The role of gender inequality in the obesity epidemic: a case study from India

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Outline

1. Introduction
2. Data and Method
3. Descriptive Statistics
4. Preliminary Results
5. Discussion and Conclusion

Introduction

1.Introduction
The obesity epidemic

- Rising epidemic of obesity is global public health concern (WHO, 2020)
    - 39% of adults (18+) in the world were overweight in 2016
    - 13% were obese

- Gendered dimension of the obesity epidemic:
    - Prevalence of female obesity higher than male obesity in most countries
    - 3 obese women for 2 obese men in the world

- Nutrition transition (Popkin 1994, 1999)

1. Introduction
Gender Inequality and Obesity

- Obesity related to many socioeconomic indicators:
  - Poverty (Hruschka, 2012)
  - Inequality (Pickett et al, 2005; Su et al., 2012)
- These dimensions are themselves related to gender inequality. Yet, the relationship between gender inequalities and obesity remains poorly explored
- Gender gap in obesity higher in middle-income countries (Ameye & Swinnen, 2019)
- At the global level, positive association between gender inequality and sex differences in obesity rates (De Soysa & Lewin, 2019; Garawi et al., 2014; Wells et al., 2012)
- Gender Inequality Index positively correlated to excess female obesity (Wells et al. 2012).
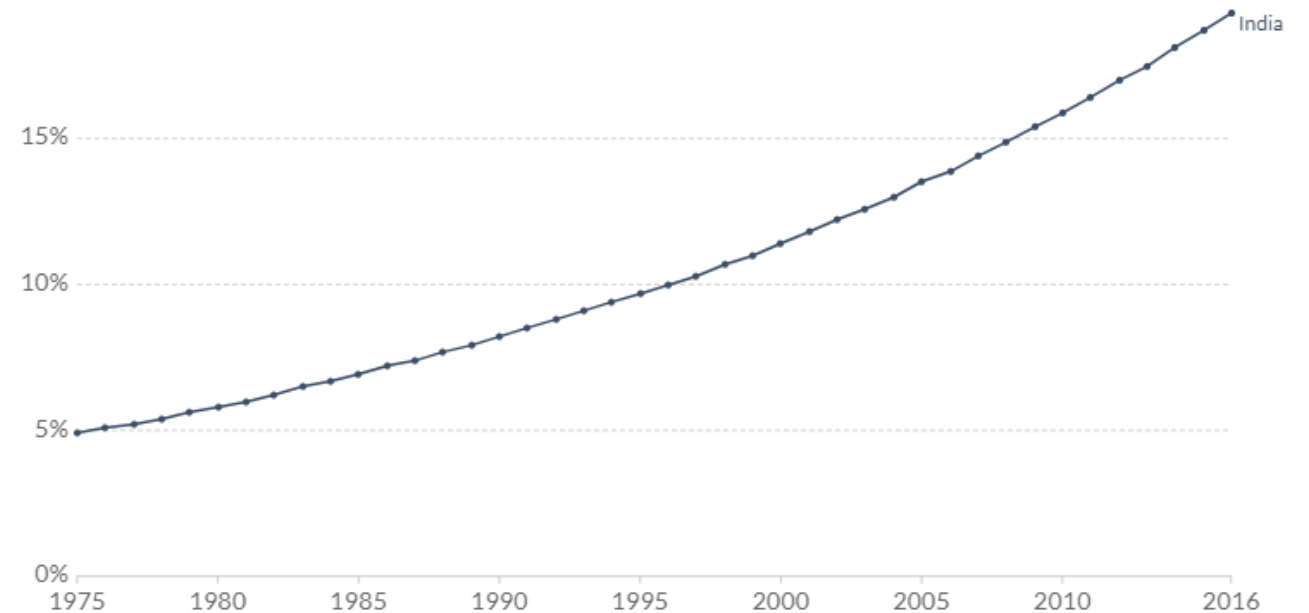
1.Introduction
The Indian context

- Lower middle-income country with an alarming increase of overweight and obesity

- Triple burden of malnutrition (Meenakshi, 2016)
  - Undernutrition
  - Overnutrition
  - Unhealthy foods

- Strong gender inequality in all areas of socioeconomic life:
  - Gender economic gaps
  - Health gender gap
  - Unequal investments in boys and girls

Share of adults that are overweight or obese, 1975 to 2016
Being overweight is defined as having a body-mass index (BMI) greater than or equal to 25. Obesity is defined by a BMI greater than or equal to 30. BMI is a person's weight in kilograms divided by his or her height in metres squared.

Our World in Data

⊕ Add country

India

15%

10%

5%

0%
1975   1980   1985   1990   1995   2000   2005   2010   2016

Source: Ritchie (2017)

1. Introduction
Research question

How does gender inequality affect women's Body Mass Index in India?

- Dynamic approach: we are interested in weight gain and weight loss between 2005 and 2011
- Gender inequality is measured at the locality level
- Gender inequality variables include objective measures and gender norms
- Is there a causal relationship?
- Are there different relationships between rural and urban areas?

Possible mechanisms:

- Two possible co-occurring factors: increase in female empowerment increases the level of food intake which (1) decreases the prevalence of undernutrition (2) increases the prevalence of overweight and obesity.
- Positive link between increase women's agency and equality in intra-household food distribution leads to more food for women
- Positive link between increase in women's agency and mobility leading to calorie expenditure
- Positive correlation between female empowerment and stress reduction or positive body image, leading to healthier lifestyles.

Data and Method

2.Data and Method

Data: India Human Development Survey (2005-2011)

✓Panel dataset

✓Nationally representative

✓Rich information (i.e. bodyweight and gender inequality indicators)

✓Large sample: 21,665 non-pregnant adult women (aged 18-65 in 2005) from 2,401 Primary Sampling Units.

2.Data and Method

Variables:

- Change in bodyweight between 2005 and 2011. Bodyweight measured by Body Mass Index (BMI=kg/m²)

- Gender inequality measured at the local level in 2005 (Primary Sampling Unit – PSU – level)
  - Objective measures of gender inequality:
    - ✓ Gender wage gap
    - ✓ Gender literacy gap
  - Indicators of gender norms:
    - ✓ Permission to leave household to visit a health centre
    - ✓ Permission to leave household to visit a friend
    - ✓ Permission to leave household for grocery shopping
    - ✓ Veiling practice (Gunghat/Purdah)

2.Data and Method

Estimation method:

1. Association between Gender Inequality and Change in bodyweight between 2005 and 2011

Multilevel model :

$$\Delta BMI_{ij} = \beta_0 + \beta_1 X_{ij} + \beta_2 X_j + \beta_3 Gender\_Ineq_j + e_{ij} + u_j$$

2. Causal Relationship between Gender Inequality and Change in bodyweight between 2005 and 2011:

Multilevel Instrumental variables model to deal with reverse causality & unobserved heterogeneity:

$$\Delta BMI_{ij} = \beta_0 + \beta_1 X_{ij} + \beta_2 X_j + \beta_3 Gender\_Ineq_j + \beta_4 \widehat{\varepsilon}_j + e_{ij} + u_j$$

$$\text{with } Gender\_Ineq_j = \alpha_0 + \alpha_1 X_j + \alpha_2 desired\_daughter_j + \varepsilon_j$$

X_{ij} and X_j are (all from 2005 wave): BMI, Age, Squared Age, Education Level, Caste/Religion, Poor Household, Urban, and Region.

Descriptive Statistics

3.Descriptive statistics:
Female weight classification (2011)

| Rural | Urban |

Rural pie chart:
- 25.4% Underweight
- 46.39% Normal weight
- 12.35% Risky excess weight
- 13.28% Overweight
- 2.60% Obesity

Urban pie chart:
- 11.66% Underweight
- 35.61% Normal weight
- 17.22% Risky excess weight
- 27.14% Overweight
- 8.37% Obesity

Legend:
- Underweight
- Normal weight
- Risky excess weight
- Overweight
- Obesity
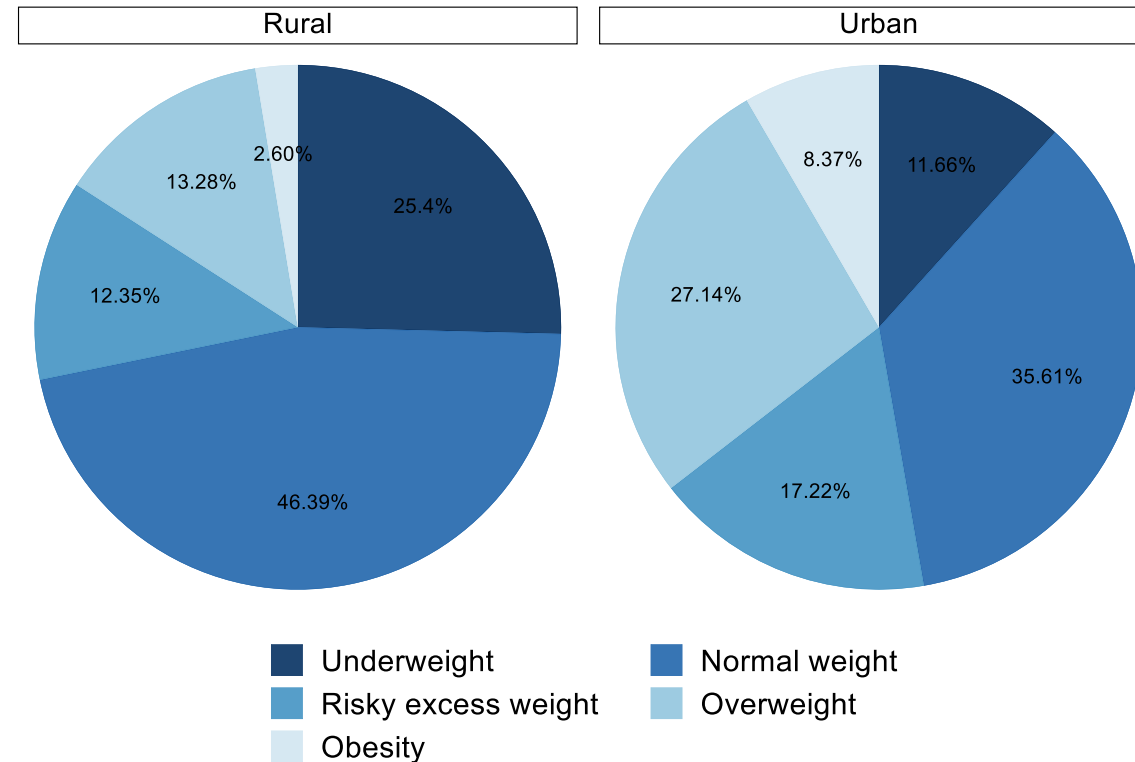
Source: Author's Calculations from IHDS (2011).

3.Descriptive statistics:
Indicators

Table 1. Sample means of main indicators

		GENDER GAP 2011	
		Rural	*Urban*
Bodyweight indicators	Gender BMI Gap in 2011 (kg/m²)	0.140	**1.027**
	Female weight gain b/w 2005 & 2011 (kg/m²)	1.184	**1.823**
Gender inequality	Gender wage gap 2011 (% of extra wage for men)	0.741	**0.971**
	Gender literacy Gap 2011 (extra percentage points for men)	**0.214**	0.107
Gender norms	Ask permission to visit health center 2011 (%)	0.487	**0.522**
	Ask permission to visit friends 2011 (%)	0.490	**0.542**
	Ask permission to go to grocery shops 2011 (%)	0.419	**0.449**
	Veiling practice 2011 (%)	0.478	**0.549**

Source: Author's Calculations from IHDS (2005-2011).

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3.Descriptive statistics:
Linear fits

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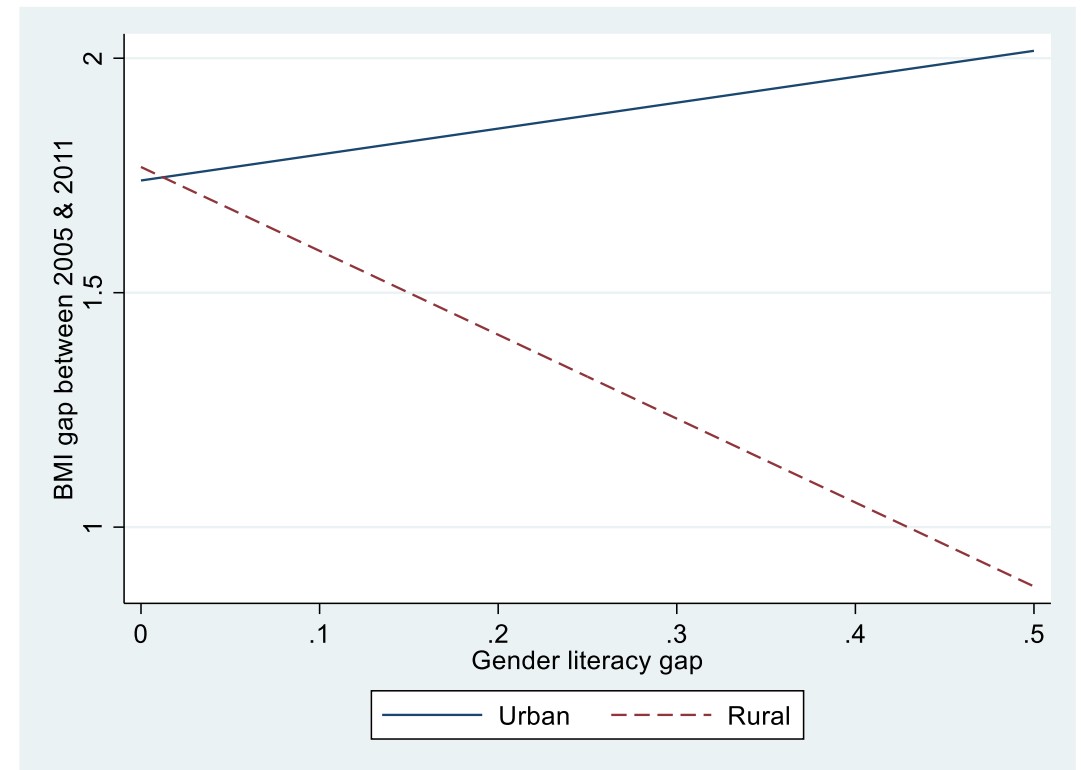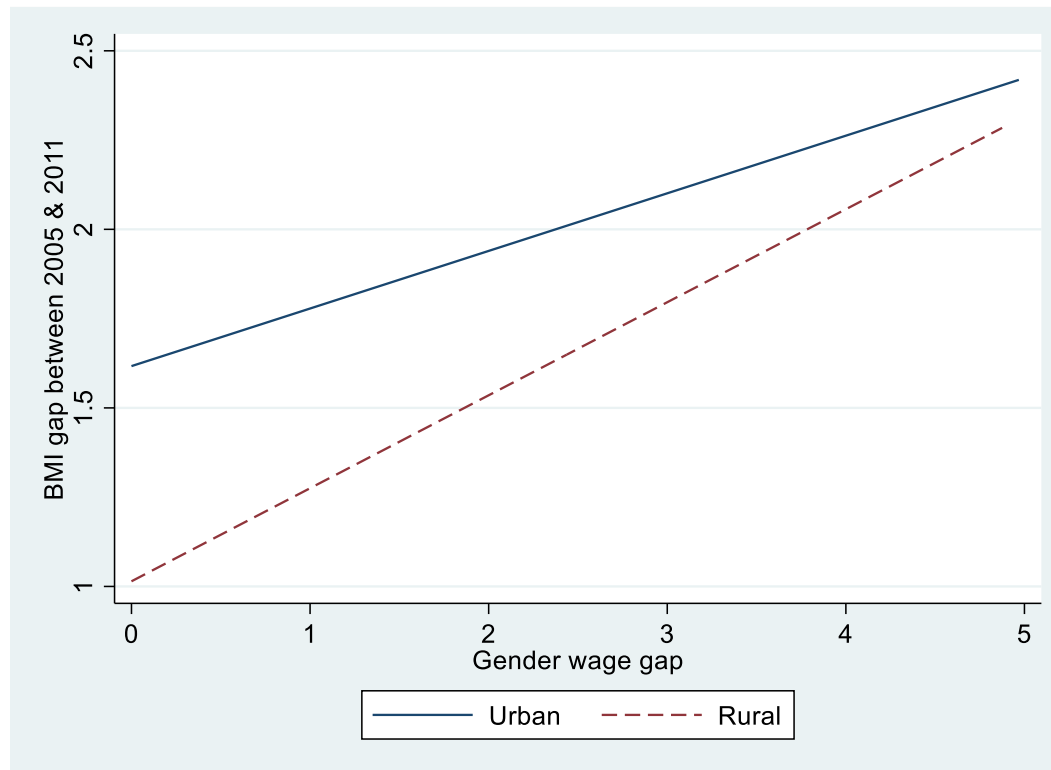
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Fractional polynomial (nonlinear) fits
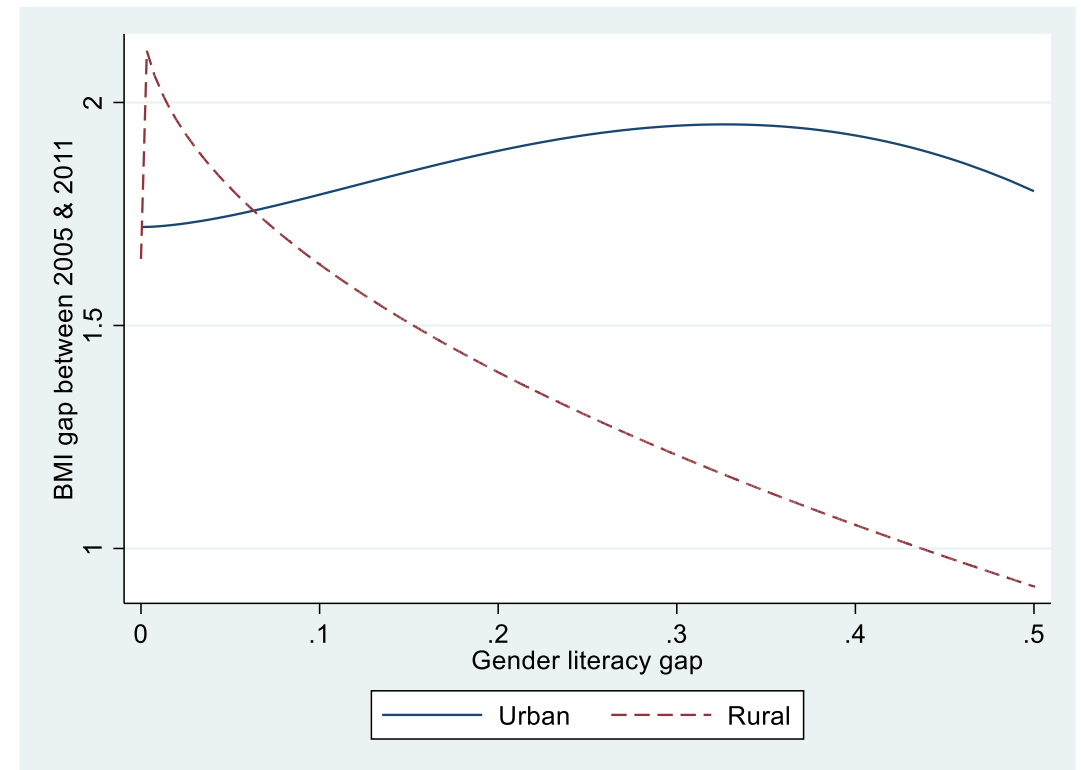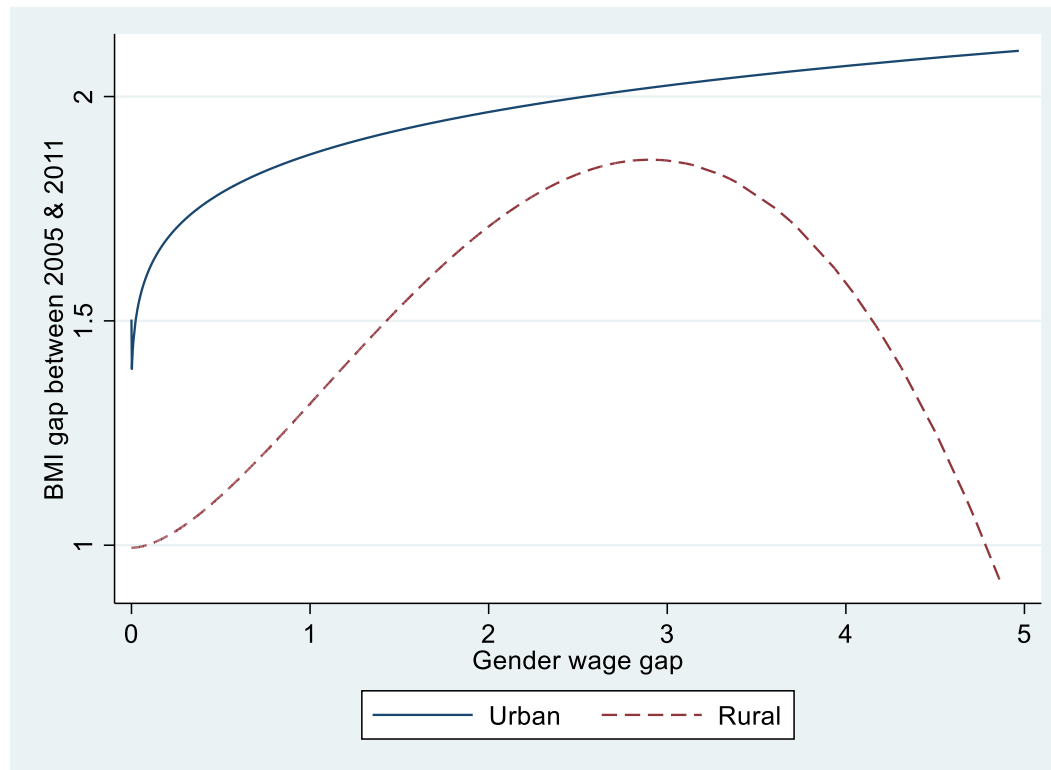
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Preliminary Results

4.Main results- *Gender inequality indicators*

Table 2. Multilevel & IV estimations of the relationship between gender inequality indicators and BMI change

Dependent Variable: BMI change b/w 2005 & 2011 (in kg/m²)	ALL WOMEN				URBAN WOMEN				RURAL WOMEN			
	Multilevel		IV-Multilevel		Multilevel		IV-Multilevel		Multilevel		IV-Multilevel	
	Linear	*Quadratic*	*Linear*	*Quadratic*	*Linear*	*Quadratic*	*Linear*	*Quadratic*	*Linear*	*Quadratic*	*Linear*	*Quadratic*
Gender literacy gap	**-1.050*****	0.042	**-4.062*****	-10.53	**-0.380**	0.549	**2.905****	-6.782	**-1.283*****	-0.652	**-6.538*****	-15.92
	(0.197)	(0.534)	**(0.0757)**	(122.5)	**(0.365)**	(0.828)	**(1.237)**	(12.75)	**(0.232)**	(0.681)	**(1.019)**	(31.65)
Square of gender literacy gap		-1.741**		13.27		-1.748		20.29		-0.939		18.84
		(0.777)		(220.7)		(1.244)		(54.54)		(0.966)		(48.83)
Observations	18,133	18,133	18,104	18,104	5,566	5,566	5,546	5,546	12,567	12,567	12,558	12,558
Number of groups	2,387	2,387	2,374	2,374	949	949	941	941	1,438	1,438	1,433	1,433
Gender wage gap	0.074**	**0.179*****	**-0.621*****	-2.956	0.069	**0.169****	1.025	**-3.029*****	**0.052**	**0.136****	**-1.084****	-3.416
	(0.031)	**(0.048)**	**(0.0243)**	(2.789)	(0.046)	**(0.076)**	(0.730)	**(0.365)**	**(0.037)**	**(0.058)**	**(0.543)**	(38.41)
Square of gender wage gap		**-0.014*****		0.297		**-0.014****		**0.549*****		**-0.011****		0.290
		(0.004)		(0.828)		**(0.006)**		**(0.129)**		**(0.005)**		(9.825)
Observations	14,472	14,472	14,455	14,455	3,812	3,812	3,800	3,800	10,660	10,660	10,655	10,655
Number of groups	1,810	1,810	1,804	1,804	629	629	626	626	1,181	1,181	1,178	1,178

Source: Author's Calculations from IHDS (2005-2011).

Note: Cluster-robust standard errors in parentheses (at the PSU level). Significance levels are: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Control variables are (all from 2005 wave): BMI, Age, Squared Age, Education Level, Caste/Religion, Poor Household, Urban, and Region. Selected instrument is the average percentage of desired daughters per PSU in 2005.

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4.Main results- *Gender inequality indicators*

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Dependent Variable: BMI change b/w 2005 & 2011 (in kg/m²)	ALL WOMEN				URBAN WOMEN				RURAL WOMEN			
	Multilevel		IV-Multilevel		Multilevel		IV-Multilevel		Multilevel		IV-Multilevel	
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29/09/2020

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4.Additionnal results- *Gender norms indicators*

Table 3. Multivariate estimations of the relationship between gender norms and BMI change

Dependent Variable: BMI change b/w 2005 & 2011 (in kg/m²)	ALL WOMEN	URBAN WOMEN	RURAL WOMEN
	Linear	*Linear*	*Linear*
Ask permission to visit healh center	**0.441***	**0.560**	0.238
	(0.149)	**(0.239)**	(0.189)
Observations	18,137	5,566	12,571
Number of PSU	2,389	949	1,440
Ask permission to visit friends	**0.530***	**0.726***	**0.323***
	(0.144)	**(0.250)**	**(0.173)**
Observations	18,137	5,566	12,571
Number of PSU	2,389	949	1,440
Ask permission to visit grocery shops	0.083	**0.517**	-0.193
	(0.115)	**(0.201)**	(0.139)
Observations	18,137	5,566	12,571
Number of PSU	2,389	949	1,440
Veiling practice	**-0.510***	-0.219	**-0.542***
	(0.117)	(0.227)	**(0.133)**
Observations	18,137	5,566	12,571
Number of PSU	2,389	949	1,440

Source: Author's Calculations from IHDS (2005-2011).

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Discussion and Conclusion

5. Discussion and Conclusion

- Our results suggest that there is a **connexion between gender inequality, women's BMI & living areas** in India:
  - Local gender inequality and restrictive gender norms are associated to **female weight gain in urban areas**
  - But **negatively associated to female BMI in rural areas**

  ❖ **Potential mechanisms:**
  - In **rural areas**, gender inequality might be associated to **food deprivations, hard labor, and lower access to health** for women related to weight loss.
  - In **urban areas**, gender inequality might be associated to **lower female mobility, sedentariness** (e.g. less outings, unemployment) and **higher socio-psychological troubles** (lower self-confidence & self-esteem) related to weight gain.

5. Discussion and Conclusion

- Necessity to include **measures to reduce gender inequality in public health policy**, especially in urban areas.

- **Current pandemic context** also likely to increase the prevalence of malnutrition & gender inequality

- **Further research is needed**
    - In ongoing research, we are trying to assess the best level to measure inequality and the representativeness of PSUs. We are exploring variables of gender inequality at the household level.