



Understanding determinants of the burden of stunting in India



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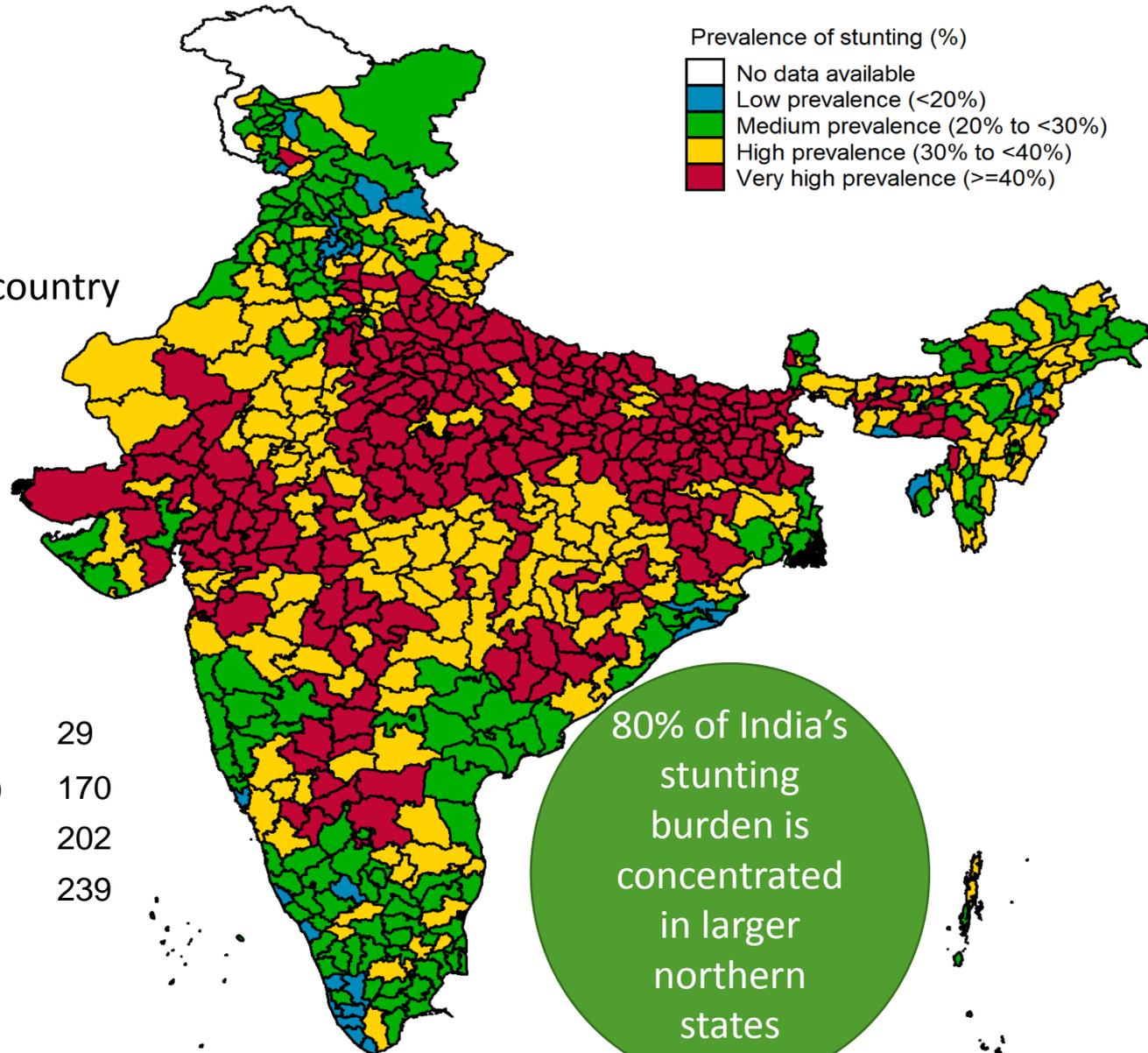
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Background

- Several studies have documented various factors associated with stunting:
 - Infant feeding (Menon et al.)
 - Sanitation (Spears et al)
 - Maternal factors (Coffey and others)
- Limited evidence exists on spatial analysis to identify hotspots of stunting and to explain the factors that contribute to **geographical inequalities** in child stunting
- This analysis is important in a policy context that aims to close gaps with a focus on the worst-off districts.

Stunting varies considerably across Indian states and districts

- Stunting ranges from **12% to 65%**
- Heavily clustered in the north and center of the country



Low prevalence (<20%)	29
Medium prevalence (20-30%)	170
High prevalence (30-40%)	202
Very high prevalence ($\geq 40\%$)	239

Differences in immediate and underlying determinants across groups of districts

	Low prevalence (<20%)	Medium prevalence (20- <30%)	High prevalence (30- <40%)	Very high prevalence (≥ 40%)
Immediate determinants				
Women with BMI <18.5	12.5	15.3*	21.9***	28.6***
Early initiation of breastfeeding	52.5	49.7	47.1	39.4***
Exclusive breastfeeding ¹	48.7	59.0	59.7	53.3
Timely introduction of foods ²	29.5	63.2**	46.9	34.2
Adequate diet	17.3	15.2	9.8***	6.9***
Underlying determinants				
Women with ≥10 years education	56.1	44.0***	33.9***	25.7***
Girls married after age of 18	90.3	83.0**	76.5***	68.5***
Asset score	61.0	52.8	39.9***	25.0***
Water within premises	60.7	50.4*	40.1***	36.3***
Open defecation density per sq km	128.1	180.5	257.6*	508.7***

Significant difference from districts with low level of stunting: *p<0.05, **p<0.01, ***p<0.001 ²Data for timely introduction of foods are available for 186 districts only

¹Data for EBF are available for 425 districts only

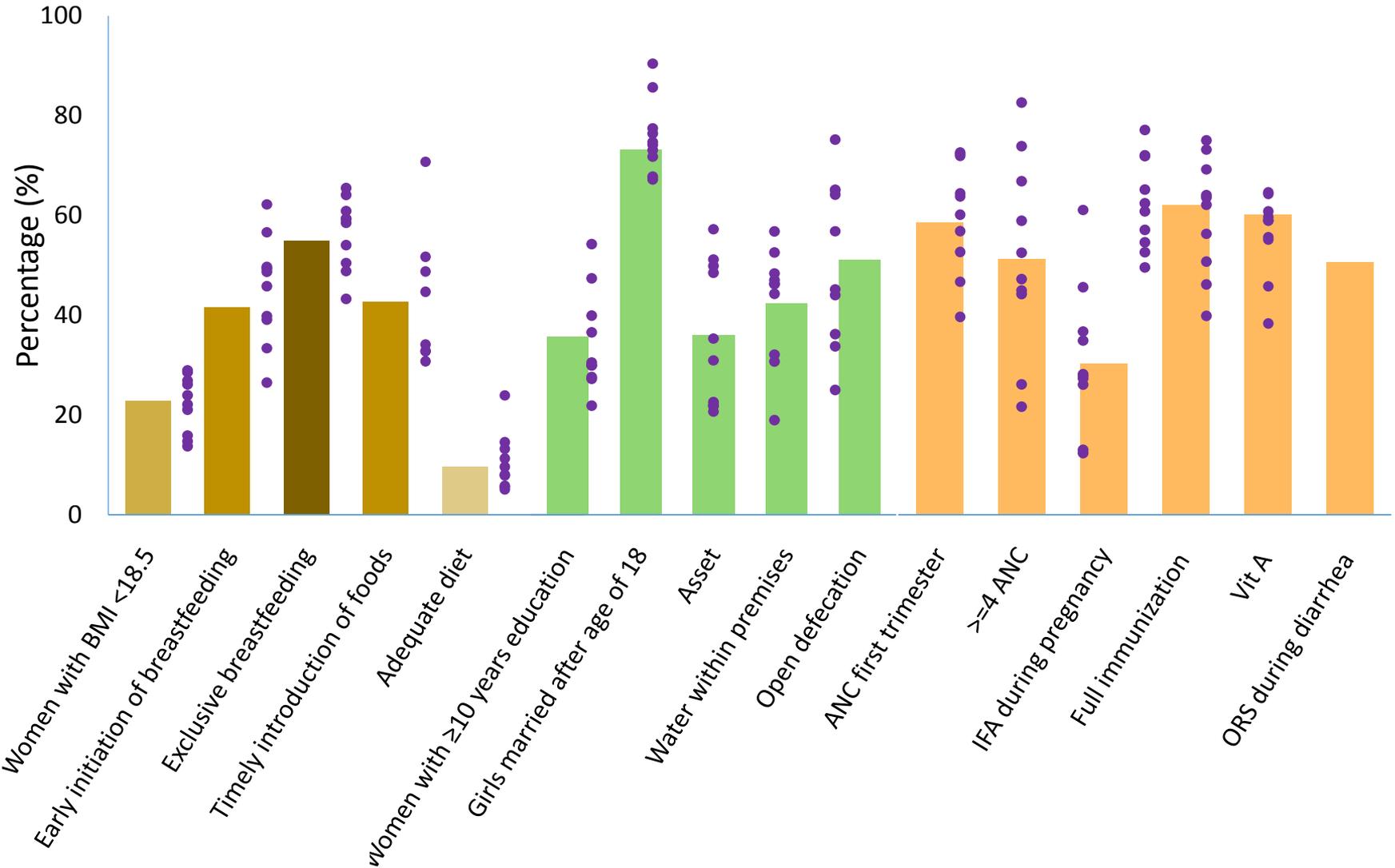
³Data for ORS during diarrhea are available for 328 districts only

Differences in coverage of nutrition-specific interventions across groups of districts

	Low prevalence (<20%)	Medium prevalence (20- <30%)	High prevalence (30- <40%)	Very high prevalence (≥ 40%)
Nutrition-specific interventions				
ANC first trimester	77.2	67.9**	62.3***	50.7***
4+ ANC visits	74.4	67.5	54.5***	35.9***
Consumed 100+ IFA during pregnancy	46.8	42.4	33.1***	20.2***
Full immunization	75.7	67.7*	62.6***	56.7***
Received vitamin A in the last 6 mos	72.4	66.0	58.7***	55.5***
ORS during diarrhea ³	91.4	65.7*	57.0**	48.5***
Other factors				
SC population	13.4	14.7	14.4	15.5
Household size	4.5	4.6	4.9*	5.4***

Significant difference from districts with low level of stunting: *p<0.05, **p<0.01, ***p<0.001

Determinants of stunting and district variability: Reducing stunting requires pulling all districts up on determinants

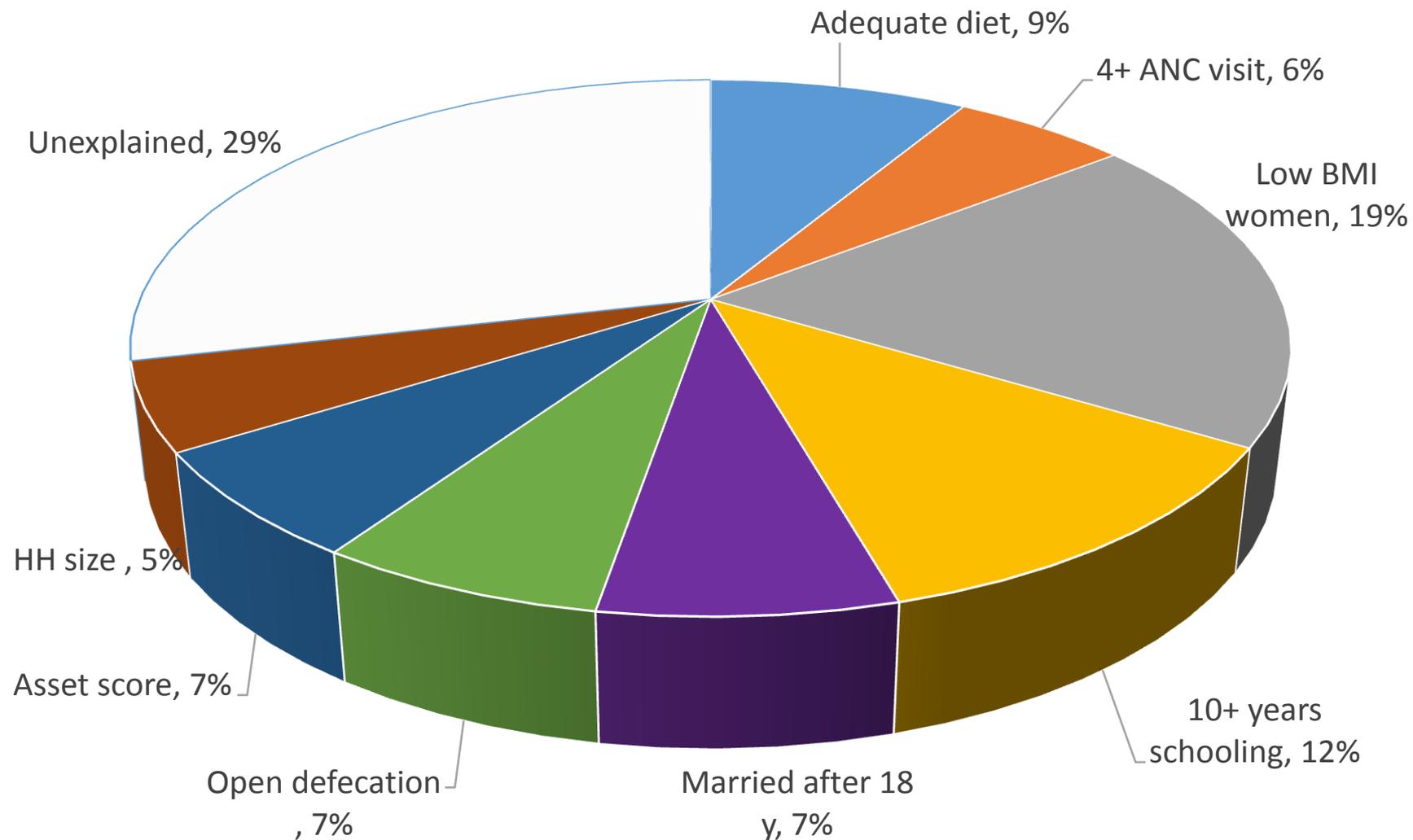


Immediate determinants:

Underlying determinants

Nutrition-specific interventions

Factors contributing to the differences in stunting prevalence between very high burden (stunting >40%) and low burden districts (stunting <20%)



Conclusion

- Our findings emphasize the **variability in stunting across India**, reinforce the **multifactorial determinants** that contribute to stunting, and highlight that **inter-district differences** in stunting are not explained by any single factor, but rather by a multitude of economic, health, hygiene and demographic factors.
- Strategies to **address these multiple determinants**, with enhanced **targeting towards higher burden districts**, could help to **reduce inequalities in childhood stunting in India**.



Thank you



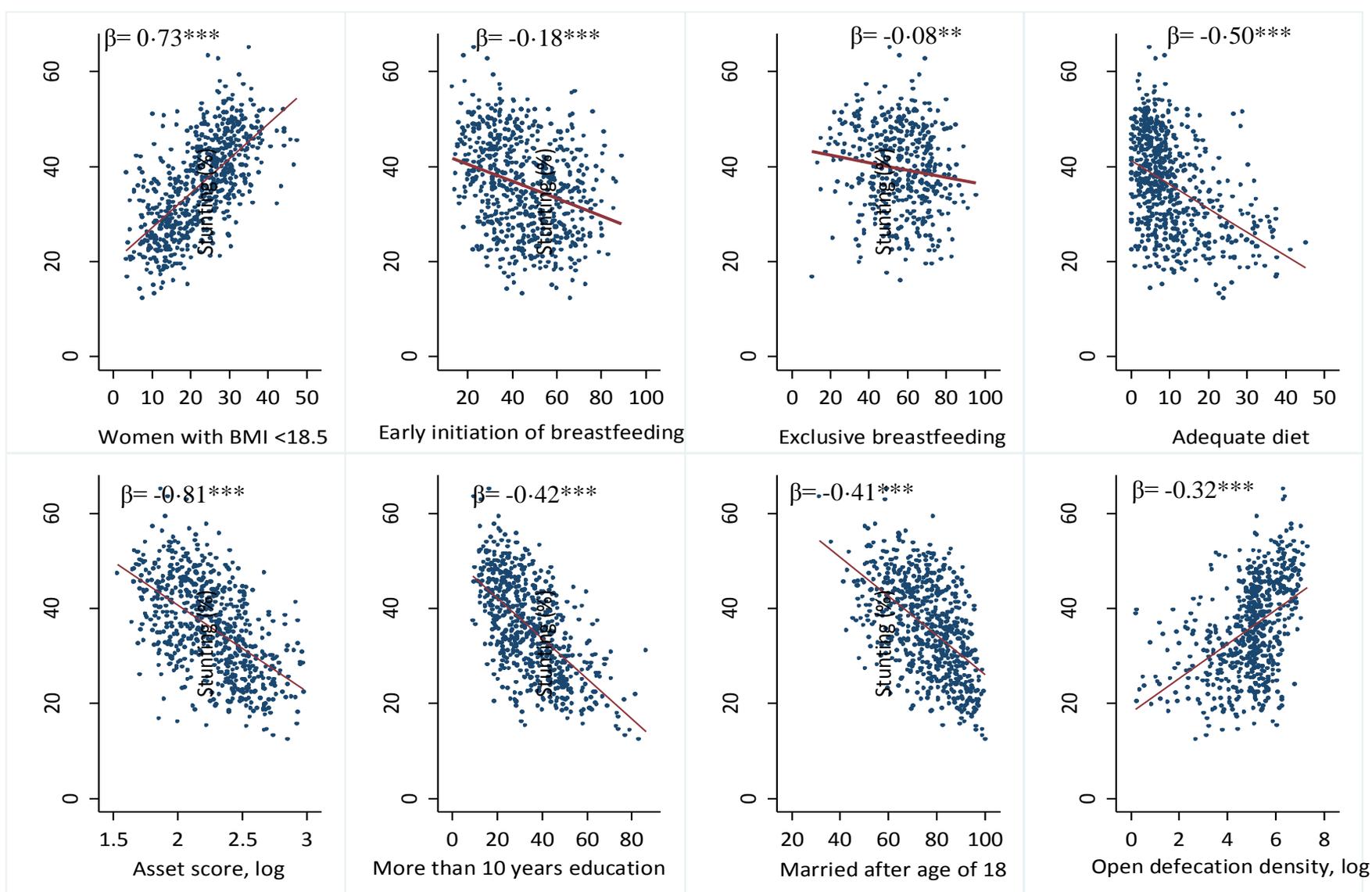


EXTRA ANALYSIS SLIDES

80% of India's stunting burden is concentrated in larger northern states

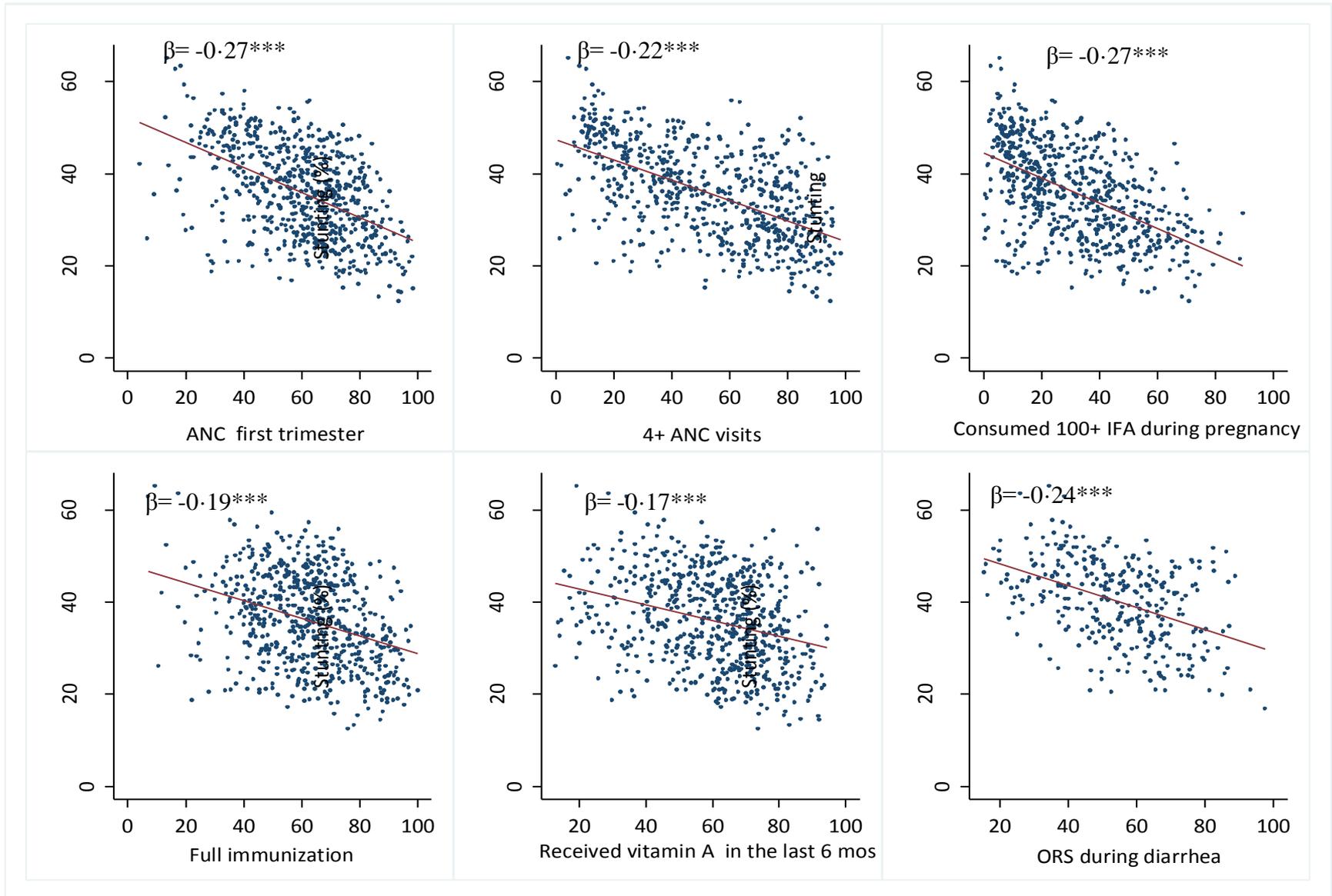
	No. districts	Share of districts (%)	Stunting Rate (%)	Stunted children	Share of stunted children (%)
Stunting burden categories					
Low prevalence (<20%)	29	4.5	16.9	723,651	1.1
Medium prevalence (20-30%)	170	25.6	25.9	8,872,991	14.1
High prevalence (30-40%)	202	31.6	35.2	16,363,830	25.9
Very high prevalence (≥ 40%)	239	37.3	46.9	37,179,537	58.9
<i>Total</i>		100.0	38.8	63,140,011	100.0
Spatial categories					
North-east and Islands	77	11.9	35.0	2,341,048	3.7
South & Smaller Northern States	165	25.4	29.5	9,627,306	15.2
Larger Northern States	407	62.7	40.7	51,828,448	82.1

Association of stunting with various immediate and underlying determinants



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

Association of stunting with various coverage indicators



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

Least squares regression models of stunting among children 0-5 years of age against its underlying determinants¹

	Model 1 ²	Model 2	Model 3	Full model
Women with BMI <18.5	0.63***			0.31***
Early initiation of breastfeeding	0.02			0.01
Adequate diet	-0.23***			-0.22***
4+ ANC visits, log		-0.67***		-0.22*
Consumed 100+ IFA during pregnancy		-0.09**		0.03
Full immunization		-0.04		-0.01
Received vitamin A in the last 6 mos		-0.02		-0.03
Women with ≥10 years education			-0.16***	-0.13**
Girls married after age of 18			-0.11***	-0.10***
Water within premises			-0.02	-0.01
Asset score, log			-0.41***	-0.16*
Open defecation density per sq km, log			0.11**	0.10*
SC population			-0.06	-0.06
Household size			1.64**	1.63**
R-square	0.68	0.61	0.72	0.74
N	640	635	640	635

¹ All models included state fixed effects and are weighted by the number of children 0-5 years in each district.

² Model 1 included immediate determinants only; model 2 included nutrition sensitive intervention only; model 3 included underlying determinants only; full model included all factors. *p<0.05, **p<0.01, ***p<0.001

Summary

- Despite a significant decline the national prevalence of stunting between 2006 and 2016 (from 48 to 38.4%), stunting in India remains high, but varies by district.
- Some 239 of the 640 districts have stunting levels above 40% and a further 202 have rates of 30-40%.
- High stunting districts are heavily clustered in the north and center of the country where the bulk of India's population resides.
- Regression models reveal several significant factors associated with stunting
- A decomposition model explains 71% of the observed difference in stunting rates. This explained share is accounted for by differences in maternal low BMI (19%), education (12%), child adequate diets (9%), sanitation, household assets and others (5-7% each).

Discussion

- Our study results are consistent with previous literature, and add insights from this most recent dataset
- A focus on addressing women's nutrition emerges as a key priority area in our analyses: maternal nutrition, education levels, age at marriage, and use/access to antenatal care services account for nearly half of differences
 - Maternal BMI explain 20% difference in low and high burden districts
 - Indian account for 1/6 the global population with 42% of low BMI prepregnant
 - Early marriage are common
- Investments in girls and women are likely to have both biological and social pathways to better nutrition for children

Limitations

- Interpret these findings as suggestive of causality, but not as indicative of strictly causal impacts.
- The regression model is ecological in nature, and could still be hampered by confounding factors
- The limited data included in the district-level summary data from the NFHS-4 preclude the inclusion of additional variables available in the unit-level data but not yet released.