

The Open University Statistics Group

2021 Report

1. Membership

Dr K. Adhikari
Professor S. Biedermann
Miss A. Bromley
Miss C. Calvert
Ms C. Christiansen (from June)
Dr F.G. Elfadaly
Dr Á.E. Faria
Dr J. Gaudoin (from September)
Dr R.M. Hilliam
Mrs R. Neal
Dr C.M. Queen
Dr E. Steele (from September)
Mx R. Thomas (to September)
Dr N.T. Trendafilov (to September)
Dr S.K. Vines

Long-term associates

Professor C.P. Farrington [Emeritus Professor]
Professor P.H. Garthwaite [Emeritus Professor]
Professor M.C. Jones [Emeritus Professor]
Professor K. McConway [Emeritus Professor]
Dr A. Noufaily (Warwick Medical School) [Visiting Research Fellow]
Dr Y.G. Weldeselassie (Warwick Medical School) [Visiting Research Fellow]
Dr H.J. Whitaker (Public Health England) [Visiting Research Fellow]

Full-time research students

Mr M.R. Khokan
Mrs M.W. Moustafa (to February)
Mr S.S. Paria

2. Introduction

Here is an overview of the substantial activities in Statistics at the Open University in 2021, in both research and teaching.

On the research side, all our usual activities and outputs are described in Section 4 onwards of this report. During the year, members of the group published 21 papers in refereed journals, along with a number of other outputs (see Section 6). Pre-publication papers can be found in our technical report series, at

<https://www.open.ac.uk/stem/mathematics-and-statistics/research/annual-reports>

On the teaching side, over 4090 students were enrolled on the Statistics modules presented for study from dates in 2021 (see Section 3).

Our dear colleague, Dr Nickolay Trendafilov, retired in September after more than 15 years of service at the Open University. Nickolay was an excellent colleague for his outstanding teaching and research. He is still research active and his excellent research contribution is still ongoing. Best wishes to Nickolay for a long and happy retirement.

We are very pleased to welcome Ms Colette Christiansen, Dr Jotham Gaudoin and Dr Emma Steele to the group as three new staff tutors in Statistics from 2021. We are sure they will be a valuable addition to the group. In the other direction, Mx Rowan Thomas has resigned from their staff tutor position in the group, but they are still performing their outstanding tutoring for a few modules as an Associate Lecturer.

The Statistical Advisory and Consultancy Services continue, supporting research in other disciplines across the Open University. These were run by Álvaro Faria and Stefanie Biedermann. Two web pages explain the services:

<https://openuniv.sharepoint.com/sites/units/stem/maths-stats-intranet/Pages/Statistics-Advisory-Service.aspx> (only available internally)

<https://openuniv.sharepoint.com/sites/units/stem/maths-stats-intranet/Pages/Statistical-Consultancy-Service.aspx> (only available internally)

Further information on the Group's research activities is available through our general web page

<https://www.open.ac.uk/stem/mathematics-and-statistics/research/research-groups/statistics>

3. Teaching

Presentation

The Group continued to present six modules of 30 CATS points each with one of them (M140) being presented twice in the year. These, with numbers of students starting the presentations of each module in 2021 given in square brackets, are:

- [M140](#) *Introducing statistics* (Chairs: Calvert, Bromley and Neal) [February 1042; October 1271]
- [M248](#) *Analysing data* (Chair: Hilliam) [759]
- [M249](#) *Practical modern statistics* (Chairs: Faria, Biedermann) [298]
- [M343](#) *Applications of probability* (Chairs: Trendafilov, Faria) [323]
- M346 *Linear statistical modelling* (Chairs: Trendafilov, Calvert) [205]
- [M347](#) *Mathematical statistics* (Chair: Elfadaly) [195].

The first level mathematics module, [MU123](#) *Discovering Mathematics*, also contains a little statistical material.

There was a markedly increase in students numbers starting M140 (21B) [42%], M248 [35%], M249 [15%] and M347 [16%] in 2021.

Production

Work on M348 *Applied Statistical Modelling* has continued, with the aim to replace M346 *Linear Statistical Modelling* in October 2022. The new module represents a very considerable update compared with the old, prompted partly by its prominent roles in our new undergraduate degree in Data Science (see below) and a new degree in Economics. Karen Vines is the production Module Team Chair and Catriona Queen is the Deputy Chair. Both are senior writers on the module and are efficiently leading and managing the production process.

Qualifications

Our modules are compulsory components of degrees in [Mathematics and Statistics](#), [Mathematics](#), [Computing & IT and Statistics](#), [Mathematics and its Learning](#), [Economics and Mathematical Sciences](#) and [Data Science](#), as well being specified options in certain other qualifications. The Mathematics and Statistics degree was awarded to 41 students in 2021. Other joint degrees that include a substantial element of statistics were awarded as well.

We also award a [Professional Certificate in Practical Statistics](#), for successful study of M140, M248, M249 and M346, and a [Graduate Certificate in Theoretical Statistics and Probability](#), for M343 and M347. In 2021, these two qualifications were awarded to 12 and 10 students, respectively.

The new undergraduate degree in [Data Science](#) continued and there were 966 students registered in 2021. The degree features all our statistics modules, some compulsory, some optional, as well as others from computing and mathematics. M140, M248 and M348 are also compulsory modules in the [Economics](#) degree with 464 students registered in 2021.

4. Research interests

Research in the Statistics Group has been centred for many years around three main themes: *Bayesian Statistics*, *Medical Statistics* and *Multivariate Statistics*. Clearly, these three general areas cover a huge variety of research projects in Statistics. *Statistical Genetics* and *Design of Experiments* are two promising topics that are currently blossoming in the group. Research also continues on topics not directly covered by these research themes, of which single case studies, distribution theory, time series forecasting, improved confidence intervals and statistics in the media are but a selection. Ongoing collaborations continue in areas such as medicine, psychology, machine learning and earth sciences.

For details, see <https://www.open.ac.uk/stem/mathematics-and-statistics/research/research-groups/statistics> and the publications, talks and other items to follow.

5. PhD awarded

Maha Moustafa for her thesis
Interval estimates for parameters of discrete sampling distributions
(supervisors: P.H. Garthwaite and F.G. Elfadaly)

6. Publications

6.1 Book

Hahné, S., Bollaerts, K. & **Farrington, P.** (2021). *Vaccination Programmes: Epidemiology, Monitoring, Evaluation*. Routledge, Taylor & Francis.

6.2 Book chapters

Christiansen, C., Potier, L. & Bell, J. (2021). *Twins and family epigenetic studies of Type 2 Diabetes*. In: Li, S. & Hopper, J.L. (eds) *Twin and Family Studies of Epigenetics, Translational Epigenetics*, **27**, 105-118. Elsevier.

Wilson, K.J., **Elfadaly, F.G.**, **Garthwaite, P.H.** & Oakley, J.E. (2021). *Recent Advances in the Elicitation of Uncertainty Distributions from Experts for Multinomial Probabilities*. In: Hanea, A.M., Nane, G.F., Bedford, T. & French, S. (eds) *Expert Judgement in Risk and Decision Analysis*. International Series in Operations Research & Management Science, **293**, 19-51. Springer, Cham.

6.3 Publications in refereed journals

Allouche, J., Rachmin, I., **Adhikari, K.**, Pardo, L.M. (et al) Fisher, D.E. & Roider, E. (2021) NNT-mediated redox changes enable UV- and MITF-independent skin pigmentation. *Cell*, **184**, 4268-4283.e20.

Anaya-Izquierdo, K., **Jones, M.C.** & Davis, A. (2021) A family of cumulative hazard functions and their frailty connections. *Statistics and Probability Letters*, **172**, article 109059.

Bagias, C., Sukumar, N., **Weldeselassie, Y.**, Oyebode, O. & Saravanan, P. (2021) Cord Blood Adipocytokines and Body Composition in Early Childhood: A Systematic Review and Meta-Analysis. *International Journal of Environmental Research and Public Health*, **18**(4):1897.

Basak, S., Basu, A. & **Jones, M.C.** (2021) On the "optimal" robustness tuning parameter. *Journal of Applied Statistics*, **48**, 536-556.

Bonfante, B., Faux, P., Navarro, N. (et al) **Adhikari, K.** & Ruiz-Linares, A. (2021) A GWAS in Latin Americans identifies novel face shape loci, implicating VPS13B and a Denisovan introgressed region in facial variation. *Science Advances*, **7**, eabc6160.

Burney, P., Patel, J., Minelli, C. (et al) Blangiardo, M., **Elfadaly, F.G.** and Buist, A.S. (2021) Prevalence and population attributable risk for chronic airflow obstruction in a large multinational study. *American Journal of Respiratory and Critical Care Medicine*, **203**, 1353-1365.

Chen, Y., André, M., **Adhikari, K.**, Blin, M., (et al) Faux, P. & Ruiz-Linares, A. (2021) A genome-wide association study identifies novel gene associations with facial skin wrinkling and mole count in Latin Americans. *British Journal of Dermatology*, **185**, 988-998.

Christiansen, C., Castillo-Fernandez, J., Domingo-Relloso, A. et al (2021) Novel DNA methylation signatures of tobacco smoking with trans-ethnic effects. *Clinical Epigenetics*, **13**(1):36.

Elfadaly, F.G., Adamson, A., Patel, J., Potts, L., Potts, J., Blangiardo, M., Thompson, J. & Minelli, C. (2021) BIMAM – A tool for imputing variables missing across datasets using a Bayesian imputation and analysis model. *International Journal of Epidemiology*, **50**, 1419-1425.

Fonseca-Rodriguez, O., Fors-Connolly, A.-M., Katsoularis, I., Lindmark, K. & **Farrington, P.** (2021) Avoiding bias in self-controlled case series studies of coronavirus disease 2019. *Statistics in Medicine*, **40**, 6197-6208.

Hilliam, R., Goldrei, D., Arrowsmith, G., Siddons, A. & Brown, C. (2021) Mathematics and statistics distance learning: more than just online learning. *Teaching Mathematics and Its Applications: An International Journal of the IMA*, **40**, 374-391.

Hilliam, R. & **Vines, K.** (2021) When one size does fit all: simultaneous delivery of statistics teaching to multiple audiences. *Journal of University Teaching & Learning Practice*, **18**, 4.

Jones, M.C. & Balakrishnan, N. (2021) Simple functions of independent beta random variables that follow beta distributions. *Statistics and Probability Letters*, **170**, article 109011.

Jones, M.C. & Marchand, É. (2021) A (non-central) chi-squared mixture of non-central chi-squareds is (non-central) chi-squared, and related results, corollaries and applications. *Stat*, article 10:e398.

Katsoularis, I., Fonseca-Rodriguez, O., **Farrington, P.**, Lindmark, K. & Fors-Connolly A.-M. (2021) Risk of acute myocardial infarction and ischaemic stroke following COVID-19 in Sweden: a self-controlled case series and matched cohort study. *Lancet*, **398**, 599-607.

Lee, K., Costeira, R., Murray, B., **Christiansen, C.**, Castillo-Fernandez, J. (et al) (2021) Estrogen and COVID-19 symptoms: associations in women from the COVID Symptom Study. *PLoS One*, **16**(9):e0257051.

Paschetta, C., de Azevedo, S., Ramallo, V., Cintas, C., Pérez, O., Navarro, P., Bandieri, L., Quinto-Sánchez, L., **Adhikari, K.**, Bortolini, M-C. (et al) González-José, R. (2021) The impact of socioeconomic and phenotypic traits on self-perception of ancestry in Latin America. *Scientific Reports*, **11**, 12617.

Periyathambi, N., Sukumar, N., **Weldeselassie, Y.** & Saravanan, P. (2021) Impact of maternal HbA1c on offspring glucose at 4-7 years of age: role of childhood adiposity and other potential confounders. *Diabetologia*, **64**, 1447-1448.

Riaz, M., AlFayyad, I., Munshi, H.H.A., Asif, M., **Adhikari, K.** & Abu-Shaheen, A. (2021) Factors Associated with Hypertension in Pakistan: A Systematic Review and Meta-Analysis. *PLoS One*, **16**, e0246085.

Saravanan, P., Sukumar, N., Adaikalakoteswari, A., Goljan, I., Venkataraman, H., Gopinath, A., Bagias, C., Yajnik, C.S., Stallard, N., **Ghebremichael-Weldeselassie, Y.** & Fall, C.H.D. (2021) Association of maternal vitamin B12 and folate levels in early pregnancy with gestational diabetes: a prospective UK cohort study (PRiDE study). *Diabetologia*, **64**, 2170-2182.

Wang, F., Luo, Q., Chen, Y., Liu, Y., Xu, K., **Adhikari, K.**, Cai, X. (et al) Liu, F., Wang, S. (2021) A genome-wide scan on individual typology angle found variants at SLC24A2 associated with skin color variation in Chinese populations. *Journal of Investigative Dermatology*, **142**, 1223-1227.e14.

6.4 Other publications

Barnett, V. & **McConway, K.** (2021) Tobias (Toby) Lewis 1918-2020. *Journal of the Royal Statistical Society, Series A*, **184**, 784-786.

Delgado, M., Imbrasas, M.D., Davies T.W., **Khokan, M.R., Adhikari, K.**, Skinner, M.M. & Zanolli, C. (2021) Pattern and magnitude of taxonomic classification accuracy of living and fossil hominoid upper molars through landmark-based and surface-based approaches. In: 11th Annual Meeting of the European Society for the Study of Human Evolution Abstracts Online, 22-24 September 2021, *PaleoAnthropology*, 2021:1:168.

Garthwaite, P.H. & Elfadaly, F.G. (2021) Elicitation of priors. *Wiley StatsRef: Statistics Reference Online*. John Wiley & Sons.

McConway, K. & Spiegelhalter, D. (2021) Sound human, steer clear of jargon, and be prepared. *Significance*, **18**, 32-34.

Weldeselassie, Y.G., Farrington, C.P. & Whitaker, H. (2021) *The Self-Controlled Case Series Method, SCCS R package version 1.5*, <https://CRAN.R-project.org/package=S>

7. Seminars at The Open University

Over the year we heard the following seminar speakers:

Luiz Carvalho (Fundacao Getulio Vargas, Brazil) *Combining probability distributions: Extending the logarithmic pooling approach*

Jefferson Chaurais and Luiz Teixeira Jr (IntellTech and Universidade Fderal da Integracao Latino-Americana, Brazil) *Tailings dam slope stability analysis using the WARIMAX-GARCH and DBSTAR forecasting models*

Steven Gilmore (King's College London) *Multi-objective optimal design of experiments*

Nuno Sepulveda (LSHTM) *DNA methylation as a marker of disease diagnosis and aging of patients with Myalgic Encephalomyelitis/Chronic Fatigue Syndrome*

Andreas Wernecke (The Open University) *Quantifying some century-scale uncertainties of the global mean sea level rise contribution from the Antactica's Amundsen Sea*

We also had our Internal Research Day, organised by K. Adhikari, where the speakers were: K. Adhikari, C. Calvert, C. Christiansen, F.G. Elfadaly, M.R. Khokan, S.S. Paria, S.K. Vines, with the invited external speakers: Sagnik Palmal (Aix Marseille Université, France), Adetola Adediran; Shroug Alzahrani; Lily Clements (University of Southampton).

8. External conference papers and posters given

S. Biedermann

CMStatistics 2021 conference (hybrid conference at KCL & online) *Finding the optimal proportions in constrained mixture experiments* [Talk given & organised a session on optimal design of experiments]

Workshop of the RSS Medical Section on Design methods for medical and clinical studies *D-optimal designs for multi-arm trials with dropouts* [Invited talk & panel member]

C. Christiansen

Epigenetics Workshop International Twins Congress *DNA methylation studies and type 2 diabetes* [Invited talk]

C.P. Farrington

First I-MOVE COVID-19 (virtual) annual conference *Assessment of changes in vaccine effectiveness over time*

State of the Art Covid-19 conference, Sweden *Risk of venous thromboembolism following COVID-19 in Sweden: a nationwide self-controlled case series and matched cohort study* [Statistical discussant]

R.M. Hilliam

Validate AI Conference (online) *Data Science accreditation: Building trust through standards & competency validation* [with G. Blackett, & P. Martynenko]

CTEL-MSOR Conference: Celebrating our Past, Embracing our Future, Coventry *Statistics Service Teaching: What type of support should we provide to create a community?* [with C. Calvert]

M.R. Khokan

Royal Statistical Society (RSS) Conference, Manchester University, Rapid Fire Talk, *Improving Power by Conditioning in Genetic Association Studies (GWAS)*

Research Student Conference (RSC), Lancaster University (online) *Improving Power by Conditioning in Genetic Association Studies (GWAS)* [Invited talk]

K. McConway

Konference for Sundhedsnetværket, Copenhagen (online) *Good and bad reporting of statistical stories in the time of Covid: what's changed and what has not* [Invited talk]

ALM-28, Numeracy and Vulnerability, Hamburg (online) *Covid-19 and numeracy challenges* [Invited plenary talk]

9. Other external seminars and talks given

K. Adhikari

A-Level Mathematics Conference 2021 for Milton Keynes schools *Fallacies with Statistics*

British Science Week, The Open University (online) *Fallacies with Statistics*

OU M&S Postgraduate Research Day *A post-PhD career in academia*

OU Research Spotlight Programme *Maths and stats in human genetics*

F.G. Elfadaly

eSTEEeM Annual Conference, The Open University *Using knowledge from Associate Lecturers in a Bayesian model to predict the probability of students' results* [Poster]

R.M. Hilliam

Horizons in STEM Higher Education Conference: Making Connections, Innovating and Sharing Pedagogy (online) *Learning & Teaching Adjustments within the Mathematical Sciences in Response to the Covid-19 Pandemic* [with M. Grove, M. Henley, K. Houston & D. Lawson]

Horizons in STEM Higher Education Conference: Making Connections, Innovating and Sharing Pedagogy (online) *Statistics Service Teaching: What type of support should we provide?* [with C. Calvert]

eSTEEeM Annual Conference, The Open University *Supporting students through their study journey: the use of qualification wide subject websites* [with G. Holden]

2nd Annual STEM Teaching Conference (online) *Towards a qualification world* [with C. Calvert]

2nd Annual STEM Teaching Conference (online) *How do students and staff use the Mathematics and Statistics Study Site?* [with G. Arrowsmith, A Siddons, D. Goldrei & C. Brown]

Royal Statistical Society Members Week Event (online) *The ABCs of CPD* [Invited talk]

M&S seminar talk *Service teaching in statistics: Embracing the differences*

Royal Statistical Society International Conference, Manchester *Shaping the Profession of Data Science by the Alliance for Data Science Professionals* [Invited talk]

Royal Statistical Society International Conference, Manchester *Professional pathways and competencies: A new look for professional membership* [Invited talk]

Royal Statistical Society, New Fellows Welcome Event (online) *Pathways to gaining professional recognition* [Invited talk]

OU Quality Enhancement Conversations: Building students' sense of community beyond modules *Study Sites: If we think they are important how can we maximise their use?* [Invited talk]

University of Warwick *Teaching and Learning Mathematics and Statistics online? What lessons can we take away?* [Invited seminar talk]

K. McConway

Celebrating Fifty years of mathematics and statistics at the Open University *What is statistics research anyway? And what does it have to do with journalism?*

Weymouth and Portland U3A science group *How statistics (and science) are reported by the media*

Talk arranged by Royal Statistical Society for statisticians in the Scottish Government *Communicating statistics to the media during the COVID pandemic*

Talk for Intelligence Forums *My statistics career and how it related to the pandemic*

Y.G. Weldeselassie

Gestational Diabetes Research Team Journal Club, University of Warwick *Analysis of hierarchical data*

10. Editorial roles

K. Adhikari

- Senior Editor: *Annals of Human Genetics*
- Review Editor: *Frontiers in Genetics, Human and Medical Genomics section*

S. Biedermann

- Associate Editor: *Statistics – A journal of theoretical and applied statistics*

J. Gaudoin

- Associate Editor: *JRSS, Series C*

R.M. Hilliam

- Statistical reviewer: *BMJ paediatrics*

M.C. Jones

- Associate Editor: *Statistica Neerlandica*
- Associate Editor: *Statistics and Probability Letters*

K. McConway

- Statistical Advisor: *Endocrine-Related Cancer*
- Statistical Advisor: *Journal of Endocrinology*
- Statistical Advisor: *Journal of Molecular Endocrinology*

11. Grant awarded**S. Biedermann**

is Co-Investigator on the EPSRC grant:

Partial recovery of missing responses - a toolbox for efficient design and analysis when data may be missing not at random

(EPSRC grant EP/V00641X/1, collaboration with Dr Robin Mitra, Cardiff University)

12. Other activities**K. Adhikari**

- gave invited lectures at the University of Bath
- gave a lecture on Statistical Methods for Data Analysis to Scotland's College Lecturers
- presented at the OU-ARC Cancer Conference (online) and the European Mathematical Genetics Meeting, Paris (online)
- interviewed for the news article: How Brexit Is Transforming the UK's STEM Community at *The Scientist*
- interviewed by the Daily Mail for the article: *A GWAS in Latin Americans identifies novel face shape loci, implicating VPS13B and a Denisovan introgressed region in facial variation*
- interviewed in an episode of BBC radio program 'More or Less' about probabilities of names in the UK
- is a member of the EPSRC Mathematical Sciences Early Career Forum

S. Biedermann

- is member of the UKRI Future Leaders Fellowships (FLF) Peer Review College (PRC)
- gave a seminar talk at the LHCS (OU) *Optimal experimental design - How to get the most out of your experiment*

F.G. Elfadaly

- is Honorary Lecturer, National Heart and Lung Institute, Imperial College London

Á.E. Faria

- examined a PhD student (Xuewen Yu - *Causal Analysis on Chain Event Graphs for Reliability Engineering*), University of Warwick

C.P. Farrington

- co-authored report from Epi-PHARE *Vaccin anti-COVID-19 Pfizer BioNTech et événements indésirables cardio-vasculaires en France chez les sujets âgés de 75 ans et plus*
- gave a seminar to EPI-PHARE, Paris La méthode SCCS

P.H. Garthwaite

- is a mentor to Kate Ren (University of Sheffield) for an NIHR fellowship
- is a member of Review Panel for Kuwait University Research Sector

J. Gaudoin

- is External Examiner for Mathematics and Statistics at the University of the West of England
- appointed to the RSS Professional Affairs Committee
- is a member of the RSS Computational Statistics and Machine Learning Committee
- is a member of the RSS Statistics in Sport Committee

R.M. Hilliam

- chaired three sessions and peer reviewed contributions for MSOR-CTEL 2021 conference
- co-organised and ran three TALMO (Teaching and Learning Mathematics Online: <http://talmo.uk/>) events
- is Invited Statistics Presenter for the Induction Course for New Lecturers in Mathematical Sciences, Institute of Mathematics and its Applications, the Isaac Newton Institute for Mathematical Sciences and the Heads of Departments of Mathematical Sciences (HoDoMS), Cambridge
- is Inaugural Chair of The Alliance for Data Science Professionals
- is Vice-President of the Royal Statistical Society (RSS)
- is a member of RSS Executive Committee, RSS Honours Committee, RSS council and Chair of the Professional Affairs Committee
- is a founding member of the RSS Teaching Statistics Special Interest Group

- is a founding member of the RSS Data Science Task Force
- is a core member of The Alan Turing Institute Data Skills Taskforce
- is an RSS accreditation assessor
- is Visiting Research Fellow in Medical Statistics, University of Derby
- is Honorary Associate Professor in Statistics, University of Warwick

K. McConway

- is a member of the Advisory Committee and a Trustee of the Science Media Centre, writing invited comments on statistical aspects of scientific papers, and contributing in other ways to the work of the Centre. He contributed 210 comments on new research and statistical bulletins, etc., the great majority of them about SARS-CoV-2. These were quoted in almost all the national newspapers, in many regional newspapers, and in several online news websites
- was interviewed for TV and radio programmes (Sky News, LBC, Times Radio), and news podcasts (Daily Mail, Times)
- interviewed for two podcasts for 'Stats + Stories', a podcast series from Miami University (Ohio, USA) and the American Statistical Association
- is a member of the Public Data Advisory Group, which advises the Cabinet Office on the public understanding of data during the pandemic
- is a committee member of the RSS Data Ethics Special Interest Group
- is external examiner for MSc in Data Analytics for Government, University College London
- gave a lecture and workshop on statistics in scientific writing for Society of Endocrinology
- gave two guest lectures on statistics in the media for undergraduate and postgraduate journalism students at City, University of London