LEEDS BECKETT UNIVERSITY
CARNEGIE SCHOOL OF SPORT

Establishing normative ranges for Bone Mineral Density outcomes in female team sport athletes

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RUGBY FOOTBALL LEAGUE

LEEDS RHINOS NETBALL

Loughborough University

ECB

Rationale

- Bone is responsive to size (~biological sex), muscle mass and gravitational loading via sport, as well as nutrition, menstrual health, other lifestyle factors (medication, smoking etc)
- Lower total and site-specific bone mineral density (BMD) contributes to osteoporosis and fracture risk, especially in females
- Athletes have been shown consistently to have higher levels of BMD
- Therefore, they are assumed to be lower risk (during and post) athletic career

However,

- Stress fractures present 10-20% of injuries in athletes
- Athletes with lower BMD compared to other athletes have higher risk of fracture and bone health issues (Always et al, 2022, Jonvik et al, 2022)

As a research practitioner, can we identify those athletes at risk via their BMD?

Research process:

Research question: Do we need athlete specific ranges for BMD to be able to look at early identification of current and future fracture risk, specifically in females

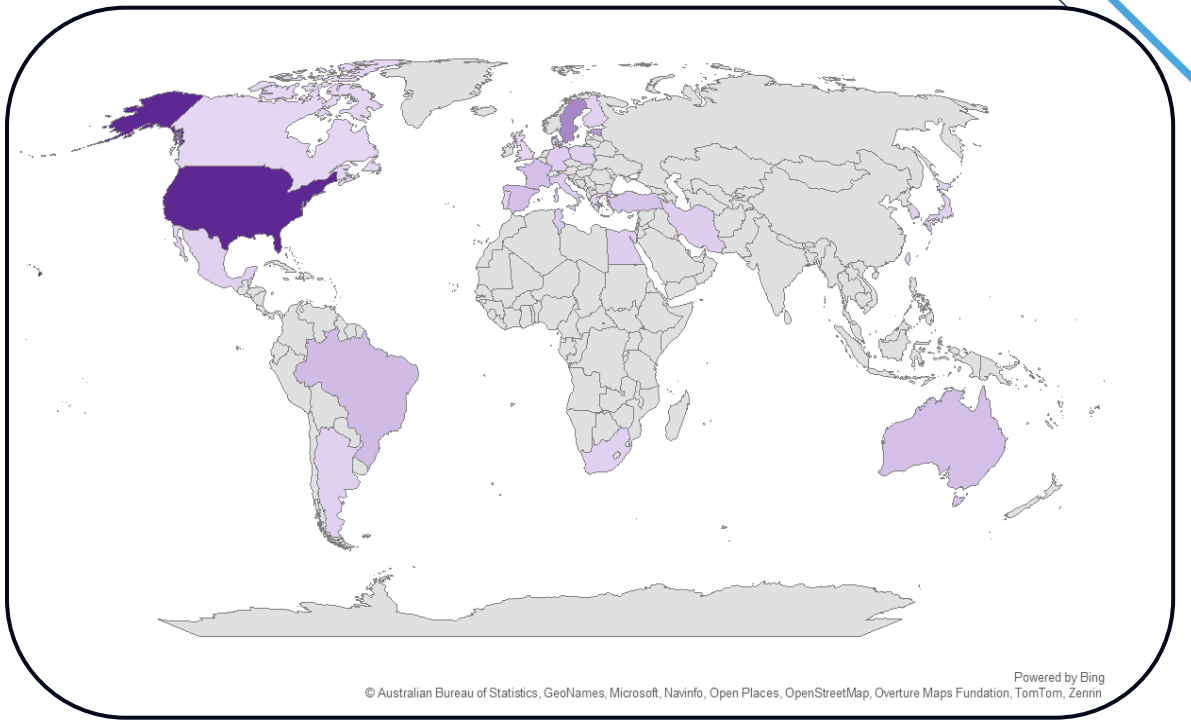
Systematic review to investigate BMD ranges in team sport athletes (male and female)

Secondary data analysis: ~200 female team sport athletes, BMD values derived from DXA scans (cricket, rugby league, netball)

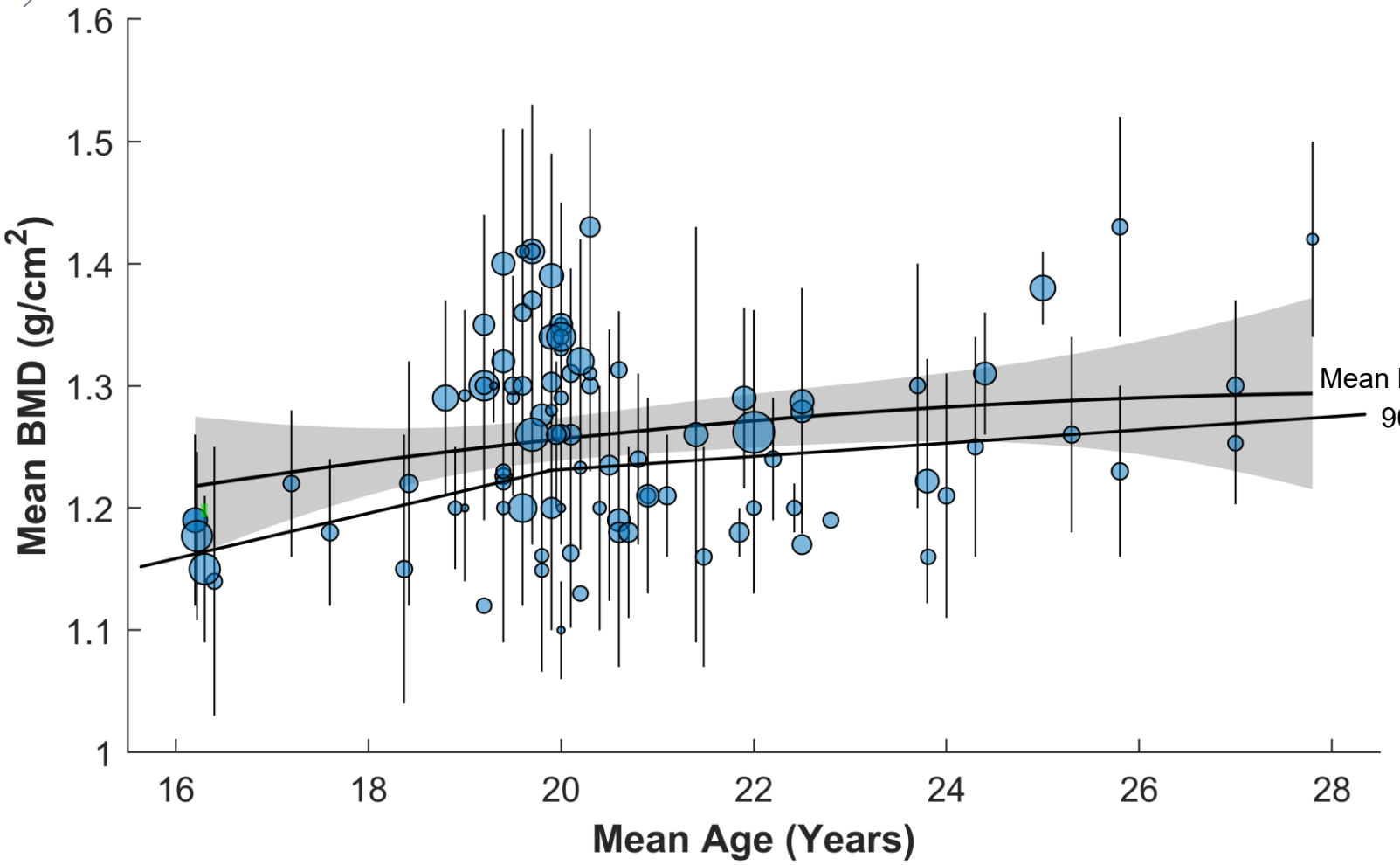
Systematic review (PRISMA)

123 studies, 113 female cohorts, 134 male cohorts

- Wide range of team sports
- N=2435;
- Age: 20.9 ± 3.7,
- Mass: 68.7± 7.5kg,
- Stature: 170.5 ± 5.4 cm



Preliminary summary of female cohorts

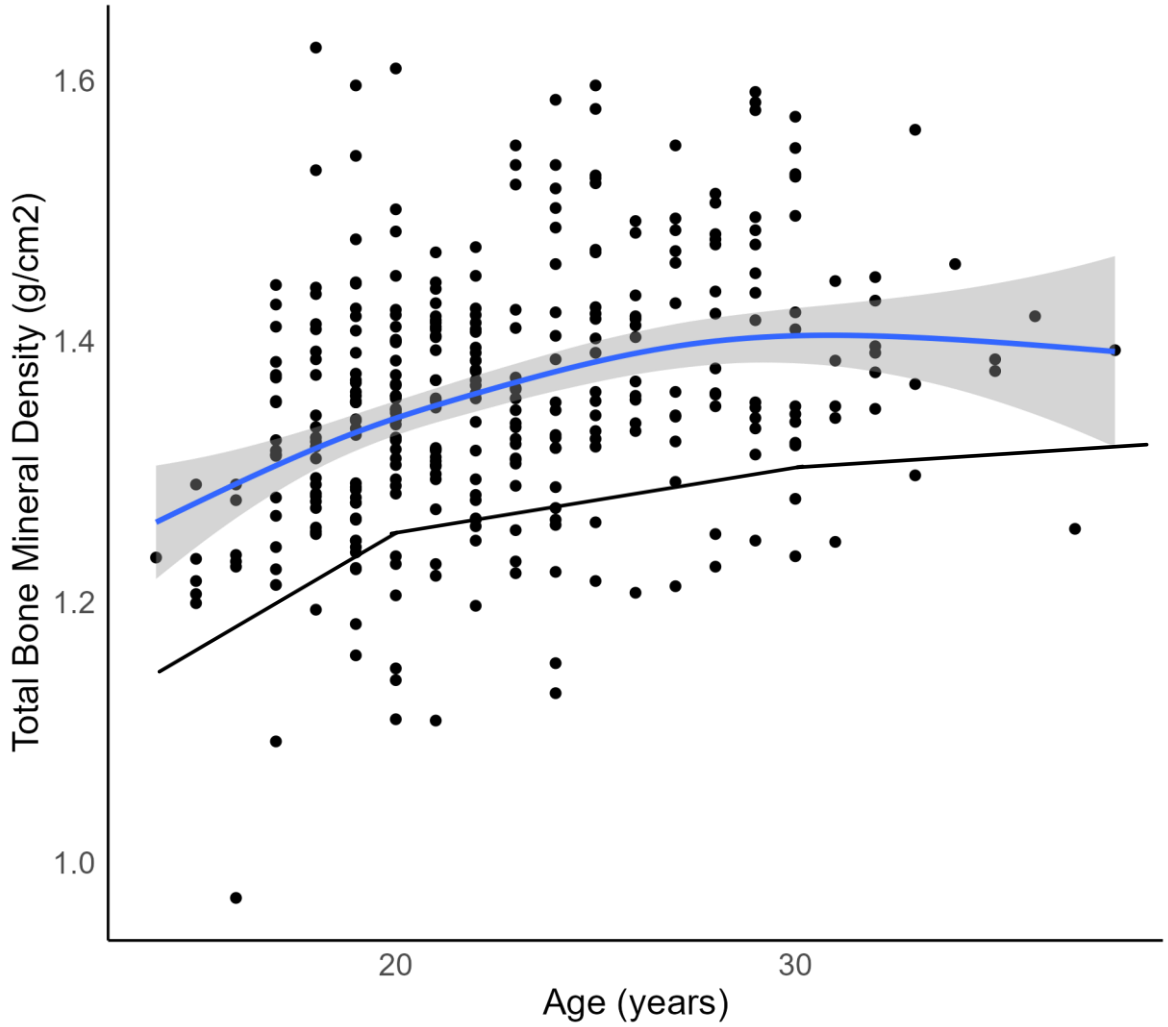


Mixed sport cohort: Netball, Rugby league and cricket

- Three team sport female cohorts participating in different studies
- Sports have different loading patterns
- Multi year data for some athletes
- Secondary data analysis of DXA scans
- Total body BMD, Lumbar spine (L1-L4) and both total hip and proximal femur (neck)

Basic characteristics (339 data points, n=204)	
Age (years)	22.8 ± 4.6
Height (cm)	170.9 ± 6.8
Body mass (kg)	70.7 ± 9.1
FFM (kg)	51.9 ± 5.6

Total body bone mineral density

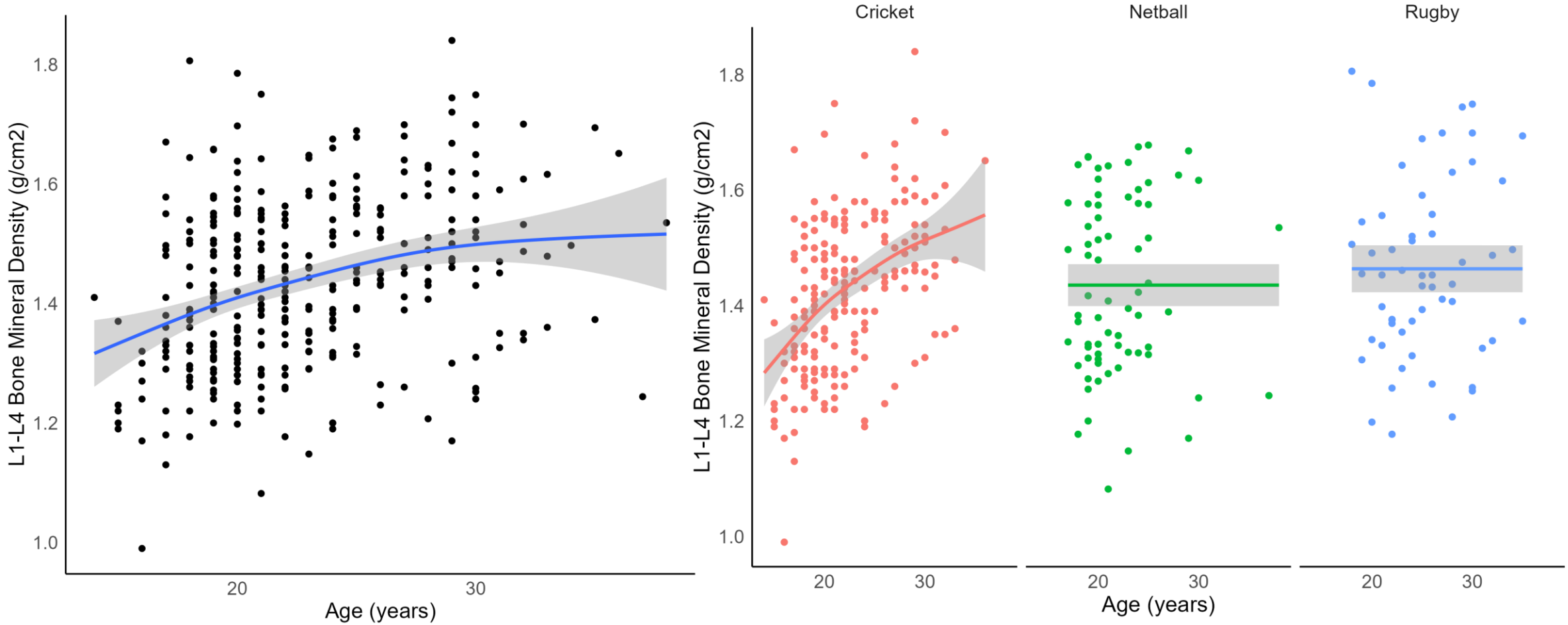


BMD total (g/cm^2)	1.354 ± 0.120
Z score (NHANES)	2.8 ± 0.9

90th percentile NHANES

Lumbar spine (L1-L4)

BMD L1-L4(g/cm^2)	1.433 ± 0.14
Z score (NHANES)	1.94 ± 1.14



Summary

- Systematic review will help define the range of BMD observed in previous studies
- Current secondary analysis will form part of ‘proof of concept’ for new BMD ranges

To follow:

- Prospective tracking of fracture and bone stress data
- Compare with individual sport data
- Prospective investigation of areas of concern (e.g. lower limb) in athletes to establish normative ranges

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Fan, B., Shepherd, J. A., Levine, M. A., Steinberg, D., Wacker, W., Barden, H. S., Ergun, D., & Wu, X. P. (2014). National Health and Nutrition Examination Survey Whole-Body Dual-Energy X-Ray Absorptiometry Reference Data for GE Lunar Systems. *Journal of Clinical Densitometry*, *17*(3), 344–377. https://doi.org/10.1016/j.jocd.2013.08.019

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