Multiethnic Prevalence of Abdominal Obesity and Associated Risk Factors in U.S. Adults 2003-2004

Heli Ghandehari, BS, Vy Le
*Sachin Kamal-Bahl, PhD
Stanley Bassin, Ed. D, and
Nathan D. Wong, PhD, MPH, FACC

Heart Disease Prevention Program,
Division of Cardiology, University of California, Irvine, California, USA, and *Merck & Co, Inc., Whitehouse Station, NJ, USA

Correspondence to: Nathan D. Wong, PhD, Heart Disease Prevention Program, C240 Medical Sciences, University of California, Irvine, CA 92697, email: ndwong@uci.edu

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Background

- Obesity is a well-recognized risk factor for cardiovascular disease (CVD) and diabetes (DM); risk factors such as hypertension, dyslipidemia, systemic inflammation are closely associated with obesity.[1]

- Although abdominal obesity is a growing epidemic worldwide, recent data on its burden in the population and relation to risk factors and global CHD risk are limited.

[1]McCowen KC, Blackburn GL, Obesity and Weight Control, in: Wong ND, Black HR, Gardin JM, Preventive Cardiology, McGraw Hill, New York 2005.

Objectives

- To determine the prevalence of obesity versus abdominal obesity among a recent multiethnic sample of U.S. adults.
- To examine the extent of cardiometabolic risk factors and estimated global risk of CHD associated with abdominal obesity.

Methods (1)

- Sample population: adults aged 20-79 years from the National Health and Nutrition Examination Survey (NHANES), 2003-2004.
- Sample size: 4,647 subjects, weighted to a US population of 202.0 million.

Methods (2)

- Obesity was defined as:
  - Body mass index (BMI) ≥30 kg/m^2
- Abdominal obesity was defined as:
  - Waist circumference (WC) >88 cm in women
  - WC >102 cm in men
  - For Hispanics, analyses were also done according to lower cutpoints for WC recommended by the International Diabetes Federation (>80 cm for women and >90 cm for men)

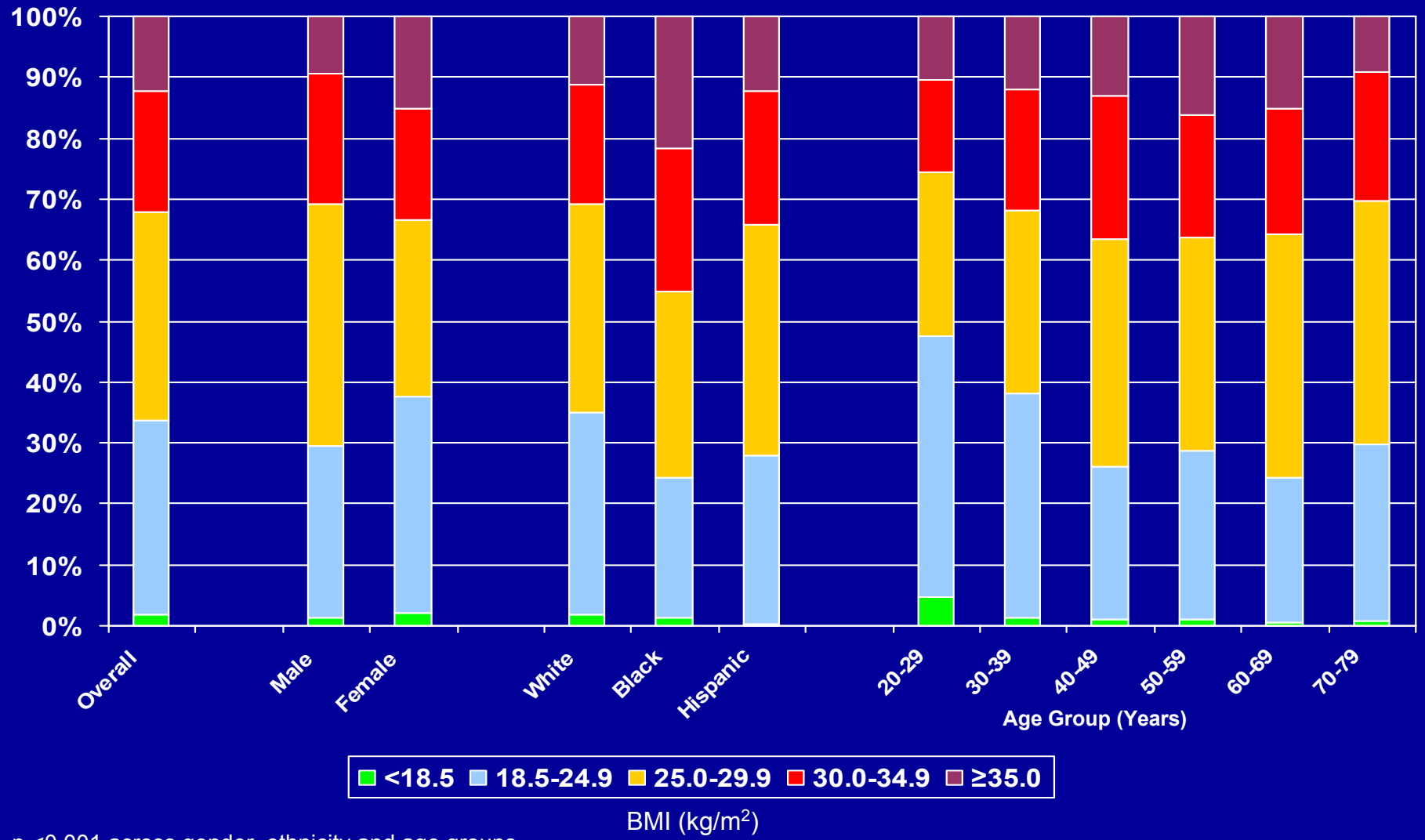
Methods (3)

- Cardiovascular disease (CVD) was defined by:
  - self-report for myocardial infarction, stroke, congestive heart failure, coronary heart disease and by ankle brachial index of <0.9 for peripheral artery disease.
- DM was defined as:
  - Self report
  - Fasting glucose ≥126 mg/dl
  - Use of an oral hypoglycemic medication or insulin
- Hypertension was defined as:
  - Blood pressure levels:
    - Systolic ≥140 mmHg
    - Diastolic ≥90 mmHg
  - Use of antihypertensive medication

Methods (4)

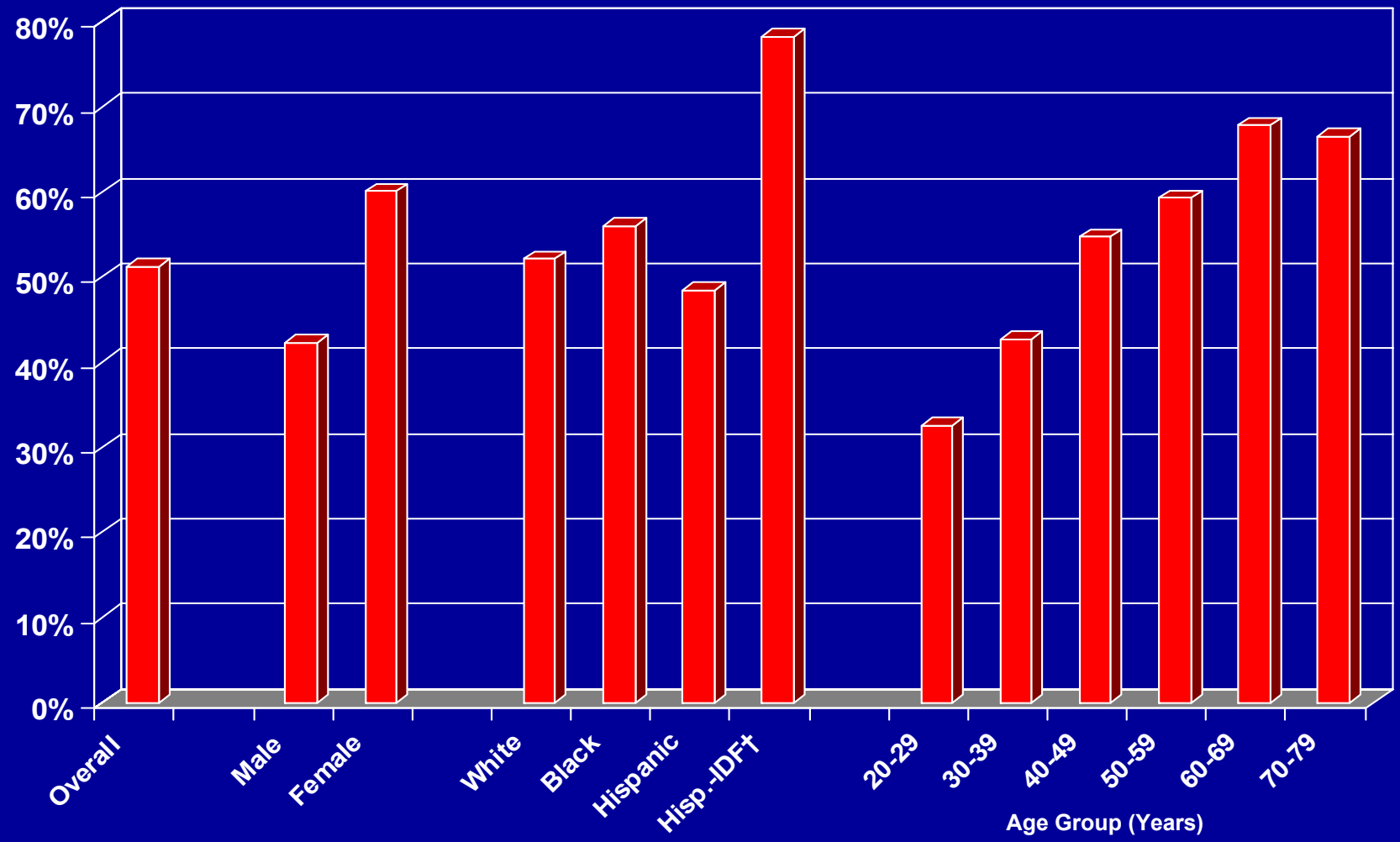
- Recommended lipid levels were defined as:
  - **LDL-C** per ATP **III** guidelines
    - <160 mg/dl if <2 risk factors
    - <130 mg/dl if ≥2 risk factors and ≤20% Framingham risk
    - <100 mg/dl if ≥2 risk factors and >20% Framingham risk or pre-existing CVD or diabetes
  - **HDL-C**
    - Men: ≥40 mg/dl
    - Women: ≥50 mg/dl
  - **Triglycerides**
    - <150 mg/dl
- Elevated C-Reactive protein defined as >3 mg/L

Percent of individuals within each BMI category (n=4,647; N=202.0 M)



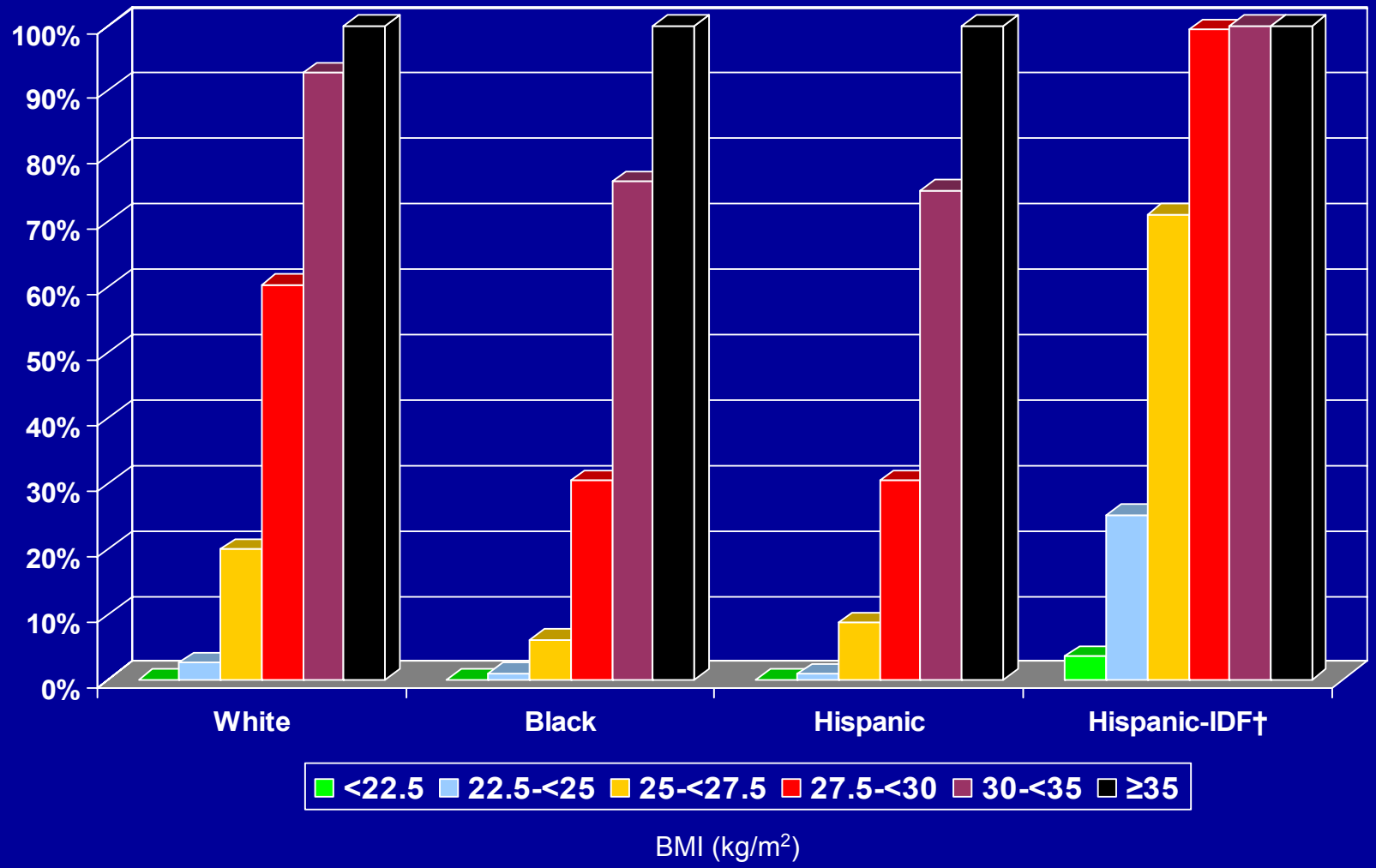
p <0.001 across gender, ethnicity and age groups.

Percent of U.S. adults with abdominal obesity* by gender, ethnicity, and age group



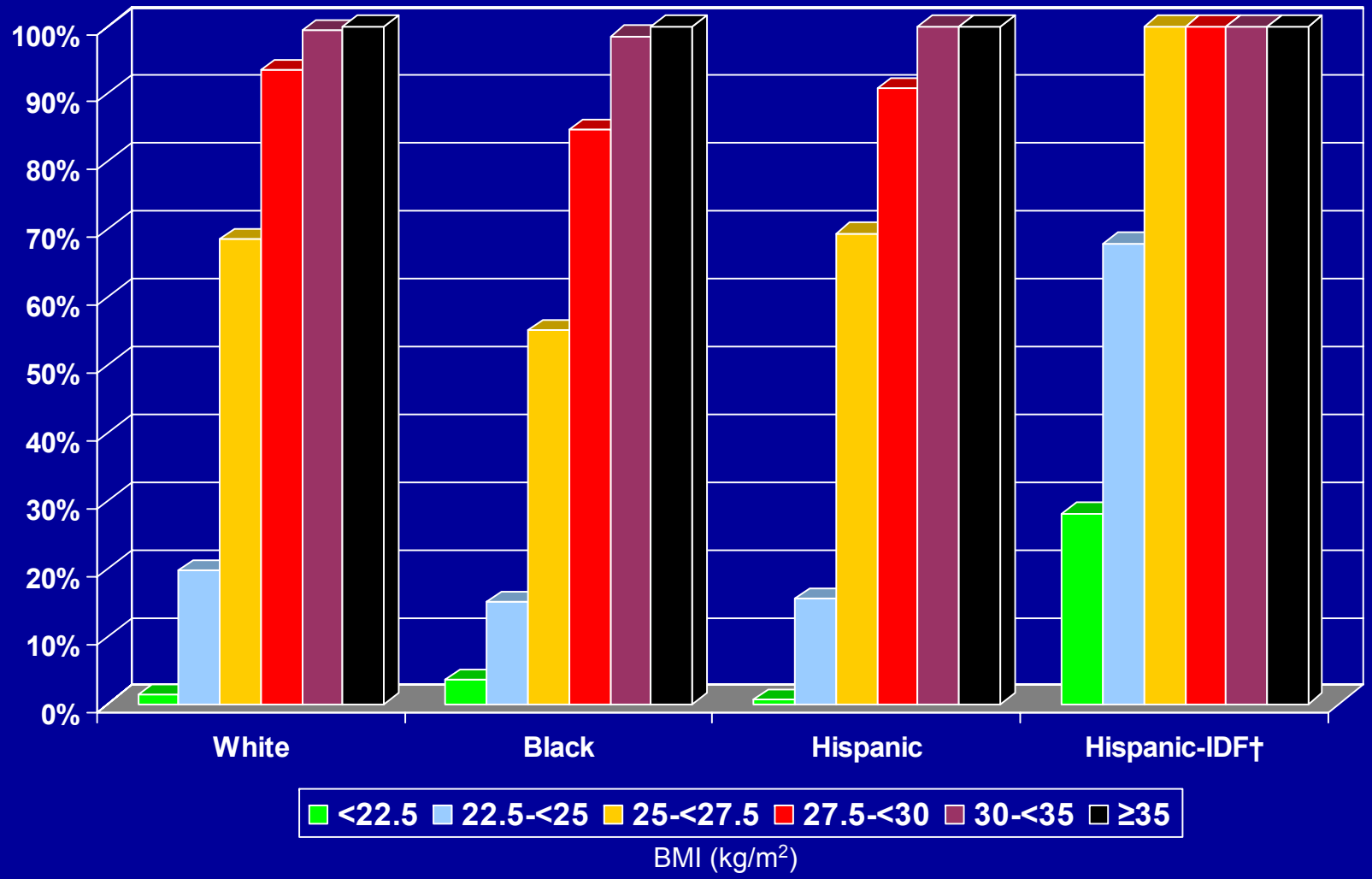
*Abdominal obesity defined as a waist circumference >88cm in women and >102 cm in men. †Hispanic IDF uses >90cm WC cutpoint for males and >80cm for females for abdominal obesity. p <0.001 across gender, ethnicity and age groups. Total n=4,332 (189.1M)

Prevalence of Abdominal Obesity by BMI Group and Ethnicity in males



†Hispanic IDF uses >90cm WC cutpoint for males for abdominal obesity. p <0.001 across BMI groups for each ethnicity.

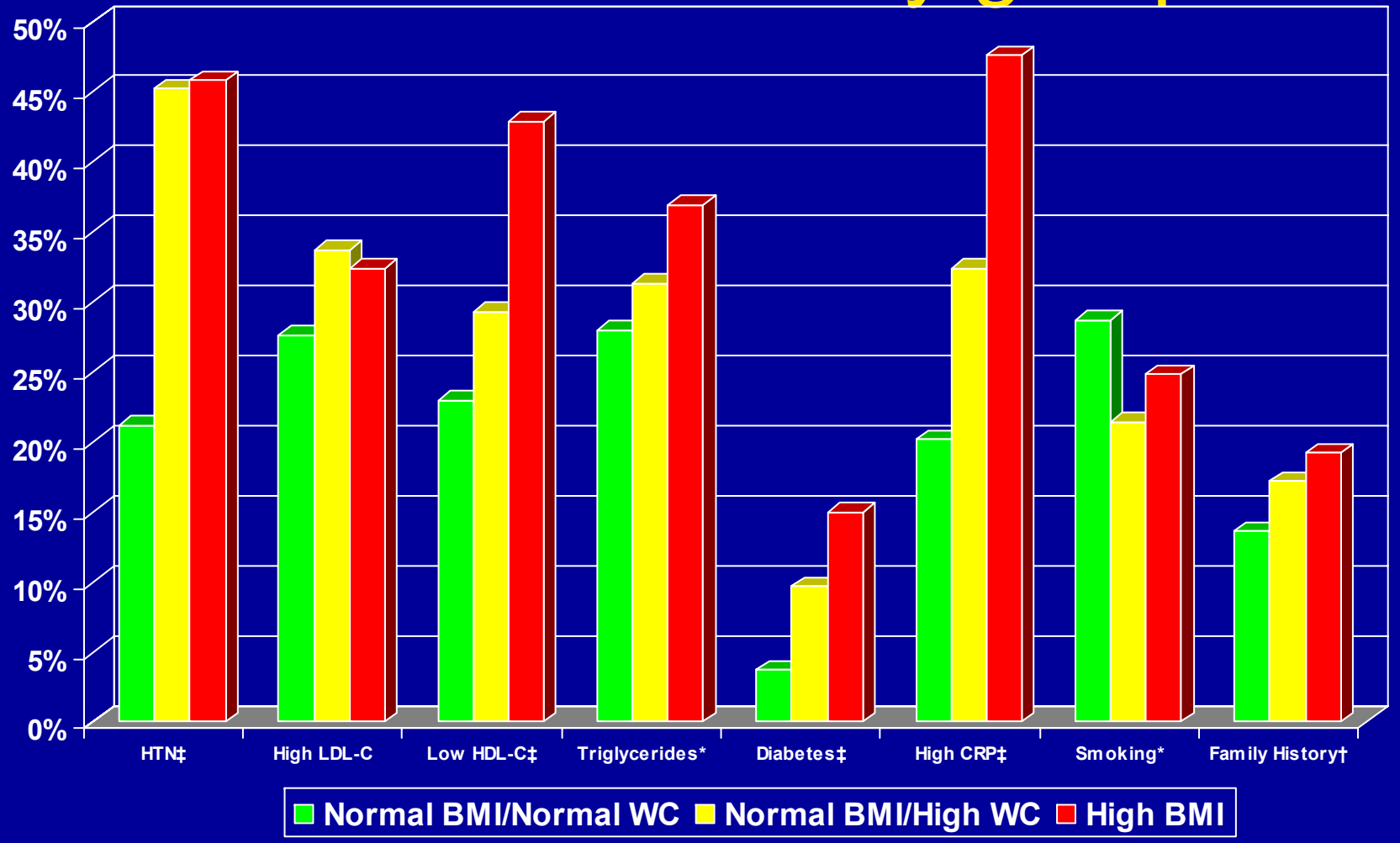
Prevalence of Abdominal Obesity by BMI Group and Ethnicity in females



Hispanic IDF uses >80cm WC cutpoint for females for abdominal obesity. p <0.001 across BMI groups for each ethnicity.

M4

Prevalence of risk factors within abdominal obesity groups



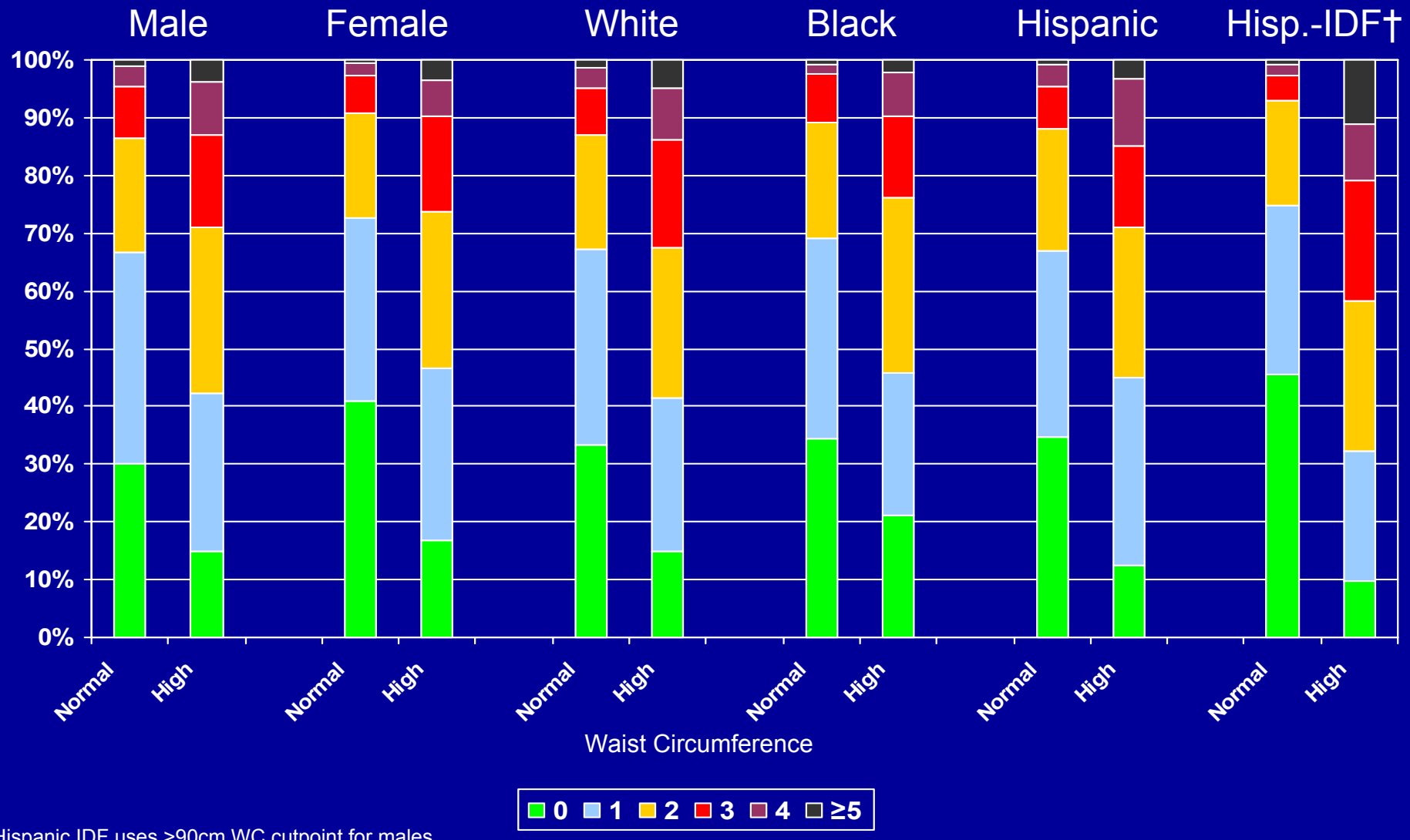
High BMI was defined as ≥30 kg/m^2; high WC was defined as >88cm in women and >102 cm in men. Of those with high BMI, only 4% were of normal waist circumference. Cardiometabolic risk factors include hypertension, elevated LDL-C, low HDL-C, elevated triglycerides, diabetes, elevated CRP, smoking and premature family history of heart attack. *p<0.05 †p<0.01 ‡p<0.001 across waist circumference groups. Sample sizes varied across risk factors.

Slide 13

M4 would be nice to see somewhere the % of those who have normal BMI who have normal WC; likewise, and more importantly, the % of people who have normal BMI but have high WC. I assume >90% of those with high BMI also have high WC, but it would be nice to see those numbers to justify why you didn't break out the high BMI category like you did for the normal BMI category (i.e., include high BMI/normal WC and high BMI/high WC)

Allison Martin Nguyen, 4/25/2008

Prevalence of cardiometabolic risk factors within abdominal obesity groups by gender and ethnicity



†Hispanic IDF uses >90cm WC cutpoint for males and >80cm for females for abdominal obesity.

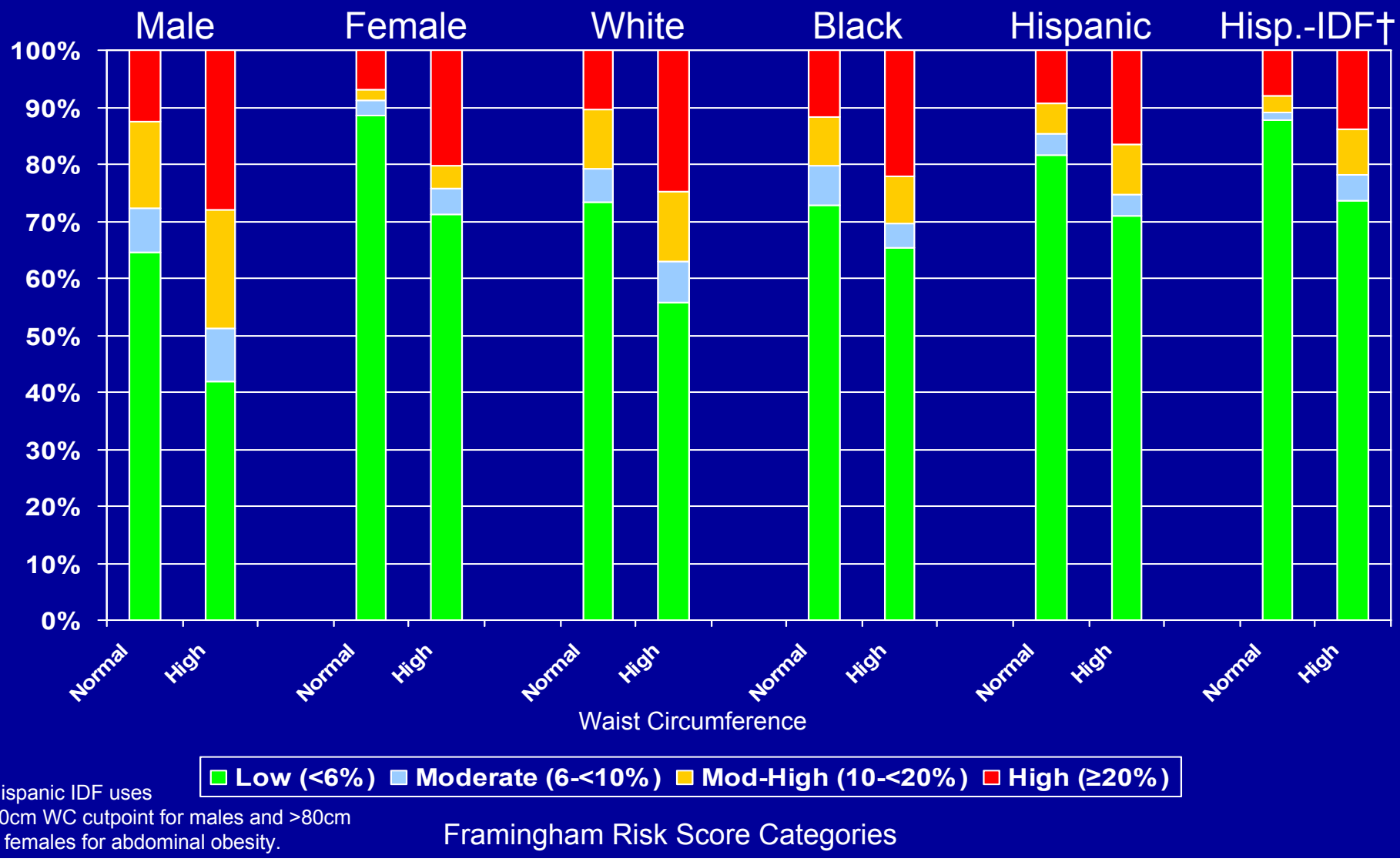
Mean number of cardiometabolic risk factors within BMI and abdominal obesity groups

	Males	Females
BMI Group (kg/m^2)		
<18.5	1.0	0.8
18.5 - <25.0	1.2	1.2
25.0 - <30.0	1.9	2.2
30.0 - <35.0	2.8	3.0
≥35.0	3.3	3.1
Waist Circumference		
Normal	1.3	1.0
High*	2.0	1.9

*High waist circumference defined as >88cm in women and >102 cm in men.

M1

Framingham risk score category within abdominal obesity groups by gender and ethnicity



†Hispanic IDF uses >90cm WC cutpoint for males and >80cm for females for abdominal obesity.

Slide 16

M1 need label for the legend below the x-axis...i.e. "Framingham Risk Score categories" or something like that.

Also, need a label directly below the x-axis that says "Waist Circumference category" or else add "WC" after the "normal" and "high" labels so it's clear these are WC categories. This same comment applies to slide 12 as well

Allison Martin Nguyen, 4/25/2008

M3

Logistic regression for multiple risk factors and high CHD risk status

	≥3 Risk Factors (unadjusted)	≥3 Risk Factors (adjusted*)	High CHD Risk
BMI Group (kg/m^2)			
<25	1.00	1.00	1.00
25 - <30	3.61 (2.89-4.50)	3.49 (2.78-4.38)	1.48 (1.13-1.95)
30 - <35	9.20 (7.17-11.8)	9.88 (7.62-12.8)	2.14 (1.57-2.93)
≥35	16.5 (12.2-22.3)	18.1 (13.2-24.8)	3.76 (2.65-5.33)
Waist Circumference			
Normal	1.00	1.00	1.00
High	10.2 (8.46-12.4)	9.98 (8.17-12.2)	2.23 (1.76-2.82)
Adjusted for BMI			
Normal	1.00	1.00	1.00
High	6.18 (4.84-7.91)	5.34 (4.10-6.96)	1.55 (1.15-2.10)

*adjusted for gender, ethnicity and age

Slide 17

M3 need to include this in the methods slides...details on how you did the logistic regression

Also, here you use the <25 as the reference group but in the other tables/charts you include lower BMIs. I actually prefer this since <25 is considered "normal"...the lower BMI groups seem to not add much and make the slides busier than needed (refer to slides 8, 10, 11, 13)

how is "high CHD risk" defined?...is this the top level of Framingham?...need to add to Methods section

Allison Martin Nguyen, 4/25/2008

Results Summary

- Abdominal obesity was present in 42.3% of men and 60.1% of women ($p < 0.001$).
- A substantial prevalence of abdominal obesity is even seen among persons classified as overweight by BMI, particularly among those with BMI 27.5-<30. Using lower recommended WC cutpoints for Hispanics identifies almost all as abdominally obese within this group.
- Most risk factors were 2-4 times more common in subjects with high WC when compared to subjects with normal WC.
- High CHD risk was more prevalent in those with high WC relative to those with normal WC in both men and women.

Discussion

- Those with high vs. normal WC were significantly more likely to have multiple cardiometabolic risk factors and high CHD risk.
- In a large study of 16,000 subjects, it was noted that WC showed the strongest correlation with other cardiovascular risk factors.[2]
- Another study reported that waist girth and waist hip ratio were associated with subclinical atherosclerosis.[3]

[2]Reeder BA, Senthilsevan A, Despres JP, et al. The association of cardiovascular disease risk factors with abdominal obesity in Canada. Canadian Heart Health Surveys Research Group. CMAJ 1997; 157 (suppl 1): S39-45.

[3]Lee CD, Jacobs DR Jr, Schreiner PJ, Iribarren C, Hankinson A. Abdominal obesity and coronary artey calcification in young adults: the Coronary Artery Risk Development in Young Adults (CARDIA) Study. Am J Clin Nutr 2007; 86: 48-54.

Strengths & Limitations

- Large, multiethnic survey representative of the US adult population.
- NHANES use of consistent protocol for measurement of BMI, WC and other risk factors.
- Inadequate ethnic information available to sub-classify Hispanic groups, or to examine these data among Asians or other ethnic groups.
- The cross-sectional nature of this survey precludes our ability to examine longitudinal associations with future development of diabetes, cardiovascular events, or mortality.

Conclusions

- Both obesity and abdominal obesity contribute to the high-risk of CHD; we note the association of WC with high-risk status is independent of BMI.
- Measurement of abdominal obesity is recommended to identify potentially high risk individuals not captured by BMI standards of obesity measurement.
- The substantial prevalence of abdominal obesity, particularly among Hispanic women, despite having a normal or borderline BMI, is alarming and emphasizes the importance of waist circumference measurements.