

Update on Stroke Epidemiology:

What a Great Year to Understand Disparities in Stroke!

George Howard

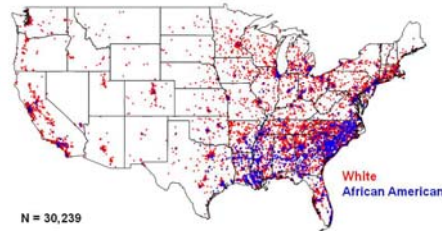
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Disparities?

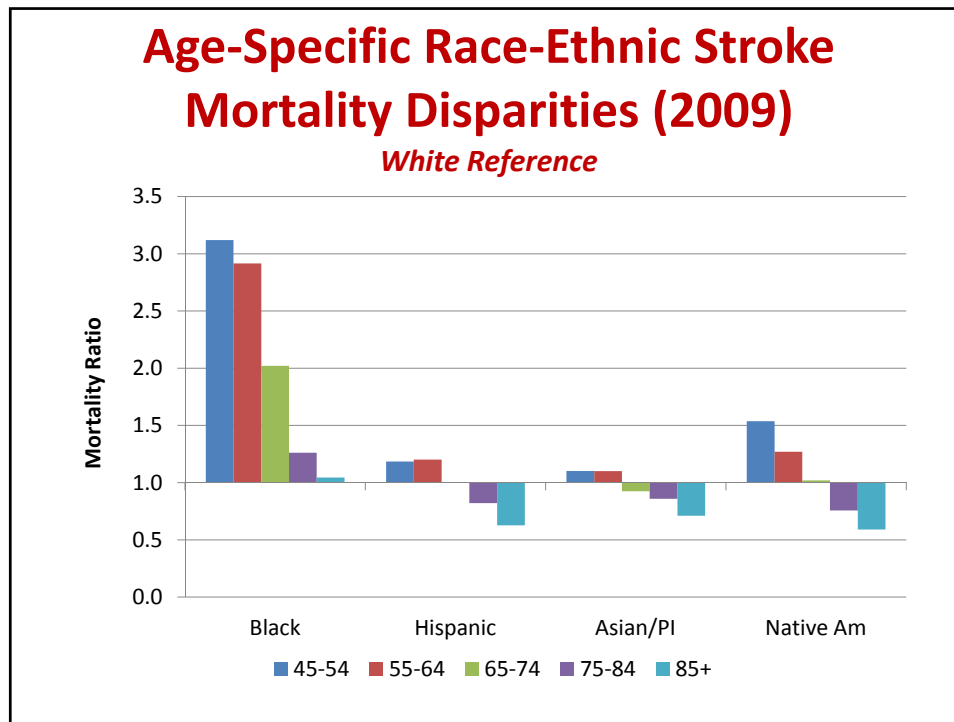
- **Clear**
 - Racial
 - Geographic
- **Requiring future investigations**
 - Urban-Rural

REasons for Geographic And Racial Differences in Stroke (REGARDS) Study

- General population study
- Central participant recruitment and telephone interview
 - 30,239 white and black participants aged 45+
 - 56% from the Stroke Belt
 - 42% black
- In-home evaluation for physical, venipuncture and ECG
- Central follow-up at 6-month intervals for detection of suspected stroke events (and other outcomes)
- Physician adjudication of new stroke events
- Goal is to assess the difference in risk of new strokes among those reporting and not reporting previous stroke at baseline



Racial Disparities?



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
- 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

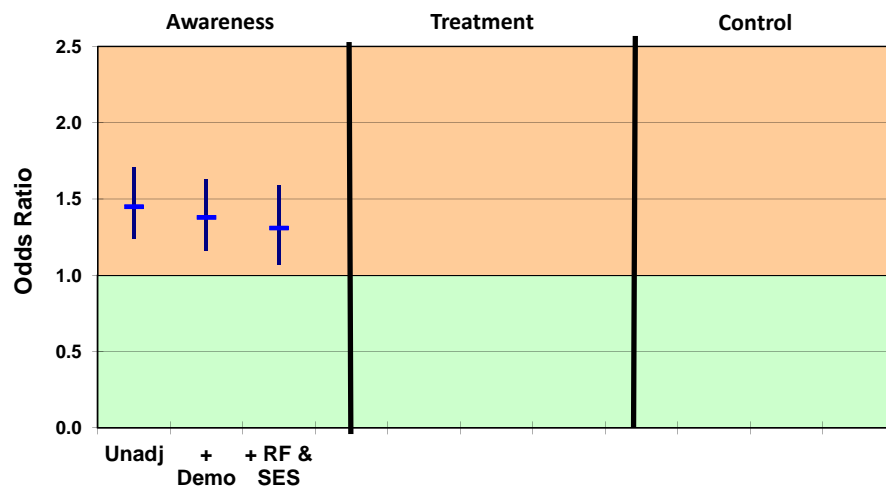
$$1.0 + (0.2 \times 2.0) + (0.15 \times 2.0) = 1.7$$
- But what accounts for the rest of the disparity????

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

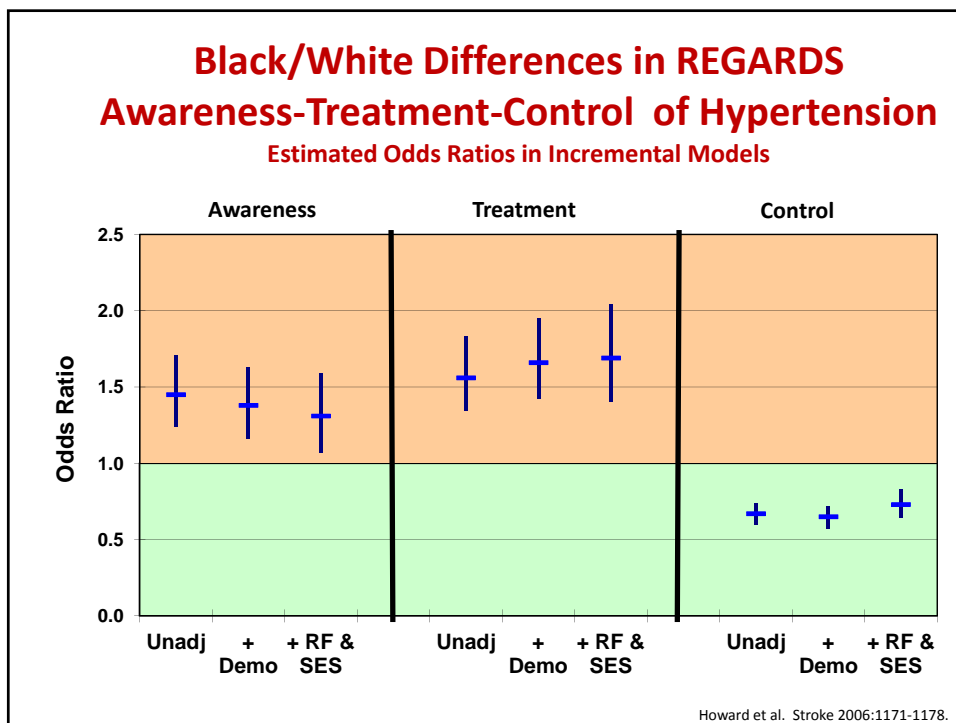
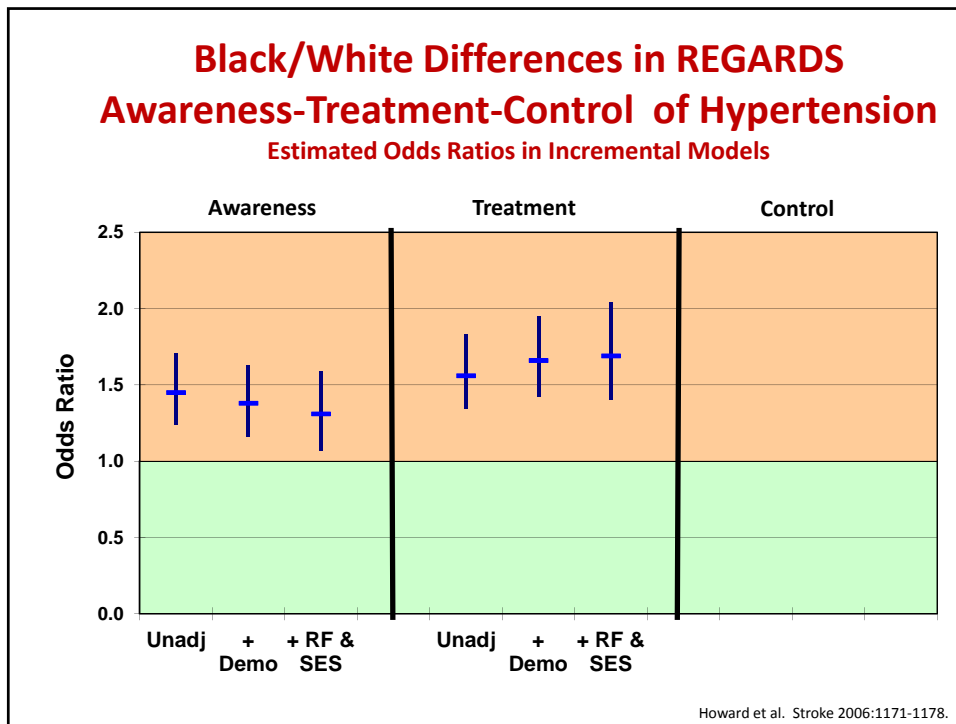
- Could lower average SES of blacks contribute to less awareness and lower treatment levels?
- The hypothesis of contributions of awareness-treatment-control have been examined in REGARDS and NHANES ... with nearly identical findings

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

Estimated Odds Ratios in Incremental Models



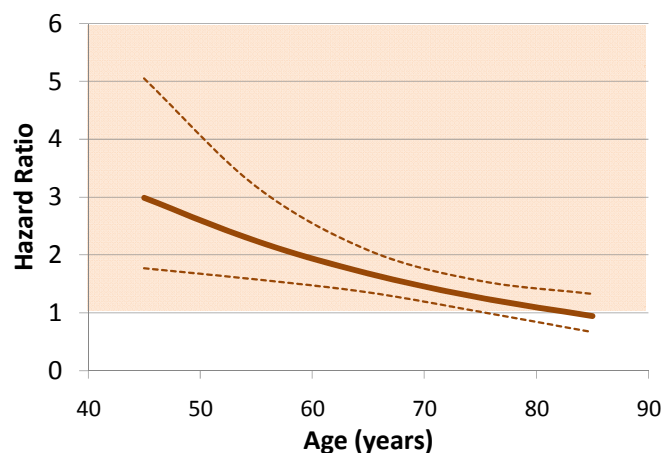
Howard et al. Stroke 2006;1171-1178.



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!
- 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?

Black-to-White Stroke Incidence Rate Ratio in REGARDS (by Age)

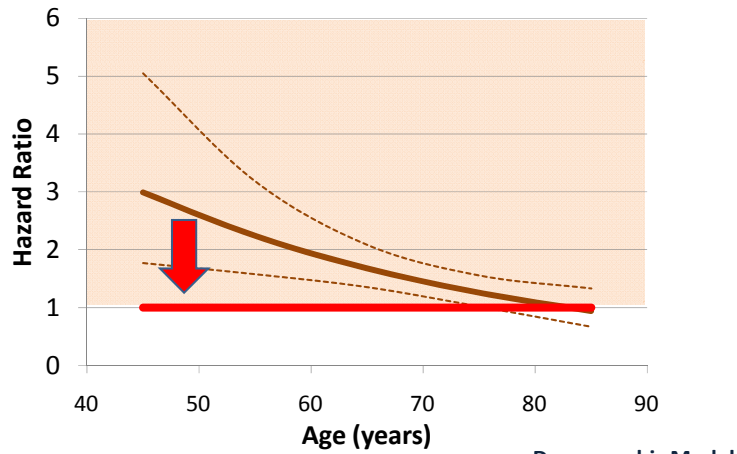


So do the “Framingham” risk factors and SES explain the racial disparities in stroke?

Demographic Model

Howard et al. Stroke 2011;42:3369-3375.

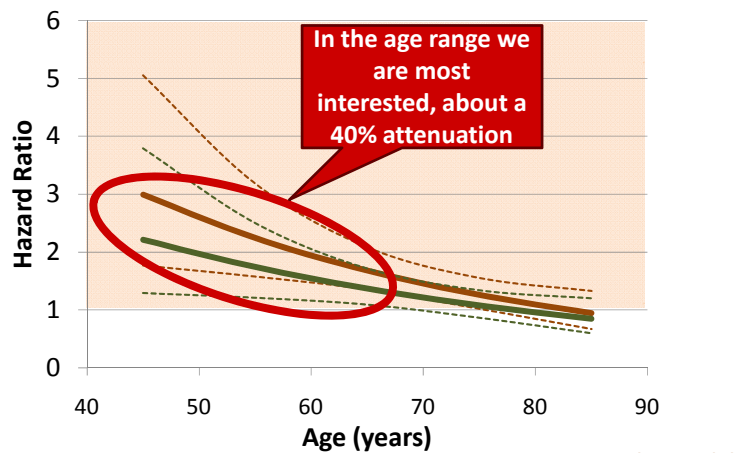
Black-to-White Stroke Incidence Rate Ratio in REGARDS (by Age)



So what effects have SES had just on for just the previous decade's risk disparities?

Howard et al. Stroke 2011;42:3369-3375.

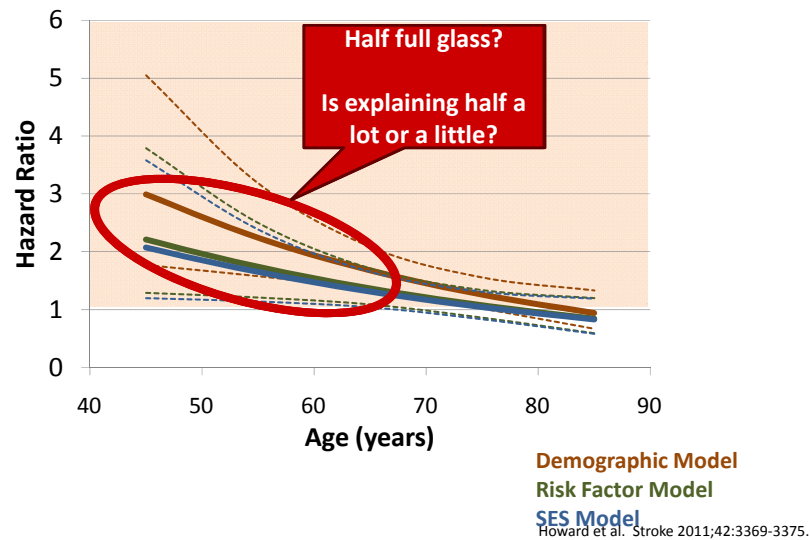
Black-to-White Stroke Incidence Rate Ratio in REGARDS (by Age)



... and how about further adjustment for SES?

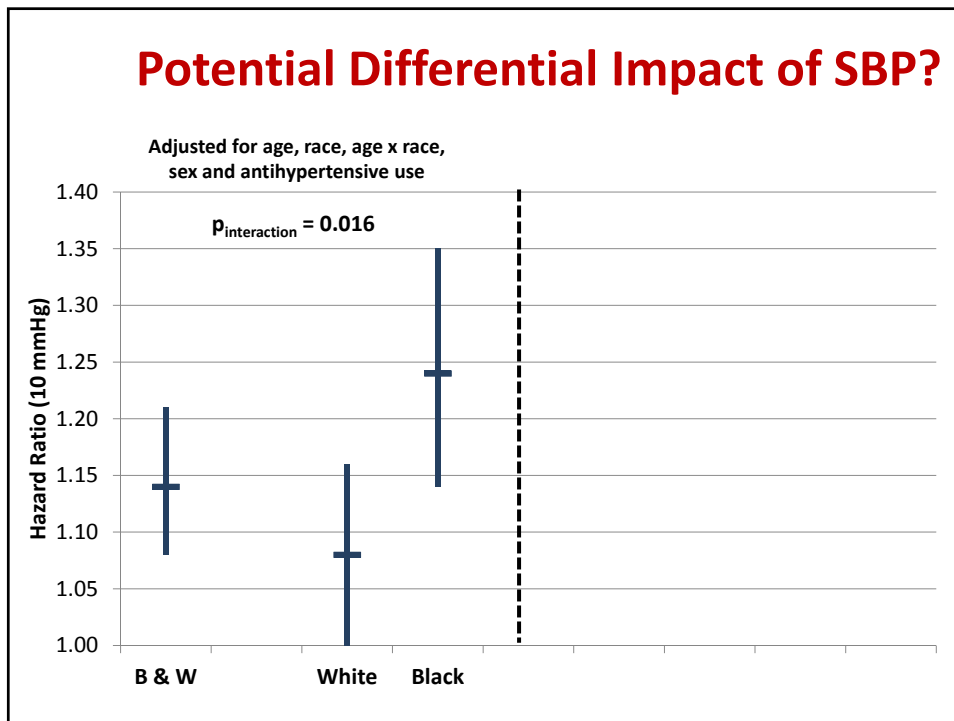
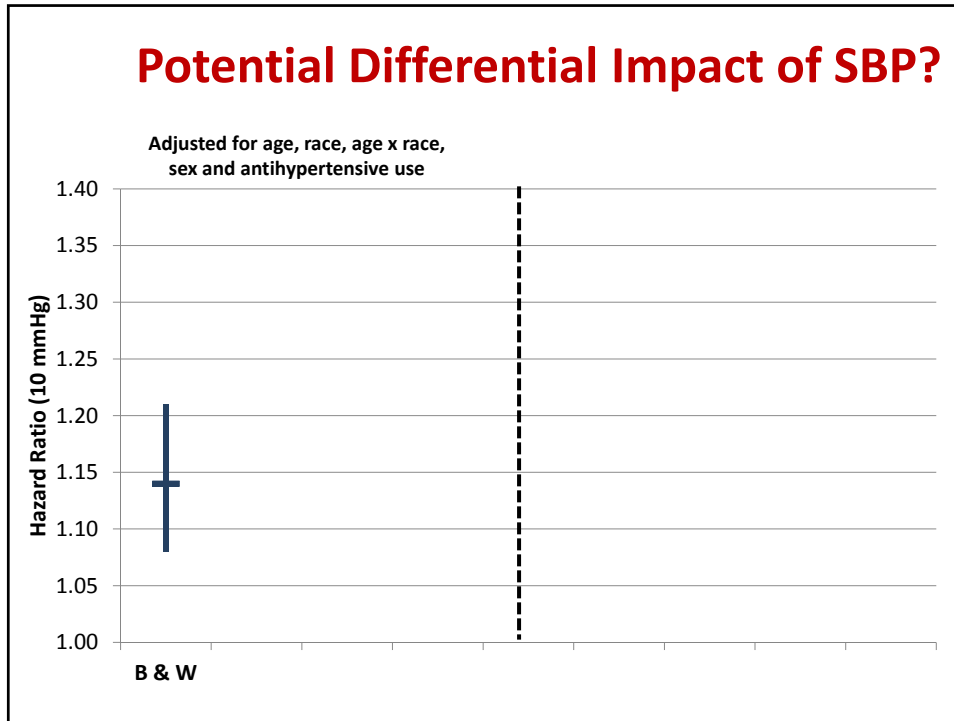
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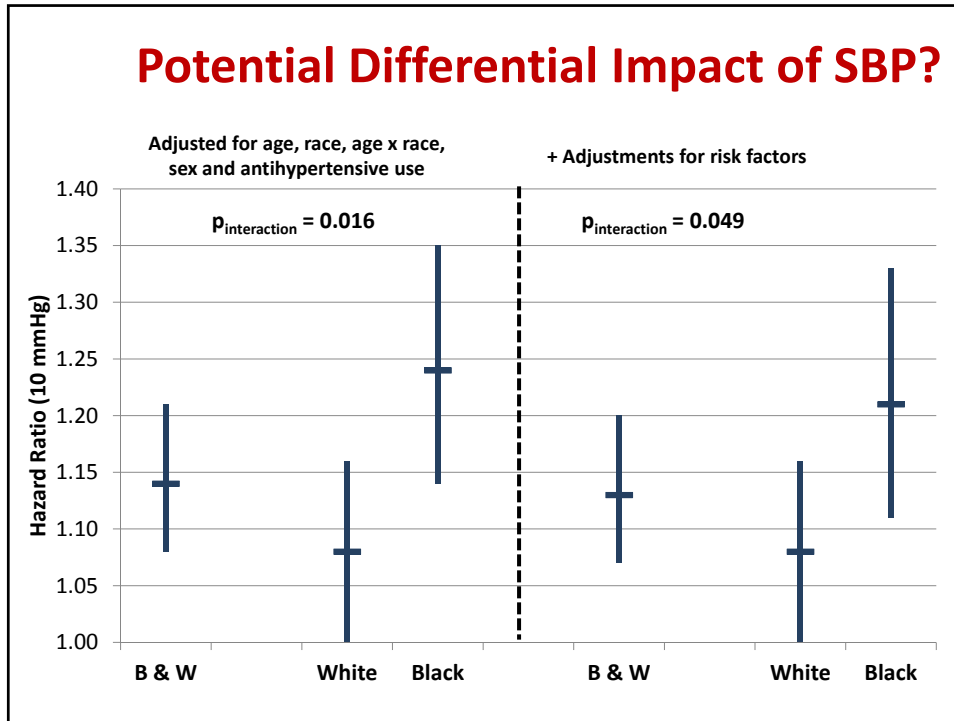
Black-to-White Stroke Incidence Rate Ratio in REGARDS (by Age)



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
 - 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?





Implications of Differential Susceptibility?

- Many interactions between race, age, and SBP
- Consider black-white stroke risk differences within strata by age and SBP
 - Age: <65, 65-74, 75+
 - SBP:
 - Normotensive (<120 mmHg)
 - Prehypertension (120 – 139 mmHg)
 - Stage 1 hypertension (140 - 159 mmHg)
 - Stage 2 hypertension (160+ mmHg)
too few white participants, not presented
- Remember ... the excess black stroke risk is at young ages (< 65 years mainly)

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

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

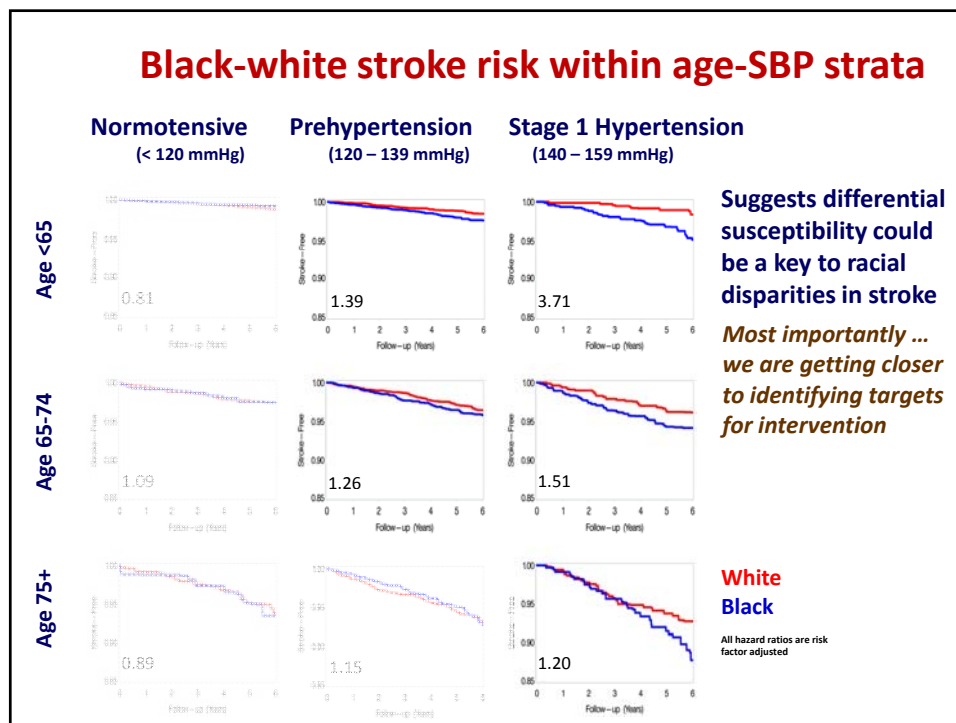
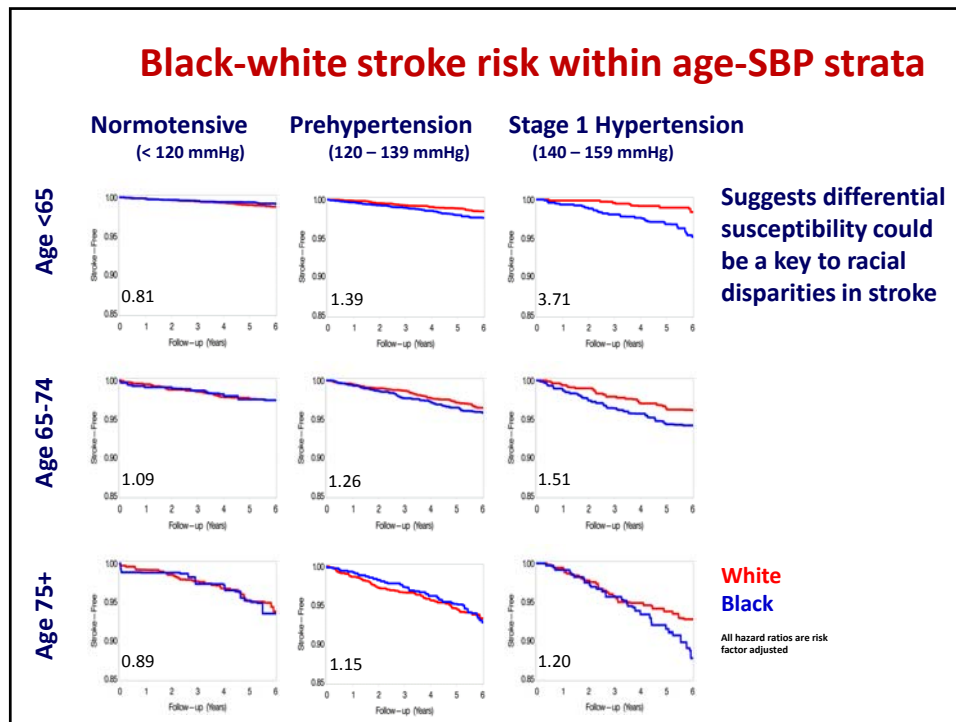
Stroke-Free

Follow-up (Years)

White

Black

HR = 0.81*



... 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**
 - 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!

Racial Disparities on Conclusions and Future?

- Hypertension may be a larger than expected contributor to the racial disparity in stroke
- Not because of a higher prevalence ... but because of a three-stage process
 - African Americans are more likely to be hypertensive
 - Once hypertensive ... it is less likely to be controlled
 - Once not controlled ... the impact is 3 times larger
- “All” we have to do is to control blood pressures in African Americans to <120 mmHg ... and the disparity would be addressed
- More to come on the impact of hypertension prevention ... this will be a major story!

Geographic Disparities?

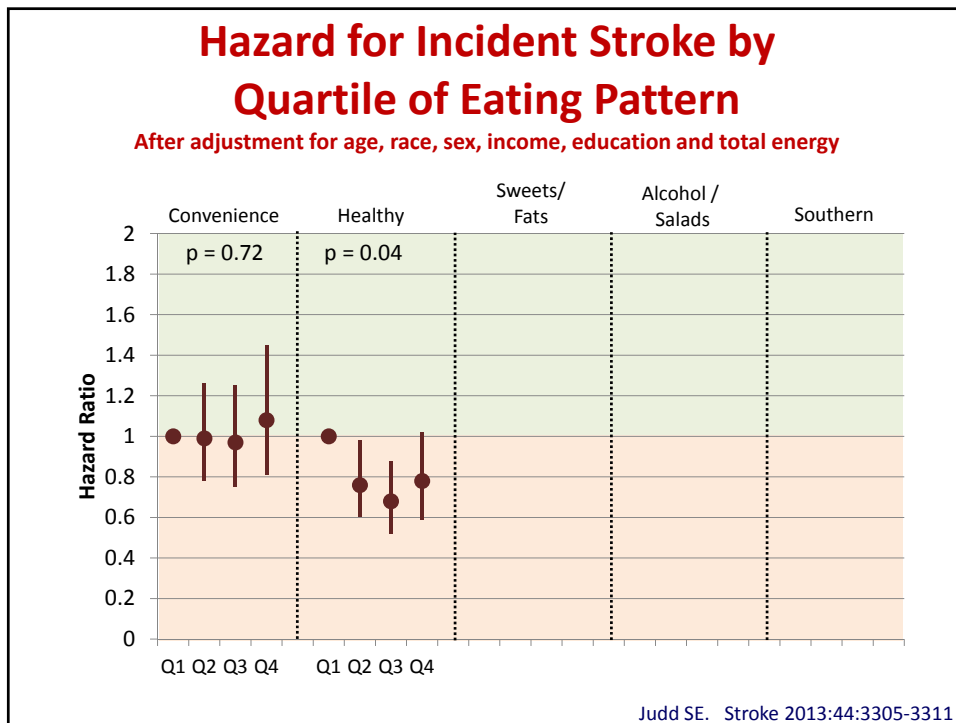
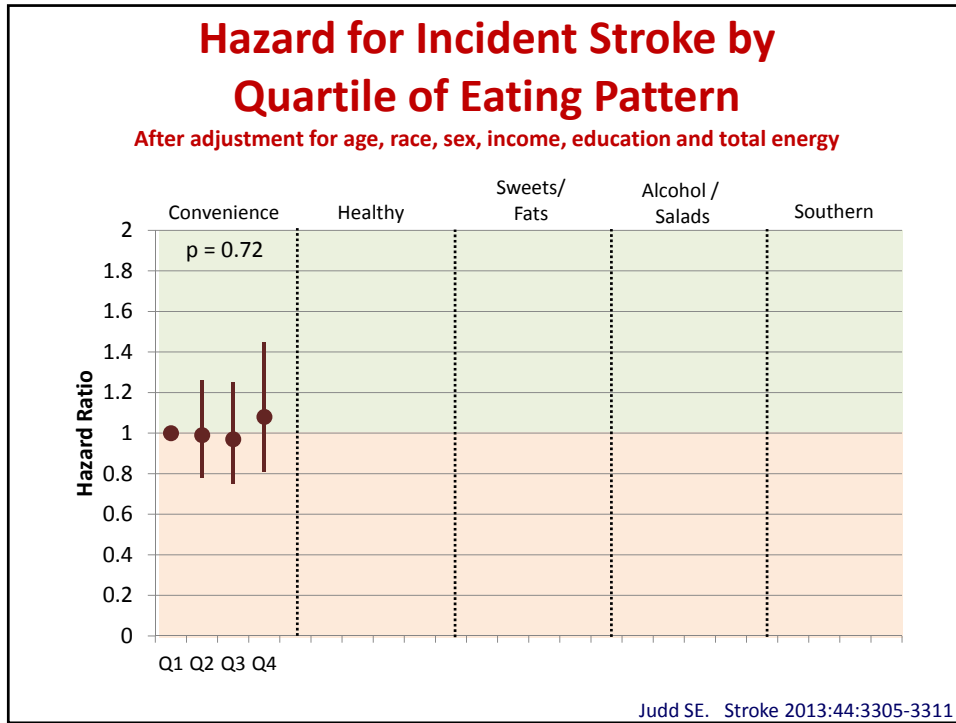
(after all ... we are at a meeting on geographic disparities!)

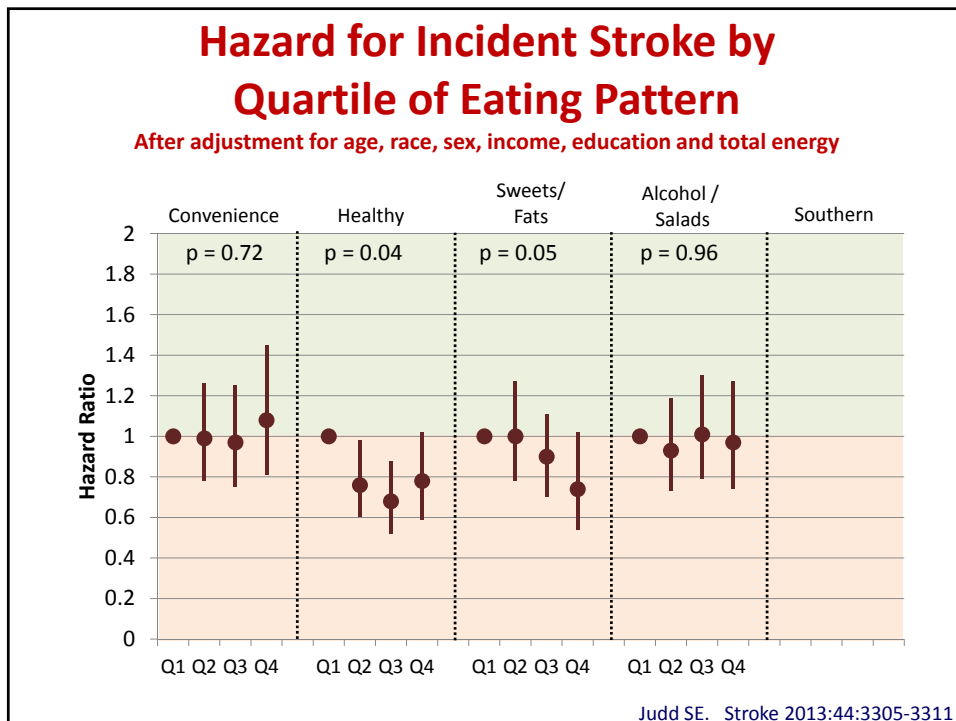
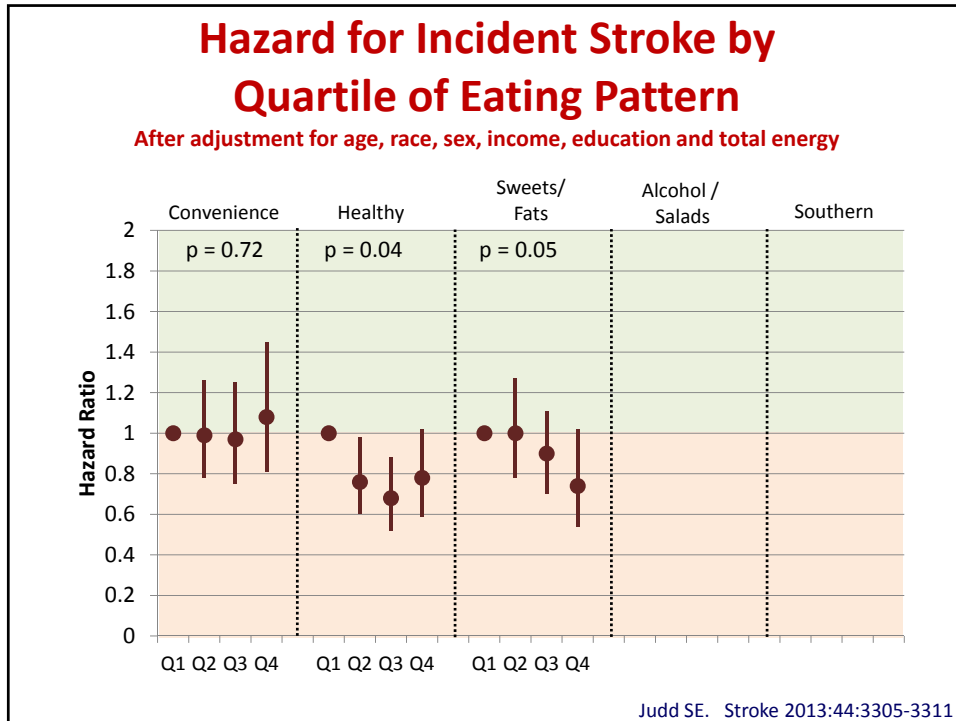
Eating Patterns in the US

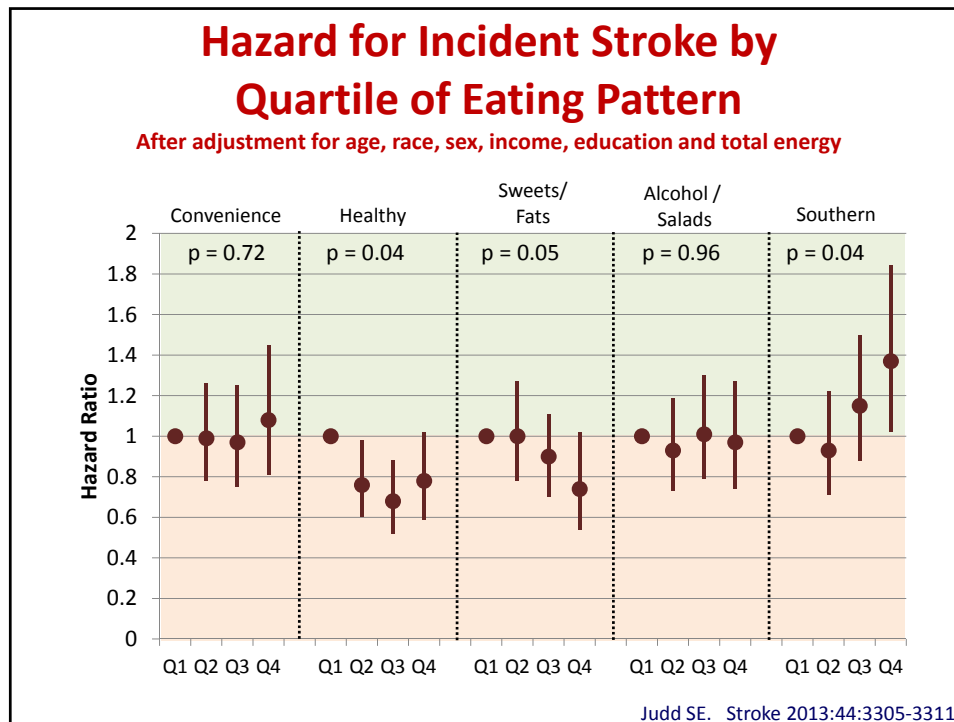
(foods with a factor loading of 0.30 or greater)

- Chinese food, fried potatoes, Mexican dishes, salty snacks, soup, mixed dish vegetables : **Convenience**
- Beans, whole grain breads, cereal, fish, fruit, poultry, soup, cruciferous vegetables, dark yellow vegetables, leafy green vegetables, other vegetables, tomatoes, mixed dish vegetables : **Healthy**
- Added fats, white bread, candy, chocolate, deserts, high-fat diary, margarine, miscellaneous sugar, salty snacks, sweet breakfast foods, tea : **Sweets & Fats**
- Butter, coffee, liquor, salad dressings, leafy green vegetables, wine : ~~Healthy diet~~ **Salads & Alcohol**
- Added fats, white bread, eggs and egg dishes, fried foods, organ meat, processed meats, sweet tea : **Southern diet**

Judd SE. Stroke 2013;44:3305-3311







Currently

- Dr. Judd has not found that eating patterns substantially mediate geographic disparities in stroke
- Work is currently underway to assess if this is because of the substantial intra-region variation in stroke risk
- More work is forthcoming!!!

This has been a great year for understanding stroke disparities!

Specific Risk Factors Contributing to the Mediation

(Preliminary REGARDS data – not for publication or presentation)

		Age							
		45		55		65		75	
		B/W Hazard Ratio	Percent of Mediation attributable to Factor	B/W Hazard Ratio	Percent of Mediation attributable to Factor	B/W Hazard Ratio	Percent of Mediation attributable to Factor	B/W Hazard Ratio	Percent of Mediation attributable to Factor
Demographic Model		2.90		2.20		1.66		1.26	
All Risk Factor Model		2.14		1.71		1.37		1.09	
Addition of Single Risk Factors to the Demographic Model	Atrial Fibrillation	2.81	12%	2.17	6%	1.68	-7%	1.30	-24%
	Diabetes	2.73	22%	2.05	31%	1.54	41%	1.16	59%
	Systolic Blood Pressure	2.55	46%	1.96	49%	1.51	52%	1.16	59%
	Antihypertensive use	2.68	29%	2.05	31%	1.56	34%	1.19	41%
	Heart Disease	2.76	18%	2.16	8%	1.7	-14%	1.33	-41%
	Current smoking	2.76	18%	2.11	18%	1.61	17%	1.22	24%
	LVH	2.79	14%	2.12	16%	1.61	17%	1.22	24%