What drives regional differences in BMI? Evidence from Spain.

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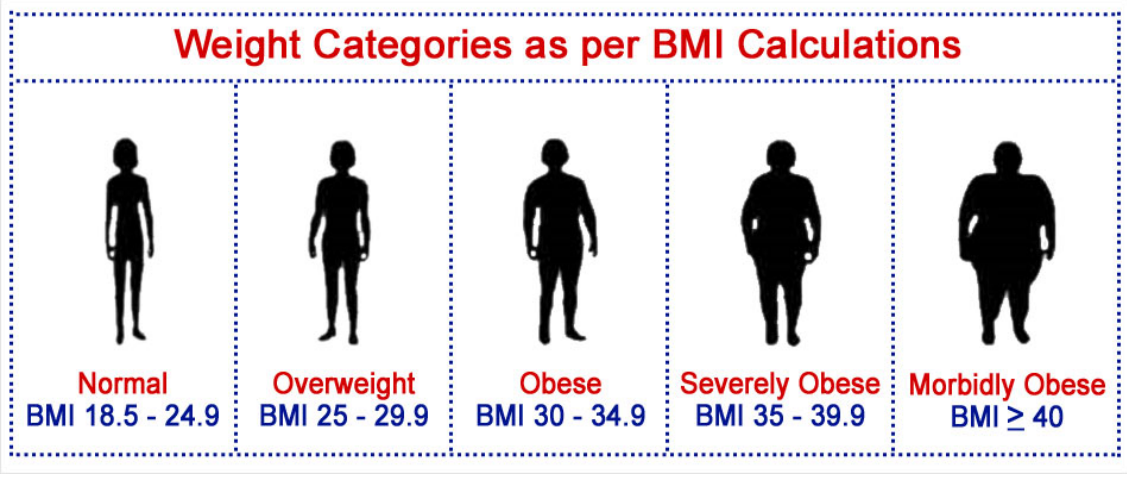
Outline

Body mass index (BMI) is a measure of body fat based on ones weight in relation to their height.



- Global rise in the prevalence of obesity (nearly doubled between 1980 and 2010, WHO).
- 41 million kids under the age of 5 were overweight/obese in 2014 worldwide (WHO).
- At least 2.8 million people die each year globally, as a result of being overweight/obese.
- Obesity is preventable!!

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- High Obesity rates compared to rest of Europe and the OECD (Spain 24,6 % - OECD average 23%)
- Decentralised health care system with 17 regions with health competencies.
- There is a regional pattern of BMI and obesity in Spain, such that in some Spanish regions the average BMI has been observed to be higher than in others.

Investigate the underlying factors that contribute in explaining why Spanish regions are so unequal in terms of their BMI.

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Distinction of two groups of high (HBMI) and low BMI (LBMI) regions, which are defined as the top five highest according to mean BMI regions and the five lowest.

Table: Groups of Regions

	Freq	%	mean BMI	S.D BMI
High BMI regions				
Andalucia	1,694	41,97	26,044	4,582
Asturias	553	13,7	26,188	4,617
Cantabria	446	11,05	25,762	4,472
Extremadura	620	15,36	26,026	4,324
Galicia	723	17,91	26,430	4,817
Total	4,036	100	26,099	4,581
Low BMI regions				
Catalonia	1,291	28,73	25,278	4,383
Madrid	1,478	32,89	24,892	4,250
Navarra	530	11,79	25,157	4,095
Pais Vasco	818	18,2	25,090	4,323
Rioja	377	8,39	24,974	3,957
Total	4,494	100	25,077	4,262

We use data from the 2014 wave of the Spanish version of the European Health Interview Survey (EHIS). We divide the observable covariates of BMI into five main groups:

1. Demographic variables: male, age
2. Family composition: marital status, number of children in the household
3. Socioeconomic status: years of schooling, income, working status
4. Lifestyle variables: sedentarism, physical activity during leisure time, smoking & drinking habits
5. Food habits: consumption of red meat, fruits, vegetables and legumes

- OLS: to analyze to what extent the controls affect BMI.
- Decomposition analysis between the 2 groups of regions using the:
  1. Classical Oaxaca-Blinder decomposition method: Disentangles the average observed gap into the contribution of explained and unexplained factors.
  2. RIF-regression decomposition technique: Disentangles the observed gap into the contribution of explained and unexplained factors **along the unconditional distribution of BMI.**

- important differentials at other points of the BMI distribution than the mean
- ability to draw conclusions for the drivers of differences in obesity only when checking the differences at the top of the unconditional BMI distribution
  $\Rightarrow$ policy makers are mostly interested on designing effective policies against overweight and obese
- public health benefits of addressing obesity are not realised by targeting differences in average BMI

Kernel Density plot of BMI

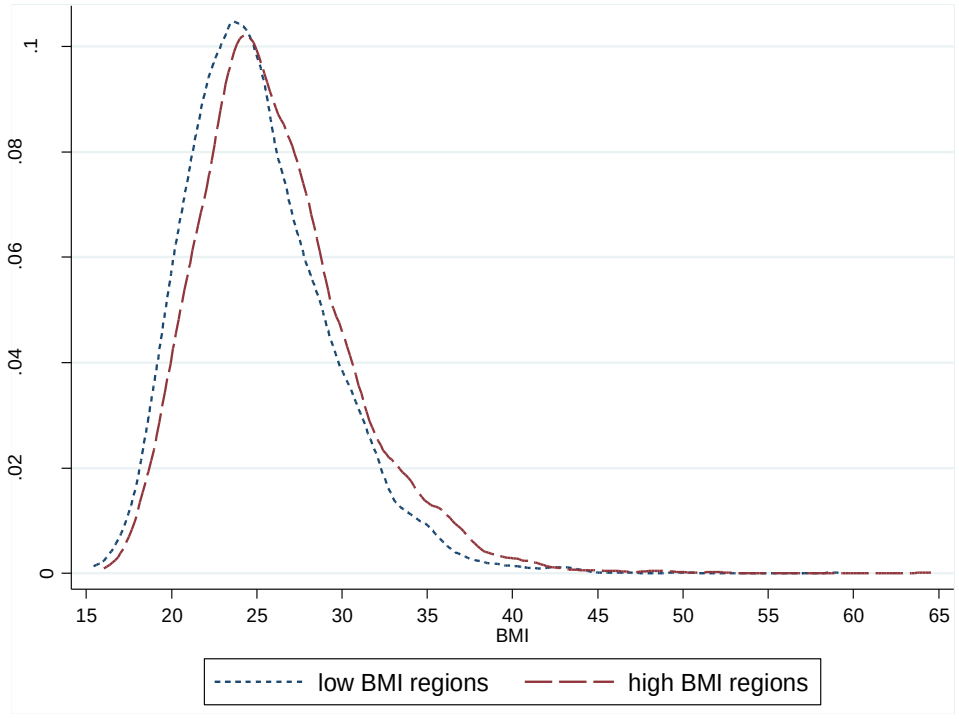

Table: Difference in characteristics

	pooled sample		HBMI regions		LBMI regions		
variables	mean	s.d	mean	s.d.	mean	s.d.	**diff high-low**
height	168,14	9,18	167,69	9,04	168,54	9,29	-0.858***
weight	72,50	14,87	73,57	14,84	71,54	14,84	2.021***
bmi	25,56	4,44	26,09	4,58	25,08	4,26	1.022***
sociodemographic characteristics							
age: 18-35	0,227	0,419	0,233	0,420	0,222	0,416	0.011
age: 36-45	0,282	0,449	0,258	0,430	0,302	0,459	-0.043***
age:46-55	0,260	0,440	0,270	0,440	0,252	0,434	0.019**
age: 55-65	0,230	0,430	0,236	0,420	0,224	0,417	0.013
male	0,490	0,500	0,489	0,500	0,495	0,500	-0.006
household composition							
married	0,579	0,494	0,604	0,489	0,551	0,500	0.050***
number of children	0,479	0,782	0,464	0,762	0,490	0,797	-0.020
socioeconomic status							
schooling	11,419	4,270	10,480	4,371	12,260	4,010	-1.780***
log income	7,080	0,325	6,974	0,692	7,175	0,737	-0.200***
missing family income	0,193	0,395	0,167	0,373	0,214	0,410	-0.049***
working	0,615	0,486	0,538	0,499	0,687	0,464	-0.152***
lifestyle variables							
sedentary job	0,357	0,479	0,297	0,456	0,412	0,492	-0.116***
weekly sport activities	0,131	0,337	0,112	0,315	0,147	0,355	-0.036***
daily smoker	0,292	0,450	0,283	0,446	0,300	0,454	-0.017*
weekly alcohol consumption (index)	5,950	10,730	5,679	10,770	6,205	10,690	-0.525**
food habits variables							
meat	0,35	0,48	0,27	0,44	0,42	0,49	-0.153***
fruit	0,75	0,44	0,75	0,43	0,74	0,44	0.006
vegetables	0,69	0,46	0,62	0,48	0,75	0,43	-0.129***
legumes	0,06	0,23	0,07	0,25	0,05	0,22	0.016***
number of observations	8530		4036		4494		

Main finding: Heterogeneous pattern of covariate effects in BMI across regions.

- Positive and significant relationship between male and BMI (strikingly greater for LBMI).
- Ageing has a positive and increasing effect on mean BMI (effect much stronger for LBMI).
- Number of kids in household is negatively correlated with BMI for LBMI (no effect in HBMI).
- Schooling and being married have both the expected negative and positive effect on mean BMI (effect much stronger for HBMI).
- Working in sedentary jobs and red meat consumption $\Rightarrow$ in detriment of HBMI residents (no effect on LBMI).
- Weekly sport activities and smoking status have the expected negative effect on BMI for both groups.

Table: Oaxaca-Blinder Decomposition

	pooled sample		**women**		**men**	
Overall decomposition	mean	z-stat	mean	z-stat	mean	z-stat
high BMI regions	26,099	361,96	25,365	237,00	26,865	288,77
low BMI regions	25,077	394,5	23,95	259,95	26,220	325,35
difference (high-low)	**1,022**	10,63	**1,41**	9,99	**0,646**	5,25
explained difference	**0,349**	6,93	**0,443**	6,22	**0,203**	3,33
sociodemographic characteristics	-0,005	-0,19	0,020	0,88	-0,013	-0,50
household composition	0,032	3,75	0,037	2,68	0,022	2,24
schooling	0,313	10,71	0,378	8,05	0,228	6,62
socioeconomic status	0,097	3,58	0,170	4,61	0,008	0,19
lifestyle variables	-0,004	-0,24	-0,016	-0,64	0,016	0,75
food habits	-0,083	-4,00	-0,148	-4,09	-0,059	-2,46
unexplained difference	**0,672**	7,11	**0,968**	6,84	**0,443**	3,59
sociodemographic characteristics	-0,375	-3,97	-0,012	-0,94	-0,014	-1,17
household composition	0,129	1,08	-0,129	-0,72	0,278	1,77
schooling	-0,469	-1,49	-0,622	-1,24	-0,179	-0,47
socioeconomic status	0,697	0,51	1,802	0,92	-0,628	-0,33
lifestyle variables	0,017	0,15	0,054	0,35	-0,041	-0,26
food habits	0,174	0,85	0,361	1,04	0,058	0,24
constant	**0,499**	0,39	**-0,485**	-0,26	**0,970**	0,56

- There is a significant BMI gap of 1.02 units between the two groups of regions (higher than usually found in similar analyses).
- 34% of the gap is explained and the remaining 66% is unexplained.
- High contribution of demographics in the unexplained part $\Rightarrow$ split by gender.
- The contribution of schooling is huge both for women and men (i.e schooling is the most important correlate to explain differences).
- Socioeconomic status (income and working status) is in detriment of the HBMI group and constitutes an important contributor of the exlained part of the difference for women.

Table: RIFR Decomposition: Women

	q1	**q2**	**q3**	**q4**	**q5**	**q6**	**q7**	**q8**	**q9**
HBMI regions	20.08	21.34	22.38	23.45	24.38	25.63	27.08	28.92	32.01
LBMI regions	19.43	20.43	21.34	22.19	23.04	24.05	25.43	27.22	29.97
difference (high-low)	**0,65**	**0,91**	**1,05**	**1.26**	**1.34**	**1.58**	**1,65**	**1,70**	**2.03**
explained difference	**0,172**	**0,274**	**0,328**	**0,427**	**0,511**	**0,567**	**0,632**	**0,663**	**0,768**
demographics	0,012	0,024	0,028	0,261	0,025	0,019	0,016	0,019	0,022
household composition	**0,038**	**0,047**	**0,049**	**0,052**	**0,041**	**0,046**	0,035	**0,061**	0,033
schooling	**0,100**	**0,182**	**0,219**	**0,267**	**0,372**	**0,438**	**0,476**	**0,575**	**0,758**
socioeconomic status	0,042	**0,078**	**0,128**	**0,136**	**0,158**	**0,197**	**0,263**	**0,270**	**0,350**
lifestyle variables	0,034	0,001	-0,006	0,027	0,017	0,010	-0,001	-0,026	-0,039
food habits variables	-0,054	-0,058	-0,090	**-0,081**	**-0,103**	**-0,143**	**-0,158**	**-0,234**	**-0,354**
unexplained difference	**0,48**	**0,64**	**0,719**	**0,837**	**0,829**	**1,015**	**1,021**	**1,042**	**1,268**
demographics	-0,016	-0,006	0,000	-0,002	-0,014	-0,010	-0,017	-0,019	0,000
household composition	0,147	0,014	0,013	**-0,384**	-0,241	-0,151	-0,185	-0,247	-0,286
schooling	-0,658	-0,699	-0,313	-0,774	-0,722	**-1,512**	-1,377	-0,859	-0,601
socioeconomic status	**4,651**	**-3,839**	**3,924**	2,494	0,714	1,506	1,803	-3,152	1,606
lifestyle variables	0,027	-0,039	0,033	-0,036	-0,098	-0,093	0,109	-0,079	-0,206
food habits variables	0,008	0,027	0,527	**0,983**	0,747	0,859	0,904	-0,156	-0,158
constant	**-3,679**	-2,501	**-3,465**	-1,445	0,443	0,416	-0,218	5,554	0,913

Table: RIFR Decomposition: Men

	q1	**q2**	**q3**	**q4**	**q5**	**q6**	**q7**	**q8**	**q9**
high BMI regions	22.46	23.67	24.51	25.39	26.24	27.35	28.38	29.88	32.22
low BMI regions	21.97	23.19	24.11	24.73	25.65	26.57	27.77	29.23	31.19
difference (high-low)	**0,48**	**0,48**	**0,40**	**0,65**	**0,59**	**0,78**	**0,61**	**0,66**	**1,02**
explained difference	**-0,072**	**0,078**	**0,110**	**0,153**	**0,196**	**0,235**	**0,267**	**0,337**	**0,410**
demographics	-0,023	-0,007	-0,003	-0,005	-0,008	-0,012	-0,010	0,001	-0,010
household composition	**0,025**	**0,022**	**0,025**	**0,020**	**0,024**	**0,030**	**0,033**	0,021	0,003
schooling	**0,075**	**0,155**	**0,175**	**0,217**	**0,205**	**0,264**	**0,248**	**0,292**	**0,383**
socioeconomic status	**-0,151**	**-0,081**	-0,070	-0,039	0,040	0,033	0,053	0,095	0,123
lifestyle variables	0,021	0,025	0,025	0,041	0,033	0,009	0,012	-0,016	-0,013
food habits variables	-0,019	-0,037	-0,042	**-0,081**	**-0,097**	**-0,089**	-0,068	-0,056	-0,076
unexplained difference	**0,558**	**0,399**	**0,293**	**0,502**	**0,399**	**0,543**	0,345	0,320	**0,615**
demographics	-0,002	-0,009	-0,010	-0,005	-0,005	-0,005	-0,005	-0,030	-0,013
household composition	0,195	0,214	0,265	0,180	0,257	0,224	0,093	0,280	0,441
schooling	-0,594	-0,544	-0,424	-0,044	0,217	-0,424	-0,274	-0,330	-0,343
socioeconomic status	1,984	0,338	1,301	1,880	1,646	0,919	-1,816	-1,050	-4,705
lifestyle variables	-0,076	-0,134	0,136	0,058	0,079	0,221	0,303	0,068	-0,210
food habits variables	-0,319	-0,135	0,218	0,215	0,402	0,715	0,530	-0,180	-0,408
constant	-0,629	0,669	-1,193	1,781	-2,198	-1,105	-1,516	1,562	5,853

- People in the LBMI group are better off in respect with their endowment in schooling and socioeconomic status.
- Schooling has a huge contribution to the explained part of the difference for both sexes and thoughout the BMI distribution.
- SES status contributes to the explained part of the difference for women but only at the two first quantiles for men.
- Women in the HBMI group are better off in respect with their endowment in food habits (however the coefficient is small).

- cannot claim causality
- self-reported BMI $\Rightarrow$ results change very little on correction (correcting formulas for Spain provided by Gil and Mora (2011)).
- use of a broad set of statistically significant variables but still $\Rightarrow$ anything uncaptured in our decomposition analysis would appear to be part of the unexplained share

1. There is a significant BMI gap between the LBMI and HBMI regions in Spain, some part of which is explained by the difference in endowments between the two groups of regions.
2. Equalising endowments across the two groups is expected to have a minimal impact in the reduction of the BMI gap.
3. The findings in the upper tail of the distribution are actually capturing obesity problems.
4. Overall, differences are not only attributable to the different levels of the variables included in the model

$\Downarrow$ a significant part of the BMI gap is due to the returns to observed characteristics which could be linked to differences in unobservable heterogeneity (reflects differences in factors that are not captured in the model like unmeasured behavioral differences, cultural perception of beauty and healthy weight, etc.)

Thank you for your attention!

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