Katherine J. Siddle, Ph.D.

RESEARCH & TEACHING INTERESTS

I am a multidisciplinary scientist with a broad background in human and pathogen genomics, transcriptomics, anthropology and experimental molecular biology. My research integrates analysis of large biological data sets, experimentation and fieldwork to investigate the genetic diversity of emerging viruses and the role of host and pathogen genetic variation in disease pathogenicity. My interests include the evolution of viral pathogens and their human hosts, host-pathogen interactions, the etiology of uncharacterized infections, cellular responses to infection, and technology development to facilitate the expansion of genomics research capacity for global health.

PROFESSIONAL EXPERIENCE

2023- **Assistant Professor,** Brown University, Providence, RI

2020-22 **Research Scientist,** Broad Institute, Cambridge, MA
Supervisor: Pardis Sabeti, MD, D.Phil.
Field of research: Virus tropism and host responses to Ebola virus and SARS-CoV-2.

2015-20 **Postdoctoral Fellow in genomics of infectious disease,** Organismic and Evolutionary Biology, Harvard University, Cambridge, MA
Faculty Advisor: Pardis Sabeti, MD, D.Phil.
Field of research: Development and application of genomic and metagenomic approaches for the detection, surveillance and epidemiology of viral pathogens

2014-15 **Postdoctoral Fellow in human immunogenomics,** Human Evolutionary Genetics, Institut Pasteur, Paris, France
Faculty Advisor: Lluis Quintana-Murci, PhD.
Field of research: Human population diversity in innate responses to diverse immune challenges

2009-10 **Research Assistant in cardiovascular genetics,** Newcastle University UK.
Supervisor: Bernard Keavney, DM.
Field of research: The genetic basis of rare congenital heart diseases

EDUCATION

2014 **Ph.D. in life sciences**, Université Pierre et Marie Curie & Institut Pasteur, Paris, France
Faculty Advisor: Lluis Quintana-Murci, PhD.
Thesis: A genome-wide perspective of the genetic regulation of the immune response to bacterial infection

2009 **M.Phil. Biological Anthropological Sciences**, University of Cambridge, Cambridge, UK

2008 **B.A. Archaeology and Anthropology**, University of Cambridge, Cambridge UK (Class I)

PUBLICATIONS

Highlighted Publications

Siddle, Katherine J., Lydia A. Krasilnikova, Gage K. Moreno, Stephen F. Schaffner, Johanna Vostok, Nicholas A. Fitzgerald, Jacob E. Lemieux, et al. 2022. “Transmission from Vaccinated Individuals in a Large SARS-CoV-2 Delta Variant Outbreak.” *Cell* 185,485-492.

Lagerborg, Kim A., Erica Normandin, Matthew R. Bauer, Gordon Adams, Katherine Figueroa, … Steven K. Reilly* & Katherine J. Siddle*. 2021. “DNA Spike-Ins Enable Confident Interpretation of SARS-CoV-2 Genomic Data from Amplicon-Based Sequencing.” *Nature Microbiology*, December.

Gaye, Amy, Tolla Ndiaye, Mouhamad Sy, Awa B. Deme, Alphonse B. Thiaw, … Katherine J. Siddle* & Daouda Ndiaye*. 2021. “Genomic Investigation of a Dengue Virus Outbreak in Thiès, Senegal, in 2018.” *Scientific Reports* 11 (1): 10321.

Lemieux, Jacob E.*, Katherine J. Siddle*, Bennett M. Shaw, Christine Loreth, Stephen F. Schaffner, Adrianne Gladden-Young, Gordon Adams, et al. 2020. “Phylogenetic Analysis of SARS-CoV-2 in Boston Highlights the Impact of Superspreading Events.” *Science*, December.

Metsky, Hayden C.*, Katherine J. Siddle*, Adrianne Gladden-Young, James Qu, David K. Yang, Patrick Brehio, Andrew Goldfarb, et al. 2019. “Capturing Sequence Diversity in Metagenomes with Comprehensive and Scalable Probe Design.” *Nature Biotechnology* 37 (2): 160–68.

Siddle, Katherine J., Philomena Eromon, Kayla G. Barnes, Samar Mehta, Judith U. Oguzie, Ikponmwosa Odia, Stephen F. Schaffner, et al. 2018. “Genomic Analysis of Lassa Virus during an Increase in Cases in Nigeria in 2018.” *The New England Journal of Medicine* 379 (18): 1745–53.

Siddle, Katherine J., Ludovic Tailleux, Matthieu Deschamps, Yong-Hwee Eddie Loh, Cécile Deluen, Brigitte Gicquel, Christophe Antoniewski, Luis B. Barreiro, Laurent Farinelli, and Lluís Quintana-Murci. 2015. “Bacterial Infection Drives the Expression Dynamics of microRNAs and Their isomiRs.” *PLoS Genetics* 11 (3): e1005064.

Siddle, Katherine J., Matthieu Deschamps, Ludovic Tailleux, Yohann Nédélec, Julien Pothlichet, Geanncarlo Lugo-Villarino, Valentina Libri, et al. 2014. “A Genomic Portrait of the Genetic Architecture and Regulatory Impact of microRNA Expression in Response to Infection.” *Genome Research* 24 (5): 850–59.

Siddle, Katherine J., J. A. Goodship, B. Keavney, and M. F. Santibanez-Koref. 2011. “Bases Adjacent to Mononucleotide Repeats Show an Increased Single Nucleotide Polymorphism Frequency in the Human Genome.” *Bioinformatics* 27 (7): 895–98.

Scholes, Clarissa*, Katherine J. Siddle*, Axel Ducourneau, Federica Crivellaro, Mari Järve, Siiri Rootsi, Maggie Bellatti, et al. 2011. “Genetic Diversity and Evidence for Population Admixture in Batak Negritos from Palawan.” *American Journal of Physical Anthropology* 146 (1): 62–72.

Additional Published Research

Adams, Gordon, Gage K. Moreno, Brittany A. Petros, Rockib Uddin, Zoe Levine, Ben Kotzen, Katelyn Messer … Katherine J. Siddle et al., 2023. The 2022 RSV surge was driven by multiple viral lineages. *NEJM*. Apr 6; 388(14): 1335–1337.

Earnest, Rebecca, Rockib Uddin, Nicholas Matluk, Nicholas Renzette, Katherine J. Siddle, Christine Loreth, Gordon Adams, et al. 2022. “Comparative Transmissibility of SARS-CoV-2 Variants Delta and Alpha in New England, USA.” *Cell Reports Medicine.* Mar 11;3(4):100583.

Petros, Brittany A., Jillian S. Paull, Christopher H. Tomkins-Tinch, Bryn C. Loftness, Katherine C. DeRuff, Paru Nair, Gabrielle L. Gionet, … Katherine J. Siddle, et al. 2022. Multimodal surveillance of SARS-CoV-2 at a university enables development of a robust outbreak response framework. *Med (N Y).* Dec 9;3(12):883-900.e13.

Tegally Houriiyah, James E. San, Matthew Cotten, Monika Moir, Bryan Tegomoh, Gerald Mboowa, Darren P. Martin, … Katherine J. Siddle, et al. 2022. The evolving SARS-CoV-2 epidemic in Africa: Insights from rapidly expanding genomic surveillance. *Science.* 378(6615):eabq5358.

Turbett, Sarah E., Christopher H. Tomkins-Tinch, Melis N. Anahtar M, Caitlin M. Dugdale, Emily P. Hyle, Erica S. Shenoy, … Katherine J. Siddle, et al. 2022. Distinguishing SARS-CoV-2 persistence and reinfection: A retrospective cohort study. *Clinical Infectious Disease.* 21:ciac830.

Welch, Nicole L., Meilin Zhu, Catherine Hua, Juliane Weller, Marzieh E. Mirhashemi, Tien G. Nguyen, Sreekar Mantena, … Katherine J. Siddle, et al. 2022. Multiplexed CRISPR-based microfluidic platform for clinical testing of respiratory viruses and identification of SARS-CoV-2 variants. *Nature Medicine.* 28(5):1083-1094.

Anahtar, Melis N., Bennett M. Shaw, Damien Slater, Elizabeth H. Byrne, Yolanda Botti-Lodovico, Gordon Adams, … Katherine J. Siddle, et al. 2021. “Development of a Qualitative Real-Time RT-PCR Assay for the Detection of SARS-CoV-2: A Guide and Case Study in Setting up an Emergency-Use, Laboratory-Developed Molecular Microbiological Assay.” *Journal of Clinical Pathology* 74 (8): 496–503.

Brown, Catherine M., Johanna Vostok, Hillary Johnson, Meagan Burns, Radhika Gharpure, Samira Sami, … Katherine J. Siddle, et al. 2021. “Outbreak of SARS-CoV-2 Infections, Including COVID-19 Vaccine Breakthrough Infections, Associated with Large Public Gatherings - Barnstable County, Massachusetts, July 2021.” *MMWR. Morbidity and Mortality Weekly Report* 70 (31): 1059–62.

Delorey, Toni M., Carly G. K. Ziegler, Graham Heimberg, Rachelly Normand, Yiming Yang, Åsa Segerstolpe, … Katherine J. Siddle, et al. 2021. “COVID-19 Tissue Atlases Reveal SARS-CoV-2 Pathology and Cellular Targets.” *Nature*, April. https://doi.org/10.1038/s41586-021-03570-8.

Normandin, Erica, Kathryn B. Holroyd, Sarah I. Collens, Bennett M. Shaw, Katherine J. Siddle, Gordon Adams, Melissa Rudy, et al. 2021. “Intrathecal Inflammatory Responses in the Absence of SARS-CoV-2 Nucleic Acid in the CSF of COVID-19 Hospitalized Patients.” *Journal of the Neurological Sciences* 430 (October): 120023.

North, Crystal M., Amy Barczak, Robert H. Goldstein, Brian C. Healy, Dianne M. Finkelstein, Delaney D. Ding, … Katherine J. Siddle, et al. 2021. “Determining the Incidence of Asymptomatic SARS-CoV-2 among Early Recipients of COVID-19 Vaccines: A Prospective Cohort Study of Healthcare Workers Before, during and after Vaccination [DISCOVER-COVID-19].” *Clinical Infectious Diseases: An Official Publication of the Infectious Diseases Society of America*, August. https://doi.org/10.1093/cid/ciab643.

Sy, Mouhamad, Aida Sadikh Badiane, Awa Bineta Deme, Amy Gaye, Tolla Ndiaye, Fatou Ba Fall, Katherine J. Siddle, et al. 2021. “Genomic Investigation of Atypical Malaria Cases in Kanel, Northern Senegal.” *Malaria Journal* 20 (1): 103.

Tomkins-Tinch, Christopher H., Jennifer S. Daly, Adrianne Gladden-Young, Nicole M. Theodoropoulos, Michael P. Madaio, Neng Yu, … Katherine J. Siddle, et al. 2021. “SARS-CoV-2 Reinfection in a Liver Transplant Recipient.” *Annals of Internal Medicine*, April. https://doi.org/10.7326/L21-0108.

Ajogbasile, Fehintola V., Judith U. Oguzie, Paul E. Oluniyi, Philomena E. Eromon, Jessica N. Uwanibe, Samar B. Mehta, Katherine J. Siddle, et al. 2020. “Real-Time Metagenomic Analysis of Undiagnosed Fever Cases Unveils a Yellow Fever Outbreak in Edo State, Nigeria.” *Scientific Reports* 10 (1): 3180.

Barnes, Kayla G., Anna E. Lachenauer, Adam Nitido, Sameed Siddiqui, Robin Gross, Brett Beitzel, Katherine J. Siddle, et al. 2020. “Deployable CRISPR-Cas13a Diagnostic Tools to Detect and Report Ebola and Lassa Virus Cases in Real-Time.” *Nature Communications* 11 (1): 4131.

Gaye, Amy, Mouhamad Sy, Tolla Ndiaye, Katherine J. Siddle, Daniel J. Park, Awa B. Deme, Aminata Mbaye, et al. 2020. “Amplicon Deep Sequencing of kelch13 in Plasmodium Falciparum Isolates from Senegal.” *Malaria Journal* 19 (1): 134.

Ndiaye, Tolla, Mouhamad Sy, Amy Gaye, Katherine J. Siddle, Daniel J. Park, Amy K. Bei, Awa B. Deme, et al. 2020. “Molecular Epidemiology of Plasmodium Falciparum by Multiplexed Amplicon Deep Sequencing in Senegal.” *Malaria Journal* 19 (1): 403.

Rotival, Maxime, Katherine J. Siddle, Martin Silvert, Julien Pothlichet, Hélène Quach, and Lluis Quintana-Murci. 2020. “Population Variation in miRNAs and isomiRs and Their Impact on Human Immunity to Infection.” *Genome Biology* 21 (1): 187.

Wohl, Shirlee, Hayden C. Metsky, Stephen F. Schaffner, Anne Piantadosi, Meagan Burns, Joseph A. Lewnard, … Katherine J. Siddle, et al. 2020. “Combining Genomics and Epidemiology to Track Mumps Virus Transmission in the United States.” *PLoS Biology* 18 (2): e3000611.

Lopez, Marie, Jeremy Choin, Martin Sikora, Katherine J. Siddle, Christine Harmant, Helio A. Costa, Martin Silvert, et al. 2019. “Genomic Evidence for Local Adaptation of Hunter-Gatherers to the African Rainforest.” *Current Biology: CB* 29 (17): 2926–35.e4.

Boisen, Matthew L., Jessica N. Hartnett, Jeffrey G. Shaffer, Augustine Goba, Mambu Momoh, John Demby Sandi, … Katherine J. Siddle, et al. 2018. “Field Validation of Recombinant Antigen Immunoassays for Diagnosis of Lassa Fever.” *Scientific Reports* 8 (1): 5939.

Choi, Kyungyong, Hyunryul Ryu, Katherine J. Siddle, Anne Piantadosi, Lisa Freimark, Daniel J. Park, Pardis Sabeti, and Jongyoon Han. 2018. “Negative Selection by Spiral Inertial Microfluidics Improves Viral Recovery and Sequencing from Blood.” *Analytical Chemistry* 90 (7): 4657–62.

Nejad, Charlotte, Katherine A. Pillman, Katherine J. Siddle, Geneviève Pépin, Minna-Liisa Änkö, Claire E. McCoy, Traude H. Beilharz, et al. 2018. “miR-222 Isoforms Are Differentially Regulated by Type-I Interferon.” *RNA* 24 (3): 332–41.

Barnes, Kayla G., Jason Kindrachuk, Aaron E. Lin, Shirlee Wohl, James Qu, Samantha D. Tostenson, … Katherine J. Siddle, et al. 2017. “Evidence of Ebola Virus Replication and High Concentration in Semen of a Patient During Recovery.” *Clinical Infectious Diseases: An Official Publication of the Infectious Diseases Society of America* 65 (8): 1400–1403.

Pai, Athma A., Golshid Baharian, Ariane Page Sabourin, Jessica F. Brinkworth, Yohann Nedelec, Joseph W. Foley, … Katherine J. Siddle, et al. 2016. “Widespread Shortening of 3’ Untranslated Regions and Increased Exon Inclusion Are Evolutionarily Conserved Features of Innate Immune Responses to Infection.” *PLoS Genetics* 12 (9): e1006338.

Fagny, Maud, Etienne Patin, Julia L. MacIsaac, Maxime Rotival, Timothée Flutre, Meaghan J. Jones, Katherine J. Siddle, et al. 2015. “The Epigenomic Landscape of African Rainforest Hunter-Gatherers and Farmers.” *Nature Communications* 6 (November): 10047.

Patin, Etienne, Katherine J. Siddle, Guillaume Laval, Hélène Quach, Christine Harmant, Noémie Becker, Alain Froment, et al. 2014. “The Impact of Agricultural Emergence on the Genetic History of African Rainforest Hunter-Gatherers and Agriculturalists.” *Nature Communications* 5: 3163.

Review Articles & Book chapters

Klitting, Raphaëlle, Samar B. Mehta, Judith U. Oguzie, Paul E. Oluniyi, Matthias G. Pauthner, Katherine J. Siddle, Kristian G. Andersen, Christian T. Happi, and Pardis C. Sabeti. 2020. “Lassa Virus Genetics.” *Current Topics in Microbiology and Immunology*, May. https://doi.org/10.1007/82_2020_212.

Ye, Simon H., Katherine J. Siddle, Daniel J. Park, and Pardis C. Sabeti. 2019. “Benchmarking Metagenomics Tools for Taxonomic Classification.” *Cell* 178 (4): 779–94.

Siddle, Katherine J., and Lluis Quintana-Murci. 2014. “The Red Queen’s Long Race: Human Adaptation to Pathogen Pressure.” *Current Opinion in Genetics & Development* 29 (December): 31–38.

PRESENTATIONS

Invited Talks and webinars

- Domestic and International monitoring of emerging SARS-CoV-2 variants; Symposium of the Massachusetts Consortium on Pathogen Readiness, October 2022.
- Developing and applying pathogen genome sequencing to characterize viral emergence and transmission; McMaster University graduate student seminar, April 2022.
- Detecting & tracking contamination in SARS-CoV-2 sequencing with spike-in controls; ARTIC-CLIMB Workshop 3, January 2022.
- Genomic surveillance of emerging viruses in Massachusetts and West Africa; Writing the Future of Infectious Disease hosted by Twist Bioscience, May 2021
- From Detection to Testing: Utilizing NGS to Power Precision Medicine GEN Live, April 2021.
- SARS-CoV-2: the science of the sequence. GEN Live, February 2021.
- The added value of genomic sequencing in SARS-CoV-2. NEB webinar, October 2020.
- Genomic epidemiology of Sars-CoV-2 in Massachusetts. Women in Data Science meeting, May 2020.
- Pathogen genomic surveillance in West Africa. Center for International Health Research seminar series, Brown University, November 2019
- Genomic Surveillance in West Africa: Lassa, Ebola and beyond. ASM Biothreats meeting, 2017.
- Profiling variation in the human miRome. Hôpital de la Salpétrière, Paris, France, 2011.

Conference Talks

- Genomic epidemiology of Lassa virus in Nigeria during a season of unusually high incidence. ASTMH annual meeting, New Orleans, 2018.
- A pan-viral capture sequencing approach to elucidate the virome of acute fever and enhance viral surveillance in West Africa. ASTMH annual meeting, Baltimore, 2017.
- Characterising the variability of the host miRNA response to mycobacterial infections. Human Genome Meeting, Geneva, 2014.

Posters and abstracts

- Systemic viral and host dynamics in lethal Ebola Virus Disease in Rhesus monkeys. Gordon Conference: Tropical Infectious Diseases, Galveston (TX), USA, 2023.
- Exploring viral and social factors underlying high incidence of negative tests in the Nigerian 2018 Lassa fever outbreak. Lassa Fever International Conference, Abuja, Nigeria, 2019.

- Genomic epidemiology of Lassa virus in Nigeria during a season of unusually high incidence. Viral Genomics and Evolution Meeting, Hinxton, UK, 2018.
- Viral metagenomics and assembly tools for West African genomics centres. Viral Genomics and Evolution Meeting, Hinxton, UK, 2016.
- Characterising genetic variation underlying the miRNA-mediated immune response to Mycobacterium tuberculosis. European Society of Human Genetics Conference, Paris, 2013.
- Searching for response miR-eQTLs to infection combining next-generation sequencing and array-based microRNA profiling. CSHL Biology of Genomes Conference, New York, 2012.
- Deep sequencing of the miRNA repertoire in response to *Mycobacterium tuberculosis* infection in a human cellular system. EMBO conference on Host Genetic Control of Infectious Diseases, Paris, 2011

TEACHING & ADVISING EXPERIENCE

Guest lectures

- NGS and bioinformatics Masterclass. Université Cheikh Anta Diop (UCAD): conference on "*Pandemics of the 21st Century*", Dakar, Senegal, Spring 2023 (2 days)
- Viral hemorrhagic fevers: how molecular insights can help understand disease. Harvard Medical School HST-40 (Microbial Pathogenesis), Fall 2022.
- Clinical metagenomics and targeted capture in West Africa, Yale School of Public Health EMD531 (Genomic epidemiology of infectious diseases), Spring 2021.
- Molecular epidemiology of hemorrhagic fever viruses, Harvard School of Public Health IID207 (Infectious Disease Outbreaks of the 20th and 21st Centuries), Spring 2020, 2021, 2022 & 2023
- Human population genomics and genetic epidemiology, Institut Pasteur, Paris, France, 2013 & Université Paris Diderot, Paris, France, 2012.
- Genome analysis, Institut Pasteur, Paris, France, 2011 & 2012.
- Human genetics and infectious disease, Institut Pasteur, Paris, France, 2011 & 2012.
- Human evolutionary genetics, Université Paris Diderot, Paris, France, 2011.

Non-academic teaching

- Scientific English for undergraduate students preparing for internships abroad, Université Paris Diderot, 2011: six week long small group teaching in scientific English.
- Summer training program in infectious disease genomics, Harvard University, 2017: guest lectures in molecular diagnostics for viral diseases and metagenomic sequencing for detecting infections in clinical samples

Short courses (developed, organized and taught)

- Introduction to phylogenetic analysis, UCAD, Dakar, Senegal, 2020 (2 days)
- Introduction to grant writing, UCAD, Dakar, Senegal, 2019 (2 days)
- Introduction to R programming, UCAD, Dakar, Senegal, 2019 (3 days)
- CRISPR-based diagnostics for infectious disease diagnosis, UCAD, Dakar, Senegal, 2019 (5 days)
- Workshop in theory and practice of hybrid capture for enrichment of viral nucleic acids, Redeemer's University, Ede, Nigeria, 2017 (5 days)

Advising Experience

- 5 graduate students at Harvard University & Broad Institute; 2 rotation students, 1 Masters student and 3 full-time PhD students (2017 - present).

- 3 undergraduate students at Harvard University & Broad Institute, 2016-2017, 2018 and 2019.
- 1 graduate student at Université Pierre et Marie Curie, 2012.
- Informal advisor to 3 graduate students and one postdoctoral trainee at Université Cheikh Anta Diop, Senegal (2015 - present)
- Managed 6 Research Associates at the Broad Institute across diverse projects (2020 - present)

FELLOWSHIPS & AWARDS

Fellowships

- COBRE Computational Biology of Human Disease pilot award (2023)
- American Society of Tropical Medicine and Hygiene Centennial award recipient (2018-2019)
- Post-doctoral fellow of the Human Frontiers in Science Program (2016-2019)
- Post-doctoral fellow of the Fondation pour la Recherche Médicale (2015-2016)
- Scholar of the Pasteur-Paris University International PhD Program (2010-2013)

Academic Recognition

- Broad Institute Excellence award in extraordinary work related to the COVID-19 pandemic (2020)
- Allen, Meek and Reed Graduate Scholarship. University of Cambridge, UK (2008-2009).

PROFESSIONAL SERVICE

Committee Experience

- Departmental weekly seminar organizing committee, Broad Institute Infectious Disease and Microbiome Program, 2022.
- Working groups for Outbreak Response and Capacity Building NIAID-CREID network (2020 – present)
- Pre-selection committee for the Broad Summer Research Program, 2021
- Pre-selection committee for the Broad Summer Scholars Program, 2022
- Organizing committee of the Young Researchers in Life Sciences Congress, Paris, France, 2014
- Organizing committee of the annual retreat of the PPU International PhD Program, 2012

Peer Reviewing

- Ad hoc reviewer for journals including; Nature, Nucleic Acids Research, Frontiers in Immunology, Emerging Infectious Diseases, Cell Reports Medicine, Viruses, Virus Evolution, and Virology.

Outreach and Diversity Involvement

- Keynote speaker, GirlUp Boston STEMinist Bootcamp, December 2020
- Guest speaker, Whitehead Institute's Seminar Series for High School Teachers, November 2020
- Broad Bio-coding club: semester-long program of weekly after school coding classes for Sixth to Eighth Grade in Cambridge Massachusetts, 2020
- Broad Scientists in the classroom: semester-long program of science lesson planning and teaching for Eighth Grade in Cambridge Massachusetts, 2017 – 2019
- Mass STEM Hub volunteer judge for student STEM week science projects, 2019
- Mentor for the Broad Summer Research Program, 2018

Professional memberships

- American Society of Tropical Medicine and Hygiene; American Society of Virology