The effects of socioeconomic status on women's double burden of malnutrition in Nepal

Angela KC[1], Andrew L. Thorne-Lyman[1], Swetha Manohar[1,2], Binod Shrestha[3], Rolf D. Klemm[1], Keith P. West[1]
[1] Johns Hopkins University, Baltimore, USA, [2] IFPRI, Washington, D.C., USA, [3] Feed the Future Innovation Lab for Nutrition, Kathmandu, Nepal

Background

- Nepal is facing an evolving double burden of malnutrition – there rise in the prevalence of overweight and obesity, with persistent burden of underweight.[1]
- Most risk factor studies of women's nutritional status have either focused on the right side of the distribution (overweight) or the left side (underweight) but few have simultaneously explored factors associated the double burden malnutrition, with both over and underweight in the same model – an approach that could have more meaningful implications for policy.

Objectives and Methods

Objective:

- We estimated the prevalence and identified the factors associated with the risk of being underweight and overweight/obesity among women of reproductive age in Nepal
- We hypothesized that SES variation would have disparate effects on the two extremes of malnutrition, exhibiting protective associations with underweight and adverse associations with overweight/obesity.

Methods:

- Sampling: Data was collected in 2016 on a national sample of households with recently married women and/or children under 5 years from 21 Village Development Committees, 7 from each of the three agro-ecological zones of Nepal.
- Sample size: 4,825 non-pregnant women with weight, height and valid BMI measurements.
- Covariates: Continuous covariates included women's age, a 7-item dietary diversity score derived with one point assigned for each food group consumed at least once over the previous 7 days; Categorical covariates included region of residence, SES quintiles generated using principle components analysis of house characteristics and asset ownership, women's education, occupation, household food insecurity calculated using the Household Food Insecurity Access Scale, a summary variable of processed food consumption over 7 days (noodles and snacks), parity, and caste.
- Statistical modeling: We used multinomial logistic regression models with three outcome categories of body mass index (BMI<18.5kg/m^2, 18.5 to 25kg/m^2, and >25 kg/m^2) to estimate multivariable adjusted relative risks including all covariates described above, with robust standard error to estimate 95% confidence intervals. Analyses were conducted with Stata® SE version 15.1.

Table 1: Background characteristics of women in 2016 (n=4,825 women)

	Underweight	Normal	Overweight/ obese
Total, n (%)	1046 (21.7%)	3066 (63.5%)	713 (14.8%)
Region, n (%)			
Mountains	102 (14.2%)	509 (71.1%)	105 (14.7%)
Hills	160 (12.2%)	847 (64.6%)	305 (23.2%)
Terai	784 (28.0%)	1,710 (61.1%)	303 (10.8%)
Mean age (Median, IQR)	24.5 (21.0-29.0)	26.0 (22.0-30.0)	28.0 (25.0-32.0)
Dietary diversity score (Median, IQR)	6.0 (5.0-7.0)	6.0 (5.0-7.0)	7.0 (6.0-8.0)
SES category, n (%)			
Lowest	286 (32.0%)	563 (62.9%)	46 (5.1%)
Lower	219 (25.3%)	583 (67.3%)	64 (7.4%)
Middle	214 (23.4%)	612 (66.9%)	89 (9.7%)
Higher	185 (19.5%)	608 (63.9%)	158 (16.6%)
Highest	119 (12.8%)	562 (60.3%)	251 (26.9%)
Woman's education, n (%)			
No education	590 (29.2%)	1,247 (61.7%)	184 (9.1%)
Primary	113 (18.1%)	418 (66.8%)	95 (15.2%)
Secondary	237 (17.3%)	895 (65.3%)	239 (17.4%)
Higher secondary or more	106 (13.1%)	506 (62.7%)	195 (24.2%)
Household food insecurity, n (%)			
None	806 (20.7%)	2,460 (63.1%)	630 (16.2%)
Mild	90 (22.0%)	280 (68.3%)	40 (9.8%)
Moderate	100 (27.5%)	226 (62.1%)	38 (10.4%)
Severe	49 (31.8%)	100 (64.9%)	5 (3.2%)
Processed food consumption (7-day frequency) , n (%)			
None	361 (23.1%)	1,037 (66.4%)	163 (10.4%)
1-4 times/ week	242 (22.7%)	667 (62.6%)	157 (14.7%)
More than 4 times/ week	443 (20.2%)	1,362 (62.0%)	393 (17.9%)

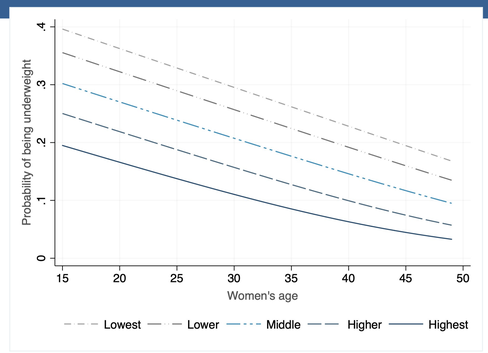
Table 2: Relative risk ratios of women's underweight (BMI<18.5) or overweight/obesity (BMI>25)[1] against the reference group of women with normal BMI.

	Underweight	Overweight/ obese
Region		
Mountains (Ref)	1.00 (Ref)	1.00 (Ref)
Hills	1.25 [0.88, 1.77]	1.13 [0.71, 1.81]
Terai	2.64 [1.96, 3.54] **	1.06 [0.67, 1.67]
Woman's age	0.96 [0.94, 0.98] **	1.10 [1.07, 1.12] **
SES category		
Middle (Ref)	1.00 (Ref)	1.00 (Ref)
Lowest	1.27 [1.05, 1.52] *	0.63 [0.41, 0.98] *
Lower	1.13 [0.90, 1.42]	0.79 [0.50, 1.22]
Higher	0.80 [0.63, 1.02]	1.71 [1.29, 2.26] **
Highest	0.65 [0.47, 0.89] *	2.42 [1.82, 3.22] **
Woman's education		
No education (Ref)	1.00 (Ref)	1.00 (Ref)
Primary	0.66 [0.51, 0.86] *	1.48 [0.95, 2.32]
Secondary	0.68 [0.54, 0.86] *	1.67 [1.12, 2.49] *
Higher secondary or more	0.66 [0.48, 0.92] *	1.56 [1.02, 2.38] *
Woman's occupation		
Wage or salaried worker (Ref)	1.00 (Ref)	1.00 (Ref)
Business, trade or self-employment	0.77 [0.46, 1.27]	1.10 [0.68, 1.78]
Agriculture/ livestock/ poultry/ aquaculture	0.95 [0.67, 1.35]	0.53 [0.32, 0.87] *
Non-earning occupation (housewife/ FCHV)	0.81 [0.59, 1.12]	0.60 [0.42, 0.86] *
Student/ not working/ others	0.74 [0.46, 1.19]	0.39 [0.18, 0.86] *
MDDW-7 score	0.99 [0.93, 1.05]	1.08 [0.99, 1.16]
Household food insecurity		
None (Ref)	1.00 (Ref)	1.00 (Ref)
Mild	1.01 [0.75, 1.37]	0.78 [0.55, 1.10]
Moderate	1.23 [0.94, 1.60]	1.05 [0.73, 1.49]
Severe	1.02 [0.69, 1.51]	0.31 [0.13, 0.78] *
Processed food consumption (7-day frequency)		
None (Ref)	1.00 (Ref)	1.00 (Ref)
1-4 times/ week	1.13 [0.94, 1.36]	1.24 [0.95, 1.62]
More than 4 times/ week	0.98 [0.83, 1.17]	1.16 [0.89, 1.50]
Parity		
None (Ref)	1.00 (Ref)	1.00 (Ref)
1-2 children	1.10 [0.79, 1.52]	1.85 [1.20, 2.86] *
3-5 children	1.12 [0.82, 1.55]	1.96 [1.04, 3.69] *
More than 5 children	0.97 [0.59, 1.58]	1.24 [0.47, 3.29]

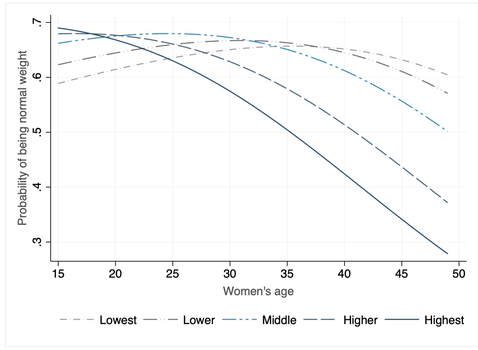
[1]Also adjusted for caste; * p<0.05; ** p<0.01

Results

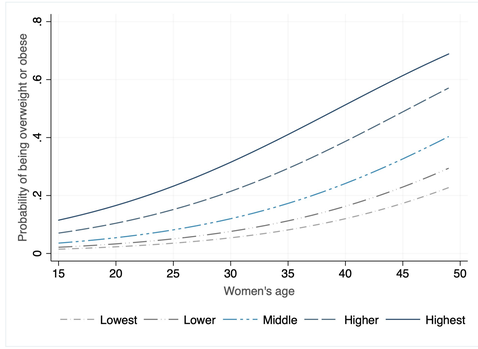
- Nationally, the prevalence of underweight was 21.7%, normal weight was 63.5%, and overweight/obesity was 14.8%.
- Household socioeconomic status had strong monotonically positive and negative associations with women's risk of being underweight and overweight respectively, with the highest SES quintile associated with a ≈2.5 times greater risk of overweight and 35% lower risk of underweight compared to middle SES (**Table 2**).
- Residence in the Terai was associated with more than two-fold risk of underweight but not overweight/obese; residence in the Hills was associated with ≈25% greater risk of being underweight and 13% more risk of being overweight/obese than the Mountains.
- Women's age was associated with a 10% increase in the risk each year, and having up to 5 children was associated with a ≈2 times greater risk of overweight/obese.
- Any processed food consumption increased the risk of overweight/obesity by ~20%.
- Having any education was associated with a ≈50% greater risk of overweight/obese; increasing education was associated with decreased risk of being underweight.
- The predicted probability of being underweight decreased with women's age, while that of being overweight increased with age across all SES strata (**Figures 1a & c**).
- Women in the highest two SES quintiles appeared to have a higher probability of being normal weight when young, but a lower probability when older (**Figure 1b**), a trend that also corresponded with increased overweight risk (**Figure 1c**).



1.a: Probability of being underweight by woman's age and socioeconomic status (SES)



1.b: Probability of being normal weight by woman's age and socioeconomic status (SES)



1.c: Probability of being overweight/obese by woman's age and socioeconomic status (SES)

Figure 1: Probabilities of being underweight, normal weight and overweight/ obese by woman's age and socioeconomic status (SES)

Conclusions

- Underweight persists as an important problem among women in Nepal despite growing prevalence of overweight. Strong regional differences also remain, with Terai having double the underweight prevalence compared to the other regions.
- Prevalence of overweight has surpassed that of underweight in the Hills, but is comparable in the Mountains, suggesting that the three regions are at different stages of the double burden.
- Both SES and age are strongly related to women's BMI in Nepal. Women in the highest SES categories appear to have greater prevalence of normal weight when young and lower when older, corresponding to an increase in the prevalence of overweight/obesity as they age.
- In contrast, the mean probability of normal weight remains largely constant by age for the lower three SES quintiles.

Acknowledgements

Funding sources: Support for this research was provided by the Feed the Future Innovation Lab for Nutrition, which is funded by the United States Agency for International Development under grant ID: AID-612-LA-15-00002. The opinions expressed herein are solely those of the authors.
The authors would like to express special gratitude to the Nutrition Innovation Lab team and the study participants, without whom this research would not have been possible.
For further information contact: Angela KC; akc4@jhu.edu

References

1. Balarajan Y, Villamor E. Nationally representative surveys show recent increases in the prevalence of overweight and obesity among women of reproductive age in Bangladesh, Nepal, and India. The Journal of Nutrition. 2009 Nov 1:jn-109.