

Adam A. Szpiro

Department of Biostatistics
University of Washington
Seattle, WA 98195

office phone: 206-616-2766
adam_szpiro@yahoo.com
<http://www.adamszpiro.com>

PROFILE

Statistician and mathematician with established record of accomplishment in applied and theoretical research, interdisciplinary collaboration, and scientific consulting.

- *Current position:* **Assistant Professor of Biostatistics at University of Washington** conducting methodological research in spatio-temporal modeling, measurement error correction, and Bayesian model robust regression and collaborating on projects in epidemiology, environmental science, and medicine.
- *Prior professional experience:* **Seven years as member of the technical staff at MIT Lincoln Laboratory** leading mathematical modeling and policy-related scientific consulting on a variety of problems in tactical air defense, homeland security, and bioterrorism defense for customers in senior government leadership.

EDUCATION

Brown University

Ph.D. in Applied Mathematics (advisor Paul Dupuis)
Sc.M. in Applied Mathematics

Providence, RI
May 1999
May 1994

University of California at San Diego

B.A. in Mathematics (summa cum laude)

La Jolla, CA
June 1993

POSITIONS

Department of Biostatistics, University of Washington

Assistant Professor
Senior Research Fellow

Seattle, WA
September 2009 – present
September 2006 – September 2009

- *Statistical Methods for Epidemiology*
 - Developed spatio-temporal model to predict individual air pollution exposures for subjects in MESA Air, a major cohort study on the relationship between air pollution and cardiovascular disease.
 - Designed methodology to correct for exposure measurement error in environmental epidemiology and other association studies where the exposures are estimated using a statistical model.
- *Methods for Model-Robust Regression*
 - Developed new Bayesian framework for model-robust regression that is analogous to estimating equations and has the same robustness properties as the 'sandwich' estimator.

- *Collaborative Research in Public Health and Medicine*
 - Collaborated on studies in environmental health and clinical medicine: confounding of air pollution exposure by noise pollution; cardiovascular health effects of traffic exposure; air pollution exposure assessment in diesel buses; physics based plume modeling; efficacy of vitamin D supplementation for kidney transplant patients.
- *Continuing Education in Biostatistics*
 - Audited core Biostatistics methods courses including generalized linear models, correlated data analysis, and categorical data analysis.

**Lincoln Laboratory, Massachusetts Institute of Technology
Bioterrorism and Tactical Air Defense Groups**

Research Staff

Lexington, MA
June 1999 – August 2006

- *Management*
 - Managed projects in biological detection technology, population health surveillance, and air defense modeling.
 - Supervised activities of doctoral level and junior staff members on research and analysis assignments.
 - Interacted with senior government officials up to four-star general to communicate project status and results and to plan future activities.
 - Negotiated contracts with outside organizations that provided specialized services in human factors, survey techniques, and specific sensor technologies.
- *Research and Development*
 - Initiated development of a model for epidemic progression and public health response and directed ongoing model enhancements and applications to bio-defense analyses.
 - Designed techniques for applying syndromic surveillance to post-detection attack characterization.
 - Led successful effort to discriminate between biological and non-biological materials using a machine-learning approach to GC-MS measurements.
 - Developed mathematical model based on physics and available measurements to describe all phases of engagement by a planned U.S. directed energy weapon system.
 - Authored tactical air defense command and control simulation and managed implementation by a team of software engineers.
- *Government Studies*
 - Delivered technology requirements for urban biodefense to the Science and Technology office in the Department of Homeland Security. Conclusions impacted policy making in outdoor aerosol monitoring, LIDAR employment, and public health surveillance.
 - Led six month study of future air defense threats to U.S. military aircraft. Tasking from the Director of Defense Research and Engineering and the Undersecretary of Defense for Intelligence. Final briefing praised by the Deputy Undersecretary of Defense for Intelligence as "the best technical analysis I've seen in years."
 - Directed system analysis team as part of a multi-year investigation of potential countermeasures to a planned U.S. directed energy weapon. Briefed findings to

senior government leadership and responded to specific analysis requests from the Chief of Staff of the Air Force.

Division of Applied Mathematics, Brown University

Graduate Fellow and Research Assistant

Providence, RI

September 1993 – May 1999

- *Stochastic Processes in Numerical Analysis*
 - Thesis: "Asymptotic Analysis and High Order Markov Chain Based Numerical Methods for Optimal Control Problems and Related Hamilton-Jacobi Partial Differential Equations" (advisor Paul Dupuis)

VISITING POSITIONS

- Visiting scholar in Mathematical Statistics at the Center for Mathematical Sciences, Lund University, Sweden, May 2008

PUBLICATIONS

JOURNAL ARTICLES

- **Szpiro A**, Sampson PD, Sheppard L, Lumley T, Adar SD, Kaufman JD. Predicting intra-urban variation in air pollution concentrations with complex spatio-temporal dependencies. *Environmetrics*, In Press, DOI: 10.1002/env.1014, 2009
- Van Hee V, Adar SD, **Szpiro A**, Barr RG, Bluemke DA, Diez Roux A, Gill E, Sheppard L, Kaufman J. Exposure to traffic and left ventricular mass and function: The multi-ethnic study of atherosclerosis. *American Journal of Respiratory and Critical Care Medicine*, Vol 179 (9), 827-834, 2009
- Adar SD, Davey M, Sullivan J, Compher M, **Szpiro A**, Liu L.-J. Predicting airborne particle levels aboard Washington state school buses. *Atmospheric Environment*, Vol 42 (23), 7590-7599, 2008
- **Szpiro A** and Dupuis P. Second order numerical methods for first order Hamilton-Jacobi equations. *SIAM Journal on Numerical Analysis*, Vol 40 (3), 1136-1183, 2002
- Dupuis P and **Szpiro A***. Convergence of the optimal feedback policies in a numerical method for a class of deterministic optimal control problems. *SIAM Journal on Control and Optimization*, Vol 40 (2), 393-420, 2001 (*author order alphabetical, Szpiro primary author)
- Lenhart S, Protopopescu V, and **Szpiro A**. Optimal control for competing coalitions, *Nonlinear Analysis: Theory, Methods, and Applications*, Vol 28 (8), 1411-1428, 1997
- **Szpiro A** and Protopopescu V. Parabolic systems with competitive interactions and control on initial conditions. *Applied Mathematics and Computation*, Vol 59 (2-3), 215-245, 1993

PREPRINTS

- **Szpiro A**, Sheppard L, and Lumley T. Efficient measurement error correction with spatially misaligned data. Berkeley Electronic Press, University of Washington Biostatistics Working Paper Series, No. 350, 2009
- **Szpiro A**, Rice K, and Lumley T. Model-robust regression and a Bayesian 'sandwich' estimator. Berkeley Electronic Press, University of Washington Biostatistics Working Paper Series, No. 338, 2008 (*under invited revision*)
- Rice K, Lumley T, and **Szpiro A**. Trading bias for precision: Decision theory for intervals and sets. Berkeley Electronic Press, University of Washington Biostatistics Working Paper Series, No. 336, 2008

PUBLISHED ABSTRACTS AND PROCEEDINGS

- **Szpiro A**, Sampson PD, Sheppard L, Wilton D, Larson T, Lumley T, Adar SD, Kaufman JD. Spatio-temporal modeling to predict intra-urban variation in air pollution levels. Presented at the 20th Conference of the International Society for Environmental Epidemiology. *Epidemiology*, Vol 19 (6 supplement), S322, 2008
- Wilton D, Larson T, Gould T, **Szpiro A**. Including Caline3 dispersion model predictions into a land use regression model for NO_x in Los Angeles, California and Seattle, Washington. Presented at the 20th Conference of the International Society for Environmental Epidemiology. *Epidemiology*, Vol 19 (6 supplement), S273, 2008
- Van Hee V, Adar SD, **Szpiro A**, Barr RG, Diez Roux A, Bluemke DA, Sheppard L, Gill EA, Bahrami H, Wassel-Fyr C, Sale MM, Mychaleckyj JC, Rich SS, Rotter JI, Kaufman J. Genetic polymorphisms, proximity to traffic, and left ventricular mass: The multi-ethnic study of atherosclerosis and air pollution. Presented at the 20th Conference of the International Society for Environmental Epidemiology. *Epidemiology*, Vol 19 (6 supplement), S133, 2008
- Pesenson A, Leca N, **Szpiro A**, Kendrick E, and Davis C. Effect of ergocalciferol therapy in kidney transplant recipients. Open communication at the American Society of Nephrology Renal Week 2007. *Journal of the American Society of Nephrology*, Vol 18 (supplement), 31A, 2007
- Pesenson A, Kendrick E, **Szpiro A**, and Davis C. Attitude and knowledge of living kidney donors after transplantation. Poster at the American Society of Nephrology Renal Week 2007. *Journal of the American Society of Nephrology*, Vol 18 (supplement), 671A, 2007
- Van Hee V, Adar SD, **Szpiro A**, Diez-Roux A, Barr RG, and Kaufman J. Proximity to major roadways and left ventricular mass and function in a multi-ethnic cohort. Presented at the 19th Conference of the International Society of Environmental Epidemiology Conference. *Epidemiology*, Vol 18 (5 supplement), S154, 2007
- **Szpiro A** and Buckeridge D. Beyond detection: attack characterization with syndromic surveillance and clinical data. Presented at the 4th Annual Syndromic Surveillance Conference. *Advances in Disease Surveillance*, Vol 1, 67, 2006

- Dupuis P and **Szpiro A**. Convergence of numerical optimal feedback policies for deterministic optimal control problems. Proceedings of the 41st IEEE Conference on Decision and Control, Vol 3, 3138-3143, 2002

OTHER PUBLICATIONS

- **Szpiro A**, Johnson B, and Buckeridge D. Health surveillance and diagnosis for mitigating a bioterror attack. MIT Lincoln Laboratory Journal, Vol 17 (1), 101-113, 2007
- **Szpiro A**, Sheppard L, Sampson P, and Kim SY. Validating national kriging exposure estimation. Letter in Environmental Health Perspectives, Vol 155 (7), A338, 2007
- Rudzinski C, Herzig-Marx R, Lin J, **Szpiro A**, and Johnson B. Pathogen detection using headspace analysis. Proceedings of the Scientific Conference on Chemical and Biological Defense Research, 2004

TECHNICAL REPORTS

- **Szpiro A** and Jamrog D. Bio-aerosol defense architecture analysis. MIT Lincoln Laboratory Report, 2006
- Jamrog D and **Szpiro A**. A smallpox and inhalation anthrax model implemented using ordinary differential equations. MIT Lincoln Laboratory Technical Report, 2006
- **Szpiro A**. Impact of a technical countermeasure on directed energy weapon system performance. MIT Lincoln Laboratory Report, 2003
- **Szpiro A**. Impact of a tactical countermeasure on directed energy weapon system performance. MIT Lincoln Laboratory Report, 2001

PRESENTATIONS

CONFERENCE PRESENTATIONS

- **Szpiro A**, Sheppard L, and Lumley T. Accounting for exposure measurement error in environmental epidemiology. Presented at the International Environmetrics Society Meeting, 2009 (*invited*)
- Sampson PD, **Szpiro A**, Sheppard L, and Lindstrom J. Spatial regression modeling with nonstationary spatial covariance structure for air quality exposure from complex spatio-temporal monitoring and GIS-based covariates. Presented at the International Environmetrics Society Meeting, 2009 (*invited*)
- **Szpiro A**, Sampson PD, Sheppard L, Wilton D, Larson T, Lumley T, and Adar SD. Spatio-temporal modeling of intra-urban variations in air pollution concentrations. Presented at the Joint Statistical Meetings, 2008

- **Szpiro A**, Rice K, and Lumley T. Model-robust Bayesian regression and the 'sandwich' estimator. Presented at the Western North American Regional Meeting of the International Biometrics Society, 2008 (*invited*)
- Sampson PD, **Szpiro A**, and Sheppard L. Spatial scales and spatial regression models of air quality exposure from complex spatio-temporal monitoring and GIS-based land use covariates. Presented at the International Environmetrics Society Meeting, 2008 (*invited*)
- Adar SD, **Szpiro A**, Davies H, and Allen R. Predicting spatial variation in community noise levels. Presented at International Society of Exposure Analysis Conference, 2007 (*peer reviewed*)
- **Szpiro A**, Sampson P, Sheppard L, Lumley L, and Adar SD. Challenges in predicting intra-urban variation in pollution levels using data from a complex spatio-temporal monitoring design. Presented at The International Environmetrics Society North America Regional Meeting, 2007 (*peer reviewed*)
- Jamrog D and **Szpiro A**. Disease modeling to assess outbreak detection and response. Presented at the SIAM Annual Meeting, 2006
- Jamrog D and **Szpiro A**. Disease modeling to assess outbreak detection and response. Presented at the SIAM Life Sciences Meeting, 2006
- **Szpiro A**. Efficient Markov chain based numerical methods for Hamilton-Jacobi PDEs. Presented at the SIAM Annual Meeting, 2004 (*invited*)

POSTER PRESENTATIONS

- Pesenson A, Leca N, **Szpiro A**, Kendrick E, and Davis C. Vitamin D supplementation with ergocalciferol in renal transplantation. Presented at the American Transplant Congress, 2007 (*peer reviewed*)
- Rudzinski C, **Szpiro A**, Herzig-Marx R, and Lin J. Headspace monitoring: the collection and classification of volatile compound signatures. Presented at the 17th Sanibel Conference on Mass Spectrometry, 2005

INVITED SEMINARS

- Faculty Interests Seminar, Department of Biostatistics, University of Washington. September 2009
- Department of Biostatistics, University of Washington. February 2009
- Department of Preventive Medicine, University of Southern California. February 2009
- Department of Statistics, Columbia University. October 2008
- Department of Atmospheric Environment, National Environmental Research Institute, University of Aarhus, Denmark. May 2008

- Center for Mathematical Statistics, Department of Mathematics, Lund University, Sweden. May 2008
- Department of Environmental Health Sciences, Columbia University. May 2008
- Joint Environmental Statistics and Exposure, Epidemiology and Risk Program Seminar, Department of Biostatistics, Harvard University. April 2008
- Biostatistics and Biomathematics Seminar, Fred Hutchinson Cancer Research Center. April 2008
- Faculty Interests Seminar, Department of Biostatistics, University of Washington. September 2007
- Probability and Random Systems Seminar, Department of Mathematics, University of North Carolina. February 1999

PROFESSIONAL ACTIVITIES

- *Referee for journals*
 - Annals of Applied Statistics
 - Health Services Research
 - Journal of the Royal Statistical Society, Series C
 - Environmetrics
 - International Society of Disease Surveillance
 - Environmental Research
 - Statistics in Medicine
 - Environmental Health Perspectives
- *Session organizer*
 - "Connections Between Bayesian and Frequentist Methods" at WNAR 2008
- *Memberships*
 - American Statistical Association
 - International Society for Environmental Epidemiology

TEACHING

- *Delivered guest lectures on "Interfacing C from R" and "Confidence Intervals and Testing"*
 - Special Topics in R, Department of Biostatistics, University of Washington, 2007/08
- *Delivered guest lecture on "Biological Terrorism and Defense"*
 - Graduate Student Colloquium, Department of Electrical Engineering, University of California at Irvine, 2005
- *Supervised Masters of Engineering Thesis*

- Cory McLean, "Epidemic Modeling Techniques for Smallpox", Massachusetts Institute of Technology, 2004
- *Designed and co-taught seminar in "History of Mathematics"*
 - Department of Mathematics, University of California at San Diego, 1991
- *Taught course sections as Teaching Assistant*
 - Methods of Applied Mathematics, Division of Applied Mathematics, Brown University, 1995
 - Calculus and Pre-Calculus, Department of Mathematics, University of California at San Diego, 1990

CONSULTING

Black Hills Center for American Indian Health

Consulting Statistician

Rapid City, SD
May 2007 – October 2007

- *South Dakota Air Pollution Study*
 - Served as the principal statistician for a study that examines the relationship between daily cases of cardiovascular and respiratory illness and time varying exposure to particulate air pollution in Rapid City and the surrounding Black Hills region.

Lincoln Laboratory, Massachusetts Institute of Technology

Consulting Scientist

Lexington, MA
September 2006 – April 2007

- *Medical Surveillance and Bioterrorism*
 - Authored an article for the MIT Lincoln Laboratory Journal integrating results from several studies of the role of medical and population health surveillance for mitigating the effects of a bioterrorism attack.

Gilbane Properties

Consulting Statistician

Providence, RI
February 1996 – October 1996

- *Retail Expansion Strategy Study*
 - Analyzed data from customer surveys and transaction records for national retail chains to determine trends based on spatial population covariates. Integrated results into Gilbane Properties report on options for locating new stores and expanding into additional metropolitan markets.

AWARDS AND HONORS

- Team Award, Directed Energy Countermeasure Assessment, MIT Lincoln Laboratory, 2006
- Dafermos Prize for Best Dissertation in Applied Mathematics, Brown University, 1999
- Wonderlic Dissertation Fellowship, Brown University, 1998

- Sigma Xi Award for Excellence in Research, Brown University, 1998
- National Science Foundation Graduate Fellowship, 1993
- National Defense Science and Engineering Graduate Fellowship, 1993 (declined)
- Summa Cum Laude, University of California at San Diego, 1993
- Co-Valedictorian, University of California at San Diego, Revelle College, 1993
- Mathematics Prize at Graduation, University of California at San Diego, Revelle College, 1993
- Goldwater Scholarship, University of California at San Diego, 1992
- Phi Beta Kappa, University of California at San Diego, 1992