

ORIGINAL RESEARCH COMMUNICATION

# BMI compared with 3-dimensional body shape: the UK National Sizing Survey<sup>1,2,3</sup>

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**Background:** Human body shape is a rich source of information about health and the risk of disease. Measuring anthropometry manually is time-consuming, however, and only a few indexes of shape (eg, body girths and their ratios) are used regularly in clinical practice or epidemiology, both of which still rely primarily on body mass index (BMI). Three-dimensional (3-D) body scanning provides high-quality digital information about shape.

**Objectives:** The objectives of the study were to investigate the relation of shape and BMI and to examine associations between age, sex, and shape.

**Design:** In a cross-sectional study of 9617 adults (45% male) aged 16–91 y who were participating in the UK National Sizing Survey, body girths and their ratios were obtained with the use of a 3-D body scan. Data on weight and height were also obtained.

**Results:** BMI was significantly associated with chest and waist in men and with hips and bust in women. In early adulthood, the sexes differed significantly in shape; however, these differences declined with age. Whereas male shape remained highly stable through adulthood, upper body girths, particularly waist, increased in women, but thigh decreased. After adjustment for other girths, waist was significantly and inversely associated with height, particularly in men. Waist varied widely in both sexes for a given BMI value.

**Conclusions:** Relations between BMI and shape differed significantly between the sexes, particularly in association with age. The inverse association between height and waist in men suggests either a genetic contribution or a link between early growth pattern and predisposition to obesity. The 3-D scans offer a novel approach for epidemiologic research into associations between body shape and health risks and outcomes.

**Key Words:** Body mass index • body shape • waist circumference • obesity • 3-dimensional body scanning

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