# Tim CD Lucas

## PERSONAL INFORMATION

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|---|---|
| *email* ✉ | timcdlucas@gmail.com |
| *github* | www.github.com/timcdlucas |
| *scholar* | Google scholar |
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## PRESENT APPOINTMENT

*2024–Present*  **University of Leicester**

*Associate Professor*

I am currently employed as an associate professor in the Department for Population Health Sciences. My research includes the development of methods to handle data with *mismatches in resolution* and that account for *human movement*. This work is largely motivated be problems in *environmental and infectious disease epidemiology*. I have developed and now *co-lead an MSc* in Population Health Data Science. I teach on the MSc Medical Statistics (Intro to R and Computationally Intensive Methods) and I teach statistics on the Medicine MBChB. I am also a Postgraduate Research Student tutor for the department.

## PREVIOUS APPOINTMENTS

*2021–2024*  **University of Leicester**

*Lecturer*

Lecturer in Biostatistics in the Department for Population Health Sciences.

*2020–2021*  **Imperial College**

*Early Career Research Fellow*

During this fellowship I developed statistical regression methods that properly account for human movement. Due to the coronavirus pandemic I spent a considerable fraction of my time working on mechanistic models of contact tracing.

*Jan–June 2020*  **University of Oxford**

*Senior Post Doc.*

Models of neglected tropical diseases and SARS-CoV-2, contributing to software and promoting good research software practices such as version control and unit testing.

*2016–2020*  **University of Oxford, Malaria Atlas Project**

*Post Doc.*

I worked as a postdoctoral researcher in geospatial epidemiology with the Malaria Atlas Project at the University of Oxford. I developed new statistical methods that combine *machine learning* and *geostatistics* and applied these methods to create the *first high-resolution, global, space-time* estimates of both *Plasmodium falciparum* and *P. vivax* leading to back-to-back lancet publications.

*2018–2019*  **Shared parental leave**

*Parental leave*

Six months shared parental leave.

*Jan–July 2016*  **University College London**

*Research Programmer*

I enabled the Madingley Model to run on a high performance cluster and ported code to R for morphological analyses amongst other tasks.

## EDUCATION

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| | *2012–2016*     University College London, CoMPLEX |
| *PhD* | *The role of population structure and size in determining bat pathogen richness*<br>I used *mechanistic transmission models* and phylogenetic regression to study the epidemiology of bat-borne diseases with applications to zoonotic surveillance and spillover risk. [pdf]<br>Supervisors: Prof. Kate Jones & Dr Hilde Herbots |
| | *2011–2012*     University College London, CoMPLEX |
| *MRes* | *Modelling Biological Complexity* · Merit |
| | *2006–2010*     University of Sheffield, Animal & Plant Sciences |
| *MBioSci* | *Zoology* · First |

### OTHER PROFESSIONAL ACTIVITIES

*Peer Review*     Journals Reviewed for include:

Journal of the Royal Statistical Society, Journal of Theoretical Biology, Nature Medicine, Nature Communications, BMC Infectious Diseases, PLoS Pathogens, Malaria Journal, Methods in Ecology and Evolution, Ecology and Evolution, Remote Sensing in Ecology and Conservation, ROpenSci.

### PEER-REVIEWED PUBLICATIONS

*2024*     Worboys H, *et al.* (2024) *Evaluation of the usability and acceptability of the P-STEP mobile app: feasibility study protocol.* Pilot and Feasibility Studies. [pdf]

Struthers D, *et al.* (2024) *Statistical stream temperature modelling with SSN and INLA: an introduction for conservation practitioners.* Canadian Journal of Fisheries and Aquatic Sciences. [pdf]

*2023*     Nandi L, **Lucas TCD**, *et al.* (2023) *disaggregation: An R Package for Bayesian Spatial Disaggregation Modeling.* Journal of Statistical Software. [pdf]

Okell L, *et al.* (2023) *Projected health impact of post-discharge malaria chemoprevention among children with severe malarial anaemia in Africa.* Nature Communications. [pdf]

Nightingale E, *et al.* (In Press) *Spatial variation in delayed diagnosis of visceral leishmaniasis in Bihar, India..* The Lancet Regional Health SEA. [pdf]

*2022*     **Lucas TCD**, Nandi AK, *et al.* (2022) *Improving disaggregation models of malaria incidence by ensembling non-linear models of prevalence.* Spatial and Spatio-temporal Epidemiology. [pdf]

Arambepola R, **Lucas TCD**, *et al.* (2022) *A simulation study of disaggregation regression for spatial disease mapping.* Statistics in Medicine. [pdf]

Andrzejaczek S, **Lucas TCD**, *et al.* (2022) *Diving into the vertical dimension of elasmobranch movement ecology.* Science Advances. [pdf]

Franklinos LHV, Redding D, **Lucas TCD**, *et al.* (2022) *Joint spatiotemporal modelling reveals seasonally dynamic patterns of Japanese encephalitis vector abundance across India.* PLoS Neglected Tropical Diseases. [pdf]

Python A, *et al.* (2022) *A downscaling approach to compare COVID-19 count data from databases aggregated at different spatial scales.* Journal of the Royal Statistical Society Series A: Statistics in Society. [pdf]

*2021*     **Lucas TCD**\*, Davis E\*, *et al.* (2021) *Engagement and adherence trade-offs for*

*SARS-CoV-2 contact tracing.* Philosophical Transactions of the Royal Society B. [pdf]

Davis E*, **Lucas TCD***, *et al.* (2021) *Contact tracing is an imperfect tool for controlling COVID-19 transmission and relies on population adherence.* Nature Communications. [pdf]

**Lucas TCD**, Nandi AK, *et al.* (2021) *Mapping malaria by sharing spatial information between incidence and prevalence datasets.* Journal of the Royal Statistical Society C. [pdf]

Graham M, Ayabina D, **Lucas TCD**, *et al.* (2021) *SCHISTOX: An individual based model for the epidemiology and control of schistosomiasis.* Infectious Disease Modelling. [pdf]

Toor J, Adams ER, *et al.* (2021) *Predicted impact of COVID-19 on neglected tropical disease programs and the opportunity for innovation.* Clinical Infectious Diseases. [pdf]

Python A, *et al.* (2021) *Predicting non-state terrorism worldwide.* Science Advances. [pdf]

Crellen T, *et al.* (2021) *Dynamics of SARS-CoV-2 with waning immunity in the UK population.* Philosophical Transactions of the Royal Society B. [pdf]

2020    **Lucas TCD** (2020) *A translucent box: interpretable machine learning in ecology.* Ecological Monographs. [pdf]

**Lucas TCD**, Pollington T, Davis E and Hollingsworth D. (2020) *Responsible modelling: Unit testing for infectious disease epidemiology.* Epidemics. [pdf]

Nguyen M, Howes RE, **Lucas TCD**, *et al.* (2020) *Mapping malaria seasonality in Madagascar using health facility data.* BMC medicine, 18(1), 1-11 [pdf]

Rathmes G, Rumisha SF, **Lucas TCD**, *et al.* (2020) *Global estimation of anti-malarial drug effectiveness for the treatment of uncomplicated* Plasmodium falciparum *malaria 1991–2019.* Malaria Journal. [pdf]

2019    Weiss DJ, **Lucas TCD**, Nguyen M, *et al.* (2019) *The global landscape of* Plasmodium falciparum *prevalence, incidence, and mortality 2000–2017.* The Lancet 394, 10195, 322–331. doi: 10.1016/S0140-6736(19)31097-9 [pdf]

Battle KE, **Lucas TCD**, Nguyen M, *et al.* (2019) *Mapping the global endemicity and clinical burden of* Plasmodium vivax *2000–2017.* The Lancet 394, 10195, 332–343. doi: 10.1016/S0140-6736(19)31096-7 [pdf]

Zhu SJ, *et al.* (2019) *The origins and relatedness structure of mixed infections vary with local prevalence of* P. falciparum *malaria.* eLife 8 e40845. doi: 10.7554/eLife.40845 [pdf]

2018    Weiss DJ, Nelson A, Gibson HS *et al.* (2018) *A global map of travel time to cities to assess inequalities in accessibility in 2015.* Nature 553 (7688), 333 [pdf]

Pfeffer D, **Lucas TCD**, May D *et al.* (2018) *malariaAtlas: an R interface to global malariometric data hosted by the Malaria Atlas Project.* Malaria Journal 17:352 doi: 10.1186/s12936-018-2500-5 [pdf]

2017    Redding D, **Lucas TCD**, Blackburn T & Jones KE. (2017) *Evaluating Bayesian spatial methods for modelling species distributions models with clumped and restricted data.* PLoS One [pdf]

Golding N, August TA, **Lucas TCD**, Gavaghan DJ, van Loon EE & McInerny G. (2017) *The zoon R package for reproducible and shareable species distribution modelling.* Methods in Ecology and Evolution. doi: 10.1111/2041-210X.12858 [pdf]

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| *2015* | **Lucas TCD**\*, Moorcroft EA\*, Freeman R, Rowcliffe MJ & Jones KE. (2015) *A generalised random encounter model for estimating animal density with remote sensor data.* Methods in Ecology and Evolution. doi: 10.1111/2041-210X.12346 [pdf] |
| *GBD* | For Global Burden of Disease capstone papers please see end of document. |
| | \* Co-first authors. |

## BOOK CHAPTERS AND PEER-REVIEWED CONFERENCE PROCEEDINGS

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| *2018* | Law HC, Sejdinovic D, *et al.* (2018) *Variational learning on aggregate outputs with Gaussian processes.* Advances in Neural Information Processing Systems [pdf] |
| *2013* | Walters CL, Collen A, **Lucas TCD**, Mroz K, Sayer CA and Jones KE. (2013) Challenges of Using Bioacoustics to Globally Monitor Bats. in *Bat Evolution, Ecology, and Conservation.* Springer New York. 479-499. |

## GRANTS AWARDED

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| *2023* | Wellcome Trust Digital Technology Development Award. PI. *A Shiny app for disaggregation regression for zoonotic disease surveillance.* £377,899. |
| | Wellcome Trust Ideathon. Co-I. *Droughts and Despair: An Innovative Tool for Policy-Makers to Assess Climate Change's Economic Impact on "Diseases of Despair" in Farming Communities.* £80,000. |
| | NIHR Predoctoral fellowship. Supervisor. £97,415. |
| | NIHR Predoctoral fellowship. Supervisor. £48,610. |
| | NIHR Predoctoral fellowship. Supervisor. £97,563. Not taken up. |
| *2022* | NIHR Leicester BRC Infrastructure Award. Co-I and "rising star" in Envionment theme and Data Innovation theme. £30,000,000. |
| | NIHR Predoctoral fellowship. Supervisor. £88,750. |
| | NIHR Predoctoral fellowship. Supervisor. £43,376. Not taken up. |
| *2020* | MRC Centre Early Career Research Fellowship. *Not all exposure to air pollution occurs at home: general methods for combining human movement and geostatistical disease data.* Three years wages and expenses. Direct costs £173,036. |
| | Co-investigator on multi-centre grant. *An analytical framework for Test, Trace and Isolate in the UK: optimising and targeting deployment alongside other measures.* UKRI-DHSC COVID-19 Rapid Response Rolling Call. Grant COV0659. £412,720. |
| | Paid expert consultant on grant. *Mapping coronavirus using a self-exciting spatio-temporal point process.* Zhejiang University Educational Funding. Grant 2020XGZX054. £11,000. |

## TEACHING AND SUPERVISION

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| *Qualifications* | Fellowship of the Higher Education Authority. |
| *Teaching* | I teach on the Medical Statistics MSc. I lead the module Computationally Intensive Methods (multiparameter likelihood problems). I lead the Statistical Computing teaching week and teach Intro to R. I teach statistics on the Medicine MBChB. |
| *Curriculum design* | I have been heavily involved in designing a new masters course, Population Health Data Science. I have had a strong role in scoping the overall landscape of health data science: what does a health data scientist do, what do they need to know? I have then been designing the intended learning outcomes for the modules Foundations of Data Science, Intro to Python and Further topics in Data Science (machine learning and forecasting). |

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| *Supervision* | I have supervised one PhD student to completion. I currently supervise three students as first supervisor and a further two students as second supervisor. I have supervised a number of master projects on the MSc Medical Statistics (two of these projects have been awarded the best project prize) as well as supervising undergraduate biological sciences analytical projects. |
| *Workshops* | External online workshop on disaggregation regression. Delivered twice due to demand. Organised and delivered four hour workshop (twice due to demand) "Machine Learning in the Health Sciences". Two hours practical workshop and two hours of case studies from members of the department. (Student evaluation of 4.1 out of 5, n = 13). Co-wrote and ran an afternoon workshop. "Advanced Statistical Modelling with TMB". (Student evaluation of 4.1 out of 5, n = 24). Further internal workshops on unit testing, cluster computing and mixed-effects models. Wrote and gave a two day workshop 'Geospatial statistics with R and INLA' at UiTM, Malaysia. |

### INVITED TALKS AND MEETINGS

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| *2024* | Invited talk at workshop on: Climate Change and Epidemics. JUNIPER, University of Oxford, UK. |
| | Invited conference talk and workshop contribution at: Hangzhou International Conference on Frontiers in Data Science. |
| *2023* | Invited participant at co-design workshop "building a community of practice around climate sensitive infectious disease modelling and research". CS&S and Wellcome Trust, Cape Town, South Africa |
| *2022* | Invited departmental seminar at Centre for Global Infectious Disease Analysis, Imperial College: Machine Learning in Behaviour, Ecology and Evolution. |
| *2020* | Invited talk at workshop on: Machine Learning in Behaviour, Ecology and Evolution. University of Neuchâtel, Switzerland (online) |
| *2017* | Plenary talk at Soft Computing in Data Science 2017. Springer, Yogyakarta, Indonesia. |

### SOFTWARE

Smart S, **Lucas TCD**. *disagapp*. A shiny app for disaggregation regression. https://github.com/simon-smart88/disagapp

Nandi A, **Lucas TCD**, Arambepola A, Python A. *disaggregation*. Disaggregation Modelling in R. https://github.com/aknandi/disaggregation

Pfeffer D, **Lucas TCD**, May D, Keddie S, Rozier J, Gibson H. *malariaAtlas*. An R Interface to Open-Access Malaria Data, Hosted by the 'Malaria Atlas Project'. https://cran.r-project.org/package=malariaAtlas

**Lucas TCD**, Python A, Redding D. *INLAutils*. Utility Functions for 'INLA'. https://github.com/timcdlucas/INLAutils

**Lucas TCD**, Goswami A. *paleomorph*. Geometric Morphometric Tools for Palaeobiology. https://cran.r-project.org/package=paleomorph

August T, **Lucas TCD**, Golding N, van Loon E, McInerny G. *Zoon*. Reproducible, Accessible & Shareable Species Distribution Modelling. https://github.com/zoonproject/zoon

**Lucas TCD**. *palettetown*. Use Pokemon Inspired Colour Palettes. https://cran.r-project.org/package=palettetown

### EXPERTISE

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| *Statistical methods* | Geospatial statistics, machine learning, Bayesian inference, TMB, Stan. |
| *Languages* | R (expert level), Python, Matlab, Mathematica. |

*Other*   Experience in R package development, shiny apps, Git/Github, unit testing, continuous integration, shell/ssh and high performance computing.

## CONTINUED PROFESSIONAL DEVELOPMENT

2023 · PGCAPP module Enhancing Student Learning and Assessment (Module 2) for HEA Fellowship. Passed.

2022 · PGCAPP module Enhancing Student Learning and Assessment (Module 1) leading to HEA Associate Fellowship. Passed.

2021 · SQL Sprint Workshop. Short course.

2020 · Lectureship Applications. One day course.

2017 · Introduction to CUDA and OpenACC. Two day course.

## REFEREES

Prof. Paul Lambert
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## GLOBAL BURDEN OF DISEASE PUBLICATIONS

*2020*   GBD 2019 Diseases and Injuries Collaborators (2020) *Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019.* The Lancet, 396 [pdf]

*2018*   GBD 2017 Risk Factor Collaborators (2018) *Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017.* The Lancet, 392 [pdf]

GBD 2017 Disease and Injury Incidence and Prevalence Collaborators (2018) *Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017.* The Lancet, 392 [pdf]

GBD 2017 DALYs and HALE Collaborators (2018) *Global, regional, and national disability-adjusted life-years (DALYs) for 359 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017.* The Lancet, 392 [pdf]

GBD 2017 Mortality Collaborators (2018) *Global, regional, and national age-sex-specific mortality and life expectancy, 1950–2017: a systematic analysis for the Global Burden of Disease Study 2017.* The Lancet, 392 [pdf]

GBD 2016 Healthcare Access and Quality Collaborators (2017) *Measuring performance on the Healthcare Access and Quality Index for 195 countries and territories and selected subnational locations: a systematic analysis from the Global Burden of Disease Study 2016.* The Lancet, 391 (10136) [pdf]

*2017*   GBD 2016 Disease and Injury Incidence and Prevalence Collaborators (2017) *Global, regional, and national incidence, prevalence, and years lived with disability for*

*328 diseases and injuries for 195 countries, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016.* The Lancet, 390 [pdf]

GBD 2016 Causes of Death Collaborators (2017) *Global, regional, and national age-sex specific mortality for 264 causes of death, 1980–2016: a systematic analysis for the Global Burden of Disease Study 2016.* The Lancet, 390 [pdf]

GBD 2016 DALYs and HALE Collaborators (2017) *Global, regional, and national disability-adjusted life-years (DALYs) for 333 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016.* The Lancet, 390[pdf]

GBD 2016 SDG Collaborators (2017) *Measuring progress and projecting attainment on the basis of past trends of the health-related Sustainable Development Goals in 188 countries: an analysis from the Global Burden of Disease Study 2016.* The Lancet, 390 [pdf]

3$^{rd}$ October, 2024