

**Contributors to the Black-White Disparity in Stroke**  
*... including an excursion upstream to disparities in hypertension*

**Satellite Conference and Live Webcast**  
**Tuesday, February 27, 2018**  
**10:00 – 12:00 p.m. Central Time**

Produced by the Alabama Department of Public Health  
 Distance Learning and Telehealth Division

**Faculty**

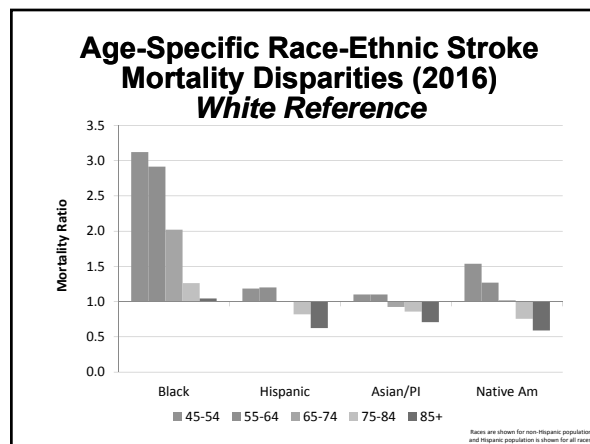
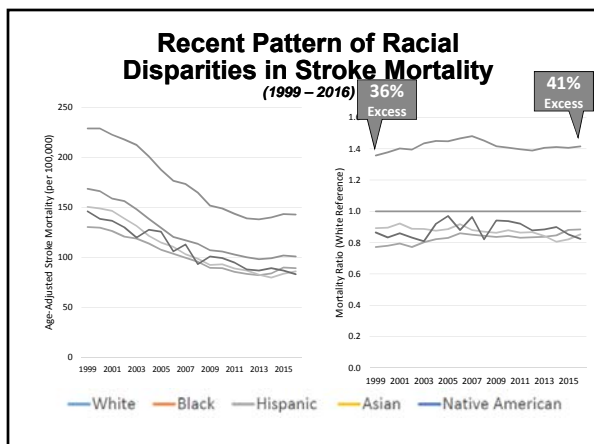
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**University of Alabama at Birmingham**

**Stroke in the US**

- Stroke imposes an immense public health burden, in the US:
  - 795,000 people experience a stroke each year
  - Larger than the population of Vermont or North Dakota
  - 7.2 million are living with the impact of a stroke

**Stroke in the US**

- Larger than the population of Massachusetts, Arizona, or Indiana
- While this is bad ... it is even worse that this burden falls harder on some than others



### Summary of Race / Ethnic Disparities in Stroke Mortality

- Good news ...
  - Stroke mortality is plummeting for all race-ethnic groups ... over 18 years:
    - 40% for whites
    - 38% for blacks
    - 31% for Hispanics
    - 43% for Asian and Native Americans
- *Falling from the 3<sup>rd</sup> to 5<sup>th</sup> leading cause of death between 2010 and 2016*

### Summary of Race/Ethnic Disparities in Stroke Mortality

- Bad news ...
  - On average, stroke mortality is about 42% higher in blacks than whites
    - ... and between the ages of 45-64, it is 200% to 300% higher
  - Decline is not as rapid for blacks as whites ... so black:white disparities are increasing
    - ... disparity increased 16% in 18 years

### Summary of Race/Ethnic Disparities in Stroke Mortality

- More good news (if you are Native American or Asian) ...
  - Stroke mortality is lower and falling faster than whites
- In 2016, 11% of stroke deaths in whites were below age 65
- ... compared to 28% of stroke deaths in blacks

### Causes of the Excess Stroke Mortality Among U.S. Blacks

- Two most common hypothesized causes for higher incidence:
  - Higher prevalence of hypertension and diabetes among blacks
  - Lower SES among blacks
- But there few data to actually support these hypotheses

### Looking under the Street Light?

- So ... there is approximately a 300% increased stroke risk in “young” blacks
- Everyone knows the prevalence of hypertension and diabetes in blacks is hugely higher than whites
- For example, in REGARDS
  - 71% of blacks are hypertensive - 51% of whites
  - 29% of blacks of diabetic - 15% of whites

### Looking under the Street Light?

- Framingham and CHS have shown hypertension and diabetes approximately double the risk of stroke
- ... but difference in the prevalences should be expected to be only a 71% increased risk
 
$$1.0 + (0.2 \times 2.0) + (0.15 \times 2.0) = 1.7$$

### Looking under the Street Light?

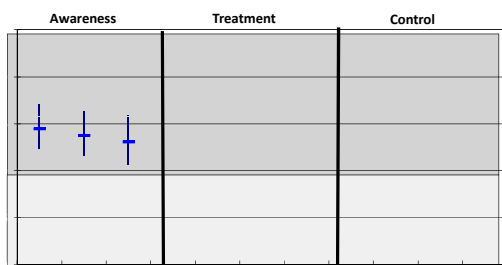
- So ... there is approximately a 300% increased stroke risk in “young” blacks
- ... but difference in the prevalences should be expected to be only a 71% increased risk
  - But what accounts for the rest of the disparity?

### Looking Just a Little Further From the Street Light

- Could lower average SES of blacks contribute to less awareness and lower treatment levels?
- The hypothesis of contributions of awareness-treatment-control have been examined in REGARDS and NHANES ... with nearly identical findings

#### Black/White Differences in REGARDS Awareness-Treatment-Control of Hypertension

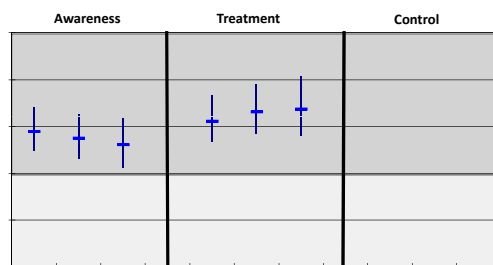
Estimated Odds Ratios in Incremental Models



Howard et al. Stroke 2006:1171-1178.

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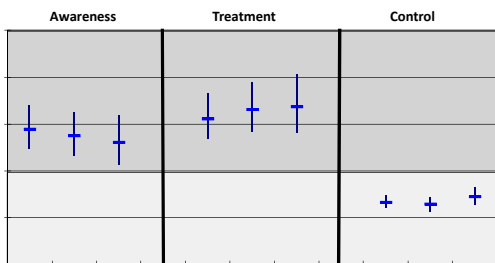
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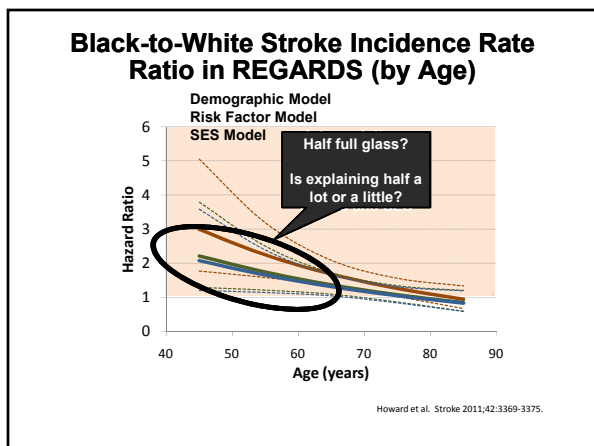
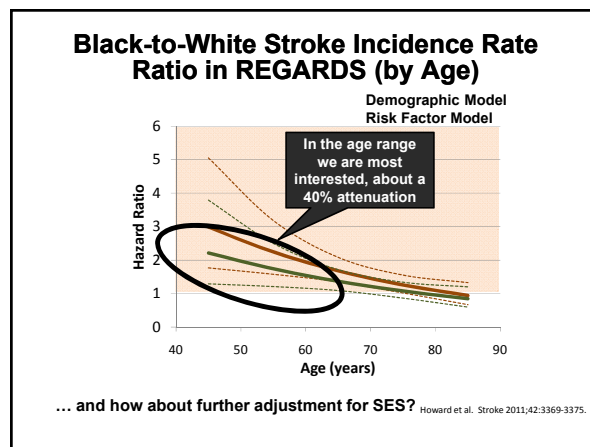
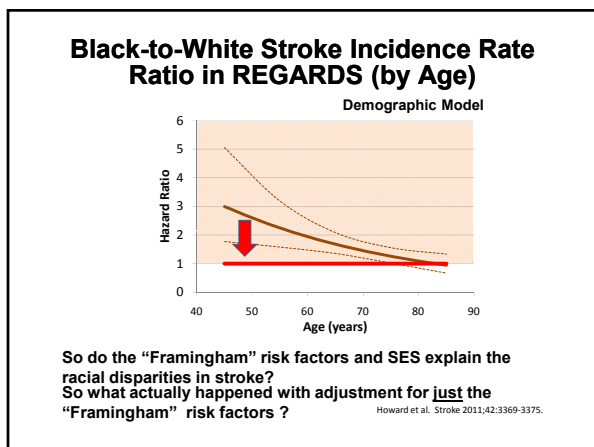
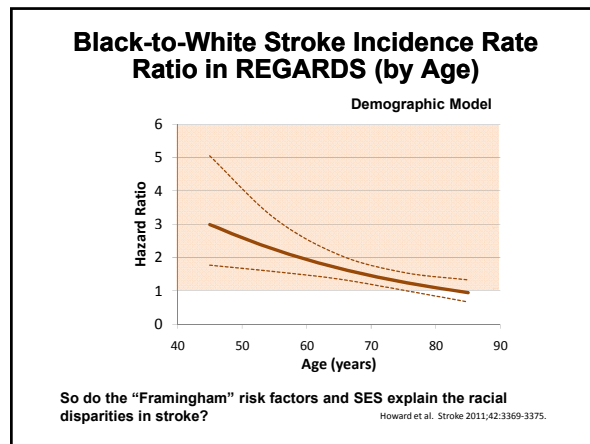
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### So does this Lack of Control Explain the Difference in Stroke Mortality?

- So ... even among treated hypertensives, blacks have average SBP levels about 5 mmHg greater than whites
- Could this (or other “traditional” risk factors) account for differences in stroke incidence?
  - Woops ... we haven’t really talked about disparities in incidence yet!

**So does this Lack of Control Explain the Difference in Stroke Mortality?**

- Both NHANES and REGARDS have examined this question ... again with very similar findings
  - Remember at age 45 blacks have 3x risk of stroke mortality, reduced to no difference at age 85
  - How about stroke incidence?



**Approaches to Reduce Racial Disparities in Stroke?**

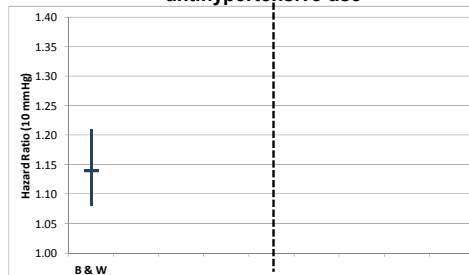
- So what can be done to address the half-full portion?
  - For most risk factors (for example, hypertension and diabetes) we are examining prevalent disease (present/absent) ... not effectiveness of treatment
  - This implies that risk factor treatment is not the key ... but risk factor prevention

### Approaches to Reduce Racial Disparities in Stroke?

- Suggesting that focus of “racial disparities in stroke” research should shift to “racial disparities in risk factor prevention” research
- ... and what is happening with the half empty portion?
  - Differential susceptibility to risk factors?
  - Residual confounding?
  - Impact of “non-traditional” risk factors?
  - Measurement error?

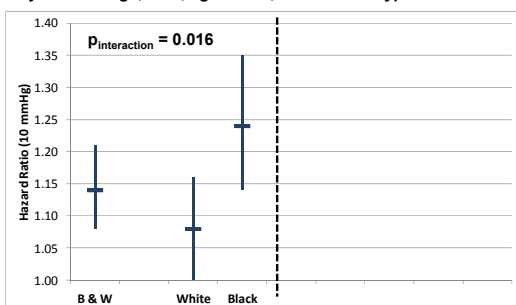
### Differential impact of SBP per 10 mmHg?

Adjusted for age, race, age x race, sex and antihypertensive use



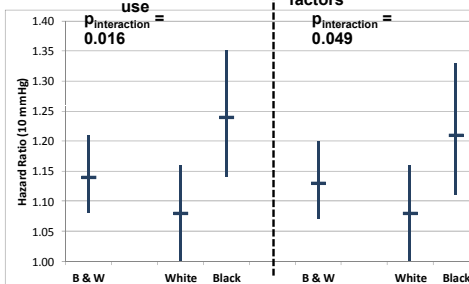
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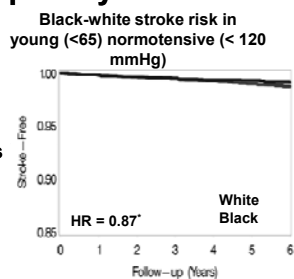
### Differential impact of SBP per 10 mmHg?

Adjusted for age, race, age x race, sex and antihypertensive use + Adjustments for risk factors



### Implications of Differential Susceptibility?

- Many interactions between race, age, and SBP
- Consider black-white stroke risk differences within strata by age and SBP

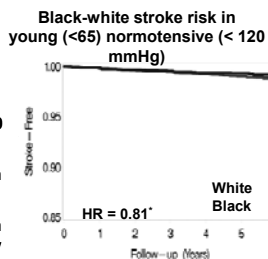


\* Adjusted for sex, diabetes, smoking, heart disease, AF, LVH

\* Black-to-white hazard ratio after adjustment for sex and hypertension medications

### Implications of Differential Susceptibility?

- Age: <65, 65-74, 75+
- SBP:
  - o Normotensive (<120 mmHg)
  - o Prehypertension (120 - 139 mmHg)
  - o Stage 1 hypertension (140 - 159 mmHg)
  - o Stage 2 hypertension (160+ mmHg) too few white participants, not presented



\* Adjusted for sex, diabetes, smoking, heart disease, AF, LVH

\* Black-to-white hazard ratio after adjustment for sex and hypertension medications

### Implications of Differential Susceptibility?

- Remember ... the excess black stroke risk is at young ages (< 65 years mainly)

Black-white stroke risk in young (<65) normotensive (< 120 mmHg)

HR = 0.81\*

\*Adjusted for sex, diabetes, smoking, heart disease, AF, LVH

\* Black-to-white hazard ratio after adjustment for sex and hypertension medications

### Black-white stroke risk within age-SBP strata

	Normotensive (< 120 mmHg)	Prehypertension (120 – 139 mmHg)	Stage 1 Hypertension (140 – 159 mmHg)		
Age <65	0.87	1.38	2.38	Suggests differential susceptibility could be a key to racial disparities in stroke	
Age 65-74	1.10	1.24	1.43		Black White
Age 75+	0.90	0.95	1.61		All hazard ratios are adjusted for sex and antihypertensive medication use

Howard, et al. JAMA Intern Med 2013;173:46-51

### ... so SBP and Racial Disparities in Stroke

- Strike 1: African Americans are more likely to be hypertensive
  - 51% of whites versus 71% of AAs in REGARDS
  - Everyone knows this
- Strike 2: African Americans are more likely to know they are hypertensive, more likely to be treated, but less likely to be controlled

### ... so SBP and Racial Disparities in Stroke

- B/W odds ratio for control ≈ 0.70
- Fewer people know this
- Strike 3: Once blood pressure is not controlled, it is much worse for AAs than whites
  - Three times as bad!

### ... and Returning to Contributors to The Half-empty Portion

- ... and what is happening with the half empty portion?
  - Differential susceptibility to risk factors?
  - Residual confounding?
  - Impact of “non-traditional” risk factors?
  - Measurement error?

### Could Racial Differences in Diet be Contributing to Racial Disparity Stroke?

**Dietary Patterns Are Associated With Incident Stroke and Contribute to Excess Risk of Stroke in Black Americans**

Suzanne E. Judd, PhD; Orlando M. Gutiérrez, MD; PK. Newby, PhD; George Howard, DPH; Virginia J. Howard, PhD; Julie L. Lischer, PhD; Brent M. Kivela, MD; James M. Shikany, DPH

**Background and Purpose**—Black Americans and residents of the Southeastern United States are at increased risk of stroke. Diet is one of many potential factors proposed that might explain these racial and regional disparities.

**Methods**—Between 2003 and 2007, the Reasons for Geographic and Racial Differences in Stroke (REGARDS) cohort study enrolled 30,239 black and white Americans aged ≥55 years. Dietary patterns were derived using factor analysis and foods from food frequency data. Incident strokes were adjudicated using medical records by a team of physicians. Cox proportional hazards models were used to examine risk of stroke.

**Results**—During 5.7 years, 490 incident strokes were observed. In a multivariable-adjusted analysis, greater adherence to the plant-based pattern was associated with lower stroke risk (hazard ratio, 0.71; 95% confidence interval, 0.56-0.91;  $P < .0005$ ). This association was attenuated after addition of income, education, total energy intake, smoking, and sedentary behavior. Participants with a higher adherence to the Southern pattern experienced a 98% increased risk of stroke (hazard ratio, 1.29; 95% confidence interval, 1.05, 1.58), with a significant ( $P = 0.009$ ) trend across quartiles. Including Southern pattern in the model mediated the black-white risk of stroke by 62%.

**Conclusions**—These data suggest that adherence to a Southern style diet may increase the risk of stroke, whereas adherence to a more plant-based diet may reduce stroke risk. Given the consistency of finding a dietary effect on stroke risk across studies, discussing nutrition patterns during risk screening may be an important step in reducing stroke. (Stroke. 2013;44:3308-3311.)

Key Words: continental population groups ■ dietary habits ■ epidemiology ■ ethnicity ■ stroke

### Could Racial Differences in Diet be Contributing to Racial Disparity Stroke?

- Food frequency data were available on 20,251 participants
- Factor analysis was used to cluster observed eating patterns in the US
- 490 stroke occurred during follow-up of these participants
- Proportional hazards analysis related “membership” in an eating pattern with stroke risk

### So what were the Eating Patterns?

- Pattern #1
  - Beans
  - Chinese food
  - Mexican dishes
  - Fried potatoes
  - Mixed dishes with meat
  - → Convenience
- Pasta dishes
- Potatoes
- Pizza
- Red meat
- Refined grains
- Salty snacks
- Soup
- Mixed dishes

### So what were the Eating Patterns?

- Pattern #2
  - Beans
  - Whole grain bread
  - Fruit
  - Fish
  - Poultry
  - Salad dressings
  - → *Healthy*
- Soup
- Cruciferous vegs
- Dark yellow vegs
- Leafy green vegs
- Tomatoes
- Other vegs

### So what were the Eating Patterns?

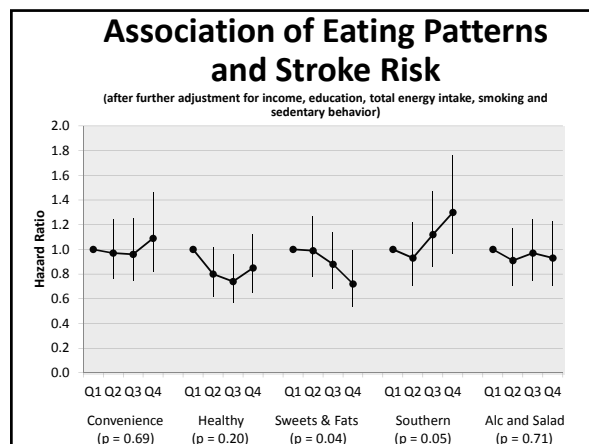
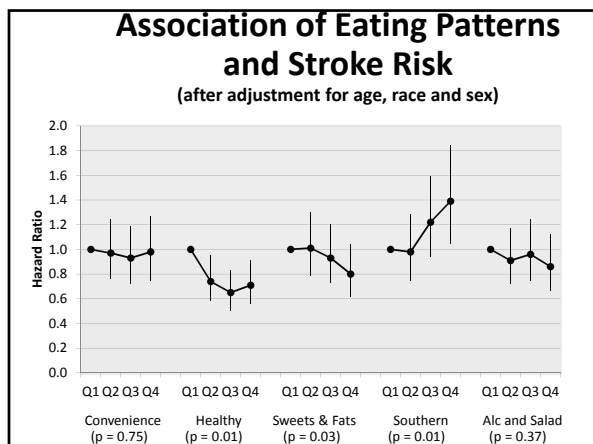
- Pattern #3
  - Added fats
  - Bread
  - Candy
  - Condiments
  - High fat dairy
  - → Sweets & Fats
- Margarine
- Chocolate
- Desserts
- Misc sugar
- Salty snacks
- Sweet breakfast food

### So what were the Eating Patterns?

- Pattern #4
  - Added fats
  - White bread
  - Eggs and egg dishes
  - Fried foods
  - → Southern
- Avoid low fat milk
- Organ meats
- Processed meats
- Sugar sweetened beverages

### So what were the Eating Patterns?

- Pattern #5
  - Butter
  - Coffee
  - Liquor
  - Leafy green vegs
  - Wine
  - *Alcohol and salads*



### Could racial differences in diet be contributing to racial disparity stroke?

- Interesting (and sort of depressing) eating patterns
- Eating patterns and stroke
  - Southern eating pattern associated with higher stroke risk (turns out ... cardiac also)
  - Only a suggestion healthy eating is protective?

### Could racial differences in diet be contributing to racial disparity stroke?

- Strange findings:
  - Sugar and fats actually appears protective
  - Convenience diet has no real increased risk (for cardiac either!)

### Could racial differences in diet be contributing to racial disparity stroke?

- Although called the “Southern” diet, African Americans eat more the diet regardless of their residence
  - The percent black in quartiles of Southern diet score increase from 9%, 24%, 40% and to 60%
  - Adjustment for the Southern Diet score mediates the black-white difference in stroke risk by 63%

### Returning to “Racial Disparities in Risk Factor Prevention” Research

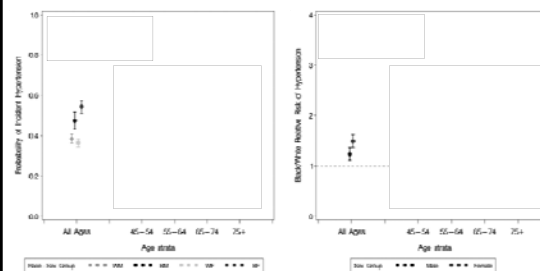
- Remember that the high prevalence of risk factors explains about 40% of the black-white difference
- The American Heart Association and others have major efforts on “primordial risk factor prevention” (prevention of the development of risk factors) in children and adolescents



### Returning to “Racial Disparities in Risk Factor Prevention” Research

- As the population ages ... attention naturally turns to primary prevention (risk factor control)
- But ... to reduce the black-white disparity, do we need to continue to think about primordial prevention in adults?

### Incident Hypertension in Adults



... so ... to address the 40% to 50% of excess stroke risk in blacks that is attributable to “traditional” risk factors

*... we are going to have to understand and change why African American are more likely to develop hypertension at any age*

### What Factors could Contribute to Higher Black Risk of Developing Hypertension?

- Socioeconomic
  - Education
  - Income
- Physiological
  - BMI
  - Waist
  - Sleep apnea

### What Factors could Contribute to Higher Black Risk of Developing Hypertension?

- Environmental
  - Poor physical environment
  - Low quality of neighborhood
- Lifestyle
  - Alcohol use
  - METS of physical activity
  - Lack of exercise
  - Sedentary time
  - Low mobility

### What Factors could Contribute to Higher Black Risk of Developing Hypertension?

- Psychosocial
  - Depression
  - Stress
  - Discrimination
  - Low social support

### What Factors could Contribute to Higher Black Risk of Developing Hypertension?

- Diet
  - Low DASH diet score
  - Low Mediterranean diet score
  - High Southern Diet Score
  - High dietary sodium / potassium ratio

### Three Stage Analytic Plan

- Step 1: Does the level of the mediator differ in blacks versus whites
  - Calculate the number of standard errors that the level differs in blacks and whites

### Three Stage Analytic Plan

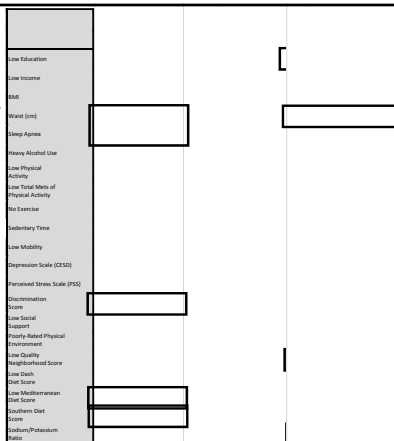
- Step 2: Is the mediator associated with higher risk of incident hypertension
  - Use logistic regression to assess relationship of mediator with risk of incident hypertension after adjustment for age, sex and SBP at baseline

### Three Stage Analytic Plan

- Step 3: Calculate the % of the black-white disparity attributable to the potential mediator
  - Perform formal mediation analysis of the change in the coefficient for race with the introduction of the confounder to the logistic model predicting incident hypertension

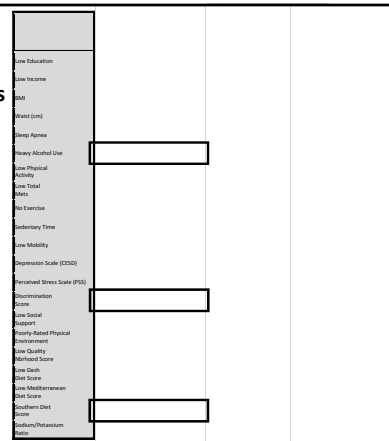
#### Mediation of Excess Hypertension Risk in Men

1. Which factors are more prevalent in blacks?
2. Which factors are associated with higher risk of incident hypertension?
3. Which factors are mediate the excess risk of hypertension in blacks?



#### Mediation of Excess Hypertension Risk in Women

1. Which factors are more prevalent in blacks?
2. Which factors are associated with higher risk of incident hypertension?
3. Which factors are mediate the excess risk of hypertension in blacks?



### Discussion

- In both men and women, the higher Southern Diet Score was the most powerful mediator of the black excess risk of diabetes
  - 51.6% in men
  - 29.2% in women

### Discussion

- A high dietary Na<sup>+</sup>/K<sup>+</sup> ratio was also a significant mediator in both men and women; and a low DASH diet score was a significant mediator in women.
- Diet appears to be a “golden” target for interventions to reduce disparities in hypertension

### Discussion

- A low level of education and neighborhood quality were the only other factor significant in both men and women
- BMI/waist were very important in women but not men
  - Strong association of BMI / waist with incident hypertension in both men and women

### Discussion

- Black women, but not black men, had higher BMI / waist than their white counterparts
- Other factors important in women (but not men) include: lower mobility, alcohol, income, physical activity and education

### Overall Conclusions

- About half of the excess stroke risk in blacks is attributable to traditional risk factors
  - To make changes ... we have to stop African Americans from developing worse risk factor profiles (and control risk factor better)
  - Promising “targets” to make a difference, particularly diet interventions

### Overall Conclusions

- The other half of the black excess risk is due to other factors
  - Hypertension is particularly important, as blacks may be differentially susceptible to hypertension
  - Novel risk factors, particularly diet, may also be playing an important role
- We are beginning to understand why African Americans are at higher risk

