

Theresa Ruth Smith

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Academic Positions

- ◇ **University of Bath, Bath, UK**, July 2016 –
Department of Mathematical Sciences
 - Senior Lecturer (Associate Professor), July 2022 –
 - Deputy Director of the EPSRC Centre for Doctoral Training in Statistical Applied Mathematics (SAMBa), February 2024 –
 - Lecturer (Assistant Professor), July 2016 – June 2022
- ◇ **Lancaster University, Lancaster, UK**, July 2014 – June 2016
Lancaster Medical School
Combining Health Information, Computation and Statistics (CHICAS)
Post Doctoral Research Associate in Spatial Epidemiology

Education

- ◇ **University of Washington**, Seattle, WA, USA.
PhD Statistics, June 2014.
Bayesian spatial and temporal methods for public health data.
- ◇ **University of Pittsburgh**, Pittsburgh, PA, USA.
BS Statistics & BA History, April 2009.
- ◇ Fellow of the Higher Education Academy, July 2017.

Publications

24. Rudge, A.,¹ McHugh, N., Tillett, W., and **Smith, T.** (2025) “An interpretable machine learning approach for detecting psoriatic arthritis in a UK primary care psoriasis cohort using electronic health records from the Clinical Practice Research Datalink.” *Annals of the Rheumatic Diseases*.
23. Riedl, C., De Cremer, D., Lucarelli, G., . . . , **Smith, T.**, Williams, H., Pescetelli, N., and Denis, G. (2025) “The potential and challenges of AI for collective intelligence.” *Collective Intelligence*.
22. Gascoigne, C., **Smith, T.**, Paige, J., and Wakefield, J. (2025) “Estimating Sub-national Under-Five Mortality Rates Using a Spatio-Temporal Age-Period-Cohort Model.” *Spatial and Spatio-temporal Epidemiology*.
21. Bullock, S., Ajmeri, N., Batty, M., . . . , **Smith, T.**, and Williams, H.T.P. (2024) “Artificial intelligence for collective intelligence: A national-scale research strategy.” *Knowledge Engineering Review*.
20. Rudge, A.,¹ Brown, S.T., Ransom, M., Helliwell, P.S., Packham, J., Tillett, W., **Smith, T.**, and McHugh, N.J. and the PROMPT study group. (2024) “Incidence of psoriatic arthritis in a UK primary care psoriasis population.” *The Journal of Rheumatology*.
19. Prior Filipe, R., Heath, A., McCullen, N., and **Smith, T.** (2024) “Forecasting and Mapping the Environmental and Health Impacts of Sustainable Regional Transport Policies.” *Sustainability*.
18. Graby, J., Khavandi, A., Gillison, F., **Smith, T.**, . . . , and Rodrigues, J. (2023) “‘Super Rehab’: can we achieve coronary artery disease regression? A feasibility study protocol.” *BMJ Open*.

¹ supervised by T Smith

17. Basson, M.,¹ Louw, T.M., and **Smith, T.R.** (2023) "Variational Tobit Gaussian process regression." *Statistics and Computing*.
16. Gascoigne, C.,¹ and **Smith, T.R.** (2023) "Penalised smoothing splines resolve the curvature identifiability problem in age-period-cohort models with unequal intervals." *Statistics in Medicine*.
15. Faraway, J., Boxall-Clasby, J., Feil, E., Gibbon, M., Hatfield, O., Kasprzyk-Hordern, B., and **Smith, T.R.** (2022) "Challenges in realising the potential of wastewater-based epidemiology to quantitatively monitor and predict the spread of disease." *Journal of Water and Health*.
14. Hillman, S., Lomax, C., Khaleel, N.¹, **Smith, T.R.**, and Gregory, J. (2022) "The roles of intolerance of uncertainty, anxiety sensitivity and distress tolerance in hoarding disorder compared with OCD and healthy controls." *Behavioural and Cognitive Psychotherapy*.
13. Kasprzyk-Hordern, B., Adams, B., Adewale, I. D., Agunbiade, F. O., Akinyemi, M. I., Archer, E., . . . , **Smith, T.R.** , . . . and Yinka-Banjo, C. O. (2022) "Wastewater-based epidemiology in hazard forecasting and early-warning systems for global health risks." *Environment International*.
12. Green, A.¹, Tillett, W., McHugh, N., **Smith, T.**, and the PROMPT study group. (2022) "Using Bayesian Networks to identify musculoskeletal symptoms influencing the risk of developing Psoriatic Arthritis in people with psoriasis," *Rheumatology*.
11. Bauer-Staeb, C., Davis, A.¹, **Smith, T.R.**, Betts, D., Wilsher, W., Eldridge, C., Griffith, E., Faraway, J., and Button, K. (2021) "The Early Impact of COVID-19 on Primary Care Psychological Therapy Services: A Descriptive Time Series of Electronic Healthcare Records." *EClinicalMedicine*.
10. DiRenzo, D.D., **Smith, T.R.**, Frech, T.M., Shah, A.A., and Pauling, J.D. (2021) "Impact of coping strategies on patient and physician perceptions of disease severity and disability in systemic sclerosis," *The Journal of Rheumatology*.
9. Pauling, J.D., **Smith, T.**, Domsic, R.T. and Frech, T.M. (2020) "Treatment efficacy in secondary Raynaud's phenomenon," *The Lancet Rheumatology*.
8. Davis, A.,¹ **Smith, T.R.**, Talbot, J., Eldridge, C., and Betts, D. (2020) "Predicting patient engagement in IAPT services: A statistical analysis of Electronic Health Records," *Evidence-Based Mental Health*.
7. Prosdocimi, I., Dupont, E., Augustin, N., Kjeldsen, T., Simpson, D. and **Smith, T.R.** (2019) "Areal models for spatially coherent trend detection: the case of British peak river flows," *Geophysical Research Letters*.
6. Pauling, J.D., Reilly, E., **Smith, T.R.**, and Frech, T.M. (2019) "Factors influencing Raynaud's condition score diary outcomes in systemic sclerosis," *The Journal of Rheumatology*.
5. Pauling, J.D., Reilly, E., **Smith, T.R.**, and Frech, T.M. (2018) "Evolving symptoms of Raynaud's phenomenon in systemic sclerosis are associated with physician and patient-reported assessments of disease severity," *Arthritis Care & Research*.
4. **Smith, T.R.** and Wakefield, J. (2016) "A review and comparison of age-period-cohort models for cancer incidence," *Statistical Science*.
3. Wakefield, J. and **Smith, T.R.** (2016) "Ecological Modeling: general issues," in *Handbook of Spatial Epidemiology*, Eds A. Lawson, S. Banerjee, R. Haining, and L. Ugarte. CRC Press.

2. **Smith, T.R.**, Wakefield, J., and Dobra, A. (2015) “Restricted covariance priors with applications in spatial statistics,” *Bayesian Analysis*.
1. Krenz, J., Hofmann, J., **Smith, T.R.**, Cunningham, R., Fenske, R., Simpson, C., and Keifer, M. (2015) “Determinants of butyrylcholinesterase inhibition among agricultural pesticide handlers in Washington State: An update,” *Annals of Occupational Hygiene*.

Current funded projects

- ◇ Co-I (trial statistician), Inflatable Prone Repositioning Device (IPRD), from Manufacturable Prototype to Marketable Product (2024 – 2026). Funder: NIHR (£357k, £21k to Mathematical Sciences).
- ◇ Co-I (Theme Lead for Healthcare Ecosystems), AI for Collective Intelligence. A UKRI AI Research Hub, led by the University of Bristol (2024 – 2029). Funder: EPSRC (£12M, £1.4M to Bath, £800k to Mathematical Sciences).
- ◇ Co-I (maths lead), Total bURden of Long-Term PSoriasis - TULiPS (2024 – 2025). Funder: NIHR (£154k, £21k to Mathematical Sciences).
- ◇ Co-I, Centre of Excellence in Water-Based Early-Warning Systems for Health Protection: CWBE (2024 – 2029). Funder: Research England (£8.4M, £600k to Mathematical Sciences).
- ◇ Co-I (trial statistician), Super Rehab trials in collaboration with the Royal United Hospital (2022 – 2026). Funders: Study 1 (Coronary Artery Disease) – NIHR; Study 2 (Atrial Fibrillation); Study 3 (Coronary Microvascular Dysfunction) – Heart Research UK.

Training Grants

- ◇ Co-I and Deputy Director, Centre for Doctoral Training in Statistical Applied Mathematics at Bath (2024 – 2033). Funder: EPSRC (£5.4M).

Previous funded projects

- ◇ Co-I (maths lead), Predicting Psoriatic Arthritis (PREDIPSA): Dynamic modelling of primary care health-records for earlier diagnosis of psoriatic arthritis (2021 – 2024). Industrial funder: UCB Pharma (£165k, £75k to Mathematical Sciences).
- ◇ PI, Dynamic prediction of competing risks within electronic patient records systems, Short Industry Fellowship with Mayden (2021 – 2022). Funder: Royal Society (£23k).
- ◇ Co-I, Building an Early Warning System for community-wide infectious disease spread: SARS-CoV-2 tracking in Africa via environment fingerprinting (2020 – 2022). Funder: GCRF/Newton Fund (£501k).
- ◇ Co-I, Environment fingerprinting via digital technology – a new paradigm in hazard forecasting and early-warning systems for health risks in Africa (2020 – 2021). Funder: EPSRC/GCRF (£150k).
- ◇ Co-I, Bringing statistical and data science capacity building to Mongolia (2020 – 2022). Funder: EPSRC/GCRF (£131k).
- ◇ Academic Supervisor (\approx PI), Knowledge Transfer Partnership with Mayden (2018 – 2020). Funders: Innovate UK (£110k) & Mayden (£54k).

Research Supervision

- ◇ PhD Students
 - A Russel, Statistical analysis of psoriatic arthritis patient data (2024 –, SAMBa).
 - A Rudge, Dynamic modelling of psoriatic arthritis (2021 –, Statistics).

- C Gascoigne, Spatial age-period-cohort methods (2018 – 2022, Statistics).
- N Khaleel, Bayesian analysis of spatial log-Gaussian Cox processes (2017 – 2022, SAMBa).
- Second supervisor: A Mahmood (2023 – , SAMBa), M Basson (2020 – , Chemical Engineering, Stellenbosch), L Oporto Lisboa (2019 – 2023, SAMBa), X Cheng (2017 – 2023, Social and Policy Studies), A Green (2018 – 2021, Pharmacoepidemiology), E Gray (2017 – 2021, SAMBa), Z Li (2018, Statistics)
- ◇ PDRAs: R Carrington (CWBE, 2025 –), E Palacios (AI4CI, 2024 –), A Davis (Mayden KTP, 2018 – 2020).
- ◇ 7 undergraduate and 10 masters projects on various applied statistics topics.

Recent Teaching

- ◇ Interdisciplinary Group Research Projects (MA50264/MA50303, Bath PhD, 2022 – 2025).
- ◇ Medical Statistics (MA30086, Bath UG, 2016 – 2019, 2022 – 2024).
- ◇ Introduction to Statistical Inference (MA20226, Bath UG, 2020 – 2022).
- ◇ Applied Statistics (MA50258, Bath MSc, 2019 – 2020).

Invited Talks

- ◇ Gaussian process models for pollution in rivers
 - Southampton Statistical Sciences Research Institute Seminar (March 2025), Cardiff University Probability, Statistics, Operations Research, Machine Learning Seminar Series (February 2025), CM Statistics: London (December 2024), BayesAI: Lancaster (September 2024), The International Conference on Spatio-Temporal Modelling: Lancaster (July 2024), Queen's University Belfast MSRC colloquium (April 2024).
- ◇ Italian Statistical Society (SIS) conference “Comparison of traffic flow data sources for air pollution modelling,” June 2023.
- ◇ University of Essex maths seminar “Dynamic prediction of competing risks in electronic patient records systems,” June 2022.
- ◇ TIES “What can the environment tell us about our health? Testing the waters for community-level surveillance.” November 2021.
- ◇ MOOD (Monitoring Outbreak Events for Disease Surveillance in a Data Science Context) consortium seminar “Modelling spatio temporal COVID-19 trends through wastewater surveillance” October 2021.
- ◇ OpenGEOHub “Analysing spatiotemporal health data.” September 2021.
- ◇ University of Glasgow statistics seminar “A collaborative project to monitor and improve engagement in talking therapies,” October 2020.
- ◇ Markov chain Monte Carlo with INLA. Imperial College workshop on “Scalable Bayesian Inference in Applied fields,” July 2019.
- ◇ Age-period-cohort models and their history. Oxford short course on “A History of the Mathematics of Populations,” June 2019.
- ◇ Hierarchical age-period-cohort models for spatial heterogeneity in mortality trends
 - University of Manchester Probability and Statistics Seminar (April 2018), University College London Statistical Science Seminar (May 2018), Royal Statistical Society Conference (September 2018), CM Statistics: Pisa (December 2018), Royal Statistical Society Highland local group (June 2019), University of Exeter Statistics Seminar (December 2019).

- ◇ Age-period-cohort models for cancer incidence and mortality
 - University of Exeter Statistics seminar (December 2019), University of Southampton S3RI seminar (April 2018), University of Edinburgh Statistics Seminar (November 2017), University of Bristol Statistics Seminar (October 2017), Age-period-cohort workshop 2, Nuffield College, Oxford (September 2017).
- ◇ Spatio-temporal log-Gaussian Cox processes for public health data
 - Inferential Challenges for Large Spatio-Temporal Data Structures: BIRS (December 2017), GEOMED: Porto, Portugal (September 2017), Workshop on Bayesian Inference for Latent Gaussian Models with Applications: University of Bath (September 2016), International Workshop on Spatio-Temporal Statistics: Imperial College London (April 2016).
- ◇ Modelling geo-located public health data using spatio-temporal log-Gaussian Cox processes
 - Computation Statistics and Machine Learning Seminar: Oxford (May 2017), j-ISBA CRiSM Seminar: Warwick University (February 2016), Statistics Seminar: Lancaster University, (November 2015), RSS 2015 Annual Conference: Exeter, September (2015).
- ◇ The Joint Statistical Meetings (JSM) “Restricted Covariance Priors with Applications in Spatial Statistics,” August 2013.

Service

- ◇ University level: Marshalling team (2021 –), Institute for Mathematical Innovation scientific panel (2020 – 2023), Bath Beacons steering group (2021 – 2022).
- ◇ Department level: Head of Group for Statistics & Probability (2024), SAMBa Executive Board (2022 –), Promotions committee (2018 – 2022), Editor of Undergraduate Newsletter (2018 – 2020), MSc curriculum committee (2017 – 2019).

Professional activities

- ◇ Royal Statistical Society: Environmental Statistics Section (Secretary 2023 – , Vice Chair 2021 – 2022) and Avon Local Group committees.
- ◇ Bath Institute for Rheumatic Diseases: Research Committee (2023 –).
- ◇ Editorial Board: *Journal of the Royal Statistical Society, Series C (Applied Statistics)* (2025 –), *Significance* (2023 –), *Scientific Reports* (2019 – 2023).
- ◇ Conference/workshop organisation
 - RSS International Conference 2024, Brighton, (invited session organiser and chair, Environmental Modelling in Industry and Government);
 - The International Environmetrics Society (TIES) Conference 2021, London (scientific committee, cancelled by COVID-19);
 - RSS Avon local group workshop in 2019 on Challenges in local air pollution modelling, Bath;
 - GEOMED 2019, Glasgow (invited session organizer and chair, Modelling and inference in environmental epidemiology);
 - International Workshop on Statistical Modelling (IWSM) 2018, Bristol (local organizer).