Verity Hill

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Profile

I am a postdoctoral research associate in molecular epidemiology and virus evolution at the Yale School of Public Health. I now primarily work on arboviruses, in particular building genomic surveillance systems for Dengue virus. Previously, I have worked extensively on the evolution and tracking of SARS-CoV-2. I am interested in combining genomic and non-genomic data for practical applications of complex phylodynamics.

Education

2017-2022 **PhD**, *BBSRC EASTBIO PhD programme*, University of Edinburgh
From epidemics to pandemics: elucidating the dynamics of Ebola Virus and SARS-CoV-2
Supervisors: Professor Andrew Rambaut and Professor Mark Woolhouse

2016–2017 **MSc**, *Control of Infectious Diseases*, London School of Hygiene and Tropical Medicine, Distinction, Highest mark in the year
Research project: *Evaluating the use of the Open Data Kit Platform for Investigating a Typhoid Fever Outbreak*, Uganda Virus Research Institute.
Supervisor: Dr Robert Downing
Taught modules include: Extended Epidemiology, Statistical Methods in Epidemiology, Pathogen Genomics, Disease modelling and dynamics, Public Health Policy and Designing Disease Control Programmes for Developing Countries.

2013–2016 **BA(Hons)**, *Biological Sciences*, University of Oxford, First Class Honours
Research project: *Does RORgt inhibition affect the autoimmune phenotype of MAIT cells?*
Supervisors: Professor Paul Klenerman and Dr Ayako Kurioka
Extended Essay: *Can social evolution theory help to solve the antibiotic crisis?* Supervisor: Dr Craig MacLean
Presentation: *Why was the 2014-15 Ebola epidemic so devastating?* Supervisor: Professor Sunetra Gupta

Employment

2022-present **Yale University, USA**, *Postdoctoral research associate, Grubaugh Lab*
Phylogenetic pillar lead in the Grubaugh research group. I support phylogenetic and evolutionary work in the lab, and am co-leading the founding of a genomic surveillance system for Dengue virus via setting up multiple international collaborations

2020 **University of Edinburgh and COG-UK, Edinburgh, UK**, *Postdoctoral scientist, Rambaut Lab*
Employed at a postdoctoral level by the UK COVID-19 genomics consortium COG-UK to support the public health response to COVID-19 in the UK.

2019 **World Health Organisation, Health Emergencies Team, Nigeria Country Office, Abuja, Nigeria**, *Intern*

Over three months, developed and delivered a training course in sequencing, bioinformatics and phylogenetics to Nigerian Centres for Disease Control scientists, wrote a policy guidance document on the use of genomics for response to outbreaks of notifiable diseases and supported normative activities of the team including participating in a Yellow Fever outbreak investigation in Ebonyi state.

2017-2020 **University of Edinburgh, Edinburgh, UK**, *Demonstrator & Tutor*

Teach a variety of coding, genomics and bioinformatics courses which are given to undergraduate and postgraduate students.

2015 **Madagascar SAVE, Antananarivo, Madagascar**, *Intern*

Over six weeks, helped to launch a grass-roots NGO, including working with the UNAIDS Community Mobilization and Networking Advisor to adapt a UNAIDS diversity and inclusion workshop for this NGO and to organise and adapt a Training of Trainers session.

Publications

Stars indicate co-first authorships

2022

Áine O'Toole*, **Verity Hill***, Ben Jackson*, Rebecca Dewar*, Nikita Sahadeo*, Rachel Colquhoun, Stefan Rooke, JT McCrone, Kate Duggan, Martin P McHugh, Samuel M Nicholls, Radoslaw Poplawski, COVID-19 Genomics UK (COG-UK) Consortium, COVID-19 Impact Project (Trinidad & Tobago Group), David Aanensen, Matt Holden, Tom Connor, Nick Loman, Ian Goodfellow, Christine VF Carrington, Kate Templeton, Andrew Rambaut Genomics-informed outbreak investigations of SARS-CoV-2 using civet *PLOS Global Public Health* 2(12) https://doi.org/10.1371/journal.pgph.0000704

John T. McCrone*, **Verity Hill***, Sumali Bajaj*, Rosario Evans Pena* [and 38 others] Context-specific emergence and growth of the SARS-CoV-2 Delta variant *Nature* 610 154-160 doi:https://doi.org/10.1038/s41586-022-05200-3

Verity Hill, Louis Du Plessis, Thomas P Peacock, Dinesh Aggarwal, Rachel Colquhoun, Alesandro M Carabelli, Nicholas Ellaby, Eileen Gallagher, Natalie Groves, Ben Jackson, J T McCrone, Áine O'Toole, Anna Price, Theo Sanderson, Emily Scher, Joel Southgate, Erik Volz, The COVID-19 Genomics UK (COG-UK) Consortium Wendy S Barclay, Jeffrey C Barrett, Meera Chand, Thomas Connor, Ian Goodfellow, Ravindra K Gupta, Ewan M Harrison, Nicholas Loman, Richard Myers, David L Robertson, Oliver G Pybus, Andrew Rambaut The origins and molecular evolution of SARS-CoV-2 lineage B.1.17 in the UK *Virus Evolution* 8(2) doi:https://doi.org/10.1093/ve/veac080

Raquel Viana, Sikhulile Moyo, Daniel G. Amoako, Houriiyah Tegally, Cathrine Scheepers [and 94 others including **Verity Hill**] Rapid epidemic expansion of the SARS-CoV-2 Omicron variant in southern Africa *Nature* 603 679-686 doi:https://doi.org/10.1038/s41586-022-04411-y

Kathryn Campbell, Robert J. Gifford, Joshua Singer, **Verity Hill**, Aine O'Toole, Andrew Rambaut, Katie Hampson, Kirstyn Brunker Making genomic surveillance deliver: A lineage classification and nomenclature system to inform rabies elimination *Plos Pathogens* 18(5) doi:10.1371/journal.ppat.1010023

Dinesh Aggarwal, Ben Warne, Aminu Jahun, William Hamilton, Thomas Fieldman, Louis Plessis, **Verity Hill**, Beth Blane, Emmeline Watkins, Elizabeth Wright, Grant Hall, Catherine Ludden, Richard Myers, Myra Hosmillo, Yasmin Goodfellow, Malte Pinckert, Iliana Georgana, Rhys Izuagbe, Danielle Leek, Olisaeloka Nsonwu, Gareth Hughes, Simon Packer, Andrew Page, Marina Metaxaki, Stewart Fuller, Gillian Weale, Jon Holgate, Rob Howes, Duncan McFarlane, Gordon Dougan, Oliver Pybus, Daniela De Angelis, Patrick Maxwell, Sharon Peacock, Michael Weekes, Chris Illingworth, Ewan Harrison, Nicholas Matheson, Ian Goodfellow, Genomic epidmiology of SARS-CoV-2 in a UK university identifies dynamics of transmission *Nature Communications* 13(751) https://doi.org/10.1038/s41467-021-27942-w

2021

Moritz UG Kraemer*, **Verity Hill***, Christopher Ruis*, Simon Dellicour*, Sumali Bajaj*, John T McCrone, Guy Baele, Kris V Parag, Anya Lindström Battle, Bernardo Gutierrez, Ben Jackson, Rachel Colquhoun, Áine O'Toole, Brennan Klein, Alessandro Vespignani, COVID-19 Genomics UK (COG-UK) Consortium‡, Erik Volz, Nuno R Faria, David M Aanensen, Nicholas J Loman, Louis du Plessis, Simon Cauchemez, Andrew Rambaut, Samuel V Scarpino, Oliver G Pybus, Spatiotemporal invsaion dynamics of SARS-COV-2 lineage B.1.1.7 emergence, *Science* 373(6557) 889-895 doi: 10.1126/science.abj0113

Verity Hill, Christopher Ruis, Sumali Bajaj, Oliver Pybus, Moritz Kraemer, Progress and Challenges in Genomic Epidemiology, *Trends in Parasitology* doi:https://doi.org/10.1016/j.pt.2021.08.007

Samuel M Nicholls, Radoslaw Poplawski, Matthew J Bull, Anthony Underwood, Michael Chapman, Khalil Abu-Dahab, Ben Taylor, Rachel M Colquhoun, Will PM Rowe, Ben Jackson, **Verity Hill**, Áine O'Toole, Sara Rey, Joel Southgate, Roberto Amato, Rich Livett, Sónia Gonçalves, Ewan M Harrison, Sharon J Peacock, David M Aanensen, Andrew Rambaut, Thomas R Connor, Nicholas J Loman, CLIMB-COVID: continuous integration supporting decentralised sequencing for SARS-CoV-2 genomic surveillance *Genome Biology*, 22(196) doi:https://doi.org/10.1186/s13059-021-02395-y

Ben Jackson, Maciej F. Boni, Matthew J. Bull, Amy Colleran, Rachel M. Colquhoun, Alistair C. Darby, Sam Haldenby, **Verity Hill**, Anita Lucaci, John T. McCrone, Samuel M. Nicholls, Áine O'Toole, Nicole Pacchiarini, Radoslaw Poplawski, Emily Scher, Flora Todd, Hermione J. Webster, Mark Whitehead, Claudia Wierzbicki, Nicholas J. Loman, Thomas R. Connor, David L. Robertson, Oliver G. Pybus, Andrew Rambaut, Generation and transmission of interlineage recombinants in the SARS-CoV-2 pandemic, *Cell* doi:https://doi.org/10.1016/j.cell.2021.08.014

Áine O'Toole, Emily Scher, Anthony Underwood, Ben Jackson, **Verity Hill**, John T McCrone, Rachel Colquhoun, Chris Ruis, Khalil Abu-Dahab, Ben Taylor, Corin Yeats, Louis Du Plessis, Daniel Maloney, Nathan Medd, Stephen W Attwood, David M Aanensen, Edward C Holmes, Oliver G Pybus, Andrew Rambaut, Assignment of epidemiological lineages in an emerging pandemic using the pangolin tool *Virus Evolution* 7(2) doi: https://doi.org/10.1093/ve/veab064

Áine O'Toole*, **Verity Hill***, Oliver G Pybus, Alexander Watts, Issac I Bogoch, Kamran Khan, Jane P Messina *et al* Tracking the international spread of SARS-CoV-2 lineages B.1.1.7 and B.1.351/501Y-V2. *Wellcome Open Research* 2021;6:121. doi:10.12688/wellcomeopenres.16661.1

Yvan Butera, Enatha Mukantwari, Maria Artesi, Jeanne D'Arc Umuringa, Áine Niamh O'Toole, **Verity Hill**, Stefan Rooke, Samuel Leandro Hong, Simon Dellicour, Onesphore Majyambere, Sebastien Bontems, Bouchra Boujemla, Josh Quick, Paola Cristina Resende, Nick Loman, Esperance Umumararungu, Alice Kabanda, Marylin Milumbu Murindahabi, Patrick Tuyisenge, Misbah Gashegu, Jean Paul Rwabihama, Reuben Sindayiheba, Djordje Gikic, Jacob Souopgui, Wilfred Ndifon, Robert Rutayisire, Swaibu Gatare, Tharcisse Mpunga, Daniel Ngamije, Vincent Bours, Andrew Rambaut, Sabin Nsanzimana, Guy Baele, Keith Durkin, Leon Mutesa, Nadine Rujeni Genomic sequencing of SARS-CoV-2 in Rwanda reveals the importance of incoming travelers on lineage diversity. *Nature Communications* 5705(12) doi:https://doi.org/10.1038/s41467-021-25985-7

Louis du Plessis*, John T McCrone*, Alexander E Zarebski*, **Verity Hill***, Christopher Ruis*, Bernardo Gutierrez, Jayna Raghwani, Jordan Ashworth, Rachel Colquhoun, Thomas R Connor, Nuno R Faria, Ben Jackson, Nicholas J Loman, Áine O'Toole, Samuel M Nicholls, Kris V Parag, Emily Scher, Tetyana I Vasylyeva, Erik M Volz, Alexander Watts, Isaac I Bogoch, Kamran Khan, David M Aanensen, Moritz UG Kraemer, Andrew Rambaut, Oliver G Pybus Establishment and lineage dynamics of the SARS-CoV-2 epidemic in the UK. *Science* 371(6530). doi: 10.1126/science.abf2946

Erik Volz, **Verity Hill**, John T McCrone, Anna Price, David Jorgensen *et al* Evaluating the effects of SARS-CoV-2 Spike mutation D614G on transmissibility and pathogenicity *Cell* 184(1), 0.1016/j.cell.2020.11.020.

2020 and earlier

Jing Lu*, Louis du Plessis*, Zhe Liu*, **Verity Hill***, Min Kang, Huifang Lin, Jiufeng Sun, Sarah François, Moritz UG Kraemer, Nuno R Faria, John T McCrone, Jinju Peng, Qianling Xiong, Runyu Yuan, Lilian Zeng, Pingping Zhou, Chumin Liang, Lina Yi, Jun Liu, Jianpeng Xiao, Jianxiong Hu, Tao Liu, Wenjun Ma, Wei Li, Juan Su, Huanying Zheng, Bo Peng, Shisong Fang, Wenzhe Su, Kuibiao Li, Ruilin Sun, Ru Bai, Xi Tang, Minfeng Liang, Josh Quick, Tie Song, Andrew Rambaut, Nick Loman, Jayna Raghwani, Oliver G Pybus, Changwen Ke Genomic epidemiology of SARS-CoV-2 in Guangdong province, China, *Cell* 181 (5) doi: 10.1016/j.cell.2020.04.023

Philippe Lemey, Samuel L Hong, **Verity Hill**, Guy Baele, Chiara Poletto, Vittoria Colizza, Áine O'Toole, John T McCrone, Kristian G Andersen, Michael Worobey, Martha I Nelson, Andrew Rambaut, Marc A Suchard Accommodating individual travel history and unsampled diversity in Bayesian phylogeographic inference of SARS-CoV-2 *Nature Communications* 11 doi: 10.1038/s41467-020-18877-9

Michael Worobey, Jonathan Pekar, Brendan B Larsen, Martha I Nelson, **Verity Hill**, Jeffrey B Joy, Andrew Rambaut, Marc A Suchard, Joel O Wertheim, Philippe Lemey The emergence of SARS-CoV-2 in Europe and North America *Science* 370 (6516) doi: 10.1126/science.abc8169

Andrew Rambaut, Edward C Holmes, Áine O'Toole,**Verity Hill**, John T McCrone, Christopher Ruis, Louis du Plessis, Oliver G Pybus A dynamic nomenclature proposal for SARS-CoV-2 lineages to assist genomic epidemiology, *Nature Microbiology* 5(11) doi: 10.1038/s41564-020-0770-5

Matthew Biggerstaff, Benjamin J Cowling, Zulma M Cucunubá, Linh Dinh, Neil M Ferguson, Huizhi Gao, **Verity Hill**, Natsuko Imai, Michael A Johansson, Sarah Kada, Oliver Morgan, Ana Pastore y Piontti, Jonathan A Polonsky, Pragati Venkata Prasad, Talia M Quandelacy, Andrew Rambaut, Jordan W Tappero, Katelijn A Vandemaele, Alessandro Vespignani, K Lane Warmbrod, Jessica Y Wong Early Release-Early Insights from Statistical and Mathematical Modeling of Key Epidemiologic Parameters of COVID-19 *Emerging Infectious Diseases* 26(11) doi: 10.3201/eid2611.201074

Verity Hill and Guy Baele Bayesian estimation of past population dynamics in BEAST 1.10 using the Skygrid coalescent model *Molecular biology and evolution* 36 (11), 2620-2628 doi: 10.1093/molbev/msz172

In revision

Verity Hill, George Githinji, Chantal B.F. Vogels, Ana I. Bento, Chrispin Chaguza, Christine V. F. Carrington, Nathan D. Grubaugh Towards a global virus genomic surveillance network. In revision for *Cell Host and Microbe*

In preparation

Verity Hill, Toby Koch, Kiet Ngo, Sean M. Bialosuknia, Steven D. Zink, Cheri A. Koetzner, Joesph G. Maffei, Alan P. Dupuis, P Bryon Backenson, Joanne Oliver, Glen Gallagher, Matt Osborne, Sandra Smole, Laura D. Kramer, Guy Baele, Chantal B.F. Vogels, Phil M. Armstrong, Alexander T. Ciota, Nathan D. Grubaugh Dynamics of Eastern equine encephalitis virus during the 2019 outbreak in the Northeast United States

Skills and Experience

Computational

Languages Python, R, bash, MATLAB, STATA

Practical LaTeX, Github, Illustrator, Geneious, Prism, ArcGIS, Python visualisation tools including Matplotlib and Geopandas, FigTree, Javascript visualisaton tools Vega and Vegalite

Software Extensive experience in using BEAST and associated packages, especially phylogeographic analyses; Experience developing flexible and user-friendly software in Python and Snakemake; Open Data Kit

Laboratory

Proficient in techniques of cell staining, tissue culture and T-cell stimulation, as well as flow cytometry.

Field

2019 **Yellow Fever outbreak investigation with the World Health Organisation and Nigerian Centres for Disease Control, Ebonyi state, Nigeria** We delivered supplies and community sensitisation, performed active and retrospective case finding and helped to organise the transportation of patient samples to laboratories with appropriate reagents. I also wrote the daily situation reports that were sent back to the country office in Abuja, including descriptive epidemiology and statistical analysis.

2017 **Field epidemiology study with the Uganda Virus Research Institute, Entebbe, Uganda** Designed, developed and delivered a pilot study to test an electronic data collection tool for Typhoid fever outbreaks, including formulating and piloting a Case Investigation Form for Typhoid Fever, dealing directly with and training clinical officers in study clinics and performing descriptive epidemiological analyses.

Lecturing

2022 **Guest seminar for Genomic Epidemiology, Yale University, USA**, *Phylogenetics and Phylogeography*

2021 **Genomic epidemiology workshop at CIDEIM, Cali, Colombia**, *Applications of Genomic epidemiology* and *Introduction to Phylogenetics*

2021 **Guest seminar for Quantitative Methods in Infectious Disease Research, Georgetown University, USA**, *Phylodynamic Approaches to Epidemic Control*

2021 **ARTIC/CLIMB workshop, online**, Delivered a lecture on genomic epidemiology, and developed an outbreak investigation exercise for participants

2020 **Guest lecture for Health Geography students at Georgetown University, online**, *Phylodynamic Approaches to Epidemic Control*

2019 **Nigerian Centres for Disease Control, Abuja, Nigeria**, Designed and delivered a lecture course of three 1.5 hour sessions, with assigned reading, quizzes and accompanying monitoring and evaluation, Lecture

2019 **Plant-ID Network, Edinburgh, UK**, *Bayesian Phylogenetics*, 1 week, Lectures and practical tutorials

2018 **West African Centre for Cell Biology of Infectious Pathogens, Accra, Ghana**, 1 week on real-time sequencing and analysis for acute viral outbreaks with ARTIC Network, Lectures and practical tutorials

Conferences and workshops

Invited Talks

2022 **Massachusetts Consortium on Pathogen Readiness Seminar**, *The origins and molecular evolution of B.1.1.7 in the UK*

2022 **Georgetown Department of Biology Seminar**, *The Dynamics of Eastern Equine Encephalitis in the US*

2021 **Annual PQC conference: From COVID-19 Genomics to spread, vaccine and therapy**, *The origins, evolution and spread of B.1.1.7 in the UK*

2021 **Genomics at Edinburgh launch event**, *Reconstructing the spatial epidemiology of SARS-CoV-2*

2021 **Research Institute for Tropical Medicine, Philippines**, *Genomic epidmiology of SARS-CoV-2*

2021 **Wellcome Trust Sanger Institute seminar series**, *Large scale genomic sequencing for investigating the dynamics of SARS-CoV-2 in the UK*

2021 **Applied Bioinformatics and Public Health Microbiology**, *Investigating outbreaks of SARS-CoV-2 using civet*

2021 **Edinburgh University Science Journals Society Conference**, *Genomics and communication in a pandemic*

2020 **Verena Consortium Lighthouse Talks**, *Exploring Ebola Virus Disease Dynamics using a Phylodynamically-informed Agent Based Model*

2020 **CZ BioHub**, *Tools for SARS-CoV-2 phylogenetics to inform public health*

2020 **COG-UK consortium**, *Civet: Cluster Investigation and Viral Epidemiology Tool*

Submitted talks

2022 **29th International Dynamics & Evolution of Human Viruses**, *Talk: The origins and molecular evolution of B.1.1.7 in the UK*

2019 **Elsevier**, *Epidemics - 7th international conference on Infectious Disease dynamics*, Talk: Phylodynamic approaches for investigating Ebola Virus Disease dynamics in Sierra Leone

2018 **University of Granada**, *European Meeting of PhD Students in Evolutionary Biology*, Poster and Talk: Real-time sequencing and its applications to public health

2018 **Wellcome Trust Sanger Institute**, *Virus and Genome Evolution conference*, Poster: Examining the drivers behind the West African Ebola Virus Disease epidemic

2018 **University of Glasgow**, *Evolution and Ecology of Infectious Diseases conference*, Poster: Examining the drivers behind the West African Ebola Virus Disease epidemic

Additional training

2018 **Advanced Python for Biologists**, *Edinburgh Genomics*, University of Edinburgh, UK

2017 **Linux and Workflows for Biologists**, *Edinburgh Genomics*, University of Edinburgh, UK

2017 **Infectious Disease Mapping Workshop**, London School of Hygiene and Tropical Medicine, UK

Funding and Awards

2018 **Most Scientifically Innovative Content (Presentation award)**, *European Meeting of PhD students in Evolutionary Biology*, Grenada, Spain

2017 **£93,000 EASTBIO BBSRC DTP award**, *Four year duration PhD programme*, University of Edinburgh

2017 **Eldryd Parry Prize**, *Awarded for highest results in MSc Control of Infectious Diseases*, London School of Hygiene and Tropical Medicine

2017 **£2000 award from Enhancing Research Activities in Epidemic Situations fund**, *To undertake MSc Research Project in Uganda*, Wellcome Trust

2015 **£500 Morris Long Vacation Award**, *To undertake internship with Madagascar SAVE*, New College, Oxford University

2015 **£2200 Higher Education Funding Council Scholarship**, *To undertake internship with Madagascar SAVE*

2015 **Academic Scholar**, New College, Oxford

Reviewing

Science, *Nature Communications*, *Virus Evolution*, *Epidemics*, *Molecular Biology and Evolution*, *Methods in Ecology and Evolution*, *The Lancet Regional Health - Americas*, *PLOS Genetics*, *Genome Biology and Evolution*

Public Engagement

2023 **Newspaper interview**, *How worried should we be about XBB.1.5*, Katherine Wu, The Atlantic

2022 **Newspaper interview**, *Will we get Omicron'd again*, Katherine Wu, The Atlantic

2022 **Podcast interview**, *Looking ahead to our third pandemic winter*, Science Friday

2022 **Newspaper interview**, *The BA.5 wave is what COVID normal looks like*, Katherine Wu, The Atlantic

2021 **Panel discussion**, *Shedding light on the invisible - how genomics is helping defeat a pandemic*, Wellcome Trust

2021 **Panel discussion**, *How UK science leads the fight against Coronavirus*, Swindon Science Festival

2021 **Podcast interview**, *The New Variant Drama*, The Vax Files

2020 **Radio interview**, *20 minute segment on COVID-19*, Radio Verulam

2020 **Newspaper interview**, *Genetic tracking helped us fight Ebola. Why can't it halt COVID-19*, Philip Keifer, 538

2018-2020 **BioPod interviewer and fact checker**, *Edinburgh University podcast about research ongoing in the School of Biological Science*

2018 **Participant in I'm a scientist, get me out of here!**, Two week event responding to online questions and live chats from secondary school children about any aspect of my research, research on epidemics, and science in general.

2017 **Presenter for Sci-fun roadshow**, I helped to demonstrate a number of small and quick science workstations in schools around Edinburgh to show to children in early secondary school.

2016-2020 **Blog**, Explaining topics in virus evolution and public health, aimed at interested members of the general public. Over 3,500 views., https://wordpress.com/view/viralverity.wordpress.com

2016-2017 **Presenter for Sublime Science**, Performing science experience for children's birthday parties aged 5-12

2015-2016 **Volunteer in Royal Scoeity public engagement events**, Worked with Professor Ashleigh Griffin's research group on two events to demonstrate key concepts in social evolution to members of the general public people of all ages.

2015 **Mentor for Schools plus**, I mentored secondary school children from the Oxford Academy in science for seven one-hour sessions to improve their confidence and interest in science, as well as their GCSE grades.

References

Prof. Andrew Rambaut
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Prof. Nathan Grubaugh
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