Callum Arnold

PhD Candidate

Pennsylvania State University, State College

+1 814 660 8355 | arnold.crk@gmail.com | callumarnold.com | 0000-0002-3245-6956 |
Callum_Arnold | arnold-c | arnold-c | thecallumarnold

Education

PhD Infectious Disease Modelling (Biology)

State College, USA

Pennsylvania State University

Aug 2020 - Jun 2025

- University Graduate Fellowship
- Homer F. Braddock Scholarship in Biology, Chemistry, and Physics (Eberly College of Science)

MSc Global Health Policy

London, UK (Online)

London School of Hygiene and Tropical Medicine

Sep 2017 - Jun 2020

- Distinction
- Board of Examiners' Academic Achievement Award

MChem Chemistry

Oxford, UK

University of Oxford

Sep 2011 - Jun 2015

- Class I in Master's research year (supervisor: Prof R. Paton)

Short Courses

Communicating Novelty and Controversy in EEID

State College, USA

Ecology & Evolution of Infectious Diseases

May 2023

- 3-day course about improving the communication of infectious disease research to a wide range of audiences, with a full-day workshop run by the Alan Alda Center for Communicating Science

Introduction to Outbreak Analytics Using R

Online

London School of Hygiene and Tropical Medicine

Nov 2021

- 5-day course on the core competencies for analyzing infectious disease outbreaks, from estimating growth rates and reproduction numbers, to reconstructing phylogentic trees and the incorporation of contact tracing data into network models

Summer Institute in Statistics and Modeling in Infectious Diseases

Seattle, USA

University of Washington

Jul 2021

- 2 week course on the modelling of infectious disease through a wide variety of statistical techniques
- Awarded SISMID scholarship
- Courses completed: Simulation-Based Inference for Epidemiological Dynamics, Contact Network Epidemiology, MCMC II for Infectious Diseases

Network Modelling for Epidemics

Seattle, USA

University of Washington

Aug 2018

- 5-day course on the application of stochastic agent-based network modelling techniques to complex epidemic models, building from deterministic and stochastic compartmental models

Research Experience

Pennsylvania State University — *State College, USA*
PhD Candidate — *Aug 2020 - Jun 2025*

- **Data4Action**: Characterized the heterogeneity of SARS-nCoV-2 seroprevalence among two geographically coincident populations, and identified risk factors for infection among students
- **Data4Action**: Performed Latent Class Analysis (LCA) on the SARS-nCoV-2 seroprevalence data, to identify the relationship between risk behavior and infection and vaccination rates among student population
- **UrgEpi**: Developing novel measles outbreak detection methods to optimize limited testing capabilities for use by Médecins Sans Frontières in the Democratic Republic of Congo
- **UrgEpi**: Examined the role of a new laboratory on the speed of diagnosis and outbreak response decisions for measles in the ex-Katanga region of the Democratic Republic of Congo

The Hospital for Sick Children — *Toronto, CAN*
Clinical Research Project Coordinator — *Apr 2018 - Dec 2019*

- Coordinated a multi-centre observational study into waning immunity in infants to measles, mumps and varicella
- Managed all data produced by the National Microbiology Laboratory and the Nova Scotia Health Authority laboratory for the waning immunity study
- Conducted data analysis on additional research studies within the Infectious Diseases division, and in collaboration with epidemiologists at Public Health Ontario

University of Oxford — *Oxford, UK*
MChem Project — *Sep 2014 - Jun 2015*

- Performed ab intio and DFT calculations, and semi-empirical computational methods, to ascertain the mechanism of an atropselective aromatic nucleophilic substitution in biaryl derivatives
- Utilised and wrote Python and Bash scripts to extract relevant data from files generated by the computational chemistry software Gaussian

Teaching Experience

Pennsylvania State University — *State College, USA*
Teaching Assistant — *Jan 2022 - Dec 2023*

- Independently taught 100 Biology students across Bio220W (Populations and Communities) and Bio240W (Function and Development of Organisms)

Summer Institute in Statistics and Modeling in Infectious Diseases — *Seattle, USA*
Teaching Assistant — *Jul 2023*

- TA'd Module 2 (Mathematical Models of Infectious Diseases) of the 2023 SISMID workshop, introducing participants to building epidemiological models in the R programming language
- Rewrote the core teaching materials to be more intuitive and demonstrate best coding practices
- Created an interactive website to accompany the course, providing interactive visuals, written in Javascript, helping student understand the key concepts
- Created and presented a new lecture on understanding and modeling heterogeneity in infectious disease models

Center for Infectious Disease Dynamics (PSU) — *State College, USA*
Instructor — *Mar 2023*

- Developed and taught an introduction to Git and GitHub workshop to graduate students, postdocs, staff, and faculty at the Pennsylvania State University's Center for Infectious Disease Dynamics
- Created an interactive website to accompany the workshop to help guide participants with examples that were directly relevant to their research

Greene's Tutorial Company *Oxford, UK*

Tutor *Sep 2015 - Jul 2017*

- Tutored GCSE and A-Level students in mathematics and the sciences to assist them in achieving their academic goals for their CIE/Edexcel/AQA exams, and for Oxford University interviews and admission tests

d'Overbroeck's *Oxford, UK*

Mathematics Teacher *Nov 2016 - Jul 2017*

- Responsible for the teaching of the A-level maths syllabus, including introductory statistics and mechanics
- Sole teacher, for one term, of a gifted year-8 student covering 1st and 2nd-year University-level maths and statistics

Professional Engagement

Invited Discussions

Ecology & Evolution of Infectious Diseases (EEID) Conference *May 2023*

- Invited to be a discussion group facilitator for the Transmission Discussion at the EEID Conference hosted in State College

Notre Dame *Apr 2022*

- Invited to speak with Dr. Alex Perkin's (Notre Dame) graduate infectious disease epidemiology course about the Data4Action project and Scientific Reports publication

Peer Review

JAMA Network Open *Jul 2023*

- Peer-reviewed for epidemiological modeling papers

Skills & Software

 `{tidyverse}` & functional programming with `{purrr}`, analysis pipelines with `{targets}`, `{rlang}` & Non-Standard Evaluation, parameterized reports with `{rmarkdown}` & Quarto, `{deSolve}`

 `{DataFrames}`, `{DifferentialEquations}`, `{CairoMakie}`, `{ModelingToolkit}`

Others: Git, REDCap, bash/zsh, vim, Python, basic JavaScript, basic CSS, STATA, basic LaTeX, pandoc

Publications

Journal Articles

1. Arnold, C. R. K., Srinivasan, S., Rodriguez, S., Rydzak, N., Herzog, C. M., Gontu, A., Bharti, N., Small, M., Rogers, C. J., Schade, M. M., Kuchipudi, S. V., Kapur, V., Read, A. F., & Ferrari, M. J. (2022). A longitudinal study of the impact of university student return to campus on the SARS-CoV-2 seroprevalence among the community members. *Scientific Reports*, *12*(1), 8586. https://doi.org/10.1038/s41598-022-12499-5
2. Fernquest, S., Palmer, A., Pereira, C., Arnold, C., Hirons, E., Broomfield, J., Newman, S., & Glyn-Jones, S. (2020). The Response of Hip Joint Cartilage to Exercise in Children: An MRI Study Using T2-Mapping. *CARTILAGE*, 1947603520931182. https://doi.org/10.1177/1947603520931182
3. Han, M. A., Storman, D., Al-Rammahy, H., Tang, S., Hao, Q., Leung, G., Kandi, M., Moradi, R., Bartoszko, J. J., Arnold, C., Rehman, N., & Guyatt, G. (2020). Impact of maternal reproductive factors on cancer risks of offspring: A systematic review and meta-analysis of cohort studies. *PLOS ONE*, *15*(3), e0230721. https://doi.org/10.1371/journal.pone.0230721
4. Piché-Renaud, P.-P., Groves, H., Kitano, T., Arnold, C., Thomas, A., Streitenberger, L., Alexander, L., Morris, S. K., & Science, M. (2020). Healthcare workers' perception of a global outbreak of novel coronavirus (COVID-19) and personal protective equipment: Survey of a pediatric tertiary care hospital. *Infection Control & Hospital Epidemiology*, 1–25. https://doi.org/10.1017/ice.2020.415

5. Science, M., Savage, R., Severini, A., McLachlan, E., Hughes, S. L., Arnold, C., Richardson, S., Crowcroft, N., Deeks, S., Halperin, S., Brown, K., Hatchette, T., Gubbay, J., Mazzulli, T., & Bolotin, S. (2019). Measles Antibody Levels in Young Infants. *Pediatrics*, e20190630. https://doi.org/10.1542/peds.2019-0630

6. Craig, R., Kunkel, E., Crowcroft, N. S., Fitzpatrick, M. C., de Melker, H., Althouse, B. M., Merkel, T., Scarpino, S. V., Koelle, K., Friedman, L., Arnold, C., & Bolotin, S. (2019). Asymptomatic Infection and Transmission of Pertussis in Households: A Systematic Review. *Clinical Infectious Diseases*. https://doi.org/10.1093/cid/ciz531

7. Fernquest, S., Arnold, C., Palmer, A., Broomfield, J., Denton, J., Taylor, A., & Glyn-Jones, S. (2017). Osseous impingement occurs early in flexion in cam-type femoroacetabular impingement. *The Bone & Joint Journal*, *99-B*, 41–48. https://doi.org/10.1302/0301-620X.99B4.BJJ-2016-1274.R1

Posters

1. Arnold, C., & Ferrari, M. J. (2023, May 22–25). *The Maximal Expected Benefit of SARS-CoV-2 Intervention Among University Students: A Simulation Study Using Latent Class Analysis*. EEID 2021, State College, USA. https://osf.io/qbtfs/

2. Arnold, C., Srinivasan, S., Herzog, C. M., Gontu, A., Bharti, N., Small, M., Rogers, C. J., Schade, M. M., Kuchipudi, S. V., Kapur, V., Andrew, R., & Ferrari, M. J. (2021, June 14–17). *SARS-CoV-2 Seroprevalence in a University Community: A Longitudinal Study of the Impact of Student Return to Campus on Infection Risk Among Community Members*. EEID 2021, Montepellier, France. https://www.eeidconference2021.org/posters-full/

3. Khan, S., Science, M., Tsang, K., Arnold, C., Hawes, J., Lee, K.-S., El Helou, S., Sanchez, P., Mertz, D., Kaufman, D., & Team, G. T. (2019, October 3). *Provider Perspectives on Non-sterile Glove Use in the NICU*. Infectious Diseases Society of America IDWeek, Washington, D.C.

4. Science, M., Khan, S., Arnold, C., Bacchini, J., Lee, K.-S., Hawes, J., Sanchez, P., Kaufman, D., & Team, G. T. (2019, October 3). *Parent Perspectives on Infection Prevention and Control in the NICU*. Infectious Diseases Society of America IDWeek, Washington, D.C.

5. Timberlake, K., Al-Dubisi, F., Arnold, C., Roofi Badie, S., Friedman, J., & Science, M. (2019, May 30). *Acute Non-Severe Respiratory Syndromes; Benchmarking for Resource Stewardship*. International Pediatric Antimicrobial Stewardship Conference, St Louis, Missouri, USA.

6. Al-Dubisi, F., Timberlake, K., Arnold, C., Roofi Badie, S., Friedman, J., & Science, M. (2019, May 29). *Acute Non-Severe Respiratory Syndromes; Benchmarking for Resource Stewardship*. University of Toronto Department of Pediatrics and Faculty of Medicine Research Day, Toronto, Canada.

7. Leps, C., Arnold, C., Benipal, S., & Persuad, N. (2019, April 5). *A realist synthesis of food provision and children's health – policy implications and areas of focus*. University of Toronto Department of Family and Community Medicine (DFCM) Conference, Toronto, Canada.

8. Garcia-Ascaso, M. T., Timberlake, K., Arnold, C., Ostrow, O., & Science, M. (2019, March 9). *Appropriateness of broad spectrum antibiotics in a Pediatric Emergency Department*. Pediatric Infectious Diseases Society, Memphis, Tennessee.

9. Science, M., Timberlake, K., Arnold, C., Fung, J., Moninhas, S., & Read, S. (2018, May 5). *Impact of Mandatory Prior Authorization and Automatic Stop Orders on Prolonged Broad Spectrum Antimicrobial Therapy*. Pediatric Academic Societies Meeting, Toronto, Canada.

10. Arnold, C., Mihai, R., Pigott, D., Sadler, G., & Belcher, E. (2017, March 12). *Feasibility of Video-Assisted Thorascopic Surgery (VATS) Parathyroidectomy in Management of Intrathoracic Parathyroid Adenoma.* SCTS Annual Meeting and Cardiothoracic Forum, Belfast, Northern Ireland.