

# USE OF WAIST-TO-HEIGHT AND HIP-TO-HEIGHT RATIOS TO ESTIMATE % FAT IN COLLEGE MEN AND WOMEN

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## INTRODUCTION

- Recent focus on circumference-to-height ratios has renewed discussion of the use of anthropometry to estimate %fat and ideal body weight (IBW).
- Considering the implications of body composition for military service, it seems prudent to evaluate the feasibility of waist (WC) and hip (HC) circumferences relative to height to estimate %fat in military eligible personnel aged 18-24 years old.

## PURPOSE

- To evaluate the relationships of WC/Ht, HC/Ht, and BMI to %fat in young college men and women.

## METHODS

- Men (n = 1501) and women (n = 1282) volunteered to be measured for a 3-skinfold estimate of %fat using the Jackson-Pollock equations.
- Skinfolts were measured the the same investigator over a 4-year period.
- WC was measured at the umbilicus and HC was determined at maximum gluteal circumference.
- WC/Ht and HC/Ht were calculated by dividing each circumference (cm) by height (cm).

## RESULTS

- In men, WC/Ht (r = 0.75), HC/Ht (r = 0.70), and BMI (r = 0.73) were significantly correlated with %fat (Figure 1).
- In women, HC/Ht (r = 0.71), WC/Ht (r = 0.66), and BMI (r = 0.74) were also significantly correlated with %fat (Figure 2).
- The correlation for women was significantly lower (p<0.01) than for men except for BMI (p=0.57).
- Regression analysis to predict %fat selected sex and HC.Ht in that order as primary variables in a validation group (n = 1267) (R = 0.87, SEE = 4.2%).
- Sex made a slightly larger percent contribution to the equation (51%) than did HC.Ht (49%).
- When the sexes were evaluated separately, regression analysis in men selected BMI and WC.Ht as primary predictors of %fat (%fat = 78.509 WC.Ht – 23.84, r = 0.77, SEE = 3.7%).
- In women, BMI and HC/Ht were the primary predictors of %fat (R = 0.76, SEE = 4.0%).
- Cross-validation of the men's equation on a randomly selected sample (n = 408) revealed predicted %fat (11.0 ± 4.1%) was not significantly different (p = 0.22) from actual %fat (10.8 ± 5.4%), and they were significantly correlated (r = 0.75)(Figure 3).
- Cross-validation of the women's equation on a randomly selected sample (n = 319) revealed there was also no significant difference (p = 0.39) between predicted (23.4 ± 5.7%) and actual %fat (23.2 ± 4.5%) with a significant correlation between the two (r = 0.72)(Figure 4).

## CONCLUSIONS

- %fat can be predicted in military-age men and women using a combination of BMI and sex-specific variables of WC/Ht or HC/Ht with an acceptable level of accuracy.
- Sex-specific equations using different circumference-to-height ratios to estimate %fat worked with equal efficiency.
- These findings should be corroborated on sample whose body composition was measured with a more standardized technique.

The views expressed in this poster are those of the authors, and do not reflect the official position or policy of the United States Air Force, The Department of the Army, The Department of Defense, or the U.S. Government.

**Table 1. Basic Demographics of Participants**

Variable	Men (n = 1501)	Women (n = 1282)
Age (yrs)	20.4 ± 1.3*	20.2 ± 1.2
Height (cm)	178.7 ± 6.7*	165.0 ± 6.3
Weight (kg)	76.6 ± 13.0*	61.4 ± 11.3
BMI	24.0 ± 3.7*	22.5 ± 3.8
Waist circumference (cm)	79.6 ± 9.8*	68.1 ± 8.8
Hip circumference (cm)	96.7 ± 7.8*	94.9 ± 8.2

\*Significant at p<0.001.

