SARAH GABRIELLE AYTON

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Expert in bioinformatics, machine learning, and computational methods with a track record of developing innovative tools for personalized patient care. Proven ability to lead multidisciplinary teams, optimize data strategies, and build key partnerships in women's health and oncology. Passionate about advanced analytics for data-driven decision-making and enhanced clinical outcomes.

EDUCATION

PhD in Computer Science, Data Science & Applied Mathematics 2023
Tecnológico de Monterrey, Monterrey, NL, Mexico
Dissertation: Automatic Multi-Target Clinical Classification and Biomarker Discovery in Cancer
Impact: Developed a cutting-edge machine learning algorithm for molecular subtyping, uncovering novel signatures to advance disease understanding, enable targeted interventions for diverse populations, and directly contribute to the evolution of personalized medicine in oncology.
Awards & Recognitions: Google Latin America Research Award (1 of 2 recipients in Mexico), Full Tuition Grant (ITESM), Doctoral Fellowship (CONACYT), AAUW Dissertation Fellowship, OAS/CONACYT/PAHO Postgraduate Study Award in Engineering, Science, and Health.

MPH in Epidemiology, Certificate in Applied Biostatistics 2018
Columbia University Mailman School of Public Health, New York, NY
Thesis: Assessing HIV & HSV risk predictors among South African females
Impact: Created the first HIV risk scoring tool for adolescent females in South Africa, enabling precise prevention strategies and improving women's' health outcomes in underserved communities.
Awards & Recognitions: Epidemiology Merit Award, Mailman School Scholars Fund, EPIC Fund.

BSc in Psychology, Neuroscience Concentration 2016
University of Massachusetts Amherst, Commonwealth Honors College, Amherst, MA
Thesis: Dengue Virus and Dengue Hemorrhagic Fever: Forecasting a Growing Health Threat
Additional Experience: Participated in the Study Abroad Health Research Program in Tanzania, contributing to a global health research initiative.

EXPERIENCE

Principal Scientist (2024-Pres.) | Senior Scientist (2022-2023) 2022-Pres.
Genesis Research Group, Real World Evidence, Hoboken, NJ

- Strategic Leadership: Directed high-impact research in maternal health, oncology, neurology, and immunology using healthcare claims data from the US, UK, and Japan. Played a pivotal role in project prioritization and resource allocation, aligning research with client objectives. Drove strategic decision-making by delivering data-driven insights that influenced the adoption of new machine learning models, enhancing client satisfaction and reducing research costs.
- Machine Learning & Innovation: Led the design and implementation of advanced machine learning methodologies in R and Python within cloud-based environments, optimizing analytics quality and predictive accuracy. Established industry best practices that directly advanced clinical healthcare technology development, supporting key product goals while adhering to HIPAA and regulatory requirements.
- Team Development & Mentorship: Built a high-performing, multidisciplinary team by mentoring junior scientists in data science, machine learning, and clinical data analysis. Fostered a culture of innovation, preparing the team to drive future healthcare data initiatives and enhancing overall analytical capabilities.

Post-Doctoral Fellow 2024-Pres.
Weill Cornell Medicine, Department of Population Health Sciences, New York, NY

- Strategic Leadership in Predictive Analytics: Led a high-impact collaboration with emergency department clinicians at Weill Cornell Hospital and external healthcare partners to develop deep learning-based risk prediction models for post-discharge hospital admissions. Directed this critical initiative to enhance patient outcomes and optimize hospital resource management, demonstrating a strategic approach to solving real-world healthcare challenges.
- Advanced Data Science & Technical Innovation: Spearheaded the integration of real-time EMR data in OMOP format using cloud-based computing and SQL, extracting actionable insights to inform clinical decision-making. Translated a novel deep learning Python package into R,

expanding its applicability and boosting model performance, showcasing advanced technical skills essential for driving innovation.

- Cross-Functional Collaboration & Stakeholder Engagement: Built strong partnerships with clinicians, data scientists, and external healthcare centers, aligning research objectives with clinical needs. Facilitated cross-functional communication to ensure the predictive model addressed key healthcare priorities, underscoring leadership in managing complex, interdisciplinary projects.
- Strategic Planning & Full Lifecycle Management: Defined project deliverables and guided research publications through their entire product lifecycle—from conceptualization to execution and dissemination. This strategic oversight ensured alignment with both clinical practice goals and impactful research outcomes.

Google Doctoral Fellow, Bioinformatics Group 2019-2023

Tecnológico de Monterrey, Department of Computer Science, Monterrey, NL, Mexico

- Strategic Research Leadership: Secured funding from top organizations (Google, PAHO) to spearhead multi-omics research in women's health and cancer genomics. Directed comprehensive analyses across 32 cancer types using advanced machine learning techniques, leading to groundbreaking publications in Genetics in Medicine that directly contributed to the field of genetic testing and precision medicine.
- Bioinformatics Tool Development: Developed the MuTATE bioinformatics platform, guiding its full lifecycle from concept to publication in Bioinformatics. The platform significantly streamlined cancer subtyping and biomarker discovery, enhancing the analysis pipeline for genetic testing. Leveraged R, Python, and cloud-based environments for predictive modeling in cancer genomics, demonstrating expertise in integrating advanced analytics into practical, scalable solutions for genetic research.
- Cross-Functional Collaboration & Product Integration: Partnered with key institutions (e.g., Columbia University, Fred Hutchinson Cancer Center) to lead cross-functional teams in molecular biology, biostatistics, and clinical diagnostics. Directed efforts to align research outcomes with clinical applications, influencing the development of innovative genetic testing solutions. Ensured the translation of research findings into actionable products that supported clinical decision-making in oncology.
- Quality Assurance & Compliance: Managed compliance with industry regulations, including HIPAA, and data privacy standards throughout research activities. Supported the development of clinical and molecular diagnostics by implementing robust quality assurance protocols, underscoring a commitment to ethical standards in genetic testing and data management.

Director of the Diabetes Nudge Lab 2019-2022

Clínicas del Azúcar, Diabetes Nudge Lab, Monterrey, NL, Mexico

- Lab Establishment & Strategic Direction: Founded and led the Diabetes Nudge Lab, a data analytics and technology hub focused on transforming diabetes care. Partnered with executive leadership, operations, marketing, and clinical teams to align projects with strategic goals, driving patient-centered outcomes.
- Data-Driven Innovation & Technology: Developed a risk prediction algorithm that enhanced accuracy by over 50%, directly improving patient retention and care. Implemented advanced technologies, including machine learning for predictive analytics and AI for EMR data extraction, resulting in cost savings and operational efficiency. Established KPI tracking processes to assess the impact of patient tracking algorithms and incentive programs, using data insights to shape future initiatives.
- Stakeholder Engagement & Transformation: Managed high-profile relationships with stakeholders like Deloitte and the World Bank, leading negotiations and compliance efforts. Presented lab initiatives to the IFC, showcasing national advancements in precision medicine and setting new standards for healthcare providers.
- Driving Change & National Scaling: Successfully scaled the lab's incentive program and risk prediction algorithms nationwide, driving organizational change and establishing benchmarks for precision medicine across healthcare systems.
- Team Development & Cross-Departmental Collaboration: Built and mentored a high-performing team, fostering a culture of innovation. Collaborated with department heads across the organization to ensure alignment and success in meeting clinical and business objectives.

Doctoral Fellow - Research Analyst 2021-2022
Heidelberg University, Heidelberg Institute of Public Health, Heidelberg, Germany

- Strategic Research & Data-Driven Impact: Led critical research projects evaluating diagnostic and medication effectiveness, leveraging regression discontinuity analysis on electronic health record data (CPRD, SAIL). Applied cloud-based computing with Python, R, and SQL to drive insights that informed clinical practice, optimizing patient care strategies and outcomes.
- Cross-Functional Leadership & Collaboration: Collaborated with interdisciplinary teams, including clinicians, data scientists, and policy experts, to ensure research aligned with clinical objectives. Directed cross-functional discussions, translating complex data into actionable healthcare solutions and influencing policy changes.
- Advanced Analytics & Knowledge Sharing: Utilized advanced statistical methods to analyze and interpret complex health data, effectively communicating findings through presentations.

PHIA Research Analyst 2018-2021
Columbia University ICAP, New York, NY

- Women's Health & Epidemiological Research: Designed and conducted geospatial and non-spatial statistical analyses of the HIV epidemic, with a focus on women's health in sub-Saharan African countries supported by PEPFAR. Utilized advanced tools such as ArcGIS, QGIS, STATA, and R to assess health outcomes in vulnerable populations, particularly adolescent girls and young women (AGYW).
- Publication & Collaboration: Led analysis for two collaborative publications between the CDC and ICAP, providing data-driven insights into TB and HIV in AGYW and their partners. Developed statistical analysis plans and prepared manuscripts that contributed to global health strategies for improving women's health.
- Cross-Functional & International Collaboration: Collaborated with international research teams, including colleagues at the CDC and national departments of health, offering expertise in statistical analysis and data interpretation. This work supported advancements in women's health interventions and public health policies in the region.

Graduate Research Analyst, Department of Epidemiology & CAPRISA 2017-2018
Columbia University Mailman School of Public Health, New York, NY

- Research & Strategic Leadership: Led the development and launch of the Ayton tool, the first HIV risk scoring tool for adolescent girls and young women (AGYW) in South Africa, driving innovation in women's health. Managed a multidisciplinary team to analyze CAPRISA 007 clinical trial data using Mplus, R, and machine learning libraries, aligning research with clinical goals and regulatory standards.
- Strategic Collaboration & Communication: Built partnerships with key stakeholders and cross-functional teams, ensuring clinical and regulatory compliance. Presented research at the SER Conference (2018) and authored manuscripts in *STI* and *Scientific Reports*, effectively translating complex data for diverse audiences.
- Advanced Data Analysis & Tool Refinement: Applied exploratory and confirmatory factor analysis to identify key HIV risk factors and HSV-2 status links. Enhanced the tool based on women's healthcare needs in resource-limited settings, clinical feedback, and comparative analysis with alternate risk assessment tools, aligning it with public health objectives.

Zika Border Health Fellow, Unidad de Investigación en Salud Pública 2017-2018
CIDICS, Universidad Autónoma de Nuevo León, Monterrey, NL, Mexico

- Strategic Research Leadership: Led development of a comprehensive survey on vector-borne diseases, utilizing Mplus to analyze complex data sets. Directed a diverse team of experts to conduct spatial and Poisson analyses with GeoDa, R, and qGIS, resulting in a nuanced understanding of Zika spread across different sociodemographic and county-level factors.
- Advanced Predictive Modeling: Employed machine learning algorithms in R to construct global niche projections for Zika's spatial distribution. This innovative approach refined the characterization of Zika's spread, providing key insights to guide health interventions.
- Cross-Functional Collaboration: Successfully coordinated with public health professionals, epidemiologists, and data scientists to integrate findings into broader disease control strategies, showcasing leadership in managing complex interdisciplinary projects.

Research Assistant, GIS Lab 2014-2016

University of Massachusetts Amherst, Amherst, MA

- Investigated Epidemiological Research & Data Analysis: Investigated spatial patterns of dengue fever, land use, and climate dynamics, conducting extensive research using datasets from the Taiwan CDC and Central Weather Bureau. Applied Poisson regression and time series analysis with ArcGIS and R to identify key determinants of dengue hemorrhagic fever outbreaks, contributing to predictive modeling in epidemiological research.
- Data Collection & Hypothesis Development: Led comprehensive data collection and collaborated with a multidisciplinary research team to formulate research hypotheses. Enhanced the research project's impact through meticulous data analysis and interpretation, supporting the development of evidence-based public health strategies.
- Technical Expertise & Innovation: Leveraged advanced GIS tools and statistical software to drive research outcomes, demonstrating technical proficiency and a strategic approach to complex data-driven problems in public health.

TEACHING

Adjunct Faculty 2018-Pres.

Introduction to Biostatistical Methods, Department of Biostatistics (2018-Pres.)

Introduction to Biostatistics, Department of Epidemiology (2020-2021)

Columbia University Mailman School of Public Health, New York, NY

- Team Leadership & Development: Hired, trained, and led a team of 3-4 Teaching Assistants annually, ensuring they were prepared to support course objectives. Managed the team to create a collaborative environment that enhanced student learning and engagement in biostatistics.
- Data-Driven Decision-Making: Designed and delivered courses focused on empowering graduate students to make informed, data-driven decisions using statistical analysis. The curriculum taught students to apply biostatistical methods in real-world scenarios, fostering critical thinking and analytical skills crucial for research-driven roles.
- Curriculum Design & Program Impact: Developed a comprehensive curriculum that aligned with the graduate degree program's core competencies. The course content was recognized and utilized by program directors to demonstrate essential competencies for student success in the department, highlighting its central role in the broader academic program.
- Cross-Departmental Collaboration: Engaged and collaborated with program directors and department heads to ensure the course met departmental goals and competencies. Adapted course content to align with evolving program objectives, maintaining high educational standards across the graduate program.
- Strategic Communication & Mentorship: Provided mentorship to students, offering guidance on research applications, statistical analysis, and interpretation of results. Received positive evaluations, recognized for translating complex statistical concepts into actionable insights, thereby preparing students for data-driven decision-making in their respective fields.

Graduate Teaching Assistant, Department of Biostatistics 2017-2018

Columbia University Mailman School of Public Health, New York, NY

- Advanced Instruction: Delivered high-level instruction in graduate courses, including Applied Regression I and Research Data Coordination, showcasing deep expertise in statistical methodologies and data analysis critical for research-driven roles in healthcare.
- Data Management & Technical Skills: Provided hands-on guidance in MS Access, VBA, SQL, and MySQL, equipping students with practical data manipulation and analysis skills—key competencies in healthcare data science.
- Course Leadership: Oversaw course administration, including grading, exam preparation, and student evaluations, demonstrating organizational skills and a commitment to fostering academic excellence. Leveraged these experiences to build a strong foundation in data strategy, analytics, and mentoring, aligning with leadership roles in healthcare data informatics.

SKILLS

Machine Learning & Risk Prediction

- Expert in developing machine learning tools for risk prediction and diagnosis, with a focus on genetic data and women's health. Proficient in R, Python, and cloud-based environments for predictive modeling in bioinformatics and clinical data analysis.

- Extensive experience in statistical modeling using R, Python, SAS, and STATA. Skilled in multivariate analysis, survival analysis, and spatial analysis (GeoDa, QGIS, ArcGIS) to uncover insights in complex health data.

Epidemiological Research & Data Analysis

- Proficient in designing and analyzing cohort studies, case-control studies, and clinical trials. Proven ability to conduct rigorous statistical analyses to inform disease risk assessment and health policy interventions.

Cross-Functional Collaboration & Leadership

- Proven Led and mentored multidisciplinary research teams, driving project success from concept to publication. Strong collaboration skills with bioinformaticians, clinicians, and external partners to align research with clinical objectives.

Strategic Communication & Funding Acquisition

- Experienced in presenting research findings to diverse audiences and publishing in high-impact journals. Adept at translating complex data into actionable insights for stakeholders and aligning research strategies with business goals.
- Successfully secured funding from Google, PAHO, and other top organizations, showcasing strategic grant writing and the ability to align research with funding priorities.

Language Proficiency

- Native English speaker, fluent in Spanish, enabling effective communication with global research partners.

SCIENTIFIC WORKS

PUBLICATIONS

Ayton, S.G., Garza-Hernandez, D., Robles-Espinoza, C.D., Fuentes-Aguilar, R.Q., Pavlicova, M, Martínez-Ledesma, E., Tamez, Peña J.G., Garcia-Pompermayer M.R., Treviño, V. Comprehensive Molecular Subtyping with MuTATE: Advancing Precision Medicine in Complex Diseases. Bioinformatics (Under Revision, 2024) — 2024

Garcia-Pompermayer, M.R., **Ayton, S.,** Silva-Luna, K., Garza-Elizondo, M.A The Power of US: Breaking Barriers and Bridging the Gap of Ultrasound in Rheumatology to Empower a New Generation. Clin Rheumatol 43, 2103–2116 (2024). https://doi.org/10.1007/s10067-024-06973-w — 2024

Ayton, S.G., Treviño, V. MuTATE – An R Package for Comprehensive Multi-Objective Molecular Modeling. *Bioinformatics*. 2023;39(9):btad507. doi:10.1093/bioinformatics/btad507 — 2023

Solmo, C., Yuengling, K.A., Cooney, M., Sachathep, K., **Ayton, S.,** Kirungi, W., Rogers, J., Jonnalagadda, S., Payne, D., Low, A. Contraception and Intersection with HIV Servives in 11 High-Burden Sub-Saharan African Countries: Results from the Population-Based HIV Impact Assessment (PHIA) Cross Sectional Studies Conducted from 2015-2018. International Journal of Gynecology and Obstetrics. 2023;10.1002/ijgo.14960. doi:10.1002/ijgo.14960 — 2023

Ayton, S., Schwitters, A., Mantell, J., Nuwagaba-Biribonwoha, H. Hakim, A. Hoffman, S. Biraro, S., Philip, N., Wiesner, L., Gummerson, E., Brown, K., Nyogea, D., Barradas, D., Nzima, M., Sachathep, K., Mnisi, Z., Fischer-Walker, C., Payne, D., Mulenga, L., Low, A. Male partner age, viral load, and HIV infection in adolescent girls and young women: Evidence from eight countries in sub-Saharan Africa. *AIDS*. 2023;37(1):113-123. doi:10.1097/QAD.0000000000003388 — 2022

Low, A., Gummerson, E., Schwitters A.M., Bonifacio, R., Teferi, M., Mutenda, N., **Ayton, S.,** Juma, J., Ahpoe, C., Ginindza, C., Patel, H., Biraro, S., Sachathep, K., Hakim, A., Barradas, D., Saandani Hassani, A., Kirungi, W., Jackson, K., Goeke, L., Philip, N.M., Mulenga, L., Ward, J., Hong, S., Rutherford, G.W., Findley, S. Food Insecurity and the Risk of HIV Acquisition: Findings From Six Sub-Saharan African Countries, 2015-2017 BMJ Open. 2022;12(7):e058704. Published 2022 Jul 12. doi:10.1136/bmjopen-2021-058704 — 2022

Ayton, S., Pavlicova, M., Robles-Espinoza, C.D., Tames, J., Treviño, V. Multiomics Subtyping for Clinically Prognostic Cancer Subtypes and Personalized Therapy: A Systematic Review and Meta-Analysis. *Genet Med.* 2022;24(1):15-25. doi:10.1016/j.gim.2021.09.006 — 2022

Ayton, S., Pavlicova, M., Abdool Karim, Q. Identification of Adolescent Girls and Young Women for targeted HIV prevention: A new risk scoring tool in KwaZulu Natal, South Africa. *Scientific Reports*. 2020;10:13017. doi:10.1038/s41598-020-69842-x — 2020

Ayton, S., Pavlicova, M., Tamir, H., Abdool Karim, Q. Development of a prognostic tool exploring female adolescent risk for HIV prevention and PrEP in rural South Africa, a generalized epidemic setting. *Sexually Transmitted Infections*. 2020; 96(1): 47-54. doi:10.1136/sextrans-2019-054067 — 2020

Ayton, S., Pavlicova, M., Tamir, H., Abdool Karim, Q. Assessing HIV & HSV risk predictors among South African females. Master's Thesis. 2018. — 2018

Ayton, S., Esteves, C., Portelli, I. R&D: Safe Surgery Innovation in Crisis. Crisis Response Journal edition 12:2. 2016. — 2016

Ayton, S., Esteves, C., Portelli, I. How Your Voice is Transforming Virtual Medicine, Crisis Response Journal. 2016. 2016

Ayton, S., Bradley, B. Dengue Hemorrhagic Fever and Dengue Virus: Forecasting a Growing Threat to Human Health. University of Massachusetts Amherst. Special Collections and University Archives: Theses and Dissertations. 2016. 2016

PRESENTATIONS, ABSTRACTS, & POSTERS

Garcia-Pompermayer, M.R., **Ayton, S.,** Silva-Luna, K., Garza-Elizondo, M.A Exploring the Power of Ultrasound in Rheumatology: Insights from Young Rheumatologists in Mexico. ACR 2023. 2023

Amano, H., Lee, W.J., Li, C., Sasaki, T., Platt, A., **Ayton, S.,** Motegi, S.I. The Real-World Treatment Patterns and Effectiveness of Upadacitinib in Patients With Moderate to Severe Atopic Dermatitis in Japan. EADV 2023. 2023

Ailani, J., Parikh, K., **Ayton, S.,** Duan, M., Gandhi, P., Umashankar, K., Wilson, L., Lipton, R.B. The Impact of Ubrogepant on the Use of Other Migraine Acute Treatments, Opioid Discontinuation, and Medication Overuse: Results From a Pre-Post Opioid Subcohort Analysis. AHS 2023. 2023

Ayton, S. Automatic Multi-Target Clinical Classification and Biomarker Discovery in Cancer. Journey 2 Innovation 2021. 2021

Dierst-Davies, R., Godby Vail, S., **Ayton, S.,** Lidrbauch, G., Vargas, J., Andric, N., Harvey, E., Szwartz, G., Garza, M., Lozano, J.A., Arias, A., Sosa, P., Martinez, P., Reyes, J. A Mixed-Methods Approach Integrating Behavioral Insights and Data Analytics to Address Retention at Diabetes Clinics in Mexico: A Guide for Program Development. APHA 2019 Annual Meeting, November 2019. 2019

Harvey, E., Andric, N., Dierst-Davies, R., Godby Vail, S., Szwartz, G., Arias, A., Coltin, K., Lozano, J.A., Garza, M., **Ayton, S.,** Lidrbauch, G., Reyes, J., Sosa, P., Martinez, P. Pathway Analysis for Care Adherence Modeling. APHA 2019 Annual Meeting, November 2019. 2019

Ayton, S., Schwitters, A., Mantell, J., Hakim, A., Hoffman, S., Philip, N., Brown, K., Barradas, D., Payne, D., Low, A. Male partner age and HIV infection among young women in cohabitating partnerships in five countries in southern Africa. 10th IAS Conference on HIV Science (IAS), 2019. 2019

Ayton, S., Cortés Hernandez, D., Picazzo Palencia, E. Using a novel spatial analysis to predict Zika distribution in the Mexico-U.S. border, 1947-2017. SER Meeting. June, 2018. 2018

Ayton, S., Cortés Hernandez, D., Zika Virus: Assessing Mexico Border Health. CIDICS, Universidad Autónoma de Nuevo León, Mexico. CIDICS Speaker Series, 2017. 2017

Ayton, S., Cortés Hernandez, D., Picazzo Palencia, E., Assessing Zika Along the U.S.-Mexico Border. Columbia University. MSPH: Epidemiology Research Conference, 2017. 2017

Ayton, S., Bradley, B., Dengue Hemorrhagic Fever and Dengue Virus: Forecasting a Growing Threat to Human Health. University of Massachusetts. Massachusetts Statewide Annual Research Conference, 2016. 2016

GRANTS & AWARDS

Full Tuition Grant for Doctoral Study in Engineering, ITESM 2019-2023

Doctoral Fellowship, Consejo Nacional de Ciencia y Tecnología (CONACYT) 2019-2023

Google Latin America Research Award (LARA) 2022-2023

AAUW Dissertation Fellowship 2022-2023

Organization of the American States (OAS), Consejo Nacional de Ciencia y Tecnología (CONACYT), and Pan-American Health Organization (PAHO) Award for Postgraduate Study in Engineering, Science, and Health in Mexico 2019

Epidemiology Merit Award, Columbia University 2016-2018

EPIC Fund Scholar, Department of Epidemiology, Columbia University 2018

Mailman School Scholars Fund Award, Columbia University 2016-2017

College of Natural Sciences Dean's List, University of Massachusetts 2013-2016

Chancellor's Award, University of Massachusetts 2013-2016

Commonwealth Honors Research Fellowship, University of Massachusetts 2016

Commonwealth Honors Research Grant, University of Massachusetts 2015

Evans Family Scholarship for Environmental Conservation, University of Massachusetts 2015

Otto Deneger Scholarship, University of Massachusetts 2015

Mass Society, University of Massachusetts 2015

Fonseca Scholarship, University of Massachusetts 2015