

# **Bone Density Variation throughout the Body**

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## **ABSTRACT**

*The general aging of the world's population has made it increasingly necessary to take steps to protect the elderly from bone fracture. The ability to quickly and accurately assess an individual's bone density may lead to technology that can adjust to the needs of people with osteopenia or osteoporosis, and potentially protect them from injury. The initial objective of this project is to quantify the variation in bone density throughout the body. The final goal is to assess whether the bone density of the phalanges or tibia can be taken to represent the quality of the bones as a whole. Quantitative computed tomography (qCT) scans of 5 human cadavers were used to measure bone density at multiple key sites on the torso, head, and extremities. About 40 selections of a 1 cm<sup>3</sup> volume were taken from each cadaver and analyzed. Many measurements were taken on the ribcage to check for general trends in bone density variation between ribs and in different locations on each rib. Sites in the lumbar spine were also selected in order to compare each subject to the general population using epidemiological software (Q-BMAP II). Other sites in the body were also measured in order to compare them with average bone density. The mean density ranged from 216.8 to 486.7 Hounsfield Units (HU) in the rib cortical bone, 923.6 to 1027.6 HU in the tibia, and 344.6 to 557.4 in the phalanges. Preliminary findings also show an increase in bone density at inferior rib levels. Further data collection will help to clearly identify trends and make more accurate comparisons.*