IFLS BMI MAIHDA

Intersectionality is the study of how multiple sociodemographic identities intersect and interact to create unique experiences of discrimination and privilege that result in inequalities in individual outcomes. Intersectionality makes visible the experiences of hidden marginalized populations.

From quantitative data analysis perspective, a natural approach to study intersectional sociodemographic inequalities in individual outcomes is to estimate linear regressions of the individual outcome of interest on their sociodemographic characteristics and their interactions. As we introduce further sociodemographic characteristics, it proves statistically and interpretationally challenging to also introduce more and more interactions, many imprecisely estimated parameters and risk of type I errors. As a result, interactions effects and therefore intersectionality in individual outcomes is typically under explored, running the risk of misunderstanding or even missing important marginalized populations.

Intersectional multilevel analysis of individual heterogeneity and discriminatory accuracy (MAIHDA) aims to address these challenges, a systematic approach to explore many and complex interaction effects. Intersectional MAIHDA involves an innovative application of two-level linear regression of individual outcomes where individuals are modeled as clustered in 10s or even 100s of strata defined by the combinations of their sociodemographics characteristics, interest lies in studying how mean outcomes vary across strata. The approach was proposed by Evans et al. (2018) and has been further developed by Evans, Merlo, Leckie, and others.

Data

Data were drawn from wave 5 of Indonesia family life survey (IFLS). Sample consists of 29934 respondents after being cleaned. The outcome is toothache experience. The sociodemographic characteristics are: age, sex, marital, urban, education, job.
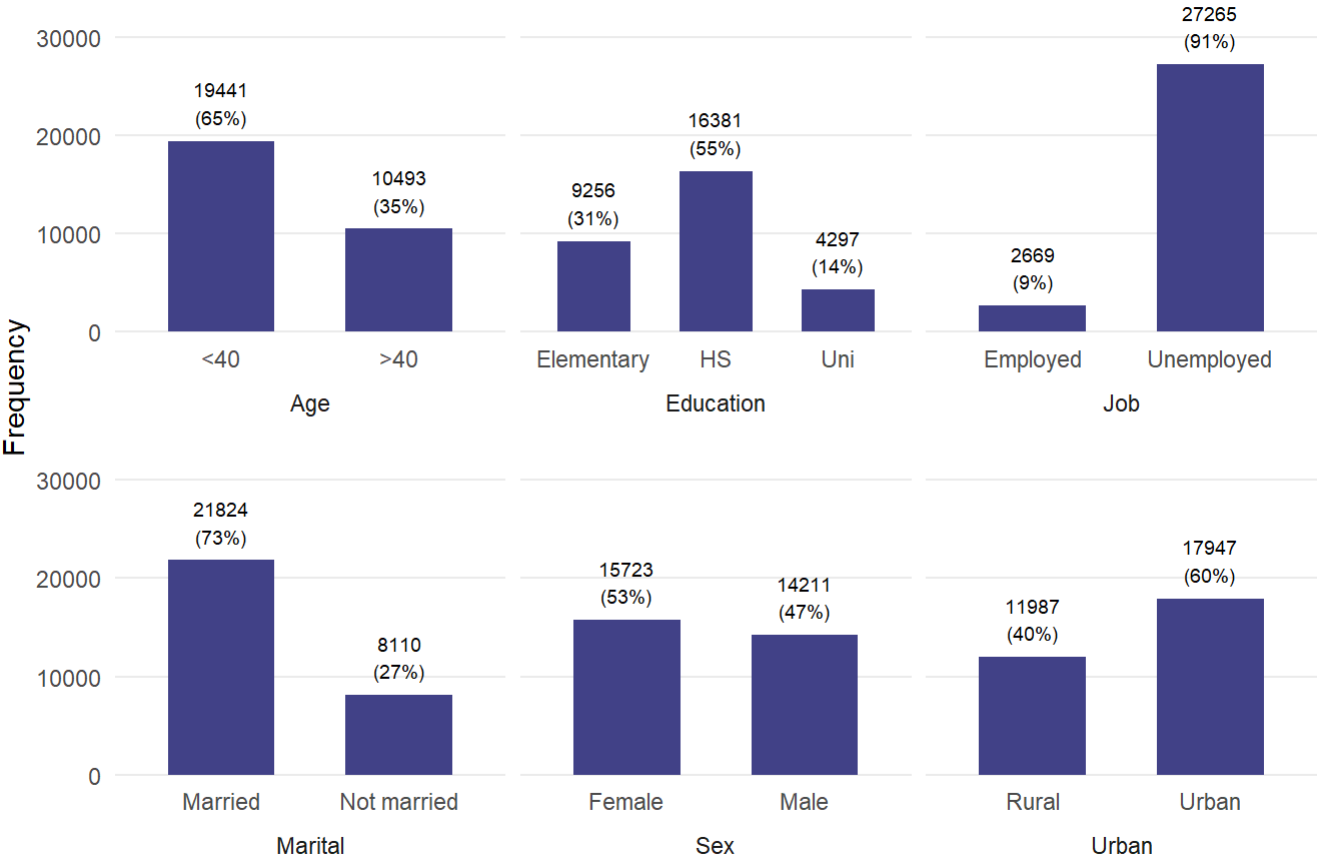
		Mean	Std. Dev.
BMI		2.3	0.8
		N	Pct.
Age	<40	19441	64.9
	>40	10493	35.1
Sex	Female	15723	52.5
	Male	14211	47.5
Marital	Married	21824	72.9
	Not Married	8110	27.1
Urban	Rural	11987	40.0
	Urban	17947	60.0

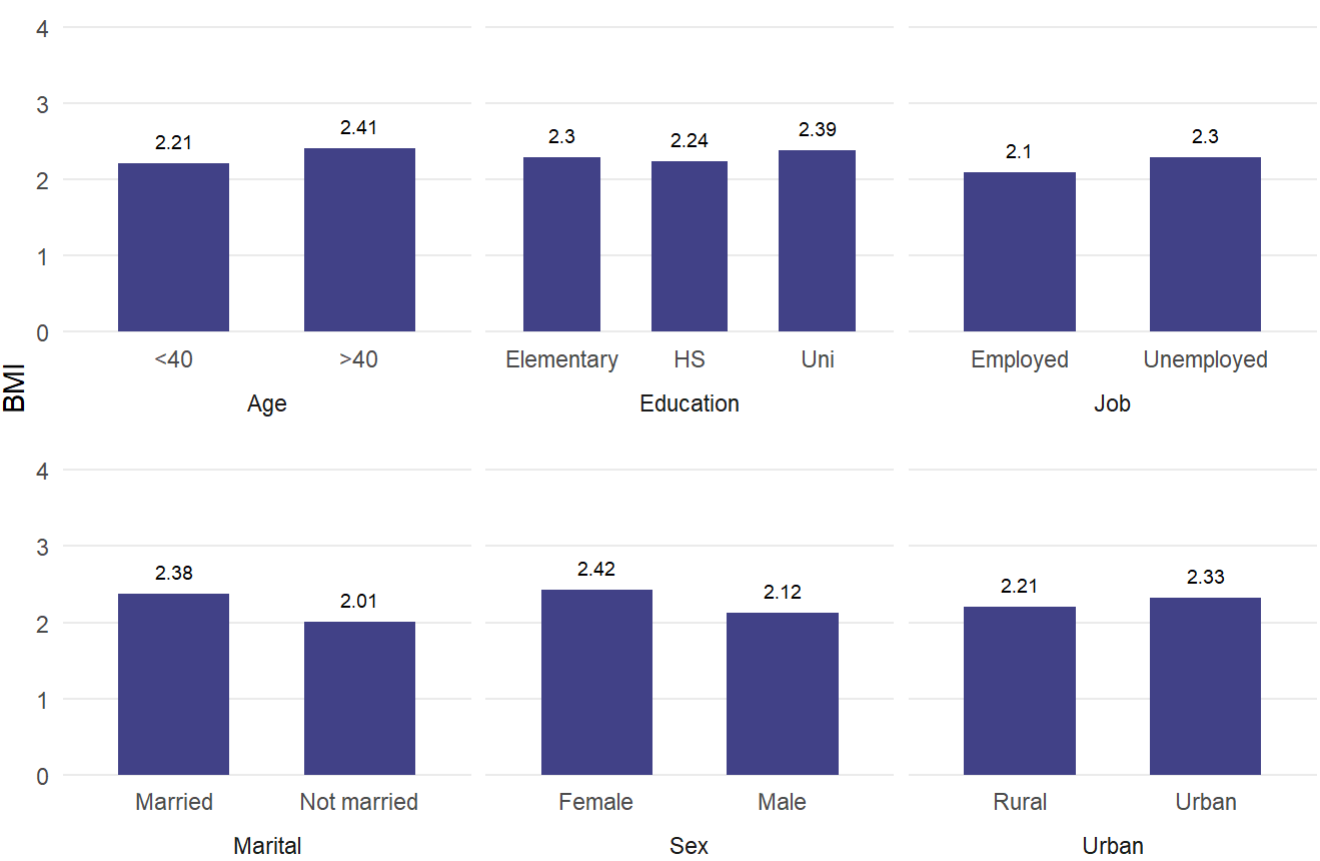|		Mean	Std. Dev.
Education	Elementary	9256	30.9
	High_school	16381	54.7
	University	4297	14.4
Job	Employed	2669	8.9
	Unemployed	27265	91.1

BMI distribution
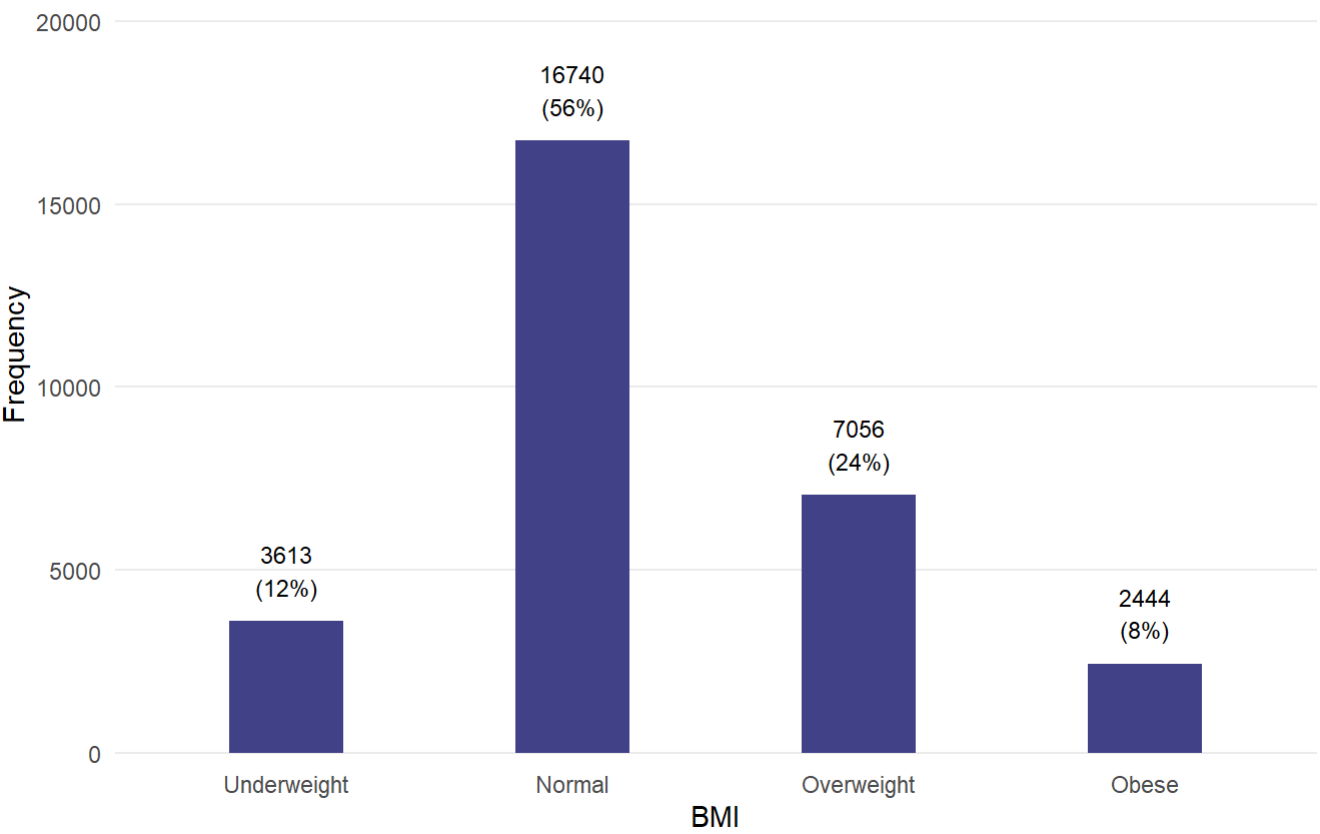
Demographic distribution
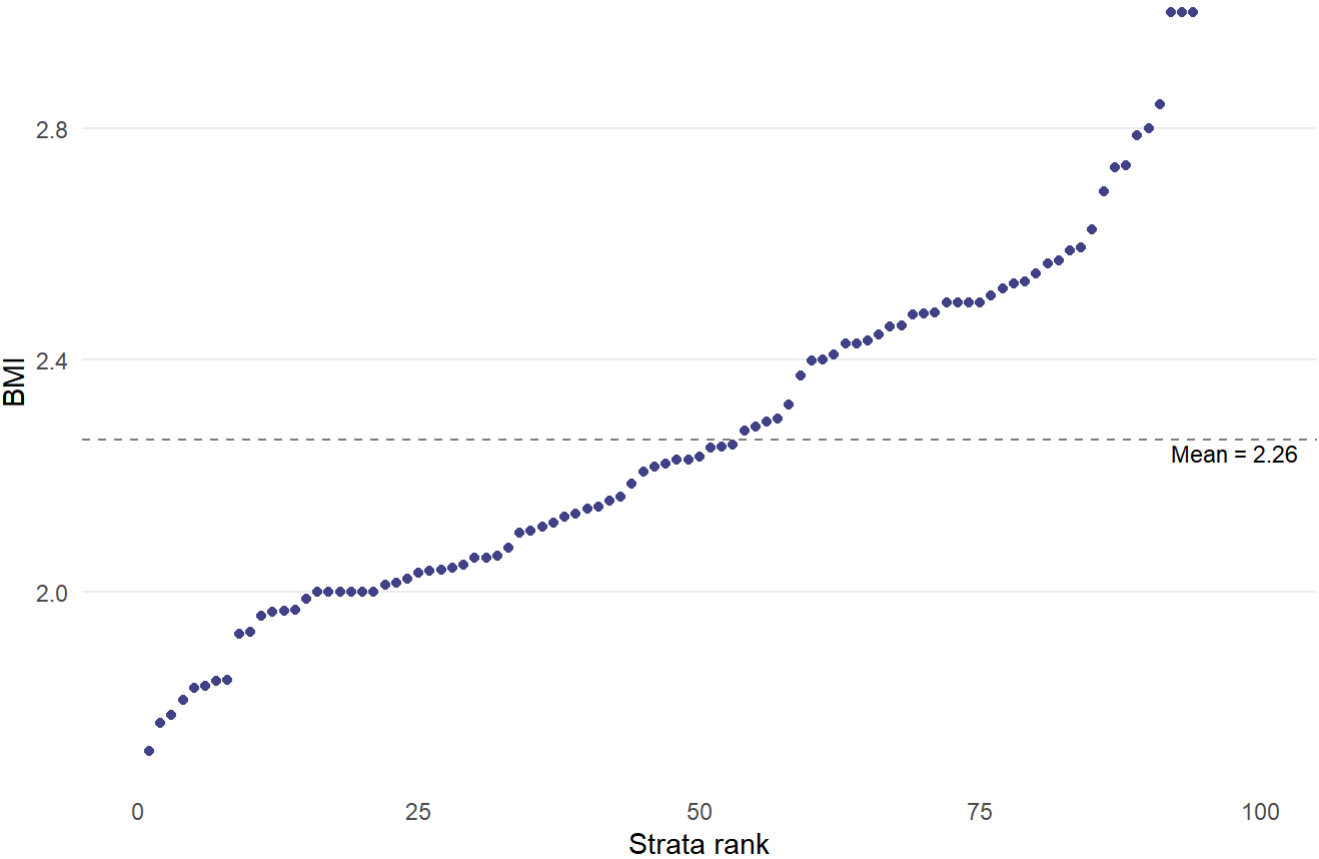

BMI means by demographic

Strata

The strata is defined by combination of age, sex, marital, urban, education and job, resulting in 94 theoretical strata. The individual BMI experience are now viewed as clustered in strata, the variables defining the strata are elevated from individual to stratum level characteristics. Intersectional strata identities and even the characteristics defining them are no longer modeled as personal characteristics (risking "blaming the victim"), but are now modeled as social contexts viewed as encompassing the broader shared social experiences of individuals in each strata.
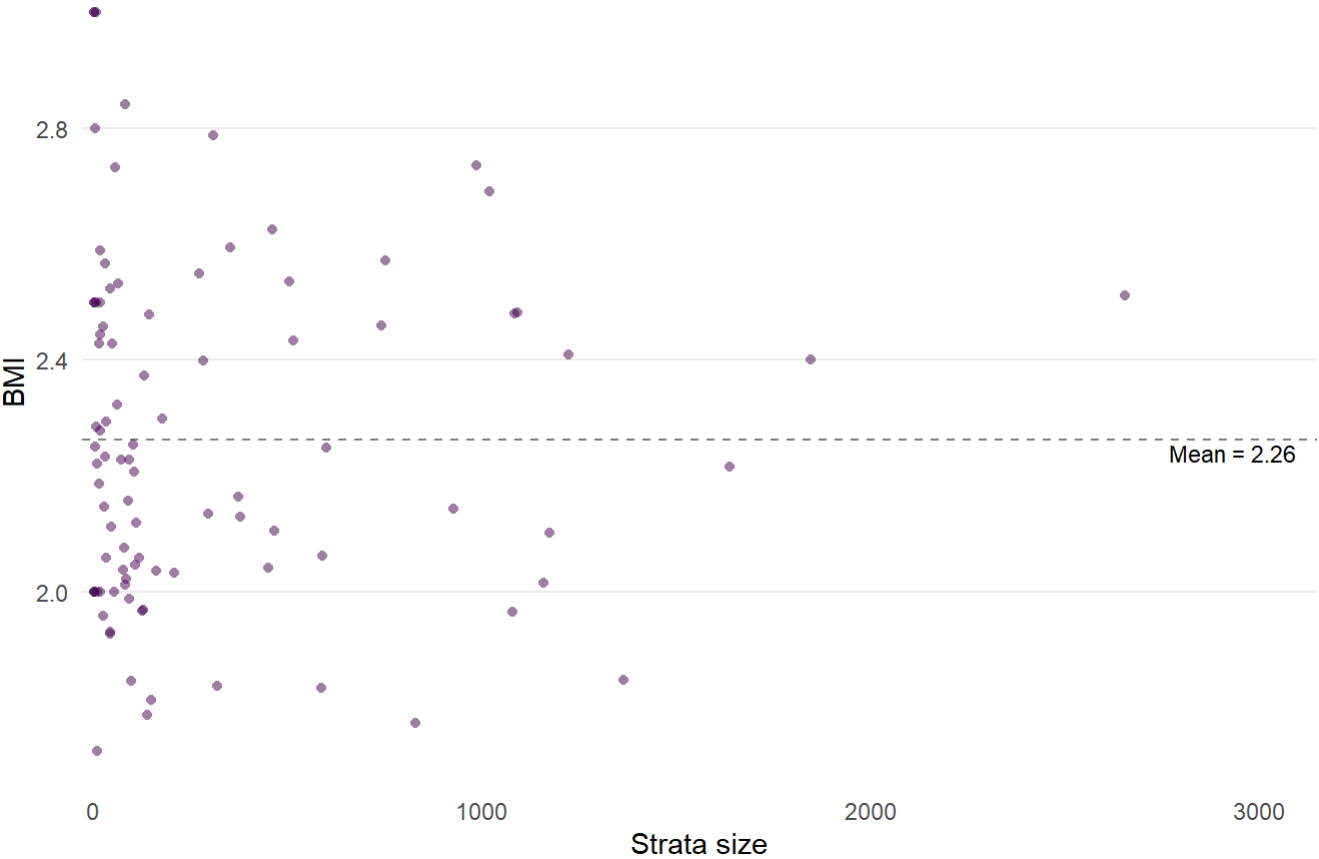
Strata size distribution

Stat	Strata size
Mean	318
Min	1
25th	26
50th	96
75th	432
Max	2656
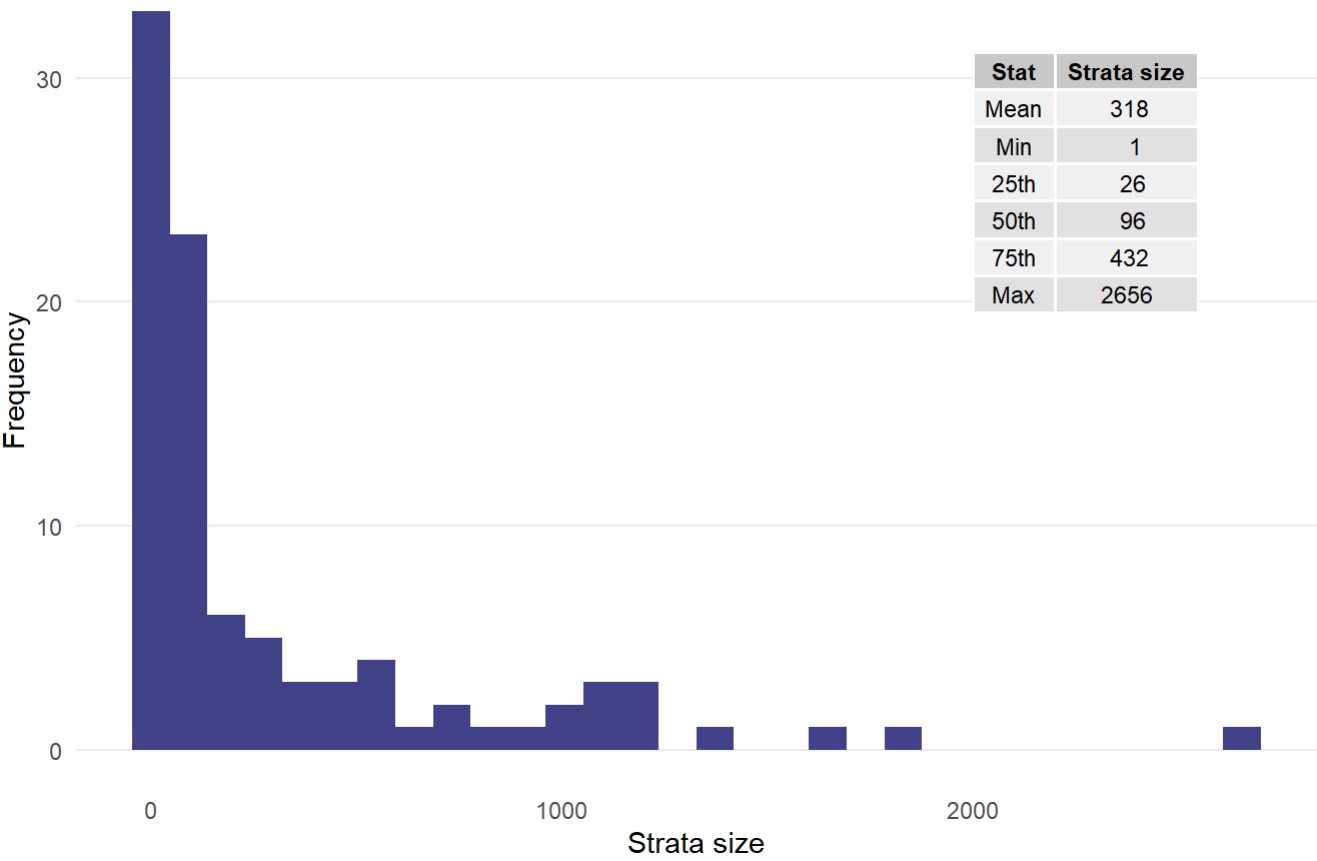
BMI means by strata

BMI means by strata size

Model fit

Model null measures the extent to which individual outcome heterogeneity is explained by sociodemographic intersections vs other factors. Optimally predicts the mean outcome for each stratum.

Model full decomposes sociodemographic mean outcomes into additive and non-additive effects and measures relative importance of interactions. Optimally predicts the strata interaction effects with built in control for type I errors of inference.

Model is fitted by maximum likelihood estimation (MLE).

Predictors	Mental health		Mental health	
	Estimates	CI (95%)	Estimates	CI (95%)
Intercept	2.25	2.19 – 2.30	1.78	1.70 – 1.86
Age: >40			0.20	0.14 – 0.27
Female			0.27	0.21 – 0.33
Married			0.26	0.20 – 0.32
Urban			0.11	0.04 – 0.17
Education: High school			0.04	-0.03 – 0.11
Education: University			0.18	0.10 – 0.26
Job: Employed			-0.07	-0.13 – 0.00
Random Effects				
σ^2	0.53		0.53	
τ_{00}	0.07 $_{strata}$		0.01 $_{strata}$	
ICC	0.11		0.03	
N	94 $_{strata}$		94 $_{strata}$	
Observations	29853		29853	
Marginal R^2 / Conditional R^2	0.000 / 0.120		0.086 / 0.120	

| Measure	Value
VPC	11.38%
VPC adj	2.51%
PCV	79.99%

Variance partition coefficient (VPC) measures the proportion of individual heterogeneity which lies between strata. The variance in individual BMI is 11.38% between strata means, and the rest 88.62% is

attributable to unmodeled factors that vary across individuals. There is less variation between strata means, than within strata. Therefore, the strata has very low discriminatory accuracy. The strata tells us very little about individual toothache.

The VPC adjusted is just 2.51% which is too little for interaction effects to explain the variation.

Percentage change in variance (PCV) measures the degree to which we explain the overall sociodemographic variation by just the main effects. The variation of sociodemographic main effects is 79.99%, and thus only 20.01% of the variation explained by sociodemographic interaction effects.

Predicted BMI strata means: Model 0
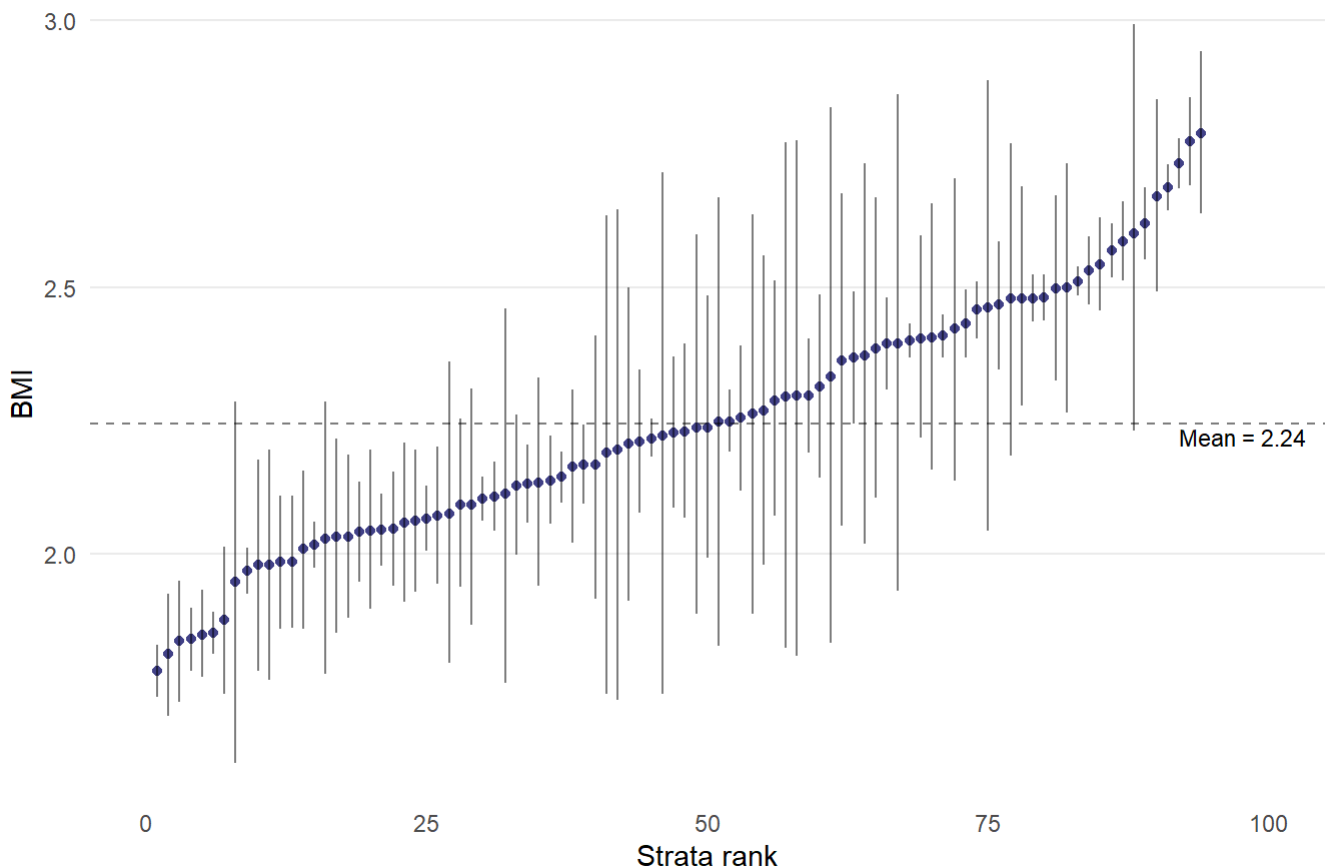
Predicted BMI strata means: Model 1
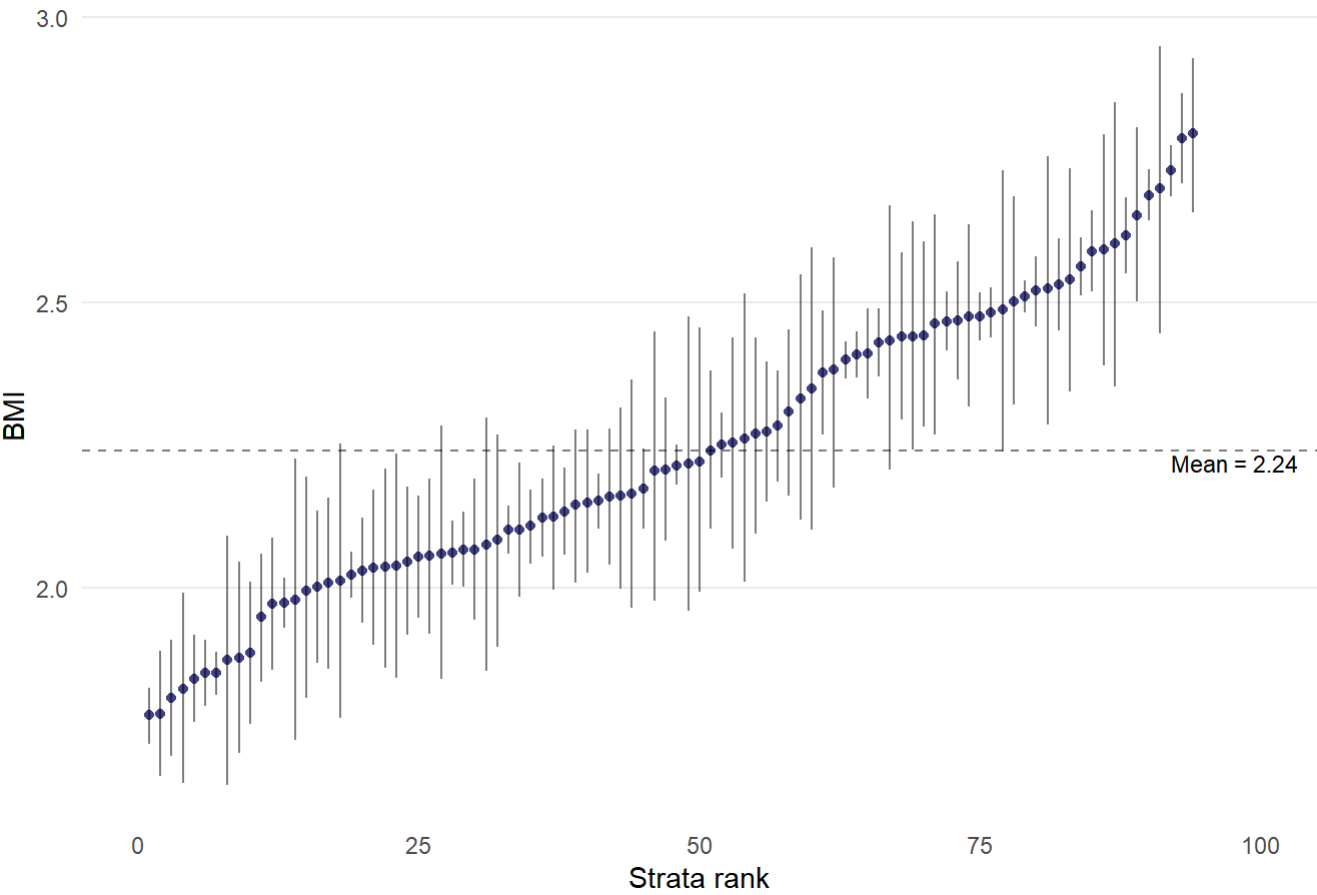
The caterpillar plot gives a sense of not just the variablity in predicted strata means, but their individual imprecision, and their lack of statistical separation.