Explaining Race and Ethnic Differences in Inflammation

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Overall Goals

- Chronic inflammation is a public health concern

- Social processes are consequential for inflammation and for disparities in inflammation

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What is Inflammation?

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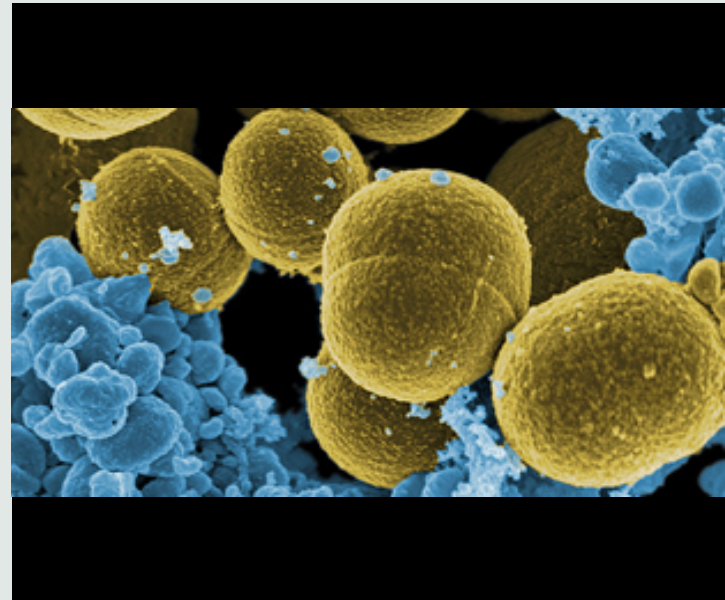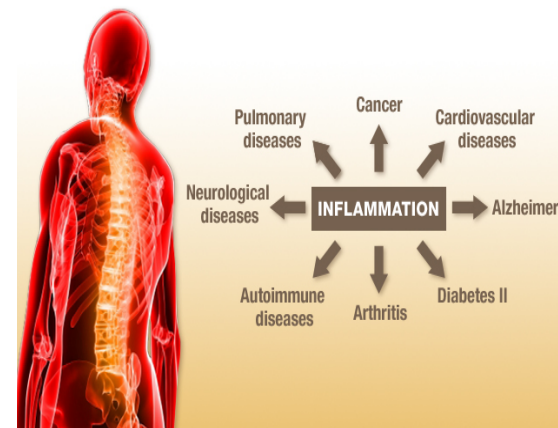
What is Inflammation?

- Immune response to:
  - Injury
  - Infection
  - Threatening, challenging, or stressful situation

- Symptoms
  - Pain, redness, swelling, increased temperature

- Preemptive inflammatory response during times of stress

- Typically short-lived (i.e., acute)

What is *Chronic* Inflammation?
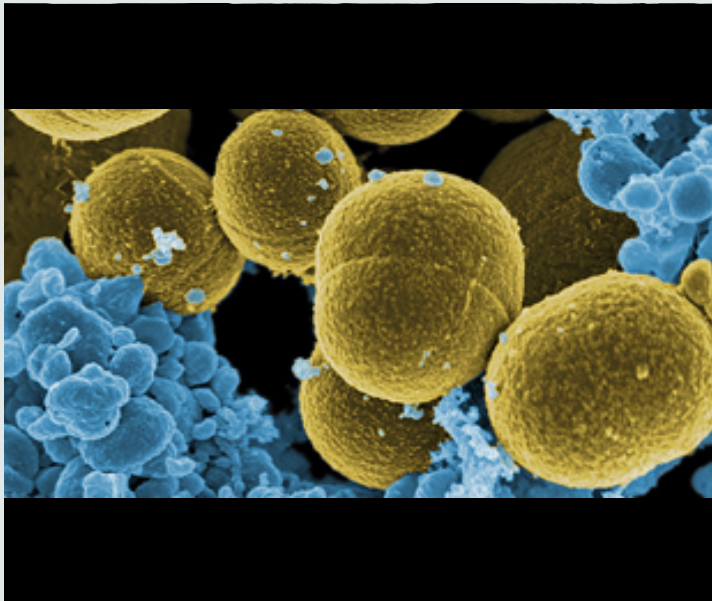
- Persistent, low-level inflammation

- Systemic vs. localized

- Asymptomatic

Determinants of Chronic Inflammation

Determinants of Chronic Inflammation

- Age

- Adverse health behaviors

- Waist circumference, Body mass index (BMI)

- Environmental pollutants

- Psychological conditions and stress exposure (e.g., discrimination)

- Socioeconomic status (e.g., **education**)
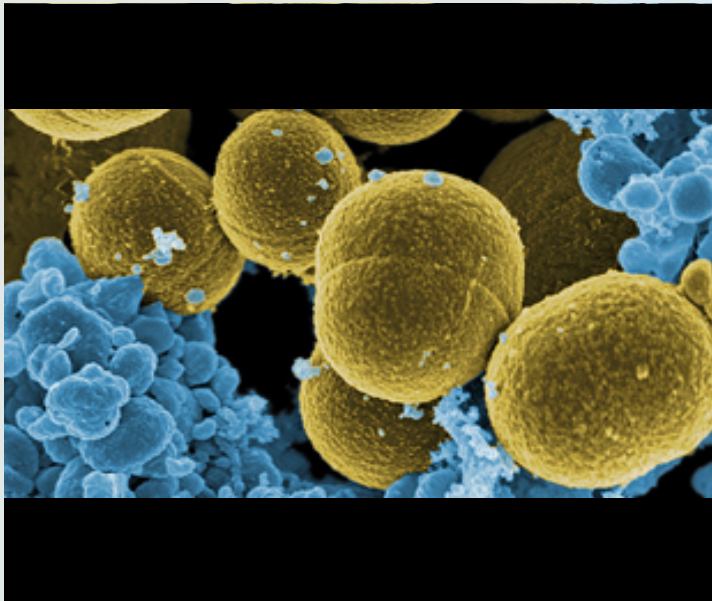
The Current Study

Research Questions

1. Are there race/ethnic differences in inflammation?

2. If so, are race/ethnic differences in inflammation explained by differences in education?

The Health and Retirement Study (HRS)

- Nationally representative survey of adults age 51 and older

- Biomarker and physical assessments started in 2006 with random half-sample

- Pooled data from 2006 and 2008
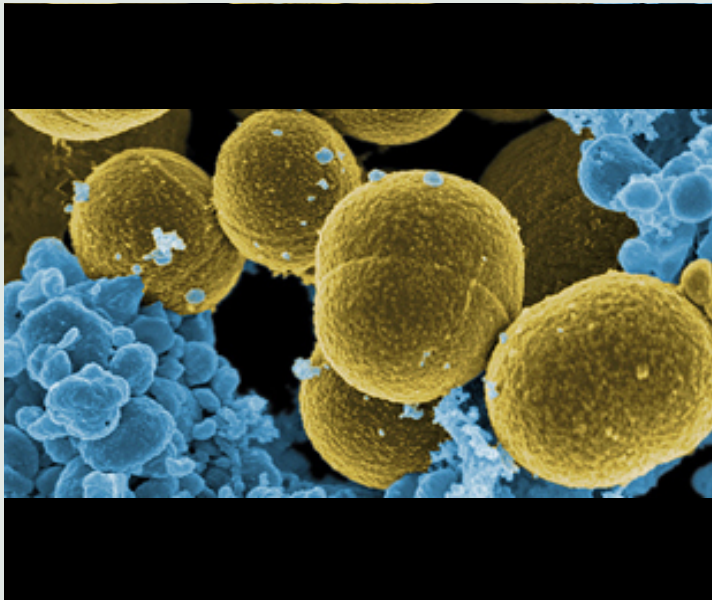
- N = 11,935

Key Variables

- Race/Ethnicity
  - African American
  - Hispanic
  - Non-Hispanic White (ref.)

- C-reactive protein (CRP)
  - General marker of inflammation
  - Log-transformed

- Education (years)

Additional Covariates

- Demographic characteristics
  - Age (years)
  - Gender (ref. = males)
  - Marital status (married, separated/divorced, widowed, never)

- Socioeconomic factors
  - Household income (log-transformed)
  - Employment status (employed, retired, other)

- Health behaviors
  - Smoking (never, former, current)
  - Alcohol (non-drinker, moderate, heavy)
  - Physical activity (no activity, ≤ 1/week, > 1/week)
    - Vigorous and moderate

- Health status
  - Waist circumference (inches)
  - Body Mass Index; BMI (kg/m^2)
  - Depressive symptoms; CES-D (range: 0-8)

Analytical Procedures

- Nested linear regression models
  1. Race/Ethnicity, Gender, Age, Marital Status
  2. … + Education
  3. … + Income, Employment Status
  4. … + Health Behaviors
  5. … + BMI, Waist, Depressive Symptoms

Study Findings

Table 1 - Select Characteristics of the Sample (n=11,935)

	Mean (SD) or %
Race (%)	
Non-Hispanic white	77.6
African American	13.1
Hispanic	8.3
Gender (%)	
Male	41.6
Female	58.4
Age (years)	69.2 (9.6)
Education (years)	12.5 (3.14)
Household income ($, thousands)	62.7 (162.6)
Waist Circumference (inches)	39.3 (6.0)
Lifetime Discrimination (range: 0-6)	0.5 (0.9)
Everyday Discrimination (range: 0-5)	0.6 (0.7)

Figure 1 - Age-adjusted Log-CRP Values by Race/Ethnicity and Gender

Figure 2 - Average Years of Education by Race/Ethnicity

Table 2. Correlation Matrix for CRP and Continuous Predictor Variables

Study Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) CRP	---						
(2) Age	-0.03**	---					
(3) Education	-0.12***	-0.14***	---				
(4) Household Income	-0.09***	-0.17***	0.39***	---			
(5) BMI	0.31***	-0.21***	-0.06***	-0.03**	---		
(6) Waist Circumference	0.28***	-0.06***	-0.07***	-0.03***	0.80***	---	
(7) Depressive Symptoms	0.11***	-0.01***	-0.23***	-0.22***	0.11***	0.09***	---

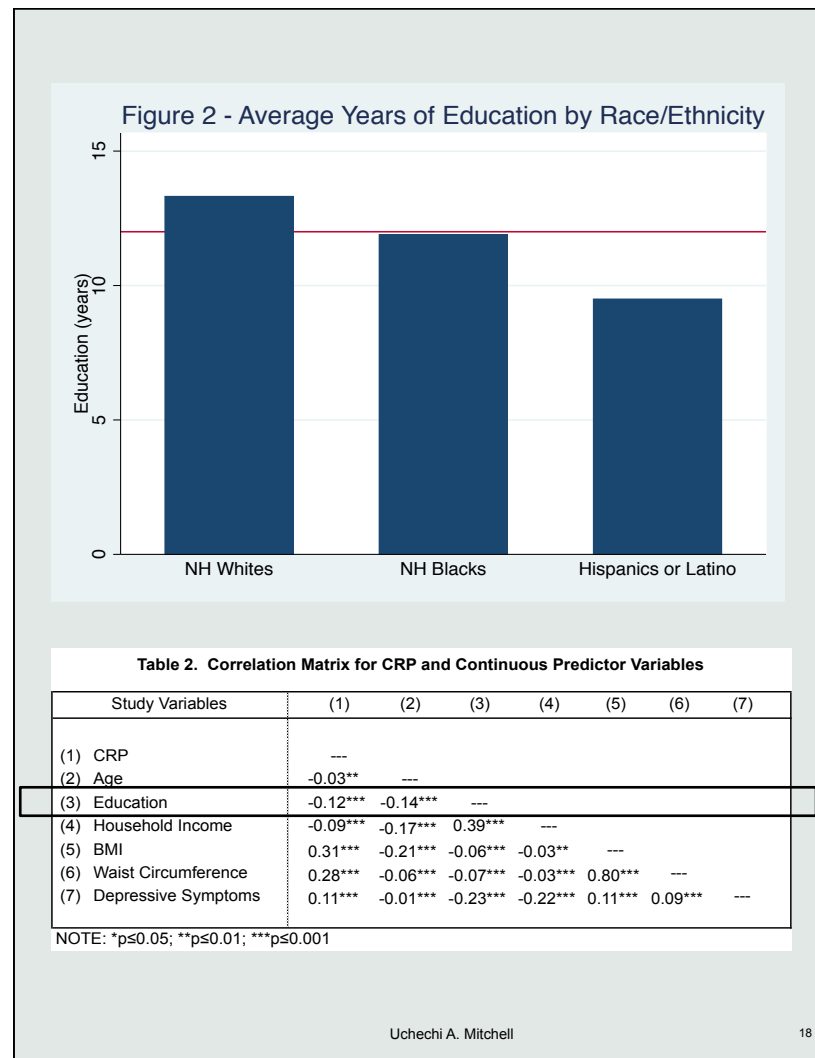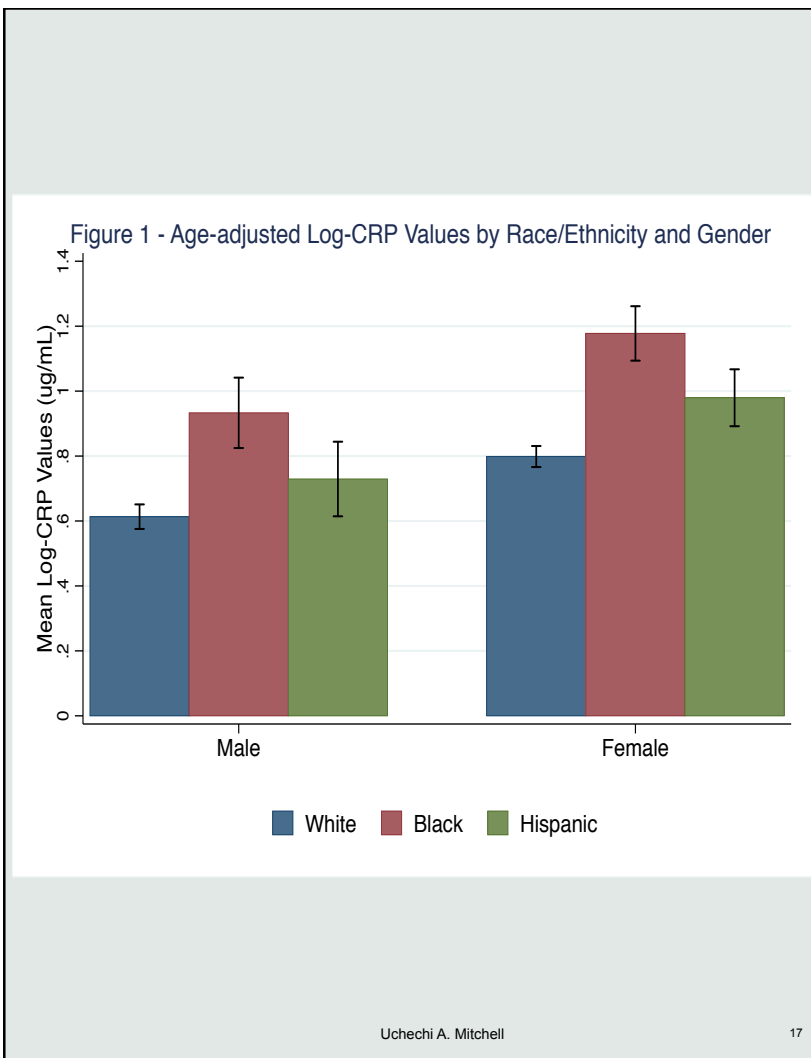NOTE: *p≤0.05; **p≤0.01; ***p≤0.001

Table 2 – Regression of Inflammation on Discrimination and Select Variables (n=11,935), Weighted

	Model 1	Model 2	Model 3	Model 4	Model 5
Race/Ethnicity (ref. White)					
Black	0.309***	0.231***	0.217***	0.195***	0.120**
Hispanic	0.140**	-0.072	-0.085	-0.034	-0.017
Gender (ref. Male)	0.213***	0.200***	0.186***	0.178***	0.338***
Education (years)		-0.053***	-0.048***	-0.034***	-0.023***
Household Income (log)			-0.019	-0.0004	0.002
Current Smoking				0.293***	0.412***
Waist Circumference (inches)					0.041***

*p < 0.05, **p < 0.01, ***p < 0.001

Model 1: race/ethnicity, gender, marital status Model 2: + education
Model 3: + household income, employment Model 4: + behaviors
Model 5: + health factors

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Conclusion

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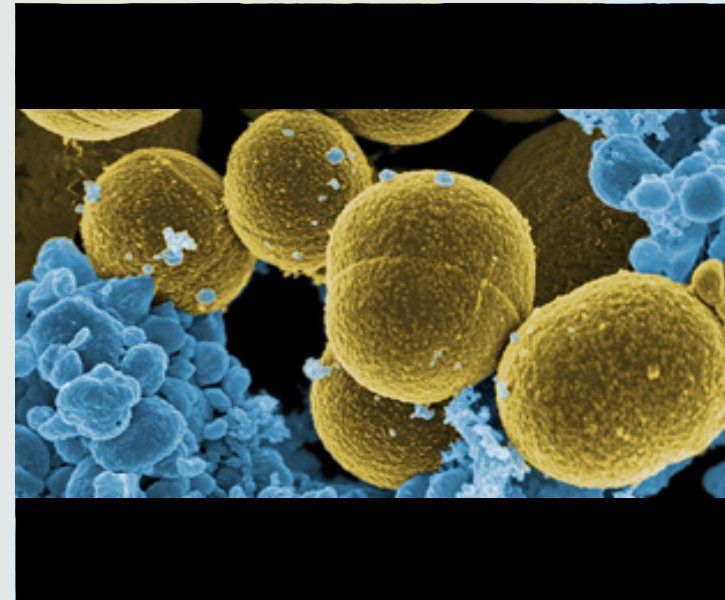
Conclusion

- Limitations
  - Subjectivity of SEM
  - Didn't test behavioral pathways

- Strengths
  - Large, representative sample
  - Formal mediation analysis
  - Incorporates a measured biological marker

- Public Health Implications
  - Understanding of health disparities
  - Link social environment to biomarkers

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Thank You

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