BODY COMPOSITION AND AGING IN POSTMENOPAUSAL WOMEN

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Introduction

- As life expectancy continues to rise, women are expected to spend more than a third of their lifetime beyond the menopausal transition

- Results from the WHI studies have made significant contributions to our knowledge of primary and secondary disease prevention in postmenopausal women

- Still many unanswered questions about the relationship between body composition and health outcomes in postmenopausal women

Objectives

(1) to present scientific research examining the relationships between body composition and health outcomes in post-menopausal women

(2) to foster discussion and dialogue about how we can leverage existing WHI data, or potentially collect additional data, to answer questions about the role of body composition in healthy aging

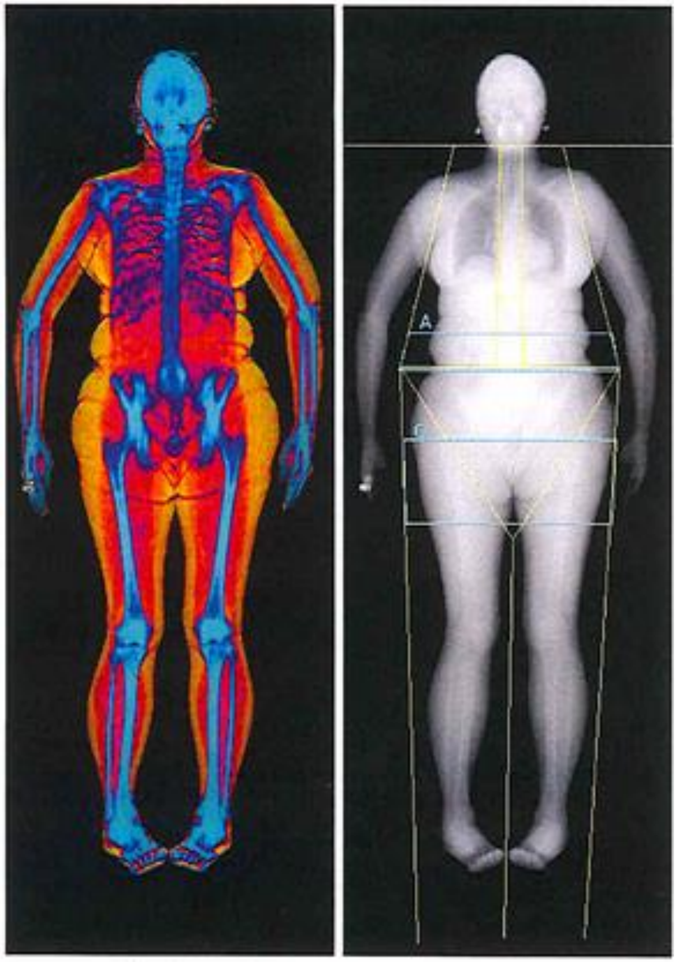
Body Composition

DXA sub-cohort

Total Cohort

- Body Mass Index (BMI)
- Waist circumference (WC)

- Total body fat
- Lean body mass
- Bone mineral density



WHI DXA sub-cohort

40 WHI Clinical Sites (CT & OS)

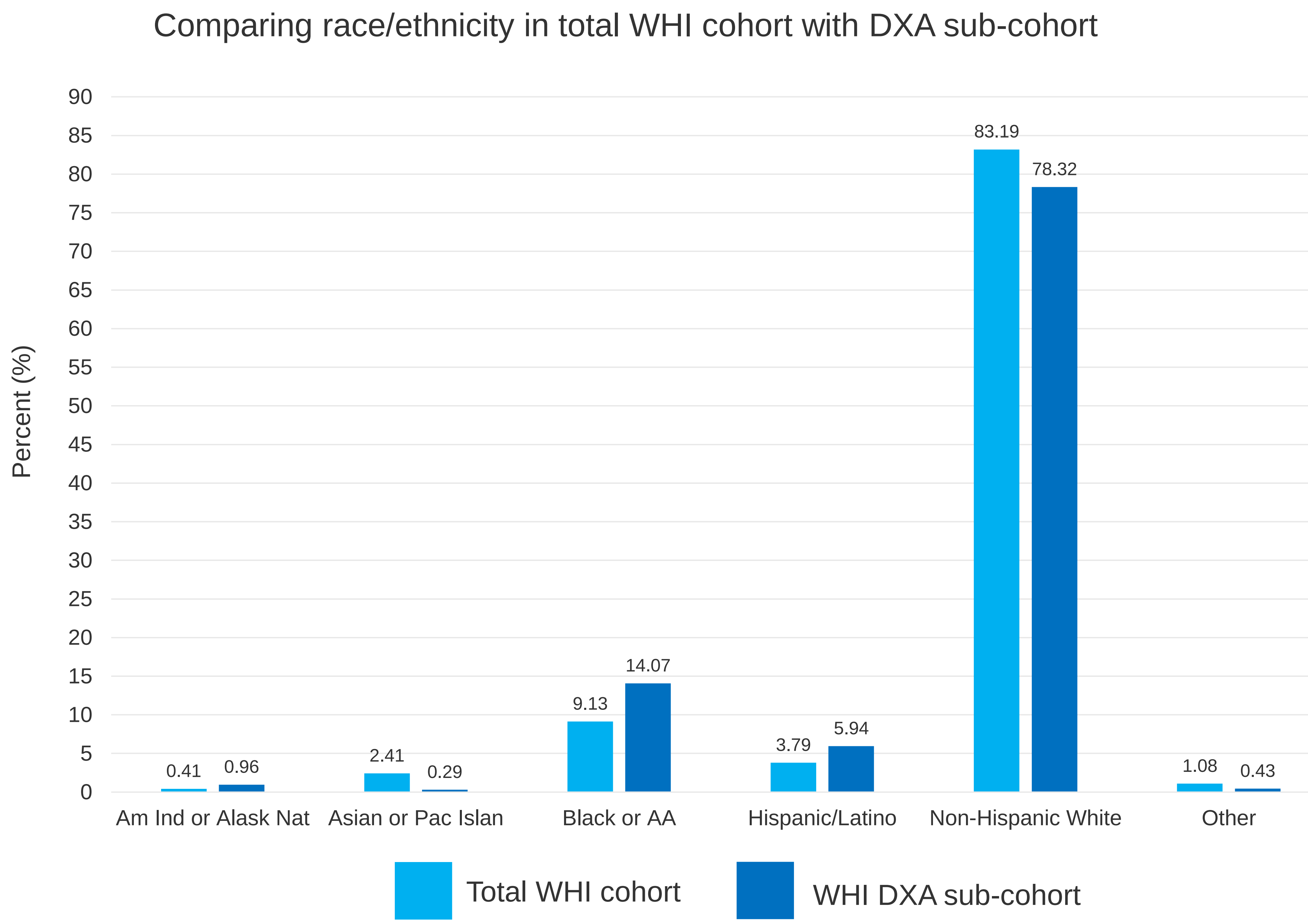
3 sites chosen for DXA sub-study

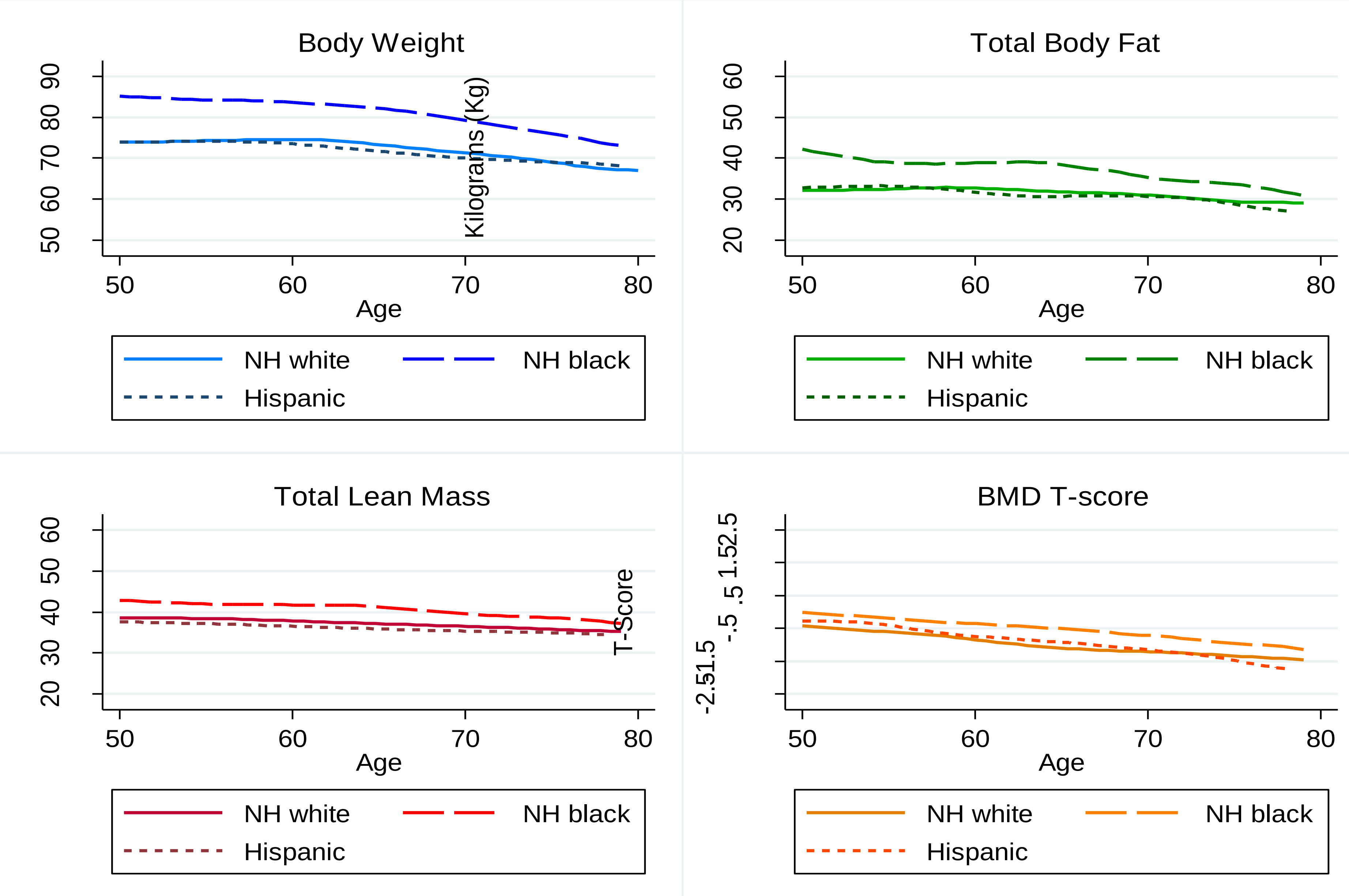
Pittsburgh n= 3590	Tucson-Phoenix n=3765	Birmingham n=3665

- Similar age distribution as WHI cohort
  - 50-59: WHI 33% vs. DXA 34%
  - 60-69: WHI 45% vs. DXA 43%
  - 70-79: WHI 22% vs DXA 23%

- Sites chosen because racially/ethnically diverse

- Longitudinal follow up
  - Baseline (n=10607) , year 3 (n=8939), year 6 (n=8239), year 9 (n=4595)


Comparing race/ethnicity in total WHI cohort with DXA sub-cohort
Percent (%)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
0.41
0.96
2.41
0.29
9.13
14.07
3.79
5.94
83.19
78.32
1.08
0.43
Am Ind or Alask Nat
Asian or Pac Islan
Black or AA
Hispanic/Latino
Non-Hispanic White
Other
Total WHI cohort
WHI DXA sub-cohort



Body Weight
Kilograms (Kg)
50 60 70 80 90
50
60
70
80
Age
NH white
NH black
Hispanic
Total Body Fat
20 30 40 50 60
50
60
70
80
Age
NH white
NH black
Hispanic
Total Lean Mass
T-Score
20 30 40 50 60
50
60
70
80
Age
NH white
NH black
Hispanic
BMD T-score
-2.51.5
-.5 .5 1.52.5
50
60
70
80
Age
NH white
NH black
Hispanic

Body composition and mortality

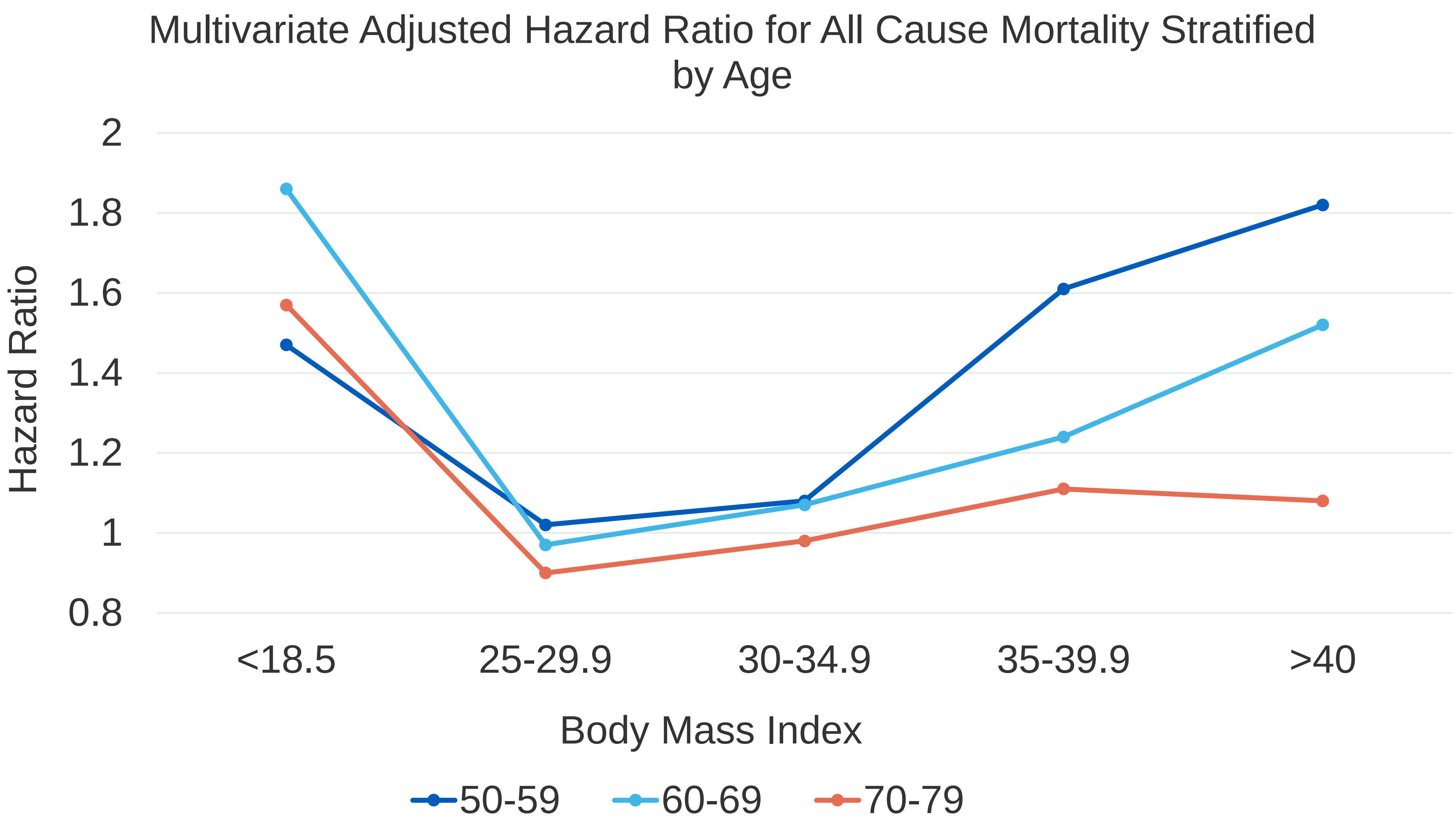
Relationship between BMI, waist circumference, total body fat, lean body mass has been examined by Jennifer Bea et al. (AJE 2015) and Zhao Chen (JAGS 2017)

- Bea et al.,
  - Evidence of “J shaped” relationship between BMI and mortality

BMI category (kg/m^2)	Adjusted HR
Underweight (<18.5)	1.09 (0.62, 1.89)
Normal weight (18.5-24.9)	--
Overweight (25-29.9)	1.03 (0.89, 1.18)
Obese I (30-34.9)	1.12 (0.95, 1.32)
Obese II (35-39.9)	1.45 (1.16, 1.82)
Obese III (>40)	1.84 (1.40, 2.43)

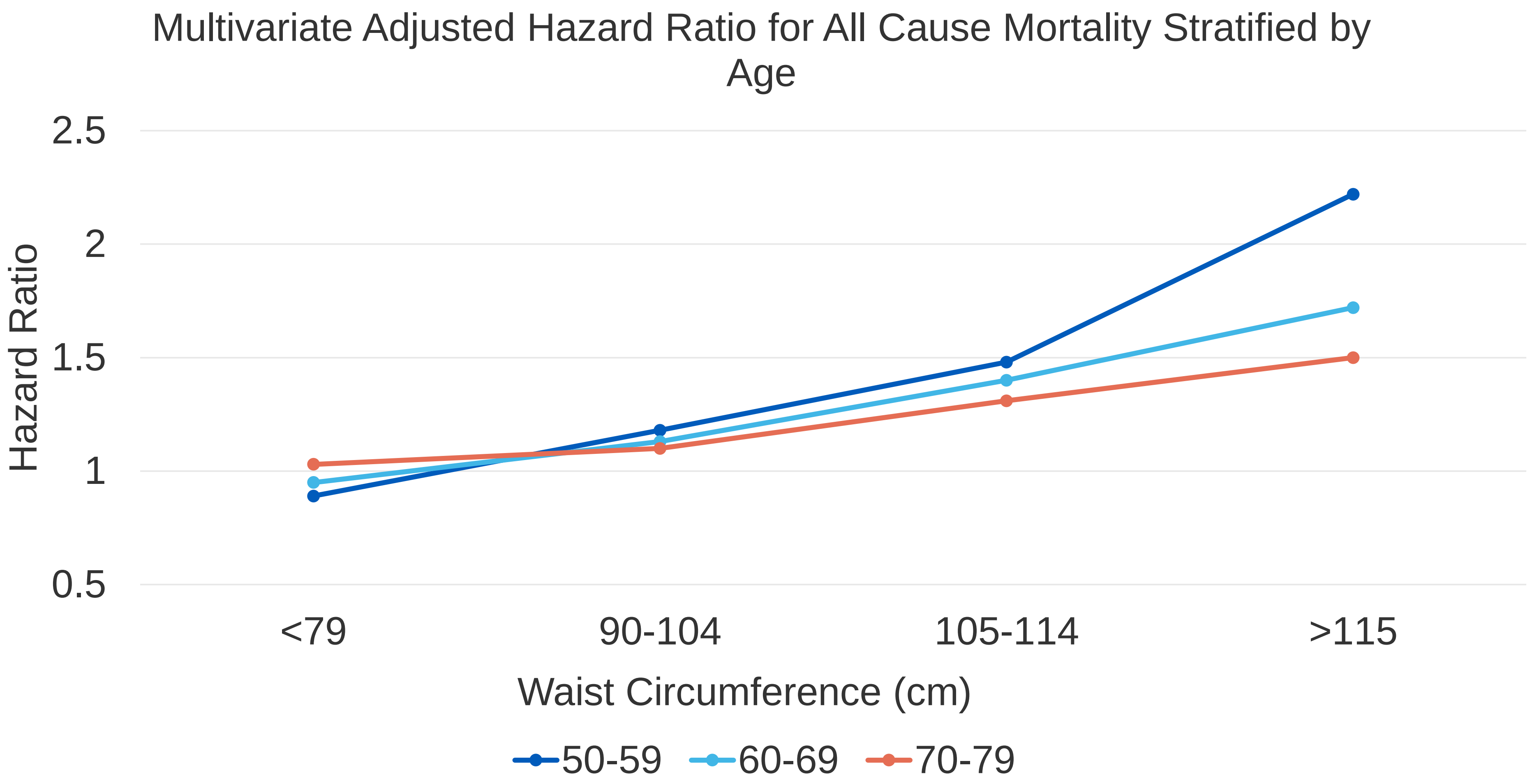
  - No evidence of increased mortality risk with increasing body fat or lean mass

BMI and mortality



Chen et al., 2017

Waist circumference and mortality



Chen et al., 2017

BMI-related misclassification

- BMI is the most frequently used metric to classify individuals according to their body weight status
- One concern about the use of BMI is that it may not accurately represent an individual’s true obesity status, resulting in exposure misclassification
- The validity of BMI-defined obesity may differ across age and race/ethnicity groups

Sensitivity and specificity of BMI

Comparing BMI defined obesity (BMI >30kg/m2) with obesity defined by percent body fat (40% BF)

	Non-Hispanic White			Non-Hispanic Black			Hispanic		
	50-59	60-69	70-79	50-59	60-69	70-79	50-59	60-69	70-79
Sensitivity (%)	**56.8** (52.9, 60.7)	**49.5** (45.1, 53.8)	**42.1** (36.2, 48.1)	**73.7** (65.5, 82.8)	**59.7** (55.1, 64.3)	**52.4** (45.9, 58.9)	**85.6** (75.6, 95.5)	**69.1** (63.5, 74.8)	**62.5** (55.0, 70.0)
Specificity (%)	**96.8** (95.6, 98.0)	**97.5** (96.7, 98.4)	**98.2** (97.5, 98.9)	**94.2** (91.9, 96.6)	**96.4** (95.0, 97.8)	**97.3** (96.2, 98.4)	**88.5** (81.3, 95.7)	**94.6** (92.5, 96.7)	**96.0** (94.1, 97.8)

(Banack et al., in press)

Quantitative bias analysis

- Used sensitivity and specificity to 'correct' misclassified obesity (BMI) using probabilistic bias analysis
- Estimated the obesity-mortality relationship (hazard ratio (95% CI))

	Non-Hispanic White		Non-Hispanic Black		Hispanic	
	Conventional estimate (95% CI)	Bias-adjusted Estimate (95% SI)	Conventional estimate (95% CI)	Bias-Adjusted Estimate (95% SI)	Conventional estimate (95% CI)	Bias-Adjusted Estimate (95% SI)
50-59	1.34 (1.22, 1.46)	1.82 (1.63, 2.01)	1.22 (1.05, 1.40)	1.67 (1.26, 2.23)	1.82 (1.31, 2.52)	3.00 (1.98, 4.34)
60-69	1.22 (1.11, 1.32)	1.63 (1.50, 1.76)	1.05 (0.91, 1.22)	1.94 (1.39, 2.81)	1.67 (1.26, 2.20)	2.01 (1.37, 2.76)
70-79	1.13 (1.07, 1.21)	1.24 (1.15, 1.33)	1.15 (0.87, 1.52)	1.54 (1.01, 2.22)	0.97 (0.66, 1.41)	1.47 (0.95,2.08)

(Banack et al., in press)

Many unanswered questions….

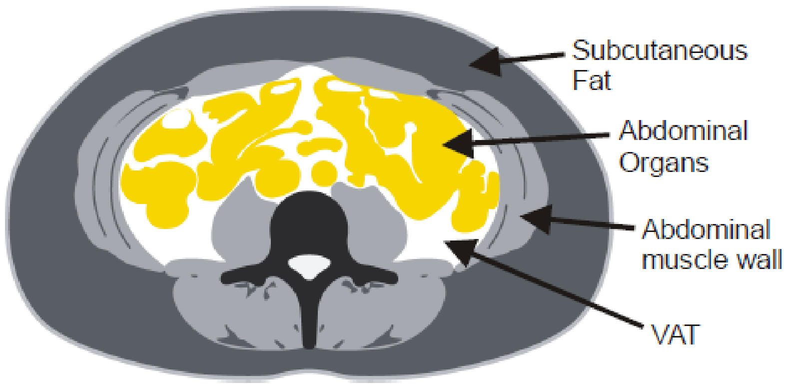
- Is it time to re-evaluate BMI cutpoints in postmenopausal women? Or time to move away from cutpoints altogether?

- Should cutpoints be based on the relationship between:
  - BMI and adiposity
  - BMI and health outcomes (i.e., for risk prediction)

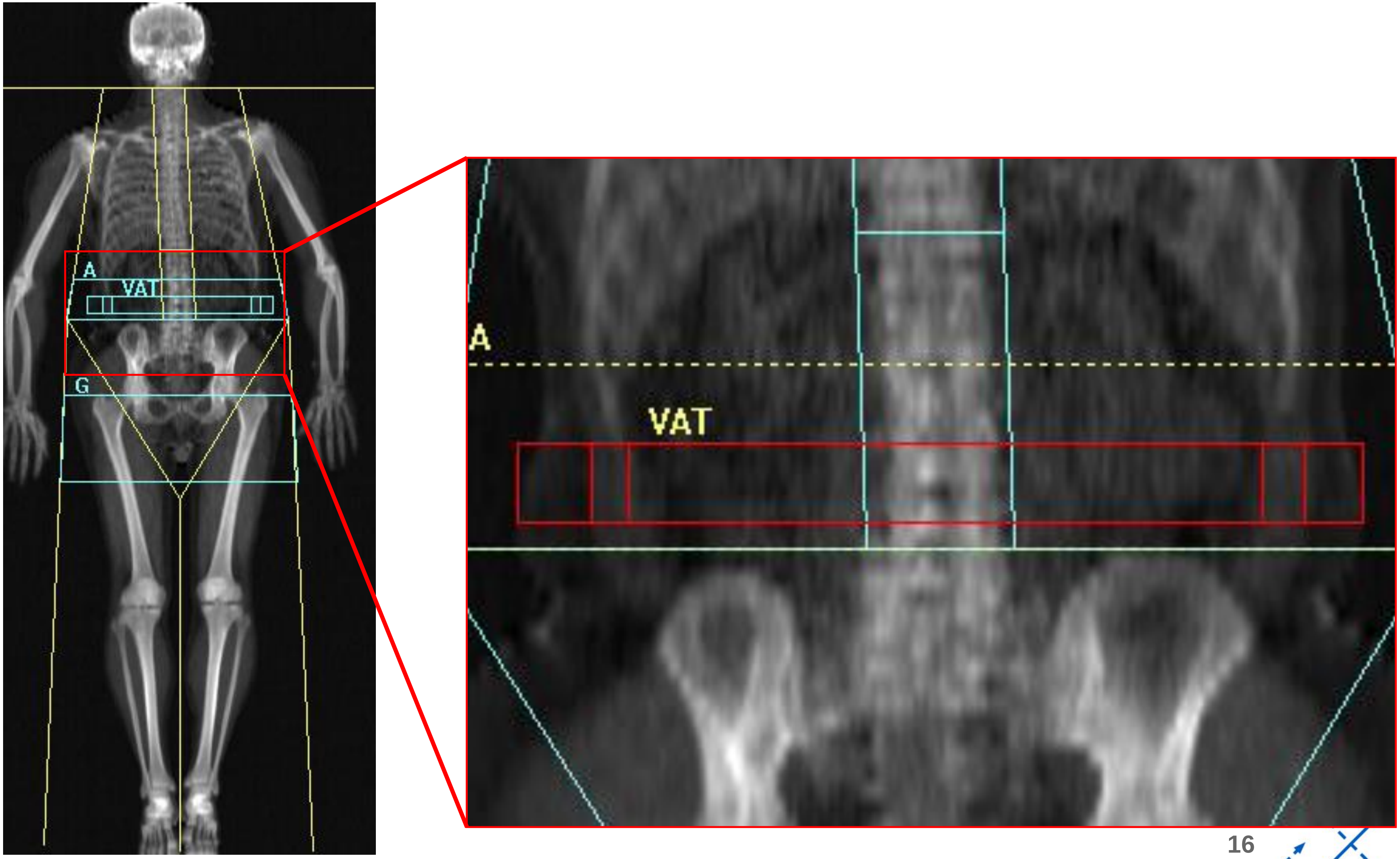
- Would considering waist circumference measures within BMI categories add valuable information for risk prediction?

Using DXA scans to estimate abdominal fat

Andrew Odegaard (UC Irvine) is working on a project using results from the WHI DXA scans to estimate visceral abdominal fat (R01, Co-I: Bea & Chen, Arizona)



Hologic Apex Software



Looking ahead

- How can we better use this resource?
    - Cross sectional analyses vs. longitudinal
    - SIG collaborations
- Should we collect additional body composition data from the participants?
    - Building on current resources
    - Return visit to WHI centers? Body composition scan at non-WHI clinic?
    - Exploring options other than DXA (e.g., low dose CT, MRI)
- Pooled cohort analyses (e.g., MrOs. Health ABC)
    - MrOS (n=5994) scans baseline, year 5, 7,14
    - Health ABC (n=3075) scans annually years 1-6, year 8, 10

We have a unique and underutilized resource that has tremendous potential to advance science

We need to do more with it!

Thank you!!

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WOMEN'S HEALTH INITIATIVE

Banting Postdoctoral Fellowships

NIH National Heart, Lung, and Blood Institute