Arslan A. Zaidi

Department of Genetics
Perelman School of Medicine
University of Pennsylvania

Email: aazaidi@pennmedicine.upenn.edu
Web: www.arslanzaidi.com
Twitter: @A_A_Zaidi

Education and training

2019—present **Postdoctoral research**, Genetics
Effect of demographic history on genetic architecture of complex traits
Advisor: Iain Mathieson
University of Pennsylvania, USA

2016—2018 **Postdoctoral research**, Genetics
Transmission dynamics of mtDNA heteroplasmies in human pedigrees
Uncovering mito-nuclear ancestry interactions in admixed populations
Advisor: Kateryna Makova
The Pennsylvania State University, USA

2010—2016 **Ph.D.**, Genetics (major), Statistics (minor)
Evolutionary genetics of human facial form: inference at the genotype—phenotype interface
Advisor: Mark Shriver
The Pennsylvania State University, USA

2007—2009 **M.Sc.**, Genetics (graduated top in class)
Advisor: Ahsan Vahidy
University of Karachi, Pakistan

2005—2007 **B.Sc.**, Microbiology
University of Karachi, Pakistan

Research goals

My overarching goal is to understand the genetic determinants of disease risk in diverse human populations. I am particularly interested in using a population-genetics lens to study how demographic history shapes the genetic variation underlying complex traits in humans. This is essential for answering why the risks for certain diseases vary across populations and to improve genetic risk prediction within and across populations. Specific projects within this area include: (i) using admixture to dissect the genetic variation underlying health disparities, (ii) treating mito-nuclear epistasis as a modifier of polygenic risk, and (iii) using endogamy and consanguinity to facilitate the discovery of genetic mechanisms of recessive diseases.

Grants and awards

2021 NIH (NIGMS) K99/R00 Pathway to Independence Award. "Leveraging human evolutionary history to improve our understanding of complex disease architecture."

2016 Co-PI (with Kateryna Makova): Seed Grant from The Center for Human Evolution and Diversity, The Pennsylvania State University, USA. "Uncovering mito-nuclear ancestry interactions in admixed human populations" ($25,000)

2013 Scholarship to attend the Summer Institute for Statistical Genetics in Seattle, USA
2013 Travel award from the Department of Anthropology, Pennsylvania State University, to attend the American Society of Human Genetics Meeting in Boston, USA
2010 Herbert J. Bailey Award from the Graduate School at The Pennsylvania State University, USA ($5,000)
2010 University Graduate Fellowship from The Pennsylvania State University, USA
2009 Two Gold Medals for highest academic achievement in M.Sc. from the University of Karachi, Pakistan

Publications and preprints

2021 Anova Sahoo S, **Zaidi AA**†, Anagol S, Mathieson I†. Long runs of homozygosity are correlated with marriage preferences across global population samples. ***BioRxiv***. doi: https://doi.org/10.1101/2021.03.04.433907. (*in press, Human Biology*) († Co-corresponding authors)

2021 Lasisi T, **Zaidi AA**, Webster TH, Stephens NB, Routch K, Jablonski NG, et al. High-throughput phenotyping methods for quantifying hair fiber morphology. ***Scientific Reports***. 11:11535.

2020 **Zaidi AA**, Mathieson I. Demographic history mediates the effect of stratification on polygenic scores. ***Elife***. 9:1–30.

2020 Li J, Conzalez Zarzar TB, White J, Indencleef K, Hoskens H, Ortega Castrillon A, Nauwelaers N, **Zaidi AA**, Eller R, Gunther T, Svensson E,Jakobsson M, Walsh S, Van Steen K, Shriver MD, Claes P. Robust Genome-Wide Ancestry Inference for Heterogeneous Datasets and Ancestry Facial Imaging based on the 1000 Genomes Project. ***Scientific Reports***. 16;10(1):1-5.

2020 Arbeithuber B, Hester J, Cremona MA, Stoler N, **Zaidi AA**, Higgins B, et al. Age-related accumulation of de novo mitochondrial mutations in mammalian oocytes and somatic tissues. ***PLoS Biology***. 18:e3000745.

2020 Barrett A, Arbeithuber B, **Zaidi AA**, Wilton P, Paul IM, Nielsen R, Makova KD. Pronounced somatic bottleneck in mitochondrial DNA of human hair. ***Philosophical Transactions of the Royal Society B***. 375(1790):20190175.

2019 **Zaidi AA***, Wilton PR*, Su MS*, Paul IM, Arbeithuber B, Anthony K, Nekrutenko A, Nielsen R, Makova KD. Bottleneck and selection in the germline and maternal age influence transmission of mitochondrial DNA in human pedigrees. ***Proceedings of the National Academy of Sciences***. 116(50):25172-8. (* Co-first authors)

2019 **Zaidi AA***, White JD*, Mattern BC, Liebowitz CR, Puts DA, Claes P, Shriver MD. Facial masculinity does not appear to be a condition-dependent male ornament and does not reflect MHC heterozygosity in humans. ***Proceedings of the National Academy of Sciences***. 116(5):1633-8. (*Co-first authors)

2019 **Zaidi AA**, Makova KD. Investigating mitonuclear interactions in human admixed populations. ***Nature ecology and evolution***. 3(2):213-22.

2019 Sero D, **Zaidi AA**, Li J, White JD, Zarzar TB, Marazita ML, Weinberg SM, Suetens P, Vandermeulen D, Wagner JK, Shriver MD. Facial recognition from DNA using face-to-DNA classifiers. ***Nature communications***. 10(1):2557.

2018 Ye D*, **Zaidi AA***, Tomaszkiewicz M*, Anthony K, Liebowitz C, DeGiorgio M, Shriver MD, Makova KD. High levels of copy number variation of ampliconic genes across major human Y haplogroups. ***Genome biology and evolution***. 10(5):1333-50. (*Co-first authors)

2018 Claes P, Roosenboom J, White JD, Swigut T, Sero D, Li J, Lee MK, **Zaidi AA**, Mattern BC, Liebowitz C, Pearson L González T, Leslie EJ, Carlson JC, Orlova E, Suetens P, Vandermeulen D, Feingold E, Marazita ML, Shaffer JR, Wysocka J, Shriver MD, Weinberg SM. Genome-wide mapping of global-to-local genetic effects on human facial shape. ***Nature genetics***. 50(3):414-23

2018 Wilton PR, **Zaidi AA**, Makova K, Nielsen R. A population phylogenetic view of mitochondrial heteroplasmy. ***Genetics***. 2018 Mar 1;208(3):1261-74.

2017 **Zaidi AA**, Mattern BC, Claes P, McEcoy B, Hughes C, Shriver MD. Investigating the case of human nose shape and climate adaptation. ***PLoS Genetics***. 13(3):e1006616 **(Cover article)**

2017 Weinberg SM, Lee MK, Leslie EJ, Orlova E, Carlson JC, Roosenboom J, Mattern BC, Liebowitz CR, White JD, **Zaidi AA**, Hernandez D, Hernandez D, Gonzalez T, Pearson LN, Sero D, Li J, Feingold E, Marazita ML, Shaffer JR, Wysocka J, Shriver MD, Claes P. Modular 3D dense surface analysis and GWAS reveal localized genetic effects on human facial morphology involving multiple novel loci. ***The FASEB Journal***. 31:394-5

2015 Cleveland HH, Schlomer GL, Vandenbergh DJ, Feinberg M, Greenberg M, Spoth R, Redmond C, Shriver MD, **Zaidi AA**, Hair KL. The conditioning of intervention effects on early adolescent alcohol use by maternal involvement and DRD4 and 5-HTTLPR candidate genes. ***Development and Psychopathology***. 27(1):51.

2014 Claes P, Liberton DK, Daniels K, Rosana KM, Quillen EE, Pearson LN, McEvoy B, Bauchet M, **Zaidi AA**, Yao W, Tang H, Barsh, GS, Absher DM, Puts DA, Rocha J, Beleza SP, Rinaldo W, Baynam G, Suetens P, Vandermeulen D, Wagner JK, Boster JS, Shriver MD. Modeling 3D facial shape from DNA. ***PLoS Genetics***. 10(3):e1004224.

Selected conference presentations

2020 **Zaidi, A.A.**, Mathieson, I. Demographic history impacts effects of stratification on polygenic scores. American Society of Human Genetics Meeting, virtual. **(Poster; reviewers' choice award)**

2019 **Zaidi, A.A.**, Mathieson, I. Rare-variant PCA corrects for stratification in GWAS under recent demographic history. American Society of Human Genetics Meeting, Houston, Texas, USA **(Poster; reviewers' choice award)**

2018 **Zaidi, A.A.**, Makova, K.D. Leveraging sex-biased admixture to uncover mito-nuclear interactions in admixed human populations. Population, Evolutionary, and Quantitative Genetics Meeting, Madison, Wisconsin **(Poster)**

2017 **Zaidi, A.A.**, Evolutionary genetics of human facial form. 40th Anniversary of the Molecular and Cellular Biology Research Center, University of Costa Rica, Costa Rica **(Keynote speaker)**

2017 **Zaidi, A.A.**, Su, S., Rebolledo-Jaramillo, B., Beiler, J., Paul, I., Wilton, P., Nekrutenko, A., Nielsen, R., Makova., K.D. Transmission dynamics of mitochondrial DNA heteroplasmies across multi-Generation pedigrees. Annual Meeting of the Society for Molecular Biology and Evolution, Austin, Texas, USA **(Poster)**

2016 **Zaidi, A.A.**, Mattern, B., Claes, P., Hughes, C., Shriver, M.D. Human nose shape differentiation is due, in part, to climate adaptation. 85th Annual American Association of Physical Anthropology Meeting, Atlanta, Georgia, USA **(Talk)**

2015 **Zaidi, A.A.**, Claes, P., Shriver, M.D. Modeling 3D facial appearance in relation to sex, genetic ancestry, and individual genes enables facial prediction from DNA. 67th Annual American Academy of Forensic Science Meeting, Orlando, Florida, USA **(Invited talk)**

2014 **Zaidi, A.A.**, Claes, P., Shriver, M.D. The World Face Space: Modeling the effects of genetic ancestry on 3D facial shape. Annual Bioinformatics and Genomics Retreat, The Pennsylvania State University, University Park, Pennsylvania, USA **(Invited talk)**

2014 **Zaidi, A.A.**, Claes, P., Daniels, K., Yao, W., Hughes, C., Malhi, R.S., Shriver, M.D. A novel method for estimating facial ancestry using 3D images. 83rd Annual American Association of Physical Anthropologists Meeting, Calgary, Canada **(Poster)**

2013 **Zaidi, A.A.**, Claes, P., Yao, W., Daniels, K., Shriver, M.D. The face can be used as a multivariate phenotype to predict long distance genomic correlations. 82nd Annual American Society of Human Genetics Meeting, Boston, Massachusetts, USA **(Poster)**

Teaching and mentoring

Research mentor

2019—present (Jinguo Huang) **Graduate student*** in the Bioinformatics and Genomics program at Penn State. Project title: Leveraging ancestry stratification in African Americans to infer the genetic architecture of skin pigmentation and facial shape (*co-supervised with Mark Shriver)

2020—2021 (Anova Sahoo) **Undergraduate student** with Iain Mathieson, UPenn. Project title: Impact of consanguinity on runs of homozygosity in humans. Work now in press in Human Biology

2017—present (Tina Lasisi) **Graduate student** with Mark Shriver, Penn State. Project title: Uncovering genetic and environmental factors underlying differences in hair morphology between human populations. Work now published in Scientific Reports

2019—2019 (Hanan Salim) **Undergraduate student** with Kateryna Makova, Penn State. Project title: Codon usage bias in human mtDNA

2017—2018 (Danling Ye) **Undergraduate student** with Kateryna Makova, Penn State. Project title: High levels of copy number variation of ampliconic genes across major human Y haplogroups. Work now published in Genome Biology and Evolution. Danling is now a graduate student in the veterinary science department at Cornell University.

Teaching assistant

2011—2016 Department of Anthropology, Pennsylvania State University

- Sex and Evolution (1 semester)
- Human Genetics (1 semester)
- Introduction to Biological Anthropology (5 semesters)

Leadership, outreach, and service

2021—present PhD Committee member for Jinguo Huang who is a graduate student in the Bioinformatics and Genomics Program at Penn State.

2021—present Editor for Frontiers in Genetics (Research Topic: "The ethics of studying the genetics of marginalized populations")

2016—present Started and currently maintain a blog intended to make statistical and population genetics intuitive. https://arslanzaidi.com

2012—present Ad-hoc reviewer for American Journal of Human Genetics, PLoS Genetics, PLoS Computational Biology, Molecular Biology and Evolution, Genome Research, Genetics, Mitochondrion, Gene, Genes and Immunity, Philosophical Transactions of the Royal Society B, Frontiers in Genetics, Systematic Biology, and Scientific Reports.

2017 Article for The Science Breaker, "How environment shapes ... your nose"

2017 Article for PLoS Blogs, "Understanding images: human nose shape and climate adaptation"

2017 Science Ask Me Anything (AMA) on Reddit

Media coverage

2017 Selected news coverage of our paper on nose shape evolution:

- "Ancestral climates may have shaped your nose" — The New York Times
- "Climate shaped the human nose, researchers say" — The Guardian