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Editor's Note

I hope you find this Spring Edition of the **sigma** Newsletter 2022 a reminder of the onset of Spring. Along the same lines you note the items in the newsletter reflects new developments and potential conferences to provoke ideas.

Beginning with introductions from Alun and Mark on their new roles on the steering group with opportunities for you to share with them your thoughts and ideas. Peter has made use of Covid-19 research to consider the value of classic statistics.

As lockdown restrictions have been removed we can look forward to meeting up sensibly in person, and included in the newsletter are a few notices of conferences coming up which will be of interest to the network members.

A big thank you to all authors for their contributions to this edition. The deadline for contributions for the next edition (Autumn 2022) is **12th September 2022**. We welcome contributions on any topic that may be of interest to practitioners and academics supporting higher education students in their learning of mathematics and statistics.

Finally, as usual: the views expressed do not necessarily constitute recommendations from the **sigma** Steering Group or any associated parties.

Happy Reading

– Chetna Patel



Welcome from New Chair of the sigma-Network Steering Group.

Alun Owen

Head of Statistics Advisory Service and Chair of sigma-Network | Coventry University

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Dear all,

I wanted to introduce myself as the new Chair of the sigma-Network, having been elected by the Steering Group in January this year.



First though I would like to express huge thanks to the outgoing Interim Chair, Emma Cliffe, for her important stewardship of the network since 2020. Emma has undertaken this 'spare time' role during what has been a very busy and challenging time for us all. However, I'm delighted to inform you that Emma will be continuing her good work as a joint Vice-Chair (Technical) of the Steering Group, and so we will be able to benefit from her technical insights and knowledge as I learn how to take over the reins from her. Emma is joined as Vice-Chair by Mark Hodds (Operations), who introduces himself in a separate article so I won't steal his thunder and leave you to see what he has to say.

I'm currently Head of the Statistics Advisory Service at Coventry University, but this is my second tour of duty at this institution, returning here in 2017. I have been working in academia since 1991, but began working in mathematics and statistics support in 2008 when I joined Coventry University (for the first time), to lead their Statistics Advisory Service, before moving to do the same at Loughborough University. I'm a member of the Royal Society's ACME GCSE Mathematics Contact Group, and through this I am able to represent the interests of HE students in terms of the GCSE mathematics curriculum. Since 2015 I have also been one of the editors of 'MSOR Connections', which is an open-access practitioner focused publication, available online at <https://journals.gre.ac.uk/index.php/msor>.

I'm actually slightly over-awed by the role of Chair, after seeing how the network was managed so well by David Bowers since its inception in 2012, and more recently by Emma. These are big boots to fill but I will aim to help and support you all as the best I can, since it is you that make up our network. To that end please feel free to get in touch with me at any time via chair@sigma.network.ac.uk.

I have seen many developments over the years, and I look forward to working with you all to address the challenges we currently face, and of course the challenges still to come. My main task will be to foster a commitment to work together to determine the future direction of mathematics and statistics support provision, as we slowly emerge from the difficulties of the past two years.

Keep up the amazing work you do.

Alun

P.S. If you are interested in how the network has developed, or simply want to see some photos of us more "mature" members of the network in our younger days, remember there is lots of information on our website at <https://www.sigma-network.ac.uk/>

ARTICLES

Introducing Mark Hodds - the New Vice-Chair (Operations) of the sigma-Network Steering Group

Mark Hodds

Assistant Professor in Mathematics and Statistics Support | Coventry University

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Hi everyone,

I'm Mark and I am the new Vice Chair (operations) of the sigma-network. My new role will involve helping the network with organising events, continuing to run the social media feed on Twitter, and ensuring we are offering our network opportunities that engage and enthuse on all things maths and stats support!

I have been working at Coventry University since 2014 and was part of the inaugural steering group in 2016. Since then I have organised several events for the network including being the chair of the organising committee for CETL-MSOR 2021, the first hybrid version of the conference.

My research interests include improving attainment and understanding at all levels of mathematics, with a particular focus on non-maths specialists such as nurses. I have conducted a lot of work into diagnostic testing and the competencies of students arriving at university. I also supervise 2 PhD students, one looking at engagement of anxious and underrepresented groups with maths and stats support and the other looking at maths and stats support in the new normal.



ARTICLES

A contemporary example of the three-treatment problem.

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Reaching the national newspapers and radio recently, the study by Grist et al. (2022) presented results on lung function for three groups of patients. One group had been released from hospital after Covid (PHC), another had long Covid but had not been in hospital (NHLC), and there were healthy volunteers as control. This is the common experiment of three treatments with control and two interventions. For quantitative data suitable for ANOVA, there is a choice of which two comparisons to make among the three treatments, if multiple testing is to be avoided, given that there are only two degrees of freedom (df). The paper states: "Specifically, whether the lung abnormalities ... in [PHC] patients are present in [NHLC] patients has not been precisely evaluated and is the aim of this study". Right, so the main aim is to compare PHC with NHLC, and this allows a second independent comparison of PHC and NHLC together (these patients have all had Covid) versus the control. These comparisons arise from the research question and the structure of

the treatments, and will give the most precise analysis. Moreover, they can, and should be, specified in advance, before the results are seen.

Using the summary data for RBC:TP, a measure of lung function, the ANOVA table can be constructed. It includes the two specific comparisons as F-tests with one df. They are orthogonal so the sums-of-squares for the two comparisons add to the sum-of-squares for the three treatments: all variation is accounted for exactly.

Data	Control	NHLC	PHC
Number in group	13	11	12
Mean	0.46	0.35	0.31
Standard deviation	0.07	0.09	0.11

Source	df	SS	MS	F	P
Three treatments	2	0.15143	—	—	—
NHLC versus PHC	1	0.00918	0.00918	1.11	0.30
(NHLC + PHC) versus control	1	0.14225	0.14225	17.20	0.00022
Residual	33	0.27290	0.00827	—	—
Total ($N=36$)	35	0.42433	—	—	—

The answer to the research question is that there is no detectable difference in lung function between NHLC and PHC. The difference is 0.04 with 95% confidence limits of -0.04 to 0.12 , which include zero. However, patients who have had Covid, irrespective of going to hospital or not, are different from the control: 0.13, confidence limits 0.07 to 0.19. (An alternative approach, if the researchers had specified it in advance, would be to make the two comparisons NHLC versus control and PHC versus control.)

Despite the clearly stated aim implying a specific comparison, the researchers resorted to "Tukey post hoc tests with Bonferroni correction" (surely only one or the other needed for multiple testing?). Feeble! This procedure merely looks for any pairwise difference among the treatments, which is inappropriate and imprecise when there is structure to the treatments and a defined research question. The honestly significant difference required by the Tukey test is about 20% larger than the least significant difference of the F-test with one df that is possible for a specific comparison specified in advance (HSD 0.091; LSD 0.076).

Focused questions, limited in number to the df among the treatments, specified in advance, leading to specific comparisons of means, will always be more precise than post hoc multiple comparisons. Researchers need to re-acquire this tool of classical statistics!

Grist et al. (2022). The investigation of pulmonary abnormalities using hyperpolarised xenon magnetic resonance imaging in patients with Long-COVID. Pre-print available from www.oxfordbrc.nihr.ac.uk (search for Grist; last accessed on 28th February 2022).

FUTURE EVENTS

CETL-MSOR 2022 - Continuing Excellence in Teaching and Learning in Mathematics, Statistics and Operational Research

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Save the Date: 1st – 2nd September 2022

Abertay University, Dundee. is looking forward to welcoming delegates to our campus for the 2022 Continuing Excellence in Teaching and Learning in Mathematics, Statistics and Operational Research (CETL-MSOR) conference on the 1st and 2nd of September 2022.

The conference themes for 2022 will focus on

- Digital accessibility
- Modes of delivery in Mathematical Sciences – the best of the old and the new
- Widening access, articulation and outreach
- Student engagement, what is it and how do we measure it?

We will be in touch soon with how to register and submit an abstract.



<https://sway.office.com/yp9DyPhqb2MYCX06?ref=email&loc=play>

FUTURE EVENTS

3rd International Conference on Developing Mathematical Resilience

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Mathematical Resilience Network

We are delighted to announce that the call for proposed submissions is now open for the Mathematical Resilience Network's 3rd International Conference on Developing Mathematical Resilience. The hybrid conference will be held on **Friday and Saturday, 1st – 2nd July 2022** at the Open University and synchronously online.

Aims and Objectives

The conference is open to all researchers, teachers and others, from across the world, who are interested in enabling people to overcome mathematics anxiety, protect their mathematical well-being and develop mathematical resilience. We also welcome submissions from those researching the affective domain of mathematics education in a broader sense.

The conference will offer an innovative and friendly environment for participants to showcase and discuss their research or emerging practice, with opportunities to receive questions and constructive feedback. The conference is currently being planned as a hybrid event to allow online and face-to-face participation, and to meet colleagues from a diversity of contexts.

Call for Submissions To promote diversity and inclusivity, there are three forms of contribution possible:

1. **Presentations.** A 20-minute session to present your research and answer questions or discuss.
2. **Workshops.** A 30-minute session allowing time for participants to engage with resources, tasks and ideas.
3. **Posters.** A virtual gallery consisting of posters and an accompanying recorded presentation. Attendees will be able to pose questions and feedback to be answered asynchronously by the presenter.

Ideally, the proposal for a contribution would take the form of an abstract of up to 250 words; a short informal description of the proposed submission would also be welcome. Please indicate which of the three formats you plan to use and the field that most relates to your research:

1. Teaching for mathematical resilience
2. Emotional regulation in mathematics teaching and learning
3. Mathematical resilience in adult and life-long learning
4. Psychological safety in the context of learning and teaching mathematics
5. Working with parents to address maths anxiety
6. Information technology, media and mathematics resilience
7. Coaching for mathematical resilience
8. Educational leadership in embedding mathematical resilience
9. Other– please specify

Guidelines

Please submit your 250-word proposal (abstract or description) at

<https://warwick.ac.uk/fac/soc/ces/research/current/mathematicsresilience/drmcon22submissionform>.

The deadline for proposal submission is **12 pm on Friday, 8th April 2022**.

The abstract decisions will be communicated by Friday 22nd April 2022.

Guidance on writing abstracts can be found at

<https://www.exordo.com/blog/how-to-write-an-abstract-for-a-conference/>

FUTURE EVENTS

The fifth international conference on E-Assessment in Mathematical Sciences (EAMS)

Chris Graham

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The fifth international conference on E-Assessment in Mathematical Sciences (EAMS) takes place between **13th and 24th June 2022**.

The conference aims to bring together researchers and practitioners with an interest in e-assessment for mathematics and the sciences. It will consist of a mix of presentations of new techniques, and pedagogic research, as well as workshops where you can get hands-on with leading e-assessment software.

EAMS 2022 is an entirely online conference, with a mix of live sessions and web-based activities, and plenty of opportunity for discussion and collaboration.

Before the conference starts, there will be a programme of optional training workshops available for participants to get hands-on with state-of-the-art maths e-assessment software.

Live talks will take place over Zoom at 9am and 4pm BST (UTC +1) each weekday, with recordings available later. The online format and longer timescale allow participants to engage more deeply with the material presented.

The call for talk and workshop proposals is currently open. If you have some research or an innovative technique related to mathematical e-assessment that you would like to present, then please submit an abstract at eams.ncl.ac.uk/call-for-speakers by **13th May**.

We're actively seeking to increase the diversity of our attendees and speakers, and particularly encourage speakers from groups under-represented in previous editions of EAMS to submit proposals.

To attend the conference, please register for free at eams.ncl.ac.uk/register.