



# What Is the Disease of Obesity?

## Anthropometric Evaluation



AACE OBESITY RESOURCE CENTER

AACE ONLINE ENDOCRINE ACADEMY

# Definition of Obesity

- Obesity is a complex, multifactorial disease characterized by excess body fat/adiposity
- Criteria for a disease
  - Impairment of normal functioning
  - Characteristic signs or symptoms
  - Harm or morbidity
- Obesity is a disease with multiple pathophysiological aspects, including genetic, environmental, physiological, and psychological factors

# Assessing Obesity in Clinical Practice

## Body Mass Index

- For screening and classification
- PQRI measure
  - Overweight:  $\geq 25$  to  $< 30$  kg/m<sup>2</sup>
    - 23 for some Asian ethnicities
  - Obesity:  $\geq 30$  kg/m<sup>2</sup>
    - Divide weight by the square of height (kg/m<sup>2</sup>)
- Must be clinically consistent with excess adiposity

## Waist Circumference

- Marker of high risk\*
  - Men  $\geq 94$ cm
  - Women  $\geq 80$ cm
- Indirect measure of central adiposity, correlated with visceral fat
- Excess abdominal fat is an independent predictor of risk factors and morbidity

\*World Health Organization waist circumference cutoff varies by race/ethnicity.



1.

## Obesity Screening



1.

Screen positive for  
overweight or obesity  
**BMI  $\geq 25$  kg/m<sup>2</sup>**  
( $\geq 23$  kg/m<sup>2</sup> in some  
ethnicities)

2.

Presence of weight-  
related disease or  
complication that  
could be improved by  
weight loss therapy



2.

## Diagnosis: Evaluation

**Evaluate  
Patient**

1. Medical history

2. Physical examination

3. Clinical laboratory tests

4. Review of systems, emphasizing weight-related complications

5. Obesity history: graph weight vs age, lifestyle patterns/preferences, previous interventions

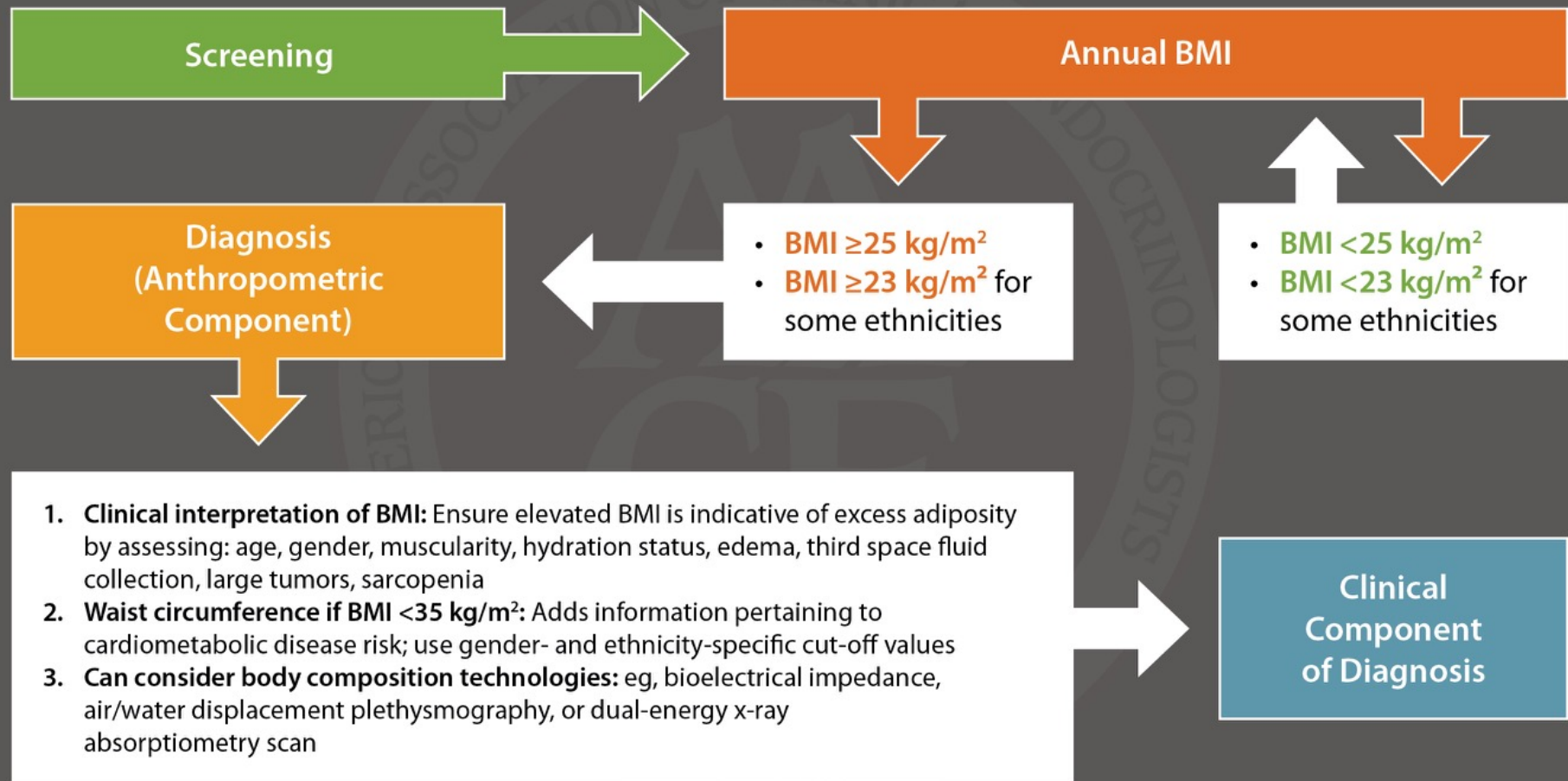




2.

## Diagnosis: Anthropometric Component

### EVIDENCE-BASED SCREENING AND DIAGNOSIS FOR EXCESS ADIPOSITY IN CLINICAL SETTINGS



Abbreviation: BMI = body mass index



2.

## Diagnostic Categories

BASED ON BMI + SCREENING FOR WEIGHT-RELATED COMPLICATIONS

NORMAL WEIGHT	STAGE 0	STAGE 1	STAGE 2
No obesity	No complications	One or more mild-to-moderate complications or may be treated effectively with moderate weight loss	At least one severe complication or requires more aggressive weight loss for effective treatment
<b>BMI &lt;25</b> <23 IN CERTAIN ETHNICITIES	<b>BMI 25–29.9</b> OVERWEIGHT <b>BMI ≥30</b> OBESITY	<b>BMI ≥25</b>	<b>BMI ≥25</b>

# AACE Recommendations for BMI

- All adults should be screened annually
  - BMI  $\geq 25$  kg/m<sup>2</sup> to evaluate further
  - BMI  $\geq 23$  kg/m<sup>2</sup>
    - South, Southeast, and East Asians
- BMI generally correlates with adiposity at the population level
  - High BMI increases risk
    - Metabolic syndrome and T2D
    - CAD
    - Mortality
- BMI is used to confirm/classify clinical excess adiposity as “overweight” or “obesity”
- Clinical evaluation and judgement must be used
  - Individual adiposity varies
  - BMI alone can over- or underestimate adiposity and risk
    - Athletes
    - Elderly, sarcopenia

## Body Mass Index and Cause-Specific Mortality Collaborative Analyses of 57 Prospective Studies (N=900,000 adults)

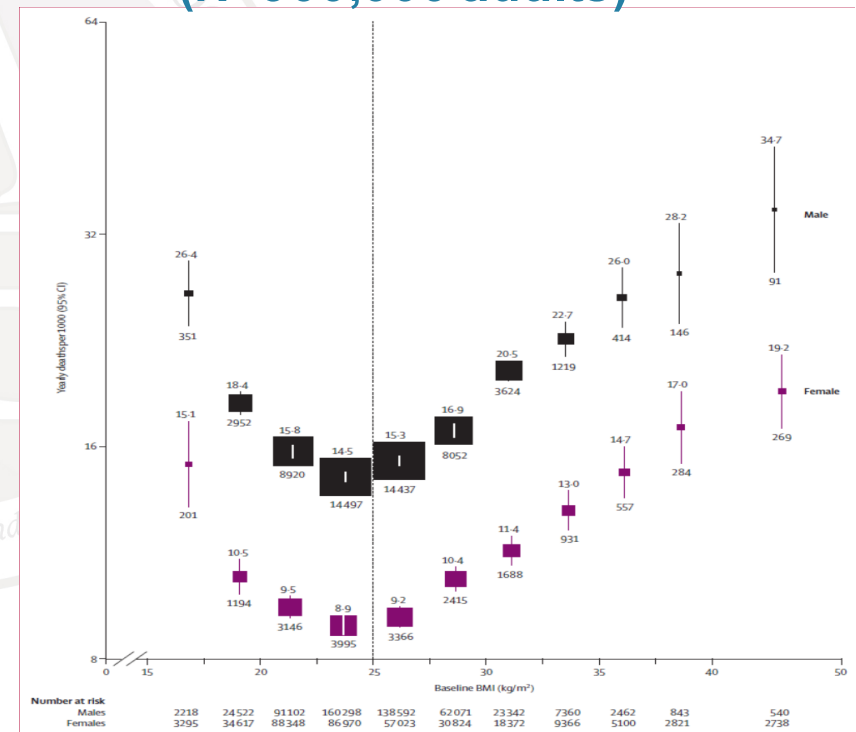


Figure 2: All-cause mortality versus BMI for each sex in the range 15-50 kg/m<sup>2</sup> (excluding the first 5 years of follow-up)



# AACE Recommendations for Waist Circumference

Measure WC in all patients with BMI <35 kg/m<sup>2</sup>

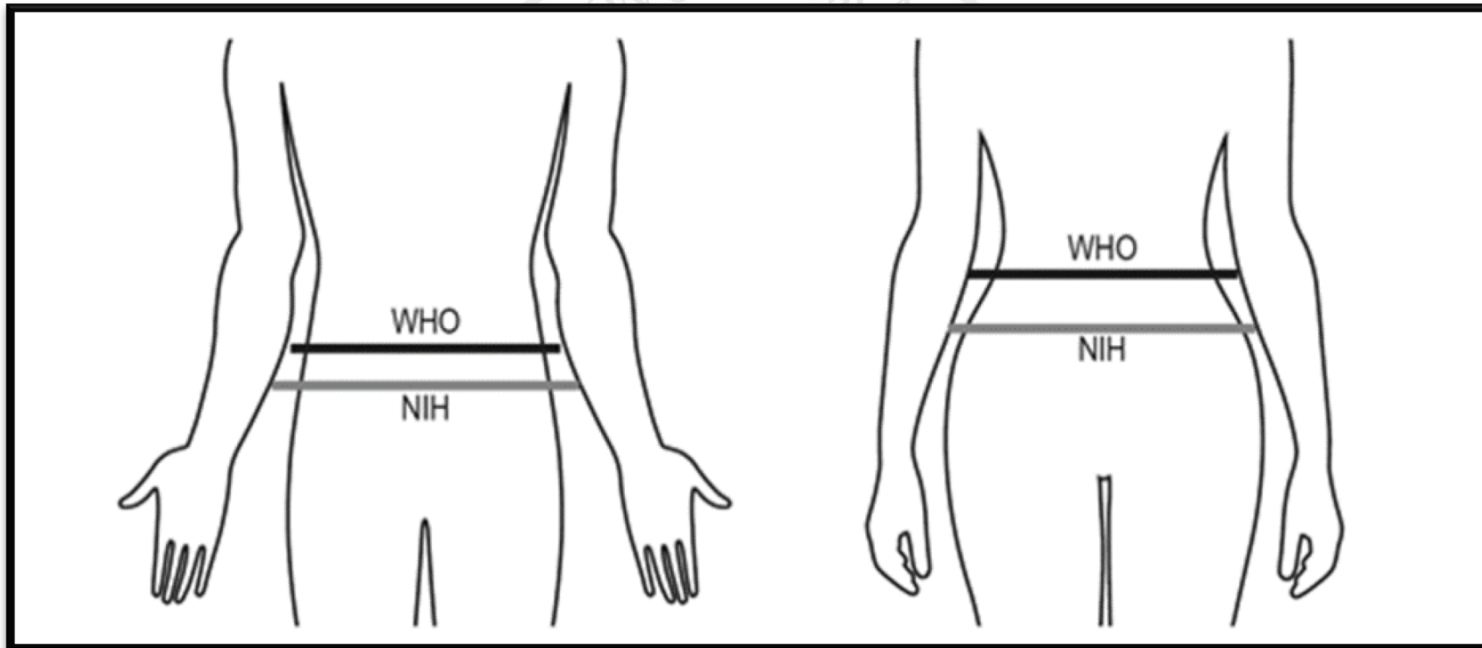
	WC values consistent with abdominal obesity and higher metabolic risk
Most adult populations	
Men	≥ 94 cm
Women	≥ 80 cm
South Asian, Southeast Asian, and East Asian adults	
Men	≥ 85 cm
Women	≥ 74-80 cm

WC = waist circumference.

Garvey TW, et al. *Endocr Pract.* 2016;22(suppl 3):1-205.

# Measuring Waist Circumference

Locate Top of Right Iliac Crest



WHO and IDF protocol\*: measure WC midway between the highest point of the iliac crest and the bottom of the ribcage.

NIH protocol: measure WC at highest point of iliac crest.

IDF = International Diabetes Federation; NIH = National Institutes of Health; WC = waist circumference; WHO = World Health Organization.

NHLBI Obesity Education Initiative. Obesity in adults. Available at: [http://www.nhlbi.nih.gov/guidelines/obesity/prctgd\\_c.pdf](http://www.nhlbi.nih.gov/guidelines/obesity/prctgd_c.pdf).  
Alberti KG, et al. *Diabet Med* 2006;23:469-480

# Classification of Weight, Waist Circumference, and Disease Risk

Classification	BMI		Waist	
	BMI (kg/m <sup>2</sup> )	Comorbidity Risk	Waist Circumference and Comorbidity Risk	
			Men ≤40 in (102 cm) Women ≤35 in (88 cm)	Men >40 in (102 cm) Women >35 in (88 cm)
Underweight	<18.5	Low but other problems		
Normal weight	18.5–24.9	Average		
Overweight	25–29.9	Increased	Increased	High
Obese class I	30–34.9	Moderate	High	Very high
Obese class II	35–39.9	Severe	Very high	Very high
Obese class III	≥40	Very severe	Extremely high	Extremely high

BMI = body mass index; NHLBI = National Heart, Lung, and Blood Institute; WC = waist circumference.

Garvey TW, et al. *Endocr Pract.* 2016;22(suppl 3):1-205. NHLBI Obesity Education Initiative. Obesity in adults. Available at: [http://www.nhlbi.nih.gov/guidelines/obesity/prctgd\\_c.pdf](http://www.nhlbi.nih.gov/guidelines/obesity/prctgd_c.pdf).

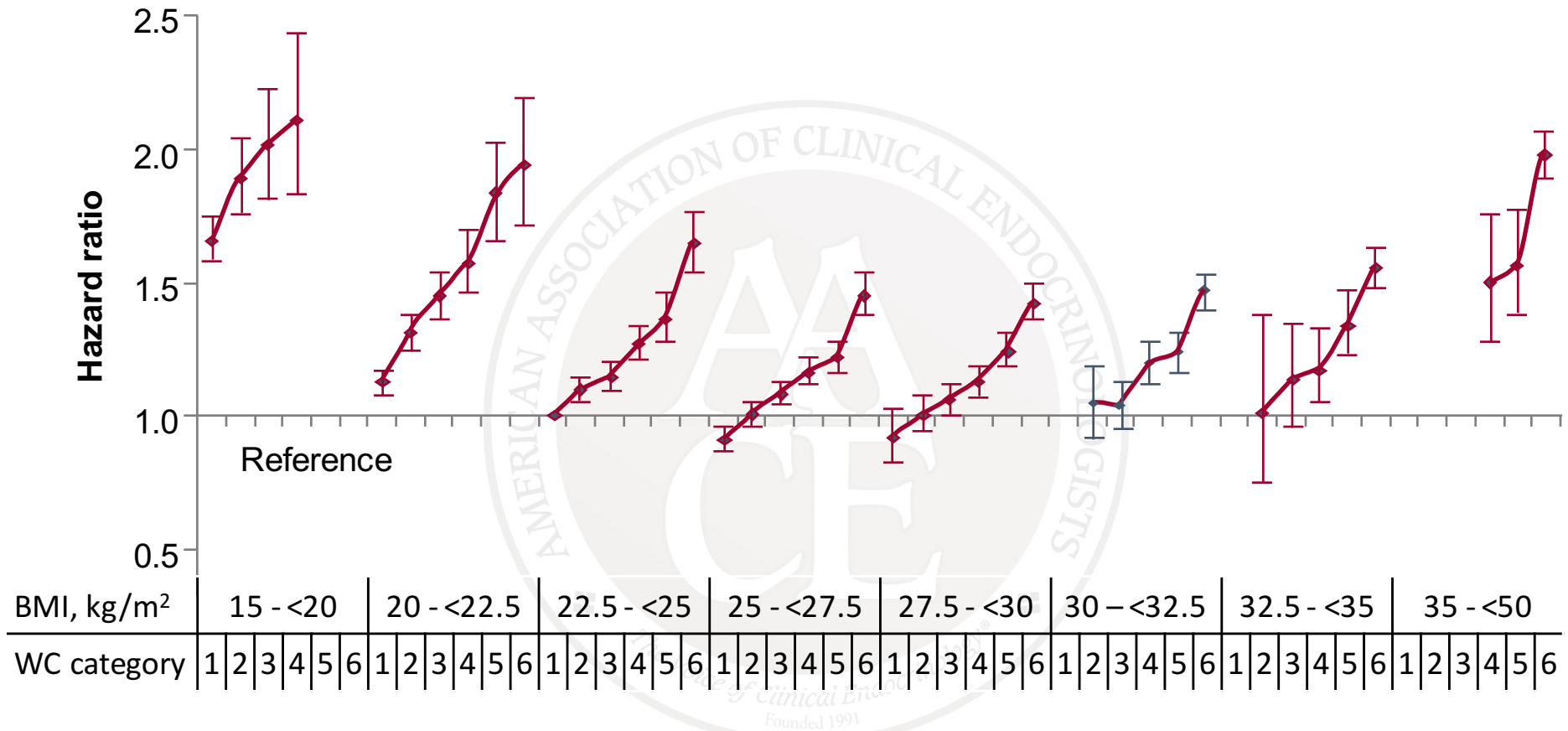
# Waist Circumference Risk Thresholds

Population, Organization	Men	Women
Europid, IDF	≥94 cm (≥37 inches)	≥80 cm (≥31 inches)
Caucasian, WHO	≥94 cm (≥37 inches) ↑ risk ≥102 cm (≥40 inches) ↑↑ risk	≥80 cm (≥31 inches) ↑ risk ≥88 cm (≥35 inches) ↑↑ risk
United States, AHA/NHLBI (ATPIII)	≥102 cm (≥40 inches)	≥88 cm (≥35 inches)
Canada, Health Canada	≥102 cm (≥40 inches)	≥88 cm (≥35 inches)
European, European Cardiovascular Societies	≥102 cm (≥40 inches)	≥88 cm (≥35 inches)
Asian (including Japanese), IDF, WHO	≥90 cm (≥35 inches)	≥80 cm (≥31 inches)
Japanese, Japanese Obesity Society	≥85 cm (≥33 inches)	≥90 cm (≥35 inches)
China, Cooperative Task Force	≥85 cm (≥33 inches)	≥80 cm (≥31 inches)
Middle East, Mediterranean, IDF	≥94 cm (≥37 inches)	≥80 cm (≥31 inches)
Sub-Saharan African, IDF	≥94 cm (≥37 inches)	≥80 cm (≥31 inches)
Ethnic Central and South American, IDF	≥90 cm (≥35 inches)	≥80 cm (≥31 inches)

AHA = American Heart Association; ATPIII = Adult Treatment Panel III; IDF = International Diabetes Federation; NHLBI = National Heart, Lung, and Blood Institute; WHO = World Health Organization.

Garvey TW, et al. *Endocr Pract.* 2016;22(suppl 3):1-205.

# Waist Circumference and Mortality



WC category, cm	1	2	3	4	5	6
Men	<90	90 - <94.9	95 - <99.9	100 - <104.9	105 - <109.0	≥110
Women	<70	70 - <74.9	75 - <79.9	80 - <84.9	85 - <89.9	≥90

Error bars represent 95% confidence intervals.

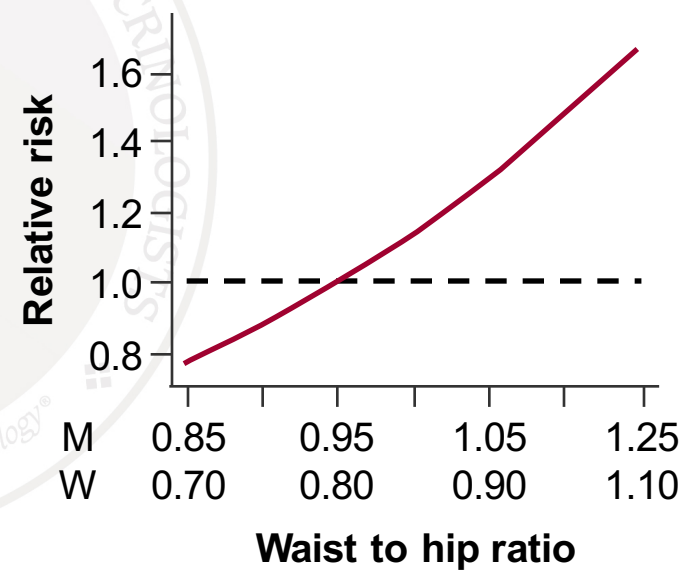
Cerhan JR, et al. *Mayo Clin Proc.* 2014;89:335-345.

# Other Measures of Abdominal Obesity

## Waist:Height Ratio

- Meta-analyses show
  - Better discriminatory power for cardiometabolic risk variables than BMI, with small advantage over WC
    - Data from mostly cross-sectional studies
  - Greater discriminatory power over BMI & WC for T2D and CVD
    - Data from prospective studies
- Cutoff value of 0.5 across different sex and ethnicities

## Waist:Hip Ratio





# Assessment of Body Composition

- If BMI and physical examination results are equivocal or require further evaluation, other measurements of adiposity may be considered at the clinician's discretion
  - Bioelectric impedance
  - Air/water displacement plethysmography
  - Dual-energy x-ray absorptiometry
- Clinical utility of these measures is limited by availability, cost, and lack of outcomes data for validated cutoff points

# Assessment of Body Composition

Method	Feature measured	Advantages	Limitations
Bioelectrical impedance analysis (BIA)	Total body water Extracellular and intracellular fluid spaces	Ease of use Low cost Speed (fast)	Population specific, poor accuracy in individuals
Dual-energy X-ray absorptiometry (DXA)	Total and regional body fat Total and regional lean mass	Ease of use Low radiation exposure Accurate	Biased for body size, sex, fatness High equipment cost Specially trained personnel
Dilution techniques	Total body water Extracellular fluid	Ease of use OK for all ages	Inaccurate in disease High equipment cost Labor-intensive analysis
Air displacement plethysmography	Total body volume Total body fat	Relatively good accuracy Speed (fast)	Less accurate in disease High equipment cost
3D photonic scanning	Total and regional body volume	OK for very obese Ease of use	Limited availability
Quantitative magnetic resonance	Total body water Total body fat	Ease of use Safety Speed (fast)	High equipment cost Limited availability
Magnetic resonance imaging (MRI)	Total and regional adipose tissue Skeletal muscle	Highly accurate and reproducible	Costly

# Summary

- Evaluation of patients for obesity should include a complete history and physical examination
- BMI cut-points vary with race/ethnicity
- Waist circumference
  - Adds information on cardiometabolic risk
  - Cut-points vary with gender and race/ethnicity
- Clinical interpretation of BMI
  - Must represent excess adiposity