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Education

Ph.D. Civil Engineering, August 2013

program in Environmental and Water Resources Engineering
The University of Texas, Austin, TX

Dissertation: *Removal of Formaldehyde from Indoor Air: Enhancing Surface-Mediated Reactions on Activated Carbon*

Advisors: Lynn E. Katz, Civil, Architectural, and Environmental Engineering
Gerald E. Speitel Jr., Civil, Architectural, and Environmental Engineering

Committee members:

Richard L. Corsi, Civil, Architectural, and Environmental Engineering
Howard M. Liljestrand, Civil, Architectural, and Environmental Engineering
Keith J. Stevenson, Chemistry and Biochemistry

E.I.T., Texas, May 2013

M.S. Civil Engineering, December 2009

The University of Texas, Austin, TX

Thesis: *Gas-phase Formaldehyde Adsorption Isotherm Studies on Activated Carbon: Correlations of Adsorption Capacity to Surface Functional Group Density*

B.S. Biology with a Minor in Chemistry, 2004

B.A. Spanish, 2004

Indiana University, Bloomington, IN

Research and Employment Experience

2004-2005 Resident Naturalist, San Luis Biological Station, Costa Rica
2005-2006 Ecological Habitat Restoration Technician and Spanish Interpreter, IN
2006-2009 NSF IGERT Graduate Trainee, The University of Texas at Austin, TX
2009-2010 Guest Researcher, National Institute of Standards and Technology, MD
2012-2012 Visiting Researcher, Tsinghua University, Beijing China (3 months)
2010-2013 US EPA STAR Graduate Doctoral Fellow, University of Texas at Austin, TX
2013-2016 Postdoctoral Fellow, University of Minnesota Institute on the Environment, MN
2017-present Asst Prof, Civil/Environmental Engineering, Colorado State University, Fort Collins, CO

Honors and Awards

2003, 2004 NSF REU Fellowship
2006, 2010, 2013 University of Texas Dept Civil Engineering Presidential Endowed Fellowships
2007 NSF IGERT Fellowship
2010, 2011, 2012 Society for Women Engineers Scholarship and Champion Awards
2010 ASHRAE Grant-in-Aid Award
2011 US EPA STAR Graduate Fellowship
2013 NSF East Asian Pacific Summer Institutes Fellowship
2018 ORAU Powe Enhancement Award for Junior Faculty
2018 Burroughs Wellcome Fund 2018 Collaborative Research Travel Grant
2018-2022 Harvard Environmental Health Fellowship
2020 Civil and Environmental Engineering Faculty Award for Excellence in Service
2020-2022 NAS Committee on "Emerging Science in Indoor Chemistry"

Publications

Google Scholar:

https://scholar.google.com/citations?user=q0hxm_gAAAAJ&hl=en

1. Guta D, Baumgartner J, Jack D, **Carter E**, Shen G, Orgill-Meyer J, Rosenthal J, Dickinson K, Bailis R, Masuda,

- and Zerriffi H. (2022). A systematic review of household energy transition in low and middle income countries. *Energy Research & Social Science*, 86, p.102463.
2. Kanagasabai T, Xie W, Yan L, Zhao L, **Carter E**, Guo D, Daskalopoulou SS, Chan Q, Elliott P, Ezzati M, Yang X. (2022). Household air pollution and blood pressure, vascular damage, and subclinical indicators of cardiovascular disease in older Chinese adults. *American Journal of Hypertension*, 35(2), pp.121-131.
 3. Li X, Clark S, Floess E, Baumgartner J, Bond T, **Carter E**. (2021). Personal exposure to PM_{2.5} of indoor and outdoor origin in two neighboring Chinese communities with contrasting household fuel use patterns. *Science of The Total Environment*, 800, p.149421.
 4. Tryner J, Phillips M, Quinn C, Neymark G, Wilson A, Jathar SH, **Carter E**, Volckens J. (2021). Design and testing of a low-cost sensor and sampling platform for indoor air quality. *Building and Environment*, 206, p.108398.
 5. Lai A, Lee M, **Carter E**, Chan Q, Elliott P, Ezzati M, Kelly F, Yan L, Wu Y, Yang X, Zhao L. (2021). Chemical investigation of household solid fuel use and outdoor air pollution contributions to personal PM_{2.5} exposures. *Environmental Science & Technology*, 55(23), pp.15969-15979.
 6. L'Orange C, Neymark G, **Carter E**, Volckens J. (2021). A high-throughput, robotic system for analysis of aerosol sampling filters. *Aerosol and Air Quality Research*, 21, p.210037.
 7. Lloyd M, **Carter E**, Diaz FG, Magara-Gomez KT, Hong KY, Baumgartner J, Herrera GVM, Weichenthal S. (2021). Predicting within-city spatial variations in outdoor ultrafine particle and black carbon concentrations in Bucaramanga, Colombia: a hybrid approach using open-source geographic data and digital images. *Environmental Science & Technology*, 55(18), pp.12483-12492.
 8. Loo RL, Lu Q, **Carter E**, Liu S, Clark S, Wang Y, Baumgartner J, Tang H, Chan Q, (2021). A feasibility study of metabolic phenotyping of dried blood spot specimens in rural Chinese women exposed to household air pollution. *Journal of Exposure Science & Environmental Epidemiology*, 31(2), pp.328-344.
 9. Winchester AK, Peterson RA, **Carter E**, Sammel MD. (2021). Impact of COVID-19 social distancing policies on traffic congestion, mobility, and NO₂ pollution. *Sustainability*, 13(13), p.7275.
 10. Lee M, **Carter E**, Yan L, Chan Q, Elliott P, Ezzati M, Kelly F, Schauer JJ, Wu Y, Yang X, Zhao L. (2021). Determinants of personal exposure to PM_{2.5} and black carbon in Chinese adults: A repeated-measures study in villages using solid fuel energy. *Environment International*, 146, p.106297.
 11. Bilsback KR, Kerry D, Croft B, Ford B, Jathar SH, **Carter E**, Martin RV, Pierce J.R. (2020). Beyond SO_x reductions from shipping: assessing the impact of NO_x and carbonaceous-particle controls on human health and climate. *Environmental Research Letters*, 15(12), p.124046.
 12. Bilsback KR, Baumgartner J, Cheeseman M, Ford B, Kodros JK, Li X, Ramnarine E, Tao S, Zhang Y, **Carter E**, Pierce JR. (2020). Estimated aerosol health and radiative effects of the residential coal ban in the Beijing-Tianjin-Hebei Region of China. *Aerosol and Air Quality Research*, 20(11), pp.2332-2346.
 13. Anderson AA, Williams E, Long M, **Carter E**, Volckens J. (2020). Organizationally based citizen science: Considerations for implementation. *Journal of Science Communication*, 19(3), p.A01.
 14. Lai AM, Clark S, **Carter E**, Shan M, Ni K, Yang X, Baumgartner J, Schauer JJ. (2020). Impacts of stove/fuel use and outdoor air pollution on chemical composition of household particulate matter. *Indoor Air*, 30(2), pp.294-305.
 15. Yan L, **Carter E**, Fu Y, Guo D, Huang P, Xie G, Xie W, Zhu Y, Kelly F, Elliott P, Zhao L. (2020). Study protocol: the INTERMAP China Prospective (ICP) study. *Wellcome Open Research*, 4, p.154.
 16. **Carter E**, Yan L, Fu Y, Robinson B, Kelly F, Elliott P, Wu Y, Zhao L, Ezzati M, Yang X, Chan Q, Baumgartner J. (2020). Household transitions to clean energy in a multiprovincial cohort study in China. *Nature Sustainability*, 3(1), pp.42-50.
 17. Barrington-Leigh C, Baumgartner J, **Carter E**, Robinson BE, Tao S, Zhang Y. (2019). An evaluation of air quality, home heating and well-being under Beijing's programme to eliminate household coal use. *Nature Energy*, 4(5), p.416.
 18. Berg KE, Clark KM, Li X, **Carter E**, Volckens J, Henry CS. (2020). High-throughput, semi-automated dithiothreitol (DTT) assays for oxidative potential of fine particulate matter. *Atmospheric Environment*, 222, p.117132.
 19. Clark SN, Schmidt AM, **Carter E**, Schauer JJ, Yang X, Ezzati M, Daskalopoulou SS, Baumgartner J. (2019). Longitudinal evaluation of a household energy package on blood pressure, central hemodynamics, and arterial stiffness in China. *Environmental Research*, 177, p.108592.

20. Li S, Yang M, **Carter E**, Schauer JJ, Yang X, Ezzati M, Goldberg MS, Baumgartner J. (2019). Exposure–response associations of household air pollution and buccal cell telomere length in women using biomass stoves. *Environmental Health Perspectives*, 127(8), p.087004.
21. Baumgartner J, Clark S, **Carter E**, Lai A, Zhang Y, Shan M, Schauer JJ, Yang X. (2019). Effectiveness of a household energy package in improving indoor air quality and reducing personal exposures in rural China. *Environmental Science & Technology*, 53(15), pp.9306-9316.
22. Puzzolo E, Zerriffi H, **Carter E**, Clemens H, Stokes H, Jagger P, Rosenthal J, Petach H. (2019). Supply considerations for scaling up clean cooking fuels for household energy in low-and middle-income countries. *GeoHealth*.
23. Erlandson GJ, Magzamen SL, **Carter E**, Sharp JL, Reynolds SJ, Schaeffer JW. (2019) Characterization of Indoor Air on a College Campus: A Pilot Study. *International Journal Environmental Research and Public Health*, 16, 2721(Special Issue 2019).
24. Lai AM, **Carter E**, Shan M, Ni K, Clark S, Ezzati M, Wiedinmyer C, Yang X, Baumgartner J, Schauer JJ. (2019). Chemical composition and source apportionment of ambient, household, and personal exposures to PM_{2.5} in communities using biomass stoves in rural China. *Science of the Total Environment*, 646, 309-319.
25. Lai A, Shan M, Deng M, **Carter E**, Yang X, Baumgartner J, Schauer JJ. (2019). Differences in chemical composition of PM_{2.5} emissions from traditional versus advanced combustion (semi-gasifier) solid fuel stoves. *Chemosphere*, 233, 852-861.
26. Lai AM, Clark S, **Carter E**, Shan M, Ni K, Yang X, Baumgartner J, Schauer JJ. (2019). Impacts of stove/fuel use and outdoor air pollution on chemical composition of household particulate matter. *Indoor Air*.
27. Barrington-Leigh C, Baumgartner J, **Carter E**, Robinson BE, Tao S, Zhang Y. (2019). An evaluation of air quality, home heating and well-being under Beijing’s programme to eliminate household coal use. *Nature Energy*, 4(5), p.416.
28. Brehmer C, Lai AM, Clark S, Shan M, Ni K, Ezzati M, Yang X, Baumgartner J, Schauer JJ, **Carter E** (2019). The oxidative potential of personal and household PM_{2.5} in a rural setting in southwestern China. *Environmental Science & Technology*.
29. Pillarisetti A, **Carter E**, Rajkumar S, Young BN, Benka-Coker ML, Peel JL, Johnson M, Clark ML (2019). Measuring personal exposure to fine particulate matter (PM_{2.5}) among rural Honduran women: A field evaluation of the Ultrasonic Personal Aerosol Sampler (UPAS). *Environment International*, 123, p50-53.
30. Archer-Nicholls S, Lowe D, Lacey F, Kumar R, Xiao Q, Liu Y, **Carter E**, Baumgartner J, Wiedinmyer C. (2019). Radiative effects of residential sector emissions in China: Sensitivity to uncertainty in black carbon emissions. *Journal of Geophysical Research: Atmospheres*.
31. Deng M, Li J, Zhang S, Shan M, Baumgartner J, **Carter E**, Yang X. (2019). Real-time combustion rate of wood charcoal in the heating fire basin: Direct measurement and its correlation to CO emissions. *Environmental Pollution*, 245, p38-45.
32. Berman JD, Burkhardt J, Bayham J, **Carter E**, Wilson A. (2019). Acute air pollution exposure and the risk of violent behavior in the United States. *Epidemiology*, 30(6), pp.799-806.
33. Burkhardt JB, Bayham J, Wilson AA, **Carter E**, Berman JD, O'Dell K, Hotmann BJ, Fischer EV, Pierce JR. (2019). The effect of pollution on crime: Evidence from data on particulate matter and ozone. *Journal of Environmental Economics and Management*, 98, 102267.
34. Li Y, **Carter E**, Fu Y, Xie G, Xie W, Kelly F, Elliott P, Yang X, Ezzati M, Baumgartner J, Zhao L, Wu Y, Chan Q. (2019). Changes of Blood Pressure and Urinary Sodium Over 18 Years in Rural China: Results From the INTERMAP China Prospective Study (vol. 139). *Circulation*.
35. Kanagasabai T, Lee M, **Carter E**, Yan L, Guo D, Chan Q, Elliott P, Ezzati M, Wu Y, Baumgartner J. (2019). Exposure to air pollution is associated with lower sleep duration and higher odds of snoring and suspected osa in China. *Sleep Medicine*, 64, p.S186.
36. **Carter E**, Shan M, Zhong Y, Ding W, Zhang Y, Baumgartner J, Yang X. (2018). Development of renewable, densified biomass for household energy in China. *Energy for Sustainable Development*, 46, p42-52.
37. Deng M, Zhang S, Shan M, Li J, Baumgartner J, **Carter E**, Yang X. (2018). The impact of cookstove operation on PM_{2.5} and CO emissions: A comparison of laboratory and field measurements. *Environmental Pollution*, 243, p31087-1095

38. Baumgartner J, **Carter E**, Schauer JJ, Ezzati M, Daskalopoulou S, Valois MF, Shan M, Yang X. (2018). Household air pollution and measures of blood pressure, arterial stiffness, and central hemodynamics. *Heart*, 104(18), p1515-1521.
39. Snider G, **Carter E**, Tseng JTW, Yang X, Ezzati M, Schauer JJ, Weidinmyer C, Baumgartner J. (2018). The impacts of cookstove usage patterns and outdoor air quality on household air pollution and cardiovascular mortality in southwestern China. *Environment International*, 117, p116-127.
40. Kodros J, **Carter E**, Brauer M, Volckens J, Bilsback K, L'Orange C, Johnson M, Pierce JR. (2018). Quantifying the contribution to uncertainty in mortality attributed to household, ambient, and joint exposure to PM_{2.5} from residential solid-fuel use. *GeoHealth*, 2, p25-39.
41. Shan M, **Carter E**, Baumgartner J, Deng M, Clark S, Schauer JJ, Ezzati M, Li J, Fu Y, Yang X. (2017). A user-centered, iterative engineering approach for advanced biomass cookstove design and development. *Environmental Research Letters*, 12(9).
42. **Carter E**, Norris C, Dionisio KL, Balakrishnan K, Checkley W, Clark ML, Ghosh S, Jack DW, Kinney PL, Marshall JD, Naeher LP, Peel JL, Sambandam S, Schauer JJ, Smith KR, Wylie BJ, Baumgartner J. (2017). Assessing exposure to household air pollution: A systematic review and pooled analysis of carbon monoxide as a surrogate measure of particulate matter. *Environmental Health Perspectives*, 125(7).
43. Clark S, **Carter E**, Shan M, Ni K, Niu H, Tseng JTW, Pattanayak SK, Jeuland M, Schauer JJ, Ezzati M, Weidinmyer C, Yang X, Baumgartner J. (2017). Adoption and use of a semi-gasifier cooking and water heating stove and fuel intervention in the Tibetan Plateau, China. *Environmental Research Letters*, 12(7).
44. Secrest MH, Schauer JJ, **Carter E**, Baumgartner J. (2017). Particulate matter chemical component concentrations and sources in settings of household solid fuel use. *Indoor Air*, 27(6).
45. Secrest MH, Schauer JJ, **Carter E**, Lai AM, Wang YQ, Shan M, Yang XD, Zhang YX, Baumgartner J. (2016). The oxidative potential of PM_{2.5} exposure from indoor and outdoor sources in rural China. *Science of the Total Environment*, 571, p1477-1489.
46. **Carter E***, Kun N*, Schauer J, Ezzati M, Zhang Y, Niu H, Lai A, Shan M, Wang Y, Yang X, Baumgartner J. (2016). Seasonal variation in outdoor, indoor, and personal air pollution exposures of women using wood stoves in the Tibetan Plateau: Baseline assessment for an energy intervention study. *Environment International*, 94, p449-457.
47. Archer-Nicholls S, **Carter E**, Kumar R, Xiao Q, Liu Y, Forstad J, Forouzanfar MH, Cohen A, Brauer M, Baumgartner J, Wiedinmyer C. (2016). The regional impacts of cooking and heating emissions on ambient air quality and disease burden in China. *Environmental Science & Technology*, 50(17).
48. **Carter E**, Archer-Nicholls S, Ni K, Lai AM, Niu H, Secrest MH, Sauer SM, Schauer JJ, Ezzati M, Wiedinmyer C, Yang X, Baumgartner J. (2016). Seasonal and diurnal air pollution from residential cooking and space heating in the eastern Tibetan Plateau. *Environmental Science & Technology*, 50(15).
49. **Carter E**, Shan M, Yang XD, Li J, Baumgartner J. (2014). Pollutant emissions and energy efficiency of Chinese semi-gasifier cookstoves and implications for future intervention strategies. *Environmental Science & Technology*, 48(11).
50. **Carter E**, Jackson MJ, Katz LE, Speitel Jr. GE. (2014). A coupled sensor-spectrophotometric device for continuous measurement of formaldehyde in indoor environments. *Journal of Exposure Science and Environmental Epidemiology*, 24.
51. Gall E, **Carter E**, Stephens BR, Earnest CM. (2013). Indoor air pollution in developing countries: research and implementation needs for improvements in global public health. *American Journal of Public Health*, 103(4).
52. **Carter E**, Katz LE, Speitel Jr. GE, Ramirez, D. (2011). Gas-phase formaldehyde adsorption isotherm studies on activated carbon: correlations of adsorption capacity to surface functional group density. *Environmental Science and Technology*, 45(15).
53. Stephens BR, **Carter E**, Gall ET, Earnest CM, Walsh EA, Hun DE, Jackson MC. (2009). Home energy-efficiency retrofits. *Environmental Health Perspectives*, 119: a283-a284.
54. **Carter, E**, Earnest, CM, Gall, ET, Guerrero, P, Hun, DE, Jackson, MC, Lo, J, Stephens, BR and Walsh, EA. (2009). Editorial: Priorities in indoor environmental science and health, as students see them. *Indoor Air*, 19.

Other Publications-Book Chapter

Ambient Combustion Ultrafine Particles and Health. United States, Nova Science Publishers, Incorporated, 2021.
Chapter 2. Combustion Sources of Ultrafine Particles in Indoor and Outdoor Air

Invited Seminars

Jan 2022, NSF Workshop on Household Hot Water Systems
Dec 2021, Yale Civil and Environmental Engineering Department Seminar
May 2021, Advancing Sustainable Household Energy Solutions webinar series speaker
Aug 2020, American Council for an Energy Efficient Economy, Energy and Behavior
Oct 2019, NIH-FIC, Implementation Science and Clean Cooking Network, MD, USA
Oct 2019, American Association of Aerosol Research, Portland, OR
July 2018, Indoor Air 2018, Philadelphia, PA
Feb 2017, International Workshop on Household Energy, Air Pollution, and Prevention
Strategies, Chinese Academy of Sciences Institute of Earth and Environment Shaanxi, China
Mar 2017, Peking University, College of Urban and Environmental Sciences
Mar 2017, Chinese Academy of Physics and Math, Hubei, China
Apr 2017, Planetary Health Alliance, Harvard University, MA, USA
June 2017, NIH-FIC, Implementation Science and Clean Cooking Network, MD, USA
Sept 2017, University of Colorado Boulder, Environmental Engineering
Oct 2017, University of Illinois Urbana-Champaign, Civil/Environmental Engineering
Nov 2017, Keynote speaker, McGill University, International Symposium on Sustainable Cities and
Environmental Health, McGill University, QC, Canada
Dec 2017, NIH-FIC, Implementation Science and Clean Cooking Network, DC, USA

Conference Proceedings and Presentations

1. Li, X., Carter, E., Baumgartner, J., Barrington Leigh, C., Harper, S., Robinson, B., Shen, G., Sternbach, T., Tao, S., Zhang, X. and Zhang, Y., 2021, August. Environmental inequality of personal exposure to PM_{2.5} and black carbon (BC) within-and between-communities in rural Beijing, China. In *ISEE Conference Abstracts* (Vol. 2021, No. 1).
2. Brehmer, C., Li, X., Sternbach, T., Lee, M., Zhang, X., Baumgartner, J., Harper, S., Robinson, B., Barrington Leigh, C., Shen, G. and Zhang, Y., 2021, August. The role of village spillover and stove use on wintertime outdoor PM_{2.5} in villages transitioning to clean heating in China. In *ISEE Conference Abstracts* (Vol. 2021, No. 1).
3. Li, X., Carter, E., Baumgartner, J., Barrington Leigh, C., Brehmer, C., Harper, S., Robinson, B., Shen, G., Sternbach, T., Tao, S. and Zhang, X., 2021, August. The influence of heating energy on indoor air quality and its association with socioeconomic status in rural Beijing. In *ISEE Conference Abstracts* (Vol. 2021, No. 1).
4. Ripley, S., Gao, D., Schmidt, A., Minet, L., Kulka, R., Carter, E., Lakey, P., Shiraiwa, M., Hatzopoulou, M., Pollitt, K.G. and Weichenthal, S., 2021, August. Spatial variations in PM_{2.5} oxidative potential in Toronto and Montreal, Canada. In *ISEE Conference Abstracts* (Vol. 2021, No. 1).
5. Lloyd, M., Carter, E., Diaz, F.G., Magara Gomez, K.T., Hong, K.Y., Baumgartner, J., Herrera G, V.M. and Weichenthal, S., 2021, August. Predicting Within-City Variations in Ultrafine Particle and Black Carbon Concentrations in Bucaramanga, Columbia Using Open Source Data and Images. In *ISEE Conference Abstracts* (Vol. 2021, No. 1).
6. Sternbach, T.J., Li, X., Zhang, X., Carter, E., Shen, G., Tao, S., Zhang, Y., Baumgartner, J. and Harper, S., 2021, August. Effects of indoor and outdoor temperatures on blood pressure and central hemodynamics in a wintertime panel of peri-urban Chinese adults. In *ISEE Conference Abstracts* (Vol. 2021, No. 1).
7. Fischer, E.V., Pierce, J.R., Magzamen, S., Ford, B., O'Dell, K., Brey, S.J., Lassman, W., Gan, R., Wilson, A., Vaidyanathan, A. and Volckens, J., 2020, December. Enabling Smoke Impacts Research Through Blended Earth Observations. In *AGU Fall Meeting Abstracts* (Vol. 2020, pp. GH016-01).
8. Hodshire, A., Abeleira, A., Ampollini, L., Arata, C., Mattila, J., Pothier, M.A., Wang, C., Abbatt, J., Carter, E., DeCarlo, P. and Goldstein, A.H., 2020, December. Now we're cooking: How do activities in the home impact exposure?. In *AGU Fall Meeting Abstracts* (Vol. 2020, pp. A184-0013).

9. Tseng, T., Carter, E., Yan, L., Chan, Q., Zhao, L., Elliott, P., Wu, Y., Yang, X., Ezzati, M., Kelly, F.J. and Baumgartner, J., 2020, October. Exposure to household air pollution and cognitive function in older Chinese adults. In *ISEE Conference Abstracts* (Vol. 2020, No. 1).
10. Velauthapillai, K., Herrera, M., Vasquez, S., Magara Gomez, K., Weichenthal, S., Baumgartner, J. and Carter, E., 2020, October. Indoor levels and personal exposures to traffic pollution and environmental noise among retired adults in urban Colombia. In *ISEE Conference Abstracts* (Vol. 2020, No. 1).
11. "High Resolution Air Pollution Exposure Assessment: New Developments for Measurement, Modeling & Health Studies", Apte, J. and Carter, E. In *32nd Annual Conference of the International Society for Environmental Epidemiology*, August 24-27, 2020 through a fully virtual platform.
12. Pierce, J.R., Bilback, K., Cheeseman, M., Ford, B., Kodros, J., Li, X., Ramnarine, E. and Carter, E., 2019, December. Estimated aerosol radiative and health effects of the residential coal ban in the Beijing-Tianjin-Hebei region of China. In *AGU Fall Meeting 2019*. AGU.
13. Carter, E., Barrington-Leigh, C., Baumgartner, J., Robinson, B., Tao, S. and Zhang, Y., 2019. Air Quality, Home Heating, and Well-Being under Beijing's Ban on Household Coal Burning. *Environmental Epidemiology*, 3, p.52.
14. Carter, E. and Marshall, J., 2019. Measuring environmental exposures in resource-constrained, remote locations. *Environmental Epidemiology*, 3, pp.51-52.
15. Berman, J., Burkhardt, J., Bayham, J., Carter, E. and Wilson, A., 2019. Acute air pollution exposure, temperature, and the risk of violent behavior in the United States. *Environmental Epidemiology*, 3, p.28.
16. Clark, S., Schmidt, A., Carter, E., Schauer, J., Lai, A., Yang, X., Shan, M., Ezzati, M., Daskalopoulou, S. and Baumgartner, J., 2019. Cardiovascular and Air Pollution Impacts of a High-Performing Semi-Gasifier Stove and Fuel Intervention in China. *Environmental Epidemiology*, 3, pp.75-76.
17. Baumgartner, J., Kanagasabai, T., Xie, W., Carter, E., Yan, L., Chan, Q., Elliott, P., Ezzati, M., Wu, Y. and Daskalopoulou, S., 2019. Associations of household solid fuel suspension with blood pressure and markers of arterial stiffness and atherosclerosis in a multi-provincial cohort of Chinese adults. *Environmental Epidemiology*, 3, p.25.
18. December 12, 2018, "A Framework for Estimating Moisture Susceptibility Attributable to Natural Flooding Hazards in the U.S", American Geophysical Union Fall Meeting, American Geophysical Union, Morrison, R. (Author), Dougherty, E. (Author), Rasmussen, K. (Author), Carter, E. (Author), Oke, O. (Author & Presenter), peer-reviewed/refereed.
19. November 2018, "The Effect of Pollution on Aggressive Behavior", Southern Economic Association, Association of Environmental and Resource Economists, Burkhardt, J. B., Bayham, J., Pierce, J. R., Fischer, E. V., Carter, E., O'dell, K. A., Ander, w. (Author).
20. September 20, 2018, "Indoor Air Quality in the Residential Environment", Colorado Environmental Health Association Annual Meeting, Carter, E. (Author & Presenter), peer-reviewed/refereed.
21. August 29, 2018, "Global Metabolic Profiling of Dried Blood Spot Samples for Personal Air Pollution Exposure in Population Studies", ISES-ISEE 2018, International Society of Environmental Epidemiology and International Society of Exposure Science, Loo, R. (Author), Wang, Y. (Author), Lin, H. (Author), Clark, S. (Author), Carter, E. (Author), Baumgartner, J. (Author & Presenter), Chan, Q. (Author), peer-reviewed/refereed.
22. August 29, 2018, "Why Is My Sensor Not Working? Making Sense of Sensor Technologies for Environmental Exposure and Health Studies", ISES-ISEE 2018, International Society of Environmental Epidemiology and International Society of Exposure Science, Carter, E. (Chair), Barratt, B. (Co-Chair), Zheng, M. (Co-Chair), peer-reviewed/refereed.
23. August 28, 2018, "Initial Household- and Village-Level Impacts of Residential Coal Use Restrictions on Indoor Air Quality in Rural Homes in Beijing, China", ISES-ISEE 2018, International Society of Environmental Epidemiology and International Society of Exposure Science, Li, X. (Author & Presenter), Baumgartner, J. (Author), Barrington-Leigh, C. (Author), Robinson, B. (Author), Carter, E. (Author), peer-reviewed/refereed.
24. August 27, 2018, "A Multi-Provincial Study of Air Pollution Exposure in Rural and Peri-Urban China", ISES-ISEE 2018, International Society of Environmental Epidemiology and International Society of Exposure Science, Lee, M. (Author & Presenter), Carter, E. (Author), Li, Y. (Author), Fu, Y. (Author), Elliott, P. (Author), Ezzati, M. (Author), Kelly, F. (Author), Wu, Y. (Author), Yang, X. (Author), Zhao, L. (Author), Chan, Q. (Author), Baumgartner, J. (Author), peer-reviewed/refereed.
25. August 27, 2018, "Household Air Pollution and Telomere Length in Rural Chinese Women Using Biomass Stoves", ISES-ISEE 2018, International Society of Environmental Epidemiology and International Society of Exposure Science, Carter, E. (Author), Li, S. (Author & Presenter), Yang, M. (Author), Schauer, J. (Author), Yang, X. (Author), Ezzati, M. (Author), Baumgartner, J. (Author), peer-reviewed/refereed.
26. July 27, 2018, "Estimating Effective Ventilation Rates in Rural Homes Using Polluting Fuels", Indoor Air 2018, International Society for Indoor Air Quality and Climate, Carter, E. (Author), Gupta, V. (Author & Presenter), Jamiyansharav, K. (Author), Adair-Rohani, H. (Author), Lewis, J. (Author), Johnson, M. (Author), peer-reviewed/refereed.
27. July 26, 2018, "Comparison of Outdoor, Indoor, and Personal PM2.5 Exposure between the Villages with/without Coal Burning in China", Indoor Air 2018, International Society for Indoor Air Quality and Climate, Li, X. (Author & Presenter),

- Clark, S. (Author), Floess, E. (Author), Baumgartner, J. (Author), Bond, T. (Author), Carter, E. (Author), peer-reviewed/refereed.
28. July 26, 2018, "Household energy transitions to address air pollution exposure, health, and climate burdens associated with solid fuel burning", *Indoor Air 2018*, International Society for Indoor Air Quality and Climate, Carter, E. (Chair), peer-reviewed/refereed.
 29. July 25, 2018, "Preliminary Indoor Air Quality Impacts of Clean Space Heating Programs for Rural Homes in Northern China", *Indoor Air 2018*, International Society for Indoor Air Quality and Climate, Carter, E. (Author & Presenter), Baumgartner, J. (Author), Robinson, B. (Author), Barrington-Leigh, C. (Author), peer-reviewed/refereed.
 30. Carter E, Kun N, Schauer J, Ezzati M, Zhang Y, Niu H, Lai A, Shan M, Wang Y, Yang X, Baumgartner J. (2016) Seasonal differences in household air pollutants and determinants of personal air pollution exposure in rural women cooking and heating with biomass fuels in the Tibetan Plateau. *28th Annual Conference of the International Society for Environmental Epidemiology, September 1-4, 2016*, Rome, Italy.
 31. Carter E, Norris C, Dionisio KL, Balakrishnan K, Checkley W, Clark ML, Ghosh S, Jack DW, Kinney PL, Marshall JD, Naeher LP, Peel JL, Sambandam S, Schauer JJ, Smith KR, Wylie BJ, Baumgartner J. (2016) Assessing exposure to household air pollution: A systematic review and meta-analysis of carbon monoxide as a surrogate measure of particulate matter. *28th Annual Conference of the International Society for Environmental Epidemiology, September 1-4, 2016*, Rome, Italy.
 32. Carter E, Archer-Nicholls S, Brauer M, Cohen A, Forouzanfar M, Frosted J, Kumar R, Lai AM, Liu Y, Ni K, Niu H, Schauer JJ, Ezzati M, Wiedinmyer C, Xiao Q, Yang X, Baumgartner J. (2016) Integrating field measurements and global models to estimate the contribution of solid fuel cooking and heating on air quality, disease burden, and climate in China. *28th Annual Conference of the International Society for Environmental Epidemiology, September 1-4, 2016*, Rome, Italy.
 33. Carter E, Secrest MH, Ni K, Sauer SM, Schauer JJ, Yang X, Baumgartner J. (2016) Natural ventilation in rural Chinese homes: estimating air exchange rates from real-time PM_{2.5} concentrations. *14th international conference on Indoor Air Quality and Climate. July 3-8, 2016*, Ghent, Belgium.
 34. Carter E, Archer-Nicholls S, Ni K, Lai A, Niu H, Secrest M, Sauer S, Schauer JJ, Ezzati M, Wiedinmyer C, Yang X, Baumgartner J. (2015) Tricks of the trade: tools for tracking and monitoring stove and fuel use. *Global Alliance for Clean Cookstoves Clean Cooking Forum 2015, panelist*, Accra, Ghana.
 35. Archer-Nicholls S, Carter E, Brauer M, Cohen A, Frostad J, Forouzanfar M, Xiao Q, Liu Y, Yang X, Baumgartner J, Wiedinmyer C. (2015) The impact of residential combustion emissions on air quality and human health in China. *American Geophysical Union Fall Meeting 2015*. California, USA.
 36. Carter E, Archer-Nicholls S, Ni K, Lai AM, Niu H, Secrest MH, Sauer SM, Schauer JJ, Ezzati M, Wiedinmyer C, Yang X, Baumgartner J. (2015) Assessing the contribution of space heating to personal air pollution exposures and kitchen concentrations in Chinese homes using biomass fuels. *International Society of Exposure Science 2015*. Nevada, USA.
 37. Carter E, Ni K, Archer-Nicholls S, Lai AM, Schauer JJ, Ezzati M, Wiedinmyer C, Yang X, Baumgartner J. (2015) Seasonal differences in ambient particulate matter pollution in the Tibetan Plateau. *American Association for Aerosol Research 2015*. Minnesota, USA.
 38. Carter E, Shan M, Li J, Yang X, Baumgartner J. (2014) Laboratory performance of advanced combustion biomass stoves in reducing household air pollution. *Indoor Air 2014*. Hong Kong.
 39. Carter E, Katz LE, Speitel GE Jr. (2014) Nitrogen-doping granular activated carbon to enhance surface-mediated removal of formaldehyde from indoor environments. *Indoor Air 2014*. Hong Kong.
 40. Carter E, Shan M, Baumgartner J. (2014) The field as a lab: design and development of household energy interventions. *International Society for Environmental Epidemiology 2014*. Seattle, WA USA.
 41. Carter E, Shan M, Baumgartner J. (2014) From the laboratory to the field: development of household energy interventions for reducing indoor air pollution. *International Symposium on Environment and Health 2014*. Beijing, China.
 42. Carter E. (2014) Where there's smoke...evaluating the benefits of household energy improvements in developing countries. *Frontiers in the Environment Lecture Series*. Minneapolis, MN USA.
 43. Carter E. (2012) Indoor air pollution studies on semi-gasifier cookstoves. *Young Scientists Forum 2012*, Beijing, China.
 44. Carter E, Katz LE, Speitel GE Jr. (2011) Impacts of activated carbon surface modification on gas-phase formaldehyde adsorption for indoor relevant conditions. *Indoor Air 2011*, Austin, TX USA.
 45. Carter E, Clancy K, Lee C, Payne-Sturges D, Silbergeld E, Zenick H. (2011) Environmentalism and environmental justice. *EPA STAR Graduate Fellowship Conference*. Washington, D.C. USA.
 46. Carter E. (2011) Emerging career pathways for PhD students. *The Society of Women Engineers Annual Meeting, WE11*, Chicago, IL USA.
 47. Carter E, Alfredo KA. (2011) Designing hands-on learning for kids. *The Society of Women Engineers Annual Meeting, WE11*, Chicago, IL USA.
 48. Carter E, Katz LE, Speitel GE Jr. (2011) Comparison of detection methods following solid-phase microextraction with on-fiber derivatization to quantify adsorption of oxygenated volatile organic compounds on activated carbon. *American Chemical Society 241st Annual Meeting*, Anaheim, CA USA.

49. Carter E. (2010) Global opportunities for graduate and post-graduate students. *The Society of Women Engineers Annual Meeting, WE10*, Orlando, FL USA.
50. Carter E, Alfredo KA, Thomas R. (2010) Graduate and post-graduate funding opportunities. *The Society of Women Engineers Annual Meeting, WE10*, Orlando, FL USA.
51. Carter E. (2010) Gas-phase adsorption studies of formaldehyde and water vapor on multiple types of activated carbon. *National Science Foundation (NSF) 2010 Integrative Graduate Education and Research Traineeship (IGERT) Annual Meeting*, Washington, DC. USA.
52. Carter E, Katz LE, Speitel GE Jr. (2009) Gas-phase formaldehyde adsorption studies on multiple types of activated carbon. *Healthy Buildings 2009*, Syracuse, NY USA.

Teaching

I developed a new upper-level undergraduate course (CIVE 442) for my department, entitled “Air Quality Engineering”, which I have taught every spring since 2018, with enrollment growing from 10 in the first year (spring 2018) to 75 in the present year (spring 2022).

I developed a new graduate-level course (CIVE 526), entitled “Pollution, Exposure, and the Environment”, which I have taught three times, with enrollment growing from 9 in the first year (spring 2019) to 20 in the present year (spring 2022).

I have also taught a graduate-level course entitled “Statistics for Environmental Monitoring”, which is a course co-listed in my department (CIVE 547) and in the Statistics Department (STAT 547). This course had not been offered for over five years when I undertook it, and I have been re-developing and updating nearly all of the course material. The course is offered as both an in-person and online course, and enrollment grew from 9 in the first year that I taught it to 26 in the most recent offering (fall 2021).

Student and Trainee Advising

Completed PhD

Oke, Oluwatobi (primary advisor)
 Mattila, James (committee member)
 Kalan, Duygu (committee member)

Current PhD

Schutt, David (primary advisor)
 Molina, Emilio (co-advisor)
 Anderson, Wes (committee member)
 Duggan, Jerry (committee member)

Completed Masters

Bangs, Evelyn (Master of Science; committee member)
 Erlandson, Grant (Master of Science; committee member)
 Gupta, Vatsal (Master of Science; committee member)
 Khurana, Kartik (Master of Science; committee member)
 Simon, John (Master of Science; committee member)
 Craft, Katie (Master of Science; committee member)
 Clark, Sierra (Master of Science; committee member)
 Rayno, Marshall (Master of Science; committee member)

Current Masters

Brehmer, Collin (Masters of Science; primary advisor)
 Walker, Kelsey (Masters of Science; primary advisor)
 Purgiel, Andrew (Masters of Science; primary advisor)
 Burke, Stephen (Master of Science; committee member)
 Drapcho, Jessica (Master of Science; committee member)
 Hackleman, Bryan (Master of Science; committee member)

King, Brenna (Master of Science; committee member)
Liu, Jianbo (Master of Science; committee member)
Stoker, Theron (Master of Science; committee member)
Thakur, Tanmay (Master of Science; committee member)

Postdoctoral Trainees

Xiaoying Li, McGill University
Kelsey Billsback, Colorado State University, co-supervisor
Jessica Tryner, Colorado State University, co-supervisor

Research Scientists and Associates

Nick Good, RS III
Adam Mayer, RA II

I have also advised 6-8 undergraduate students on an annual basis for the past five years.
Further, I have 1-3 undergraduate students active in my research group on an annual basis.

Highlighted Research Support

Carter E. (PI), 09/01/2021 – 08/31/2023, \$1,500,000

Colorado Department of Public Health and Environment, Office of Health Equity

Indoor Air Quality and Ventilation in Non-Residential Indoor Environments

This project establishes baseline and follow-up quantitative evaluation of indoor air quality and ventilation in small workplaces in rural and underserved communities throughout Colorado to assess the impacts of investments in physical upgrades to facilities intended to address health inequities in the Colorado workplaces. Further, this project involves development of easily understood educational and informative materials for workers and employers.

Role: PI

Carter E. (PI as part of multi-PI project with Volckens J), 09/01/2019 – 08/31/2023, \$2,164,257

HHS/CDC/NIOSH R01OH011660

A Citizen-Science Approach to Occupational Hazard Assessment

This project examines whether workers can use novel technology that we develop to self-assess their exposure to air pollution hazards on the job and whether this approach can produce measurable gains in workplace safety culture.

Carter E. (PI), 02/01/2019 – 03/31/2023, \$240,000

T.H. Chan School of Public Health, Harvard University, JPB Environmental Health Fellowship

Health and Housing: Indoor Environmental Quality in Disparate Systems of Home Governance

This fellowship supports development of the fellow's research program to addresses disparities in social and environmental exposures and health outcomes through pilot-scale research projects and professional development among other early-career researchers (fellows).

Carter E. (PI), 06/01/19 – 07/31/22, \$200,000

City of Fort Collins

Fort Collins Epic Home Study: Indoor Environmental Quality in Renter- and Owner-Occupied Homes

Develop and implement a field-based study to measure air pollution concentrations, estimate exposures to airborne pollutants, and elucidate patterns and predictors of indoor environmental quality in owner- and renter-occupied homes that undergo home energy audits prior to potential home performance upgrades.

Role: PI

Carter E. (PI at CSU; subaward from McGill University), 04/01/20 – 03/31/23, \$369,957

Health Effects Institute/McGill University

How Do Household Energy Interventions Work?

The study quantifies the mechanisms through which the Beijing coal ban and heat pump subsidy program may impact human health, including quantification of: (i) the contribution of changes in the chemical composition of

PM2.5 to the overall effect on health outcomes; and (ii) the impact of the policy on outdoor air quality and personal air pollution exposures; namely, source contribution from household coal burning.

Carter E. (PI at CSU; joint PIs within Colorado School of Public Health), 06/30/19 – 12/31/21, \$30,000

Dickinson K. (co-PI)

Colorado School of Public Health

Health in Public Housing

This study established baseline indoor environmental quality in Denver Housing Authority homes prior to planned and ongoing redevelopment of aging housing properties.

Carter E. (PI), 01/01/18 – 06/30/19, \$56,000

National Institutes of Health Fogarty International Center

Evaluating Supply Chains for Biomass Pellets as Household Fuel in Northern China

This study documented and evaluated barriers and enablers among diverse stakeholders in northern China to the development of biomass pellets as a household fuel for space heating.

Carter E. (Co-PI), 01/01/18 – 12/31/22, \$600,000

Magzamen, S. L. (PI), Wilson, T. A. (Co-PI), Jathar, S. (Co-PI)

US EPA-Environmental Protection Agency

Southeast Wisconsin Interdisciplinary Study of Children's Health, Ecological Exposures and Social Environment (SWISCHEESE)

Carter, E. (Co-PI), 03/01/20 – 03/31/23, \$125,000

Volckens, J. (PI), L'Orange, C. C. P. (Co-PI), Bond, T. C. (Co-PI)

US EPA-Environmental Protection Agency

Advancing Sustainable Household Energy Solutions (ASHES)

Carter, E. (Co-PI), 07/01/18 – 06/30/23, \$253,684

Farmer, D. K. (PI)

Sloan Foundation

Isomeric separation of oxidized organic compounds by mass-spectrometry for indoor chemistry studies

Professional Leadership and Service Activities

Professional Society Memberships

International Society Environmental Epidemiology, International Society of Indoor Air Quality and Climate, Association of Environmental Engineering and Science Professors

Manuscript and Abstract Reviewing

Nature Energy, Nature Behavior, Nature Sustainability, Environmental Health Perspectives, Environmental Science and Technology, Environmental Research Letters, Indoor Air, Aerosol and Air Quality Research, American Journal of Public Health, Atmospheric Environment, International Journal of Environmental Research and Public Health; International Society of Indoor Air Quality and Climate; Healthy Buildings; American Council for an Energy-Efficient Economy

Grant Reviewing

US National Science Foundation; UK Natural Environment Research Council; USAID; High Plains and Intermountain Center for Agricultural Safety and Health; CSU Office of Vice President of Research

Committees External to Colorado State University

Association of Environmental Engineering and Science Professors (Student Services Committee); National Academies of Science Committee on “Emerging Science in Indoor Chemistry”