potter, S. Shrestha, and C. Parks (In preparation). Pesticides and Cognitive Functioning in the Ag Health Study. *Environ Health Perspect*.

4. Choi, G. and **A. P. Keil** (In preparation). When Should You Use Natural Log-Transformations of Exposures? *Env. Health Perspect*.

5. **Keil**, **A. P.** (In preparation[a]). On the Ambiguous Definition of "Overall Effect" of an Exposure Mixture. *Env. Health Perspect*.

6. **Keil**, **A. P.**, K. K. Ferguson, A. J. White, G. Choi, and J. P. Buckley (In preparation). A Review and Field Guide to Joint Effect Estimation of Multiple Exposures. *Epidemiology*.

7. **Keil**, **A. P.** and G. B. Hamra (In preparation). MCMC: Must Check Model Convergence. *Epidemiology*.

8. **Keil**, **A. P.**, M. Jonsson Funk, S. R. Cole, S. Mooney, J. K. Edwards, and D. J. Westreich (In preparation). On Being Wrong: Model Misspecification and Causal Misspecification. *Epidemiology*.

9. **Keil**, **A. P.**, D. Zeng, M. G. Hudgens, and D. J. Westreich (In preparation). Improving Inference with Machine Learning: Black Box Algorithms in Service of Epidemiology. *Am J Epidemiol*.

10. **Keil**, **A. P.** (In preparation[b]). Muting Bias Amplification in Exposure Mixtures. *Epidemiology*.

11. **Keil**, **A. P.**, S. R. Cole, and D. Westreich (In preparation). Super Learning in the SAS System. *Epidemiology*.

12. **Keil**, **A. P.**, E. Tchetgen Tchetgen, and S. R. Cole (In preparation). Bayesian Causal Inference: Marginal Structural Models without Weights. *Stat Med*.

13. Bertke, S. J., R. D. Daniels, and **A. P. Keil** (2020). Lung Cancer Mortality and Styrene Exposure in the Reinforced Plastics Boatbuilding Industry: Exposure- Response Analysis Using g-Estimation. *Am J Epidemiol* **Under review**.

14. **Keil**, **A. P.**, J. K. Edwards, A. I. Naimi, and S. R. Cole (2020). Markov Unchained: A Guided Walk through the Metropolis Algorithm. *Am J Epidemiol* **In revision**.

15. Niehoff, N. M., K. M. O'Brien, **A. P. Keil**, K. E. Levine, C. Liyanapatirana, L. G. Haines, C. R. Weinberg, and A. J. White (2020). Metals and Breast Cancer Risk: A Prospective Study Using Toenail Biomarkers. *Int. J. Epidemiol.* **Under review**.

PhD thesis

1. **Keil**, **A. P.** (2014a). "Healthy Worker Survivor Bias in a Cohort of Uranium Miners from the Colorado Plateau". PhD thesis. University of North Carolina at Chapel Hill.

Teaching activities

Courses

2020	Co-instructor	*Analytic Methods in Observational Epidemiology (EPID 718)*; 30 students
2020	Instructor	*Motivating and practicing Bayesian data analysis for epidemiologic problems: independent study*; 2 students
2016-2019	Co-instructor	*Perspectives in Epidemiology and Public Health (EPID 890)*; 5-10 students
2018	Instructor	*Introduction to Epidemiology and Causal Inference (ULM Summer School of Epidemiology)*; 20 students
2011	Instructor	*SAS and Data Management (EPID 700)*; 30 students

Guest lectures

2020	Instructor	"G-computation" in *A Gentle Introduction to Simulations for Epidemiology (EPID 799A)*; 20 students
2020	Instructor	"Reliability" in *Design of Clinical Research (EPID 804)*; 20 students
2019	Instructor	"Missing data in survival analysis" in *Biomarkers in Population-Based Research (EPID 742)*; 25 students
2019	Instructor	"Inference in studies with biomarkers subject to limits of detection" in *Epidemiologic Analysis Of Time-To-Event Data (EPID 722)*; 15 students
2016-2018	Instructor	"G-formula" in *Epidemiologic Analysis Of Time-To-Event Data (EPID 722)*; 25 students
2018	Instructor	Bayesian statistics and simulations in R *Introduction to R (EPID 799C)*; 15 students
2016,17	Instructor	Various topics in *Fundamentals of Epidemiology (EPID 710)*; 30 students
2016-20	Instructor	"Ionizing radiation and cancer: Epidemiology and studies of survivors of the atomic bombings of Hiroshima and Nagasaki" in *Environmental Epidemiology (EPID 785); 10 students*
2014	Instructor	"BUGS is not WinBUGS (and vice versa)" in *Advanced Methods for Epidemiology: Introduction to Bayesian Statistics (EPID 730)*; 15 students

Current grant and other support

09/2018-Current	R01ES029531 (NIH/NIEHS): Public Health Priority Setting For Environmental Metals Mixtures And Birth Defects	(Keil, Fry) Role: MPI. Duration: 5 years.
08/2019-Current	R01OH011409 (CDC/NIOSH): Occupational Exposure To Ionizing Radiation: Models For Policy Making	(Richardson) Role: Investigator. Duration: 3 years.
09/2018-Current	8323751 (NIH/NIEHS): Inter-governmental personnel act agreement: advanced methods for mixtures research	Role: Investigator. Duration: 4 years.
03/2019-Current	Patient-Centered Outcomes Research Institute (PCORI): Enhancing Hybrid Study Designs for Comparative Effectiveness Research	(Lund) Role: Co-Investigator. Duration: 3 years.

Service

I have performed peer reviews for the following publications: Epidemiology, American Journal of Epidemiology, International Journal of Epidemiology, European Journal of Epidemiology, Biometrics, Statistics in Medicine, Annals of Statistics, Environmental Health Perspectives, Patterns, Occupational and Environmental Medicine, Annals of Epidemiology, American Journal of Industrial Medicine, Demography, BMC Public Health, Radiation and Environmental Biophysics, IEEE Journal of Biomedical and Health Informatics, International Journal of Hygiene and Environmental Health, Autism Research, and more. I have served as a review editor for Frontiers in Public Health (Occupational Health and Safety section). I have served as a grant reviewer for the Research Opportunities Program, Ministry of Labor, Ontario Canada.

Leadership, mentoring and outreach activities

I am currently lead principal investigator on an R01 grant (R01ES029531), which funds the development of new methods to analyze exposure mixtures for estimating population level impacts of well water exposures on birth defects. As part of this grant, I am directly responsible for a graduate research assistant in the Epidemiology program, and help mentor other graduate research assistants in the department of Environmental Sciences and Engineering at UNC. As shown below, I serve as official mentor through dissertation or Master's paper committee for 12 current students and 5 previous students. I am also currently serving as a mentor on two F30 proposals (MD/PhD dissertation fellowships). Part of my work is also funded through an Intergovernmental Personnel Act appointment at NIEHS, where I serve as a mentor to a number of postdoctoral and predoctoral fellows, including serving as mentor on two K99/R00. I am proud to serve as a mentor for such a large group of racially, ethnically, and intellectually diverse group of men and women, each of whom has improved me professionally and personally. As part of my R01, I am currently seeking a student with which to write a diversity supplement (PA-18-586) to help fund the research development of a student from an underrepresented group.

Master's paper and Dissertation committees:

Student	Year of Degree	Position
Adrien Wilkie	2014	Master's paper reader
Nathan De Bono	2018	Dissertation committee member
Jean Strelitz	2018	Dissertation committee member
Nicole Niehoff	2019	Dissertation committee member
Ibrahim Zaganjor	2020	Dissertation committee member
Giehae Choi	2020	Dissertation committee member
Danielle Chun	*	Dissertation committee member
Kristin Sullivan	*	Dissertation committee member
Kenny Chen	*	Dissertation committee member
Bailey DeBarmore	*	Dissertation committee member
Tiansheng Wang	*	Dissertation committee member
Amber Hall	*	Dissertation committee member
Morgan Richey	*	Dissertation committee member
Lauren Eaves	*	Dissertation committee member
Jeliyah Clark	*	Dissertation committee member
Hanna Jardel	*	Dissertation committee member
Deanna Zhu	*	Dissertation committee member
Josée Dussault	*	Dissertation committee member

*Current