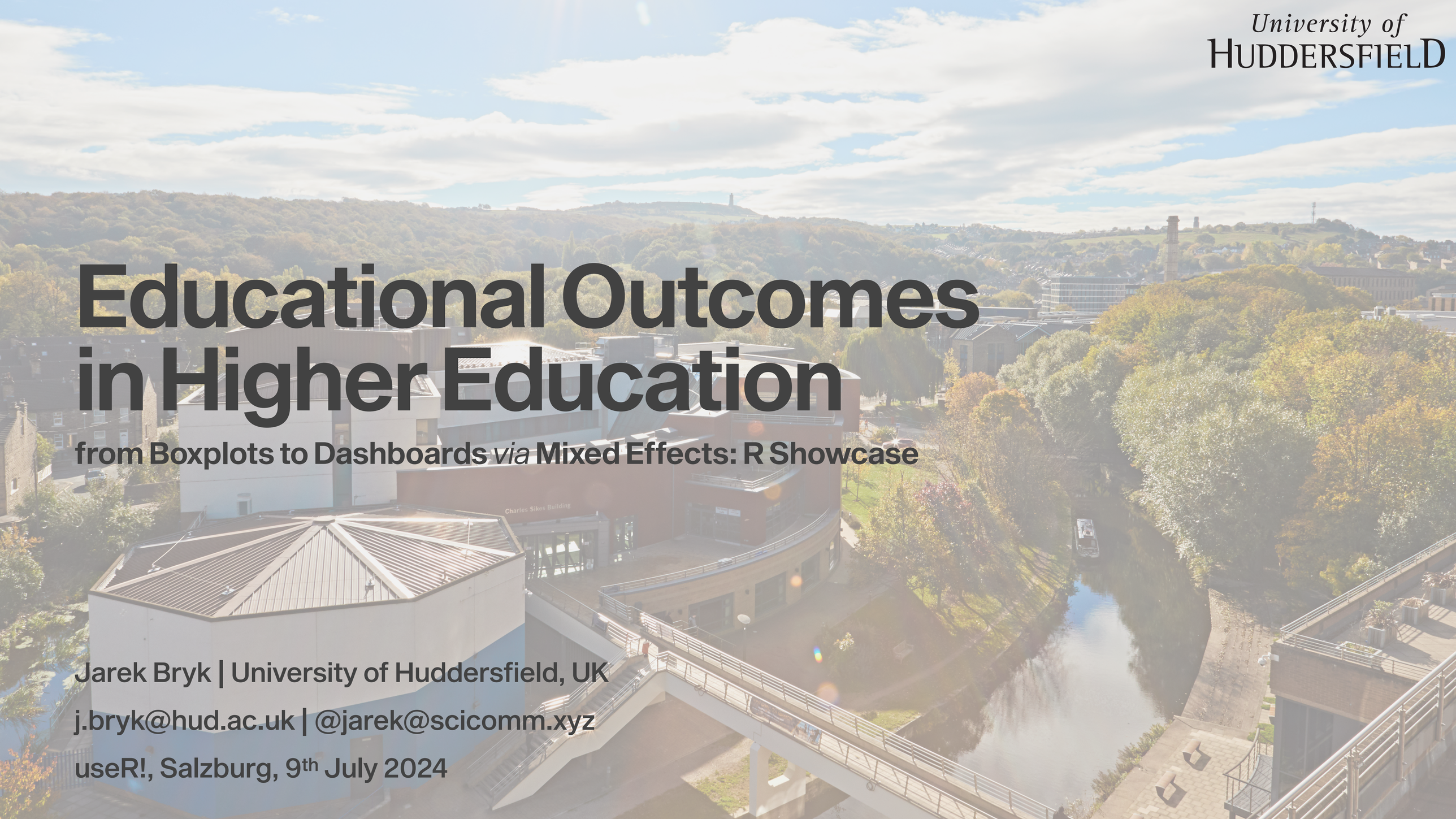
University of HUDDERSFIELD

Educational Outcomes in Higher Education

from Boxplots to Dashboards *via* Mixed Effects: R Showcase



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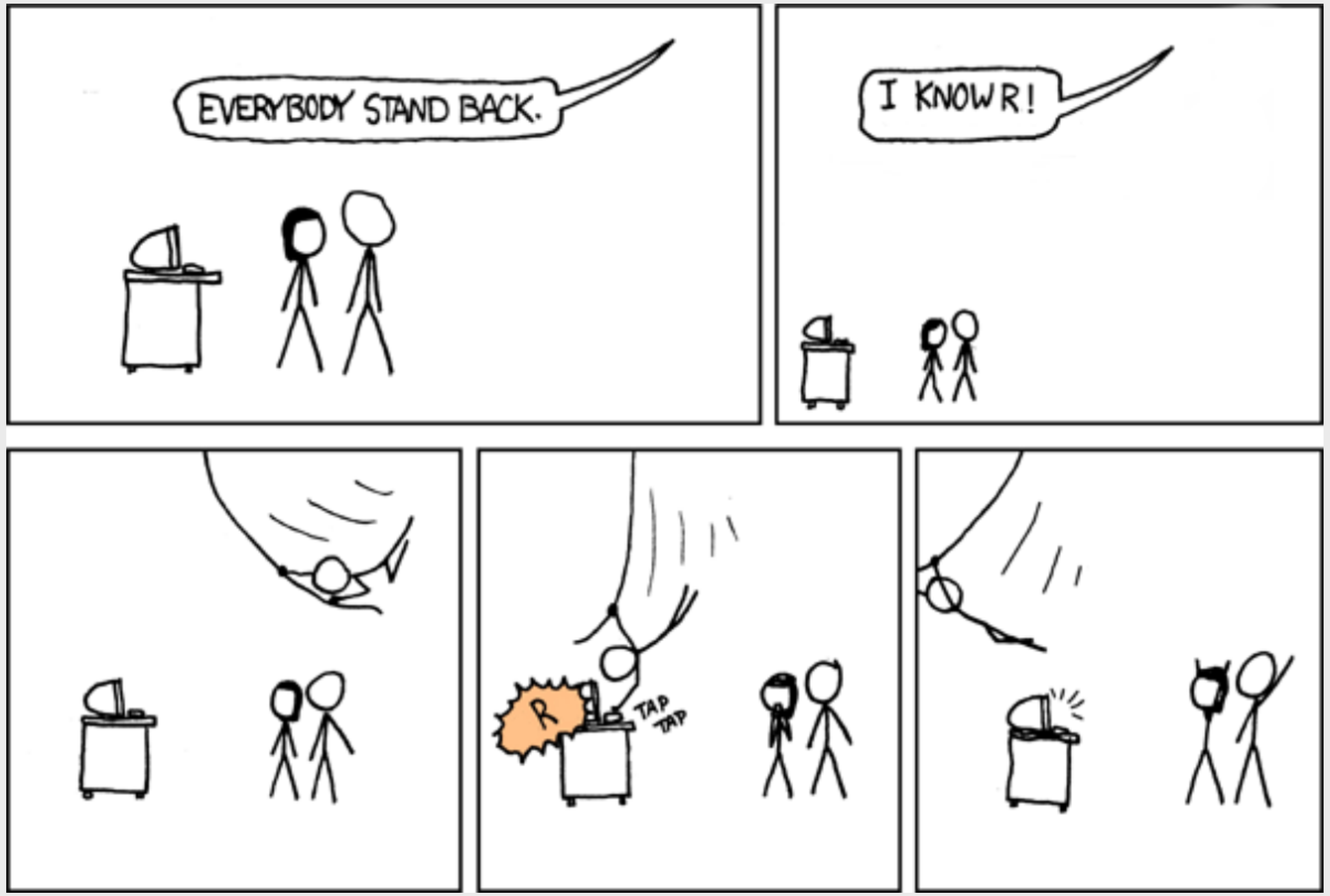
useR!, Salzburg, 9th July 2024

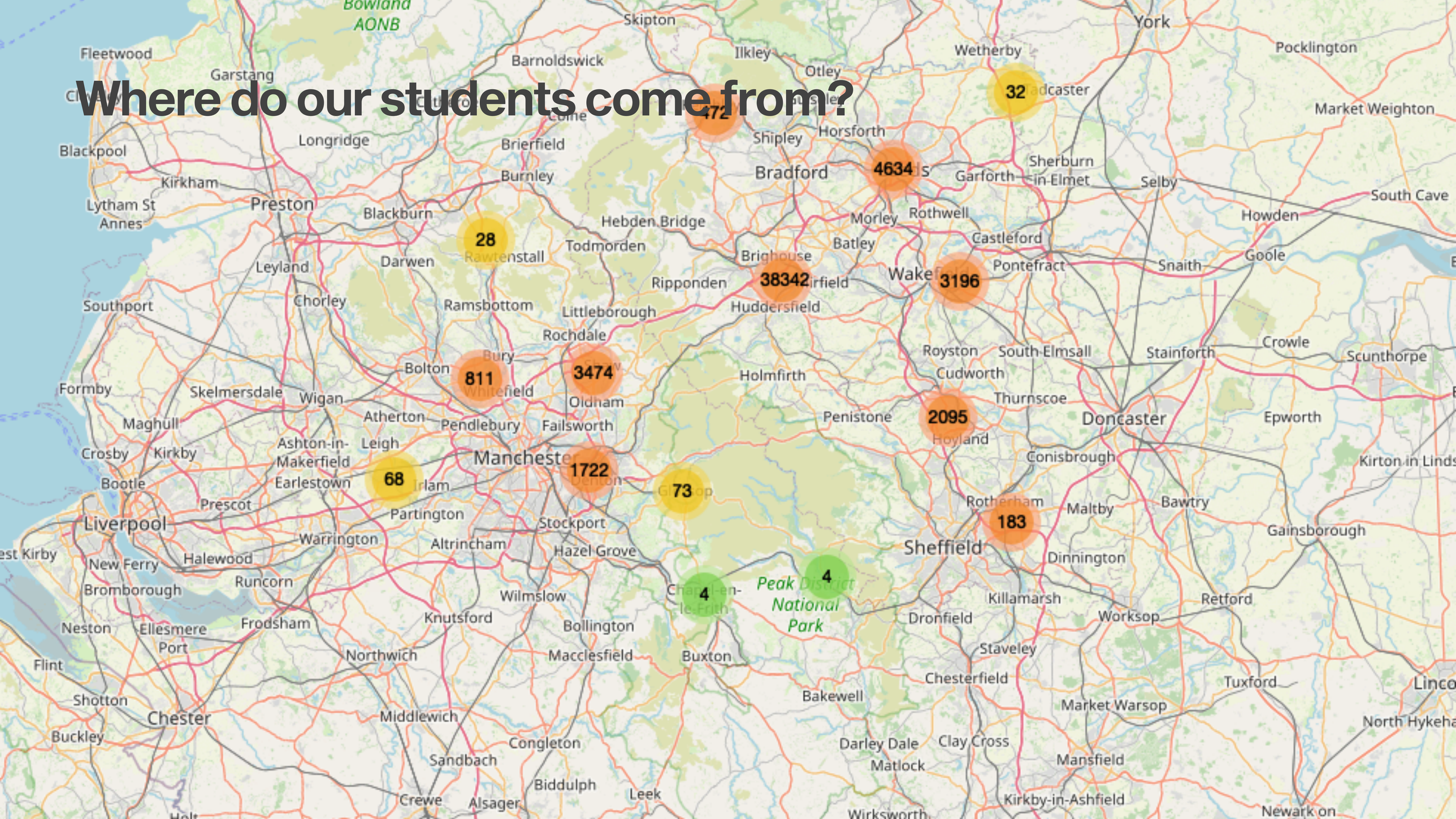
This is not about fancy stuff

It’s about lots of little things that are good enough, accurate enough, quickly enough



Source (with apologies to Randal Munroe): https://xkcd.com/208/

Where do our students come from?



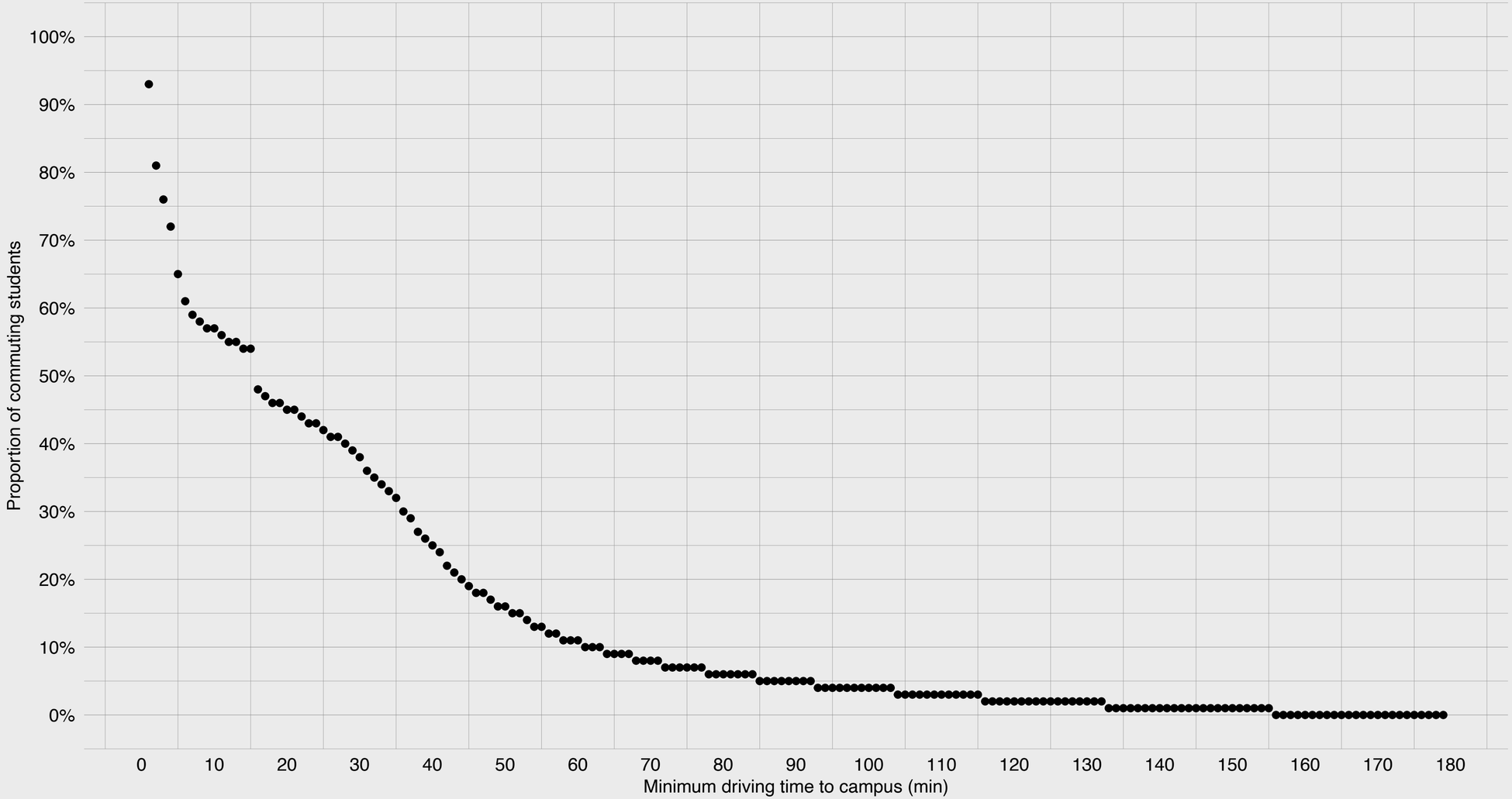
Travel time

Query travel time to campus using Google Maps API

- ☑ Get coordinates of a centre of a postcode polygon for each students' term-time postcode (available from the Office for National Statistics)
- ☑ Use Google Maps API to calculate driving distance to campus from each coordinate
- ☑ Plot proportion of students travelling longer than x minutes, for every minute between $1 < x < 180$

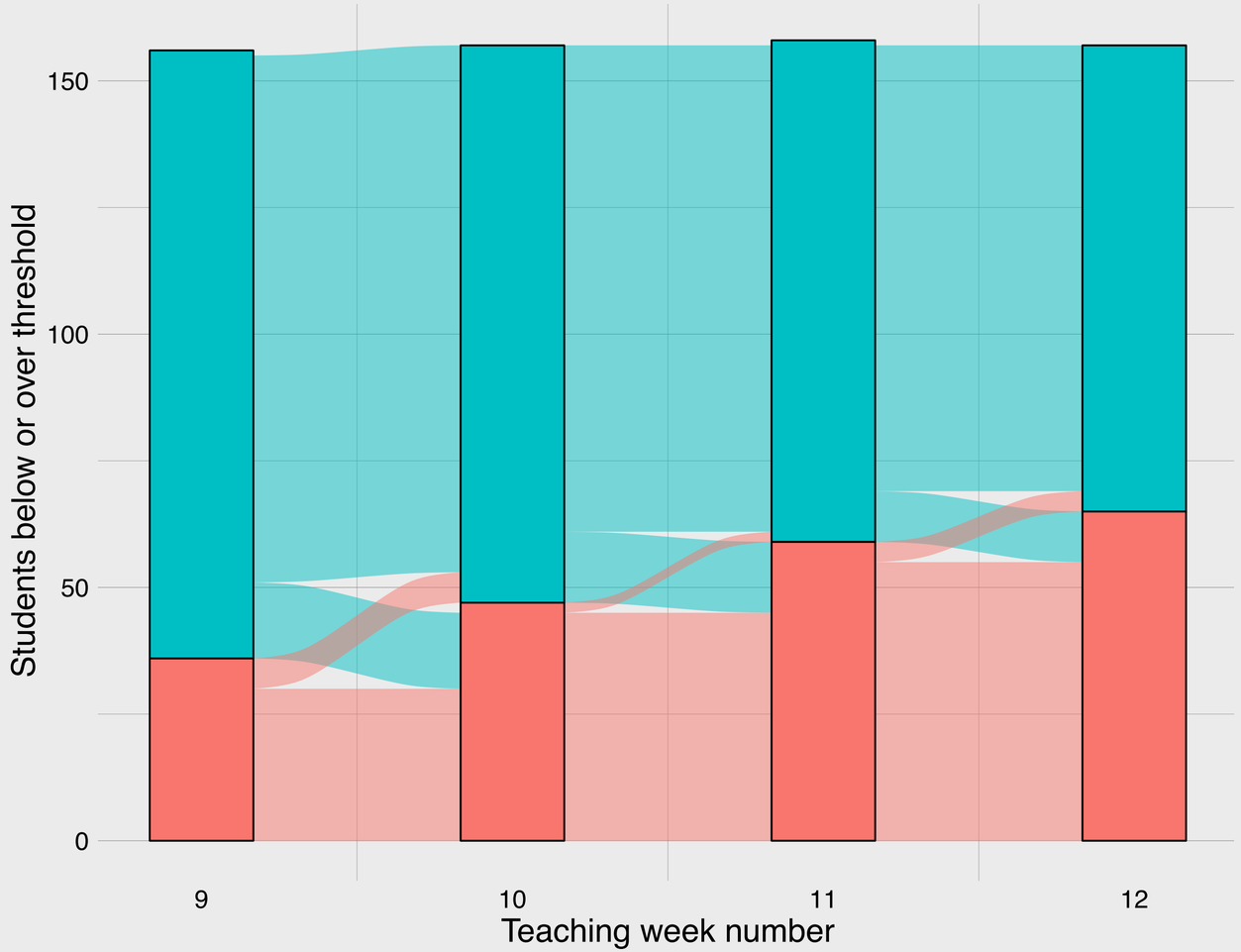
Who is a commuter?

Proportion of students who travel to campus more than x minutes



Is poor/good attendance random?

...or are the same students usually attending poorly/well?

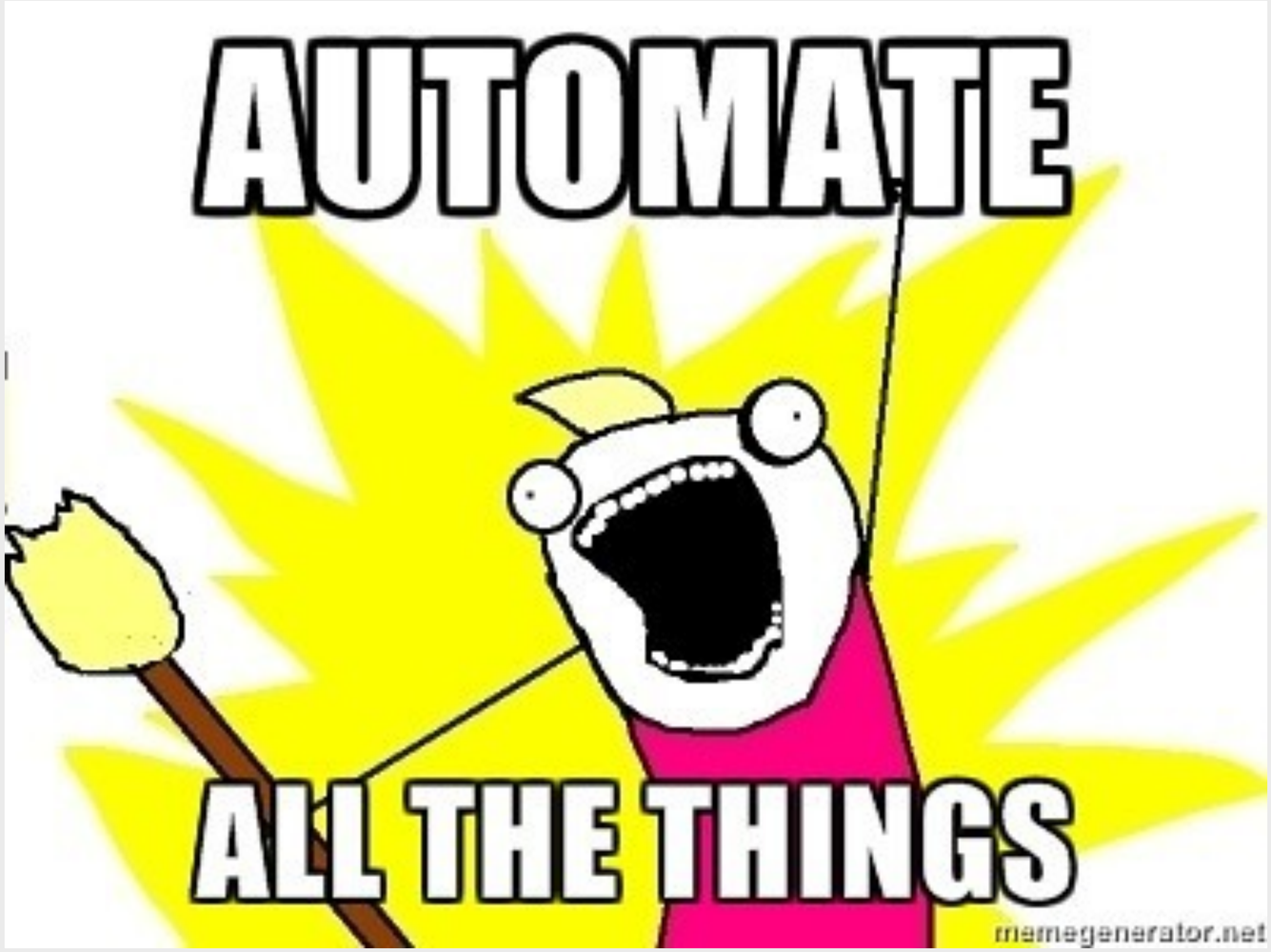


Students attending >= 70% of classes in a week

Students attending < 70% classes in a week

Challenges of attendance monitoring

- Attendance is managed by a separate team in each school/faculty
- Typically only cumulative attendance is considered by attendance monitoring team
- Tutors can view attendance weekly, but they have to click through each student, each week
- Tutors only can view students’ use of VLE, but only per students, per module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PAT report for Jarek Bryk - Vivaldi

PAT report for Jarek Bryk

Weekly report summarising personal academic tutees' attendance and their use of Brightspace

PUBLISHED
December 18, 2023

Introduction

This report characterises students' performance over time using two metrics, attendance and Brightspace use. They are explained in detail at the end of the document.

Summary table

This table summarises three parameters for each tutee:

- Completion of the academic integrity quiz. Only a single most recent result is reported.
- Average attendance in the last three weeks up to the date of the current report.
- Number of days since the last accession of Brightspace, calculated relative to the date of the current report.

The table is interactive - columns are resizable and clicking on their names sorts the values.

Student name	Student ID	Year of study	AI quiz stage	AI quiz status	Last Brightsp... access (days)	Average atten... (last 3 weeks)
		MSc/topup			2	87.5%
		MSc/topup			1	84.7%
		MSc/topup			3	76.4%
		2	Compulsory	No attempt	1	82.7%
		1	Stage1	Pass	1	62.2%

Student name	Student ID	Year of study	AI quiz stage	AI quiz status	Last Brightsp... access (days)	Average atten... (last 3 weeks)
		2	Compulsory	Pass	3	77.2%
		1	Stage1	Pass	1	24.8%
		2	Compulsory	No attempt	1	88.9%
		1			3	90.3%
		2	Compulsory	Pass	5	85.7%
		2	Compulsory	Pass	4	80.7%
		1	Stage2	Pass	3	71%
		1	Compulsory	Needs improve...	0	21.1%
		2	Compulsory	No attempt	1	100%
		2	Compulsory	Pass	1	100%
		2	Compulsory	Pass	3	88.9%
		1	Compulsory	Pass	6	21.4%
		1	Compulsory	Pass	3	58.5%
		3/4			1	33.3%

Attendance

Weekly attendance levels for each student. Shaded areas are term breaks.

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[[1]]
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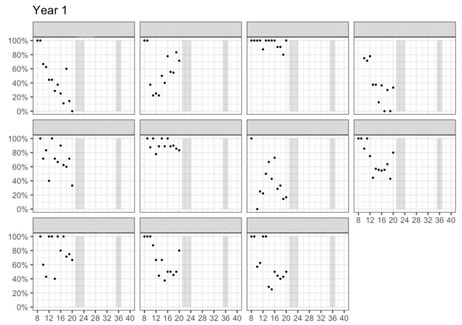
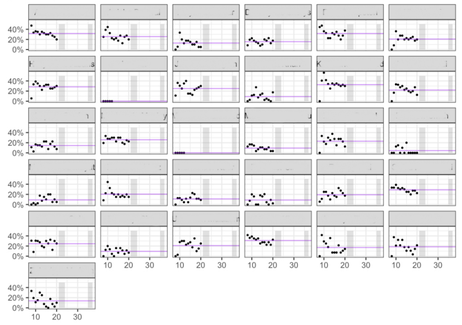
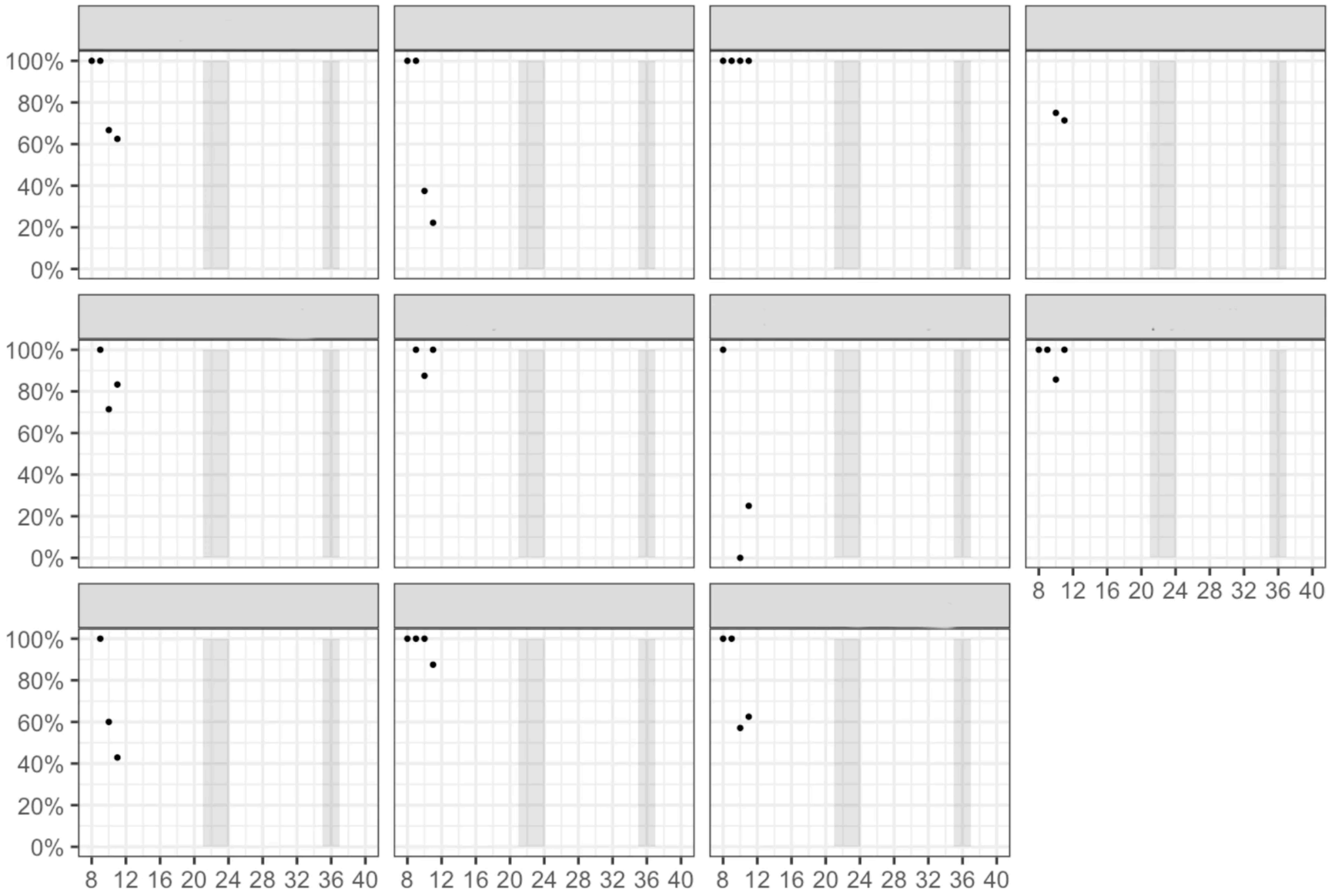


Brightspace use

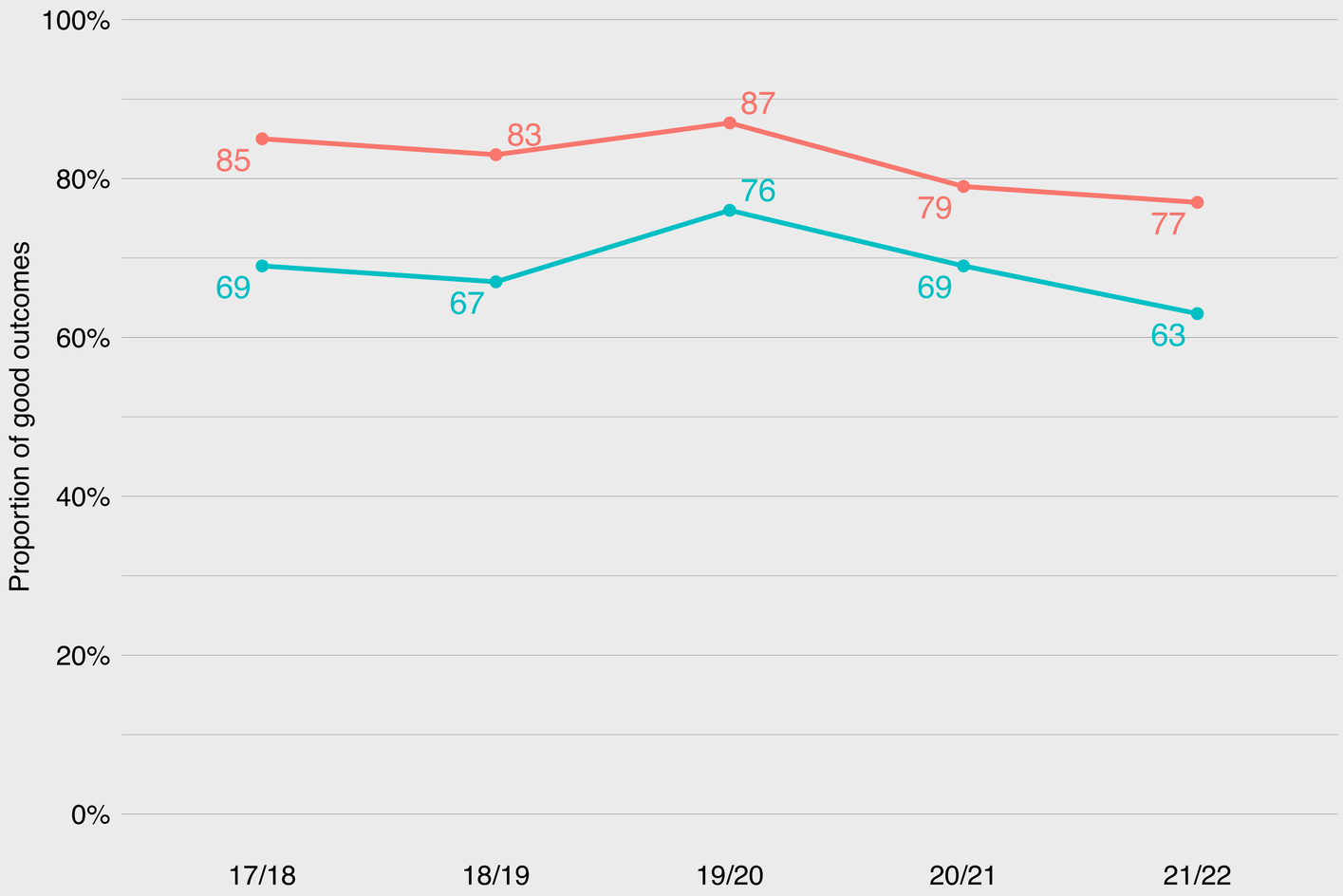
Figure 2. Weekly use of Brightspace. Shaded areas are term breaks. Purple line is an average use so far.




100%
80%
60%
40%
20%
0%
8 12 16 20 24 28 32 36 40

Differential attainment

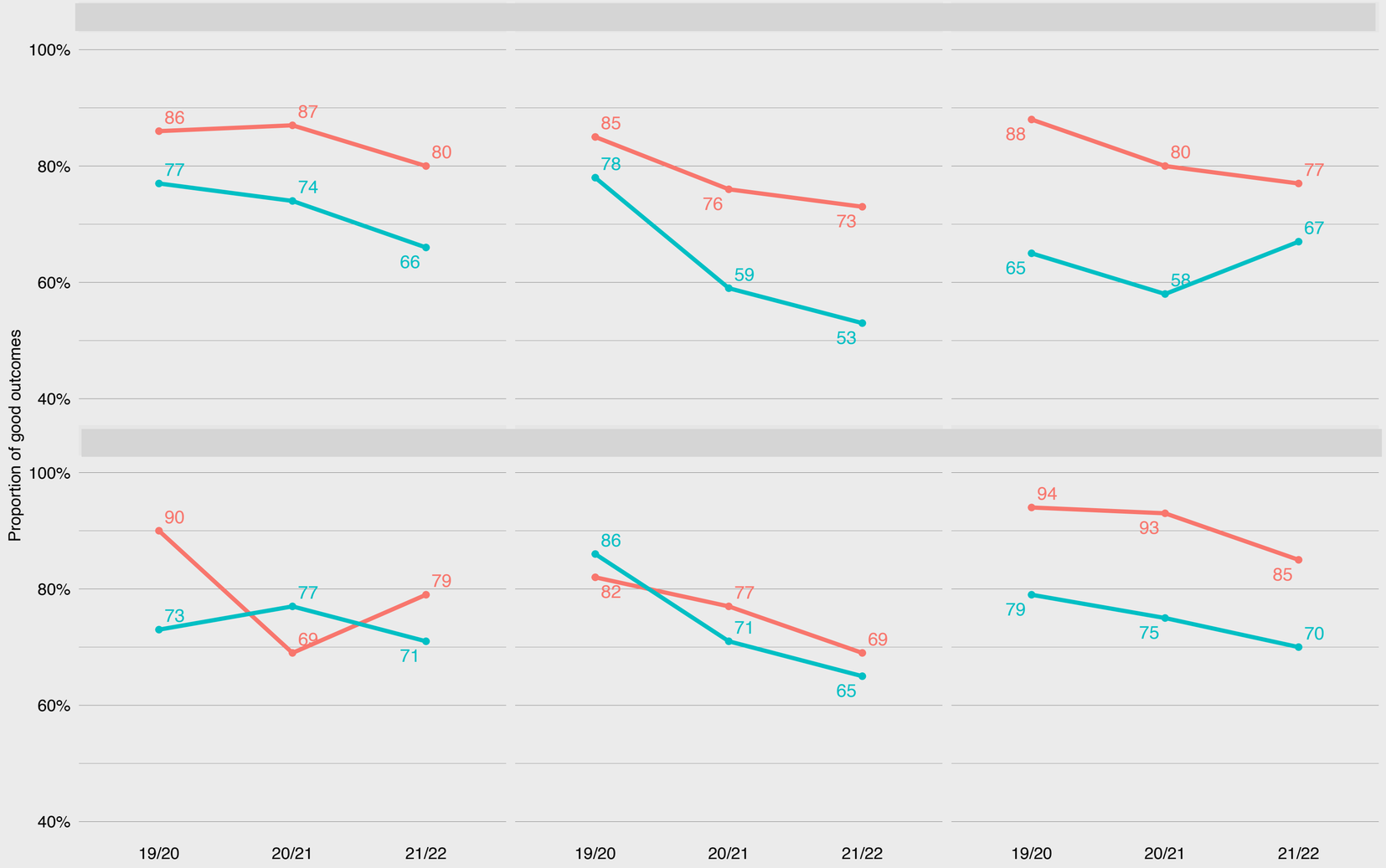
Proportion of “good outcomes” by ethnicity (white *vs* BAME)



Attainment gap is the difference between the two lines

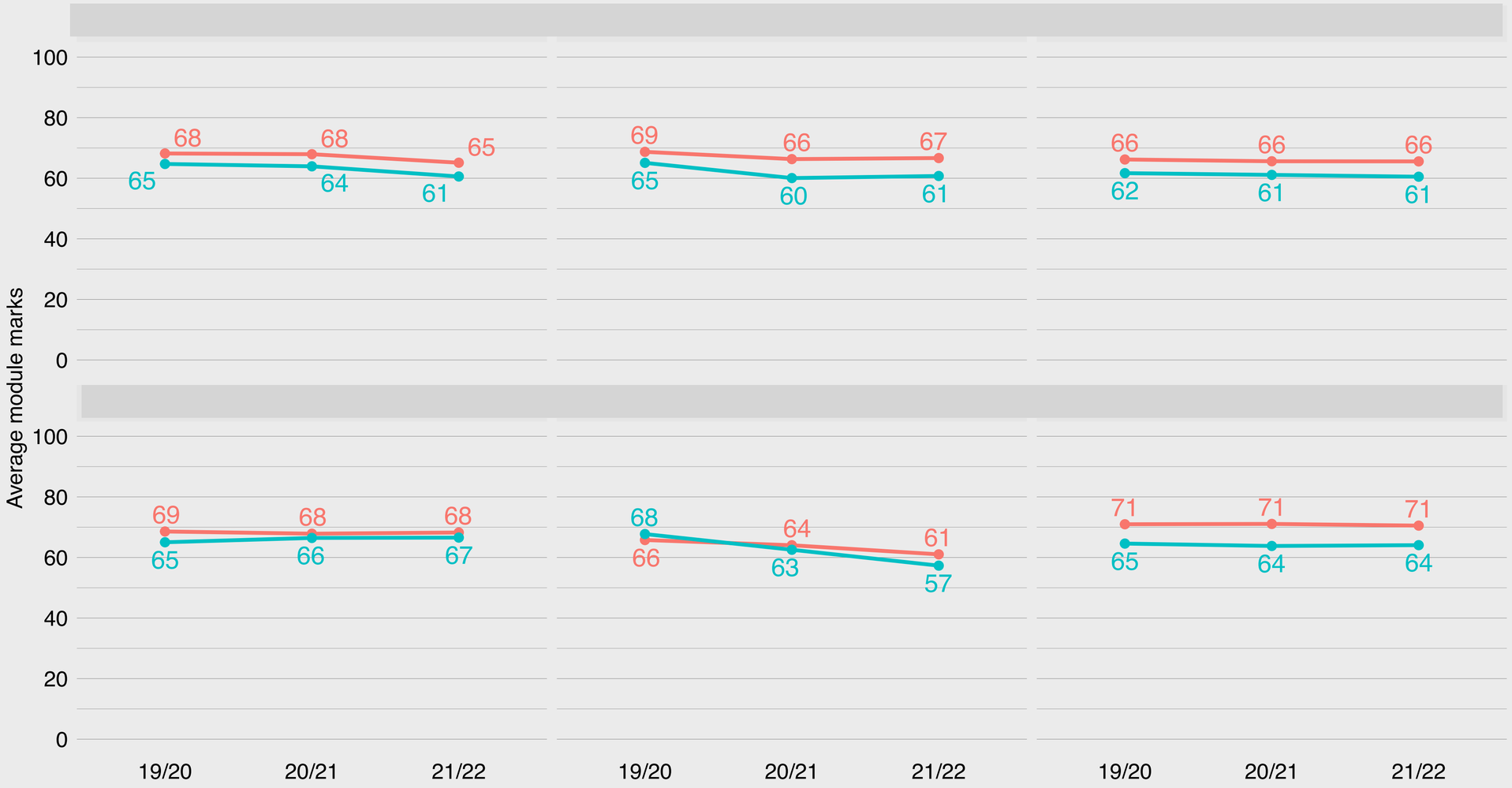
Variation in attainment gap in individual schools

...is large - we can't consider institution as a whole



But: average module marks of white vs BAME students

Wait, what? They are much closer?



UK degree outcomes:

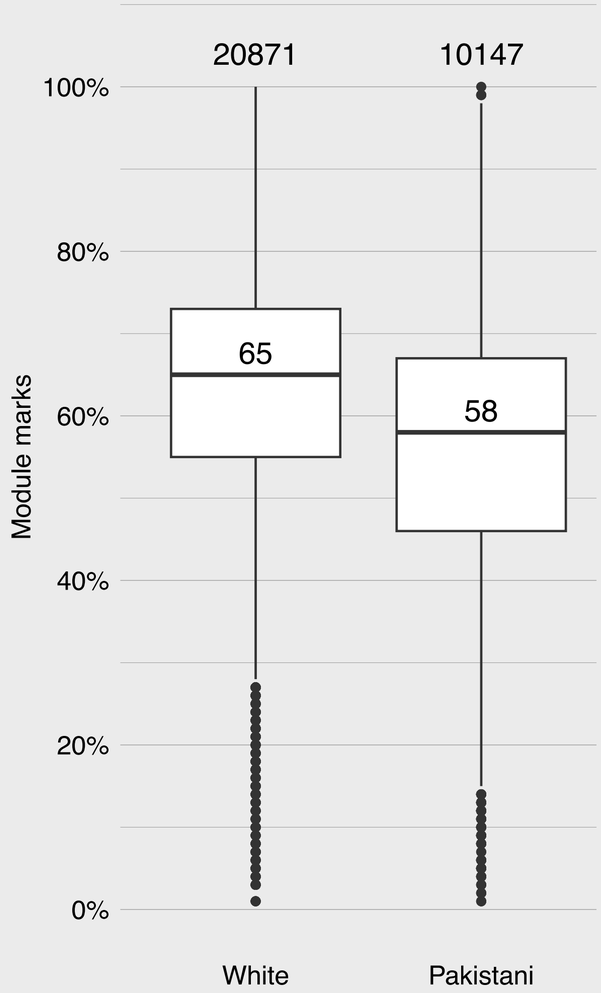
1st (>= 70%)

2:1 (>= 60%)

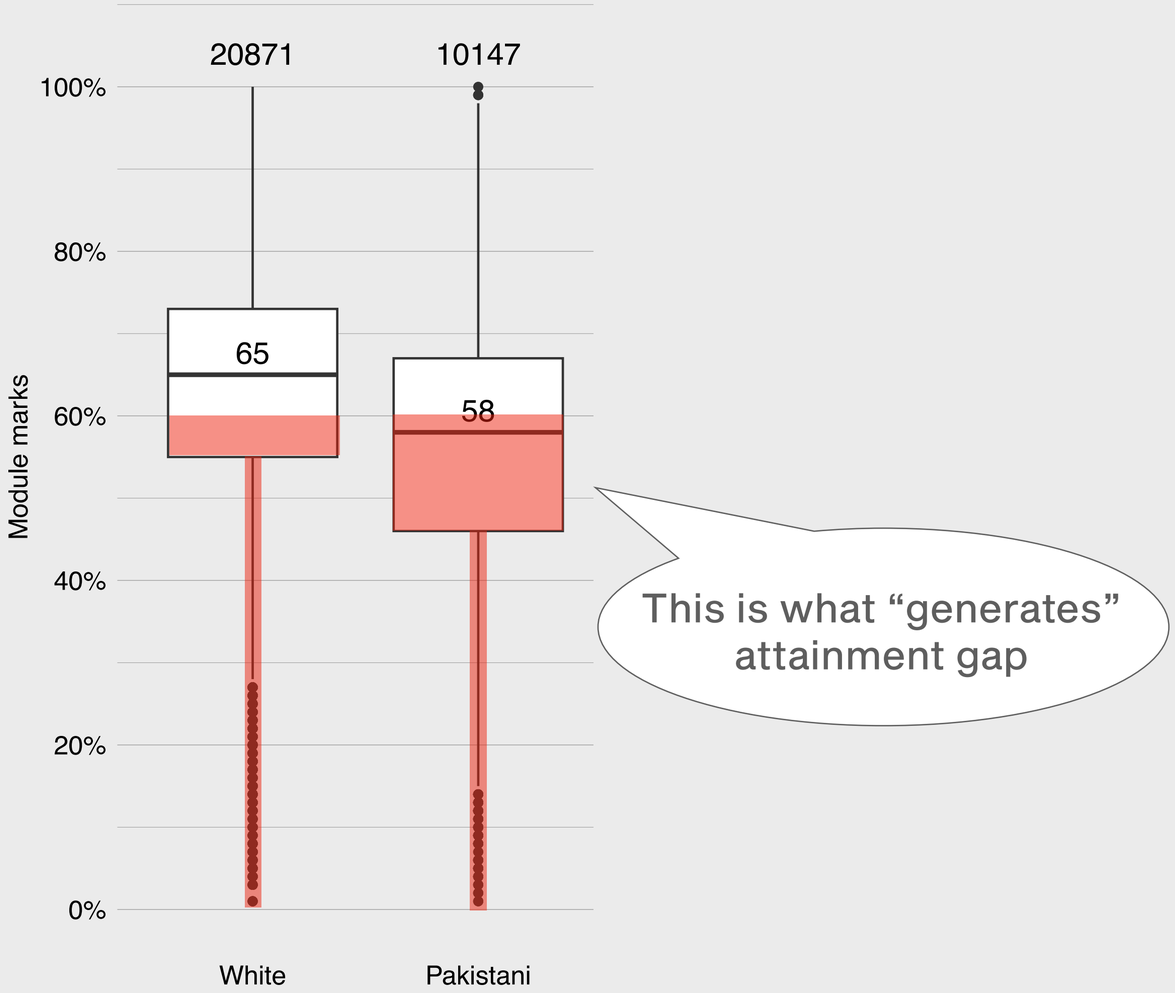
2:2 (>= 50%)

3rd (>= 40%)

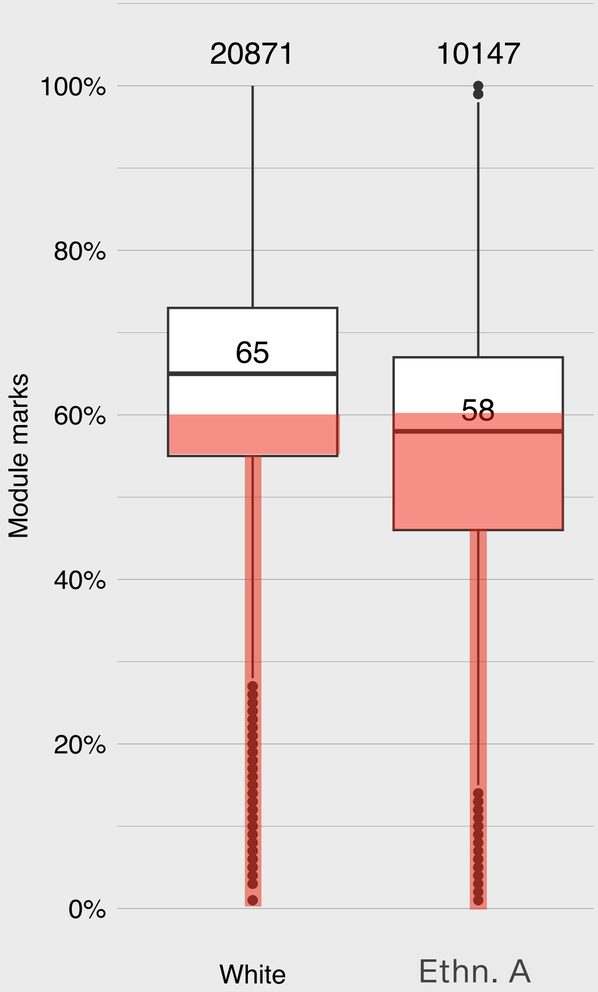
Distribution of module marks by ethnicity

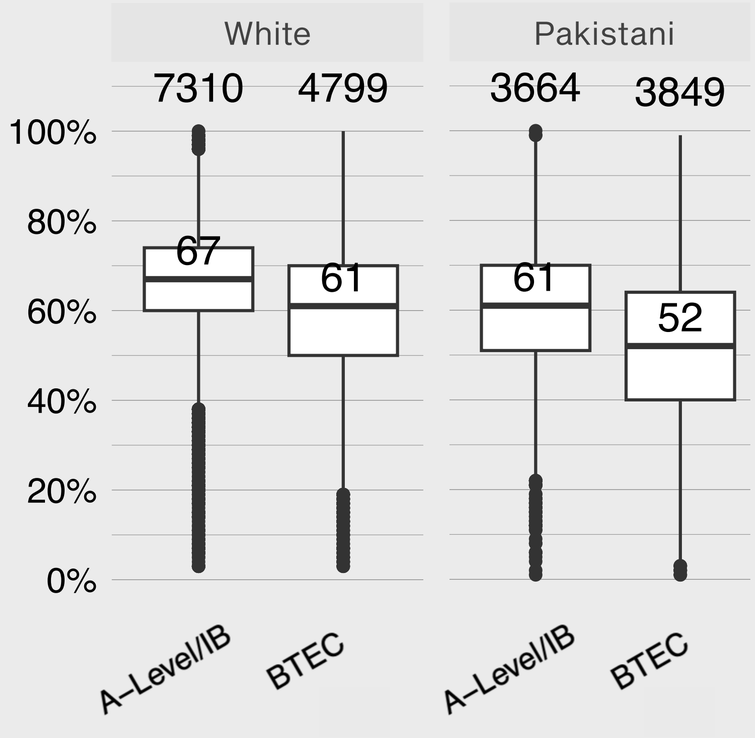


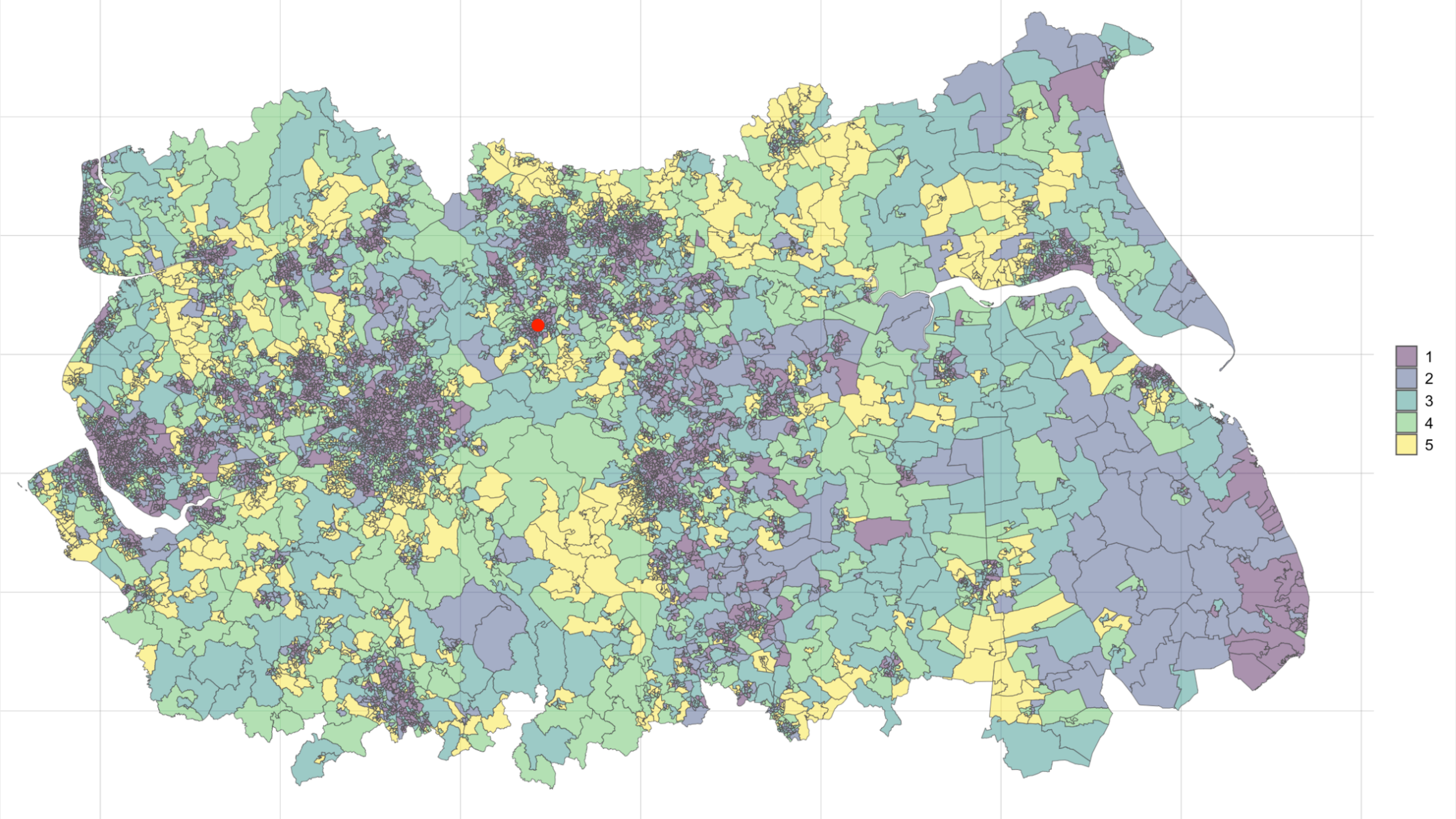
Distribution of module marks by ethnicity

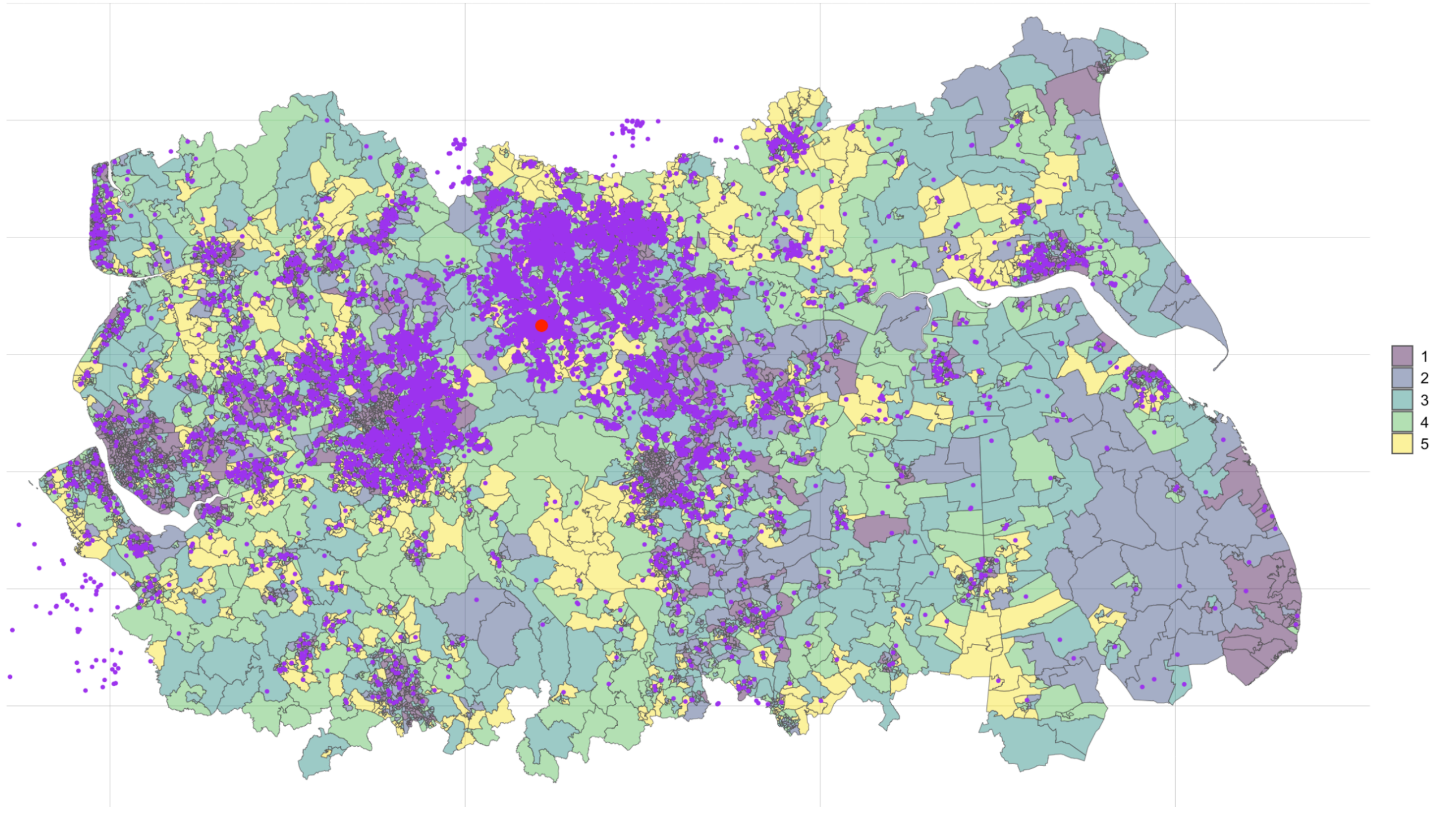


Distribution of module marks by entry qualifications and ethnicity

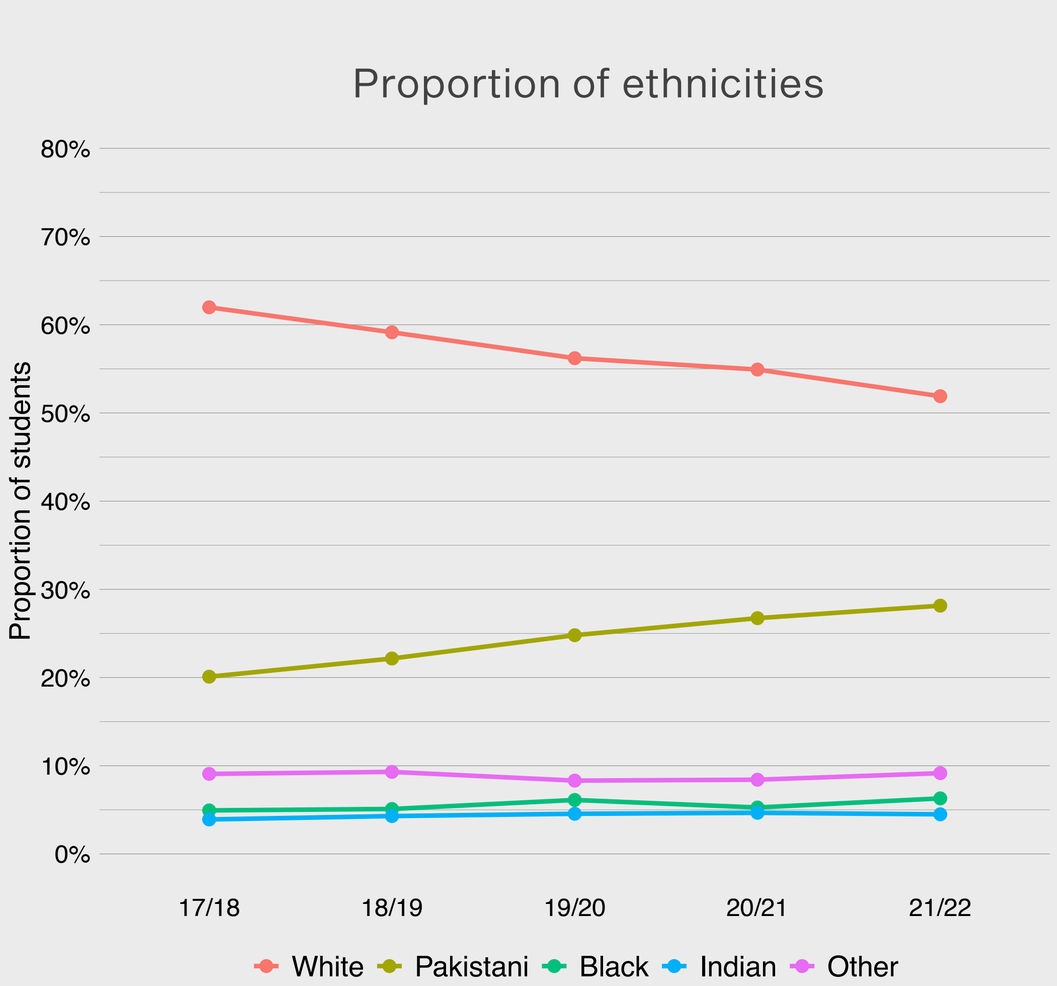


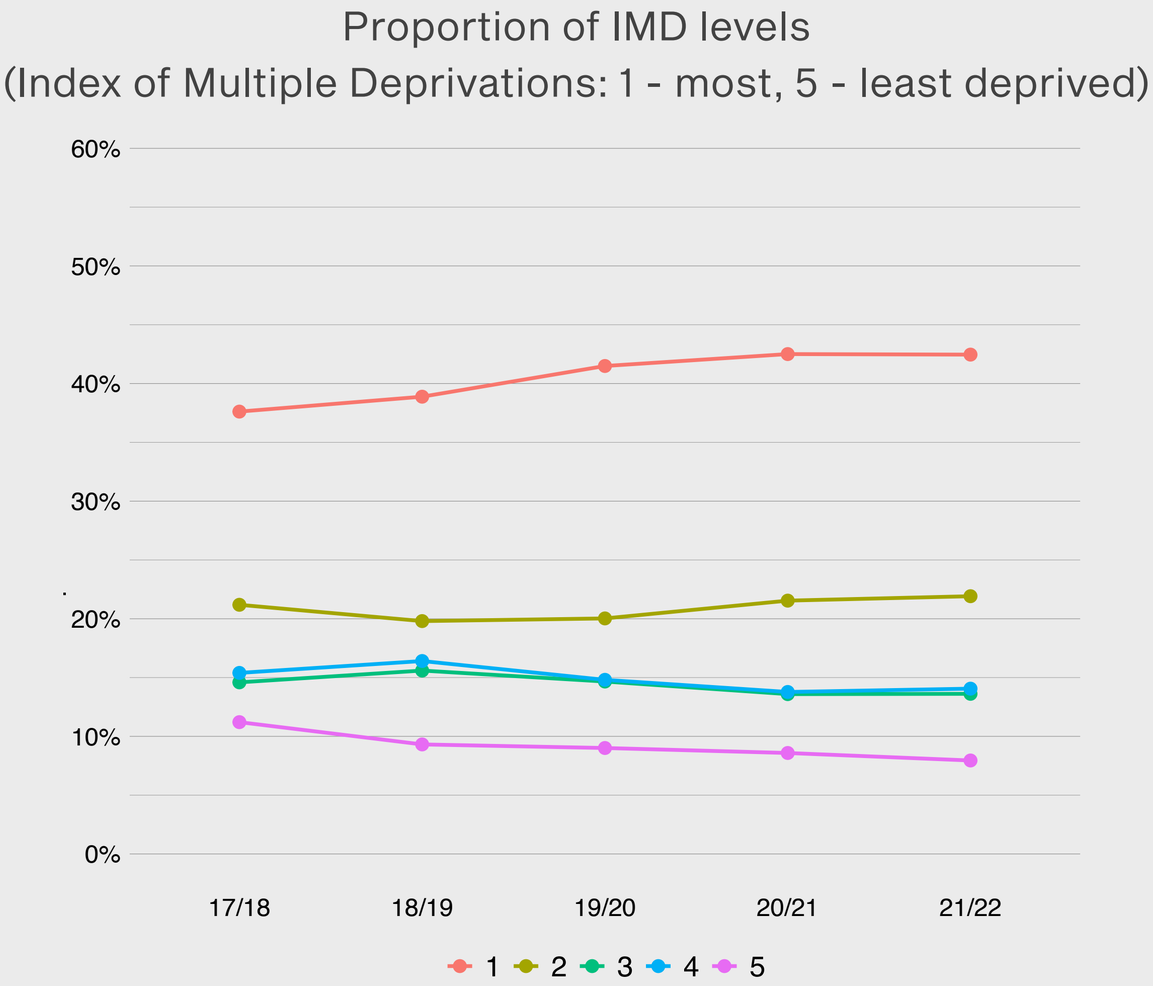



1
2
3
4
5

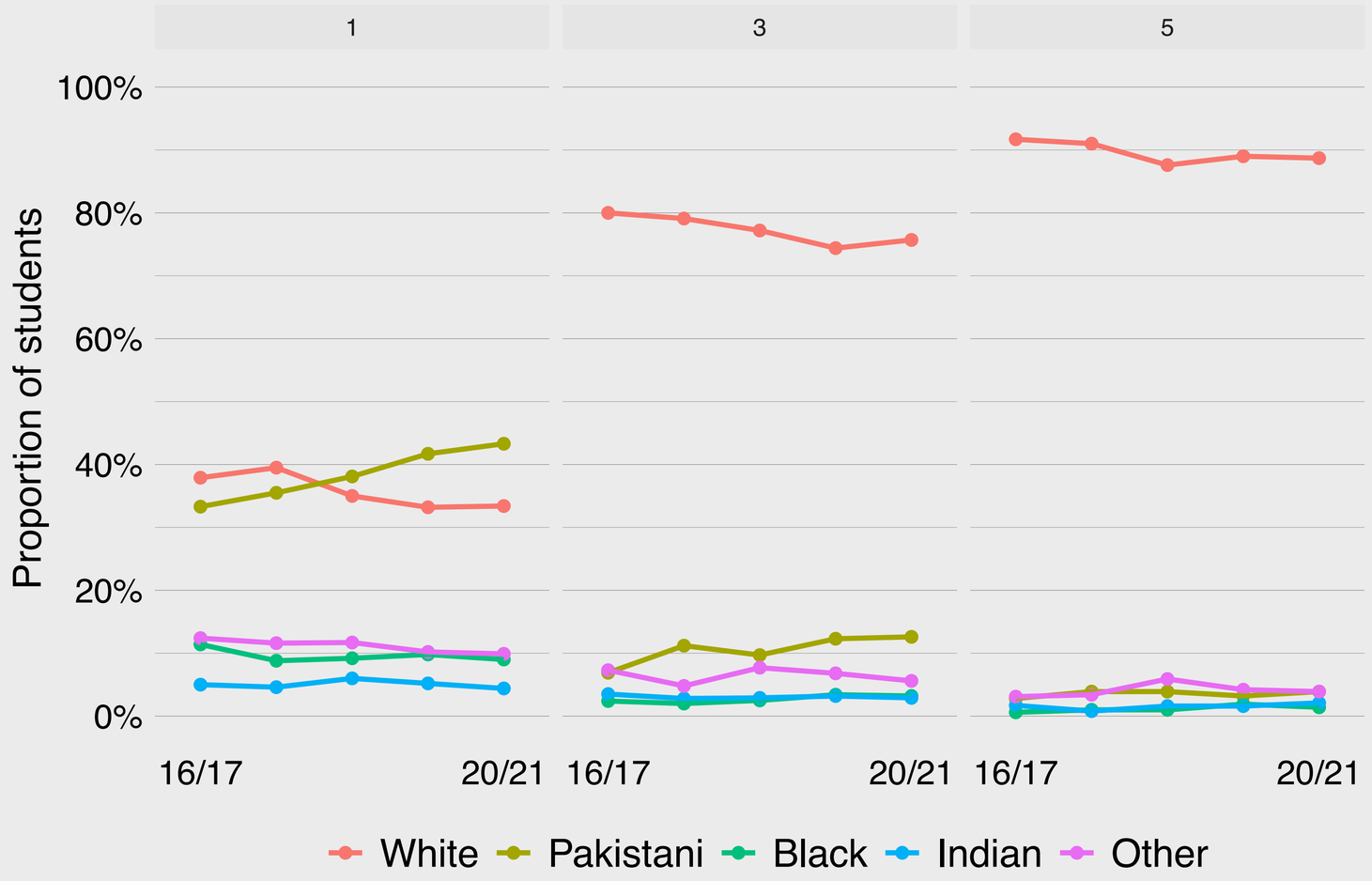

1
2
3
4
5

Intersectionality is key





Proportion of ethnicities in IMD levels



How to disentangle these relationships?

...with statistics...

- A single average module mark for each student → outcome
- On whole school level with department as a random effect (otherwise very small n for some categories of students)
- Considered effects of gender, ethnicity, entry qualification and IMD relative to a reference category
- Reference category: white female with A level from IMD5

How to disentangle these relationships?

...with statistics...

Parameter	Effect (21/22)	p
Model reference category (white female, A level, IMD5)	65.10	
Male	-3.19	0.001
BTEC	-8.27	0.001
A-Level/BTEC	-6.27	0.004
Other Level 3	-0.40	
Other	-2.52	
Pakistani	-2.42	
Indian	-0.14	
Black	-3.23	
Other	-3.56	0.018
IMD4	0.86	
IMD3	-0.63	
IMD2	-0.02	
IMD1	-0.91	

Data: people who mine it and mind it

- Dr Keith McCabe and his team in the Planning and Business Intelligence group → **source of The Truth®** (demographics, marks and qualifications)
- Jon Adamson and Steve Bentley → VLE usage
- Andrew Sharp and his team, particularly Manraj Singh and Dr Lorraine Smith in the Computing and Library Services → attendance and staff reports
- Dr John Stephenson → statistics support
- Coordination → PVCTL Prof. Jane Owen-Lynch and the Strategic Teaching and Learning Team

Thank you.

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useR!, Salzburg, 9th July 2024