

Research report

Dietary diversity and food expenditure as indicators of food security in older Taiwanese [☆]Yuan-Ting Lo ^a, Yu-Hung Chang ^b, Meei-Shyuan Lee ^{a,c,d}, Mark L. Wahlqvist ^{a,c,d,e,*}^a Graduate Institute of Life Sciences, National Defense Medical Center, Taiwan, ROC^b Division of Health Policy Translation, Institute of Population Health Sciences, National Health Research Institutes, Taiwan, ROC^c School of Public Health, National Defense Medical Center, Taiwan, ROC^d Monash Asia Institute, Monash University, Victoria, Australia^e Division of Preventive Medicine and Health Services Research, Institute of Population Health Sciences, National Health Research Institutes, 35 Keyan Road, Zhunan, Miaoli 35053, Taiwan, ROC

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ABSTRACT

Food quality is a measure of food security in vulnerable groups. The elderly are often nutritionally vulnerable, but how much of this is reflected in food quality and determined by financial status is unclear. We determined whether expenditure on dietary quality challenges food security in the aged. We used the representative Elderly Nutrition and Health Survey in Taiwan during 1999–2000 ($n = 1783$), and evaluated dietary quality by a Dietary Diversity Score (DDS, range: 0–6) based on a 24-h dietary recall. Monthly mean national food prices were used to estimate food expenditure. In general, it was found to cost more to achieve a greater DDS. The food expenditure of subjects whose DDS = 6 was 2.20 times greater than the DDS ≤ 3 group, after controlling for covariates. Elders of lower socioeconomic status tended to choose foods which would have cost less. However, a sub-group of elders who achieve the highest DDS with limited money offer approaches to food-money management. Nutrition policy directed to food insecure groups, like the aged, could employ health promotion strategies which reduce financial barriers to healthy eating.

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Introduction

Food security is a growing concern worldwide and its measure can facilitate development of improved health policy. Researchers use proxy measures such as coping strategy indices, food expenditure, and dietary diversity for different aspects of food security (Barrett, 2010; Thorne-Lyman et al., 2010). Food diversity has been shown to be important for health – both in increasing the likelihood of nutrient adequacy and lowering mortality rates (Bernstein et al., 2002; Kant, Schatzkin, Harris, Ziegler, & Block, 1993; Lee, Huang, Su, Lee, & Wahlqvist, 2011; Marshall, Stumbo, Warren, & Xie, 2001; Wahlqvist, Kouris-Blazos, & Savige, 2002; Wahlqvist & Specht, 1998). Hence, dietary diversity is a health-related indicator for dietary quality and a useful means of measuring food security (Hoddinott & Yohannes, 2002; Ruel, 2003). The Dietary Diversity Score (DDS) considers both food group numbers and servings and, as

developed by Kant, can be a practical and simple tool for these purposes in individuals (Kant et al., 1993). It has demonstrable predictive power for health outcomes, notably mortality, for the elderly in particular (Lee et al., 2011), unlike some other available food variety instruments where such evidence is pending (FAO, 2008, 2011; Hodgson, Hsu-Hage, & Wahlqvist, 1994; Ruel, 2003).

For older people, the choice and consumption of food is determined especially by quality, taste, health and economic considerations (Lilley, 1996). However, only a few studies have considered the economics of food choice (Cade & Booth, 1990; Drewnowski, Darmon, & Briend, 2004; Lo, Chang, Lee, & Wahlqvist, 2009; Monsivais & Drewnowski, 2007). That food cost of healthy diets is likely to be more burdensome is evident in Western food patterns (Kettings, Sinclair, & Voevodin, 2009), but few studies have considered this possibility in Asian food cultures or older groups.

Taiwan has a higher elderly poverty rate compared to twelve Western OECD countries (Tai & Pixley, 2008) and poor elders often have to curb their spending on food to have money for medical expenses (Wu, 2009), despite a national health insurance scheme. There is a need to identify means by which food security might be achieved in the face of limited resources for Taiwanese elderly.

The present study explores the association between DDS as a measure of food quality and security in relation to food expenditure among a representative Taiwanese elderly population.

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Materials and methods

Study population

The population studied was that of the representative Elderly Nutrition and Health Survey in Taiwan, conducted between 1999 and 2000 (Pan et al., 2005; Wu et al., 2005). There were 1911 free-living participants who provided a 24-h dietary recall. We excluded 126 participants who had extremely high or low total daily energy intakes (<500 or >3500 kcal/day in women, <800 or >4200 kcal/day in men), and 2 participants reported that they drank milk only. This left 1783 eligible participants (874 men and 909 women). The study protocol was approved by the ethics committees of both Academia Sinica and the National Health Research Institutes in Taiwan.

Dietary Diversity Score (DDS)

A DDS was generated based on the presence of six food groups from a 24-h dietary recall. The six food groups (dairy, meats, rice and grains, fruits, vegetables, and fat and oil) were determined according to the Taiwanese Food Guides (DOH, 1995). The “meats group” comprised protein rich foods, i.e., eggs, fish and shellfish, soybean products, and meat (live-stock and poultry). A minimum intake of half a serving per day for one food group is required for a DDS score of 1. Thus, the DDS ranged from 0 to 6 with higher scores correlating with better nutrient intakes (Kant et al., 1993; Lee, Huang, & Wahlqvist, 2010; Lee et al., 2011).

Food price calculation

Food categorization

There were 3646 individual food items in the 24-h dietary recalls. To best achieve food price assignment, we combined, categorized and encoded similar food items. Food combination and categorization were based on: (1) the same or similar names, e.g., white pomfret, pomfret, silver pomfret, and harvest fish were placed in the same class; (2) similar nutrient profile, e.g., chicken nugget, chicken drum stick or thigh and chicken wing were

classified into chicken; (3) comparable food physical properties, e.g., various cookies, ice creams or different juices; and (4) similar ingredients and different preparations, e.g., sunny-side up egg, over hard egg and scrambled egg were classified as egg. The condensed list of 843 foods was further classified into twelve categories: rice and grains, dairy, meat (live-stock and poultry), fish and shellfish, eggs, soybean products, vegetables (vegetable, mushroom, and seaweed), fruits, fat and oil, and miscellaneous.

Food pricing

Food retail prices (in New Taiwan Dollars, NTD) were compiled from the Taiwanese Council of Agriculture, databases such as those of the Agriculture and Food Agency, Poultry and Livestock Products Current Trade, and the Fisheries Agency from January 1999 to December 2000 (AFA, 1999–2000a, 1999–2000b; FA, 1999–2000). Food prices were also obtained from a widely available supermarket chain with consistency across Taiwan using non-discounted pricing in 2009. For packaged foods, the price of the large package size was selected for the various brands on the basis of a cultural preference for the less costly items on a cost per serving bases. The supermarket prices were deflated according to the Consumer Price Index (CPI) for 1999–2000. We were able to find prices for most food items; but for those that were not available, proxy prices were used based on the lowest food prices for the same food classification or lowest food prices for products with similar ingredients. In the case of ready-to-eat foods, the prices of frozen-food and delicatessen items were used (Monsivais & Drewnowski, 2007). For each food, price per 100 g as purchased was derived. Of the 843 foods, the prices for 628 foods (75%) were available; the remaining 25% were calculated via proxy.

Food expenditure

All foods were recorded with the weight of the as-purchased form. The food prices were expressed as NTD/100 g by interview month from 1999 to 2000. Food cost (NTD/day) was calculated by multiplying the purchased weight (g) by the price of food (NTD/g), and summing the cost of all foods which an individual consumed. This food cost was used as the food expenditure of participants' and it was assumed that they ate at home. This food expenditure did not include alcohol, drinking water or condiments.

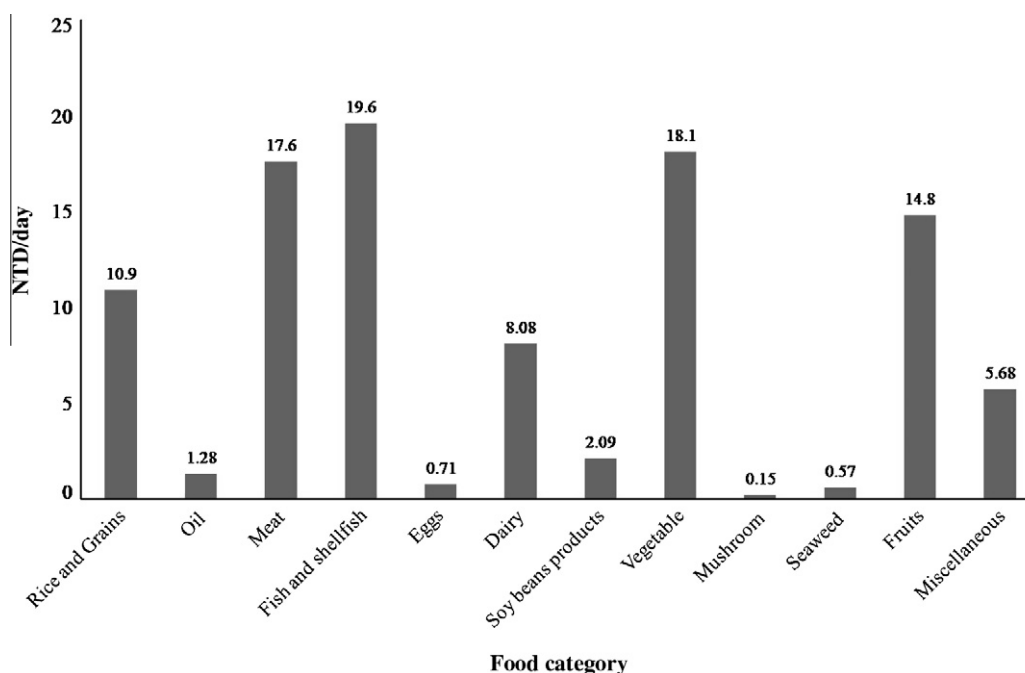


Fig. 1. Mean daily expenditure (NTD/day) of 12 food categories.

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