

Sheila M. Gaynor

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EDUCATION

Harvard University

Ph.D. in Biostatistics, May 2018

08/2013-05/2018

Cambridge, MA

- Dissertation Title: “Statistical Methods for Integratively Characterizing Genetic and Genomic Data”
- Advisors: Dr. John Quackenbush and Dr. Xihong Lin

A.M. in Biostatistics, May 2015

University of North Carolina at Chapel Hill

B.S.P.H in Biostatistics and B.A. in Mathematics, May 2013

08/2009-05/2013

Chapel Hill, NC

- Honors Thesis Title: “Identification of Biologically Relevant Subtypes via Preweighted Sparse Clustering”
- With highest honors and highest distinction

ACADEMIC APPOINTMENT

Harvard T.H. Chan School of Public Health

Postdoctoral Fellow, Department of Biostatistics

06/2018-Present

Boston, MA

- Fellowship with Dr. Xihong Lin
- Develop statistical and computational methods to analyze whole genome sequencing, genomic, and clinical data
- Collaborate on large-scale studies including the NHLBI Trans-Omics for Precision Medicine (TOPMed) Program
- Focus on rare variant, fine mapping, and functional annotation methods and applications

EXPERIENCE

Center for Translational Pain Medicine, Duke University

Statistical Consultant

2017-Present

Durham, NC

Analysis of patients with pain phenotyping and development of clinically-implemented algorithm of pain subtyping

Behavioral Science Research, Boston University

Visiting Researcher

2015-2017

Boston, MA

Modeled a study of smokers unmotivated to quit using latent class analysis

Neurobiology of Fear Laboratory, McLean Hospital

Visiting Researcher

2015-2017

Belmont, MA

Analyzed a study of post-traumatic stress disorder using network and mediation analysis

Department of Biomedical Informatics, Harvard University

Rotation Student

2014

Boston, MA

Implemented bioinformatics tools to call copy number variants in The Cancer Genome Atlas (TCGA)

Department of Biostatistics, University of North Carolina

Honors Undergraduate Researcher

2011-2013

Chapel Hill, NC

Developed sparse clustering method for data with high-variance features or an outcome in supervised settings

Department of Biostatistics, University of North Carolina

Summer Undergraduate Research Fellow

2012

Chapel Hill, NC

Analyzed the association between hormonal contraceptive use and pain conditions

Outcome Research Office, Washington University in St. Louis	2010-2011
Statistical Consultant and Intern	St. Louis, MO
<i>Investigated comorbidity scoring methods and prognostic models for cancer survival in hospital biobanks</i>	
Department of Biostatistics, Washington University in St. Louis	2010
Summer Institute for Training in Biostatistics Trainee	St. Louis, MO
<i>Learned and applied principles of applied biostatistics</i>	

FELLOWSHIPS AND GRANTS

Awarded

NIH F31 Kirschstein Predoctoral Individual National Research Service Award 09/17-05/18
 NIH/NHLBI HL138832

- *Integrative analysis of lung disease genotypes and gene expression*
- Goal: To develop statistical methods and open source tools for jointly analyzing genetic and genomic data to understand the genetic basis of lung diseases

NSF Graduate Research Fellowship 08/13-05/18
 NSF DGE1144152, DGE1745303

- *Graduate Research Fellowship Program in Mathematical Sciences - Biostatistics*
- Goal: To obtain training in biostatistical theory, methods, and computation and support doctoral research

Under Review

K99/R00 Pathway to Independence Award Submitted 06/19
 NIH/NHLBI

- *Statistical methods to integrate rich functional and phenotypic data in whole genome sequencing analyses*
- Goal: To develop statistical and computational methods for massive whole genome sequencing data and transition to independent research

HONORS AND AWARDS

2017	Summer Institute in Statistical Genetics Scholarship, University of Washington Department of Biostatistics
2017	Program in Quantitative Genomics Travel Award, Harvard T.H. Chan School of Public Health
2016	XSEDE Computation Allocation, NSF
2016	Certificate of Distinction in Teaching, Harvard University Department of Biostatistics
2013	T32 NIH HIV/AIDS Training Grant Fellowship, NIAID
2013	Delta Omega Undergraduate Award, Delta Omega Public Health Honors Society
2013	Carolina Research Scholar, UNC Office of Undergraduate Research
2013	Buckley Public Service Scholar, UNC Carolina Center for Public Service
2012	Phi Beta Kappa, University of North Carolina
2012	Summer Undergraduate Research Fellowship, University of North Carolina

PUBLICATIONS

Peer-Reviewed

1. **Gaynor, S.M.**, Schwartz, J., and Lin, X. (2019). Mediation analysis for common binary outcomes. *Statistics in Medicine*, 38(4), 512-529.
2. **Gaynor, S.M.***, Sun, R.*, Lin, X., and Quackenbush, J. (2019). Identification of differentially expressed gene sets using the Generalized Berk-Jones statistic. *Bioinformatics*.
3. Borrelli, B., **Gaynor, S.**, Tooley, E., Armitage, C. J., Wearden, A., & Bartlett, Y.K. (2018). Identification of three different types of smokers who are not motivated to quit: Results from a latent class analysis. *Health Psychology*, 37(2), 179.

4. **Gaynor, S.**, and Bair, E. (2017). Identification of relevant subtypes via preweighted sparse clustering. *Computational Statistics and Data Analysis*, 116, 139-154.
5. Bair, E., **Gaynor, S.**, Slade, G.D., Ohrbach, R., Fillingim, R.B., Greenspan, J.D., Dubner, R., Smith, S.B., Diatchenko, L., and Maixner, W. (2016). Identification of clusters of individuals relevant to temporomandibular disorders and other chronic pain conditions: the OPFERA study. *Pain*, 157(6), 1266.
6. Kallogjeri, D., **Gaynor, S.M.**, Piccirillo, M.L., Jean, R.A., Spitznagel Jr, E.L., & Piccirillo, J.F. (2014). Comparison of comorbidity collection methods. *Journal of the American College of Surgeons*, 219(2), 245-255.

Submitted and Preprints

1. **Gaynor, S.M.**, Fagny, M., Lin, X., Platig, J., and Quackenbush, J. Connectivity of variants in eQTL networks dictates reproducibility and functionality. bioRxiv 515551 [Preprint].
2. **Gaynor, S.M.**, Lin, X., and Quackenbush, J. Spectral clustering in regression-based biological networks. bioRxiv 651950 [Preprint].
3. **Gaynor, S.M.**, Fillingim, R.B., Zolnoun, D.A., Slade, G.D., Ohrbach, R., Greenspan, J.D., Maixner, W., and Bair, E. Association between craniofacial pain and hormonal contraceptive use: The OPFERA study.
4. **Gaynor, S.M.**, Bortsov, A., Maixner, W., and Smith, S.B. Pragmatic patient profile clustering identifies diagnostically and prognostically informative subgroups.
5. McCaw, Z.R., **Gaynor, S.M.**, Sun, R., and Lin, X. Cross-tissue eQTL Calling via Surrogate Expression Analysis.
6. Sun, R.*, Xu, M.*, Li, X., **Gaynor, S.M.**, Zhou, H., Bosse, Y., Lam, S., Tsao, M., Tardon, A., Chen, C., Doherty, J., Goodman, G., Egil Bojesen, S., Teresa, M.T., Johansson, M., Field, J.K., Bickeboller, H., Wichmann, H., Risch, A., Rennert, G., Arnold, S., Wu, X., Melander, O., Brunnstrom, H., Marchand, L.L., Zong, X., Liu, G., Andrew, A., Duell, E., Kiemeny, L.A., Shen, H., Haugen, A., Johansson, M., Grankvist, K., Caporaso, N., Woll, P., Teare, M.D., Scelo, G., Hong, Y., Yuan, J., Lazarus, P., Schabath, M.B., Aldrich, M.C., Albanes, D., Brennan, P., Barbie, D., Mak, R., Hung, R.J., Amos, C.I., Christiani, D.C and Lin, X. Identification of inflammation and immune-related risk variants associated with squamous cell lung cancer.
7. Li, X.*, Li, Z.*, Zhou, H., **Gaynor, S.M.**, Liu, Y., Chen, H., Sun, R., Dey, R., Arnett, D.K., Aslibekyan, S., Ballantyne, C.M., Bielak, L.F., Blangero, J., Boerwinkle, E., Bowden, D.W., Broome, J.G., Conomos, M.P., Correa, A., Curran, J.E., Cupples, L.A., Freedman, B.I., Guo, X., Kardia, S.L.R., Kathiresan, S., Khan, A.T., Kooperberg, C.L., Irvin, M.R., Laurie, C.C., Manichaikul, A.W., Mahaney, M.C., Mathias, R.A., Morrison, A.C., Martin, L.W., McGarvey, S.T., Mitchell, B.D., Montasser, M.E., Moore, J., O'Connell, J.R., Palmer, N.D., Pampana, A., Peralta, J.M., Peyser, P.A., Psaty, B.M., Vasan, R.S., Redline, S., Rice, K.M., Rich, S.S., Smith, J.A., Tsai, M., Tiwari, H.K., Wang, F.F., Weeks, D.E., Weng, Z., Wilson, J.G., Yanek, L.R., NHLBI Trans-Omics for Precision Medicine (TOPMed) Consortium, TOPMed Lipids Working Group, Neale, B.M., Sunyaev, S.R., Abecasis, G.R., Rotter, J.I., Willer, C.J., Peloso G.M., Natarajan, P., and Lin, X. Dynamic incorporation of multiple in-silico functional annotations empowers rare variant association analysis of large whole genome sequencing studies at scale.
8. Raffield, L.M., Iyengar, A.K., Wang, B., **Gaynor, S.M.**, Spracklen, C.N., Kowalski, M.H., Salimi, S., Polfus, L.M., Benjamin, E.J., Bis, J.C., Bowler, R., Cade, B.E., Comellas, A.P., Correa, A., Durda, P., Gogarten, S., Jain, D., Kral, B.G., Lange, L.A., Larson, M.G., Laurie, C., Lee, J., Lewis, J.P., Mitchell, B., Pankratz, N., Rich, S.S., Rotter, J.I., Ryan, K., Tracy, R.P., Yanek, L.R., Zhao, L.P., Lin, X., Li, Y., Dupuis, J., Reiner, A.P., Mohlke, K.L., Auer, P.L., TOPMed Inflammation Working Group, and NHLBI Trans-Omics for Precision Medicine (TOPMed) Consortium. Allelic heterogeneity at CRP locus identified by whole-genome sequencing in multi-ancestry cohorts.

* Indicates equal contribution as first authors

Book Chapters

1. Klengel, T., Lebois, L.A.M., **Gaynor, S.M.**, and Guffanti, G. (2018). Genetics and Gene-Environment Interaction. In Stoddard Jr, F.J., Benedek, D.M., Milad, M.R., and Ursano, R. J. (Eds.). Trauma-and stressor-related disorders. Oxford University Press. (198-210).

EDUCATIONAL CONTRIBUTIONS

Teaching

- | | |
|------------|---|
| 2017 | Teaching Assistant, ID 201: Principles of Biostatistics and Epidemiology, Harvard University Department of Biostatistics |
| 2017 | Guest Lecturer, BST 254: Effective Grant & Research Proposal Writing for Biostatistics Research, Harvard University Department of Biostatistics |
| 2016 | Director of Independent Study in Biostatistics, Harvard University Department of Biostatistics |
| 2015, 2016 | Biostatistics and Epidemiology Program Tutor, Harvard University Commonwealth Fund Fellowship in Minority Health Policy |
| 2015 | Founding Head Teaching Assistant, ID 201: Principles of Biostatistics and Epidemiology, Harvard University Department of Biostatistics |
| 2015 | Guest Lecturer, ID 201: Principles of Biostatistics and Epidemiology, Harvard University Department of Biostatistics |
| 2014 | Teaching Assistant, BIO 200: Principles of Biostatistics, Harvard University Department of Biostatistics |

Advising and Mentorship

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|-----------|---|
| 2019 | Claire Tseng, <i>Undergraduate Independent Study, Biostatistics, Harvard University</i> |
| 2018-2019 | Wenying Deng, <i>Master's Research Assistantship, Biostatistics, Harvard University</i> |
| 2018 | Mengting Li, <i>Master's Thesis Committee, Biostatistics, Harvard University</i> |
| 2017 | Graduate Mentor, <i>Harvard Summer Program in Biostatistics & Computational Biology</i> |

PRESENTATIONS

Oral Presentations

- | | |
|---------|---|
| 06/2019 | Dynamic incorporation of functional annotations in rare variant analysis. <i>Framingham Heart Study FOCuS Seminar Series.</i> |
| 04/2019 | Identification of rare variant sets associated with lung function via set-based analyses incorporating in-silico functional annotations. <i>NHLBI TOPMed In-Person Meeting.</i> |
| 07/2018 | Degree centrality of SNPs in eQTL networks. <i>Joint Statistical Meetings.</i> |
| 04/2017 | Reframing eQTL Networks to account for intermediate analyses. <i>Biostatistics Student Seminar.</i> |
| 03/2017 | Error quantification in biologically relevant eQTL network metrics. <i>ENAR Spring Meeting.</i> |
| 03/2017 | Mediation analysis of pathways to PTSD diagnosis. <i>Massachusetts General Hospital Trauma Genomics Group.</i> |
| 02/2017 | Causal mediation analysis for genomic data. <i>Broad Institute Statistical Genetics Seminar.</i> |
| 10/2016 | Graduate Research Fellowships. <i>Biostatistics Student Seminar.</i> |
| 07/2016 | Genomic analysis with common binary outcomes via mediation. <i>Joint Statistical Meetings.</i> |
| 03/2016 | Mediation methods for case-control settings with applications to genomics. <i>ENAR Spring Meeting.</i> |
| 10/2015 | Integrating epigenetic and genomic analyses via mediation analysis. <i>Harvard Medical School Epigenetics Symposium.</i> |
| 08/2015 | A mediation-based integrative genomic analysis of lung cancer. <i>Biostatistics Student Seminar.</i> |
| 07/2015 | Mediation-based integrative genomic analysis. <i>Joint Statistical Meetings.</i> |
| 03/2015 | Mediation-based integrative genomic analysis. <i>ENAR Spring Meeting.</i> |
| 03/2015 | Prewighted sparse clustering with applications to temporomandibular disorder. <i>International Association for Dental Research Epi-Forum.</i> |
| 03/2014 | Identification of biologically relevant subtypes via preweighted sparse clustering. <i>ENAR Spring Meeting.</i> |

Poster Presentations

- 07/2019 Rare variant association analysis for studies with rich phenotyping subject to missingness. *American Society for Human Genetics Annual Meeting*.
- 07/2019 Fine mapping causal variants with functional annotations. *Joint Statistical Meetings*. Oral poster.
- 03/2018 Assessing the Effective Degree of SNPs in eQTL Networks. *ENAR Spring Meeting*. Oral poster.
- 10/2016 Mediation methods applied to post-traumatic stress disorder to identify genomic effects. *American Society for Human Genetics Annual Meeting*.
- 04/2015 A mediation-based integrative genomic analysis of lung cancer. *Harvard Graduate Women in Science and Engineering Symposium*.
- 04/2013 The association between oral contraceptive use and painful conditions. *UNC Celebration of Undergraduate Research*.
- 10/2012 OPPERA Study Identifies an Association Between the Use of Hormonal Contraceptives and Oro-facial Pain and Headaches. *International Pelvic Pain Society Conference*. Prepared poster, First place in poster competition.
- 04/2012 Identification of clinically relevant disease subtypes using supervised sparse clustering. *ENAR Spring Meeting*.

PROFESSIONAL SERVICE

- 2018-2019 Organizer, Harvard Biostatistics Postdoctoral Mental Health Study
- 2017-2018 Member, Harvard Biostatistics Colloquium Committee
- 2016-2018 Co-organizer, Harvard Biostatistics-Biomedical Informatics Big Data Seminar
- 2015-2017 Member, Harvard Biostatistics Student Advising Committee
- 2016 Graduate Participant, International High Performance Computing Summer School
- 2015-2016 Organizer & Coordinator, Harvard Big Data Seminar
- 2015 Chair, ENAR Session on Graphical Modeling
- 2014 Judge, Harvard School of Public Health Poster Day

TECHNICAL SKILLS

- | | |
|----------------------|---|
| Statistical Software | R, Experience in: SAS, STATA, Python |
| Genetics Software | PLINK, GCTA |
| Other Software | Linux computing, GitHub, L ^A T _E X, Microsoft Office, Cytoscape |

REFERENCES

Xihong Lin, Professor
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Harvard T.H. Chan School of Public Health
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John Quackenbush, Henry Pickering Walcott Professor of Computational Biology and Bioinformatics. Chair
Department of Biostatistics
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William Maixner, Joannes H. Karis M.D. Professor of Anesthesiology
Department of Anesthesiology
Duke University School of Medicine
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Department of Biostatistics and Department of Epidemiology
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