DENSITOMETRY DISCORDANCE

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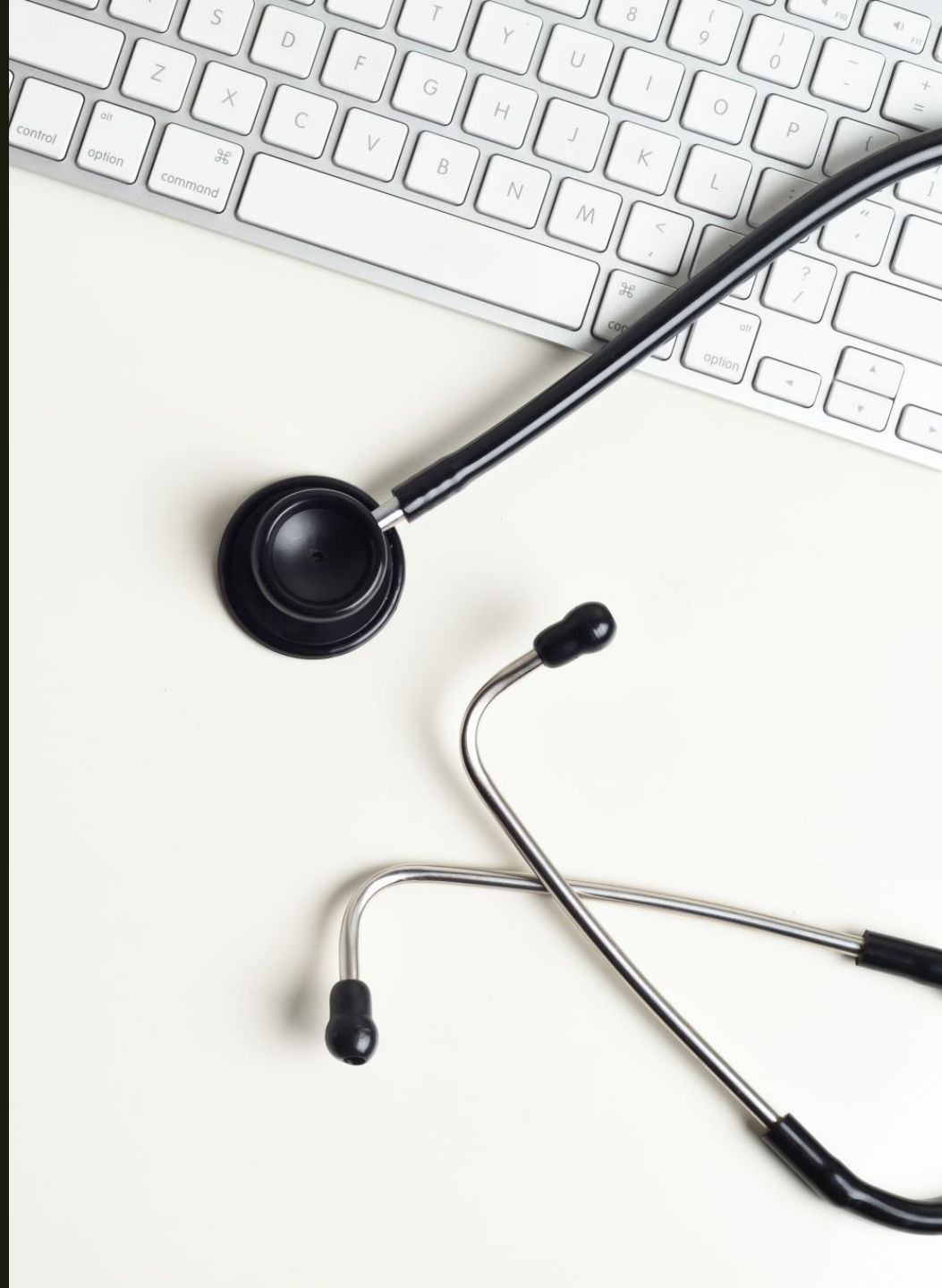


Background

- DXA is currently the gold standard for diagnosis of osteoporosis at two reference sites: hip and spine

- Emerging densitometry technologies include: **REMS**, pQCT, MRI

REMS
Radiofrequency Echographic MultiSpectrometry

- 3.5 MHz ultrasound scan of hip and upper lumbar spine
- Simultaneous acquisition of conventional B-mode images and corresponding unprocessed RF signals
- Backscatter RF signals analysed to determine density *and* microarchitectural quality through detailed comparisons with reference spectral models
- Process is fully automated and reduces to a minimum possibilities for human error

REMS Performance

	Spine	Hip
SMALLEST DETECTABLE DIFFERENCE (SDD) [g/cm2]	0.010	0.005
INTRA-OPERATOR REPEATABILITY (RMS-CV) [%]	0.35%	0.25%
INTER-OPERATOR REPEATABILITY (RMS-CV) [%]	0.54%	0.41%
DIAGNOSTIC AGREEMENT WITH QUALITY ASSURED DXA	**93.1%**	**94.2%**

Study rationale: Investigation of REMS Discordance

- Discordance is a discrepancy in the BMD measurements at the two reference sites, which poses a predicament for how to incorporate BMD measurement when deciding on the diagnosis and management of postmenopausal osteoporosis. (Yoon, 2021)

  - ***Minor diagnostic discordance:*** *difference of one WHO diagnostic classification e.g. Hip osteopenia / Spine osteoporosis*

  - *Major diagnostic discordance: difference of two WHO diagnostic classifications e.g. Hip normal / Spine osteoporosis*

  - *Numerical discordance: > 1.0 SD between T scores at two reference sites*

Published data: Best and Worst

Paper	Concordance	Minor	Major
Woodson 2000	56	39	5
Moayyeri 2005	58.3	38.9	2.7
Maghraoui 2007	54.3	41.5	4.3
Fink 2008	58.5	37.5	4
Mounach 2009	54	42	4
Derakhshan 2012	58.2	40	1.8
Singh 2012	48.85	34.48	16.67
Younes 2014	49.4	45.7	4.8
McGowam 2016	51.2	36.5	7.6
Ayaz 2017	59.7	38.3	1.9
Lee 2017	29	67	4
Singh 2018	48.95	34.38	16.67
Chan 2020	67.4	30.3	2.3
Singh 2020	42.5	54.15	3.35
Goh 2021	65.9	34.1 (not split)	
Yoon 2022	68.5	29.5	2

Reasons for discordance

Physiological

Pathophysiological

Anatomic

Artefactual

Technical

Impact of Discordance

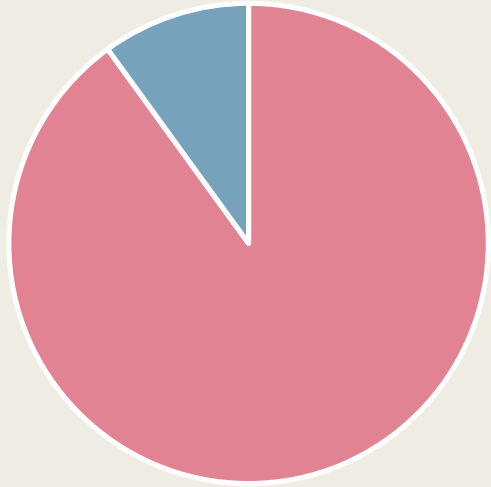
OUR RESEARCH

Methods

- Retrospective study of prospectively collected data of patients having REMS scans between 2018 and 2022
- All patients provided fully informed consent
- Calculation of discordance rates
- Comparison of results with existing literature

Dataset

- 1855 individuals
- 90% Female
- Average age: 59 (10-89)
- Post menopausal: 91%



RESULTS

Diagnostic Discordance

Minor: 15.4%

Major: 0%

REMS diagnostic concordance: 84.6%

Numerical concordance

≤ 0.5 SD difference: 73.9%

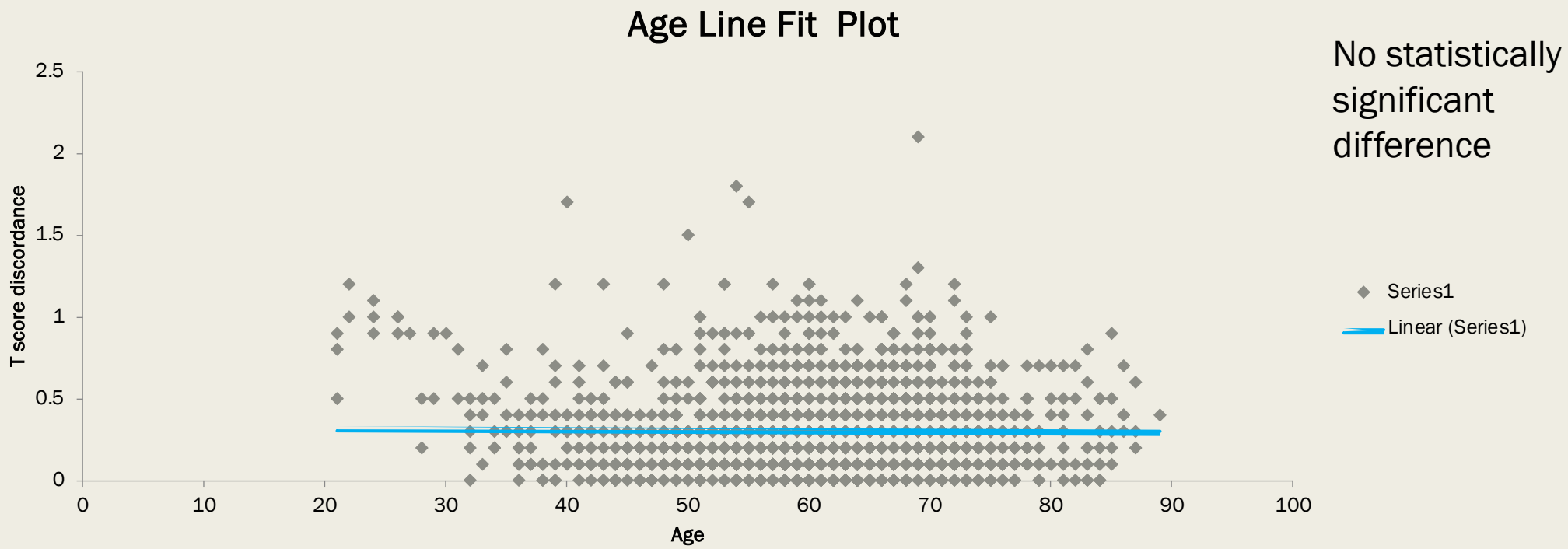
0.6–1.0 SD difference: 19.4%

> 1.0 SD difference: 6.5%

Numerical concordance with REMS: 93.5%

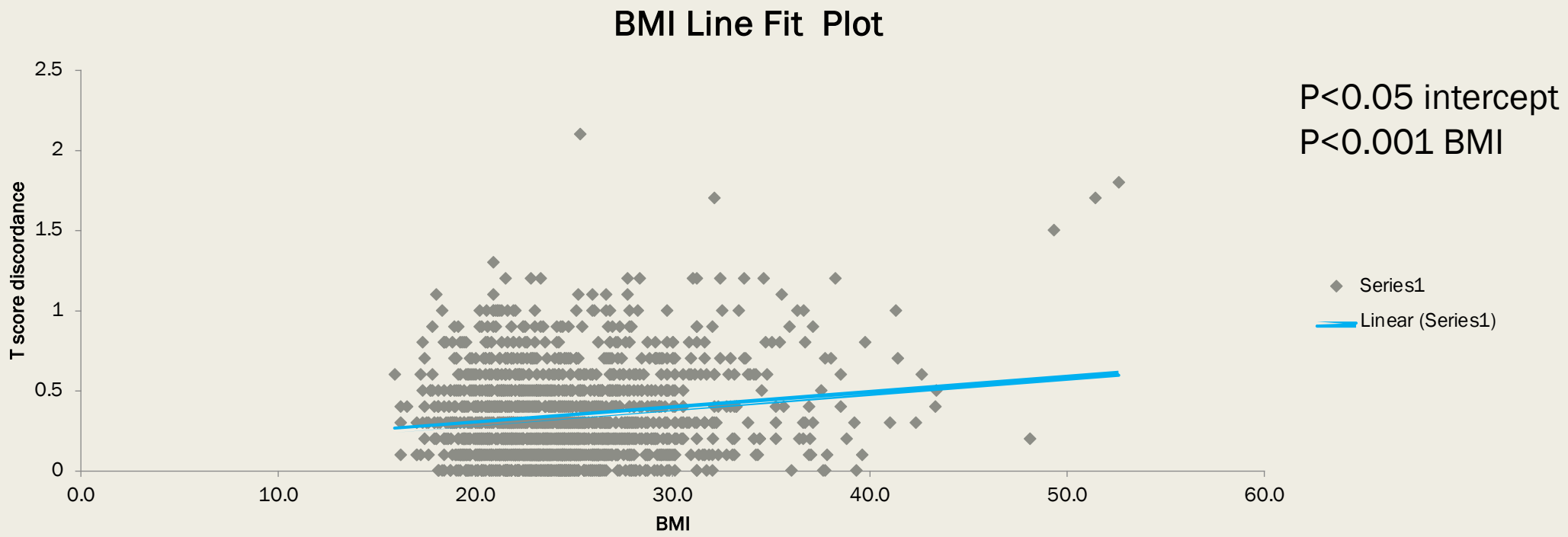
INFLUENCES ON DISCORDANCE

Age and numerical discordance



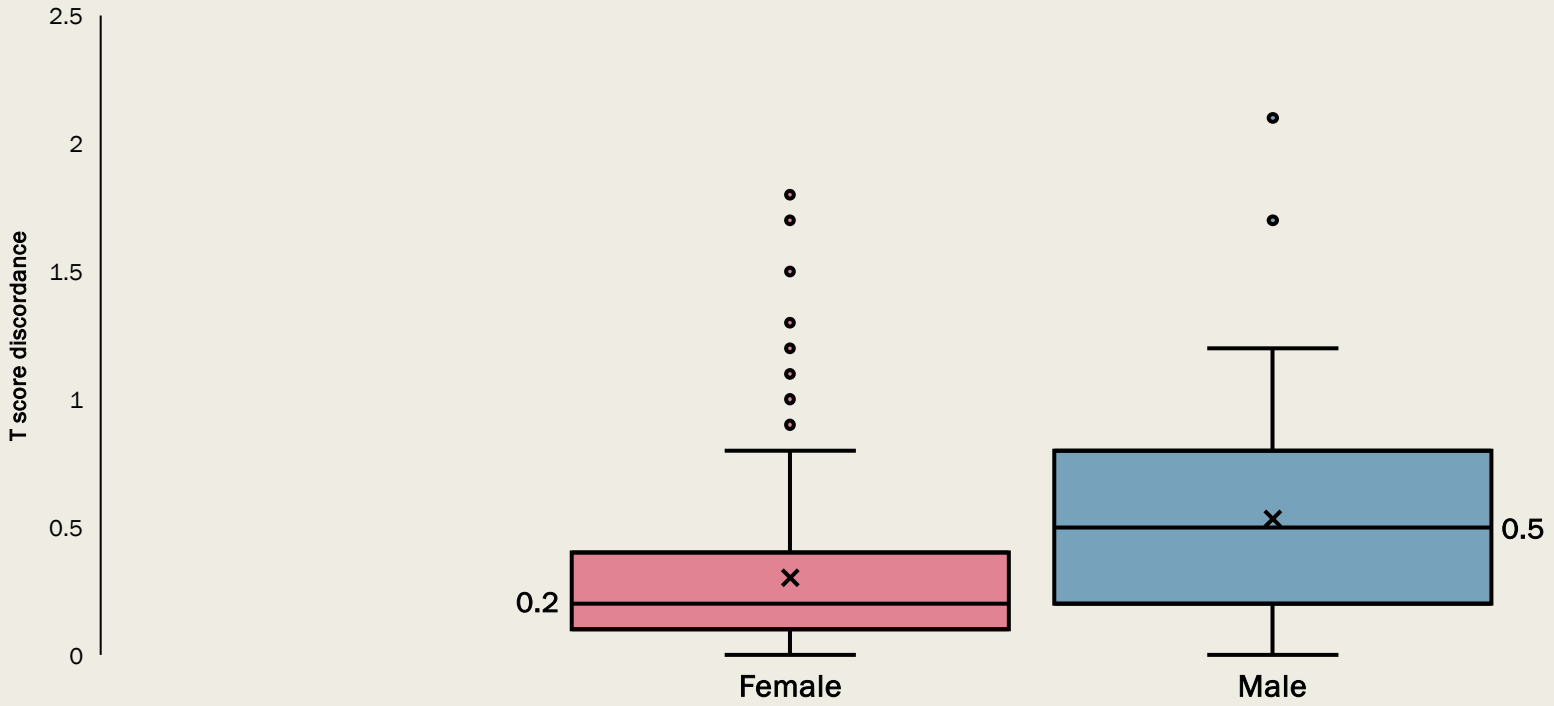
No statistically significant difference

BMI and numerical discordance



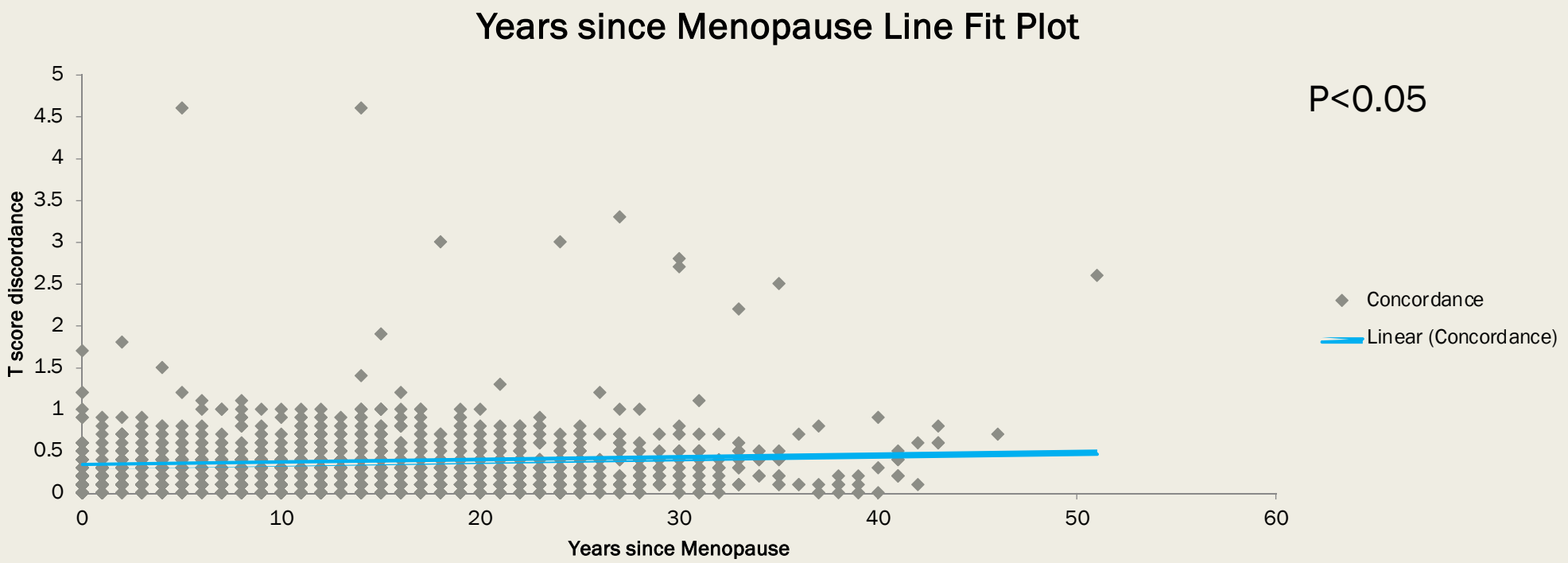
P<0.05 intercept
P<0.001 BMI

Effect of gender



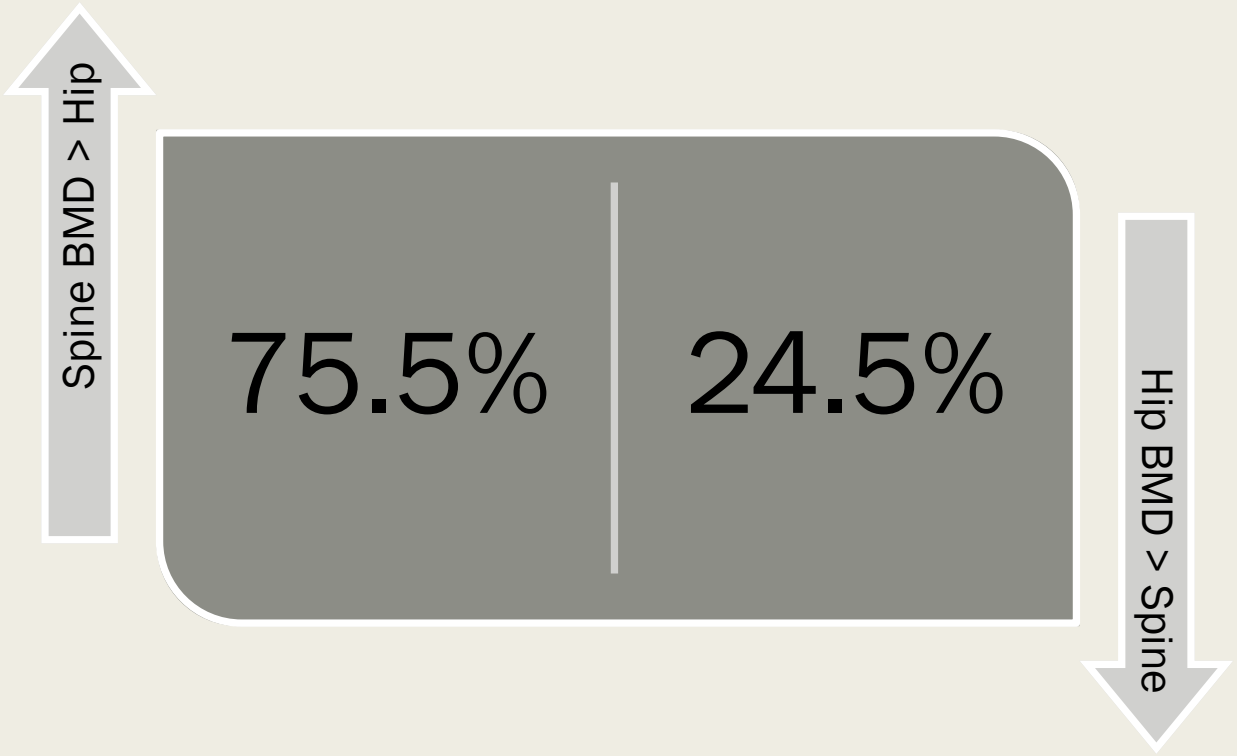
P<0.001

Effect of years since menopause



P<0.05

Ranking of discordance



DISCUSSION

Discussion:

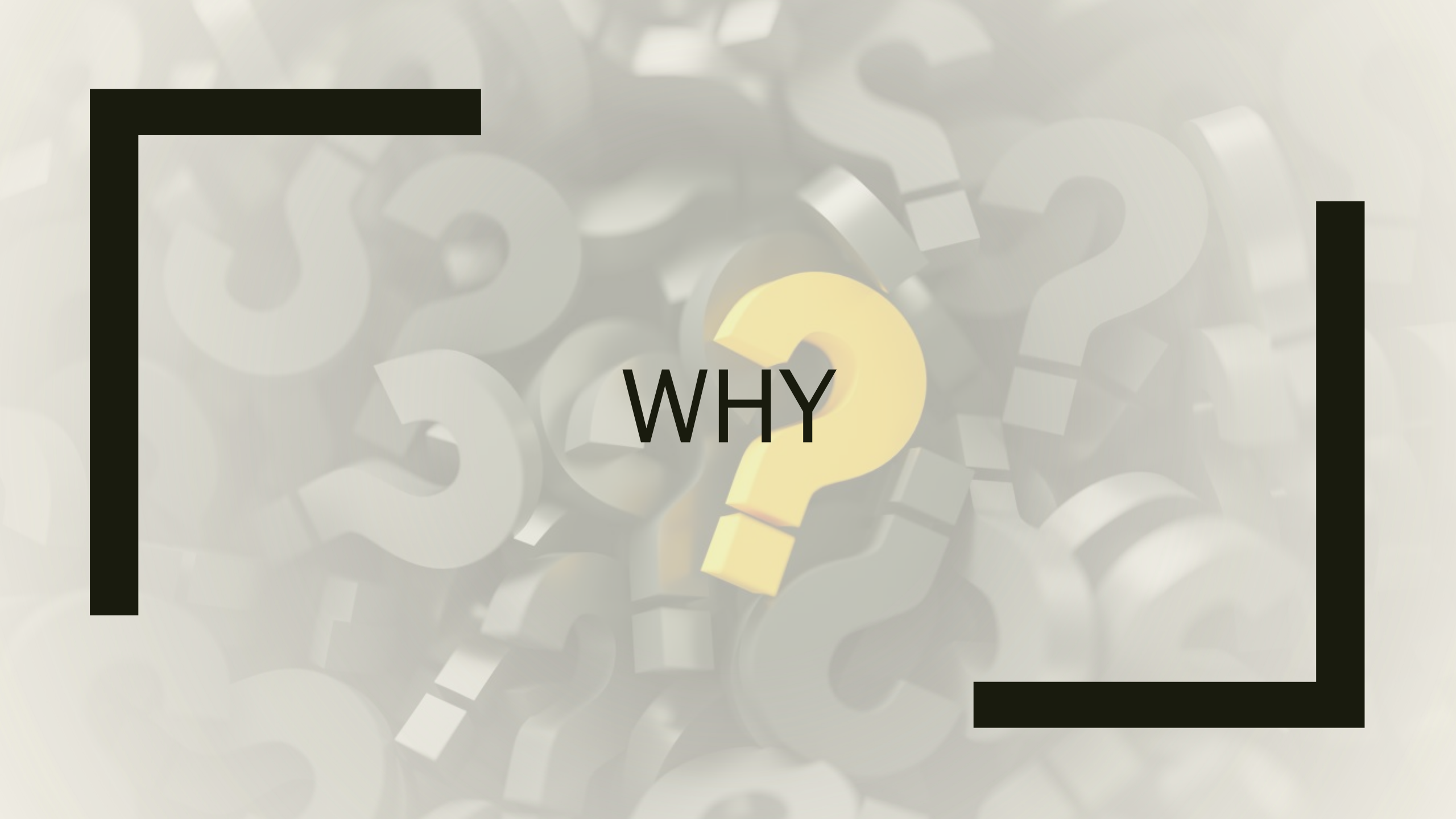
REMS results show

- BMD is affected by age and BMI
- BMI has a greater impact on hip BMD than spine BMD
- BMI and gender had a small but statistically significant effect on hip-spine discordance
- REMS shows reduced hip-spine discordance rates compared to published data from DXA

REMS compared to DXA

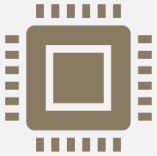
	REMS results	Previously published DXA data
Minor discordance	15.4%	30 - 67%
Major discordance	0%	2 - 16.7%

WHY



WHY?

REMS Avoids patient positioning problems



REMS has reduced post-processing errors

REMS auto-excludes artefactual readings

Conclusions

- REMS has a lower discordance rate than the published data for DXA
- REMS has a lesser degree of variability due to human error compared to DXA
- REMS has inbuilt algorithms to reduce the effect of densitometry anomalies unlike DXA
- Densitometry results from REMS may afford more diagnostic accuracy so reducing the incidence of treatment errors