



Education, Gender and State Level Gradients in the Health of Older Indians: Evidence from LASI Biomarker Data

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Outline

- Introduction: the LASI biomarker study
- Why study C-reactive protein & Hemoglobin?
- Policy background
- Research questions
- Analytic approach
- Findings
- Conclusion and Implications

The Longitudinal Aging Study in India, LASI

- LASI is a nationally representative, longitudinal survey of aging, health, and retirement in India
 - 50,000 respondents at age 45+ and their spouses regardless of age
 - representative of both the nation and the state
 - biomarker collection
 - 2010 Pilot study interviewed the 1,600 respondents at age 45+ from 4 states
 - 1,305 respondents, 78% of the sample, provided DBS

LASI biomarker study

- DBS samples are stored at the National Aids Research Institute (NARI)
- USC-UCLA Center on Biodemography & Population Health (CBPH) supported a validation study, enabling the cross-walk between the NARI and the U of Washington Lab.
- P. Hu supervised two one-week training of NARI staff with the support from U of Washington and Purdue U.
- LASI biomarker data will be released soon at the [USC Gateway to Global Aging Data: www.g2aging.org](http://www.g2aging.org)

Why study CRP and Hb?

- C-reactive protein
 - A biomarker for systemic inflammation, which is associated with **increased risk of cardiovascular disease**
 - Cardiovascular disease is the number one cause of death
 - Accounts for **25% of deaths among adults**
- Hemoglobin
 - Decreased Hb concentration indicates **anemia**
 - Anemia is a common medical condition in India, **especially for women** with >40% prevalence (Balarajan et al., 2011)

Policy background: Public health priorities

- CVD has been low on the country's public health agenda
 - Due to the perception that CVD is largely **a problem of the urban rich**
- Nutrition-related anemia remains one of the country's major public health concerns, especially among women
 - India has the **highest incidence of anemia** in the world and has remained static for the past decade

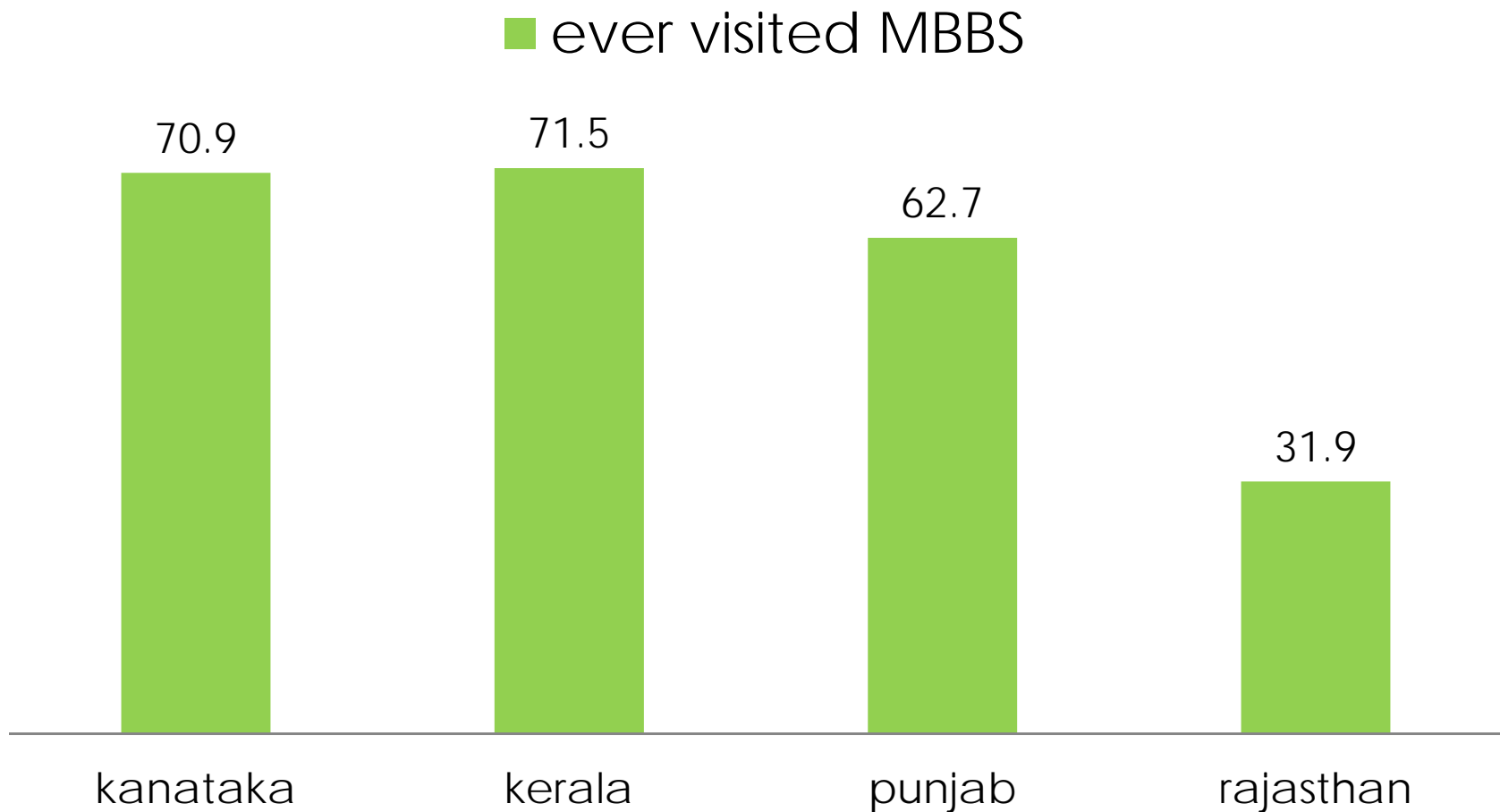
Significant state variations exist in India

- India is a union of 29 states and 6 territories, which vary greatly in their economic development, cultures, and policies
- Over time, these cross-state differences have widened
- Cross-state variation in economic development, education, and health policies may lead to cross-state variation in CRP and Hb risk

State-level variation in economic growth is significant

	Punjab	Rajasthan	Karnataka	Kerala
1960-61 mean per capita consumption (Rs/month)				
Rural	82.06	55.70	59.19	46.64
Urban	83.71	66.60	72.05	53.60
1993-94 mean pcc				
Rural	79.23	58.07	62.52	73.44
Urban	100.34	75.87	79.82	89.32

State-level variation in health care utilization is also significant



Research Questions

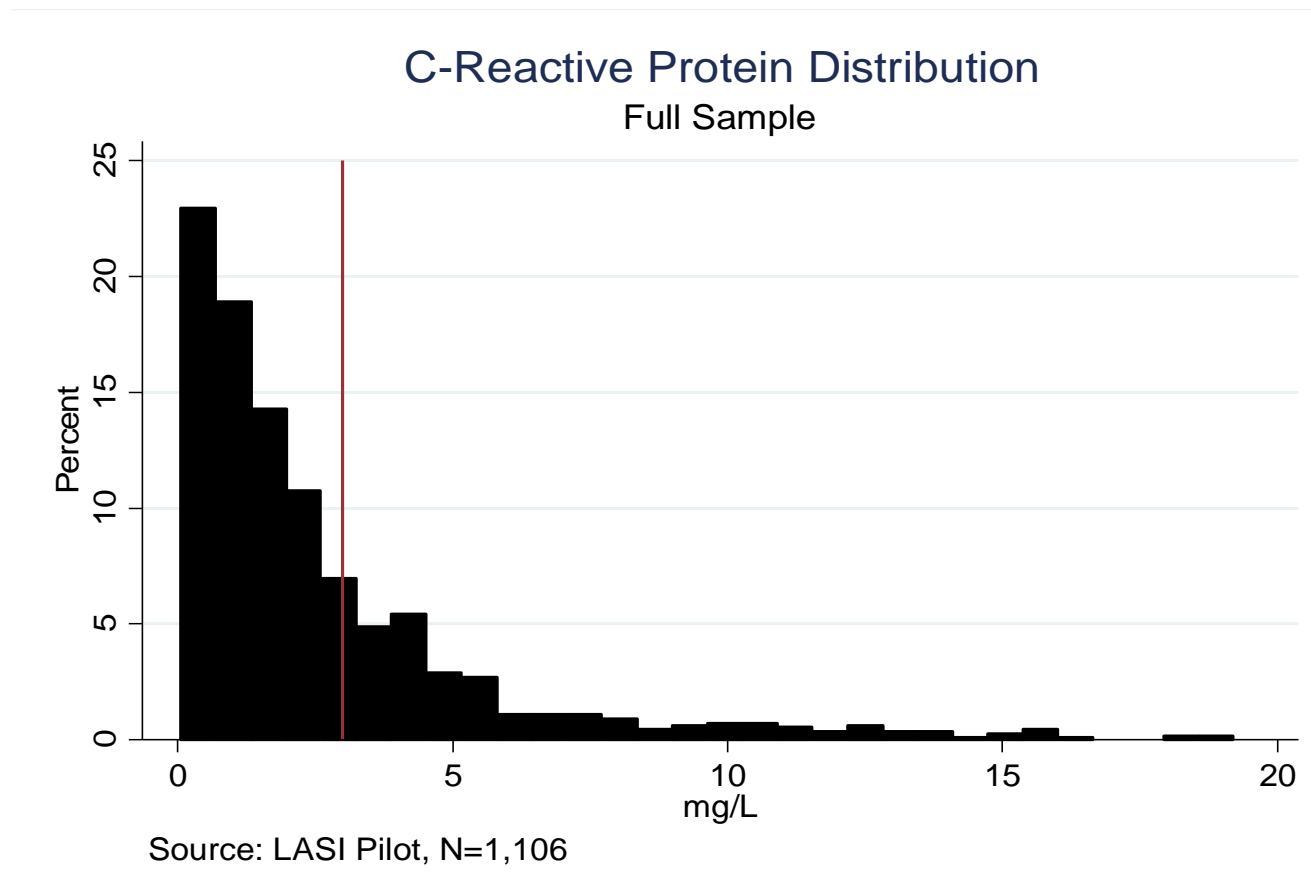
- Does an education gradient exist in CRP?
- Is CRP risk greater in urban or rural areas?
- Is there state variation in CRP risk? If so, what contributes to that variation?
- Does an education gradient exist in Hb?
- Is Hb risk greater for women or men?

Analytic approach

- Distribution of CRP and Hb
- Mean CRP and Hb for sub-populations
- OLS models for CRP and Hb, while controlling for age, gender, caste, education, urban/rural, state
- Oxaca-Blinder decomposition to further examine state differences

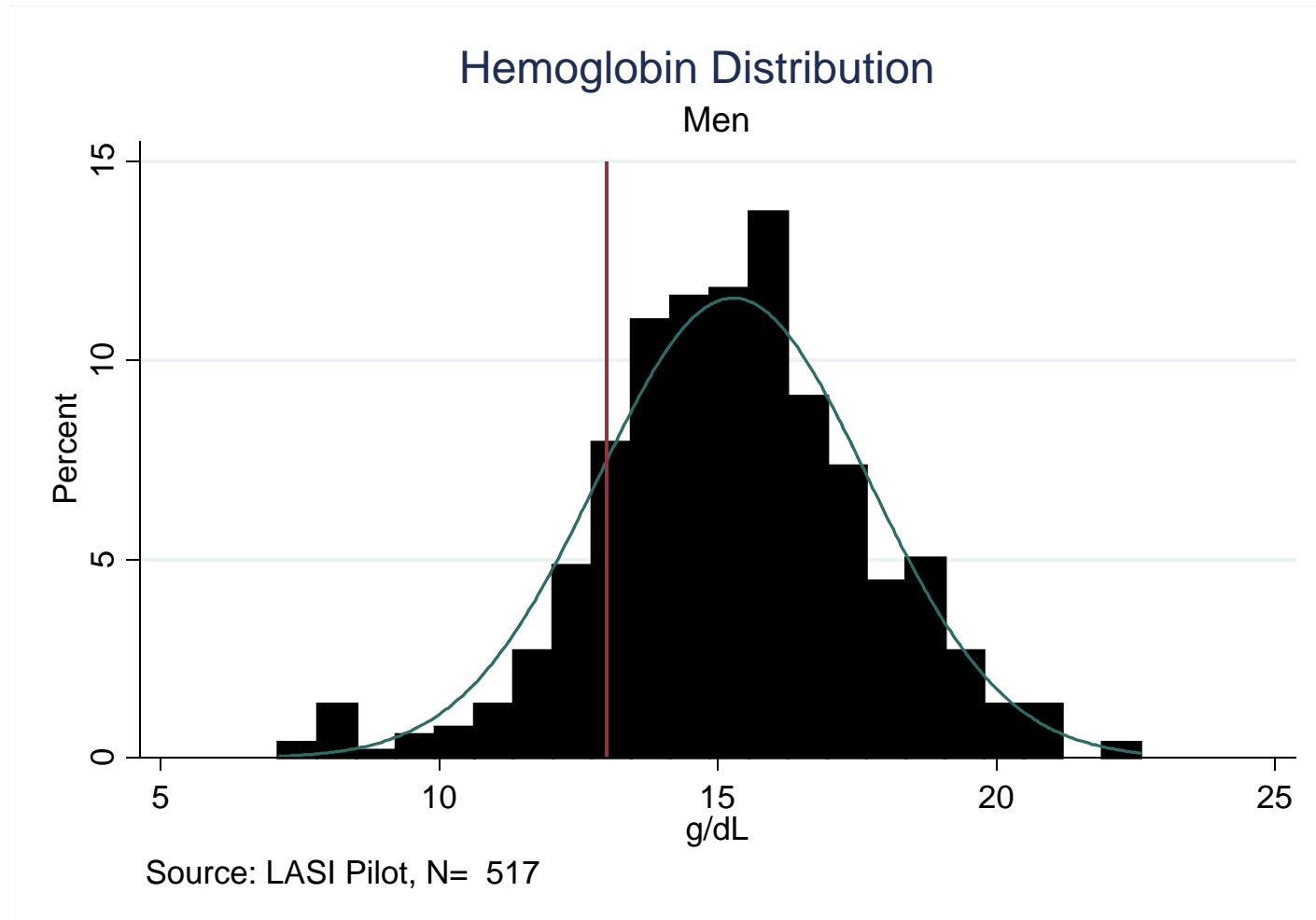
Distribution of CRP

mean=2.69 mg/L, median=1.64, high risk (>3.0)=**29.6%**



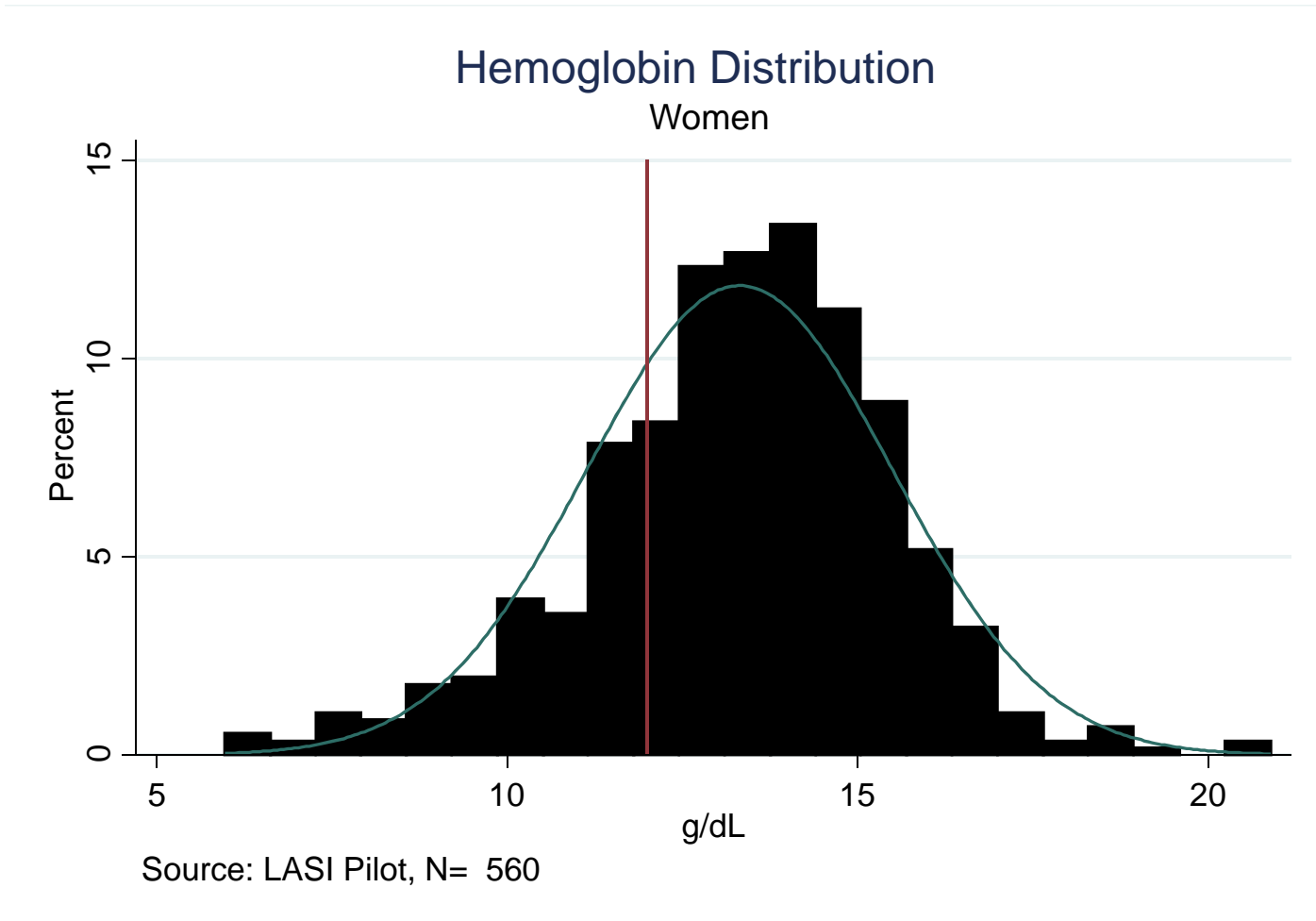
Distribution of Hb

Male mean=15.27 g/dL, male median=15.36
Male high risk: (<13.0 g/dL)=**14.4%**



Distribution of Hb

Female mean=13.27 g/dL, female median=13.49
Female high risk: (< 12 g/dL)=**25.6%**



Mean CRP by sub-population & t-test for mean difference

	Mean	P-value		Mean	T-test
Age 45-54	2.47		Male	2.78	0.432
55 – 64	2.71	0.249	Female	2.61	
65 – 74	2.85	0.191	Urban	3.16	
75+	3.61	0.030	Rural	2.53	0.007
			Punjab	3.06	
No Schooling	2.53		Rajasthan	3.28	0.447
Some Formal Education	2.88	(0.098)	Kerala	1.96	0.000
			Karnataka	2.51	0.009

Regression coefficients from OLS: CRP

	OLS			OLS
Age: (45 – 54 reference)			Rural	-0.772***
55 – 64	0.266		State: (Punjab)	
65 – 74	0.421		Rajasthan	0.472
75+	1.135***		Kerala	-1.127***
Female	-0.099		Karnataka	-0.451*
Some school	-0.216		R sq	0.052

Controls for caste, adjusted for survey design

***p<.01, **p<.05, *p<.10

*Addition of BMI, Heart Condition and Smoking to previous model: **CRP***

	OLS	
BMI	0.090***	
Heart Condition	0.487*	
Current Smoker	0.406	

Others controls as previous slide, adjusted for survey design

***p<.01, **p<.05, *p<.10

Heart condition=Diabetes/Stroke/Hypertension/Heart

*Oxaca-Blinder decomposition:
State variation in CRP risk compared
to Rajasthan*

	Rajasthan	Punjab	Kerala	Karnataka
Mean	3.274***	3.055***	1.926***	2.509***
		(0.257)	(0.278)	(0.257)
Difference from Rajasthan		0.219	1.348***	0.765**
		(0.313)	(0.341)	(0.310)
Endowments		-0.054	0.323	-0.353
		(0.150)	(0.459)	(0.306)
Coefficients		0.946*	1.967**	0.799*
		(0.467)	(0.717)	(0.430)
Interaction		-0.673	-0.942	0.318
		(0.404)	(0.843)	(0.493)
Observations		532	560	507

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Mean Hb by sub-population & t-test for mean difference

	Mean	P-value		Mean	P-value
Age 45-54	14.4		Male	15.3	
55 – 64	14.2	0.51	Female	13.3	0.00
65 – 74	14.0	0.06	Urban	14.7	
75+	13.8	0.09	Rural	14.1	0.10
			Punjab	14.1	
No Schooling	14.88		Rajasthan	13.7	0.37
Some Formal Education	14.88	(0.000)	Kerala	14.7	0.14
			Karnataka	14.5	0.47

Regression coefficients from OLS: *Hb*

	OLS			OLS
Age: (45 – 54 reference)			Rural	-0.455
55 – 64	-0.314		State: (Punjab)	
65 – 74	-0.423*		Rajasthan	-0.477
75+	-0.399		Kerala	0.261
Female	-1.969***		Karnataka	-0.088
Some schooling	-0.707***	-1.009***	R sq	0.223

Controls for caste, adjusted for survey design

***p<.01, **p<.05, *p<.10

*Addition of BMI, Heart Condition and Smoking to previous model: **Hb***

	OLS	
BMI	0.040 ^{***}	
Heart Condition	0.395 ^{**}	
Current Smoker	0.429 [*]	

Others controls as previous slide, adjusted for survey design

***p<.01, **p<.05, *p<.10

Heart condition=Diabetes/Stroke/Hypertension/Heart

Conclusions: CRP

- CRP is greater for the oldest old and urban residents
- An Education gradient does NOT exist in CRP
- CRP is lowest in Kerala
- State variation in CRP is mainly explained by the effects of risk factors

Conclusions: Hb

- Hb risk is greater for women than men
- A Strong education gradient exists in Hb
- No state variation exists in Hb

Implications

- CVD is not only a health problem for those with high SES, also for those with low SES
- Why is getting old in Kerala associated with less CRP risk than getting old in other states?
 - Access to health care

Implications

- Malnutrition associated with poverty remains as an important health issue
- Women and lower SES groups have less access to food than men and higher SES

Longitudinal Aging Study in India



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