

Association between Food Insecurity, a Contribution of the Fruit and Vegetables' Consumption, and Diabetes Incidence among Indonesian Adults

Emyr Reisha Isaura^{1,2*}/Yang-Ching Chen^{1,3}/Shwu-Huey Yang^{1,4,5}

¹ School of Nutrition and Health Sciences, College of Nutrition, Taipei Medical University, Taiwan / ² Department of Biostatistics, Epidemiology, and Population Health, Gadjah Mada University, Indonesia / ³ Department of Family Medicine, Taipei Medical University Hospital, Taiwan / ⁴ Nutrition Research Center, Taipei Medical University Hospital, Taiwan / ⁵ Research Center of Geriatric Nutrition, College of Nutrition, Taipei Medical University, Taiwan

OBJECTIVE

The relationship between food insecurity and chronic disease are well known. Food insecurity related to hypertension and diabetes, which is the main risk factors for cardiovascular disease [1,2]. Food insecure people have some difficulties in providing themselves a balanced diet [3-5]. Tyrovolas and Panagiotakos suggested that increased fruit and vegetable consumption can be a protector from cardiovascular diseases [6]. However, the contribution of the number of days of fruit and vegetables' consumption in the association between food insecurity and the incidence of diabetes among Indonesian adults is rather vague.



Fruit and Veggies' Consumption

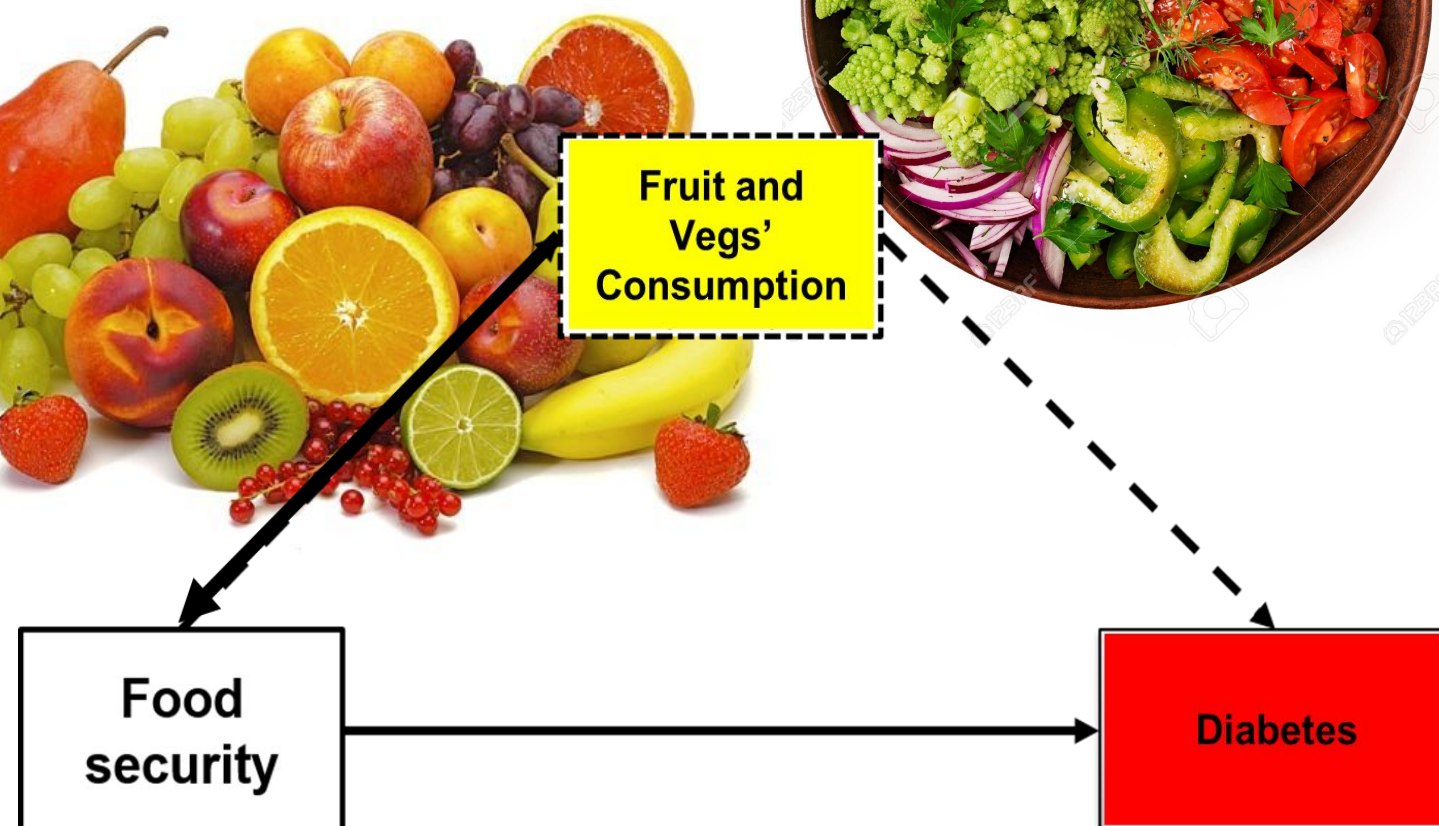


Figure 1. Fruit and Vegetables' consumption may contribute in the association between Food Security and Diabetes

METHODS

Data in this study were obtained from 3955 participants of the Indonesia Family Life Survey (IFLS) in 2007 and 2014. Further, the measurement of food insecurity was used the World Food Programme (WFP) concept that was employed food frequency questionnaire on a food consumption score analysis [7]. Food security practically associated with the frequency of food and the diversity of a person's diet [8-10]. The generalized estimating equation (GEE) test was used to test the hypothesis model while accounting for the health behaviors and socio-demographic characteristics in this study.

Table 1. General Estimating Equations (GEE) Result between Food security, Fruit and Vegetables' Consumption, and Diabetes

DV	IV	β Coef.	CI	P-value
Unadjusted				
Diabetes ^a	FS ^b	-0.010	(-0.017, -0.039)	0.002
	Fruit	-0.001	(-0.001, 5.30x10 ⁻⁵)	0.064
	Vegetables	-0.003	(-0.004, -0.002)	< 0.001
Adjusted				
Diabetes ^a	FS ^b	-2.17x10 ⁻⁴	(-3.70x10 ⁻⁴ , -6.39x10 ⁻⁵)	0.005
	Fruit	-7.56x10 ⁻⁴	(-1.75x10 ⁻³ , 2.35x10 ⁻⁴)	0.135
	Vegetables	-0.001	(-0.002, -4, 16x10 ⁻⁴)	0.006

Abbreviations: DV, dependent variables; IV, independent variables; FS, food security; CI, confidence interval; β coef., β coefficient. Generalized Estimating Equation (GEE) test was used an independent variable (2007 & 2014) and a dependent variable (2007 & 2014) with family (Gaussian) link (identity) correlation (independent). Adjustments variables are age, sex, body shape index, blood pressures, education level, marital status, geographical residences, smoking status, physical activity level. ^a Diabetes categorical data (diabetes vs. non-diabetes) as an dependent variable. Diabetes defined from the self reported questionnaire. ^b Food security level categorized as food secure, food insecure.

RESULTS

The GEE test was confirmed the positive association between food insecurity and diabetes in the adjusted and unadjusted model ($p = 0.005 - < 0.001$). The number of days of vegetables' consumption was statistically negatively associated with diabetes in both models ($p = 0.006 - < 0.001$). The number of days of fruits' consumption was negatively associated with diabetes but not statistically significant in both models. The meal preferences (i.e., fruit and vegetables consumption) are associated with the nutritional knowledge and the ability of the person [3], in particular for people with diabetes.

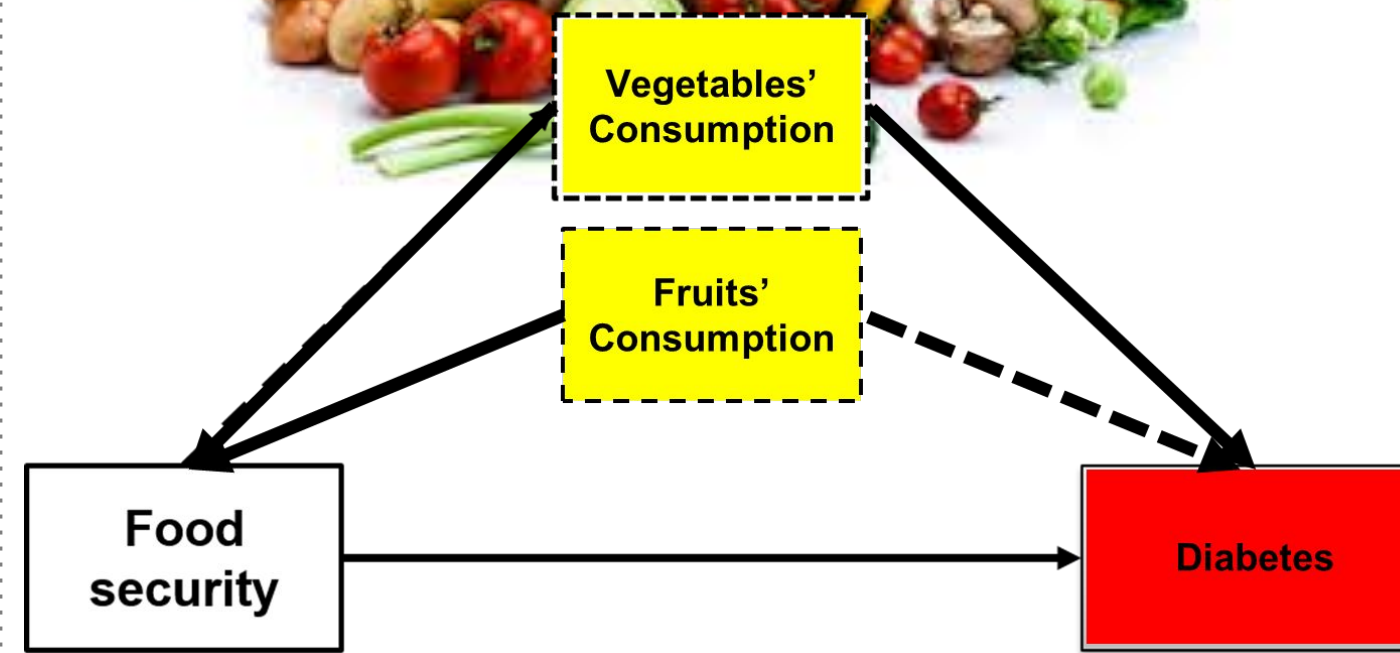


Figure 2. A contribution of Vegetables' consumption in the association between Food Security and Diabetes

CONCLUSIONS

Food insecurity is positively associated while the number of days of vegetables' consumption is negatively associated with diabetes. Strategies to improve the prevention of diabetes among adults may consider enrichment of fruit and vegetables' tailored-meal on the restaurants' menu together with the nutrition education, into account.



BIBLIOGRAPHY

- Isaura, E.R.; Chen, Y.C.; Yang, S.H. The association of food consumption scores, body shape index, and hypertension in a seven-year follow-up among Indonesian adults: A longitudinal study. *Int J Env Res Pub He* **2018**, *15*, 175.
- Seligman, H.K.; Laraia, B.A.; Kushel, M.B. Food insecurity is associated with chronic disease among low-income rhanes participants. *J Nutr* **2010**, *140*, 304-310.
- Drewnowski, A.; Specter, S.E. Poverty and obesity: The role of energy density and energy costs. *Am J Clin Nutr* **2004**, *79*, 6-16.
- Isaura, E.R.; Chen, Y.C.; Yang, S.H. Pathways from food consumption score to cardiovascular disease: A seven-year follow-up study of Indonesian adults. *Int J Env Res Pub He* **2018**, *15*, 1567.
- Laraia, B.A. Food insecurity and chronic disease. *Adv Nutr* **2013**, *4*, 203-212.
- Tyrovolas, S.; Panagiotakos, D.B. The role of mediterranean type of diet on the development of cancer and cardiovascular disease, in the elderly: A systematic review. *Maturitas* **2010**, *65*, 122-130.
- World Food Programme. *Food consumption score nutritional quality analysis guidelines (fcs-n)*; United Nations World Food Programme, Food security analysis (VAM): Rome, Italy, 2015.
- Hoddinott, J.; Yohannes, Y. Dietary diversity as a food security indicator. *Food consumption and nutrition division discussion paper* **2002**, *136*, 2002.
- Wiesmann, D.; Bassett, L.; Benson, T.; Hoddinott, J. *Validation of the world food programme's food consumption score and alternative indicators of household food security*. Intl Food Policy Res Inst: 2009.
- Ruel, M.T. Is dietary diversity an indicator of food security or dietary quality? A review of measurement issues and research needs. *Food Nutr Bull* **2002**, *24*, 231-232.