Theresa Ruth Smith

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Academic Positions

- **University of Bath, Bath, UK**, July 2016 –
  Department of Mathematical Sciences
  - Professor of Statistics and Data Science, July 2026–
  - Co-Director of the EPSRC Centre for Doctoral Training in Statistical Applied Mathematics (SAMBa), June 2026 –
  - Senior Lecturer (Associate Professor), July 2022 – June 2026
  - Deputy Director of SAMBa, February 2024 – May 2026
  - 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

34. Abramik, J., Murphy, D., Graby, J., Lacey, A., **Smith, T.**,..., Thompson, D., and Khavandi, A. (2026) "Design and rationale for MICROFIT (Microvascular Coronary Rehabilitation for Improving Treatment) – a feasibility randomised trial of intensive lifestyle rehabilitation for symptomatic coronary microvascular dysfunction." *Frontiers in Cardiovascular Medicine*.
33. Boxall-Clasby, J., Ceolotto, N., Gibbon, M. J., Jagadeesan, K. K., Feil, E. J., **Smith, T.**, Robertson, M., Standerwick, R., Barden, R., Faraway, J., and Kasprzyk-Hordern, B. (2026) "Accounting for methodological variabilities in disease outbreak surveillance using wastewater-based epidemiology: a case study with SARS-CoV-2." *Analytical and Bioanalytical Chemistry*.
32. Kimpton, J.,[1] Akpabio, A., Watts, A., Tansley, S., **Smith, T.**, McHugh, N., and Tillett, W. (2026) "Prevalence and Clinical Relevance of Anti-Drug Antibodies in Psoriatic Arthritis: A Systematic Review." *RMD Open*.
31. Palacios, E.,[1] Howlett, N., Lo, Y.T.E., Roy, S., Wood, R., and **Smith, T.** (2026) "Bed occupancy forecast for decision-making during periods of high hospital pressure." *International Journal of Medical Informatics*.
30. Wells, M., **Smith, T.**, Domsic, R.T., Anilkumar, A., Frech, T.M., Herrick, A.L., Hummers, L.K., Shah, A.A., Denton, C.P., Khanna, D., Barratt, S.L., and Pauling, J.D. (2026) "The clinical utility of telangiectasia quantification as markers of vascular disease progression in systemic sclerosis." *Rheumatology*.

[1] supervised by T Smith

29. Gollins, C., Russell, A.,[1] **Smith, T.**, Vivekanantham, A., Booke, M., Coates, L.C., Gullick, N., McHugh, N., Fahy, C., Tillett, W., and the SEQUENCE Study Group (2026) "A Retrospective Observational Study of Effectiveness of Sequential Biologic and Targeted Synthetic DMARDs in Psoriatic Arthritis in the UK." *Rheumatology*.
28. Fishpool, K., Silverthorne, C., Brooke, M., Morris, L., McHugh, N., Ovens, J., **Smith, T.**, Tillett, W., and Dures, E. (2026). "The self-management support needs of people with psoriatic arthritis: a realist review protocol." *BMJ Open*.
27. Condry, J., Georgiou, A., Vangsgaard, A., Mills, H., **Smith, T.**, Hunt, A., and Lunt A.J.G. (2025) "A randomised crossover trial of staff time with proned patients in the ICU using the 'BathMat'." *Trials*.
26. Murphy, D., Graby, J., **Smith, T.**, . . . , and Khavandi, A. (2025) "Effectiveness of a novel intervention (Super Rehab) in overweight patients with atrial fibrillation (SuRe AF): protocol for a randomised controlled trial." *BMJ Open*.
25. Gascoigne, C., Riebler, A., and **Smith, T**. (2025) "Smooth predictions for age-period-cohort models: a comparison between splines and random processes." *BMC Medical Research Methodology*.
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 Subnational 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*.
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 to Mathematical Sciences).
- ◇ Co-I (maths lead), Total bUrden of Long-Term PSoriasis - TULiPS (2024 – 2026). 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).

Training Grants

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

Previous Funded Projects

- ◇ Co-I (trial statistician), Super Rehab trials in collaboration with the Royal United Hospital (2022 – 2026). Funders: Study 1 (Coronary Artery Disease) – NIHR (£327k); Study 2 (Atrial Fibrillation) – RUHX; Study 3 (Coronary Microvascular Dysfunction) – Heart Research UK (£195k).
- ◇ 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).
- ◇ 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 (≈ PI), Knowledge Transfer Partnership with Mayden (2018 – 2020). Funders: Innovate UK (£110k) & Mayden (£54k).

Research Supervision

- ◇ PhD Students
  - S Ding, Probabilistic source apportionment of *E. coli* (2026 –, SAMBa).
  - A Challenger, Using AI to identify the risk of multimorbidity in patients with immune-mediated inflammatory diseases (2025 – , Statistics).
  - A Russell, Statistical analysis of psoriatic arthritis patient data (2024 –, SAMBa).
  - A Rudge, Dynamic modelling of psoriatic arthritis (2021 – 2025, 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: R Phillipps (2026 – , SAMBa), J Kimpton (2025 – , Pharmacy and Pharmacology), A Mahmood (2023 – , SAMBa), M Basson (2020 – 2026, 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 MSc projects on various applied statistics topics.

Recent Teaching

◇ Bayesian Statistics (MA32023, Bath UG, 2026).

◇ Theoretical fundamentals of statistical applied mathematics (MA52124, Bath PhD, 2025 –).

◇ 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 and Seminars

◇ University of Exeter Statistics and Data Science Seminar ”Statistical Inference from Real-World Health Data: From Early Detection to Treatment Effectiveness,” February 2026.

◇ Royal Statistical Society International Conference, Introductory Talk on Spatial Cross Validation, Edinburgh, September 2025.

◇ University of Bristol, Health Data Research Network ”Interpretable machine learning approaches for detecting psoriatic arthritis using electronic health records,” April 2025.

◇ Gaussian process models for pollution in rivers

  - University College London Statistics Seminar (November 2025), Limerick MACSI Seminar (October 2025), 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: Department Executive Committee (2024 – 2026), 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: Currently on the Environmental Statistics Section (Secretary 2023 – , Vice Chair 2021 – 2022) and Data Science and AI Section committees. Previously on the Avon Local Group and Computational Statistics and Machine Learning committees.
- ◇ Bath Institute for Rheumatic Diseases: Research Committee (2023 –).
- ◇ Editorial Boards: *Journal of the Royal Statistical Society, Series C (Applied Statistics)* (2025 –), *Significance* (2023 –), *Scientific Reports* (2019 – 2023).

◇ Conference/workshop organisation

- RSS: How to Navigate AI Regulations Without Becoming a Lawyer (July 2026, Bath), Invited Session Organizer for the International Conference in 2024 and 2025, Online workshop on Data Fusion in Environmental Statistics (November 2025), Challenges in local air pollution modelling (May 2019, Bath);
- TIES: London, scientific committee (2021, cancelled by COVID-19);
- GEOMED: Invited session organizer and chair (2019, Glasgow);
- IWSM Bristol, local organizing committee (2018, Bristol).