Bruce J. Swihart

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Professional Statement and Research Interests

I am a postdoctoral fellow in Biostatistics at the Johns Hopkins Bloomberg School of Public Health. Currently, I am working in the area of **functional data analysis** with applications to **high-dimensional, structurally complex datasets** in **Cancer, HIV, Sleep Epidemiology, and Stroke Kinematics.** Recently, I led a Kaggle team to a top 1% finish in the Heritage Health Prize, a two-year competition involving **big healthcare data, machine learning, and prediction.** Professionally, I strive for breadth and depth, working with a variety of collaborators in their fields to a level of not only statistical support, but also scientific contribution. My research interests include: **big data, categorical data, functional data, longitudinal data, hidden Markov models, marginal models, mixed effect models, survival analysis, machine learning, prediction,** and **visualization.**

Expertise

Machine Learning and **Prediction** with **Big Healthcare Data**
- 2 years experience predicting Days In Hospital from previous year's insurance claims
- Orchestrated top 1% finish of 1358 teams in Kaggle-hosted Heritage Health Prize Competition

Recurrent Event, Competing Risks, Multistate Survival Analysis with **Big Data**
- 8 years experience modeling the sleep hypnogram in epidemiological studies
- 3 months experience modeling accelerometry data classified into activity states

Marginalized, Conditional, & Bridged Mixed Effects Models for **Correlated Binary Data**
- 4 years experience proving connection to copulas, developing conceptual framework, and advancing new models which have simultaneous interpretations for population and subject-specific binary outcomes

Education

Johns Hopkins Bloomberg School of Public Health:
- Postdoctoral Fellowship in Biostatistics advised by **Ciprian Crainiceanu**, 2014
- PhD in Biostatistics advised by **Brian Caffo**, 2011
- Thesis: *From Individuals to Populations: Application and Insights Concerning the Generalized Linear Mixed Model*

University of Colorado at Denver and Health Sciences Center Graduate:
- Master of Science in Biometrics/Biostatistics, 2006
- Thesis: *Characterizing Sleep Structure Using the Hypnogram*

University of Colorado at Boulder Graduate:
- Bachelor of Science in Applied Mathematics with Distinction, 2004

Relevant work/research experience

2011 – Present	Postdoctoral Fellow
	▪ PhD-level biostatistician in functional data analysis working with Ciprian Crainiceanu, PhD
2009	Google, Summer Intern
	▪ Statistical Analyst working on Human Evaluation of Ads / Rater Performance with Pete Meyer, PhD
2005-2009	Johns Hopkins University
	▪ Statistical Analyst working on Sleep Heart Health Study with Naresh Punjabi, MD/PhD
	▪ Statistical Analyst working on Kidney Transplantation Policy with Dorry Segev, MD
2006-2009	Western Slope Sleep Center: Sleep Lab Altitude Study
	▪ Statistical Analyst working with D. Patz, MD
2006	National Jewish Research Center
	▪ Statistical Programmer working on monotone nonparametric regression with Matt Strand, PhD
1999-2006	Mathematics Tutor
2001-2004	The Retina Center
	▪ Employed by Ophthalmologist William Waterhouse, MD
	▪ Patient History Research, Article Retrieval, Creating Digital Slide Library
2002-2003	SimAuthor, Inc.
	▪ Data Analyst for desktop flight simulator product
2002	Mesa State College
	▪ Mathematics Researcher in digital de-blurring techniques
2000	National Oceanic and Atmospheric Administration (Dept. of Commerce)
	▪ Funded by competitive Summer Undergraduate Research Experience Grant
	▪ Weather modeling with Matlab

Relevant teaching experience (Johns Hopkins Biostatistics Department)

140.656	Multi-Level Modeling	Teaching Assistant	2009-2011
140.655	Longitudinal Data Analysis	Teaching Assistant	2009-2011
140.633	Medical Product Regulation	Teaching Assistant	2010
140.611-2	Statistical Reasoning I/II	Teaching Assistant	2010
280.345	Biostatistics in Public Health	Teaching Assistant	2009
140.613-4	Data Analysis Workshop I/II	Teaching Assistant	2007-2009
140.751-4	Advanced Biostatistics	Teaching Assistant	2007-2008
	Computing Club	Co-President	2007-2008

Technical skills

Statistics: R, WinBUGS, Matlab, SAS, STATA, bayesX
Document preparation: LaTeX (via emacs, winEdt, TexShop), Microsoft Office

Honors and positions held

Helen Abbey Award	2011
June B. Culley Award	2009
Student-Faculty Liaison, JHSPH Dept. of Biostatistics	2008-2009
Thomas I. and Louis D. Dublin Award	2008
Best Biostatistics Poster, Delta Omega Poster Competition	2008
2nd Overall, Applied Research section, Delta Omega Poster Competition	2008
Honorary membership to American Public Health Association (APHA)	2008
United States Institute of Peace Conflict Resolution Workshop Participant	2008
Mason F. Lord Lecture and Poster Competition, 2nd Place	2007
NSF Graduate Research Fellowship Honorable Mention	2006
UCDHSC Biostatistics Marvin Porter Outstanding Student Award	2006
UCDHSC Graduate Fellowship Grant Recipient	2005
Student-Faculty Liaison UCDHSC, Dept. of Biostatistics	2004-2005
Student Service Award, Dept. of Preventive Medicine and Biometrics	2004-2005
Dean's List, University of Colorado, 8 semesters	2000-2004
Honorary Officer, Society for Industrial and Applied Mathematicians	2000-2004
Greatest Contribution, Spring, Alpha Gamma Omega, Univeristy of Colorado	2004
Engineering Excellence Fund Trustee (managed annual $1.1 million budget)	2002-2004
Student Gov. Rep. at Large, Univeristy of Colorado Engineering Council	2002
3rd Highest Score in State of Colorado on Putnam Examination	2000
Eugene Carroll Scholarship Recipient (merit-based)	2000-2004
Boettcher Scholar (merit-based full tuition undergraduate scholarship)	2000

Publications

1. **Swihart B**, Goldsmith J, Crainiceanu C (2013, To appear). Restricted likelihood ratio tests for functional effects in the functional linear model. Technometrics. (Draft at http://biostats.bepress.com/jhubiostat/paper247.)

2. **Swihart B**, Caffo B, Crainiceanu C (2013, To appear). A unifying framework for marginalized random intercept models of correlated binary outcomes. International Statistical Review. (Draft at http://www.bepress.com/jhubiostat/paper213.)

3. Griswold M, **Swihart B**, Caffo B, Zeger S (2013). Practical marginalized multilevel models. Stat, 2: 129-142. Doi: 10.1002/sta4.22

4. Langrock R, **Swihart B**, Caffo B, Crainiceanu C, Punjabi N (2013). Combining hidden Markov models for comparing the dynamics of multiple sleep electroencephalograms. Statistics in Medicine, 32: 3342-3356. Doi:10.1002/sim5747

5. **Swihart B**, Punjabi N, Crainiceanu C (2013, Submitted). Modeling sleep fragmentation in populations of sleep hypnograms. Computational Statistics and Data Analysis.

6. **Swihart B**, Goldsmith J, Crainiceanu C (2013, Submitted). Predicting stroke status from kinematics. Biometrics.

7. **Swihart B**, Caffo B, Crainiceanu C, Punjabi N (2012). Mixed-effect Poisson log-linear models for clinical and epidemiological sleep hypnogram data. Statistics in Medicine, 31(9):855-870. URL http://www.onlinelibrary.wiley.com/doi/10.1002/sim.4457/full.

8. Caffo B, **Swihart B**, Punjabi N (2012). Commentary on: A novel approach to prediction of mild obstructive sleep disordered breathing in a population-based sample. Best of Sleep Medicine 2012: An Annual Collection of Scientific Literature (book chapter).

9. Gao H, Buist D, Timothy L, Bosco J, **Swihart B** (2012). Lasagna plots made in different (statistical) ovens. Epidemiology, 23(6):934, doi:10.1097/EDE.0b013e31826d08c7

10. **Swihart B**, Caffo B, James B, Strand M, Schwartz B, Punjabi N (2010). Lasagna plots: a saucy alternative to spaghetti plots. Epidemiology, 21(5):621–625, doi:10.1097/EDE.0b013e3181e5b06a. URL http://journals.lww.com/epidem/Fulltext/2010/09000/#54906063.

11. Laffan A, Caffo B, **Swihart B**, Punjabi N (2010). Utility of Sleep Stage Transitions in Assessing Sleep Continuity. Sleep; 33(12):1681-1686.

12. Patz D, **Swihart B**, White D (2010). CPAP pressure requirements for obstructive sleep apnea patients at varying altitudes. Sleep; 33(5):715–718.

13. Strand M, Zhang Y, **Swihart B** (2010). Monotone nonparametric regression and confidence intervals. Communications in Statistics-Simulation and Computation, 39(4):828–845.

14. Gentry S, Montgomery R, **Swihart B**, Segev D (2009). The roles of dominos and nonsimultaneous chains in kidney paired donation. American Journal of Transplantation; 9(6):1330–1336.

15. Caffo B, **Swihart B**, Crainiceanu C, Laffan A, Punjabi N (2009). An overview of observational sleep research with application to sleep stage transitioning. CHANCE; 22:10–15. URL http://dx.doi.org/10.1007/s144-009-0002-5.

16. **Swihart B**, Caffo B, Bandeen-Roche K, Punjabi N (2008). Characterizing sleep structure using the hypnogram. Journal of Clinical Sleep Medicine: JCSM: official publication of the American Academy of Sleep Medicine 2008; 4(4):349.

17. Patz D, Spoon M, Corbin R, Patz M, Dover L, **Swihart B**, White D (2006). The effect of altitude descent on obstructive sleep apnea*. Chest; 130(6):1744.

Manuscripts in preparation

1. Ellison D, Lee S, **Swihart B,** Sun Y, Crainiceanu C, Ewald A, Levchenko, A. Cancer Organoid Growth Patterns. In preparation. 2013.

2. **Swihart B**, Lau B. CD4 functional clusters post-ART. In preparation. 2013.

Commentaries / Book Chapters

1. **Swihart B**, Punjabi N, Caffo B. Commentary on: A Novel Approach to Prediction of Mild Obstructive Sleep Disordered Breathing in a Population-Based Sample: the Sleep Heart Health Study. The Best of Sleep Medicine 2012: An Annual Collection of Scientific Literature. CreateSpace, 2012.

Selected oral and poster presentations

1. **Swihart B** (2014)**.** Binary data: recent advances and new challenges. Statistische Woche, Hanover Germany 2014. *Invited.*

2. **Swihart B** (2014)**.** Testing for functional effects in genomics. ENAR 2014. *Invited.*

3. **Swihart B** (2013)**.** Losing $3 million and being happy: a tale of money, lives and prediction. JSM 2013.

4. **Swihart B** (2013)**.** Testing for functional effects. ENAR 2013. *Invited.*

5. **Swihart B** (2012)**.** Modeling populations of sleep hypnograms. Merck, Rahway NJ. *Invited.*

6. **Swihart B** (2010). Copulas over partitions and marginalized models. Emory University, Atlanta GA. *Invited.*

7. **Swihart B** (2010). Copulas over partitions and marginalized models. Johns Hopkins Statistical Methods for New Technologies, Baltimore, MD.

8. **Swihart B** (2010). Marginalization. Johns Hopkins Multilevel Modeling Class, Baltimore, MD.

9. **Swihart B** (2010). Copulas over partitions and marginalized models. Johns Hopkins Center on Aging and Health, Baltimore, MD.

10. **Swihart B** (2009). Matching for multiple groups. Johns Hopkins Center on Aging and Health, Baltimore, MD.

11. **Swihart B** (2008). Gibbs sampler and Metropolis Hastings algorithm. Johns Hopkins Journal Club, Baltimore, MD.

12. **Swihart B** (2008). Your brain on logarithm of the likelihood. Johns Hopkins Journal Club, Baltimore, MD.

13. **Swihart B** (2007).   Lasagna plots: a saucy alternative to spaghetti plots. Johns Hopkins Center on Aging and Health, Baltimore, MD.

14. **Swihart B** (2007). Heterogeneity? Yeah, I have a model for that. Johns Hopkins Center on Aging and Health, Baltimore, MD.

15. **Swihart B** (2007). The compression of multi-state morbidity. Johns Hopkins Lord Lecture Poster Presentation, Baltimore, MD.

16. **Swihart B** (2006). Novel methods in the visualization of transitional phenomena. JSM Poster Session, Seattle, WA.

17. **Swihart B** (2006). Novel methods in the visualization of transitional phenomena. WNAR Student Oral Presentation, Flagstaff, AZ.