



RSS Annual  
Conference 2021

ROYAL  
STATISTICAL  
SOCIETY  
DATA | EVIDENCE | DECISIONS

# Teaching statistics to non-specialists in a pandemic setting: Opportunities and challenges

Dr Margaret MacDougall  
University of Edinburgh

Professor Bill Browne  
University of Bristol

Professor Mine Çetinkaya-Rundel  
Duke University & R Studio Inc

8 September 2021

Invited session on behalf of  
RSS Teaching Statistics SIG

# SCHEDULE

Necessity as the mother of invention: Interactivity and partnership in the teaching of statistics to medical students

Margaret MacDougall

(14.25-14.45)

Teaching statistics to psychology and education Masters students: A blended learning approach

Bill Browne

(14.45-15.05)

Introduction to data science, for all, online

Mine Cetinkaya-Rundel

(15.05-15.25)

Panel discussion – please raise your Zoom hand!

(15.25-15.40)



Necessity as the mother of invention: Interactivity and partnership in the teaching of statistics to medical students



THE UNIVERSITY  
of EDINBURGH

**RSS Conference 2021**

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# SOME HISTORY

- Insufficient exposure of medical students in early years to uniting theory and practice in statistics
- Challenge of mismatch in level of prior learning versus student and supervisor expectations in later years for short research projects – pressure to publish or mirror published statistical analyses!
- Personal research on statistical learning needs of undergraduate medical students – the need for doors of opportunity to open to allow application of this research

# RELEVANT WORK

[Medical graduate views on statistical learning needs for clinical practice: a comprehensive survey](#)

MacDougall, M., Cameron, H. & Maxwell, S., 31 Dec 2019, In: BMC Medical Education. 20, 1

[An overview of Preparing medical students for self-directed learning in statistics: What should we expect of tomorrow's doctors?](#)

MacDougall, M., 1 Apr 2011, In: Maths Stats and Operational Research Connections. 11, 1, p. 18-22

[Ten Tips for Promoting Autonomous Learning and Effective Engagement in the Teaching of Statistics to Undergraduate Medical Students Involved in Short-Term Research Projects](#)

MacDougall, M., 2008, In: Journal of Applied Quantitative Methods. 3, 3, p. 223-240

# 1ST DOOR OF OPPORTUNITY OPENS...

- New BMedSci Health Sciences intercalated honours (IH) degree programme for Year 3 MBChB students
- First academic year 2018 – 2019
- Equivalent of 5 half-days of teaching within Research Skills in Health Sciences (RSHS) module - students engaged in learning **which integrates skills acquired in statistics theory and practice**
- Students supported with formative assignments and model examples and solutions

# OLD ASSESSMENT

- Design: assessment of statistics squeezed into 2-hour written Research Skills exam
- The problem – students did not have time to engage in sound statistical reporting or exercise the depth of prior learning available through model solutions, formative exercises and data analysis
- The result: absence of evidence of learning through assessment

# INTENDED OBJECTIVES FOR NEW STATISTICS ASSESSMENT FOR LEARNING

- Eliminating non-reflective speed test approach to assessing statistics in original research skills exam
- Instilling statistical rigour to avoid perpetuation of statistical misunderstanding in high ranking clinical journals
- Making medical students confident and competent as consumers and **producers** of statistics in preparation for clinical practice

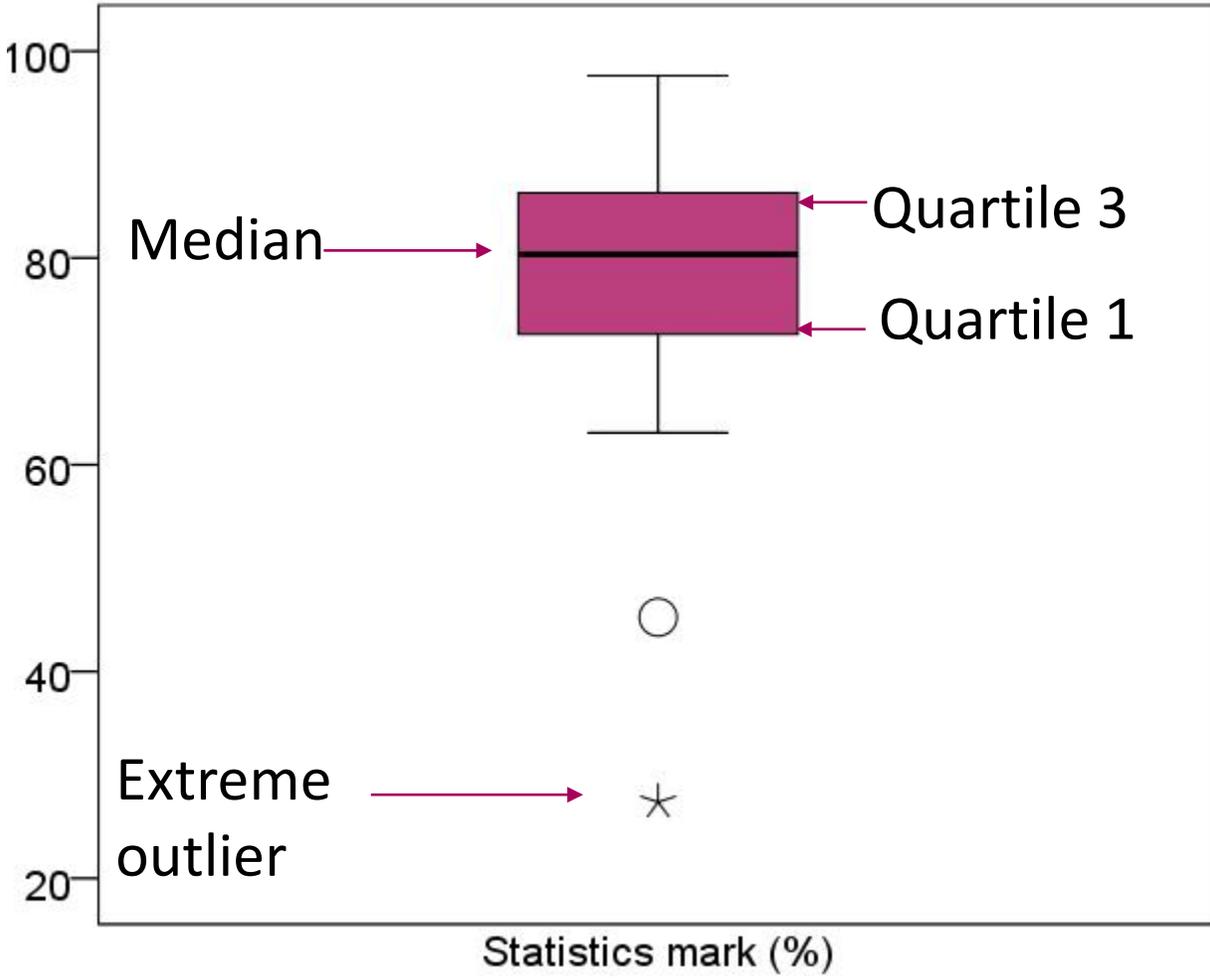
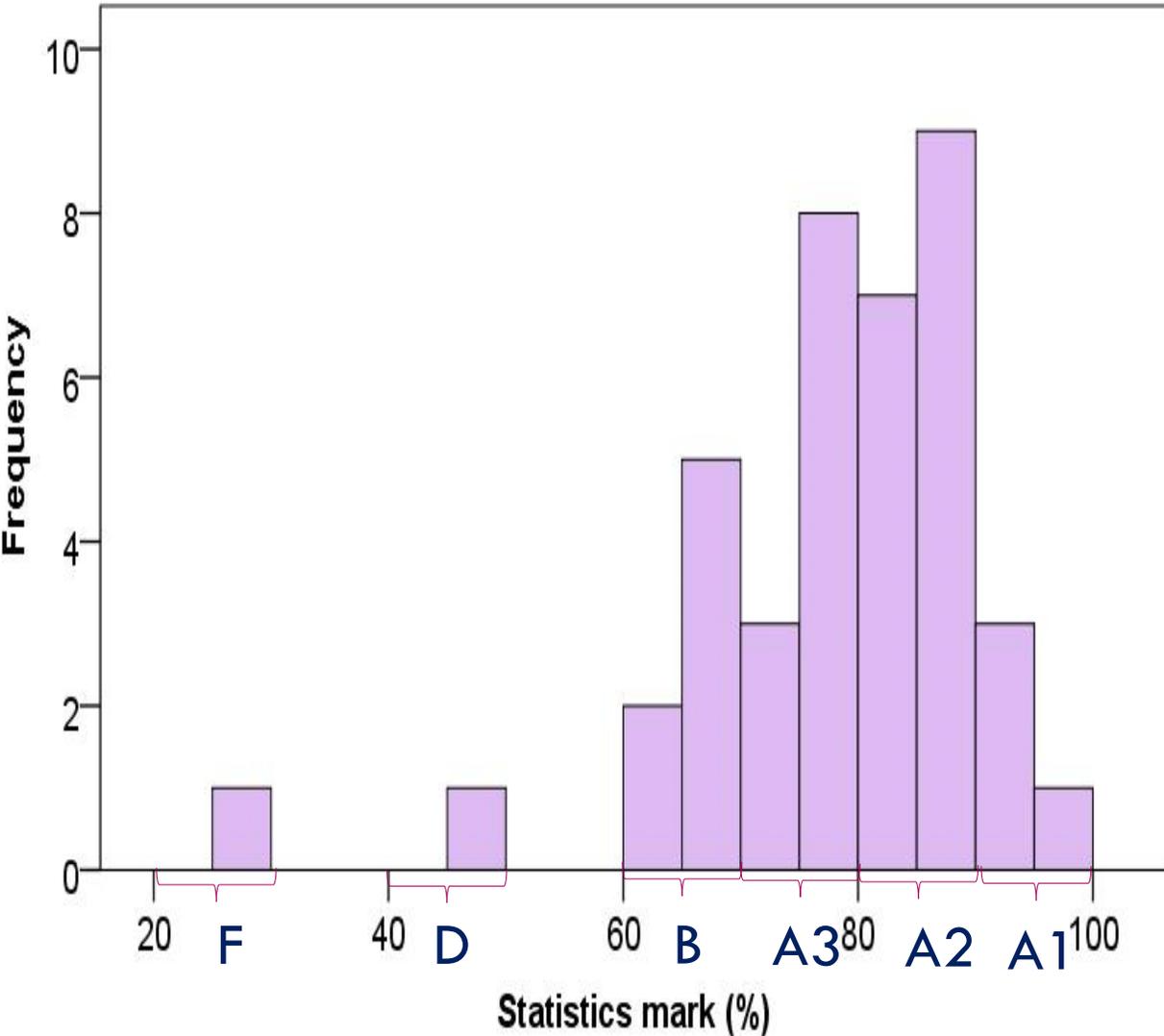
# **2<sup>ND</sup> DOOR OF OPPORTUNITY OPENS:**

All statistics teaching and assessment delivered online in response to Covid-19 pandemic

# NEW ASSESSMENT

- 1<sup>st</sup> year of 3-hour standalone open-book statistics exam: sound interpretation and reporting of statistics based on hypothetical data analysis
- Questions designed within context of clinical case-scenarios (as previously)
- Recommended completion time of 3 hours; 24-hour window to accommodate different time zones.
- The result: in general, greatly improved attention to detail and rigour

# DISTRIBUTION OF STATISTICS % MARKS



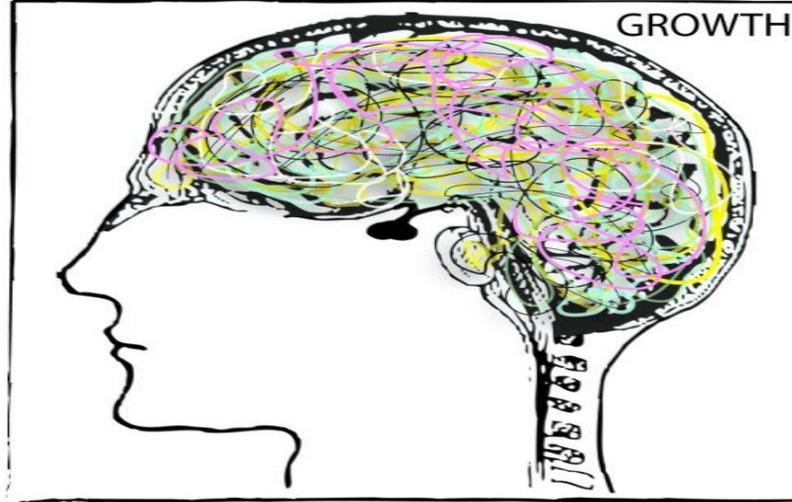
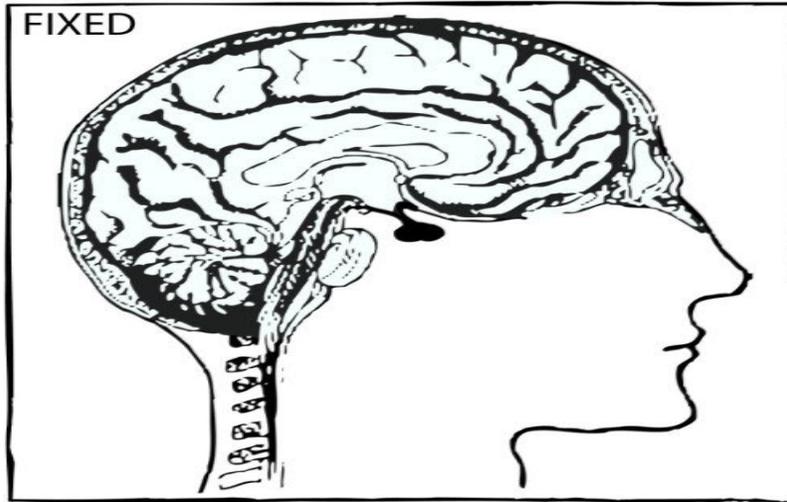
# TIME FOR SOME RAP!



# ADVANCE HE ASSESSMENT TORCHBEARERS MAP

- An interactive map hosting presentations on HE contributions to HE assessment from many different countries (<https://www.advance-he.ac.uk/membership/member-events/july-celebrating-success-and-addressing-challenges-assessment>)
- Crowdsourcing pandemic assessment practices across the globe.
- Personal contribution: *Assessment for learning: Medical students gaining confidence and competency as producers of statistics*

# GROWTH VERSUS FIXED MINDSET



Carol Dweck, American  
Psychologist

## FIXED

vs

## GROWTH

avoids challenges

gives up easily

see effort as fruitless

ignores useful criticism

threatened by others

embraces challenges

persists in obstacles

see effort as necessary

learns from criticism

inspired by others' success

*Carol Dweck's Mindset/graphic Lillibridge/dakota1966*

# BUILDING AN ONLINE STUDENT-STAFF PARTNERSHIP WITH PER-SESSION FEEDBACK

- Approach: link provided in chat box at the end of each session
- Students requested to respond to a couple of questions – one rating the session and the other a free-text question on what they valued most about the session and any suggestions to improve the session, where appropriate
- Students valued the opportunity to see suggestions being acted on in real time.

# IDEAS FROM FEEDBACK- GENERIC IN NATURE

- Translate explicit navigational steps for finding resources into within-session learning activities.
- Avoid the virtual equivalent of students being locked in the room. (Example: close break-out rooms for breaks)
- Be receptive to teacher training! (Example: more polls to gauge understanding)
- Be open to recalibrating the scales. (Example: more breaks for theory-intensive components of session)

# FURTHER READING

## Teaching Matters blog article

Building an online student-staff partnership with per-session feedback: Perspectives from Medical Statistics, Margaret MacDougall and Sophia Wong Ching Hwai (Year 3 undergraduate medical student); June 2021

<https://edin.ac/38CFOOn>

# 3RD DOOR OF OPPORTUNITY OPENS...

Year 3 Research Skills Course: More teaching and learning time in statistics obtained for academic year 2021 – 2022

# **4TH DOOR OF OPPORTUNITY OPENS...**

Curriculum redevelopment in Year 2 of MBChB curriculum:  
academic year 2021 - 2022

# RELATED CHANGES TO THE CURRICULUM: PUTTING RESEARCH INTO PRACTICE

- Transfer of **statistical** learning in Year 3 single honours degree programme to **learning for all** Year 2 MBChB students through semester 1 component of Research and Evidence-Based Medicine Course
- All teaching is online but live sessions are to be complemented with recorded lectures to manage competing demands from non-statistical courses

# WHAT WILL HAPPEN TO ASSESSMENT?

Year 2 – all assessment online

- In-course assessment (ICA): a) critical reflection through debate, b) data analysis and interpretation of findings for clinical case scenario
- General end-of-semester online 'knowledge-based' exam: statistics questions to be included!

# WHAT WILL HAPPEN TO ASSESSMENT?

## Year 3

- Open-book 3-hour written assessment in statistics to be retained as unique feature of course
- Exploring option to remove 24-hour window as quality insurance measure
- New statistical topics to be included to replace those carried over to Year 2 - to be informed by research on statistical learning needs

# FUTURE CHALLENGES

Main challenge: making statistical learning in Year 3 available for all UG medical students

## Current challenges

- IH students offered 20-credit courses only
- Timetable clashes across different IH courses
- Availability of eligible markers and corresponding funding – future discussion point with Biomedical Teaching Organisation

# IDEAS TO PURSUE – YEAR 3 LEARNING AND TEACHING

- **Delivering suite of statistics modules for students to choose from**
- **Providing recorded lectures to accommodate timetable clashes**

**THANK YOU FOR YOUR INTEREST!**