

Curriculum Vitae

H. Christopher Frey

Position

Glenn E. Futrell Distinguished University Professor of Civil, Construction, and Environmental Engineering, North Carolina State University, Raleigh, NC



Education Background

Ph.D., Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, PA, May 1991.

Master of Engineering, Mechanical Engineering, Carnegie Mellon University, Pittsburgh, PA, May 1987.

B.S., Mechanical Engineering, University of Virginia, Charlottesville, VA, May 1985.

Professional Experience (Selected)

1994-present Faculty (Assistant Professor, Associate Professor, Professor, Distinguished University Professor) in Department of Civil, Construction, and Environmental Engineering at North Carolina State University, Raleigh, NC

2014 – present Adjunct Professor, Hong Kong University of Science and Technology

2016 – 2018 Director (Member), Board of Directors, Air & Waste Management Association, Pittsburgh, PA (elected)

2015 – 2018 Member, Particulate Matter Review Panel, Clean Air Scientific Advisory Committee (CASAC), U.S. Environmental Protection Agency. Also member 2007-2011.

2012 – 2018 Member, Science Advisory Board, U.S. Environmental Protection Agency

2012 - 2015 Chair, Clean Air Scientific Advisory Committee (CASAC), U.S. Environmental Protection Agency (Member 2008 to

	2012)
2012-2014	Chair, Ozone Review Panel, U.S. EPA Clean Air Scientific Advisory Committee
2006-2007	Sabbatical: Exposure Modeling Advisor, National Exposure Research Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC
2006	President, Society for Risk Analysis

Publications (selected 30 of 120 journal papers)

1. Che, W., H.C. Frey, Z. Li, X. Lao, A.K.H. Lau, "Indoor Exposure to Ambient Particles and Its Estimation Using Fixed Site Monitors," *Environmental Science and Technology*, published 11/6/18 as Just Accepted" paper. DOI: 10.1021/acs.est.8b04474.
2. Tanvir, S., H.C. Frey, and N.M. Roupail, "Effect of Light Duty Vehicle Performance on a Driving Style Metric," *Transportation Research Record*, published online September 7, 2018 (in press).
<http://journals.sagepub.com/doi/abs/10.1177/0361198118796070>
3. Frey, H.C., "2018 Critical Review: Trends in Onroad Transportation Energy and Emissions," *Journal of the Air & Waste Management Association*, 68(6):514-563 (2018). DOI: 10.1080/10962247.2018.1454357. 50 pages
4. Kumar, P., A. P. Patton, J. L. Durant, H. C. Frey, "A review of factors governing exposure to PM_{2.5}, ultrafine particles and black carbon in Asian transport microenvironments," *Atmospheric Environment*, 187:301-316 (2018).
5. Kumar, P., I. Rivas, A.P. Singh, V.J. Ganesh, M. Ananya, H.C. Frey, "Dynamics of Coarse and Fine Particles Exposure in Transport Microenvironments," *npj Climate and Atmospheric Science*, June 3, 2018, published online at: doi:10.1038/s41612-018-0023-y
6. Delavarrafiee, M., and H.C. Frey, "Real-World Fuel Use and Gaseous Emission Rates for Flex Fuel Vehicles Operated on E85 versus Gasoline," *J. Air & Waste Management Association*, 68(3):235-254 (March 2018).
7. Khan, T., and H.C. Frey, "Comparison of Real-world Versus

- Certification Emission Rates for Light Duty Gasoline Vehicles," *Science of the Total Environment*, 622-623:790-800 (2018).
8. Li, Z., W. Che, H.C. Frey, A.K.H. Lau, "Factors Affecting Variability in PM_{2.5} Exposure Concentrations in a Metro System," *Environmental Research*, 160C:20-26 (2018).
 9. Frey, H.C., M. Delavarrafiee, and S. Singh, "Real-World Freeway and Ramp Activity and Emissions for Light Duty Gasoline Vehicles," *Transportation Research Record*, 2627:17-25 (2017).
<https://doi.org/10.3141/2627-03>.
 10. Li, Z., W. Che, H.C. Frey, A.K.H. Lau, "Characterization of PM_{2.5} Exposure Concentration in Transport Microenvironments Using Portable Air Monitors," *Environmental Pollution*, 228:433-442 (2017).
 11. Graver, B.M., H.C. Frey, and J. Hu, "Effect of Biofuels on Real-World Emissions of Passenger Locomotives," *Environmental Science and Technology*, 50(21):12030-12039 (2016).
 12. Graver, B.M., and H.C. Frey, "Highway Vehicle Emissions Avoided by Diesel Passenger Rail Service Based on Real-World Data," *Urban Rail Transit*, 2(3-4):153-171 (2016).
 13. Che, W., H.C. Frey, and A.K.H. Lau, "Sequential Measurement of Intermodal Variability in Public Transportation PM_{2.5} and CO Exposure Concentrations," *Environmental Science and Technology*, 50(16):8760-8769 (2016).
 14. Hu, J., H.C. Frey, and S.S. Washburn, "Comparison of Vehicle-Specific Fuel Use and Emissions Models Based on Externally and Internally Observable Activity Data," *Transportation Research Record*, 2570:30-38 (2016).
 15. Khan, T., and H.C. Frey, "Evaluation of Light Duty Gasoline Vehicle Rated Fuel Economy Based on In-Use Measurements," *Transportation Research Record*, 2570:21-29 (2016).
 16. Sandhu, G.S., H.C. Frey, S. Bartelt-Hunt, and E. Jones, "Real-World Activity, Fuel Use, and Emissions of Diesel Side-Loader Refuse Trucks," *Atmospheric Environment*, 129:98-104 (March 2016).
 17. Liu, B., and H.C. Frey, "Variability in Light Duty Gasoline Vehicle

- Emission Factors from Trip-Based Real-World Measurements," *Environmental Science & Technology*, 49(20):12525-12534 (2015).
18. Che, W., H.C. Frey, and A.K.H. Lau, "Comparison of Sources of Variability in School Age Children Exposure to Ambient PM_{2.5}," *Environmental Science and Technology*, 2015, 49(3):1511–1520.
 19. Jiao, W., and H.C. Frey, "Comparison of Fine Particulate Matter and Carbon Monoxide Exposure Concentrations for Selected Transportation Modes," *Transportation Research Record*, 2428(2):54-62 (2014).
 20. Che, W., H.C. Frey, and A. Lau, "Assessment of the effect of population and diary sampling methods on estimation of school-age children exposure to fine particles," *Risk Analysis*, 34(12):2066-2079 (December 2014).
 21. Jiao, W., and H.C. Frey, "Method for Measuring the Ratio of In-Vehicle to Near-Vehicle Exposure Concentrations of Airborne Fine Particles," *Transportation Research Record*, 2341:34-42 (2013).
 22. Mannshardt, E., K. Sucic, W. Jiao, F. Dominici, H.C. Frey, B. Reich, and M. Fuentes, Comparing Exposure Metrics for the Effects of Fine Particulate Matter on Emergency Hospital Admissions, *Journal of Exposure Science and Environmental Epidemiology*, 23:627-636 (doi:10.1038/jes.2013.39). (2013).
 23. Jiao, W., H.C. Frey, and Y. Cao, "Assessment of Inter-Individual, Geographic, and Seasonal Variability in Estimated Human Exposure to Fine Particulate Matter." *Environmental Science and Technology*, 46(22):12519-12526 (2012).
 24. Chang, H.H., M. Fuentes, and H. C. Frey, "Time Series Analysis of Personal Exposure to Ambient Air Pollution and Mortality Using an Exposure Simulator," *Journal of Exposure Science and Environmental Epidemiology*, 22, 483-488 (2012).
 25. Cao, Y., and H.C. Frey, "Modeling of Human Exposure to In-Vehicle PM_{2.5} from Environmental Tobacco Smoke," *Human and Ecological Risk Assessment*, 18(3):608-626 (2012).
 26. Cao, Y., and H.C. Frey, "Geographic differences in inter-individual

- variability of human exposure to fine particulate matter," *Atmospheric Environment*, 45(32):5684-5691 (2011).
27. Liu, X., and H.C. Frey, "Modeling Of In-Vehicle Human Exposure to Ambient Fine Particulate Matter," *Atmospheric Environment*, 45(27):4745-4752 (2011).
28. Cao, Y., and H.C. Frey, "Assessment of Inter-Individual and Geographic Variability in Human Exposure to Fine Particulate Matter in Environmental Tobacco Smoke," *Risk Analysis*, 31(4):578-591 (2011).
29. Liu, X., H.C. Frey, and Y. Cao, "Estimation of In-Vehicle Concentration and Human Exposure for PM2.5 Based on Near Roadway Ambient Air Quality and Variability in Vehicle Operation," *Transportation Research Record*, No. 2158:105-112 (2010).
30. Ozkaynak, H., H.C. Frey, J. Burke, and R.W. Pinder, "Analysis of coupled model uncertainties in source to dose modeling of human exposures to ambient air pollution: a PM2.5 case-study," *Atmospheric Environment*, 43(9): 1641-1649 (March 2009).