ARIC Manuscript Proposal # 1589

PC Reviewed: 12/8/09  Status: A  Priority: 2
SC Reviewed: _________  Status: _____  Priority: ____

1.a. Full Title: Ethnic differences in body composition given the same body mass index level

b. Abbreviated Title (Length 26 characters): Body composition differences

2. Writing Group:
Writing group members:
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  June Stevens
  Eva Katz
  Jianwen Cai

I, the first author, confirm that all the coauthors have given their approval for this manuscript proposal. _KPT___ [please confirm with your initials electronically or in writing]

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ARIC author to be contacted if there are questions about the manuscript and the first author does not respond or cannot be located (this must be an ARIC investigator).
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3. Timeline: Work will begin immediately. This proposal is a continuation of the ethnic (White, African American and Chinese) comparison being conducted by our research group. This work is part of Dr. Truesdale’s re-entry supplement funded by NIDDK.
4. **Rationale:**

Numerous studies have shown that body mass index (BMI) and body fat (composition) is associated with increase risk for an abnormal metabolic profile (e.g. hypertension, diabetes, dyslipidemia) and cardiovascular disease (CVD). The increase risk has been shown across gender and ethnicities; however, there is some evidence of gender and ethnic differences in the risks.

Some researchers have advocated lower cut points for overweight and obesity in Asian populations. The main two arguments for the lower cut points are 1) higher disease burden among Asians at lower BMIs, and 2) higher percent body fat among Asians compared to Caucasians at the same BMI level. The majority of the published manuscripts cited to support argument #1 are cross-sectional and do not include a Caucasian comparison group. Our research group (led by Dr. June Stevens) published a manuscript in 2008 (1) using data from the ARIC and People’s Republic of China (PRC) studies in order to compare incident diabetes and hypertension across the three ethnic groups (American White, American Blacks and Chinese Asians). We found larger associations with BMI in Chinese compared to Whites and American Blacks for hypertension. Chinese Asians also had a larger association with BMI compared to American Whites but similar to American Blacks. We are currently comparing incident dyslipidemia and mortality across these three ethnic groups.

The second main argument for lower cut points is the differences in body fat or composition across ethnicities. Researchers have shown that compared to Caucasians, Asians have higher amounts of visceral adipose tissue (VAT) (2, 3) but African Americans have less (4-7). This does not take into account differences in the BMI distribution in these ethnic groups. In the ARIC and PRC studies we know that the BMI distribution in these three ethnic groups varied with Chinese Asians being thinner than American Whites and American Blacks (1). Asians have less skeletal muscle mass, low bone density and excess fat for a given BMI while African Americans have more skeletal mass and bone mineral content (8).

Deurenberg et al conducted a meta-analysis using 32 studies and compared seven ethnic groups including Caucasians, American Blacks and Chinese (9). They found for the same level of percent body fat, age and gender, American Blacks BMI had 1.3 kg/m² higher BMI and Chinese had 1.9 kg/m² lower BMI compared to Caucasians.

Wu et al compared Caucasians, African Americans, Asian Americans and Hispanic Americans men and women living in New York (10). Weight and height were measured and DXA was used to determine truncal fat, total body fat and percent body fat. They found among men that Asians had a higher percent body fat than the other three ethnic groups, African Americans had lower percent body fat than Caucasians or Hispanics. In women, Asians had a higher percent body fat than Caucasians and African Americans and Hispanics had higher percent body fat than African Americans and Caucasians. It is...
important to note the body composition of Chinese adults living in China may be different than Chinese adults living in the United States (9).

Differences in body composition have been examined between African Americans and Whites. Stevens et al used data from the Charleston heart study to show that after adjusting for age, smoking and BMI, African American women had smaller waist circumference (88.9 cm) compared to White women (92.2 cm) (11). Prior to adjusting for BMI, African American women were found to have larger waist circumference. This was due to the greater mean BMI in African American women compared to White women. Duncan et al showed using baseline ARIC data that African Americans men and women had smaller waist-to-hip ratios compared to Whites after adjusting for BMI, age, field center, educational attainment, smoking, percent weight gained after age 25, physical activity and alcohol consumption (12). This relationship was not observed in women when the models were only adjusted for age and center. Neither study examined longitudinal changes in anthropometry. In addition, we know of no studies that compared longitudinal changes in body composition and weight change in Chinese living in China and Americans.

In addition to the ARIC study data, we will use data from the People’s Republic of China (PRC) Study. The PRC Study is a prospective, observational study of cardiovascular disease in China. This was a joint research program sponsored by the NIH involving the People’s Republic of China and the United States of America under the USA-PRC Cooperation in Science and Technology to conduct prospective studies on CVD and its risk factors. In 1983–1984, baseline data were collected from 13,210 Chinese men and women aged 24 – 84 years. Participants were from urban and rural regions of Beijing (Northern China) and Guangzhou (Southern China). Follow-up examinations were in 1987-88 and 1993-94. There were 6,575 subjects were between the ages of 45 to 64 at baseline (3,286 Chinese women and 3,289 Chinese men).

The Collaborative Studies Coordinating Center (CSCC) at the University of North Carolina, Chapel Hill served as the coordinating center for both the PRC and ARIC studies. They provided training manuals and protocols for data collection and were responsible for data processing and review for both studies. Informed consent was obtained from each participant at each examination. Many of the data collection methods were similar among the PRC and ARIC studies.

5. Main Hypothesis/Study Questions:
- Examine and compare the mean waist circumference, hip circumference and waist-to-hip ratio at different body mass index levels in Chinese Asians, American Whites and American Blacks. We hypothesize that given the same BMI, Chinese Asians and American Blacks will have smaller waist circumference, hip circumference and waist-to-hip ratio than American Whites. After also adjusting for trunk height and leg length, we hypothesize the three ethnic groups will have similar waist circumference, hip circumference and waist-to-hip ratio.
- Examine and compare longitudinal changes in waist circumference and hip circumference controlling for changes in body weight in Chinese Asians, American
Whites and American Blacks. We hypothesize that after controlling for changes in body weight, Chinese Asians will have larger changes in waist circumference but smaller changes in hip circumference than White Americans. Whereas, African Americans will have smaller changes in waist circumference but larger changes in hip circumference than White Americans.

6. Design and analysis (study design, inclusion/exclusion, outcome and other variables of interest with specific reference to the time of their collection, summary of data analysis, and any anticipated methodologic limitations or challenges if present).

We will use data from the ARIC visits 1-4

<table>
<thead>
<tr>
<th>Identification information</th>
<th>Demographics</th>
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<tbody>
<tr>
<td>Patient ID</td>
<td>Gender</td>
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<tr>
<td>Date of visit</td>
<td>Ethnicity</td>
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<td>Education</td>
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<tr>
<th>Anthropometrics</th>
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<td>Weight</td>
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<td>Weight at age 25</td>
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<tr>
<td>Height</td>
<td>Physical activity</td>
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<tr>
<td>Waist circumference</td>
<td>Medication usage</td>
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<td>Hip circumference</td>
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<tr>
<td>Waist-to-hip ratio</td>
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<td>Sitting height</td>
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**Outcome:** The outcomes for the first aim of this proposal are continuous waist circumference, hip circumference and waist to hip ratio. For the second aim, the outcomes are continuous change in waist circumference, hip circumference and waist-to-hip ratio. For the second aim, we will examine 3 and 9 year changes in body composition.

**Exposures:** The main exposure is BMI for aim 1 and weight change for aim 2.

**Covariates:** The potential covariates include field center, age, physical activity, education level, smoking status, alcoholic beverage consumption, leg length and trunk height.

**Exclusions:**
- Ethnicity other than White or African-American
- African-Americans in Minnesota or Maryland
- Missing anthropometrics at baseline
- Missing covariates
**Brief data analysis plan:** We will examine race-gender differences in waist circumference, hip circumference and waist-to-hip ratio before and after adjusting for BMI and other covariates using multiple linear regression (PROC GLM or GENMOD in SAS). We will also examine the differences in waist circumference, hip circumference and waist-to-hip ratio within small BMI increments (~2 units). The Wald test will be used test for race and gender differences.

We will use similar analysis plans to examine race-gender differences in 3 and 9 year changes in waist circumference, hip circumference and waist-to-hip ratio after adjusting for changes in BMI (weight).

Waist circumference was measured at different locations in the ARIC and PRC cohorts. To our knowledge, there is no published conversion equation to correct for the potential measurement bias. However, we conducted an anthropometric calibration study in 104 White and African American men and women aged 45-64 in order to develop a prediction equation to convert waist at the umbilicus to waist at the midpoint. The participants were recruited also based on self-reported weight and height to ensure that the distribution of weight status will be similar to the weight status distribution found in the ARIC cohort at baseline.

7.a. Will the data be used for non-CVD analysis in this manuscript?  __x__ Yes  ____ No

b. If Yes, is the author aware that the file ICTDER03 must be used to exclude persons with a value RES_OTH = “CVD Research” for non-DNA analysis, and for DNA analysis RES_DNA = “CVD Research” would be used?  __x__ Yes  ____ No

(This file ICTDER03 has been distributed to ARIC PIs, and contains the responses to consent updates related to stored sample use for research.)

8.a. Will the DNA data be used in this manuscript?  ____ Yes  __x__ No

8.b. If yes, is the author aware that either DNA data distributed by the Coordinating Center must be used, or the file ICTDER03 must be used to exclude those with value RES_DNA = “No use/storage DNA”?  ____ Yes  ____ No

9. The lead author of this manuscript proposal has reviewed the list of existing ARIC Study manuscript proposals and has found no overlap between this proposal and previously approved manuscript proposals either published or still in active status. ARIC Investigators have access to the publications lists under the Study Members Area of the web site at: [http://www.cscc.unc.edu/ARIC/search.php](http://www.cscc.unc.edu/ARIC/search.php)

  __x__ Yes  _______ No
10. What are the most related manuscript proposals in ARIC (authors are encouraged to contact lead authors of these proposals for comments on the new proposal or collaboration)?

<table>
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<th>MS #</th>
<th>First Author</th>
<th>Title</th>
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<tr>
<td>59A</td>
<td>Duncan, B.</td>
<td>Correlates of body fat distribution - variation across categories of race, sex and body mass in the Atherosclerosis Risk in Communities Study</td>
</tr>
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* This study used only baseline data.

11. a. Is this manuscript proposal associated with any ARIC ancillary studies or use any ancillary study data?  ____ Yes  ____ No

11.b. If yes, is the proposal

  ____ A. primarily the result of an ancillary study (list number* _________)
  ____ B. primarily based on ARIC data with ancillary data playing a minor role (usually control variables; list number(s)* _________ _________ _________)

*ancillary studies are listed by number at http://www.cscc.unc.edu/aric/forms/

12. Manuscript preparation is expected to be completed in one to three years. If a manuscript is not submitted for ARIC review at the end of the 3-years from the date of the approval, the manuscript proposal will expire.


