

Howard H. Chang

- CONTACT INFORMATION** [Department of Biostatistics and Bioinformatics](#)
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howard.chang@emory.edu
- EDUCATION**
- 2009 Ph.D. in Biostatistics
 Johns Hopkins Bloomberg School of Public Health, Maryland, USA
 Primary advisor: Francesca Dominici; Co-advisor: Roger D. Peng
- 2004 B.Sc. in Statistics (Honours) and Microbiology & Immunology
 University of British Columbia, Vancouver, Canada
- PROFESSIONAL EXPERIENCE**
- 2011 - Present Assistant Professor
 Department of Biostatistics and Bioinformatics
 Emory University
- 2009 - 2011 SAMSI Postdoctoral Fellow
 Duke University and North Carolina State University
- HONORS**
- 2014 RSPH Biostatistics Departmental Teaching Award
 2014 3rd prize of *IJERPH* 2014 Best Paper Award
 2012 ENAR Poster Award
 2009 ENAR Distinguished Student Paper Award
 2004 UBC Stanley W. Nash Medal in Statistics
 2002 NSERC Undergraduate Summer Research Scholarship
- RESEARCH INTERESTS** Environmental statistics, spatial-temporal epidemiology, climate change, measurement error, and Bayesian methods.
- PUBLICATIONS**
1. Ward M, Dhingra R, Remais JV, **Chang HH**, Johnston LM, Jaykus LA, Leon J (2015+). Associations between weather and microbial contamination on fresh-produce prior to harvest. *Journal of Food Protection*.
 2. Gass K, Balachandran S, **Chang HH**, Russell AG, Strickland MJ (2014+). Ensemble-based source apportionment of fine particulate matter and emergency department visits for pediatric asthma. *American Journal of Epidemiology*.
 3. Reich BJ, **Chang HH**, Foley K (2014+). [A spectral method for spatial downscaling](#). *Biometrics*. DOI: 10.1111/biom.12196.
 4. Neelon B, **Chang HH**, Ling Q, Hastings SN (2014+). [Flexible space-time hurdle models for zero-inflated count data: exploring spatiotemporal trends in emergency department visits](#). *Statistical Methods in Medical Research* DOI: 10.1177/0962280214527079.
 5. Strickland MJ, Klein M, Flanders WD, **Chang HH**, JA Mulholland, PE Tolbert, LA Darrow (2014). [Associations between outdoor air pollutant concentrations and emergency department visits for pediatric asthma: stratification by potentially susceptible subpopulations](#). *Epidemiology*, 25, 902-909.

6. Dionisio KL, Baxter LK, **Chang HH** (2014). [An empirical assessment of exposure measurement error and effect attenuation in bipollutant epidemiologic models](#). *Environmental Health Perspectives*, 122, 1216-1224.
7. Lorenz A, Dhingra R, **Chang HH**, Bisanzio D, Liu Y, Remains JV (2014). [Inter-model comparison of the landscape determinants of vector-borne disease: implications for epidemiological and entomological risk modeling](#). *PLoS ONE*. DOI: 10.1371/journal.pone.0103163.
8. Pearce JL, Waller LA, **Chang HH**, Klein M, Mulholland JA, Sarnat JA, Sarnat SE, Strickland MJ, Tolbert PE (2014). [Using self-organizing maps to develop ambient air quality classifications: a time series example](#). *Environmental Health*. doi:10.1186/1476-069X-13-56.
9. **Chang HH**, Hu X, Liu Y (2014). [Calibrating MODIS aerosol optical depth for predicting daily PM_{2.5} concentrations via statistical downscaling](#). *Journal of Exposure Science and Environmental Epidemiology*, 24, 398-404.
10. Tian S, **Chang HH**, Wang C, Jiang J, Wang X, Niu J (2014). [Multi-TGDR, a multi-class regularization method, identifies the metabolic profiles of hepatocellular carcinoma and cirrhosis infected with hepatitis B or hepatitis C virus](#). *BMC Bioinformatics*, 15:97.
11. Reich BJ, **Chang HH**, Strickland MJ (2014). [Spatial health effects analysis with uncertain residential locations](#). *Statistical Methods in Medical Research*, 23:119-133.
12. Gass K, Klein M, **Chang HH**, Flanders WD, Strickland MJ (2014). [Classification and regression trees for epidemiologic research](#). *Environmental Health*, 12:17.
13. **Chang HH**, Hao H, Sarnat SE (2014). [A statistical modeling framework for projecting future ambient ozone and its health impact due to climate change](#). *Atmospheric Environment*, 89, 290-297.
14. Balachandran S, **Chang HH**, Pach JE, Holmes HA, Mulholland JA, Russell AG (2013). [Bayesian-based ensemble technique for source apportionment of PM_{2.5}](#). *Environmental Science & Technology*. 47, 13511-13518.
15. Dhingra R, Jimenez V, **Chang HH**, Gambhir M, Liu Y, Remais, JV (2013). [Spatially-explicit simulation modeling of ecological response to climate change: methodological considerations in predicting shifting population dynamics of infectious disease vectors](#). *International Journal of Geo-Information*. 2(3), 645-664.
16. Sarnat SE, Sarnat JA, Mulholland J, Isakov V, Ozkaynak H, **Chang HH**, Klein M, Tolbert PE (2013). [Application of alternative spatiotemporal metrics of ambient air pollution exposure in a time-series epidemiological study in Atlanta](#). *Journal of Exposure Science and Environmental Epidemiology*, 23, 593-605.
17. Sarnat JA, Sarnat SE, Flanders WD, **Chang HH**, Mulholland J, Baxter L, Isakov V, Ozkaynak H (2013). [Spatiotemporally-resolved air exchange rate as a modifier of acute air pollution-related morbidity in Atlanta](#). *Journal of Exposure Science and Environmental Epidemiology*. 23, 606-615.
18. **Chang HH**, Reich BJ, and Miranda ML (2013). [A spatial time-to-event approach for estimating associations between air pollution and preterm birth](#). *Journal of the Royal Statistical Society Series C*. 62(2), 167-179.
19. Miranda ML, Edwards SE, **Chang HH**, Auten R (2013). [Proximity to roadways and pregnancy outcomes](#). *Journal of Exposure Science and Environmental Epidemiology*. 23(1), 32-38.

20. Zhou J, **Chang HH**, Fuentes M (2012). [Estimating the health impacts of climate change with calibrated model output](#). *Journal of Agricultural, Biological, and Environmental Statistics*. 17(3), 377-394.
21. **Chang HH**, Fuentes M, and Frey HC (2012). [Time series analysis of personal exposure to ambient PM_{2.5} and mortality using an exposure simulator](#). *Journal of Exposure Science and Environmental Epidemiology*. 22(5), 483-488.
22. **Chang HH**, Reich BJ, and Miranda ML (2012). [Response to Dr. Zeger: Epidemiologic studies of the health associations of environmental exposures with preterm birth](#). *American Journal of Epidemiology*. 175(2): 111-112.
23. **Chang HH**, Reich BJ, and Miranda ML (2012). [Time-to-event analysis of fine particle air pollution and preterm birth: results from North Carolina, 2001-2005 \(with invited commentary\)](#). *American Journal of Epidemiology*. 175(2): 91-98.
24. **Chang HH**, Peng RD, and Dominici F (2011). [Estimating the acute health effects of coarse particulate matter accounting for exposure measurement error](#). *Biostatistics*. 12(4):637-653.
25. **Chang HH**, Zhou J, and Fuentes M (2010). [Impact of climate change on ambient ozone level and mortality in Southeastern United States](#). *International Journal of Environmental Research and Public Health*. 7(7):2866-2880.
26. Gallicchio L, **Chang HH**, Christo D, Huang H, Strickland P, Ruczinski I, Hoffman SC, and Helzlsouer K (2009). [Single nucleotide polymorphisms in obesity-related genes and all-cause and cause-specific mortality](#). *BMC Medical Genetics*. 10(1):103
27. Lieschen, QH, **Chang HH**, Blomquist JL, Okoh YK, and Handa HL (2009). [Scheduled cesarean delivery: maternal and neonatal risks in a community hospital setting](#). *American Journal of Perinatology*. 26(4): 271-277
28. Peng, RD, **Chang HH**, Bell ML, McDermott A, Zeger SL, Samet JM, and Dominici F (2008). [Coarse particulate matter and emergency hospital admissions for cardiovascular and respiratory diseases: results for 108 US counties, 1999-2005](#). *Journal of the American Medical Association* 299(18): 2172-9.
29. Handa VL, Cundiff G, **Chang HH**, Helzlsouer KJ (2008). [Female sexual function and pelvic floor disorders](#). *American Journal of Obstetrics and Gynecology* 111(5): 1045-52.
30. Gallicchio L, **Chang HH**, Christo D, Huang H, Strickland P, Ruczinski I, Hoffman SC, and Helzlsouer K (2008). [Single nucleotide polymorphisms in inflammation-related genes and mortality in a community-based cohort in Washington County, Maryland](#). *American Journal of Epidemiology* 167(7): 807-13.
31. **Chang H**, Fu A, Le ND, and Zidek, JV (2006). [Designing environmental monitoring networks to measure extremes](#). *Environmental and Ecological Statistics* 14(3): 201-21.
32. Sundin OH, Broman KW, **Chang HH**, Vito EC, Stark WJ, and Gottsch JD (2006). [A common locus for late-onset Fuchs corneal dystrophy maps to 18q21.2-q21.32](#). *Invest Ophthalmol Vis Sci* 47(9):3919-26.
33. Boyce KJ, **Chang H**, Kronstad JW (2005) [An *Ustilago maydis* septin is required for filamentous growth in culture and for full symptom development on maize](#). *Eukaryot Cell* 4(12):2044-56.

BOOK
CHAPTERS

1. Russell AG, Holmes H, Friberg M, Ivey C, Hu Y, Balachandran S, Mulholland J, Tolbert P, Sarnat J, Sarnat S, Strickland M, **Chang HH**, Liu Y (2014). [Use of Air Quality Modeling Results in Health Effects Research](#). *Air Pollution Modeling and its Application XXIII*. Springer.
2. Holmes HA, Zhai X, Redman J, Digby K, Ivey C, Balachandran S, Sororian SA, Friberg M, Zhang W, Maier ML, Hu Y, Russell AG, Mulholland JA, **Chang HH** (2014). [Improved Spatiotemporal Source-Based Air Pollutant Mixture Characterization for Health Studies](#). *Air Pollution Modeling and its Application XXIII*. Springer.

PRESENTATIONS
(INVITED)

A distributed exposure time-to-event model for estimating associations between air pollution and preterm birth. ENAR, 2014, Baltimore MD.

Time series analysis of air pollution and health accounting for spatial exposure uncertainty. JSM, 2013, Montreal, QC, Canada.

Time series analysis of air pollution and health accounting for spatial exposure uncertainty. ENAR, 2013, Orlando, FL.

Spatial exposure uncertainties in air pollution and health studies. Spatial Statistics Conference, 2012, Miami, FL.

Time series analysis of personal exposure to ambient PM_{2.5} and mortality using an exposure simulator. GeoMedical Systems International Conference, 2011, Victoria, BC, Canada.

Challenges in exposure estimation for studies of air pollution and health. Department of Epidemiology and Biostatistics, Drexel University, March 2011. Philadelphia, PA.

Challenges in exposure estimation for studies of air pollution and health. Public Health Program, Brown University, March 2011. Providence, RI.

Time-to-event analysis of preterm birth and fine particulate matter. Department of Preventive Medicine, Keck School of Medicine, University of Southern California. February, 2011. Los Angeles CA.

Challenges in exposure estimation for studies of air pollution and health. Department of Biostatistics, Emory University, February, 2011. Atlanta GA.

Impact of climate change on ambient ozone level and mortality in Southeastern United States. SAMSI Spatial Program Transition Workshop, Oct 2010. Durham, NC

Time-to-event analysis of preterm birth and fine particulate matter. Summer Research Conference, Southern Regional Council on Statistics, June 2010. Virginia Beach VA.

Impact of climate change on ambient ozone level and mortality in Southeastern United States. SAMSI Workshop on Statistical Aspects of Environmental Risk, April, 2010. Research Triangle Park, NC

Statistical methods for estimating the health effects of coarse particulate matter. Department of Preventive Medicine, Keck School of Medicine, University of Southern California. March, 2009. Los Angeles CA.

PRESENTATIONS *Time series analysis of personal exposure to ambient PM_{2.5} and mortality using an exposure simulator.* International Society for Environmental Epidemiology Annual Conference, (PEER-REVIEWED) 2012, Columbia, South Carolina, 2012.

Fine particle air pollution and preterm birth: results from North Carolina, 2001-2005. Congress of Epidemiology, 2011, Montreal, QC, Canada.

TEACHING *Thesis Advisees*

Brooke Hixson	Ph.D. Biostatistics (2011-present)
Bruce Ling	Ph.D. Biostatistics, 2014

Anran Liu	MSPH Biostatistics (current)
Tong Wang	MPH Biostatistics (current)
Yuqi Sun	MPH Biostatistics (current)
Marcy Shaeffer	MPH Biostatistics (current)
Chenyin Liu	MPH Biostatistics (current)
Qunna Li	MSPH Biostatistics, 2014
Erin Hulland	MPH Biostatistics, 2014
Meilin Huang	MSPH Biostatistics, 2013

Committee Member/Thesis Reader

Cassandra O'Lenick	Ph.D. Environmental Health
Heather Strosnider	Ph.D. Environmental Health
Dongni Ye	Ph.D. Environmental Health
Cesunica Ivey	Ph.D. Environmental Engineering (GA Tech)
Qian An	Ph.D. Biostatistics, 2014
Pallavi Mishra	Ph.D. Biostatistics, 2014
Yize Zhou	Ph.D. Biostatistics, 2014
Katherine Gass	Ph.D. Epidemiology, 2014

Chang Liu	MPH Biostatistics, 2014
Jie Chen	MPH Biostatistics, 2013
Hua Hao	MPH Epidemiology, 2013

Kathy Qu	BS Applied Mathematics Honors, 2014
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Course Instructor (class size)

Emory	2012-13	BIOS 526	Modern Regression Analysis (16)
	2013-14	BIOS 526	Modern Regression Analysis (20)
		BIOS 560R	Applied Bayesian Analysis (24)
	2013-14	BIOS 526	Modern Regression Analysis (30)
		BIOS 760R	Advanced Spatial Statistics (9)
Duke	2010-11	STAT 103	Probability and Statistical Inference (125)

Guest Lectures/Mentoring

2014	SAMSI	Industrial Math/Stat Modeling Workshop
2013	SAMSI	Industrial Math/Stat Modeling Workshop
2010	SAMSI	Undergraduate Modeling Workshop
2009	SAMSI	Two-day Undergraduate Workshop
	SAMSI	Spatial Epidemiology (6 lectures on times series analysis)

PROFESSIONAL SERVICES *Journal Referee*

American Journal of Epidemiology (11)
 Annals of Applied Statistics
 Annals of Epidemiology
 Atmospheric Environment (4)
 Biometrics
 Biostatistics (3)
 Climate Research
 Computational Statistics & Data Analysis
 Environmental and Ecological Statistics (2)
 Environmental Health Perspectives (6)
 Environmental Research (3)
 Environmental Health (3)
 Environment International
 Environmental Science & Technology (7)
 Environmetrics (2)
 Epidemiology (3)
 Geographical Analysis
 International Journal of Environmental Research and Public Health
 Journal of the American Statistical Association
 Journal of Agricultural, Biological, and Environmental Statistics (4)
 Journal of Exposure Science and Environmental Epidemiology (5)
 Journal of the Royal Statistical Society - Series A
 New England Journal of Medicine
 PLoS ONE (3)
 Spatial and Spatial-temporal Epidemiology (7)
 Statistics in Medicine (5)

Ad hoc Grant Reviewer

- NIH Neurological, Aging and Musculoskeletal Epidemiology (NAME) Study Section, June 2013.
- Israel Science Foundation, February 2014.
- University of Mississippi Medical Center, Intramural Research Support Program, March 2014.
- NIH Infectious, Reproductive, Asthma and Pulmonary Conditions (IRAP) Study Section, June 2014.

Panel/Committee Member

- Panelist, Expert Consultation to Evaluate Statistical Approaches for Use in Multi-pollutant Analysis, US Environmental Protection Agency, April 2012
- Member, External Scientific Advisory Committee, Electric Power Research Institute. Project: Development of a Medicare Cohort Dataset for Use in Air Pollution Epidemiology.

ACADEMIC SERVICES

University

2013 - Emory Graduate Diversity Fellowship committee

Departmental

2012 - PhD admission committee
 2013 - Recruitment committee
 2014 - Diversity committee

PROFESSIONAL MEMBERSHIPS International Biometric Society (ENAR), American Statistical Association, Society for Epidemiologic Research

GRANT SUPPORT

Current as PI

2014-2016 Statistical Methods for Exposure Uncertainty in Air Pollution and Health Study
 Source: NIEHS (R21 ES022795)
 PI: H Chang.

Current as Co-Investigator or Biostatistician

2011-2005 EPA Clear Air Research Center
 Source: US EPA R834799
 PI: P Tolbert. 25% Effort.

2013-2015 Climate Change and Heat-Related Morbidity Among Vulnerable Populations in Atlanta
 Source: NIH NIEHS ES023763.
 PI: S Sarnat. 15% Effort.

2014-2019 Analytical methods for estimating the joint climatological-social drives of water quality and supply in contracting tropical zones: Ecuador and China
 Source: NSF
 PI: J Remais. 10% Effort

2014-2015 Orissa trial - assessing the effect of improved rural sanitation on diarrhoea quality and supply in contracting tropical zones: Ecuador and China
 PI: T Clasen. 10% Effort

2012-2016 Spatial and Temporal Modeling of PM_{2.5} and Infant Morbidity
 Source: University of California, Irvine (Subcontract) 5R01ES019897.
 PI: M Strickland. 5% Effort.

2012-2016 Environmental Approaches to Prevention
 Pacific Institute for Research and Evaluation (Subcontract).
 PI: L Waller. 8% Effort.

2012-2014 Monitoring and Evaluation framework of the Dubai Cares' WASH in School Initiative
 Source: Dubai Cares.
 PI: M Freeman. 5% Effort.

2014-2016 Dorm Room Inhalation to Vehicle Emissions (DRIVE) Study
 Source: Health Effects Institute
 PI: J Sarnat. 5% Effort.

Completed

2013-2015 The Influence of Environmental Change on Parasite Diffusion through Human, Invertebrate and Environmental Pathways

Source: University of California, Berkeley (Subcontract).
PI: J Remais

2009-2012 Enhancing Environmental Public Health Tracking with Satellite Driven
Particle Exposure Modeling and Epidemiology.
Source: NASA
PI: Y Liu.