



# **Exploring Math Proficiency of Primary School Teachers: Insights from LSAY and PISA**

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# Structure of this presentation

- 1 **What is my project about?** *What was I analysing? What was the motivation and my contribution?*
- 2 What was the methodology?
- 3 What was the data like?
- 4 What were the results, implications and limitations?

# What is the Grattan Institute?

**Grattan Institute** is an independent think tank which produces high-quality public policy recommendations for Australia's future.

Split into different programs:

## Programs

Budget policy	Education	Migration and labour markets
Climate change	Energy	Retirement incomes
Democracy and public integrity	Equity	Tax reform
Disability	Health	Transport and cities
Economic growth	Housing	





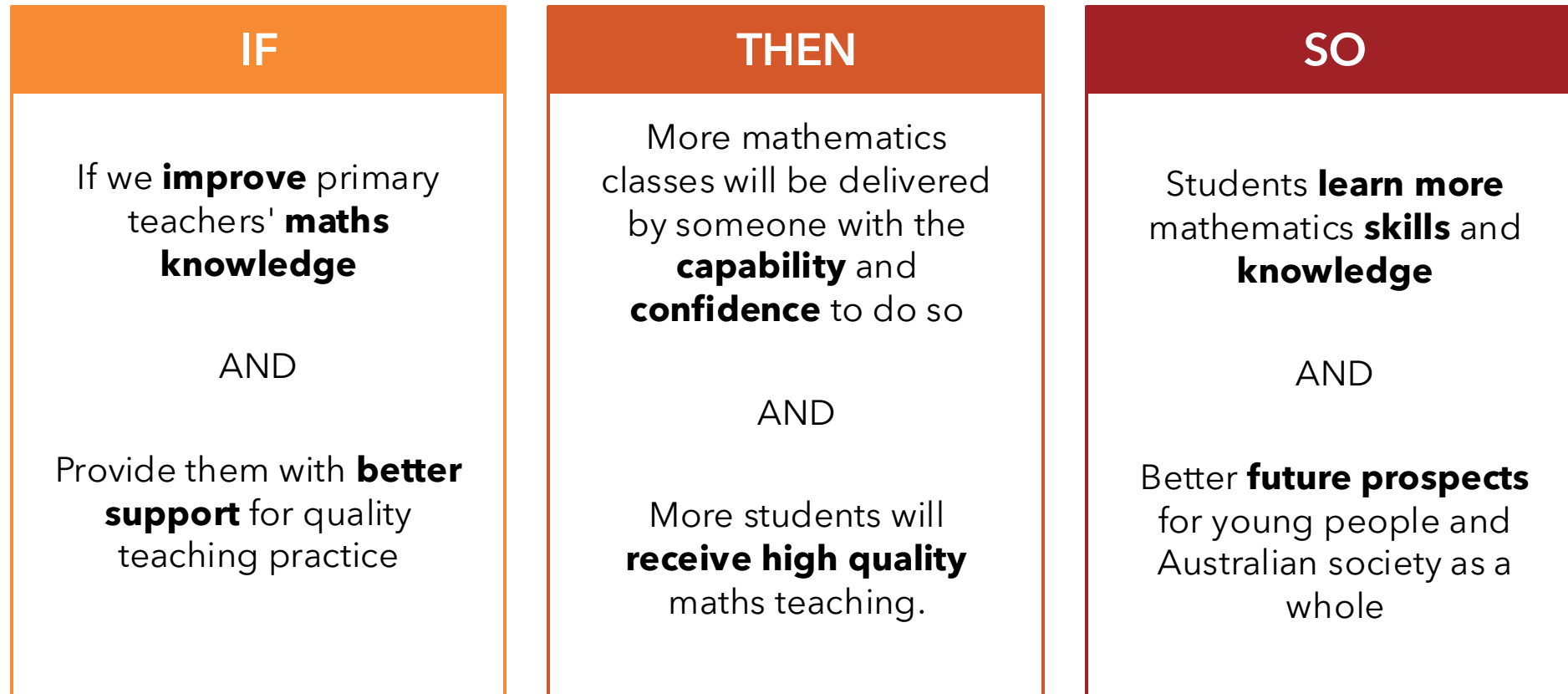
**The Question:** What would it take for all students to **experience high-quality mathematics instruction** throughout primary school?

THE SCOPE

THE APPROACH

THE OUTPUTS

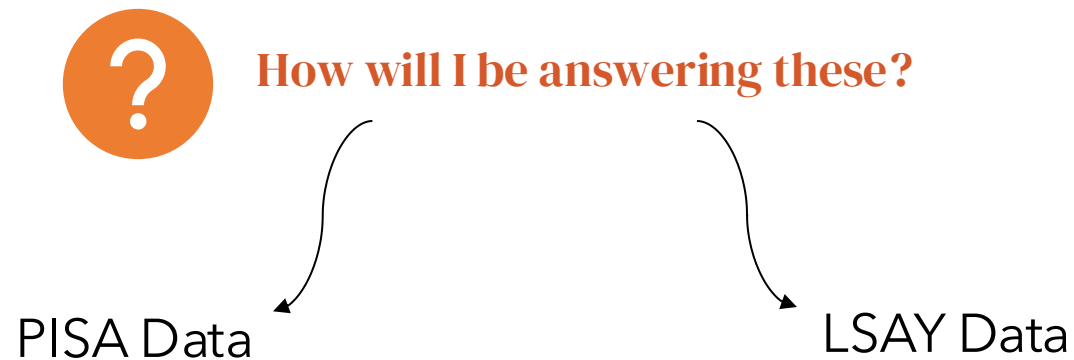
# What is the theory of change?



# What am I doing?

## Exploring Four Main Questions

1. How well are teachers performing in maths across the years?
2. How are they performing in comparison to other 'professionals'?
3. How are they performing in comparison to the rest of the Australian population?
4. How many teacher are performing above the proficiency standard in each year + across years?



# What are the LSAY and PISA?

## Longitudinal Surveys of Australian Youth

The following question asks how you feel about your life. On a scale from 0 to 10, zero means you feel “not at all satisfied” and ten means you feel “completely satisfied”. Overall, how satisfied are you with life these days?

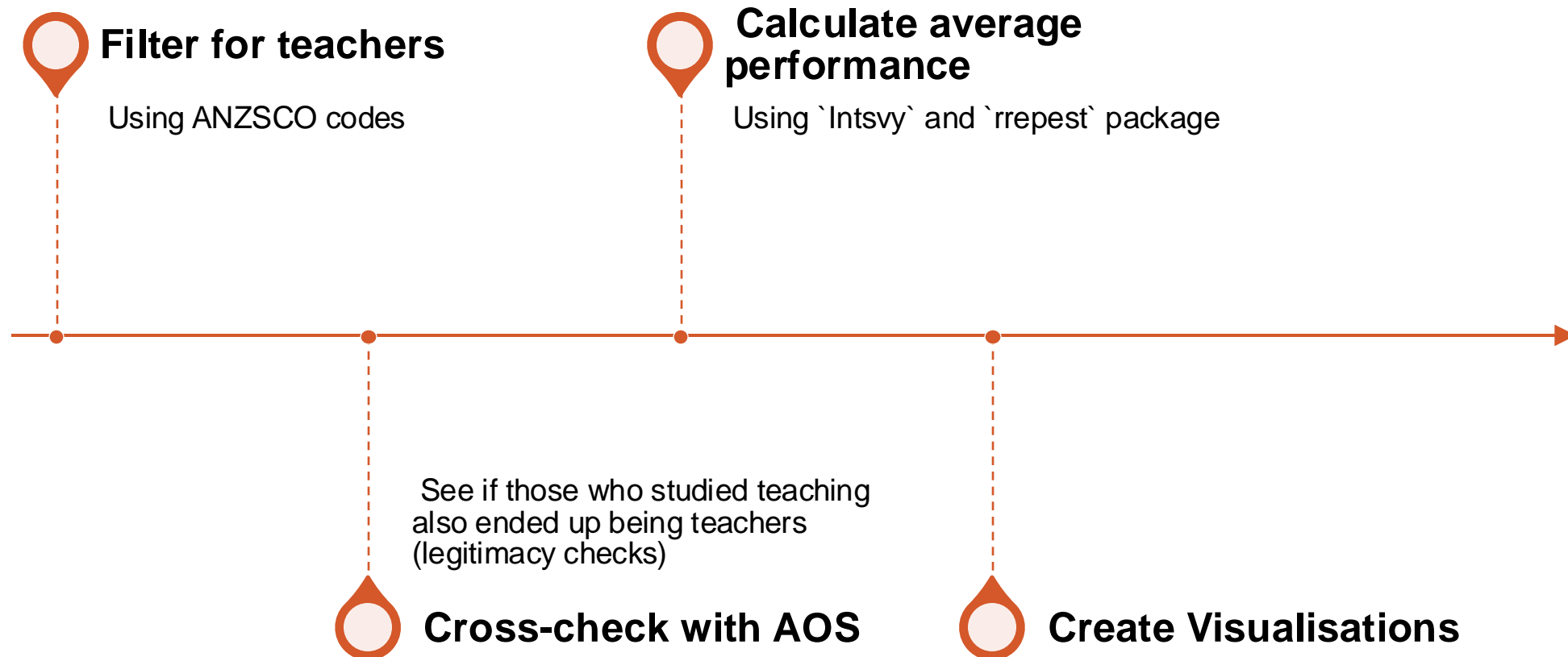
00 Not at all satisfied  
01-09  
10 Completely satisfied  
98 (DO NOT READ) Prefer not to say

## Programme for International Student Assessment **PISA**

For a rock concert a rectangular field of size 100 m by 50 m was reserved for the audience. The concert was completely sold out and the field was full with all the fans standing.

Which one of the following is likely to be the best estimate of the total number of people attending the concert?

- A 2 000
- B 5 000
- C 20 000
- D 50 000
- E 100 000





# Dummy Data

STIDSTD	STATEID	SECTOR	SCHOOLID	SCHID_R	SCHOOLIP	LOC	SEX	INDIG	PV1MATH	PV2MATH	PV3MATH	PV4MATH	PV5MATH	ST38Q03	ST38Q04	ST38Q05	ST38Q06	ST38Q07	ST38Q08	ST38Q09	ST38Q10	ST38Q11	IC01Q01
1	5	2	276755	276755	1	2	1	1	437.57	587.11	428.78	594.54	501.83	4	9	6	1	4	5	2	7	3	6
2	3	2	15007	704287	2	1	1	0	538.65	597.64	436	493.95	559.17	9	8	2	2	9	1	1	5	6	5
3	2	1	15007	704287	1	2	1	0	521.64	470.16	487.62	427.59	407	1	7	5	5	1	2	9	5	2	5
4	1	1	276755	276755	1	1	2	1	428.73	593.13	341.66	369.07	568.15	4	9	1	7	7	6	3	9	9	1
5	1	2	15007	704287	2	2	2	1	409.06	437.42	549.05	352.68	472.92	3	8	4	8	3	8	8	2	6	5
6	5	2	276755	704287	1	2	2	0	508.24	432.18	443.74	402.4	462.99	2	1	5	4	5	2	9	5	6	9
7	1	1	15007	276755	1	2	1	0	457.26	493.84	521.8	389.66	439.31	6	3	8	8	5	4	8	3	7	2
8	5	1	15007	704287	2	1	2	0	529.41	433.94	427.6	420.98	454.92	5	4	7	9	9	8	1	2	1	6
9	3	2	15007	276755	2	1	2	1	504.05	596.75	469.8	568.12	426.69	5	8	2	7	2	1	8	3	3	5
10	4	1	15007	276755	2	2	2	0	493.2	436.72	527.9	580.83	581.81	8	8	6	1	5	2	1	3	6	2
11	4	1	15007	704287	2	2	2	1	591.7	442.58	386.35	431.53	381.99	5	4	1	8	4	2	5	2	5	4
12	3	1	15007	276755	1	2	1	1	449.27	527.7	301.82	446.15	557.94	5	6	3	4	6	2	8	3	3	3
13	3	2	276755	276755	1	1	2	0	494.43	492.12	449.6	436.38	361.7	2	6	8	9	7	2	3	1	2	6
14	3	1	276755	276755	1	2	2	0	407.29	523.72	322.7	480.18	471.01	8	4	7	7	3	2	2	8	5	9
15	2	1	276755	704287	2	2	2	1	521.12	442.69	447.46	496.24	518.11	7	5	3	1	8	3	2	3	6	7
16	2	1	276755	704287	2	2	2	1	583.17	495.15	540.83	575.2	369.24	3	9	3	5	6	5	8	5	1	1
17	5	2	276755	276755	2	2	1	0	412.74	387.44	350.06	475.88	360.09	7	1	9	4	3	2	7	2	6	9
18	1	2	15007	704287	2	1	1	0	447.14	369.37	373.21	524.1	396.04	5	4	7	8	6	3	9	8	4	2
19	2	2	276755	276755	2	2	1	0	544.62	463.41	489.03	579.13	375.98	9	6	8	9	8	9	3	3	4	9
20	5	1	15007	704287	2	1	1	1	550.28	488.2	549.07	363.89	443.12	4	5	1	5	7	3	2	2	9	2
21	4	1	276755	276755	2	2	2	0	432.84	467.37	405.87	593.94	391.68	2	8	5	3	2	5	9	3	4	7
22	1	2	276755	276755	1	1	2	1	467.55	350.28	431.99	546.18	450.99	9	9	5	3	6	9	1	3	5	9
23	1	1	276755	704287	1	1	1	1	453.77	359.9	307.42	504.66	469.7	3	3	8	9	8	5	3	4	6	1
24	3	2	15007	704287	1	1	1	0	503.61	422.18	349.13	352.23	550.78	3	1	2	9	8	1	6	9	3	4
25	4	1	276755	704287	1	1	1	1	412.29	416.58	312.61	510.22	458.55	3	6	3	4	1	8	1	9	2	2
26	3	2	276755	704287	1	1	2	1	532.48	408.18	306.93	488.56	533.45	4	9	2	3	9	9	2	1	1	4
27	3	2	15007	276755	2	1	1	1	585.45	383.44	418.6	436.07	446.03	5	2	9	4	9	4	2	9	7	7

PISA uses PVs as a statistical approach to report student performance on assessments.

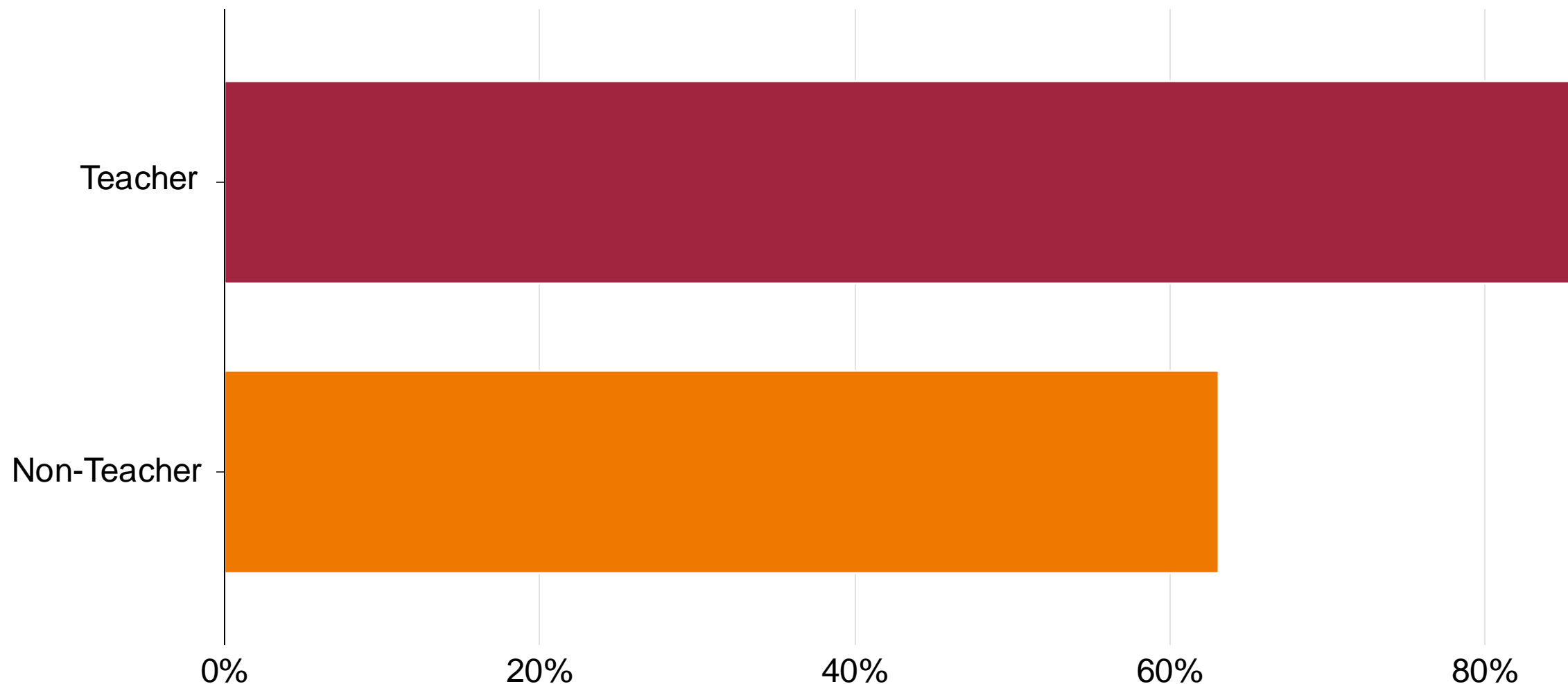
- Not actual test scores, but are multiple imputed values that represent a range of possible scores

## Why?

- **Handle limited test data:** PISA is large, students only answer a subset of questions, allows estimate of performance across the test.
- **Managing uncertainty and error:** Providing a distribution of possible scores, better reflecting error inherent in large-scale assessments. Also avoids overconfidence in a single score representing student ability.
- **Improving population estimates:** Allow for more accurate population-level estimates by integrating variability from individual student responses.

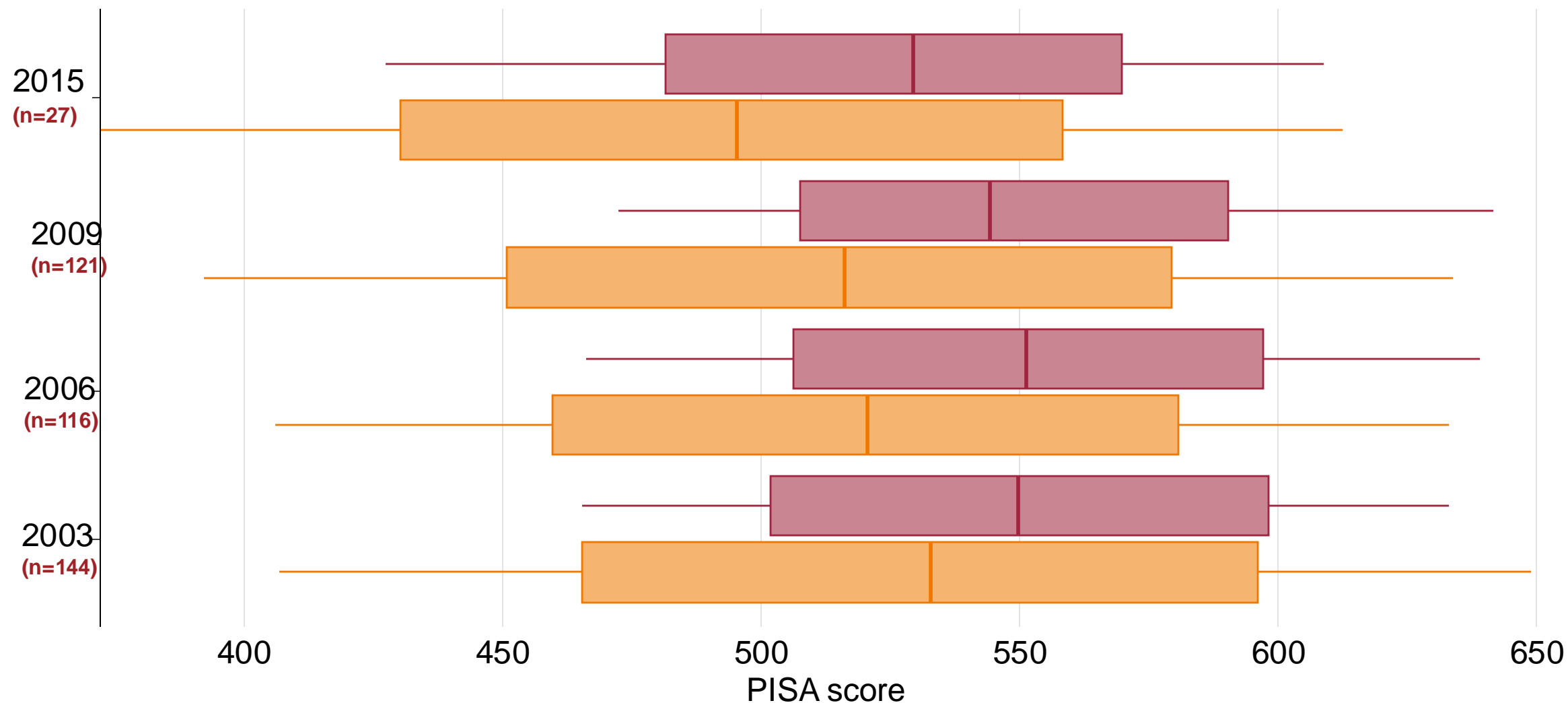
## Teachers tend to have higher proficiency in mathematics compared to non-teachers over time

Weighted average proficiency in PISA mathematics for teachers and non-teachers over time



# Teachers tended to perform better across each year of testing

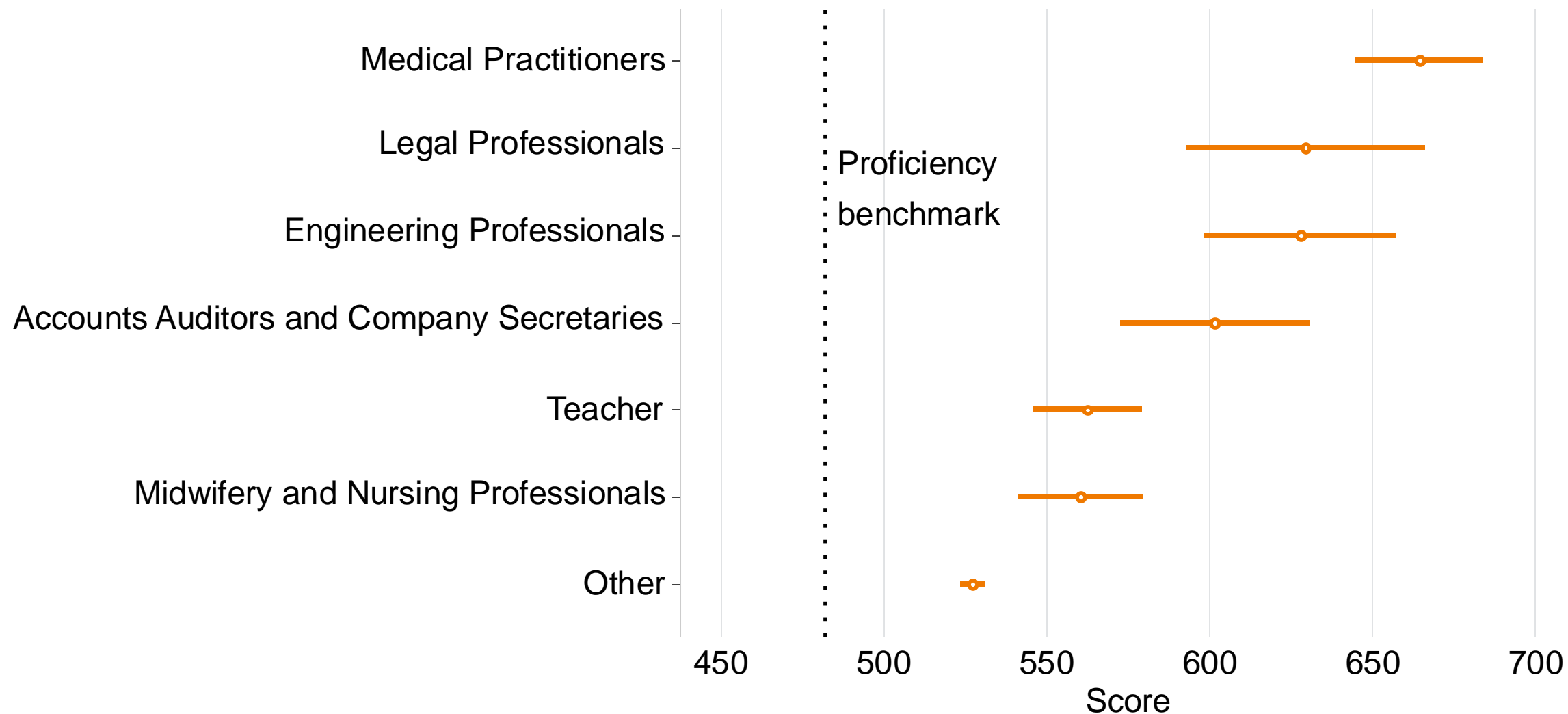
Scores in PISA mathematics of **non-teachers** and **teachers**



Notes: The boxplots show the median, interquartile range, and 10th and 90th percentiles.

# Teachers at 15 years-old were less likely to be proficient in math compared to other professionals

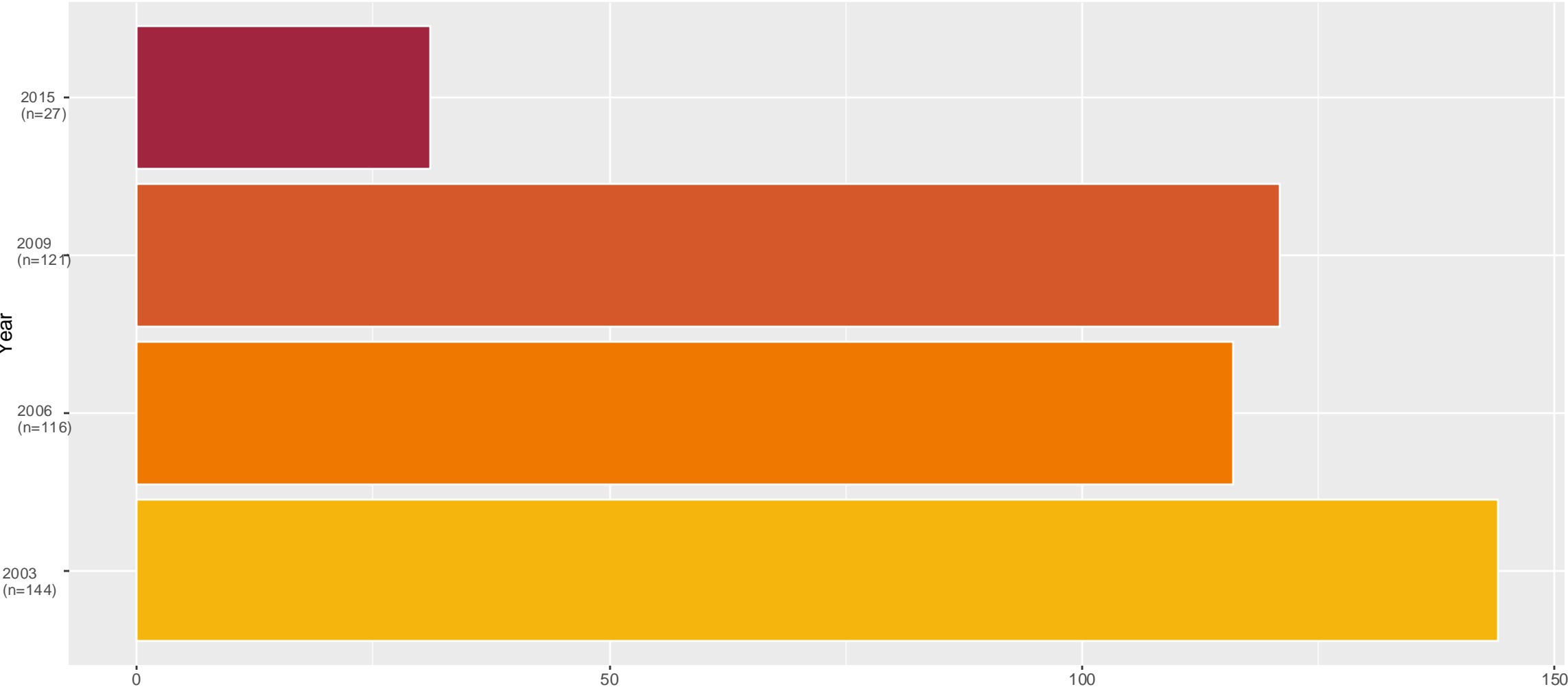
Average PISA 2003 Maths scores for teachers and other professionals, with 90 per cent confident intervals



# CONSIDERATIONS & LIMITATIONS

# Teachers counts in 2015 are significantly disproportionate to other years

Count of Primary School Teachers in Each PISA Year



## **Attrition rate**

- Individuals who remain in the study may be more academically inclined, doing better in PISA and causing upward bias in the results.

## **Confounding variables**

- Influence of confounding variables such as early academic advantages or socioeconomic status may influence PISA scores.

## **Historical data**

- PISA scores reflect math skills for a certain period, but those inferences may still be limited as math proficiency can evolve through education and professional experiences.

## **Conduct statistical tests**



CONCLUSION