



Measuring the distance to the epidural space in women of childbearing age: preliminary results from a retrospective MRI study

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Introduction

- Epidural depth is difficult to predict, especially for patients with raised BMI.
- Raised BMI increases distance from skin to the spinous processes, but should not affect distance between supraspinous ligament and the posterior epidural space.
- Our study sought to ascertain if this distance was consistent amongst women of childbearing age, and whether it was associated with height, weight or BMI.
- Comparison was performed of distance from supraspinous ligament to the epidural space in patients of different ethnicities, in light of MBRRACE-UK reports repeatedly showing ethnicity to be associated with poorer maternal and neonatal outcomes.¹

Methods

- Retrospective review of all MRI spine studies performed in women of childbearing age (18-45) in our hospital in 2016.
- Distance from supraspinous ligament to the posterior epidural space was measured at each lumbar interspace (L1-L2 to L5-S1). All measurements were performed twice, by independent data collectors.
- Scans were excluded if there were either congenital or acquired diseases of the bony spine, or if MRI measurements from different data collectors were >10% apart.
- Mean distance from supraspinous ligament to the epidural space was calculated.
- Electronic records were examined to determine ethnicity, height, weight and BMI.
- Statistical analysis was by linear regression with calculation of correlation coefficients for height, weight and BMI vs distance to the epidural space, and use of the Mann-Whitney U Test to analyse the effect of ethnicity.

References

- Knight M, Bunch K, Patel R, et al. (Eds.) on behalf of MBRRACE-UK. Saving Lives, Improving Mothers' Care Core Report - Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2018-20. Oxford: National Perinatal Epidemiology Unit, University of Oxford; 2022.

Figure 1: Density plot of distance to the epidural space at each lumbar interspace

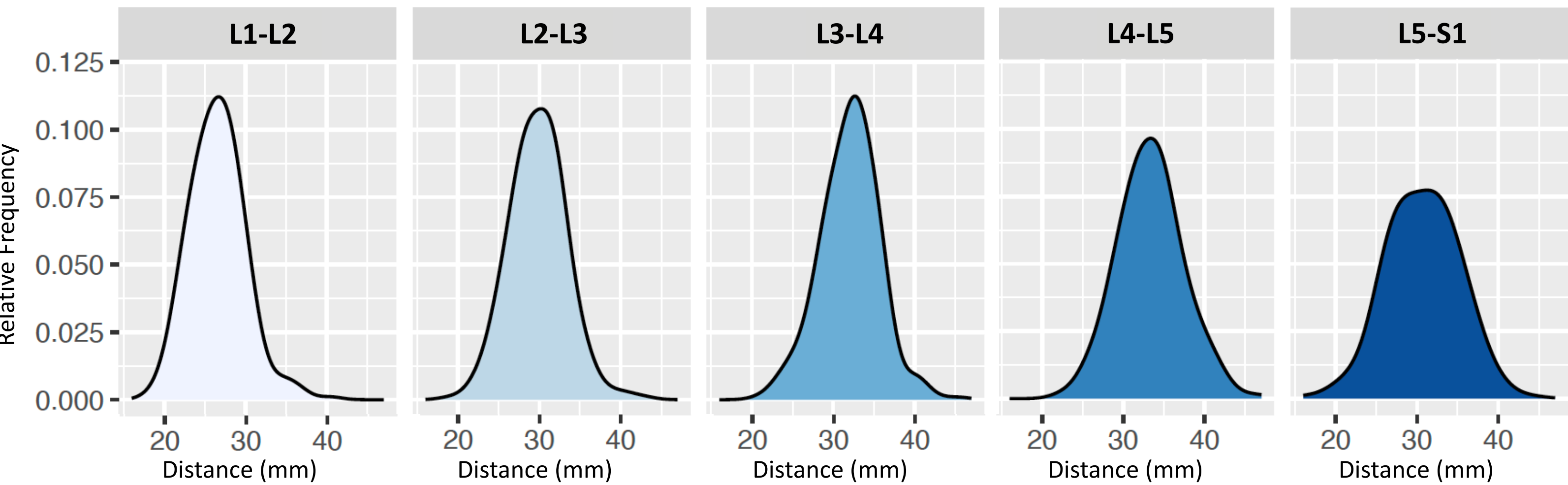


Figure 2: Distance to the epidural space at lumbar interspaces

Lumbar interspace	Mean distance (mm) to epidural space (95% CI)
L1-L2 (n=283)	26.5 (19.8-33.3)
L2-L3 (n=315)	29.8 (22.9-36.7)
L3-L4 (n=316)	32.0 (24.9-39.2)
L4-L5 (n=270)	33.3 (25.3-41.4)
L5-S1 (n=231)	30.7 (21.9-39.5)

Figure 3: Scatterplot of height vs distance to the epidural space

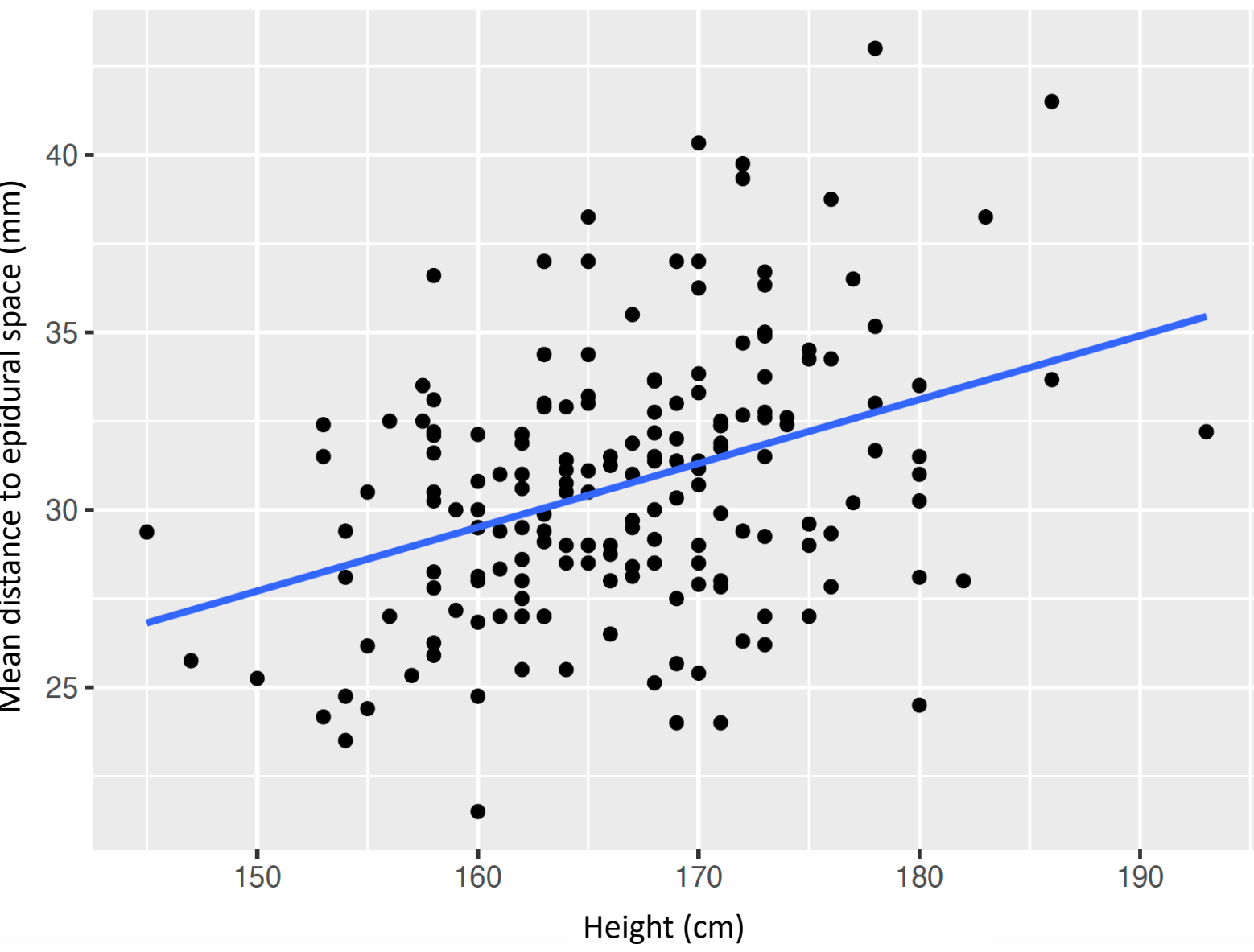


Figure 4: Scatterplot of BMI vs distance to the epidural space

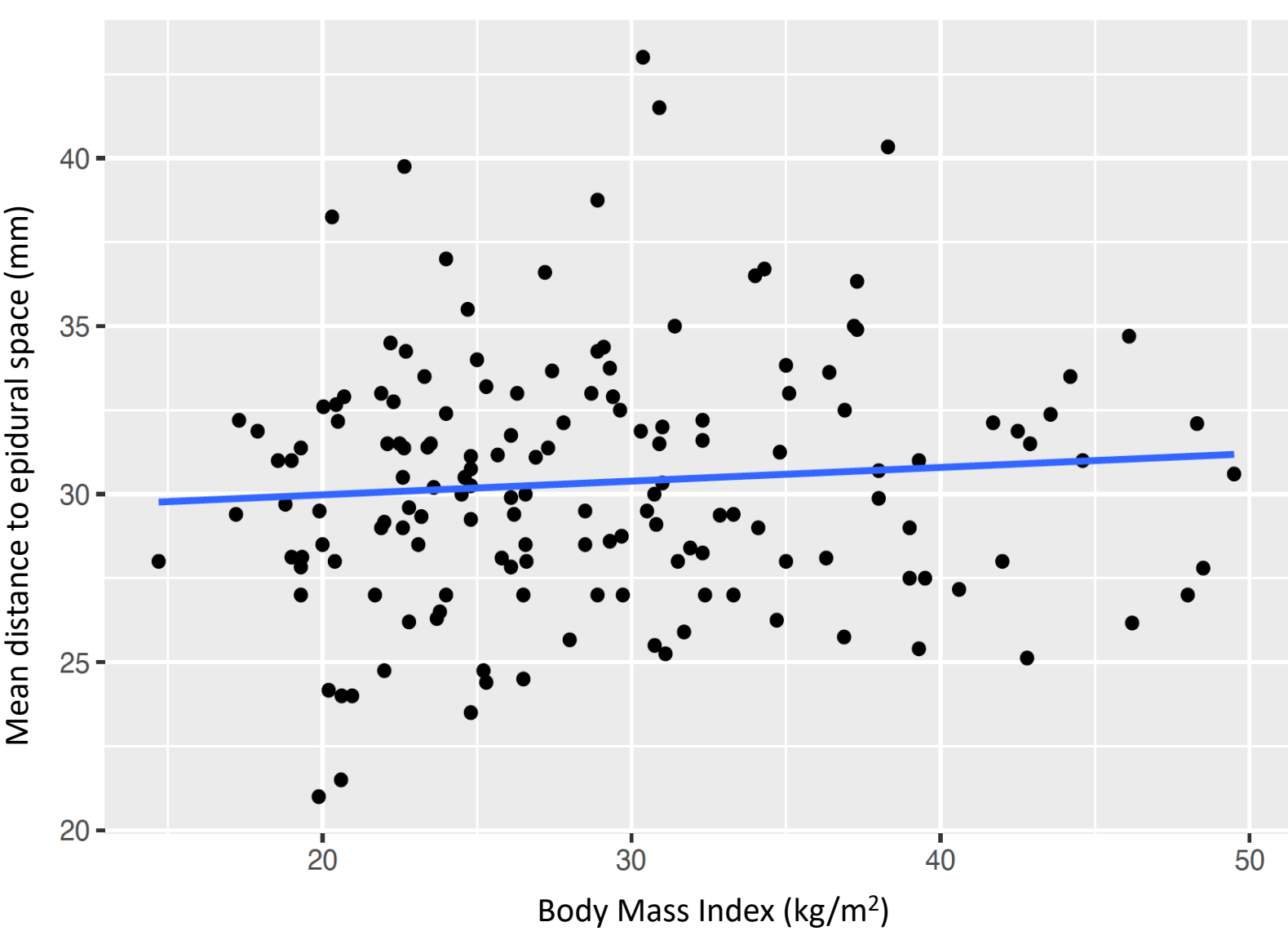
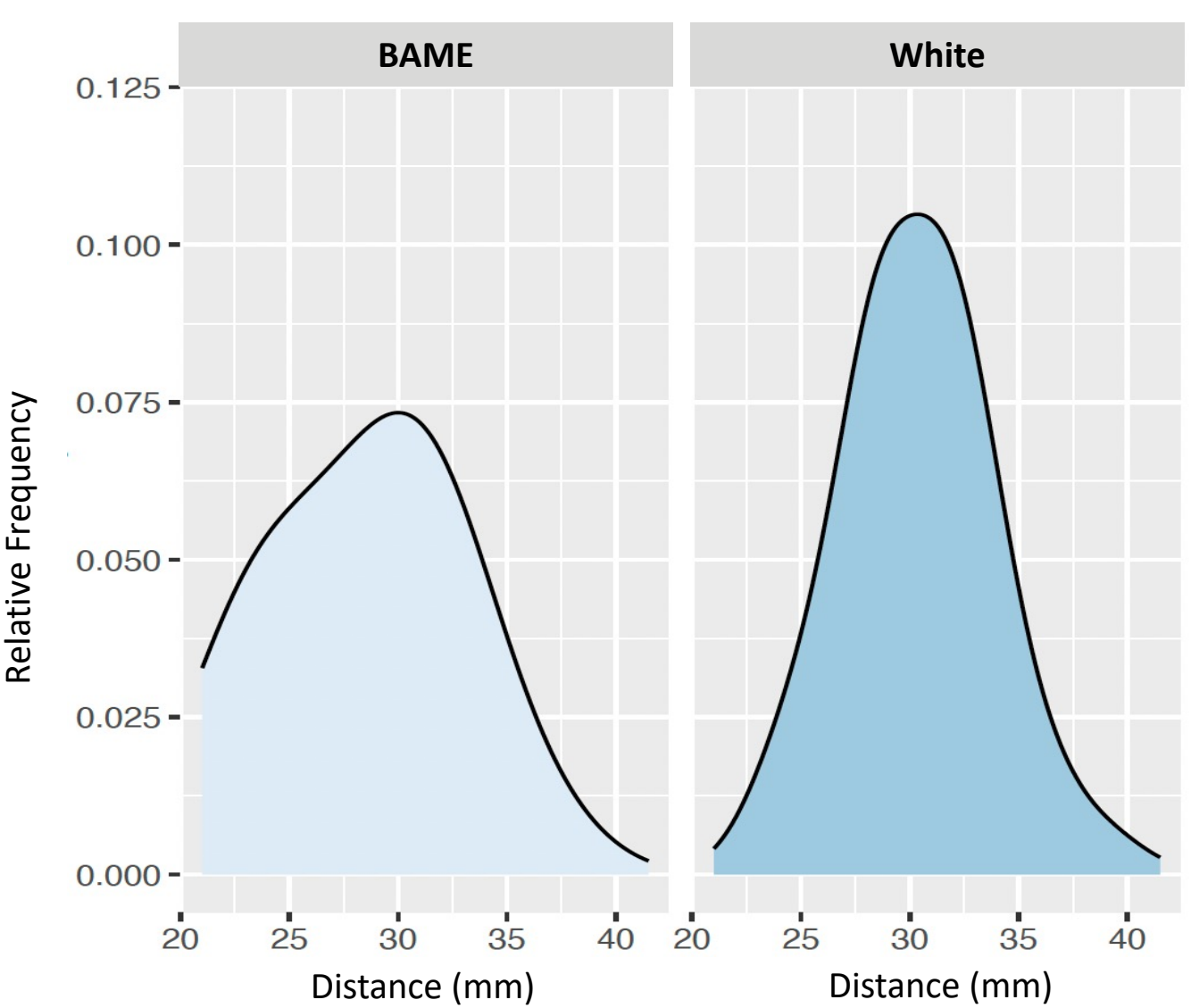


Figure 5: Density plot of distance to the epidural space by ethnicity



Results

- 478 cases reviewed; 34 excluded due to pathology.
- Our results show a normal distribution of distance from supraspinous ligament to the epidural space at all lumbar interspaces (Fig. 1).
- Overall mean distance to the epidural space was 30.5mm (95% CI 21.7-39.3mm).
- See Fig. 2 for mean distance for each lumbar interspace.
- There was a weak correlation between height and distance to the epidural space (correlation coefficient (r) = 0.374) (Fig. 3).
- There was no correlation between BMI and distance to the epidural space (r =0.084) (Fig. 4), and minimal correlation between weight and distance to the epidural space (r =0.221).
- There was a significant difference in distance to the epidural space between patients of white (n =301, median=30.3, IQR 28-32.6mm) and BAME background (n =29, median=29.0, IQR 24.5-31.7mm) (U =3298, p =0.030) (Fig. 5).

Discussion

- This study characterises the distribution of distance from supraspinous ligament to the epidural space in the lumbar region.
- Knowledge of this distribution could guide prediction of depth to the epidural space when performing epidurals, particularly in high BMI patients.
- Taller patients are likely to have increased depth of epidural space, but this only approximates to 2mm per 10cm height difference.
- Whilst our analysis demonstrates a difference between white and BAME patients that reaches statistical significance, the validity and clinical significance is uncertain due to the very small number of BAME patients.
- Replication of this study in a centre with greater ethnic diversity is required to power this comparison appropriately, and facilitate subgroup analysis.

Thank you

- With thanks to Dr A Fahim and Dr I Mohammed Ali for their assistance with data collection.