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**Title:** Obesity and bone health in COPD

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**Body:** Osteoporosis is a well-known comorbidity of COPD; the increased risk in COPD is related to systemic inflammation, reduced physical activity or low lean muscle mass, corticosteroid use, smoking and age. Obesity in COPD is also increasingly common. We hypothesized that in COPD, obesity is protective against osteoporosis. Aim: To determine the association between COPD, body weight and osteoporosis. Methods: People with COPD (>55years) underwent a multidimensional assessment to measure body mass, bone mineral density (BMD), systemic inflammation (CRP), spirometry and symptoms. Participants were stratified into 2 groups; obese (BMI  $\geq 30$ kg/m) and non-obese (BMI <30kg/m). Results: We recruited 41 participants, 21 (51%) were female with a mean (SD) age of 70.9 (8.7), BMI of 28 (0.7) and FEV1 % predicted of 51.2 (19). There were 24 (58%) who were obese. The total BMD of the obese group was significantly higher than the non-obese group (1.1 (0.14) versus 0.88 (0.22);  $p=0.0003$ ). Similarly the total body BMD T score was significantly better in the obese group (-0.008 v -2.186;  $p<0.0001$ ). There were fewer participants in the osteopenic or osteoporotic range in the obese (9 [37.5%]) compared with the non-obese 15 (88.3) group;  $p=0.001$ . Using linear regression analysis, appendicular skeletal muscle mass (ASMM), log CRP and BMI were all positively associated with BMD T Score. In a multiple regression model ( $r^2=0.5692$ ;  $p=0.001$ ) adjusted for age, gender and BMI, ASMM was the only positive predictor of BMD T score. Conclusion: Obesity is protective of poor bone health in COPD; this may be another key to the understanding of the obesity paradox in COPD. Assessing bone health in COPD patients with normal BMI is important.