



Application number/Title: 17881 - Quantitatively understanding how bone mineral density varies with age and disease using DXA Region Free Analysis

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Keywords provided by the Applicant PI to describe the research project:

ageing, fracture, imaging, osteoporosis

Application Lay Summary:

Fragility fractures due to the osteoporosis disease bring a heavy burden on the UK economy each year. UK Biobank provides a unique dataset of DXA images not only in scale but also in anatomic variability, imaging the whole body, lumbar and lateral spine, knee, and hip, that offers an opportunity for a comprehensive population analysis of bone mineral density (BMD) changes during ageing. We aim to employ our recently developed DXA region free analysis (DXA RFA) technique to study how pixel-level BMD distribution will change as we age and how this correlates with incidental fracture risk. Our intended purpose is to use a novel high resolution DXA tool to better understand how BMD varies with age and gender, and fits directly with the stated purpose of the Biobank UK dataset to improve the prevention, diagnosis and treatment of osteoporosis, and other diseases. We will use the UK Biobank dataset to build high resolution population base bone maps to identify what are the normal changes in bone architecture and density with age, how individuals may vary from the normal pattern and the implications of this. This research aims at identify how bone quality changes during ageing using a new way of looking at bone scans. We are using a new software that fits the information from the scan to a standard 'template', allowing us to look at the images in finer detail. We have already generated bone 'maps' for older patients with osteoporosis, and here we will the information gap for younger patients so that we have a template model for ageing from the age of 40 though to old age that will enable us to better understand bone ageing, health and disease. We are developing a spatiotemporal atlas of bone mineral density (BMD) maps in a cohort of 5,000 women aged 75-97 from MRC-Hip database. We wish to extend the age range of the model and adjust for gender and body composition by incorporating the full DXA cohort from UK

Biobank into our reference population for pixel-level BMD analysis based on DXA scans. We apply for access to the full UK Biobank DXA imaging dataset across all anatomic sites. We understand that the collection process is ongoing and at this stage, we request access to the $n \sim 6,000$ subjects currently available.