

Development and evaluation of the Vietnamese Healthy Eating Index

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Background

The focus on dietary patterns rather than single foods or nutrients has been recommended as a more appropriate approach to explore the relationships between diets and diseases¹. Developing diet quality indices, as the representation of a priori dietary patterns, are characterized by assessing overall diet quality in terms of conformance to the Food based dietary guidelines (FBDGs) is one of these dietary pattern approaches^{2,3}.

To the best of our knowledge, no index is being developed to measure the adherence to the 2016-2020 Vietnamese FBDGs and dietary quality of Vietnamese adults.

Objectives

This study aimed at:

- Developing the Vietnamese Healthy Eating Index (VHEI) to measure the adherence to the 2016-2020 Vietnamese FBDGs for adults and diet quality.
- Examining the associations between the VHEI and households' characteristics, energy and nutrient intake of the study population.

Methods

Study population and dietary assessment

- This is a secondary analysis of the Vietnamese general nutrition survey 2009-2010.
- Food consumption data over the past 24 hours was described by a representative household member who was responsible for preparing meals.
- Data of 8,241 households was translated into individual dietary intake data using the adult female equivalent (AFE) approach.

Development of the Vietnamese Healthy Eating Index

- The eight individual components that contribute to the VHEI were developed to reflect the recommendations for the eight food groups of the Vietnamese FBDGs as described in **Table 1**.
- All component scores were summed up to obtain a total score ranging from 0 (the lowest adherence) to 80 (the highest adherence).

Evaluation of the Vietnamese Healthy Eating Index

- The index was examined to describe the degree to which each individual component influenced the total VHEI score.
- The associations between the VHEI and households' characteristics, total energy and selected nutrients intakes were also examined

Table 1. Operationalization of the Vietnamese Healthy Eating Index

Components of the Vietnamese Healthy Eating Index (VHEI)	Recommended servings daily	Calculations of One serving	Standard for minimum score of 0 points	Standard for continuous scoring of 0 – 10 points	Standard for maximum score of 10 points
Adequacy					
Vegetables	3 – 4	80g vegetables	0	>0 - <3	≥3
Fruits	3	80g fruits	0	>0 - <3	≥3
Optimum					
Grain dishes	12 – 15	20g of carbohydrate	0 or ≥30	>0 – <12 or >15 – <30	12 – 15
Protein dishes	5 – 6	7g of protein	0 or ≥12	>0 – <5 or >6 – <12	5 – 6
Dairy	3 – 4	100mg of calcium	0 or ≥8	>0 – <3 or >4 – <8	3 – 4
Fats and oils	5 – 6	5g lipid	0 or ≥12	>0 – <5 or >6 – <12	5 – 6
Moderation					
Sugar and sweets	< 5	5g sugar	≥10	≥5 – <10	<5
Salt and sauces	< 1	5g salt (1938mg sodium)	≥2	≥1 – <2	<1

Results

- The mean (SD) score of the VHEI was 43.7 (8.2) and ranged from 12.7 to 72.1 out of a possible total of 80.
- All these individual components showed significant positive trend across tertiles of the VHEI as shown in **Figure 1**.

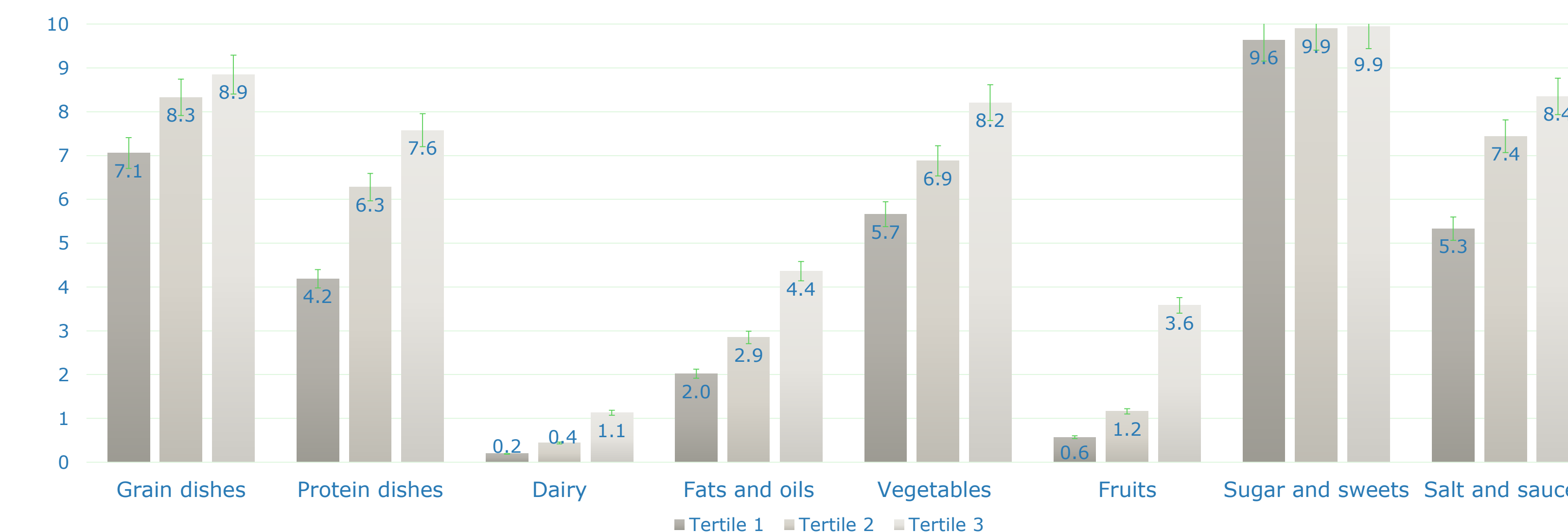


Figure 1. Mean (SD) score of each individual component across tertiles (T) of the Vietnamese Healthy Eating Index (VHEI) (T1 = low score = lower adherence = lower diet quality), means adjusted using sample weights. Eight individual components of the VHEI showed significant positive trend across tertiles of the VHEI as examining by general linear model (P for trend <0.001). Estimated Pearson correlation between each individual component and the total VHEI score): Grain dishes (r = 0.38), Protein dishes and Fruits (r = 0.48), Dairy (r = 0.28), Fats and Vegetables (r = 0.37), Sugar (r = 0.13), Salt (r = 0.36), P<0.001.

- In T3 most households were from Red River delta (29.0%) while in T1 most households were in Northern and central coastal areas (33.2%) (**Figure 2**).
- Approximately 50% of the participants in T1 were from the two lowest income groups, while approximately 60% of the participants in T3 were from the two highest income groups (**Figure 3**).

Figure 2. Ecological zones of surveyed households across tertiles (T) of Vietnamese Healthy Eating Index

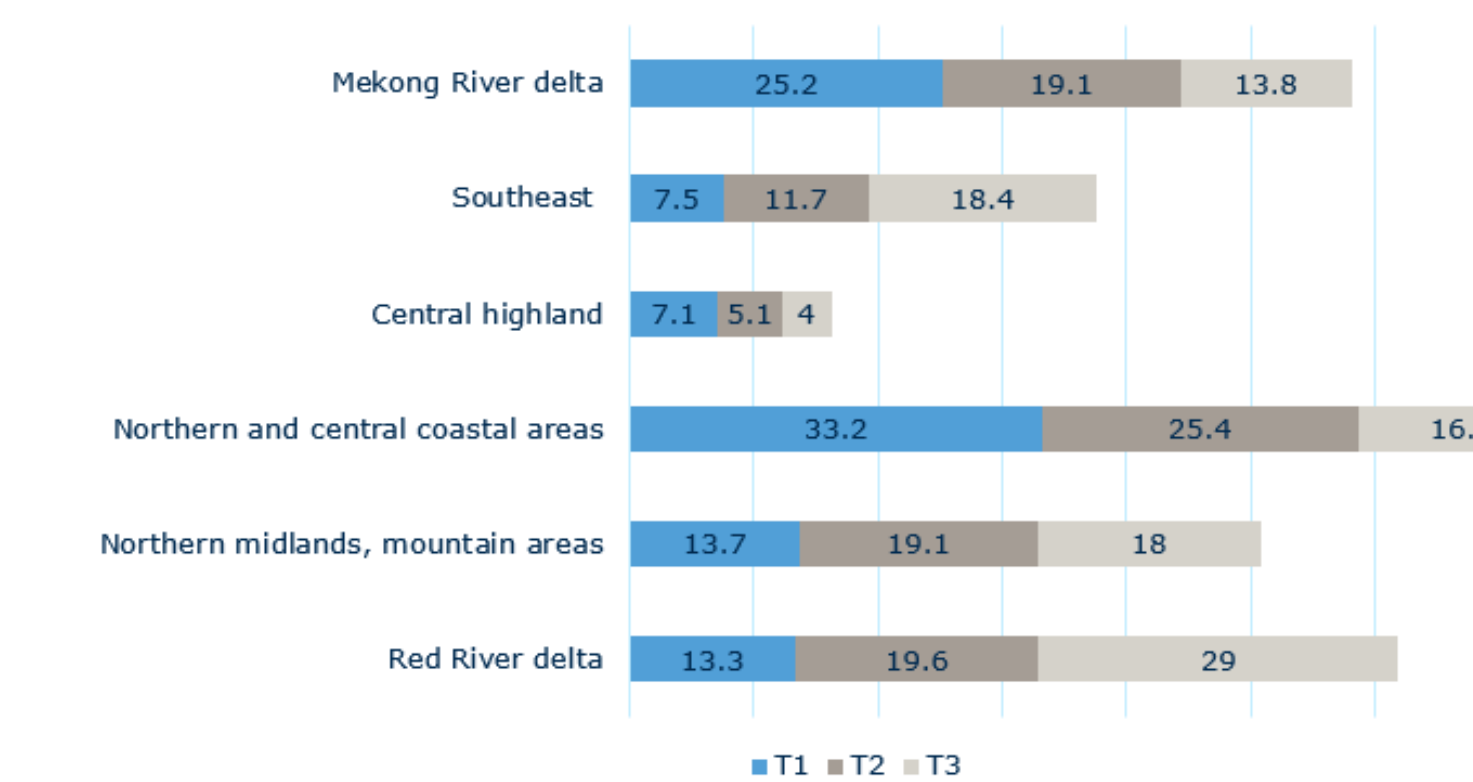
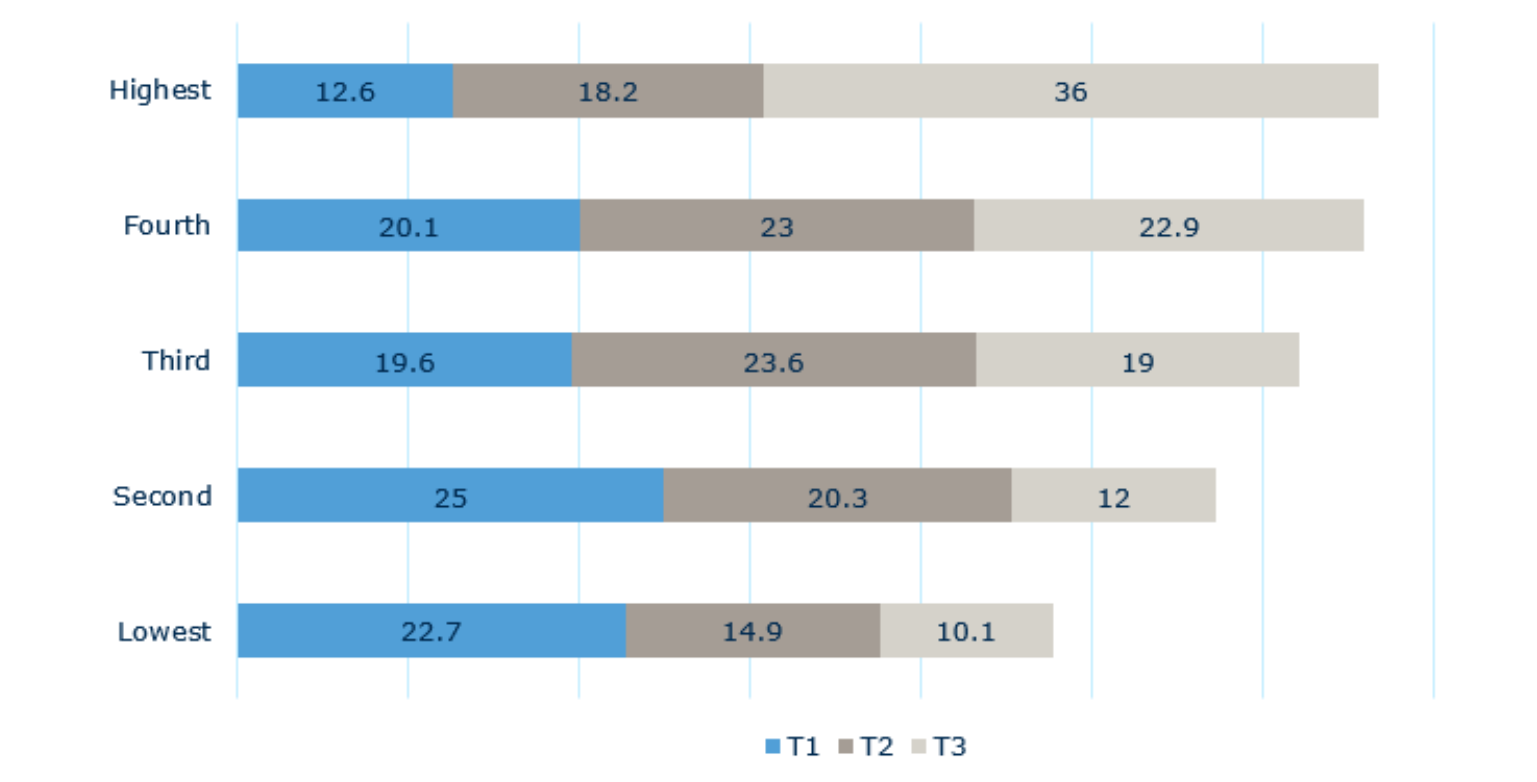


Figure 3. Households wealth of surveyed households across tertiles (T) of Vietnamese Healthy Eating Index



- The intakes of all selected micronutrients were positively associated with the VHEI, both before and after energy intake adjustments, except for thiamin and vitamin E. Positive associations were observed for these nutrients after energy intake adjustment (**Table 2**).

Table 2. Energy-adjusted micronutrients intakes per day of study population across tertiles (T) of Vietnamese Healthy Eating Index (low score = lower adherence = lower quality diet)

Micronutrients* (AFE/day)	Tertile of VHEI						P**
	T1 (n = 2747)		T2 (n = 2747)		T3 (n = 2747)		
Potassium (mg/1000 kcal)	1164.4	351.0	1234.1	316.0	1367.8	311.0	<0.001
Calcium (mg/1000 kcal)	211.5	122.0	235.4	120.0	262.1	118.0	<0.001
Magnesium (mg/1000 kcal)	115.8	60.0	120.0	50.7	131.1	45.9	<0.001
Iron (mg/1000 kcal)	6.3	2.5	6.9	2.4	7.6	2.5	<0.001
Zinc (mg/1000 kcal/d)	5.2	1.1	5.4	1.1	5.6	1.0	<0.001
Folate (µg/1000 kcal/d)	154.8	135.0	187.0	135.1	222.8	139.9	<0.001
Riboflavin (mg/1000 kcal/d)	0.3	0.2	0.4	0.2	0.5	0.2	<0.001
Thiamin (mg/1000 kcal/d)	0.5	0.3	0.6	0.3	0.7	0.2	<0.001+
Vitamin C (mg/1000 kcal)	31.2	32.7	38.8	30.7	54.4	36.8	<0.001
Vitamin B6 (µg/1000 kcal)	0.8	0.3	0.9	0.3	1.0	0.3	<0.001
Vitamin B12 (µg/1000 kcal)	1.2	1.6	1.5	1.6	1.6	1.6	<0.001
Vitamin E (mg/1000 kcal)	1.9	1.7	2.4	1.7	2.8	1.6	<0.001+

AFE, Adult Female Equivalent.

(*) Data is in means and standard deviation, means adjusted using sample weights; (**) P for trend.

(+) The intakes of micronutrients thiamin and vitamin E were not associated with the VHEI before energy intake adjustments with p=0.064 and p=0.130, respectively.

Conclusion

- Our findings show that the VHEI is a valid tool to rank participants based on their adherence to the 2016-2020 Vietnamese FBDGs.
- The VHEI showed to be a valuable measure of diet quality as participants with a higher VHEI score have higher micronutrient intakes.

References

- (1) Jones-McLean, E.M., B. Shatenstein, and S.J. Whiting, *Dietary patterns research and its applications to nutrition policy for the prevention of chronic disease among diverse North American populations*. Appl Physiol Nutr Metab, 2010. 35(2): p. 195-8.
- (2) Trijsburg, L., et al., *Diet quality indices for research in low- and middle-income countries: a systematic review*. Nutrition Reviews, 2019. 77(8): p. 515-540.
- (3) Kennedy, E.T., et al., *The Healthy Eating Index: Design and Applications*. Journal of the Academy of Nutrition and Dietetics, 1995. 95(10): p. 1103-1108.